JOINT TECHNICAL DOCUMENT

Volume II-B

Appendices G through U
Gregory Canyon Landfill
San Diego County, California

September 2010, January 2011

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Joint Technical Document

Gregory Canyon Landfill

San Diego County, California

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Volume II-A
Appendices
A thru F

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JOINT TECHNICAL DOCUMENT
FOR THE
GREGORY CANYON LANDFILL
VOLUME II-B

TABLE OF CONTENTS

LIST OF APPENDICES

Appendix G:	Monitoring and Reporting Plan
Appendix G-1:	Water Supply Report
Appendix G-2:	Workplan for Additional Groundwater Monitoring Well Installation and Wellhead Protection Area Identification at the Proposed Gregory Canyon Landfill Site
Appendix H:	Liner Performance Evaluation Proposed Composite Liner System
Appendix I:	100-Year Developed and Undeveloped Hydrology Study
Appendix I-1:	Storm Water Management Plan and Hydrogeomorphology Report
Appendix I-2:	Biological Assessment for the Gregory Canyon San Luis Rey River Bridge Replacement
Appendix I-3:	Habitat Restoration and Resource Management Plan for Gregory Canyon Landfill Property
Appendix J:	Drainage Calculations
Appendix K:	Excerpts from Evaluation of Air Toxics Health Risks - Final Report (Dames & Moore, January, 1999)
Appendix L:	Soil Loss Analysis
Appendix M:	Geotechnical Construction Quality Assurance (CQA) Plan for Construction of the Final Cover System
Appendix N:	Geotechnical Construction Quality Assurance (CQA) Plan for Construction of the Liner System
Appendix O:	Post-Closure Maintenance and Monitoring Forms
Appendix P:	Financial Assurance Documentation
Appendix Q:	San Luis Rey Municipal Water District Agreement, dated April 1996 and First Supplement, dated June 2004
Appendix R:	Closure and Post-Closure Cost Estimate Back-Up Information
Appendix S:	Tentative Waste Discharge Requirements and Monitoring and Reporting Program Order No. R9-2009-004
Appendix T:	Memorandum – Trash BMPs for Bridge
Appendix U:	Site Capacity

APPENDIX G

MONITORING AND REPORTING PLAN

MONITORING AND REPORTING PLAN

GREGORY CANYON LANDFILL
SAN DIEGO, CALIFORNIA

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Revision 1: November 2003
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735

MONITORING AND REPORTING PLAN
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS

SECTION **PAGE**

1.0 INTRODUCTION 1

2.0 SETTING 1
- 2.1 General 1
  - 2.1.1 Location 2
  - 2.1.2 Site Use 2
  - 2.1.3 Adjacent Land Use 2
- 2.2 Topography and Drainage 2
- 2.3 Regional Geologic Setting 3
  - 2.3.1 Regional Stratigraphic Setting 3
  - 2.3.2 Regional Structural Setting 3
- 2.4 Regional Hydrogeologic Setting 4
  - 2.4.1 Surrounding Water Uses 6
- 2.5 Local Geology 7
  - 2.5.1 Local Stratigraphy 7
  - 2.5.2 Local Structural Geology 10
- 2.6 Local Hydrogeologic Setting 12
  - 2.6.1 Surface Water Flow 12
  - 2.6.2 Groundwater Flow 12
  - 2.6.3 Water Chemistry 15
  - 2.6.4 Background Water Quality Database Development .. 18

3.0 WATER QUALITY MONITORING PROGRAM 19
- 3.1 General 19
- 3.2 Monitoring Points and Points of Compliance 19
  - 3.2.1 Monitoring System 19
  - 3.2.2 Proposed Detection Monitoring Program Frequency 23
- 3.3 Sampling and Analysis 23

736

MONITORING AND REPORTING PLAN
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS (CONT'D)

SECTION **PAGE**

3.4 Monitoring Parameters 24
3.4.1 Groundwater Monitoring Parameters 24
3.4.2 Surface Water Monitoring Parameters 25
3.4.3 Vadose Zone Monitoring Parameters 25
3.4.4 Leachate Monitoring Parameters 25
3.5 Concentration Limits and Statistical Analysis 26
3.6 Proposed Monitoring Frequency 26

4.0 CLOSURE 27

LIST OF TABLES

Table 1 - Site Monitoring Well Information
Table 2 Monitoring Well Construction Data
Table 3 - Historical Summary – Monitoring Well GLA-2
Table 4 - Historical Summary – Monitoring Well GLA-4
Table 5 - Historical Summary – Monitoring Well GLA-5
Table 6 - Historical Summary – Monitoring Well GLA-10
Table 7 - Historical Summary – Monitoring Well GLA-11
Table 8 - Historical Summary – Monitoring Well GLA-12
Table 9 - Historical Summary – Monitoring Well GLA-13
Table 10- Historical Summary – Monitoring Well GLA-14
Table 11- Historical Summary – Monitoring Well GLA-16
Table 12- Historical Summary – Monitoring Well Lucio #2
Table 13- Historical Summary – Monitoring Well MWD #34
Table 14- Comparison Data – Bedrock Aquifer
Table 15- Comparison Data – Alluvial Aquifer
Table 16- Historical Summary – Surface Water Station SLRSW-1
Table 17- Historical Summary – Surface Water Station SLRSW-2
Table 18- Comparison Data – Surface Water

MONITORING AND REPORTING PLAN
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS (CONT'D)

LIST OF FIGURES

Figure 1 - Gregory Canyon Landfill Site Map
Figure 2 - Site Location Map
Figure 3 - Configuration of the Water Table in the Alluvial Aquifer on 12/16/96
Figure 4 - Configuration of the Piezometric Surface in the Fractured Bedrock Aquifer on 10/09/04
Figure 5 - Proposed Detection Monitoring Network

ATTACHMENTS

1 Sampling and Analysis Plan
2 Boring Logs and Well Construction Diagrams

1.0 INTRODUCTION

This report is submitted to satisfy the requirements of Section 20385 of Title 27 of the California Code of Regulations (CCR Title 27) and the Code of Federal Regulations Title 40 (40 CFR), part 258.50 through 258.54, which requires landfill owners/operators to implement a Detection Monitoring Program (DMP) to provide best assurance of earliest detection of a release from the waste management unit. This proposed Monitoring and Reporting Program (M&RP) applies to the DMP for the proposed GCLF in San Diego County, California.

This M&RP is proposed for inclusion in the Waste Discharge Requirements (WDRs) for the proposed GCLF in San Diego County, California. The GCLF will operate as a Class III municipal solid waste facility, under the regulatory oversight of the California Integrated Waste Management Board (CIWMB) and the San Diego Regional Water Quality Control Board (RWQCB). The proposed M&RP has been prepared in accordance with CCR Title 27, and is intended to accommodate the monitoring requirements associated with development of the GCLF.

2.0 SETTING

2.1 GENERAL

The GCLF will be situated on an approximately 196-acre portion of a land parcel (including 13 acres for power pole pads) with a total area of 1,770 acres (Figure 1). The Gregory Canyon Ltd. has purchased the property and intends to reserve a minimum of 1330 acres as an environmental "buffer" and use 308 acres for landfill activities. The 308 acres will be partitioned into a 183-acre refuse area footprint, 87 acres designated as stockpile/borrow areas west of the proposed landfill footprint, 12 acres for an ancillary facilities area, 7 acres for the access road, bridge and internal haul road, and approximately 6 acres for two desilting basins.

The proposed landfill will be permitted as a Class III landfill accepting non-hazardous solid wastes and construction and demolition (inert) wastes, using the canyon and area fill method of filling. The daily maximum tonnage permitted will be a maximum of 5,000 tons per day (tpd), with a total site life of approximately 30 years. The final grading contours will reach a maximum elevation of 1,100 feet above mean sea level (amsl), for an ultimate disposal capacity of 30 million tons of refuse.

Currently, the California Environmental Quality Act (CEQA) review process has been completed with regulatory permitting being conducted in 2004. Gregory Canyon Ltd. anticipates that ancillary facilities and initial refuse cell development will be completed in 2005. The GCLF could be ready for disposal operations in 2005.

2.1.1 LOCATION

The GCLF is located in northern San Diego County, off State Route 76 (SR-76). The proposed landfill will fill Gregory Canyon, a north-draining tributary canyon to the San Luis Rey River valley (Figure 2).

2.1.2 SITE USE

Gregory Canyon is an undeveloped canyon, without a previous history of agricultural, industrial, commercial, or residential use. Since access to the site is unrestricted to animals, persons, or vehicles, likely past uses may have included recreational hiking, cattle grazing, and off-road vehicle traffic.

2.1.3 ADJACENT LAND USE

Land adjacent to Gregory Canyon is used for agriculture, dairy farming, and sand and gravel extraction. Two dairies (Lucio and Verboom) have operated to the northwest of the canyon for a number of years, on land currently leased from Gregory Canyon Ltd. The Lucio Dairy, north of the San Luis Rey River and south of Pala Road, closed in 1986, before Gregory Canyon, Ltd. purchased the property. The Verboom Dairy, which is also located south of Pala Road and west of the Lucio Dairy, closed more recently.

The Hanson sand and gravel extraction operation is located to the northeast of the site. This operation mines the alluvial deposits of the San Luis Rey River, which runs from east to west 500 feet north of the northernmost edge of the proposed landfill footprint. The active channel of the river has an elevation of 310 feet amsl, whereas the lowest point in the landfill will have an elevation of 380 feet amsl. The piezometric level at the toe of the landfill is at approximately 340 feet amsl, 30 feet above the active channel of the river.

West of Gregory Canyon there is undeveloped grassy land, while south of Gregory Canyon there is extensive acreage used for citrus and avocado orchards in the drainage basin of Couser Canyon. The Pala Indian Reservation is located to the east of Gregory Canyon and includes a portion of Gregory Mountain. Overall, the reservation land is rural, with limited agricultural and more recent commercial development, including a gaming facility, vehicle fueling station, and approximately 500-room hotel.

2.2 TOPOGRAPHY AND DRAINAGE

The proposed landfill site is located in Gregory Canyon, a north-draining tributary canyon to the San Luis Rey River valley (Figure 2). East of the canyon, Gregory Mountain rises steeply to a maximum elevation of 1844 feet (ft) amsl. The western ridge is less steep, and rises to a maximum elevation of only 940 feet amsl. The

thalweg of the existing canyon drops in elevation from about 920 ft amsl at the head of the canyon on the south, to about 320 ft amsl at its northern terminus. The average slopes are about 5:1 (horizontal:vertical) near the canyon thalweg, become 2:1 at the east edge of the proposed landfill footprint, and are often 1:1 or steeper on the upper part of the eastern slope above the site. The western flank of the canyon is defined by a rounded ridgeline, with rather uniform slopes at inclinations of 2:1 to 3:1.

2.3 REGIONAL GEOLOGIC SETTING

2.3.1 REGIONAL STRATIGRAPHIC SETTING

Pre-batholithic, metasedimentary and metavolcanic rocks outcrop throughout the Peninsular Ranges. In San Diego County, outcrops include the Triassic/Jurassic Bedford Canyon sedimentary sequence and the overlying Jurassic Santiago Peak volcanics.

Late Cretaceous sedimentary rocks in the Camp Pendleton area include the largely non-marine Trabuco Formation, and the marine Williams Formation, which in the San Luis Rey and Encinitas areas, are grouped in the Lusardi and Point Loma Formations. Cretaceous rocks are not exposed in the immediate vicinity of the project site.

Post-Cretaceous rocks lie unconformably (i.e., younger strata were deposited after a period of erosion) on either the Cretaceous rocks or the crystalline basement, but are largely confined to coastal margins some distance from the project site.

In many instances, the crystalline rocks are covered by residual soils, or colluvial, and alluvial deposits. The colluvial deposits are typically located along the base of slopes and are formed as a result of the downslope movement of soil and rock by the force of gravity. The alluvial deposits are found to some degree in most drainages, with deposits of considerable thickness present in the major river valleys.

2.3.2 REGIONAL STRUCTURAL SETTING

The tectonic regime of the region has changed significantly between the time of emplacement of the intrusions of the Bonsall Tonalite and the Indian Mountain Leucogranodiorite and the present. During the Mesozoic, a subduction zone was active off the coast of California, which led to magma generation and intrusion to form these units.Tectonic conditions changed during the Cenozoic, when subduction ceased, and transform faulting began on what is now identified as the San Andreas fault system (i.e., the underthrust of the Pacific plate was replaced by lateral shear between the plates). Horizontal motion started between 25 and 20 million years ago in the San Diego region (Atwater, 1970), and since then the tectonic "grain" of the

Peninsular Ranges province has been dominated by strike-slip faulting along northwest-trending faults like the San Andreas, San Jacinto, Elsinore, and Rose Canyon faults.

The Elsinore fault zone runs about six miles northeast of Gregory Canyon, and is thus the closest of these large structural discontinuities to the site. Like the rest of the mentioned faults, the Elsinore fault zone is the result of the right-slip motion between the North American and Pacific plates.

2.4 REGIONAL HYDROGEOLOGIC SETTING

Gregory Canyon is located in the San Diego Hydrologic Basin, which occupies approximately 3,900 square miles of San Diego County and portions of Orange and Riverside Counties in southwestern California. This hydrologic basin lies within the Peninsular Ranges physiographic province of California. A relatively narrow coastal plain on the west, and rugged mountains and steep-walled, narrow valleys inland that generally trend from east to west characterizes the physiographic province.

The San Luis Rey River occupies a narrow valley in the basin that is filled with water-bearing alluvial sediments bounded by sedimentary rocks in the lower reach of the basin, and igneous and metamorphic rocks in the middle and upper reaches. The alluvial deposits along the San Luis Rey River form narrow elongated groundwater basins. The San Luis Rey Hydrologic Unit has been subdivided into three hydrologic areas from east to west, which include the Warner, Monserate and Lower San Luis (Mission). The Monserate Hydrologic Area occupies approximately the middle one-third of the San Luis Rey Hydrologic Unit and is the closest to the proposed landfill. The Monserate Hydrologic Area is further subdivided into three hydrologic subareas which include from east to west, the La Jolla Amago, Pauma and Pala Hydrologic Subareas (RWQCB 1994). Gregory Canyon is located in the Pala Hydrologic Subarea.

In this area of the site, groundwater moves from east to west, down gradient from the Pauma Basin to the Pala Basin and then to the Bonsall Basin of the Lower San Luis Hydrologic Area. The boundaries of each basin are drawn where the basement complex (hard crystalline rock) is exposed at the surface and where distinct bedrock constrictions in the San Luis Rey Valley segment the valley fill. The alluvial and colluvial deposits of the San Luis Rey River and tributary canyons, are composed mainly of coarse granular materials overlying variably weathered bedrock.

Recharge to the Monserate Hydrologic Area occurs by infiltration of precipitation, subsurface flow from the Warner Hydrologic Area, and infiltration of runoff from the surrounding mountain areas. Surface water flow in the San Luis Rey River is impounded by the dam at Lake Henshaw in the Warner Hydrologic Area, located approximately 23 miles upstream of the project area.

Because ground-water recharge is inconsistent and seasonal, historical depth-to-water measurements from the period 1965 to 1990 for the alluvial aquifer indicate that ground-water levels for a particular well may fluctuate from the ground surface to approximately 25 feet bgs in the center of the valley [California Department of Water Resources (CDWR) 1971; U.S. Geological Survey (USGS) 1990].

Colluvial deposits consisting of sediments ranging in size from clay to boulders interfinger with the alluvial sands and gravels along the basin margins, and underlie the tributary canyons as well. The alluvial deposits of the San Luis Rey River, which are composed of clay- to gravel-size material, and the colluvium occupying the basin margins and tributary canyons overlie variably weathered bedrock.

Total thickness of the alluvial sediments in the Pala Basin ranges from zero at the basin margins to in excess of 165 feet, over the proposed GCLF bridge crossing (GLA, 2000). A study by the USGS (Moreland, 1974) estimated the maximum depth of the alluvium in the Pala Basin at 244 feet (in one well 9S/2W-26G1 located in the far upper reach of the Pala Basin), and an average depth of 150 feet. At well GMW-2 (Figure 2-3), located near the southern edge of the Pala Basin at the mouth of Gregory Canyon, the thickness of alluvium is only about 50 feet (G&M 1990).

Due to an abundance of coarse sand and gravel deposits and minimal clay, the best recharge areas are located in the central and west-central portions of the basin (NBS Lowry, 1995). Reported well yields for alluvium in the Pala Basin from a study by NBS Lowry (1995) indicate rates of production range from 300 gpm to 1600 gpm. Specific capacities for alluvium along the axis of the basin range from 13 gallons per minute per foot (gpm/ft) to greater than 115 gpm/ft of drawdown (Moreland 1974). Hydraulic conductivities range from 750 gpd/ft^2 to 1000 gpd/ft^2.

Granitic and metamorphic crystalline rocks underlie the valley fill and adjacent slopes. Groundwater occurrence and movement in the bedrock medium depends upon fracture size, frequency density and interconnection, rather than matrix properties as in alluvial soils. Though it is common usage to speak of a bedrock "aquifer" (as distinct from the alluvial aquifer), wells penetrating fractures containing groundwater are not typically a dependable source of water for large-scale agricultural, municipal or industrial uses. Highly productive wells completed in bedrock are generally those located within alluvial valleys, which store groundwater that is in hydraulic connection with the underlying fracture system (San Diego County Water Authority [SDCWA], 1997).

Wells within valleys and canyons where surficial deposits are absent or minimal generally yield only small quantities of groundwater and here the bedrock aquifer may be more important for recharge to downstream alluvial aquifers. Although it is a source of recharge to the alluvial aquifer, there has been little attempt to quantify the properties of the bedrock flow system regionally and the Pala Basin as defined by the CDWR (1971) does not include the adjacent bedrock aquifer.

2.4.1 SURROUNDING WATER USES

The Porter-Cologne Water Quality Control Act and the Federal Water Pollution Control Act Amendments of 1972 require that Water Quality Control Plans (Basin Plans) be prepared for the nine state-designated hydrologic basins in the State of California. The State Water Resources Control Board (SWRCB) approved the San Diego Region Basin Plan (Basin Plan) on March 20, 1975 and an update to the Basin Plan was drafted in 1994 (RWQCB 1994). The purpose of the San Diego Region Basin Plan is to identify beneficial water uses, establish water quality objectives, implement a program to meet these objectives, and establish a surveillance program to monitor the effectiveness of the plan.

Traditionally the Pala Basin groundwater has been used for agriculture and livestock, although more recently a few commercial materials companies have been established in the basin. Pala basin groundwater provides nearly all of the potable water supply within the Pala Indian Reservation and the SLRMWD, and is used for other municipal and agricultural purposes in the basin (NBS Lowry, 1995). The largest concentration of known offsite wells in the vicinity of Gregory Canyon is in the alluvial basin of the San Luis Rey River (Pala Basin), with a few additional domestic wells serving dwellings in Couser Canyon. It is anticipated that in the future the Pala Basin groundwater within a mile of the site will be used for municipal and agricultural purposes. The USEPA has not designated the Pala Basin as a sole source aquifer. According to the interviewed operators of the orchards south of Gregory Canyon, irrigation water for these orchards is derived from the San Diego Aqueduct and not from wells.

Because ground water in the Pala Hydrologic Subarea is designated for use as domestic or municipal supply, chemical constituents in ground water must not exceed the maximum concentration limits (MCLs) specified in state and federal regulations. The primary standards are provided in California Code of Regulations, Title 22 (CCR 22), Chapter 15, Article 4, Sections 64431 and 64444, Tables 64431-A and 64444-A and the Code of Federal Regulation, Title 40, part 141. The primary standards are threshold concentrations for specific minerals and chemicals to protect human health.

The state has also developed secondary standards for constituents that may adversely affect the taste, odor or appearance of the water. These secondary MCLs are provided in the CCR 22, Chapter 15, Article 4, §64449, Tables 64449-A and -B. Groundwater in the Pala Hydrologic Subarea is also designated for use as an agricultural supply, and it should not contain concentrations of chemical constituents above these secondary standards.

2.5 LOCAL GEOLOGY

2.5.1 LOCAL STRATIGRAPHY

Various geologic units occur within the project area. In the lower portions of the canyon, a thin veneer of unconsolidated residual soils, colluvial, or alluvial deposits mantles over a substrate of weathered tonalite. Igneous intrusive and metamorphic rocks with various degrees of weathering form the topographic highs. The following subsections describe the geologic units that occur at the site in further detail.

Surficial Soils

According to Woodward-Clyde (1995), the topsoil units encountered in the area vary in thickness from about six inches to three feet, and are composed of silty sand, silty sand with clay, and silty sand with cobbles and boulders. In general, one would expect the steeper, upper slope area of the landfill site to have slightly thinner soil accumulations (0 to 6 inches) than the intermediate or lower slope areas. Underlying the topsoil are residual soil horizons or weathered rocks. The grading plan calls for removal of surficial soils over the entire footprint of the landfill.

Alluvium

Two alluvial units have been mapped at the lower elevations near the mouth of Gregory Canyon. The younger unit, Qal-1 is formed by overbank deposits from the active San Luis Rey river channel, which are interbedded with channel deposits from the Gregory Canyon drainage. These deposits are relatively thin and contain gravels, cobbles and boulders, supported by a sandy silt matrix. The older alluvial subunit, Qal-2, is a terrace remnant of older alluvium from the Gregory Canyon drainage.

The alluvial wedge pinches out to the south, before reaching the footprint of the proposed development. In other words, the buttress at the foot of the landfill, and the refuse prism, will be founded on bedrock, and not on alluvium. The wedge thickens to the north until eventually it merges with the channel deposits of the San Luis Rey River. Well GMW-2, located near the mouth of the canyon, cut through a 50-foot section of alluvial deposits before reaching the underlying bedrock.

Colluvium

Colluvium forms a veneer over most of the surface of the proposed landfill site. In most instances it consists of silty sand with rock clasts that range in size from gravel to very large boulders. Finer-grained deposits, largely devoid of rock clasts, were encountered in test pits located at the southern end of the canyon. Older colluvium

was encountered in some of the test pits and consisted of clayey sand to sandy clay with varying rock content and slight to moderate cementation.

Rock clasts exposed at the surface of the colluvial veneer vary from gravel- to boulder-size material. Boulders of leucogranodiorite, some in excess of 20 feet in maximum dimension, are present along much of the eastern sideslopes. Based on borings drilled during previous investigations, it appears that boulders are extensive in the subsurface.

The thickness of the colluvial deposits in the landfill site area is highly variable. Cross-section interpretations by Geraghty & Miller (1990) show thickness variations from 2 to 50 feet. The upper slope area is likely to be underlain by thin colluvial deposits and surficial soils formed on highly weathered crystalline rock. Debris chutes and drainage channels may be locally backfilled with colluvium of moderate thickness, but in general, the upper slopes are not likely to be underlain by thick, laterally continuous deposits of colluvium. Lower slope areas are expected to be underlain by much deeper and laterally extensive colluvial deposits consisting of a matrix of silty sand and clay around larger cobbles and boulders.

The current grading plan calls for removal of surficial soil and colluvium over the entire footprint of the landfill.

Bedrock

The area of the proposed landfill was included in the regional map of Larsen (1948), who used the term Bonsall Tonalite to describe the rocks underlying the western ridge, and the term Indian Mountain Leucogranodiorite to describe the light-colored, bold outcrops of granitic rock underlying the eastern ridge of the site area. Larsen (1948) also mapped an intervening band of metamorphic rock along the lower slopes of the eastern ridge, which he correlated with the sedimentary Triassic/ Jurassic Bedford Canyon Formation; rocks of this unit have relict volcanic textures, however, and are probably best correlated with the Jurassic Santiago Peak volcanics.

Metamorphic rocks (TJm). The metamorphic rocks present along the easterly slopes of Gregory Canyon form a north-south-trending belt of older rock that was intruded by batholithic rocks. Specifically, the tonalite intruded and intermingled with the metamorphic rock, and both units were subsequently intruded by the leucogranodiorite.

The metamorphic rock band includes amphibolites and metavolcanic rocks, in some locations with migmatitic structure that resembles gneissic banding. The rocks are generally dark blueish gray, hard, and only slightly weathered. They have aphanitic to porphyroblastic textures, but relict porphyritic textures suggest a volcanic protolith for some of the units.

As mentioned above, Larsen (1948) correlated these metamorphic rocks with the Bedford Canyon Formation (a sequence of mildly metamorphosed sedimentary rocks represented by deformed slates, schists, quartzites and localized occurrences of limestone), which is widespread in the Santa Ana Mountains. At Gregory Canyon, however, there are no outcrops of slates, quartzites or marbles, and there is a preponderance of metavolcanic rocks. It seems more reasonable to correlate the Gregory Canyon sequence with the Jurassic Santiago Peak volcanics, a unit composed of metavolcanic and metasedimentary rocks exposed elsewhere in San Diego County.

Of the 183-acre refuse footprint, less than 10 acres along its eastern edge encroach over the outcrop of the metamorphic rocks.

Tonalite (Kbt). The tonalite that underlies the western slopes and the central portion of the Gregory Canyon area is an extensive rock unit in the area. Larsen (1948) referred to this rock unit as the Bonsall Tonalite. The tonalite is a dark gray, phaneritic rock, with medium- to coarse crystallinity that includes a variety of related rock types such as gabbro. Other common variations noted in the tonalite are the locally veined and streaked appearance and the migmatitic fabric that is observed near the contact with the metamorphic rocks.

The rock is also characterized by rare inclusions of the metamorphic rocks, and by numerous leucogranodiorite dikes that include fine-grained aplites and coarse-grained pegmatites.

The tonalite is moderately to intensely weathered in most outcrops, although small cores of only slightly weathered tonalite form boulder knobs on the western flank of Gregory Canyon. Moderately weathered tonalite still preserves its phaneritic texture, but the weathered rock is less cohesive than the pristine rock, and the constituent minerals are slightly altered to oxides and clays, particularly along the edges. The intensely weathered tonalite has a granular texture that only vaguely recalls the original phaneritic texture, and is oxidized throughout. The constituent minerals are partially altered to oxides and clays, and disaggregate easily under pressure. Depth of weathering, as determined from exploratory drilling by Geraghty & Miller (1990), ranges between 65 feet in GMP-3 and 95 feet in GMW-2.

The tonalite comes in contact with the metamorphic rock along the easterly side slopes of Gregory Canyon, although the contact is typically covered by colluvium or obscured by surficial soils. Because the metamorphic rocks were intruded by the tonalite at a relatively high temperature (900° to 1200° C), where the contact was observed in our field investigations, it is irregular and somewhat transitional due to the effects of partial melting of the pre-existing rock. Based on its map position, as inferred from isolated outcrops of both rock types, the contact appears to dip to the east at angles of 20 to 25 degrees.

Leucogranodiorite (Kglgd). The leucogranodiorite map unit is a light-colored, biotite-bearing granodiorite that forms the prominent mountain flanking the eastern side of Gregory Canyon, outside of the footprint of the landfill. This prominent mountain is referred to as Gregory Mountain, but Larsen (1948) referred to it as Indian Mountain and to the light-colored rock as the Indian Mountain Leucogranodiorite. In hand specimen, the rock has a phaneritic texture with medium- to coarse-crystallinity, is light gray to buff, and has less than 5% dark minerals (biotite and iron-titanium oxides). Quartz, plagioclase, and potassium feldspar are the dominant felsic minerals.

Besides forming the core of Gregory Mountain, the leucogranodiorite also forms dikes that cut older units. The dikes vary in thickness from less than an inch up to five feet, and in most instances are pegmatitic. On account of their coarse crystallinity and superimposed fracturing, some dikes may constitute preferential paths of water flow.

The degree of weathering of the leucogranodiorite is generally slight, as can be inferred from the bold outcrops of Gregory Mountain. The dikes, on the other hand, vary in degree of weathering from low to moderate. Moderately weathered dikes are pervasively oxidized and have "cloudy" feldspars, but still preserve their phaneritic texture.

The main body of the leucogranodiorite is in intrusive contact with the metamorphic band midway along the easterly side slope of Gregory Canyon. The contact zone is narrow and abrupt where it can be observed, but is generally buried under talus. Based on its map position, as inferred from the abrupt change in topography, the contact is nearly vertical.

2.5.2 LOCAL STRUCTURAL GEOLOGY

Lineaments

GLA (1997) inspected historical aerial photographs in order to identify potential structural discontinuities in the area of the proposed GCLF. In the small-scale photographs (1:42,500 to 1:65,000), Gregory Canyon seems to be anomalously straight, but in the large-scale photographs it does not appear to be truly "linear".

The lineament analysis did not disclosed regional, through-going discontinuities across the footprint of the site. Likewise, geologic mapping of the site has not disclosed the existence of major faults across the footprint of the landfill, although thin shear zones of limited lateral extent have been mapped. Some of these shear zones have been annealed by granitic dikes, which demonstrates that they are Mesozoic in age.

Discontinuities at Outcrop Level

Structural discontinuities (joints, dikes) are common in the rocks that form the substrate of the canyon. Based on an extensive study of structural discontinuities in both outcrop and exploration boreholes (GLA, 1997), GLA concluded that the main orientations of discontinuity were:

	Dip direction	Strike direction	Dip angle
Direction 1	270°	360°	65°
Direction 2	90°	360°	80°
Direction 3	255°	345°	60°
Direction 4	330°	60°	65°
Direction 5	360°	90°	45°

These predominant orientations are consistent with the overall tectonic stress regime of the area, as described in the section on regional structural geology:

Discontinuities in Boreholes

In 1997, fourteen boreholes were logged with an optical borehole imaging probe (BIP) by COLOG. This technique is based on direct optical observation of the wall of the borehole and is recorded on videotape for viewing. Based on inspection of the BIP log each fracture is identified with a depth, orientation, and fracture ranking from 0 to 5, with a 0 indicating a closed feature, and 5 indicating a wide aperture fracture or fracture zone. Most of the fractures rank from 0 to 2, with only 20 fractures ranked at 3 and only two fractures ranked at 4 (GLA, 1997). A well by well summary of the BIP log data is provided in the Hydrogeologic Investigation Report by GLA (1997) along with a discussion of the cumulative results of fracture strike orientation and dip angles plotted for all of the tested wells. Additional borehole fracture analysis was performed during a supplemental hydrogeologic investigation conducted in 2004, and which included geophysical logging of nine bedrock borings with an optical televiewer (GLA, 2004). Based on review of the fracture data from both investigations, structural orientation and spatial distribution patterns of fractures in boreholes were consistent with the analysis of similar outcrop data discussed above.

Despite the relative abundance of fractures observed in boreholes, few were ultimately correlated with groundwater flow. As suggested by the ranking survey noted above, and by close examination of the borehole videotapes, most fractures are closed with no discernible aperture, or they are filled with mineralization. Fractures in the latter category are vein-like features with no apparent porosity. Some small igneous dikes and large mineral veins related to plutonic processes have been counted as fractures in several boreholes. These features are not water bearing, and would not change the results of the borehole survey were they accounted for.

Data from the surface and subsurface fracture observations indicate that while fracture density is significantly high in the bedrock, generally secondary porosity (created by open fractures) in the water-bearing zone is probably very low. Further discussion of the bedrock fractured flow system (i.e., secondary porosity) is included in Section 2.6.2.

2.6 LOCAL HYDROGEOLOGIC SETTING

The following sections describe hydrogeologic conditions at the GCLF, including surface water flow and drainage controls, and estimated groundwater gradients and flow paths.

2.6.1 SURFACE WATER FLOW

There are no permanent, natural surface water bodies, and no springs at the GCLF. Precipitation-related runoff waters from the site will be channeled into an engineered peripheral drain and debris retention basin. The desilting basin has been designed to accommodate flow from a 100-year, 24-hour frequency rain event.

2.6.2 GROUNDWATER FLOW

There are two distinct groundwater systems within Gregory Canyon. An alluvial aquifer hosted by the sediment wedge on the mouth of the canyon, and a bedrock system hosted by the fractured tonalite that forms the substrate of the canyon. The general direction of groundwater movement in both aquifers is northerly, toward the alluvial aquifer of the San Luis Rey River.

Alluvial aquifer

The alluvial wedge pinches out to the south, before reaching the footprint of the proposed development. In other words, the buttress at the foot of the landfill, and the refuse prism, will overlie bedrock or engineered fill, and not alluvium. The wedge thickens to the north until eventually merging with the channel deposits of the San Luis Rey River. Well GMW-2, located near the mouth of the canyon, cut through a 50-foot section of alluvial deposits before reaching the underlying bedrock.

Figure 3 shows the alluvial aquifer based on water level data collected on December 16, 1996, when there was measurable groundwater in the alluvial wells. This aquifer likely merges with the San Luis Rey alluvial aquifer to the north. Groundwater flow is to the north, under a gradient of about 0.045 ft/ft. Water level measurements recorded for these wells periodically between December 1996 and March 2002 indicate similar configurations of the water table over time, although more recent water level measurements obtained in 2004 indicate that the

majority of the wells no longer contain measurable groundwater on which to develop groundwater contours.

Bedrock Fracture Flow System

The GCLF has 26 bedrock monitoring wells within the proposed landfill footprint and along the periphery of the site. Studies conducted to date indicate that groundwater in Gregory Canyon can be characterized as a fracture-controlled, interconnected flow system. This fracture-controlled groundwater communicates with, and recharges the alluvial water in the San Luis Rey River valley (Pala Basin), although the contributions from the bedrock are relatively minor relative to the volume of water transmitted through the alluvium.

The piezometric surface presented on Figure 4 reflects the main elements of the topography and illustrates the role of Gregory Mountain as the principal recharge area of Gregory Canyon. Derivation of a piezometric surface from wells isolated from one another by non-water bearing rock attests to the hydraulic interconnection of the fracture system. Water level measurements recorded for these wells through October 2004 show no significant variations in the piezometric surface over time (Table 1), although an overall decline in the water levels is recognized associated with a long-term regional drought. Therefore, it is concluded that the groundwater flow in the canyon is consistent over time and is thus predictable.

Both COLOG, Inc. and GLA performed cross-hole aquifer tests to quantitatively assess the interconnectivity of the bedrock aquifer. Three COLOG cross-hole tests, conducted in 1996 as part of the Phase 5 hydrogeologic investigation (GLA, 1997), documented hydraulic connectivity between the pumping and the observation wells. Based on the 167-foot capture radius documented by the pair GMP-2/ GLA-7, an initial assumption of monitoring wells spaced at an average spacing of 300 feet was considered to be reasonably expected to detect potential groundwater impacts under the proposed landfill. However, additional cross-hole testing was proposed following well construction to confirm the extent of their capture zones, and the spacing between the wells reduced as appropriate based on the pumping test data.

Subsequent to the Phase 5 hydrogeologic investigation (GLA, 1997), GLA conducted pumping tests in two wells (GLA-3 and GLA-8) to evaluate the hydraulic properties of the bedrock aquifer (GLA, 2001). Results from the first pumping test at well GLA-3 indicate that while pumping at 10 gallons per minute (gpm), the wells are in hydraulic communication to a distance of 200 feet (to GLA-13). In the vicinity of well GLA-8, located further up the canyon in unweathered tonalite, distance-drawdown analysis indicated an effective radius of influence of 250 feet from well GLA-8 when pumping at 2 gpm.

In order to provide an additional demonstration of the proposed groundwater monitoring system to effectively monitor the groundwater from the proposed landfill, GLA conducted a supplemental hydrogeologic investigation in the summer 2004, which included constructing seven bedrock wells to be used in the groundwater monitoring network at the downgradient limit of the landfill. A total of five long-term variable rate or constant rate aquifer pumping tests were performed along with three slug tests (drawdown-recovery) in bedrock wells as part of this supplemental hydrogeologic investigation (GLA, 2004).

Review of the work to date (including well test results and all drilling logs), suggests that three fracture flow domains can be identified as follows:

- A groundwater flow barrier formed by the unweathered tonalite underlying the west ridgeline;
- A low flow zone forming an extension of the west ridgeline; and
- A maximum flow zone along the axis of Gregory Canyon in the weathered bedrock zone.

As presented above, boring GLA-17, and wells GLA-4, GLA-9, and GMP-3, drilled along the west ridgeline to depths significantly below the projected equipotential surface are dry (one well, GLA 4 is recharged by a perched water condition), and other wells drilled in unweathered bedrock underlying the northern extension of the west ridgeline (in the low flow zone) recharge very slowly from relatively isolated fractures. Therefore, the west ridgeline is believed to form a groundwater flow barrier. This interpretation is included on Figure 4, which illustrates modified equipotential and water table contours based on this interpretation.

The line of wells across the mouth of Gregory Canyon inclusive of GLA-14 and GLA-12 (Figure 4) spans two bedrock domains apparently reflecting two degrees of fracture interconnectivity. Those wells east of and including GLA-13 all show a response to drawdown of other wells in that group. In contrast, wells west of GLA-13 can be characterized as representing a low flow zone, and have not been shown to respond similarly. This does not suggest that the wells in the low flow zone are isolated from each other or from wells east of and including GLA-13, since the projected equipotential surface includes all of the well data. Rather it suggests that the fraction of connected fractures within the low flow zone is less than in the bedrock domain to the east, assuming no difference in the transmissivity of the fractures. While a smaller well spacing in the low flow zone could be utilized to identify a similar drawdown response, it is not necessary to place additional wells in the low flow zone to detect contaminant transport because all fractures are recharged from the same source.

Fracture flow below the equipotential surface is west northwest from the Gregory Mountain recharge area to Gregory Canyon (Figure 4); occurs largely in the

weathered zone; and is bounded by unweathered tonalite under the west ridgeline. The groundwater flow direction is effectively parallel to this groundwater flow barrier so that groundwater flowing under the landfill footprint will be brought to the line of compliance wells. Copies of the boring logs and well construction logs for wells located within the Gregory Canyon Landfill vicinity are included in Attachment 2.

2.6.3 WATER CHEMISTRY

Groundwater

Water quality data for wells in the Pala Hydrologic Subarea are sparse. One key indicator of groundwater quality is the total dissolved solids (TDS) concentration. As a result, for aesthetic reasons, the state has recommended that the TDS concentration be no greater than 500 mg/l in drinking water supplies. Currently, TDS concentrations in SDCWA imported supplies range from about 500 to 700 mg/l (SDCWA, 1997). Based on available groundwater quality data, the alluvial aquifer in the Pala Basin is good, with groundwater concentrations of TDS estimated in the range of 200 to 860 mg/l (J.A. Moreland, 1974) compared with 600 to 3,400 mg/l TDS for the Bonsall Basin, the next basin downgradient of the Pala Basi within the San Luis Rey River valley. The average TDS concentration for the Pala Basin is estimated to be 600 mg/l (NBS Lowry, 1995).

The historical groundwater chemistry database for the GCLF is limited to the data obtained for water samples collected from the exploration wells that existed at the Gregory Canyon site in October 1991 (WCC 1995), and subsequent sampling performed by GLA in August 1999, and four quarterly events beginning in December 2000. For the WCC data, TDS ranged from 379 to 1,060 mg/l, and pH ranged from 6.83 to 7.47. Only the groundwater samples from wells GMP-1, GMW-1, GMW-2 and GMW-3 met the state recommendation of 500 mg/l TDS for drinking water and beneficial groundwater use areas (RWQCB 1994).

Analytical results from groundwater samples collected by GLA from wells sited within Gregory Canyon during an August 1999 sampling event are relatively consistent with those obtained by WCC in October 1991. Specifically, samples were obtained from upgradient monitoring wells GLA-4 and GLA-5 and downgradient wells GLA-2, GLA-7 and GLA-10 (Figure 5). Three residential/production wells were also sampled within the San Luis Rey River valley. One residential well (Verboom Well No. 5) is located on the west side of the site near the Verboom residence, the second residential well coincides with the SLRMWD well #34, and the third residential well is Lucio Well #2, located on the north side of the river on the Lucio Family Dairy property.

In accordance with CCR 27 Section 20415(e)(6), GLA obtained four quarters of groundwater and surface water data from the proposed background monitoring

points and wells downgradient of the proposed landfill site to evaluate background water quality values between December 2000 and December 2001. In addition, monthly water levels were measured to establish the expected highest and lowest annual groundwater elevations for the site.

Following completion of the four quarters of data, the water quality data was tabulated by well. This quarterly sampling program included collection of samples from the bedrock aquifer in upgradient (background) wells GLA-4, GLA-5, and GLA-11, and downgradient (point-of-compliance) wells GLA-2, GLA-10, GLA-12, GLA-13, and GLA-14, and from the alluvial aquifer in background (upgradient) well Lucio #2, and downgradient alluvial wells GLA-16, and SLRMWD designated well #34 (MWD #34). Samples collected from each of these wells were analyzed for the full suite of constituents of concern (COCs) provided in the Code of Federal Regulations (40 CFR Part 258, Appendix II). Included in this list of compounds are cyanide, sulfide, 20 metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), chlorinated herbicides, pesticides and polychlorinated biphenyls (PCBs). In addition, samples were submitted for indicator parameters including chloride, nitrate, sulfate, pH, and TDS.

Summaries of the analytical results obtained for each groundwater monitoring well are provided on Tables 3 through 13. Tables 14 and 15 present a comparison of the median concentrations of inorganic constituents in groundwater obtained from August 1999 (if available) and the subsequent four sampling rounds. These tables also present the detected organic compounds (averaged when a constituent was detected more than one time) for bedrock aquifer and alluvial aquifer samples, respectively.

In evaluating general water quality, the median values for each constituent were compared with currently established state and federal MCLs and San Diego RWQCB Basin Objectives. Review of the median data indicates that with the exception of chloride, TDS and nitrate, the groundwater water quality is generally good. The following table presents those median concentrations that were found to equal or exceed a currently established state or federal MCLs or basin objectives.

Bedrock Aquifer Wells
MCL Exceedances versus Median Concentration

CONSTITUENT	STANDARD	UPGRADIENT LOCATIONS			DOWNGRADIENT LOCATIONS				
General Chemistry (mg/L):		**GLA-4**	**GLA-5**	**GLA-11**	**GLA-2**	**GLA-10**	**GLA-12**	**GLA-13**	**GLA-14**
Chloride	300(4) / 500(1,3)	NA	NA	NA	450	NA	NA	NA	NA
Nitrate	15(4) / 45(1,3)	NA	18.8	NA	42.9	NA	NA	28.3	15.3
Total Dissolved Solids	900(4) / 1000(2)	NA	1120	NA	1410	NA	NA	1000	NA

NOTES: 1. California Primary Drinking Water Standards.
2. California Secondary Drinking Water Standards.
3. Federal Maximum Contaminant Levels.
4. Basin Objective – Pala Hydrologic Subarea.
NA – Not Applicable (no exceedance)

In the bedrock aquifer, comparison of the median data across the site indicates that samples from upgradient (background) wells GLA-4 and GLA-11 contained some of the lowest concentrations of most of the general chemistry constituents and several metals. Samples from downgradient well GLA-2 contained several general chemistry and metals at the highest concentrations in the bedrock aquifer wells. The samples from background well GLA-5, located at the head of the canyon, contained elevated concentrations of nitrate, and TDS, and the highest concentrations of sulfate and barium compared with the other bedrock aquifer wells. For the alluvial aquifer, the groundwater data is relatively consistent between the three sampled wells, with slightly lower concentrations measured in SLRMWD well #34.

Review of the Appendix II COC data demonstrates that no pesticides or PCBs were detected in groundwater at the Gregory Canyon site, and only one chlorinated herbicide (2,4-D) was identified once and at a trace concentration in the sample from downgradient well GLA-13. In contrast, several VOCs and SVOCs were detected one or more times in the proposed groundwater monitoring system samples. The majority of the detected VOCs are either common laboratory compounds such as acetone, carbon disulfide, and chloroform, or are constituents in hydrocarbon-based fuel (such as benzene, toluene, ethylbenzene and xylenes). Review of the quality assurance/quality control (QA/QC) blank sample data obtained with the primary samples also indicates measurable VOCs in blank samples including benzene, ethylbenzene, toluene and xylenes in the equipment and field blanks. The majority of the detected SVOCs were phthalates, which are plasticizers commonly attributed to laboratory or field contamination. Because the data obtained to date suggest only sporadic detections of VOCs and SVOCs, those identified are often attributed to laboratory/field-introduced impacts, and there are few on-site sources for these compounds, laboratory or field contamination is suspected. This conclusion will be confirmed during future quarterly sampling events (scheduled to begin during the first quarter 2004) that will be required prior to and during development of the landfill.

Surface Water

In addition to groundwater samples, surface water samples were collected in the San Luis Rey River from surface water stations SLRSW-1 (upstream of Gregory Canyon) and SLRSW-2 (downstream of Gregory Canyon). The samples were also analyzed for all of the COCs listed in 40 CFR, Part 258, Appendix II along with the metal surrogates chloride, nitrate, sulfate, pH, and TDS. Summaries of the analytical results obtained for each surface water monitoring station are provided on Tables 16 and 17. Table 18 presents a comparison of the median surface water sample concentrations obtained from August 1999 and four sampling rounds for inorganic constituents and presents the detected organic compounds (averaged when a constituent was detected more than one time).

Comparison of the surface water sample data with currently established state and federal MCLs and surface water basin objectives indicates that only the median TDS concentrations in both surface water samples exceeded the basin objective. Further review of the data indicated very little difference between the median values up and downstream of the canyon. This finding is not surprising considering the relatively undisturbed nature of the area.

2.6.4 BACKGROUND WATER QUALITY DATABASE DEVELOPMENT

As stated above, the first four rounds of background samples were submitted for analysis of the full suite of 40 CFR 258 Appendix II COCs in order to asses the general groundwater quality in the vicinity of the landfill prior to landfill construction or operation. In order to develop a statistical database of background water quality, a quarterly water quality monitoring program will begin now that construction and testing of the proposed groundwater monitoring well network has been completed (with the exception of proposed background well GLA-18). Based on guidelines obtained from the RWQCB, up to 16 data points is recommended to establish the baseline and characterize the naturally occurring water quality of the site before waste is received by the facility. The monitoring program will include collection of samples from existing bedrock monitoring wells GLA-2, GLA-3, GLA-4, GLA-5, GLA-11, GLA–12, GLA-13, GLA-14, GLA-A through GLA-G; and alluvial wells GMW-3, GLA-16, and replacement alluvial wells Lucio #2R and SLRMWD #34R. Surface water samples will also be collected within the San Luis Rey River at sample locations SLRSW-1 and SLRSW-2, to assist in establishing a background surface water quality data base. Following a significant rain event, if sufficient water is present, surface water will be obtained from a location within the mouth of Gregory Canyon at sample location GCSW-2, approximately 30 feet east of well GLA-10 (Figure 5).

Samples will be collected for the 40 CFR 258 Appendix I list of constituents including a minimum of 47 VOCs, along with the metal surrogates (chloride, nitrate as nitrogen, sulfate, pH and TDS) in lieu of the 15 heavy metals. Samples will also be analyzed for the indicator metals, calcium, magnesium and sodium. Because the site is located in an agricultural area, the samples will also be tested for chlorinated herbicides and organochlorine pesticides for a period of at least one year (four quarterly sampling events) to establish a broader baseline of water quality data for these constituents. Sampling will be conducted quarterly until a minimum of 16 data points have been obtained for each of the subject wells and surface water sampling locations. Continued quarterly sampling as the landfill is constructed should result in the collection of the RWQCB recommended 16 data points prior to waste disposal. However, once the landfill construction schedule is established, if necessary, a more accelerated sampling and analysis program (e.g., bimonthly or monthly) will be implemented to obtain the baseline data. This should represent a very robust database for intrawell statistical analysis, the most sensitive method available and appropriate for a pristine project site. The non-statistical VOC special

test will be employed for VOCs detected in downgradient wells and surface water. When the landfill is constructed, sampling and analysis will be conducted in accordance with the monitoring and reporting program provided in waste discharge requirements adopted by the RWQCB.

3.0 WATER QUALITY MONITORING PROGRAM

This section identifies the basis for the proposed water quality M&RP for detection monitoring of groundwater and surface water for the back canyon area of the GCLF.

3.1 GENERAL

The Comprehensive Water Quality Control Plan Report, San Diego Region (9) (Basin Plan) was adopted by this Regional Board on September 8, 1994; superseding the previous 1975 Basin Plan. According to the Basin Plan, the GCLF is located in the Pala Hydrologic Subarea, of the Monserate Hydrologic Area (903.21). The Basin Plan establishes beneficial uses for surface water and groundwater in this Hydrologic Subarea including municipal, agricultural and industrial supply. In addition, surface water provides beneficial uses for water- and non-water-contact recreation and provides warm- and cold-water habitats to sustain aquatic organisms.

3.2 MONITORING POINTS AND POINTS OF COMPLIANCE

The following sections describe the monitoring systems proposed to evaluate groundwater conditions at the GCLF in accordance with CCR Title 27 §20405, and 40 CFR 258.51 through 258.54. Figure 5 identifies the approximate locations of proposed monitoring wells located in the San Luis Rey River valley and identified for landfill area monitoring. This section establishes the basis for the proposed water quality M&RP for detection monitoring of the bedrock fracture flow system and alluvial aquifer at the GCLF. Well selection was based on the results of the various phases of hydrogeologic investigation at the GCLF including hydrophysical logging, pumping tests, two-dimensional flow modeling, and an understanding of site conditions.

3.2.1 MONITORING SYSTEM

As a result of the hydrogeologic investigations, it is concluded that the alluvial and shallow bedrock systems are interconnected and groundwater freely communicates between them. Though the alluvial system represents the zone with the highest overall hydraulic conductivity, these materials will be removed within the landfill footprint (i.e., the landfill will be underlain by bedrock and engineered fill), and a release from the landfill is expected to be detectable in the fractured bedrock aquifer first. As a result, the monitoring system's first defense beyond the landfill liner system is the series of weathered/ fractured bedrock wells proposed along the downgradient limit of the landfill, or point of compliance (POC). All of

the bedrock wells are screened across the first water bearing zone with the majority of these bedrock wells screened across the upper more weathered/fractured bedrock zone and thus the more highly conductive portion of the fractured bedrock flow system. However, a dual detection monitoring system, which includes dedicated wells in both the alluvial and bedrock groundwater systems, is proposed.

The detection monitoring program will include downgradient wells to collect representative samples of groundwater at the POC, and upgradient wells to collect samples of groundwater that are representative of "background" conditions. As currently proposed, with the exception of the spacing between wells GLA-14 (west of the landfill) and GLA-A, the wells are spaced about 50 to 240 feet apart, with a higher density of wells (closer spacing) along the western ridge saddle area of the site (wells GLA-A, GLA-D, GLA-E, GLA-F, and GLA-2) where there are fewer interconnected water bearing fractures. Wells GLA-14 and GLA-A, which are currently constrained by the SDCWA aqueduct easement are spaced approximately 400 feet apart. Cross-hole testing performed following well construction demonstrates that the proposed monitoring network will be able to provide the earliest detection of a release of waste constituents to ground water from the proposed solid waste management unit at Gregory Canyon. The results of the recent well testing are provided in a supplemental hydrogeologic investigation report (GLA, 2004). As an additional groundwater system enhancement, each of the bedrock POC wells will be equipped with a dedicated pump and plumbed to convey groundwater to an on-site tank. In this way, a hydraulic barrier will be maintained along the POC and capture the groundwater as it flows to the POC. Figure 5 presents the proposed locations of water quality detection monitoring points and the detection monitoring program monitoring system is summarized in the following table.

Gregory Canyon Landfill
Detection Monitoring Program

Monitoring Point	Unit	Monitoring Point I.D.	Status
Groundwater Monitoring Well	Bedrock Aquifer	GLA-4, GLA-5, GLA-11, GLA-18*	Background/ Cross-gradient
Groundwater Monitoring Well	Bedrock Aquifer	GLA-2, GMW-1, GLA-12, GLA-13, GLA-14, GLA-A, GLA-B, GLA-C, GLA-D,GLA-E, GLA-F, and GLA-G	Compliance
Water Level Measuring Station	Bedrock Aquifer	GLA-1, GLA-3, GLA-7, GLA-8, GLA-10	Not Applicable
Groundwater Monitoring Well	Alluvial Aquifer	Lucio #2R	Background
Groundwater Monitoring Well	Alluvial Aquifer	GMW-3	Compliance
Groundwater Monitoring Well	Alluvial Aquifer	GLA-16, SLRMWD #34R	Sentry
Surface Water Station	Gregory Canyon	GCSW-2	Compliance
Surface Water Station	San Luis Rey River	SLRSW-1	Background
Surface Water Station	San Luis Rey River	SLRSW-2	Compliance

Gregory Canyon Landfill
Detection Monitoring Program (Cont'd)

Monitoring Point	Unit	Monitoring Point I.D.	Status
Subdrain	Facilities Area	GCSD-1	Compliance
Drainage Layer Tank	Facilities Area	DL-1	Compliance
LCRS Tank	Facilities Area	LCRS-1**	Compliance

*Proposed well to be constructed.
**Sampled in October each year.

Groundwater Monitoring Points – For the bedrock aquifer, POC groundwater monitoring wells include GLA-12, GLA-13, GLA-14, GLA-2, GMW-1, and GLA-A through GLA-G as shown on Figure 5. Wells GLA-1, GLA-3, and GLA-10, will be utilized as water level measuring station and as contingency monitoring wells. In addition, though wells GLA-7 and GLA-8 are located within the future landfill footprint, they will also continue to be used as water level measuring stations until landfill development reaches their location, at which time they will be properly abandoned.

Existing wells GLA-4, GLA-5, GLA-11, and proposed well GLA-18 (located on the east side of the landfill footprint) will be background wells. Of these wells, the only well that cannot be constructed prior to landfill operations is GLA-18. Because of the steep slopes, access to this well location is not anticipated until the landfill operations extend a significant distance up the canyon and the utility pad is constructed. Until that time, a drill rig will not be able to gain access to the area for well construction.

In response to concerns regarding the continuity of the groundwater barrier along the western ridge of Gregory Canyon and the potential for "short-circuits", additional geologic monitoring of the tonalite barrier will be required during excavation of the western landfill subgrade to identify and mitigate potential water bearing fractures. During the excavation of each phase of the proposed unit, the subgrade will be mapped with the purpose of identifying any potentially through-going and non-interconnected fractures or faults. Upon completion of the excavation and prior to landfilling in that phase, an As-Built Geologic Report will be prepared by a California Registered Geologist and included in the final CQA certification report. This As-Built Geologic Report will include a detailed fracture and fault analysis (including stereoplots as appropriate) sufficient either to: 1) conclude that through-going disconnected fractures do not exist, or 2) recommend a method of mitigating any such fractures or faults that are identified. At a minimum, to be identified as a problematic structure, a fault or fracture should be traceable across the entire as-built cut slope of the western (tonalite) ridge, exhibit an open aperture capable of transmitting significant groundwater (i.e., a sustained discharge of 1 gallon per minute) and be disconnected from other fracture systems that would carry flow toward the thalweg of Gregory Canyon. If a through-going and non-interconnected fracture or fault potentially capable of transmitting groundwater through the western (tonalite) ridge is exposed in the excavated

slopes, the RWQCB will be notified immediately and by writing within seven days of discovery. At a minimum, if a through-going and non-interconnected fracture or fault capable of transmitting groundwater is discovered, additional groundwater monitoring will be proposed to the RWQCB and the M&RP will be revised accordingly to monitor this zone.

The water quality monitoring program will also include monitoring in the San Luis Rey River valley alluvial prism from compliance well GMW-3 and Lucio Dairy well #2R (located at the Lucio Dairy near the northeastern property boundary). Wells GLA-16 and SLRMWD#34R, (SLRMWD designation), will serve as alluvial "sentry" wells located further downgradient of the facility along the modeled groundwater flowpath (GLA, 1995). Under this monitoring program, the proposed monitoring well network will be maintained throughout the life of the landfill and through the post-closure period. Existing wells, which are not included within the monitoring network but are located within the footprint of the landfill will be properly abandoned prior to landfilling in that area. It should be noted that in the event that facility construction requires the destruction of any of these wells (e.g., a well located in the proposed ancillary facilities area), a replacement well would be constructed in the vicinity of the originally designated well. Table 2 provides a description of the well construction details for the proposed detection monitoring program wells.

Surface Water Monitoring Points - Three surface water monitoring points are proposed. Because there is no evidence of a spring in the canyon and rainwater that would flow into the canyon would have very little time in contact with the surficial soils, sampling from an upstream background location is not possible. . However, surface water monitoring within Gregory Canyon downgradient of the landfill is proposed as an indicator of landfill impacts to surface water. The canyon compliance location will be located toward the mouth of the canyon (GCSW-2), approximately 30 feet north of well GLA-10. To monitor the surface water quality in the San Luis Rey River, surface water sampling locations were selected up- and down-stream of the Gregory Canyon drainage to the San Luis Rey River. The background San Luis Rey River surface water monitoring point (SLRSW-1) will be located in the San Luis Rey River downstream from the Hanson sand and gravel pits. It will provide water quality data for surface water entering the site from the Hanson sand and gravel quarry. The compliance surface water monitoring point (SLRSW-2) will be located downstream of the landfill at a sampling point just east of the proposed access road bridge.

Vadose Zone Monitoring Points – Although groundwater is not expected to seep beneath the landfill, because the landfill is to be placed within a canyon, as prudent engineering, a subdrain system will be installed below the landfill footprint to intercept any groundwater entering the canyon. As designed, groundwater in the subdrain would flow by gravity to a storage tank. In addition, the leak detection/drainage layer located between the upper and lower high density

polyethylene (HDPE) liner systems, will transmit any liquid in this layer by gravity to the LCRS tank by way of an inspection/sampling sump. The subdrain tank and leak detection/drainage layer inspection sump will be monitored quarterly and if groundwater/liquid is present they will be sampled. Peripheral vadose zone monitoring points are unnecessary, because the facility will be fully lined and will have an active landfill gas collection system.

Leachate Monitoring Points - Leachate collected by the LCRS will be sampled at one of the two downgradient tanks.

3.2.2 PROPOSED DETECTION MONITORING PROGRAM FREQUENCY

Groundwater Monitoring - In accordance with CCR Title 27 §20415, the landfill operator will collect samples from the designated monitoring points on a quarterly basis. In addition, as new wells are added to the monitoring program, samples will be collected four to six times per year as necessary to obtain a representative background water quality database for each new well.

Surface Water Monitoring – Surface waters will be sampled and analyzed on a quarterly basis, assuming water is present at the designated surface water monitoring locations.

Vadose Zone Monitoring – Once the landfill has been constructed, the subdrain and leak detection/drainage layers will be monitored quarterly and samples will be collected if water is present.

Leachate Monitoring – Once the landfill begins operation, the pH and electric conductivity of the leachate will be monitored on a continuous basis with an automated probe. The LCRS tank will be sampled annually in October at a minimum for all of the 40 CFR 258 Appendix II COCs. Any constituent identified in the October leachate sample that is not currently included as a water quality monitoring parameter will be included in a retest sampling event in April of the following year. With the exception of heavy metals, which are generally poor indicators of a release, verified COCs, as determined by the April retest, will be added to the list of routine (quarterly) water quality monitoring parameters for the site.

3.3 SAMPLING AND ANALYSIS

Groundwater, surface water and other liquid sampling and analytical methods, decontamination, and sample transfer protocols are described in detail in the Sampling and Analysis Plan (Attachment 1). Depending on the location of the well, two separate sampling procedures are proposed for the GCLF. As a result of the hydraulic barrier system to be employed at the POC, all POC fractured bedrock flow system wells will be sampled in accordance with a well recovery procedure discussed under the Bedrock Compliance Well Sampling Procedures

section of the Sampling and Analysis Plan. All other wells (alluvial and bedrock-background/cross-gradient) will be sampled in accordance with the procedures discussed under the standard sampling procedures section.

3.4 MONITORING PARAMETERS

3.4.1 GROUNDWATER MONITORING PARAMETERS

The following groundwater monitoring parameters (MPars) are proposed for the GCLF:

- General Chemistry – Metal surrogates (chloride, nitrate as nitrogen, pH, sulfate, TDS)
- Metals - calcium, magnesium, sodium
- Organics – 40 CFR 258, Appendix I VOCs.

A justification for the above alternative list of MPars (the Appendix I list of constituents, but substituting the metal surrogates for the 15 heavy metals, and the addition of the indicator metals calcium, magnesium and sodium) has been submitted to the RWQCB under separate cover.

Sampling of representative landfill perimeter wells (GLA-2, GLA-4, GLA-5, GLA-10, GLA-11, GLA-12, GLA-13, and GLA-14, and the wells within the San Luis Rey River valley (Lucio #2, SLRMWD #34 and GLA-16), was conducted on a quarterly basis beginning in December 2000 (at least one year prior to the placement of waste at the site in accordance with CCR 27 §20415(e)(6)), to develop an initial database on the water quality prior to landfill activities. Water levels were also measured in each of the wells monthly between November 2000 and December 2001 to establish the highest and lowest anticipated water level.

As described in Section 2.6.3, during the first four quarterly monitoring events (prior to landfill operation), groundwater monitoring wells and surface water monitoring points were sampled for the full suite of "constituents of concern" (COCs) as defined by the Code of Federal Regulations (40 CFR Part 258 Appendix II). As stated in Section 2.6.4 above, existing groundwater and surface water points within the monitoring program will continue to be sampled and tested quarterly for the Appendix I list of constituents (except the metal surrogates will be included in lieu of the 15 heavy metals) and the indicator metals calcium, magnesium and sodium, beginning with the fourth quarter 2004 monitoring period to develop a representative statistical database of background water quality chemistries. Subsequent quarterly monitoring events will continue to include analysis for the above MPars. Additionally, samples will be collected from each media (e.g., groundwater monitoring wells, surface water, drainage layer and subdrain water) every five years, or otherwise in accordance with current CCR Title 27 regulations and tested for the full list of 40 CFR 258 Appendix II COCs.

With the exception of the heavy metals, COCs identified in a sample and verified by retest will be added to the list of routine MPars. In lieu of adding the heavy metals, continued monitoring of the metal surrogates is proposed.

Whenever a new background well is added to the DMP, the new well will be sampled four to six times per year initially to obtain a minimum of four rounds of data for the full 40 CFR 258 Appendix II COCs, and then for the DMP MPars in order to establish the background database for groundwater in the new well for robust statistical analysis.

Implementation of the M&RP requires that the lowest possible detection limits be achieved for each constituent included in the program. For a given laboratory, the Method Detection Limit (MDL) is defined as the lowest concentration at which that laboratory can differentiate with 99% reliability between a sample which contains the constituent and one that does not. Although there are several test methods for analysis of VOCs in water, EPA Method 8260 (utilizing a gas chromatograph and mass spectrophotometry) is recommended because it can be used to identify all 40 CFR Appendix I VOCs.

3.4.2 SURFACE WATER MONITORING PARAMETERS

If present, monitoring of surface water bodies must be performed in accordance with CCR Title 27 §20415(c). Surface water samples will be analyzed for the same indicator monitoring parameters established for groundwater monitoring program.

3.4.3 VADOSE ZONE MONITORING PARAMETERS

Subdrain/Drainage Layer Liquids – Although groundwater/liquid is not expected in the subdrain or drainage layer system, liquids, if present, will be sampled and analyzed for the same indicator monitoring parameters established for groundwater monitoring.

3.4.4 LEACHATE MONITORING PARAMETERS

Leachate – Liquids emanating from the LCRS will be analyzed annually in October at a minimum for the 40 CFR 258, Appendix II list of COCs. With the exception of the heavy metals, which are generally poor indicators of a release, any constituent identified in the October leachate sample that is not currently included as a water quality monitoring parameter and is confirmed to be present by a retest sample collected and analyzed in April of the following year will be added to the list of routine (quarterly) water quality monitoring parameters for the site.

3.5 CONCENTRATION LIMITS AND STATISTICAL ANALYSIS

CCR Title 27 §20400 requires that concentration limits for monitoring parameters be established for the site COCs. The data thus collected will be analyzed for significance using historical statistical comparisons that take into account possible time-dependent trends in the data. As a basis, it is proposed to compare compliance wells with background wells. For the purpose of identifying subtle trends at a local scale, however, a well by well correlation of observed values versus time can be very useful. For one thing, observations from previous sampling periods have a "predictive" value if the data are time-dependent. By establishing a correlation equation and a confidence interval based on the spread of the historical data, the value of the current sampling period can be compared with the predicted interval. If the observed value is larger than the upper limit of the interval, then contamination is reported. If it is not, then it is deemed appropriate to group the current value with the historical data, being that it is internally consistent, and complete a background-to-compliance ANOVA Equivalent analysis.

The ANOVA Equivalent procedure calculates the trends with time of the background and compliance data, and tests the differences between the variance of each compliance well against a trend-corrected estimate of the background standard error. Once a sufficient database has been established, which is expected with the proposed collection of quarterly (or more frequent) samples from existing monitoring points prior to the receipt of waste by the landfill, intrawell statistical analysis will be implemented in lieu of interwell (background-to compliance) tests. Intrawell methods are particularly suited to a non-homogeneous fractured bedrock aquifer such as occurs beneath the proposed GCLF, whereby the naturally occurring constituent concentrations are spatially variable. Under this method a correlation equation is calculated for each well, based on the historical data, and a "normal" range of values is predicted for the following monitoring period. If the value of the last sampling period is inconsistent with the historical data trend, then contamination is suspected. This method is consistent with the statistical technique of prediction intervals recommended by the U.S. EPA and CCR Title 27.

The water quality results for the GCLF will also be evaluated using the VOC Special non-statistical test for VOCs detected less than 10 percent of the time in background samples. A release will be tentatively indicated if either two or more VOCs exceed their respective method detection limits (MDLs) in a sample, or if any single VOC exceeds its practical quantitation limit (PQL). VOC detections will be subjected to verification sampling and analysis in accordance with CCR Title 27 §20420 (j)(1).

3.6 PROPOSED MONITORING FREQUENCY

The proposed routine monitoring program will include quarterly sampling and analysis for the routine monitoring parameters from each monitoring point (surface water, groundwater, and vadose zone subdrain/drainage layer). Now that the

proposed monitoring system has been constructed, this program will include the collection of quarterly samples in existing monitoring wells beginning with the fourth quarter 2004, so that a sufficient database is developed for each available well prior to the acceptance of waste by the landfill. In addition, once the facility begins to accept waste, a single COC sample will be collected from each monitoring point every fifth year. Groundwater levels also will be measured quarterly in all monitoring wells and water level measuring stations.

Quarterly groundwater monitoring reports will be prepared to summarize the deterministic and statistical analyses of groundwater flow, groundwater chemistry, and vadose zone chemistry. Annual groundwater monitoring reports will also include time-series plots depicting concentration trends of routine monitoring parameters detected in groundwater.

Quarterly Sampling and Reporting Schedule

Quarter	Sampling Dates	Reporting Date
First Quarter (Winter)	January 1 through 31	April 30
Second Quarter (Spring)	April 1 through 30	July 31
Third Quarter (Summer)	July 1 through 31	October 31
Fourth Quarter (Fall)/Annual	October 1 through 31	January 31

4.0 CLOSURE

The proposed M&RP described herein is based on the regulations contained in CCR Title 27 and 40 CFR 258. The recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical and hydrogeologic principles and practices. This report makes no other warranties, either expressed or implied as to the professional advice or data included in it. Our firm should be notified of any pertinent change in the project, or if conditions are found to differ from those described herein, since this may require a reevaluation of the conclusions and recommendations.

TABLES

TABLE 1
SITE MONITORING WELL INFORMATION
GREGORY CANYON LANDFILL

WELL INFORMATION	GLA-1	GLA-2	GLA-3	GLA-4	GLA-5	GLA-7	GLA-8	GLA-10	GLA-11	GLA-12	GLA-13	GLA-14	GLA-16	GLA-A	GLA-B	GLA-C	GLA-D	GLA-E*	GLA-F*	GLA-G	MW-3	GMW-1	GMW-2	GMW-4	GMP-2
Elevation of Well (feet MSL):																									
Top of Well Casing	343.72	379.39	332.02	904.99	927.92	402.85	633.11	326.59	777.32	345.79	358.15	334.13	307.54	380.35	347.04	343.45	367.65	383	374	347.58	327.58	331.36	324.64	637.53	437.64
Total Depth of Well (ft.): At installa	300	95	150	250	195	160	300	57.0	243	53	70	56	33.5	104	91.0	81	145	153	166	101	24.6	90	106	116	87.5
Depth of Screened Interval	20-300	70-95	45-150	30-240	30-190	30-160	15-300	50-57	202.5-242.5	32-52	49.5-69.5	35.5-55.5	9.5-29.5	74-104	51-91	41-81	95-145	80-150	80-165	61-101	?-24.6	48-90	50-106	55-116	45-87
Depth to Water (from top of well casing (ft.)):																									
12/3/1996	37.98	69.65	21.81	165.00**	41.44	33.46	62.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.24	19.84	-	68.13
12/16/1996	37.10	69.73	23.84	149.93**	42.57	34.82	62.40	22.20	-	-	-	-	-	-	-	-	-	-	-	-	23.20	21.89	20.46	65.72	69.54
9/13/1999	39.36	70.58	25.38	70.57	41.22	37.72	64.85	23.27	-	-	-	-	-	-	-	-	-	-	-	-	24.10	23.37	21.39	68.17	72.42
3/14/2000	38.05	71.11	23.66	60.39	41.29	39.11	63.70	22.01	193.36	36.96	49.25	38.18	13.92	-	-	-	-	-	-	-	22.98	22.97	20.03	68.69	73.88
11/14-15/00	38.82	72.36	24.80	62.53	39.80	41.58	66.21	22.66	194.98	38.08	50.52	38.89	15.35	-	-	-	-	-	-	-	23.56	24.12	20.52	71.53	76.33
12/5-6/00	-	72.23	-	64.71	40.54	-	-	23.30	195.30	37.96	50.54	38.73	15.06	-	-	-	-	-	-	-	-	-	-	-	-
1/30/2001	40.25	72.99	26.78	76.25	40.55	43.43	67.86	23.05	195.72	37.98	50.55	38.58	14.91	-	-	-	-	-	-	-	-	-	-	-	-
2/26/2001	40.09	72.98	26.74	71.60	41.42	43.72	68.13	22.93	195.59	37.93	50.52	38.51	14.82	-	-	-	-	-	-	-	-	-	-	-	-
3/12/2001	39.99	72.95	26.57	70.50	40.58	43.82	67.50	22.73	195.57	37.79	50.38	38.41	14.60	-	-	-	-	-	-	-	-	-	-	-	-
4/13/2001	40.08	73.08	26.55	148.69**	40.28	43.92	67.23	22.71	195.36	37.83	50.37	38.35	14.62	-	-	-	-	-	-	-	-	-	-	-	-
5/14/2001	40.22	73.19	26.78	98.09**	40.71	44.18	67.67	23.01	196.36	37.97	50.57	38.50	14.82	-	-	-	-	-	-	-	-	-	-	-	-
6/20/2001	40.62	73.25	27.11	74.50	39.66	44.40	68.57	23.19	196.25	38.66	50.73	38.66	15.07	-	-	-	-	-	-	-	-	-	-	-	-
7/11/2001	40.63	73.43	27.24	128.18**	40.10	44.54	68.98	23.54	196.86	38.40	51.00	38.83	15.31	-	-	-	-	-	-	-	-	-	-	-	-
8/29/2001	40.80	73.62	27.56	76.72	41.13	44.95	69.67	23.68	196.74	38.64	51.24	39.05	15.69	-	-	-	-	-	-	-	-	-	-	-	-
9/5/2001	40.72	73.53	26.91	74.25	41.16	44.71	67.95	22.96	196.63	38.62	51.20	39.05	15.73	-	-	-	-	-	-	-	-	-	-	-	-
10/29/2001	40.80	73.90	27.54	75.43	41.43	45.50	70.06	23.55	196.98	38.73	51.37	39.27	16.03	-	-	-	-	-	-	-	-	-	-	-	-
11/28/2001	40.68	73.88	27.5	73.64	42.11	45.77	69.92	23.36	197.08	38.65	51.36	39.05	15.46	-	-	-	-	-	-	-	-	-	-	-	-
12/11/2001	40.55	73.25	27.37	73.06	42.25	45.80	69.80	22.49	196.62	38.55	51.18	38.89	15.20	-	-	-	-	-	-	-	-	-	-	-	-
3/29/2002	40.70	73.98	27.48	70.60	NA	46.79	70.96	23.22	197.14	38.64	51.39	38.75	14.94	-	-	-	-	-	-	-	-	-	-	-	-
8/19/2002	41.64	74.19	28.39	69.87	42.57	47.88	72.27	24.45	197.79	39.48	52.21	40.31	16.87	-	-	-	-	-	-	-	-	-	-	-	-
8//25/2004	41.90	75.49	29.08	72.84	39.89	52.16	73.78	24.09	201.20	39.85	53.00	40.90	17.22	77.85	42.67	39.79	62.92	-	-	43.25	-	-	-	-	-
10/9/2004	41.78	75.45	28.94	73.09	40.62	52.41	73.89	24.00	200.73	39.83	52.87	41.32	17.71	77.85	42.58	39.71	62.87	77.6	69.7	43.15	23.85	26.80	21.89	79.97	86.94
Elevation of Water Surface (ft. MSL):																									
12/3/1996	305.74	309.74	310.21	739.99**	886.48	369.39	570.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310.12	304.80	-	369.51
12/16/1996	306.62	309.66	308.18	755.06**	885.35	368.03	570.71	304.39	-	-	-	-	-	-	-	-	-	-	-	-	304.38	309.47	304.18	571.81	368.10
9/13/1999	304.36	308.81	306.64	834.42	886.70	365.13	568.26	303.32	-	-	-	-	-	-	-	-	-	-	-	-	303.48	307.99	303.25	569.36	365.22
3/14/2000	305.67	308.28	308.36	844.60	886.63	363.74	569.41	304.58	583.96	308.83	308.90	295.95	293.62	-	-	-	-	-	-	-	304.60	308.39	304.61	568.84	363.76
11/14-15/00	304.90	307.03	307.22	842.46	888.12	361.27	566.90	303.93	582.34	307.71	307.63	295.24	292.19	-	-	-	-	-	-	-	304.02	307.24	304.12	566.00	361.31
12/5-6/00	-	307.16	-	840.28	887.38	-	-	303.29	582.02	307.83	307.61	295.40	292.48	-	-	-	-	-	-	-	-	-	-	-	-
1/30/2001	303.47	306.40	305.24	828.74	887.37	359.42	565.25	303.54	581.60	307.81	307.60	295.55	292.63	-	-	-	-	-	-	-	-	-	-	-	-
2/26/2001	303.63	306.41	305.28	833.39	886.50	359.13	564.98	303.66	581.73	307.86	307.63	295.62	292.72	-	-	-	-	-	-	-	-	-	-	-	-
3/12/2001	303.73	306.44	305.45	834.49	887.34	359.03	565.61	303.86	581.75	308.00	307.77	295.72	292.94	-	-	-	-	-	-	-	-	-	-	-	-
4/13/2001	303.64	306.31	305.47	756.30**	887.64	358.93	565.88	303.88	581.96	307.96	307.78	295.78	292.92	-	-	-	-	-	-	-	-	-	-	-	-
5/14/2001	303.50	306.2	305.24	806.90**	887.21	358.67	565.44	303.58	580.96	307.82	307.58	295.63	292.72	-	-	-	-	-	-	-	-	-	-	-	-
6/20/2001	303.10	306.14	304.91	830.49	888.26	358.45	564.54	303.40	581.07	307.13	307.42	295.47	292.47	-	-	-	-	-	-	-	-	-	-	-	-
7/11/2001	303.09	305.96	304.78	776.81**	887.82	358.31	564.13	303.05	580.46	307.39	307.15	295.30	292.23	-	-	-	-	-	-	-	-	-	-	-	-
8/29/2001	302.92	305.77	304.46	828.27	886.79	357.90	563.44	302.91	580.58	307.15	306.91	295.08	291.85	-	-	-	-	-	-	-	-	-	-	-	-
9/5/2001	303.00	305.86	305.11	830.74	886.76	358.14	565.16	303.63	580.69	307.17	306.95	295.08	291.81	-	-	-	-	-	-	-	-	-	-	-	-
10/29/2001	302.92	305.49	304.48	829.56	886.49	357.35	563.05	303.04	580.34	307.06	306.78	294.86	291.51	-	-	-	-	-	-	-	-	-	-	-	-
11/28/2001	303.04	305.51	304.52	831.35	885.81	357.08	563.19	303.23	580.24	307.14	306.79	295.08	292.08	-	-	-	-	-	-	-	-	-	-	-	-
12/11/2001	303.17	306.14	304.65	831.93	885.67	357.05	563.31	304.10	580.70	307.24	306.97	295.24	292.34	-	-	-	-	-	-	-	-	-	-	-	-
3/29/2002	303.02	305.41	304.54	834.39	NA	356.06	562.15	303.37	580.18	307.15	306.76	295.38	292.60	-	-	-	-	-	-	-	-	-	-	-	-
8/19/2002	302.08	305.20	303.63	835.12	885.35	354.97	560.84	302.14	579.53	306.31	305.94	293.82	290.67	-	-	-	-	-	-	-	-	-	-	-	-
8//25/2004	301.82	303.90	302.94	832.15	888.03	350.69	559.33	302.50	576.12	305.94	305.15	293.23	290.32	302.50	304.37	303.66	304.73	-	-	304.33	-	-	-	-	-
10/9/2004	301.94	303.94	303.08	831.90	887.30	350.44	559.22	302.59	576.59	305.96	305.28	292.81	289.83	302.50	304.46	303.74	304.78	305.40	304.30	304.43	303.73	304.56	302.75	557.56	350.70

Notes:

NM - Not measured/not applicable.

*GLA-E and GLA-F - Reference elevaton based on topgraphic map/not survey.

** GLA-4 - Water level had not yet recovered prior to Water level measurement.

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767

768

TABLE 2
MONITORING WELL CONSTRUCTION DATA
GREGORY CANYON LANDFILL MONITORING WELLS

Well Number	Status	Casing Elevation (feet MSL)	Depth (in feet) To: Bottom of Well	First Water	Static Water (feet)	Static Water (date)	Original Well Construction: Diameter & Material	Filter Pack	Slot Size	Screen Interval	Drilling Method	Aquifer Material
Detection Monitoring Wells												
GLA-2	Compliance	379.39	95.4	-	75.49	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	70.38-95.38	Air Rotary	Bedrock
GLA-4	Background	904.99	250	103	72.84	8/25/04	5.5" Open Hole	None	NA	30-240	Dual Wall Rev. - Air	Bedrock
GLA-5	Background	927.92	195	100	39.89	8/25/04	5.5" Open Hole	None	NA	30-190	Dual Wall Rev. - Air	Bedrock
GLA-11	Background	777.32	243	231	201.20	8/25/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	202.5-242.5	Air Rotary	Bedrock
GLA-12	Compliance	345.79	53	38	39.85	8/25/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	32-52	Air Rotary	Bedrock
GLA-13	Compliance	358.15	70	58	53.00	8/25/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	49.5-69.5	Air Rotary	Bedrock
GLA-14	Compliance	334.13	56	42	40.90	8/25/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	35.5-55.5	Air Rotary	Bedrock
GLA-18 [2]	Background	915 (est.)	-	-	-	-	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	To be determined	Air Rotary	Bedrock
GLA-A	Compliance	380.35	104.4	85	77.85	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	74.4-104.4	Air Rotary	Bedrock
GLA-B	Compliance	347.04	91.5	42	42.67	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	51.2-91.2	Air Rotary	Bedrock
GLA-C	Compliance	343.45	81.5	46.7	39.79	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	41-81	Air Rotary	Bedrock
GLA-D	Compliance	367.65	146.2	105.6	62.92	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	95.1-145.1	Air Rotary	Bedrock
GLA-E [3]	Compliance	385 (est.)	152.9	152.8	77.6	10/9/04	Open Hole (pend. constr.)	#3 Monterey Sd.	0.020"	83-153	Air Rotary	Bedrock
GLA-F [3]	Compliance	375 (est.)	165.5	164.8	69.7	10/9/04	Open Hole (pend. constr.)	#3 Monterey Sd.	0.020"	65-165	Air Rotary	Bedrock
GLA-G	Compliance	347.58	104	85	43.25	8/25/04	4" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	61.15-101.15	Air Rotary	Bedrock
Lucio #2R [4]	Background	310 (est.)	40	12.5	12.7	6/8/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	10-40	Hollow-Stem Auger	Alluvium
GMW-1	Compliance	331.36	90.5	21.25	26.8	10/9/04	5" and 4.25" Open Hole	None	NA	48-90.5	Air Rotary	Bedrock
GMW-3	Compliance	320.36	49.5	12.83	16.32	3/14/00	4" Dia. Sch. 40 PVC	2/12 Sand	0.020"	9.5-49.5	Hollow-Stem Auger	Alluvium
SLRMWD #34R [4]	Sentry	310 (est.)	30	12.6	15.0	10/9/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	9-29	Hollow-Stem Auger	Alluvium
GLA-16	Sentry	307.54	33.5	10.6	17.22	8/25/04	2" Dia. Sch. 40 PVC	#3 Monterey Sd.	0.020"	9.5-29.5	Air Rotary	Alluvium
Water Level Measuring Stations (wells GLA-7 and GLA-8 will be abandoned prior to landfilling in that area)												
GLA-3 [1]	Compliance	332.02	150	-	29.08	8/25/04	Open Hole (pend. constr.)	None	NA	45-100	Air Rotary	Bedrock
GLA-1	-	343.72	300	210	41.9	8/25/04	Open Hole	None	NA	20-300	Dual Wall Rev. - Air	Bedrock
GLA-7	-	402.85	160	50	52.16	8/25/04	Open Hole	None	NA	30-160	Dual Wall Rev. - Air	Bedrock
GLA-8	-	633.11	300	86	73.78	8/25/04	Open Hole	None	NA	15-300	Dual Wall Rev. - Air	Bedrock
GLA-10	-	326.59	57	33	24.09	8/25/04	Open Hole	None	NA	50-57	Dual Wall Rev. - Air	Bedrock

Notes: GLA-17 was drilled to 500 feet and was dry. Borehole was downhole logged before it was grouted to surface with neat cement slurry.

1. The bottom of existing well GLA-3 will be grouted to design depth of approximately 100 feet below ground surface once groundwater monitoring system is approved.
2. GLA-18 will be constructed once the transmission line power pole pad has been constructed and there is adequate drilling rig access to the proposed location.
3. Wells GLA-E and GLA-F had not reached static water levels during the drilling program, and therefore will be constructed as wells once the groundwater system is approved.
4. R indicates replacement constructed in vicinity of the existing groundwater monitoring well.

TABLE 3
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-2

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	164	369	450	529	600	450	422	168	164	600
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	26.2	41.8	42.9	42.9	43	42.9	39.4	7.4	26.2	43
pH	units	7.10	7.39	7.37	7.34	7.9	7.37	7.42	0.29	7.10	7.9
Sulfate	mg/L	136	160	150	160	190	160	159	20	136	190
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	888	1400	1410	1620	1940	1410	1452	384	888	1940
METALS											
Antimony	mg/L	NA	**0.010**	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	**0.001**	0.0007	0.0007	**0.0019**	NC	NC	NC	NC	NC
Barium	mg/L	NA	**0.053**	0.0009	0.066	**0.066**	0.07	0.06	0.01	0.053	0.066
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	**0.00031**	NC	NC	NC	NC	NC
Calcium	mg/L	NA	120	160	170	180	165	158	26	120	180
Chromium	mg/L	NA	0.004	0.004	0.004	**0.0031**	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00085**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.005**	0.003	0.003	**0.0061**	NC	NC	NC	NC	NC
Lead	mg/L	NA	**0.0004**	**0.0005**	0.004	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	71	92	100	96	94	90	13	71	100
Mercury	mg/L	NA	0.00010	0.00010	**0.00013**	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.003	**0.0066**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.003	**0.001**	0.0006	0.012	0.003	0.005	0.006	0.001	0.012
Silver	mg/L	NA	**0.004**	0.003	**0.003**	**0.0018**	0.003	0.0029	0.0011	0.0018	0.004
Sodium	mg/L	NA	200	240	230	240	235	228	19	200	240
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.040	0.050	0.040	0.041	0.041	0.043	0.005	0.040	0.050
Zinc	mg/L	NA	0.0085	0.011	**0.0057**	0.022	0.0098	0.0118	0.0071	0.0057	0.022
VOLATILE ORGANIC COMPOUNDS											
Acetone	µg/L	**4.3**[a]	0.5	5.935	5.935	4.2	NC	NC	NC	NC	NC
p+m-Xylenes	µg/L	**0.69**	0.5	NA	NA	0.30	NC	NC	NC	NC	NC
Toluene	µg/L	**0.52**	0.5	0.047	0.047	0.22	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	0.35	0.5	0.13	0.044	0.23	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**1.8**[a]	0.33	NA	2.0	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	NA	**0.28**[a]	0.24	NA	2.1	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 4
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-4

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	46	68	75	78	78	75	69	13	46	78
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	1.0	1.61	1.50	1.48	1.6	1.50	1.44	0.25	1.0	1.61
pH	units	6.42	7.21	7.22	7.03	7.1	7.1	7.0	0.33	6.42	7.22
Sulfate	mg/L	30	39	38	35	42	38	37	5	30	42
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	444	477	453	490	480	477	469	19	444	490
METALS											
Antimony	mg/L	NA	**0.020**	0.008	0.008	**0.00013**	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	0.0007	**0.0009**	0.0007	**0.0012**	NC	NC	NC	NC	NC
Barium	mg/L	NA	**0.030**	0.0009	0.030	**0.028**	0.030	0.029	0.001	0.028	0.030
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.0004	0.004	0.004	**0.00020**	NC	NC	NC	NC	NC
Calcium	mg/L	NA	58	72	72	71	72	68	7	58	72
Chromium	mg/L	NA	0.0004	0.004	0.004	**0.0071**	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00044**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.008**	0.003	**0.004**	**0.0055**	0.0055	0.0058	0.002	0.004	0.008
Lead	mg/L	NA	**0.0004**	0.0004	0.0004	**0.00019**	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	21	23	22	20	22	22	1	20	23
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.020	**0.0047**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	**0.0006**	0.0006	**0.0022**	NC	NC	NC	NC	NC
Silver	mg/L	NA	**0.004**	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	68	79	74	77	76	75	5	68	79
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.010	0.003	**0.007**	**0.0066**	0.007	0.0079	0.0019	0.0066	0.010
Zinc	mg/L	NA	**0.032**	0.460	0.450	1.200	0.455	0.536	0.486	0.032	1.200
VOLATILE ORGANIC COMPOUNDS											
1,2,4-Trimethylbenzene	µg/L	0.21	0.5	0.078	0.52	NA	NC	NC	NC	NC	NC
1,3,5-Trimethylbenzene	µg/L	0.24	0.5	0.066	**0.21**	NA	NC	NC	NC	NC	NC
Benzene	µg/L	0.25	0.5	0.044	**0.11**	0.18	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.17	0.5	0.057	**0.41**	0.18	NC	NC	NC	NC	NC
n-Propylbenzene	µg/L	0.25	0.5	0.053	**0.12**	NA	NC	NC	NC	NC	NC
Naphthalene	µg/L	0.57	0.5	0.094	**0.26**	0.42	NC	NC	NC	NC	NC
tert-Butylbenzene	µg/L	0.16	0.5	0.066	**0.08**	NA	NC	NC	NC	NC	NC
Toluene	µg/L	0.11	0.5	0.047	1.4[a]	0.22	NC	NC	NC	NC	NC
Xylenes (Total)	µg/L	NA	1.0	0.236	2.7	NA	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
Benzoic Acid	µg/L	NA	0.86	0.86	2.6	NA	NC	NC	NC	NC	NC
bis(2-Ethylhexyl) Phthalate	µg/L	NA	2.4[a]	0.34	1.1[a]	2.0	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	NA	0.25	0.25	**0.44**[a]	2.1	NC	NC	NC	NC	NC
Di-n-butyl Phthalate	µg/L	NA	0.25	0.25	**0.36**[a]	2.6	NC	NC	NC	NC	NC
Naphthalene	µg/L	NA	0.25	0.25	**0.29**[a]	3.5	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 5
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-5

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Sep 2001	Dec 2001
GENERAL CHEMISTRY								
Chloride	mg/L	157	156	163	NA	150	150	147
Cyanide	mg/L	NA	0.0063	0.0063	NA	0.0006	0.0006	0.02
Nitrate/Nitrite	mg/L	16.6	18.6	18.8	NA	21	21	NA
Nitrate as Nitrogen	mg/L	NA	NA	NA	NA	NA	NA	1.94
pH	units	6.66	7.09	7.28	NA	6.70	6.7	6.3
Sulfate	mg/L	309	313	317	NA	350	350	203
Sulfide	mg/L	NA	0.050	0.050	NA	0.1	0.1	0.1
Total Dissolved Solids (TDS)	mg/L	992	1030	1000	NA	1120	1130	1650
METALS								
Antimony	mg/L	NA	**0.010**	0.008	NA	0.00012	0.00012	0.01
Arsenic	mg/L	NA	0.0007	0.0007	NA	0.00030	0.00030	0.005
Barium	mg/L	NA	0.150	0.180	NA	0.170	0.170	0.005
Beryllium	mg/L	NA	0.00032	0.00032	NA	0.00042	0.00042	0.002
Cadmium	mg/L	NA	0.004	0.004	NA	0.00012	0.00012	0.04
Calcium	mg/L	NA	93	110	NA	110	100	19.1
Chromium	mg/L	NA	0.004	0.004	NA	**0.0022**	**0.0032**	0.02
Cobalt	mg/L	NA	0.002	0.002	NA	**0.00052**	**0.00051**	NA
Copper	mg/L	NA	0.003	0.003	NA	**0.0022**	**0.0024**	0.005
Lead	mg/L	NA	0.0004	0.0004	NA	**0.00070**	**0.00140**	0.002
Magnesium	mg/L	NA	56	66	NA	58	57	74
Mercury	mg/L	NA	0.00010	0.00010	NA	0.00043	0.00043	0.001
Nickel	mg/L	NA	0.003	0.003	NA	**0.0038**	**0.0039**	0.04
Selenium	mg/L	NA	0.0006	**0.0007**	NA	**0.0016**	**0.0017**	0.005
Silver	mg/L	NA	**0.003**	0.003	NA	**0.00013**	**0.00010**	0.005
Sodium	mg/L	NA	100	120	NA	140	130	165
Thallium	mg/L	NA	0.020	0.0007	NA	0.00063	0.000069	0.01
Tin	mg/L	NA	NA	0.006	NA	0.00083	0.000083	0.05
Vanadium	mg/L	NA	0.020	0.020	NA	0.038	0.038	0.05
Zinc	mg/L	NA	**0.018**	0.089	NA	0.022	0.028	0.01
VOLATILE ORGANIC COMPOUNDS								
Carbon Disulfide	µg/L	0.54	0.5	0.266	0.266	**0.31**[a]	**0.28**[a]	NA
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**1.8**[a]	0.34	NA	2.0	2.0	0.83
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

TABLE 5 (CONT'D)
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-5

ANALYTE	UNITS	Dec 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY							
Chloride	mg/L	150	150	153	6	147	163
Cyanide	mg/L	0.02	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	NA	18.8	19.2	1.9	16.6	21
Nitrate as Nitrogen	mg/L	1.76	NC	NC	NC	NC	NC
pH	units	NA	6.70	6.79	0.35	6.3	7.28
Sulfate	mg/L	179	313	289	69	179	350
Sulfide	mg/L	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	1575	1120	1214	278	992	1650
METALS							
Antimony	mg/L	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	0.170	0.168	0.013	0.150	0.180
Beryllium	mg/L	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NC	NC	NC	NC	NC
Calcium	mg/L	17.0	97	75	44	17	110
Chromium	mg/L	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	68	62	63	7	56	74
Mercury	mg/L	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0016	0.0013	0.0006	0.0007	0.0017
Silver	mg/L	NA	0.0001	0.0011	0.0017	0.000098	0.0030
Sodium	mg/L	158	135	136	24	100	165
Thallium	mg/L	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.029	0.029	0.010	0.020	0.038
Zinc	mg/L	NA	0.025	0.039	0.033	0.018	0.089
VOLATILE ORGANIC COMPOUNDS							
Carbon Disulfide	µg/L	NA	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND							

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

TABLE 6
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-10

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	120	142	151	144	140	142	139	12	120	151
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.00006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	7.1	6.34	6.59	6.17	5.4	6.34	6.32	0.62	5.4	7.1
pH	units	6.70	7.35	7.30	7.18	7.4	7.30	7.19	0.28	6.70	7.4
Sulfate	mg/L	63	61	62	60	60	61	61	1	60	63
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	608	637	587	590	1250	608	734	289	587	1250
METALS											
Antimony	mg/L	NA	**0.009**	0.008	**0.009**	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	0.0007	0.0007	0.0007	0.00030	NC	NC	NC	NC	NC
Barium	mg/L	NA	**0.061**	0.0009	0.064	**0.061**	0.061	0.062	0.002	0.061	0.064
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	57	68	62	63	63	63	5	57	68
Chromium	mg/L	NA	**0.004**	0.004	0.004	**0.0030**	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00040**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.009**	0.003	0.003	**0.0020**	NC	NC	NC	NC	NC
Lead	mg/L	NA	**0.0006**	0.0004	0.0004	**0.00029**	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	32	39	36	33	35	35	3	32	39
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	**0.004**	0.003	0.003	**0.0033**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	0.0006	0.0006	**0.0024**	NC	NC	NC	NC	NC
Silver	mg/L	NA	**0.005**	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	82	98	88	91	90	90	7	82	98
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.030	0.040	0.030	0.031	0.031	0.033	0.005	0.030	0.040
Zinc	mg/L	NA	**0.026**	0.270	0.072	0.700	0.171	0.267	0.307	0.026	0.700
VOLATILE ORGANIC COMPOUNDS (µg/L)											
Carbon Disulfide	µg/L	0.54	0.5	0.266	0.266	5.5[a]	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.17	0.5	0.057	**0.07**	0.18	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**2.5[a]**	0.34	**0.59[a]**	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 7
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-11

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	177	177	184	180	179	180	3	177	184
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	0.020	0.020	0.32	**0.17**	NC	NC	NC	NC	NC
pH	units	7.61	7.74	7.60	7.4	7.61	7.59	0.14	7.4	7.74
Sulfate	mg/L	82	78	85	94	84	85	7	78	94
Sulfide	mg/L	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	763	733	750	750	750	749	12	733	763
METALS										
Antimony	mg/L	0.008	0.008	0.008	**0.00026**	NC	NC	NC	NC	NC
Arsenic	mg/L	0.004	0.006	0.004	0.004	0.004	0.005	0.001	0.004	0.006
Barium	mg/L	**0.002**	0.0009	**0.0060**	**0.0039**	0.00	0.00	0.00	0.002	0.006
Beryllium	mg/L	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	90	100	98	93	96	95	5	90	100
Chromium	mg/L	0.004	0.004	0.004	**0.0087**	NC	NC	NC	NC	NC
Cobalt	mg/L	0.002	0.002	0.002	**0.00045**	NC	NC	NC	NC	NC
Copper	mg/L	**0.004**	0.003	0.003	**0.0039**	NC	NC	NC	NC	NC
Lead	mg/L	**0.0007**	0.0004	0.0004	0.019	NC	NC	NC	NC	NC
Magnesium	mg/L	27	32	32	31	32	31	2	27	32
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	**0.004**	0.003	0.020	0.013	0.013	0.012	0.008	0.004	0.020
Selenium	mg/L	0.003	0.0006	0.0006	**0.0015**	NC	NC	NC	NC	NC
Silver	mg/L	0.003	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	91	100	110	120	105	105	13	91	120
Thallium	mg/L	**0.030**	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	0.006	0.006	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	0.003	0.003	**0.0060**	**0.0050**	NC	NC	NC	NC	NC
Zinc	mg/L	**0.0091**	0.00089	0.013	0.024	0.013	0.015	0.008	0.009	0.024
VOLATILE ORGANIC COMPOUNDS										
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.37**[a]	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.5	0.057	**0.09**	0.18	NC	NC	NC	NC	NC
Toluene	µg/L	0.5	**0.13**[a]	**0.25**[a]	0.22	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
bis(2-Ethylhexyl) Phthalate	µg/L	0.33	6.6[a]	4.2[a]	2.0	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	0.25	0.25	**0.40**[a]	2.1	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 8
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-12

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	115	117	119	120	118	118	2	115	120
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	0.24	0.28	0.28	**0.1**	0.26	0.23	0.09	0.1	0.28
pH	units	7.38	7.42	7.16	6.9	7.27	7.22	0.24	6.9	7.42
Sulfate	mg/L	38	39	38	46	39	40	4	38	46
Sulfide	mg/L	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	517	490	520	510	514	509	14	490	520
METALS										
Antimony	mg/L	**0.020**	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	0.0007	0.0007	0.0007	**0.00045**	NC	NC	NC	NC	NC
Barium	mg/L	**0.020**	0.0009	0.020	**0.017**	0.020	0.019	0.002	0.017	0.020
Beryllium	mg/L	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	42	47	49	48	48	47	3	42	49
Chromium	mg/L	**0.005**	0.004	0.004	**0.0036**	NC	NC	NC	NC	NC
Cobalt	mg/L	0.002	0.002	0.002	**0.00027**	NC	NC	NC	NC	NC
Copper	mg/L	**0.008**	0.003	0.003	**0.0052**	NC	NC	NC	NC	NC
Lead	mg/L	**0.002**	0.0004	0.0004	**0.00010**	NC	NC	NC	NC	NC
Magnesium	mg/L	26	29	30	27	28	28	2	26	30
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	**0.004**	0.003	0.003	**0.0025**	NC	NC	NC	NC	NC
Selenium	mg/L	0.0006	**0.0007**	0.0006	**0.0023**	NC	NC	NC	NC	NC
Silver	mg/L	**0.006**	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	74	86	88	86	86	84	6	74	88
Thallium	mg/L	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	0.006	0.006	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	0.030	0.030	0.030	0.028	0.030	0.030	0.001	0.028	0.030
Zinc	mg/L	**0.016**	0.00089	0.010	**0.0072**	0.010	0.011	0.004	0.007	0.016
VOLATILE ORGANIC COMPOUNDS										
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.3**[a]	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
bis(2-Ethylhexyl) Phthalate	µg/L	**0.35**[a]	0.33	**0.79**[a]	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 9
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-13

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	127	290	269	260	265	237	74	127	290
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	25.9	28.5	29.3	28	28.3	27.9	1.5	25.9	29.3
pH	units	7.49	7.24	7.19	6.7	7.22	7.16	0.33	6.7	7.49
Sulfate	mg/L	119	129	137	130	130	129	7	119	137
Sulfide	mg/L	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	885	1010	990	1120	1000	1001	96	885	1120
METALS										
Antimony	mg/L	0.008	0.008	**0.010**	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	0.002	0.0007	0.0007	**0.00098**	NC	NC	NC	NC	NC
Barium	mg/L	**0.020**	0.0009	0.079	**0.073**	0.073	0.057	0.032	0.020	0.079
Beryllium	mg/L	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	67	100	100	110	100	94	19	67	110
Chromium	mg/L	0.004	0.004	0.004	**0.0056**	NC	NC	NC	NC	NC
Cobalt	mg/L	0.002	0.002	0.002	**0.00055**	NC	NC	NC	NC	NC
Copper	mg/L	0.003	0.003	0.003	**0.0028**	NC	NC	NC	NC	NC
Lead	mg/L	**0.0006**	**0.0004**	0.00040	########	NC	NC	NC	NC	NC
Magnesium	mg/L	39	65	65	62	64	58	13	39	65
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	0.003	0.003	**0.0030**	**0.0062**	NC	NC	NC	NC	NC
Selenium	mg/L	0.003	**0.0008**	0.0006	**0.0037**	NC	NC	NC	NC	NC
Silver	mg/L	0.003	0.003	0.003	########	NC	NC	NC	NC	NC
Sodium	mg/L	110	130	130	140	130	128	13	110	140
Thallium	mg/L	0.020	0.0007	0.0007	########	NC	NC	NC	NC	NC
Tin	mg/L	NA	0.006	0.006	########	NC	NC	NC	NC	NC
Vanadium	mg/L	0.020	0.030	0.030	0.032	0.030	0.028	0.005	0.020	0.032
Zinc	mg/L	**0.021**	0.047	0.047	0.053	0.047	0.042	0.014	0.021	0.053
VOLATILE ORGANIC COMPOUNDS										
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.35**[a]	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
bis(2-Ethylhexyl) Phthalate	µg/L	**0.99**[a]	0.33	**0.67**[a]	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs										
2,4-D	µg/L	0.16	0.16	0.16	0.17	NC	NC	NC	NC	NC

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

TABLE 10
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-14

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	159	160	155	160	160	159	2	155	160
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	15.6	15.5	15.1	14	15.3	15.1	0.7	14	15.6
pH	units	7.47	7.56	7.29	6.8	7.38	7.28	0.34	6.8	7.56
Sulfate	mg/L	74	70	75	71	73	73	2	70	75
Sulfide	mg/L	0.050	0.050	0.25	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	697	667	667	730	682	690	30	667	730
METALS										
Antimony	mg/L	**0.010**	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	0.0007	**0.0009**	0.0007	**0.0014**	NC	NC	NC	NC	NC
Barium	mg/L	**0.096**	0.120	0.130	0.110	0.12	0.11	0.01	0.096	0.13
Beryllium	mg/L	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	69	82	75	73	74	75	5	69	82
Chromium	mg/L	0.004	0.004	0.004	**0.0038**	NC	NC	NC	NC	NC
Cobalt	mg/L	0.002	0.002	0.002	**0.00035**	NC	NC	NC	NC	NC
Copper	mg/L	**0.007**	0.003	0.003	**0.0014**	NC	NC	NC	NC	NC
Lead	mg/L	0.004	**0.0004**	0.004	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	39	46	43	38	41	42	4	38	46
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	0.003	0.003	**0.004**	**0.0067**	NC	NC	NC	NC	NC
Selenium	mg/L	0.0006	**0.0008**	0.0006	**0.0032**	NC	NC	NC	NC	NC
Silver	mg/L	0.003	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	84	100	92	94	93	93	7	84	100
Thallium	mg/L	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	0.006	**0.003**	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	0.030	0.030	0.030	0.025	0.030	0.029	0.003	0.025	0.030
Zinc	mg/L	**0.012**	0.00089	**0.0092**	**0.0054**	0.0092	0.0089	0.0033	0.0054	0.012
VOLATILE ORGANIC COMPOUNDS										
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.31**[a]	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
bis(2-Ethylhexyl) Phthalate	µg/L	0.33	0.33	**1.2**[a]	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 11
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-16

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	105	104	109	110	107	107	3	104	110
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	6.24	5.90	6.60	7.1	6.42	6.46	0.51	5.90	7.1
pH	units	7.50	7.52	7.49	7.0	7.50	7.38	0.25	7.0	7.52
Sulfate	mg/L	109	98	108	120	109	109	9	98	120
Sulfide	mg/L	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	690	620	683	750	687	686	53	620	750
METALS										
Antimony	mg/L	**0.010**	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	**0.001**	**0.002**	**0.001**	**0.0014**	0.0012	0.0014	0.0005	0.001	0.002
Barium	mg/L	**0.061**	0.0009	0.081	**0.075**	0.08	0.07	0.01	0.061	0.081
Beryllium	mg/L	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	76	77	85	82	80	80	4	76	85
Chromium	mg/L	**0.0050**	0.004	0.004	**0.0088**	NC	NC	NC	NC	NC
Cobalt	mg/L	0.002	0.002	0.002	**0.00039**	NC	NC	NC	NC	NC
Copper	mg/L	**0.0040**	0.003	0.003	**0.0012**	NC	NC	NC	NC	NC
Lead	mg/L	**0.0005**	**0.0005**	0.00040	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	36	37	41	36	37	38	2	36	41
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	0.003	0.003	0.003	**0.0029**	NC	NC	NC	NC	NC
Selenium	mg/L	0.003	**0.0006**	0.0006	**0.0018**	NC	NC	NC	NC	NC
Silver	mg/L	0.003	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	72	74	81	80	77	77	4	72	81
Thallium	mg/L	**0.020**	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	0.006	0.006	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	0.030	0.030	0.030	0.029	0.030	0.030	0.001	0.029	0.030
Zinc	mg/L	**0.0073**	0.00089	**0.0012**	**0.0044**	0.0044	0.0043	0.0031	0.0012	0.0073
VOLATILE ORGANIC COMPOUNDS										
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.32**[a]	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
Acenaphthene	µg/L	0.23	**0.31**	0.36	2.9	NC	NC	NC	NC	NC
bis(2-Ethylhexyl) Phthalate	µg/L	0.33	0.33	**0.81**[a]	2.0	NC	NC	NC	NC	NC
Hexachlorobenzene	µg/L	0.27	**0.67**	0.27	2.4	NC	NC	NC	NC	NC
Pyrene	µg/L	0.23	**0.60**	0.23	1.7	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs										
beta-BHC	µg/L	0.0076	0.0011	0.0011	0.01	NC	NC	NC	NC	NC

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 12
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL LUCIO-2

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	91	94	91	103	100	94	96	5	91	103
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	0.7	0.42	1.40	0.57	1.0	0.7	0.82	0.39	0.42	1.40
pH	units	6.80	7.35	7.51	7.35	7.2	7.35	7.24	0.27	6.80	7.51
Sulfate	mg/L	168	147	134	159	160	159	154	13	134	168
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	671	657	610	667	680	667	657	28	610	680
METALS											
Antimony	mg/L	NA	0.008	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	0.007	**0.001**	0.0007	**0.00066**	NC	NC	NC	NC	NC
Barium	mg/L	NA	0.110	0.120	0.110	0.100	0.110	0.110	0.008	0.100	0.120
Beryllium	mg/L	NA	0.0003	0.0003	0.0003	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	86	98	94	97	96	94	5	86	98
Chromium	mg/L	NA	0.004	0.004	**0.0040**	0.00012	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00059**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.007**	0.003	**0.006**	**0.0057**	0.006	0.0062	0.0007	0.0057	0.007
Lead	mg/L	NA	**0.0007**	**0.0006**	**0.0007**	0.000098	0.0007	0.0007	0.0001	0.0006	0.0007
Magnesium	mg/L	NA	30	35	34	32	33	33	2	30	35
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.003	**0.0038**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	**0.0006**	0.0006	**0.0018**	NC	NC	NC	NC	NC
Silver	mg/L	NA	0.003	0.003	**0.005**	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	60	68	67	72	68	67	5	60	72
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.006	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.010	0.010	0.010	0.014	0.010	0.011	0.002	0.010	0.014
Zinc	mg/L	NA	**0.021**	0.0009	**0.0090**	**0.0085**	0.0090	0.0128	0.0071	0.0085	0.021
VOLATILE ORGANIC COMPOUNDS											
Acetone	µg/L	4.9[a]	0.5	5.935	5.935	4.2	NC	NC	NC	NC	NC
Chloroform	µg/L	1.2	0.98	0.164	0.164	0.28	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	0.33	0.33	**0.62**[a]	2.0	NC	NC	NC	NC	NC
Hexachlorobutadiene	µg/L	NA	0.64	0.36	0.36	3.6	NC	NC	NC	NC	NC
Pyrene	µg/L	NA	**0.27**	0.23	0.23	1.7	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit:
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 13
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL MWD-34

ANALYTE	UNITS	Aug 1999	Déc 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	78	75	81	78	78	78	78	2	75	81
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	**0.077**	0.020	0.020	0.020	**0.04**	NC	NC	NC	NC	NC
pH	units	7.01	7.64	7.69	7.66	6.3	7.64	7.26	0.61	6.3	7.69
Sulfate	mg/L	150	144	144	140	140	144	144	4	140	150
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	558	547	543	560	580	558	558	14	543	580
METALS											
Antimony	mg/L	NA	0.008	0.008	0.008	**0.00013**	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	0.007	**0.001**	0.0007	**0.00052**	NC	NC	NC	NC	NC
Barium	mg/L	NA	**0.100**	0.110	0.100	**0.091**	0.100	0.100	0.008	0.091	0.110
Beryllium	mg/L	NA	0.00032	0.00032	0.00030	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	74	86	79	81	80	80	5	74	86
Chromium	mg/L	NA	**0.004**	0.004	0.004	**0.00072**	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00042**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.006**	0.003	0.003	**0.0008**	NC	NC	NC	NC	NC
Lead	mg/L	NA	0.0004	**0.0005**	0.0004	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	26	30	28	27	28	28	2	26	30
Mercury	mg/L	NA	0.00010	0.00010	0.00100	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.003	**0.0025**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	0.0006	0.0006	0.00093	NC	NC	NC	NC	NC
Silver	mg/L	NA	**0.004**	0.003	**0.004**	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	58	66	61	65	63	63	4	58	66
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	**0.004**	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.003	0.003	0.003	**0.0023**	NC	NC	NC	NC	NC
Zinc	mg/L	NA	**0.014**	0.0009	**0.0028**	**0.0055**	0.0055	0.0074	0.0058	0.0028	0.014
VOLATILE ORGANIC COMPOUNDS (µg/L): ND											
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L): ND											
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 14
GREGORY CANYON LANDFILL
BEDROCK AQUIFER COMPARISON DATA
DOWNGRADIENT VS. UPGRADIENT MEDIAN

ANALYTE	DOWNGRADIENT LOCATIONS					UPGRADIENT LOCATIONS			ARARs	BASIN OBJECTIVES
	GLA-2 MEDIAN	GLA-10 MEDIAN	GLA-12 MEDIAN	GLA-13 MEDIAN	GLA-14 MEDIAN	GLA-4 MEDIAN	GLA-5 MEDIAN	GLA-11 MEDIAN		
GENERAL CHEMISTRY (mg/L):										
Chloride	450	142	118	265	160	75	150	179	500 **(2)	300
Cyanide	NC	NC	NC	NC	NC	NC	NC	NC	0.2 (1,3)	NV
Nitrate/Nitrite	42.9	6.34	0.26	28.3	15.3	1.50	18.8	NC	45 (1,3)	15
pH (units)	7.37	7.30	7.27	7.22	7.38	7.1	6.70	7.61	NV	NV
Sulfate	160	61	39	130	73	38	313	84	500 **(2)	500
Sulfide	NC	NC	NC	NC	NC	NC	NC	NC	NV	NV
Total Dissolved Solids (TDS)	1410	608	514	1000	682	477	1120	750	1000 **(2)	900
METALS (mg/L):										
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	0.006 (1,3)	NV
Arsenic	NC	NC	NC	NC	NC	NC	NC	0.004	0.01 (1,3)	0.01
Barium	0.07	0.061	0.020	0.073	0.12	0.030	0.170	0.004	1(1) / 2(3)	1
Beryllium	NC	NC	NC	NC	NC	NC	NC	NC	0.004 (1,3)	NV
Cadmium	NC	NC	NC	NC	NC	NC	NC	NC	0.005 (1,3)	0.005
Calcium	165	63	48	100	74	72	97	96	NV	NV
Chromium-Total	NC	NC	NC	NC	NC	NC	NC	NC	0.05(1) / 0.1(3)	0.05
Cobalt	NC	NC	NC	NC	NC	NC	NC	NC	NV	NV
Copper	NC	NC	NC	NC	NC	0.0055	NC	NC	1.0(2)	1.0
Lead	NC	NC	NC	NC	NC	NC	NC	NC	0.015 (1,3)	0.015
Magnesium	94	35	28	64	41	22	62	32	NV	NV
Mercury	NC	NC	NC	NC	NC	NC	NC	NC	0.002 (1,3)	0.002
Nickel	NC	NC	NC	NC	NC	NC	NC	0.013	0.1 (1)	0.1
Selenium	0.003	NC	NC	NC	NC	NC	0.0016	NC	0.05 (1,3)	0.05
Silver	0.003	NC	NC	NC	NC	NC	0.0001	NC	0.1 (2)	0.1
Sodium	235	90	86	130	93	76	135	105	NV	NV
Thallium	NC	NC	NC	NC	NC	NC	NC	NC	0.002 (1,3)	0.002
Tin	NC	NC	NC	NC	NC	NC	NC	NC	NV	NV
Vanadium	0.041	0.031	0.030	0.030	0.030	0.007	0.029	NC	NV	NV
Zinc	0.0098	0.171	0.010	0.047	0.0092	0.455	0.025	0.013	5.0 (2)	5.0
VOLATILE ORGANIC COMPOUNDS (µg/L):										
Acetone	4.3	ND	ND	ND	ND	ND	ND	ND	NV	NV
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	0.52	ND	ND	NV	NV
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	0.21	ND	ND	NV	NV
Benzene	ND	ND	ND	ND	ND	0.11	ND	ND	1(1) / 5(3)	1
Carbon Disulfide	ND	5.5	0.3	0.35	0.31	ND	0.295	0.37	NV	NV
Ethylbenzene	ND	0.07	ND	ND	ND	0.41	ND	0.09	700(1,3)	700
n-Propylbenzene	ND	ND	ND	ND	ND	0.12	ND	ND	NV	NV
Naphthalene	ND	ND	ND	ND	ND	0.26	ND	ND	NV	NV
tert-Butylbenzene	ND	ND	ND	ND	ND	0.08	ND	ND	NV	NV
Toluene	0.52	ND	ND	ND	ND	1.4	ND	0.19	150 (1)/1000(3)	150
Trichlorofluoromethane	0.13	ND	ND	ND	ND	ND	ND	ND	150(1)	150
p+m-Xylenes	0.69	ND	ND	ND	ND	2.7	ND	ND	1750(1)/10,000(3)	1750
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L):										
Benzoic Acid	ND	ND	ND	ND	ND	2.6	ND	ND	NV	NV
bis (2-Ethylhexyl) phthalate	1.8	1.55	0.57	0.83	1.2	1.75	1.8	4.2	4(1)/6(3)	4
Butylbenzyl phthalate	0.78	ND	ND	ND	ND	0.44	ND	0.40	NV	NV
Di-n-butyl phthalate	ND	ND	ND	ND	ND	0.36	ND	ND	NV	NV
Naphthalene	ND	ND	ND	ND	ND	0.29	ND	ND	NV	NV
HERBICIDES, PESTICIDES & PCBs (µg/L):										
2,4-D	ND	ND	ND	0.17	ND	ND	ND	ND	70(1)	70

NOTES:

NC No calculation performed. Requires a minimum of three data entries.

NV No value available (in ARAR or Basin Objectives column).

ARAR = Applicable or Relevant and Appropriate Requirement.

** Value shown is the upper maximum contaminant limit (MCL).

(1) California Primary Drinking Water Standards.

(2) California Secondary Drinking Water Standards.

(3) Federal Maximum Contaminant Levels (MCLs).

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

ND Not detected above the method detection limit

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TABLE 15
GREGORY CANYON LANDFILL
ALLUVIAL AQUIFER COMPARISON DATA
DOWNGRADIENT VS. UPGRADIENT MEDIAN

ANALYTE	DOWNGRADIENT LOCATIONS		UPGRADIENT LOCATION	ARARs	BASIN OBJECTIVES
	GLA-16 MEDIAN	SLR#34 MEDIAN	LUCIO #2 MEDIAN		
GENERAL CHEMISTRY (mg/L):					
Chloride	107	78	94	500 **(2)	300
Cyanide	NC	NC	NC	0.2 (1,3)	NV
Nitrate/Nitrite	6.42	NC	0.7	45 (1,3)	15
pH (units)	7.50	7.64	7.35	NV	NV
Sulfate	109	144	159	500 **(2)	500
Sulfide	NC	NC	NC	NV	NV
Total Dissolved Solids (TDS)	687	558	667	1000 **(2)	900
METALS (mg/L):					
Antimony	NC	NC	NC	0.006 (1,3)	NV
Arsenic	0.0012	NC	NC	0.01 (1,3)	0.01
Barium	0.08	0.100	0.110	1(1) / 2(3)	1
Beryllium	NC	NC	NC	0.004 (1,3)	NV
Cadmium	NC	NC	NC	0.005 (1,3)	0.005
Calcium	80	80	96	NV	NV
Chromium-Total	NC	NC	NC	0.05(1) / 0.1(3)	0.05
Cobalt	NC	NC	NC	NV	NV
Copper	NC	NC	0.006	1.0(2)	1.0
Lead	NC	NC	0.0007	0.015 (1,3)	0.015
Magnesium	37	28	33	NV	NV
Mercury	NC	NC	NC	0.002 (1,3)	0.002
Nickel	NC	NC	NC	0.1 (1)	0.1
Selenium	NC	NC	NC	0.05 (1,3)	0.05
Silver	NC	NC	NC	0.1 (2)	0.1
Sodium	77	63	68	NV	NV
Thallium	NC	NC	NC	0.002 (1,3)	0.002
Tin	NC	NC	NC	NV	NV
Vanadium	0.030	NC	0.010	NV	NV
Zinc	0.0044	0.0055	0.0090	5.0 (2)	5.0
VOLATILE ORGANIC COMPOUNDS (µg/L):					
Acetone	ND	ND	4.9	NV	NV
Carbon Disulfide	0.32	ND	ND	NV	NV
Chloroform	ND	ND	1.2	700(1,3)	700
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L):					
Acenaphthene	0.31	ND	ND	NV	NV
bis (2-Ethylhexyl) phthalate	0.81	ND	0.62	4(1)/6(3)	4
Hexachlorobenzene	0.67	ND	ND	1(1,3)	1
Hexachlorobutadiene	ND	ND	0.64	NV	NV
Pyrene	0.60	ND	0.27	NV	NV
HERBICIDES, PESTICIDES & PCBs (µg/L): ND					

NOTES:

NC No calculation performed. Requires a minimum of three data entries.

NV No value available (in ARAR or Basin Objectives column).
ARAR = Applicable or Relevant and Appropriate Requirement.

** Value shown is the upper maximum contaminant limit (MCL).

(1) California Primary Drinking Water Standards.

(2) California Secondary Drinking Water Standards.

(3) Federal Maximum Contaminant Levels (MCLs).

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

ND Not detected above the method detection limit

TABLE 16
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - SURFACE WATER STATION SW-1

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	86	103	107	113	120	107	106	13	86	120
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	**0.098**	**0.030**	0.020	**0.059**	**0.1**	0.079	0.072	0.034	0.030	0.1
pH	units	7.08	7.92	8.18	7.98	7.2	7.92	7.67	0.50	7.08	8.18
Sulfate	mg/L	84	185	183	204	220	185	175	53	84	220
Sulfide	mg/L	NA	0.43	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	585	657	627	703	720	657	658	55	585	720
METALS											
Antimony	mg/L	NA	**0.010**	0.008	0.008	**0.00018**	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	**0.002**	**0.001**	**0.001**	0.002	0.002	0.002	0.001	0.001	0.002
Barium	mg/L	NA	**0.077**	0.0009	0.082	**0.071**	0.077	0.077	0.006	0.071	0.082
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	81	98	94	86	90	90	8	81	98
Chromium	mg/L	NA	**0.005**	0.004	0.004	**0.00039**	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00042**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.009**	0.003	0.003	**0.00085**	NC	NC	NC	NC	NC
Lead	mg/L	NA	0.004	0.0004	**0.0007**	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	30	34	35	33	34	33	2	30	35
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.003	**0.0028**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	0.0006	0.0006	**0.0014**	NC	NC	NC	NC	NC
Silver	mg/L	NA	**0.006**	0.003	**0.005**	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	67	76	73	80	75	74	5	67	80
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.010	0.003	0.010	**0.0092**	0.010	0.0097	0.0005	0.0092	0.010
Zinc	mg/L	NA	**0.0066**	**0.0020**	0.0050	**0.0093**	0.0058	0.0057	0.0031	0.0020	0.0093
VOLATILE ORGANIC COMPOUNDS (µg/L): ND											
Acetone	µg/L	4.8[a]	0.5	5.935	5.935	4.2	NC	NC	NC	NC	NC
Carbon Disulfide	µg/L	0.54	0.5	6.4[a]	0.266	0.26	NC	NC	NC	NC	NC
Toluene	µg/L	0.11	0.5	0.047	0.047	**0.33**	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	3.2[a]	0.33	**0.38**[a]	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 17
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - SURFACE WATER STATION SW-2

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	96	105	109	111	120	109	108	9	96	120
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	0.3	**0.021**	0.020	**0.030**	**0.15**	0.09	0.12525	0.1305	0.021	0.3
pH	units	7.40	7.92	7.96	7.86	6.9	7.86	7.608	0.46	6.9	7.96
Sulfate	mg/L	171	185	184	195	210	185	189	15	171	210
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	622	660	623	700	730	660	667	48	622	730
METALS											
Antimony	mg/L	NA	**0.020**	0.008	0.008	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	**0.0009**	**0.001**	0.0007	**0.0016**	0.001	0.001	0.0004	0.0009	0.0016
Barium	mg/L	NA	**0.080**	0.0009	0.088	**0.082**	0.08	0.08	0.004	0.08	0.088
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	78	97	96	91	93.5	90.5	8.7	78	97
Chromium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	**0.00047**	NC	NC	NC	NC	NC
Copper	mg/L	NA	**0.008**	0.003	0.003	**0.00092**	NC	NC	NC	NC	NC
Lead	mg/L	NA	0.004	0.0004	0.0004	0.000098	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	29	35	36	33	34	33.3	3.1	29	36
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.003	0.003	0.003	**0.0031**	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	0.0006	0.0006	**0.0010**	NC	NC	NC	NC	NC
Silver	mg/L	NA	**0.004**	0.003	**0.006**	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	65	76	75	80	75.5	74	6.4	65	80
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	**0.008**	0.003	**0.008**	**0.0064**	0.008	0.0075	0.0009	0.0064	0.008
Zinc	mg/L	NA	**0.0067**	0.00089	**0.0014**	**0.0074**	0.0067	0.0052	0.0033	0.0014	0.0074
VOLATILE ORGANIC COMPOUNDS (µg/L): ND											
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**0.55**[a]	0.33	NA	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

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TABLE 18
GREGORY CANYON LANDFILL
SURFACE WATER COMPARISON DATA
DOWNSTREAM VS. UPSTREAM MEDIAN

ANALYTE	DOWNSTREAM LOCATION SLRSW-2 MEDIAN	UPSTREAM LOCATION SLRSW-1 MEDIAN	ARARs	BASIN OBJECTIVES
GENERAL CHEMISTRY (mg/L):				
Chloride	109	107	500 **(2)	250
Cyanide	NC	NC	0.2 (1,3)	NV
Nitrate/Nitrite	0.09	0.079	45 (1,3)	NV
pH (units)	7.86	7.92	NV	NV
Sulfate	185	185	500 **(2)	250
Sulfide	NC	NC	NV	NV
Total Dissolved Solids (TDS)	660	657	1000 **(2)	500
METALS (mg/L):				
Antimony	NC	NC	0.006 (1,3)	NV
Arsenic	0.001	0.002	0.01 (1,3)	0.01
Barium	0.08	0.077	1(1) / 2(3)	1
Beryllium	NC	NC	0.004 (1,3)	NV
Cadmium	NC	NC	0.005 (1,3)	0.005
Calcium	93.5	90	NV	NV
Chromium-Total	NC	NC	0.05(1) / 0.1(3)	0.05
Cobalt	NC	NC	NV	NV
Copper	NC	NC	1.0(2)	1.0
Lead	NC	NC	0.015 (1,3)	0.015
Magnesium	34	34	NV	NV
Mercury	NC	NC	0.002 (1,3)	0.002
Nickel	NC	NC	0.1 (1)	0.1
Selenium	NC	NC	0.05 (1,3)	0.05
Silver	NC	NC	0.1 (2)	0.1
Sodium	75.5	75	NV	NV
Thallium	NC	NC	0.002 (1,3)	0.002
Tin	NC	NC	NV	NV
Vanadium	0.008	0.010	NV	NV
Zinc	0.0067	0.0058	5.0 (2)	5.0
VOLATILE ORGANIC COMPOUNDS (µg/L):				
Acetone	ND	4.8	NV	NV
Carbon Disulfide	ND	6.4	NV	NV
Toluene	ND	0.33	150 (1)/1000(3)	150
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/L):				
bis (2-Ethylhexyl) phthalate	0.55	1.79	4(1)/6(3)	4
HERBICIDES, PESTICIDES & PCBs (µg/L): ND				

NOTES:

NC No calculation performed. Requires a minimum of three data entries.

NV No value available (in ARAR or Basin Objectives column).
ARAR = Applicable or Relevant and Appropriate Requirement.

** Value shown is the upper maximum contaminant limit (MCL).

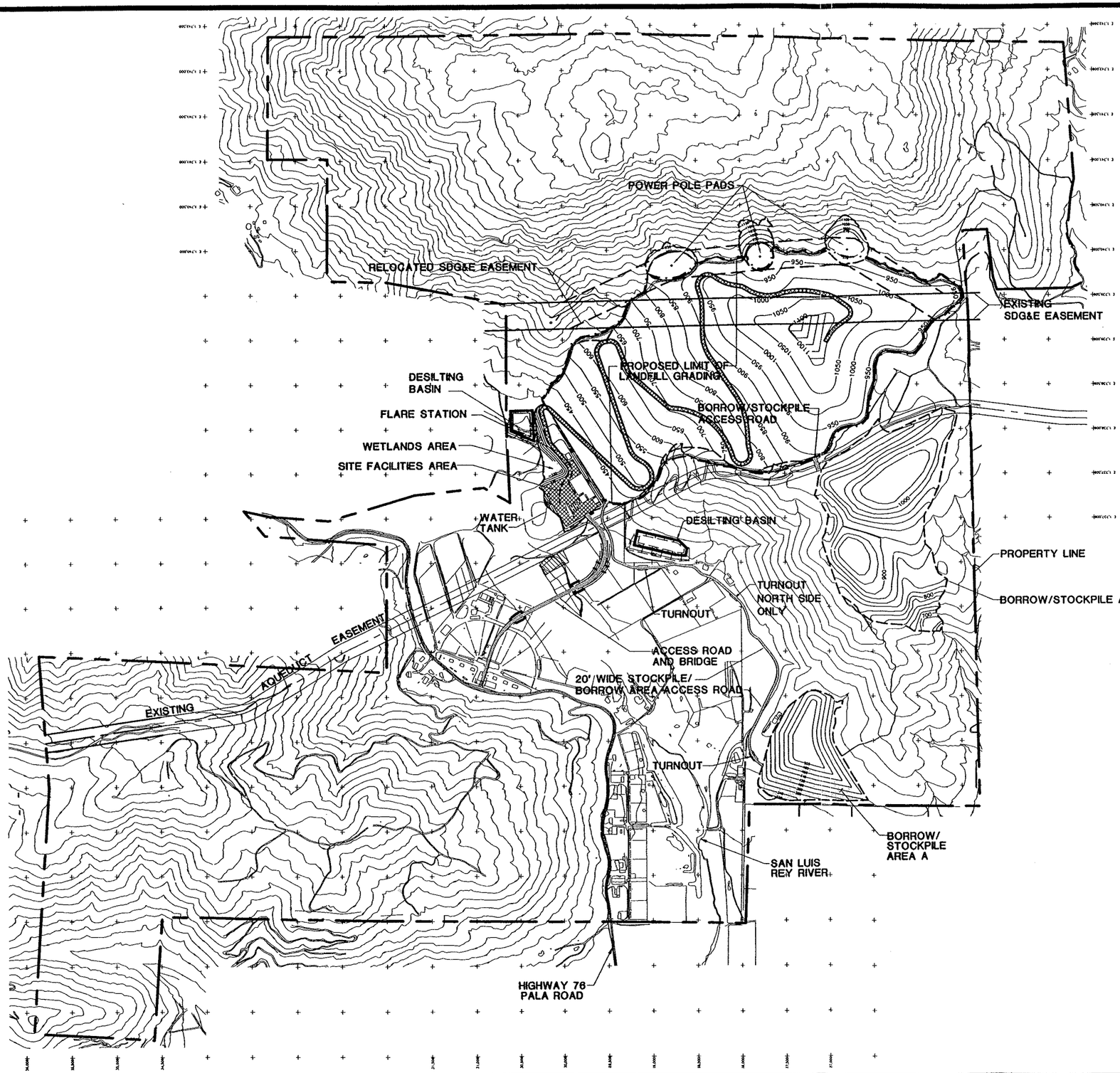
(1) California Primary Drinking Water Standards.
(2) California Secondary Drinking Water Standards.
(3) Federal Maximum Contaminant Levels (MCLs).

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

ND Not detected above the method detection limit

FIGURES

786



LEGEND

- PROPERTY LINE
- APPROXIMATE LIMIT OF LANDFILL GRADING
- BORROW/STOCKPILE AREA LIMITS
- FINAL CONTOUR
- EXISTING CONTOUR
- ACCESS/HAUL ROAD

N

GRAPHIC SCALE
600 0 300 600 1200
(in feet)
1 inch = 1200 ft.

FIGURE 1

GREGORY CANYON LANDFILL SITE MAP

MONITORING AND REPORTING PROGRAM
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	NOVEMBER 2003	9539

787

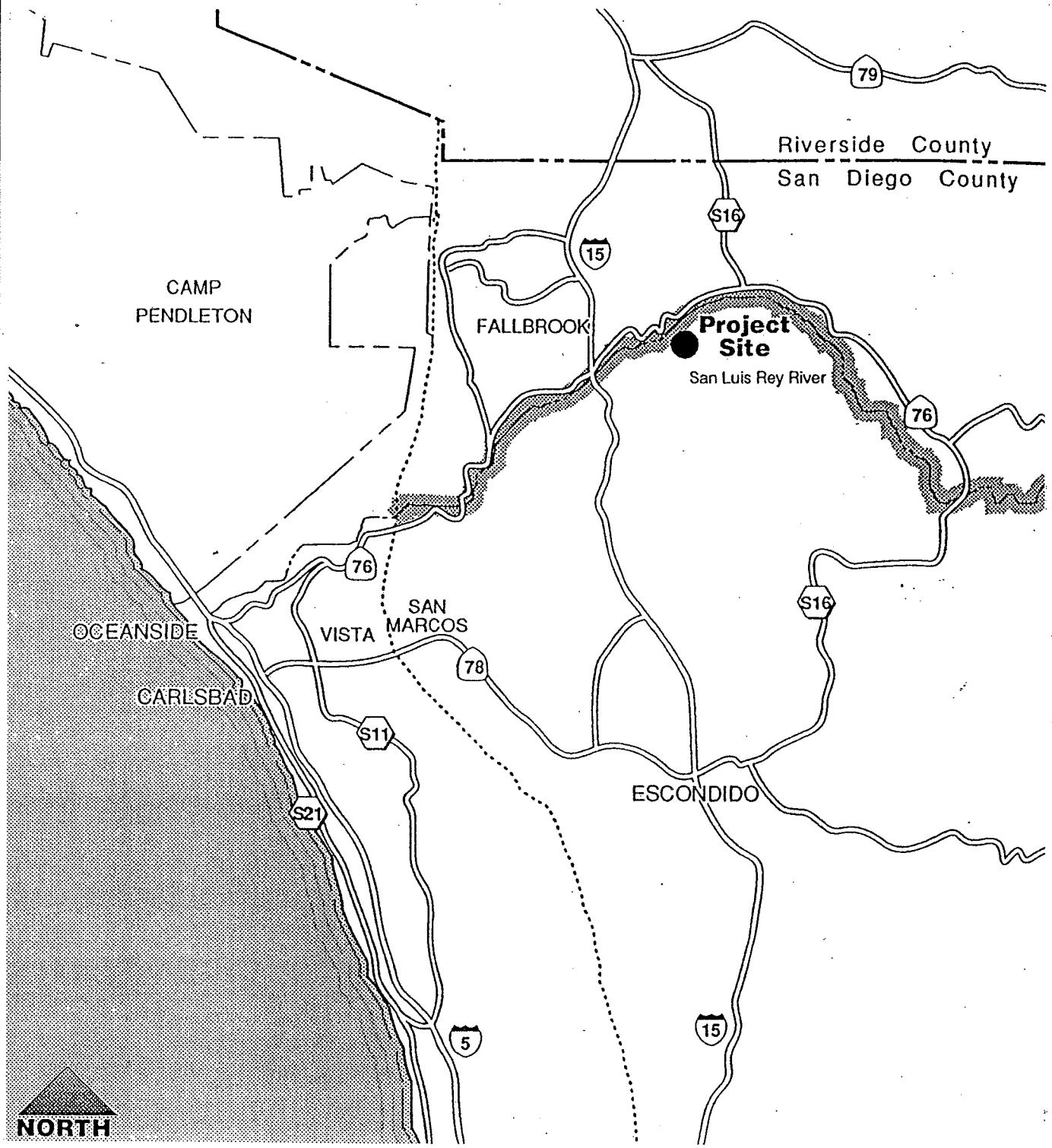


FIGURE 2

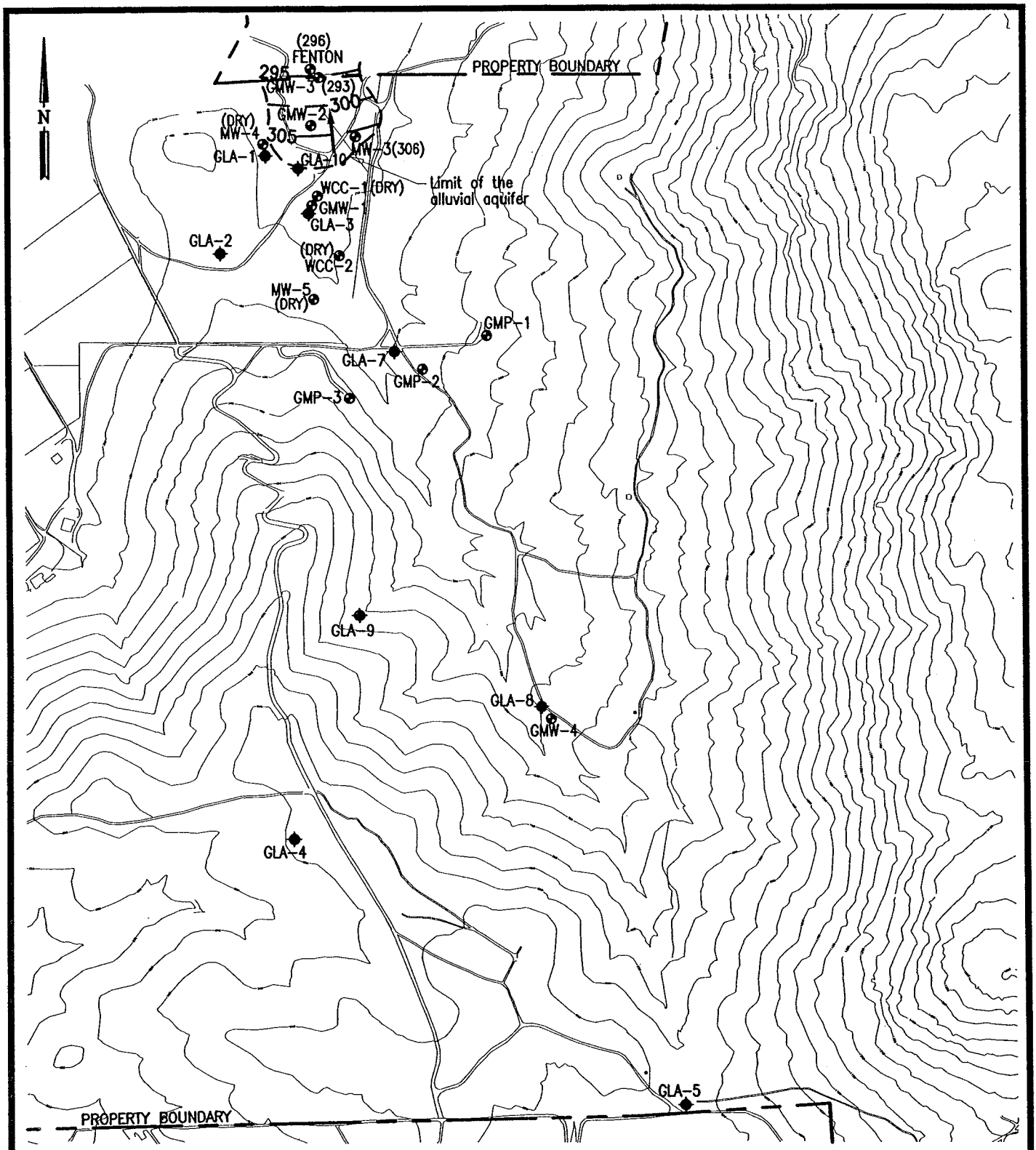
SITE LOCATION MAP

MONITORING AND REPORTING PROGRAM
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	MAY 2003	9539

788



GRAPHIC SCALE

350 0 175 350 700

(in feet)

1 inch = 700 ft.

EXPLANATION:

- MONITORING WELL BY GLA
- MONITORING WELL BY OTHERS
- 300 WATER TABLE ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

FIGURE 3

CONFIGURATION OF THE WATER TABLE IN THE ALLUVIAL AQUIFER ON 12/16/96

MONITORING AND REPORTING PROGRAM
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

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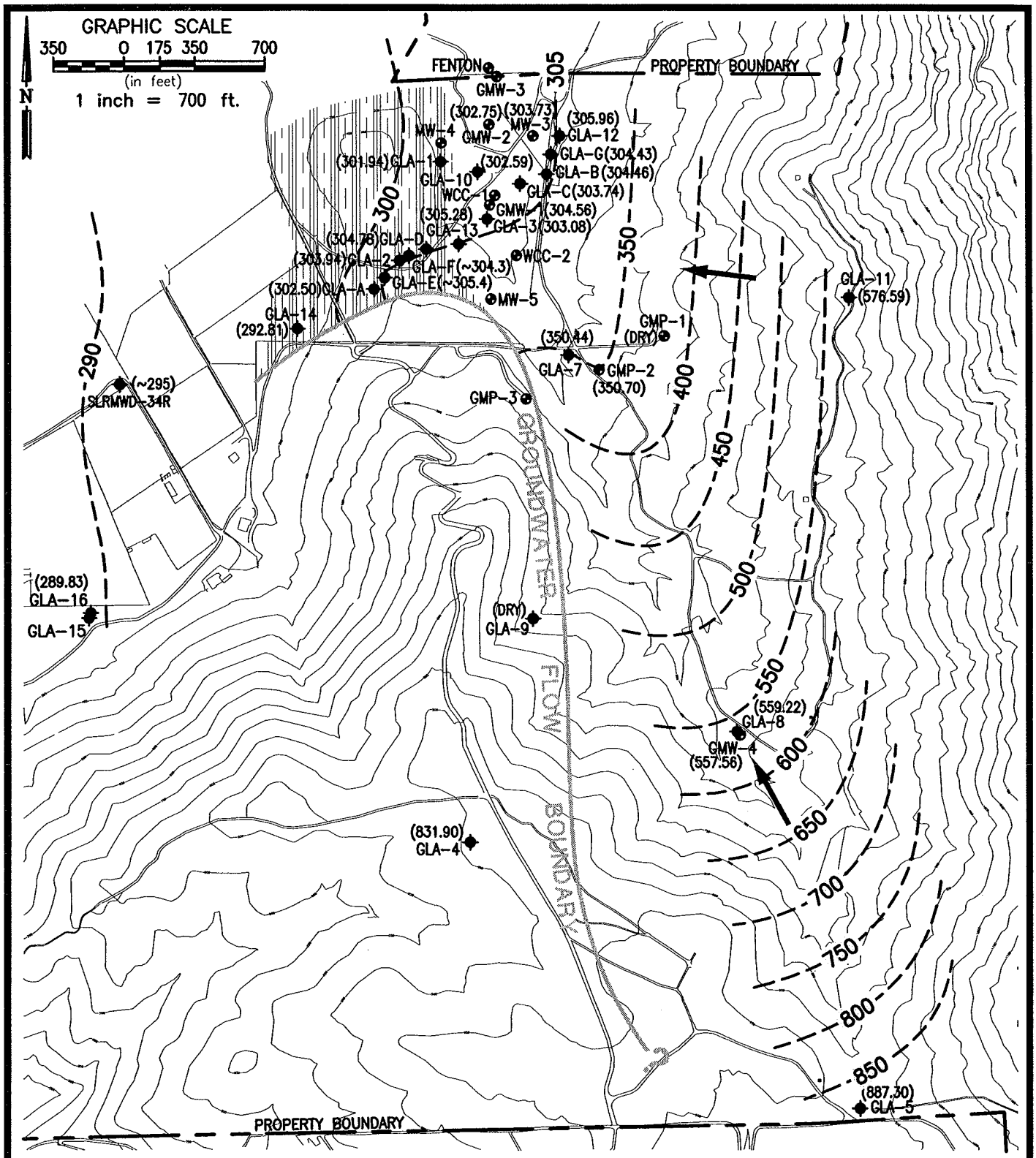
VL	MAY 2003	9539



EXPLANATION:

- MONITORING WELL BY GLA
- MONITORING WELL BY OTHERS
- (887.30) GROUNDWATER ELEVATION (OCTOBER 2004)
- 700 PIEZOMETRIC SURFACE ELEVATION CONTOUR (OCTOBER 2004)
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER BARRIER (QUERIED WHERE UNCERTAIN OF SOUTHERN EXTENSION)
- LOW PERMEABILITY ZONE

FIGURE 4

CONFIGURATION OF THE PIEZOMETRIC SURFACE IN THE FRACTURED BEDROCK AQUIFER ON 10/09/04

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SAN DIEGO COUNTY, CALIFORNIA

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VL	OCTOBER 2004	9539

790

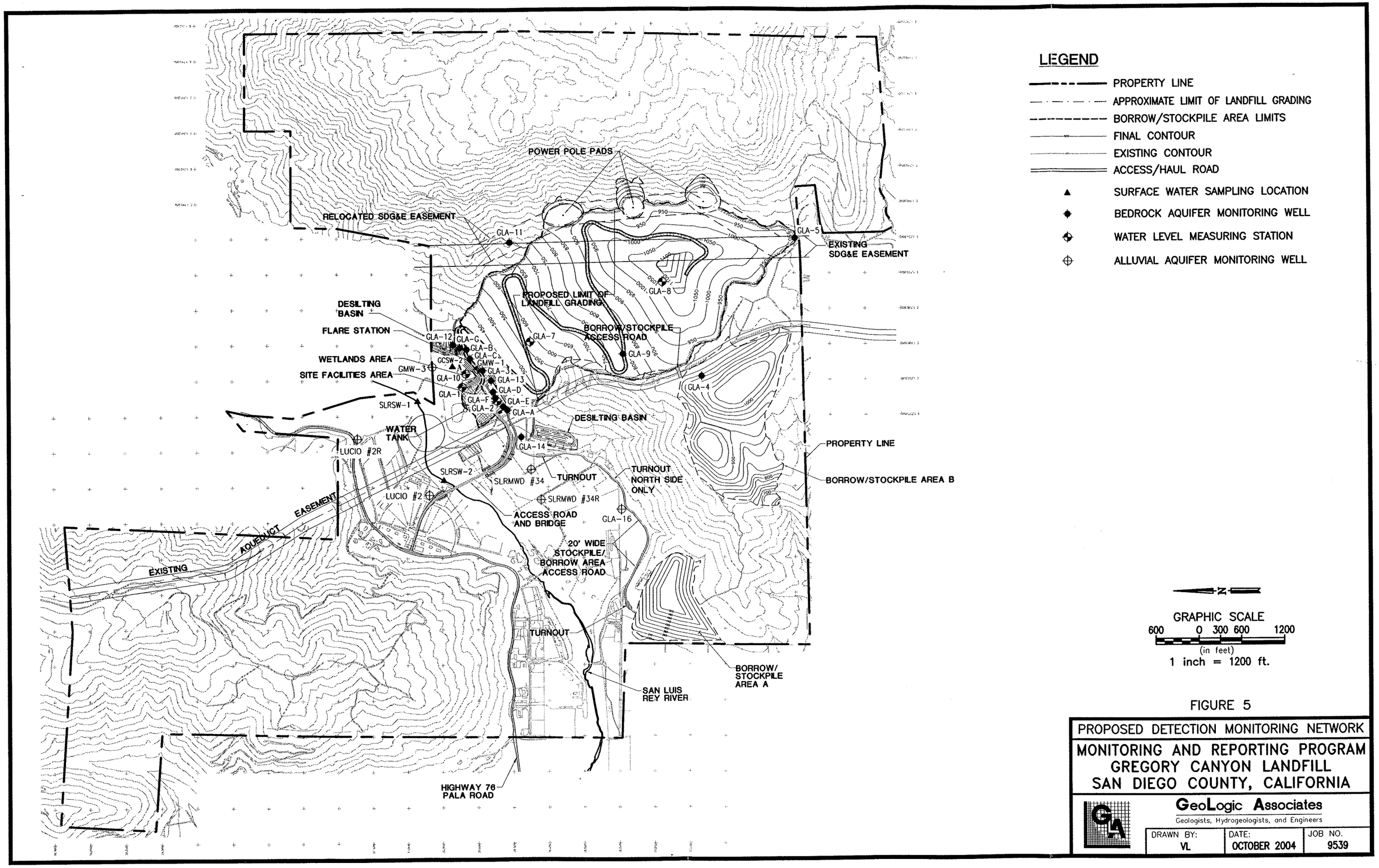

FIGURE 5

PROPOSED DETECTION MONITORING NETWORK

MONITORING AND REPORTING PROGRAM
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
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VL	OCTOBER 2004	9539

ATTACHMENT 1

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS PLAN

GROUNDWATER QUALITY MONITORING PROGRAM FOR THE GREGORY CANYON LANDFILL

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June 2001
Revision 1: January 2005

793

SAMPLING AND ANALYSIS PLAN
FOR GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	2
2.0	FIELD EQUIPMENT	3
	2.1 FIELD EQUIPMENT CALIBRATION	3
	2.2 MAINTENANCE OF FIELD EQUIPMENT	4
3.0	FIELD MEASUREMENTS	4
4.0	FIELD QA/QC FOR WATER SAMPLING AND ANALYSIS	5
5.0	LABORATORY QA/QC FOR ALL SAMPLES	7
6.0	GROUNDWATER SAMPLING PROCEDURES	8
7.0	SURFACE WATER SAMPLING PROCEDURES	11
8.0	LEACHATE, SUBDRAIN AND DRAINAGE LAYER SAMPLING PROCEDURES	11
9.0	SAMPLE CUSTODY AND DOCUMENTATION	12
10.0	SAMPLE HANDLING AND PACKING	15
11.0	REFERENCES	16

SAMPLING AND ANALYSIS PLAN

GROUNDWATER QUALITY MONITORING PROGRAM FOR GREGORY CANYON LANDFILL

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) provides guidelines to be followed for Detection Monitoring at the proposed Gregory Canyon Sanitary Landfill, pursuant to Title 27, Chapter 3, Subchapter 3 of the California Code of Regulations.

The primary objective of the SAP is to provide a series of procedures for obtaining field measurements and chemical data in a consistent manner, in accordance with USEPA criteria for precision, accuracy, representativeness, completeness, and comparability. Project-specific SAP objectives have been developed following the objectives outlined in the U.S. EPA documents entitled Test Methods for Evaluating Solid Waste (US EPA, 1986), and Methods for Chemical Analysis of Water and Wastes (US EPA, 1983).

The SAP has been designed to control data quality within current US EPA established limits, and the related protocols in the SAP were tailored to both the project objectives and the data quality objectives. Quality Assurance/Quality Control (QA/QC) associated with the sampling and screening methodologies will consist of the following activities:

- Sample collection, preservation, transportation and storage
- Sample custody documentation
- Calibration and preventive maintenance of analytical instrumentation and apparatus
- Data reduction, validation, and reporting
- Assessment of data quality
- Analytical quality control
- Reporting

During the assessment of field and laboratory analytical data, qualitative limitations associated with the individual measurements will be identified and defined. Several types of QA/QC samples will be used in the programs (e.g., field and trip blanks, and duplicate samples), to provide the primary basis for quantitatively estimating data quality. The QA/QC activities proposed will include an evaluation of the analytical results obtained from all samples collected during the sampling programs, so that data quality can be assessed relative to individual analyses and overall sampling program performance.

2.0 FIELD EQUIPMENT

A variety of instruments may be used to collect data during the course of site investigations and monitoring programs at the site. All instruments and equipment used will be maintained, calibrated, and operated according to the manufacturers' guidelines and recommendations. When in the field, a photocopy of the manufacturer's operation and calibration recommendations will accompany each instrument, and a copy of the calibration, maintenance, and repair log will also be kept on-site for each instrument.

2.1 FIELD EQUIPMENT CALIBRATION

The following equipment and calibration procedures shall be used where appropriate for the field investigation.

Steel measuring tapes - For surface measurements and measuring of well depths. Calibration: Tapes will be inspected at least one time per week to check for kinks, stretching, or worn markings.

Electric water level meters - For water level measurements in wells. Calibration: Meter tapes will be checked against steel surveyor's tape at the beginning and end of each monitoring round.

Digital pH meter - pH meters will be calibrated to a pH 7 buffer and another buffer solution with a pH spanning the range of pH values to that of the sample (typically either a pH of 4 or 10) prior to the measurement of each individual sample. Due to the significant effect that temperature has on pH measurements, the temperature of the buffer solution will also be measured and adjusted on the pH meter prior to calibration. After calibration, the pH probe will be rinsed with distilled or deionized water, and the temperature of the sample will be measured. If the sample temperature varies from the buffer temperature, then the pH meter will be adjusted to the sample temperature. The temperature compensation procedure is not needed for pH meters with automatic temperature compensation. The pH meter will be kept in the shade at all times, if possible.

Electrical conductivity meter - For measurement during well development and purging. Calibration: Factory calibrated annually. Temperature correction applied during measurement. Daily check using standard solution (0.00702N potassium chloride) at ambient temperature.

Mercury thermometers - Mercury thermometers may be used for measurement of water temperatures during well development and purging. Calibration: Factory calibrated.

Multiple Sensor Meter (pH, Dissolved Oxygen, Conductivity, Temperature, Turbidity – For measurement during well development and purging. Calibration: At least daily, submerge the probe into the calibration beaker filled with manufacturer auto-calibration solution and press the button to obtain a simultaneous one-point calibration.

796

Equipment not listed herein will be calibrated according to manufacturers' recommendations and/or generally accepted practice. Calibration procedures will be documented for the project file. Instruments for which calibration cannot be easily checked will be either tested against another instrument of a similar type, or will be returned to the manufacturer for appropriate calibration. If tested against another instrument capable of making the same measurements, variation between instruments must not exceed five percent. If readings vary more than five percent, the instrument will be returned to the manufacturer for calibration.

Scheduled periodic calibration of testing equipment will not relieve field personnel of the responsibility of employing properly functioning equipment. If equipment malfunction is suspected, the device will be removed from service, tagged so that it is not inadvertently used, and the appropriate personnel notified so that re-calibration can be performed or a substitute piece of equipment can be obtained.

2.2 MAINTENANCE OF FIELD EQUIPMENT

All field equipment will be maintained by the company from which it is subcontracted/owned, or by the technicians in the laboratory. Any equipment or device determined to not be in good working order will be replaced or repaired promptly. A record of instrument calibration and maintenance will be maintained. For instruments that require frequent calibration, and to enable the user to document the procedures used to verify the accuracy of the instrument, a service manual will accompany the instrument at all times.

Equipment that fails a calibration check, or becomes inoperable during use, will be removed from service. It will be segregated to prevent inadvertent use and tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily re-calibrated prior to future use. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed re-calibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented and the appropriate personnel notified.

3.0 FIELD MEASUREMENTS

Water level measurements - Water levels will be measured to 0.01 foot under static water level conditions with an electric water level meter. Water level will be measured at least twice and the arithmetic mean reported.

pH - After calibration of the pH meter, the pH probe will be rinsed with distilled or deionized water in a wash bottle and allowed to air dry. During measurement, several readings will be taken and the arithmetic mean used as the reported value. The probe will be sprayed with distilled or deionized water or clean water after the sample measurement for storage. The user's manual for the pH meter will be available to field personnel.

297

Electrical conductivity - Calibration of the conductivity meter will be performed a minimum of once per day. A standard solution of known conductivity will be available to check precision. After calibration, the probe will be rinsed with distilled or deionized water in a wash bottle and allowed to air dry. During measurement, several readings will be taken and the arithmetic mean used as the reported value. The user's manual for the electrical conductivity meter will be available to field personnel.

Multiple Sensor Meter (pH, Dissolved Oxygen, Conductivity, Temperature, Turbidity – Calibration of the multiple sensor meter will be performed a minimum of once per day. After calibration, the probe will be rinsed with clean water. During well pumping the discharge water is routing through a flow-through cell attached to the probe for measurement. Measurements will be taken at regular intervals (depending on the water discharge rate) to evaluate water quality and assess parameter stabilization. The user's manual for the multiple sensor meter will be available to field personnel.

Flow rates - Because flow rates may change, several single instantaneous readings on a flowmeter or calibrated receptacle will be made throughout the duration of pumping.

Surveying Data - All sampling sites will be located on aerial photographs or other maps by reference to known features. Generally, location accuracy will be better than 5 feet. The elevation of sampling sites and monitoring wells that have not been previously surveyed will be surveyed to the nearest 0.01 foot. This survey will be tied into a benchmark from the coordinate system.

4.0 FIELD QA/QC FOR WATER SAMPLING AND ANALYSIS

Sample labels/tags - All sample tag/labels shall include the analyses to be performed, the sample identifier, date of collection, time of collection, sampler's signature or initials, type of sample (grab or composite), and whether any preservatives were added. All information included on the sample tag/label shall be cross-referenced in the field logbook, including the sample tag/label number. The field sampler in charge shall complete a sample tag/label for each container. All sample tag/label information shall be inscribed using waterproof ink.

Field QC samples shall also be assigned a similar sample number to prevent the laboratory from identifying those samples. In addition, to prevent the field blank samples from being used for laboratory QC analyses (i.e., matrix spikes), a unique sample shall be designated for laboratory use, and a notation that the sample is to be used for laboratory QA shall be made on the sample tag and the chain-of-custody record.

To be confident that the sample handling and decontamination procedures do not induce contaminant introduction into the samples, and to verify the laboratory's ability to reproduce results for nearly identical samples, trip blanks, equipment blanks, and field duplicates will be prepared and submitted to the laboratory along with the actual field samples.

The water to be used for field blanks should meet the standard of the American Society for Testing and Materials for Type II water, and shall be obtained from the laboratory performing the analyses. All blanks submitted for analysis shall be labeled in the same manner as in the regular samples, to prevent the laboratory from identifying them and handling them differently. These QA/QC samples are described below.

Trip blanks - Trip blanks will be used when water samples are collected in the field. Trip blanks provide a check on contaminants that may have originated from sample handling and transportation activities, and/or in the laboratory. A trip blank is required with each shipment of samples for volatile analysis only when no other blank is analyzed. A trip blank for volatile organic analysis will be prepared in the laboratory by filling sample containers with analyte-free water and shipping the blank to the site along with the empty sample containers. The trip blank will be numbered, packaged, and sealed in an identical manner as the other water samples collected for volatile organic analysis and will be carried to the well and set next to the well during sampling along with the empty sample containers. The trip blank will then be shipped with the other samples to the laboratory for analysis. At no time will the trip blank be opened during sampling. Trip blanks will be included with groundwater samples at a rate of one per day.

Equipment blanks - An equipment blank is analyte-free water, supplied by the laboratory, that is poured into or pumped through decontaminated sampling equipment and collected in sampling containers. The equipment blank will identify sample contamination that is associated with improper sample equipment decontamination, bottle contamination, or contamination associated with bottle or sample shipment. The equipment blank will not, on its own, identify the exact source of contamination. Equipment blanks will be prepared in the field during the day, or at the end of each sampling day, by pouring analyte-free water through recently decontaminated groundwater sampling equipment. The analyte-free water will then be placed in 40-ml glass vials, sealed, labeled, and stored along with all other samples in an ice-cooled container. The equipment blanks will be analyzed for the same VOCs as the other groundwater samples. At least one equipment blank/day/sample crew will be required for each laboratory being used.

Field duplicates for water samples - A field duplicate is a second sample collected from a given location and must be taken concurrently with the primary sample. A field duplicate sample provides the data user with information regarding the precision of the analysis being completed. A lack of precision may indicate that the sample matrix is not homogeneous or that the sampling and analytical procedures are not capable of providing consistent results. If the results of duplicate analyses do not fall within the control limits specified for the analysis, actions should be taken to correct the situation and the data should only be used with a recognition of its potential lack of precision. Field duplicates will be collected from the same sampling apparatus as the primary samples, and will be packaged, sealed, and analyzed in an identical manner as the primary water sample. To prevent special handling of the samples by the laboratory, samples collected for duplicate analysis will not be identified as duplicates to the laboratory. Field duplicates will be collected at the rate of five to ten percent of the total number of water samples collected.

Split samples - Split samples are typically collected to evaluate the comparability of results from two or more laboratories performing the same analysis or to verify the capability of one laboratory to perform an analysis. The same sampling equipment shall be used for collecting both sets of samples and sample bottles for all laboratories will be obtained from the same source.

When it is necessary to use more than one laboratory because a single laboratory cannot provide the capability necessary, a minimum of ten percent of the samples will be split and analyzed by each. Data are not necessarily comparable and should be used with caution when the results of two or more split samples do not agree within ten percent, or other mitigating circumstances are identified. If the split-sample results show a great deal of variance or one laboratory consistently shows analytes above detection limits while the other does not, a problem likely exists that must be corrected immediately. After identification and resolution of split-sample discrepancies, the affected samples must be re-analyzed, if sample holding times permit, or new samples should be obtained.

5.0 LABORATORY QA/QC FOR ALL SAMPLES

This section specifies the minimum laboratory QA/QC requirements, including a laboratory certification/performance evaluation program, QA/QC documentation, and data validation.

Groundwater samples shall be analyzed using drinking water protocols, so that detection limits are below State and Federal maximum contaminant levels (MCLs).

Laboratories must have in place a documented analytical QA/QC program that will include procedures followed on a daily basis to reduce variability and errors, identify and correct measurement problems, and provide a statistical measure of data quality. The basic requirements for a laboratory QA/QC program are described in the US EPA's Test Methods for Evaluating Solid Waste. Data whose quality does not meet the requirements of this document, regardless of laboratory certification, shall be excluded. All relevant detailed portions of the laboratory QA/QC program will be considered an official part of the project record.

Water analyses shall be performed using appropriate methods approved by US EPA. The Director of the laboratory whose name appears on the certification shall agree to the following responsibilities: 1) supervise all analytical work in his/her laboratory; and 2) sign all reports. All monitoring instruments and equipment shall be properly calibrated and maintained for accuracy of measurements.

Method selection - The methods of analysis and the detection limits used shall be appropriate for the State Primary Drinking Water Standard, Federal MCL, or other established ARAR, and for the expected concentrations. For monitoring of any constituent or parameter that is found in concentrations that produce more than 90 percent non-numerical determinations (i.e., "trace" or "ND") in data from Background Monitoring Points for that medium, the analytical method having the lowest method detection limit (MDL) shall be selected. For organic chemical constituents identified in 40 CFR Part 258 Appendix I, the laboratory will use EPA Method

8260. For the remaining organic chemical constituents listed in Appendix II, EPA Methods 8270, 8150, and 8080 shall be used, or the most current EPA-approved methods for semivolatile organics, herbicides, and pesticides and PCBs, respectively.

Nominal MDL and Practical Quantitation Limit (PQL) - MDLs and PQLs shall be derived by the laboratory for each analytical procedure, according to laboratory accreditation procedures established by the State of California. These nominal MDLs and PQLs shall reflect the detection and quantifying capabilities of the specific analytical procedure and equipment used by the laboratory, rather than simply being quoted from US EPA analytical method manuals. If the laboratory suspects that, due to a change in matrix or other effects, the true detection limit or quantitation limit for a particular analytical run differs significantly from the laboratory-derived nominal MDL/PQL values, the results shall be flagged accordingly, along with an estimate of the detection limit and quantitation limit actually achieved.

Trace results - Analytical results falling between the MDL and the PQL shall be reported as "trace" (along with the laboratories best estimate of the actual concentration), and shall be accompanied both by the (nominal or estimated) MDL and PQL values for that analytical run.

QA/QC data - All QA/QC data shall be reported along with the sample results to which it applies, including: the method, equipment used and analytical detection limits, the recovery rates and an explanation for any recovery rate that is less than 80 percent, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name of the person(s) performing the analyses. Sample results shall be reported unadjusted for blank results or spike recovery. In cases where contaminants are detected in QA/QC samples (i.e., field, trip, or laboratory blanks), the accompanying sample results shall be appropriately flagged.

Common laboratory contaminants - A procedure must be identified to evaluate the significance of analytical results for a constituent that is a common laboratory contaminant (e.g., methylene chloride, acetone, diethylhexyl phthalate, and di-n-octyl phthalate). If the QA/QC samples show evidence of laboratory contamination for a constituent, then analytical results involving detection of this constituent in any background or downgradient sample shall be reported and flagged.

Unknowns - Unknown chromatographic peaks shall be reported, along with an estimate of the concentration of the unknown analyte. When unknown peaks are encountered, second column or second method conformation procedures shall be performed to attempt to identify and more accurately quantify the unknown analyte.

6.0 GROUNDWATER SAMPLING PROCEDURES

The following sampling and decontamination procedures provide minimum requirements that shall be followed when performing groundwater sampling at the Gregory Canyon Landfill. Depending on the location of the well, two separate sampling procedures are proposed for the Gregory Canyon Landfill. As a result of the hydraulic barrier proposed at the point of compliance (POC), all compliance bedrock aquifer wells will be sampled in accordance with the

procedures discussed under the bedrock compliance well sampling procedures section. All other wells (alluvial and bedrock-background/cross-gradient) will be sampled in accordance with the procedures discussed under standard sampling procedures section.

Decontamination - Before initial sampling, all sampling equipment shall be washed with a non-phosphate detergent and rinsed with tap water and distilled or deionized water. All rinsing shall be performed by pouring the medium directly over the sampling equipment. Sampling equipment shall be dedicated to a well, or adequately decontaminated between use, or be made of disposable material. If sampling equipment cannot be dedicated to a well, a sample of the final rinsate shall be analyzed as a rinsate blank at a frequency of one per day for all sample parameters. If sampling equipment cannot be dedicated to a well and is to be decontaminated between uses, the wells must be sampled in order of anticipated increasing contamination.

Procedures to be used for groundwater sampling are outlined in the Practical Guide for Groundwater Sampling and RCRA Groundwater Monitoring Technical Enforcement Guidance Document.

Standard Purging Procedures for Sampling – Prior to collecting groundwater samples, purging of a well is necessary to provide a representative sample of groundwater that approximates formational conditions. Temperature, pH, turbidity, and EC or conductivity of the purged water are measured to evaluate whether stable conditions have been achieved. It is assumed that stability or formational conditions have been achieved when the difference between successive field indicator measurements is less than ten percent. The amount of water that must be purged from a well is a function of the stability of the measured parameters, as well as the recovery rate of the well. Purging should be performed at a sufficiently slow rate so that recharging water does not cascade in the filter pack and casing.

A well is considered to be fast recharging if groundwater levels recover to within 80 percent or more of the original static water level within two hours of purging. A minimum of one borehole volume should be purged before temperature, pH, turbidity, and EC parameters are measured in the purged water. An additional one-half borehole volume should be purged prior to re-measuring the water quality parameters. It is assumed that stability or formational conditions have been achieved when the difference between successive measurements is less than ten percent. If the values vary by more than 10 percent, additional one-half borehole volumes should be purged until temperature, pH, and EC parameters have adequately stabilize, up to a total of three borehole volumes. The well should be allowed to recharge to 80 percent of its static condition prior to sample collection.

A well is considered to be slow recharging if groundwater levels do not recover to within 80 percent or more within two hours of purging. Slow recharging wells should be purged by removing one borehole volume of water, and then allowing the well to recover for up to two hours prior to collecting samples.

A borehole volume is the amount of water contained within the casing of a well (called a casing volume) plus the water contained within the filter pack surrounding the well casing. The following equation is used to calculate the borehole volume in the screened interval of a well:

$$\text{Borehole volume (gallons)} = (7.48\pi/4)[CD^2+P(BD^2-CD^2)](WD-GW)$$

Where:

BD = borehole diameter (feet)
CD = casing diameter (feet)
P = porosity of filter pack (as a decimal)
WD = well depth (feet)
GW = depth to groundwater (feet)

The following equation is used to calculate the borehole volume in the unscreened interval of a well:

$$\text{Borehole volume (gallons)} = (7.48\pi/4)(CD^2)(WD-GW)$$

Where:

CD = casing diameter (feet)
WD = well depth (feet)
GW = depth to groundwater (feet)

Bedrock Compliance Well Purging Procedures for Sampling – As a result of very low flow rates in the majority of bedrock wells at the POC, a permanent dewatering condition at the POC is proposed for the Gregory Canyon Landfill, thereby creating a hydraulic sump. To achieve a permanent dewatering condition at the POC, bedrock wells will be equipped with float sensors and electric submersible pumps. As a result, additional purging of bedrock wells at the POC is unnecessary to provide a representative sample of groundwater that approximates formational conditions. Prior to sample collection each bedrock well would be allowed to recover (no greater than 48 hours), until a sufficient volume of water enters the well to collect a sample.

Sample retention - Sample containers should be filled based on decreasing volatility. That is, containers used to analyze for VOCs should be filled first, followed by semi-volatiles, pesticides and PCBs, metals, and general chemistry constituents. Samples shall be collected using either an approved, non-aerating dedicated submersible pump; bladder pump; or bottom-loading stainless steel or Teflon bailer with a bottom emptying device and a flow control device for the bottom of the bailer. VOC vials shall be filled by pouring the sample down the sides of the container with as little turbulence as possible. Vials shall be filled completely and immediately capped leaving zero airspace in the vial. The vial shall then be turned upside down, and tapped to check for air bubbles. If an air bubble is trapped in the vial, and exceeds the size of a pea, the sample shall be discarded and a new sample collected; the remaining sample is not to be topped off. For VOC analysis, a minimum of two vials shall be collected per sample; however, they shall not be composited or mixed. VOC samples should never be field-filtered.

With the exception of metals samples, which may require field-filtering, all groundwater samples shall be poured directly into the sample containers. Samples should never be transferred from one sample container to another. Groundwater samples shall be preserved immediately after collection and then cooled with ice to about 4°C until analysis.

7.0 SURFACE WATER SAMPLING PROCEDURES

The following sampling and decontamination procedures provide minimum requirements that shall be followed when performing surface water sampling at the Gregory Canyon Landfill.

Surface water locations will be sampled by submersing the laboratory-supplied sampling container, or a decontaminated dipper, in a slow moving portion of the surface water at each designated sampling station, taking precautions to not unduly agitate the water. Stagnant water will not be sampled if this can be avoided. If several samples are to be taken, the sampler will start at the downstream position and move upstream.

Equipment decontamination, sample handling, and sample documentation procedures will be similar to those used for groundwater sampling, but samples should be field-filtered immediately upon collection.

Analytical procedures will be similar to those used for analysis of groundwater samples.

8.0 LEACHATE, SUBDRAIN AND DRAINAGE LAYER SAMPLING PROCEDURES

The following sampling and decontamination procedures provide minimum requirements that shall be followed when performing sampling of the leachate, leak detection/drainage layer (between the upper and lower high density polyethylene [HDPE] liner systems) and subdrain at the Gregory Canyon Landfill.

Leachate, drainage layer and subdrain samples will be collected from their respective sump(s) or tank. Samples will be collected with a disposable Teflon bailer with a bottom-emptying device and a flow control device for the bottom of the bailer. VOC vials shall be filled by pouring the sample down the sides of the container with as little turbulence as possible. Vials shall be filled completely and immediately capped leaving no airspace in the vial. The vial shall then be capped, turned upside down, and tapped to check for air bubbles. If an air bubble is trapped in the vial, and exceeds the size of a pea, the sample shall be discarded and a new sample collected; the remaining sample is not to be topped off. For VOC analysis, a minimum of two vials shall be collected per sample; however, they shall not be composited or mixed. VOC samples should never be field-filtered.

Equipment decontamination, sample handling, and sample documentation procedures will be similar to those used for groundwater sampling, but samples to be analyzed for metals should be field-filtered immediately upon collection, or stored in a container without preservative for laboratory filtering upon arrival at the laboratory.

Analytical procedures will be similar to those used for analysis of groundwater samples.

9.0 SAMPLE CUSTODY AND DOCUMENTATION

Sample custody and documentation procedures described in this section will be followed to account for all project documents including: logbooks, field data records, correspondence, sample tags/labels, graphs, chain-of-custody records and any other project-specific information.

Sample identification documents - The following documents will be used to maintain identification and chain-of-custody of all samples and to control sample disposition.

Sample tags and labels - All samples shipped to the laboratory shall have either a sample tag or label attached to each container. At a minimum, the sample tag/label shall include space to identify analyses to be performed, the sample identifier, date of collection, time of collection, sampler's signature or initials, type of sample (grab or composite), and whether any preservatives were added. All information included on the sample tag/label shall be cross-referenced in the field logbook, including the sample tag/label number. The field sampler in charge shall complete a sample tag/label for each container. All sample tag/label information shall be inscribed using waterproof ink.

Field logs - When field measurements are taken, results shall be recorded directly on field data sheets. The entries shall include the sample identifier, date and time (military) of the measurement, sampler's name, and any observations made at the time of the measurement. Types of field measurements shall include, but not be limited to pH, conductivity, water temperature, and water level. Visual observations include physical appearance of the water samples (color, turbidity, and suspended solids), and physical appearance of the well.

Field data sheets shall be used to record all pertinent information throughout the project using waterproof ink. The individuals making entries shall sign the logbooks after each entry. All entries shall be dated. Entries shall be objective and factual since they may later be used for report preparation and are considered legal documents. Typically, the following information should be recorded in the field before, during, and after sampling:

GENERAL
- Well I.D.
- Date and time

ELEVATION
- Elevation of measuring point ($\pm$0.01 feet)
- Depth to water table ($\pm$0.01 feet)
- Depth to bottom of well casing ($\pm$0.01 feet)
- Depth to top of screened interval ($\pm$0.01 feet)

PURGING
- Casing diameter
- Borehole diameter
- Water column in perforated zone
- Water column in blank casing zone
- Pre-sampling purged volume (up to 3 borehole volumes)

Purging device (e.g., submersible pump, bailer)
Purging rate
Time at beginning and end of purging
Well recovery rate (measured after sampling)
Disposition of purged water (e.g., barrels, baker tank)

FIELD MEASUREMENTS

Temperature
pH
Conductivity
Turbidity (NTU)

SAMPLING

Sampling device
Placement of sampling device (bottom, top, or middle of water column)
Sampling flow rate

Chain-of-Custody records - All samples shall be collected under chain-of-custody procedures to maintain and document sample possession. All samples will be accompanied at all times by this Chain-of-Custody record. When transferring samples, the individuals relinquishing and receiving samples will sign, date, and note the time on the record. This record will be used to document sample custody transfer from the sampler, to another team member, to a shipper, or the laboratory.

Samples will be packaged properly for shipment and dispatched to the laboratory for analysis, with an appropriate Chain-of-Custody record identifying its contents accompanying each shipment. The method of shipment, courier name(s), and other pertinent information will be entered in the "Remarks" section of the Chain-of-Custody record.

The original record accompanies the shipment. If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, a bill of lading will be used. Freight bills, Postal Service receipts, and bills of lading will be retained as part of the permanent documentation. Whenever samples are split with another party, it will be noted in the "Remarks" section of the Chain-of-Custody record. The note will indicate with whom the samples were split and will be signed by both the sampler and recipient. All shipments will be accompanied by the Chain-of-Custody record identifying its contents.

The field sampler is responsible for the care and custody of the samples until they are shipped or otherwise delivered to the laboratory custodian. Custody seals shall be used whenever samples are not in someone's possession. Custody seals may be placed directly on the sample container, a shipping cooler, or the door to a storage facility. Custody seals shall be placed so that it is not possible to tamper with the samples without breaking the seal. Custody seals may be placed on individual sample bottles; however, care must be taken not to cover the Teflon septum on volatile organic analysis vials. Placing custody seals on individual bottles will maintain sample integrity if the seals on the shipping container are accidentally broken.

When transferring the possession of samples, the persons relinquishing and receiving the samples shall sign, date, and note the time on the Chain-of-Custody record. This record documents sample custody from the person responsible for sample packaging, to the sampler, and finally through the laboratory. Any person who assumes custody of the samples, including mail clerks, must sign the Chain-of-Custody record. Overnight carriers typically refuse to sign Chain-of-Custody records; thus, when samples are relinquished to an overnight carrier, the signed chain-of-custody record must be placed into the shipping container along with the samples and the shipping containers must be sealed by the person relinquishing custody. The carrier may then transport the samples to the destination. Upon receipt, the person who opens the shipping container shall sign the Chain-of-Custody record, accepting custody of the samples. This is sufficient to maintain custody as long as the seals are not broken during shipment. If a custody seal is broken during shipment, the contractor in charge of sampling shall immediately be notified.

All sample shipment containers shall be accompanied by a Chain-of-Custody record that corresponds to the samples contained within. The original record shall accompany the shipment, and a copy shall be retained by the sampling coordinator.

Shipping of samples - Samples will be delivered to the laboratory for analysis as soon as practical after the number of samples and number of coolers are sufficient to comprise a shipment (preferably the same day the sample was taken, but never exceeding the prescribed sample holding time for the specified analyses). The shipment will be accompanied by the Chain-of-Custody record.

Laboratory custody - A designated sample custodian shall accept custody of the shipped samples and verify that the information on the sample tags/labels and matches the information on the Chain-of-Custody records. Important information regarding the shipment shall be documented, including whether the custody seals are intact, sample bottles are broken, or samples were not stored properly (e.g., the analytical laboratory shall report the temperature of the shipped contents when received).

The sample custodian shall use the sample identifier (i.e., tag number) or assign a unique laboratory number to each tag to track the sample through the laboratory. The sample custodian shall then maintain custody in a secure temperature-controlled area until sample analysis. The custodian shall distribute samples to the appropriate analysts who are responsible for the care and custody of the samples until they are exhausted or returned to the sample custodian.

When all sample analyses and QA/QC checks have been completed, the unused portion of each sample shall be properly stored. All identifying tags/labels, data sheets, and laboratory records shall be retained as part of the permanent documentation. Prior to destruction of any records, either originals or copies of the records shall be offered to the Client and/or its Contractor.

Corrections to documentation - As previously stated, all original data shall be written in waterproof ink. If waterproof ink cannot be used, a logbook notation shall be made to explain why it was not used. Corrections shall be made by drawing a single line through the incorrect

entry and then adding the correct entry. The person recording the initial entry shall, if possible, make all corrections. All corrections shall be initialed and dated by the person recording them.

10.0 SAMPLE HANDLING AND PACKING

Sample handling - The procedures for collecting water and other liquid samples (leachate, drainage layer liquid) requires that the sample be discharged directly to the sample container(s). This section describes sample container requirements and shipping requirements. Required sample containers for specific analyses are listed in the approved analytical method.

Sample containers - Sample containers will be obtained from the laboratory performing the analyses. The laboratory must have documented standardized bottle washing procedures and be capable of demonstrating the cleanliness of the containers through its QA program. Sample containers may also be purchased through an outside source if that source has a QA program in-place to demonstrate that the containers are clean. Sample containers must be cleaned specifically for the analysis to be performed.

Sample custody starts with the cleaning of the sample containers. Once they are cleaned and packaged, custody seals shall be placed on the packages to document that they have not been tampered with during shipment. The seals shall only be broken when it is time to use the containers. Any unused containers shall remain in custody or in a secured area until they are used. When opening a new package of containers, the condition of the custody seal shall be recorded in the field logbook.

Sample shipping - The short holding times associated with many sample analyses may make it necessary to ship samples by either overnight or common carrier. Samples preserved with nitric acid may not be shipped on passenger aircraft or railroads. All State, Federal and Local regulations must be carefully observed when shipping any type of sample.

The following guidelines allow for the proper shipping of most samples using an overnight air service. A detailed description of proper shipping techniques is presented in the User's Guide to the Contract Laboratory Program and NEIC Policy and Procedures.

Samples shall be placed in a leak-proof shipping container and cooled using ice packs or ice sealed plastic bags to cool the samples at about 4°C. A picnic-type cooler works well; however, other shipping containers may be used. To prevent breakage, bubble-wrap or an alternative material shall be placed around the samples so they do not touch each other or the sides of the shipping container. The Chain-of-Custody Records and other paperwork that must accompany the shipment shall be sealed in a plastic bag and taped to the inside of the lid of the shipping container. The cooler is then closed and wrapped with strapping tape and any drain plugs should be taped shut. Custody seals are placed on the cooler in opposite corners so they will be broken if the container is opened during shipment. Finally, the container is ready for shipping when all necessary shipping labels and address labels are applied.

11.0 REFERENCES

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Monitoring. NEIC Policies and Procedures. EPA-330/9-78-001-R. May, 1978 (revised June, 1985).

U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. User's Guide to the Contract Laboratory Program. Washington, D.C., December, 1986.

U.S. Environmental Protection Agency, Region IX. Preparation of a PRP Sample Plan. October, 1987.

U.S. Environmental Protection Agency, Office of Research and Development. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. QAMS-005/80. Washington, D.C., December, 1980.

U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory. Practical Guide for Groundwater Sampling. EPA/600/2-85/10. Ada, Oklahoma. September, 1985.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response and Office of Waste Programs Enforcement. RCRA Groundwater Monitoring Technical Enforcement Guidance Document. September, 1986.

U.S. Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement. Data Quality Objectives for Remedial Response Activities. EPA 540/5-87/003A. Washington, D.C. March, 1987.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Test Methods for Evaluating Solid Waste (First Update). EPASW-846. January, 1988.

U.S. Environmental Protection Agency, Contract Laboratory Program. Statement of Work for Organics Analysis, Multimedia, Multi-Concentration. October, 1986.

U.S. Environmental Protection Agency, Contract Laboratory Program. Statement of Work for Inorganic Analysis, Multimedia, Multi-Concentration. SOW No. 787.

Office of the Federal Register, National Archives and Records Administration. Code of Federal Regulations, Protection of Environment, Title 40, Parts 100 to 149.

ATTACHMENT 2

BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

GeoLogic Associates

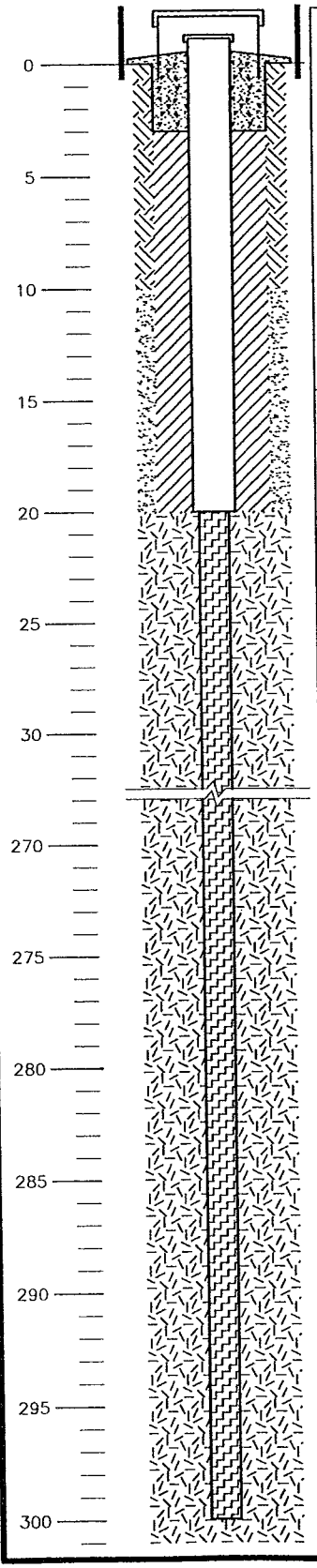
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-1**

PAGE: 1 OF 1

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 342.5 feet
ELEVATION TOP OF CASING: 343.72 feet
DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
TOTAL DEPTH: 300 feet



DRILLING SUMMARY:

Total Depth: 300 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +1.22 to 20 feet.)

Screen: NONE – OPEN HOLE. (From 20 to 300 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 20 feet.)

Filter Pack: NONE – FRACTURED ROCK.

Residual Soil. (From 0 to 10 feet.)

DECOMPOSED ROCK. (From 10 to 20 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/19/96	10:12	11/20/96	9:07
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/13/96	–	12/13/96	–
Casing Install:	11/19/96	10:36	11/19/96	12:14
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/20	6:30	99.5'	1.5'	234'	235.5'	TSR
12/16	–	37.1'	1.5'	296.4'	297.9'	LL

811

GeoLogic Associates

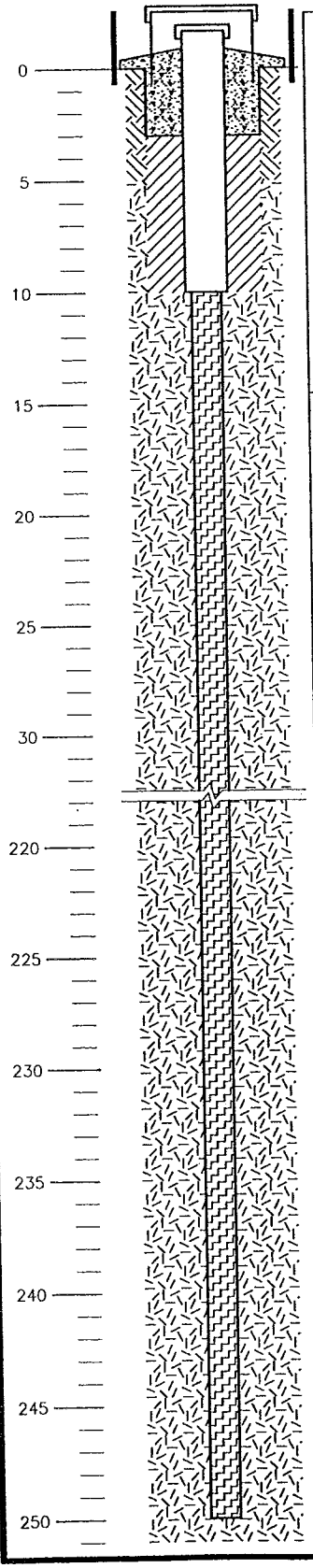
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-2**

PAGE: 1 OF 1

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 377.1 feet
ELEVATION TOP OF CASING: 379.45 feet
DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
TOTAL DEPTH: 250 feet



DRILLING SUMMARY:

Total Depth: 250 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +2.35 to 10 feet.)

Screen: NONE – OPEN HOLE. (From 10 to 250 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 10 feet.)

Filter Pack: NONE – FRACTURED ROCK.

Residual Soil. (From 0 to 5 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/18/96	11:20	11/19/96	8:19
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/12/96	–	12/12/96	–
Casing Install:	11/18/96	11:50	11/18/96	12:48
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/19	6:40	127.5'	1.5'	126'	247.5'	TSR
11/19	15:05	105'	1.5'	103.5'	270'	TSR
11/20	10:03	73.8'	1.5'	72.3'	301.2'	TSR
12/16	–	69.73'	1.5'	68.23'	305.27'	LL

812

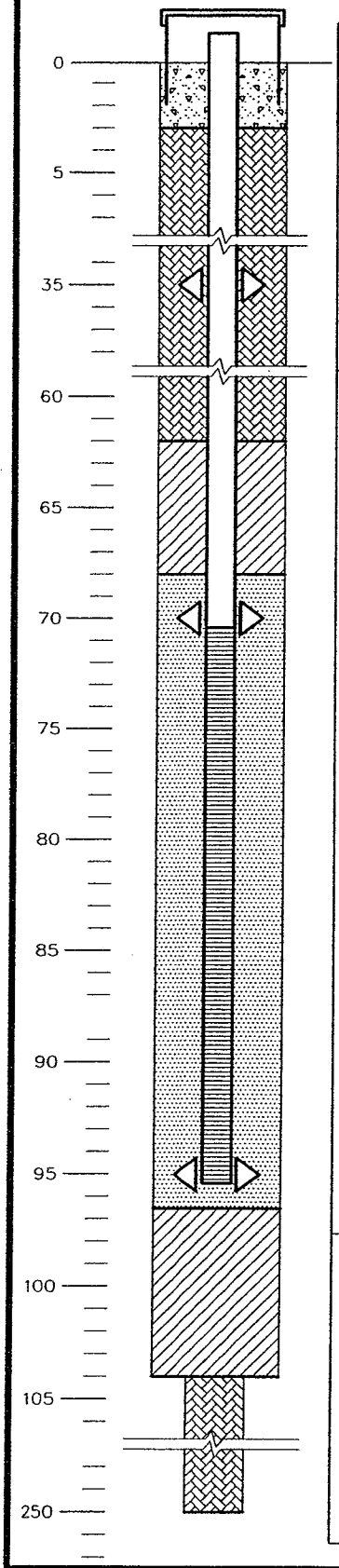
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-2**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 377.33
ELEVATION TOP OF CASING: 379.39
DATE STARTED: 6/25/04
DATE FINISHED: 6/28/04
TOTAL DEPTH: 95.38 feet



DRILLING SUMMARY:

Total Depth: Reamed to 104 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor from 0 to 20'

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.06 to 70.38 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 70.38 to 95.38 feet.)

Filter Pack: #3 Monterey type sand. (From 68 to 96.5 feet.)

Bentonite Seal: Medium chipped bentonite. (From 62 to 68 feet and from 96.5 to 104 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 3 to 62 feet and from 104 to 250 feet.)

Centralizer: Stainless steel. (At 35, 70 and 95 feet.)

Cement: From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/18/96	11:20	11/19/96	8:19
Coring:	–	–	–	–
Geophys. Logging:	12/12/96	–	12/12/96	–
Bottom Seal Placement: (Grout/Bentonite)	6/24/04	14:00	6/28/04	10:41
Ream:	6/25/04	15:00	6/28/04	9:00
Casing Install:	6/28/04	10:28	6/28/04	10:55
Filter Placement:	6/28/04	10:41	6/28/04	10:23
Seal Placement: (Bentonite)	6/28/04	11:03	6/28/04	11:08
Seal Placement: (Grout)	6/28/04	12:20	6/28/04	13:00

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/06/04	11:44	11:58
Bailing	7/06/04	12:00	12:07
Pumping			

Total Gallons Removed: 10

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:
Well was developed by surging and bailing until dry.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
7/26/04	7:30	20 days after well development	–	76.58	300.75	WBL

83

GeoLogic Associates

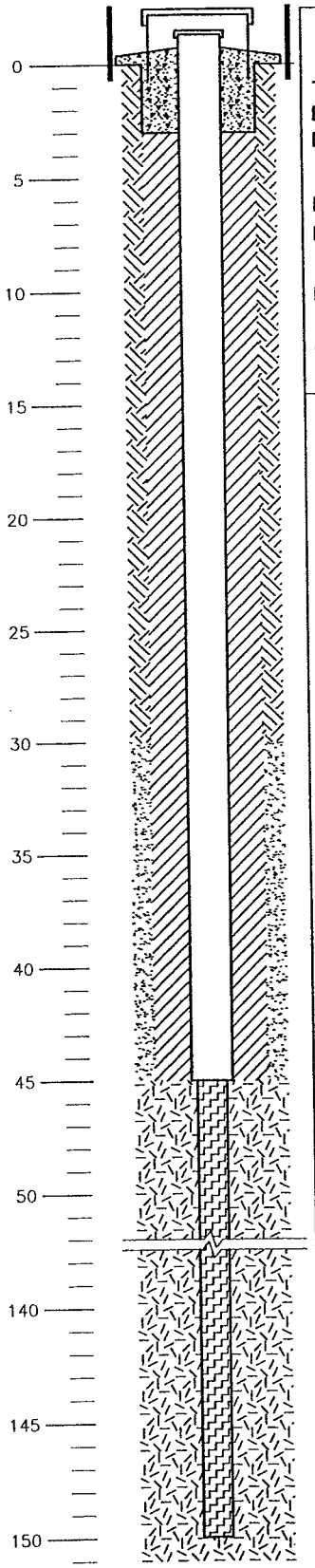
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-3**

PAGE: 1 OF 1

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 330.6 feet
ELEVATION TOP OF CASING: 332.02 feet
DATE STARTED: 11/25/96
DATE FINISHED: 11/26/96
TOTAL DEPTH: 150 feet



DRILLING SUMMARY:

Total Depth: 150 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +1.42 to 45 feet.)

Screen: NONE – OPEN HOLE. (From 45 to 150 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 45 feet.)

Filter Pack: NONE – FRACTURED ROCK.

ALLUVIUM/COLLUVIUM. (From 0 to 30 feet.)

DECOMPOSED ROCK. (From 30 to 45 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/25/96	12:15	11/26/96	7:31
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/14/96	–	12/14/96	–
Casing Install:	11/25/96	12:45	11/25/96	15:33
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/26	6:45	21'	1.5'	19.5'	309'	TSR
12/16	–	23.84'	1.5'	22.34'	306.16'	LL

814

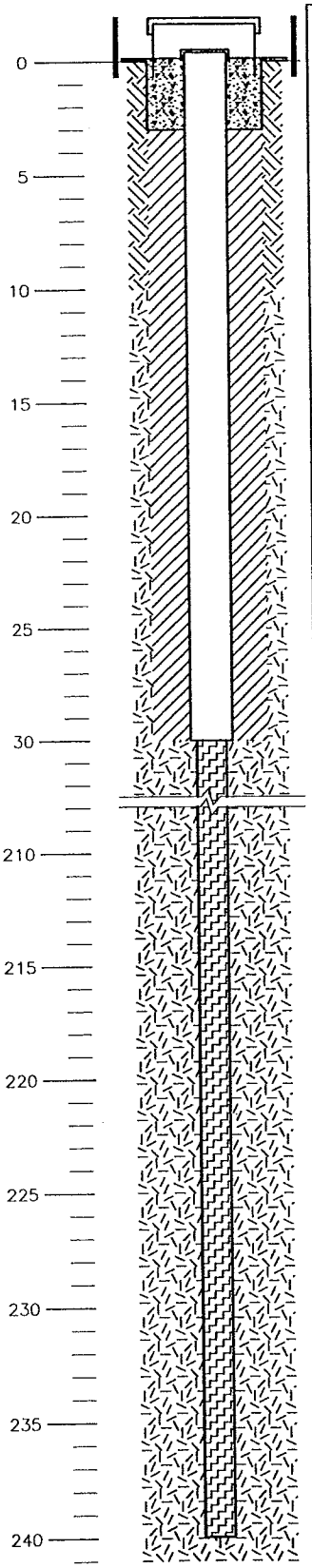
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-4**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER/M. VINCENT
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 904.9 feet
ELEVATION TOP OF CASING: 904.99 feet
DATE STARTED: 11/26/96
DATE FINISHED: 11/27/96
TOTAL DEPTH: 240 feet



DRILLING SUMMARY:

Total Depth: 240 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +0.09 to 30 feet.)

Screen: NONE – OPEN HOLE. (From 30 to 240 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 30 feet.)

Filter Pack: NONE – FRACTURED ROCK.

Residual Soil. (From 0 to 10 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/26/96	–	11/27/96	11:08
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/17/96	–	12/17/96	–
Casing Install:	11/26/96	–	11/26/96	–
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
12/02	6:55	103.2'	1.5'	101.7'	801.8'	TSR
12/16	–	149.93'	1.5'	148.43'	755.07'	LL

815

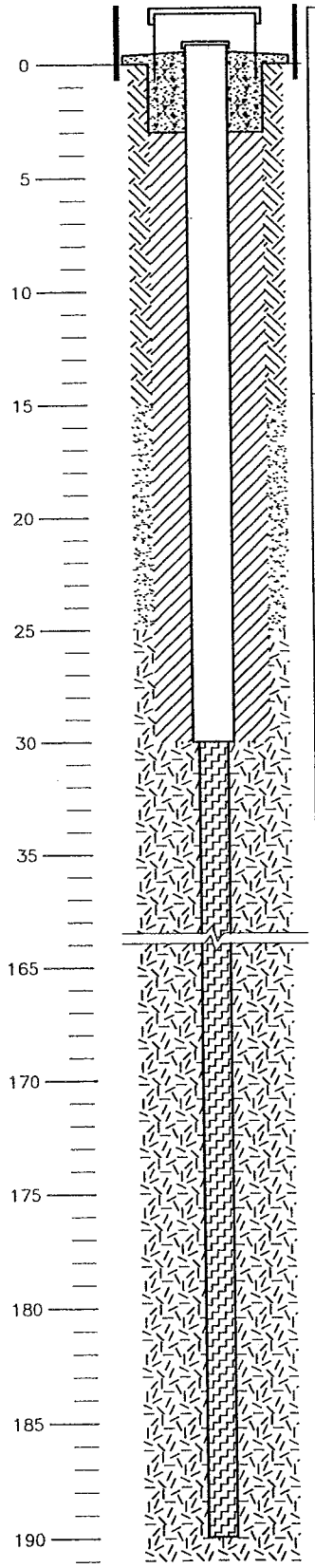
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-5**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 927.1 feet
ELEVATION TOP OF CASING: 927.92 feet
DATE STARTED: 11/20/96
DATE FINISHED: 11/21/96
TOTAL DEPTH: 190 feet



DRILLING SUMMARY:

Total Depth: 190 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +0.82 to 30 feet.)

Screen: NONE – OPEN HOLE. (From 30 to 190 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 30 feet.)

Filter Pack: NONE – FRACTURED ROCK.

COLLUVIUM/Residual Soil. (From 0 to 15 feet.)

DECOMPOSED ROCK. (From 15 to 25 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/20/96	11:20	11/21/96	9:47
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/16/96	–	12/16/96	–
Casing Install:	11/20/96	–	11/20/96	15:57
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/21	6:30	41'	1.5'	39.5'	889'	TSR
12/16	–	42.57'	1.5'	41.07'	887.43'	LL

816

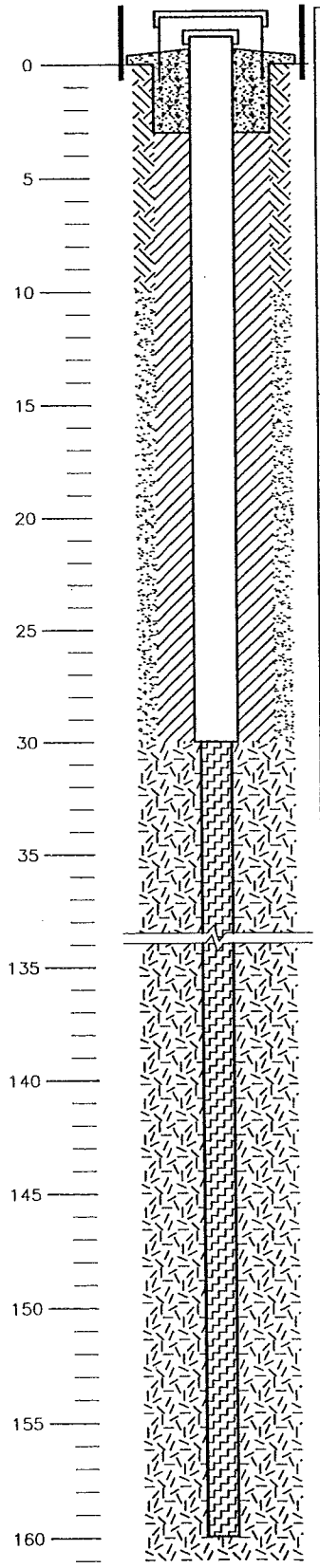
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-7**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 401.6 feet
ELEVATION TOP OF CASING: 402.85 feet
DATE STARTED: 11/21/96
DATE FINISHED: 11/22/96
TOTAL DEPTH: 160 feet



DRILLING SUMMARY:

Total Depth: 160 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +1.25 to 30 feet.)

Screen: NONE – OPEN HOLE. (From 30 to 160 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 30 feet.)

Filter Pack: NONE – FRACTURED ROCK.

COLLUVIUM. (From 0 to 10 feet.)

DECOMPOSED ROCK. (From 10 to 30 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/21/96	13:55	11/22/96	10:21
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/19/96	–	12/19/96	–
Casing Install:	11/21/96	–	11/21/96	–
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
12/16	–	34.82'	1.5'	33.32'		TSR

817

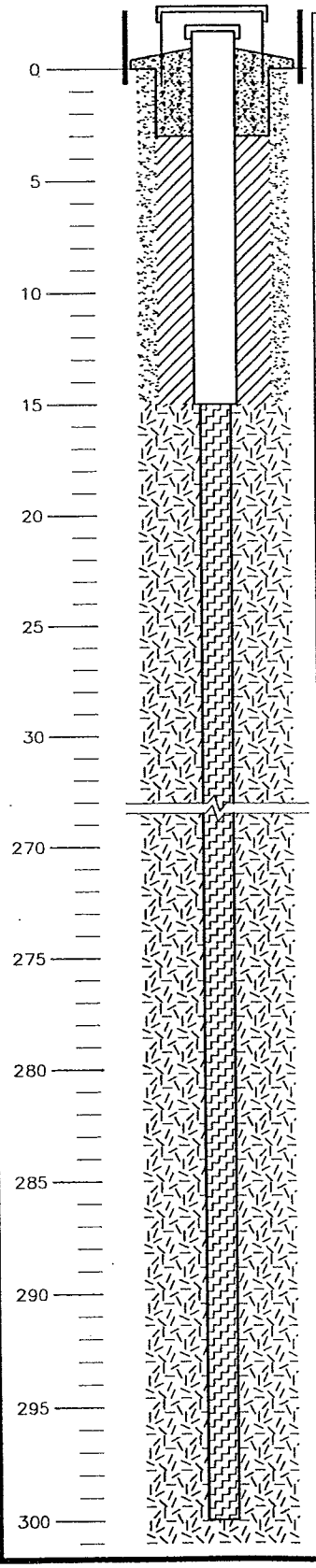
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-8**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: M. VINCENT/T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 632.7 feet
ELEVATION TOP OF CASING: 633.11 feet
DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
TOTAL DEPTH: 300 feet



DRILLING SUMMARY:

Total Depth: 300 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +1.41 to 15 feet.)

Screen: NONE – OPEN HOLE. (From 15 to 300 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 15 feet.)

Filter Pack: NONE – FRACTURED ROCK.

DECOMPOSED ROCK. (From 0 to 15 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/24/96	9:20	11/25/96	11:17
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/18/96	–	12/18/96	–
Casing Install:	11/24/96	–	11/24/96	–
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/25	6:45	61'	1.5'	59.5'	559'	TSR
12/16	–	62.40'	1.5'	60.9'	557.6'	LL

8/8

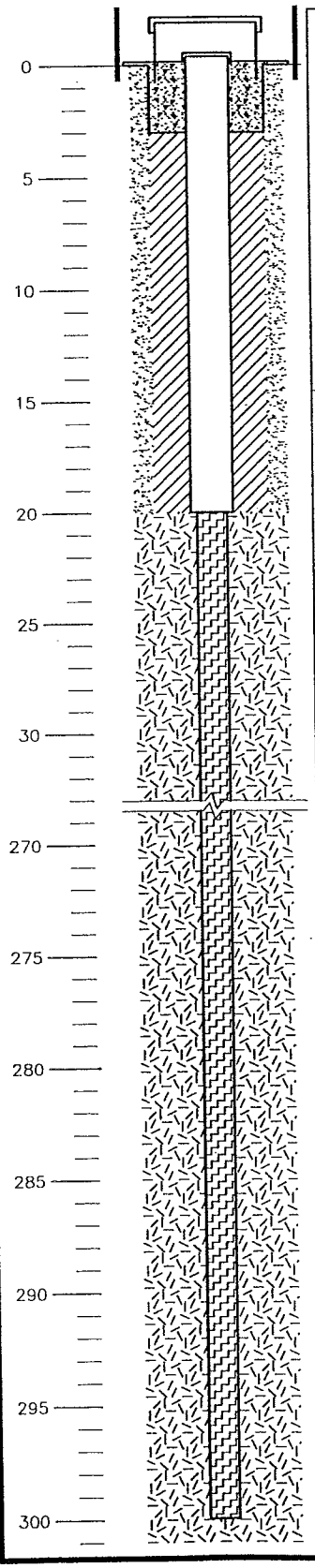
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-9**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: M. VINCENT/T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 615.4 feet
ELEVATION TOP OF CASING: 615.61 feet
DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
TOTAL DEPTH: 300 feet



DRILLING SUMMARY:

Total Depth: 300 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +0.21 to 20 feet.)

Screen: NONE – OPEN HOLE. (From 20 to 300 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 20 feet.)

Filter Pack: NONE – FRACTURED ROCK.

DECOMPOSED ROCK. (From 0 to 20 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	12/05/96	–	12/07/96	8:57
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	N/A	–	N/A	–
Casing Install:	–	–	–	–
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
12/07	8:57	DRY	1.5'	N/A	N/A	TSR
12/16	–	DRY	1.5'	N/A	N/A	LL

819

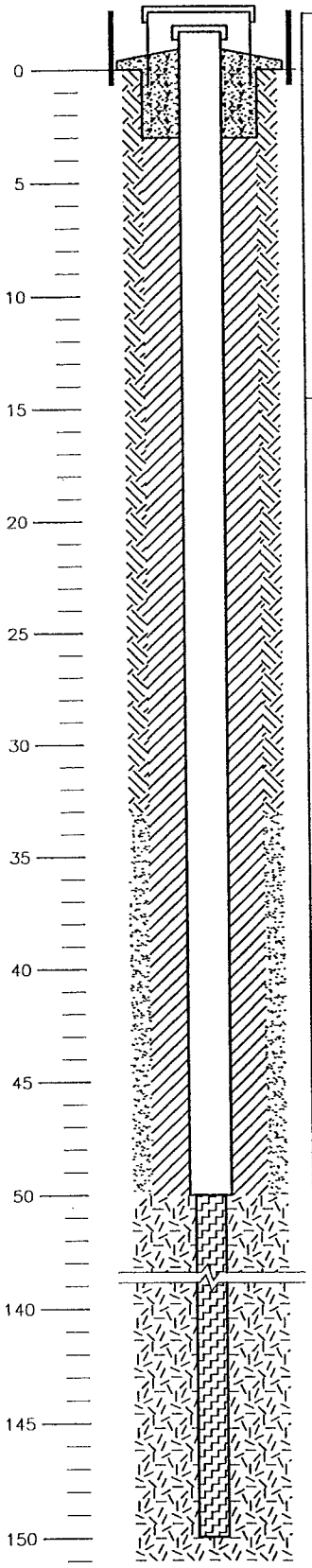
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-10**

JOB NO.: 9539
PROJECT: PROPOSED SAN DIEGO COUNTY LANDFILL
LOCATION: GREGORY CANYON, PALA AREA
INSPECTOR: M. VINCENT/T. REEDER
CHECKED BY: T. REEDER

ELEVATION GROUND LEVEL: 324.6 feet
ELEVATION TOP OF CASING: 326.59 feet
DATE STARTED: 12/03/96
DATE FINISHED: 12/05/96
TOTAL DEPTH: 150 feet



DRILLING SUMMARY:

Total Depth: 150 feet
Borehole diameter: 5.5 inches O.D.
Driller: Layne Cristensen

Rig: DUAL WALL REVERSE
Bit(s): CARBIDE BUTTON BIT

Drilling Fluid: Air

Protective Casing: N/A

WELL CONSTRUCTION DETAILS:

Casing: 6-inch diameter, flush threaded, Schedule 40 PVC (boring reamed to 8-inch diameter prior to placement of casing). (From +1.99 to 50 feet.)

Screen: NONE – OPEN HOLE. (From 50 to 150 feet.)

Bentonite Seal: Bentonite pellets. (From 3 to 50 feet.)

Filter Pack: NONE – FRACTURED ROCK.

COLLUVIUM. (From 0 to 33 feet.)

DECOMPOSED ROCK. (From 33 to 50 feet.)

Portland Type II cement with bentonite. (From 0 to 3 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	12/03/96	11:57	12/05/96	11:06
Coring:	–	–	–	–
Ream:	–	–	–	–
Geophys. Logging:	12/15/96	–	12/15/96	–
Casing Install:	12/03/96	–	12/03/96	–
Filter Placement:	–	–	–	–
Seal Placement:	–	–	–	–
Seal Placement 2nd:	–	–	–	–

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Bail			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
12/03	–	17'	2'	15'	308'	MV
12/16	–	22.2'	2'	20.2'	300.8'	LL

820

GeoLogic Associates

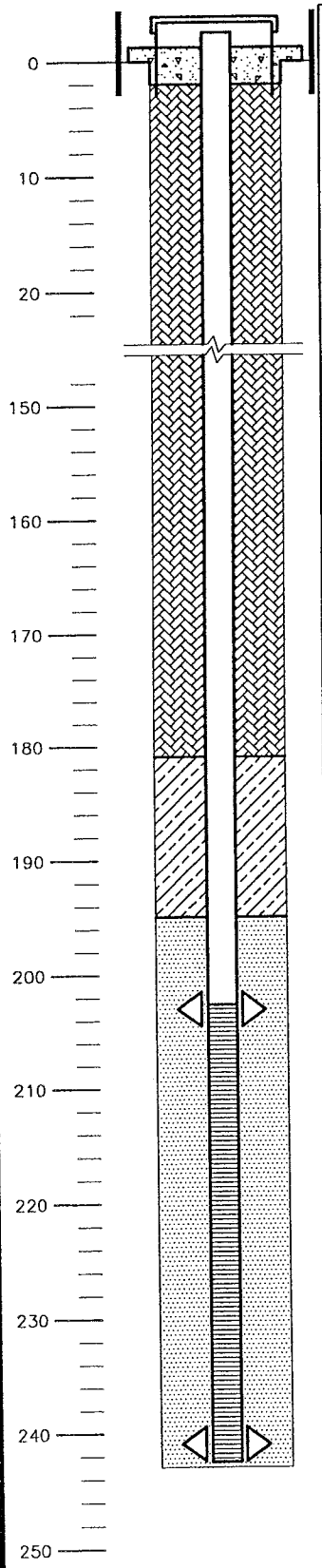
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-11**

PAGE: 1 OF 1

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 775.22
ELEVATION TOP OF CASING: 777.32
DATE STARTED: 11/30/99
DATE FINISHED: 12/02/99
TOTAL DEPTH: 242.5 feet



DRILLING SUMMARY:

Total Depth: 243 feet
Borehole diameter: 6.5"

Driller: Water Development Corporation
Rig: Dresser T-70
Bit(s): Downhole Hammer

Drilling Fluid: Air

Protective Casing: None

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +2.1 to 202.5 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 202.5 to 242.5 feet.)

Grout Seal: Portland type I-II neat cement with 5% bentonite. (From 2 to 181.0 feet.)

Bentonite Seal: Medium bentonite chips. (From 181.0 to 195.0 feet.)

Filter Pack: #3 Monterey Sand. (From 195 to 243 feet.)

Centralizer: Stainless steel. (At 202 and 242 feet.)

Concrete

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/30/99	8:20	11/30/99	15:27
Coring:	-	-	-	-
Casing Install:	12/1/99	16:00	12/1/99	16:33
Filter Placement:	12/1/99	16:37	12/1/99	16:44
Seal Placement: (Bentonite Chips)	12/1/99	16:44	12/1/99	16:58
Seal Placement 2nd: (Grout)	12/2/99	10:41	12/2/99	11:10

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	12/7/99	11:10	11:50
Air Lift Pumping			
Other - Bailer	12/7/99	11:50	16:30

Total Gallons Removed: 75

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/30/99	16:30			231' bgs		WBL
12/07/99	11:10			191.5' bgs		WBL

821

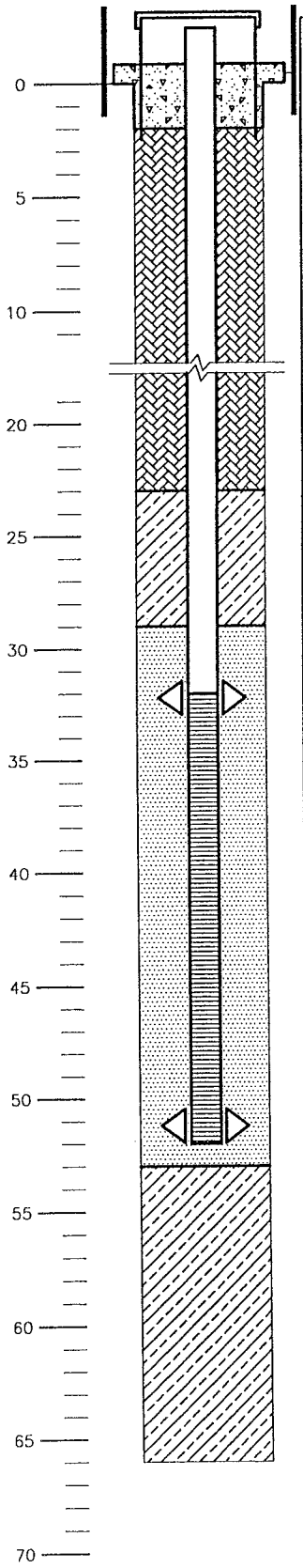
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-12**

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 343.91
ELEVATION TOP OF CASING: 345.79
DATE STARTED: 11/24/99
DATE FINISHED: 11/24/99
TOTAL DEPTH: 52 feet



DRILLING SUMMARY:

Total Depth: 66 feet
Borehole diameter: 6-5/8"

Driller: Water Development Corporation
Rig: Dresser T-70
Bit(s): Tri-cone/Downhole Hammer

Drilling Fluid: Air

Protective Casing: 9-7/8" ø steel.

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +1.88 to 32 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 32 to 52 feet.)

Grout Seal: Portland type I-II neat cement with 5% bentonite. (From 2 to 23 feet.)

Bentonite Seal: Medium bentonite chips. (From 23 to 29 feet and from 53 to 66 feet.)

Filter Pack: #3 Monterey Sand. (From 29 to 53 feet.)

Centralizer: Stainless steel. (At 32 and 52 feet.)

Concrete

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	-	-	-	-
Coring:	-	-	-	-
Casing Install:	11/24/99	15:03	11/24/99	15:09
Filter Placement:	11/24/99	15:10	11/24/99	15:15
Seal Placement: (Bentonite Chips)	11/24/99	14:58 15:15	11/24/99	15:03 15:16
Seal Placement 2nd: (Grout)	11/24/99	15:35	11/24/99	15:40

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	12/7/99	7:20	8:05
Air Lift Pumping			
Other - Bailer	12/7/99	8:05	10:30

Total Gallons Removed: 40

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/24/99	13:00			36.7' bgs		WBL
12/07/99	7:20			35.1' bgs		WBL

822

GeoLogic Associates

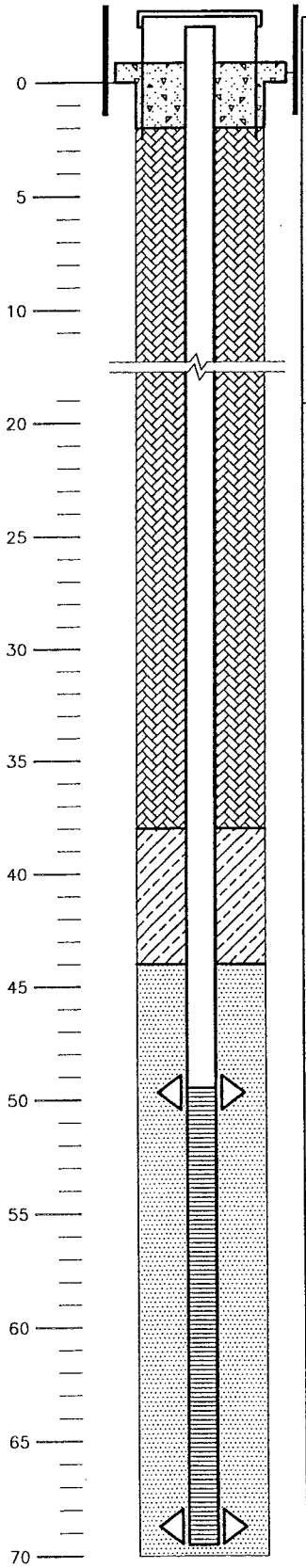
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-13**

PAGE: 1 OF 1

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 355.90
ELEVATION TOP OF CASING: 358.15
DATE STARTED: 11/22/99
DATE FINISHED: 11/23/99
TOTAL DEPTH: 69.5 feet



DRILLING SUMMARY:

Total Depth: 70 feet
Borehole diameter: 6.5"

Driller: Water Development Corporation
Rig: Dresser T-70
Bit(s): Tri-cone

Drilling Fluid: Air

Protective Casing: 9-7/8" ø steel.

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +2.25 to 49.5 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 49.5 to 69.5 feet.)

Grout Seal: Portland type I-II neat cement with 5% bentonite. (From 2 to 38 feet.)

Bentonite Seal: Medium bentonite chips. (From 38 to 44 feet.)

Filter Pack: #3 Monterey Sand. (From 44 to 70 feet.)

Centralizer: Stainless steel. (At 49 and 69 feet.)

Concrete

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/22/99	15:00	11/23/99	8:22
Coring:	-	-	-	-
Casing Install:	11/23/99	10:26	11/23/99	10:35
Filter Placement:	11/23/99	10:35	11/23/99	10:39
Seal Placement: (Bentonite Chips)	11/23/99	10:40	11/23/99	10:42
Seal Placement 2nd: (Grout)	11/23/99	10:57	11/23/99	11:13

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	12/6/99	14:00	14:45
Air Lift Pumping			
Other - Bailer	12/6/99	14:45	16:30

Total Gallons Removed: 45

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/23/99	7:00			49.7' bgs		WBL
12/06/99	14:18			47.0' bgs		WBL

823

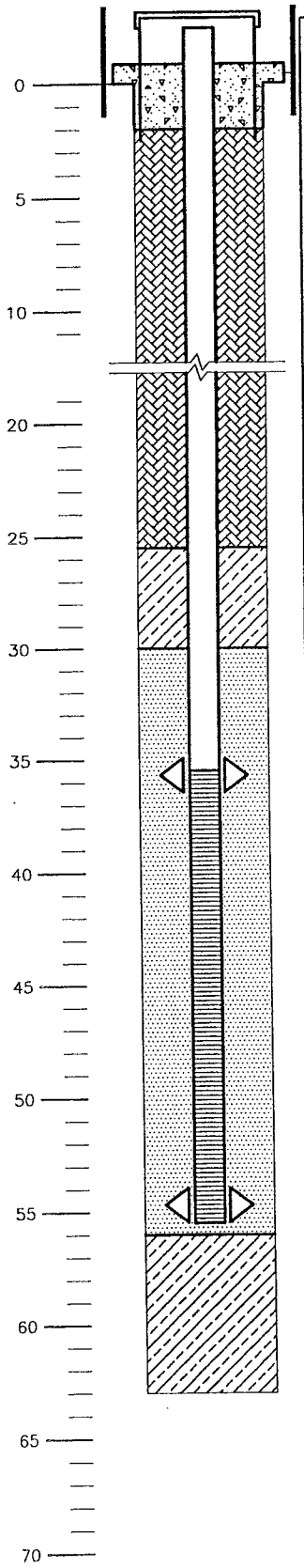
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-14**

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 332.21
ELEVATION TOP OF CASING: 334.13
DATE STARTED: 11/21/99
DATE FINISHED: 11/22/99
TOTAL DEPTH: 55.5 feet



DRILLING SUMMARY:

Total Depth: 63 feet
Borehole diameter: 9-7/8"

Driller: Water Development Corporation
Rig: Dresser T-70
Bit(s): Tri-cone

Drilling Fluid: Air

Protective Casing: 9-7/8" ø steel.

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +1.92 to 35.5 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 35.5 to 55.5 feet.)

Grout Seal: Portland type I-II neat cement with 5% bentonite. (From 2 to 25.5 feet.)

Bentonite Seal: Medium bentonite chips. (From 25.5 to 30 feet and from 56 to 63 feet.)

Filter Pack: #3 Monterey Sand. (From 30 to 56 feet.)

Centralizer: Stainless steel. (At 35 and 55 feet.)

Concrete

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/21/99	7:35	11/21/99	16:15
Coring:	-	-	-	-
Casing Install:	11/22/99	8:23	11/22/99	8:28
Filter Placement:	11/22/99	8:30	11/22/99	8:36
Seal Placement: (Bentonite Chips)	11/22/99	7:52 8:38	11/22/99	7:54 8:40
Seal Placement 2nd: (Grout)	11/22/99	9:05	11/22/99	9:15

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	12/6/99	9:35	10:20
Air Lift Pumping			
Other - Bailer	12/6/99	10:20	12:35

Total Gallons Removed: 45

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/22/99	7:00			36.5' bgs		WBL
12/06/99	9:20			36.5' bgs		WBL

824

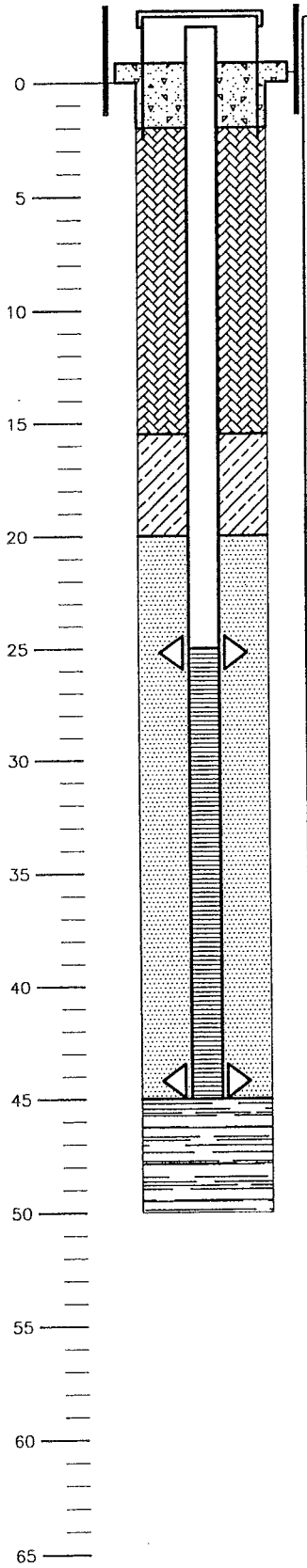
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-15**

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 304.82
ELEVATION TOP OF CASING: 306.80
DATE STARTED: 11/19/99
DATE FINISHED: 11/20/99
TOTAL DEPTH: 45 feet



DRILLING SUMMARY:

Total Depth: 50 feet
Borehole diameter: 9-7/8"

Driller: Water Development Corporation
Rig: Dresser T-70
Bit(s): Tri-cone

Drilling Fluid: Air

Protective Casing: 9-7/8" ø steel.

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +1.98 to 25 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 25 to 45 feet.)

Grout Seal: Portland type I-II neat cement with 5% bentonite. (From 2 to 15.5 feet.)

Bentonite Seal: Medium bentonite chips. (From 15.5 to 20 feet.)

Filter Pack: #3 Monterey Sand. (From 20 to 45 feet.)

Centralizer: Stainless steel. (At 25 and 45 feet.)

Concrete

Slough

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	11/19/99	13:10	11/19/99	17:10
Coring:	-	-	-	-
Casing Install:	11/20/99	8:30	11/20/99	8:37
Filter Placement:	11/20/99	8:40	11/20/99	13:00
Seal Placement: (Bentonite Chips)	11/20/99	13:08	11/20/99	13:12
Seal Placement 2nd: (Grout)	11/20/99	14:45	11/20/99	15:20

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Air Lift Pumping			
Other -			

Total Gallons Removed:

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
11/20/99	7:00			25.0' bgs		WBL
11/21/99	8:30			11.7' bgs		WBL
12/08/99	8:50			12.3' bgs		WBL

825

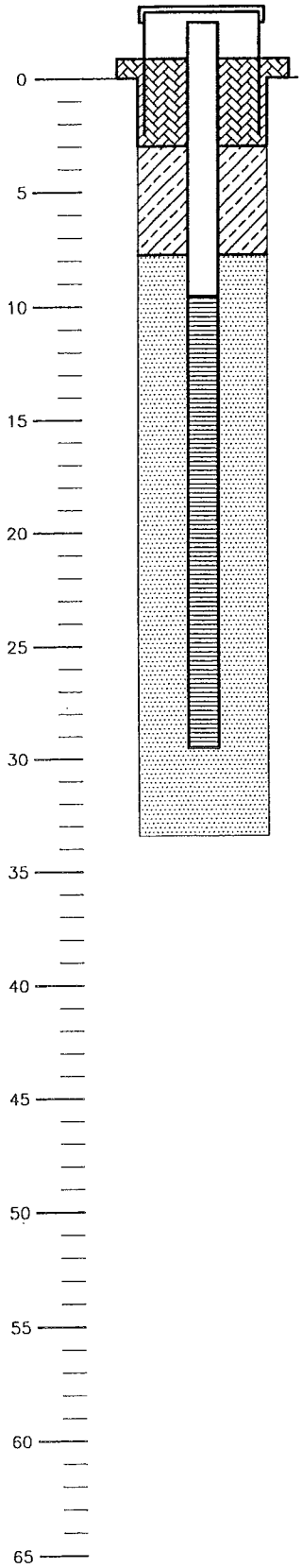
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-16**

JOB NO.: 9539
PROJECT: DETECTION MONITORING PROGRAM
LOCATION: GREGORY CANYON LANDFILL
INSPECTOR: W. LOPEZ, CEG
CHECKED BY: S. BATTELLE, CHG

ELEVATION GROUND LEVEL: 305.28
ELEVATION TOP OF CASING: 307.54
DATE STARTED: 12/20/99
DATE FINISHED: 12/20/99
TOTAL DEPTH: 29.5 feet



DRILLING SUMMARY:

Total Depth: 33.5 feet
Borehole diameter: 8"

Driller: Water Development Corporation
Rig: CME-95
Bit(s): Hollow Stem Auger

Drilling Fluid: Air

Protective Casing: Hollow Stem Auger

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter Sch. 40 PVC with flush threaded joints. (From +2.26 to 9.5 feet.)

Screen: 2" diameter Sch. 40 PVC with 0.020" slots and flush threaded joints. (From 9.5 to 29.5 feet.)

Grout Seal: Readi-mix concrete. (From 0 to 3 feet.)

Bentonite Seal: Medium bentonite chips. (From 3 to 7.8 feet.)

Filter Pack: #3 Monterey Sand. (From 7.8 to 33.5 feet.)

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	12/20/99	10:00	12/20/99	10:15
Coring:	-	-	-	-
Casing Install:	12/20/99	10:15	12/20/99	10:30
Filter Placement:	12/20/99	10:30	12/20/99	10:55
Seal Placement: (Bentonite Chips)	12/20/99	10:55	12/20/99	11:05
Seal Placement 2nd: (Grout)	12/20/99	11:15	12/20/99	11:30

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	12/23/99	11:40	12:10
Air Lift Pumping			
Other - Bailer	12/23/99	12:10	14:00

Total Gallons Removed: 65

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond.	Temp (°F)

Comments:

WELL MONITORING DATA:

Date	Time	Reading	Corr.	Depth	SWL	By
12/20/99	11:10			10.6' bgs		WBL

826

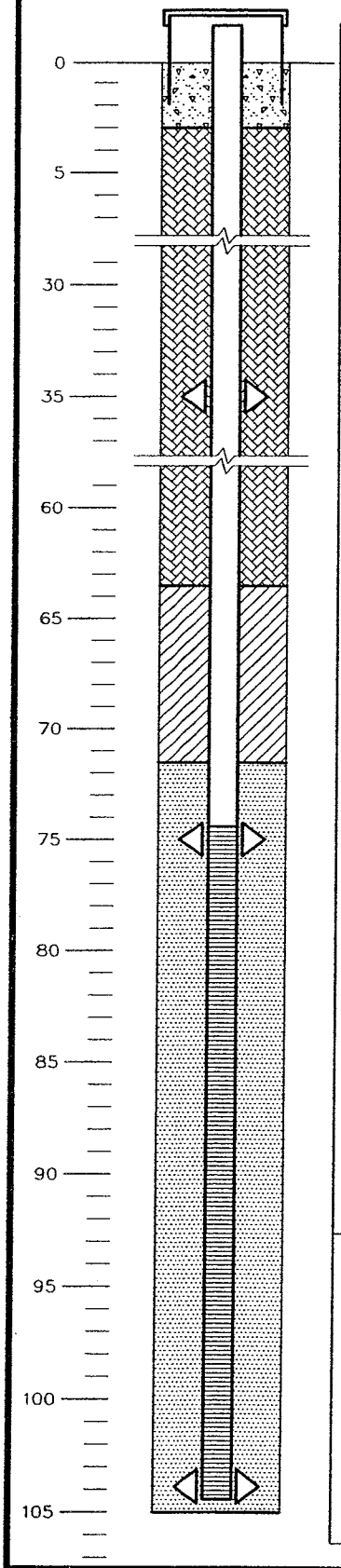
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-A**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 377.49
ELEVATION TOP OF CASING: 380.35
DATE STARTED: 7/20/04
DATE FINISHED: 7/21/04
TOTAL DEPTH: 104.4 feet



DRILLING SUMMARY:

Total Depth: 105 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE / DOWNHOLE HAMMER

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor from 0 to 20'

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.86 to 74.4 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 74.4 to 104.4 feet.)

Filter Pack: #3 Monterey type sand. (From 71.5 to 105 feet.)

Bentonite Seal: Medium chipped bentonite. (From 63.5 to 71.5 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 3 to 63.5 feet.)

Centralizer: Stainless steel. (At 35, 75 and 104 feet.)

Cement: From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/08/04	16:50	6/09/04	9:55
Coring:	-	-	-	-
Ream:	-	-	-	-
Geophys. Logging:	6/11/04	7:30	6/11/04	9:15
Casing Install:	6/24/04	10:00	6/24/04	10:10
Filter Placement:	6/24/04	10:15	6/24/04	11:10
Seal Placement: (Bentonite)	6/24/04	11:10	6/24/04	11:20
Seal Placement: (Grout)	6/24/04	12:30	6/24/04	13:10

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/06/04	8:30	8:40
Bailing	7/06/04	8:40	9:00
Pumping	7/06/04	10:25	11:15

Total Gallons Removed: 165

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging, bailing and pumping water until visibly clear, approximately less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
6/11/04	7:15	Prior to well construction	-	75.22	302.27	WBL
7/06/04	8:25	Prior to well development	-	75.30	302.19	WBL

87

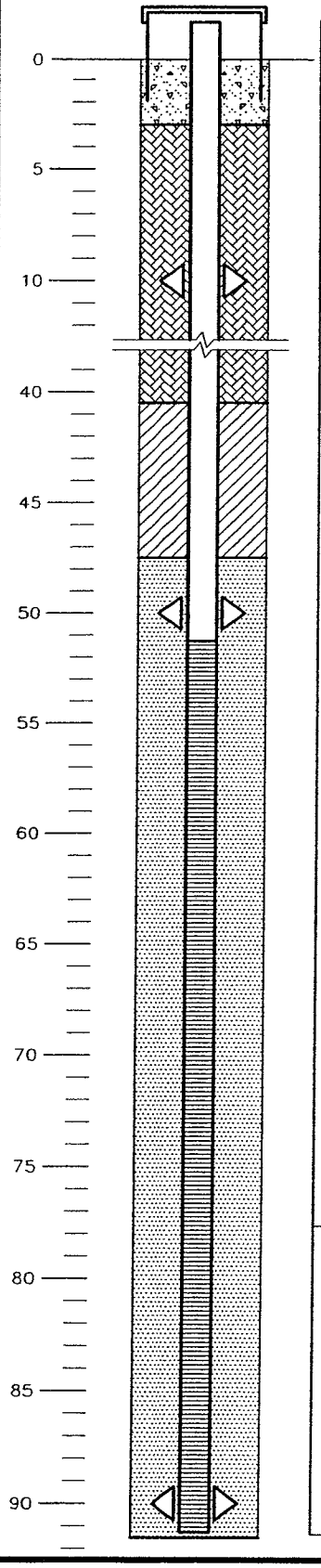
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-B**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: J. HOWER, CEG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 344.14
ELEVATION TOP OF CASING: 347.04
DATE STARTED: 6/09/04
DATE FINISHED: 6/23/04
TOTAL DEPTH: 91.22 feet



DRILLING SUMMARY:

Total Depth: 91.5 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE / DOWNHOLE HAMMER

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor from 0 to 20'

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.9 to 51.22 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 51.22 to 91.22 feet.)

Filter Pack: #3 Monterey type sand. (From 47.5 to 91.5 feet.)

Bentonite Seal: Medium chipped bentonite. (From 40.5 to 47.5 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 3 to 47 feet.)

Centralizer: Stainless steel. (At 10, 50 and 90 feet.)

Concrete From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/09/04	15:57	6/10/04	10:49
Coring:	-	-	-	-
Ream:	-	-	-	-
Geophys. Logging:	6/11/04	9:30	6/11/04	11:15
Casing Install:	6/21/04	10:20	6/21/04	10:50
Filter Placement:	6/21/04	10:52	6/21/04	11:15
Seal Placement: (Bentonite)	6/21/04	11:27	6/21/04	11:38
Seal Placement: (Grout)	6/23/04	8:30	6/23/04	9:45

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block			
Bailing			
Pumping	6/28/04 6/29/04	15:00	16:00

Total Gallons Removed: 2400

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed during pump test conducted on 6/28/04 and 6/29/04. Discharge visibly clear, less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
6/11/04	8:19	Prior to well construction	-	39.70	304.44	AF
7/06/04	14:30	After well development	-	40.00	304.14	WBL

838

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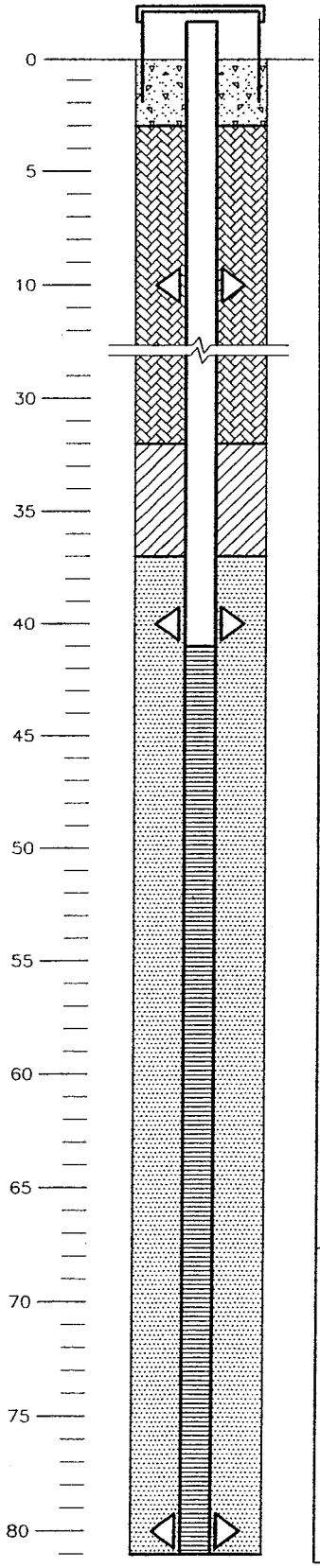
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-C**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 340.76
ELEVATION TOP OF CASING: 343.45
DATE STARTED: 6/03/04
DATE FINISHED: 6/03/04
TOTAL DEPTH: 81 feet



DRILLING SUMMARY:

Total Depth: 81 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE / DOWNHOLE HAMMER

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor ~~from 0 to 20'~~

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.69 to 41 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 41 to 81 feet.)

Filter Pack: #3 Monterey type sand. (From 37 to 81 feet.)

Bentonite Seal: Medium chipped bentonite. (From 32 to 37 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 3 to 32 feet.)

Centralizer: Stainless steel. (At 10, 40 and 80 feet.)

Concrete From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/10/04	16:35	6/11/04	9:19
Coring:	-	-	-	-
Ream:	-	-	-	-
Geophys. Logging:	6/18/04	7:30	6/18/04	9:00
Casing Install:	6/21/04	13:05	6/21/04	13:35
Filter Placement:	6/21/04	13:35	6/21/04	14:05
Seal Placement: (Bentonite)	6/21/04	14:08	6/21/04	14:23
Seal Placement: (Grout)	6/23/04	10:15	6/23/04	11:30

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/06/04	14:15	14:28
Bailing	7/06/04	14:28	14:38
Pumping	7/06/04	14:50	PM

Total Gallons Removed: 170

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging, bailing and pumping water until visibly clear, approximately less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
6/12/04	15:55	Prior to well construction	-	40.14	303.31	WBL
7/06/04	14:10	Prior to well development	-	37.12	306.33	WBL

829

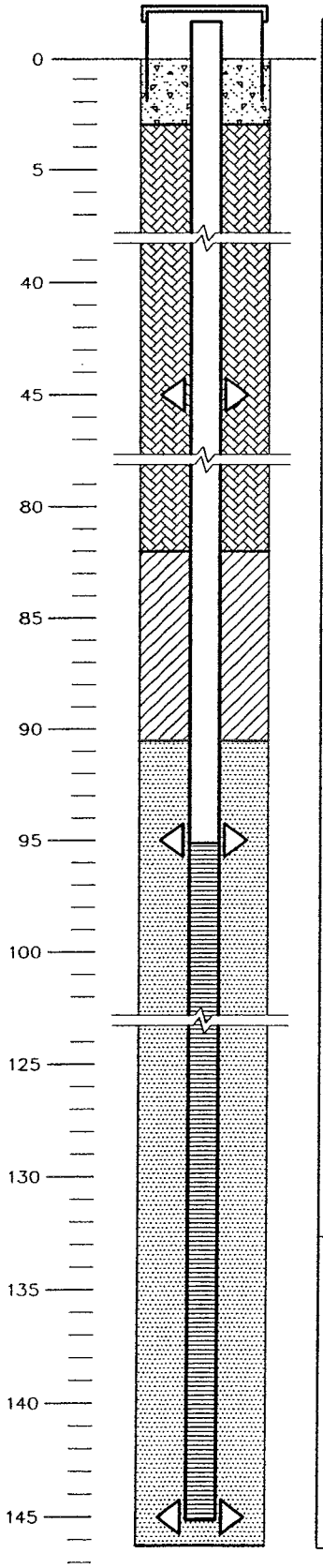
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-D**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 364.77
ELEVATION TOP OF CASING: 367.65
DATE STARTED: 6/07/04
DATE FINISHED: 6/25/04
TOTAL DEPTH: 145.1 feet



DRILLING SUMMARY:

Total Depth: 146.2 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE / DOWNHOLE HAMMER

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor from 0 to 20'

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.88 to 95.1 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 95.1 to 145.1 feet.)

Filter Pack: #3 Monterey type sand. (From 90.5 to 146.2 feet.)

Bentonite Seal: Medium chipped bentonite. (From 82 to 90.5 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 3 to 82 feet.)

Centralizer: Stainless steel. (At 45, 95 and 145 feet.)

Cement: From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/07/04	14:25	6/08/04	8:55
Coring:	-	-	-	-
Ream:	-	-	-	-
Geophys. Logging:	6/11/04	13:15	6/11/04	15:15
Casing Install:	6/25/04	7:30	6/25/04	7:45
Filter Placement:	6/25/04	8:10	6/25/04	8:45
Seal Placement: (Bentonite)	6/25/04	8:45	6/25/04	8:54
Seal Placement: (Grout)	6/25/04	10:30	6/25/04	11:10

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/06/04	13:15	13:25
Bailing	7/06/04	13:25	13:50
Pumping			

Total Gallons Removed: 90

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging and bailing until dry.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
6/21/04	11:30	Prior to well construction	-	59.50	305.27	WBL
7/06/04	12:15	Prior to well development	-	60.27	304.50	WBL

830

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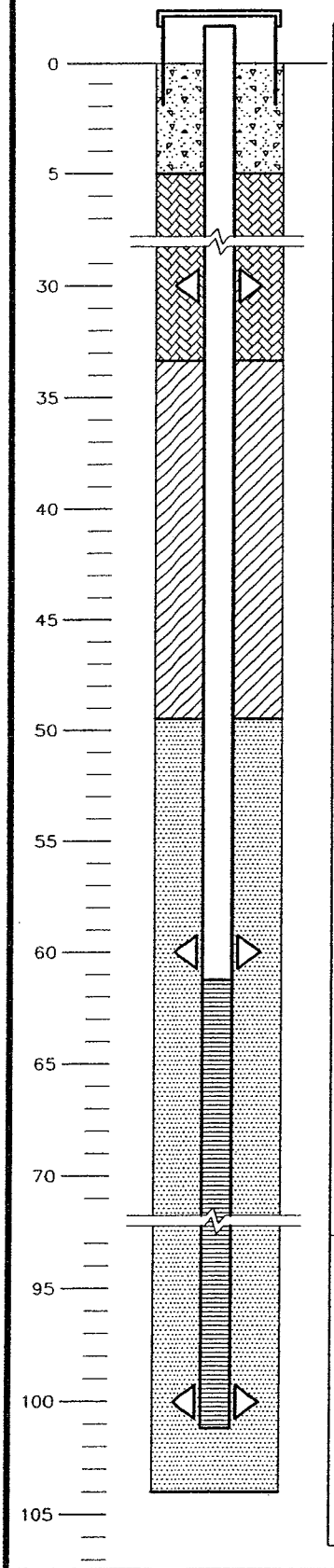
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **GLA-G**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: 345.04
ELEVATION TOP OF CASING: 347.58
DATE STARTED: 7/20/04
DATE FINISHED: 7/21/04
TOTAL DEPTH: 101.15 feet



DRILLING SUMMARY:

Total Depth: 104 feet
Borehole diameter: 8-1/2"
Driller: WDC EXPLORATION AND WELLS

Rig: SPEED STAR 30K
Bit(s): TRI-CONE / DOWNHOLE HAMMER

Drilling Fluid: AIR

Protective Casing: 9-5/8" diameter steel conductor from 0 to 20'

WELL CONSTRUCTION DETAILS:

Casing: 4" diameter, flush threaded, Sch. 40 PVC. (From +2.54 to 61.15 feet.)

Screen: 4" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 61.15 to 101.15 feet.)

Filter Pack: #3 Monterey type sand. (From 49.5 to 104 feet.)

Bentonite Seal: Medium chipped bentonite. (From 33.3 to 49.5 feet.)

Grout Seal: Neat cement slurry with 5% bentonite. (From 5 to 33.3 feet.)

Centralizer: Stainless steel. (At 30, 60 and 100 feet.)

Cement: From 0 to 5 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	7/20/04	9:40	7/20/04	11:07
Coring:	-	-	-	-
Ream:	-	-	-	-
Geophys. Logging:	7/21/04	7:30	7/21/04	9:15
Casing Install:	7/21/04	10:23	7/21/04	10:45
Filter Placement:	7/21/04	10:47	7/21/04	11:42
Seal Placement: (Bentonite)	7/21/04	12:15	7/21/04	12:30
Seal Placement: (Grout)	7/21/04	15:00	7/21/04	15:30

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	7/22/04	10:15	10:25
Bailing	7/22/04	10:25	10:35
Pumping	7/22/04	11:03	17:10

Total Gallons Removed: 522

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging, bailing and pumping water until visibly clear, approximately less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL (feet)	By
7/22/04	10:00	Prior to well development	-	40.18	304.86	WBL

831

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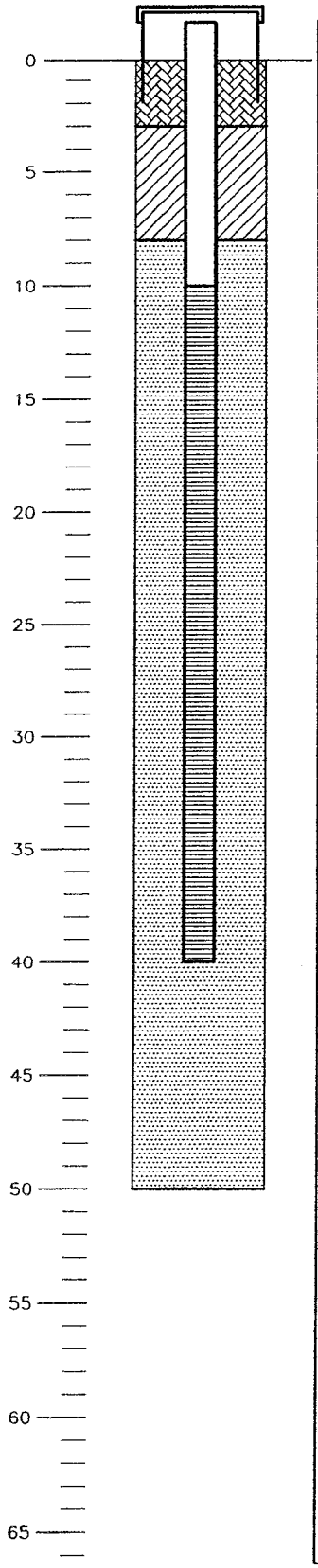
MONITORING WELL COMPLETION SUMMARY

WELL NO.: **LUCIO-2R**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: ND
ELEVATION TOP OF CASING: ND
DATE STARTED: 6/03/04
DATE FINISHED: 6/03/04
TOTAL DEPTH: 40 feet



DRILLING SUMMARY:

Total Depth: 50 feet
Borehole diameter: 8"
Driller: WDC EXPLORATION AND WELLS

Rig: CME-95
Bit(s): BLADE BIT

Drilling Fluid: NA

Protective Casing: AUGER

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter, flush threaded, Sch. 40 PVC. (From +3 to 10 feet.)

Screen: 2" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 10 to 40 feet.)

Filter Pack: #3 Monterey type sand. (From 8 to 50 feet.)

Bentonite Seal: Medium chipped bentonite. (From 3 to 8 feet.)

Concrete Seal: From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/03/04	8:33	6/03/04	9:03
Coring:	–	–	–	–
Ream:	–	–	–	–
Casing Install:	6/03/04	9:08	6/03/04	9:10
Filter Placement:	6/03/04	9:10	6/03/04	10:03
Seal Placement: (Bentonite)	6/03/04	10:03	6/03/04	10:05
Seal Placement: (Concrete)	6/03/04	10:20	6/03/04	10:45

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	6/08/04	10:00	10:10
Bailing	6/08/04	10:15	10:20
Pumping	6/08/04	10:30	11:00

Total Gallons Removed: 155

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging, bailing and pumping water until visibly clear, approximately less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By
6/03/04	9:10	During well construction	–	12.5	–	WBL
6/08/04	9:30	Prior to well development	–	12.7	–	WBL
6/08/04	11:00	After well development	–	12.7	–	WBL

832

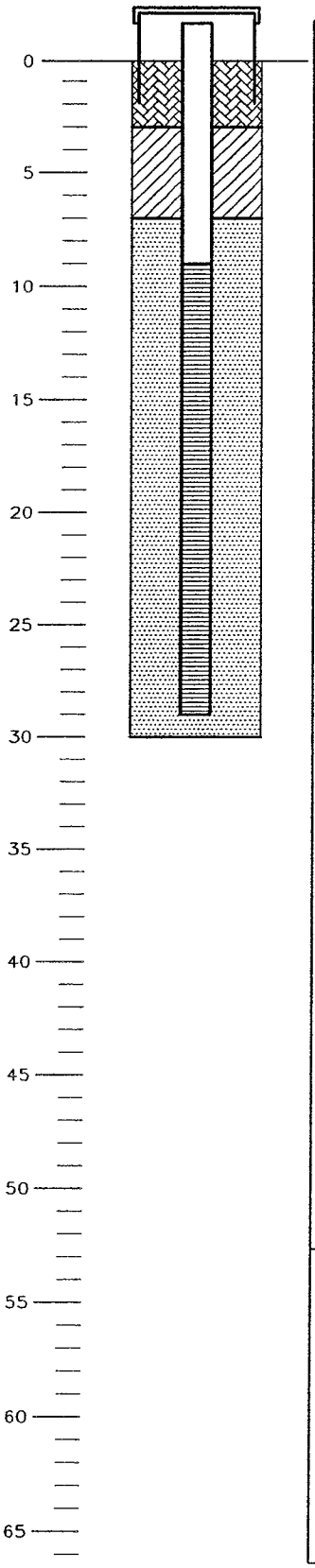
GeoLogic Associates

MONITORING WELL COMPLETION SUMMARY

WELL NO.: **SLRMWD-34R**

JOB NO.: 9539
PROJECT: GREGORY CANYON LANDFILL
LOCATION: GREGORY CANYON, PALA, CA
INSPECTOR: W. LOPEZ, CHG
CHECKED BY: W. LOPEZ, CHG

ELEVATION GROUND LEVEL: ND
ELEVATION TOP OF CASING: ND
DATE STARTED: 6/03/04
DATE FINISHED: 6/03/04
TOTAL DEPTH: 29 feet



DRILLING SUMMARY:

Total Depth: 30 feet
Borehole diameter: 8"
Driller: WDC EXPLORATION AND WELLS

Rig: CME-95
Bit(s): BLADE BIT

Drilling Fluid: NA

Protective Casing: AUGER

WELL CONSTRUCTION DETAILS:

Casing: 2" diameter, flush threaded, Sch. 40 PVC. (From +3 to 9 feet.)

Screen: 2" diameter, flush threaded, Sch. 40 PVC with 0.020" slots. (From 9 to 29 feet.)

Filter Pack: #3 Monterey type sand. (From 7 to 30 feet.)

Bentonite Seal: Medium chipped bentonite. (From 3 to 7 feet.)

Cement Seal: From 0 to 3 feet.

WELL CONSTRUCTION LOG:

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	6/03/04	12:20	6/03/04	12:40
Coring:	-	-	-	-
Ream:	-	-	-	-
Casing Install:	6/03/04	12:42	6/03/04	12:45
Filter Placement:	6/03/04	12:45	6/03/04	13:08
Seal Placement: (Bentonite)	6/03/04	13:08	6/03/04	13:10
Seal Placement: (Cement)	6/03/04	13:15	6/03/04	13:45

WELL DEVELOPMENT LOG:

	Date	Start Time	Finish Time
Surge Block	6/08/04	11:45	11:55
Bailing	6/08/04	12:00	12:05
Pumping	6/08/04	12:15	12:45

Total Gallons Removed: 155

STABILIZATION TEST DATA:

Gallons	pH	Spec. Cond. (µs/cm)	Temp (°F)

Comments:

Well was developed by surging, bailing and pumping water until visibly clear, approximately less then 5 NTU.

WELL MONITORING DATA:

Date	Time	Description	Corr.	Depth (feet)	SWL	By
6/03/04	14:00	After well construction	-	12.6	-	WBL
6/08/04	11:25	Prior to well development	-	13.4	-	WBL
6/08/04	13:00	After well development	-	13.4	-	WBL

833

GeoLogic Associates

BORING LOG

BORING NO.: GLA-1

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 99.5 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/19 10:12						0–5			SP GP	RESIDUAL SOIL mixed with decomposed rock. Yellowish brown (10R5/4). Drills as a coarse SAND. Moderately to highly weathered. Dominant lithic fragments are decomposed LEUCOGRANODIORITE with iron oxide staining.	Dry.
						10–15				Decomposed GRANODIORITE with quartz. Light brownish gray (2.5Y6/2) to brown (10YR5/3). Oxidized with altered biotite and some pink (7.5YR7/4) potassium-feldspar. Cut by quartz feldspar dikes.	Damp.
						15–20				BONSALL TONALITE. Gray (2.5Y5/1). Drills as a fine to medium sand with some coarse fragments. Highly to moderately weathered; some iron oxide staining; altered micas.	Damp.
						20–25				...(20') – slightly less weathered (moderately weathered) and more felsic.	
						25–30					
						30–35				...(30') – TONALITE drills as a fine sand with minor coarse sand – fine gravel size fragments. Color changes to gray (2.5Y6/1).	
						35	12/16/96				
12:14	10:36					40					
		1.17				45				GRANODIORITE/TONALITE lithic fragments. Slightly weathered and oxidized. Gray (N6); many fragments display foliation; rare pinkish white (5YR8/2) potassium feldspar, probably as dikes.	
						50–55				GRANODIORITE. Increase in felsic lithic fragments. Gray (10YR6/4) to light gray (10YR7/1). More quartz and feldspar dikes; foliation is less common. Iron oxide staining on quartz and feldspar.	
12:35	12:31					60				GRANODIORITE/TONALITE. Less felsic fragments. Color change to gray (5Y5/1 to N5); with very minor pinkish white to reddish yellow (5YR8/2 to 7.5YR7/6) potassium feldspar; very minor iron oxide staining.	

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

834

GeoLogic Associates

BORING LOG

BORING NO.: GLA-1

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 99.5 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
12:35						60				GRANODIORITE/TONALITE. Less felsic fragments. Color change to gray (5Y5/1 to N5); with very minor pinkish white to reddish yellow (5YR8/2 to 7.5YR7/6) potassium feldspar; very minor iron oxide staining.	
						65				TONALITE. Gray (N6). Slightly weathered. Mineralogy is hornblende, pyroxene, feldspar (plagioclase), and minor quartz. ...(70') - slightly darker; less potassium feldspar.	
						70					
						75					
12:59	12:57	0.91				80					...(80') - dry.
						85					
		0.91				90					
						95				...(95') - mixed TONALITE and GRANODIORITE. Darker gray (N5) and light gray (N7) (TONALITE inclusions in GRANODIORITE?).	
13:24	13:21					100	▼				
						105					
		1.05				110				...(110') - less segregated GRANODIORITE/TONALITE.	
						115				...(115') - slightly more felsic lithic fragments. GRANODIORITE/TONALITE with slightly oxidized quartz/feldspar dikes.	
13:46	13:43					120				...(120') - More uniform appearance. Felsic fragments absent - no dikes.	

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835

GeoLogic Associates

BORING LOG

BORING NO.: GLA-1

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 99.5 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:46						120				...(120') - More uniform appearance. Felsic fragments absent - no dikes.	
						125				...(125') - same as above. GRANODIORITE/ TONALITE. Gray (N5). Slight foliation on some fragments.	Dry.
		0.91				130				GRANODIORITE/TONALITE. Gray (N5).	
						135					
	14:08					140					
14:12						145					
						150					
						155					
	14:33	0.95				160				...(160') - slightly more felsic fragments, possibly dikes in the TONALITE.	
14:37						165				...(165') - less felsic fragments; more mafics.	
						170					
						175					
	14:56	1.05				180					
15:25											

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836

GeoLogic Associates

BORING LOG

BORING NO.: GLA-1

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 99.5 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:25						180					
						185					
						190				...(190') – some very minor iron oxide staining along fractured surfaces.	
						195				GRANODIORITE/TONALITE. Gray (N5). Slightly weathered to fresh.	
	15:47	0.91				200					
15:50						205				...(205') – increase in felsic minerals (quartz and feldspar); probably GRANODIORITE dikes in the TONALITE. White (N8) felsic fragments represent approximately 35–40% of material.	
						210	▽				...(210') – dampness on outside of drill stem.
						215				...(215') – felsic fragments increase to 50%.	
	16:09	1.05				220				LEUCOGRANODIORITE. White (N8 to 10YR8/1) with minor inclusions of TONALITE. Slightly weathered; minor iron oxide staining; with pinkish white (5YR8/2) potassium feldspar.	
16:12						225				GRANODIORITE/TONALITE with felsic dikes. Gray (N5) TONALITE with approximately 30% LEUCOGRANODIORITE dikes.	...(223') – damp.
						230				...(230') – 5% felsic fragments.	
						235				...(235') – felsic fragments increase to 40%. LEUCOGRANODIORITE dikes in TONALITE. Light gray (N6). Slightly oxidized.	
	16:30	1.11				240				...(240') – felsic fragments represent approximately 50% of the material (QUARTZ GRANODIORITE?).	
11/20 7:35											

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839

GeoLogic Associates

BORING LOG

BORING NO.: GLA-1

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/19/96
DATE FINISHED: 11/20/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 99.5 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/20 7:35						240				...(240') - felsic fragments represent approximately 50% of the material (QUARTZ GRANODIORITE?).	
						245				...(245') - felsic fragments less than 5% (GRANODIORITE with 30%+ quartz and feldspar). Light gray (N6); with pink (5Y7/4) potassium feldspar; some epidote and chlorite alteration.	Wet.
7:41	7:47	0.83				250				...(250') - no pink potassium feldspar. Increase in GRANODIORITE/TONALITE fragments foliation.	
						255				...(255') - darker. TONALITE with little felsic fragments. Gray (N5). Very minor quartz/ feldspar dikes.	Dry.
8:08	7:59	0.56				260				TONALITE. Dark gray (N5). Hard; minor foliation of mafic minerals.	
						265					...(265') - enough water flowing into the hole to wet sample when adding rod.
8:17	8:16	1.25				270				...(270') - Migmatitic texture on some fragments. GRANODIORITE/TONALITE with minor epidote and chlorite alteration. Slightly more felsic than above.	
						275					
8:42	8:29	0.83				280					
						285				...(285') - white zeolite coating on fracture surface on one lithic fragment. Very minor iron oxide staining on some fragments. Minor chlorite and epidote alteration.	Damp.
	8:53	0.91				290				...(290') - very minor pinkish white (5Y8/2) potassium feldspar. ...(295') - no visible potassium feldspar (5YR8/2).	
						295					
	9:07					300					

NOTES:
1. Total depth of borehole 300 feet.
2. Conductor casing set to 20 feet.
3. Open hole interval (exposed bedrock) between 20 and 300 feet below ground surface.
4. Groundwater first encountered between 200 and 220 feet.
5. Depth to water on 12/16/96 measured at 37.10 feet.

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

840

GeoLogic Associates

BORING LOG

BORING NO.: GLA-2

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
ELEVATION: 375 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 70 feet
TOTAL DEPTH: 250 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/18 11:20						0			SM	RESIDUAL SOIL. Loose, non-cohesive, with coarse SAND to fine GRAVEL-sized rock fragments. Yellowish-brown (10YR5/4).	Dry.
						5				BONSALL TONALITE. Strongly weathered (probably "C" horizon). Brown (10YR5/3). Drills as a fine silty sand.	Damp.
						10				...(10') - becomes coarser with fine sand to medium gravel-sized fragments; coarser fragments are dominantly composed of quartz and feldspar (probably derived from a LEUCOGRANODIORITE dike).	
		0.67				15					
11:42	11:50					20				...(20') - slightly coarser.	Drier.
						25				GRANODIORITE. Gray (2.5Y5/1) to grayish brown (2.5Y5/2). Drills as a loose fine sand with minor coarse sand-size fragments of quartz and feldspar.	Dry.
12:26	12:05	0.87				30				LEUCOGRANODIORITE dike (?). Color changes to light gray (2.5Y7/1) to gray (2.5Y6/1). Drills as a very fine sand; minor coarse sand-size fragments; rare gravel-size fragments. Increase in felsic minerals (quartz and feldspar); decrease in mafics. ...(35'-40') - sample consists only of coarse fragments. Pale red (2.5YR7/2).	Dry. Drilling becomes more difficult from this depth on.
13:25	12:48					35					
						40				...(40') - LEUCOGRANODIORITE dike (?). Gray (2.5Y7/1). Very felsic.	Dry.
						45				...(45') - GRANODIORITE. Slightly darker, but still gray (2.5Y7/1).	
						50				...(50') - darker gray (2.5Y6/1. Increase in mafics (biotite).	Dry.
						55				...(55') - slightly darker gray (2.5Y6/1 to 2.5Y5/1). Drills as a very fine sand, with minor coarse sand and medium gravel fragments.	
13:40	13:37	1.67				60				...(60') - iron oxide staining on fragments (probably weathered fracture). Gray (7.5YR5/1).	

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841

GeoLogic Associates

BORING LOG

BORING NO.: GLA-2

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
ELEVATION: 375 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 70 feet
TOTAL DEPTH: 250 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:40						60				...(60') - iron oxide staining on fragments (probably weathered fracture). Gray (7.5YR5/1).	
						65				GRANODIORITE. Gray (7.5YR5/1). Moderately weathered with iron oxide staining, probably along fractures. Some GRANODIORITE fragments display foliation.	
							12/16/96				
						70				...(70') - less oxidation. GRANODIORITE/ TONALITE.	
						75					
14:02	13:58	1.11				80				...(80') - slightly weathered. Very little iron oxide staining. Color change to gray (N6 to N5) with some bluish gray (5B5/1).	
						85				...(85') - less weathered. No iron oxide staining.	
						90					
						95				...(95') - slightly less mafic. Pronounced foliation on many fragments.	
14:24	14:20	1.11				100					
						105					
						110					
						115					
14:44	14:41	1.18				120				GRANODIORITE. Gray (N5). Slightly weathered.	

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842

GeoLogic Associates

BORING LOG

BORING NO.: GLA-2

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
ELEVATION: 375 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 70 feet
TOTAL DEPTH: 250 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:44						120, 125				GRANODIORITE. Gray (N5). Slightly weathered.	
						130, 135				GRANODIORITE with minor quartz feldspar dikes. Gray (N5). Slightly weathered. ...(135') - lighter color; gray (N6) to light gray (N7). Less mafics; more quartz and feldspar.	
15:02						140, 145, 150	▽				...(140') - damp. ...(150') - moist.
						155, 160					
15:36	15:25	0.87				165, 170					...(160') - possibly moist; will let hole sit 15 minutes to see if water seeps into the hole. ...(165') - wet. ...(170') - drilling dry again; probably very low seepage into hole.
						175, 180					
16:13	15:59	0.87									...(180') - moist; will let hole sit 15 minutes before putting in next stem. Refuel.

CONTINUED ON NEXT PAGE

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843

GeoLogic Associates

BORING LOG

BORING NO.: GLA-2

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
ELEVATION: 375 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 70 feet
TOTAL DEPTH: 250 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
16:13						180				...same as above.	...(180') – moist; will let hole sit 15 minutes before putting in next stem. Refuel. ...(181') – wet. ...(185') – damp.
						185					
						190				TONALITE. Darker gray (N5 to N4), with white (N8) fragments mixed in composed of quartz and feldspar (probably derived from quartz/feldspar dikes in TONALITE).	
11/19 6:45						195				TONALITE. Gray (N5) to dark gray (N4), with white (N8) fragments of quartz/feldspar mixed in (<10%) (probably derived from quartz/feldspar dikes in TONALITE).	
6:54						200					
						205					
						210				...(210') – pink (5YR8/3) potassium feldspar fragments present in mix. Increase in felsic fragments up to 15–20% of material (TONALITE with feldspathic dikes). Some chlorite alteration of mafics.	
						215				...(215') – decrease in felsic fragments to approximately 5%. No obvious potassium-feldspar fragments.	
7:24	7:18	0.83				220					...(220') – still drilling damp. ...(223') – very minor water in hole when adding rod.
						225					
						230				...(230') – same as above.	Drilling drier to just slightly damp. ...(235') – drilling wet again; driller thinks there is water pressure; material is clogging up cyclone.
						235					
8:04	7:50	0.77				240				TONALITE/DIORITE. Mafic fragments are dark gray to very dark gray (N4 to N3) when wet. Less than 3% felsic fragments.	

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844

GeoLogic Associates

BORING LOG

BORING NO.: GLA-2

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/18/96
DATE FINISHED: 11/19/96
ELEVATION: 375 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 70 feet
TOTAL DEPTH: 250 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:04						240				TONALITE/DIORITE. Mafic fragments are dark gray to very dark gray (N4 to N3) when wet. Less than 3% felsic fragments.	
						245					
	8:19	0.67				250				...(250') - some epidote alteration of plagioclase; some chlorite alteration of mafics.	
						255				NOTES: 1. Total depth of borehole 250 feet. 2. Conductor casing set to 10 feet. 3. Open hole interval (exposed bedrock) between 10 and 250 feet below ground surface. 4. Groundwater first encountered at 150 feet. 5. Depth to water on 12/16/96 measured at 69.73 feet.	
						260					
						265					
						270					
						275					
						280					
						285					
						290					
						295					
						300					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

845

GeoLogic Associates

BORING LOG

BORING NO.: GLA-3

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/25/96
DATE FINISHED: 11/26/96
ELEVATION: 330 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 21 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/25 12:15						0			SM SP	TOPSOIL/COLLUVIUM: SILTY SAND with GRAVEL; sub-angular clasts of TONALITE and LEUCOGRANODIORITE; loose. Dark grayish brown (10YR4/3).	Moist.
						5			SW	ALLUVIUM: SAND, medium- to coarse-grained, minor fines, with fine- to coarse-grained angular gravel-size fragments of mostly LEUCOGRANODIORITE with some TONALITE. Brown (10YR5/3).	...(5') - damp.
						10				SAND with minor fine- to coarse-grained GRAVEL. Light yellowish brown (2.5Y6/4) to very pale brown (2.5Y7/3).	...(10') - damp.
						15					
						20			SW		
						25	12/16/96				
						30				DECOMPOSED LEUCOGRANODIORITE (GRUSS). Light olive brown (2.5Y5/6), highly weathered; Fe-oxide staining. Drills as a fine- to coarse-grained sand/silty sand; soft, loose.	...(30') - damp.
						35				DECOMPOSED LEUCOGRANODIORITE. Olive (5Y5/3) with Fe-oxide staining. Highly weathered and decomposed.	
						40				DECOMPOSED LEUCOGRANODIORITE. Light olive brown (2.5Y5/4). Drills as fine- to coarse-grained sand with minor gravel. Highly weathered and decomposed.	...(40') - damp.
						45				...(45') - color change to olive brown (2.5Y4/4).	
						50				DECOMPOSED LEUCOGRANODIORITE. Pale brown (10YR6/3) to yellowish brown (10YR5/4). Drills as loose, soft, medium- to coarse-grained sand. Potassium feldspar is reddish yellow (7.5YR6/6-6/8) with Fe-oxide staining.	...(50') - damp.
						55				...(60') - cuttings change in color to pale olive (5Y6/3); larger lithic fragments are gray (10YR6/1) to light brownish gray (10YR6/2); decrease in oxidation staining; color intensity of potassium feldspar decreases to pink (7.5YR8/3) to pinkish gray (7.5YR7/2).	
15:33	12:45	2				60					

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846

GeoLogic Associates

BORING LOG

BORING NO.: GLA-3

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/25/96
DATE FINISHED: 11/26/96
ELEVATION: 330 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 21 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:33						60				...(60') – cuttings change in color to pale olive (5Y6/3); larger lithic fragments are gray (10YR6/1) to light brownish gray (10YR6/2); decrease in oxidation staining; color intensity of potassium feldspar decreases to pink (7.5YR8/3) to pinkish gray (7.5YR7/2).	
						65	▽			LEUCOGRANODIORITE. Weathered and decomposed. Cuttings are mixed yellow (10YR7/6) and grayish brown (10YR5/2) with minor reddish yellow (7.5YR7/6) potassium feldspar.	...(65') – groundwater first encountered. Moderately wet.
						70				...(70') – cuttings are light olive brown (2.5Y5/4).	...(70') – damp.
						75				...(75') – cuttings are olive brown (2.5Y4/3).	Hole produces water at a rate of about 15 gpm.
						80					
						85				...(85') – slightly darker, more mafic.	
						90				GRANODIORITE/TONALITE. Composed mostly of plagioclase, quartz and mafics. Slightly weathered. Dark greenish gray (5B4/1); larger lithic fragments are gray (N5); potassium feldspar is reddish yellow (7.5YR6/6). Less than 3% Fe-oxide staining on some quartz and feldspar dikes.	...(90') – moist.
						95					
16:03	16:01	1.43				100				TONALITE. Relatively unweathered. Gray (N5) with little Fe-oxide staining.	
						105					
						110					
						115					
11/26	16:31	0.71				120				...(120') – minor (less than 5%) potassium feldspar.	

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847

GeoLogic Associates

BORING LOG

BORING NO.: GLA-3

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/25/96
DATE FINISHED: 11/26/96
ELEVATION: 330 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 21 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/26						120				...(120') - minor (less than 5%) potassium feldspar.	
						125					
						130				TONALITE. Gray (N5). Slightly weathered with less than 1% feldspar. Minor quartz/feldspar dikes.	
						135					
7:25	7:19	1.67				140				...(140') - color change to dark gray (N4).	
						145					
	7:31					150					
						155					

Notes:

1. Total depth of borehole 150 feet.
2. Conductor casing set to 45 feet.
3. Open hole interval (exposed bedrock) between 45 and 150 feet below ground surface.
4. Groundwater first encountered at 65 feet.
5. Depth to water on 12/16/96 measured at 23.84 feet.

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

848

GeoLogic Associates

BORING LOG

BORING NO.: GLA-4

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER / M. VINCENT, CEG

DATE STARTED: 11/26/96
DATE FINISHED: 11/27/96
ELEVATION: 905 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 103.2 feet
TOTAL DEPTH: 240 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/26						0			SM SC	TOPSOIL: SILTY SAND with CLAY to CLAYEY SAND. Reddish brown (5Y3/3) to dark brown (7.5YR3/3), soft, loose. Less than 6" thick.	Moist.
						5			SP	ALLUVIUM: Coarse SAND with fine GRAVEL and angular felsic clasts. Pale yellow (2.5Y7/4) to very pale brown (10YR7/4).	...(0.5') - damp.
						10				TONALITE: Moderately weathered with minor quartz/ feldspar dikes.	Damp.
						15				TONALITE with less than 30% of quartz/ feldspar dikes. Gray (N5).	
						20				...(20') - increase in felsic cuttings to 50%.	
						25				LEUCOGRANODIORITE DIKE. Yellow (10YR7/6) with Fe-oxide staining. Cuttings are approximately 40% TONALITE and 60% LEUCOGRANODIORITE.	Damp.
						30				LEUCOGRANODIORITE DIKE (30-35%) in TONALITE. Weathered potassium feldspar is pink (5Y7/4). Cuttings are somewhat oxidized.	
						35					
11/27 6:58						40				TONALITE. Greenish gray (5GY6/1), phaneritic with fine crystallinity and anhedral to subhedral crystals. Moderately weathered and hydrothermally altered. Hornblende and biotite phenocrysts show moderate chlorite-epidote hydrothermal alteration.	
						45					
						50				...(49') - color change to greenish gray (10BG6/1).	
						55				TONALITE. Bluish gray (10B5/1), phaneritic with fine crystallinity and anhedral to subhedral crystals; biotite- and hornblende-rich. Weak alteration to chlorite-epidote.	
						60					
7:27		~0.7								...(61') - slightly higher mafic mineral content than above.	

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849

GeoLogic Associates

BORING LOG

BORING NO.: GLA-4

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER / M. VINCENT, CEG

DATE STARTED: 11/26/96
DATE FINISHED: 11/27/96
ELEVATION: 905 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 103.2 feet
TOTAL DEPTH: 240 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
7:27						60				...(61') - Slightly higher content of biotite than above. ...(61'-65') - weak limonite staining on fracture surfaces. Slightly more chloritized biotite than above. ...(65') - weak foliation as evidenced by preferred orientation of biotite crystals.	
						65					
						70					...(70') - dry.
										...(72') - slightly more felsic than above, with slight increase in crystal size from fine- to medium-crystallinity feldspar and hornblende phenocrysts.	
						75				...(75') - same as above.	
7:51		~0.95				80				...(80') - same as above.	Dry.
						85				...(85') - same as above. ...(86'-92') - fracture zone with minor limonite and pyrolusite mineral coatings on fracture surfaces.	
8:03						90					...(90') - dry.
						95				...(94') - aplite dike(s) consisting mostly of potassium feldspar with minor quartz. ...(95'-100') - minor limonite staining visible on fracture surfaces.	
						100				...(100'-105') - no visible oxidation.	Dry.
8:50						105					...(103.2') - groundwater sounded on 12/02/96.
						110				...(110'-115') light bluish gray (5B8/1), feldspar- and quartz-rich felsic dike(s). ...(116'-120') - no visible dikes. ...(120'-137') - abundant fragments of medium- to coarse-grained potassium-feldspar and minor quartz dike(s). Host rock TONALITE shows evidence of moderate chlorite-epidote hydrothermal alteration. Fractures show possible zeolite veining with minor oxidation staining on non-mineral filled fractures. Host rock TONALITE is bluish gray (5PB5/1), aphanitic to phaneritic (very fine- to fine-crystallinity) with abundant biotite and hornblende.	Dry.
9:22						115					
						120					Dry.

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850

GeoLogic Associates

BORING LOG

BORING NO.: GLA-4

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER / M. VINCENT, CEG

DATE STARTED: 11/26/96
DATE FINISHED: 11/27/96
ELEVATION: 905 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 103.2 feet
TOTAL DEPTH: 240 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						120				...(120'-137') - abundant fragments of medium- to coarse-grained potassium-feldspar and minor quartz dike(s). Host rock TONALITE shows evidence of moderate chlorite-epidote hydrothermal alteration. Fractures show possible zeolite veining with minor oxidation staining on non-mineral filled fractures. Host rock TONALITE is bluish gray (5PB5/1), aphanitic to phaneritic (very fine- to fine-crystallinity) with abundant biotite and hornblende.	...(120') - dry.
						125					
						130					...(130') - dry. Moderately hard drilling.
						135					Groundwater sounded at 103.2' below ground surface on 12/02/96 at 6:55.
8:08						140					No free groundwater while drilling or stacking rods.
						145					Hard drilling. No free groundwater while drilling or stacking rods.
8:24						150					...(149.93') - groundwater sounded on 12/16/96.
						155				...(154') - color change to bluish gray to dark bluish gray (10B4.5/1) with increase in felsic mineral content and increase in crystal size to fine- to medium-crystallinity; anhedral to subhedral feldspar crystals. Cuttings show a weak foliation as evidenced by the segregation of mafic and felsic minerals, and by the preferred orientation of biotite crystals. No visible oxidation of fractures. Rock is unfractured to weakly fractured. No chlorite-epidote alteration visible.	
8:36						160					Hard to very hard drilling. No free groundwater encountered.
						165					
						170					Hard to very hard drilling. No free groundwater encountered.
						175				...(175') - same as above.	
9:10						180					Hard to very hard drilling. No free groundwater encountered.

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851

GeoLogic Associates

BORING LOG

BORING NO.: GLA-4

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER / M. VINCENT, CEG

DATE STARTED: 11/26/96
DATE FINISHED: 11/27/96
ELEVATION: 905 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 103.2 feet
TOTAL DEPTH: 240 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:10						180					
						185				...(185') - same as above.	
						190				...(190') - better developed foliation with depth. No visible jointing or fracturing.	Hard to very hard drilling. No free groundwater encountered.
						195				...(195'-240') - same as above.	
9:43						200					Hard to very hard drilling. No free groundwater encountered.
						205					
						210					Hard to very hard drilling. No free groundwater encountered.
						215					
10:23						220					Hard to very hard drilling. No free groundwater encountered.
						225					
						230					Hard to very hard drilling. No free groundwater encountered.
						235					
	11:08					240					

Notes:

1. Total depth of borehole 240 feet.
2. Conductor casing set to 30 feet.
3. Open hole interval (exposed bedrock) between 30 and 240 feet below ground surface.
4. Groundwater first encountered between 103 and 140 feet.
5. Depth to water on 12/16/96 measured at 149.93 feet.

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852

GeoLogic Associates

BORING LOG

BORING NO.: GLA-5

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/20/96
DATE FINISHED: 11/21/96
ELEVATION: 930 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 41 feet
TOTAL DEPTH: 190 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/20 11:20						0–15			SM SP	COLLUVIUM/RESIDUAL SOIL: SILTY SAND with coarse-grained SAND and fine-grained GRAVEL and minor CLAY; sub-angular sand and gravel size clasts of TONALITE and LEUCOGRANODIORITE. Dark reddish brown (5YR3/3).	Damp.
						15–25				WEATHERED TONALITE. Light olive brown (2.5Y5/3). Drills as a medium- to coarse-grained sand. Minor quartz and feldspar dikes.	Damp. ...(20') - damp.
						25–40				TONALITE. Gray (2.5Y6/1) to light brownish gray (2.5Y6/2). Moderately weathered. Drills as a fine- to coarse-grained sand with minor fine-grained gravel size fragments. Minor quartz/feldspar dikes.	Less damp.
15:57						40–60	11/21/96 12/16/96			TONALITE/QUARTZ DIORITE. Olive (5Y5/3) cuttings, with black (N2.5) and dark gray (N4) lithic fragments. More mafic than above. Drills as a fine-grained sand. ...(50'-55') - color change to light brownish gray (2.5Y6/2) to olive gray (5Y6/2).	
						60–				TONALITE. Gray (5Y6/1). Moderately weathered. Less mafic than above.	

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853

GeoLogic Associates

BORING LOG

BORING NO.: GLA-5

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/20/96
DATE FINISHED: 11/21/96
ELEVATION: 930 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 41 feet
TOTAL DEPTH: 190 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				TONALITE. Gray (5Y6/1). Moderately weathered. Less mafic than above.	
						65					
						70					
						75				...(75'-80') - slightly more felsic, gray (2.5Y6/1) TONALITE; cuttings are sand-size with quartz/feldspar fragments.	
16:27	16:24					80				TONALITE/QUARTZ DIORITE. Gray (N5) lithic fragments. More mafic than above; chlorite alteration of mafics.	
						85				...(85'-90') - felsic cuttings increase to 20% (probably indicates quartz/potassium feldspar dikes in the TONALITE/QUARTZ DIORITE). Felsic fragments have pink (5YR7/4) potassium feldspar. Chlorite alteration of mafics in the TONALITE.	
						90					...(93'-96') - "soft" drilling.
						95				GRANODIORITE. Bluish gray (5B6/1 to 5/1) with minor reddish yellow (5YR7/6); potassium feldspar and quartz cuttings. GRANODIORITE fragments are chloritized. White coatings on some fractures (zeolite?). ...(100') - decrease in felsic cuttings to less than 10%. Majority of cuttings are of TONALITE with granodiorite dikes; some feldspar and chlorite alteration of mafics; gray (N5).	
						100	▽				...(100') - moist.
						105					
11/21										TONALITE. Gray (N5). Moderate to slightly weathered and fractured.	...(105') - damp.
						110				...(110') - very minor fragments of quartz/feldspar with minor mafics as veins/dikes in TONALITE.	
						115					
	7:35					120					...(120') - water coming up hole.

CONTINUED ON NEXT PAGE

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854

GeoLogic Associates

BORING LOG

BORING NO.: GLA-5

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/20/96
DATE FINISHED: 11/21/96
ELEVATION: 930 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 41 feet
TOTAL DEPTH: 190 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
7:35						120					...(120') - water coming up hole.
						125					
						130				TONALITE. Gray (N5). Slightly weathered; fractured. Chlorite alteration of mafics. Less than 1% quartz/feldspar fragments from dikes, and a few rare fragments of zeolite(?) from fracture infilling; minor iron oxide staining.	
						135					
						140					
						145					
						150					
						155					
						160					
						165				...(165') - increase in felsic fragments to 40%.	Sample is wet.
9:08	9:07	0.54				170				...(170') - increase in quartz/feldspar dikes. Decrease in chlorite alteration.	Drier.
						175				...(175') - decrease in felsic fragments to less than 10%.	
9:27	9:23	0.67				180				TONALITE/QUARTZ DIORITE. ...(180') - less than 3% felsic fragments.	

CONTINUED ON NEXT PAGE

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655

GeoLogic Associates

BORING LOG

BORING NO.: GLA-5

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/20/96
DATE FINISHED: 11/21/96
ELEVATION: 930 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 41 feet
TOTAL DEPTH: 190 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:27						180				...(180') - less than 3% felsic fragments.	
						185					
	9:47	0.50				190				...(190') - increase in felsic fragments to 10%.	Lost bit downhole.
						195				Notes: 1. Total depth of borehole 190 feet. 2. Conductor casing set to 30 feet. 3. Open hole interval (exposed bedrock) between 30 and 190 feet below ground surface. 4. Groundwater first encountered at 100 feet. 5. Depth to water on 12/16/96 measured at 42.57 feet.	
						200					
						205					
						210					
						215					
						220					
						225					
						230					
						235					
						240					

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856

GeoLogic Associates

BORING LOG

BORING NO.: GLA-7

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/21/96
DATE FINISHED: 11/21/96
ELEVATION: 403 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 50 feet
TOTAL DEPTH: 160 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/21 13:55						0			SM SW	COLLUVIUM: SILTY SAND, coarse-grained; contains fine gravel fragments. Yellowish brown (10YR5/7).	Damp.
						5			SW	SAND (DG?). Light yellowish brown (2.5YR6/4). May be boulder of decomposed leucogranodiorite.	
						10				DECOMPOSED ROCK (TONALITE?): Olive (5Y5/3). Drills as a fine- to medium-grained sand. Oxidized fragments of brownish yellow (10YR6/8) quartz/ potassium feldspar.	...(10') - damp.
						15					
						20				TONALITE/DIORITE. Very dark gray (5Y3/1). Sub-angular to subrounded oxidized fragments.	
						25				TONALITE. Gray (N5). Highly weathered and decomposed. Drills as an olive (5Y5/3), fine- to coarse-grained sand.	...(25') - damp.
						30					
							12/16/96				
						35					
						40				...(40') - color change to olive gray (5Y5/2 to 4/2).	
						45					
						50					...(50') - groundwater encountered.
						55					
	14:20					60				TONALITE. Olive (5Y4/3). Highly weathered. Drills as a fine- to coarse-grained sand. Large fragments are gray (N5).	...(60') - abundant water coming out of hole on 11/22/96.
11/22 8:25											

CONTINUED ON NEXT PAGE

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857

GeoLogic Associates

BORING LOG

BORING NO.: GLA-7

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/21/96
DATE FINISHED: 11/21/96
ELEVATION: 403 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 50 feet
TOTAL DEPTH: 160 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:25						60				TONALITE. Olive (5Y4/3). Highly weathered. Drills as a fine- to coarse-grained sand. Large fragments are gray (N5).	...(60') - abundant water coming out of hole on 11/22/96.
						65				...(65') - moderately weathered TONALITE.	...(65') - damp.
8:35	8:31	1.67				70				...(70') - color change to olive gray (5Y4/2). Lithic fragments are larger and appear less weathered.	...(70') - moist.
						75					
						80					
						85				...(85') - approximately 35% of lithic fragments are of white (N8) quartz/feldspar dikes. TONALITE fragments are very dark gray (N3).	...(85') - moist.
						90					
						95					
8:52	8:50	1.33				100				...(100') - color of cuttings change to dark gray (N4). Lithic fragments of TONALITE are very dark gray (N3); less than 5% felsic fragments. Slight weathering.	...(100') - wet.
						105					
						110					
						115				...(115') - color of cuttings changes to very dark gray (N3). TONALITE fragments are very mafic with dark gray (N4) plagioclase (borderline GABBRO). Slightly weathered. Tonalite fragments are black (N2.5).	
9:24	9:21	0.69				120					...(120') - abundant water in hole.

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858

GeoLogic Associates

BORING LOG

BORING NO.: GLA-7

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 11/21/96
DATE FINISHED: 11/21/96
ELEVATION: 403 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 50 feet
TOTAL DEPTH: 160 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:24						120				...same as above.	...(120') - abundant water in hole.
						125					
						130					
						135					
9:54	9:49	0.80				140				...(140') - increase in felsics to 40% (probably derived from quartz/feldspar dikes in TONALITE).	
						145				GRANODIORITE. Gray (N6) with pale red (2.5YR7/2) orthoclase feldspars. Olive (5Y4/4) chlorite/epidote alteration of some clasts, particularly along fracture surfaces.	
						150				TONALITE. Dark gray (N4) with less than 5% felsic fragments.	
						155					
	10:21	0.74				160				GRANODIORITE. Gray (N6) with only rare pale red (2.5YR7/2) potassium feldspar.	
						165				Notes: 1. Total depth of borehole 160 feet. 2. Conductor casing set to 30 feet. 3. Open hole interval (exposed bedrock) between 30 and 160 feet below ground surface. 4. Groundwater first encountered at 50 feet. 5. Depth to water on 12/16/96 measured at 34.82 feet.	

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

859

GeoLogic Associates

BORING LOG

BORING NO.: GLA-8

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG; T. REEDER

DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 61 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/24 9:20						0				WEATHERED BEDROCK - TONALITE. Light yellowish brown (10YR6/4). Phaneritic with fine-crystallinity, amphibole-rich and biotite-rich. Some hydrothermal alteration to chlorite-epidote facies.	
						5				...(6') - color change to light gray (10YR7/1).	
						10				...(10') - color change to gray (2.5Y6/1). Less oxidation of biotite than above.	
						15					Conductor casing set to 15'. Begin drilling 5-inch diameter with downhole carbide button hammer.
						20					
						25				...(24') - color change to gray (5Y6/1) to light olive gray (5Y6/2). Increase in chlorite-epidote alteration products and minor increase in iron-oxide alteration products.	Slightly damp.
						30					
						35					
						40					
11:45										UNWEATHERED BEDROCK - TONALITE. Gray (5Y6/1). Phaneritic with fine-crystallinity, subhedral crystals, biotite and hornblende-rich. Pervasive, moderate to weak chlorite-epidote hydrothermal alteration.	
						45					
						50					
						55				...(53'-56') - color change to light brownish gray (2.5Y6/2). Increase in jointing/fracturing as evidenced by increase in oxidation products and weathered feldspar phenocrysts.	
						60	11/25/96				
							12/16/96				

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860

GeoLogic Associates

BORING LOG

BORING NO.: GLA-8

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG; T. REEDER

DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 61 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60	11/25/96 12/16/96				
						65				...(64') – color change to light yellowish brown (2.5Y6/3.5).	
						70				...(67'–78') – possible weathered joints as evidenced by alternating zones of light yellowish brown (10YR6/4) weathered rock and greenish gray (10BG5/1) unweathered rock. Contains fragments of dark gray (N4) to greenish gray (10BG5/1), micaceous and amphibole-rich TONALITE with fine- to medium-crystallinity phenocrysts of weak red (10R4/3) feldspar.	
						75					...(75') – slightly damp.
										...(78') – color change to greenish gray (5BG5/1).	
12:08						80				...(81'–86') – TONALITE to GRANODIORITE. Phaneritic with medium crystallinity; subhedral to euhedral, white to light red (2.5YR6.5/8) potassium feldspar phenocrysts. Minor amounts of white to light red (2.5YR6.5/8) 1/32-inch thick mineral vein infilling (zeolite?) on some fracture surfaces. Mineral veins show some reaction with the host rock, as evidenced by epidote alteration envelopes. ...(86') – groundwater encountered in weathered fracture zone. Weathered rock is pale olive (5Y6/3) in color.	...(83') – larger pieces of sample expelled from the cyclone. ...(85') – stop at 12:28 to trip rods out of hole to repair downhole hammer. ...(86') – groundwater encountered. Mineral vein materials do not appear to react to weak HCl solution.
12:53	12:28					85					
						90					...(90') – very dry.
						95					
						100				...(98') – decrease in amount of weathered fracture zones. Abundant healed fractures showing shear structures in possible hydrothermal (zeolite) mineral veins approximately 1/2-inch thick.	...(100'–105') – somewhat abundant groundwater.
						105					
						110					
						115					
13:26		1.17				120					

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

861

GeoLogic Associates

BORING LOG

BORING NO.: GLA-8

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG; T. REEDER

DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 61 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:26						120					
						125					
13:38						130				...(128') - increase in mafic minerals with associated color change to brownish gray (10B5/1).	
	13:45					135				...(135'-140') - healed fractures showing shear structures in possible hydrothermal (zeolite) mineral veins approximately 1/2-inch thick. Veins contain 1/32-inch to 1/16-inch diameter TONALITE fragments as inclusions. Vein materials are typically greenish gray (5BG6/1) in color with less than 1/64-inch thick iron-oxide and pyrolusite coatings between the vein material and the host-rock.	...(135') - stop drilling at 13:45 to trip out rods due to blockage in the downhole hammer. Begin drilling with tri-cone bit.
14:25											
14:42						140					
	15:10	0.22				145				...(143') - abundant olive gray to light red (2.5YR5/8), euhedral feldspar phenocrysts. A weak foliation is evidenced by the partial segregation of mafic and felsic minerals and by the preferred orientation of platy feldspar and biotite phenocrysts. No visible signs of mineral veining on fracture surfaces.	...(145') - stop drilling at 15:10. Trip out rods and replace tri-cone bit with downhole hammer.
15:32											
						150				...(150') - minor occurrence of mineral veining along fracture surfaces, along with non-mineralized fractures.	
15:44		1.11				155					
						160				...(160') - same as above.	
						165				...(165') - same as above.	
16:01		1.43				170				...(169') - decrease in the amount of feldspar phenocrysts with light red (2.5YR5/8) coloration. Most phenocrysts are white.	
16:10						175				...(172') - increase in amount of mineral veining with associated increase in chloritization. Possible fracture zone.	
						180				...(177') - most feldspar phenocrysts are colored light red (2.5YR5/8). ...(180'-185') - decrease in light red colored feldspar phenocrysts and increase in white colored feldspar.	

CONTINUED ON NEXT PAGE

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862

GeoLogic Associates

BORING LOG

BORING NO.: GLA-8

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG; T. REEDER

DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 61 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						180				...(180'-185') - decrease in light red colored feldspar phenocrysts and increase in white colored feldspar.	
						185					
						190				...(190') - same as above.	
						195				...(195') - same as above.	
						200					
						205				TONALITE - dark gray (N4), weathered, with some epidote alteration of feldspar, quartz and granodiorite veins.	...(205') - wet.
						210				CONTACT ZONE: mixed TONALITE and LEUCOGRANODIORITE - mineralogy includes: greenish gray (5G6/1), altered plagioclase; pale red (2.5YR7/2) to light red (2.5YR7/6) orthoclase; white (N8) quartz and plagioclase; dark gray (N4) to dark greenish gray (5GY4/1) mafics (pyroxene, hornblende and biotite). Quartz-filled veins in some of the cuttings.	
						215				...(215') - increase to 80% of cuttings of LEUCOGRANODIORITE with potassium-feldspar and some mafics.	
						220				...(220') - equal proportions in cuttings of greenish gray (5G6/1) TONALITE(?) to pale red (2.5YR7/2) LEUCOGRANODIORITE.	
						225				...(225') - mix of dark gray (N4) TONALITE and light red (2.5YR7/2) LEUCOGRANODIORITE.	
						230				...(230') - approximately 70% greenish gray (5G6/1), altered TONALITE and 30% pale red (2.5YR7/2) GRANODIORITE.	
						235				...(235') - cuttings become darker due to increase in dark gray (N4) mafics.	
11/25 8:14						240				...(240') - TONALITE is dark gray (N4) with greenish gray (5G6/1), altered plagioclase and dark gray (N4) mafics. Decrease in potassium-feldspar/LEUCOGRANODIORITE fragments to less than 15%.	

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863

GeoLogic Associates

BORING LOG

BORING NO.: GLA-8

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG; T. REEDER

DATE STARTED: 11/24/96
DATE FINISHED: 11/25/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 61 feet
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11/25 8:14						240				...(240') - TONALITE is dark gray (N4) with greenish gray (5G6/1), altered plagioclase and dark gray (N4) mafics. Decrease in potassium-feldspar/LEUCOGRANODIORITE fragments to less than 15%.	
						245				...(245') - increase in LEUCOGRANODIORITE fragments to about 30%; color intensifies to light red (2.5Y7/6).	
						250				...(250') - TONALITE color becomes lighter - gray (N5). Less than 5% LEUCOGRANODIORITE fragments.	
						255				...(255') - same as above, with minor greenish gray (5G6/1 to 5GB6/1), altered (chloritized?) plagioclase.	
	8:35	0.95				260				...(260') - approximately 10% LEUCOGRANODIORITE fragments.	
8:38										TONALITE/GRANODIORITE - gray (N5) to dark gray (N4), with some greenish gray (5G6/1), altered (chloritized?) plagioclase, and LEUCOGRANODIORITE dikes with less than 2% pale red (2.5YR7/2) to light red (2.5YR7/6) orthoclase.	
						265				...(265') - mix of LEUCOGRANODIORITE and GRANODIORITE cuttings. Some greenish gray (5G6/1) altered plagioclase.	
						270					
						275				...(275') - same as above.	
	8:54	1.25				280				...(280') - orthoclase feldspar/ leucogranodiorite fragments decrease to less than 5%.	
8:58						285				...(285') - increase in LEUCOGRANODIORITE fragments to approximately 35%.	
						290				...(300') - decrease in orthoclase feldspar to approximately 15%; increase in greenish gray (5G6/1), altered plagioclase.	
						295				NOTES: 1. Total depth of borehole 300 feet. 2. Conductor casing set to 15 feet. 3. Open hole interval (exposed bedrock) between 15 and 300 feet below ground surface. 4. Groundwater first encountered at 86 feet. 5. Depth to water on 12/16/96 measured at 62.40 feet.	
	9:17	1.05				300					

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864

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						0, 5				DECOMPOSED TONALITE. Olive gray (5Y4/2). Highly weathered and decomposed. Drills as a fine-grained sand to silty sand with coarse-grained sand to fine-grained gravel size fragments.	Drilling on cut - all topsoil removed. Damp.
						10, 15, 20				LEUCOGRANODIORITE DIKE. Light yellowish brown (2.5Y6/4) to pale yellow (2.5Y7/4). Highly weathered and decomposed. Fe-oxide staining, and oxidation and chloritization of mafics.	Damp.
						25, 30, 35				TONALITE. Dark gray (5Y4/1) to very dark gray (5Y3/1). Moderately weathered. Minor Fe-oxide staining; some chloritization of mafics. ...(35') - quartz veins in TONALITE.	Damp.
14:00						40				GRANODIORITE dike in TONALITE (about 60% GRANODIORITE). Light gray (2.5Y7/2) to pale yellow (2.57/3). Oxidized; weathered; some epidote alteration of feldspar and chloritization of mafics.	
						45, 50				DIORITE/TONALITE. Black (N2.5) to very dark gray (N3). Slightly to moderately weathered. Altered biotite on some fragments; minor epidote alteration of some feldspars. Cuttings include fragments of GRANODIORITE; oxidized with some epidote and chlorite alteration. ...(50') - very minor quartz/feldspar fragments in cuttings.	Damp.
						55				GRANODIORITE dike in TONALITE. White (N8) and black (N2.5) mafics. Approximately 30% GRANODIORITE and 70% TONALITE.	
14:22	14:20	1				60				DIORITE/TONALITE. Very dark gray (N3) to black (N2.5) with GRANODIORITE fragments in cuttings. Slightly weathered to fresh. Zeolite(?) and chlorite as fracture infillings; minor disseminated pyrite in veins and in host rock at contact.	

CONTINUED ON NEXT PAGE

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865

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:22						60				DIORITE/TONALITE. Very dark gray (N3) to black (N2.5) with GRANODIORITE fragments in cuttings. Slightly weathered to fresh. Zeolite(?) and chlorite as fracture infillings; minor disseminated pyrite in veins and in host rock.	
						65				DIORITE. Very dark gray (N3) to black (N2.5). Slightly weathered to fresh; minor chloritization. No quartz/feldspar fragments.	...(65') - damp to dry. Hard drilling.
						70					
						75					
14:46	14:43	0.95				80					
						85					...(85'-90') - very hard drilling. Broke tooth off bit.
						90					
						95					
15:24	15:19	0.61				100				DIORITE. Very dark gray (N3) to black (N2.5) with minor quartz/feldspar veins with some zeolite(?) alteration/infillings along fractures and chloritization.	
						105					
						110					
						115					
						120					

CONTINUED ON NEXT PAGE

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666

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:22						60				DIORITE/TONALITE. Very dark gray (N3) to black (N2.5) with GRANODIORITE fragments in cuttings. Slightly weathered to fresh. Zeolite(?) and chlorite as fracture infillings; minor disseminated pyrite in veins and in host rock.	
						65				DIORITE. Very dark gray (N3) to black (N2.5). Slightly weathered to fresh; minor chloritization. No quartz/feldspar fragments.	...(65') – damp to dry. Hard drilling.
						70					
						75					
14:46	14:43	0.95				80					
						85					...(85'–90') – very hard drilling. Broke tooth off bit.
						90					
						95					
15:24	15:19	0.61				100				DIORITE. Very dark gray (N3) to black (N2.5) with minor quartz/feldspar veins with some zeolite(?) alteration/infillings along fractures and chloritization.	
						105					
						110					
						115					
						120					

CONTINUED ON NEXT PAGE

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867

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
16:02	15:58	0.59				120, 125				...(125') - no apparent quartz/feldspar dikes.	
						130, 135, 140, 145				DIORITE. Very dark gray (N3) to black (N2.5). Fresh; hard. Quartz/feldspar fragments with altered biotite and some epidote alteration of feldspars. Very minor disseminated pyrite. ...(135') - no apparent quartz/feldspar fragments.	Rock is fractured, but very hard - breaking buttons off bit. Dry.
12/06 8:20						150, 155, 160, 165, 170, 175				DIORITE. Very dark gray (N3) to black (N2.5). Fresh; very hard; mostly unaltered. Very minor quartz/feldspar fragments with some chloritized biotite. ...(175') - DIORITE with GRANODIORITE/ TONALITE dikes. Chlorite alteration, especially along contact of dikes with DIORITE.	
	8:46	0.77									
9:20						180				Altered GRANODIORITE and quartz/feldspar dikes in TONALITE. Greenish gray (5G5/1). Chloritization of some fractures, and thin coatings of zeolite(?) along some fracture surfaces.	Dry.

CONTINUED ON NEXT PAGE

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868

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:20						180				Altered GRANODIORITE and quartz/feldspar dikes in TONALITE. Greenish gray (5G5/1). Chloritization of some fractures, and thin coatings of zeolite(?) along some fracture surfaces.	Dry.
						185				...(185') - TONALITE without felsic fragments.	
						190				...(190') - more mafic - DIORITE.	
						195				...(195') - minor quartz/feldspar fragments in cuttings.	
10:22	9:46	0.77				200				...(200') - DIORITE/TONALITE. Dark gray (N4); increase in felsic fragments in cuttings.	Wait 20 minutes for water. No water.
						205					
						210				...(210') - minor quartz/feldspar fragments in cuttings.	
						215				...(215') - some chloritized fragments - look like fracture coatings; very dark gray (N3).	
10:51	10:47	0.80				220				TONALITE/DIORITE. Very dark gray (N3). Hard; fresh. Very minor granodiorite fragments with some disseminated pyrite(?).	
						225				...(225') - some chloritized fragments, dark greenish gray (5G4/1 to 5BG4/1).	
						230				...(230') - DIORITE. Dark gray (N4) to gray (N5). Less mafics.	
						235					
11:20	11:15	0.83				240					

CONTINUED ON NEXT PAGE

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869

GeoLogic Associates

BORING LOG

BORING NO.: GLA-9

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: T. REEDER

DATE STARTED: 12/05/96
DATE FINISHED: 12/07/96
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: Not encountered
TOTAL DEPTH: 300 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
11:20						240					
						245					
	11:35	0.67				250				...(250') – cuttings are very dark gray (N3) to gray (N4); minor quartz/feldspar fragments.	Changing bit. Fuel up. Let hole sit over one hour – end of sounder is moist, but no free water in hole.
14:27						255				...(255') – DIORITE with no apparent quartz/feldspar dikes. More mafic; darker.	
	14:48	0.48				260					
14:53						265					
						270				...(270') – very minor quartz/feldspar fragments in cuttings.	
						275					
	15:50	0.35				280					Change bit.
12/07 8:30						285				TONALITE. Minor quartz/feldspar dikes with chloritized mafics along contact with TONALITE.	About 0.5" of water at bottom of hole on 12/07 (condensation?).
						290				TONALITE/GABBRO. Very dark gray (N3). Fresh; hard; tight. Minor quartz/feldspar dikes. Minor chloritization of some mafics.	Used up 4 bits (last one only made it 20 feet) – too many carbide fragments in hole. Rubber fitting on bit broke.
						295					
	8:57	0.74				300				NOTES: 1. Total depth of borehole 300 feet. 2. Conductor casing set to 30 feet. 3. Open hole interval (exposed bedrock) between 20 and 300 feet below ground surface. 4. No free groundwater encountered.	

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870

GeoLogic Associates

BORING LOG

BORING NO.: GLA-10

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG / T. REEDER

DATE STARTED: 12/03/96
DATE FINISHED: 12/05/96
ELEVATION: 325 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 33 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
12/03 11:57						0			SW/SM	ALLUVIUM: SAND to SILTY SAND - very fine- to medium-grained with minor coarse sand to pebbles, with boulders of granodiorite and lesser amounts of tonalite. SAND is poorly sorted, micaceous and feldspathic. Dark brown (7.5YR3/3.5).	
						5					Dry to damp.
						10				...(10'-20') - gradational color change to pinkish gray to brown (7.5YR5/2) with associated decrease in silt and micaceous minerals.	...(10') - dry to damp.
						15					...(15') - dry to damp. ...(17') - groundwater encountered.
						20	12/16/96				
12:35	12:16	1.32				25			SW	GRAVELLY SAND - poorly sorted, medium- to very coarse-grained, arkosic. Abundant subrounded to sub-angular, tonalitic and granodioritic GRAVEL to BOULDERS.	...(25') - stop drilling to repair rig at 12:16. Start drilling again at 12:35.
						30					
						35				WEATHERED BEDROCK - TONALITE: Dark gray (2.5Y4/1) to dark grayish brown (2.5Y4/2). Phaneritic with fine- to medium- crystallinity. Biotite- and hornblende-rich. Weakly weathered with moderate to strong oxidation of biotite and hornblende to chlorite, and with minor alteration of feldspar crystals to clay.	...(33') - wet.
						40					...(40') - wet.
						45				...(45'-50') - predominantly fine-crystallinity.	...(45') - damp.
						50					...(50') - moist to dry. Set conductor casing to 50' below ground surface.
						55				...(53') - color change to olive gray (5Y5/2).	...(55') - dry.
						60					...(60') - dry.

CONTINUED ON NEXT PAGE

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871

GeoLogic Associates

BORING LOG

BORING NO.: GLA-10

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG / T. REEDER

DATE STARTED: 12/03/96
DATE FINISHED: 12/05/96
ELEVATION: 325 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 33 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60					...(60') – dry.
										...(62') – color change to dark greenish gray (10Y4/1).	
						65					
						70				...(70') – color change to pale olive to olive (5Y5.5/3).	
										...(73') – color change to greenish gray (5GY5.5/1).	
						75					
										...(77') – color change to gray (N5).	
12/05 8:54	13:04					80					...(80') – stop drilling to set conductor casing to 50' below ground surface.
						85				TONALITE/DIORITE. Very dark gray (N3). Weathered and moderately decomposed. Fe-oxide stained with altered mica and/or pyrite on oxidized pieces; chloritization of some mafics.	...(87') – water production from borehole while drilling approximately 5-6 gpm.
						90				GRANODIORITE dikes in TONALITE. White (N8). Contains black (N2.5) mafic minerals (biotite, hornblende and pyroxene). Very slight chloritization of some mafics (pyroxene) in very dark gray (N3), weathered and moderately decomposed TONALITE.	...(90') – wet.
						95				...(95') – less than 10% GRANODIORITE dike fragments in TONALITE.	
9:27	9:25	0.65				100				...(100') – 40% GRANODIORITE in TONALITE.	
						105				...(105') – dark gray (N4) mixed TONALITE and GRANODIORITE.	Moist.
						110				Gray (N5 to N6) GRANODIORITE.	
						115				Gray (N5 to N6) GRANODIORITE/TONALITE.	...(115') – wet.
10:05	10:02	0.57				120				...(120') – same as above.	Wet.

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872

GeoLogic Associates

BORING LOG

BORING NO.: GLA-10

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON
DRILLING METHOD: DUAL-WALL REVERSE, AIR
CONTRACTOR: LAYNE - ENVIRONMENTAL
LOGGED BY: M. VINCENT, CEG / T. REEDER

DATE STARTED: 12/03/96
DATE FINISHED: 12/05/96
ELEVATION: 325 feet
NORTHING: ND
EASTING: ND

GW DEPTH: 33 feet
TOTAL DEPTH: 150 feet

TIME START	TIME STOP	RATE, FT/MIN	WATER SAMPLE INTERVAL	SAMPLE SIZE, INCHES	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
10:05						120				...(120') - same as above.	Wet.
						125				...(125') - less than 5% orthoclase feldspar.	
						130				...(130') - no potassium-feldspar; less than 5% GRANODIORITE dikes in TONALITE.	
						135				...(135') - increase in GRANODIORITE to approximately 50% of cuttings; moderately weathered, with minor pink potassium-feldspar.	
10:47	10:44	0.51				140				...(140') - moderately weathered TONALITE with GRANODIORITE dikes.	
						145				Gray (N6), moderately weathered TONALITE/ GRANODIORITE with some epidote/chlorite alteration.	...(145') - wet.
	11:06	0.53				150				...(150') - less than 1% epidote or zeolite alteration and fracture infillings.	
						155				Notes: 1. Total depth of borehole 150 feet. 2. Conductor casing set to 50 feet. 3. Open hole interval (exposed bedrock) between 50 and 150 feet below ground surface. 4. Groundwater first encountered at 33 feet. 5. Depth to water on 12/16/96 measured at 22.20 feet.	

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873

GeoLogic Associates
Boring Log

BORING NO.: GLA-11

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/30/99
DATE FINISHED: 11/30/99
ELEVATION: 775.22
NORTHING: 2070002.607
EASTING: 6300855.954

GW DEPTH: 231 feet
TOTAL DEPTH: 243 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:20						0			SM/ ML	SOIL: Strong brown (7.5YR5/6) SILTY SAND to SANDY SILT with CLAY. SAND is fine- to medium-grained and moderately graded.	Dry.
						5				WEATHERED BEDROCK: Olive gray (5Y5/2), phaneritic, fine-grained, moderately weathered and oxidized HORNFELS.	
						10					
						15					
						20					
8:42						25					
8:46										...(28') - color grades to gray 5Y5/1.	
						30					
						35					
						40					
8:55						45					
9:03											
						50				UNWEATHERED BEDROCK: Dark gray (N4), phaneritic, fine-grained, subhedral, hornblend rich HORNFELS.	Dry.

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GeoLogic Associates
Boring Log

BORING NO.: GLA-11

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/30/99
DATE FINISHED: 11/30/99
ELEVATION: 775.22
NORTHING: 2070002.607
EASTING: 6300855.954

GW DEPTH: 231 feet
TOTAL DEPTH: 243 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						50				UNWEATHERED BEDROCK: Dark gray (N4), phaneritic, fine-grained, subhedral, hornblend rich HORNFELS.	Dry.
						55					
						60					
9:25						65					
9:29						70				...(70'-80') - moderately weathered.	
						75					
						80					
9:50						85					
9:55						90					
						95					
						100				Strong brown (7.5YR5/8) to white (7.5YR8/1), phaneritic, fine- to coarse-grained, moderately weathered, subhedral to euhedral GRANODIORITE dikes in HORNFELS with potassium feldspar phenocrysts.	Dry.

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874

GeoLogic Associates
Boring Log

BORING NO.: GLA-11

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/30/99
DATE FINISHED: 11/30/99
ELEVATION: 775.22
NORTHING: 2070002.607
EASTING: 6300855.954

GW DEPTH: 231 feet
TOTAL DEPTH: 243 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						100				Strong brown (7.5YR5/8) to white (7.5YR8/1), phaneritic, fine- to coarse-grained, moderately weathered, subhedral to euhedral GRANODIORITE dikes in HORNFELS with potassium feldspar phenocrysts.	Dry.
10:22						105					
10:28						110				HORNFELS with minor GRANODIORITE dikes.	Dry.
						115					
						120					
11:00						125					
11:05						130					
						135					
						140				...(141'-144') - GRANODIORITE dike.	
11:37						145					
11:45						150				...(150') - predominantly mafic with no dikes.	Dry.

CONTINUED ON NEXT PAGE

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875

GeoLogic Associates
Boring Log

BORING NO.: GLA-11

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/30/99
DATE FINISHED: 11/30/99
ELEVATION: 775.22
NORTHING: 2070002.607
EASTING: 6300855.954

GW DEPTH: 231 feet
TOTAL DEPTH: 243 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						150				...(150') – predominantly mafic with no dikes.	Dry.
						155					
						160					
12:22						165					
12:26											
						170					Dry.
						175					
						180					
13:04						185					
13:10											
						190				...(189'-191') – GRANODIORITE dike.	
						195					
						200					Dry.

CONTINUED ON NEXT PAGE

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876

GeoLogic Associates
Boring Log

BORING NO.: GLA-11

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/30/99
DATE FINISHED: 11/30/99
ELEVATION: 775.22
NORTHING: 2070002.607
EASTING: 6300855.954

GW DEPTH: 231 feet
TOTAL DEPTH: 243 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						200				...same as above.	Dry.
13:47						205					
13:51						210					
						215					
						220					Wait 30 minutes. Obstruction encountered at 158'. Tape is wet at 75'. Free groundwater encountered when drilling resumed.
14:28						225					
15:03						230	▽				
						235					
						240					Blow out water. Wait 10 minutes; borehole still produces water.
15:27											
						245				Notes: 1. Total depth of boring 243 feet. 2. Groundwater first encountered at 231 feet. 3. Monitoring well constructed on 12/2/99 (see Monitoring Well Completion Summary).	
						250					

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877

GeoLogic Associates
Boring Log

BORING NO.: GLA-12

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/24/99
DATE FINISHED: 11/24/99
ELEVATION: 343.91
NORTHING: 2070784.338
EASTING: 6299410.816

GW DEPTH: 36.7 feet
TOTAL DEPTH: 66.0 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:16						0			SM/ ML	SOIL: Strong brown (7.5YR4/6) SILTY SAND to SANDY SILT with CLAY. SAND is fine-grained and poorly graded.	Dry.
						5, 10, 15				WEATHERED BEDROCK: Strong brown (7.5YR4/4), fine-grained GRANODIORITE (GRUSS) weathered with iron-oxide staining and alteration of feldspar crystals to clay.	Damp.
8:38						20, 25				Yellowish brown (10YR5/4) to brownish yellow (10YR6/6), phaneritic, fine- to medium-grained, moderately weathered and oxidized GRANODIORITE. ...(23') - gradational color change to pale yellow (5Y7/3).	Damp. Switched from tri-cone bit to downhole hammer. Conductor casing set to 18'.
8:57						30, 35, 40				UNWEATHERED BEDROCK: Pale yellow (5Y7/3), phaneritic, fine to coarse subhedral to euhedral GRANODIORITE with white to light red (2.5YR7/6) potassium feldspar phenocrysts.	Moist.
9:30											Wait 45 minutes. Sound for water. Groundwater encountered at 38 feet.
10:18						45					Very moist.
						50				...(48') - color change to light olive brown (2.5Y4/3). ...same as above.	Very moist.

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878

GeoLogic Associates
Boring Log

BORING NO.: GLA-12

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/24/99
DATE FINISHED: 11/24/99
ELEVATION: 343.91
NORTHING: 2070784.338
EASTING: 6299410.816

GW DEPTH: 36.7 feet
TOTAL DEPTH: 66.0 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						50				...same as above.	Very moist.
						55					
						60					
10:38						65					Wait 2 hours. Sound for water. Groundwater sounded at 36.7 feet.
						70				Notes: 1. Total depth of boring 66 feet. 2. Groundwater first encountered at 38 feet. Static water level measured at 36.7 feet. 3. Monitoring well constructed on 11/24/99 (see Monitoring Well Completion Summary).	
						75					
						80					
						85					
						90					
						95					
						100					

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879

GeoLogic Associates
Boring Log

BORING NO.: GLA-13

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/22/99
DATE FINISHED: 11/23/99
ELEVATION: 355.90
NORTHING: 2070269.329
EASTING: 6298912.906

GW DEPTH: 49.7 feet
TOTAL DEPTH: 69.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:00						0			SM/ ML	SOIL: Light yellowish brown (10YR6/4) SILTY SAND to SANDY SILT. SAND is fine-grained and poorly graded.	Dry.
						5				WEATHERED BEDROCK: Strong brown (7.5YR5/8 to 7.5YR4/6), fine-grained TONALITE (GRUSS). Weathered with Fe-oxide staining and alteration of feldspar crystals to clay.	Damp.
						10					
						15					
						20					Switched from tri-cone to button bit.
15:17											
15:26						25				Olive (5Y5/3) to olive gray (5Y5/2), phaneritic, hornblend- and quartz-rich fine- to coarse-grained TONALITE with strong oxidation of hornblend and biotite phenocrysts.	Damp.
						30				...(30') - color grades to gray (5Y6/1).	
						35					
						40					
15:43											
15:46						45					Damp.
						50				UNWEATHERED BEDROCK: Dark gray (5Y4/1) to white (5Y8/1), phaneritic, fine- to coarse-grained TONALITE to GRANODIORITE with abundant felsic minerals with lesser mafic minerals. Shows minor effects of iron-oxide staining.	Moist.

CONTINUED ON NEXT PAGE

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880

GeoLogic Associates
Boring Log

BORING NO.: GLA-13

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/22/99
DATE FINISHED: 11/23/99
ELEVATION: 355.90
NORTHING: 2070269.329
EASTING: 6298912.906

GW DEPTH: 49.7 feet
TOTAL DEPTH: 69.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						50				UNWEATHERED BEDROCK: Dark gray (5Y4/1) to white (5Y8/1), phaneritic, fine- to coarse-grained TONALITE to GRANODIORITE with abundant felsic minerals with lesser mafic minerals. Shows minor effects of iron-oxide staining.	Moist.
						55					
							▽				Wait 20 minutes. Sound for water. Groundwater encountered at 58 feet and rising.
						60					
16:04											
11/23 7:46											Very hard drilling. Water enters borehole while drilling.
						65					
8:22											
						70				Notes: 1. Total depth of boring 69.5 feet. 2. Groundwater first encountered at 58 feet. Static water level measured at 49.7 feet. 3. Monitoring well constructed on 11/23/99 (see Monitoring Well Completion Summary).	
						75					
						80					
						85					
						90					
						95					
						100					

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881

GeoLogic Associates
Boring Log

BORING NO.: GLA-14

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/21/99
DATE FINISHED: 11/21/99
ELEVATION: 332.21
NORTHING: 2069847.129
EASTING: 6298115.681

GW DEPTH: 36.5 feet
TOTAL DEPTH: 63 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
7:35						0			SM/ ML	SOIL: Dark yellowish brown (10YR4/4) SILTY SAND to SANDY SILT with CLAY. SAND is fine-grained and poorly graded.	Dry.
7:47						5					
7:53						10					
8:08						15				WEATHERED BEDROCK: Strong brown (7.5YR5/8), fine-grained TONALITE (GRUSS) weathered with iron-oxide staining and alteration of feldspar crystals to clay.	Damp.
8:13										Light olive gray (5Y6/2) to gray (5Y5/1), phaneritic, fine- to coarse-grained, hornblend and quartz rich TONALITE with oxidation of hornblend and biotite phenocrysts. ...(20'-22') - white (5Y8/1), unweathered GRANODIORITE dike composed of predominantly quartz and feldspar phenocrysts.	Hard drilling.
8:33						20					
8:48						25					
10:30											
15:00						30					
15:45						35	▼				Moist.
15:20						40	▽				...(42') - groundwater first encountered.
15:26						45					
15:52						50				UNWEATHERED BEDROCK: Dark gray (5Y4/1), phaneritic, subhedral, fine-grained, biotite- and hornblend-rich TONALITE.	Groundwater air lifted out of boring while drilling.

CONTINUED ON NEXT PAGE

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880

GeoLogic Associates
Boring Log

BORING NO.: GLA-14

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/21/99
DATE FINISHED: 11/21/99
ELEVATION: 332.21
NORTHING: 2069847.129
EASTING: 6298115.681

GW DEPTH: 36.5 feet
TOTAL DEPTH: 63 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:52						50				UNWEATHERED BEDROCK: Dark gray (5Y4/1), phaneritic, subhedral, fine-grained, biotite- and hornblend-rich TONALITE.	Groundwater air lifted out of boring while drilling.
						55					
						60					
16:15											
						65				Notes: 1. Total depth of boring 63 feet. 2. Groundwater first encountered at 42 feet. Static water level measured at 36.5 feet. 3. Monitoring well constructed on 11/22/99 (see Monitoring Well Completion Summary).	
						70					
						75					
						80					
						85					
						90					
						95					
						100					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

883

GeoLogic Associates
Boring Log

BORING NO.: GLA-15

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 11/19/99
DATE FINISHED: 11/19/99
ELEVATION: 304.82
NORTHING: 2068403.283
EASTING: 6297080.768

GW DEPTH: 12 feet
TOTAL DEPTH: 50 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:10						0			SM/ ML	ALLUVIUM: Light olive brown (2.5Y5/3) SILTY SAND to SANDY SILT. SAND is very fine-grained, poorly graded and micaceous.	Dry.
13:20						5			SM	Dark grayish brown (2.5Y4/2), poorly graded, fine- with trace of medium-grained, micaceous SILTY SAND.	Moist.
13:34						10	▼				Very moist.
13:47						15				...(15') - SAND grades to fine- to medium-grained.	Slightly wet.
13:53						20					
						25	▽				...(25') - groundwater first encountered.
						30					Slightly wet.
14:15						35				...(35') - contains trace amounts of coarse-grained SAND and GRAVEL.	Groundwater air lifted out of borehole while drilling.
16:50						40					
						45					
17:10						50				Notes: 1. Total depth of boring 50 feet. 2. Groundwater first encountered at 25 feet. Static water level measured at 12 feet. 3. Monitoring well constructed on 11/20/99 (see Monitoring Well Completion Summary).	

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884

GeoLogic Associates
Boring Log

BORING NO.: GLA-16

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: HOLLOW STEM AUGER – 8"ø
CONTRACTOR: WATER DEVELOPMENT CORPORATION
LOGGED BY: W. LOPEZ, CEG

DATE STARTED: 12/20/99
DATE FINISHED: 12/20/99
ELEVATION: 305.28
NORTHING: 2068429.193
EASTING: 6297089.329

GW DEPTH: 10.6 feet
TOTAL DEPTH: 33.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
10:00						0			SM/ ML	ALLUVIUM: Light olive brown (2.5Y5/3) SILTY SAND to SANDY SILT. SAND is very fine-grained, poorly graded and micaceous.	Dry.
						5			SM	Dark grayish brown (2.5Y4/2), poorly graded, fine- with trace of medium-grained, micaceous SILTY SAND.	Moist.
						10	▽				Slightly wet. ...(10.6') – groundwater first encountered.
						15					
						20					
						25					
						30					
10:15											
						35				Notes: 1. Total depth of boring 33.5 feet. 2. Groundwater first encountered at 10.6 feet. 3. Monitoring well constructed on 12/20/99 (see Monitoring Well Completion Summary).	
						40					
						45					
						50					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

885

GeoLogic Associates
Boring Log

BORING NO.: GLA-17

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/16/04
DATE FINISHED: 6/18/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: NA
TOTAL DEPTH: 500 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:48						0				WEATHERED BEDROCK: Gray to dark gray (N4-N5), fine, hightly weathered, poorly indurated TONALITE.	Damp.
8:55										...(5') - intermittent apalite dikes.	
9:24						10				...(10') - highly to moderately weathered, moderately indurated.	...(10') - set conductor casing to 10 feet.
9:31										...(15'-18') - light yellowish brown (10YR 6/4) GRANODIORITE dike with fine to coarse euhedral crystals.	Damp.
9:36						20				...(22'-23') - brown (7.5YR 5/2), fine to medium GRANODIORITE dike.	Damp.
						30				...(33') - fine to medium with some iron-oxide staining.	
9:47											
9:53						40				BEDROCK: Very dark gray (N3), aphanitic to fine, slightly to moderately weathered, well indurated TONALITE with some iron-oxide staining.	
						50					...(50') - inject water for dust control.
10:06											
10:16						60					
						70				...(69') - color change to dark grayish brown (2.5Y 4/2).	
10:24											
10:31						80					
						90					
10:41										...(96') - quartz vein.	
10:50						100					

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886

GeoLogic Associates
Boring Log

BORING NO.: GLA-17

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/16/04
DATE FINISHED: 6/18/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: NA
TOTAL DEPTH: 500 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
10:50						100					
						110					
11:09											
11:17						120				...(119') – fine to medium with some iron-oxide staining, slightly weathered.	
						130				...(125') – color change to pale olive (5Y 6/3); fine to coarse, moderately weathered, some iron-oxide staining.	
11:30										...(134') – color change to olive gray (5Y 5/2); thin apalite dike.	
11:35						140					
						150				...(150') – fine-grained.	
11:51											
12:18						160					
										...(166') – calcite veins.	
						170				...(170'-173') – pale brown (10YR 6/3) to brown (10YR 5/3), fine to coarse GRANODIORITE dike with some iron-oxide staining.	
12:36										...(173') – dark gray (N4) to black (N2.5), aphanitic to fine, very well indurated TONALITE with thin calcite veins.	
12:42						180					
						190					
											...(192'-196') – no cuttings return.
13:13										...(196') – predominately fine euhedral crysals.	
13:20						200					

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887

GeoLogic Associates
Boring Log

BORING NO.: GLA-17

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/16/04
DATE FINISHED: 6/18/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: NA
TOTAL DEPTH: 500 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
13:20						200				...same as above.	
						210					
13:53											
14:00						220					
						230					
14:34											
14:39						240					
						250					
15:13											
15:19						260					
						270					
15:15											
6/17 7:15						280					
						290				...(290–300') – predominately aphanitic.	
7:50											
7:54						300				...(300') – dark gray to gray (N4–N5), fine to medium, very well indurated TONALITE.	

CONTINUED ON NEXT PAGE

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888

GeoLogic Associates
Boring Log

BORING NO.: GLA-17

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/16/04
DATE FINISHED: 6/18/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: NA
TOTAL DEPTH: 500 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
7:54						300				...(300') – dark gray to gray (N4–N5), fine to medium, very well indurated TONALITE.	
						310					
8:29											
8:34						320					
						330					
9:13											
9:23						340					
						350					
9:58											
10:10						360				...(360') – fine to aphanitic with calcite veins.	
						370					
11:01											
11:12						380					
						390					
11:49											
12:01						400					

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889

GeoLogic Associates
Boring Log

BORING NO.: GLA-17

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/16/04
DATE FINISHED: 6/18/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: NA
TOTAL DEPTH: 500 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
12:01						400				...same as above.	
12:18											
6/18 7:54						410					
8:10											
8:14						420					
						430					
9:03											
9:08						440					
						450					
9:41											
9:48						460					
						470					
10:16											
10:21						480					
						490					
11:00						500					

Notes:

1. Total depth of boring 500 feet.
2. No groundwater encountered.
3. Borehole geophysics conducted on 6/21/04.
4. Boring abandoned with neat cement grout on 6/22/04.

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

900

GeoLogic Associates
Boring Log

BORING NO.: GLA-3S

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/14/04
DATE FINISHED: 6/15/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 24.37 feet
TOTAL DEPTH: 80 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:40						0			SW	YOUNGER ALLUVIUM: Dark brown (10YR 2/2) GRAVELLY SAND with COBBLES and BOULDERS. SAND is fine to medium, well graded; GRAVEL and COBBLES well rounded.	Moist.
						5				...(6') – color change to brown (75YR 5/4).	
8:48											
6/15 8:33						10					Refusal on boulder, switch to Stratex.
										...(12') – BOULDER.	
						15				...(14') – SAND is fine to coarse with volcanic COBBLES.	
										...(17') – increasing GRAVEL, COBBLES, and BOULDERS.	
						20					
									SM	OLDER ALLUVIUM: Light brown (7.5YR 6/4) SILTY SAND with scattered GRAVEL. SAND is fine to coarse, well graded.	Moist.
						25	▼			...(26') – color change to yellow-brown (7.5YR 4/4).	Very moist
8:52											
						30				...(31') – increasing GRAVEL and COBBLES cemented with silica, well indurated.	Moist.
						35					
										WEATHERED BEDROCK: Olive (5Y 5/4), highly weathered with iron-oxide staining and alteration of feldspars to CLAY, medium to coarse GRANODIORITE (GRUSS).	Very moist. ...(37') – set conductor casing.
						40				...(41') – color change dark brown (10YR 3/3).	
						45				...(44'-47') – apalite dike, fine to coarse, well indurated.	...(44') – damp.
9:40										...(47') – moderately weathered.	
9:54						50				...(49') – iron-oxide staining on fractured surfaces.	
10:00							▽			...(51') – apalite vein.	...(52') – wet.
13:29											

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901

GeoLogic Associates
Boring Log

BORING NO.: GLA-3S

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/14/04
DATE FINISHED: 6/15/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 24.37 feet
TOTAL DEPTH: 80 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
10:00						50				...(51') – apalite vein.	
13:29											...(52') – wet.
13:31											
13:36						55					
13:42										...(58') – increasing mafic minerals.	Saturated.
13:48						60					
						65					
						70					
						75					
14:00						80					
						85					
						90					
						95					
						100					

Notes:

1. Total depth of boring 80.0 feet; borehole open to 77.5 feet.
2. Groundwater first encountered at 52.0 feet on 6/15/04; static water level measured at 24.37 feet on 6/17/04.
3. Borehole geophysics performed on 6/18/04.
4. Borehole abandoned with neat cement grout on 6/23/04.

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

902

GeoLogic Associates
Boring Log

BORING NO.: GLA-A

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/08/04
DATE FINISHED: 6/09/04
ELEVATION: 429575.97
NORTHING: 1737085.44
EASTING: 377.49

GW DEPTH: 75.12 feet
TOTAL DEPTH: 105 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
16:50						0			SM	SOIL: Strong brown (7.5YR 4/6), fine, poorly graded SILTY SAND.	Dry.
						5					
										WEATHERED BEDROCK: Olive brown (2.5Y 4/3), fine, highly weathered with iron-oxide staining, poorly indurated TONALITE (GRUSS).	Slightly moist.
						10					
						15					
17:00										...(18') – color change to dark gray (2.5Y 4/1); moderately to slightly weathered, moderately indurated.	...(16') – set conductor casing, switch to downhole hammer.
6/07 7:15						20				BEDROCK: Black (N2.5), fine to medium, hornblend rich with quartz, moderately indurated TONALITE.	Dry.
7:22						25					
7:32											
						30				...(30') – color varies from black (N2.5) to dark gray (2.5Y 4/1).	Dry.
						35					
						40					
7:55											
8:23						45					
						50					
						55					
						60					

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

903

GeoLogic Associates
Boring Log

BORING NO.: GLA-A

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/08/04
DATE FINISHED: 6/09/04
ELEVATION: 429575.97
NORTHING: 1737085.44
EASTING: 377.49

GW DEPTH: 75.12 feet
TOTAL DEPTH: 105 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...same as above.	
8:42											
8:56						65					
						70					
						75	▼				
						80					
9:13										...(83'-95') - color predominately dark gray (2.5Y 4/1); increasing quartz and feldspar.	Cuttings moist.
9:30						85	▽				...(85') - first water encountered.
						90					
						95					
						100					
9:55											
						105				Notes: 1. Total depth of boring 105 feet. 2. Groundwater first encountered at 85 feet, static water level measured at 75.12 feet on 6/11/04. 3. Borehole geophysics donducted on 6/11/04. 4. Monitoring well constructed in boring (see well completion summary).	
						110					
						115					
						120					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

904

GeoLogic Associates
Boring Log

BORING NO.: GLA-B

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG/A. FYODOROVA

DATE STARTED: 6/09/04
DATE FINISHED: 6/10/04
ELEVATION: 430149.38
NORTHING: 1737940.66
EASTING: 344.14

GW DEPTH: 40.66 feet
TOTAL DEPTH: 91.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
15:57						0			SM	COLLUVIUM: Dark yellowish brown (10YR 4/4), fine, poorly graded SILTY SAND.	Slightly moist.
16:00						5					
16:25						10				...(10') – grain size increase to fine to coarse with fine GRAVEL; well graded.	Moist.
16:37						15				WEATHERED BEDROCK: Light olive brown (2.5Y 5/4), fine, highly weathered with iron-oxide staining and alteration of feldspars to CLAY, poorly indurated GRANODIORITE (GRUSS).	Moist.
6/10 8:11						20				...(22–25') – color change to strong brown (7.5YR 5/6); grain size increase to fine to coarse.	
8:14						25					
8:26											
8:28											... (26') – set conductor casing.
8:35						30					
						35				...(35') – color change to olive brown (2.5Y 4/3).	Very moist.
8:41						40	▼ ▽				
9:21											...(42') – sound for water, wet at bottom of boring.
						45					
						50					...(52'–60') – very moist.

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

905

GeoLogic Associates
Boring Log

BORING NO.: GLA-B

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG/A. FYODOROVA

DATE STARTED: 6/09/04
DATE FINISHED: 6/10/04
ELEVATION: 430149.38
NORTHING: 1737940.66
EASTING: 344.14

GW DEPTH: 40.66 feet
TOTAL DEPTH: 91.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						50					...(52'-60') - very moist.
						55					
9:30						60				...(60') - medium to coarse.	
10:12											...(62') - sound for water, water measured at 57.75 feet.
						65				...(65') - fine to medium.	
						70				...(71') - fine, moderately weathered.	
						75				...(76') - fine to coarse.	Moist.
10:22						80					...(80') - free water.
10:27						85					
10:49						90				UNWEATHERED BEDROCK: Gray (N5-N6), medium to coarse, very well indurated GRANODIORITE/TONALITE with euhedral crystals.	
						95				Notes: 1. Total depth of boring 91.5 feet (refusal with tri-cone bit). 2. Groundwater first encountered at 42 feet on 6/10/04; static water level measured at 40.66 feet on 6/11/04. 3. Borehole geophysics conducted on 6/11/04. 4. Groundwater monitoring well constructed in boring (see well completion summary).	
						100					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

906

GeoLogic Associates
Boring Log

BORING NO.: GLA-C

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/10/04
DATE FINISHED: 6/11/04
ELEVATION: 430101.73
NORTHING: 1737809.29
EASTING: 340.76

GW DEPTH: 40.14 feet
TOTAL DEPTH: 81 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:35						0			SM	TOPSOIL: Brown (75YR 4/3), fine to coarse, well graded SILTY SAND.	Dry.
						5			SM	COLLUVIUM: Strong brown (7.5YR 5/6), fine to medium, moderately graded SILTY SAND. ...(6') – well indurated.	Damp.
						10				...(10') – GRAVEL and COBBLES predomiately apalite and metavolcanics.	
						15				WEATHERED BEDROCK: Strong brown (7.5YR 5/6), fine to coarse, highly weathered with alteration of feldspars to CLAY, poorly indurated GRANODIORITE (GRUSS). ...(17') – pegmatite dike. ...(18'–19') – apalite dike.	Very moist.
16:46											
6/11 7:42						20				...(20') – becomes moderately weathered with slight iron–oxide staining.	
						25				...(24'–25') – pegmatite dike. ...(26'–27') – diabase/mafic dike, highly weathered to CLAY.	...(26') – very moist. ...(27') – set conductor casing.
8:01											
8:07						30					
						35				...(33') – color change to dark grayish brown (2.5Y 4/2).	
						40	▼				
						45	▽				
8:14											
8:55						50					...(50') – wait 30 minutes sound for water; water measured at 46.7'.

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907

GeoLogic Associates
Boring Log

BORING NO.: GLA-C

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: A. FYODOROVA

DATE STARTED: 6/10/04
DATE FINISHED: 6/11/04
ELEVATION: 430101.73
NORTHING: 1737809.29
EASTING: 340.76

GW DEPTH: 40.14 feet
TOTAL DEPTH: 81 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:55						50					...(50') – wait 30 minutes sound for water; water measured at 46.7'.
						55				...(55'–56') – color change to olive brown (2.5Y 4/3).	
9:02						60					
9:08											
						65					...(63'–67') – no cuttings return.
										...(67') – slightly to moderately weathered.	Moist.
						70					
											...(72') – very moist.
						75				...(75') – slightly weathered.	
											...(77') – wet.
9:19						80					
						85				Notes: 1. Total depth of boring 81.0 feet; borehole open to 77.5 feet. 2. Groundwater first encountered at 46.7 feet; static water level measured at 40.14 feet on 6/11/04. 3. Borehole geophysics conducted on 6/18/04. 4. Groundwater monitoring well constructed in boring (see well completion summary).	
						90					
						95					
						100					

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908

GeoLogic Associates
Boring Log

BORING NO.: GLA-D

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/07/04
DATE FINISHED: 6/08/04
ELEVATION: 429775.68
NORTHING: 1737341.82
EASTING: 364.77

GW DEPTH: 59.5 feet
TOTAL DEPTH: 146.2 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
14:25						0			SC	SOIL: Dark reddish brown (5YR 3/3), fine, poorly graded CLAYEY SAND.	Moist.
						5				WEATHERED BEDROCK: Olive brown (2.5Y 4/3) to brown (10YR 4/3), fine, highly weathered with iron-oxide staining, poorly indurated TONALITE (GRUSS) with GRANODIORITE dikes composed of quartz and feldspar phenocrysts.	Slightly moist.
14:32											
15:00						10					
						15				...(15') - fine to medium; increasing felsic minerals.	
15:12											...(18') - set conductor casing.
15:18						20				...(22') - moderately weathered with some highly weathered intervals.	
						25					
						30				BEDROCK: Brown (10YR 4/3) to black (N2.5), fine to medium, hornblend and quartz rich, moderately indurated TONALITE.	Dry.
						35					
15:30											
16:02						40					Switch to downhole hammer.
16:09											
16:15						45					
						50				...(50') - color change to black (N2.5).	
						55					
						60	▼				...(60') - dry.

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

909

GeoLogic Associates
Boring Log

BORING NO.: GLA-D

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/07/04
DATE FINISHED: 6/08/04
ELEVATION: 429775.68
NORTHING: 1737341.82
EASTING: 364.77

GW DEPTH: 59.5 feet
TOTAL DEPTH: 146.2 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...same as above.	...(60') – dry.
16:30											
16:35						65					
						70					
						75					
						80					
16:55											
17:05						85					
						90					
						95					
						100				...(100–110') – very well indurated.	...(98') – very moist to slightly wet cuttings.
17:50						105	▽				
6/08 7:25											...(105.6') – first water encountered.
						110					
						115					
						120					

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

910

GeoLogic Associates
Boring Log

BORING NO.: GLA-D

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/07/04
DATE FINISHED: 6/08/04
ELEVATION: 429775.68
NORTHING: 1737341.82
EASTING: 364.77

GW DEPTH: 59.5 feet
TOTAL DEPTH: 146.2 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						120				...same as above.	
8:08						125					
8:18											
						130					...(130') - cuttings are damp.
						135					
						140					...(142') - very moist.
8:55						145					
						150				Notes: 1. Total depth of boring 146.2 feet. 2. Groundwater first encountered at 105.6 feet on 6/7/04, static water level measured at 59.5 feet on 6/21/04. 3. Borehole geophysics conducted on 6/11/04. 4. Monitoring well constructed in boring (see well completion summary).	
						155					
						160					
						165					
						170					
						175					
						180					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

911

GeoLogic Associates
Boring Log

BORING NO.: GLA-E

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/14/04
DATE FINISHED: 7/15/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 152.80 feet
TOTAL DEPTH: 152.85 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
16:58						0			SM	SOIL: Brown (7.5YR 5/4), fine to medium, poorly graded SILTY SAND.	Dry.
						5				WEATHERED BEDROCK: Brown (7.5YR 5/4) to strong brown (7.5YR 5/6), fine to medium, moderately weathered, moderately indurated TONALITE (GRUSS) with GRANODIORITE dikes.	Dry.
						10				BEDROCK: Olive brown (2.5Y 5/4), fine to coarse, well indurated, unweathered TONALITE. ...(13') – color change to dark gray (7.5YR 4/1) to (5Y 4/1).	Dry.
17:30						15					
6/15 8:10 8:13											...(16') – set conductor casing, switch to downhole hammer.
8:25						20					
						25					...(25') – slightly moist.
						30					
						35					
8:33											
8:39						40					
						45					...(45') – dry.
						50					
						55					
8:49											
8:51						60					

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

912

GeoLogic Associates
Boring Log

BORING NO.: GLA-E

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/14/04
DATE FINISHED: 7/15/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 152.80 feet
TOTAL DEPTH: 152.85 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:51						60				...same as above.	
8:53											
9:10						65				...(65') – minor iron-oxide staininig.	Dry.
						70					
						75					
9:20											
9:27						80				...(80') – color change to gray (N5-N6); very well indurated.	Dry.
						85					
						90					
						95					
9:44											
9:50						100					...(100') – dry.
						105					
						110					
						115					
10:10											
10:28						120					...(120') – dry.

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

913

GeoLogic Associates
Boring Log

BORING NO.: GLA-E

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/14/04
DATE FINISHED: 7/15/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 152.80 feet
TOTAL DEPTH: 152.85 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
10:28						120				...same as above.	...(120') – dry.
						125					
						130					
						135					
10:52											
11:03						140					...(140') – dry.
										...(142') – well indurated.	
						145					
						150					Stop for 2 hours, sound for water, wet at bottom of boring.
11:15							▽				
						155				Notes: 1. Total depth of boring 152.85 feet. 2. Groundwater first encountered at 152.8'. 3. Borehole geophysics conducted on 7/20/04.	
						160					
						165					
						170					
						175					
						180					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

914

GeoLogic Associates
Boring Log

BORING NO.: GLA-F

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/16/04
DATE FINISHED: 7/16/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 164.8 feet
TOTAL DEPTH: 165.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
7:30						0			SM	SOIL: Strong brown (7.5YR 5/6), fine to medium, poorly graded SILTY SAND.	Dry.
						5				WEATHERED BEDROCK: Dark brown (7.5YR 3/4), fine to medium, highly weathered with iron-oxide staining and alteration of feldspars to CLAY, poorly indurated TONALITE (GRUSS).	Moist.
						10				Olive brown (2.5Y 4/3), fine to medium, moderately weathered, poorly to moderately indurated TONALITE.	Moist.
						15					
						20					...(17') – set conductor casing, switch to downhole hammer. ...(20') – dry.
8:05						25					
8:13						30				BEDROCK: Gray (2.5Y 4/1), fine to medium, unweathered, well indurated TONALITE.	Dry.
						35					
						40					
8:20						45				...(45') – very well indurated.	
8:26											
						50					
						55					
						60					

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

915

GeoLogic Associates
Boring Log

BORING NO.: GLA-F

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/16/04
DATE FINISHED: 7/16/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 164.8 feet
TOTAL DEPTH: 165.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...same as above.	
8:40						65					
8:48											
						70					
						75					...(75') – dry.
						80					
9:03						85					...(83') – dry.
9:09											
						90					
						95					
						100					
9:25						105					...(103') – dry.
9:35											
						110					
						115					
						120					

CONTINUED ON NEXT PAGE

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

916

GeoLogic Associates
Boring Log

BORING NO.: GLA-F

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/16/04
DATE FINISHED: 7/16/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 164.8 feet
TOTAL DEPTH: 165.5 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						120				...same as above.	
9:55						125					...(123') - dry.
10:02											
						130					
						135					
						140					
10:24						145					
10:30											...(146') - very moist.
						150					
						155					
						160					
10:45						165	▽				
						170				Notes: 1. Total depth of boring 165.5 feet. 2. Groundwater first encountered at 164.8'. 3. Borehole geophysics conducted on 7/20/04.	
						175					
						180					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

917

GeoLogic Associates
Boring Log

BORING NO.: GLA-G

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/20/04
DATE FINISHED: 7/20/04
ELEVATION: 430247.55
NORTHING: 1737961.72
EASTING: 345.04

GW DEPTH: 40.18 feet
TOTAL DEPTH: 104 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
9:40						0			SM	COLLUVIUM: Strong brown (7.5YR 4/6), fine to coarse, well graded SILTY SAND with iron-oxide staining.	Dry.
						5					
										...(8') – color change to brown (7.5YR 5/4).	Moist.
						10					
										...(12') – color change to strong brown (7.5YR 5/6)	
						15				...(13–16') – GRANODIORITE BOULDER.	
											...(16') – set conductor casing.
10:13						20				WEATHERED BEDROCK: Brown (7.5YR 4/4), fine to coarse, highly weathered with iron-oxide staining and alteration of feldspars to CLAY, poorly indurated GRANODIORITE.	...(20') – switch to downhole hammer.
10:21											
10:24						25				...(24') – color change to light yellowish brown (2.5Y 6/4).	
10:29											
						30					
						35				...(35') – color change to olive brown (2.5Y 4/3) to dark grayish brown (2.5Y 4/2); moderately weathered, poorly indurated, little to no CLAY.	
						40	▼				
10:36											
10:41						45					
											...(48') – very moist.
						50					
						55					
						60				...(60') – fine to medium.	

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

918

GeoLogic Associates
Boring Log

BORING NO.: GLA-G

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: AIR ROTARY
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 7/20/04
DATE FINISHED: 7/20/04
ELEVATION: 430247.55
NORTHING: 1737961.72
EASTING: 345.04

GW DEPTH: 40.18 feet
TOTAL DEPTH: 104 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
						60				...(60') – fine to medium.	
10:46											
10:51						65				...(65'–70') – color change to pale yellow (2.5Y 7/4); medium to coarse.	...(65') – very moist to slightly wet.
						70				...(70') – color change to yellowish brown (10YR 5/8); fine to medium.	
						75					
						80					
10:56											
11:02						85	▽			...(85') – color change to dark grayish brown (2.5Y 4/2); fine to coarse.	...(85') – first water encountered.
						90					
											...(93') – slightly wet.
						95					
						100					
11:07											
						105				Notes: 1. Total depth of boring 104 feet. 2. Groundwater first encountered at 85 feet on 7/20/04; static water level measured at 40.18 feet on 7/22/04. 3. Borehole geophysics conducted on 7/20/04. 4. Groundwater monitoring well constructed on 7/21/04 (see well completion summary).	
						110					
						115					
						120					

The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

919

GeoLogic Associates
Boring Log

BORING NO.: LUCIO-2R

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: HOLLOW STEM AUGER
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/03/04
DATE FINISHED: 6/03/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 12.5 feet
TOTAL DEPTH: 50 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
8:33						0			SM	ALLUVIUM: Brown (10YR 4/2), fine to coarse, well graded SILTY SAND with GRAVEL. GRAVEL is subrounded to subangular.	Slightly moist.
						5					...(5') – moist.
						10					
							▼				
						15					
8:45						20			SW	Dark gray (10YR 4/1), well graded, fine to coarse SAND with fine to medium, subrounded to subangular GRAVEL.	Wet.
						25					
8:54						30					
						35					
8:58						40					...(40') – saturated.
						45					
9:03						50					
						55				Notes: 1. Total depth of boring 50 feet. 2. Groundwater measured at 12.5 feet. 3. Groundwater monitoring well constructed on 6/3/04 (see well conmpletion summary).	
						60					

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

920

GeoLogic Associates
Boring Log

BORING NO.: SLRMWD-34R

JOB NO.: 9539
SITE LOCATION: GREGORY CANYON LANDFILL
DRILLING METHOD: HOLLOW STEM AUGER
CONTRACTOR: WDC EXPLORATION AND WELLS
LOGGED BY: W. LOPEZ, CHG

DATE STARTED: 6/03/04
DATE FINISHED: 6/03/04
ELEVATION: ND
NORTHING: ND
EASTING: ND

GW DEPTH: 12.6 feet
TOTAL DEPTH: 30 feet

TIME	DRY DENSITY (LBS/CU. FT.)	MOISTURE (%)	BLOWS (COUNT/FT.)	SAMPLE SIZE (INCHES)	SAMPLE NO.	DEPTH IN FEET	ELEVATION IN FEET	MATERIAL SYMBOL	USCS/GEOLOGIC FORMATION	DESCRIPTION	COMMENTS
12:20						0			SM	ALLUVIUM: Yellowish brown (10YR 5/4), fine, poorly graded, micaceous SILTY SAND.	Dry.
						5					...(5') – slightly moist.
						10					
							▼			...(12') – fine to coarse with trace of fine to medium, subgrounded GRAVEL.	
12:28						15					...(14') – wet.
						20					...(20') – saturated.
						25			SW	Dark gray (10YR 4/1), fine to coarse SAND with trace of subrounded GRAVEL.	
12:40						30					
						35				Notes: 1. Total depth of boring 30 feet. 2. Groundwater measured at 12.6 feet. 3. Groundwater monitoring well constructed on 6/3/04 (see well completion summary).	
						40					
						45					
						50					
						55					
						60					

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The data presented on this log is a simplification of actual conditions encountered and applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change with the passage of time.

921

APPENDIX G-1

WATER SUPPLY REPORT

WATER SUPPLY REPORT

GREGORY CANYON LANDFILL
SAN DIEGO, CALIFORNIA

APRIL 2006
Revised March 2007

PREPARED FOR:

Gregory Canyon, Ltd.
3 Embarcadero Center, Suite 2360
San Francisco, California 94111

PREPARED BY:

GeoLogic Associates
16885 West Bernardo Drive, Suite 305
San Diego, California 92127

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS

SECTION **PAGE**

PREFACE iii

1.0 INTRODUCTION 1
- 1.1 Regional Hydrogeologic Setting 1
- 1.2 Site Hydrogeology 3

2.0 ON-SITE WATER RESOURCES 5
- 2.1 Project Water Supply Requirements 5
- 2.2 Gregory Canyon Alluvial Aquifer/Bedrock Groundwater Systems 6
- 2.3 Available Percolating Bedrock Water Supply 9
- 2.4 Potential Impacts Associated with Use of Percolating Groundwater 12

3.0 OFF-SITE HIGHLY-TREATED RECYCLED WATER 12
- 3.1 Potential Impacts Associated with Highly-Treated Recycled Water 14
  - 3.1.1 Potential Degradation of Groundwater Quality 14
  - 3.1.2 Potential Personnel Health and Safety Impacts Associated with the Recycled Water 17

4.0 CUMULATIVE IMPACTS 18

5.0 CLOSURE 19

6.0 REFERENCES 20

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

TABLE OF CONTENTS (CONT'D)

LIST OF TABLES

Table 1 - Historical Summary – Monitoring Well GLA-2
Table 2 - Historical Summary – Monitoring Well GLA-4
Table 3 - Historical Summary – Monitoring Well GLA-5
Table 4 - Historical Summary – Monitoring Well GLA-10
Table 5 - Historical Summary – Monitoring Well GLA-11
Table 6- Historical Summary – Monitoring Well GLA-12
Table 7- Historical Summary – Monitoring Well GLA-13
Table 8- Historical Summary – Monitoring Well GLA-14
Table 9- Historical Summary – Monitoring Well GLA-A
Table 10- Historical Summary – Monitoring Well GLA-B
Table 11- Historical Summary – Monitoring Well GLA-C
Table 12- Historical Summary – Monitoring Well GLA-D
Table 13- Historical Summary – Monitoring Well GLA-E
Table 14- Historical Summary – Monitoring Well GLA-F
Table 15- Historical Summary – Monitoring Well GLA-G

LIST OF FIGURES

Figure 1 - San Luis Rey Hydrologic Unit
Figure 2 - Site Location Map
Figure 3 - Well Location Map
Figure 4A - Configuration of Water Table in the Alluvial/Colluvial Aquifer (April 2005)
Figure 4B Configuration of Piezometric Surface in the Bedrock Aquifer (August 2005)
Figure 5 - Recycled Water Storage and Distribution Plan

APPENDICES

A Well GLA-3 Aquifer Test Data Evaluation

PREFACE

This report was prepared to provide additional documentation regarding the water supply needs of the proposed Gregory Canyon Landfill (GCLF) project. It was developed in response to a court order related to this portion of the Final Environmental Impact Report (FEIR) for the GCLF project. This report incorporates technical data and an analysis of the available on-site water resources and presents potential off-site water resources for the project and actions to accommodate use of off-site water resources. In addition, this report includes an evaluation of potential impacts associated with the use of both on-site and off-site water resources over the life of the landfill.

To date, there have been more than six phases of geologic and hydrogeologic characterization. Initial site characterization was completed by Geotechnical Consultants, Inc. (GCI) for the County of San Diego and the U.S. Department of Interior (GCI, 1989). The second and third phases were completed by Geraghty and Miller (G&M, 1988, 1990). The fourth phase included the work of Woodward-Clyde Consultants completed in 1991 and reported in 1995 (WCC, 1995). The fifth phase included a hydrogeologic study completed by GeoLogic Associates (GLA, 1997), and the sixth phase addressed geotechnical issues (GLA, 1998 and 1999). In support of the EIR and subsequent Joint Technical Document (JTD) for the GCLF project, or in response to comments received on the draft EIR, GLA has also completed additional supplemental studies and reports. The major project reports pertaining to the site hydrogeology are provided below.

1. Geotechnical Consultants, 1989, Preliminary assessment of geologic and hydrogeologic conditions, Gregory Canyon site: Draft Environmental Impact Report, Environmental Impact Statement for the North County Class III Landfill, San Diego County, California.

2. Geraghty & Miller, 1988, Phase I hydrogeologic investigation - Proposed North County Landfill, San Diego, California: Consultant's report to Waste Management of North America, Western Region.

3. Geraghty & Miller, 1990, Phase II investigation - Proposed Gregory Canyon Class III Landfill, San Diego County, California: Consultant's report to Waste Management of North America, Western Region.

4. Woodward-Clyde, 1995, Geology and hydrogeology report, Gregory Canyon Landfill, Pala, San Diego County, California: Consultant's report to Gregory Canyon Ltd. (March, 1995).

5. GeoLogic Associates, 1997, Phase 5 - Hydrogeologic investigation for the Gregory Canyon proposed landfill site: Consultant's report to Gregory Canyon Ltd.

6. GeoLogic Associates, 1998, Phase 6 - Geotechnical investigation for the Gregory Canyon proposed landfill site: Consultant's report to Gregory Canyon Ltd.

7. GeoLogic Associates, 2001, Addendum to Geotechnical Investigation of the Proposed Access Road and Bridge over San Luis Rey River, April.

8. GeoLogic Associates, 2001, Phase 5 Supplemental investigation, results of pumping tests, January.

9. GeoLogic Associates, 2003, Geologic, hydrogeologic, and geotechnical investigations report, September.

10. GeoLogic Associates, 2004, Supplemental hydrogeologic investigation report, October.

This water supply technical report is divided into three sections. Following an introductory section describing the regional and site hydrogeologic setting, Section 2 presents a discussion of the available on-site bedrock (percolating) groundwater resources, within the limits of the Gregory Canyon property and the calculated safe yield for water supplied from the bedrock system for daily project water needs. Section 3 provides a discussion of off-site water resources and in particular the use of disinfected tertiary-treated recycled water and permitting requirements for the use of this recycled water for the GCLF. Section 4 presents an evaluation of cumulative impacts to water service and facilities. Section 5 presents conclusions related to the impacts associated with the use of on-site and off-site water resources for the project.

1.0 INTRODUCTION

Gregory Canyon is located in an area dominated by crystalline rocks, which make up the area's steep topography, with intervening alluvial valleys. Most of the area is undergoing erosion and mass wasting, but the major river valleys, such as the San Luis Rey River valley, have thick accumulations of sediments, referred to as alluvium. The alluvium undergoes cycles of deposition and erosion, depending on the water flow in the drainage system, typically with low flows during the summer months and variable flows during the winter rainy season. Limited groundwater exists in the fractures within the crystalline rocks compared with the groundwater stored in alluvial sediments. The following sections provide a discussion of the hydrogeologic characteristics in the region surrounding Gregory Canyon and on site.

1.1 REGIONAL HYDROGEOLOGIC SETTING

The Gregory Canyon watershed is tributary to the San Luis Rey River and is part of the San Luis Rey Hydrologic Unit (Figure 1). This hydrologic unit encompasses a semi-rectangular area of about 565 square miles. The San Luis Rey River occupies a narrow valley in the basin that is filled with water-bearing alluvial sediments bounded by sedimentary rocks in the lower reach of the basin, and igneous and metamorphic rocks in the middle and upper reaches. The alluvial deposits along the San Luis Rey River form narrow elongated groundwater basins. The San Luis Rey Hydrologic Unit has been subdivided into three hydrologic areas from east to west, which include the Warner, Monserate and Lower San Luis (Mission). The Monserate Hydrologic Area occupies approximately the middle one-third of the San Luis Rey Hydrologic Unit and is the closest to the proposed landfill. The Monserate Hydrologic Area is further subdivided into three hydrologic subareas which include from east to west, the La Jolla Amago, Pauma and Pala Hydrologic Subareas (RWQCB, 1994). Groundwater moves from east to west, downgradient from the Pauma Basin to the Pala Basin and then to the Bonsall Basin of the Lower San Luis Hydrologic Area. The boundaries of each basin are drawn where the basement complex (hard crystalline rock) is exposed at the surface and where distinct bedrock constrictions in the San Luis Rey Valley segment the valley fill.

Because groundwater recharge is seasonal and inconsistent, groundwater levels in the valley fluctuate. Historical depth-to-water measurements from the period between 1965 to 1990 for the alluvial aquifer indicate depth to groundwater ranges from the ground surface (in the river) to approximately 25 feet below ground surface (bgs) [California Department of Water Resources (CDWR) 1971; U.S. Geological Survey (USGS) 1990].

The GCLF site is located to the south and adjacent to the Pala Basin boundary (Figure 2). The Pala Basin covers approximately 4,500 acres, being nearly eight miles long and averaging about 0.5 miles in width (NBS Lowry, 1995). Total thickness of the alluvial sediments in the Pala Basin ranges from zero at the basin margins to in excess of 165 feet, under the proposed GCLF bridge crossing (GLA, 2001). A study by the USGS (Moreland, 1974) estimated the maximum depth of the alluvium in the Pala Basin at 244 feet (in one well 9S/2W-26G1 located in the far upper reach of the Pala Basin), and an

average depth of 150 feet. At well GMW-3 (Figure 3), located near the southern edge of the Pala Basin at the mouth of Gregory Canyon, the alluvium is a minimum of 50 feet thick (to total depth drilled).

Due to an abundance of coarse sand and gravel deposits and minimal clay, the best recharge areas are located in the central and west-central portions of the basin (NBS Lowry, 1995). Reported well yields for alluvium in the Pala Basin from a study by NBS Lowry (1995) indicate rates of production range from 300 gpm to 1600 gpm. Specific capacities for alluvium along the axis of the basin range from 13 gallons per minute per foot (gpm/ft) to greater than 115 gpm/ft of drawdown (Moreland, 1974). Hydraulic conductivities range from 750 gpd/ft^2 to 1000 gpd/ft^2 (100 to 135 ft/day).

Granitic and metamorphic crystalline rocks underlie the valley fill and adjacent slopes. Groundwater occurrence and movement in the bedrock medium depends upon fracture size, aperture, density, and interconnection, rather than matrix properties as in alluvial soils. Though it is common usage to speak of a bedrock "aquifer" (as distinct from the alluvial aquifer), wells penetrating fractures containing groundwater are not typically a dependable source of water for large-scale agricultural, municipal or industrial uses. Wells within valleys and canyons where surficial deposits are absent or minimal generally yield only small quantities of groundwater (typically less than 5 gpm to about 20 gpm). These results are proportional to the relative porosity of the two media (25-50% for alluvium, and 0-10% for fractured crystalline rock). The variations in the range of production provide a context for distinguishing between the two types of groundwater occurrence, although there has been little attempt to quantify the properties of the bedrock flow system regionally. In fact, the Pala Basin as defined by the CDWR (1971) does not include the adjacent bedrock.

Water Resources. The San Diego County Water Authority (SDCWA) is a public agency that was founded in 1944 to supplement existing supplies by importing water into the San Diego Region. In response to continued demand for water and the decreased reliability of imported water sources, SDCWA has been evaluating the potential to develop additional local water supplies and water storage. To this end, SDCWA is considering water conservation, water transfers, water reclamation and purification, and groundwater resource development and management. SDCWA developed a Groundwater Resource Development Report (June 1997) to assist in developing a Groundwater Implementation Plan and to serve as a reference and resource document to be updated periodically. In this report, the Mission, Bonsall, Pala and Pauma basins within the San Luis Rey River Basin, were considered (among others) as productive shallow alluvial aquifers within the SDCWA service area.

SDCWA assigned a high score to the Pala/Pauma Basins, along with several other groundwater basins and surface reservoirs, during its initial "Regional Screening of New Sources of Water." Accordingly, these basins were targeted for further analysis under the "Analysis of Alternatives". The resulting analysis of alternatives ranked the groundwater basins including the Pala/Pauma groundwater basins in a lower group (less attractive), and therefore they were not considered further as a viable new source of water. The primary reasons for the low ranking included very low groundwater elevations that would

require extensive pumping facilities for water conveyance, relatively little emergency storage capacity, and the need for extensive infrastructure including wells and connecting pipelines throughout the basin.

Water Quality. Water quality data for wells in the Pala Hydrologic Subarea are sparse. One key indicator of groundwater quality is the total dissolved solids (TDS) concentration. For aesthetic reasons, the state has established a recommended TDS concentration of 500 mg/L in drinking water supplies, with an upper limit of 1000 mg/L. Currently, TDS concentrations in SDCWA imported supplies range from about 500 to 700 mg/L (SDCWA, 1997). Based on available groundwater quality data, the alluvial aquifer in the Pala Basin is good, with groundwater concentrations of TDS estimated in the range of 200 to 860 mg/l (Moreland, 1974) compared with 600 to 3,400 mg/l TDS for the Bonsall Basin, the next basin downgradient of the Pala Basin within the San Luis Rey River valley.

1.2 SITE HYDROGEOLOGY

Gregory Mountain is an elongated, relatively flat-topped prominence, drained to the east, north and west (into Gregory Canyon) by steep, rocky secondary canyons. The potential catchment area of the mountain is large and it clearly dominates recharge to Gregory Canyon. Recharge to Gregory Canyon from the west ridgeline and southern drainage divide is believed to be relatively minimal. Though no permanent springs have been identified in Gregory Canyon, the presence of some riparian vegetation along the thalweg of the canyon, and its tributaries, suggests that the piezometric level of the underlying aquifer is close to the surface along the lowest points of the canyon. Studies by GLA and others, including the drilling, construction and testing of groundwater monitoring wells, have assisted in evaluating groundwater flow within the project area.

There are two distinct groundwater zones within Gregory Canyon; an alluvial aquifer hosted by the sediment wedge at the mouth of the canyon and thickening northward toward the San Luis Rey River, and a crystalline bedrock fracture flow system hosted by the fractured tonalite that forms the substrate of the canyon. The general direction of groundwater movement in both aquifers is northerly, toward the alluvial aquifer of the San Luis Rey River (Figures 4A and 4B).

Alluvial Aquifer. Two alluvial units have been mapped at the lower elevations near the mouth of Gregory Canyon, which form a wedge of sediments in the lower reaches of Gregory Canyon. The younger unit, Qal-1 is formed by overbank deposits from the active San Luis Rey river channel, which are interbedded with channel deposits from the Gregory Canyon drainage. These deposits are relatively thin and contain gravels, cobbles and boulders, supported by a sandy silt matrix. The older alluvial subunit, Qal-2, is a terrace remnant of older alluvium from the Gregory Canyon drainage.

Figure 4A shows a contour map of the water table in the alluvial aquifer based on data collected on April 5, 2005 (the most recent time when significant groundwater was measured in the on-site alluvial wells). This alluvial wedge pinches out to the south before reaching the proposed landfill footprint. It thickens to the north until eventually it

merges with the channel deposits of the San Luis Rey River. Well GMW-3, near the mouth of the canyon, encountered a minimum 50-foot section of alluvial deposits (to the total depth drilled) and has been identified as an alluvial well to be used for water quality monitoring of the site. The other alluvial wells within the vicinity of Gregory Canyon include wells MW-3, WCC-1, and WCC-2. However, it should be noted that only wells GMW-3 and MW-3 have contained measurable groundwater, while well WCC-2 has never contained measurable groundwater. WCC (1995) concluded that groundwater within the alluvium forms an unconfined aquifer recharged primarily by direct infiltration from precipitation or runoff from the bedrock ridges east and west of the canyon. The available data suggest groundwater flow is northerly, at a gradient of about 0.02 ft/ft.

As stated above, the reported hydraulic conductivities for the coarse sand and gravel deposits within the Pala Basin range from 750 to 1,000 gpd/ft^2 (100 to 135 ft/day) (Moreland, 1974). In contrast to this more coarse-grained sediment typical of the Pala Basin as a whole, WCC (1995) estimated that the hydraulic conductivity of alluvial and colluvial materials in Gregory Canyon ranges between 0.9 and 16 gpd/ft^2 (0.12 to 2.14 ft/day) Supporting this lower local value, Geraghty & Miller (1990) performed a pumping test in well GMW-3 and estimated the transmissivity of the alluvial aquifer using the Cooper-Jacob method, at 700 gpd/ft, and from this value the hydraulic conductivity was estimated to be approximately 11 gpd/ft^2 (1.47 ft/day). These lower hydraulic conductivity values are consistent with the finer overbank deposits identified in the boring log and typical of the basin margin areas.

Bedrock Fracture Flow System. The bedrock to the south, outside of the Pala Basin, includes the Bonsall Tonalite, which describes the rocks underlying the western ridge adjacent to Gregory Canyon, and the Indian Mountain Leucogranodiorite describing the light-colored, bold outcrops of granitic rock underlying the eastern ridge of the site area and an intervening band of metamorphic rock along the lower slopes of the eastern ridge, which probably are best correlated with the Jurassic Santiago Peak volcanics. Detailed descriptions of each of these bedrock units is provided in the geologic, hydrogeologic, and geotechnical investigations report prepared by GLA (September, 2003).

There are 25 bedrock monitoring wells within the proposed landfill footprint and along the periphery of the site, constructed during various investigative phases of the project (Figure 4B). Studies conducted to date indicate that groundwater in Gregory Canyon can be characterized as a fracture-controlled, interconnected flow system. Results obtained from pumping tests of Gregory Canyon bedrock well GLA-3, likely one of the most productive well within Gregory Canyon, identify a calculated hydraulic conductivity value of approximately 45 gpd/ft^2 (6 ft/day).

Wells accessing the water-bearing fractures register water levels defining a systematic piezometric surface (Figure 4B). Flow apparently is enhanced even by a moderate degree of rock decomposition and mineral vein dissolution. As interpreted from drilling logs, the zone of weathering in the bedrock is deeper along the invert of Gregory Canyon and shallows on the sidewalls. Relatively significant water producing zones are mostly located in the weathered zone in wells near the canyon axis. In contrast, flow in

unweathered rock is more limited in terms of both quantity and occurrence of producing fractures. In fact, four wells (GLA-4, GLA-9, GLA-17 and GMP-3) drilled along the west ridgeline to depths significantly below the projected equipotential surface are dry (one well, GLA 4, is recharged by a perched water condition), and other wells drilled in unweathered bedrock underlying the northern extension of the western ridgeline (in the low-permeability zone shown on Figure 4B) recharge very slowly from relatively isolated fractures. Therefore, the western ridgeline is believed to form a groundwater flow barrier. Figure 4B shows that fracture flow below the equipotential surface is west-northwest at a relatively steep gradient of about 0.14 ft/ft in the upper portions of the canyon to about 0.09 ft/ft closer to the bottom of the canyon. Groundwater flows from the Gregory Mountain recharge area to Gregory Canyon; occurs largely in the weathered zone; and is bounded by unweathered tonalite under the western ridgeline. Derivation of a piezometric surface from wells isolated from one another by non-water bearing rock attests to the hydraulic interconnection of the fracture system.

The water level in the alluvium adjacent the bedrock, which fluctuates seasonally and with climatic intervals, is the local base level of the equipotential surface. During wet periods, whether considered on an annual or decadal basis, water levels rise in the alluvial aquifer at the mouths of adjoining canyons, and the adjacent equipotential surface expands as the bedrock's fracture system fills. During the years that preceded the second highest recorded year of precipitation in 2005, the water level in the alluvial aquifer dropped below the screen levels of wells at the mouth of Gregory Canyon, and the bedrock equipotential surface also contracted.

2.0 ON-SITE WATER RESOURCES

Groundwater outside of the Pala Basin is derived primarily from the infiltration (percolation) of rainfall and surface water runoff into open fractures within the otherwise impermeable crystalline bedrock, and is defined as percolating groundwater. This section presents a discussion of the available percolating (bedrock) water resources on the GCLF property and provides an analysis of the long-term safe yield from the bedrock wells for project water uses.

2.1 PROJECT WATER SUPPLY REQUIREMENTS

As presented in the FEIR (Section 4.15.3.3), the GCLF water demand includes daily operational needs of 0 to 30,000 gallons per day (gpd) of water for dust control and 0 to 10,000 gpd of water for ancillary use, landscape irrigation and fire protection (if needed). Operation of the landfill will use about 40,000 gpd of water, or about 38 acre-feet per year. The actual water demand will vary depending on the weather conditions and the time of year, with very little water use for dust control and irrigation on rainy days. In contrast, very dry days such as those occurring during the Santa Ana winds, would require a higher amount of water usage. The landscape irrigation will be limited to small areas of permanent landscaping at the landfill entrance and around the administrative facilities, as well as within the proposed biological mitigation sites. Other landscaped areas will use non-irrigated, drought tolerant native vegetation, which would be watered

only at planting and during the initial establishment period. Fire protection water will be supplied by water within an on-site storage tank.

During periodic construction of new lined sections of the landfill, however, an additional 125,000-165,000 gpd of water is estimated for installation of the clay liner and for ancillary uses, for a maximum water use of about 205,000 gpd during periods of simultaneous construction and operation.

Based upon the landfill location, primarily underlain by bedrock, on-site water resources available to meet the projects water demands will include the use of percolating (bedrock) water (i.e., water supplied from areas outside of the Pala Basin that are considered to be comparably impermeable with limited groundwater occurring within the fractured crystalline bedrock). It is proposed that the on-site percolating water be used anywhere at the landfill location.

The project will prioritize the allocation of water needs of the project, as much as is practical. Only a limited amount of water is needed to support the establishment of the plant community as part of the project habitat creation program within the San Luis Rey River valley, for permanent landscaping at the entrance of the landfill, or for dust control on the access road, all of which are situated within the alluvial basin portion of the site. On-site percolating water will be used first for these areas and small areas of permanent landscaping around the administrative offices, and daily operational applications including dust control within the ancillary facilities and along the haul roads and the borrow/stockpile areas, portions of which may be underlain by either bedrock or the margins of the alluvial basin. In this way, off-site water can be applied more broadly as operational water within the landfill footprint and during periodic construction phases of the project, although it will be available to support the entire project's water needs. Bottled potable drinking water will be supplied for personnel use at the landfill.

2.2 GREGORY CANYON ALLUVIAL AQUIFER/BEDROCK GROUNDWATER SYSTEMS

The proposed landfill site is located in Gregory Canyon, a north-draining tributary canyon to the San Luis Rey River valley (Figure 1). In the lower portions of Gregory Canyon, a thin veneer of unconsolidated residual soils, colluvial, and alluvial deposits mantle a substrate of weathered tonalite. The topographic highs bounding the canyon are formed by igneous intrusive and metamorphic rocks with varying degrees of weathering.

The California State Department of Water Resources (CDWR) Bulletin 118 entitled *California's Groundwater*, defines a groundwater basin as an area underlain by permeable material capable of furnishing a significant supply of groundwater to wells or storing a significant amount of water (CDWR, 1975). The DWR has delineated the limits of each groundwater basin in two dimensions, developed initially on the presence and areal extent of unconsolidated alluvial soils from area geologic maps. Well completion reports for wells in basin areas were then used to identify the top of the water table and the top of impermeable bedrock. If less than 25 feet of permeable material was present or

if there was no groundwater within the permeable material, the area was eliminated from the map. The well completion reports were also used to determine if water supply wells located within the basin area were extracting groundwater from permeable materials or from bedrock beneath the permeable material. If the wells only extracted groundwater from the bedrock, the area was eliminated from the map. If an area lacked well information, the areas were retained from the areal geology until additional information could be collected. Figure 2 is a map developed from the CDWR (1975) showing the approximate limits of the Pala Basin, the alluvial basin occupied by the San Luis Rey River and located to the north of Gregory Canyon. Wells GMW-3 and MW-3 are screened within saturated alluvium, though measured water levels in well MW-3 indicate that this well has a maximum of about 11 feet of saturated alluvial section (in April 2005), and less than three feet typically.

For the Gregory Canyon area of the site, well GMW-3 is the northernmost well in the mouth of Gregory Canyon, and screened over the thickest section (50 feet minimum) of alluvial sediments to its total depth. Based on the screened interval within the alluvium, this well is being defined as an alluvial well, although the hydraulic conductivity of this well (11 gpd/ft^2) is less than has been calculated in several of the bedrock wells, and likely would not produce a significant supply of groundwater. This lower hydraulic conductivity result is likely associated with the finer-grained sediments deposited on the margins of the valley. Therefore, it is located at the approximate southern limit of the Pala Basin within Gregory Canyon.

Groundwater occurrence and movement in bedrock depends upon fracture size, frequency, aperture, density and interconnection, rather than matrix properties as in alluvial soils. Borehole dilution testing was performed by COLOG, Inc. (GLA, 1997), to determine the transmissive intervals within the fractured bedrock in 11 open boreholes on the project site. COLOG, Inc. adapted the borehole dilution method, using de-ionized water as the tracer and periodic measurements of the ambient temperature and fluid electric conductivity (FEC) as measures of "concentration" of the tracer. Once borehole water has been diluted with the deionized water to reduce the FEC and create thermal equilibrium, changes in the temperature and the FEC assist in locating hydraulically transmissive zones in the bedrock, and calculating the average velocity of the groundwater moving from these zones into the open borehole. The results obtained by COLOG, Inc. after applying this technique in the logging of the 11 wells are summarized below.

1. As shown in the following table, in shallow wells (e.g., GMW-1, GMW-4, and GMP-2), and in the shallow portions of wells GLA-5 and GLA-7, the transmissive intervals are broad and continuous, consistent with the deeply weathered nature of the tonalite.

Well	Depth to water (feet)	Depth of transmissive interval (feet)	Specific discharge (ft/day)	Open/Screened Interval (feet)
GMW-1	21.89	65-83	0.26, 0.31	48–90.5
GMW-4	65.72	66-74	0.11-0.13	55-116
GMP-2	69.54	70-86	0.14-0.18	45-87.5
GLA-5	42.57	43-66	0.05	30-190
GLA-7	34.82	35-72	0.16-0.24	30-160

2. As shown in the following table, in the deeper portion of the GLA wells, where the tonalite is less weathered, there are very few transmissive intervals. They range in thickness between 2 and 8 feet, and represent between 1% and 5% of the total length of the bedrock section. These results are indicative of fracture flow.

Well	Depth to water (feet)	Depth of transmissive interval (feet)	Specific discharge (ft/day)	Open/Screened Interval (feet)
GLA-1	37.10	ND	ND	20-300
GLA-2	69.73	83-85	0.17	70.38-95.38
GLA-3	23.84	66-70/ 82-84	0.23/ 0.29	45-100
GLA-4	68*	70-72, 126-134	0.03/0.07	30-240
GLA-5	42.57	96-99	0.06	30-190
GLA-8	62.40	175-180	--	15-300
GLA-10	22.20	58-64	0.02	50-57

Note:
* The static depth to water was 149.93 feet bgs, but the transmissivity of the well was so low that water added during testing did not drain. Thus, the reported transmissive intervals and specific discharge values are transient.

3. For the deep GLA wells, in all but one instance the intervals of groundwater flow is within fractures in more weathered bedrock, within 60 feet of the piezometric surface. Groundwater flow is largely concentrated in discrete shallow fracture zones. Deeper fractures possess lower transmissivity, apparently as a result of more complete mineralization.

Results from the tested wells exhibit flow within one or more fractured zones in the underlying bedrock to demonstrate the presence of a fractured flow system. Based on this testing and subsequent investigative phases of the project, average yield and low-yield wells were identified within the GCLF site. The average yield bedrock wells (wells yielding from 5 to 20 gpm) were found to be located within the axis of Gregory Canyon itself (e.g., GMW-1, GMW-4, and GLA-3) within more deeply weathered bedrock, while the low-yield bedrock wells (e.g., wells GLA-1, GLA-2, GLA-4, GLA-A, GLA-D, GLA-E, GLA-F and dry well GLA-9) with recovery rates less than 5 gpm, and typically less than 1 gpm, are located along the western ridgeline, where there is very little weathering and the majority of the fractures have been mineralized.

2.3 AVAILABLE PERCOLATING BEDROCK WATER SUPPLY

The project water resources will be prioritized for the GCLF so that depending on its availability, the on-site percolating bedrock water will be used first for areas designated for biological mitigation, landscape irrigation, and dust control on site haul roads and Borrow/Stockpile areas A and B before imported water resources are used.

There are currently 21 bedrock monitoring wells included in the groundwater monitoring program for the GCLF site. Included in the groundwater monitoring program are 11 bedrock monitoring wells (wells GLA-2, GLA-12, GLA-13, GLA-A through GLA-G, and GMW-1) located on the downgradient (north) side of the landfill in the ancillary facilities area of the site. These proposed monitoring wells are located ideally for downgradient water quality monitoring because groundwater flow is effectively parallel to this boundary and groundwater flowing under the landfill footprint will be brought to the line of these wells. Based on discussions with the Regional Water Quality Control Board (RWQCB), as an additional groundwater system enhancement, each of these downgradient bedrock wells will be equipped with a dedicated pump and plumbed to convey groundwater to an on-site tank. The pump controller for each well will cycle the pump on and off at a rate that matches each well's production capability based on pumping test data. This pumping will capture the groundwater as it flows from beneath the landfill. Figure 3 presents the locations of the water quality detection monitoring program wells.

Pumping tests have been performed in several of the bedrock wells including wells GLA-3, GLA-8, GLA-13, GLA-A, GLA-B, GLA-G, and GMP-2 (GLA, 1997, 2000, 2004). The greatest production was identified within the more deeply weathered bedrock within the center of Gregory Canyon. Wells drilled in unweathered bedrock underlying the northern extension of the western ridgeline (wells west of well GLA-13) recharge very slowly from relatively isolated fractures and have very little production capability. Bedrock wells east of and including well GLA-13 are identified as average yield wells capable of pumping at rates ranging from about 1 gpm to up to 17 gpm.

Further analysis of the pumping test data for well GLA-3, likely one of the most productive wells within Gregory Canyon, was performed to evaluate the long-term sustainable yield in this well. The analysis included review of the well GLA-3 aquifer pumping tests conducted in 2000 and 2004 (GLA, 2001, 2004), and a computer simulation of the well's behavior during continuous pumping at three different rates over various durations. Using the Rockware98 software package's Drawdown Calculator (RockWare Inc. 1998), and the well's aquifer properties, the drawdown was calculated for continuous pumping from this well at a rate of 10, 15 and 20 gpm after periods of 2, 20, 200 and 2000 days. The results of this analysis indicated that pumping rates greater than 15 gpm would draw groundwater down below approximately 53 feet (near the base of the effective aquifer) after 2000 days ($\pm$ 5.5 years). The resulting analysis indicates that although greater pumping rates can be achieved from well GLA-3, the long-term sustainable yield in GLA-3 is approximately 12 gpm or 17,280 gpd (Appendix A).

If the average yield wells are pumped at the toe of the landfill, as is proposed, including wells GLA-B, GLA-C, GLA-G and GLA-12 (estimated to pump 1 to 2 gpm per well), and GLA-13 and GMW-1 (estimated to pump about 4 gpm and 10 gpm, respectively), in addition to well GLA-3 to capture the groundwater as it flows from beneath the landfill, and to provide a water supply, these wells can be reasonable expected to provide approximately 30 gpm (43,200 gpd), sufficient water to support daily operations (e.g., landscape irrigation, dust control and fire protection estimated at 1 to 40,000 gpd).

The bedrock pumping test-derived aquifer properties and the Gregory Canyon catch basin area were used to assess a safe yield for pumping within Gregory Canyon (Appendix A). The safe yield can be defined as the rate at which water can be withdrawn from an aquifer without depleting the supply to such an extent that withdrawal at this rate is harmful to the aquifer itself, or to the quality of the water. Therefore, the safe yield calculation was performed to assess a reasonable level of pumping that did not exceed the amount of groundwater flowing in, and surface water infiltration into the bedrock within the Gregory Canyon catch basin area. The study evaluated the currently proposed landfill configuration in which bedrock will be excavated no more than five feet above the highest anticipated groundwater elevation, rather than the originally proposed landfill configuration as presented in the GCLF 2003 Draft EIR, which would have excavated a portion of the weathered bedrock to depths that are below the piezometric surface. In addition, the safe yield calculation takes into account the entire approximately 415-acre Gregory Canyon catch basin area (i.e., ridgeline to ridgeline and top to bottom of the canyon), not just that portion of the landfill that was to be excavated below the piezometric surface evaluated previously. Since there are no rain gauges in the vicinity of the landfill to provide the historical precipitation data for Gregory Canyon, precipitation data from Lake Henshaw, which averages 25 inches per year, and a 5% infiltration and aquifer recharge rate, were used. Lake Henshaw was selected because, of rain gauge data available in the vicinity of the project location, it provides well documented precipitation data over 42 years. The calculation yields a cumulative pumping rate from the bedrock wells that should not exceed 27 gpm (38,880 gpd). This safe yield value is slightly more conservative than was estimated from the pumping and production data obtained from individual wells including in the proposed pumping program at the toe of the landfill. Recognizing that the actual infiltration rate or average precipitation may be lower, further monitoring of water levels will be conducted to continue to evaluate the effects of the pumping program on the bedrock fracture flow system with pumping reduced, as appropriate to maintain a safe yield within Gregory Canyon.

At the GCLF site, water quality within the bedrock fracture flow system has been evaluated over a number of years. GLA performed an initial limited water quality evaluation in August 1999, and subsequently obtained four quarters of water quality data between December 2000 and December 2001. More recently, beginning in December 2004, water quality samples are being collected to provide a statistically representative database of the water quality data in proposed detection monitoring wells at GCLF site. Bedrock wells within the water quality monitoring program include wells GMW-1,

GLA-2 and its replacement well GLA-2R (GLA-2/2R), GLA-3, GLA-4, GLA-5, GLA-11, GLA-12, GLA-13, GLA-14, and GLA-A through GLA-G. The number of samples collected from each well is based on the age of the well and when it was incorporated into the groundwater monitoring program.

None of the water quality data collected to date suggests the presence of measurable organic compounds (i.e., volatile organic compounds, pesticides, and herbicides) in wells at the GCLF site. As presented on Tables 1 through 15, for the bedrock wells the inorganic water quality data including chloride, nitrate, sulfate and TDS indicates that there are two populations of water quality data for each of these constituents, with generally higher concentrations of samples from wells located in the "saddle" area in the northern portion of the western ridgeline and at the top of the canyon (well GLA-5).

Chloride concentrations in the bedrock wells range from about 50 mg/L (in samples from well GLA-4) to as much as 1300 mg/L (in samples from well GLA-D) with an average chloride concentration of about 250 mg/L. Samples with chloride concentrations that consistently exceed the State secondary MCL of 250 mg/L occur in northerly western ridgeline "saddle" wells GLA-2/2R, GLA-D, GLA-E, and GLA-F. Sulfate concentrations range from about 40 mg/L (in well GLA-4) to 350 mg/L (in well GLA-5), with only the sulfate concentrations in well GLA-5 exceeding the state secondary MCL of 250 mg/L in GCLF site bedrock wells. The average nitrate as nitrogen concentration in bedrock wells is 15 mg/L, with concentrations that are less than 1 mg/L in samples from wells GLA-B, GLA-G, GLA-11 and GLA-12 on the northeast side of the GCLF. However, the State primary MCL (10 mg/L) is exceeded in samples from northerly western ridgeline saddle wells GLA-A, GLA-D, GLA-E, GLA-F, GLA-2/2R, GLA-13 and GLA-14, and in well GLA-5 located at the top of the canyon, with the highest values measured in samples from well GLA-2/2R. Finally, TDS concentrations range from slightly less than 500 mg/L (in samples from well GLA-4) to over 2500 mg/L (in samples from well GLA-D), and average 945 mg/L. Water quality results that exceed the State upper MCL for TDS of 1000 mg/L were measured in samples from the northern western ridgeline saddle wells GLA-D, GLA-E, GLA-F, and GLA-2/2R, and in well GLA-5 at the top of the canyon compared with the rest of the sampled wells on the site.

The fact that many of the highest inorganic constituent concentrations occur in the well GLA-5 at the top of the canyon and in wells located within bedrock that includes very few fractures and very low production suggests that because of the paucity of fractures and very little groundwater movement through the zone, the groundwater has time to accumulates minerals from within the available fractures, or general chemistry constituents such as nitrate from area fertilizers (especially in well GLA-5 located adjacent to agricultural areas). Wells in more weathered bedrock experience significantly more groundwater flow and as a result have very little residence time within the fractures for accumulation and exchange of minerals from the bedrock. Considerable dilution would also be expected from water flowing from Gregory Canyon recharge areas.

2.4 POTENTIAL IMPACTS ASSOCIATED WITH USE OF PERCOLATING GROUNDWATER

Potential impacts associated with the proposed water supply program may include the following:

- Reduced daily volumes of bedrock (percolating) groundwater for project water supply needs.

A safe yield of 27 gpm (38,880 gpd) was calculated for the bedrock fracture flow system within the entire Gregory Canyon catch basin area. The safe yield is exceeded if the amount of water that is pumped from the bedrock exceeds that amount of water that enters the bedrock system through infiltration. Each of the wells located along the downgradient point of compliance will be equipped with a dedicated pumping system and controller to convey water to an on-site water supply tank. Using the controller, each pump will cycle on and off at a rate that matches the wells production capabilities, and maintain the safe yield for the Gregory Canyon catch basin area.

Over the course of the project, the well production may decline, as might occur under a long-term drought condition. In response to reduced availability of percolating water from the bedrock well system for daily operational water uses, additional recycled water will be used to supplement the percolating water and meet the project water supply needs, primarily within the landfill footprint. As much as possible, the available percolating water will be prioritized and applied to areas of the site that are outside of the landfill footprint, before imported recycled water. With the proposed use of wells with dedicated pumping systems to manage the volumes of water pumped from the bedrock and regular assessment of the safe yield for Gregory Canyon, impacts from the pumping of the bedrock groundwater for water supply purposes would be avoided.

3.0 OFF-SITE HIGHLY-TREATED RECYCLED WATER

It is recognized that the on-site bedrock (percolating) water sources are insufficient to fully support both landfill operations and construction activities at the GCLF. Disinfected tertiary-treated recycled water, supplied by the Olivenhain Municipal Water District (OMWD), has been identified as a reasonable off-site water source for project uses, as opposed to drinking water sources. In recent years, this type of water is commonly being used for domestic, agricultural, commercial and industrial uses where drinking water quality is not required. OMWD currently operates a 2 million gallon per day treatment plant that converts wastewater to recycled water, and a 3 million gallon recycled water blending reservoir.

The off-site water is highly treated for unrestricted uses other than drinking water to meet or exceed the requirements established in Title 22, Division 4, Chapter 3, of the California Code of Regulations (CCR) to ensure proper health protection and specify the treatment level is consistent with the intended use of the water. Because the water is produced from municipal wastewater, the treatment program is extensive. The OMWD treatment plant processes wastewater through tertiary treatment, followed by proper

disinfection, before it is blended with imported water for distribution. This type of treatment program is designed to remove virtually all of the pathogenic organisms that may have originated in the initial waste stream. At the same time, the treatment process is not as extensive as that required for potable water and therefore it is not safe for drinking, inadvertent inhalation as might occur from overspray applications, or ingesting from skin contact.

The San Diego County Department of Environmental Health (DEH) and the RWQCB are the primary agencies responsible for regulating the treatment and use of recycled water on specific projects. The DEH provides plan check and inspection services and the RWQCB issues the waste discharge permits for the production and distribution of recycled water. Discussions with both of these agencies indicate that the proposed project application of recycled water for dust control and construction operations are compatible uses. A waiver must be issued by the RWQCB to the OMWD for the application of their recycled water to the project area in the Pala Hydrologic Subarea, followed by a revision to OMWD's Master Reclamation Permit.

For the GCLF project, recycled water will be trucked by 2300 gallon water trucks from an OMWD Santa Fe Valley Reservoir and Pump Station site located near the intersection of Artesian Road and Marantha Way. The trucks will travel on Marantha Way to Camino Del Norte Road to access Interstate 15 and deliver the recycled water to a tank located in the landfill ancillary facilities area. As shown on Figure 5, the recycled water will be gravity-fed from each transport truck to a designated 20,000-gallon capacity storage tank. It is proposed that on-site recycled water applications will be limited to water trucks; there will be no irrigation piping or hose bibs that would provide an opportunity for inadvertent cross-connections or human consumption at the site.

During operations and construction, recycled water will be applied by water trucks as needed throughout the day. Generally, for dust control unpaved roads will be wetted down as needed during construction. Recycled water applications for clay liner processing will occur in place or adjacent to cell construction within the landfill footprint, as it is needed during the construction process. All of the water applications will be conducted by the water truck driving the site area or road to release a relatively consistent stream of water to dampen the area/clay material. With the exception of some localized landscape irrigation applications, stationary applications that might create ponding will not be allowed. Runoff will be avoided at all times.

On-site precautions are necessary to protect project employees from health and safety concerns associated with the use of recycled water on the project site. This includes the following:

- Designation of a Recycled Water Site Supervisor trained in the use of recycled water and capable of giving regular and continuous training and oversight to site personnel on its uses,
- Readily available potable water for drinking and hand washing on the site,
- Use of signage on all on-site water trucks and drop tanks with "Recycled Water – Do Not Drink" and purple paint or wrapping on distribution points, and

- Disinfection of all water trucks and tanks prior to reuse with other than recycled water.

In addition, best management practices will be implemented to protect the environment from ponding and inadvertent runoff including secondary containment around the storage tanks capable of holding the tank volume.

Under a worst case scenario, Gregory Canyon Ltd. has contracted to obtain sufficient water for all of the project's water needs for the life of the project, including daily operational water.

3.1 POTENTIAL IMPACTS ASSOCIATED WITH HIGHLY-TREATED RECYCLED WATER

Potential impacts associated with the proposed water supply program may include the following:

- Potential degradation of groundwater quality from the application of recycled water, and
- Potential public health and safety impacts associated with the use of recycled water.

Each of these potential impacts is described in the following sections.

3.1.1 Potential Degradation of Groundwater Quality

Recognizing that recycled water is widely used for dust control, grading projects and irrigation, the use of highly-treated recycled water for the GCLF project introduces water with a different water quality that could affect the existing water quality conditions at the GCLF site. Currently the San Diego Basin Plan (1994) has established municipal and domestic supply, agricultural supply and industrial process supply as existing beneficial uses of groundwater in the Pala Hydrologic Subarea. Water that is designated for use as domestic or municipal supply may not exceed the MCLs established by the State. The Basin Plan further states that for recycled water that is discharged, it should not exceed the Basin Plan water quality objectives (WQOs), which are established by the RWQCB for the protection of the water for beneficial uses. The OMWD is required to conduct continuous, monthly, quarterly and annual monitoring of its effluent to ensure proper treatment is being conducted from the treatment plant. A comparison of the Basin Plan groundwater quality objectives for the Pala Hydrologic Subarea (RWQCB, 1994) and 12-month (2005) average recycled water quality data from the OMWD plant calculated from the fourth quarter 2005 monitoring period are provided in the following table, along with average constituent concentrations measured to date from the bedrock groundwater monitoring wells on the GCLF site:

Analyte	Pala Basin WQOs (RWQCB, 1995)	Receiving Bedrock Groundwater (average value from on-site well data)	OMWD Recycled Water Quality Data (12-month average – 4th quarter 2005)
TDS	900 mg/L	945 mg/L	917 mg/L
Sulfate	500 mg/L	107 mg/L	214.75 mg/L
% Sodium	60%	NA	63.42%*
Manganese	0.05 mg/L	NA	0.01 mg/L
Boron	0.75 mg/L	NA	0.10 mg/L
Turbidity	5 NTU	NA	<2 NTU
Fluoride	1.0 mg/L	NA	0.3 mg/L
Chloride	300 mg/L	246 mg/L	259 mg/L
Nitrate – N	15 mg/L	15 mg/L	NA
Iron	0.3 mg/L	NA	Non-Detect last 8 quarters
MBAS	0.5 mg/L	NA	Non-Detect last 8 quarters
Odor	None	NA	NA (None)
Color	15 units	NA	9.6

Note: MBAS – Methyl Blue-Activated Substances (tests the presence of detergent in the water.
NTU – Nephelometric Turbidity Unit.
NA – Not Analyzed.
* The yearly, rolling average % Sodium was exceeded during this quarter.

In addition to the above constituents, the recycled water effluent metals monitoring results indicated no measurable concentrations of aluminum, chromium, copper, manganese, nickel, lead, zinc, cadmium, silver, arsenic, mercury or selenium. Of the metals monitored in the effluent, only a concentration of 0.04 mg/L of barium was measured, well below the state MCL of 1.0 mg/L. OMWD also reports that in the past year, although not currently included in the required list of routine monitoring parameters for the treatment plant, analyses were performed for a broader suite of analytes, which may be present in the incoming wastewater. The results of these tests indicated that most of these analytes were not detected in the effluent samples. OMWD reports that no pharmaceutical manufacturing facilities exist within the District. Therefore, the presence of pharmaceuticals in recycled water is highly unlikely.

Review of this recycled water quality data indicates that with the exception of the slightly elevated values for percent sodium and TDS measured during the past year, the recycled water quality is compatible with the Pala Basin WQOs. It should be noted however, that the measured TDS values in bedrock groundwater monitoring wells across the GCLF site contain an average TDS concentration (945 mg/L) that is greater than the Basin WQO of 900 mg/L and the TDS concentration measured in the recycled water. OMWD has indicated that the measured values are for the effluent water coming out of the treatment plant and the value may be lower when the treated water is blended, although blending is only performed as necessary to meet the recycled water demands of its customers.

In addition, it is recognized that the recycled water will contain higher concentrations of some constituents compared with the existing alluvial and bedrock water quality data measured in representative wells at the GCLF site. However, if it is assumed that a maximum of 193 acre-feet per year (AFY) of recycled water is applied to the site during construction and operations at a rate of 750 gallons per acre per application, and using a conservative evaporation rate of 45 inches for San Diego County, it is calculated that a

minimum of 30 percent of the water (58 AFY) would evaporate. Using an average of 25 inches of rainfall for the area, an estimated 865 AFY of rainwater would fall on the project site; more than six times the volume of remaining applied recycled water, and providing significant dilution to the recycled water so that it is unlikely that the recycled water would have a negative effect on the underlying groundwater. It should be noted that this is a conservative estimate since a significant quantity of the total volume of recycled water applied during landfill construction and operations would be applied within the landfill footprint and captured by the liner containment systems.

The highest risk to the surrounding groundwater (and surface water) might be expected by a significant release and resulting runoff of recycled water from one of the on-site recycled water storage tanks. To prevent this from occurring, the on-site recycled water storage tank facility will include construction and maintenance of secondary containment capable of holding the entire tank volume. The containment system will consist of an impervious material that will also prevent downward migration of the recycled water if it is released into the containment structure. It is proposed that all of the project's water needs may be met with the use of imported highly-treated water. The principle recycled water applications and proposed project practices are described below.

Daily Waste and Cover Soil Compaction/Dust Control Water. Recycled water may be applied to the haul roads, work areas within the landfill, and the borrow/stockpile areas as part of daily operations and construction activities for dust suppression or to assist in compacting the waste or the overlying daily cover soils. The process typically will include driving a water truck on the road or area that is to receive the recycled water for compaction or dust suppression. As the truck is driven, enough water is released to dampen the surface without creating significant ponding. Most of the applied water is surficial and will evaporate rather than percolate down into the underlying soil. As a result, these water applications may be conducted frequently, especially on hot days when evaporation is greatest. Though not expected, water migrating downward from areas within the landfill footprint that receive recycled water will be captured by the leachate collection and removal system (LCRS) for collection at the base of the landfill in one of the two LCRS tanks. Best management practices will be employed to limit runoff outside of the area to be sprayed for dust control or compaction and prevent ponding of water during water applications to reduce the impacts of recycled water on the underlying groundwater.

Landscape Irrigation Water. Although it is proposed that percolating water will be used for landscape irrigation, some areas of the site may receive recycled water if the percolating water supply is limited. As with dust control, the water truck will be used to spray the area to receive the irrigation water. No hard plumbed irrigation systems are proposed for recycled water use. For irrigation purposes, the planted material may be encircled by a collection basin to better capture the water for uptake by the plant's root system. However, the majority of the applied water will either be taken up by the plant or evaporate. Very little of the water would be expected to migrate downward to the underlying groundwater flow system. Best management practices will be employed during the recycled water application to plants to limit runoff outside of the area to be irrigated.

Construction Water. Water use during construction will include dust control (described above) and processing water for the low-permeability soil (clay) liner and protective cover soil. Prior to the placement of the low-permeability soil layer or the uppermost protective cover soil, the base of the composite liner system includes the placement of a 12-inch thick subdrain gravel layer with a series of drainage pipes connected to a downgradient tank that will collect groundwater that intersects the landfill excavation area. On top of the subdrain layer, after a 12-ounce geotextile is placed over the gravel subdrain layer, a 24-inch thick low-permeability soil layer will be constructed. Low-permeability soil placement will be conducted in a series of six to eight-inch lifts, under the direction of a construction quality assurance (CQA) monitor. Prior to compaction, the low-permeability soil will be blended and moisture conditioned. The moisture conditioning process will include the addition of recycled water at a level that allows the clay to absorb the liquid into its matrix and become uniform and homogeneous. Addition of excessive water resulting in potential runoff is neither appropriate, nor acceptable during material processing as it will not produce the necessary soil product for placement and compaction. The processing area will be within the landfill footprint area, either for in-place compaction or adjacent to cell construction and will include containment to prevent excess water from leaving the area. Downward migration into the underlying bedrock is expected to be very low associated with the material processing, since by the nature of the clay, the water is not likely to be released readily from it, and because the excess water would be captured by the subdrain.

Once the 24-inch thick low-permeability soil layer is constructed, based on the performance characteristics of the low-permeability soil product required for liner construction, the water will bind within its matrix. It is anticipated that only a very low volume of construction water is likely to be released from the clay following its construction and this would be captured by the subdrain. Similarly, during placement of the protective cover soil and subsequent daily cover soils over landfill waste cells, recycled water will be added to assist in soil compaction. The excess water, if any, would flow downward to the LCRS for collection and conveyed to the LCRS tanks. Therefore, with the use of best management practices of avoiding ponding and runoff during the material processing and placement construction operations, impacts to groundwater are expected to be very low from the application of recycled water.

3.1.2 Potential Personnel Health and Safety Impacts Associated with the Recycled Water

The facility is isolated from the general population, and not readily accessible to the public at large. As a result, exposures to the recycled water from the water truck delivery and distribution programs are generally limited to areas outside of public access. Therefore, the risk to the public is negligible. However, the use of recycled water for project non-potable water supply purposes, though highly treated and disinfected, may pose the potential for site personnel contact that may be a significant impact to their health. The greatest potential risks to personnel health are related to direct contact with the water and inadvertent ingestion and inhalation of the overspray. In addition, the tanks and water trucks that receive the recycled water must be carefully managed and

maintained to assure that the recycled water delivered by the water purveyor is of the same quality (i.e., has not been degraded) while it is stored on site. The best way to assure the health and safety of the site personnel is with the designation of a Recycled Water Site Supervisor who is responsible for the on-site recycled water system and for all involved personnel on the site. This Supervisor will have the following duties and responsibilities:

- Have attended a State or County DEH-approved training class on the use of recycled water to be fully informed as what recycled water is and how it is produced.
- Responsible for proper installation, operation and maintenance of the on-site recycled water tanks and water trucks and appurtenances, including flushing and disinfection of water trucks and tanks prior to reuse with other than recycled water.
- Keep the water purveyor informed of any failures, emergencies and proposed changes that occur involving the recycled water system and maintain a current copy of the recycled water agreement on site.
- Provide continuous and regular training to on-site personnel on the presence and proper use of recycled water, including protocols such as washing of hands and areas that become in contact with recycled water, and avoiding overspray from the water trucks to protect their health and safety.
- Ensure compliance with all rules, regulations and best management practices for the use of recycled water on the site. Included in the implementation of best management practices is instruction of on-site staff about avoiding ponding, overland runoff, and releases of recycled water other than required in support of the project.
- Act as a 24-hour contact and liaison with the recycled water purveyor to ensure the safe and efficient use of recycled water at the site.
- Proper posting of recycled water tanks and trucks with "RECYCLED WATER – DO NOT DRINK" in large readable (English/Spanish) print, and distribution piping colored purple or wrapped with purple tape.

With a well informed Recycled Water Site Supervisor and site personnel, the health and safety risks associated with the use of recycled water are expected to be low.

4.0 CUMULATIVE IMPACTS

A discussion of potential cumulative impact on public services and utilities, including water service and facilities, was contained in Section 5.2.14 of the 2003 Draft EIR.

A reanalysis of potential impacts has been undertaken, considering the nature and location of current proposed individual cumulative projects, which were identified in the traffic report prepared by Darnell & Associates and contained in Appendix A to the Revised Final EIR.

The project will rely primarily on the use of recycled water to meet its projected needs. The use of recycled water would have no impact on water service and facilities, as those relate to potable water.

The only potentially potable water that would be used for the project is percolating bedrock groundwater pumped from areas outside of the Pala Basin. Section 2.3 of this report contains a safe yield calculation. The calculation yields a cumulative pumping rate from the bedrock wells that should not exceed 27 gpm (38,880 gpd). Pumping at this level is sustainable, and will not cause any cumulative impacts to water service and facilities.

In addition, the location of current individual cumulative projects in the area around the proposed project has been reviewed. None of those are in the near vicinity of Gregory Canyon. As a result there are no other projects that might use this same percolating bedrock groundwater as overlying users, such that the safe yield calculation above would be altered.

5.0 CLOSURE

This report is based on the data presented above and described herein. GeoLogic Associates should be notified of any conditions that differ from those described herein since this may require reevaluation of the data and conclusions provided above. This report has not been prepared for use by other parties or projects other than those described above. It may not contain sufficient information for other parties or purposes.

This report has been prepared in accordance with generally accepted geologic and hydrogeologic practices, and makes no warranties, either expressed or implied, as to the professional content and data presented herein.

Based upon the data provided in this report, and incorporation of the project features notes, the project will not have any significant project-related or cumulative impacts on water supply resources requiring mitigation.

GeoLogic Associates

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Project Manager

6.0 REFERENCES

California Department of Water Resources (CDWR), 1975, California's Groundwater, Bulletin No. 118.

Cooper, H.H., and C.E. Jacob, 1946, "A generalized graphical method for evaluating formation constants and summarizing well field history," Transactions of the American Geophysical Union, Vol. 27, No. 4.

GeoLogic Associates, 1997, "Phase 5 Hydrogeologic Investigation, Proposed Gregory Canyon Landfill, San Diego County, California," prepared for Gregory Canyon Ltd., January.

GeoLogic Associates, 1998, Phase 6 - Geotechnical Investigation for the Gregory Canyon proposed landfill site: Consultant's report to Gregory Canyon Ltd.

GeoLogic Associates, 1999, Technical Memorandum, Geology and Soils, Proposed Gregory Canyon Landfill, November.

GeoLogic Associates, 2001, "Phase 5 Supplemental Investigation, Results of Pumping Tests," prepared for Gregory Canyon Ltd., January.

GeoLogic Associates, 2001, Addendum to Geotechnical Investigation of the Proposed Access Road and Bridge over San Luis Rey River, April.

GeoLogic Associates, 2003, "Geologic, Hydrogeologic and Geotechnical Investigations Report, Gregory Canyon Landfill," prepared for Gregory Canyon Ltd., May 2003, revised November 2003.

Geoscience, 1993, Geohydrologic study of the San Luis Rey MWD area, Consultant's Report to the San Luis Rey Municipal Water District (Excerpt portion from confidential report).

Geotechnical Consultants, 1989, Preliminary assessment of geologic and hydrogeologic conditions, Gregory Canyon site: Draft Environmental Impact Report, Environmental Impact Statement for the North County Class III Landfill, San Diego County, California.

Geraghty & Miller, 1988, Phase I hydrogeologic investigation - Proposed North County Landfill, San Diego, California: Consultant's report to Waste Management of North America, Western Region.

Geraghty & Miller, 1990, Phase II investigation - Proposed Gregory Canyon Class III Landfill, San Diego County, California: Consultant's report to Waste Management of North America, Western Region.

Larsen, E.S., 1948, Batholith and associated rocks of the Corona, Elsinore and San Luis Rey quadrangles, Southern California: Geological Society of America Memoir 29, 182 pp.

Moreland, J.A., 1974, Hydrologic and salt-balance investigations utilizing digital models, Lower San Luis Rey River area, San Diego County, California, USGS Water Resources Investigation Bulletin 24-74.

NBS Lowry, 1995, Groundwater Feasibility Study, prepared for the San Diego County Water Authority.

Puls, R.W., and M.J. Barcelona, 1996, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, U.S. EPA Publication No. EPA/540/S-95/504.

Regional Water Quality Control Board, San Diego Region (RWQCB), 1994, Water Quality Control Plan for the San Diego Basin (9).

San Diego County Water Authority (SDCWA), 1997, Groundwater Report, June.

United States Geological Survey, 1990, Water Well Database: Electronic database.

Woodward-Clyde, 1995, Geology and hydrogeology report, Gregory Canyon Landfill, Pala, San Diego County, California: Consultant's report to Gregory Canyon Ltd. (March, 1995).

TABLES

TABLE 1
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-2/GLA-2R

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY								
Chloride	mg/L	164	369	450	529	600	828	790
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NA	NA
Nitrate as N	mg/L	26.2	41.8	42.9	42.9	43	47.6	31
pH	units	7.10	7.39	7.37	7.34	7.9	7.4	7.2
Sulfate	mg/L	136	160	150	160	190	200	150
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	888	1400	1410	1620	1940	2470	2200
METALS								
Antimony	mg/L	NA	**0.010**	0.008	0.008	0.00012	NA	NA
Arsenic	mg/L	NA	**0.001**	0.0007	0.0007	**0.0019**	NA	NA
Barium	mg/L	NA	**0.053**	0.0009	0.066	**0.066**	NA	NA
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00051	NA	NA
Calcium	mg/L	NA	120	160	170	180	270	240
Chromium	mg/L	NA	0.004	0.004	0.004	0.0031	NA	NA
Cobalt	mg/L	NA	0.002	0.002	0.002	0.00085	NA	NA
Copper	mg/L	NA	0.005	0.003	0.003	0.0063	NA	NA
Lead	mg/L	NA	0.0004	0.0005	0.004	0.000098	NA	NA
Magnesium	mg/L	NA	71	92	100	96	130	120
Mercury	mg/L	NA	0.00010	0.00010	0.00013	0.00043	NA	NA
Nickel	mg/L	NA	0.003	0.002	0.003	**0.0066**	NA	NA
Selenium	mg/L	NA	0.003	**0.001**	0.0006	0.012	NA	NA
Silver	mg/L	NA	**0.004**	0.003	**0.003**	**0.0018**	NA	NA
Sodium	mg/L	NA	200	240	230	240	240	190
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NA	NA
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NA	NA
Vanadium	mg/L	NA	0.040	0.050	0.040	0.041	NA	NA
Zinc	mg/L	NA	0.0085	0.011	**0.0057**	0.022	NA	NA
VOLATILE ORGANIC COMPOUNDS								
Acetone	µg/L	4.3[a]	0.5	5.935	5.935	4.2	3.6	6.2
p+m-Xylenes	µg/L	0.69	0.5	NA	NA	0.30	NA	0.26
Toluene	µg/L	0.52	0.5	0.047	0.047	0.22	0.12	0.15
Trichlorofluoromethane	µg/L	0.35	0.5	0.13	0.044	0.23	0.094	0.19
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**1.8**[a]	0.33	NA	2.0	NA	NA
Butylbenzyl Phthalate	µg/L	NA	**0.29**[a]	0.24	NA	2.1	NA	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 1 (CONT'D)
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-2/GLA-2R

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	630	480	529	538	206	164	828
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	34	33	41.8	38	7.1	26.2	47.6
pH	units	7.0	7.4	7.37	7.34	0.25	7.0	7.9
Sulfate	mg/L	180	160	160	165	21	136	200
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	1900	1700	1700	1725	471	888	2470
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	0.07	0.06	0.01	0.053	0.066
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	200	190	185	191	47	120	270
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper.	mg/L	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	100	91	98	100	18	71	130
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	0.003	0.005	0.006	0.001	0.012
Silver	mg/L	NA	NA	0.003	0.0029	0.0011	0.0018	0.004
Sodium	mg/L	210	190	220	218	23	190	240
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	0.041	0.043	0.005	0.040	0.050
Zinc	mg/L	NA	NA	0.0098	0.0118	0.0071	0.0057	0.022
VOLATILE ORGANIC COMPOUNDS								
Acetone	µg/L	6.2	6.2	NC	NC	NC	NC	NC
p+m-Xylenes	µg/L	0.26	0.26	NC	NC	NC	NC	NC
Toluene	µg/L	0.15	0.15	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	0.20	0.20	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 2
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-4

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY								
Chloride	mg/L	46	68	75	78	78	76	79
Cyanide	mg/L	NA	0.0063	0.0063	0.0063	0.0006	NA	NA
Nitrate as N	mg/L	1.0	1.61	1.50	1.48	1.6	1.18	1.2
pH	units	6.42	7.21	7.22	7.03	7.1	6.8	6.8
Sulfate	mg/L	30	39	38	35	42	38	39
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	444	477	453	490	480	553	530
METALS								
Antimony	mg/L	NA	**0.020**	0.008	0.008	**0.00019**	NA	NA
Arsenic	mg/L	NA	0.0007	**0.0009**	0.0007	**0.0012**	NA	NA
Barium	mg/L	NA	**0.030**	0.0009	0.030	**0.028**	NA	NA
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	NA	0.0004	0.004	0.004	0.00020	NA	NA
Calcium	mg/L	NA	58	72	72	71	96	85
Chromium	mg/L	NA	0.0004	0.004	0.004	**0.0071**	NA	NA
Cobalt	mg/L	NA	0.002	0.002	0.002	0.00044	NA	NA
Copper	mg/L	NA	**0.008**	0.003	**0.004**	**0.0055**	NA	NA
Lead	mg/L	NA	0.0004	0.0004	0.0004	0.00019	NA	NA
Magnesium	mg/L	NA	21	23	22	20	24	22
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00043	NA	NA
Nickel	mg/L	NA	0.003	0.003	0.020	**0.0042**	NA	NA
Selenium	mg/L	NA	0.0006	0.0006	0.0006	**0.0022**	NA	NA
Silver	mg/L	NA	**0.004**	0.003	0.003	0.000098	NA	NA
Sodium	mg/L	NA	68	79	74	77	82	78
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000065	NA	NA
Tin	mg/L	NA	NA	0.006	0.002	0.000083	NA	NA
Vanadium	mg/L	NA	0.010	0.003	**0.007**	**0.0066**	NA	NA
Zinc	mg/L	NA	**0.032**	0.460	0.450	1.200	NA	NA
VOLATILE ORGANIC COMPOUNDS								
1,2,4-Trimethylbenzene	µg/L	0.21	0.5	0.078	0.52	NA	0.16	0.15
1,3,5-Trimethylbenzene	µg/L	0.24	0.5	0.068	0.21	NA	0.13	0.13
Benzene	µg/L	0.25	0.5	0.044	0.11	0.18	0.13	0.12
Ethylbenzene	µg/L	0.17	0.5	0.057	0.41	0.18	0.14	0.14
n-Propylbenzene	µg/L	0.25	0.5	0.053	0.12	NA	0.11	0.12
Naphthalene	µg/L	0.57	0.5	0.094	0.26	0.42	0.12	0.12
tert-Butylbenzene	µg/L	0.16	0.5	0.066	0.08	NA	NA	NA
Toluene	µg/L	0.11	0.5	0.049	1.4[a]	0.22	0.12	0.13
Xylenes (Total)	µg/L	NA	1.0	0.236	2.7	NA	0.40	0.40
SEMI-VOLATILE ORGANIC COMPOUNDS								
Benzoic Acid	µg/L	NA	0.86	0.86	2.6	NA	NA	NA
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**2.4**	0.34	**1.1**[a]	2.0	NA	NA
Butylbenzyl Phthalate	µg/L	NA	0.25	0.25	**0.44**[a]	2.1	NA	NA
Di-n-butyl Phthalate	µg/L	NA	0.25	0.25	**0.36**[a]	2.6	NA	NA
Naphthalene	µg/L	NA	0.25	0.25	**0.29**[a]	3.5	NA	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 2 (CONT'D)
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-4

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	75	77	76	72	10	46	79
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	1.7	1.6	1.5	1.4	0.24	1.0	1.7
pH	units	7.1	6.9	7.03	6.95	0.26	6.42	7.22
Sulfate	mg/L	42	41	39	38	4	30	42
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	490	510	490	492	35	444	553
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	0.030	0.029	0.001	0.028	0.030
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	60	71	72	73	12	58	96
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	0.0055	0.0058	0.002	0.004	0.008
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	24	23	23	22	1	20	24
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	80	80	79	77	4	68	82
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	0.007	0.0079	0.0019	0.0066	0.010
Zinc	mg/L	NA	NA	0.455	0.536	0.486	0.032	1.200
VOLATILE ORGANIC COMPOUNDS								
1,2,4-Trimethylbenzene	µg/L	0.11	0.20	NC	NC	NC	NC	NC
1,3,5-Trimethylbenzene	µg/L	0.11	0.11	NC	NC	NC	NC	NC
Benzene	µg/L	0.12	0.12	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.13	0.13	NC	NC	NC	NC	NC
n-Propylbenzene	µg/L	0.13	0.13	NC	NC	NC	NC	NC
Naphthalene	µg/L	0.098	0.098	NC	NC	NC	NC	NC
tert-Butylbenzene	µg/L	0.12	0.12	NC	NC	NC	NC	NC
Toluene	µg/L	0.15	0.86[b]	NC	NC	NC	NC	NC
Xylenes (Total)	µg/L	0.40	0.40	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
Benzoic Acid	µg/L	NA	NA	NC	NC	NC	NC	NC
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
Di-n-butyl Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
Naphthalene	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[b] Also found in blank.

TABLE 3
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-5

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Sep 2001	Dec 2001	Dec 2001
GENERAL CHEMISTRY									
Chloride	mg/L	157	156	163	NA	150	150	147	150
Cyanide	mg/L	NA	0.0063	0.0063	NA	0.0006	0.0006	0.02	0.02
Nitrate as N	mg/L	16.6	18.6	18.8	NA	21	21	1.94	1.76
pH	units	6.66	7.09	7.28	NA	6.70	6.7	6.3	NA
Sulfate	mg/L	309	313	317	NA	350	350	203	179
Sulfide	mg/L	NA	0.050	0.050	NA	0.1	0.1	0.1	0.1
Total Dissolved Solids (TDS)	mg/L	992	1030	1000	NA	1120	1130	1650	1575
METALS									
Antimony	mg/L	NA	**0.010**	0.008	NA	0.00012	0.00012	0.01	NA
Arsenic	mg/L	NA	0.0007	0.0007	NA	0.00030	0.00030	0.005	NA
Barium	mg/L	NA	0.150	0.180	NA	0.170	0.170	0.005	NA
Beryllium	mg/L	NA	0.00032	0.00032	NA	0.00042	0.00042	0.002	NA
Cadmium	mg/L	NA	0.004	0.004	NA	0.00012	0.00012	0.04	NA
Calcium	mg/L	NA	93	110	NA	110	100	19.1	17.0
Chromium	mg/L	NA	0.004	0.004	NA	**0.0022**	**0.0032**	0.02	NA
Cobalt	mg/L	NA	0.002	0.002	NA	**0.00052**	**0.00051**	NA	NA
Copper	mg/L	NA	0.003	0.003	NA	**0.0022**	**0.0024**	0.005	NA
Lead	mg/L	NA	0.0004	0.0004	NA	**0.00070**	**0.00140**	0.002	NA
Magnesium	mg/L	NA	56	66	NA	58	57	74	68
Mercury	mg/L	NA	0.00010	0.00010	NA	0.00043	0.00043	0.001	NA
Nickel	mg/L	NA	0.003	0.003	NA	**0.0038**	**0.0039**	0.04	NA
Selenium	mg/L	NA	0.0006	**0.0007**	NA	**0.0016**	**0.0017**	0.005	NA
Silver	mg/L	NA	**0.003**	0.003	NA	**0.00013**	**0.00010**	0.005	NA
Sodium	mg/L	NA	100	120	NA	140	130	165	158
Thallium	mg/L	NA	0.020	0.0007	NA	0.00063	0.00063	0.01	NA
Tin	mg/L	NA	NA	0.006	NA	0.00083	0.00083	0.05	NA
Vanadium	mg/L	NA	0.020	0.020	NA	0.038	0.038	0.05	NA
Zinc	mg/L	NA	**0.018**	0.089	NA	0.022	0.028	0.01	NA
VOLATILE ORGANIC COMPOUNDS									
1,2,4-Trimethylbenzene	µg/L	0.21	0.5	0.078	0.078	NA	NA	0.45	NA
Carbon Disulfide	µg/L	0.54	0.5	0.266	0.265	0.31[a]	0.28[a]	NA	NA
Toluene	µg/L	0.11	0.5	0.047	0.047	0.22	0.22	0.24	NA
SEMI-VOLATILE ORGANIC COMPOUNDS									
bis(2-Ethylhexyl) Phthalate	µg/L	NA	**1.8**[a]	0.34	NA	2.0	2.0	0.83	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected									

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 3 (CONT'D)
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-5

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	140	NA	140	140	150	149	8	140	163
Cyanide	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	29.2	NA	20	22	19.4	17.1	8.7	1.76	29.2
pH	units	6.8	NA	7.5	7.3	6.8	6.93	0.39	6.3	7.5
Sulfate	mg/L	343	NA	270	280	311	291	60	179	350
Sulfide	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	1140	NA	980	1000	1075	1162	246	980	1650
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	0.170	0.168	0.013	0.150	0.180
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	110	NA	97	110	100	85	39	17	110
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	61	NA	51	54	58	61	7	51	74
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	0.0016	0.0013	0.0006	0.0007	0.0017
Silver	mg/L	NA	NA	NA	NA	0.0001	0.0011	0.0017	0.000098	0.0030
Sodium	mg/L	140	NA	120	140	140	135	20	100	165
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	0.029	0.029	0.010	0.020	0.038
Zinc	mg/L	NA	NA	NA	NA	0.025	0.039	0.033	0.018	0.089
VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trimethylbenzene	µg/L	0.16	NA	0.11	**0.15**	NC	NC	NC	NC	NC
Carbon Disulfide	µg/L	0.26	NA	0.38	0.38	NC	NC	NC	NC	NC
Toluene	µg/L	0.12	NA	0.15	0.57[b]	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS										
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[b] Also found in blank.

TABLE 4
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-10
(WATER LEVEL MEASURING STATION)

ANALYTE	UNITS	Aug 1999	Dec 2000	Mar 2001	Jun 2001	Sep 2001	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY											
Chloride	mg/L	120	142	151	144	140	142	139	12	120	151
Cyanide	mg/L	NA	0.0063	0.0062	0.0063	0.00006	NC	NC	NC	NC	NC
Nitrate/Nitrite	mg/L	7.1	6.34	6.59	6.17	5.4	6.34	6.32	0.62	5.4	7.1
pH	units	6.70	7.35	7.30	7.18	7.4	7.30	7.19	0.28	6.70	7.4
Sulfate	mg/L	63	61	62	60	60	61	61	1	60	63
Sulfide	mg/L	NA	0.050	0.050	0.050	0.1	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	608	637	587	590	1250	608	734	289	587	1250
METALS											
Antimony	mg/L	NA	0.009	0.008	0.009	0.00012	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	0.0007	0.0007	0.0007	0.00030	NC	NC	NC	NC	NC
Barium	mg/L	NA	0.061	0.0009	0.064	0.061	0.061	0.062	0.002	0.061	0.064
Beryllium	mg/L	NA	0.00032	0.00032	0.00032	0.00042	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	0.004	0.004	0.004	0.00012	NC	NC	NC	NC	NC
Calcium	mg/L	NA	57	68	62	63	63	63	5	57	68
Chromium	mg/L	NA	0.004	0.004	0.004	0.0030	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	0.002	0.002	0.002	0.00040	NC	NC	NC	NC	NC
Copper	mg/L	NA	0.009	0.003	0.003	0.0020	NC	NC	NC	NC	NC
Lead	mg/L	NA	0.0006	0.0004	0.0004	0.00029	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	32	39	36	33	35	35	3	32	39
Mercury	mg/L	NA	0.00010	0.00010	0.00010	0.00045	NC	NC	NC	NC	NC
Nickel	mg/L	NA	0.004	0.003	0.003	0.0033	NC	NC	NC	NC	NC
Selenium	mg/L	NA	0.0006	0.0006	0.0006	0.0024	NC	NC	NC	NC	NC
Silver	mg/L	NA	0.005	0.003	0.003	0.000098	NC	NC	NC	NC	NC
Sodium	mg/L	NA	82	98	88	91	90	90	7	82	98
Thallium	mg/L	NA	0.020	0.0007	0.0007	0.000063	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	0.006	0.002	0.000085	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	0.030	0.040	0.030	0.031	0.031	0.033	0.005	0.030	0.040
Zinc	mg/L	NA	0.026	0.270	0.072	0.700	0.171	0.267	0.307	0.026	0.700
VOLATILE ORGANIC COMPOUNDS (µg/L)											
Carbon Disulfide	µg/L	0.54	0.5	0.266	0.266	5.5[a]	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.17	0.5	0.057	0.07	0.18	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl) Phthalate	µg/L	NA	2.5[a]	0.34	0.59[a]	2.0	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): ND											

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

TABLE 5
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-11

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY							
Chloride	mg/L	177	177	184	180	192	200
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NA	NA
Nitrate as N	mg/L	0.020	0.020	0.32	0.17	0.018	0.090
pH	units	7.61	7.74	7.60	7.4	7.3	7.2
Sulfate	mg/L	82	78	85	94	91	97
Sulfide	mg/L	0.050	0.050	0.050	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	763	733	750	750	550	760
METALS							
Antimony	mg/L	0.008	0.008	0.008	0.00026	NA	NA
Arsenic	mg/L	0.004	0.006	0.004	0.004	NA	NA
Barium	mg/L	0.002	0.0009	0.0060	0.0039	NA	NA
Beryllium	mg/L	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NA	NA
Calcium	mg/L	90	100	98	93	110	120
Chromium	mg/L	0.004	0.004	0.004	0.0087	NA	NA
Cobalt	mg/L	0.002	0.002	0.002	0.00045	NA	NA
Copper	mg/L	0.004	0.003	0.003	0.0039	NA	NA
Lead	mg/L	0.0007	0.0004	0.0004	0.019	NA	NA
Magnesium	mg/L	27	32	32	31	32	35
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NA	NA
Nickel	mg/L	0.004	0.003	0.020	0.013	NA	NA
Selenium	mg/L	0.003	0.0006	0.0006	0.0015	NA	NA
Silver	mg/L	0.003	0.003	0.003	0.000098	NA	NA
Sodium	mg/L	91	100	110	120	100	110
Thallium	mg/L	0.030	0.0007	0.0007	0.000063	NA	NA
Tin	mg/L	NA	0.005	0.006	0.000083	NA	NA
Vanadium	mg/L	0.003	0.003	0.0060	0.0050	NA	NA
Zinc	mg/L	0.0091	0.00089	0.013	0.024	NA	NA
VOLATILE ORGANIC COMPOUNDS							
Carbon Disulfide	µg/L	0.5	0.266	0.266	0.37[a]	0.26	0.37
Ethylbenzene	µg/L	0.5	0.057	0.09	0.18	0.14	0.14
Toluene	µg/L	0.5	0.13[a]	0.25[a]	0.22	0.24	0.15
SEMI-VOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl) Phthalate	µg/L	0.33	6.6[a]	4.2[a]	2.0	NA	NA
Butylbenzyl Phthalate	µg/L	0.25	0.25	0.40[a]	2.1	NA	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected							

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 5
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-11

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	190	190	187	186	8	177	200
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	0.10	0.033	0.10	0.14	0.110	0.033	0.32
pH	units	7.1	7.3	7.4	7.41	0.22	7.1	7.74
Sulfate	mg/L	86	84	86	87	6	78	97
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	740	720	745	721	70	550	763
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	0.004	0.005	0.001	0.004	0.006
Barium	mg/L	NA	NA	0.00	0.00	0.00	0.002	0.006
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	100	110	100	103	10	90	120
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	29	29	32	31	2	27	35
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	0.013	0.012	0.008	0.004	0.020
Selenium	mg/L	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	97	95	100	103	10	91	120
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	0.013	0.015	0.008	0.009	0.024
VOLATILE ORGANIC COMPOUNDS								
Carbon Disulfide	µg/L	0.38	0.38	NC	NC	NC	NC	NC
Ethylbenzene	µg/L	0.13	0.13	NC	NC	NC	NC	NC
Toluene	µg/L	0.15	0.15	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
Butylbenzyl Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 6
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-12

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY							
Chloride	mg/L	115	117	119	120	120	130
Cyanide	mg/L	0.0063	0.0063	0.0065	0.0006	NA	NA
Nitrate as N	mg/L	0.24	0.28	0.28	0.1	0.46	0.49
pH	units	7.38	7.42	7.16	6.9	7.3	7.1
Sulfate	mg/L	38	39	38	46	44	49
Sulfide	mg/L	0.050	0.050	0.050	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	517	490	520	510	333	540
METALS							
Antimony	mg/L	0.020	0.008	0.008	0.00012	NA	NA
Arsenic	mg/L	0.0007	0.0007	0.0007	0.00045	NA	NA
Barium	mg/L	0.020	0.0009	0.020	0.017	NA	NA
Beryllium	mg/L	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NA	NA
Calcium	mg/L	42	47	49	48	51	55
Chromium	mg/L	0.005	0.004	0.004	0.0036	NA	NA
Cobalt	mg/L	0.002	0.002	0.002	0.00027	NA	NA
Copper	mg/L	0.008	0.003	0.003	0.0052	NA	NA
Lead	mg/L	0.002	0.0004	0.0004	0.00010	NA	NA
Magnesium	mg/L	26	29	30	27	29	32
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NA	NA
Nickel	mg/L	0.004	0.003	0.003	0.0025	NA	NA
Selenium	mg/L	0.0006	0.0007	0.0006	0.0023	NA	NA
Silver	mg/L	0.006	0.003	0.003	0.000098	NA	NA
Sodium	mg/L	74	86	88	86	87	100
Thallium	mg/L	0.020	0.0007	0.0007	0.000063	NA	NA
Tin	mg/L	NA	0.006	0.006	0.000083	NA	NA
Vanadium	mg/L	0.030	0.030	0.030	0.028	NA	NA
Zinc	mg/L	0.016	0.00089	0.010	0.0072	NA	NA
VOLATILE ORGANIC COMPOUNDS							
Carbon Disulfide	µg/L	0.5	0.266	0.266	0.3[a]	0.20	0.37
SEMI-VOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl) Phthalate	µg/L	0.35[a]	0.33	0.79[a]	2.6	NA	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected							

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 6
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-12

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	120	120	120	120	4	115	130
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	0.46	0.47	0.37	0.35	0.14	0.1	0.49
pH	units	7.0	7.0	7.13	7.16	0.19	6.9	7.42
Sulfate	mg/L	46	46	45	43	4	38	49
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	510	520	514	493	66	333	540
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	0.020	0.019	0.002	0.017	0.020
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	48	49	49	49	4	42	55
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	28	29	29	29	2	26	32
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	89	87	87	87	7	74	100
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	0.030	0.030	0.001	0.028	0.030
Zinc	mg/L	NA	NA	0.010	0.011	0.004	0.007	0.016
VOLATILE ORGANIC COMPOUNDS								
Carbon Disulfide	µg/L	0.38	0.38	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 7
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-13

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY							
Chloride	mg/L	127	290	269	260	204	160
Cyanide	mg/L	0.0063	0.0063	0.0063	0.0006	NA	NA
Nitrate as N	mg/L	25.9	28.5	29.3	28	18.4	19
pH	units	7.49	7.24	7.19	6.7	7.0	6.8
Sulfate	mg/L	119	129	137	130	92	95
Sulfide	mg/L	0.050	0.050	0.050	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	885	1010	990	1120	815	780
METALS							
Antimony	mg/L	0.008	0.008	**0.010**	0.00012	NA	NA
Arsenic	mg/L	0.002	0.0007	0.0007	0.00098	NA	NA
Barium	mg/L	**0.020**	0.0009	0.079	**0.073**	NA	NA
Beryllium	mg/L	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NA	NA
Calcium	mg/L	67	100	100	110	84	75
Chromium	mg/L	0.004	0.004	0.004	**0.0056**	NA	NA
Cobalt	mg/L	0.002	0.002	0.002	0.00055	NA	NA
Copper	mg/L	0.003	0.003	0.003	**0.0028**	NA	NA
Lead	mg/L	**0.0006**	**0.0004**	0.00040	0.000098	NA	NA
Magnesium	mg/L	39	65	65	62	48	45
Mercury	mg/L	0.00010	0.00010	0.00010	0.00043	NA	NA
Nickel	mg/L	0.003	0.003	**0.0030**	**0.0062**	NA	NA
Selenium	mg/L	0.005	**0.0008**	0.0006	**0.0037**	NA	NA
Silver	mg/L	0.003	0.003	0.003	0.000098	NA	NA
Sodium	mg/L	110	130	130	140	110	120
Thallium	mg/L	0.020	0.0007	0.0007	0.000063	NA	NA
Tin	mg/L	NA	0.006	0.006	0.000085	NA	NA
Vanadium	mg/L	0.020	0.030	0.030	0.032	NA	NA
Zinc	mg/L	**0.021**	0.047	0.047	0.053	NA	NA
VOLATILE ORGANIC COMPOUNDS							
Acetone	µg/L	0.5	5.935	5.935	42	3.9	6.1
Carbon Disulfide	µg/L	0.5	0.266	0.266	**0.35**[a]	0.20	0.37
SEMI-VOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl) Phthalate	µg/L	**0.99**[a]	0.33	**0.67**[a]	2.0	NA	NA
HERBICIDES, PESTICIDES, & PCBs							
2,4-D	µg/L	0.16	0.16	0.16	**0.17**	0.033	0.033

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

[a] Suspected laboratory/field contaminant.

TABLE 7
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-13

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	97	170	187	197	71	97	290
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	24	31	27	25.5	4.7	18.4	31
pH	units	6.7	7.1	7.05	7.03	0.28	6.7	7.49
Sulfate	mg/L	110	120	120	117	16	92	137
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	720	920	903	905	133	720	1120
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	0.073	0.057	0.032	0.020	0.079
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	45	81	83	83	21	45	110
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	31	50	49	51	13	31	65
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	140	150	130	129	15	110	150
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	0.030	0.028	0.005	0.020	0.032
Zinc	mg/L	NA	NA	0.047	0.042	0.014	0.021	0.053
VOLATILE ORGANIC COMPOUNDS								
Acetone	µg/L	13[c]	6.2	NC	NC	NC	NC	NC
Carbon Disulfide	µg/L	0.58	0.58	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs								
2,4-D	µg/L	0.033	0.012	NC	NC	NC	NC	NC

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[c] Documented laboratory/field contaminant.

TABLE 8
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-14

ANALYTE	UNITS	Dec 2000	Mar 2001	Jun 2001	Sep 2001	Dec 2004	Apr 2005
GENERAL CHEMISTRY							
Chloride	mg/L	159	160	155	160	149	160
Cyanide	mg/L	0.0062	0.0063	0.0063	0.0006	NA	NA
Nitrate as N	mg/L	15.6	15.5	15.1	14	13.4	14
pH	units	7.47	7.56	7.29	6.8	7.0	7.0
Sulfate	mg/L	74	70	75	71	68	72
Sulfide	mg/L	0.050	0.050	0.25	0.1	NA	NA
Total Dissolved Solids (TDS)	mg/L	697	667	667	730	657	710
METALS							
Antimony	mg/L	0.010	0.008	0.008	0.00012	NA	NA
Arsenic	mg/L	0.0007	0.0009	0.0007	0.0014	NA	NA
Barium	mg/L	0.096	0.120	0.130	0.110	NA	NA
Beryllium	mg/L	0.00032	0.00032	0.00032	0.00042	NA	NA
Cadmium	mg/L	0.004	0.004	0.004	0.00012	NA	NA
Calcium	mg/L	69	82	75	73	67	75
Chromium	mg/L	0.004	0.004	0.004	0.0038	NA	NA
Cobalt	mg/L	0.002	0.002	0.002	0.00035	NA	NA
Copper	mg/L	0.007	0.003	0.003	0.0014	NA	NA
Lead	mg/L	0.004	0.0004	0.004	0.000098	NA	NA
Magnesium	mg/L	39	46	43	38	38	42
Mercury	mg/L	0.00010	0.00010	0.00010	0.00042	NA	NA
Nickel	mg/L	0.003	0.003	0.004	0.0067	NA	NA
Selenium	mg/L	0.0006	0.0008	0.0006	0.0032	NA	NA
Silver	mg/L	0.003	0.003	0.003	0.000098	NA	NA
Sodium	mg/L	84	100	92	94	91	98
Thallium	mg/L	0.020	0.0007	0.0007	0.000063	NA	NA
Tin	mg/L	NA	0.006	0.003	0.000063	NA	NA
Vanadium	mg/L	0.030	0.030	0.030	0.025	NA	NA
Zinc	mg/L	0.012	0.00089	0.0092	0.0054	NA	NA
VOLATILE ORGANIC COMPOUNDS							
Carbon Disulfide	µg/L	0.5	0.266	0.266	0.31	0.20	0.37
SEMI-VOLATILE ORGANIC COMPOUNDS							
bis(2-Ethylhexyl) Phthalate	µg/L	0.33	0.33	1.2	2.0	NA	NA
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected							

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

TABLE 8 (CONT'D)
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-14

ANALYTE	UNITS	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Chloride	mg/L	160	160	160	158	4	149	160
Cyanide	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	14	14	14	14.5	0.82	13.4	15.6
pH	units	6.7	7.4	7.1	7.15	0.32	6.7	7.56
Sulfate	mg/L	69	68	71	71	3	68	75
Sulfide	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids (TDS)	mg/L	770	590	682	686	54	590	770
METALS								
Antimony	mg/L	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	0.12	0.11	0.01	0.096	0.13
Beryllium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	67	67	71	72	5	67	82
Chromium	mg/L	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	38	38	39	40	3	38	46
Mercury	mg/L	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	91	90	92	93	5	84	100
Thallium	mg/L	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	0.030	0.029	0.003	0.025	0.030
Zinc	mg/L	NA	NA	0.0092	0.0089	0.0033	0.0054	0.012
VOLATILE ORGANIC COMPOUNDS								
Carbon Disulfide	µg/L	0.38	0.38	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS								
bis(2-Ethylhexyl) Phthalate	µg/L	NA	NA	NC	NC	NC	NC	NC
HERBICIDES, PESTICIDES, & PCBs (µg/L): None Detected								

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 9
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-A

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	447	75	120	150	135	198	169	75	447
Nirate as N	mg/L	19.9	28	27	30	27.5	26.2	4.4	19.9	30
pH	units	7.0	7.1	6.9	7.1	7.1	7.0	0.1	6.9	7.1
Sulfate	mg/L	100	89	95	100	98	96	5	89	100
Total Dissolved Solids (TDS)	mg/L	1450	670	740	760	750	905	365	670	1450
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	150	55	58	71	65	84	45	55	150
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	86	30	31	38	35	46	27	30	86
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	130	120	130	140	130	130	8	120	140
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS										
Methylene Chloride	µg/L	0.18[a]	0.43	0.44	0.44	NC	NC	NC	NC	NC
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[a] Suspected laboratory/field contaminant.

TABLE 10
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-B

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	124	150	130	130	130	134	11	124	150
Nitrate as N	mg/L	0.59	0.19	0.60	0.60	0.60	0.50	0.20	0.19	0.60
pH	units	6.9	6.8	6.8	6.9	6.9	6.9	0.1	6.8	6.9
Sulfate	mg/L	51	56	53	54	54	54	2	51	56
Total Dissolved Solids (TDS)	mg/L	580	570	560	560	565	568	10	560	580
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	66	64	59	56	62	61	5	56	66
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	31	32	29	30	31	31	1	29	32
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	88	88	91	88	88	89	2	88	91
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS: None Detected										
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 11
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-C

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	131	130	140	140	136	135	6	130	140
Nitrate as N	mg/L	1.06	1.9	1.2	1.2	1.2	1.34	0.38	1.06	1.9
pH	units	7.2	6.8	6.7	6.9	6.9	6.9	0.2	6.7	7.2
Sulfate	mg/L	61	61	64	64	63	63	2	61	64
Total Dissolved Solids (TDS)	mg/L	600	600	590	570	595	590	14	570	600
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	61	60	57	57	59	59	2	57	61
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	33	35	31	33	33	33	2	31	35
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	90	100	95	92	94	94	4	90	100
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS: None Detected										
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

TABLE 12
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-D

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	1300	1200	670	690	945	965	332	670	1300
Nitrate as N	mg/L	17.5	19	22	22	20.5	20.1	2.3	17.5	22
pH	units	7.1	6.9	6.9	7.0	7.0	7.0	0.1	6.9	7.1
Sulfate	mg/L	140	140	120	110	130	128	15	110	140
Total Dissolved Solids (TDS)	mg/L	2600	3200	2200	2300	2450	2575	450	2200	3200
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	380	350	210	230	290	293	85	210	380
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	210	200	110	120	160	160	52	110	210
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	200	180	140	140	160	165	30	140	200
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trimethylbenzene	µg/L	0.16	0.15	0.11	0.21	NC	NC	NC	NC	NC
Toluene	µg/L	0.12	0.15	0.15	0.94[b]	NC	NC	NC	NC	NC
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit.
Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[b] Also found in blank.

TABLE 13
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-E

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	263	270	270	290	270	273	12	263	290
Nitrate as N	mg/L	27.2	34	32	26	29.6	29.8	3.8	26	34
pH	units	7.4	7.3	7.4	7.1	7.4	7.3	0.1	7.1	7.4
Sulfate	mg/L	160	170	160	150	160	160	8	150	170
Total Dissolved Solids (TDS)	mg/L	840	1100	1100	1100	1100	1035	130	840	1100
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	130	120	110	120	120	120	8	110	130
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	58	59	54	59	59	58	2	54	59
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	160	180	190	180	180	178	13	160	190
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trimethylbenzene	µg/L	0.16	0.15	0.11	**0.34**	NC	NC	NC	NC	NC
Toluene	µg/L	0.12	0.15	0.15	1.4[b]	NC	NC	NC	NC	NC
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[b] Also found in blank.

TABLE 14
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-F

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	426	570	510	510	510	504	59	426	570
Nitrate as N	mg/L	22.1	30	31	29	29.5	28	4	22.1	31
pH	units	7.2	7.1	6.9	7.0	7.1	7.1	0.1	6.9	7.2
Sulfate	mg/L	100	130	130	130	130	123	15	100	130
Total Dissolved Solids (TDS)	mg/L	1500	1800	1800	1800	1800	1725	150	1500	1800
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	190	240	200	210	205	210	22	190	240
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	70	100	83	86	85	85	12	70	100
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	120	140	140	150	140	138	13	120	150
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trimethylbenzene	µg/L	0.16	0.15	0.11	0.26	NC	NC	NC	NC	NC
Toluene	µg/L	0.12	0.15	0.15	1.0[b]	NC	NC	NC	NC	NC
HERBICIDES & PESTICIDES (8150/8081)										
2,4-D	µg/L	0.033	0.033	0.012	0.19	NC	NC	NC	NC	NC

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

[b] Also found in blank.

TABLE 15
GREGORY CANYON LANDFILL
HISTORICAL SUMMARY DATA - MONITORING WELL GLA-G

ANALYTE	UNITS	Dec 2004	Apr 2005	Aug 2005	Nov 2005	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY										
Chloride	mg/L	122	130	120	120	121	123	5	120	130
Nitrate as N	mg/L	0.67	0.60	0.71	0.72	0.69	0.68	0.05	0.60	0.72
pH	units	7.1	6.7	6.8	6.9	6.9	6.9	0.2	6.7	7.1
Sulfate	mg/L	49	54	51	51	51	51.3	2.1	49	54
Total Dissolved Solids (TDS)	mg/L	550	550	550	470	550	530	40	470	550
METALS										
Antimony	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Arsenic	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Barium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Beryllium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cadmium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Calcium	mg/L	55	58	49	50	53	53	4	49	58
Chromium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Cobalt	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Copper	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Lead	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	30	33	28	29	30	30	2	28	33
Mercury	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Nickel	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Selenium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Silver	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	86	92	88	86	87	88	3	86	92
Thallium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Tin	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Vanadium	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
Zinc	mg/L	NA	NA	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS: None Detected										
HERBICIDES & PESTICIDES (8150/8081): None Detected										

NOTES:

NA = Not Analyzed/Not Applicable

Indicates that the analyte was not detected above laboratory practical quantitation limit. Value listed is laboratory detection limit or estimated trace (BOLDED) concentration.

NC No calculation performed. Requires a minimum of three data entries.

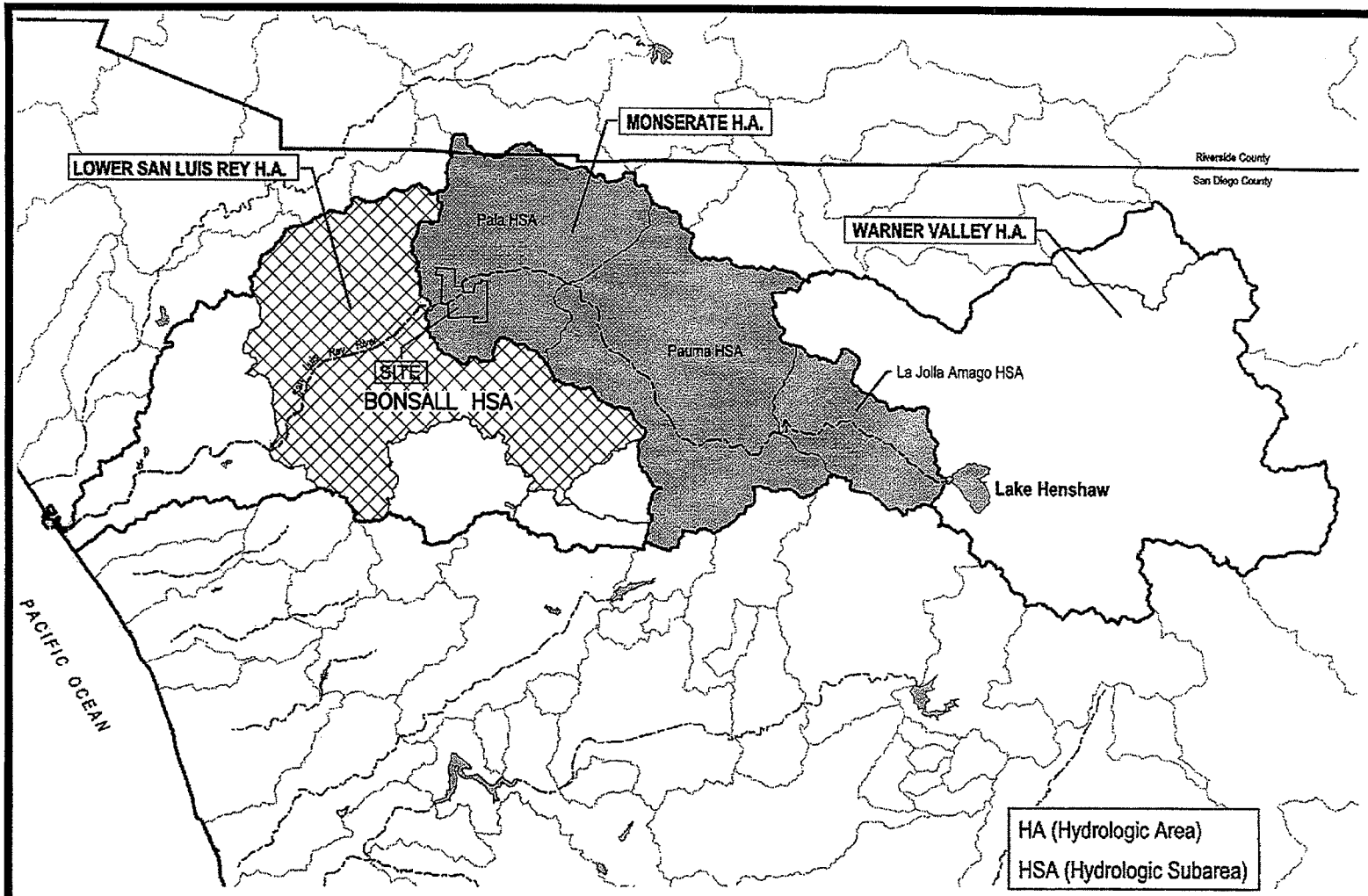


FIGURE 1

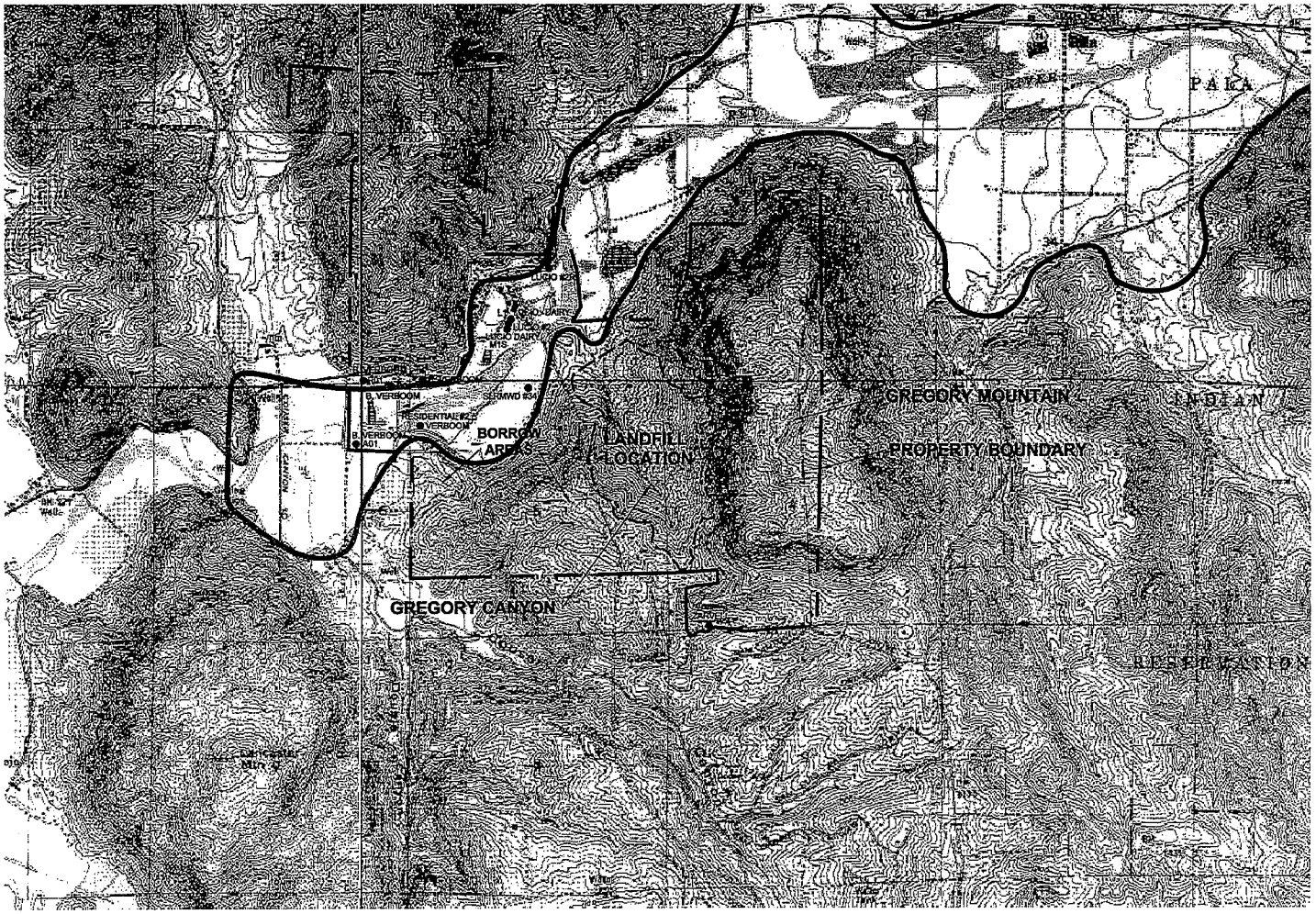
SAN LUIS REY HYDROLOGIC UNIT

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2006	9539

SOURCES:
SANDAG GIS DATA, 1997
DAVID EVANS AND ASSOCIATES, INC., 1999
PCR SERVICES CORPORATION, 1999



LUCIO #2R ● APPROXIMATE LOCATION OF ON-SITE MONITORING WELL

APPROXIMATE LIMIT OF PALA BASIN

REFERENCE:

USGS 7.5 MINUTE PALA (1988) AND BONSALL (1975) CALIFORNIA QUADRANGLES

CALIFORNIA DEPARTMENT OF WATER RESOURCES WATER WELL DRILLERS REPORTS

SAN DIEGO COUNTY WATER AUTHORITY GROUNDWATER REPORT (1997)

N

APPROXIMATE SCALE: 1" = 2300'

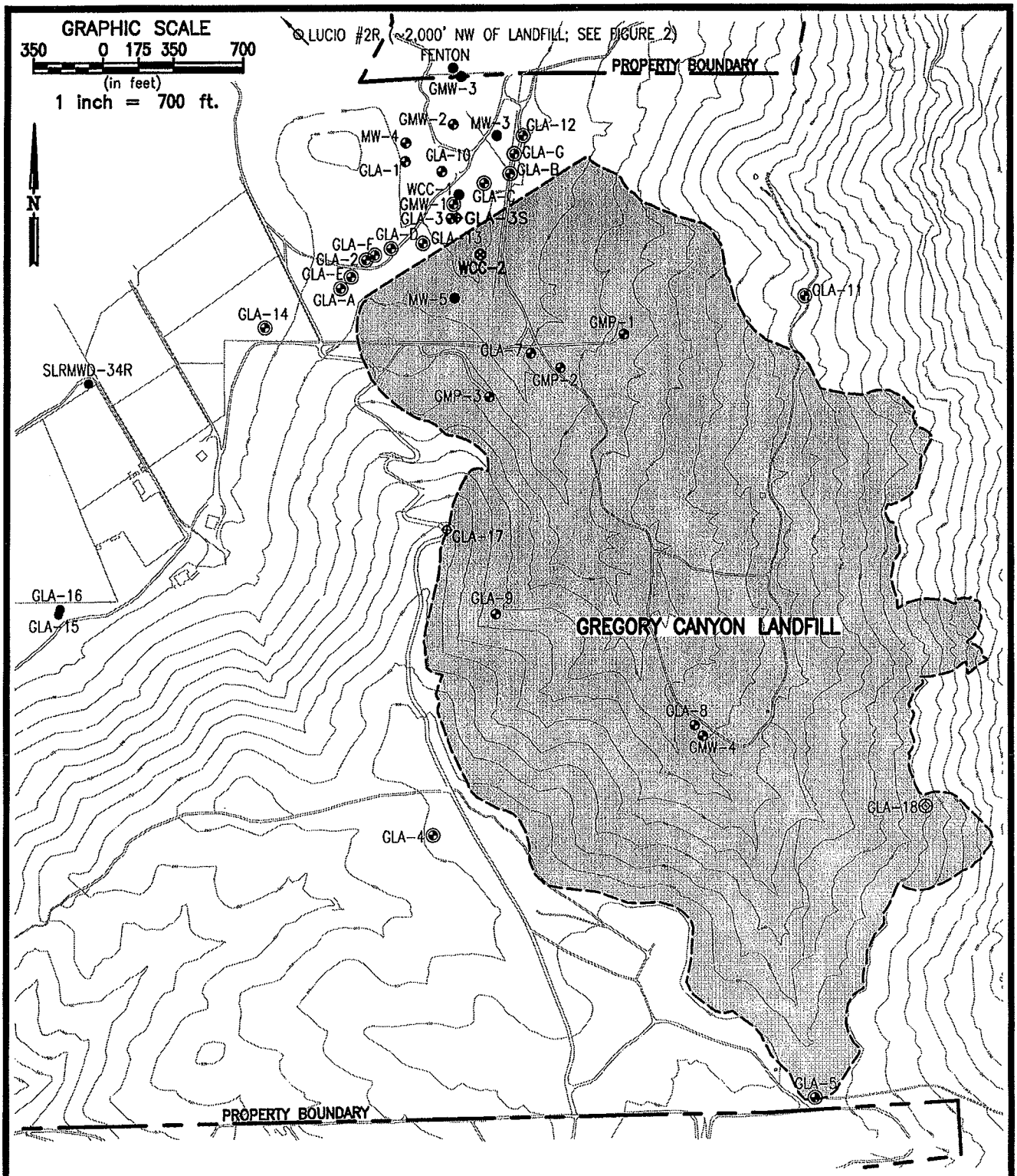
FIGURE 2

SITE LOCATION MAP

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2006	9539



EXPLANATION:

- ● ALLUVIAL/COLLUVIAL WELL
- ◐ BEDROCK WELL
- ⊗ WELL SCREENED ACROSS ALLUVIUM AND BEDROCK
- ○ BEDROCK WATER QUALITY MONITORING WELL
- ⊕ EXPLORATORY BORING (GLA, 2004)
- ⊹ PROPOSED MONITORING WELL

FIGURE 3

WELL LOCATION MAP

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2008	9539

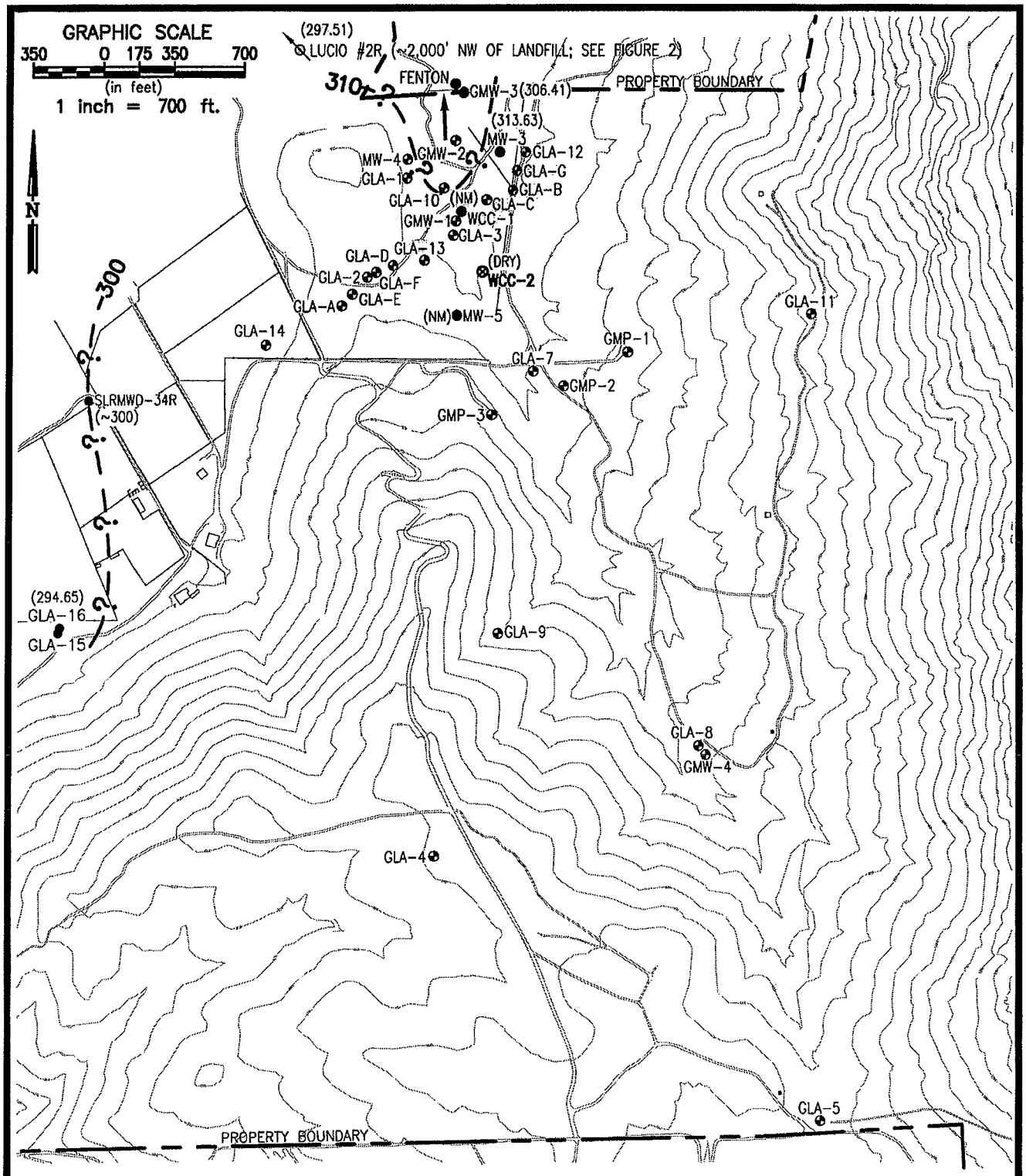


FIGURE 4A

CONFIGURATION OF WATER TABLE IN THE ALLUVIAL/COLLUVIAL AQUIFER (APRIL 2005)

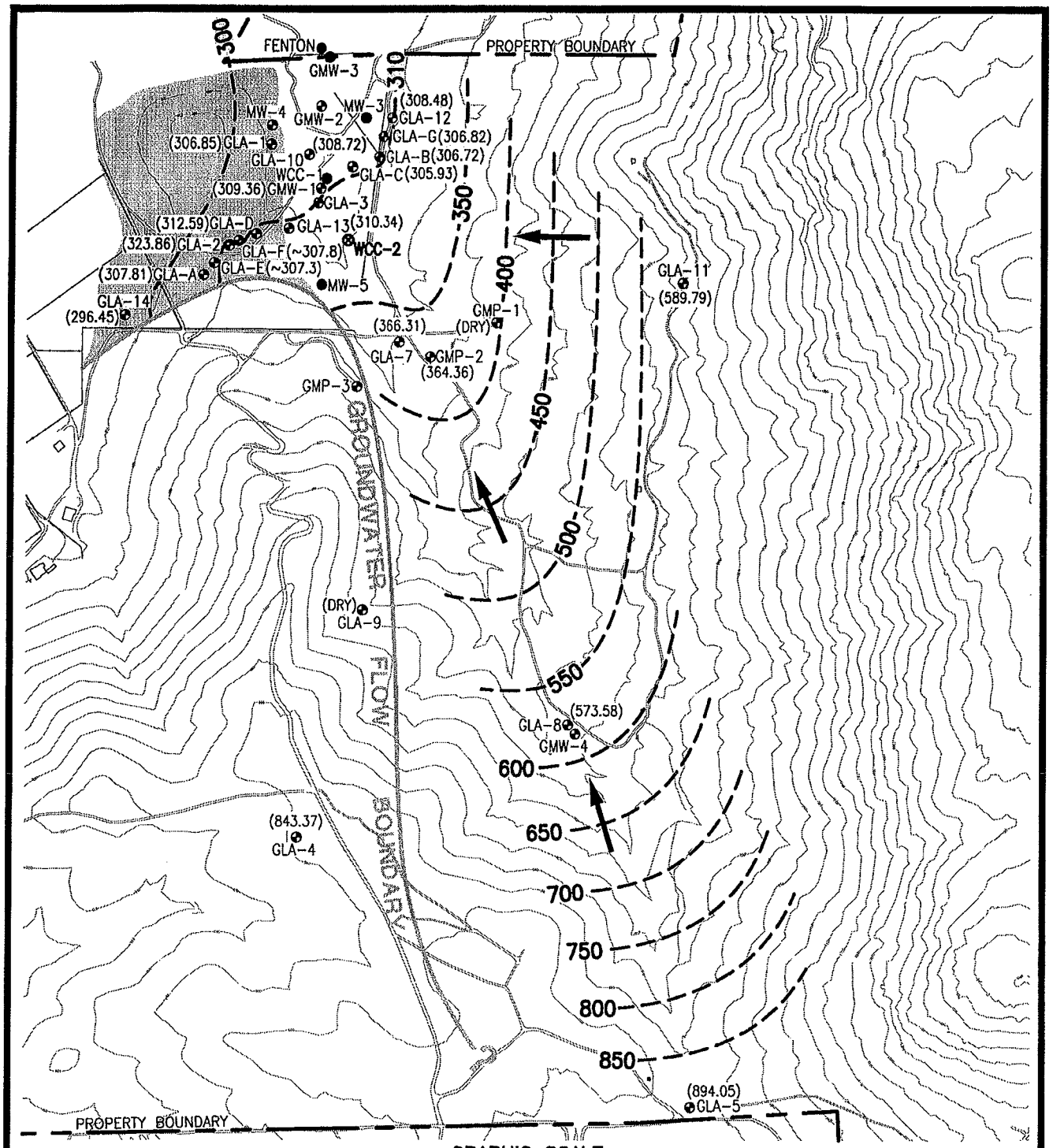
WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

EXPLANATION:

- ● ALLUVIAL/COLLUVIAL WELL
- ⊕ BEDROCK WELL
- ⊗ WELL SCREENED ACROSS ALLUVIUM AND BEDROCK
- -?— —310— WATER TABLE ELEVATION CONTOUR (APRIL 2005)
- ← GROUNDWATER FLOW DIRECTION

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2006	9539



GRAPHIC SCALE

350 0 175 350 700

(in feet)

1 inch = 700 ft.

EXPLANATION:

- ● ALLUVIAL/COLLUVIAL WELL
- ⊕ BEDROCK WELL
- ⊗ WELL SCREENED ACROSS ALLUVIUM AND BEDROCK
- --750-- PIEZOMETRIC SURFACE ELEVATION CONTOUR (AUGUST 2005)
- ← GROUNDWATER FLOW DIRECTION
- GROUNDWATER BARRIER (QUERIED WHERE UNCERTAIN OF SOUTHERN EXTENSION)
- LOW PERMEABILITY ZONE

N

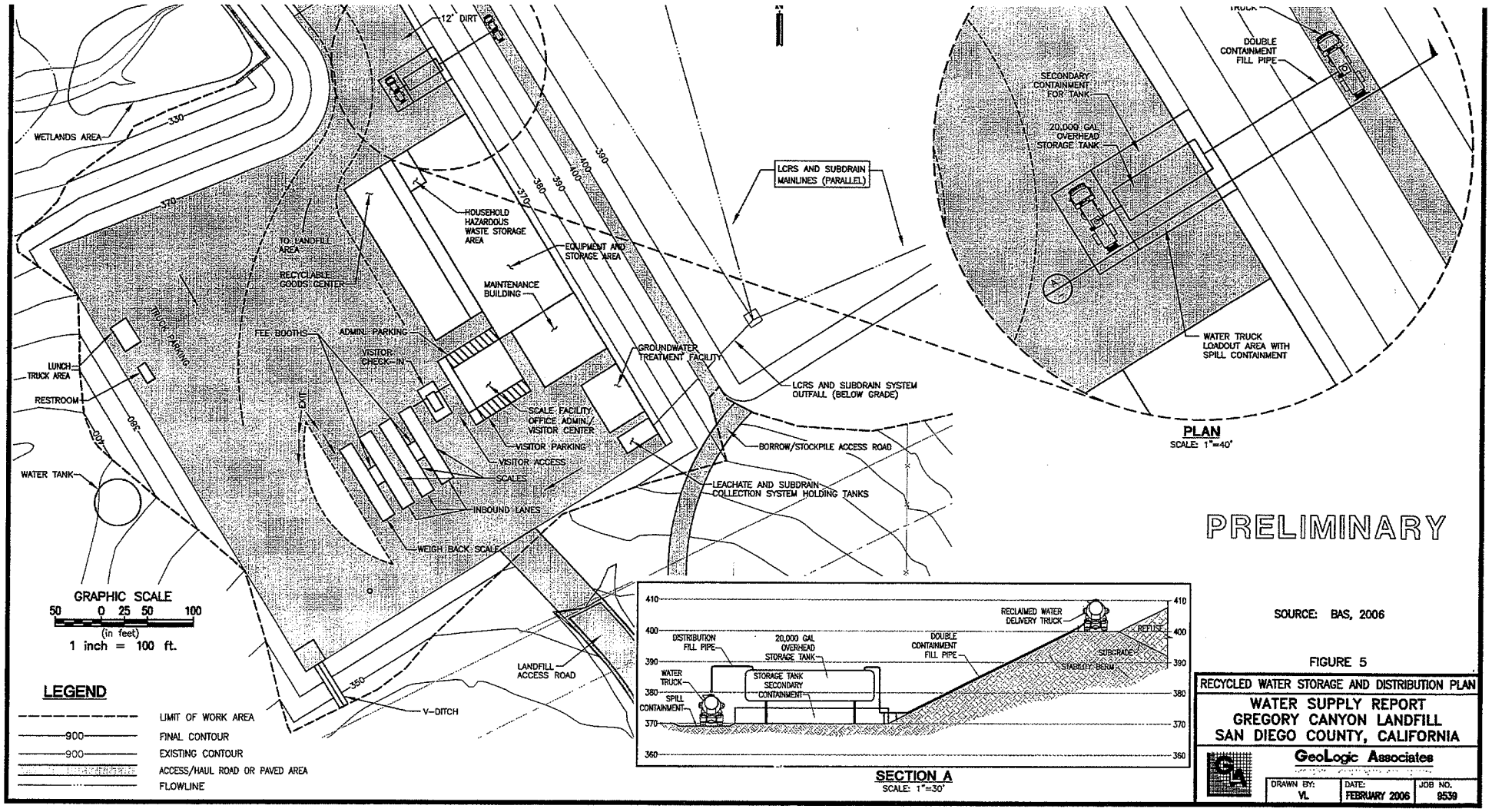
FIGURE 4B

CONFIGURATION OF PIEZOMETRIC SURFACE IN THE BEDROCK AQUIFER (8/03/2005)

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2006	9539



SOURCE: BAS, 2006

FIGURE 5

RECYCLED WATER STORAGE AND DISTRIBUTION PLAN

WATER SUPPLY REPORT
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates

DRAWN BY:	DATE:	JOB NO.
VL	FEBRUARY 2006	9539

APPENDIX A

WELL GLA-3 AQUIFER TEST DATA EVALUATION

MEMORANDUM

TO: **Sarah Battelle, GLA**

FROM: **Ralph Murphy, GLA**
Jason Sapp, GLA

DATE: **December 5, 2005**

RE: **Well GLA-3 Aquifer Test Data Evaluation**
Gregory Canyon, San Diego County, California

Well pumping performance data were reviewed to estimate the long-term yield that may be obtained using well GLA-3 to supply water for the proposed Gregory Canyon Landfill in San Diego County, California. Well GLA-3 was constructed without well screen to a depth of 150 feet in fractured granitic rock in November 1996 and using 45 feet of schedule 80 PVC casing to isolate water-bearing rock from overlying alluvial materials (GeoLogic Associates [GLA], 1997). The pumping test data evaluated herein have been previously reported (GLA, 2001, 2004).

Data obtained by GLA during aquifer tests completed on November 27, 2000 and June 18, 2004 were evaluated using the AquiferTest Pro software package (Waterloo Hydrogeologic Inc., version 3.5 [2002]) and the Cooper-Jacob Step Test algorithm to estimate aquifer hydraulic properties including hydraulic conductivity (K) and transmissivity (T). As shown on the attached pumping test analysis reports, and as summarized on Table 1, the K and T values that were calculated for the 2004 pumping test compare favorably with the results obtained for the 2000 data set, with an average T value for the aquifer near well GLA-3 of approximately 365 feet-squared per day (ft^2/d). Transmissivity is a function of effective aquifer thickness and was estimated to be approximately 60 feet at well GLA-3 based on tracer tests completed in the well borehole in December 1996 (GLA, 1997). Below a depth of approximately 95 feet, bedrock fractures in the well bore are apparently less numerous and more tightly spaced, resulting in little water production from deeper zones.

Using observed drawdown data measured in well GLA-3 and in observation wells GMW-1, GLA-B, and GLA-12, the RockWorks 98 software package's Drawdown Calculator (RockWare Inc., 1998) was then used to iteratively back-calculate appropriate Storativity (S) and Transmissivity (T) values for the fractured bedrock aquifer near well GLA-3. As shown in the attached drawdown calculations, the "best fit" between observed and calculated drawdown for the data sets was obtained using a T value of 550 ft^2/d, and an S value of 0.09.

Using the best fit T and S results, the RockWorks software was again employed to calculate what the drawdown would be in well GLA-3 pumping at discharge rates of 10, 15, and 20 gallons per minute (gpm) after periods of 2, 20, 200 and 2000 days of continuous pumping. A shown on Figure 1, these calculations indicate that pumping rates greater than 15 gpm (21,600 gallons per day [gpd]) will draw groundwater levels below approximately 53 feet (near the base of the effective aquifer) after 2000 days ($\pm$5.5 years) of pumping. These data also indicate that the long-term sustainable yield in GLA-3 is approximately 12 gpm (17,280 gpd).

Climate data available from the San Diego County Water Authority (www.sdcwa.org) were evaluated to develop an estimate of the "safe yield" in the Gregory Canyon area. Pumping that exceeds the amount of groundwater flowing in, or surface water infiltrating into, the fractured

aquifer near well GLA-3 will exceed the aquifer's safe yield. The basin area surrounding Gregory Canyon is approximately 415 acres. Assuming that infiltration and aquifer recharge are approximately 5% of the approximately 25 inches of rain that fall on average each year at the site, the safe yield near well GLA-3 is calculated to be about 14.1 million gallons per year, or about 27 gpm. While use of an areal recharge rate of 5% is common for hydrologic analyses in southern California (e.g., Woolfenden and Koczot, 2001), it should be noted that the terrain in Gregory Canyon is locally steep with associated high runoff rates. Accordingly, actual infiltration (aquifer recharge) rates in the area could be less than 5% of rainfall with a corresponding decline in safe yield.

Of note, it is estimated that operations at the Gregory Canyon Landfill will require 40,000 gallons of water a day, or the equivalent of pumping about 28 gpm. This volume is slightly more than the average rate of recharge that can be expected to replenish the aquifer annually, and likely can not be entirely derived from the aquifer underlying the landfill without steadily reducing groundwater resources beneath the site. Moreover, as the land surface overlying the aquifer is reduced through time by the placement of refuse in the landfill, the volume of precipitation runoff that percolates into the aquifer may decline thus further reducing the volume of water available on site.

ATTACHMENTS

Table 1 – Well GLA-3 Aquifer Test Results
Figure 1 – Forecasted Drawdown Comparison
Pumping Test Analysis Reports
Iterative Drawdown Analysis Reports

REFERENCES

GeoLogic Associates, 1997, "Phase 5 Hydrogeologic Investigation," Proposed Gregory Canyon Landfill, San Diego County, California, prepared for Gregory Canyon Landfill, LTD., December.

_____, 2001, "Phase 5 Supplemental Investigation, Results of Pumping Tests," prepared for Gregory Canyon Ltd., January.

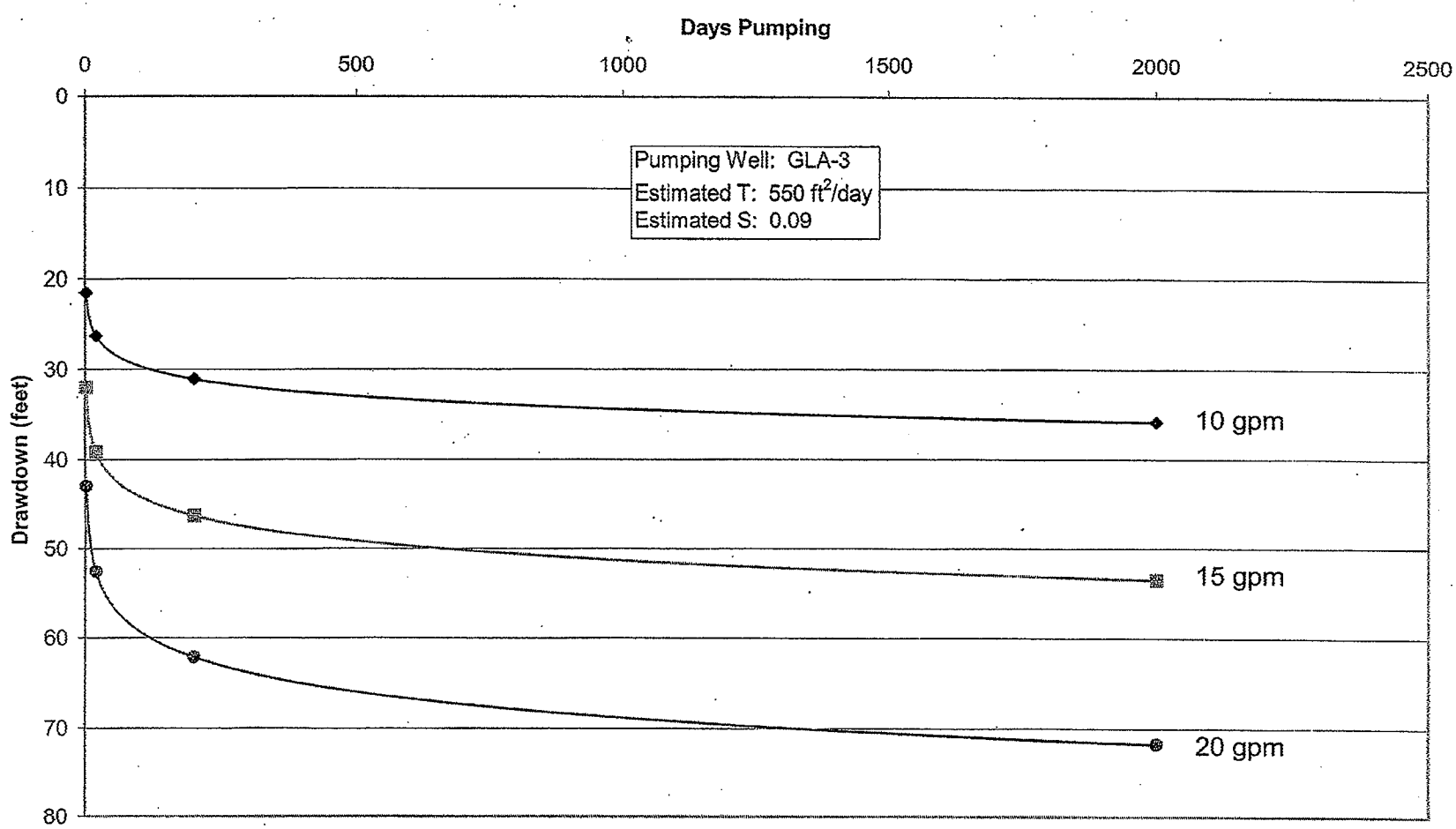
_____, 2004, "Supplemental Hydrogeologic Investigation," Gregory Canyon Landfill, San Diego County, California, prepared for Gregory Canyon Landfill, LTD., October.

Woolfenden, L.R., and Koczot, K.M., 2001, "Numerical Simulation of Ground-Water Flow and Assessment of the effects of Artificial Recharge in the Rialto-Colton Basin, San Bernardino County, California", U.S. Geological Survey Water-Resources Investigations Report 00-4243.

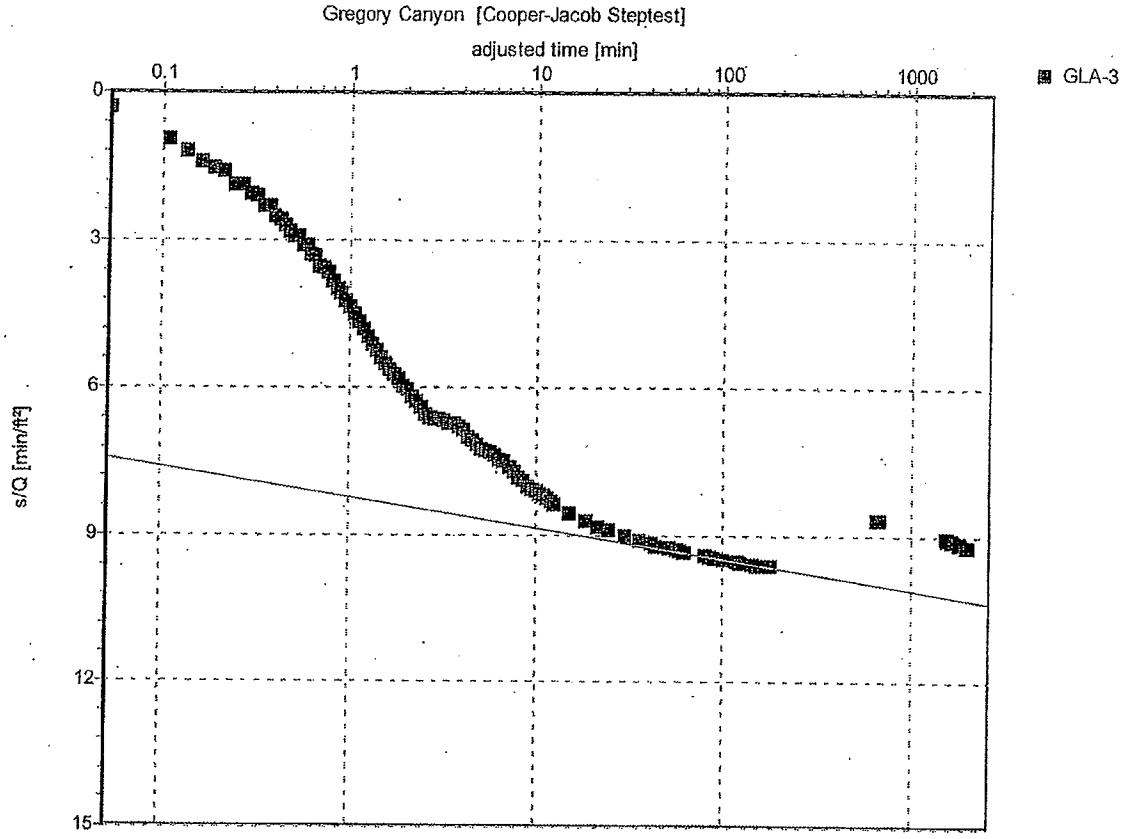
Table 1
Well GLA-3 Aquifer Test Results
Gregory Canyon Landfill, San Diego County

Date	Well	Distance From Pumping Well (feet)	Analytical Method	Data Points	Hydraulic Conductivity (ft/day)	Transmissivity (ft^2/day)
Nov. 27, 2000	GLA-3	1	Cooper-Jacob (time-drawdown)	Late	5.89	352
	GMW-1	51	Cooper-Jacob (time-drawdown)	Late	6.26	325
Jul. 18, 2004	GLA-3	1	Cooper-Jacob Step Test	Middle	6.95	417
	GLA-B	370	Cooper-Jacob Step Test	All	39.7	2380
	GLA-12	545	Cooper-Jacob Step Test	Middle	39.2	2350

Figure 1
Forecasted Drawdown Comparison
Gregory Canyon Landfill, San Diego County



GeoLogic Associates	Pumping Test Analysis Report
1831 Commercenter East	Project: GC Analyses (aquifer b=60)
San Bernardino, California 92408	Number: 1995.0039.074
Phone (909) 383-8728	Client: Gregory Canyon, LTD



Pumping Test: **Gregory Canyon**

Analysis Method: **Cooper-Jacob Steptest**

Analysis Results:	Transmissivity:	4.17E+2 [ft²/d]	Conductivity:	6.95E+0 [ft/d]

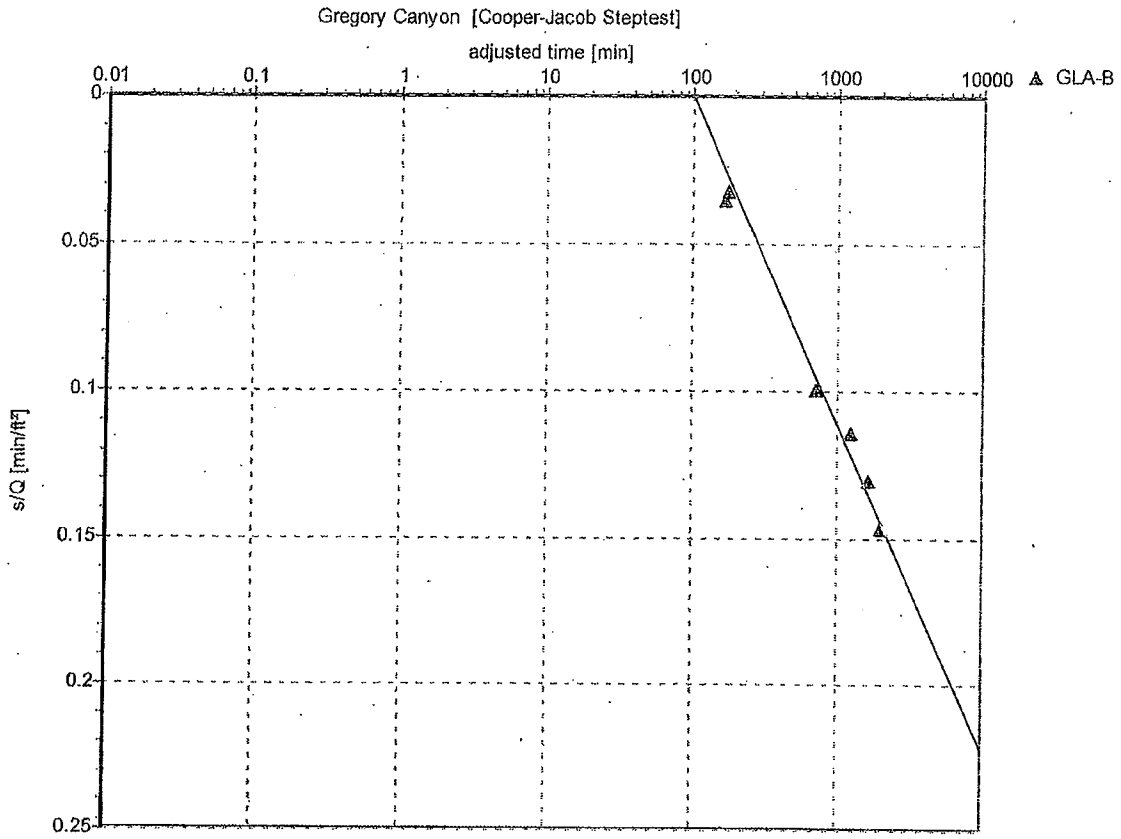
Test parameters:				
	Pumping Well:	PW	Aquifer Thickness:	60 [ft]
	Casing radius:	0.35 [ft]	Unconfined Aquifer	
	Screen length:	120 [ft]		
	Boring radius:	0.35 [ft]		
	Discharge Rate:	14.933704 [U.S. gal/min]		

Comments:

Evaluated by: JAS

Evaluation Date: 12/1/2005

GeoLogic Associates	Pumping Test Analysis Report
1831 Commercenter East	Project: GC GLA-3 Analyses (aquifer b=60)
San Bernardino, California 92408	Number: 1995.0039.074
Phone (909) 383-8728	Client: Gregory Canyon, LTD



Pumping Test: **Gregory Canyon**

Analysis Method: **Cooper-Jacob Steptest**

Analysis Results:	Transmissivity:	2.38E+3 [ft²/d]	Conductivity:	3.97E+1 [ft/d]
	Storativity:	2.73E-3		

Test parameters:	Pumping Well:	PW	Aquifer Thickness:	60 [ft]
	Casing radius:	0.35 [ft]	Confined Aquifer	
	Screen length:	120 [ft]		
	Boring radius:	0.35 [ft]		
	Discharge Rate:	14.933704 [U.S. gal/min]		

Comments:

Evaluated by:

Evaluation Date: 12/1/2005

GeoLogic Associates	Pumping Test Analysis Report
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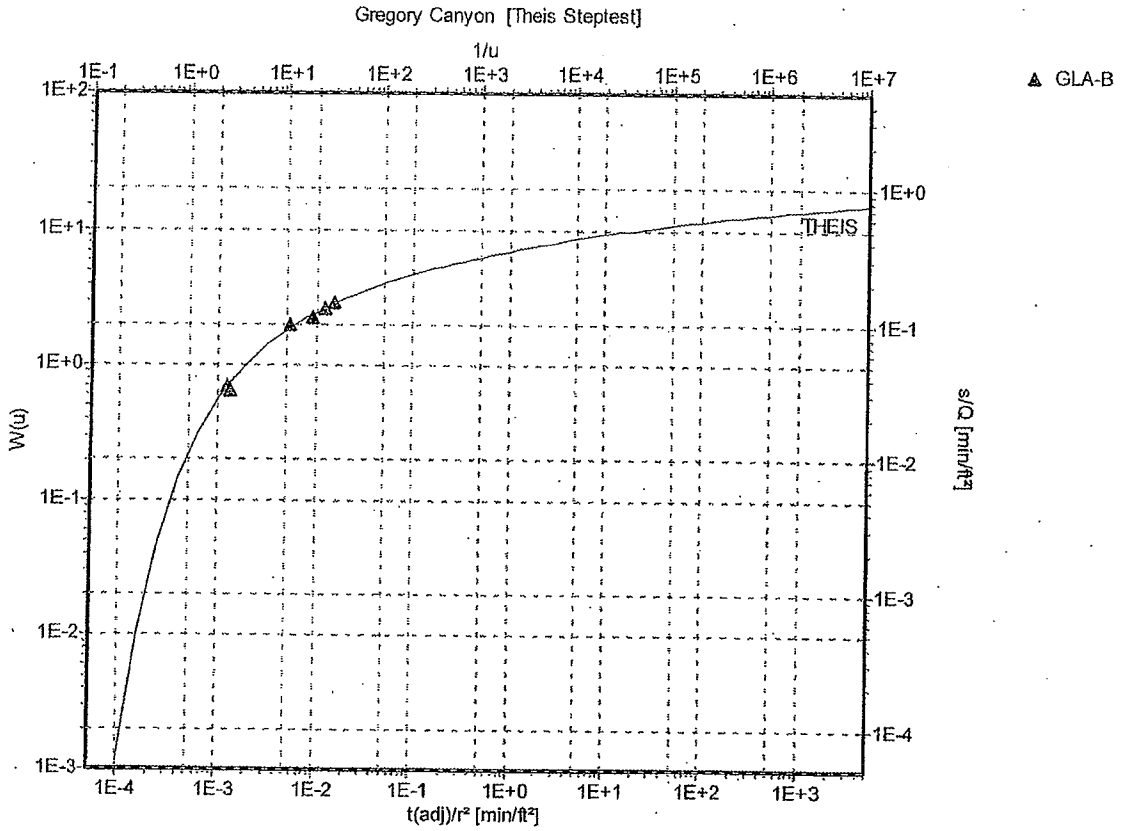
San Bernardino, California 92408	Number: 1995.0039.074
Phone (909) 383-8728	Client: Gregory Canyon, LTD



Pumping Test: **Gregory Canyon**

Analysis Method: **Theis Steptest**

Analysis Results:	Transmissivity:	2.30E+3 [ft²/d]	Conductivity:	3.83E+1 [ft/d]
	Storativity:	3.21E-3		

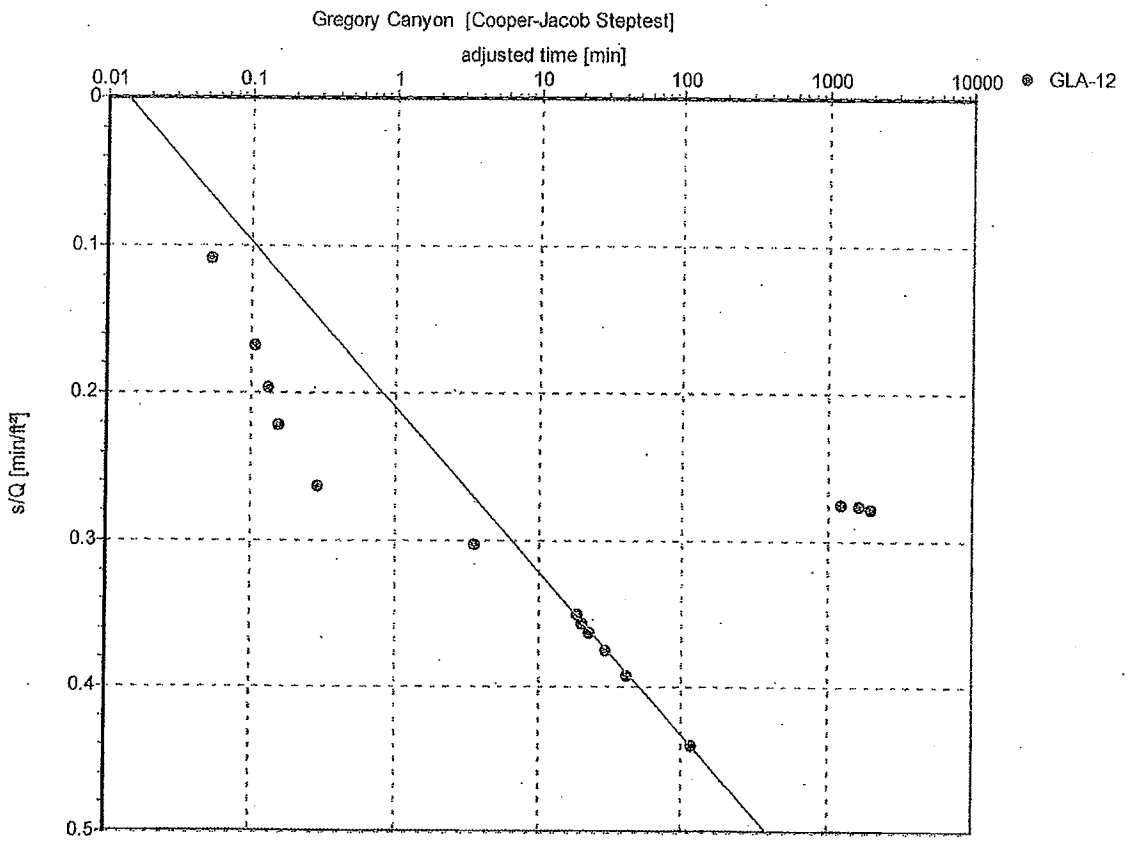
Test parameters:	Pumping Well:	PW	Aquifer Thickness:	60 [ft]
	Casing radius:	0.35 [ft]	Confined Aquifer	
	Screen length:	120 [ft]		
	Boring radius:	0.35 [ft]		
	Discharge Rate:	14.933704 [U.S. gal/min]		

Comments:

Evaluated by: JAS

Evaluation Date: 12/1/2005

GeoLogic Associates	Pumping Test Analysis Report
1831 Commercenter East	Project: GC GLA-3 Analyses (aquifer b=60)
San Bernardino, California 92408	Number: 1995.0039.074
Phone (909) 383-8728	Client: Gregory Canyon, LTD



Pumping Test: **Gregory Canyon**

Analysis Method: **Cooper-Jacob Steptest**

Analysis Results:				
	Transmissivity:	2.35E+3 [ft²/d]	Conductivity:	3.92E+1 [ft/d]
	Storativity:	1.81E-7		

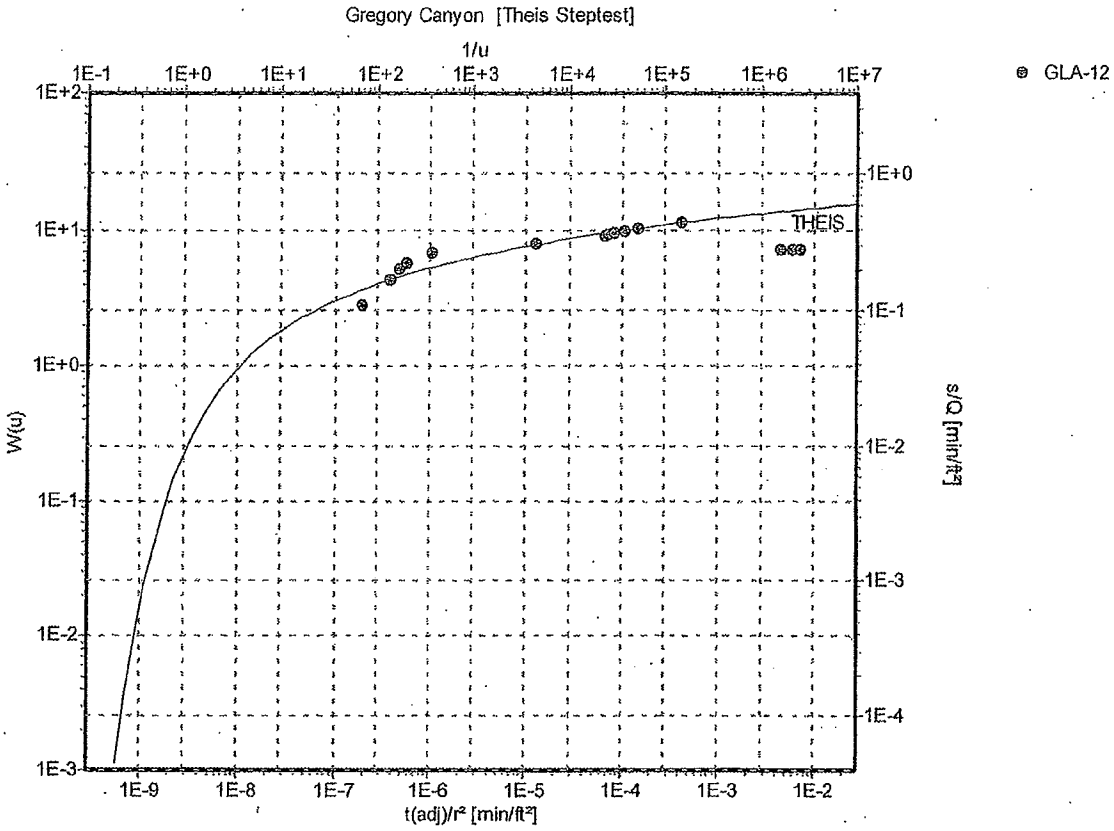
Test parameters:				
	Pumping Well:	PW	Aquifer Thickness:	60 [ft]
	Casing radius:	0.35 [ft]	Confined Aquifer	
	Screen length:	120 [ft]		
	Boring radius:	0.35 [ft]		
	Discharge Rate:	14.933704 [U.S. gal/min]		

Comments:

Evaluated by: JAS

Evaluation Date: 12/1/2005

GeoLogic Associates	Pumping Test Analysis Report
1831 Commercenter East	Project: GC GLA-3 Analyses (aquifer b=60)
San Bernardino, California 92408	Number: 1995.0039.074
Phone (909) 383-8728	Client: Gregory Canyon, LTD



Pumping Test: **Gregory Canyon**

Analysis Method: **Theis Steptest**

Analysis Results:	Transmissivity:	2.95E+3 [ft²/d]	Conductivity:	4.91E+1 [ft/d]
	Storativity:	2.31E-8		

Test parameters:	Pumping Well:	PW	Aquifer Thickness:	60 [ft]
	Casing radius:	0.35 [ft]	Confined Aquifer	
	Screen length:	120 [ft]		
	Boring radius:	0.35 [ft]		
	Discharge Rate:	14.933704 [U.S. gal/min]		

Comments:

Evaluated by: JAS

Evaluation Date: 12/1/2005

Drawdown

Pumping Rate: 14.9 Gallons Per Minute

Well Radius: 0.35 Feet

Pumping Duration: 1.9 Days

Transmissivity: 550 Square Feet Per Day

Storativity: .09

Saturated Thickness: 60 Feet

Distance Increments: 0.5 Feet

Units: Metric / Imperial

Contours / Gridlines / Annotation

Exit / Help

Distance	Drawdown
0	-31.84
0.5	-29.63
1	-25.32
1.5	-22.81
2	-21.02
2.5	-19.64
3	-18.51
3.5	-17.55
4	-16.72
4.5	-15.99
5	-15.34
5.5	-14.75
6	-14.22
6.5	-13.72
7	-13.26
7.5	-12.84
8	-12.44
8.5	-12.07
9	-11.72
9.5	-11.39
10	-11.08
10.5	-10.78
11	-10.49
11.5	-10.22
12	-9.97
12.5	-9.72
13	-9.48
13.5	-9.25
14	-9.03
14.5	-8.82
15	-8.62

Units = Feet

Start | Calendar - Microsoft Outl... | GA-Survey - Inspect... | Microsoft Word | RockWorks98 | 12:00 PM

DrawDown

Pumping Rate: 10 Gallons Per Minute

Well Radius: 0.35 Feet

Pumping Duration: 2 Days

Transmissivity: 550 Square Feet Per Day

Storativity: .09

Saturated Thickness: 60 Feet

Distance from Pump: 25 Feet

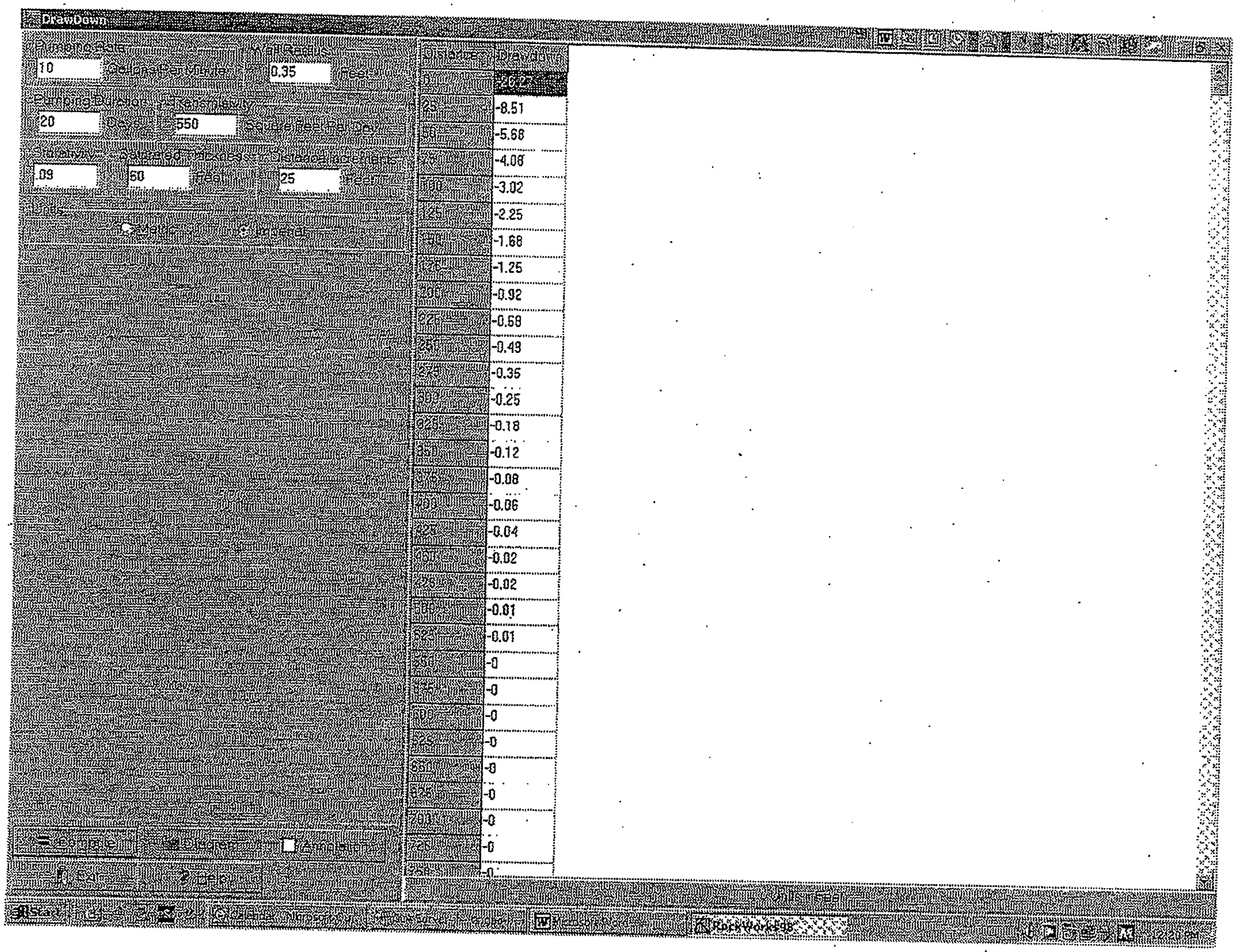
Units: Metric / Feet

Distance	Drawdown
0	-21.8
25	-3.88
50	-1.53
75	-0.58
100	-0.2
125	-0.06
150	-0.02
175	-0
200	-0
225	-0
250	-0
275	-0
300	-0
325	-0
350	-0
375	-0
400	-0
425	-0
450	-0
475	-0
500	-0
525	-0
550	-0
575	-0
600	-0
625	-0
650	-0
675	-0
700	-0
725	-0
750	-0

Connect Points Display Annotation

Calculate Reset

Unit = Feet


DrawDown
10
0.35
20
550
.09
50
25
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-5.68
-4.06
-3.02
-2.25
-1.68
-1.25
-0.92
-0.68
-0.49
-0.35
-0.25
-0.18
-0.12
-0.08
-0.06
-0.04
-0.02
-0.02
-0.01
-0.01
-0
-0
-0
-0
-0
-0
-0
-0
Start

DrawDown

Commission: 10 Cents/Contract

Well Basis: 0.35 Pos

Average Daily Volume: 200 Pos

Tick Value: 550 Cents/contract

Volatility: .09

Simulated Trades: 60 Pos

Stop Loss: 25 Pos

Mode: Metric Imperial

Balance	Drawdown
	$-10.7
25	-13.29
50	-10.4
75	-8.72
100	-7.54
125	-6.63
150	-5.89
175	-5.27
200	-4.74
225	-4.29
250	-3.88
275	-3.53
300	-3.21
325	-2.92
350	-2.66
375	-2.42
400	-2.21
425	-2.02
450	-1.84
475	-1.68
500	-1.53
525	-1.39
550	-1.27
575	-1.15
600	-1.05
625	-0.95
650	-0.86
675	-0.78
700	-0.71
725	-0.64
750	-0.58

Units: Pos

Compute 3d Display Generate

Exit Help

Start Rockworks98

DrawDown

Pumping Rate: 10 Gallons per Minute

Well Radius: 0.35 feet

Transmissivity: 2000 Gallons per Day per Foot

Storativity: 550 Square Feet per Day

Aquifer Thickness: .09 feet

Saturated Thickness: 60 feet

Distance Monitored: 25 feet

Units: Metric / Imperial

Calculate / Clear / Calculation / Exit / Help

Minutes	Drawdown
1	-25.87
25	-18.08
50	-15.19
75	-13.5
100	-12.31
125	-11.38
150	-10.62
175	-9.98
200	-9.43
225	-8.94
250	-8.51
275	-8.11
300	-7.75
325	-7.43
350	-7.12
375	-6.84
400	-6.58
425	-6.33
450	-6.1
475	-5.88
500	-5.68
525	-5.48
550	-5.3
575	-5.12
600	-4.95
625	-4.79
650	-4.64
675	-4.49
700	-4.35
725	-4.21
750	-4.08

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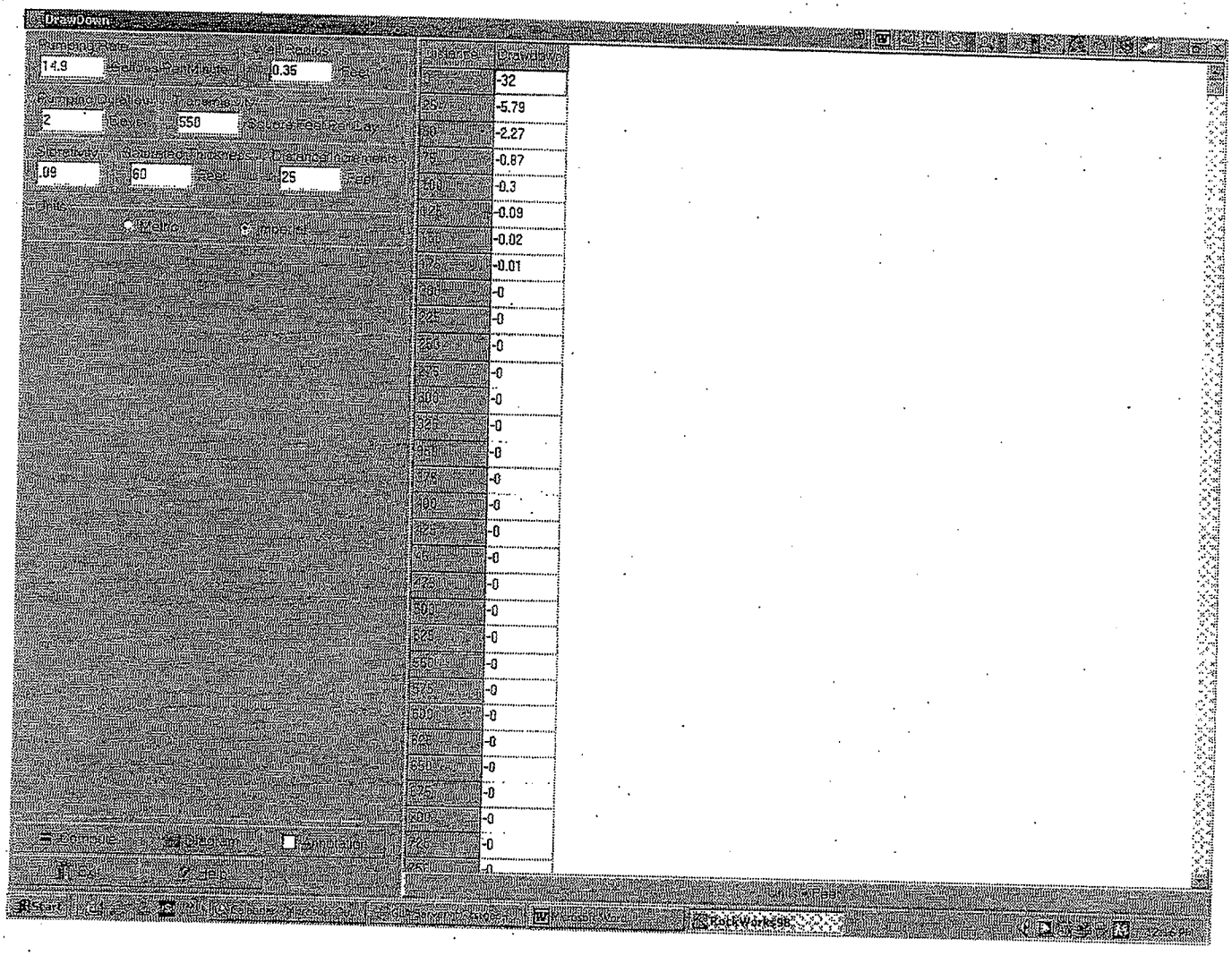
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14.9
0.35
2
550
.09
60
25
Metric
Imperial
Distance
DrawDown
-32
-5.79
-2.27
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-0.09
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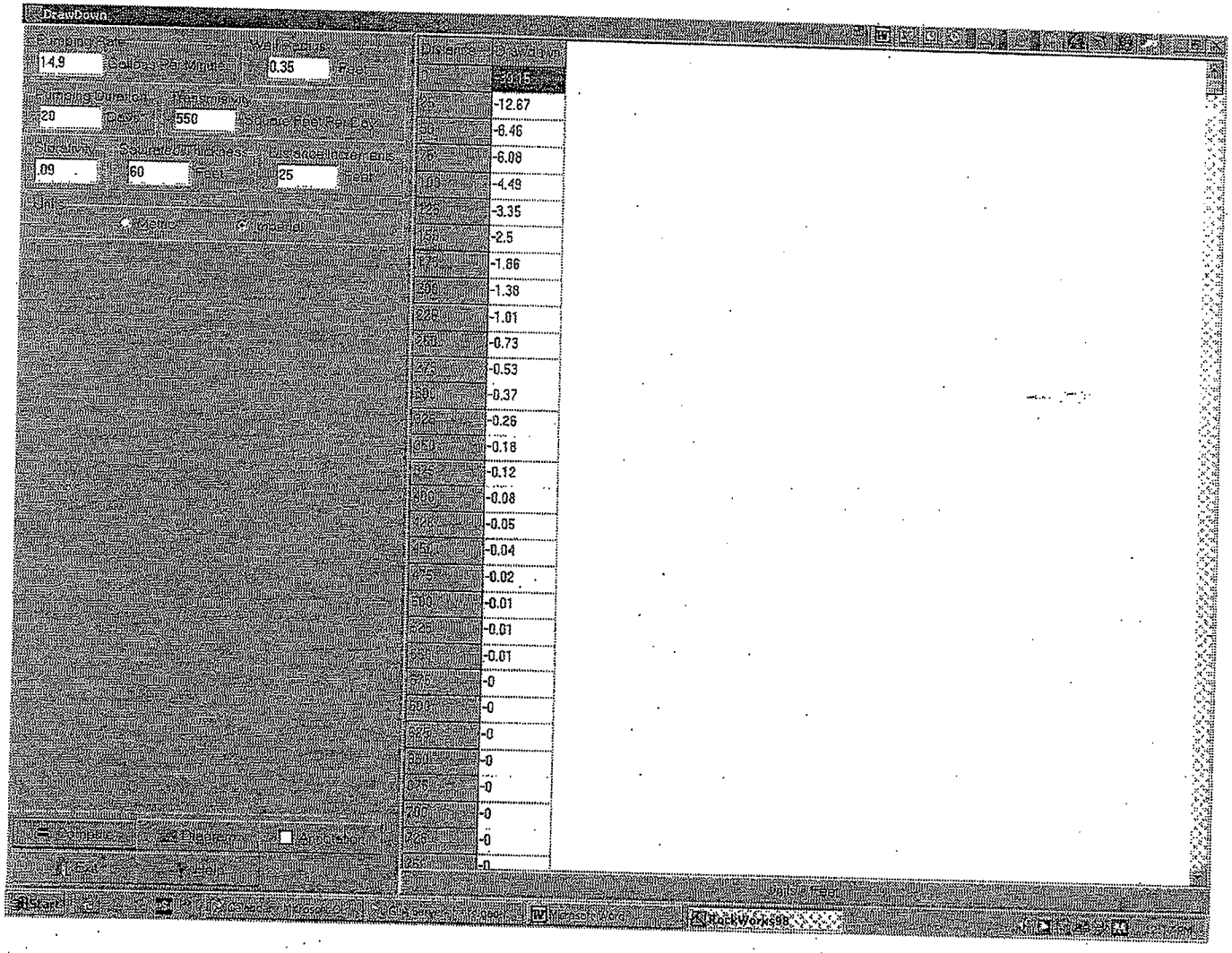
Console
Display
Save Grid
Ok
Help
Start
RockWorks98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Pumping Rate
14.9
Gallons Per Minute
0.35
Pumping Duration
20
Days
550
Gallons Per Day
Gradient
.09
60
Feet
25
Feet
Units
Metric
Imperial
Distance
Drawdown
0
-20.15
25
-12.67
50
-6.46
75
-6.08
100
-4.49
125
-3.35
150
-2.5
175
-1.86
200
-1.38
225
-1.01
250
-0.73
275
-0.53
300
-0.37
325
-0.26
350
-0.18
375
-0.12
400
-0.08
425
-0.05
450
-0.04
475
-0.02
500
-0.01
525
-0.01
550
-0.01
575
-0
600
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625
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675
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700
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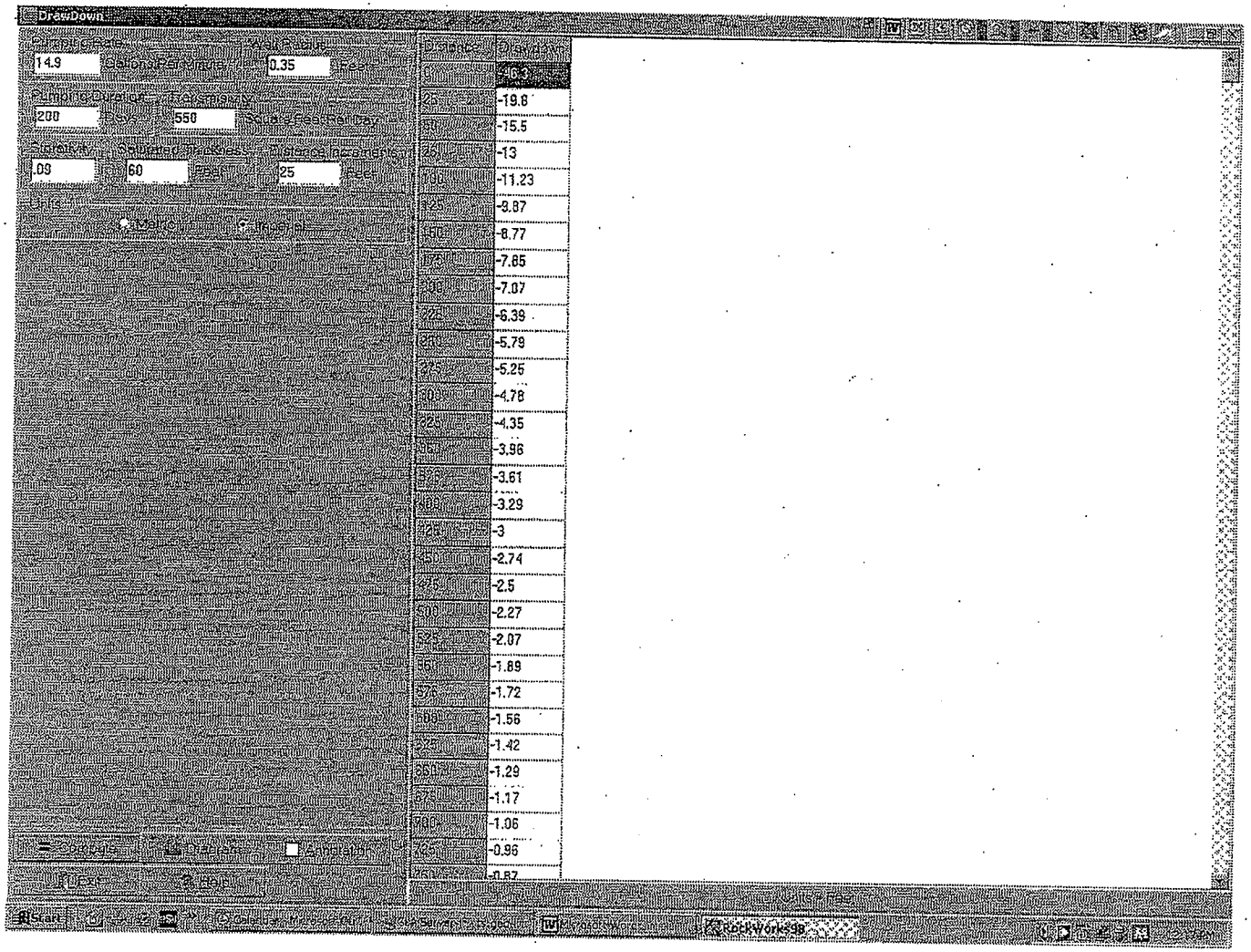
750
-0
Start
Pulse Pro
TackWorks98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200
550
1.09
60
25
Distance
DrawDown
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-15.5
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-8.77
-7.85
-7.07
-6.39
-5.79
-5.25
-4.78
-4.35
-3.96
-3.61
-3.29
-3
-2.74
-2.5
-2.27
-2.07
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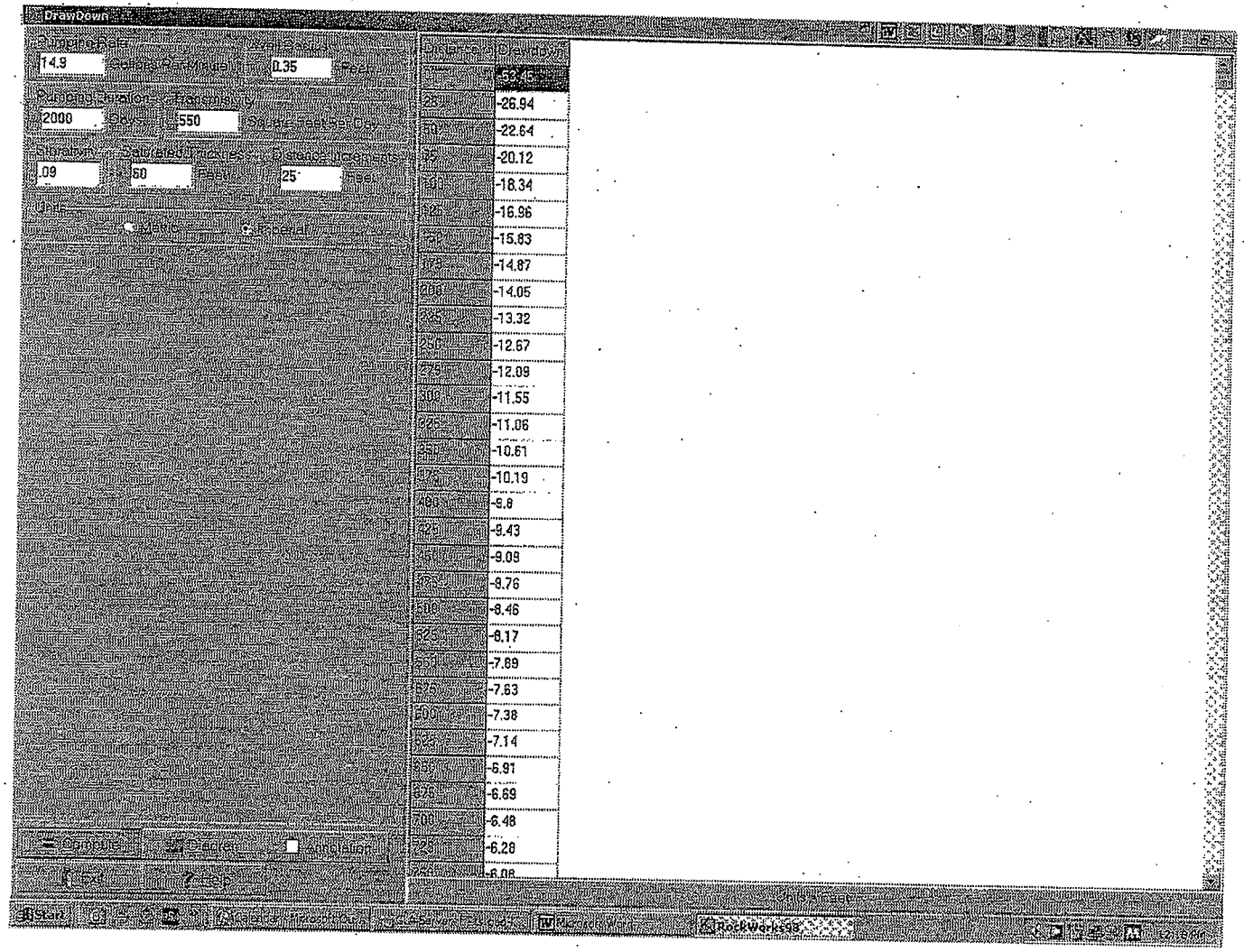
Start
RobotWorks98


DrawDown
14.9
0.35
2000
550
.09
50
25
Options
Calculate
Simulation
Exit
Help
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-12.67
-12.09
-11.55
-11.06
-10.61
-10.19
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-9.09
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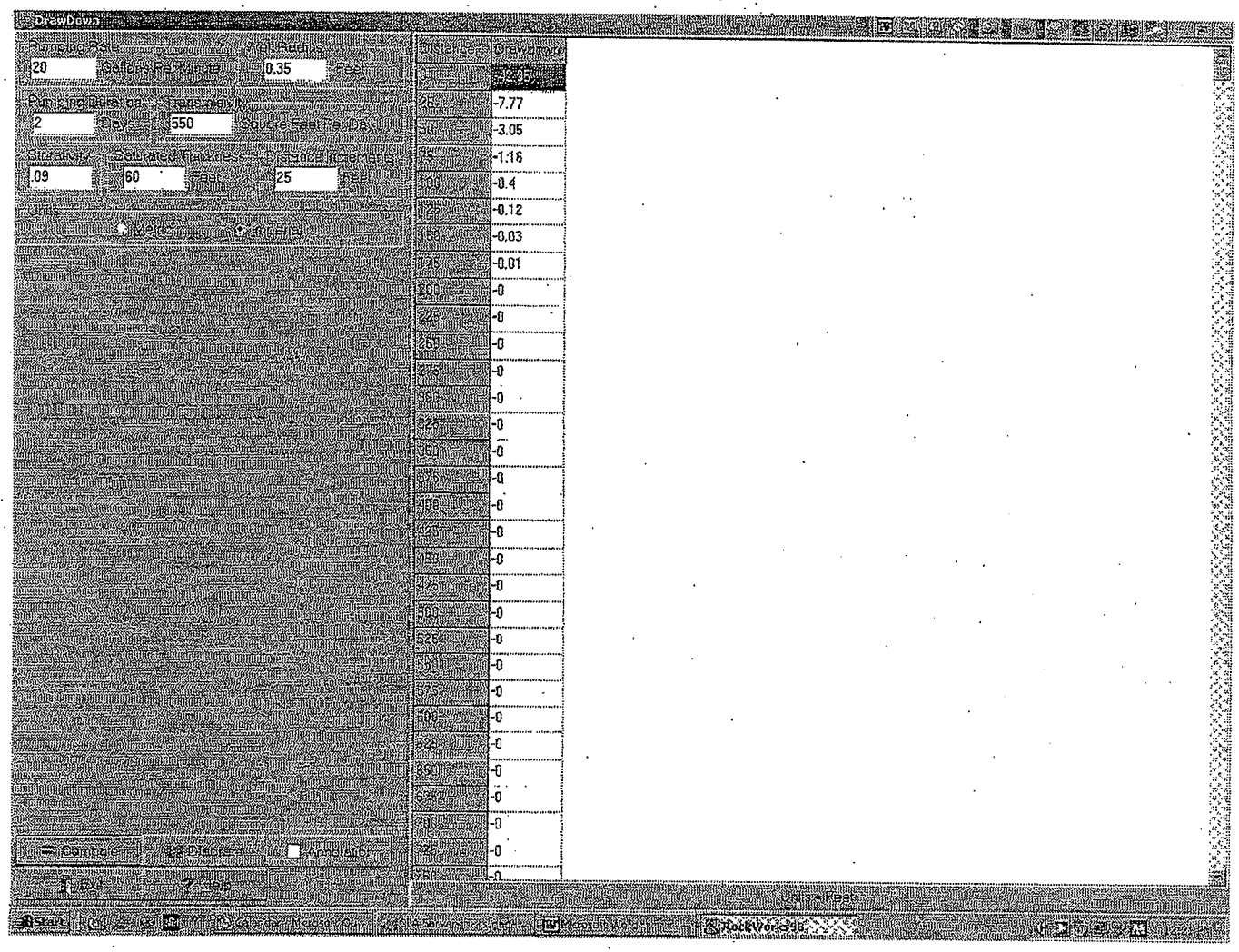
DrawDown
Pumping Rate
20
Gallons Per Minute
Well Radius
0.35
Feet
Pumping Duration
2
Day
Transmissivity
550
Square Feet Per Day
Storativity
.09
Saturated Thickness
60
Feet
Distance Increment
25
Feet
Distance
Drawdown
0
-12.65
25
-7.77
50
-3.05
75
-1.16
100
-0.4
125
-0.12
150
-0.03
175
-0.01
200
-0
225
-0
250
-0
275
-0
300
-0
325
-0
350
-0
375
-0
400
-0
425
-0
450
-0
475
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500
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525
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550
-0
575
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600
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625
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675
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700
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725
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750
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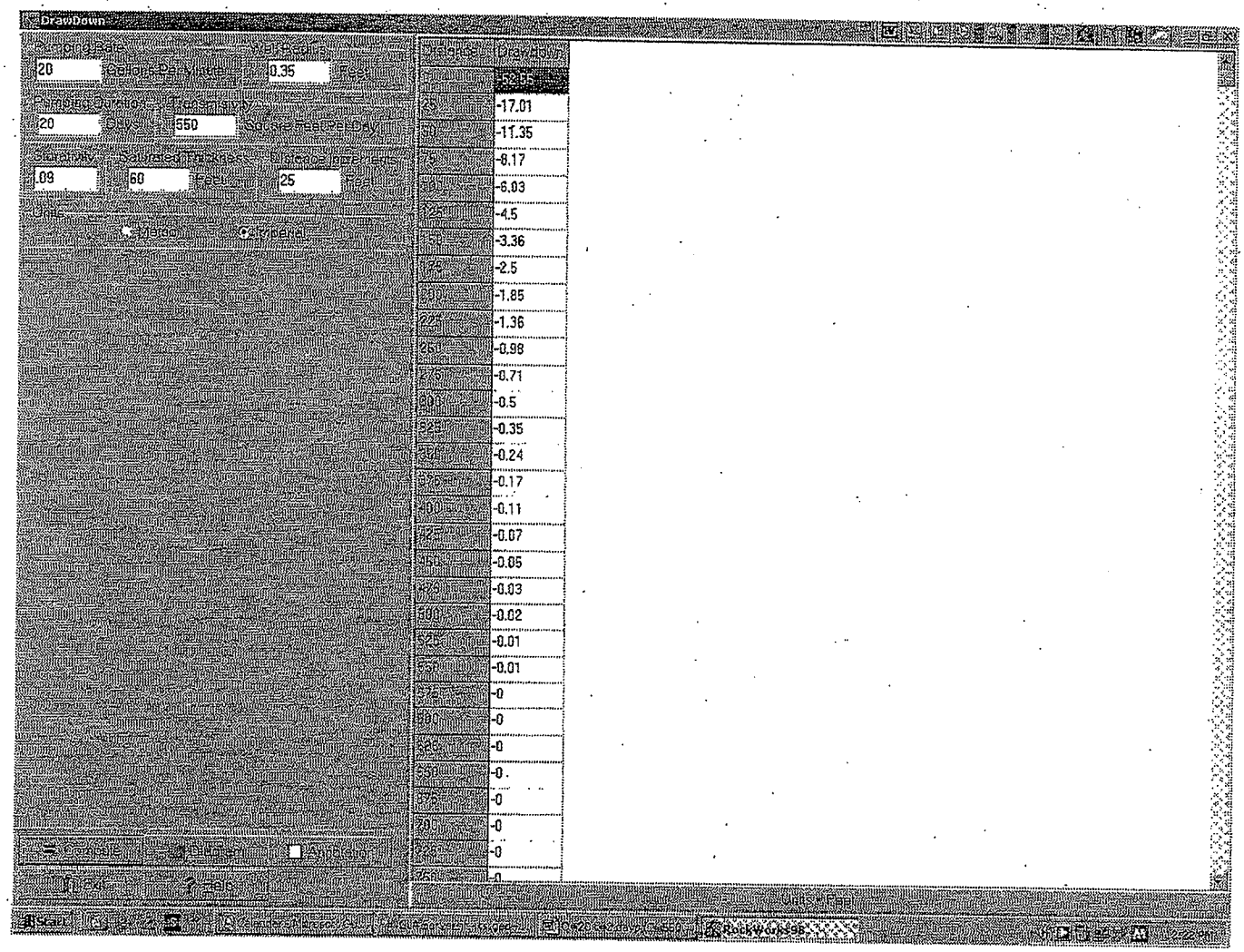
Feet


DrawDown
Pumping Rate
20
Gallons Per Minute
Well Radius
0.35
Feet
Pumping Duration
20
Days
Transmissivity
550
Square Feet Per Day
Storativity
.09
Saturated Thickness
60
Feet
Distance Between Wells
25
Feet
Units
Standard
Metric
Calculate
Print
Help
Distance
Drawdown
52.55
25
-17.01
50
-11.35
75
-8.17
100
-6.03
125
-4.5
150
-3.36
175
-2.5
200
-1.85
225
-1.36
250
-0.98
275
-0.71
300
-0.5
325
-0.35
350
-0.24
375
-0.17
400
-0.11
425
-0.07
450
-0.05
475
-0.03
500
-0.02
525
-0.01
550
-0.01
575
-0
600
-0
625
-0
650
-0
675
-0
700
-0
725
-0
750
-0
Units Feet
Start
RockWorks98

DrawDown

Pumping Rate: 20 Gallons Per Minute

Well Radius: 0.35 Feet

Compressibility: 200 Days

Transmissivity: 550 Square Feet Per Day

Specific Gravity: .09

Saturated Thickness: 60 Feet

Distance Increments: 25 Feet

Units: Metric / Imperial

Distance	Drawdown
0	53.14
25	-26.57
50	-20.81
75	-17.45
100	-15.08
125	-13.25
150	-11.78
175	-10.54
200	-9.49
225	-8.57
250	-7.77
275	-7.05
300	-6.41
325	-5.84
350	-5.32
375	-4.85
400	-4.42
425	-4.03
450	-3.68
475	-3.35
500	-3.05
525	-2.78
550	-2.53
575	-2.3
600	-2.09
625	-1.9
650	-1.73
675	-1.57
700	-1.42
725	-1.28
750	-1.15

Compute | Graph | Compare

Start | RockWorks98 | 12:22 PM

DrawDown

Pumping Rate: 20 Gallons Per Minute

Well Radius: 0.35 Feet

Aquifer Transmissivity: 2000 Gpd

Storativity: 550 Gallons Per Day

Storativity: .09

Saturated Thickness: 60 Feet

Distance Downstream: 25 Feet

Units: Meters / Feet

Compute

Exit

Help

Xanadu

Distance	Drawdown
0	-37.71
25	-36.16
50	-30.39
75	-27.01
100	-24.62
125	-22.76
150	-21.24
175	-19.96
200	-18.86
225	-17.88
250	-17.01
275	-16.23
300	-15.51
325	-14.85
350	-14.25
375	-13.68
400	-13.16
425	-12.66
450	-12.2
475	-11.76
500	-11.35
525	-10.96
550	-10.59
575	-10.24
600	-9.9
625	-9.58
650	-9.27
675	-8.96
700	-8.7
725	-8.43
750	-8.17

Visual Basic

Start

Rockwell-SBC

12:29 PM

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

MEMORANDUM

TO: E. William Hutton, P.C.

FROM: Sarah Battelle, GeoLogic Associates SKB

DATE: March 14, 2007

SUBJECT: **TREATED WATER QUALITY EVALUATION GREGORY CANYON LANDFILL PROJECT SAN DIEGO COUNTY, CALIFORNIA**

INTRODUCTION

At your request, this memorandum summarizes the results of an evaluation of the possible effluent limitations that may be established for disinfected tertiary treated water to be used to meet all or part of the water supply needs for the Gregory Canyon Landfill project. In performing this evaluation, Tentative Order No. 2006-0064 was reviewed. This Order was issued by the San Diego Regional Water Quality Control Board (RWQCB) to update the existing Waste Discharge Requirements (WDRs) for use of treated water from the Fallbrook Public Utility District (FPUD) Treatment Plant No. 1 Reclamation Project to include user applications within the Mission and Bonsall Hydrologic Subareas (HSAs), immediately downgradient of the Pala HSA in which the Gregory Canyon Landfill is located. All three of these HSAs are located within the San Luis Rey Hydrologic Unit.

It should be noted that following review of the Tentative Order and revisions by the RWQCB, the FPUD stated that the associated groundwater and surface water monitoring requirements in the Order were overly onerous, and would make water recycling economically infeasible. In response to this concern, the RWQCB removed the groundwater and surface water monitoring requirements. A second set of comments including submittal of a redline version of the Tentative Order by the FPUD addressed only the production and distribution of water recycling and removed the WDRs, requesting that instead each user apply for WDRs before receiving recycled water. The RWQCB rejected these revisions and recommended adoption of Order No. 2006-0064 including the WDRs. To date, based on a review of recently adopted orders by the RWQCB, the Tentative Order has not yet been adopted. If this approach is adopted, the only permit required to use Olivenhain Municipal Water District (OMWD) recycled water at the project site would be a revision to the OMWD Master Reclamation Permit.

WATER QUALITY OBJECTIVES AND BASIS FOR EFFLUENT LIMITATIONS

The RWQCB adopted the San Diego Basin Plan which establishes beneficial uses and water quality objectives (WQOs) for groundwater including the Mission and Bonsall HSAs. In establishing and presenting the effluent limitations in the Tentative Order, the RWQCB has included those constituents with WQOs within the HSAs. The following table presents the WQOs for the Mission and Bonsall HSAs and the Pala HSA.

16885 W. Bernardo Dr., Suite 305, San Diego, CA 92127 Phone: (858) 451-1136 Fax: (858) 451-1087

Analyte	Mission and Bonsall Basin WQOs	Pala Basin WQOs
TDS	1500 mg/L	900 mg/L
Sulfate	500 mg/L	500 mg/L
% Sodium	60%	60%
Manganese	0.15 mg/L	0.05 mg/L
Boron	0.75 mg/L	0.75 mg/L
Turbidity	5 NTU	5 NTU
Fluoride	1.0 mg/L	1.0 mg/L
Chloride	500 mg/L	300 mg/L
Nitrate – N	45 mg/L	15 mg/L
Iron	0.85 mg/L	0.3 mg/L
MBAS	0.5 mg/L	0.5 mg/L
Odor	None	None
Color	15 units	15 units

Source: RWQCB, San Diego Basin Plan

Notes: MBAS – Methyl Blue-Activated Substances (tests the presence of detergent in the water)
NTU – Nephelometric Turbidity Unit
NA – Not Analyzed

In the Basin Plan, the RWQCB states that point sources must be controlled to achieve the numerical WQOs in the effluent rather than in the groundwater. The Basin Plan also states that waters designated for use as domestic or municipal supply, such as the Mission, Bonsall and Pala HSAs, shall not contain concentrations of chemical constituents that exceed the maximum contaminant levels (MCLs) as specified in the California Code of Regulations, Title 22 (CCR 22). Finally, for discharges of recycled water not upgradient of municipal water supply reservoirs such as the Mission, Bonsall and Pala HSAs, the Basin Plan states that the effluent limitations will be at levels that are not less than constituent concentrations of water supply plus a typical incremental increase resulting from domestic water use, but not more than the Basin Plan WQOs.

It is clear that the effluent limits for disinfected tertiary water are established to protect the underlying groundwater based on the groundwater WQOs established for the HSA(s) in which the water is to be discharged. The RWQCB recognizes that under typical treated water applications, the water is used to support irrigation operations and higher constituent concentrations result in the fraction of the applied water which percolates to the groundwater due to evapotranspiration effects. As a result, the effluent limits frequently require constituent concentrations in the effluent to be lower than the corresponding groundwater WQOs. Consequently, the 12-month average and daily maximum effluent limits in the Order are statistically-derived from the FPUD Plant No. 1 effluent data to meet the numerical groundwater WQOs not to be exceeded more than 10 percent of the time in a one-year period in the effluent.

MAXIMUM EFFLUENT CONCENTRATIONS

In the Tentative Order, the RWQCB established incremental daily and 12-month average concentrations over water supply concentrations for those constituents with established WQOs for the Mission and Bonsall HSAs. The incremental increases were developed by the RWQCB based on actual effluent data submitted by FPUD for the disinfected tertiary treated effluent and potable supply waters from the Metropolitan Water District (MWD), the agency that supplies

water to the area. From this data, the Order states that the effluent limitation that applies is either a value equal to the concentration in the water supply plus the site-specific incremental increase, or the effluent limitation, whichever is more stringent. The water supply values from the 2003 annual water quality report provided by the MWD and incremental daily maximum values are presented below with the 12-month average and daily maximum effluent limitations as provided in the Tentative Order.

Analyte	MWD 2003 Annual Water Quality – Average	Incremental Daily Maximum –Effluent Limitations	12-Month Average Effluent Limitations	Daily Maximum Effluent Limitations
TDS	487 mg/L	510 mg/L	1420 mg/L	1620 mg/L
Sulfate	171 mg/L	110 mg/L	475 mg/L	540 mg/L
Boron	0.13 mg/L	1.10 mg/L	---	---
Turbidity	0.06 NTU	---	---	---
Fluoride	0.22 mg/L	1.3 mg/L	---	---
Chloride	81 mg/L	110 mg/L	450 mg/L	580 mg/L
Nitrate and Nitrate as N	ND	---	---	---
Color	2 units	15 units	---	---

Source: RWQCB Tentative Order No. 2006-0064.

In addition, to the above listed effluent limitations, the RWQCB requires that the treated effluent comply with WQOs (MCLs) established by CCR 22 for various metals and organic compounds. However, the OMWD water has been represented to meet all CCR 22 requirements.

GREGORY CANYON EFFLUENT LIMITATIONS

Additional effluent and water quality data are necessary to develop site-specific incremental daily effluent limitations for the use of disinfected tertiary effluent and potable supply waters for the Gregory Canyon Landfill project. However, the 12-month average and daily maximum effluent limitations for TDS, chloride and sulfate can be calculated from the WQOs established for the Pala HSA. Tentative Order No. 2006-0064 establishes daily maximum effluent limitations for TDS and sulfate that are 8 percent above of their WQO, and a chloride value that is 16 percent higher than its WQO. The 12-month average effluent limitations for TDS and sulfate are 95 percent of the WQO and the chloride value is 90 percent of the WQO. Using the Pala HSA WQOs, the resultant 12-month average and daily maximum effluent limitations would be as follows:

Analyte	Pala HSA WQO	Calculated 12-Month Average Effluent Limitation	Calculated Daily Maximum Effluent Limitation	OWMD Effluent Data (12-month Average – 4th Quarter 2005)
TDS	900 mg/L	855 mg/L	972 mg/L	917 mg/L
Sulfate	500 mg/L	475 mg/L	540 mg/L	214.75 mg/L
Chloride	300 mg/L	270 mg/L	348 mg/L	259 mg/L

Comparison of the effluent data from the OMWD with the calculated 12-month average and daily maximum values indicates that the effluent meets the daily maximum values for all three constituents, and only exceeds the 12-month average value for TDS.

If the 12-month average value provided by the OMWD is representative of the current plant effluent, and it is necessary to achieve 12-month average TDS concentrations that are below 855 mg/L, the project may consider blending a small quantity of the recycled water (e.g., less than 10% of the total daily water needs of the project) with water that is processed through the on-site reverse osmosis (RO) water treatment system to create a TDS concentration that is below the calculated limit.

The RO water treatment system proposed for the project has removal efficiency of at least 98 percent for inorganic compounds, such as TDS, sodium, sulfate and chloride. In the case of TDS, recycled water having an initial TDS concentration of 917 mg/L would, after treatment, have a TDS concentration of approximately 18 mg/L. In turn, a blend of less than 1 gallon (the calculated value is approximately 0.75 gallons) of RO treated recycled water to every 10 gallons of OMWD-supplied recycled water would reduce the effluent concentration to the anticipated TDS effluent standard of 855 mg/L.

The 60 percent sodium WQO for the Pala Basin was the other constituent reported to have been exceeded in the OMWD recycled water based on a reported 12-month average of 63.42 percent sodium for the effluent during the fourth quarter 2005. Using a minimum 98 percent removal efficiency for sodium (and calcium, magnesium, and potassium, which make up the calculation of percent sodium) through the RO water treatment system, the RO treated recycled water would yield an effluent of about 1 percent sodium. Using the same blend of 0.75 gallons of RO treated recycled water with 10 gallons of OMWD-supplied recycled water, the percent sodium is reduced below the 60 percent sodium WQO for the Pala Basin to 59 percent sodium.

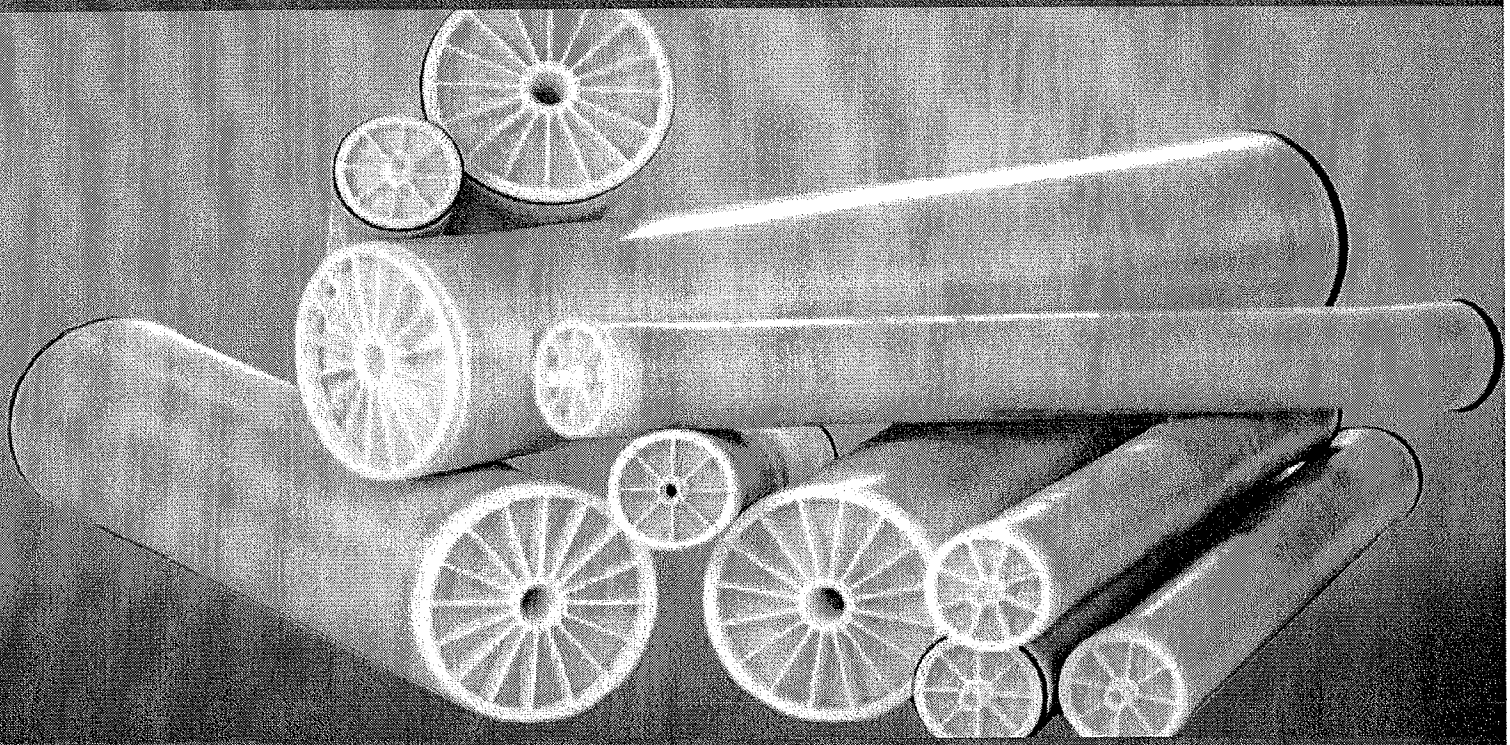
The 50 gallons per minute RO water treatment plant can produce up to 72,000 gallons per day of RO-treated recycled water, which represents approximately 35% of the projects maximum water requirements of 205,000 gallons per day. Thus, the RO water treatment plant can produce more than an adequate supply of water for blending, since that requirement is less than 20,000 gallons per day for blending (assuming up to 1 gallon of RO treated recycled water for every 10 gallons of OMWD recycled water) for the projects maximum daily water supply needs and achieving Pala Basin WQOs.

However, it is important to note that the majority of the site water use will occur on the landfill footprint, which is designed with redundant environmental protections within its liner system that will capture the treated water applied over it. Therefore, concerns associated with the application of treated water to the ground as is typical of irrigation operations, which may concentrate the chemical constituents by evapotranspiration and potentially pose a threat to groundwater quality, are not applicable within the footprint of the Gregory Canyon Landfill. Direct application of the treated water to the landfill will not impact the WQOs of the Pala HSA since the liner system prevents contact between the treated water and the underlying groundwater. The project should only consider providing some form of blending to water that is applied to areas that do not include the additional environmental protections (i.e., areas outside of the lined landfill footprint).

In summary, the current project includes significant environmental protections within the landfill footprint that will provide protection to the underlying groundwater and make effluent limits

established for the protection of groundwater unwarranted in that area. Only in areas of the project site where the treated water is likely to be applied outside of the lined landfill do more stringent effluent limitations seem appropriate. Blending of the recycled water with RO-treated water is feasible for those applications.

If you have any questions, please call me at (858) 451-1136.



USFilter

MEMBRANE SERVICES AND PRODUCTS

RO Membrane Product Guide

8" RO Membranes

Manufacturer	Model	GPD	% Reject (min.)
FILMTEC™	**BW30-365**	**9,500**	**99**
FILMTEC	**BW30-400**	**10,500**	**99**
FILMTEC	**BW30LE-440**	**11,500**	**99**
FILMTEC	**BW30-365FR**	**9,500**	**99**
FILMTEC	RO-390-FF	6,800	98
FILMTEC	**HSRO-390-FF**	**6,800**	**98**
FILMTEC	SW30-8040	6,000	98.6
FILMTEC	SW30HR-8040	4,000	99.2
FILMTEC	SW30HR-380	6,000	99.4
Hydranautics®	**CPA2**	**10,000**	**99.2**
Hydranautics	**CPA3**	**11,000**	**99.6**
Hydranautics	CPA4	6,000	99.7
Hydranautics	ESPA1	12,000	99
Hydranautics	ESPA2	9,000	99.5
Hydranautics	ESPA3	15,000	98
Hydranautics	LFC1	10,000	99
Hydranautics	SWC1	5,000	99.6
Hydranautics	SWC2	6,200	99.2
Hydranautics	SWC3	5,900	99.6

4" RO Membranes

Manufacturer	Model	GPD	% Reject (min.)
FILMTEC	**BW30-4040**	**2,200**	**98**
FILMTEC	BW30LE-4040	2,800	98
FILMTEC	RO-4040-FF	2,400	99.5
FILMTEC	HSRO-4040-FF	1,900	99.5
FILMTEC	SW30-4040	1,500	99.2
FILMTEC	SW30HR-4040	1,000	99.2
FILMTEC	TW30-4040	2,200	98
Hydranautics	**CPA2-4040**	**2,250**	**99.2**
Hydranautics	ESPA1-4040	2,600	99
Hydranautics	ESPA2-4040	1,900	98
Hydranautics	ESPA3-4040	3,000	98
Hydranautics	SWC1-4040	1,100	99.6
Hydranautics	SWC2-4040	1,400	99.2

Items in **RED** are stocked by USFilter. For availability of other items, please contact your local USFilter sales representative.

Standard Elements Cross-Reference Guide

8" RO Membranes

Type	FILMTEC	Hydranautics	FLUID SYSTEMS™	TriSep™	DESAL™	Osmonics™
TFC - 365 sq ft.	BW30-365	CPA2	8822HR-365	8040-ACM2-TSA		815-HF(PA)
TFC - 400 sq. ft.	BW30-400	CPA3	8822HR-400	8040-ACM2-UWA	AG8040F400	815-HF(PA)-400
TFC - LP - 400+ sq. ft.	BW30LE-440	ESPA1	8821ULP-400	8040-ACM4-UWA	AK8040F400	
TFC - LF - 365 sq. ft.	BW30-365FR	LFC1		8040-X201-TSA		
TFC - SW	SW30-8040	SWC2	2822SS-360	8040-ACMS-SSA	SE8040F	
TFC - SW	SW30HR-8040	SWC1	2822SS	8040-ACMS-SPA	AD8040F	
TFC - SW	SW30HR-380	SWC3	2822SS-360	8040-ACMS-SPA	SC8040F	
CA		CAB1	8221SD	8040-SB50-TSA	CE8040F	815-SR
CA		CAB2	8221HR	8040-SB20-TSA	CD8040F	815-HR
CA		CAB3	8221HR	8040-SB20-TSA	CD8040F	815-HR
NF	NF40-8040		8921S	8040-XN40-TSA	DL8040F	815-NF300(PA)
NF	NF70-400	8040-UHY-ESNA		8040TS80-UWA	HL8040F400	
UF		8040-TFF-P100		8040-UE50-TXA	EW8040F	815-PT3PS

4" RO Membranes

Type	FILMTEC	Hydranautics	FLUID SYSTEMS	TriSep	DESAL	Osmonics
TFC - 4040	BW30-4040	CPA2-4040	4820HR	4040-ACM2-TSF	AG4040FF	414-HF (PA)
TFC - LP - 4040	BW30LE-4040	ESPA1-4040	4821ULP	4040-ACM4-TSF	AK4040FF	
TFC - SW - 4040	SW30-4040	SWC1-4040	1820SS	4040-ACMS-SSF	SE4040FF	
TFC - TW - 4040	TW30-4040			4040-ACM2-TST	AG4040TF	
CA		CAB1-4040	4221SD	4040-SB50-TSA	CE4040F	
CA		CAB2-4040	4221HR	4040-SB20-TSA	CD4040F	
TFC-NF	NF40-4040		4921S		DL4040F	411-NF300(PA)
TFC-NF	NF70-4040	4040-UHT-ESNA		4040-TS80-TSF	HL4040FF	
UF		4040-TFV-P100		4040-UE50-TXF	EW4040F	411-PT3PS

TFC= Thin Film Composite LP = Low Pressure LF = Low Fouling SW = Seawater
TW = Tap Water NF= Nanofilter CA= Cellulose Acetate UF= Ultrafilter

YOU CHOOSE FROM

THREE LEVELS OF SERVICE

USFilter offers three levels of off-site cleaning service for your 4" and 8" elements. You choose the level of service that meets your needs and budget.

PLATINUM LEVEL CLEANING PROGRAM:

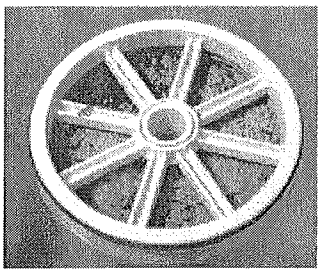
- Determination of the proper cleaning chemicals, dosage rates and sequences
- Evaluation of feedwater analysis and operation data prior to fouling
- In-house experimentation and analytical diagnostic testing, as required
- 100% of the elements pre- and post-tested
- Elements bagged, boxed, palletized and (on request) preserved
- Report issued with the membranes

GOLD LEVEL CLEANING PROGRAM:

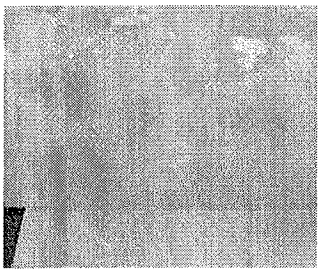
- Determination of the proper cleaning chemicals, dosage rates and sequences
- Evaluation of feedwater analysis and operation data prior to fouling
- In-house experimentation and diagnostic testing, as required
- Approximately 10% of the elements pre- and post-tested
- Elements bagged, boxed, palletized and (on request) preserved
- Report issued with the membranes

SILVER LEVEL CLEANING PROGRAM:

- Standard low pH followed by high pH cleaning procedures
- No pre- and post-testing
- Elements bagged, boxed, palletized and (on request) preserved
- Recommended for high volume quick turnaround applications



Dirt and debris plugging feed end of the element



Biological and silt fouling of the membrane surface

The benefits of off-site membrane cleaning:

- Improves membrane reject and flow reducing post-RO polishing costs
- Increases membrane life
- Costs less than replacement membranes
- Reduces direct labor costs
- Reduces system downtime from days to hours (especially with USFilter rental elements)
- Removes discharge of cleaning chemicals avoiding wastewater issues and plant upsets
- Eliminates record keeping and storage of cleaning chemicals
- Reduces power consumption
- Reduces water consumption and related waste disposal volume caused by fouled membranes

Optimally, membrane cleaning should be performed more as a matter of routine maintenance than by necessity. We have observed in the field that cleanup frequency varies from weekly to annually. As a general rule of thumb, USFilter recommends that systems with good feedwater quality and pretreatment require a cleanup once every three to six months as a good maintenance procedure.

ON-SITE CLEANING

USFilter can provide on-site membrane cleaning services utilizing your clean-in-place (CIP) skid and standard cleaning procedures. Depending on your needs, we can provide on-site labor and/or supervisory personnel, along with the cleaning chemicals.

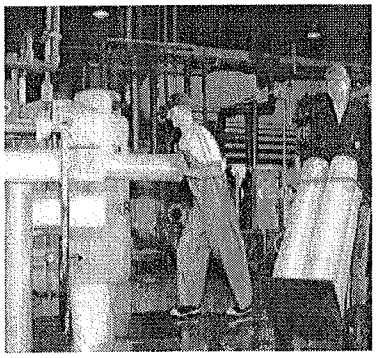
OFF-SITE CLEANING

The results of off-site cleaning are dramatically different from on-site cleaning. Through the operation of over 1,000 membrane systems, USFilter's specially designed off-site membrane cleaning facilities provide better cleaning, extend membrane life and are more cost effective than on-site cleanings.

Conventional on-site cleanings can increase the life of a membrane, but the flow rates will eventually decline (see Figure 1).

USFilter's off-site cleaning process is specifically designed to restore RO membranes to or near the original manufacturer's performance specifications. Our proprietary equipment and strict cleaning process - air dosage rates, temperature and flow rates – are tightly controlled to ensure optimum cleaning performance, resulting in longer intervals between cleanings and/or replacement. The cleaning process does not affect the structural integrity of the membrane and, therefore, does not void the manufacturer's warranty.

Figures 2, 3 and 4 illustrate the dramatic gains that can be achieved with off-site membrane cleaning and recovery.



Membrane care center

USFilter Regional Membrane Care Centers

- Fallsington, PA
- Conroe, TX
- Los Angeles, CA
- Milpitas, CA
- Rockford, IL
- Jacksonville, FL
- Toronto, Ontario, Canada

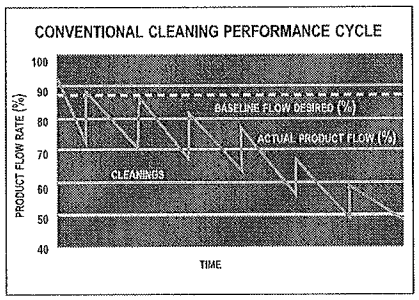


Figure 1

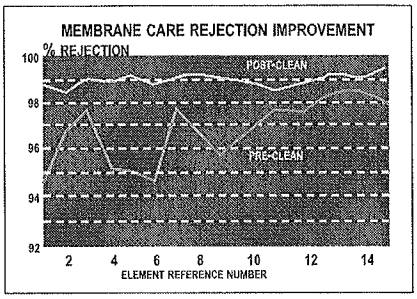


Figure 2

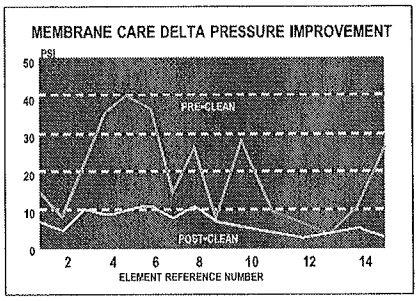


Figure 3

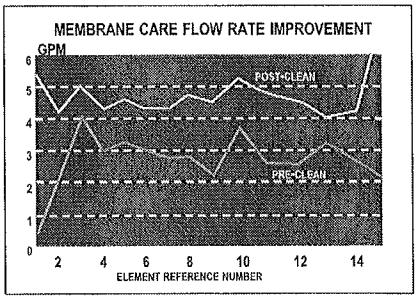


Figure 4

USFilter Regional Distribution and Stocking Facilities

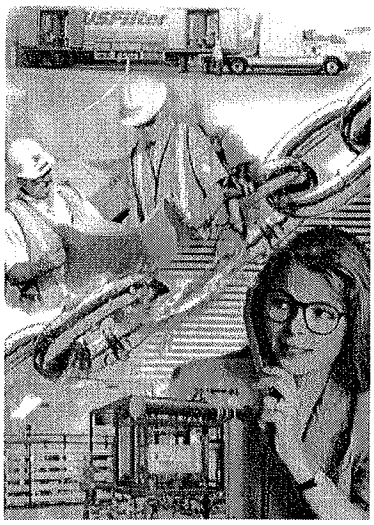
- Billerica, MA
- Fallsington, PA
- Jacksonville, FL
- Rockford, IL
- Conroe, TX
- Signal Hill, CA
- Toronto, Ontario, Canada

USFilter is the innovative leader in continually defining industry standards, pioneering new techniques in system design and establishing new applications to meet high-purity water requirements. Our wide range of technologies includes the membrane purification processes - Reverse Osmosis (RO), Ultrafiltration (UF), Microfiltration (MF) and Nanofiltration (NF). We design, build, install, operate and service these systems. Our extensive operational experience is unmatched in the water industry, with responsibility for over 1,000 RO systems and 50,000+ membranes. USFilter combines proven technologies and operational experience to provide economical, reliable solutions.

USFilter's Membrane Care Program℠ provides the services and products to keep your system operating at peak performance. Whether you need our world-class design services or assistance optimizing your current membrane system, we can assist you through our Membrane Center of Excellence. This center is dedicated to developing new membranes, optimizing existing membranes and creating innovative cleaning techniques.

USFilter is your single source for all replacement membranes, accessories and parts. In addition to our large inventory of membranes and replacement parts, our trained service technicians can provide assistance with membrane removal, installation and/or cleaning (on- or off-site). We offer membrane autopsies and complete laboratory services to evaluate system performance and improve productivity. Our service contracts provide peace of mind knowing your system is being monitored and maintained by trained USFilter technicians. They ensure your system is operating at peak design levels and downtime is minimized, so you can concentrate on your core business. At USFilter, we have the right products and services to meet your needs and budget.

Your water purification system is a long-term investment. It makes sense to protect your investment by partnering with USFilter for long-term performance and reliable, continuous service.



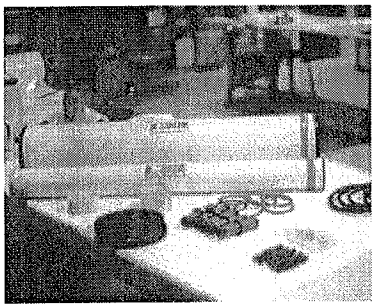
USFILTER CAPABILITIES

- Large inventory of stocked membranes – FILMTEC and Hydranautics
- 7 regional membrane care centers
- 24-hour customer service
- Same day shipment of stocked membranes
- RO accessories and cleaning chemicals
- Rental RO membranes
- Extensive analytical and laboratory testing
- Data analysis, normalization and technical system evaluation
- Complete off-site membrane cleaning, performance recovery and testing services
- On-site membrane cleaning services
- Service and maintenance contracts
- Trained technical and service phone support staff
- Troubleshooting and field engineering support
- Local support and service network
- Personnel training
- Mobile RO systems for long or short term requirements

YOUR FULL SERVICE MEMBRANE SUPPLIER

We understand how important it is for your membrane system to operate reliably and economically. That's why we offer a wide range of cost-effective aftermarket products to keep your system up and running. From replacement membranes and system components to cleaning chemicals, we have the products when and where you need them.

REPLACEMENT MEMBRANES AND SYSTEM COMPONENTS



Membrane Components

USFilter is your leading source for replacement membranes. We supply elements from all of the major manufacturers. For your convenience, we inventory FILMTEC and Hydranautics membranes at our seven regional distribution facilities. This enables us to meet short lead times and thereby minimize your system's downtime. Whether it involves normal wear-and-tear replacement, maintenance or spares inventory, USFilter has the products to support your membrane system. In addition to our inventory of elements, our regional distribution facilities also stock major components, such as replacement gauges, pumps and end caps. USFilter can deliver the part you need in the time frame you need it.

MEMBRANE FOULING AND THE RIGHT CLEANING CHEMICALS

RO FOULING COMPONENTS

Metal Oxides
- Iron
- Manganese
- Aluminum

Scaling Salts
- Calcium Carbonate
- Calcium Sulfate
- Barium Sulfate
- Strontium Sulfate
- Calcium Fluoride
- Silica

Colloids (SDI)
- Silica
- Clay
- Silt
- Rust

Organic (TOC)
- Humic Acids and Other Natural Organics
- Coagulants - Flocking Agents
- Incompatible Pretreatment Chemicals

Biological
- Organic Slimes
- Bacteria

The membrane separation process utilizes a high-pressure feed to force water through a semipermeable barrier. As the water passes through the membrane, contaminants are rejected and eventually flushed away to a wastestream. The concentration of the contaminants is a critical factor in the design and operation of a membrane system. During normal operations, membranes can become fouled by scaling salts, inorganic oxides, colloidal material, or biological matter.

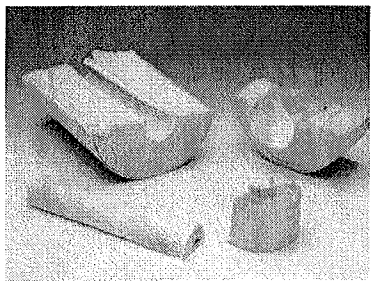
Fouling involves the entrapment of material in the feed/brine path or deposits on the surface of the membrane. These deposits can accumulate until they cause a loss in productivity, increase in feed pressure requirements, loss of salt rejection, or all three.

USFilter can determine the source of your fouling problem and make recommendations on the selection and purchase of proper chemical treatments and, if necessary, appropriate pretreatment steps. Our broad membrane system expertise enables us to provide reliable diagnosis methods and sound troubleshooting to return your equipment to optimum performance. We are able to work with all the RO chemical manufacturers and provide you with the best combination RO antiscalants, chemical feed systems and dosing rates to keep your RO system running smoothly.

COMPLETE SERVICES FOR YOUR MEMBRANE SYSTEM

At USFilter, our customers are our number one priority – before and after the sale. USFilter's professional services not only help you select the right water treatment system, but we also offer complete support at every phase throughout the life of your system. These services include water quality analyses, system installations and start-ups, membrane cleanings and maintenance contracts.

MEMBRANE CENTER OF EXCELLENCE ANALYTICAL SERVICES



Example of destructive autopsy

USFilter is committed to providing the services required to keep your water treatment systems operating at peak performance. Our analytical testing includes feedwater and outlet water analyses and various membrane analytical techniques. Our Membrane Center of Excellence can provide feed, concentrate and permeate water analyses, SDI pad analyses and various membrane analytical techniques. These include non-destructive, destructive and complete autopsies and optimum cleaning analyses. Membrane analysis assists in identifying the fouling agent(s), proper cleaning techniques and proper pretreatment methods to prevent reoccurring fouling.

NON-DESTRUCTIVE TESTS:
- External visual exam
- Bubble test - physical integrity of the membrane envelope tested
- Membrane performance testing – flux, pressure and percent reject
- Analysis of cleaning solution

DESTRUCTIVE TESTS:
- Internal visual exam
- Coupon testing of membrane surface
- Dye testing
- Metals analyses
- Digestion – ICP
- SEM EDX

ORGANIC ANALYSES:
- FTIR spectroscopy
- HPLC-FTIR and/or UV spectroscopy
- GCMS spectroscopy
- Loss on ignition – organic vs. inorganic foulants
- Fujiwara test – chlorine oxidation of polyamide elements

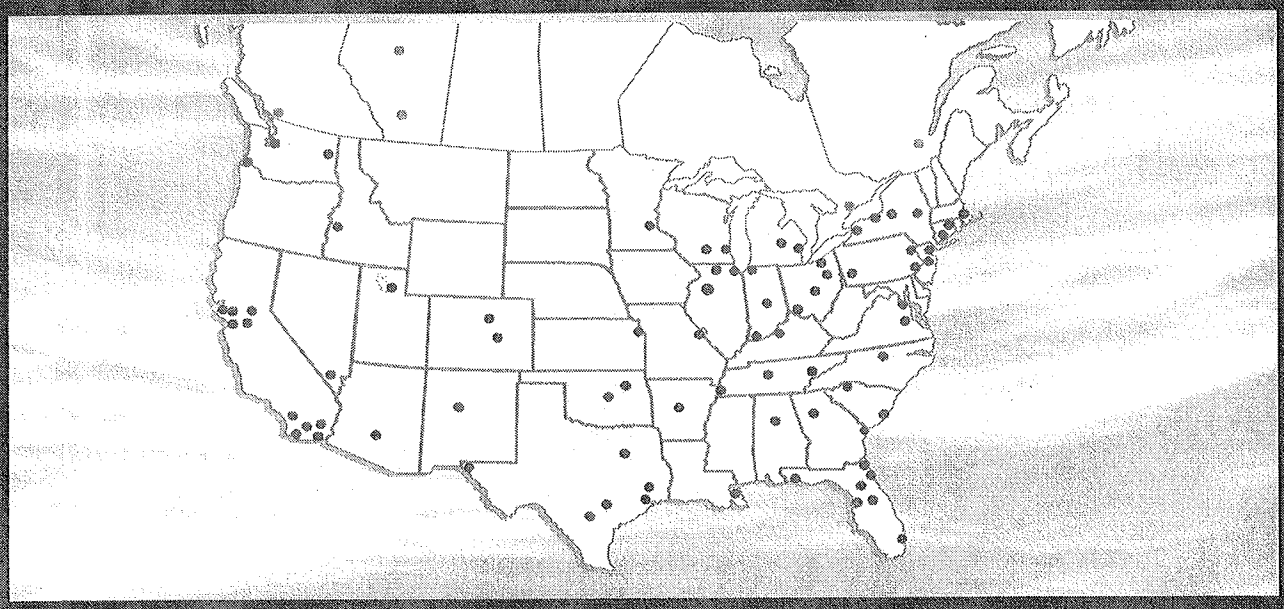
CONTRACT SERVICES

Flexibility plays a major role in USFilter's service strength. Customer-tailored maintenance agreements can be designed to meet any need and budget. Selection of services, service frequency and billing configurations are determined by your needs and can be upgraded at any time. Agreements can include warranty extensions, preventative maintenance, emergency repair, parts and expendables.

LOW FOULING MEMBRANES AND ORGANICS

USFilter was instrumental in the development of low fouling membranes by the manufacturers; however, they were not the sole answer to tough organic fouling applications. USFilter developed a proprietary RO system operation protocol to significantly reduce membrane fouling. The combination of low fouling elements with the operation protocol has changed the cleaning frequency from weekly to once every 4-6 months in some cases. If you have a tough organic fouling problem, USFilter has the answer.

WITH OVER 80 SERVICE CENTERS IN NORTH AMERICA, USFILTER IS READY TO SERVE YOU QUICKLY AND EFFICIENTLY



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In Canada West (Calgary)

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WTC-MEM-BR-0905

GeoLogic Associates

Geologists, Hydrogeologists and Engineers

MEMORANDUM

TO: E. William Hutton, P.C.

FROM: Sarah Battelle, GeoLogic Associates SAB

DATE: March 16, 2007

SUBJECT: **APPLICATION OF PRODUCTION AND EXTRACTION WELLS FOR GROUNDWATER MONITORING PROGRAMS GREGORY CANYON LANDFILL PROJECT SAN DIEGO COUNTY, CALIFORNIA**

At your request, this memorandum documents the practice of using production wells, including domestic water wells, and groundwater extraction wells as part of routine groundwater monitoring programs at solid waste facilities. In our experience with groundwater monitoring and reporting programs at about 70 solid waste facilities within the State, production and groundwater extraction wells are sometimes included in the monitoring program to provide water chemistry data in the vicinity of the particular well. GLA is aware of many production and domestic wells included in monitoring programs including domestic/water supply and production wells adjacent to the Crazy Horse, Johnson Canyon, Jolon Road, Forward, Bonsall, and Twenty-Nine Palms Landfills, and groundwater extraction wells used as sampling points at the Otay, Ramona, Sycamore, and San Marcos landfills.

It should be noted that the purpose of the groundwater monitoring program is to obtain a "sample" of the groundwater in the vicinity of the well. Often, for production wells and groundwater extraction wells, the sample that is collected represents the water that is pumped to the surface for its collection and site use, or human consumption, as applicable. The water chemistry data obtained provide the information needed to evaluate the acceptable nature of the water at the discharge point for site use/consumption. This type of sample is representative of the groundwater under a routine, pumped condition. Using this same sampling method over time, the most recent water chemistry data can be compared with the historical data to assess changes in the chemistry.

To collect a sample that more closely represents the *in-situ* groundwater (i.e., groundwater before it is pumped to the surface), the pump rate may be reduced to produce the least effect (i.e, low turbidity, low levels of mixing and agitation) on the groundwater drawn to the surface. At the Gregory Canyon Landfill site, it is proposed that the pump controller be equipped with a variable frequency drive to allow for a lower flow rate for this purpose. In addition, it is recognized that pumping wells that are water level measuring stations must be shut off for at least a day to allow the water level to reach static conditions before a water level measurement is taken.

If you have any questions, please call me at (858) 451-1136.

16885 W. Bernardo Dr., Suite 305, San Diego, CA 92127 Phone: (858) 451-1136 Fax: (858) 451-1087

Geo-Logic
ASSOCIATES
Geologists, Hydrogeologists and Engineers

MEMORANDUM

TO: William Hutton, Esq.

FROM: Sarah Battelle, Geo-Logic Associates
William Lopez, Geo-Logic Associates

DATE: November 7, 2009

RE: **EVALUATION OF ADDITIONAL PERCOLATING GROUNDWATER RESOURCES ON THE GREGORY CANYON PROPERTY SAN DIEGO COUNTY, CALIFORNIA**

The purpose of this memorandum is to present an evaluation of the available groundwater resources within fractured crystalline rock (percolating bedrock) on the Gregory Canyon property (outside of the pumping wells at the base of the Gregory Canyon watershed) that could be utilized for the landfill project. For this evaluation, three areas were identified including

1. Area 1 - an 82.5 acre basin on the north side of State Highway 76 directly north of the former Lucio Dairy property;
2. Area 2 - a 98.5 acre basin that drains to Couser Canyon that includes portions of the project Stockpile B area; and
3. Area 3 - a smaller, 37.8 acre basin that includes portions of the project Stockpile A area (Figure 1).

Before providing this evaluation of additional groundwater resources, it is important to understand the background for the initial assessment of percolating groundwater within Gregory Canyon as presented below.

BACKGROUND

To estimate the potentially available water within Gregory Canyon, well pumping test data and geophysical test data were used from fractured crystalline bedrock well GLA-3; one of the better water producing bedrock wells within the Gregory Canyon watershed. Downhole geophysical testing (tracer tests) performed in the well borehole indicate that below a depth of 95 feet (approximately 60 feet below the water level), the bedrock fractures in the well bore are less numerous and provide substantially less water production. Therefore, the effective fractured bedrock groundwater resource was interpreted to have a thickness of 60 feet. As described in the 2007 Revised Final Environmental Impact report and Appendix C, Water Supply Report, RockWorks Drawdown Calculator software (RockWare, Inc., 1998), was employed using the pump test data to calculate the drawdown in well GLA-3 after 2000 days (+5.5 years) at discharges of 10, 15, and 20 gallons per minute (gpm). These calculations indicate that pumping rates greater than 15 gpm (21,600 gallons per day [gpd]) will draw the groundwater below approximately 53 feet (near the base of the effective aquifer. Therefore the long-term sustainable yield in GLA-3 was estimated to be approximately 12 gpm (17,280 gpd).

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Recognizing that well GLA-3 was one of a series of seven wells screened in the fractured crystalline bedrock proposed to be pumped along the base of the Gregory Canyon watershed, pumping rates were reviewed, using aquifer pumping test data, for the additional pumping wells to estimate the sustainable yield for wells along the base of the Gregory Canyon watershed. Estimated pumping rates ranged from 1 to 2 gpm in proposed pumping wells (GLA-B, GLA-C, GLA-G and GLA-12), approximately 4 gpm from well GLA-13, and up to 10 gpm from well GMW-1, resulting in an estimated "sustainable yield" cumulative pumping rate of 30 gpm (43,200 gpd) or 48.4 AFY.

Factors that affect the amount of percolating groundwater that can be pumped without significant impact (i.e., sustainable yield) also include the underlying storage capacity of the fractured crystalline rock system, in addition to precipitation and percolation. In fractured crystalline rock, the fracture openings and density decrease with depth, and the effective porosity within the fractured crystalline rock will decrease exponentially with depth. In San Diego County, a depth of 400 feet to 500 feet is generally considered to be the depth at which individual fracture widths are thought to become insignificant. Assuming a total depth of 400 feet is used, an estimated maximum volume of 1815 acre-feet of water may be stored within the crystalline rock fractures in the area occupied by the Gregory Canyon watershed, with only about 50 percent of the stored water actually recoverable. This means that in a given year the pumping of 48.4 AFY of percolating groundwater represents only about 5% of the overall storage capacity[1] within the fractured crystalline bedrock.

In addition, a "safe yield" calculation for Gregory Canyon was also performed to estimate the volume of water that could be pumped from the Gregory Canyon watershed without creating a significant impact to this water resource. The safe yield calculation used available long-term rainfall data from Lake Henshaw of 25 inches, the Gregory Canyon catch basin area of 415 acres, and an assumption that 5 percent of the rain falling within Gregory Canyon would infiltrate the fractured crystalline bedrock. From this calculation, the estimated safe yield associated with the pumping wells at the base of Gregory Canyon was 27 gpm (38,880 gpd); a somewhat lower value than estimated from the "sustainable yield" cumulative pumping data. The greatest potential uncertainty in the safe yield calculation is the annual rainfall estimation. This uncertainty was discussed in the Revised Final Environmental Impact Report (RFEIR)[2].

Comparing these two distinct analytical approaches, the sustainable yield analysis assures no significant impact to this groundwater resource through limiting pumping to a given elevation, to maintain equilibrium and avoid overdrafting. The strategy adopted in the RFEIR to achieve this goal was the use of level controls in each pumping well. The level control would be set to cycle the pump on and off within the limits established by the calculated long-term sustainable yield.[3] Water level controls in each of the proposed pumping wells at the base of Gregory Canyon would be established based on the results of aquifer pumping tests in each well and the resultant long-term (minimum 5-year) sustainable yield, calculated in the same way as for well GLA-3 and generally accepted practices utilized by the County of San Diego[4].

---

[1] *48.4 / (1,815 x 50%) = 5.3%*

[2] *RFEIR, Response to Comments 007-6, Appendix II, 2007*

[3] *Id.*

[4] *County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements, Groundwater Resources, Land Use and Environment Group, March 17, 2007.*

In comparison, the safe yield analysis only looked at precipitation and percolation over a given catch basin area, without consideration of storage capacity or other site-specific data (e.g, soil type, soil moisture, evapotranspiration). However, safe yield can be useful in establishing a general estimate of how much water can be pumped to maintain equilibrium. The strategy adopted in the RFEIR was to utilize safe yield as a monitoring tool to compare actual pumping with calculated safe yield values through the use of flow totalizer meters. That data can be compared over time with the calculated estimated safe yield volume, which is based on average rainfall and percolation.[5]

As described in the RFEIR, through use of these measuring tools, the volume of water stored in the fractures could be controlled over the long term and over a range of climatic conditions to assure no significant impact to the available water resources within Gregory Canyon, and in particular that the volume of water stored within the fractured rock system within the Gregory Canyon watershed would not be over-drafted.

The RFEIR included a project design feature specifying the use of level controls and totalizer meters[6]. However, this project design feature did not discuss the analytical process for calibrating the level controls; therefore, it is recommended that this project design feature be updated to describe the process of establishing the long-term sustainable yield in more detail.

OTHER BASIN AREAS

Without having drilled wells and performed pumping tests in the proposed Areas 1 through 3, as a first approximation of the potential available water resource in these areas, the same rainfall and infiltration rate assumptions were used as the estimated safe yield calculation performed for the catch basin occupied by Gregory Canyon (GLA memorandum dated December 5, 2005). It is recommended that pumping tests be performed and a long term sustainable yield estimates established for each pumping well, along with installation of level controls and a totalizer meters. However, for purposes of the analysis of impacts to these groundwater resources, it is recommended that the calculated safe yield be utilized, as this would establish a conservative estimate of the available percolating groundwater.

As described above, the method uses a simple calculation of the estimated volume of rain (25 inches per year) that falls within the catch basin and assumes that 5% will infiltrate the fractured crystalline rock system and be captured (aquifer recharge). The calculated average rate of aquifer recharge is a function of the area within the catch basin. Based on the three catch basin areas, the following estimated safe yield values were calculated in gallons per day (gpd) and acre-feet per year (AFY):

Area	Acreage	Est. Daily Vol. (gpd)	AFY
1	82.5	7673	8.6
2	98.5	9161	10.3
3	37.8	3515	3.9
	TOTAL	**20,349**	**22.8**

[5] *RFEIR, Response to Comment 007-6, Volume II to 2007 EIR.*
[6] *Id.*

Since there are no proposed modifications to these catch basins (i.e., construction or development) that would have an effect on the ability of the underlying fractured crystalline rock to capture rainfall and no wells that would compete for the water in storage within these catch basins, under the above assumptions, no reduction in the average rate of aquifer recharge would be expected.

The estimated safe yield within Gregory Canyon of 38,880 gallons per day (43.6 AFY) and the estimated safe yield calculated for the three additional site catch basins of 20,349 gallons per day (22.8 AFY), provide an estimate of 59,229 gallons per day (66.4 AFY) of groundwater from the fractured crystalline rock system that may be captured, stored and used on the project site. It is recognized that the safe yield volume will be reduced as the Gregory Canyon watershed area is reduced (a portion of the recharge area is removed by landfill construction), ultimately reducing the main canyon estimated safe yield (43.6 AFY) by 19.4 AFY to 24.2 AFY or 21,576 gallons per day when the 183-acre landfill footprint is fully constructed. No change in recharge will occur in the three additional catch basins.

It is recommended that the same safe yield and sustainable yield analyses, strategies and tools be incorporated as a project design feature for the three other percolating groundwater catch basins on the landfill property. Once the pumping wells are installed, pump tests will be performed to calculate a long-term sustainable yield pumping rate and maximum allowable drawdown for each pumping well location to avoid over-drafting and prevent significant impacts to the water resource. In addition, given the proximity of the Area 1 and Area 3 bedrock pumping wells to the Pala Basin alluvial aquifer, it is recommended that an alluvial monitoring well be installed in the vicinity of the Area 1 and Area 3 pumping wells to monitor alluvial groundwater elevations during the pumping tests and provide verification that the bedrock wells are not drawing water from the alluvium.

VERIFICATION ANALYSIS

As noted above, without pump test data for each well, there will be uncertainty regarding the exact amount of percolating groundwater that can by pumped and utilized with no significant impact to water resources. The largest source of uncertainty results from climatic factors, and in particular, fluctuations in the amount of rainfall.

In order to provide ongoing verification of a less than significant impact, it is recommended that each pumping well undergo a new pumping test on a bi-annual basis (every other year), the sustainable yield re-calculated using RockWorks Drawdown Calculator software (or an equivalent method approved by the LEA), and the level controls re-set based on the results of the calculation of long term sustainable yield.

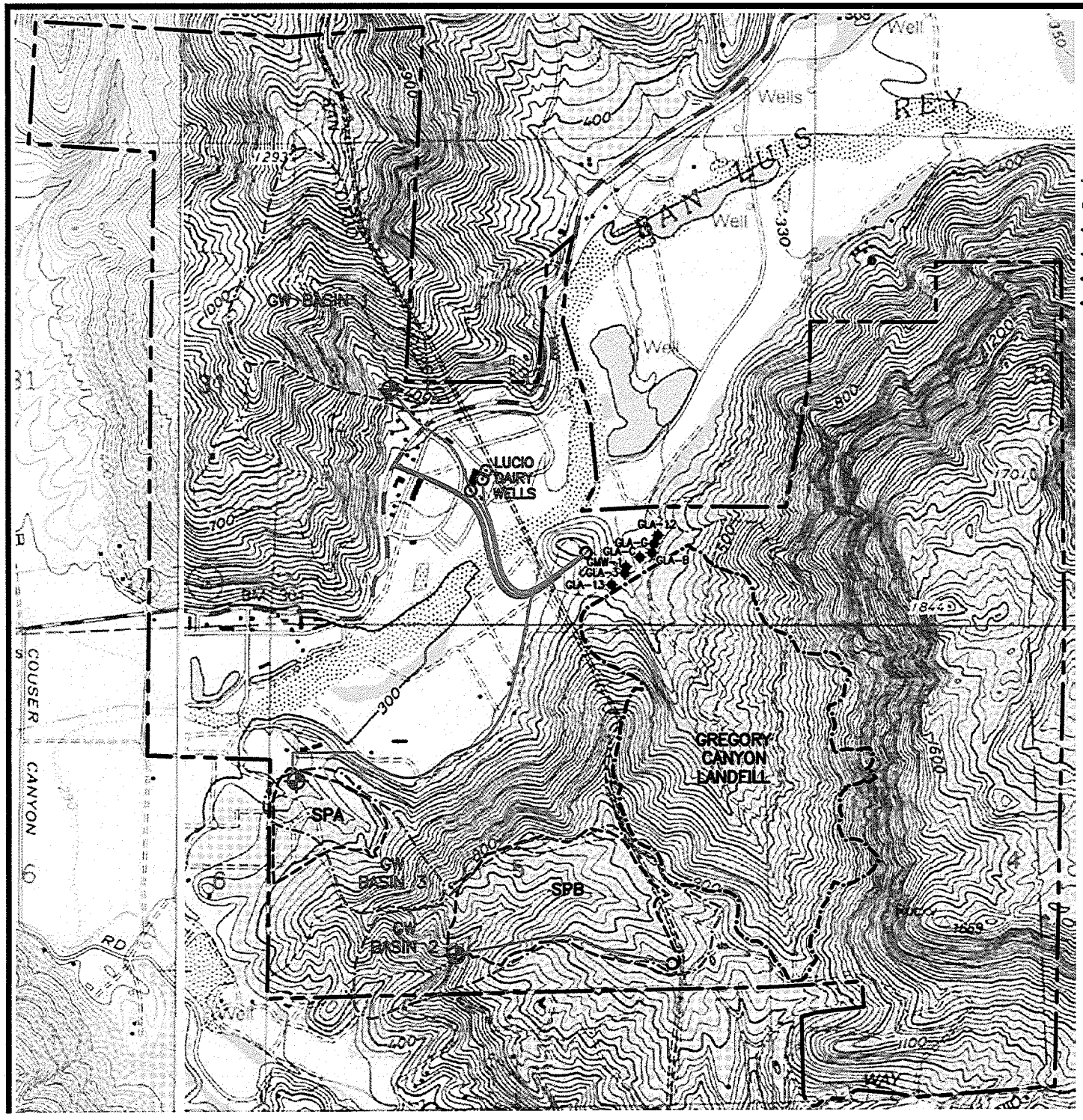
Alluvial groundwater capture will also be evaluated to ensure that groundwater extracted from crystalline bedrock wells does not draw groundwater from the alluvial aquifer. It is recommended that alluvial wells MW-3 and proposed alluvial well GMW-2A be used as observation wells during the pumping tests performed for crystalline bedrock wells GLA-3, GLA-12, GLA-13, GLA-B, GLA-C, GLA-G, and GMW-1. If drawdown is measured in the adjacent alluvial observation wells during the pumping test, the pumping rate will be adjusted so that no measurable drawdown is indicated in these alluvial observation wells.

Finally, a safe yield evaluation will be undertaken on a bi-annual basis, comparing the calculated safe yield with actual pumping rates obtained from the totalizer meters. Based on this comparison, coupled with the bi-annual sustainable yield analysis, a recommendation regarding additional modifications to pumping rates will be submitted to the LEA for review and concurrence.

To the extent there is a shortfall in the available supply of percolating groundwater from the four catch basins in aggregate, as determined by a drop in the groundwater level below the long term sustainable yield determined depths, the landfill would utilize trucked recycled water, as was presented in the RFEIR and analyzed in the 2009 Addendum.[7]

I hope that this memorandum assists you in the assessment of available on site groundwater resources for the Gregory Canyon Landfill project.

[7] *RFEIR, Response to Comments 007-6, Appendix_ to 2009 EIR Addendum.*



EXPLANATION:

- PERCOLATING GROUNDWATER WELL
- RIPARIAN GROUNDWATER WELL
- PROPOSED PERCOLATING GROUNDWATER WELL
- WATER TANK(S) LOCATION
- PROPOSED PIPELINE ROUTE
- ACCESS ROAD
- STOCKPILE AREA BOUNDARY
- APPROXIMATE LIMIT OF GROUNDWATER BASIN
- LANDFILL LIMIT
- PROPERTY BOUNDARY

REFERENCE: USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) PALA (1997) AND BONSALL (1975) CALIFORNIA QUADRANGLES

N

GRAPHIC SCALE
600 0 300 600 1200
(in feet)

FIGURE 1

PROPOSED ON-SITE PUMPING WELLS

GREGORY CANYON LANDFILL
SAN DIEGO COUNTY
CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
M	DECEMBER 2000	0530

APPENDIX G-2

WORKPLAN FOR ADDITIONAL GROUNDWATER MONITORING WELL INSTALLATION AND WELLHEAD PROTECTION AREA IDENTIFICATION AT THE PROPOSED GREGORY CANYON LANDFILL SITE

WORKPLAN FOR ADDITIONAL GROUNDWATER MONITORING WELL INSTALLATION AND WELLHEAD PROTECTION AREA IDENTIFICATION AT THE PROPOSED GREOGRY CANYON LANDFILL SITE

1.0 INTRODUCTION

This workplan has been prepared for Gregory Canyon Ltd. to present a proposed approach to enhancing the existing groundwater monitoring system and identifying the wellhead protection area for the proposed Gregory Canyon Landfill (GCL) site in northern San Diego County, California. The work outlined herein is intended to address issued raised by the San Diego Regional Water Quality Control Board in their Tentative Waste Discharge Requirements (WDRs) and incorporates third-party recommendations for additional groundwater monitoring.

2.0 BACKGROUND

2.1 PROPOSED SITE DEVELOPMENT

The proposed Gregory Canyon Landfill site occupies 1770 acres in northern San Diego County approximately three miles east of Interstate 15 (I-15) and two miles southwest of the community of Pala (Figure 1). State route 76 (SR-76) and the San Luis Rey River run east-west through the project site. The Gregory Canyon Landfill Project includes the construction of a lined landfill, two soil stockpiles, and ancillary structures including an access road and bridge from SR-76 to the landfill; a scale area; a recyclable goods collection center; a facilities and operation area; a leachate collection and removal system (LCRS) including storage tanks; surface water control facilities, including desilting basins; a water treatment plant; a visitors' center; an administration building; a maintenance office; a shop and yard; a fueling station/storage area; a water tank; truck wash and wash-water treatment area; groundwater extraction and monitoring wells; a landfill gas collection and recovery system; and a groundwater subdrain collection system. Approximately 308 acres of the 1,770-acre site will be used for landfill activities.

2.2 LANDFILL SITE DESCRIPTION

Elevations within the landfill site range from approximately 1,200 feet above mean sea level (amsl) at the head of Gregory Canyon at the south, to 300 feet amsl at the mouth of the canyon in the San Luis Rey River drainage. Much of the canyon is steep, rugged terrain containing numerous boulder outcrops on the eastern side with only a few isolated boulders on the west canyon wall. The canyon flattens somewhat at the mouth where it meets the alluvial deposits of the San Luis Rey River drainage. A prominent knoll extends into the drainage channel on the west side of the canyon mouth.

2.3 SITE GEOLOGY

Several geologic units occur within the project site. In the lower portions of Gregory Canyon, a thin veneer of unconsolidated residual soils, colluvial, and alluvial deposits mantles a substrate of weathered tonalite. The topographic highs bounding the canyon are formed by igneous intrusive and metamorphic rocks with varying degrees of weathering. The following subsections describe in detail the geologic units that are exposed at the site. Plate 1 is a site geologic map.

Surficial Soils: According to Woodward-Clyde (1995), the topsoil units encountered in the area vary in thickness from about six inches to three feet, and are composed of silty sand, silty sand with clay, and silty sand with cobbles and boulders. In general, it is expected that the steeper, upper slope area of the landfill site include slightly thinner soil accumulations than the intermediate or lower slope areas. Underlying the topsoil are residual soil horizons or weathered bedrock.

Alluvium: Two alluvial units have been mapped at the lower elevations near the mouth of Gregory Canyon. The younger unit, Qal-1 is formed by overbank deposits from the active San Luis Rey river channel, which are interbedded with channel deposits from the Gregory Canyon drainage. These deposits are relatively thin and contain gravels, cobbles and boulders, supported by a sandy silt matrix. The older alluvial subunit, Qal-2, is a terrace remnant of older alluvium from the Gregory Canyon drainage.

Though the alluvial wedge pinches out to the south, to the north the wedge thickens until eventually it merges with the channel deposits of the San Luis Rey River. Well GMW-2, near the mouth of the canyon, encountered a 50-foot section of alluvial deposits before reaching the underlying bedrock.

Colluvium: Colluvium forms a veneer over most of the surface of the proposed landfill site. In most instances it consists of silty sand with rock clasts that range in size from gravel to very large boulders. Finer-grained deposits, largely devoid of rock clasts, were encountered in test pits located at the southern end of the canyon. Older colluvium was also encountered, and consisted of clayey sand to sandy clay with varying rock content and slight to moderate cementation.

Rock clasts exposed at the surface of the colluvial veneer vary from gravel- to boulder-size material. Boulders of leucogranodiorite, some in excess of 20 feet in maximum dimension, are present along much of the eastern sideslopes. Based on borings drilled during previous investigations, it appears that boulders are extensive in the subsurface.

The thickness of the colluvial deposits in the landfill site area is highly variable. Cross-section interpretations by Geraghty & Miller (1990) show thickness variations from 2 to 50 feet. The upper slope area is likely to be underlain by thin colluvial deposits and surficial soils formed on highly weathered crystalline rock. Debris chutes and drainage channels may be locally backfilled with colluvium of moderate thickness, but in general, the upper slopes are not likely to be underlain by thick, laterally continuous deposits of colluvium. Lower slope areas are expected to be underlain by much deeper and laterally extensive colluvial deposits consisting of a matrix of silty sand and clay around larger cobbles and boulders.

The current grading plan calls for removal of surficial soil and loose colluvium over the entire footprint of the landfill.

Metamorphic rocks: The metamorphic rocks present along the easterly slopes of Gregory Canyon form a north-south-trending belt of older rock that was intruded by batholithic rocks (Plate 1). Specifically, the tonalite intruded and intermingled with the metamorphic rock, and both units were subsequently intruded by the leucogranodiorite.

The metamorphic rocks include amphibolites and metavolcanic rocks that locally exhibit some migmatitic structure that resembles gneissic banding. The rocks are generally dark blueish gray, hard, and only slightly weathered with aphanitic to porphyroblastic textures. Relict porphyritic textures suggest a volcanic protolith for some of the units.

Of the 196 acres of the proposed landfill footprint, approximately 12 acres along the eastern side encroach over the outcrop of metamorphic rocks.

Bonsall Tonalite: The Bonsall Tonalite is exposed throughout the center of the site and is a dark gray rock, with medium to coarse crystallinity that includes a variety of related rock types such as gabbro. Other common variations noted in the tonalite are the locally veined and streaked appearance and the migmatitic fabric that is observed near the contact with the metamorphic rocks. The rock is also characterized by rare inclusions of the metamorphic rocks, and by numerous leucogranodiorite dikes that include fine-grained aplites and coarse-grained pegmatites.

The Bonsall Tonalite is moderately to intensely weathered in most outcrops, although small cores of only slightly weathered tonalite form boulder knobs in the western flank of Gregory Canyon. Moderately weathered tonalite still preserves its phaneritic texture, but the weathered rock is less cohesive than the pristine rock, and the constituent minerals are slightly altered to oxides and clays, particularly along the edges. The intensely weathered tonalite has a granular texture that only vaguely recalls the original phaneritic texture, and is oxidized throughout. The constituent minerals are partially altered to oxides and clays, and disaggregate easily under pressure. Depth of weathering, as determined from exploratory drilling, ranges between 10 feet (GLA-E) and about 100 feet (GLA-G).

The tonalite comes in contact with the metamorphic rock along the easterly side slopes of Gregory Canyon, although the contact is typically covered by colluvium or obscured by surficial soils. Based on its map position, as inferred from isolated outcrops of both rock types, the contact appears to dip to the east at angles of 20° to 25°.

Leucogranodiorite: The leucogranodiorite map unit is a light-colored, biotite-bearing granodiorite that forms the prominent mountain flanking the eastern side of Gregory Canyon. In hand specimen, the rock has a phaneritic texture with medium- to coarse-crystallinity, is light gray to buff, and has less than 5% dark minerals (biotite and iron-titanium oxides). Quartz, plagioclase, and potassium feldspar are the dominant felsic minerals.

Besides forming the core of Gregory Mountain, the leucogranodiorite also forms dikes that cut older units. The dikes vary in thickness from less than an inch up to five feet, and in most instances are pegmatitic. The degree of weathering of the leucogranodiorite is generally slight, as can be inferred from the bold outcrops of Gregory Mountain. The dikes, on the other hand, vary in degree of weathering from low to moderate. Moderately weathered dikes are pervasively oxidized and have "cloudy" feldspars, but still preserve their phaneritic texture.

The main body of the leucogranodiorite is in intrusive contact with the metamorphic band of rocks midway along the easterly side slope of Gregory Canyon. The contact zone is narrow and abrupt where it can be observed, but is generally buried under talus. Based on its map position, as inferred from the abrupt change in topography, the contact is nearly vertical.

2.4 HYDROGEOLOGY

Gregory Canyon is located in an area dominated by crystalline rocks with intervening alluvial valleys. Limited groundwater exists in the fractures within the crystalline rocks compared with the groundwater stored in alluvial sediments. Provided herein is a discussion of the hydrogeologic characteristics in the region surrounding Gregory Canyon.

Regional Hydrogeologic Setting: The Gregory Canyon watershed is tributary to the San Luis Rey River and is part of the San Luis Rey Hydrologic Unit. This hydrologic unit encompasses a semi-rectangular area of about 565 square miles, extending from Warner Springs to the east to the Pacific Ocean to the west, and is divided into several basins, the boundaries of which are drawn where the basement complex (hard crystalline rock) is exposed at the surface and where distinct bedrock constrictions in the San Luis Rey Valley segment the valley fill.

The GCLF site is located to the south and adjacent to the Pala Basin boundary, which covers approximately 4,500 acres. The Pala Basin is approximately eight miles long and averages about 0.5 mile in width, and has a maximum alluvial thickness in excess of about 244 feet, based on USGS studies. At well GMW-2, located near the southern edge of the Pala Basin at the mouth of Gregory Canyon, the thickness of alluvium is about 50 feet (G&M 1990).

Site Hydrogeology: There are two distinct groundwater zones within Gregory Canyon. An alluvial aquifer hosted by the sediment wedge at the mouth of the canyon, and a fractured bedrock system comprising the fractured tonalite that forms the substrate of the canyon. The general direction of groundwater movement in both aquifers is northerly, toward the alluvial aquifer of the San Luis Rey River.

The alluvial aquifer occupies the lower reaches of Gregory Canyon, though it pinches out to the south (as indicated by dry wells MW-4, WCC-1, WCC-2, and MW-5). Groundwater within the alluvium forms an unconfined aquifer recharged by direct infiltration from precipitation or runoff from the bedrock ridges east and west of the canyon, and by underflow through weathered bedrock. The available data suggest

groundwater flow is to the north, under a gradient of about 0.045 ft/ft. Measured hydraulic conductivity of alluvial and colluvial materials in Gregory Canyon ranges between 0.9 and 16 gpd/ft^2.

The bedrock system is monitored by 19 bedrock monitoring wells within the proposed landfill footprint and along the periphery of the site, constructed during various investigative phases of the project. Studies conducted to date indicate that groundwater in Gregory Canyon can be characterized as a fracture-controlled, interconnected flow system. This fracture-controlled groundwater communicates with, and recharges the alluvial water in the San Luis Rey River valley (Pala Basin). The fractured bedrock flow system can be differentiated into an upper zone of active flow through a network of interconnected fractures and weathered rock, and a deeper zone of relatively low flow through more widely spaced fractures. Boreholes drilled within the canyon itself encountered tonalite with various degrees of hydrothermal alteration, and significant fracturing in the upper 50 to 100 feet. Water-bearing fractures become sparse at depths greater than 100 feet.

Groundwater in the bedrock generally mimics the canyon topography, converging along the axis of the canyon and then flowing to the north at a gradient of about 0.13 feet per foot. Aquifer pump testing conducted on wells near the mouth of the canyon indicate hydraulic conductivity values for the bedrock flow system range from 1.75E-05 to 26.5 feet per day, with the variation resulting from fracture density, aperture, and infilling.

2.5 EXISTING GROUNDWATER MONITORING SYSTEM

The existing monitoring well network includes 19 monitoring wells and eight piezometers. One additional fractured (unweathered) bedrock well, GLA-18, will be drilled during landfill development in an area that is currently inaccessible. The existing monitoring network is summarized on the following table:

Well Position	Monitored Unit	Wells
Upgradient (Background)	Unweathered Bedrock	GLA-4, GLA-5, and GLA-11
	Alluvium	Lucio #2R
Downgradient (Compliance)	Alluvium	GMW-3, GLA-16, SLRMWD Well 34R
	Weathered Bedrock	GLA-14, GLA-B, GLA-C, GLA-G, and GMW-1
	Unweathered Bedrock	GLA-A, GLA-D, GLA-E, GLA-F, GLA-2, GLA-12, and GLA-13
Piezometers	Weathered Bedrock	GLA-3, GLA-7, GLA-10, GMW-2, and GMP-2.
	Unweathered Bedrock	GLA-1, GLA-8, and GMW-4.

Sampling of 15 representative landfill wells (GLA-2/2R, GLA-4, GLA-5, GLA-11, GLA-12, GLA-13, GLA-14, GMW-1, and GLA-A through -G and four wells within the San Luis Rey River valley (GMW-3, Lucio #2/2R, SLRMWD #34/34R and GLA-16) has been conducted on a quarterly to bimonthly basis, and the data are being used to develop a database on the water quality prior to landfill activities. Water levels are also measured on a quarterly to bimonthly basis from wells and some key piezometers listed above.

2.6 INDEPENDENT GROUNDWATER MONITORING NETWORK EVALUATION

In response to groundwater monitoring conditions outlined in the tentative Waste Discharge Requirements and associated Monitoring and Reporting Program issued by the San Diego Regional Water Quality Control Board, Gregory Canyon Limited contracted Dr. David Huntley of San Diego State University to conduct an independent, third-party evaluation of the adequacy of the proposed groundwater monitoring program for the GCLF. Dr. Huntley concluded that, although a release from the landfill would be attenuated within 50 feet of reaching alluvial soils, the current monitoring network does not contain sufficient discrete monitoring of the alluvium and unweathered bedrock groundwater flow systems along the thalweg/axis of Gregory Canyon. Dr. Huntley's technical memorandum is included as Attachment 1 to this workplan. This workplan is designed to address the need to enhance the existing groundwater monitoring network as outlined in this independent evaluation.

3.0 PROPOSED MONITORING WELL CONSTRUCTION

To enhance the existing groundwater monitoring network as outlined in Dr. Huntley's independent evaluation of the GCLF groundwater monitoring program, Gregory Canyon Ltd is proposing to construct five new monitoring wells at the site. The siting criteria, drilling and construction methodologies, and aquifer testing to be performed are described in detail below.

3.1 SITING CRITERIA

The independent evaluation identified that some of the existing wells along the Gregory Canyon Landfill Point-of-Compliance are not ideally situated or constructed for discrete evaluation of groundwater in the alluvium and unweathered bedrock. The independent assessment recommends the following:

- One monitoring well screened solely in the canyon alluvium along the canyon thalweg.
- One monitoring well screened solely in the weathered bedrock west of the canyon thalweg.
- One monitoring well screened solely in the unweathered bedrock along the canyon thalweg.
- Two monitoring wells screened solely in the unweathered bedrock to the east of the canyon thalweg.

Based on the recommendations for additional monitoring wells, Gregory Canyon Ltd proposes the following monitoring well locations:

Well GMW-2A: As shown on Plate 1, this alluvial monitoring well will be constructed within 20 feet of existing monitoring well GMW-2. The proposed location for well GMW-2A provides the closest approach to the landfill where the canyon alluvium can be consistently monitored. Based on the log for well GMW-2, well GMW-2A will be approximately 45 feet deep.

Well GLA-19: As shown on Plate 1, well GLA-19 will be located along the Point-of-Compliance approximately 90 feet west of GLA-3. The purpose of this well is to provide discrete monitoring of the weathered bedrock to the west of the canyon thalweg, complementing the Point-of-Compliance weathered bedrock monitoring system provided by existing wells GMW-1, GLA-C, GLA-B, and GLA-G and filling a perceived potential gap to the west of these four wells. Together, these five wells provide thorough coverage of the weathered bedrock flow system along the Point-of-Compliance as illustrated on Plate 2.

Well GMW-1D: As shown on Plate 1, well GMW-1D will be located along the Point-of-Compliance adjacent to weathered bedrock well GMW-1, but will be screened solely in unweathered bedrock. The location for this well was selected to address a concern raised in the independent evaluation that the canyon axis may represent an area of increased fracture density that may continue into the deeper unweathered bedrock. Drilling of well GMW-1D, as well as the other unweathered bedrock monitoring wells, will continue until water-producing fractures are encountered, but no greater than 400 feet below the ground surface.

Well GLA-CD: This well will be located along the Point-of-Compliance approximately 35 feet west of weathered bedrock well GLA-C, as shown on Plates 1 and 2. The location of this well was selected to provide unweathered bedrock monitoring capability along the canyon axis. It is anticipated that this well will be no deeper than 400 feet.

Well GLA-BD: Located just west of weathered bedrock well GLA-B, this well along with wells GLA-CD and GMW-1D will provide three compliance monitoring points along the canyon axis at the Point-of-Compliance for discrete unweathered bedrock monitoring. This well is anticipated to be drilled no deeper than 400 feet. The relatively short distance between wells GMW-1D, GLA-CD, and GLC-BD (about 270 feet) also provides an opportunity to stress the unweathered groundwater flow system and determine flow characteristics and interconnectedness of fractures between the unweathered, weathered, and alluvial flow systems.

3.2 DRILLING

Following approval of this workplan, Gregory Canyon Ltd will obtain drilling permits from the County of San Diego Department of Environmental Health.

All monitoring well drilling will be conducted under the supervision of a State of California Registered Professional Geologist by a C-57-licensed well drilling professional firm using dual wall reverse air-rotary methods (or equivalent). Well GMW-2A is proposed to be terminated in alluvium at a depth of approximately 45 feet below ground surface. As shown on Plate 2, Well GLA-19 is to be screened in weathered bedrock at a depth of approximately 75 feet. Wells GMW-1D, GLA-CD, and GLA-BD will be screened in unweathered bedrock to a maximum depth of 400 feet each.

3.2.1 Decontamination

Other than factory decontaminated and plastic wrapped well casing and disposable bailers, all materials entering the borehole or wells will be decontaminated on site. Decontamination will be accomplished using a stiff brush, steam-cleaner and non-phosphate detergent, followed by a double rinse using potable water.

Decontamination of the drill rig will be required prior to arrival at the site. As the site is in a native condition, no further decontamination of the rig will be required unless fuel or hydraulic leakage occurs. In this case, decontamination will be performed at a pre-selected location on the property. At this location, the well contractor will establish a decontamination "pad" where all decontamination waters will be contained and collected on visqueen sheets. All decontamination waters will be transferred from the sheeting to drums for later disposal. The contractor shall also provide racks to enable thorough cleaning of drill rods and equipment. Following decontamination, drill rods will be allowed to air dry on the racks before transport to the new drilling location. Any decontaminated materials that are not utilized within one-half day shall be wrapped in plastic in preparation for later use.

3.2.2 Borehole Drilling

All drilling and well construction operations will be completed in accordance with procedures approved by the San Diego County Department of Environmental Health Services and listed in California Department of Water Resources (DWR) Bulletin 74-90. Drilling will be accomplished using either Dual-Wall Reverse-Circulation Percussion-Hammer (Reverse Circulation), Air-Rotary Casing-Hammer (ARCH), or equivalent drilling methods. These methods are considered acceptable provided that:

- Casing separates the borehole from native materials to the full depth of the borehole.
- Drilling fluids (mud or foam) are <u>not</u> be utilized.
- If required by drilling conditions, potable water may be injected in a "misting" manner with the prior approval of the geologist and providing that the well contractor demonstrates by approved laboratory analyses (EPA 601/602 and EPA 314.0) that the water source and storage vessel are suitable for this purpose.
- The drilling air source is equipped with an approved filter.
- A temporary borehole protective cover of steel sheeting will be placed on the entry hole during any breaks in the drilling process. In the event that a borehole needs to be abandoned during the drilling program, the hole will be sealed by placement of a neat cement slurry (with 5 percent bentonite by weight) using tremie pipe and positive displacement techniques.
- After the boreholes are drilled to the target depths, downhole geophysical logging methods, including optical televiewer and fluid conductivity logs, will be employed to establish zone of water production and to determine the final well design.

3.2.3 Soil Sampling

Grab soil samples will be obtained from the drill cyclone at 5-foot vertical intervals, or whenever a change in lithology is noted, through the entire depth of the borehole.

3.2.4 Cuttings Disposal

The GCLF site has no known subsurface contamination. As a result, drill cuttings will be left at each well site. The cuttings will be spread in such a manner that they do not impede or significantly alter surface water drainage patterns or impact identified sensitive habitat. .

3.2.5 Disposal of Waters Generated During Drilling

Water may be generated during drilling, well installation and well development. Because there is no known groundwater contamination, water generated during drilling will be discharged to the ground surface in a manner that does not create a pond, cause erosion, or affect identified sensitive habitat. In addition, no water will be allowed to flow to the San Luis Rey River.

3.2.6 Borehole Logging

All drilling operations will be observed continuously and all samples, drill cuttings and changes in drilling conditions will be logged by or under the direct supervision of a State of California Registered Professional Geologist. Boring logs will be prepared for each well boring, and include descriptions for the following items:

- Borehole designation and location.
- Times and dates that drilling-excavation began and ended.
- Type of drilling equipment used, including manufacturer, make, and model for any special modifications.
- Name(s) of geologist(s) responsible for log description.
- Name(s) of other personnel assisting in the logging.
- Description of soils according to the Unified Soil Classification System (including Munsell Soil Color identification) and accepted geologic nomenclature.
- Systematic descriptions of litho logic and structural changes in strata or soil horizons including thickness of units, as well as depth and elevation of changes.
- Observation of bedrock fracturing
- Presence and depth of groundwater.
- Caving or sloughing conditions in the hole including depth and elevation.
- Sampling interval(s), including depths and elevations.
- Any unusual color, staining, or odors of chemical or waste origin.
- Drilling advancement in feet per hour (average) and/or feet per minute, noting any periods of difficult of very easy drilling.
- Any subsurface structures or unusual features encountered.
- Other notes and descriptions as appropriate.

3.2.7 Borehole Geophysical Testing

Borehole geophysical testing will be conducted in the boreholes for wells completed in the weathered and unweathered bedrock to identify water producing zones for final well design. Geophysical methods will include oriented optical televiewer logging to identify zones of fracturing and fracture orientation and fluid conductivity logging to identify water-producing zones in each borehole. The information obtained from the geophysical tests will be used to determine the location and length of the screened intervals in the bedrock wells.

3.3 AQUIFER TESTING

With the exception of well GMW-2A, which will be screened across alluvial soils, the proposed wells will be screened across fractured bedrock. Because the fractures may be more transmissive than traditional well screens and filter packs, aquifer testing will be conducted in the open borehole so that potential hydraulic restrictions from the well materials do not affect the results of the test.

It is currently planned that both a step-drawdown test and a constant rate pumping test will be performed, using wells within an approximately 200-foot radius as observation wells. The purpose of the step-drawdown test is to determine a sustainable pumping rate for the long-term constant rate pumping test. The constant rate pumping test will be conducted for 48 to 72 hours to evaluate communication between wells along the Point-of-Compliance and to determine whether the unweathered bedrock is indeed a discrete groundwater flow system. The aquifer tests will also provide additional information regarding the adequacy of well spacing along the downgradient Point-of-Compliance.

Aquifer Testing Procedure

For both aquifer pumping test methods, the groundwater level response to pumping will be continuously recorded using calibrated pressure transducers connected to a surface data logger or a submersible data logger/pressure transducer (such as a Hermit Troll™). The results of the tests will be downloaded to a computer and analyzed using recognized techniques (e.g., Theis, Cooper/Jacob, Hantush, Neuman, etc.) and computer software (i.e., SATEM, AQTESOLV, etc.). The step-drawdown test will be conducted in two- to four hour steps to determine an optimal pumping rate for the constant rate, long-term pumping test. The constant rate pumping test will be conducted for a period of up to 72 hours to determine the performance characteristics of the well and the hydraulic parameters of the aquifer. Once sufficient pumping test data have been obtained, the pump will be turned off, and the data loggers will record the aquifer recovery period. Pumping test data will then be downloaded and analyzed to assess the transmissivity, storativity, and specific yield of the wells.

The following table summarizes the proposed aquifer testing layouts:

Pumping Well	Observation Wells
GLA-CD	GMW-1, GMW-1D, GLA-B, GLA-BD, GLA-C, GLA-3, and GLA-10
GLA-BD	GLA-B, GLA-C, GLA-CD, GLA-G, MW-3, and GMW-1D
GLA-19	GLA-13, GLA-3, GMW-1, GMW-1D, and GLA-D
GLA-1D	GLA-3, GLA-19, GMW-1, GLA-10, GLA-C, and GLA-CD

Extensive aquifer testing has been conducted in the past at the site, resulting in pumping at wells GLA-G, GLA-13, GLA-3, GLA-8, and GLA-B. The aquifer tests proposed in the preceding table will supplement hydrogeologic information obtained from past tests and will help ensure adequate groundwater monitoring and hydrogeologic information for the wellhead protection area analysis described in section 4.0 of this workplan

Because groundwater quality data indicates that there are no impacts to groundwater, the RWQCB has given verbal permission for discharge of the pumped water to the ground as long as it does not reach the San Luis Rey River. It is anticipated that up to 40,000 gallons of water could be generated during the pumping tests.

3.3 WELL CONSTRUCTION

The monitoring well design configuration is summarized on the following table.

Monitoring Well Design Summary

Screened Interval	Variable (20 feet)
Borehole Diameter	10 inch (minimum)
Well Casing Diameter	4-inch
Casing Material	SCH. 80 PVC
Screen Material	SCH. 80 PVC with 0.020-inch slots
Filter Pack Material	#3 Monterey
Intermediate Well Seal (above sand)	Bentonite Chips (no pellets) 10 feet (min.) thick
Well Seal	Neat cement (Type I/II) with 5% bentonite
Surface Improvements	5-foot x 5-foot by 4-inch concrete pad. 8-Inch diameter, lockable, steel riser. Four 3-inch diameter, concrete-filled traffic control bollards, if needed.

3.3.1 Well Installation

All well construction practices will be in accordance with the California Well Construction and Abandonment Procedures (DWR Bulletin 74-90), and with well construction standards established by the San Diego County Department of Environmental Health.

Well Materials – Well materials shall consist of the following:

- Well casing and screen will be virgin, decontaminated and factory-sealed well materials.
- All well materials shall be covered with plastic when delivered on site and shall remain covered until used in construction.

- The permanent groundwater monitoring wells will be constructed using 4-inch I.D. Schedule 80 PVC casing in 10-inch (minimum) diameter boreholes. Wells screens shall also be 4-inch I.D. Schedule 80 PVC (Figure 4) with the screen length to be approximately 20 feet (based on geophysical test results).
- Well screen shall be slotted in the factory at widths appropriate to the screened formation and filter pack (anticipated to be 0.040-inch).
- All casing and screens will be flush-threaded, and a threaded bottom plug will be placed at the base of the wells. No glue or solvents will be used to join the pipe sections.
- Stainless steel centralizers will be installed at the top and bottom of the screened interval and at 50-foot increments along the blank casing.

Installation Methods - The annulus around the screen interval will be filled with the appropriate filter pack, using tremie placement techniques, and the sand will be surged and settled concurrent with placement. Filter packs will consist of commercial washed and graded sands. Well filter packing will extend from one foot below the bottom of the screened interval to a minimum of two feet above the screened section. Depth soundings will be performed to evaluate the thickness and uniformity of the sand pack and to assure that no bridging occurs.

A minimum 10-foot thick, hydrated, granular bentonite seal (chips) shall be placed above the filter pack. The bentonite will be hydrated after placement using a minimum of 20 gallons of commercially-obtained water introduced after every 2.5-foot of bentonite placement. After introduction of the water, the bentonite seal will be allowed to hydrate for a period of not less than one-half hour prior to placement of overlying slurry seal materials. Depth soundings will be performed to evaluate the thickness and uniformity of the bentonite seal and to assure that no bridging occurs.

The remaining annulus of the borehole above the hydrated bentonite seal will be sealed with a neat cement (with 5 percent bentonite by weight) slurry seal placed by tremie pipe using positive displacement techniques. The annulus slurry seal materials will consist of commercial well sealing cement (Portland Type I/II) and bentonite, and have a water to cement ratio that includes no more than 8 gallons of water per sack of cement.

Well Head Security - Following permanent well installation and well development, a temporary lockable cover will be placed to secure the well. Eight-inch diameter steel conductor casing will be placed over the top of the permanent well casing and a 5x5-foot by 4-inch thick concrete pad will be constructed around the well casing. As needed, four (4) 3-inch diameter, concrete-filled traffic control bollards will be installed at its corners and one of the bollards will be installed within 4-inch diameter steel sleeve to allow for later removal of the bollard and access to the well by service equipment.

3.3.2 Well Development

Following construction, the annular grout will be allowed to cure for a minimum of 24 hours prior to final well development. At that time the wells will be developed using a bailer and surge block and by pumping and surging with a well development pump until

visually clear water is discharged from the well, and the temperature, pH, and specific conductivity of discharge water stabilizes.

Well development records will be recorded on a Well Construction Summary log, and will include the following information:

- Name of geologist.
- Total depth of well, casing diameter, and well volume.
- Starting groundwater level.
- Time log of groundwater removal, general clarity, temperature, pH, and electrical conductivity.
- Total well volumes removed.
- Pump flow rate.
- Final depth to water.

3.3.3 Construction Documentation

A well construction summary report will be prepared for submittal to the RWQCB and State of California Department of Water Resources following installation of the new monitoring wells. The report will include a time log of well construction activities, boring logs, and individual well schematics showing well construction details. At a minimum, well construction logs will include the following information:

- Name of geologist and drilling contractor,
- Date and times of drilling and well construction,
- Drilling and well construction methods,
- Drilling fluid composition (if any),
- Type of drill rig,
- Total borehole and well depths,
- Elevation of first groundwater,
- Elevation of groundwater after development of the well,
- Diameter of borehole and casing,
- Length, elevation, and materials used in casing and screen intervals,
- Length, elevation, and materials used for sand filter packs, bentonite chips and grout seals,
- Methods of construction including depth of tremie, quantity of water added, and spacing of casing centralizers,
- Surface completion details, and
- Survey coordinates and elevations of ground surface and top of casing.

3.4 GROUNDWATER SAMPLING

Following construction of the five new monitoring wells, each well will be sampled for the routine monitoring parameters and the list of constituents of concern (COCs) outlined in Title 40, Part 258, Appendix II of the Code of Federal Regulations. Sampling and analytical methodologies are described below.

3.4.1 Sampling Methodology

Groundwater sampling will be conducted by Geo-Logic's groundwater sampling personnel. At the start of each day, the field equipment will be calibrated and a field calibration data sheet will be completed and signed by each of the field technicians. Prior to sampling, the depth to groundwater will be measured to the nearest 0.01 foot from an established well datum (e.g., top of casing) using a decontaminated electric sounding device. These depths will then be used to calculate the water surface elevations in the wells, and to calculate appropriate purge volumes.

Each of the wells will be purged with a non-dedicated pump or a bailer. Because there is no indication of impacts to groundwater at the Gregory Canyon Landfill site, purge water will be discharged away from the well in a manner that limits soil erosion and ponding, and that does not cause the water to enter the San Luis Rey River. As each well is purged, the purge water will be periodically tested for key indicator parameters (pH, temperature, electric conductivity, dissolved oxygen, and turbidity) with a field instrument to assess the presence of fresh water in the well prior to primary sample collection. Upon stabilization of the monitoring parameters and after evacuation of a minimum of 1.5 borehole volumes, samples will be collected.

Once a sufficient purge volume has been removed, a sample will be collected with a new disposable bailer. The bailer will be slowly lowered into the water column to minimize disturbance to the collected sample, and a bottom-emptying device will be inserted into the bottom of the bailer to release the sample. For wells that have very slow recharge rates (i.e., more than two hours to recover to 80 percent of its original water level), the well will be purged dry and a sample will be collected after the water level has recovered sufficiently for sample collection. Samples will be collected based on the analytes sensitivity to volatilization, beginning with the VOCs, then other organic constituents, followed by routine general chemistry parameters and metals.

As part of the quality assurance/quality control (QA/QC) for the monitoring program, trip blanks will be provided by the contract laboratory, and will accompany sample containers from the laboratory, through the field operations, and return to the laboratory unopened to evaluate if contamination has been introduced from the sample containers or laboratory water. An equipment (rinsate) blank will also be collected at a frequency of one per day and will consist of distilled, de-ionized water passed through representative sampling equipment (e.g., bailers and bottom emptying devices) as a test of equipment decontamination. Finally, field (ambient) blanks will be collected by pouring distilled, de-ionized water directly into a set of sample vials as a test of site-specific environmental conditions. Field blanks will be collected at a frequency of one per day. Blank samples will be analyzed for VOCs only (U.S. EPA Test Method 8260), and all QA/QC test samples will accompany the primary sample submittals to the laboratory. As a final QA/QC check, blind duplicate samples will be collected at a frequency of one per 10 samples (i.e., two duplicate samples per sampling event).

The field data will be recorded on a groundwater sampling field data form to include information such as the well name, depth to groundwater, well construction data, date and time of sampling event, sampler's initials, well condition and inspection information,

purging and sampling data, and any other pertinent notes associated with the sampling event. Once a sample is collected, it will be stored in a field ice chest where "blue ice" packs will be used to cool the samples to approximately 4°C. To prevent breakage, vermiculite or an alternative material will be placed around the samples so they do not touch each other or the side of the shipping container. Each sample will be catalogued on appropriate Chain-of-Custody documentation after it has been collected, and these Chain-of-Custody records, and other appropriate paperwork, will be sealed in a plastic bag taped to the lid of the shipping container and will accompany each sample to the analytical laboratory. It is anticipated that samples will be provided to the laboratory courier at the end of each sampling day. The field sampler will be responsible for the care and custody of the samples until they are shipped or otherwise delivered to the laboratory custodian.

3.4.2 Groundwater Analytes

Groundwater samples collected from the five new wells proposed at the GCLF will be analyzed for the following constituents:

Analyte	EPA Test Method
Routine Monitoring Parameters	
Chloride	300.0
Nitrate as Nitrogen	300.0
Sulfate	300.0
Total Dissolved Solids	160.1
Calcium	6010B
Magnesium	6010B
Sodium	6010B
Appendix I Volatile Organic Compounds	8260B
40CFR Part 258 Appendix II Analytes	
Appendix II Volatile Organic Compounds	8260B
Semivolatile Organic Compounds	8270C
Organochlorine Pesticides	8081A
Organophosphorus Compounds	8141A
Chlorinated Herbicides	8151A
Polychlorinated Biphenyls	8082
Title 22 Metals	6010B/7000
Cyanide	9014
Sulfide	9034

3.4.3 Sampling Schedule

Sampling of the proposed five new monitoring wells will be conducted after well development is completed, and then on a quarterly basis (each season) until four years of background water quality data have been collected.

3.5 REPORT PREPARATION

Following installation and aquifer testing of the five new monitoring wells, a technical report will be prepared summarizing the field findings, including the borehole geologic conditions, well construction procedures, aquifer testing procedures and results, and an assessment of the local hydrogeologic conditions. The report will include geologic, geophysical, and construction logs of each well, well development summaries of each

well, aquifer test field notes and computer generated interpretation of the data, maps and survey data documenting the locations of each well.

Groundwater monitoring data collected from the five new wells will be included in annual summary reports that are currently generated for the site, or in more frequent water quality monitoring reports that will be generated once the site becomes operational. The water quality monitoring reports will include a description of groundwater monitoring activities, sample collection and procurement information, field sampling notes, chain-of-custody documentation, certified laboratory analytical results, and a technical discussion of the water quality data with respect to background results, State of California and federal water quality protection standards, and historical results.

Well construction will commence upon approval of this workplan. The final report will be prepared following well construction, aquifer testing, and collection and analysis of the first round of water quality data.

4.0 WELLHEAD PROTECTION AREA IDENTIFICATION

The Tentative WDRs require Gregory Canyon Ltd to identify the Wellhead Protection Area (WHPA) surrounding the GCLF site. At a minimum wells to be considered for the WHPA includes those within 2300 feet of the site in any direction as outlined in the tentative WDRs, and that can reasonably be expected to be impacted by a release from the facility. To evaluate wells to be included in the WHPA, Gregory Canyon Ltd will follow the guidelines provided by the United States Environmental Protection Agency (USEPA) in their 1991 document, "Delineation of Wellhead Protection Areas in Fractured Rocks." The proposed scope of work to be followed is outlined in the following sections.

4.1 SELECTION OF ANALYTICAL METHODOLOGY

USEPA guidance provides four analytical approaches to identifying a WHPA in areas of fractured bedrock, as listed below from the simplest to most complex approach:

- Vulnerability Mapping with Arbitrary Fixed Radius or Simplified Shape Method
- Hydrogeologic/Flow System Mapping with Time of Travel estimation or Uniform Flow Equation application
- Residence Time
- Numerical Flow with Contaminant Fate and Transport Modeling.

Gregory Canyon Ltd intends to first utilize the Hydrogeologic/Flow System Mapping with Uniform Flow Equation approach to evaluate potential wells that could be affected by a release from the facility. Should this approach suggest that there are no wells within the modeled wellhead protection area that could be reasonably affected by a release from the facility, the analysis will conclude. Should this approach suggest the possibility of wells being impacted by a release from the facility, then a more robust numerical groundwater flow and contaminant fate and transport modeling approach will be undertaken.

4.2 HYDROGEOLOGIC/FLOW SYSTEM MAPPING

Based on the USEPA studies, the use of flow system mapping resulted in defining the largest Zone of Contribution, and included nearly all areas delineated by numerical modeling. As a result, the flow system mapping approach should be considered a conservative and representative approach to identification of a WHPA.

Using this approach, well construction, borehole geology, groundwater equipotential data, and groundwater pumping rates are assimilated to establish a conceptual model of groundwater flow conditions at each potential receptor well. A point source of contamination from the landfill would be identified by the closest point of the landfill to the well.

To complete the hydrogeologic/flow system mapping, the following specific work tasks would be undertaken:

4.2.1 Local Production Well Determination

As shown on Figure 1, Gregory Canyon Ltd has already compiled a list of production wells in the vicinity of the GCLF. This list will be updated to account for any new wells that have been added in the last few years in addition to any wells that have been decommissioned. A map similar to Figure 1 will be generated with the updated information.

4.2.2 Groundwater Equipotential Assessment

Groundwater elevation data will be collected for wells within the subject area to establish groundwater flow directions and gradients. As shown on Figure 1, wells within the subject area are known to be screened in alluvium, bedrock, and across both units. Wherever possible, discrete equipotential data will be used to determine whether different flow conditions exist in the two water-bearing units. A groundwater equipotential contour map will be developed to illustrate flow conditions. Multiple equipotential maps will be prepared should the data indicate more than one discrete aquifer.

4.2.3 Assessment of Aquifer Properties

Several aquifer tests have been conducted at the GCLF site to evaluate groundwater flow conditions in alluvium and bedrock. As additional data are obtained for local production wells, available aquifer test data will be assimilated for use in determining the Zone of Contribution around each well. If aquifer test data are not available for local production wells, the data collected at the GCLF site or provided in published literature will be applied as appropriate based on the screened interval of each production well.

Well geologic logs and construction logs will also be obtained and reviewed to assess zones of fracturing, fracture orientations, and screened interval for each well. Because wells in the subject area are screened in both alluvium and bedrock, the flow system analysis may require use of different properties for each well.

4.2.4 Estimation of Groundwater Production

For each production well in the subject area, records or estimates of groundwater production will be obtained. Gregory Canyon Ltd will canvass the well owners to determine their water usage so that this information can be incorporated into the Zone of Contribution assessment.

4.2.5 Determination of Wellhead Protection Area

Utilizing the hydrogeologic data and groundwater pumping rates, Zones of Contribution will be established around each production well within 2300 feet of the facility and that can reasonably be expected to be affected by a release from the facility. The WHPA will be drawn as the limits of each Zone of Contribution, whether individual or overlapping.

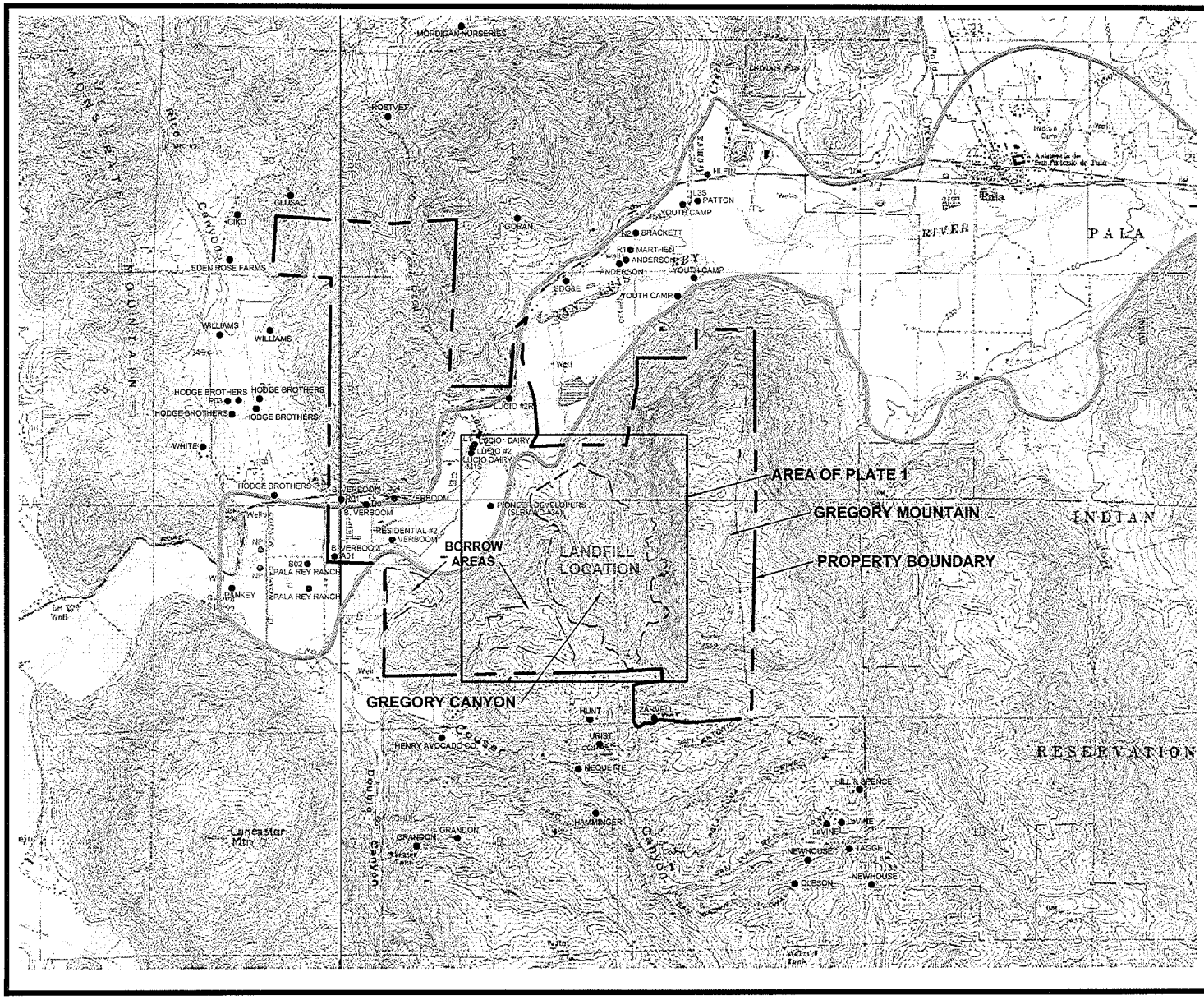
4.3 POTENTIAL IMPACT ASSESSMENT

Following establishment of the WHPA(s), modeling of the fate and transport of a hypothetical release from the GCLF will be undertaken to determine the potential for a release from the landfill to affect one or more of the WHPAs. For this analysis, the existing groundwater flow and fate and transport models will be re-evaluated based on recently-obtained hydrogeologic information and recalibrated using the most up-to-date groundwater equipotential information. A hypothetical release of volatile organic compounds (VOCs) from the facility will be simulated. VOCs are recognized as common byproducts of the anaerobic decomposition of municipal solid waste, and are considered to be among the most mobile landfill contaminant when release to groundwater. The hypothetical release will consider typical landfill leachate and condensate chemistries, using data collected from landfills within San Diego County. The volume of the release will consider the maximum volume of the leachate/condensate storage facility at the GCLF. Modeling of the release will utilize conservative estimates for dilution, attenuation, and transformation of the most recalcitrant compound(s) based on published and industry-recognized values for these properties. As such, the contaminant fate and transport model should provide a reasonable estimate of a worst-case scenario. Should the results of contaminant fate and transport modeling indicate a reasonable possibility that a release from the GCLF could affect the WHPA(s), Gregory Canyon Ltd would be prepared to add properties served by those wells to its Replacement Water Contingency Plan.

4.4 WHPA REPORT PREPARATION

For the WHPA assessment, a comprehensive report will be prepared summarizing the assumptions, data, and analyses conducted for this assessment. The the report will include a synopsis of the data obtained during the study, a map showing the wells within 2300 feet of the facility boundary and that can reasonably be expected to be affected by a landfill release, a discussion of assumptions used to model the Zone(s) of Contribution, a discussion of the assumptions used to construct a contaminant fate and transport model, and the result of the modeling efforts. The report will be supported by summary tables, graphics and illustrations, and appendices containing the field and laboratory data,

modeling output, and other pertinent information. The final report will be submitted to the RWQCB and uploaded on their Geotracker system within 180 days of adoption of the site Waste Discharge Requirements.



EXPLANATION:

WHITE● APPROXIMATE LOCATION OF LOCAL GROUNDWATER WELL SCREENED IN BEDROCK (NOT FIELD VERIFIED)

PANKEY● APPROXIMATE LOCATION OF LOCAL GROUNDWATER WELL SCREENED IN ALLUVIUM (NOT FIELD VERIFIED)

NPI● APPROXIMATE LOCATION OF LOCAL GROUNDWATER WELL SCREENED IN ALLUVIUM AND BEDROCK (NOT FIELD VERIFIED)

APPROXIMATE LIMIT OF PALA BASIN

REFERENCE:

USGS 7.5 MINUTE PALA (1997) AND BONSALL (1975) CALIFORNIA QUADRANGLES

CALIFORNIA DEPARTMENT OF WATER RESOURCES WATER WELL DRILLERS REPORTS

SAN DIEGO COUNTY WATER AUTHORITY GROUNDWATER REPORT (1997)

N

APPROXIMATE SCALE: 1" = 2300'

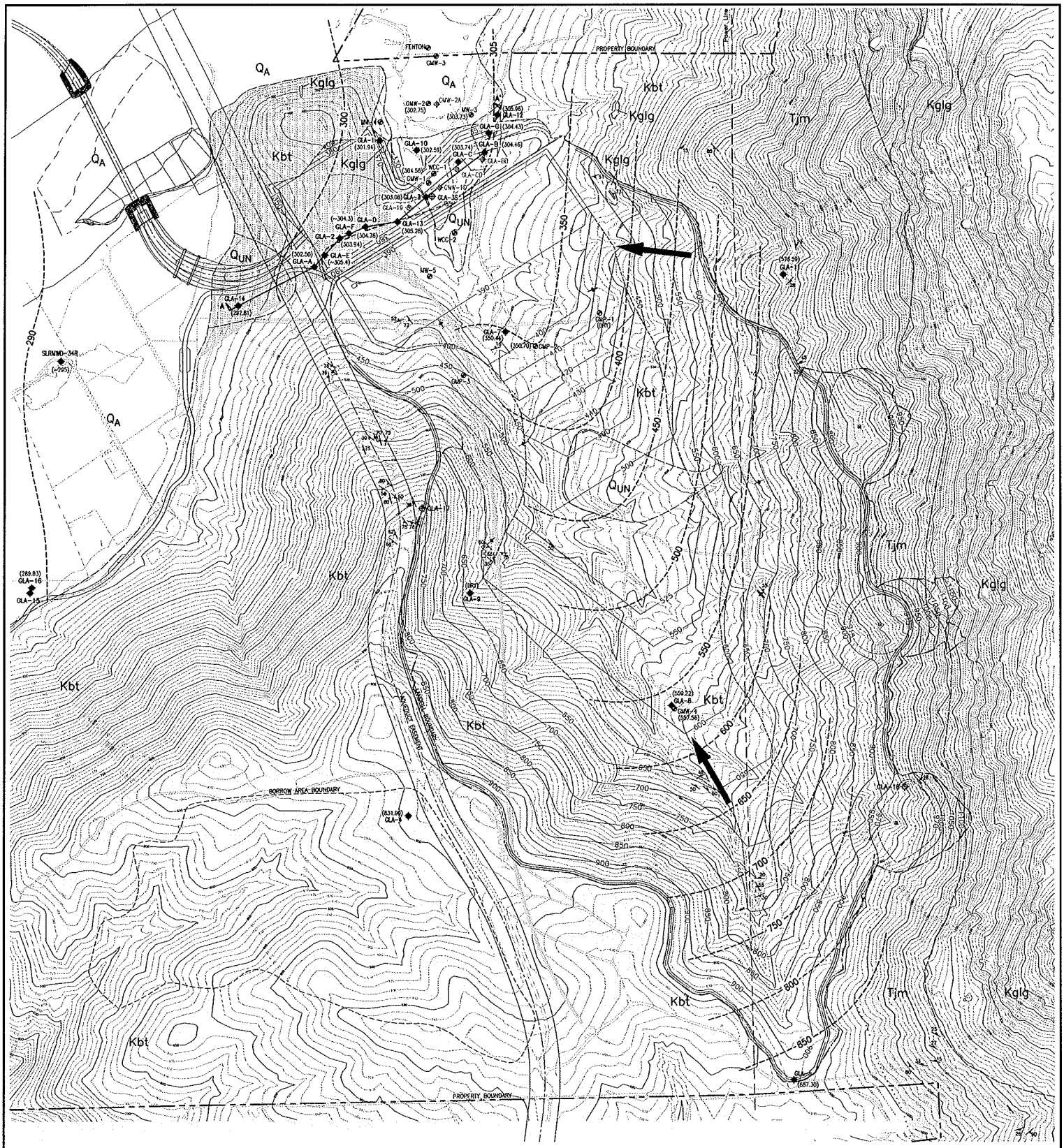
FIGURE 1

SITE LOCATION MAP

WORKPLAN FOR ADDITIONAL MONITORING WELL INSTALLATION
GREGORY CANYON LANDFILL SITE
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
VL	JULY 2009	9539



LEGEND:

SURFICIAL DEPOSITS (DENOTED AS Q_S ON SOME SECTIONS AND FIGURES):

Q_A — ALLUVIUM DEPOSITED AT THE MOUTH OF GREGORY CANYON CONTIGUOUS WITH THE SAN LUIS REY RIVER FLOODPLAIN. UNCONSOLIDATED DEPOSITS OF SAND, SILT AND GRAVEL WITH VARIABLE AMOUNTS OF COBBLES AND BOULDERS.

Q_{UN} — UNDIFFERENTIATED COLLUVIUM, SLOPE WASH, TALUS AND DEBRIS FLOW DEPOSITS THAT FORM A VENEER OVER MOST OF THE AREA SHOWN IN THE MAP. ON THE EAST FLANK OF THE CANYON THEY COMPRISE COBBLES AND BOULDERS OF LEUCOGRANODIORITE SET IN A LOCALLY CONSOLIDATED MATRIX OF SAND AND SILT. ON THE WEST FLANK OF THE CANYON THEY INCLUDE MOSTLY SAND AND SILT DERIVED FROM WEATHERED TONALITE.

BEDROCK:

Kglg — GREGORY MOUNTAIN LEUCOGRANODIORITE. PHANERITIC TEXTURE WITH MEDIUM TO COARSE CRYSTALLINITY. LIGHT GRAY TO BUFF WITH LESS THAN 5% DARK MINERALS. FORMS THE CORE OF GREGORY MOUNTAIN, AND ALSO FORMS DIKES THAT CUT OLDER UNITS.

Kbt — BONSALL TONALITE. PHANERITIC TEXTURE WITH MEDIUM TO COARSE CRYSTALLINITY. DARK GRAY. TYPICALLY DEEPLY WEATHERED AND FRIABLE.

Tjm — METAMORPHIC ROCKS. AMPHIBOLITES AND METAVOLCANIC ROCKS, IN SOME LOCATIONS WITH MIGMATITIC STRUCTURE THAT RESEMBLES GNEISSIC BANDING. APHANITIC TO PORPHYROBLASTIC TEXTURE; RELICT PORPHYRITIC TEXTURES SUGGEST A VOLCANIC PROTOLITH FOR SOME OF THE UNITS. MEDIUM TO DARK BLUISH GRAY. GENERALLY MASSIVE AND HARD.

APPROXIMATE GEOLOGIC CONTACT
APPROXIMATE GEOLOGIC CONTACT OBSCURED BY SURFICIAL DEPOSITS
51 — STRIKE AND DIP OF FOLIATION
VERTICAL FOLIATION
15 — STRIKE AND DIP OF JOINTS
73 — STRIKE AND DIP OF DIKE
PROPOSED GROUNDWATER MONITORING WELL
GROUNDWATER MONITORING WELL BY GLA
EXPLORATORY BORING (GLA, 2004)
FUTURE GROUNDWATER MONITORING WELL
GROUNDWATER MONITORING WELL BY OTHERS
(687.30) — GROUNDWATER ELEVATION (OCTOBER 2004)
700 — PIEZOMETRIC SURFACE ELEVATION CONTOUR (OCTOBER 2004)
GROUNDWATER FLOW DIRECTION
GROUNDWATER BARRIER (QUERIED WHERE UNCERTAIN OF SOUTHERN EXTENSION)
LOW PERMEABILITY ZONE
700 — BOTTOM GRADE CONTOURS
A — A' CROSS-SECTION LOCATION

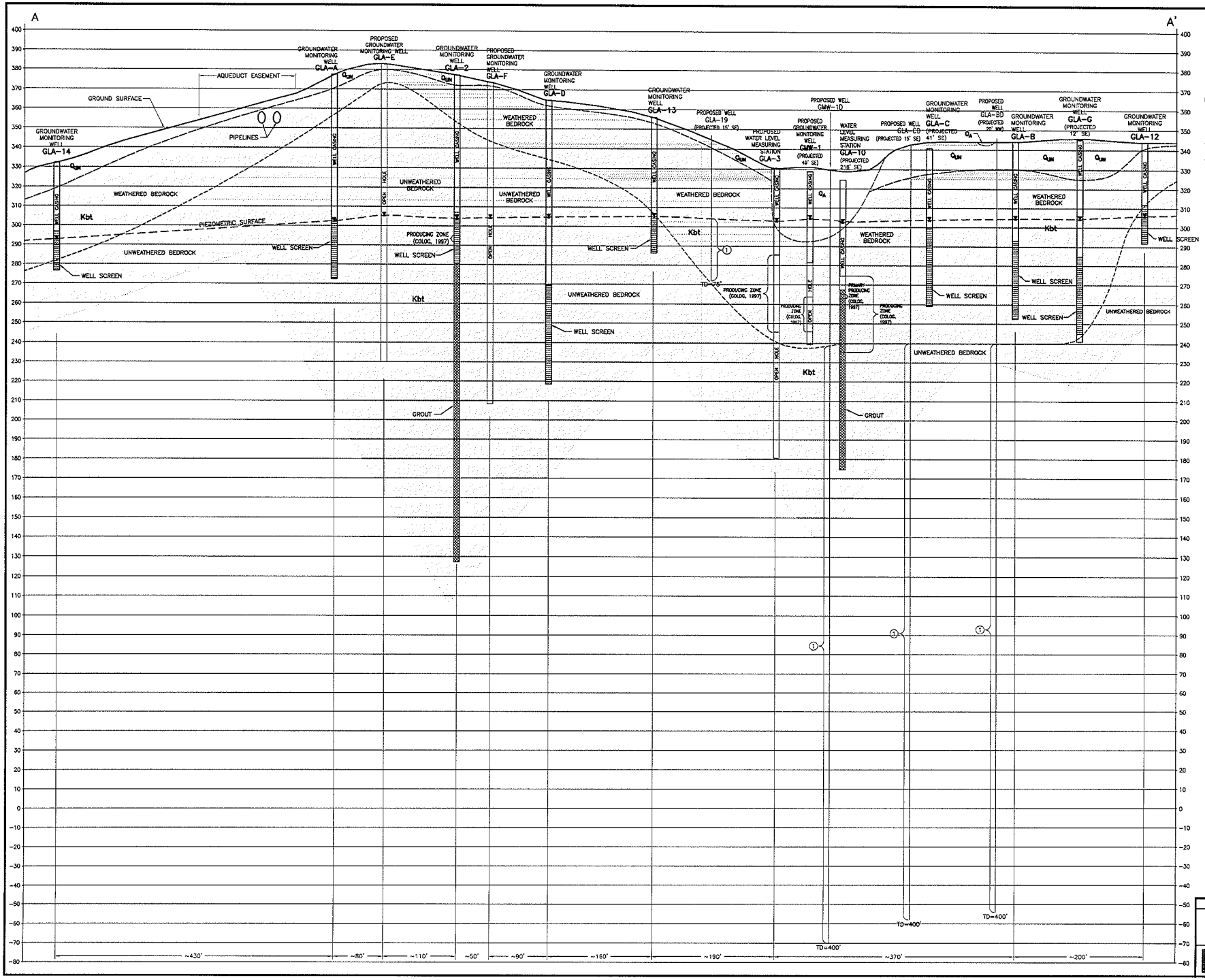
GRAPHIC SCALE
200 0 100 200 400
(IN FEET)
1 inch = 200 ft.

PLATE 1

SITE GEOLOGY
WORKPLAN FOR ADDITIONAL MONITORING WELL INSTALLATION
GREGORY CANYON LANDFILL SITE
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

DRAWN BY:	DATE:	JOB NO.
ML	JULY 2009	9539



EXPLANATION:

Q_A ALLUVIUM

Q_{UN} UNDIFFERENTIATED SURFICIAL DEPOSITS INCLUDING RESIDUAL SOILS, COLLUVIUM AND LOCAL ALLUVIUM

BEDROCK (WEATHERED AND UNWEATHERED):

Kbt BONSALL TONALITE WITH MINOR DIKES AND VEINS OF GREGORY MOUNTAIN LEUCOGRANODIORITE AND PEGMATITE.

APPROXIMATE GEOLOGIC CONTACT

APPROXIMATE PIEZOMETRIC SURFACE (10/09/04)

(1) PROPOSED WELLS WILL HAVE 20 TO 40-FOOT WELL SCREENS SURROUNDING THE PRODUCING ZONE AS IDENTIFIED USING BOREHOLE GEOPHYSICAL METHODS

PROFILE SCALES
HORIZ.: 1" = 60'
VERT.: 1" = 20'

PLATE 2

GEOLOGIC CROSS-SECTION A-A'

WORKPLAN FOR ADDITIONAL MONITORING WELL INSTALLATION
GREGORY CANYON LANDFILL SITE
SAN DIEGO COUNTY, CALIFORNIA

GeoLogic Associates
Geologists, Hydrogeologists, and Engineers

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VL	JULY 2009	9539

APPENDIX H

LINER PERFORMANCE EVALUATION
PROPOSED COMPOSITE LINER SYSTEM

GeoLogic Associates

Geologists, Hydrogeologists and Engineers

April 5, 2004
JN: 9539-65

Gregory Canyon Ltd.
991-C-404 Lomas Santa Fe Drive
Solana Beach, CA 92075

Attention: Mr. Richard Chase

RE: LINER PERFORMANCE EVALUATION
PROPOSED COMPOSITE LINER SYSTEM
GREGORY CANYON LANDFILL

INTRODUCTION

This letter report provides an evaluation of the expected performance of the composite liner system proposed for the Gregory Canyon Landfill in San Diego County, California. The proposed design includes a geocomposite clay liner (GCL) sandwiched between two high density polyethylene (HDPE) geomembrane layers, and on the floor areas (i.e., where the gradient is less than 5 to 1) a gravel or equivalent drainage layer on a third HDPE geomembrane layer, all of which will overlie a 2-foot thick low permeability clay layer. The proposed liner section will be placed on essentially uncompressible foundation materials and will be overlain by a prescriptive leachate collection and recovery system (LCRS) that will minimize the potential for leachate accumulation in the landfill prism.

This proposed liner system design includes the low-permeability and chemical resistance capabilities of the GCL (with a hydraulic conductivity of $<1x10^{-9}$ cm/sec), low-permeability clay (with a hydraulic conductivity of $<1x10^{-7}$ cm/sec), and HDPE geomembrane layers, with the conveyance and leak detection capabilities of the drainage layer. As designed, this liner system greatly exceeds the minimum "prescriptive" design standards for Class III solid waste sites as defined by California Code of Regulations Title 27 (CCR 27), and for Class I hazardous waste sites as defined in CCR 23.

The bottom liner system design, from top to bottom, includes the following elements:

- 24-inch-thick protective soil cover
- 12 ounce (oz.) non-woven geotextile
- 12-inch thick LCRS gravel layer
- 16 oz. non-woven geotextile
- 80-mil HDPE geomembrane, textured on both sides
- Non-woven geotextile-supported geocomposite clay liner (GCL)
- 60 mil HDPE geomembrane, textured on both sides
- 16 oz. non-woven geotextile
- 9-inch minimum thickness gravel or equivalent drainage layer, with a collection pipe

16885 W. Bernardo Dr., Suite 305, San Diego, CA 92127 Phone: (858) 451-1136 Fax: (858) 451-1087

- 16 oz. non-woven geotextile
- 60-mil HDPE geomembrane, textured on both sides
- 24-inch-thick layer of low hydraulic conductivity (<1x10-7 cm/sed) soil layer
- 12 oz. non-woven geotextile
- 12-inch-thick subdrain gravel layer

The slope liner system design (i.e., sections with gradients greater than 5 to 1), includes the following elements:

- 24-inch minimum thickness protective soil cover
- 16 oz. non-woven geotextile
- 80-mil HDPE geomembrane, single-sided textured (textured side down)
- Non-woven geotextile-supported geocomposite clay liner (GCL)
- 60 mil HDPE geomembrane, textured on both sides
- 24-inch-thick layer of low hydraulic conductivity ($<1x10^{-7}$ cm/sed) soil layer

DISCUSSION

The water quality protection afforded by the proposed landfill liner system offers significant enhancements compared to the prescriptive design included in 27 CCR. The relatively impermeable character of HDPE geomembranes, inclusion of both a primary (upper) and secondary geomembrane layer in a double-composite liner system, and a drainage layer underlain by a third geomembrane, significantly increases its protectiveness compared to the single geomembrane layer in the prescriptive design. Liner system elements and benefits are described below.

Manufacturing and/or Construction Defects in Liner Materials

As a result of improved geosynthetic manufacturing processes, and with the exception of physical defects, modern HDPE geomembranes are essentially impermeable. In addition, because of the extensive manufacturing quality controls, defects are typically identified early in the manufacturing process (often even before shipment of product) and manufacturing defects on installed liners have become relatively rare. Similarly, landfill liner construction today is typically performed by pre-qualified contractors working under the observation and testing services of qualified construction quality assurance (CQA) crews. As a result, construction-related defects are also unusual. In fact, using typical landfill construction protocols, manufacturing/construction-related defects in landfill liners are now infrequent and breeches are generally identified at densities of less than about 1 square centimeter per acre[1]. However, a thicker 80-mil HDPE geomembrane liner has been included in the design to provide added resistance to punctures or damage by surface construction activities following its placement.

[1] Schroeder, P.R., Lloyd, C.M., Zappi, P.A., and Aziz, N.M., 1994, The Hydrologic Evaluation of Landfill Performance (HELP) Model version 3, United States Environmental Protection Agency Office of Research and Development.

Given the probability that minor and relatively infrequent defects will be spatially distributed in both the primary and secondary geomembranes, it is highly unlikely that any defect in the primary geomembrane will directly overlie a defect in the secondary membrane. As a result, the relative performance of either liner will be governed largely by the potential for communication between the primary membrane defects and the secondary membrane defects (i.e., performance is measured as a function of how leachate migrates from an upper defect to a lower defect).

As published in an earlier liner performance demonstration (dated May 29, 2003), the transport time for leachate to travel through a 1 square centimeter leak in the primary geomembrane to a similar leak in the secondary geomembrane was calculated to take hundreds of years and the volume leachate available for infiltration through the secondary geomembrane defect would be minute (less than one milliliter per year). This calculation assumed that the maximum leachate head calculated by HELP3 analyses remains on the liner (3 inches or 0.25 feet) and assuming that the two geomembrane leaks are separated horizontally by 10 feet, as is proposed for the Gregory Canyon Landfill liner system design.

In summary, the proposed liner configuration provides substantial resistance to the downgradient migration of leachate to the drainage layer by incorporating a GCL in the potential pathway. As a result, the travel time from defect to defect is substantially increased and the total volume of leachate migrating through the primary membrane is substantially reduced. In fact, delivery of leachate from the primary geomembrane defect to the secondary geomembrane defects is calculated to take hundreds of years, and the volume of leachate available for infiltration through a secondary geomembrane defect would be minute.

Secondary Protection

For the Gregory Canyon Landfill liner configuration, even if leachate were to migrate through the primary and secondary liner, on the floor areas it will encounter a drainage layer of gravel or equivalent media bounded by a third HDPE liner at its base. The drainage layer with collection piping, designed to convey liquid by gravity to a dedicated storage tank, will remove the leachate (similar to the LCRS) and serve as a leak detection system to indicate if leachate has migrated beneath the encapsulated GCL. Beyond this drainage layer, the liner system also includes a continuous 2-foot thick layer of low permeability ($<1 \times 10^{-7}$ cm/sec) material as a further barrier to keep leachate away from the liner subgrade.

As a result of the heavy equipment that is used to construct the LCRS and to deliver operations layer soils and overlying refuse, the most serious damage to liner systems often occurs after construction. In addition, considering the limited visibility that equipment operators have, such damage is often not recognized and can result in much larger breeches in the primary geomembrane than occur during construction. As stated above, the primary (top) geomembrane liner will be 80 mils, rather than the prescriptive 60 mil thickness to provide additional resistance to punctures and surface construction

activities. As an additional aid in monitoring the integrity of the encapsulated GCL layers of the liner system, Gregory Canyon Limited has agreed to implement an electronic leak location survey as part of the final quality control for the upper geomembrane installation. The method is designed to identify holes in the geomembrane after the LCRS gravel and/or the protective soil cover layer has been placed. Any identified electrical anomaly will be investigated and the liner repaired as needed.

SUMMARY

The proposed liner configuration will afford significantly enhanced water quality protection compared to the prescriptive design included in CCR 27 for solid waste facilities or in CCR 23 (hazardous waste landfill regulations). The proposed liner configuration provides enhanced protection from both manufacturing/construction defects and post-construction damage to the liner with the low-permeability properties of the GCL in the proposed liner configuration working to isolate the leachate from the secondary geomembrane layer. As proposed, considering the slow velocity of leachate transport through the GCL, it may be hundreds or thousands of years before small volumes of leachate could be delivered to a defect in the secondary geomembrane. In the event that leachate is transmitted through the secondary geomembrane, as it enters the drainage layer it will be conveyed to a storage tank, and the tank will be monitored regularly as part of landfill operations and the quarterly water quality monitoring program. The drainage layer is underlain by a third HDPE geomembrane and as a final defense, a 2-foot thick low-permeability clay layer.

CLOSURE

This letter report has not been prepared for use by parties or projects other than those named or described above. It may not contain sufficient information for other parties or other purposes. This report has been prepared in accordance with generally accepted geotechnical practices and makes no other warranties, either expressed or implied, as to the professional advise or data included in it.

GeoLogic Associates

Sarah J. Battelle, CHg
Vice President

926

APPENDIX I

100-YEAR DEVELOPED AND UNDEVELOPED HYDROLOGY STUDY

BAS
(909) 860-7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB GREENOLY CANYON LANDFILL – HYDROLOGY
SHEET NO. 1 OF 1
CALCULATED BY CHM DATE 9/24/2004
CHECKED BY DATE
SCALE N.A.

FIND: DETERMINE THE PEAK RUNOFF FLOWS (Q_{100} & Q_{10}) TO USE IN SIZING THE STORM DRAIN STRUCTURES AND DESILTING BASIN.

CRITERIA: USE 2003 SAN DIEGO COUNTY HYDROLOGY MANUAL [SDCHM] MANUAL, WHICH IS BASED ON THE RATIONAL METHOD, AND THE AES SOFTWARE (WHICH IS COUNTY APPROVED)

INPUT DATA FROM SDCHM ARE:

APPENDIX A – SOIL TYPE = D

APPENDIX B – P^6 MUST BE 45% TO 65% OF P^{24}

P^6 100 YR 6HR – 3.5 IN P^6/P^{24} = 58% OK
P^{24} 100 YR 24HR – 6.0 IN

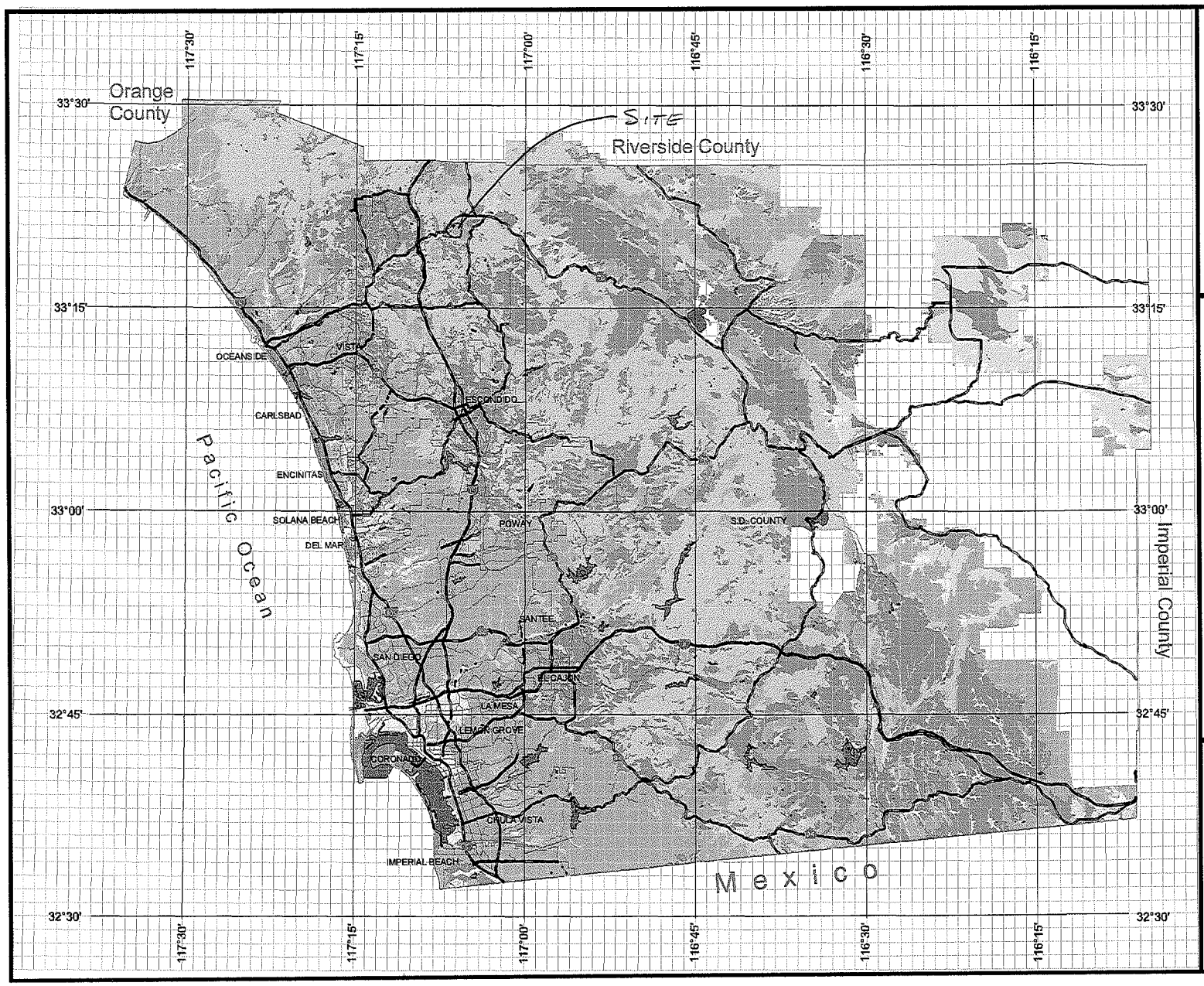
P^6 10 YR 6HR – 2.2 IN P^6/P^{24} = 55% OK
P^{24} 10 YR 24HR – 4.0 IN

APPENDIX C – PZN FIG C-1 = 2.0

(SEE FOLLOWING PAGES FOR REFERENCES)

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D ← USE
- Undetermined
- Data Unavailable

DPW GIS — Department of Public Works Geographic Information Services

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N W E S

3 0 3 Miles

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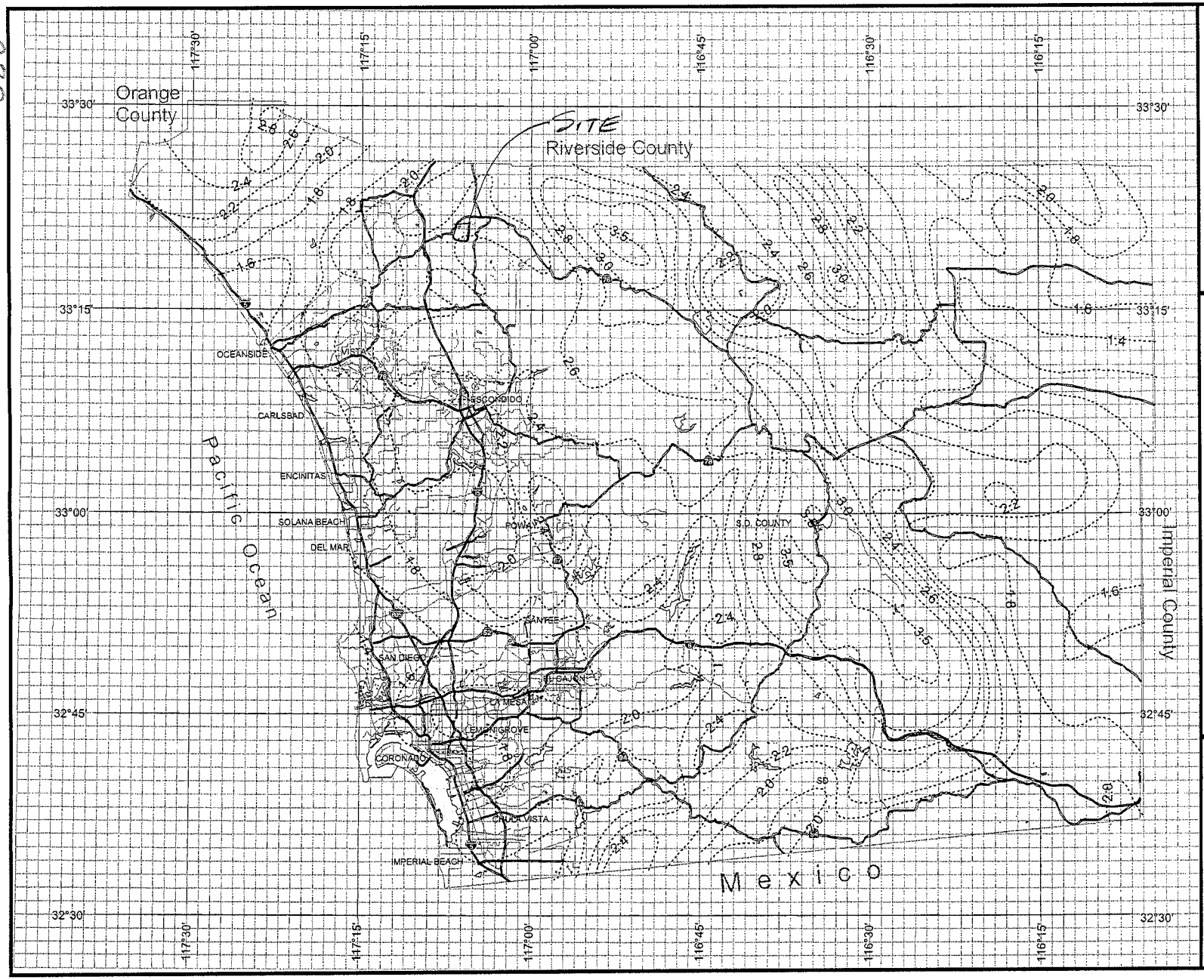

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

2.2 IN

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Department of Public Works
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W E
S

3 0 3 Miles

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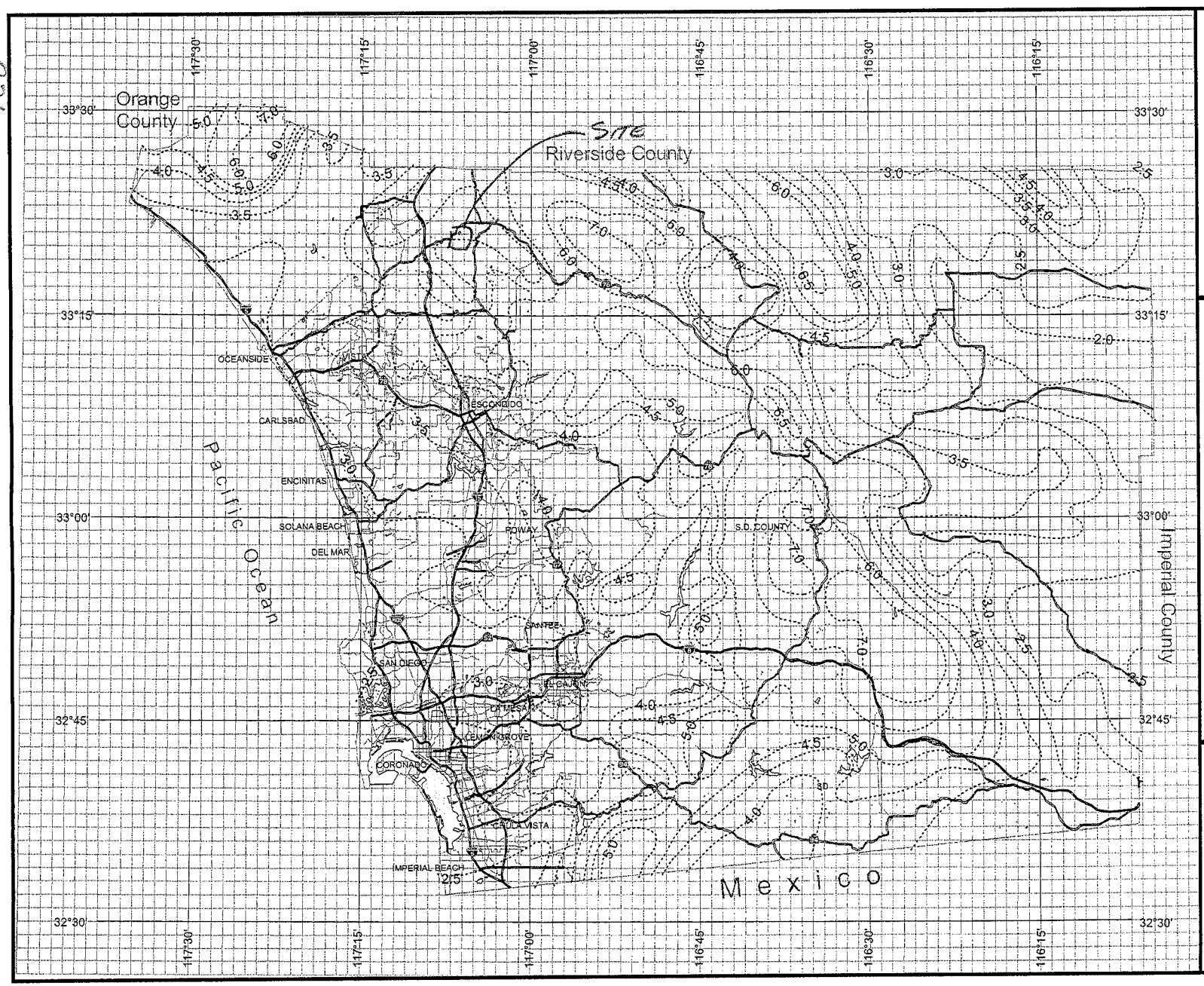

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

4.0 IN

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3 0 3 Miles

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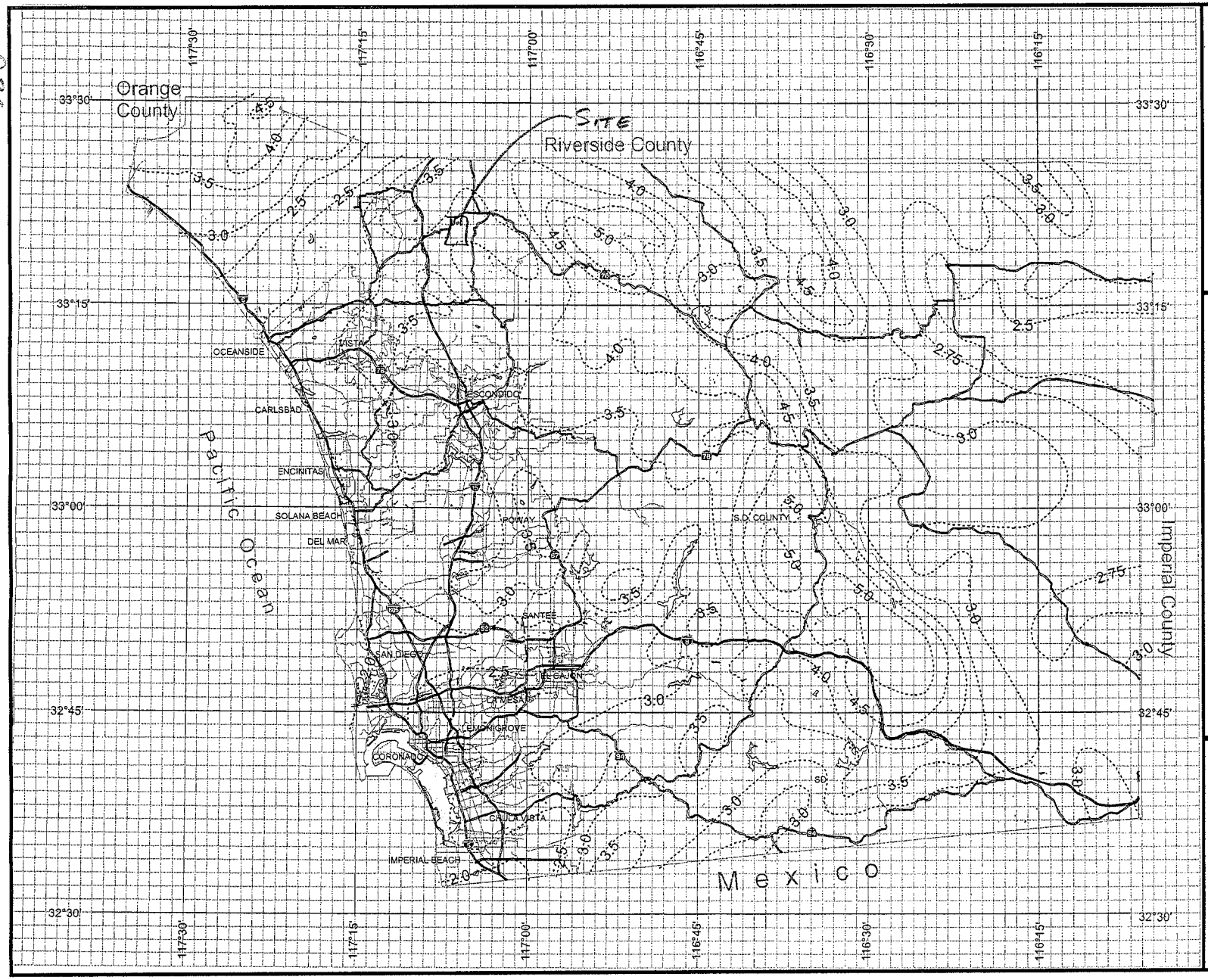

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

3.5 IN

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3 0 3 Miles

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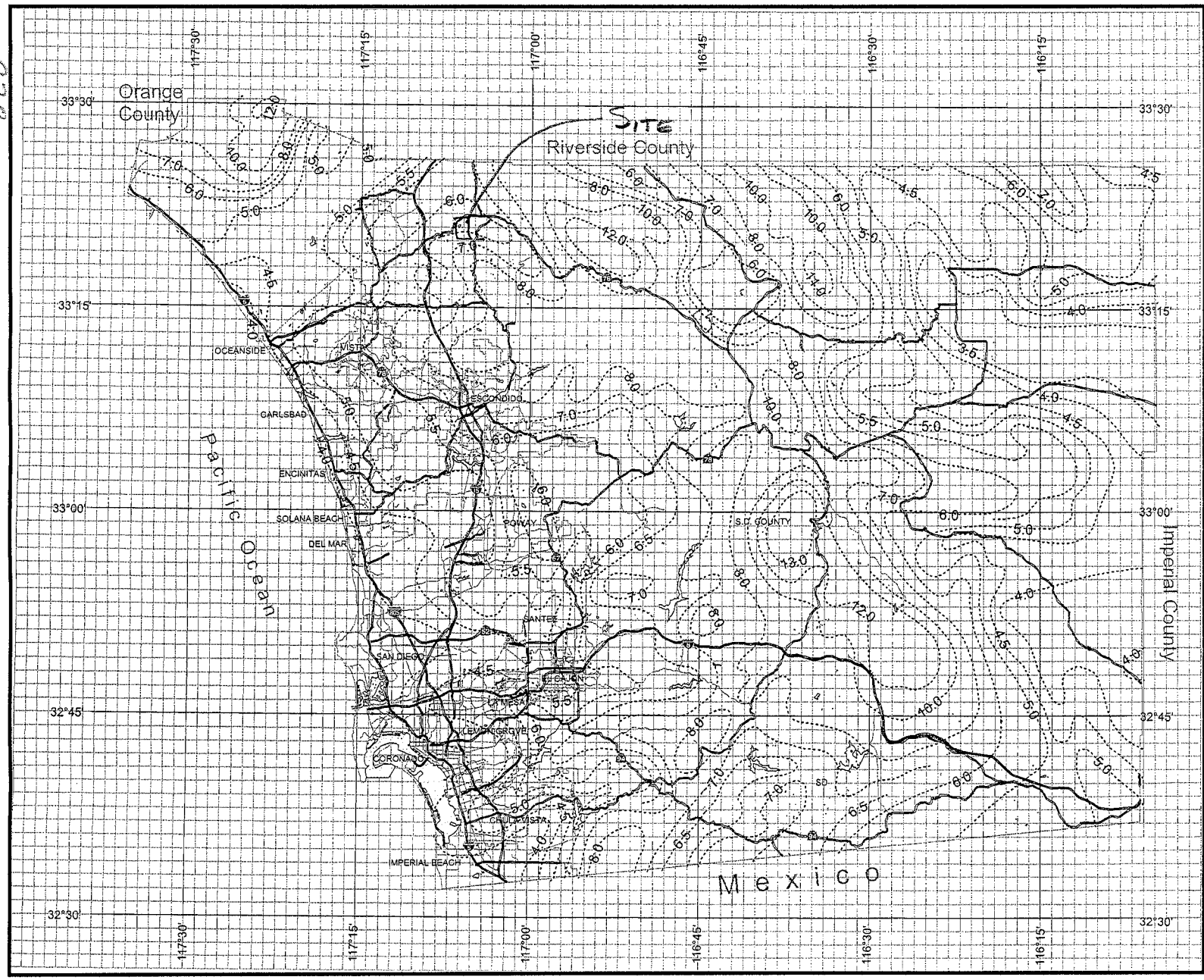

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

6.0 in

DPW GIS
Department of Public Works Geographic Information Services

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N
W E
S

3 0 3 Miles

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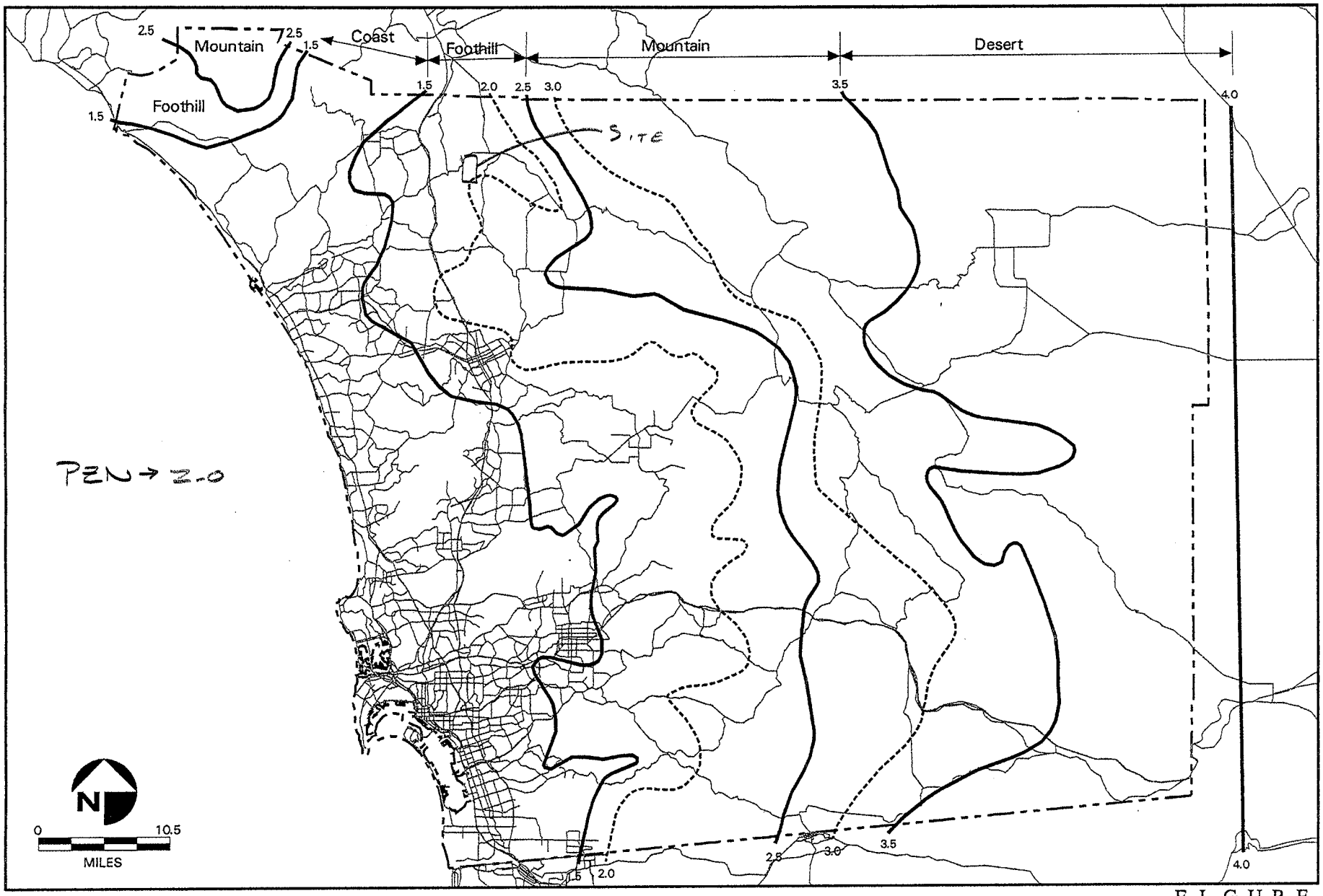


FIGURE

C-1

County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

```
****************************************************************************

  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2004 Advanced Engineering Software (aes)
            Ver. 2.0 Release Date: 01/01/2004  License ID 1211

                          Analysis prepared by:

                       Bryan A. Stirrat & Associates
                           1360 Valley Vista Dr.
                             Diamond Bar, Ca
                                 91786

 ************************** DESCRIPTION OF STUDY **************************
* GREGORY CANYON HYDROLOGY (100-YEAR)                                     *
* EXISTING CONDITION (PRE-LANDFILL)                                       *
* CHM                                                                     *
 ***************************************************************************

  FILE NAME: GREGEX.DAT
  TIME/DATE OF STUDY: 14:09 10/18/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.350
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    S.C.S. S-GRAPH USED.
    SAN DIEGO COUNTY DEPTH-AREA FACTORS USED
    UNADJUSTED  6-HOUR RAINFALL DEPTH (INCHES) =   3.50
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   6.00
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  3.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.01 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(GLOBAL):
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
UPSTREAM ELEVATION(FEET) =   1705.00
DOWNSTREAM ELEVATION(FEET) =   1687.00
ELEVATION DIFFERENCE(FEET) =     18.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      1.40
TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.40

****************************************************************************
FLOW PROCESS FROM NODE      1.01 TO NODE      1.02 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1687.00  DOWNSTREAM(FEET) =   1525.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   900.00   CHANNEL SLOPE =  0.1800
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.710
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     27.01
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.82
AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   1.92
Tc(MIN.) =   8.19
SUBAREA AREA(ACRES) =    21.70       SUBAREA RUNOFF(CFS) =   50.96
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     22.20         PEAK FLOW RATE(CFS) =      52.14

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   9.56
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.02 =  1000.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.02 TO NODE      1.03 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1525.00  DOWNSTREAM(FEET) =   1385.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00   CHANNEL SLOPE =  0.2000
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.210
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     77.25
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.18
AVERAGE FLOW DEPTH(FEET) =   0.47   TRAVEL TIME(MIN.) =   1.04
Tc(MIN.) =   9.23
SUBAREA AREA(ACRES) =    23.10       SUBAREA RUNOFF(CFS) =   50.21
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     45.30         PEAK FLOW RATE(CFS) =      98.46

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.54   FLOW VELOCITY(FEET/SEC.) =  11.93
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.03 =  1700.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.03 TO NODE      1.04 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1385.00  DOWNSTREAM(FEET) =    650.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1700.00   CHANNEL SLOPE =  0.4324
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    158.51
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  18.07
AVERAGE FLOW DEPTH(FEET) =   0.56   TRAVEL TIME(MIN.) =   1.57
Tc(MIN.) =  10.80
SUBAREA AREA(ACRES) =    61.10       SUBAREA RUNOFF(CFS) =  120.02
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =    106.40         PEAK FLOW RATE(CFS) =     209.00

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.65   FLOW VELOCITY(FEET/SEC.) =  19.43
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.04 =  3400.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.04 TO NODE      1.05 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    500.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1300.00   CHANNEL SLOPE =  0.1154
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.131
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    308.57
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.47
AVERAGE FLOW DEPTH(FEET) =   1.09   TRAVEL TIME(MIN.) =   1.61
Tc(MIN.) =  12.41
SUBAREA AREA(ACRES) =   110.80       SUBAREA RUNOFF(CFS) =  199.00
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =    217.20         PEAK FLOW RATE(CFS) =     390.10

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.22   FLOW VELOCITY(FEET/SEC.) =  14.34
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.05 =  4700.00 FEET.

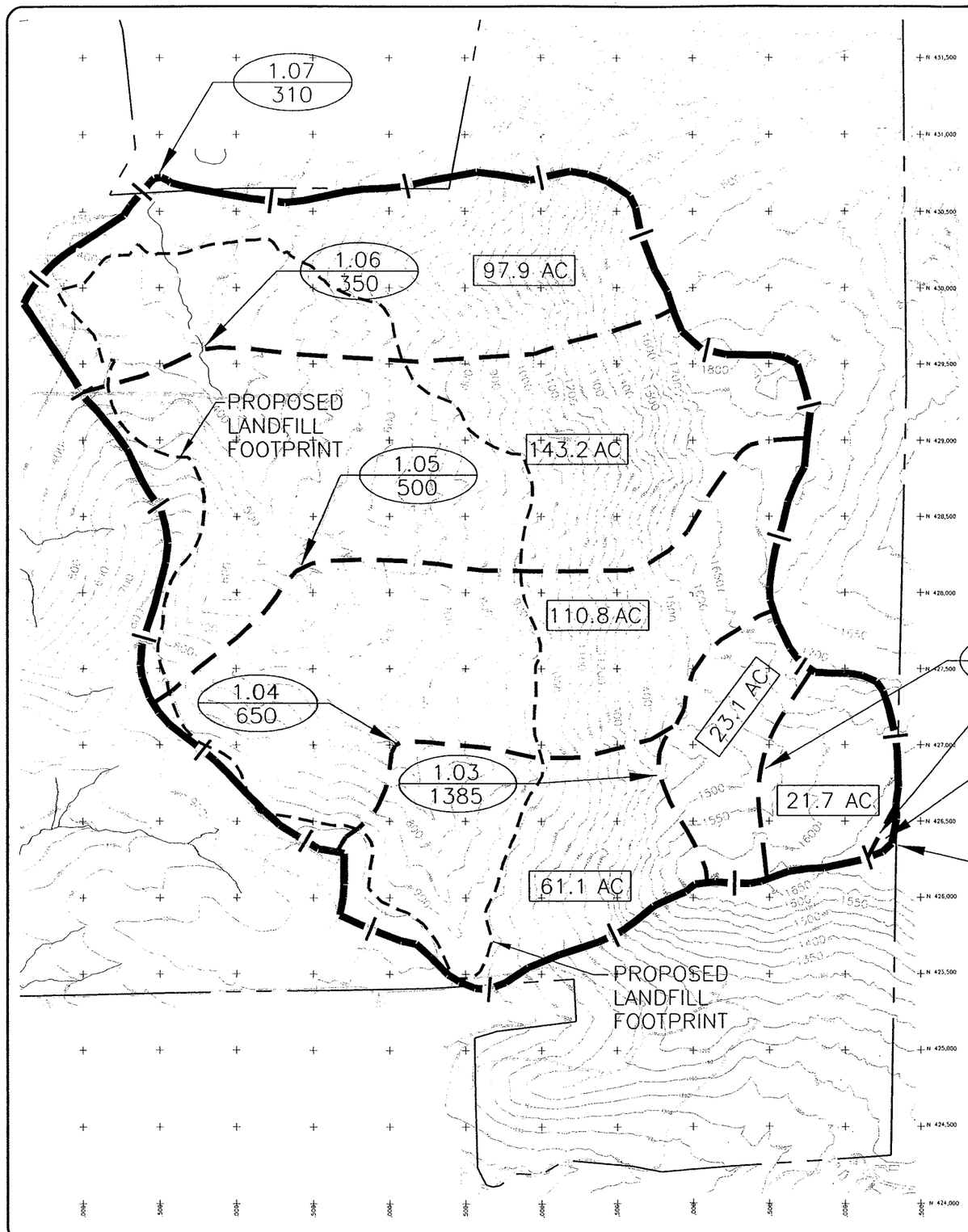
****************************************************************************
FLOW PROCESS FROM NODE      1.05 TO NODE      1.06 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    500.00  DOWNSTREAM(FEET) =    350.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1600.00   CHANNEL SLOPE =  0.0938
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.686
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    507.60
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.22
AVERAGE FLOW DEPTH(FEET) =   1.45   TRAVEL TIME(MIN.) =   1.88
```

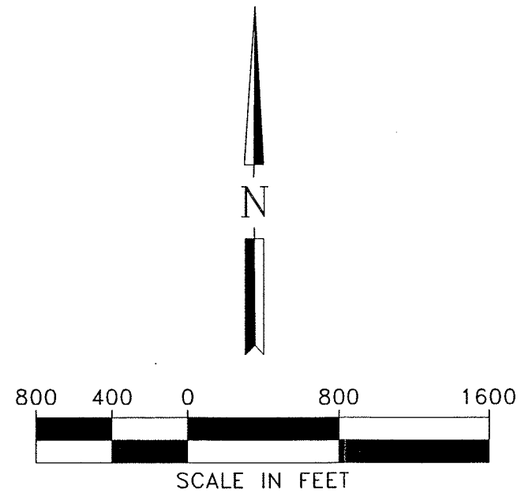
```
Tc(MIN.) =  14.28
SUBAREA AREA(ACRES) =    143.20        SUBAREA RUNOFF(CFS) =  234.87
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     360.40          PEAK FLOW RATE(CFS) =     591.11

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.56   FLOW VELOCITY(FEET/SEC.) =  14.81
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.06 =  6300.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.06 TO NODE      1.07 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    350.00  DOWNSTREAM(FEET) =    310.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1200.00   CHANNEL SLOPE =  0.0333
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   3.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.319
*USER SPECIFIED(GLOBAL):
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    665.13
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.40
AVERAGE FLOW DEPTH(FEET) =   2.08   TRAVEL TIME(MIN.) =   1.92
Tc(MIN.) =  16.20
SUBAREA AREA(ACRES) =    97.90        SUBAREA RUNOFF(CFS) =  148.00
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =    458.30          PEAK FLOW RATE(CFS) =     692.85

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  2.12   FLOW VELOCITY(FEET/SEC.) =  10.51
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.07 =  7500.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    458.30  TC(MIN.) =     16.20
PEAK FLOW RATE(CFS)    =    692.85
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```





LEGEND

- DRAINAGE TRIBUTARY AREA
- LANDFILL FOOTPRINT
- DRAINAGE SUB-AREA
- 1.00 / 725 — NODE NAME / ELEVATION — NODE DESCRIPTION
- 10.10 AC — AREA IN ACRES

GREGORY CANYON LANDFILL
100-YEAR RUNOFF SUMMARY TABLE

NODE NO.	SUBAREA (ACRES)	RUNOFF (CFS)	AREA (ACRES)	RUNOFF (CFS)	COMMENTS
1.00-1.01	0.5	1.4	0.5	1.4	INITIAL AREA
1.01-1.02	21.7	51.0	22.2	52.1	
1.02-1.03	23.1	50.2	45.3	98.5	
1.03-1.04	61.1	120.0	106.4	209.0	
1.04-1.05	110.8	199.0	217.2	390.1	
1.05-1.06	143.2	234.9	360.4	591.1	
1.06-1.07	97.9	148.0	458.3	692.9	

JOB NO. 9590
DATE 12-5-97
DRAWN BY D.L.L.
CHECKED BY G.V.N.

GREGORY CANYON LANDFILL-COUNTY OF SAN DIEGO

100-YEAR PRE-DEVELOPMENT CONDITION HYDROLOGY MAP

BAS
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE DIAMOND BAR, CA 91765
(909) 860-7777

939

```
****************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2004 Advanced Engineering Software (aes)
              Ver. 2.0 Release Date: 01/01/2004  License ID 1211

                              Analysis prepared by:

                         Bryan A. Stirrat & Associates
                             1360 Valley Vista Dr.
                               Diamond Bar, Ca
                                   91786

 ************************* DESCRIPTION OF STUDY *************************
* GREGORY CANYON HYDROLOGY (100-YEAR)                                    *
* FINAL PROPOSED GRADING                                                 *
* CHM                                                                    *
 ************************************************************************

  FILE NAME: GREGDEV.DAT
  TIME/DATE OF STUDY: 09:40 10/04/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ====== =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    S.C.S. S-GRAPH USED.
    SAN DIEGO COUNTY DEPTH-AREA FACTORS USED
    UNADJUSTED  6-HOUR RAINFALL DEPTH (INCHES) =   3.50
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   6.00
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  3.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.01 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
```

```
UPSTREAM ELEVATION(FEET) =   1820.00
DOWNSTREAM ELEVATION(FEET) =   1800.00
ELEVATION DIFFERENCE(FEET) =     20.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      0.56
TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
FLOW PROCESS FROM NODE      1.01 TO NODE      1.02 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1800.00  DOWNSTREAM(FEET) =   1650.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1000.00   CHANNEL SLOPE =  0.1500
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.130
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     10.17
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.29
AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   3.15
Tc(MIN.) =   9.42
SUBAREA AREA(ACRES) =     8.80       SUBAREA RUNOFF(CFS) =   18.88
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =      9.00         PEAK FLOW RATE(CFS) =      19.31

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   6.51
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.02 =  1100.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.02 TO NODE      1.03 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1650.00  DOWNSTREAM(FEET) =    915.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1350.00   CHANNEL SLOPE =  0.5444
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.556
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     58.93
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.51
AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   1.55
Tc(MIN.) =  10.97
SUBAREA AREA(ACRES) =    40.70       SUBAREA RUNOFF(CFS) =   79.14
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     49.70         PEAK FLOW RATE(CFS) =      96.64

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =  16.87
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.03 =  2450.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.03 TO NODE      1.04 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    890.00
```

```
CHANNEL LENGTH THRU SUBAREA(FEET) =  1200.00   CHANNEL SLOPE =  0.0208
CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.152
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    129.84
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.70
AVERAGE FLOW DEPTH(FEET) =   1.58   TRAVEL TIME(MIN.) =   1.36
Tc(MIN.) =  12.33
SUBAREA AREA(ACRES) =    36.80       SUBAREA RUNOFF(CFS) =   66.36
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     86.50         PEAK FLOW RATE(CFS) =     155.99

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.75   FLOW VELOCITY(FEET/SEC.) =  15.48
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.04 =  3650.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.04 TO NODE      1.05 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    890.00  DOWNSTREAM(FEET) =    648.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   900.00   CHANNEL SLOPE =  0.2689
CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.991
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    168.74
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  24.10
AVERAGE FLOW DEPTH(FEET) =   1.32   TRAVEL TIME(MIN.) =   0.62
Tc(MIN.) =  12.95
SUBAREA AREA(ACRES) =    14.60       SUBAREA RUNOFF(CFS) =   25.50
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =    101.10         PEAK FLOW RATE(CFS) =     176.61

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.35   FLOW VELOCITY(FEET/SEC.) =  24.38
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.05 =  4550.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      1.05 TO NODE      1.06 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    648.00  DOWNSTREAM(FEET) =    345.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1400.00   CHANNEL SLOPE =  0.2164
CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.50
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.850
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    222.44
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  39.50
AVERAGE FLOW DEPTH(FEET) =   1.10   TRAVEL TIME(MIN.) =   0.59
Tc(MIN.) =  13.54
SUBAREA AREA(ACRES) =    54.00       SUBAREA RUNOFF(CFS) =   91.66
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =    155.10         PEAK FLOW RATE(CFS) =     263.26

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  1.22   FLOW VELOCITY(FEET/SEC.) =  41.43
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.06 =  5950.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.06 TO NODE      1.07 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    330.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.0333
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.650
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    268.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.22
  AVERAGE FLOW DEPTH(FEET) =   1.38   TRAVEL TIME(MIN.) =   0.91
  Tc(MIN.) =  14.45
  SUBAREA AREA(ACRES) =     6.60       SUBAREA RUNOFF(CFS) =   10.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =    161.70         PEAK FLOW RATE(CFS) =     263.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.36   FLOW VELOCITY(FEET/SEC.) =   8.18
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.07 =  6400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.06 TO NODE      1.07 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  14.45
  RAINFALL INTENSITY(INCH/HR) =   4.65
  TOTAL STREAM AREA(ACRES) =   161.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    263.26

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.01 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1705.00
  DOWNSTREAM ELEVATION(FEET) =   1688.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.12
  TOTAL AREA(ACRES) =      0.40   TOTAL RUNOFF(CFS) =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE      4.01 TO NODE      4.02 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1688.00  DOWNSTREAM(FEET) =   1610.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.1560
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
```

```
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.859
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.10
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.07
AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.64
Tc(MIN.) =   7.91
SUBAREA AREA(ACRES) =     6.60       SUBAREA RUNOFF(CFS) =   15.84
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =      7.00         PEAK FLOW RATE(CFS) =      16.80

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   6.32
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.02 =   600.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.02 TO NODE      4.03 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1610.00  DOWNSTREAM(FEET) =   1525.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00   CHANNEL SLOPE =  0.2125
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.468
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     33.79
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.86
AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   0.75
Tc(MIN.) =   8.66
SUBAREA AREA(ACRES) =    15.00       SUBAREA RUNOFF(CFS) =   33.96
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     22.00         PEAK FLOW RATE(CFS) =      49.81

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =  10.05
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.03 =  1000.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.03 TO NODE      4.04 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1525.00  DOWNSTREAM(FEET) =   1250.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00   CHANNEL SLOPE =  0.3438
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.033
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     79.09
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.47
AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.99
Tc(MIN.) =   9.65
SUBAREA AREA(ACRES) =    27.70       SUBAREA RUNOFF(CFS) =   58.49
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     49.70         PEAK FLOW RATE(CFS) =     104.94

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =  14.86
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.04 =  1800.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE       4.04 TO NODE       4.05 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1250.00  DOWNSTREAM(FEET) =    945.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1200.00   CHANNEL SLOPE =  0.2542
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.524
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    130.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.15
  AVERAGE FLOW DEPTH(FEET) =   0.58   TRAVEL TIME(MIN.) =   1.41
  Tc(MIN.) =  11.07
  SUBAREA AREA(ACRES) =    26.40       SUBAREA RUNOFF(CFS) =   51.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     76.10         PEAK FLOW RATE(CFS) =     147.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =  14.62
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.05 =  3000.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       4.05 TO NODE       4.06 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    945.00  DOWNSTREAM(FEET) =    941.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1150.00   CHANNEL SLOPE =  0.0035
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.865
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    150.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.96
  AVERAGE FLOW DEPTH(FEET) =   2.79   TRAVEL TIME(MIN.) =   2.41
  Tc(MIN.) =  13.48
  SUBAREA AREA(ACRES) =     4.00       SUBAREA RUNOFF(CFS) =    6.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     80.10         PEAK FLOW RATE(CFS) =     147.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.75   FLOW VELOCITY(FEET/SEC.) =   7.92
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.06 =  4150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       4.06 TO NODE       4.07 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    941.00  DOWNSTREAM(FEET) =    938.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00   CHANNEL SLOPE =  0.0043
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.572
  OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    148.56
```

```
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.57
AVERAGE FLOW DEPTH(FEET) =   2.62   TRAVEL TIME(MIN.) =   1.36
Tc(MIN.) =  14.84
SUBAREA AREA(ACRES) =     1.80       SUBAREA RUNOFF(CFS) =    2.88
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     81.90         PEAK FLOW RATE(CFS) =     147.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  2.60   FLOW VELOCITY(FEET/SEC.) =   8.55
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.07 =  4850.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.07 TO NODE      4.08 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    938.00  DOWNSTREAM(FEET) =    912.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00   CHANNEL SLOPE =  0.0325
CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.429
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    147.97
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  17.85
AVERAGE FLOW DEPTH(FEET) =   1.51   TRAVEL TIME(MIN.) =   0.75
Tc(MIN.) =  15.59
SUBAREA AREA(ACRES) =     1.10       SUBAREA RUNOFF(CFS) =    1.71
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     83.00         PEAK FLOW RATE(CFS) =     147.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.50   FLOW VELOCITY(FEET/SEC.) =  17.86
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.08 =  5650.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.08 TO NODE      4.09 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    912.00  DOWNSTREAM(FEET) =    450.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  2100.00   CHANNEL SLOPE =  0.2200
CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.257
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    153.90
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  35.46
AVERAGE FLOW DEPTH(FEET) =   0.89   TRAVEL TIME(MIN.) =   0.99
Tc(MIN.) =  16.57
SUBAREA AREA(ACRES) =     9.10       SUBAREA RUNOFF(CFS) =   13.56
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     92.10         PEAK FLOW RATE(CFS) =     147.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.86   FLOW VELOCITY(FEET/SEC.) =  34.96
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      4.09 =  7750.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.08 TO NODE      4.09 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.257
OPEN BRUSH POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) =     4.60   SUBAREA RUNOFF(CFS) =     6.85
TOTAL AREA(ACRES) =      96.70   TOTAL RUNOFF(CFS) =  147.12
TC(MIN.) =  16.57
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
FLOW PROCESS FROM NODE      4.09 TO NODE      1.09 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =  16.57
RAINFALL INTENSITY(INCH/HR) =   4.26
TOTAL STREAM AREA(ACRES) =    96.70
PEAK FLOW RATE(CFS) AT CONFLUENCE =    147.12

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1      263.26    14.45       4.650        161.70
    2      147.12    16.57       4.257         96.70

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1      391.58    14.45       4.650
    2      388.16    16.57       4.257

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    391.58   Tc(MIN.) =   14.45
TOTAL AREA(ACRES) =    258.40
LONGEST FLOWPATH FROM NODE      4.00 TO NODE      1.09 =  7750.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.09 TO NODE      1.09 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE      2.00 TO NODE      2.01 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
UPSTREAM ELEVATION(FEET) =   1105.00
DOWNSTREAM ELEVATION(FEET) =   1104.00
ELEVATION DIFFERENCE(FEET) =      1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.029
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.886
SUBAREA RUNOFF(CFS) =      0.62
TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.62

****************************************************************************
FLOW PROCESS FROM NODE      2.01 TO NODE      2.02 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1104.00  DOWNSTREAM(FEET) =   1100.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.510
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.46
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   5.13
  Tc(MIN.) =  15.16
  SUBAREA AREA(ACRES) =     3.70       SUBAREA RUNOFF(CFS) =    5.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      4.00         PEAK FLOW RATE(CFS) =       6.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   1.77
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.02 =   520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.02 TO NODE      2.03 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1100.00  DOWNSTREAM(FEET) =   1000.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.1538
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.198
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     14.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.07
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   1.78
  Tc(MIN.) =  16.94
  SUBAREA AREA(ACRES) =    11.60       SUBAREA RUNOFF(CFS) =   17.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     15.60         PEAK FLOW RATE(CFS) =      22.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   6.92
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.03 =  1170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.03 TO NODE      2.04 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1000.00  DOWNSTREAM(FEET) =    948.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00   CHANNEL SLOPE =  0.0743
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.905
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     28.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.81
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   2.01
  Tc(MIN.) =  18.95
```

```
SUBAREA AREA(ACRES) =      7.50        SUBAREA RUNOFF(CFS) =    10.25
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =      23.10          PEAK FLOW RATE(CFS) =       31.57

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   6.05
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.04 =  1870.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      2.04 TO NODE      2.05 IS CODE =  41
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   948.00  DOWNSTREAM(FEET) =   944.00
FLOW LENGTH(FEET) =  1900.00   MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.47
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     31.57
PIPE TRAVEL TIME(MIN.) =   7.09    Tc(MIN.) =  26.04
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.05 =  3770.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      2.04 TO NODE      2.05 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.181
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) =   13.30   SUBAREA RUNOFF(CFS) =   14.81
TOTAL AREA(ACRES) =     36.40   TOTAL RUNOFF(CFS) =   40.53
TC(MIN.) =  26.04

****************************************************************************
FLOW PROCESS FROM NODE      2.05 TO NODE      2.06 IS CODE =  41
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   944.00  DOWNSTREAM(FEET) =   940.00
FLOW LENGTH(FEET) =   500.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS  22.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   8.70
GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     40.53
PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =  26.99
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.06 =  4270.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      2.05 TO NODE      2.06 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.108
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) =    9.60   SUBAREA RUNOFF(CFS) =   10.44
TOTAL AREA(ACRES) =     46.00   TOTAL RUNOFF(CFS) =   50.04
TC(MIN.) =  26.99

****************************************************************************
```

```
  FLOW PROCESS FROM NODE      2.06 TO NODE      2.07 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   940.00  DOWNSTREAM(FEET) =   890.00
  FLOW LENGTH(FEET) =  1050.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.59
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     50.04
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =  27.99
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.07 =  5320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.06 TO NODE      2.07 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.036
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    7.90   SUBAREA RUNOFF(CFS) =    8.40
  TOTAL AREA(ACRES) =     53.90   TOTAL RUNOFF(CFS) =   57.28
  TC(MIN.) =  27.99

****************************************************************************
  FLOW PROCESS FROM NODE      2.07 TO NODE      2.08 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   890.00  DOWNSTREAM(FEET) =   500.00
  FLOW LENGTH(FEET) =  2000.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  30.18
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     57.28
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =  29.09
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.08 =  7320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.07 TO NODE      2.08 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.961
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   51.60   SUBAREA RUNOFF(CFS) =   53.48
  TOTAL AREA(ACRES) =    105.50   TOTAL RUNOFF(CFS) =  109.35
  TC(MIN.) =  29.09

****************************************************************************
  FLOW PROCESS FROM NODE      2.08 TO NODE      2.09 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   500.00  DOWNSTREAM(FEET) =   360.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  13.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  36.72
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
```

```
PIPE-FLOW(CFS) =    109.35
PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =  29.41
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.09 =  8020.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      2.08 TO NODE      2.09 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.941
GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  95
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4159
SUBAREA AREA(ACRES) =   17.20   SUBAREA RUNOFF(CFS) =   41.48
TOTAL AREA(ACRES) =    122.70   TOTAL RUNOFF(CFS) =  150.06
TC(MIN.) =  29.41

****************************************************************************
FLOW PROCESS FROM NODE      2.09 TO NODE      3.03 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =  29.41
RAINFALL INTENSITY(INCH/HR) =   2.94
TOTAL STREAM AREA(ACRES) =   122.70
PEAK FLOW RATE(CFS) AT CONFLUENCE =    150.06

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE      3.01 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
UPSTREAM ELEVATION(FEET) =   1100.00
DOWNSTREAM ELEVATION(FEET) =   1082.00
ELEVATION DIFFERENCE(FEET) =     18.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      1.12
TOTAL AREA(ACRES) =      0.40   TOTAL RUNOFF(CFS) =      1.12

****************************************************************************
FLOW PROCESS FROM NODE      3.01 TO NODE      3.02 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1082.00  DOWNSTREAM(FEET) =    975.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1783
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.808
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     11.07
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.76
AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.74
Tc(MIN.) =   8.00
SUBAREA AREA(ACRES) =     8.30       SUBAREA RUNOFF(CFS) =   19.78
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
```

```
TOTAL AREA(ACRES) =       8.70          PEAK FLOW RATE(CFS) =       20.73

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   7.19
LONGEST FLOWPATH FROM NODE      3.00 TO NODE      3.02 =   700.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    975.00  DOWNSTREAM(FEET) =    340.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  3000.00   CHANNEL SLOPE =  0.2117
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.024   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.352
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     87.42
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.81
AVERAGE FLOW DEPTH(FEET) =   0.44   TRAVEL TIME(MIN.) =   3.62
Tc(MIN.) =  11.62
SUBAREA AREA(ACRES) =    70.50       SUBAREA RUNOFF(CFS) =  132.06
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     79.20         PEAK FLOW RATE(CFS) =     148.36

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =  16.09
LONGEST FLOWPATH FROM NODE      3.00 TO NODE      3.03 =  3700.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =  11.62
RAINFALL INTENSITY(INCH/HR) =   5.35
TOTAL STREAM AREA(ACRES) =    79.20
PEAK FLOW RATE(CFS) AT CONFLUENCE =    148.36

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1      150.06    29.41       2.941        122.70
    2      148.36    11.62       5.352         79.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1      207.66    11.62       5.352
    2      231.58    29.41       2.941

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    231.58   Tc(MIN.) =   29.41
TOTAL AREA(ACRES) =    201.90
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      3.03 =  8020.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =  11
----------------------------------------------------------------------------
```

```
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

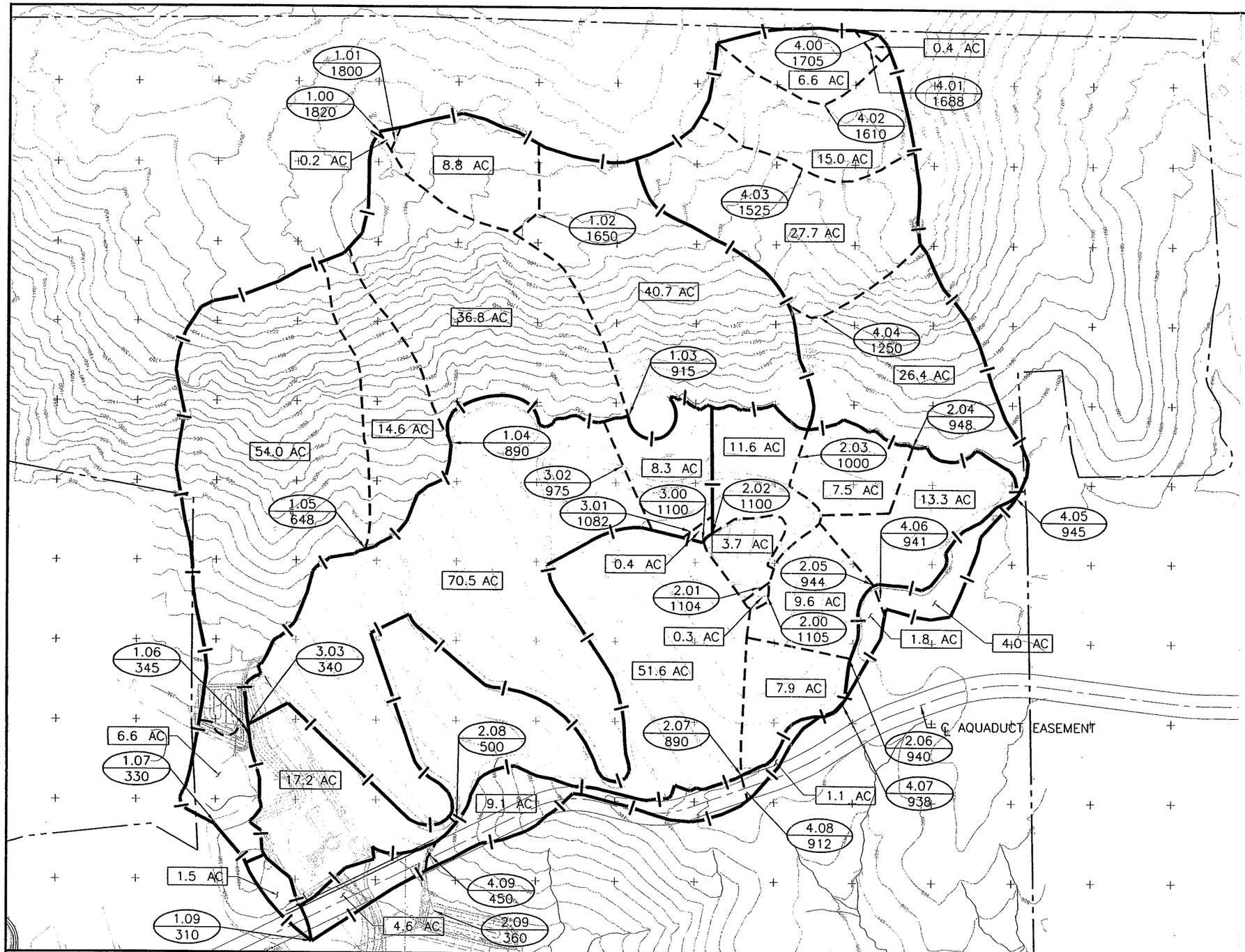
** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc       INTENSITY      AREA
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
   1        231.58    29.41        2.941       201.90
LONGEST FLOWPATH FROM NODE       2.00 TO NODE       3.03 =  8020.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc       INTENSITY      AREA
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
   1        391.58    14.45        4.650       258.40
LONGEST FLOWPATH FROM NODE       4.00 TO NODE       3.03 =  7750.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc       INTENSITY
NUMBER      (CFS)     (MIN.)    (INCH/HOUR)
   1       505.40      14.45        4.650
   2       479.24      29.41        2.941

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    505.40   Tc(MIN.) =   14.45
TOTAL AREA(ACRES) =    460.30
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    460.30  TC(MIN.) =     14.45
PEAK FLOW RATE(CFS) Q100 =  505.40  < 692.9 (PRE-DEVELOPED Q100)
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

THE PEAK FLOW FOR THE PROPOSED SITE IS LESS THAN THE PRE-DEVELOPED THEREFORE THE BASIN DESIGNS NEED ONLY TO REDUCE THE SEDIMENT.



GRAPHIC SCALE

300 150 0 300 600

(IN FEET)

N

GREGORY CANYON LANDFILL
100-YEAR RUNOFF SUMMARY TABLE

NODES NO.	SUB AREA (ACRES)	RUNOFF (CFS)	SUBAREA (ACRES)	RUNOFF (CFS)	COMMENTS
1.00–1.01	0.20	0.56	0.20	0.56	INITIAL
1.01–1.02	8.80	18.88	9.00	19.31	
1.02–1.03	40.70	79.14	49.70	96.64	
1.03–1.04	36.80	66.36	86.50	155.99	
1.04–1.05	14.60	25.50	101.10	176.61	
1.05–1.06	54.00	91.66	155.10	263.26	
1.06–1.07	6.60	10.74	161.70	263.26	
1.07			161.70	263.26	CONFLUENCE
4.00–4.01	0.40	1.12	0.40	1.12	INITIAL
4.01–4.02	6.60	15.84	7.00	16.80	
4.02–4.03	15.00	33.96	22.00	49.81	
4.03–4.04	27.70	58.49	49.70	104.94	
4.04–4.05	26.40	51.04	76.10	147.12	
4.05–4.06	4.00	6.81	80.10	147.12	
4.06–4.07	1.80	2.88	81.90	147.12	
4.07–4.08	1.10	1.71	83.00	147.12	
4.08–4.09	9.10	13.56	92.10	147.12	
4.08–4.09	4.60	6.85	96.70	147.12	ADDITIONAL
1.09			96.70	147.12	CONFLUENCE
2.00–2.01	0.30	0.62	0.30	0.62	INITIAL
2.01–2.02	3.70	5.84	4.00	6.31	
2.02–2.03	11.60	17.04	15.60	22.92	
2.03–2.04	7.50	10.25	23.10	31.57	
2.04–2.05	13.30	14.81	36.40	40.53	ADDITIONAL
2.05–2.06	9.60	10.44	46.00	50.04	ADDITIONAL
2.06–2.07	7.90	8.40	53.90	57.28	ADDITIONAL
2.07–2.08	51.60	53.48	105.50	109.35	ADDITIONAL
2.08–2.09	17.20	17.70	122.70	150.06	ADDITIONAL
3.00–3.01	0.40	1.12	0.40	1.12	INITIAL
3.01–3.02	8.30	19.78	8.70	20.73	
3.02–3.03	70.50	132.06	79.20	148.36	

LEGEND

- DRAINAGE TRIBUTARY AREA
- DRAINAGE SUB-AREA
- 1.00 / 1705 — NODE NAME / ELEVATION — NODE DESCRIPTION
- 54.00 AC — AREA IN ACRES

PRELIMINARY

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
100-YEAR DEVELOPED CONDITION
HYDROLOGY MAP

DESIGNED BY : C.M.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 9-2004	FILE NO.: 241850B.DWG
CHECKED BY :	DATE :	DRAWING 24
APPROVED BY :	DATE :	

FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

954

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  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                        2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2004 Advanced Engineering Software (aes)
            Ver. 2.0 Release Date: 01/01/2004  License ID 1211

                          Analysis prepared by:

                      Bryan A. Stirrat & Associates
                          1360 Valley Vista Dr.
                            Diamond Bar, Ca
                                91786

 ************************** DESCRIPTION OF STUDY **************************
* GREGORY CANYON HYDROLOGY (10-YEAR)                                      *
* FINAL PROPOSED GRADING                                                  *
* CHM                                                                     *
 ***************************************************************************

  FILE NAME: GREG10.DAT
  TIME/DATE OF STUDY: 07:47 10/06/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    UNADJUSTED  6-HOUR RAINFALL DEPTH (INCHES) =   0.00
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.00
  *PRECIPITATION ZONE NUMBER (PZN) = 0.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.01 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1105.00
  DOWNSTREAM ELEVATION(FEET) =   1104.00
```

```
  ELEVATION DIFFERENCE(FEET) =       1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.029
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.700
  SUBAREA RUNOFF(CFS) =       0.39
  TOTAL AREA(ACRES) =       0.30   TOTAL RUNOFF(CFS) =       0.39

****************************************************************************
  FLOW PROCESS FROM NODE      2.01 TO NODE      2.02 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1104.00  DOWNSTREAM(FEET) =   1100.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.716
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.22
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   6.17
  Tc(MIN.) =  16.20
  SUBAREA AREA(ACRES) =     3.70       SUBAREA RUNOFF(CFS) =    3.52
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      4.00         PEAK FLOW RATE(CFS) =       3.80

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   1.49
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.02 =   520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.02 TO NODE      2.03 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1100.00  DOWNSTREAM(FEET) =   1000.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.1538
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.511
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      8.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.17
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   2.10
  Tc(MIN.) =  18.29
  SUBAREA AREA(ACRES) =    11.60       SUBAREA RUNOFF(CFS) =   10.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     15.60         PEAK FLOW RATE(CFS) =      13.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   5.87
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.03 =  1170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.03 TO NODE      2.04 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1000.00  DOWNSTREAM(FEET) =    948.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   700.00   CHANNEL SLOPE =  0.0743
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
```

```
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.320
 ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  89
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     16.76
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.89
 AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   2.39
 Tc(MIN.) =  20.68
 SUBAREA AREA(ACRES) =     7.50       SUBAREA RUNOFF(CFS) =    6.09
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =     23.10         PEAK FLOW RATE(CFS) =      18.76

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   5.12
 LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.04 =  1870.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      2.04 TO NODE      2.05 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.00  DOWNSTREAM(FEET) =   944.00
 FLOW LENGTH(FEET) =  1900.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  21.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.37
 GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     18.76
 PIPE TRAVEL TIME(MIN.) =   7.25    Tc(MIN.) =  27.93
 LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.05 =  3770.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      2.04 TO NODE      2.05 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.911
 ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  89
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA(ACRES) =   13.30   SUBAREA RUNOFF(CFS) =    8.90
 TOTAL AREA(ACRES) =     36.40   TOTAL RUNOFF(CFS) =   24.35
 TC(MIN.) =  27.93

****************************************************************************
 FLOW PROCESS FROM NODE      2.05 TO NODE      2.06 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   944.00  DOWNSTREAM(FEET) =   940.00
 FLOW LENGTH(FEET) =   500.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  16.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.70
 GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     24.35
 PIPE TRAVEL TIME(MIN.) =   1.08    Tc(MIN.) =  29.01
 LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.06 =  4270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      2.05 TO NODE      2.06 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.865
 ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =     9.60   SUBAREA RUNOFF(CFS) =     6.27
  TOTAL AREA(ACRES) =      46.00   TOTAL RUNOFF(CFS) =    30.02
  TC(MIN.) =  29.01

****************************************************************************
  FLOW PROCESS FROM NODE      2.06 TO NODE      2.07 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   940.00  DOWNSTREAM(FEET) =   890.00
  FLOW LENGTH(FEET) =  1050.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.17
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     30.02
  PIPE TRAVEL TIME(MIN.) =   1.15    Tc(MIN.) =  30.17
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.07 =  5320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.06 TO NODE      2.07 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.818
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =     7.90   SUBAREA RUNOFF(CFS) =     5.03
  TOTAL AREA(ACRES) =      53.90   TOTAL RUNOFF(CFS) =    34.30
  TC(MIN.) =  30.17

****************************************************************************
  FLOW PROCESS FROM NODE      2.07 TO NODE      2.08 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   890.00  DOWNSTREAM(FEET) =   500.00
  FLOW LENGTH(FEET) =  2000.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.94
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     34.30
  PIPE TRAVEL TIME(MIN.) =   1.28    Tc(MIN.) =  31.45
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.08 =  7320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.07 TO NODE      2.08 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.770
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    51.60   SUBAREA RUNOFF(CFS) =    31.97
  TOTAL AREA(ACRES) =     105.50   TOTAL RUNOFF(CFS) =    65.36
  TC(MIN.) =  31.45

****************************************************************************
  FLOW PROCESS FROM NODE      2.08 TO NODE      2.09 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   500.00  DOWNSTREAM(FEET) =   360.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  31.65
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     65.36
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =  31.82
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      2.09 =  8020.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.08 TO NODE      2.09 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.757
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4159
  SUBAREA AREA(ACRES) =   17.20   SUBAREA RUNOFF(CFS) =   24.78
  TOTAL AREA(ACRES) =    122.70   TOTAL RUNOFF(CFS) =   89.65
  TC(MIN.) =  31.82

****************************************************************************
  FLOW PROCESS FROM NODE      2.09 TO NODE      3.03 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  31.82
  RAINFALL INTENSITY(INCH/HR) =   1.76
  TOTAL STREAM AREA(ACRES) =   122.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     89.65

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.01 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1100.00
  DOWNSTREAM ELEVATION(FEET) =   1082.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.011
  SUBAREA RUNOFF(CFS) =      0.70
  TOTAL AREA(ACRES) =      0.40   TOTAL RUNOFF(CFS) =      0.70

****************************************************************************
  FLOW PROCESS FROM NODE      3.01 TO NODE      3.02 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1082.00  DOWNSTREAM(FEET) =    975.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1783
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.172
  ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.83
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.86
AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   2.06
Tc(MIN.) =   8.32
SUBAREA AREA(ACRES) =     8.30       SUBAREA RUNOFF(CFS) =   12.12
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =      8.70         PEAK FLOW RATE(CFS) =      12.70

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   6.05
LONGEST FLOWPATH FROM NODE      3.00 TO NODE      3.02 =   700.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    975.00  DOWNSTREAM(FEET) =    340.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  3000.00   CHANNEL SLOPE =  0.2117
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.024   MAXIMUM DEPTH(FEET) =   5.00
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.205
ANNUAL GRASS (DRYLAND) POOR COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     52.75
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.89
AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   4.20
Tc(MIN.) =  12.53
SUBAREA AREA(ACRES) =    70.50       SUBAREA RUNOFF(CFS) =   79.09
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =     79.20         PEAK FLOW RATE(CFS) =      88.85

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =  13.80
LONGEST FLOWPATH FROM NODE      3.00 TO NODE      3.03 =  3700.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.02 TO NODE      3.03 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =  12.53
RAINFALL INTENSITY(INCH/HR) =   3.21
TOTAL STREAM AREA(ACRES) =    79.20
PEAK FLOW RATE(CFS) AT CONFLUENCE =     88.85

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       89.65    31.82       1.757        122.70
    2       88.85    12.53       3.205         79.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1      124.14    12.53       3.205
    2      138.35    31.82       1.757

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
PEAK FLOW RATE(CFS) =    138.35   Tc(MIN.) =   31.82
TOTAL AREA(ACRES) =    201.90
LONGEST FLOWPATH FROM NODE      2.00 TO NODE      3.03 =  8020.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =    201.90  TC(MIN.) =     31.82
PEAK FLOW RATE(CFS)    =    138.35
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

APPENDIX I-1

STORM WATER MANAGEMENT PLAN AND HYDROGEOMORPHOLOGY REPORT

STORMWATER MANAGEMENT PLAN FOR GREGORY CANYON LANDFILL

Prepared for

Gregory Canyon Landfill, Ltd.
249 South Highway 101, #377
Solana Beach, CA 92075

URS Project No. 27654025.00020

December 14, 2007
Last Revised September 22, 2008

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
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TABLE OF CONTENTS

Section 1 BACKGROUND 1-1

1.1 Regional Requirements 1-1
1.2 Project Description 1-2

Section 2 PRIORITY PROJECT DETERMINATION 2-1

2.1 Priority Project Table 2-1
2.2 Site Description 2-1
2.3 Treatment Control BMP Requirements 2-4

Section 3 WATERSHED 3-1

3.1 Beneficial Uses 3-1

Section 4 POLLUTANTS OF CONCERN 4-1

Section 5 CONSTRUCTION BMPS 5-1

Section 6 SITE DESIGN AND LOW IMPACT DEVELOPMENT BMPS 6-1

Section 7 SOURCE CONTROL BMPS 7-1

Section 8 TREATMENT CONTROL BMPS 8-1

8.1 Runoff Calculations 8-2
8.2 Project Treatment BMPs 8-5
8.3 BMP Selection Description 8-6

Section 9 MAINTENANCE 9-1

Section 10 HYDROMODIFICATION EVALUATION 10-1

Tables

Table 1	Project Information
Table 2	SWMP Revisions
Table 3	Priority Project Determination
Table 4	Site Description Components
Table 5	Treatment Control BMP Determination
Table 6	Beneficial Uses for Inland Surface Waters and Ground Waters
Table 7	Anticipated and Potential Pollutants Generated by Land Use Type
Table 8	Site Design Options
Table 9	Channel Modification Criteria Evaluation
Table 10	Source Control BMP Identification
Table 11	Treatment Control BMP Selection Matrix
Table 12a	Project Runoff Values
Table 12b	Project Hydrograph Volumes
Table 13	Maintenance Category
Table E-1.	Summary of Bio-filtration Design Factors (Strips And Swales)
Table E-2.	Summary of Infiltration Area Siting and Design Criteria

Attachments

Attachment A	Project Location Map
Attachment B	Project Site Map
Attachment C	Relevant Monitoring Data
Attachment D	Treatment BMP Location Map
Attachment E	Treatment BMP Design
Attachment F	Treatment BMP Operation and Maintenance
Attachment G	Engineer's Certification Sheet

amsl	above mean sea level
BMP	Best Management Practice
GCLF	Gregory Canyon Landfill
I-15	Interstate 15
LID	Low Impact Development
LLC	Limited Liability Company
MS4	Municipal Separate Storm Sewer Systems
RWQCB	Regional Water Quality Control Board
SDG&E	San Diego Gas and Electric
SWMP	Stormwater Management Plan
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
URS	URS Corporation
WPO	County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance

SECTION 1 BACKGROUND

Table 1
Project Information

Project Name:	Gregory Canyon Landfill
Applicant::	Gregory Canyon Landfill, Ltd. 249 South Highway 101, #377 Solana Beach, CA 92075
Plan Prepared By:	URS Corporation
Date:	November 16, 2007
Revision Date:	September 22, 2008

Table 2
SWMP Revisions

Project Review Stage	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
Resource Agency Permitting	X		
Final Engineering Design	X		

1.1 REGIONAL REQUIREMENTS

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity must be accompanied by a Storm Water Management Plan (SWMP) (Section 67.804.f). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority project are required to prepare a major SWMP.

The current standard County SWMP template was modified herein to incorporate the requirements listed in the California Regional Water Quality Control Board, San Diego Region, Order Number R9-2007-0001, NPDES No. CAS0108758, Waste Discharge Requirements for Discharges of Urban Runoff From the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, the San Diego Unified Port District, and the San Diego County Regional Airport Authority. This permit will be referenced as the 2007 Municipal Permit.

Note that the project is located outside of the urban and environmentally sensitive areas as defined on the maps in Appendix B of the County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects and is not directly tributary to a Municipal Separate Storm Sewer System (MS4), and therefore would not technically be subject to the requirements of the new Municipal Permit. However, a number of the Low Impact Development (LID), Best Management Practices (BMPs), Treatment Control BMPs, and Hydromodification requirements presented in the

Municipal Permit will be incorporated into the project to minimize the potential for stormwater quality degradation and hydromodification impacts to the San Luis Rey River.

1.2 PROJECT DESCRIPTION

The Gregory Canyon Landfill (GCLF) is located in north central part of San Diego County near the community of Pala. The GCLF is north of the community of Valley Center, east of Fallbrook and Interstate 15 (I-15) and west of the community of Pala and the Pala Indian Reservation. It lies approximately 25 miles east of the Pacific Ocean, about three miles east of I-15, and about five miles south of the northern County boundary.

The GCLF property includes approximately 1,770 acres of which approximately 308 acres will be used for overall landfill activities (e.g., stockpile areas, ancillary facilities, access road, refuse disposal) of which 183 acres will be used for refuse disposal. The proposed site will be permitted as a Class III landfill. The proposed project area will also include two designated soil stockpile/borrow areas. Borrow /Stockpile Area A will be located west of the proposed landfill footprint adjacent to the western property boundary, and Borrow/Stockpile Area B will be located immediately southwest and adjacent to the proposed landfill footprint. Other project components include ancillary facilities area, access road and bridge from State Route 76 crossing San Luis Rey River, internal haul road, and installation of environmental monitoring and control systems.

GCLF drainage facilities will consist of two desilting basins and surface drainage features including bench drains and pipe downdrains for landfill area drainage, and perimeter surface drains for collection and conveyance of runoff originating outside of the landfill footprint. Additionally, the landfill design will incorporate post-construction site design, source control, and treatment control stormwater quality BMPs.

1.2.1 Drainage Design Features

To reduce the potential long-term impacts of the landfill and associated facilities on surface water quality, a number of drainage features would be incorporated into the project to direct runoff away from the landfill working face and borrow/stockpile areas, to minimize erosion and resulting sediment and to provide desiltation prior to runoff discharge into the San Luis Rey River that could result from stormwater runoff.

With regard to the landfill footprint, the primary function of the proposed drainage facilities is to divert and convey stormwater flows in a controlled manner in order to minimize erosion and inhibit the potential infiltration of surface water run-on into the refuse disposal areas. On-site drainage features are designed to control stormwater that falls on the landfill and the surrounding support facilities. A berm around the landfill deck perimeter would intercept stormwater flows and direct water into the downdrains, which would convey the flows to the buried drainage pipes located around the perimeter of the refuse footprint. The buried drainage pipes would be sloped to maintain positive flow and discharge to the desilting basins. These basins would act to reduce the amount of silt ultimately discharged from the landfill site. Stormwater from the surrounding facilities would sheet flow directly into the perimeter drainage channels, which would convey flows around the desilting basins and would discharge in a combined

outfall with discharges from the desilting basins. Energy dissipators would reduce discharge velocities to predevelopment conditions.

The downdrains would be laid perpendicular to slope contours and located atop, and anchored into, the final landfill surface. They would extend up the completed side slopes of the landfill as the filling progresses. The downdrains would also have inlets at each bench to accommodate flows along the inside edge of the benches resulting from stormwater from the landfill side slopes.

SECTION 2 PRIORITY PROJECT DETERMINATION

2.1 PRIORITY PROJECT TABLE

Based upon evaluation and completion of Table 3 below, the project would be considered a priority project. Detailed priority project definitions are included in the 2007 Municipal Permit.

Table 3
Priority Project Determination

PRIORITY PROJECT	YES	NO
Redevelopment within the County Urban Area that creates, adds, or replaces at least 5,000 net square feet of additional impervious surface area on an already developed site that falls into one of the categories below.		X
Housing subdivisions of 10 or more dwelling units.		X
Commercial developments greater than 1 acre.	X	
Developments of heavy industry greater than one acre.		X
Automotive repair shops.		X
Restaurants, where the land area for development is greater than 5,000 square feet.		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface.	X	
Environmentally Sensitive Areas: All development and redevelopment located within or directly adjacent to or discharging directly to an environmentally sensitive area (where discharges from the development or redevelopment will enter receiving waters within the environmentally sensitive area), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition.		X
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff.	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater.	X	
Retail Gasoline Outlets 5,000 square feet or larger or with a projected Average Daily Traffic of 100 or more vehicles.		X

2.2 SITE DESCRIPTION

Table 4 provides the suggested site description components to be discussed in this section. Following the section is description of the applicable components. The order of the discussion proceeds in a slightly different order than that presented in Table 4 to provide continuity of the discussion.

Table 4
Site Description Components

	SITE DESCRIPTION COMPONENT	COMPLETED	NA
1.	Describe the topography of the project area.	X	
2.	Describe the local land use within the project area and adjacent areas.	X	
3.	Evaluate the presence of dry weather flow.	X	
4.	Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	X	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	X	
6.	Determine if there are any High Risk Areas (municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.	X	
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.		X
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	X	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	X	
10.	Determine contaminated or hazardous soils within the project area.	X	

2.2.1 Topography

Approximately 75 percent of the project site consists of steeply sloping, rocky land which is naturally vegetated and undeveloped. From a geologic perspective, the project is located within the Penisular Range. Regional topography in the Peninsular Range is characterized by considerable relief with relatively moderate to steep slopes. East of Gregory Canyon, Gregory Mountain rises steeply to a maximum elevation of 1,844 feet above mean sea level (amsl). The western ridge rises to a maximum elevation of 940 feet amsl. The thalweg (*i.e.,* the flow line) of the canyon itself drops in elevation from 920 feet amsl at the head of the canyon on the south to 320 feet amsl on its northern terminus into the San Luis Rey River. Elevations on the Gregory Canyon site range from approximately 300 feet above mean sea level (amsl) at the mouth of the canyon in the San Luis Rey River drainage to 1,200 feet amsl at the head of the canyon at the south. Much of the canyon is steep, rugged terrain containing numerous boulder outcrops on the eastern side with only a few isolated boulders on the western canyon wall. The canyon flattens somewhat at the mouth where it meets the alluvial deposits of the San Luis Rey River drainage. The overall slope of the canyon is approximately 12% from top to bottom along the thalweg. The Gregory Canyon watershed drains approximately 458 acres or approximately one tenth of one percent of the San Luis Rey River basin area. Gregory Canyon flows northward to the San Luis Rey River.

2.2.2 General Climate

The median annual rainfall based upon 30 years of rainfall data analysis by URS Corporation (URS) for the Fallbrook rain gauge (located approximately 10 miles northwest of the project) is 14.1 inches. The

rainy season is from October to April with most significant rain events occurring between December and March. Summers are typically dry with only infrequent thunderstorms.

2.2.3 Soils and Groundwater

Most of the area is undergoing erosion and mass wasting, but the major river valleys have thick accumulations of sediments, technically referred to as alluvium. The alluvium undergoes cycles of deposition and erosion, depending on the water flow in the drainage system. The existing slopes on the lower area of Gregory Canyon are about 5:1 (horizontal-to-vertical ratio), become 2:1 to the east, and are 1:1 and steeper on the upper part of the eastern slope. The western flank of the canyon is defined by a rounded ridgeline, with rather uniform slopes at inclinations of 2:1 to 3:1.

2.2.4 Local Land Use

Land uses in this part of the County are primarily rural, including agriculture, large lot residential, scattered small communities, and occasional large-scale commercial/industrial uses (primarily mining). Existing and past land uses on the site include open space, agricultural uses (dairy), residential development, a San Diego Gas & Electric (SDG&E) high voltage electrical transmission line on the east side of the site, and buried pipelines of the San Diego Aqueduct through the central portion of the site.

2.2.5 Dry Weather Flows

Flows in Gregory Canyon are considered ephemeral (*i.e.,* it flows briefly in direct response to heavy precipitation in the vicinity). Surface flow in the canyon occurs during moderate to large storm events (in excess of the 5-year storm event). However, surface flows from Gregory Canyon will not reach the San Luis Rey River due to rapid infiltration within the San Luis Rey River 500-year floodplain terrace. Typically, the San Luis Rey River is at zero to low flow during the summer months and has variable flows during the winter rainy season.

2.2.6 Receiving Waters and 303(d) Status

The San Luis Rey River is the receiving water from the GCLF. The San Luis Rey River is listed for 303(d) Total Dissolved Solids (TDS) (total of 19 miles) and Chloride (lower 13 miles) impairment downstream of the project area.

2.2.7 High Risk Areas

There are no municipal or domestic water supply reservoirs located within or downstream of the project. An existing underground water aqueduct and SDG&E power lines run along the west and east portions of the project, but these utilities will be relocated or protected as necessary to prevent potential service interruption due to stormwater related issues during landfill operation.

2.2.8 Regional Board Special Requirements

Total Maximum Daily Loads (TMDLs) and effluent limits have not been established for the San Luis Rey River or the project. Regional Board special requirements will be determined during the permitting phase of the project and incorporated into this SWMP if applicable and appropriate to stormwater issues.

2.3 TREATMENT CONTROL BMP REQUIREMENTS

The checklist below outlines the requirements to determine if Treatment Control Best Management Practices (BMPs) are required for the project based upon current County of San Diego SUSMP requirements. Based upon completion of Table 5, GCLF is not technically required to implement treatment control BMPs because it is not located in the County urban area or tributary to an MS4. However, the project is proposing to use LID techniques and treatment control BMPs to minimize the potential for stormwater quality degradation and hydromodification impacts to the San Luis Rey River.

Table 5
Treatment Control BMP Determination

NO.	CRITERIA	YES	NO	INSTRUCTION
1.	Is this an emergency project?		X	If YES, go to 6. If NO, continue to 2.
2.	Have TMDLs been established for surface waters within the project limit?		X	If YES, go to 5. If NO, continue to 3.
3.	Will the project directly discharge to a 303(d) impaired receiving water body?	X		If YES, go to 5. If NO, continue to 4.
4.	Is this project within the urban and environmentally sensitive areas as defined on the maps in Appendix B of the County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?		X	If YES, continue to 5. If NO, go to 6.
5.	Consider approved Treatment BMPs for the project.	X		If YES, go to 7.
6.	Project is not required to consider Treatment BMPs.			Document for Project Files by referencing this checklist.
7.	End			

SECTION 3 WATERSHED

The project is located in the following watershed.

☐ San Juan ☐ Santa Margarita ☒ San Luis Rey ☐ Carlsbad
☐ San Dieguito ☐ Penasquitos ☐ San Diego ☐ Pueblo San Diego
☐ Sweetwater ☐ Otay ☐ Tijuana

Hydrologic sub-area number(s) and name(s): 903.21, San Luis Rey River Hydrologic Unit, Monserate Hydrologic Area, Pala Hydrologic SubArea.

3.1 BENEFICIAL USES

The beneficial uses for Inland Surface Waters and Ground Waters for the San Luis Rey River are provided in Table 6, and were obtained from the San Diego RWQCB Basin Plan. These beneficial uses apply for both San Luis Rey River and Gregory Canyon (tributary).

Table 6
Beneficial Uses for Inland Surface Waters and Ground Waters

	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters																
San Luis Rey between Couser Canyon and Gomez Creek	903.21	X	X	X					X	X		X	X	X		
Groundwater																
Pala HSA	903.21	X	X	X												

X = Existing Beneficial Use

MUN – Municipal and Domestic Supply; AGR - Agricultural Supply; IND – Industrial Services Supply; PROC – Industrial Process Supply; GWR - Ground Water Recharge; FRESH - Freshwater Replenishment; POW - Hydropower Generation; REC1– Contact Recreation; REC2 – Non-Contact Recreation; BIOL - Preservation of Biological Habitats of Special Significance; WARM – Warm Freshwater Habitat:; COLD - Cold Freshwater Habitat; WILD – Wildlife Habitat; RARE - Rare, Threatened, or Endangered Species; SPWN - Spawning, Reproduction, or Early Development.

SECTION 4 POLLUTANTS OF CONCERN

Using Table 7, pollutants that are anticipated to be generated from the proposed priority project categories were identified. Based upon the variety of activities associated with GCLF, all of the pollutants shown in Table 7 could be potential pollutants depending on the location within the project footprint and operational activity.

Table 7
Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
Priority Project Categories	**Sediments**	**Nutrients**	**Heavy Metals**	**Organic Compounds**	**Trash & Debris**	**Oxygen Demanding Substances**	**Oil & Grease**	**Bacteria & Viruses**	**Pesticides**
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development >100,000 ft^2	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft^2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated

P = potential

(1) A potential pollutant if landscaping exists on-site.

(2) A potential pollutant if the project includes uncovered parking areas.

(3) A potential pollutant if land use involves food or animal waste products.

(4) Including petroleum hydrocarbons.

(5) Including solvents.

SECTION 5 CONSTRUCTION BMPS

The proposed construction BMPs that may be used are listed below.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☒ Dewatering Operations
- ☒ Vehicle and Equipment Maintenance
- ☒ Desilting Basin
- ☒ Gravel Bag Berm
- ☒ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☒ Concrete Waste Management
- ☒ Water Conservation Practices
- ☒ Paving and Grinding Operations
- ☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

SECTION 6 SITE DESIGN AND LOW IMPACT DEVELOPMENT BMPS

To minimize stormwater impacts, site design measures must be addressed. Site design measures overlap low impact development techniques. The 2007 Municipal Permit requires that all Priority Development Projects incorporate the following LID BMPs listed below where applicable and feasible:

- Conserve natural areas, including existing trees, other vegetation, and soils
- Construct streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised
- Minimize the impervious footprint of the project
- Minimize soil compaction where feasible
- Minimize disturbances to natural drainages (*e.g.*, natural swales, topographic depressions, etc.)

The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, then that the measure will be used for this project. If NO is checked, a brief explanation is provided as to why the option was not selected.

Table 8
Site Design Options

		OPTIONS	YES	NO	N/A
1.		Was the project relocated or realigned to avoid/reduce impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?	X		
2.		Was the project designed to minimize impervious footprint?	X		
3.		Was the project designed to conserve natural areas where feasible?	X		
4.		Where landscape is proposed, can rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?	X		
5.		For roadway projects, can structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?	X		
6.		Can any of the following methods be utilized to minimize erosion from slopes:			
	6a.	Disturbing existing slopes only when necessary?	X		
	6b.	Minimize cut and fill areas to reduce slope lengths?		X	
	6c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?		X	
	6d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?	X		
	6e.	Rounding and shaping slopes to reduce concentrated flow?	X		
	6f.	Collecting concentrated flows in stabilized drains and channels?	X		

Notes:
6b. Cut and fill areas are minimized to the extent practicable, but slope lengths are based upon geotechnical recommendations for maximum cut and fill slope angles.
6c. Retaining walls are provided in one case to avoid an existing wetland area near the facility operations pad and entrance to the landfill. Additional retaining walls will be provided where necessary, but retaining walls are not used systematically to reduce slope steepness or length.

If the project includes work in channels, then complete the following checklist. Information shall be obtained from the project drainage report.

Table 9
Channel Modification Criteria Evaluation

NO.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project increase velocity or volume of downstream flow?		X		If YES go to 5. *Project treatment control BMPs will reduce flowrate, volume, and velocity to pre-development conditions.*
2.	Will the project discharge to unlined channels?	X			If YES go to 5.
3.	Will the project increase potential sediment load of downstream flow?		X		If YES go to 5. *Project desilting basins will provide sediment load reductions.*
4.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect upstream and/or downstream channel stability?		X		If YES go to 7. *Project will cross San Luis Rey River but will not affect upstream and/or downstream channel stability.*
5.	Review channel lining materials and design for stream bank erosion.	X			Continue to 6.
6.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	X			Continue to 7.
7.	Include, where appropriate, energy dissipation devices at culverts.	X			Continue to 8. *Energy dissipation will be provided at culvert and pipe outlets.*
8.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	X			Continue to 9.
9.	Include, if appropriate, detention facilities to reduce peak discharges.	X			*Desilting Basins and infiltration areas will be incorporated into project design.*
10.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless predevelopment conditions are determined to be so erosive that hardening would be required even in the absence of the proposed Development.			X	Continue to 11.
11.	Provide other design principles that are comparable and equally effective.	X			Continue to 12.
12.	End				

SECTION 7 SOURCE CONTROL BMPS

The following table provides a listing of the source control BMPs identified for the project. Note that some source control BMPs such as biofilter strips and swales are considered Low Impact Development (LID) techniques.

Table 10
Source Control BMP Identification

BMP			YES	NO	N/A
1.	Provide Storm Drain System Stenciling and Signage				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language and/or graphical icons to discourage illegal dumping.	X		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.	X		
2.	Design Outdoor Material Storage Areas to Reduce Pollution Introduction				
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.			X
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.	X		
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.	X		
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.	X		
3.	Design Trash Storage Areas to Reduce Pollution Introduction (Applies to Site Facility Area - Not Landfill)				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	X		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	X		
4.	Use Efficient Irrigation Systems & Landscape Design				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible. Note: All irrigation will be by truck.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.			X
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.			X

Table 10. Source Control BMP Identification (Continued)

BMP			YES	NO	N/A
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.			X
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		
5.	Private Roads				
	The design of private roadway drainage shall use at least one of the following:				
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.	X		
	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.		X	
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.		X	
	5.d.	Other methods that are comparable and equally effective within the project.	X		
6.	Residential Driveways & Guest Parking				X
	The design of driveways and private residential parking areas shall use one at least of the following features.				X
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.			X
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.			X
	6.c.	Other features which are comparable and equally effective.			X
7.	Dock Areas				X
	Loading/unloading dock areas shall include the following.				X
	7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.			X
	7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.			X
	7.c.	Other features which are comparable and equally effective.			X
8.	Maintenance Bays				X
	Maintenance bays shall include the following.				
	8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff. Note: The maintenance building within the Site Facility Area will be enclosed.	X		

Table 10. Source Control BMP Identification (Continued)

BMP			YES	NO	N/A
	8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.	X		
	8.c.	Other features which are comparable and equally effective.			X
9.	Vehicle Wash Areas				X
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.				X
	9.a.	Self-contained; or covered with a roof or overhang.			X
	9.b.	Equipped with a clarifier or other pretreatment facility.			X
	9.c.	Properly connected to a sanitary sewer.			X
	9.d.	Other features which are comparable and equally effective.			X
10.	Outdoor Processing Areas				
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements. Note: The working face of the landfill will not be covered.				
	10a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.			X
	10b.	Grade or berm area to prevent run-on from surrounding areas.	X		
	10.c.	Installation of storm drains in areas of equipment repair is prohibited.			X
	10.d.	Other features which are comparable or equally effective.	X		
11.	Equipment Wash Areas				
	Outdoor equipment/accessory washing and steam cleaning activities shall:				X
	11.a.	Be self-contained; or covered with a roof or overhang.			X
	11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate			X
	11.c.	Be properly connected to a sanitary sewer.			X
	11.d.	Other features which are comparable or equally effective.			X
12.	Parking Areas				
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.				

Table 10. Source Control BMP Identification (Continued)

BMP			YES	NO	N/A
	12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.			X
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.			X
	12.c.	Other design concepts that are comparable and equally effective.	X		
13.	Fueling Area				
	Non-retail fuel dispensing areas shall contain the following. Note: The site facilities area will include a diesel storage tank within a concrete enclosure.				
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.	X		
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.	X		
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.	X		
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.	X		

SECTION 8 TREATMENT CONTROL BMPS

To select structural treatment BMPs the following BMP Selection Matrix (Table 11) was used. Each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 7). Any pollutants identified in Table 7, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 11, which maximizes pollutant removal for the particular primary pollutant(s) of concern. Priority projects that are not anticipated to generate a pollutant for which the receiving water is Clean Water Act Section 303(d) impaired shall select a single or combination of stormwater BMPs from Table 11, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 11
Treatment Control BMP Selection Matrix

Pollutant of Concern	Treatment Control BMP Categories (1)						
	Biofilters	Detention Basins	Infiltration Basins(2)	Wet Ponds or Wetlands	Drainage Inserts	Filtration	Hydrodynamic Separator Systems(3)
Sediment	M	H	H	H	L	H	M
Nutrients	L	M	M	M	L	M	L
Heavy Metals	M	M	M	H	L	H	L
Organic Compounds	U	U	U	U	L	M	L
Trash & Debris	L	H	U	U	M	H	M
Oxygen Demanding Substances	L	M	M	M	L	M	L
Bacteria	U	U	H	U	L	M	L
Oil & Grease	M	M	U	U	L	H	L
Pesticides	U	U	U	U	L	U	L

(1) Copermittees are encouraged to periodically assess the performance characteristics of many of these BMPs to update this table.
(2) Including trenches and porous pavement.
(3) Also known as hydrodynamic devices and baffle boxes.
L: Low removal efficiency
M: Medium removal efficiency
H: High removal efficiency
U: Unknown removal efficiency
Sources: Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (1993), National Stormwater Best Management Practices Database (2001), and Guide for BMP Selection in Urban Developed Areas (2001).

8.1 RUNOFF CALCULATIONS

A Treatment BMP must address runoff from developed areas. Provided in Table 12 are the pre- and post-construction runoff flowrates and volumes for the project. Outfalls are labeled on the BMP map. Note that both the Rational Method and the Unit Hydrograph Method were used to calculate flowrates from the site. The Rational Method was applied only for the 100-year storm event and flowrates for lower storm events were determined based upon the ratio of rainfall intensity values assuming the same time of concentration and runoff coefficient. The Unit Hydrograph Method was used to simulate naturally occurring conditions within the canyon and calibrated based upon observed runoff events within Gregory Canyon. Calculations are provided in Attachment E.

Although the Rational Method runoff calculations indicate no increased flows within this area, the Unit Hydrograph Method hydrology calculations indicate the potential for increased flowrate and volume due to the proposed change in runoff patterns. Runoff from the steep upper portions of the canyon will be diverted away from the center of the canyon in perimeter drainage channels and will, therefore, not have the opportunity to infiltrate within the flatter portions of the canyon.

Table 12a
Project Runoff Values

Unit Hydrograph Method Analysis (HEC-1) - Runoff Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Combined Outfall 1 - 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)
2	1.5	**0**	0	0	0	0	1	1	2	**2**	*	*
5	2	**0**	0	0	0	0	5	3	6	**8**	*	*
10	2.4	**6**	0	0	0	0	11	3	8	**16**	*	*
25	2.8	**14**	0	0	0	0	21	9	9	**29**	*	*
50	3.1	**61**	0	0	0	0	94	55	11	**140**	*	*
100	3.4	**94**	0	0	0	0	119	71	12	**179**	*	*

* These Outfalls were not analyzed using the Unit Hydrograph Method due to their small size and short time of concentration.

Rational Method Analysis (HEC-1) - Runoff Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Combined Outfalls 1 -3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)
Water Quality	0.2	**32.1**	0	0	0	0	16.3	15.8	1.3	**33.3**	0.22	0.17
2	1.5	**284**	0	0	0	0	181	131	16	**223**	1.6	1.3
5	2	**379**	0	0	0	0	242	175	21	**297**	2.2	1.7
10	2.4	**530**	0	0	0	0	290	210	25	**357**	2.6	2.1
25	2.8	**545**	0	0	0	0	338	245	30	**416**	3.1	2.4
50	3.1	**587**	0	0	0	0	375	271	33	**461**	3.4	2.7
100	3.4	**693**	0	0	0	0	411	297	36	**505**	3.7	2.9

Table 12b
Project Hydrograph Volumes

Unit Hydrograph Method Analysis (HEC-1) - Volume Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Combined Hydrograph Outfall 1 - 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)
2	1.5	**0**	0	0	0	0	0.13	0	0.36	**0.49**	*	*
5	2	**0**	0	0	0	0	1.2	0.5	0.57	**2.3**	*	*
10	2.4	**0.8**	0	0	0	0	2.5	1.2	0.76	**4.5**	*	*
25	2.8	**2.3**	0	0	0	0	4.3	2.1	0.95	**7.3**	*	*
50	3.1	**14.2**	0	0	0	0	11.4	6.5	1.09	**19.0**	*	*
100	3.4	**18.8**	0	0	0	0	14.1	8.4	1.23	**23.7**	*	*

* These Outfalls were not analyzed using the Unit Hydrograph Method due to their small size and short time of concentration.

Rational Method Analysis - Volume Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Combined Hydrograph Outfall 1 - 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)
Water Quality	0.85	**11.4**	0	0	0	0	5.8	5.6	0.4	**11.8**	0.08	0.06
2	1.5	**20.1**	0	0	0	0	10.2	9.9	0.8	**20.8**	0.14	0.11
5	2	**26.7**	0	0	0	0	13.6	13.1	1.1	**27.8**	0.18	0.14
10	2.4	**32.1**	0	0	0	0	16.3	15.8	1.3	**33.3**	0.22	0.17
25	2.8	**37.4**	0	0	0	0	19.0	18.4	1.5	**38.9**	0.25	0.20
50	3.1	**41.4**	0	0	0	0	21.1	20.4	1.6	**43.1**	0.28	0.22
100	3.4	**45.4**	0	0	0	0	23.1	22.3	1.8	**47.2**	0.31	0.24

8.2 PROJECT TREATMENT BMPS

Following are the minimum Treatment BMP(s) that are currently proposed for this project.

Biofilters

☒ Vegetated swale (two minimum on facilities area and one downstream of facilities area at Outfall 3)

☐ Vegetated strips (two vegetated strips may be used in lieu of the two vegetated swales on the site facilities area depending on final engineering grading plan constraints)

☐ Wetland vegetation swale

☐ Bioretention

Detention Basins

☐ Extended/dry detention basin with grass lining

☐ Extended/dry detention basin with impervious lining

Infiltration Basins

☒ Infiltration basin (flow spreading and infiltration into natural areas downstream of Outfalls 1, 2, 4 and 5)

☐ Infiltration trench

☐ Porous asphalt

☐ Porous concrete

☐ Porous modular concrete block

Wet Ponds or Wetlands

☐ Wet pond/basin (permanent pool)

☐ Constructed wetland

Drainage Inserts (See note below)

☒ Oil/Water separator (a minimum of one oil-water separator that will collect runoff from the landfill entry area and discharge separated water to the bio-filters and media filtration device at Outfall 3)

☐ Catch basin insert

☐ Storm drain inserts

☒ Catch basin screens *(two pre-infiltration filters are proposed for Outfall 5 along the access road at the low point west of the bridge. This is the only type of filter screening device available due to grade*

conditions. There is less than a foot of elevation difference between the roadway and the infiltration areas.)

Filtration

☒ Media filtration *(one media filter is proposed for the access road south of the bridge on the east side of the road that will treat both sides of the road and a minimum of one media filtration device is proposed for the site facility area downstream of the bio-filtration devices.)*

☐ Sand filtration

Hydrodynamic Separator Systems

☐ Swirl Concentrator

☐ Cyclone Separator

☐ Baffle Separator

☐ Gross Solids Removal Device

☐ Linear Radial Device

Note: Catch basin inserts and storm drain inserts are excluded from use on County maintained right-of-way and easements.

Treatment BMP Datasheets and design calculations are provided in Attachment E of this SWMP. Attachment E includes the following:

1. Description of how each treatment BMP was designed.
2. Engineering calculations for the BMP(s).
3. BMP Datasheets.

8.3 BMP SELECTION DESCRIPTION

Provided below is a description of post-construction BMPs selected for this project for each outfall. The BMP locations and conceptual drawings are provided in Attachment E. The main goal of the BMP selection was to prevent hyromodification impacts to the San Luis Rey River and to provide stormwater quality treatment using LID BMPs.

- Outfall 1 - East Desilting Basin: This outfall is the existing main canyon outlet point. Runoff from the eastside landfill operating area will be directed to a desilting basin which will provide both silt removal and some peak flowrate attenuation benefits. Runoff from the upper east canyon will be directed to the outlet in a perimeter drainage channel. To mitigate for the potential for increased flowrates and volumes, runoff from the landfill and upper canyon will be directed with energy dissipation to an existing natural depression/infiltration area immediately east of the main canyon thalweg. The existing area has the required volume and infiltration rates to infiltrate proposed flow volumes to mimic natural conditions.

- Outfall 2 - West Desilting Basin: There is currently no existing defined outfall at the outlet from this desilting basin. Runoff from the west side of the landfill will be directed to a desilting basin that will provide both silt removal and peak flowrate attenuation benefits. Runoff from the upper southwest canyon will be directed with energy dissipation to the outlet in a perimeter drainage channel. Flows discharging the basin and from the perimeter drainage channel will be directed to the upland areas downstream of the desilting basin. Flows from the desilting basin would be directed to level spreaders/energy dissipators prior to discharge to the flat, highly permeable upland area. This design will allow for infiltration of all surface runoff from the west side of the landfill prior to reaching the San Luis Rey River. The required infiltration area is approximately 4.2 acres.
- Outfall 3 - Site Facilities Area: Within the site facilities area vehicular activities associated with routine operation and the receipt of refuse for disposal could result in trace petroleum hydrocarbons and tracking of sediments onto the paved surfaces of the ancillary facilities area including the queuing area for the fee booths and scales, main haul road, landfill equipment maintenance and re-fueling areas. The source control BMPs to be implemented specific to the ancillary facilities areas would include dry measures such as cleaning the paved surfaces of sediment with a street sweeper and the use of absorbents for leaks and spills from vehicular activities. The equipment maintenance area has been designed to eliminate contact with stormwater by conducting operations in a covered area and diverting flows around the entire ancillary facilities area. In addition, the hazardous waste storage facility, which is located in the ancillary facilities area, would be enclosed with secondary containment. Treatment control BMPs will consist of: a minimum of one oil-water separator that will collect runoff from the landfill entry area and discharge separated water to the bio-filters or media filtration device; bio-filters around the draining perimeter of the facility as the primary LID BMP, supplemented by a structural media filtration device (Stormfilter Vault or equivalent device) at the downstream end of the swales to provide an additional level of water quality treatment prior to discharge off the site facilities area.
- Outfall 4 - Bridge (South): Runoff from the access road and bridge will be directed to roadway curb inlets. One of the inlets will contain media filtration cartridges (6'x12' Curb Inlet Stormfilter device or equivalent) to filter the stormwater from both sides of the access road prior to discharge to the 36-inch cross culvert and finally to an energy dissipation/infiltration area. Flows in excess of the water quality design flow will sheet flow out into the relatively flat floodplain terrace area where infiltration will occur.
- Outfall 5 - Bridge (North): Runoff from the access road and bridge will be directed to curbside structural pre-infiltration filter devices (Kristar SwaleGard Culvert Pre-Filter or equivalent device) prior to discharge to small energy dissipation/infiltration areas. Flows in excess of the water quality design flow will sheet flow out into the relatively flat floodplain terrace area where infiltration will occur.

SECTION 9 MAINTENANCE

Table 13 provides the County maintenance mechanisms/categories. The selected BMPs for this project constitute Second or Third Category Maintenance Mechanism. The long-term fiscal resources for the selected maintenance mechanism(s) will be Gregory Canyon Landfill, Ltd.

Table 13
Maintenance Category

	(Private Responsibility)		(Public Responsibility)	
	First Category	**Second Category**	**Third Category**	**Fourth Category**
Importance of Maintenance	Minimal concern; inherent in BMP or property stewardship	Need to make sure private owners maintain, and provide County ability to step in & perform maintenance	Warrants Flood Control Dist. (FCD) assuming responsibility, with funding related to project	Broader public responsibility for maintenance and funding (beyond project)
Typical BMPs	Biofilter (Grass swale, grass strip, vegetated buffer); Infiltration basin/trench	[First cat. Plus:] Minor wetland swale; Small detention basin; Single storm drain insert/Oil-water separator/Catch basin insert&screen	[Second cat. Plus:] Wetland swale or bioretention; Detention basin (extended/dry) Wet ponds & wetlands; Multiple storm drain inserts; Filtration systems	[Third cat. Plus:] Retrofit public storm drain inserts, etc. Master plan facility that serves area larger than project
Mechanisms	1. Stormwater Ordinance requirement with code enforcement. 2. Nuisance abatement with costs charged back to property owner. 3. Condition in ongoing permit such as a Major Use Permit (if project has MUP). 4. Notice to new purchasers. 5. Subdivision public report "white papers" to include notice of maintenance responsibility.		1. Dedication to FCD. 2. Formation of benefit area. 3. FCD maintenance documentation.	1. Dedication to FCD or County. 2. FCD/County maintenance documentation.
		6. Recorded easement agreement w/ covenant binding on successors.		
Funding Source(s)	None necessary	Security (Cash deposit, Letter of Credit, or other acceptable to County) for interim period. Agreement for security to contain provisions for release or refund, if not used.	**Start-up interim:** Developer fee covering 24 months of costs **Permanent:** FCD Assessment per FCD Act Sec 105-17.5	Varies: gas tax for BMP in road ROW, Transnet for CIP projects, Special funding or General funding for others.

SECTION 10 HYDROMODIFICATION EVALUATION

The 2007 Municipal Permit requires implementation of hydromodification assessments for priority projects greater than 50 acres. Gregory Canyon Landfill will likely be subject to these requirements when they take effect in 2008. Following are two sections from the 2007 Municipal Permit relating to the hydromodification requirements.

D.1.d (10) Downstream Erosion

"As part of its local SUSMP, each Copermittee shall develop and apply criteria to Priority Development Projects so that runoff discharge rates, durations, and velocities from Priority Development Projects are controlled to maintain or reduce downstream erosion conditions and protect stream habitat."

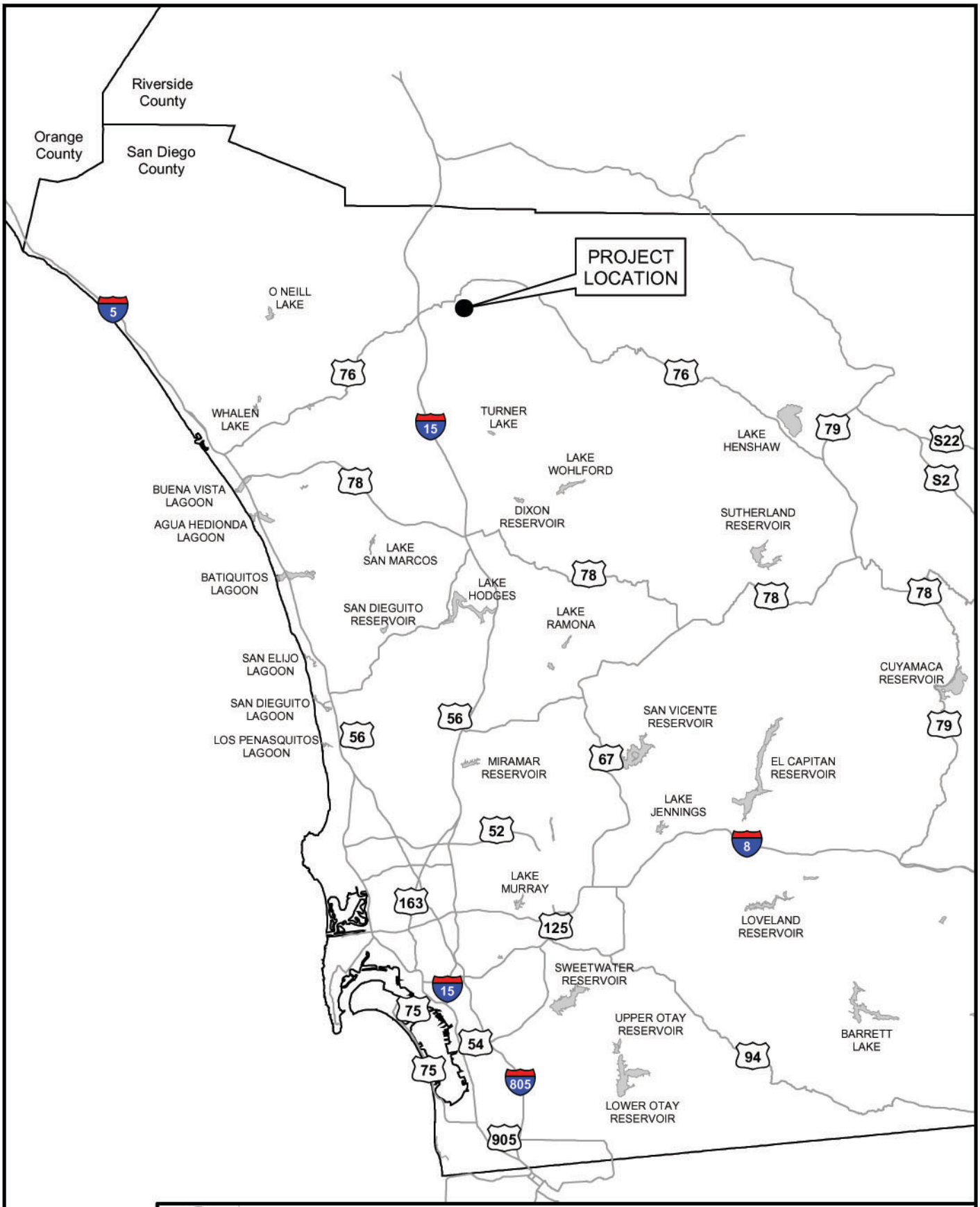
D.1.g (1) (c) Require Priority Development Projects to implement hydrologic control measures so that Priority Development Projects' post-project runoff flow rates and durations (1) do not exceed pre-project runoff flow rates and durations for the range of runoff flows identified under section D.1.g.(1)(b), where the increased flow rates and durations will result in increased potential for erosion or other significant adverse impacts to beneficial uses, attributable to changes in the flow rates and durations, and (2) do not result in channel conditions which do not meet the channel standard developed under section D.1.g.(1)(a) for channel segments downstream of Priority Development Project discharge points."

In response to the requirements of the 2007 Municipal Permit, the County of San Diego will prepare a Hydromodification Management Plan (HMP) for review and approval by the RWQCB. In the meantime, the County is preparing Interim Hydromodification requirements for use until the HMP is approved.

This project will evaluate potential hydromodification impacts by analyzing pre- and post- project flowrates and hydrograph volumes. Typically hydromodification impacts are evaluated for flowrates and hydrograph volumes less than the 10-year storm event, and are generally evaluated for 2 to 5-year storm events (or a percentage of those storm event flows). Conservatively, potential hydromodification impacts from the project were evaluated using a full range of flowrates and volumes from the 2- to 100-year storm event. The flowrates and volumes are provided in Tables 12a and 12b and in Attachment E.

The goal of the selected project treatment BMPs was to mimic the existing canyon flows and volumes tributary to the San Luis Rey River to provide both water quality treatment benefits and to minimize the potential for hydromodification impacts. This will be accomplished by construction of bio-swales and infiltration areas. Infiltration areas will be sized to infiltrate the required water quality volume.

The 2007 URS report "Evaluation of Hydrogeomorphology and Potential Beneficial Uses at Gregory Canyon," provides additional information on Gregory Canyon hydrology and effects to beneficial uses.



SOURCES: SANDAG
(Roads, Lakes, Rivers),
CDFG (Counties Boundaries).

PROJECT LOCATION
GREGORY CANYON LTD. LLC

URS

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SCALE: 1" = 8.5 miles (1:538,560)

CHECKED BY: MS	DATE: 9-20-05	FIG. NO:
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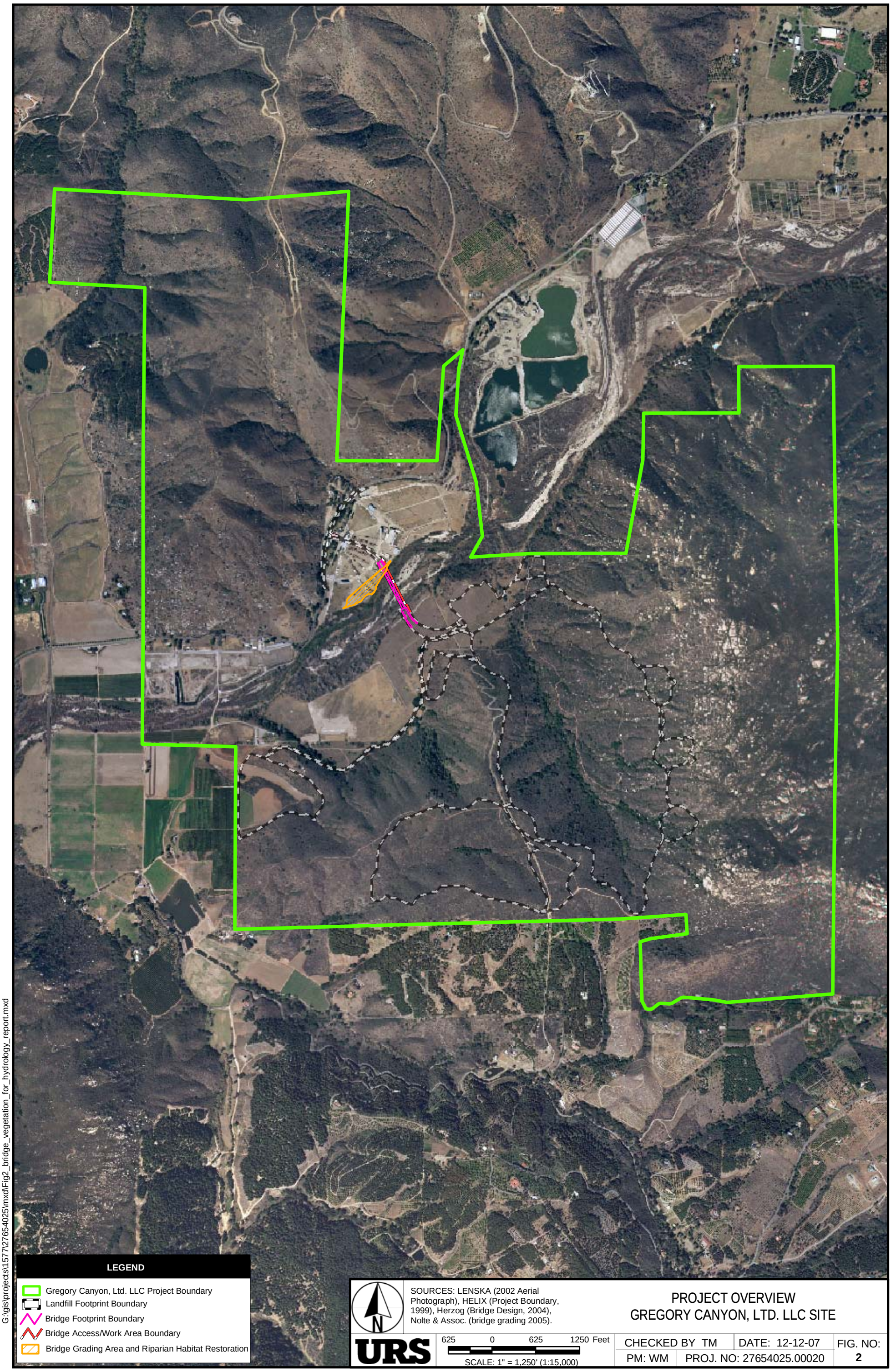

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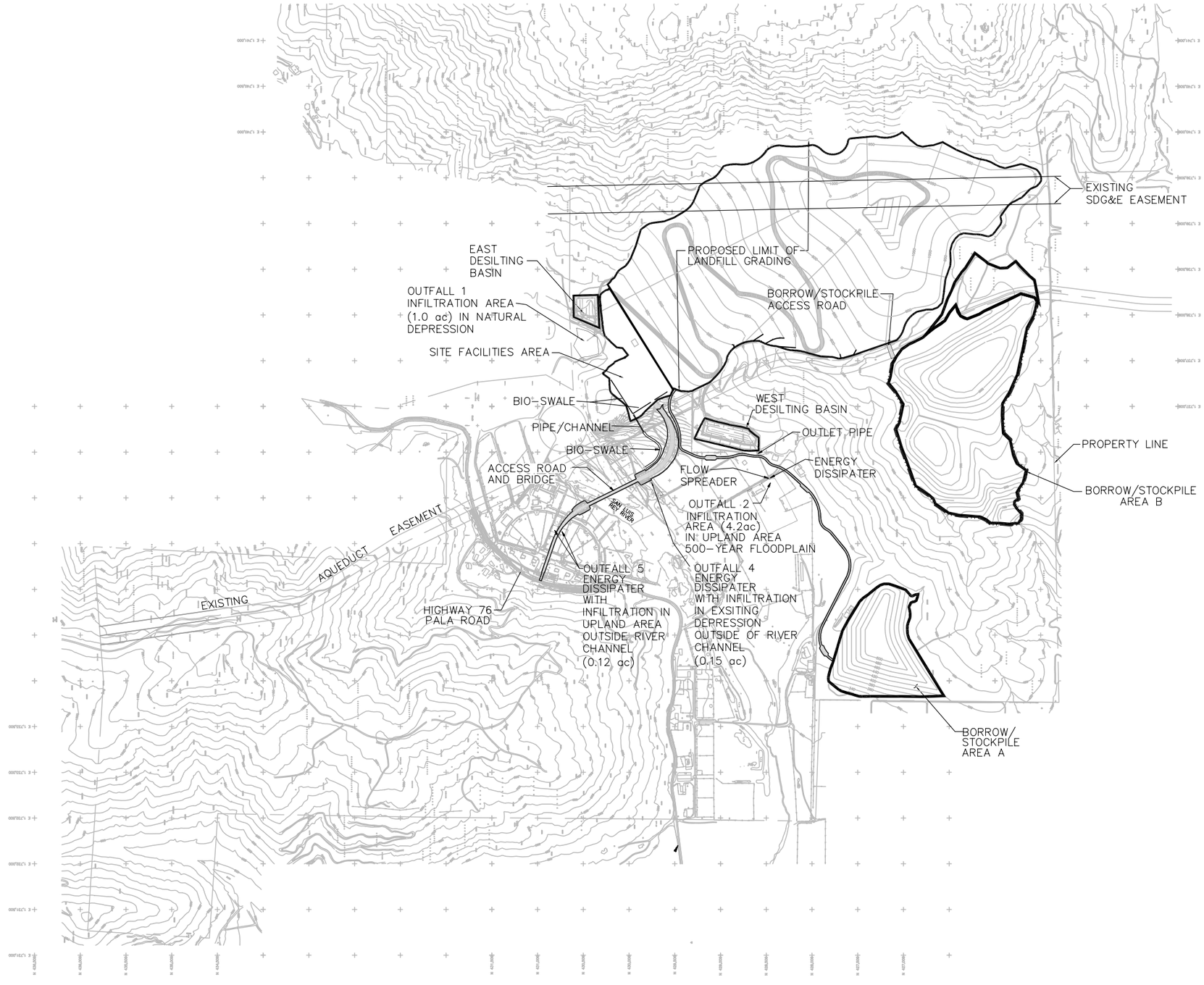
Note: No Relevant Surface Water Quality Monitoring Data is Currently Available



STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON TOPO
GREGORY CANYON, LTD. LLC SITE

URS

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SCALE: 1"= 1200'

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PM: WPM	PROJ. NO: 27654025.00020	3

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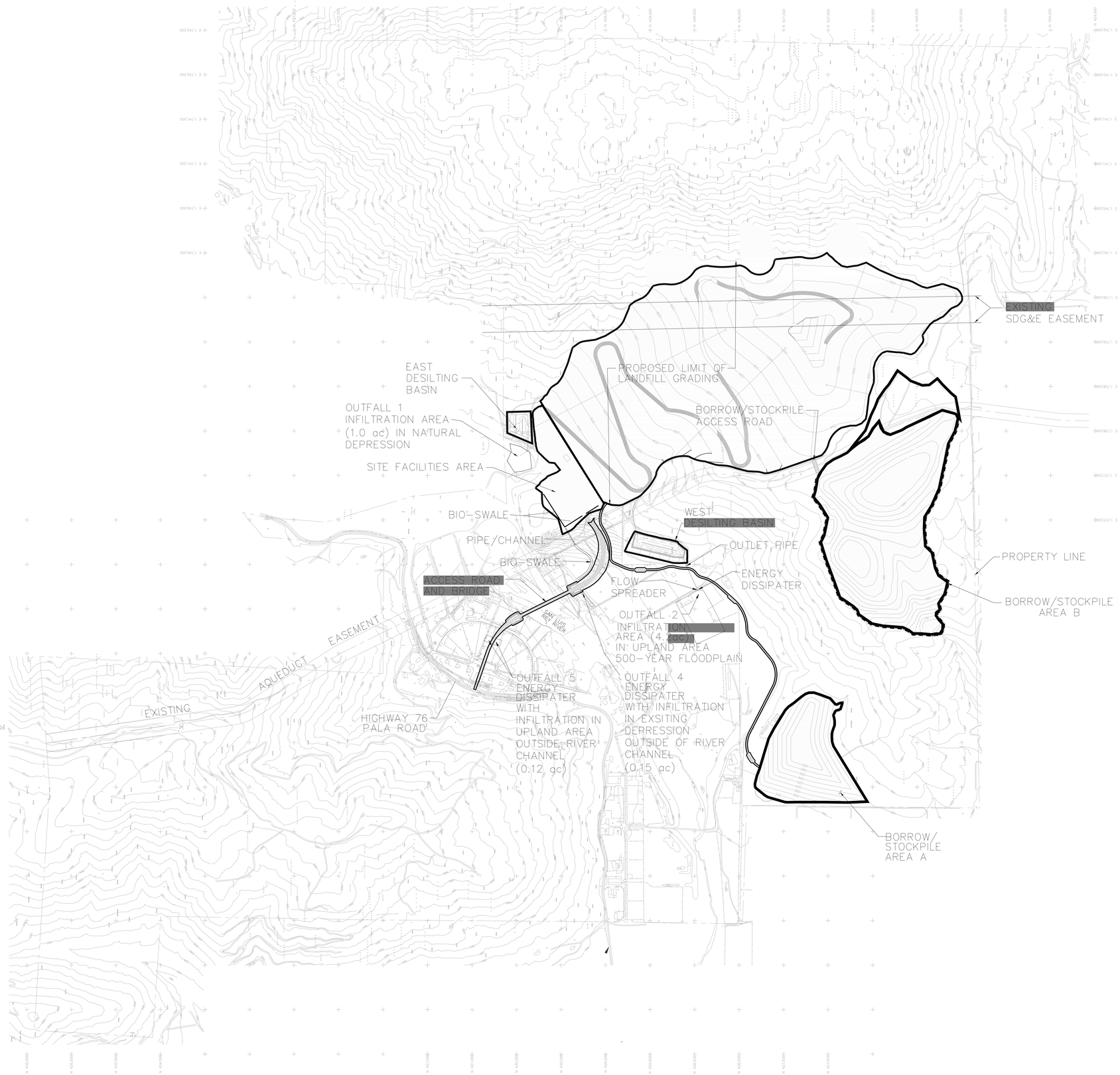

STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON TOPO
GREGORY CANYON, LTD,N LLC

URS

200 0 200 400 Feet
SCALE: 1"= 400'

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PM: WPM	PROJ. NO: 27654025.00020	1

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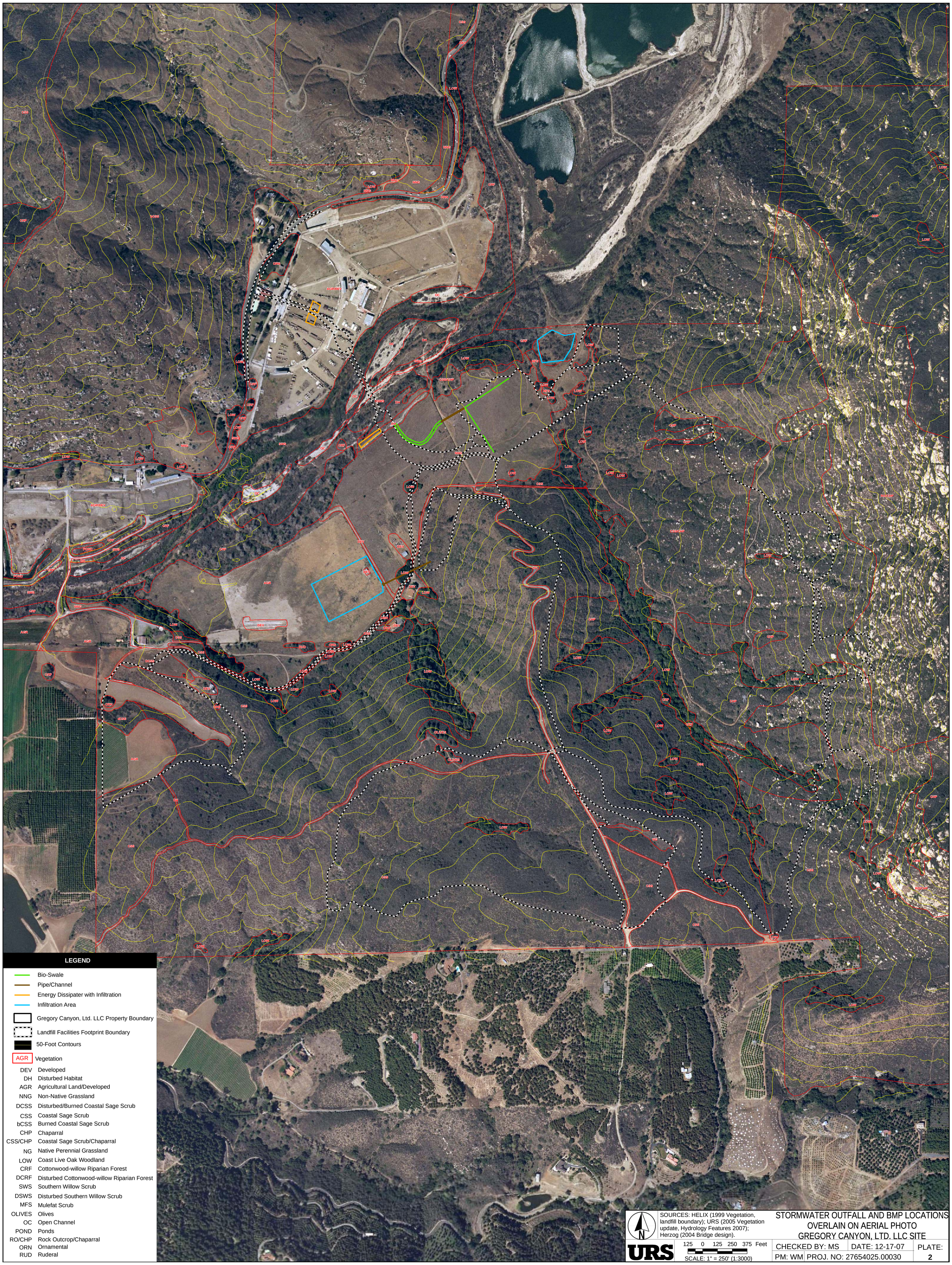
LEGEND
Bio-Swale
Pipe/Channel
Energy Dissipater with Infiltration
Infiltration Area
Gregory Canyon, Ltd. LLC Property Boundary
Landfill Facilities Footprint Boundary
50-Foot Contours
AGR Vegetation
DEV Developed
DH Disturbed Habitat
AGR Agricultural Land/Developed
NNG Non-Native Grassland
DCSS Disturbed/Burned Coastal Sage Scrub
CSS Coastal Sage Scrub
bCSS Burned Coastal Sage Scrub
CHP Chaparral
CSS/CHP Coastal Sage Scrub/Chaparral
NG Native Perennial Grassland
LOW Coast Live Oak Woodland
CRF Cottonwood-willow Riparian Forest
DCRF Disturbed Cottonwood-willow Riparian Forest
SWS Southern Willow Scrub
DSWS Disturbed Southern Willow Scrub
MFS Mulefat Scrub
OLIVES Olives
OC Open Channel
POND Ponds
RO/CHP Rock Outcrop/Chaparral
ORN Ornamental
RUD Ruderal
N
SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).
125 0 125 250 375 Feet
SCALE: 1" = 250' (1:3000)
URS
STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON AERIAL PHOTO
GREGORY CANYON, LTD. LLC SITE
CHECKED BY: MS
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PLATE:
PM: WM
PROJ. NO: 27654025.00030
2
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Table E-1. Summary of Bio-filtration Design Factors (Strips And Swales)

Description	Applications/Siting	Preliminary Design Factors
Swales are vegetated channels that receive and convey storm water. Strips are vegetated buffer strips over which storm water flows as sheet flow. Treatment Mechanisms: Filtration through the vegetation Sedimentation Adsorption to soil particles Infiltration Pollutants removed: Debris and solid particles Some dissolved constituents	Site conditions and climate allow vegetation to be established Flow velocities not high enough to cause scour	Swales sized as a conveyance system (per County flood routing and scour procedures) Swale water depth as shallow as the site will permit Strips sized as long (in direction of flow) and flat as the site allows Strips should be free of gullies or rills No minimum dimensions or slope restrictions for treatment purposes Vegetation mix appropriate for climates and location

Table E-2. Summary of Infiltration Area Siting and Design Criteria

Description	Applications/Siting	Preliminary Design Factors
Depressions designed to hold runoff and infiltrate into the soil without discharge Treatment Mechanism: Infiltration Pollutants removed: All constituents	> 10 ft to seasonally high water table (or 4 ft if justified by adequate groundwater observations for a minimum of 1 year) Soil infiltration rate of 1.3 cm/hr (0.5 in/hr) Clay content < 30%, and < 40% clay and silt combined Sufficient horizontal hydraulic capacity Infiltrated water is unlikely to affect the stability of downgradient structures, slopes, or embankments Runoff quality has standards for infiltration to local groundwater If pretreatment is required, only approved BMPs should be considered Consult with RWQCB, water agencies, vector control authorities, and local utilities	Maintenance access (road around basin and ramp to basin invert) Optional upstream diversion channel or pipe, or downstream overflow structure Flood control spillway Scour protection on inflow and spillway Size to capture the water quality volume Infiltrate water quality volume within 48 to 72 hours Use ½ the measured infiltration rate to size the basin > 10 feet downgradient and 100 ft upgradient from structural foundations > 100 ft from drinking water wells Emergency/maintenance gravity drain

Runoff Calculations

Unit Hydrograph Method Analysis (HEC-1) - Runoff Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Combined Hydrograph Outfall 1 - 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)
2	1.5	**0**	0	0	0	0	1	1	2	**2**	*	*
5	2	**0**	0	0	0	0	5	3	6	**8**	*	*
10	2.4	**6**	0	0	0	0	11	3	8	**16**	*	*
25	2.8	**14**	0	0	0	0	21	9	9	**29**	*	*
50	3.1	**61**	0	0	0	0	94	55	11	**140**	*	*
100	3.4	**94**	0	0	0	0	119	71	12	**179**	*	*

* These Outfalls were not analayzed using the Unit Hydrograph Method due to their small size and short time of concentration.

Rational Method Analysis (HEC-1) - Runoff Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)	Outfall 1 (cfs)	Outfall 2 (cfs)	Outfall 3 (cfs)	Combined Outfalls 1 -3 (cfs)	Outfall 4 (cfs)	Outfall 5 (cfs)
Water Quality	0.2	**32.1**	0	0	0	0	16.3	15.8	1.3	**33.3**	0.22	0.17
2	1.5	**284**	0	0	0	0	181	131	16	**223**	1.6	1.3
5	2	**379**	0	0	0	0	242	175	21	**297**	2.2	1.7
10	2.4	**530**	0	0	0	0	290	210	25	**357**	2.6	2.1
25	2.8	**545**	0	0	0	0	338	245	30	**416**	3.1	2.4
50	3.1	**587**	0	0	0	0	375	271	33	**461**	3.4	2.7
100	3.4	**693**	0	0	0	0	411	297	36	**505**	3.7	2.9

Volume Calculations

Unit Hydrograph Method Analysis (HEC-1) - Volume Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Combined Hydrograph Outfall 1 - 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)
2	1.5	**0**	0	0	0	0	0.13	0	0.36	**0.49**	*	*
5	2	**0**	0	0	0	0	1.2	0.5	0.57	**2.3**	*	*
10	2.4	**0.8**	0	0	0	0	2.5	1.2	0.76	**4.5**	*	*
25	2.8	**2.3**	0	0	0	0	4.3	2.1	0.95	**7.3**	*	*
50	3.1	**14.2**	0	0	0	0	11.4	6.5	1.09	**19.0**	*	*
100	3.4	**18.8**	0	0	0	0	14.1	8.4	1.23	**23.7**	*	*

* These Outfalls were not analayzed using the Unit Hydrograph Method due to their small size and short time of concentration.

Rational Method Analysis - Volume Comparison

		Existing					Proposed					
Storm Frequency	6-hour Storm Rainfall (inches)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)	Outfall 1 (ac-ft)	Outfall 2 (ac-ft)	Outfall 3 (ac-ft)	Combined Hydrograph Outfall 1 - 3 (ac-ft)	Outfall 4 (ac-ft)	Outfall 5 (ac-ft)
Water Quality	0.85	**11.4**	0	0	0	0	1.8	3.0	0.4	**5.3**	0.08	0.06
2	1.5	**20.1**	0	0	0	0	10.2	9.9	0.8	**20.8**	0.14	0.11
5	2	**26.7**	0	0	0	0	13.6	13.1	1.1	**27.8**	0.18	0.14
10	2.4	**32.1**	0	0	0	0	16.3	15.8	1.3	**33.3**	0.22	0.17
25	2.8	**37.4**	0	0	0	0	19.0	18.4	1.5	**38.9**	0.25	0.20
50	3.1	**41.4**	0	0	0	0	21.1	20.4	1.6	**43.1**	0.28	0.22
100	3.4	**45.4**	0	0	0	0	23.1	22.3	1.8	**47.2**	0.31	0.24

* Water Quality Volume for Outfalls 1 and 2 is calculated for landfill area only (not natural hillsides).

Required Infiltration Volumes

Outfall 1 Required Infiltration Volume (ac-ft)	Outfall 2 Required Infiltration Volume (ac-ft)	Outfall 3 Required Infiltration Volume (ac-ft)	Outfall 4 Required Infiltration Volume (ac-ft)	Outfall 5 Required Infiltration Volume (ac-ft)	Outfall 1 Required Infiltration Volume (cf)	Outfall 2 Required Infiltration Volume (cf)	Outfall 3 Required Infiltration Volume (cf)	Outfall 4 Required Infiltration Volume (cf)	Outfall 5 Required Infiltration Volume (cf)
0.00	3.00	0.40	0.08	0.06	0	130680	17424	3371	2638
0.13	0.00	0.36	0.14	0.11	5663	0	15551	5949	4655
1.20	0.50	0.57	0.18	0.14	52272	21780	24927	7932	6207
1.70	1.20	0.76	0.22	0.17	74052	52272	32931	9518	7449
2.00	2.10	0.95	0.25	0.20	87120	91476	41164	11104	8690
0.00	6.50	1.09	0.28	0.22	0	283140	47568	12294	9621
0.00	8.40	1.23	0.31	0.24	0	365904	53742	13484	10552

Surface Area assuming Maximum 2 foot ponding depth

Outfall 1 Required Surface Area (sf)	Outfall 2 Required Surface Area (sf)	Outfall 3 Required Surface Area (sf)	Outfall 4 Required Surface Area (sf)	Outfall 5 Required Surface Area (sf)
0	65340	8712	1685	1319
2831	0	7775	2974	2328
26136	10890	12464	3966	3104
37026	26136	16466	4759	3724
43560	45738	20582	5552	4345
0	141570	23784	6147	4811
0	182952	26871	6742	5276

Infiltration: 72-hour drawdown maximum

Infiltration Rate (in/hr)	Maximum Depth (ft)
0.5	3
1	6
2	12
3	18
6	36

Infiltration: 48-hour drawdown maximum

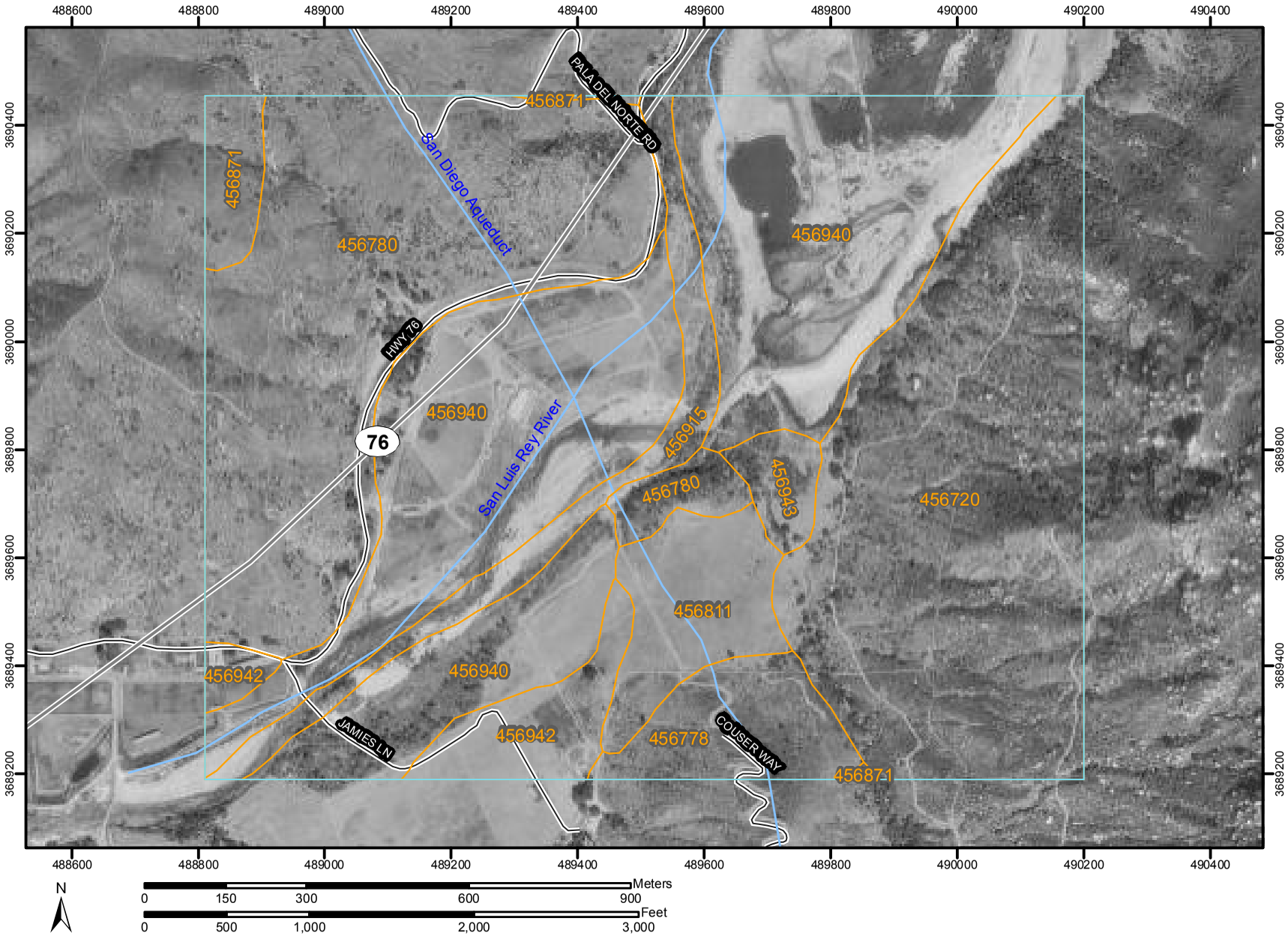
Infiltration Rate (in/hr)	Maximum Depth (ft)
0.5	2
1	4
2	8
3	12
6	24

Soils Information

Outfall	Soil Type	Infiltration Rate (in/hr)	Depth to water table	Water Capacity (inches)	Drainage class
1	VaB	2 - 6	> 80"	11.9	Well Drained
2	VaA	2 - 6	> 80"	14.1	Well Drained
3	FaD2	0.2 - 0.6	> 80"	13.2	Well Drained
4	TuB	6 - 20	> 80"	6.7	Somewhat excessively drained
5	TuB	6 - 20	> 80"	6.7	Somewhat excessively drained

VaB = Visalia Sandy Loam, 2-5% slopes
VaA = Visalia Sandy Loam, 0-2% slopes
FaD2 = Fallbrook sandy loam, 9-15% slopes
TuB = Tujunga sand, 0-5% slopes

Source: NRCS Web Soil Survey 2.0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488800
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489400
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489800
490000
490200
490400
3690400
3690200
3690000
3689800
3689600
3689400
3689200
PALA DEL NORTE RD
HWY 76
76
San Diego Aqueduct
San Luis Rey River
JAMIES LN
COUSER WAY
456871
456780
456940
456915
456943
456720
456811
456942
456778
N
Meters
0
150
300
600
900
Feet
0
500
1,000
2,000
3,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Municipalities

Cities

Urban Areas

Water Features

Oceans

Streams and Canals

Transportation

Rails

Roads

Interstate Highways

US Routes

State Highways

Local Roads

Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 5, Jan 4, 2007

Date(s) aerial images were photographed: 10/2/1995

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
456720	Acid igneous rock land	123.4	24.2%
456778	Cieneba coarse sandy loam, 30 to 65 percent slopes, ero ded	19.4	3.8%
456780	Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	125.3	24.6%
456811	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	21.8	4.3%
456871	Las Posas stony fine sandy loam, 30 to 65 percent slope s	8.6	1.7%
456915	Riverwash	20.7	4.1%
456940	Tujunga sand, 0 to 5 percent slopes	165.5	32.5%
456942	Visalia sandy loam, 0 to 2 percent slopes	17.7	3.5%
456943	Visalia sandy loam, 2 to 5 percent slopes	6.6	1.3%
Totals for Area of Interest (AOI)		509.1	100.0%

GREGORY CANYON - SITE FACILITIES AREA BIOSWALE SIZING CALCULATION

Bio-Swale Calculation Summary Table

	Design Flow (cfs)	Water Quality Flow (cfs)	Channel Slope (ft/ft)	Channel Length (ft)	Side Slopes (V:H)	Bottom Width (ft)	Design Q Velocity (fps)	Design Q Depth (ft)	WQF Velocity (fps)	WQF Depth (ft)	HRT (minutes)	HRT/(DxV)
1	20	0.65	0.01	300	1 to 4	2	2.4	1.2	0.34	0.5	15	86.51
2	20	0.65	0.010	200	1 to 4	2	2.4	1.2	0.34	0.5	10	57.67

NOTES:

1. Bioswales designed per the following criteria (Caltrans criteria)

At Water Quality Flow (WQF):

Manning's n=0.20 to 0.24
Maximum flow depth of 6 inches (0.5 feet)
Velocity less than 1 feet per second (fps)
Hydraulic Residence Time (HRT) > 5 minutes
Bottom width minimum 2 feet

At Design Flow (Q100)

Manning's n=0.05
Maximum flow depth less than 2 feet
Velocity less than 4 fps

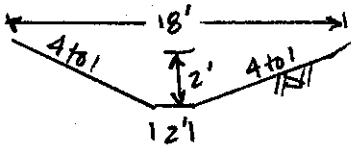
Site-Facility-Bio-swale - Qwqf

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.200	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.65	ft³/s



Results

Normal Depth	0.48	ft
Flow Area	1.89	ft²
Wetted Perimeter	5.96	ft
Top Width	5.84	ft
Critical Depth	0.14	ft
Critical Slope	1.22878	ft/ft
Velocity	0.34	ft/s
Velocity Head	0.00	ft
Specific Energy	0.48	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.48	ft
Critical Depth	0.14	ft
Channel Slope	0.01000	ft/ft
Critical Slope	1.22878	ft/ft

Site-Facility-Bio-swale - Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	20.00	ft^3/s

Results

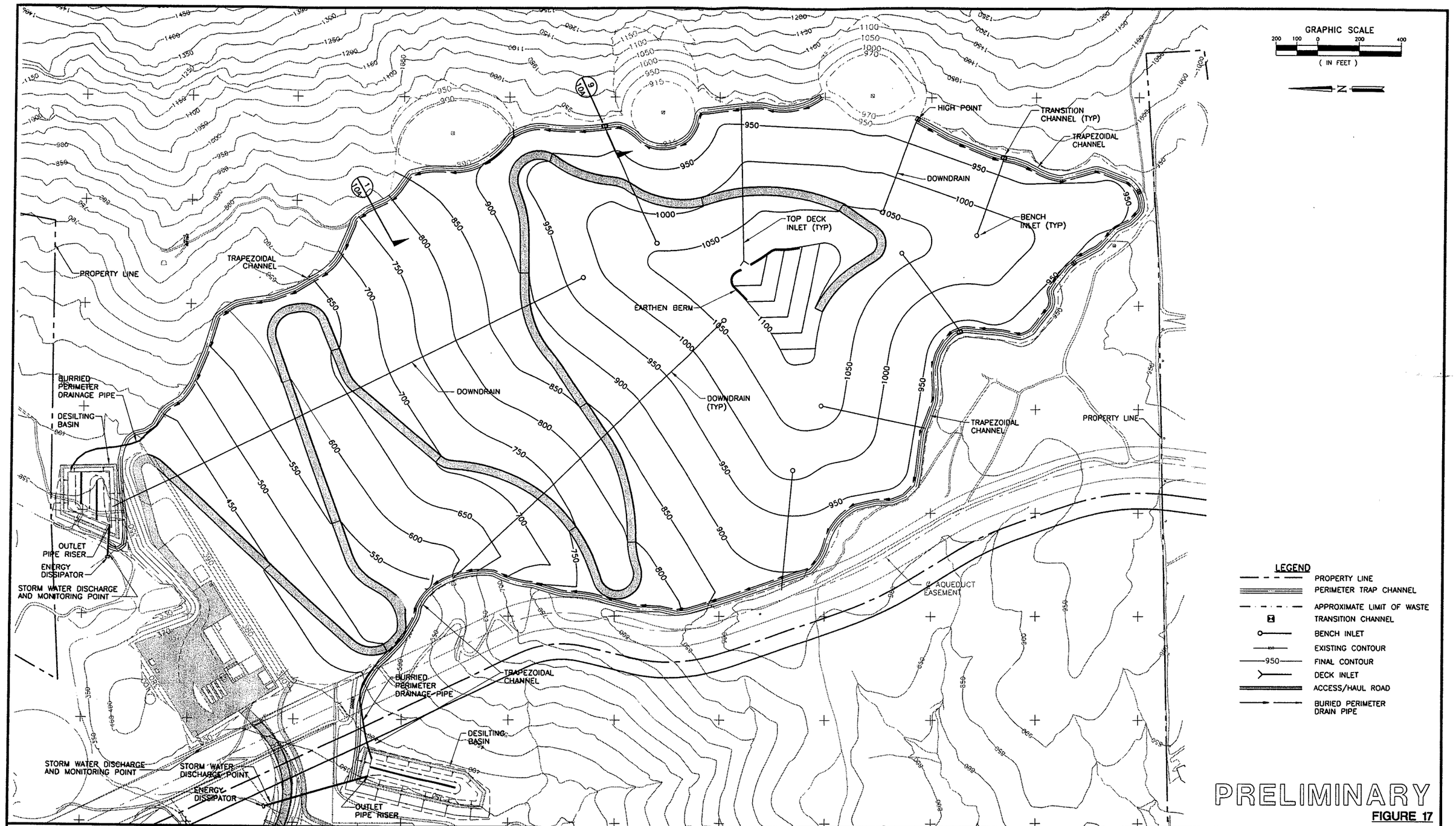
Normal Depth	1.23	ft
Flow Area	8.53	ft^2
Wetted Perimeter	12.15	ft
Top Width	11.85	ft
Critical Depth	0.88	ft
Critical Slope	0.04631	ft/ft
Velocity	2.35	ft/s
Velocity Head	0.09	ft
Specific Energy	1.32	ft
Froude Number	0.49	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.23	ft
Critical Depth	0.88	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.04631	ft/ft



PRELIMINARY

FIGURE 17

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
FINAL DRAINAGE PLAN

DESIGNED BY : C.M.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 4-2002	FILE NO.: 340570B.DWG
CHECKED BY :	DATE :	DRAWING 7
APPROVED BY :	DATE :	

FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

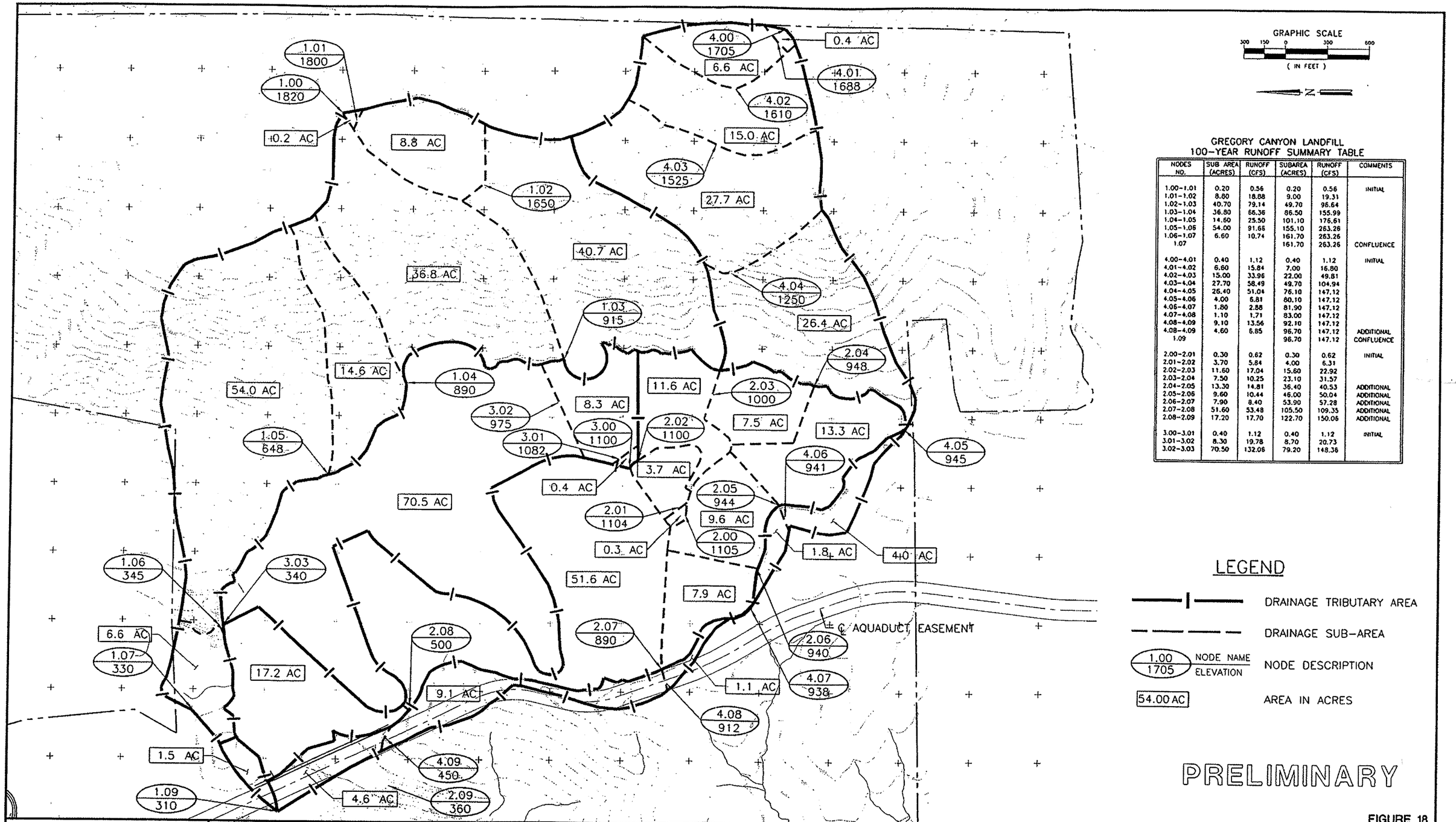


FIGURE 18

GREGORY CANYON LANDFILL
100-YEAR RUNOFF SUMMARY TABLE

NODES NO.	SUB AREA (ACRES)	RUNOFF (CFS)	SUBAREA (ACRES)	RUNOFF (CFS)	COMMENTS
1.00-1.01	0.20	0.56	0.20	0.56	INITIAL
1.01-1.02	8.80	18.88	9.00	19.31	
1.02-1.03	40.70	79.14	49.70	96.64	
1.03-1.04	36.80	66.36	86.50	155.99	
1.04-1.05	14.60	25.50	101.10	176.61	
1.05-1.06	54.00	91.66	155.10	263.26	
1.06-1.07	6.60	10.74	161.70	263.26	
1.07			161.70	263.26	CONFLUENCE
4.00-4.01	0.40	1.12	0.40	1.12	INITIAL
4.01-4.02	6.60	15.84	7.00	16.80	
4.02-4.03	15.00	33.96	22.00	49.81	
4.03-4.04	27.70	58.49	49.70	104.94	
4.04-4.05	26.40	51.04	76.10	147.12	
4.05-4.06	4.00	6.81	80.10	147.12	
4.06-4.07	1.80	2.88	81.90	147.12	
4.07-4.08	1.10	1.71	83.00	147.12	
4.08-4.09	9.10	13.56	92.10	147.12	
4.08-4.09	4.60	6.85	96.70	147.12	ADDITIONAL
1.09			96.70	147.12	CONFLUENCE
2.00-2.01	0.30	0.62	0.30	0.62	INITIAL
2.01-2.02	3.70	5.84	4.00	6.31	
2.02-2.03	11.60	17.04	15.60	22.92	
2.03-2.04	7.50	10.25	23.10	31.57	
2.04-2.05	13.30	14.81	36.40	40.53	ADDITIONAL
2.05-2.06	9.60	10.44	46.00	50.04	ADDITIONAL
2.06-2.07	7.90	8.40	53.90	57.28	ADDITIONAL
2.07-2.08	51.60	53.48	105.50	109.35	ADDITIONAL
2.08-2.09	17.20	17.70	122.70	150.06	ADDITIONAL
3.00-3.01	0.40	1.12	0.40	1.12	INITIAL
3.01-3.02	8.30	19.78	8.70	20.73	
3.02-3.03	70.50	132.08	79.20	148.36	

NO.	REVISION DESCRIPTION	BY:

BAS
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1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
100-YEAR DEVELOPED CONDITION
HYDROLOGY MAP

DESIGNED BY : C.M.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 9-2004	FILE NO.: 2418508.DWG
CHECKED BY :	DATE :	DRAWING 24
APPROVED BY :	DATE :	

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BIO-FILTERS AND INFILTRATION AREAS

The operational and maintenance needs of the bio-filter and infiltration areas are:

- Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals.
- Animal and vector control.
- Sediment removal to optimize performance.
- Trash, debris, vegetation trimmings, tree pruning, and leaf collection and removal to prevent obstruction of a bio-filter and monitoring equipment.
- Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas.
- Erosion and structural maintenance to prevent the loss of soil and maintain the performance of the BMP.

Inspection Frequency

The BMPs will be inspected:

- After every large storm (after every storm monitored or those storms with more than 0.50 inch of precipitation.)
- On a weekly basis during extended periods of wet weather.

Aesthetic and Functional Maintenance

- Aesthetic maintenance is important for public acceptance of stormwater facilities.
- Functional maintenance is important for performance and safety reasons.

Both forms of maintenance will be combined into an overall Stormwater Management System Maintenance.

Aesthetic Maintenance

The following activities will be included in the aesthetic maintenance program:

- Weed Control. Weeds within the bio-filters will be removed through mechanical means. Herbicide will not be used because these chemicals may impact the water quality monitoring.

Functional Maintenance

Functional maintenance has two components:

Preventive maintenance
Corrective maintenance

Preventive Maintenance

Preventive maintenance activities to be instituted at a bio-filter are:

- Vegetation seed mix within the bio-filters will be designed to be kept short to maintain adequate hydraulic functioning and to limit the development of faunal habitats.
- Trash and Debris. During each inspection and maintenance visit to the site, debris and trash removal will be conducted to reduce the potential for inlet and outlet structures and other components from becoming clogged and inoperable during storm events.
- Sediment Removal. Sediment accumulation, as part of the operation and maintenance program, will be monitored during the dry season, after every large storm (0.50 inch). Specifically, if sediment reaches a level at or near bio-filter plant height, or could interfere with flow or operation, the sediment will be removed. If accumulation of debris or sediment is determined to be the cause of decline in design performance, prompt action will be taken to restore the bio-filter/infiltration area to design performance standards. Actions will include using additional vegetation and/or removing accumulated sediment to correct channeling or ponding. Characterization and appropriate disposal of sediment will comply with applicable local, county, state, or federal requirements.
- Removal of Standing Water. Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas.
- Fertilization and Irrigation. The vegetation seed mix has been designed so that fertilization and irrigation is not necessary. Fertilizers and irrigation will not be used to maintain the vegetation.
- Elimination of Mosquito Breeding Habitats. The most effective mosquito control program is one that eliminates potential breeding habitats.

Corrective Maintenance

Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of the BMP. Corrective maintenance activities include:

- Removal of Debris and Sediment. Sediment, debris, and trash, which impede the hydraulic functioning of the BMP, will be removed and properly disposed.
- Structural Repairs. Qualified individuals (i.e., the designers or contractors) will conduct repairs where structural damage has occurred.
- Embankment and Slope Repairs. Once deemed necessary, damage to the embankments and slopes of the BMP will be repaired.
- Erosion Repair. Where factors have created erosive conditions (i.e., concentrated flow, etc.), corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of the BMP. There are a number of corrective actions than can be taken. These include erosion control blankets, riprap, or reduced flow through the area. Designers or contractors will be consulted to address erosion problems if the solution is not evident.
- Fence Repair. Where applicable, repair of fences will be done within 30 days to maintain the security of the site.
- Elimination of Animal Burrows. Animal burrows within the bio-filters will be filled and steps taken to remove the animals if burrowing problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated. If the BMP performance is affected, abatement will begin.

- General Facility Maintenance. In addition to the above elements of corrective maintenance, general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.

Debris and Sediment Disposal

Waste generated at bio-filters/infiltration areas is ultimately the responsibility of Gregory Canyon Landfill, Ltd. Disposal of sediment, debris, and trash will comply with applicable local, county, state, and federal waste control programs.

Hazardous Waste

Suspected hazardous wastes will be analyzed to determine disposal options. Hazardous wastes generated onsite will be handled and disposed of according to applicable local, state, and federal regulations. A solid or liquid waste is considered a hazardous waste if it exceeds the criteria listed in the CCR, Title 22, Article 11.

CERTIFICATION SHEET

This Stormwater Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

MATTHEW C. MOORE
December 11, 2007
REGISTERED CIVIL ENGINEER
No. C 56780
Exp. 06-30-09

R E P O R T

UPDATED EVALUATION OF HYDROGEOMORPHOLOGY AND BENEFICIAL USES AT GREGORY CANYON

Prepared for

Gregory Canyon Landfill, Ltd.
249 South Highway 101 #377
Solana Beach, CA 92075

Updated September 15, 2010

Prepared by:
Bill Magdych Associates
Environmental Consulting

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Baseline Conditions 2-1

2.1 Geomorphology 2-1
2.2 Hydrology 2-3
2.3 Biology 2-9
2.4 Beneficial Uses 2-10
2.5 Summary 2-11

Section 3 Effects of the Project 3-1

3.1 Effects on Beneficial Uses 3-1
3.2 Hydromodification 3-8

Section 4 Evaluation of Mitigation Measures 4-1

Section 5 References 5-1

Tables

Table 1 Gregory Canyon Hydrology Summary
Table 2 Gregory Canyon Runoff-Frequency Analysis for Downstream Pala Photo
Table 3 Beneficial uses for Inland Surface Waters and Ground Waters

Figures

Figure 1 Project Location
Figure 2 Project Overview
Figure 3 Stormwater Outfall and BMP Locations Overlain on Topo Map
Figure 4 Stormwater Outfall and BMP Locations Overlain on Aerial Plots
Figure 5 1928 Aerial Photograph of Project Vicinity
Figure 6 USACE 2010 Drainages
Figure 7 January 2010 Storm Rainfall in Gregory Canyon
Figure 8 Drainage Swales

Appendices

Appendix A Data and Calculations for the Cross Section Analysis for Gregory Canyon

Plates

Plate 1 Stormwater Outfall and BMP Locations Overlain on Topo Map
Plate 2 Stormwater Outfall and BMP Locations Overlain on Aerial Plots

AGR	Agricultural Supply
amsl	above mean sea level
Basin Plan	San Diego Basin Plan 9
BMP	Best Management Practice
CEQA	California Environmental Quality Act
cfs	Cubic feet per second
COLD	Cold Freshwater Habitat
Corps	U.S. Army Corps of Engineers
CSDFC	County of San Diego Flood Control
HEC-1	Name of Hydrologic Model
HMP	Hydromodification Management Plan
IND	Industrial Services Supply
LID's	low-impact development stormwater control measures
MUN	Municipal and Domestic Supply
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OHWM	Ordinary High Water Mark
Porter Cologne	Porter Cologne Water Quality Control Act
REC1	Contact Recreation
REC2	Non-contact Recreation
RWCQB	San Diego Regional Water Quality Control Board
thalweg	The lowest portion of the canyon along the entire length of the valley's downslope
U.S.	United States
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WARM	Warm Freshwater Habitat
WILD	wildlife habitat

SECTION 1 INTRODUCTION

This report describes existing hydrogeomorphology and beneficial uses that may be affected by the Gregory Canyon Landfill Project at Gregory Canyon in northern San Diego County to support permitting under the Porter Cologne Water Quality Act and Section 401 of the Federal Clean Water Act, as well as other potential State, Local, and other permits. This report updates URS (2008), which was prepared for Gregory Canyon Limited, and it contains the original information from URS (2008) plus updated information. The project area is located approximately 3.5 miles east of I-15 along SR76 and the San Luis Rey River (Figure 1). An overview of the proposed project is provided in Figure 2, and more detailed descriptions of stormwater and Best Management Practice (BMP) locations are shown in Figures 3 and 4, and Plates 1 and 2. Figure 5 shows conditions on the site in 1928. Figure 6 shows the results of a delineation of waters of the United States by the U.S. Army Corps of Engineers (USACE) Los Angeles District in 2010. Figure 7 shows patterns of rainfall observed during a large storm event in January, 2010. Figure 8 shows drainage swales that will be created on the project site in addition to previous project features.

This report first discusses the existing natural floodplain drainage of Gregory Canyon, which is generally located along the thalweg of Gregory Canyon. Although this portion of the report is focused on issues related to potential State laws and regulations especially as it applies to the Porter Cologne Water Quality Control Act (Porter Cologne), it also includes a discussion of Federal determinations for the project area that may be relevant to the discussion. This discussion of Federal issues may support other future permitting efforts, such as California Department of Fish and Game permitting and other permits.

This report uses definitions from Porter Cologne, as well as other State and Federal laws and regulations, and common terms from science and technology. Several definitions from Porter Cologne (§13050 Definitions) used in this report include:

(d) “Waste” includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers of whatever nature prior to, and for purposes of, disposal.

(e) “Waters of the state” means any surface water or groundwater, including saline waters, within the boundaries of the state.

(f) “Beneficial uses” of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

(g) “Quality of the water” refers to chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affect its use.

(h) “Water quality objectives” means the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

(k) “Contamination” means an impairment of the quality of the waters of the state by waste to a degree which creates a hazard to the public health through poisoning or through the spread of disease. “Contamination” includes any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected.

(l)(1) “Pollution” means an alteration of the quality of the waters of the state by waste to a degree which unreasonably affects either of the following:

(A) The waters for beneficial uses.

(B) Facilities which serve these beneficial uses.

(2) “Pollution” may include “contamination.”

These definitions contained in Porter Cologne are of a general nature. The purpose of this report is to analyze the hydrogeomorphology of the drainage using more detailed criteria and methodologies, and to use those findings to assess potential impacts on beneficial uses and appropriate compensation measures.

Second, this report includes a discussion of potential hydromodification of the San Luis Rey River by assessing potential impacts from the construction of the landfill access road and bridge, and by comparing anticipated pre- and post-development stormwater flows within the watershed of Gregory Canyon. This portion of the report also includes a discussion of low-impact development stormwater control measures (LID’s) that would be incorporated into the project to meet the requirements of the 2007 Municipal Permit.

SECTION 2 BASELINE CONDITIONS

2.1 GEOMORPHOLOGY

Gregory Canyon was formed by erosion processes that occurred primarily between 10,000 and 20,000 years ago during the early Holocene and Pleistocene epochs. The present local climate and hydrological conditions are drier than during the period of primary formation. The median annual rainfall based upon 30 years of rainfall data analysis by URS Corporation for the Fallbrook rain gauge (located approximately 10 miles northwest of the project) for this time period is 14.1 inches. The rainy season is from October to April with most significant rain events occurring between December and March. Summers are typically dry with only infrequent thunderstorms.

Gregory Canyon currently consists of a "V" to "U" shaped canyon with a narrowly defined 100 to 500-year floodplain closely associated within tens of feet of the canyon's thalweg (thalweg is used in this case to refer to the lowest portion of the canyon along the entire length of a valley's downslope, which is also considered as the continuous line that follows the path of maximum slope or descent between the top of the canyon and the bottom of the canyon, rather than the lowest portion of a stream channel). Gregory Canyon descends northward toward the San Luis Rey River floodplain, which runs approximately east to west through the greater property. The remaining drainage/erosion features onsite are minor without channels defined by banks, as considered in a geomorphological sense, such as discussed in Rosgen (1996).

Approximately 75 percent of the project site consists of steeply sloping, rocky land that is naturally vegetated and undeveloped. From a geologic perspective, the project is located within the Peninsular Range. Regional topography in the Peninsular Range is characterized by considerable relief with relatively moderate to steep slopes. East of Gregory Canyon, Gregory Mountain rises steeply to a maximum elevation of 1,844 feet above mean sea level (amsl). The western ridge rises to a maximum elevation of 940 feet amsl. The thalweg of the canyon itself drops in elevation from 920 feet amsl at the head of the canyon on the south to 320 feet amsl on its northern terminus into the San Luis Rey River. Elevations on the Gregory Canyon site range from approximately 300 feet amsl at the mouth of the canyon in the San Luis Rey River floodplain to 1,200 feet amsl at the head of the canyon at the south. Much of the canyon is steep, rugged terrain containing numerous boulder outcrops on the eastern side with only a few isolated boulders on the western canyon wall. The canyon flattens somewhat at the mouth where it meets the alluvial deposits of the San Luis Rey River floodplain. The Gregory Canyon watershed drains approximately 458 acres or approximately one tenth of one percent of the San Luis Rey River basin area.

Soils within Gregory Canyon consist of sandy loams and clays, with some cobble and rock. The steep upper slopes of the canyon, especially on Gregory Mountain, have exposed non-soil granite surfaces with many fractures. The overall slope in the canyon along its thalweg is approximately 11%. Vegetation cover in the canyon includes dense non-native grassland, native scrub and chaparral, and coast live oak woodland, which are all upland vegetation communities. The San Luis Rey River floodplain consists primarily of non-native grasslands and developed lands from prior agricultural and dairy activities onsite that surround the riparian vegetation communities of the San Luis River (these riparian communities are generally contained within the approximate 25-year floodplain of the San Luis Rey River). Other hilly

and mountain slopes onsite are covered by mixtures of non-native grasses, and native scrub and chaparral vegetation communities with some coast live oak woodland.

As discussed in more detail in Section 2.2, the canyon does not experience surface water flow in most years and/or most of each year. Water flow in the canyon occurs only during extreme storm events or very wet years, and such water flow is ephemeral in nature without periods of prolonged post-storm flows. The water flows in the canyon generally consist of shallow concentrated flows along the canyon's thalweg. Conditions similar to those in the canyon exist in the borrow areas, and water flow is similarly rare and limited to brief patterns of shallow concentrated flow that does not reach the creek in Couser Canyon or the San Luis Rey River.

Rosgen (1996) provides a stream classification system that is widely accepted in the United States. The Rosgen stream classification system results in classifications based on channel morphology and hydrologic considerations. The path of shallow concentrated flow during more extreme rain events in the canyon does not exhibit erosion in most years, and the bottom of this flow path is vegetated in most areas. Therefore, the Rosgen stream classification system was applied to objectively evaluate the drainage feature of the canyon. The Rosgen system defines hydrogeomorphological features that can be measured in the field to apply the classification. These features include consideration of bankfull depth, bankfull width, bankfull discharge, flood-prone width, entrenchment ratio, sinuosity, and slope (Rosgen 1996).

Bankfull depth, bankfull width, and bankfull discharge are associated with the bankfull stage of a stream. Dunne and Leopold (1978) define the bankfull stage of a stream as "*The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.*" Rosgen (1996) equates the bankfull stage with the U.S. Army Corps of Engineers (Corps) definition of the Ordinary High Water Mark (OHWM). The drainage path in Gregory Canyon is relatively straight with surface flows absent in most years and that are only ephemeral in nature during extreme rain events sufficient enough to produce shallow concentrated flow along the canyon's thalweg. There are also insufficient features in Gregory Canyon to define the bankfull stage based on additional guidance provided by Rosgen (1996). Bankfull depth, bankfull width, and bankfull discharge are zero in Gregory Canyon. The flood-prone width of the drainage feature defined as 2x the maximum depth at bankfull capacity is also zero, as is the entrenchment ratio defined as the flood-prone width divided by the bankfull width. Sinuosity in the canyon approaches 1.0, and the overall slope is approximately 11%. Based on these features, the drainage path in Gregory Canyon cannot be classified as a stream using the Rosgen system. The drainage path in the canyon is best defined as a path of shallow concentrated flow with such flows being ephemeral in nature and without surface flow in most years. The nature of these shallow concentrated flows is described in more detail in Section 2.2.

We also evaluated the canyon using the California Rapid Assessment Method (CRAM) (Collins et al., 2006). CRAM includes procedures for evaluating existing drainage features, and we attempted to apply those procedures to Gregory Canyon. However, once again it was not possible to define streams, wetlands, or similar surface waters within the canyon using CRAM because of the lack of a definable bankfull stage or related parameters. These results further support the findings from applying the Rosgen classification system.

The USACE (2010) performed a new delineation of waters of the U.S., in which it found that the central thalweg of Gregory Canyon was jurisdictional waters of the U.S. (Figure 6). The USACE (2010) did not find a channel with a continuous ordinary high water mark extending from Gregory Canyon to the San Luis Rey River. This new finding by the USACE does not result in changes to other evaluations, such as with regard to Rosgen (1996) or using CRAM. No additional jurisdictional waters of the U.S. were determined by the USACE.

The USACE evaluated drainage features in portions of Borrow Areas A and B for this project; however, no jurisdictional waters of the U.S. were found in these borrow areas. The drainage patterns in the borrow areas are similar to those in Gregory Canyon, but with generally less pronounced features. Patterns of shallow concentrated flow are not expressed in most years in the borrow areas, and surface flow from these borrow areas does not reach the creek in Couser Canyon or the San Luis Rey River. Evaluation pursuant to Rosgen (1996) and CRAM also do not support classifying these erosional drainage patterns in portions of the borrow areas as streams.

The San Luis Rey River is a stream bearing features of a lotic aquatic habitat including an OHWM, bankfull stage, and other geomorphological features of a stream. It is classified as a type C5 stream using the Rosgen (1996) stream classification system, which is characterized as a stream with broad valleys with terraces in association with floodplains and alluvial soils. The river flows through alluvial sands deposited over historic times. This reach of the river has experienced overall degradation (erosion) over time since the construction of Lake Henshaw, which has blocked transport of sediments to this reach and which has also created more focused seasonal flows that have greater capacity to erode the local alluvium. Instream sand mining upstream of the project area, on the Pala Indian Reservation, has also created conditions that support further stream degradation. Riparian vegetation communities are generally confined within the 25-year floodplain of the San Luis Rey River within the greater project area.

2.2 HYDROLOGY

2.2.1 Rainfall and Runoff Analysis for Gregory Canyon

URS previously evaluated hydrology within Gregory Canyon for the Corps (URS 2004). The nearest representative rainfall gauge with many years of record is at Fallbrook (30 years of record was used in the 2004 analysis). Another, newer gauge was recently installed at the Couser Canyon Road crossing of the San Luis Rey River, just west of the project site. Patterns observed to date at the Couser Canyon gauge are similar to those observed at Fallbrook. The median annual rainfall for the time period through 2004 is 14.1 inches. Recent years of extreme rainfall through 2004 relative to the median annual rainfall include 1997/1998 (approximately 29 inches), 1994/1995 (approximately 30 inches), and 1992/1993 (approximately 37 inches). The remaining years between 1992 and 2004 include only 2 years that were near the median annual rainfall (1996/1997 at approximately 16 inches and 2002/2003 at approximately 14 inches), while the remaining 7 years are below the median annual rainfall.

The existing condition 2-, 5-, 10-, 25-, 50, and 100-year storm event runoff values (surface flows) for Gregory Canyon were analyzed in this study. The runoff was analyzed using the United States Army Corps of Engineers (USACE) HEC-1 hydrology model in conjunction with the Natural Resources Conservation Service (NRCS) (formerly called the Soil Conservation Service) hydrologic method as outlined in the 1993 and 2003 editions of the San Diego County Hydrology Manual. The Rational Method

procedure is commonly used to calculate runoff for study areas less than a square mile, although this method is expected to exaggerate flows within the watershed. The Rational Method was originally designed for watersheds of less than 200 acres and assumes uniform rainfall intensity over the whole watershed, which is unlikely for larger watersheds in the southwestern U.S., where thunderstorms are highly localized (USACE 2004), and other methods, such as the methods used for this analysis, are recommended by that reference. TXDOT (2009) does not recommend using the Rational Method for watersheds greater than 200 acres and for analysis of floods from less than 10-year events to avoid inaccuracy inherent in the Rational Method. Therefore, the NRCS hydrologic method was chosen for the 2004 report because it is an approach that considers the time distribution of rainfall, the initial rainfall losses to interception and depression storage, and an infiltration rate that decreases during the course of a storm. Therefore, the NRCS hydrologic method is expected to result in flow predictions that are closer approximations of actual conditions than the Rational Method.

The URS report (2004) calculated the runoff from Gregory Canyon using two approaches. The first approach used the 6-hour and 24-hour duration storms with a Type B rainfall distribution pursuant to the 1993 San Diego County Hydrology Manual guidelines. The second approach used a 24-hour duration storm with a nested storm pattern distribution pursuant to the 2003 San Diego County Hydrology Manual guidelines. Attachment A of URS (2004) provides the hydrology map, hydrology model input parameters, rainfall data, and HEC-1 output, respectively.

Table 1 provides a summary of the hydrology analysis results. The 6-hour storm duration runoff values are considered more appropriate in this case because the watershed is less than one square mile (0.567 square mile), and therefore, the 6-hour storm duration represents a storm pattern that is more realistic and likely to be encountered in Gregory Canyon. Analysis of actual daily rainfall amounts from 1948-1988 and 1998 to 2004 (47 years of record; there were gaps in the daily record between 1988 and 1998) for the Fallbrook rain gauge indicate that the 6-hour duration rainfall values shown in Table 1 have a much higher degree of incidence for a given storm frequency (2-, 5-, 10-, 25-, 50-year) than the corresponding 24-hour duration rainfall values, which further supports our understanding that the 6-hour storm is more representative of values that have been experienced in Gregory Canyon. In fact, the 5-year, 24-hour storm duration rainfall amount of 3.5 inches shown in Table 1 was only exceeded twice during the 47-year period of record (4.3% of the time, compared to the reported frequency of 20% of the time in Table 1), and the 10-year, 24-hour storm duration rainfall of 4.1 inches was exceeded only once (2.1% of the time, compared to the reported frequency of 10% of the time in Table 1). Therefore the 6-hour storm duration analysis is considered a more realistic representation of hydrologic events within Gregory Canyon, and the 24-hour storm duration analysis is considered to be a substantial overestimation of events within Gregory Canyon.

Additionally, the runoff values from the 6-hour storm events are considered conservative because they are based on standard County hydrology procedures and guidelines. The County of San Diego hydrology procedures were put in place chiefly for the design of flood control structures, storm drain pipes, and the like to provide more conservative results than one would expect to typically find in the field for the purpose of ensuring that structures and property are protected from potential flooding. Therefore, the assumptions used exceed representation of actual events that would be experienced in Gregory Canyon, especially with regard to events that would lead to formation of a stream or wash with a defined bankfull stage. For example, the County hydrology procedures assume a high degree of soil wetness prior to the occurrence of the design storm, which is typically not the norm, except during extremely wet years.

The results shown in Table 1 document that surface water flows are not expected to occur within Gregory Canyon for the 6-hour storm under conditions for the 2-year and 5-year storm. No flows are expected for the 24-hour storm under conditions for the 2-year storm, and only small flows are expected with the 5-year, 24-hour storm event based on the model. It is important to note that the period of record documents that the 24-hour rainfall amount equal to or exceeding the 5-year storm event of 3.5 inches from Table 1 actually only occurred 4.1% of the time, instead of the expected 20% of the time if the assumptions for the magnitude of the 5-year storm were correct (i.e., that individual rain events are evenly distributed over all years, rather than concentrated in wet years). Therefore, flows in Gregory Canyon are clearly documented to be unusual events. Furthermore, analysis of the recent daily rainfall data indicates that there had not been sufficient rainfall within the five years prior to 2004 to produce runoff within Gregory Canyon for either the 6-hour or 24-hour duration storm events.

2.2.2 Analysis of Observed Flows in Gregory Canyon

Surface water flows were observed in Gregory Canyon during the latter part of the 2004-2005 rain year (i.e., the approximate period between October 2004 and May 2005). National Weather Service (NWS) data shows the 2004-2005 rain year to be the third wettest year in 155 years of record (National Weather Service 2005). This was an extreme rain year. However, no surface flow was observed in Gregory Canyon until the latter part of this rain year, and surface flow only occurred at a time when numerous prior rain events had resulted in very high levels of soil saturation within the local watershed.

Mr. Stanley McGarr, Tribal Secretary of the Pala Band of Mission Indians, provided photographs in a letter dated March 15, 2005 to Mr. David Castanon of the Corps that showed shallow concentrated flow in Gregory Canyon associated with storms in January 2005. Mr. Rand Allan of County of San Diego Flood Control (CSDFC) calculated that the individual January 2005 storms corresponded to approximately 2-5 year rainfall events based on rainfall gage data from Couser Canyon. URS received the daily rain gage data for Couser Canyon for January 2005 from Mr. Allan, and used this data to perform an independent rainfall-frequency analysis using the same methods as CSDFC, and the results were the same as the County results for the accumulated 1-hour and 6-hour rainfall values. For shorter rainfall durations (15-minute and 30-minute rainfall durations), the recorded rainfall amounts and corresponding intensities at the Couser Canyon rainfall gage indicate that 10-year rainfall events occurred on January 9 and 11, 2005.

The Pala photos showed runoff within Gregory Canyon, which our previous HEC-1 modeling predicted could begin with a 5 to 10-year rainfall event. However, the flowrate in the photos was not measured or calculated and also was not associated with a runoff return frequency by representatives of the Pala Band. Evaluation of the rainfall return frequency alone does not always provide an accurate estimate of the runoff return frequency. The actual runoff flowrate may be lower or higher depending on the antecedent soil moisture conditions within the watershed. For example, the HEC-1 model for the 2-year rainfall event produces approximately 10-year runoff values when it is assumed that the antecedent soil moisture content is at a maximum. The amount of runoff from a given rainfall event is based on a number of factors including multiple storm pattern timing, rainfall intensity, duration, and soil saturation. In cases of extreme rainfall and saturated soils, the runoff return frequency for an individual storm can be much higher than the rainfall return frequency. That is, a single 2 to 5-year rainfall event that occurs after a

series of other 1 to 2-year rainfall events may result in 10, 25, or 50-year runoff events within the watershed.

The San Luis Rey watershed exhibited this type of behavior during the late December 2004 and early January 2005 storms. The San Luis Rey stream gage data indicated that the flowrate within the river corresponded to approximately a 25-year flood event (maximum flowrate of 16,866 cfs on January 12, 2005). If the overall San Luis Rey watershed experienced rainfall events on the order of 2-5 year rainfall return frequencies, this indicates that watershed response was greater than would typically be expected due to the number of prior rainfall events. The rainfall data for Couser Canyon indicated that there was a substantial amount of rainfall prior to the January 12, 2005 peak flood flow on the river, which provided a high degree of soil saturation.

A runoff-frequency analysis was performed for Gregory Canyon at the most downstream Pala photo location within Gregory Canyon to determine the runoff return frequency associated with the higher flood limits shown in the photo using the following methods:

1. Located photo location in the field using distinct natural features observed in the photo, and measured canyon cross section dimensions (depth versus distance) for the high flow mark and actual stream flow at the time of the photo at several locations within the photo area;

2. Measured canyon bottom longitudinal slope through cross section locations;

3. Calculated associated flowrates corresponding to the cross section dimensions using Manning's Equation within Haestad Method's FlowMaster computer software; and

4. Correlated the calculated flowrates corresponding to the outer flood limits shown in the photo to the previously calculated runoff-frequency table for Gregory Canyon provided as Table 1 in URS (2004).

Table 2 provides the results of the runoff-frequency analysis at the photo cross section. The computed discharges corresponding to the outer flood limits in the most downstream Pala photo range from 21 to 31 cubic feet per second (cfs) (average 26 cfs). The corresponding runoff return frequency for the average high flows through cross sections 1 to 3 were: 37-year flood flow for the 6-hour storm, 27-year flood flow for the 24-hour storm event, and a 10-year flood flow return frequency for the 2003 Method nested storm.

The results in Table 2 clearly indicate that flood flow return frequency associated with the downstream Pala photo was definitely greater than the modeled 2 to 5-year flows and indicates that the estimated 2 to 10-year rainfall event produced an approximate 10 to 40-year flood event within Gregory Canyon, which is consistent with the San Luis Rey stream gage data. The flood flow limits shown in the photos were not produced by ordinary rainfall-runoff events, but instead were produced by a combination of extended rainfall producing saturated soil conditions followed by additional storms resulting in the infrequent flood flows shown in the photos.

No flow occurred in Gregory Canyon between early 2005 and the end of 2009. A large storm event occurred in the area during January 15-22, 2010. Heavy rainfall from that storm event was centered over the project site for the duration of this storm period. Rainfall was monitored on site with a rain gauge that

was located in the central portion of the site between the landfill and borrow areas. This rain gauge provided a good representation of the storm event on site, although heavier rains were observed on the higher slopes of Gregory Mountain such that it provided a slightly lower representation of the total rain that fell within the canyon's watershed. Most of the rainfall on the project site occurred between January 18, 2010 and January 22, 2010 with a total rainfall on the canyon's watershed of 6.11 inches, which is a very large cumulative rain event occurring over a short period of time. Figure 7 shows the distribution of rainfall over this period of time, which was effectively continuous over the course of the entire storm period between January 18 and 22, 2010. The amount of rain that fell during this period and the continuous nature of this rainfall is best representative of approximately a 25-year or greater storm event for Gregory Canyon relative to storms modeled in Table 1. Surface water flow occurred in the canyon midday on January 21, 2010; however, water flow from the canyon did not reach the San Luis Rey River until January 22, 2010, and flow to the San Luis Rey River stopped shortly after the end of the rainfall, which occurred near midnight on January 22, 2010. The peak instantaneous discharge from Gregory Canyon was measured to range from 4 cfs to 5.6 cfs in the lower canyon. No flow to the San Luis Rey River was present on January 23, 2010 or later. Therefore, this substantial rain event resulted in ephemeral runoff from Gregory Canyon to the San Luis Rey River that lasted less than 24 hours, which further demonstrates the minor contribution made by the infrequent flows in Gregory Canyon to the San Luis Rey River.

2.2.3 Cross Section Analysis for Gregory Canyon

In 2007, URS expanded the 2005 analysis to include additional cross sections within Lower Gregory Canyon to determine the flow return frequency associated with identifiable landform terraces above the canyon thalweg. Seven additional cross sections were taken upstream of the three cross sections described above using the same method as described previously. Photos and cross section plots are provided in Appendix A. Below is a summary of the cross section measurement and hydraulic analysis methodology.

2.2.3.1 Cross Section Analysis Methodology

Cross Section Location and Measurement

- An additional seven cross sections were taken at select locations in lower Gregory Canyon upstream of the three cross sections identified in the previous section. Cross sections were taken parallel to the stream line and were measured using a level line and tape measure to record break point locations corresponding to landform terrace locations along the cross section line. Field observed cover was noted for use in the hydraulic analysis.
- Stream slope was determined from USGS topographic maps for cross sections 5 through 10 in the steeper portions of the lower canyon. Stream slope was determined by field measurements for cross sections 1 through 3 (most downstream cross sections described in previous subsection).

Hydraulic Analysis

- Manning's normal depth calculations were performed to determine flow depths for the various return frequency storm event runoff values calculated in the hydrology analysis. FlowMaster

2005 software by Bentley was used to input the field measured cross section data and calculate normal depths.

- Manning's channel roughness coefficients used in the analysis ranged from 0.03 to 0.04 corresponding to a relatively clean 'channel' with minor to moderate amounts of vegetation and rocks.
- The flow rates associated with the 5-, 10-, 25-, 50-, and 100-year return frequencies were used to calculate normal depths, topwidths, velocities, etc. in the field measured cross sections.

2.2.3.2 Cross Section Analysis Results

The following discussion provides the results of the cross section hydraulic analysis of the field measured cross sections. Following is a summary of the hydraulic analysis results:

- Flow depths and topwidths were plotted against flow rate (discharge) for the field measured cross sections to determine limiting depths and top-widths for the 6-hour storm. In general flow depths were less than 1.8 feet and top-widths were less than 20 feet (5-15 feet typical).
- 100-year, 6-hour storm: Flow depths range from 1.4 to 2.5 feet; Top-widths range from 7 to 20 feet.
- 50-year, 6-hour storm: Flow depths range from 1.0 to 1.9 feet; Top-widths range from 6 to 17 feet.
- 25-year, 6-hour storm: Flow depths range from 0.25 to 0.75 foot; Top-widths range from 3 to 8 feet.
- 10-year, 6-hour storm: Flow depths range from 0.2 to 0.8 foot; Top-widths range from 2 to 6 feet.

It is important to note that the flow depths for the 100-year storm are less than 2.5 feet deep, indicating that even extreme runoff events in the canyon do not produce substantial flood depths. In general the flow associated with the lower landform terrace above the thalweg is typically 0.6 to 1.6 feet and corresponding to 25 to 50-year storm events. The cross section analysis in conjunction with the hydrology analysis indicate that flow depths up to the lower landform terrace along the Canyon thalweg are associated with infrequent storm events (25 to 50-year events).

2.2.4 Sediment and Nutrient Transport

Sediment and associated nutrient transport through the canyon is limited to infrequent rainfall events that produce runoff (typically greater than the 5-year rainfall event) in the canyon. Minor amounts of sediment, debris, and associated nutrients are transported through the canyon during surface flow events (between 5- and 10-year storm events). Sediments and nutrients from Gregory Canyon (when there is flow in the Canyon) are deposited in or upstream of the San Luis Rey River 500-year floodplain. River velocities in the 500-year floodplain are typically not sufficient to re-suspend and carry deposited sediment, debris, and associated nutrients for significant lengths. Similar conditions occur in the borrow areas where water flow is very rare and does not enter the bottom lands of Couser Canyon.

2.2.5 Hydrology Summary

Hydrologic modeling and field observations document that surface water flows in Gregory Canyon are limited and rare in occurrence, and that surface water flows are insufficient to define a channel with an observable bankfull stage. URS observations during the 2004-2005 rain year document that surface flows associated with a 37-year flood event in the canyon did not reach the San Luis Rey River channel; rather, these extreme flood flows from the canyon percolated into the alluvium within the 500-year floodplain of the San Luis Rey River, approximately greater than 500 feet from the San Luis Rey River channel. Observations during the 2009-2010 rainfall year documented a small volume of discharge of short duration into the San Luis Rey River, but only as the result of a continuous 4-6 day period of intense storms. The patterns of surface water runoff in Gregory Canyon document that the potential for transport of sediments, nutrients, and other constituents from the Canyon to the San Luis Rey River via surface water flow are minimal. Similar conditions occur in the borrow areas where water flow is very rare and the ability to transport materials to the creek in Couser Canyon and/or the San Luis Rey River are negligible.

2.3 BIOLOGY

The biological resources of the project site and greater property have been reviewed and reported in detail in several documents, including: the 2003 Draft EIR and Final Biological Technical Report (Appendix L) (San Diego County 2003), Biological Assessment for the Gregory Canyon San Luis Rey River Bridge Replacement (URS 2006), Biological Technical Report for Gregory Canyon Landfill CEQA Update (URS 2007a), Summary of Arroyo Toad Data for the Gregory Canyon Landfill through 2007 (URS 2007b), and the Revised Final EIR (San Diego County 2007). This discussion summarizes the information in these documents regarding aquatic and riparian habitats and other resources associated with potential beneficial uses that may be affected by the project.

The Gregory Canyon drainage does not support aquatic habitat. The limited ephemeral flows that may occur in the canyon during extreme rain events do not persist for long enough periods to support aquatic life on a regular basis. The dominant vegetation communities in Gregory Canyon are upland plant communities, including stands of coast live oak. Coast live oak is not a hydrophytic plant and the NRCS Plants Database considers it intolerant of anaerobic conditions that would form with saturated wetland soil conditions. Coast live oaks onsite are distributed in areas of thicker soils or along fracture zones that can accommodate the deep root structure of this tree, and this tree is not associated with wetland conditions onsite. A few specimen sycamore trees and isolated mulefat that are in areas dominated by non-native grasses or native upland scrub habitat occur in the canyon. Both plants are considered to occur in uplands approximately 33% of the time (based on their facultative wet status in the National Wetland Inventory list of hydrophytic vegetation). Although sycamore and mulefat are hydrophytic plants, neither is present in areas that demonstrate hydric soils or wetland hydrology, and they are not dominants where they occur. Wetlands are not present in Gregory Canyon. Similar conditions occur in the borrow areas, which are upland biological communities lacking wetlands. Most of the borrow areas are covered by coastal sage scrub habitat, with a few patches of coast live oak, and no aquatic life is supported in these areas.

The San Luis Rey River provides aquatic and riparian habitats along its course through the greater property. The San Luis Rey River experiences intermittent flows in at least some years in this area, although perennial flows may occur at other times. Aquatic habitat is generally limited to within the limits of the river's bankfull stage, although occasional ephemeral ponds can form outside the river's banks, usually in side overflow channels that occur during flooding. The flow path of the river within the bankfull stage is currently vegetated in most areas with emergent marsh vegetation (such as cattails (*Typha sp.*) or willows. Stretches or pools of open water may form within the bankfull stage. The area outside of the bankfull stage extending approximately to the 25-year floodplain of the river tends to be dominated by riparian woodland, southern willow scrub, and open sandbars, and these areas generally lack indicators of hydric soils or wetland hydrology. There is a generally distinct transition to upland habitats beyond these areas, usually associated with a distinct landform terrace onsite. Remnant southern willow scrub or riparian woodland vegetation may persist in some of the upland areas closer to the river, usually consisting of sparse mulefat or occasional willows, on the south side of the river. Most of the area within the 500-year floodplain south of the river is dominated by non-native grassland – a remnant of dairy operations that have been onsite since at least the 1920s based on review of historic aerial photographs from San Diego County (Figure 5). The north side of the river between SR76 and the river is largely disturbed and developed land from the prior dairy operations. The area of the large dairy yard north of the river at the proposed bridge crossing of the river was historically alluvial sands with an apparent mix of coastal sage scrub, sycamore, and coast live oak vegetation based on review of historic aerial photographs from San Diego County. However, that land was developed many years ago by the dairies.

The San Luis Rey River provides breeding habitat for arroyo toad, least Bell's vireo, and southwestern willow flycatcher. No other endangered species occur onsite. Arroyo toads also use areas with suitable soft sandy soils outside of the primary riparian zone of the San Luis Rey River. The analysis performed for the project's Section 7 Consultation with the U.S. Fish and Wildlife Service (USFWS) (URS 2006, 2007b) shows that arroyo toad use of uplands is largely limited to the south side of the river in appropriate sandy soils. This analysis also shows a trend of declining activity as non-native grass densities have increased onsite after cattle grazing was stopped. The San Luis Rey River riparian zone provides suitable habitat for most general riparian species found in the region. Warm water fisheries may be present in this area; however, the waters of the river are too warm to support cold water fisheries in this reach. Surveys conducted in 2010 for fish species found largemouth bass, green sunfish, and mosquito fish present in the San Luis Rey River; however, no steelhead were observed. Trends of reduced water flow in the San Luis Rey River on the property that resulted in no flow on much of the site by July 2010, and no flow upstream or downstream earlier in the year, demonstrate normal patterns of seasonal drying and intermittent water flow on site and in this greater reach of the river that do not favor residence by fish species, especially cold water fisheries.

2.4 BENEFICIAL USES

The San Diego Regional Water Quality Control Board (RWCQB) has five policies for management of beneficial uses and water quality in the San Diego Region:

Policy 1 – Water quality objectives, beneficial uses, and water quality control plans and policies adopted by the State Water Resources Control Board and the Regional Water Quality Control Board shall be an integral part of the basis for water quality management.

Policy 2 - Water shall be reclaimed and reused to the maximum extent feasible.

Policy 3 - Point sources and nonpoint sources of pollution shall be controlled to protect designated beneficial uses of water.

Policy 4 - Instream beneficial uses shall be maintained, and when practical, restored, and enhanced.

Policy 5 - A detailed and comprehensive knowledge of the beneficial uses, water quality and activities affecting water quality throughout the Region shall be maintained.

The beneficial uses for Inland Surface Waters and Ground Waters for the San Luis Rey River are provided in Table 3, and were obtained from the San Diego RWQCB Basin Plan. These beneficial uses apply for both San Luis Rey River, the Gregory Canyon drainage (tributary), and the borrow areas; however, most of these beneficial uses are not expressed within Gregory Canyon or the borrow areas. Therefore, this table has been modified from the Basin Plan to indicate actual conditions that either exist or have potential to exist within Gregory Canyon along its thalweg and within the borrow areas.

2.5 SUMMARY

Gregory Canyon is located in an arid region of southern California and only experiences surface water flows during extreme rain events, and surface water flow does not occur within Gregory Canyon in most years or during most of the time in years when surface flows do occur. Surface water flows are not of sufficient magnitude or duration to result in the regular destruction of vegetation, regularly move sediments from the canyon, form or remove bars within the canyon, form or change bends and meanders along the canyon's thalweg, or generally perform work that results in the average morphologic characteristics of channels. Although a swale is formed along the canyon's thalweg, it is of historic (Holocene and Pleistocene) origin, and it is bounded by inconsistent landform terraces that correspond to a wide range of larger scale flood levels (such as from 50 to 500 years in recurrence frequency). These landform terraces may be locally continuous within the canyon; however, they do not relate to continuous patterns of floodplains within the canyon. The landform along the thalweg of the canyon does not support characteristics to define a bankfull stage or related geomorphological parameters, and the thalweg and swale within the canyon cannot be defined as a stream using the Rosgen (1996) stream classification system. The thalweg of the canyon is best defined as the basic path of shallow concentrated flows that may occur with extreme rain events, which do not occur in most years. Similar conditions are found in the borrow areas, which are less likely to exhibit surface water flow. The canyon and borrow areas do not support hydrogeomorphological descriptors consistent with landforms or biological habitats representative of areas influenced by surface water flow or groundwater.

Hydrologic modeling of the canyon confirms a pattern of rare surface flows that do not occur in most years. Using the 1993 San Diego County Method for predicting runoff from 6-hour storms, which describes the likely duration of rain events for this canyon better than longer term rain events, surface flows are not expected to occur until approximately a 10-year storm event. Shallow concentrated flows

have been observed in the canyon, most noticeably during the latter half of the 2004-2005 rain year, which was the third wettest year in 155 years of record for San Diego County. These shallow concentrated flows only occurred late in that rain year, in 2005, after a long period of recurring low frequency return rain events in 2004 that had saturated the local watershed. These flows were consistent with the predictions of the hydrologic models and confirm that surface flow does not occur within Gregory Canyon in most years, and that such flow is ephemeral in nature and associated with extreme rain events. Overall, flows are not predicted to occur with sufficient frequency and have not been observed to occur with sufficient frequency to create a channel within the canyon with a bankfull stage as defined by Rosgen (1996). Observations of flow during the 2009-2010 rainfall year were consistent with these findings.

The mouth of Gregory Canyon broadens and flattens out as it reaches the 500-year floodplain of the San Luis Rey River. The swale that transports infrequent shallow concentrated flows from Gregory Canyon becomes undefined as it reaches the 500-year floodplain of the San Luis Rey River. Shallow concentrated flows from Gregory Canyon that were associated with a 37-year flood event observed in January 2005 did not reach the San Luis Rey River, and rather, percolated into the soils of the 500-year floodplain of the river at the mouth of the canyon. Discharges of surface flows from Gregory Canyon to the San Luis Rey River are generally not expected to occur under most conditions. Therefore, transport of nutrients, sediments, and potential contaminants from Gregory Canyon to the San Luis Rey River via surface water flow are unlikely to occur under existing conditions.

Gregory Canyon and the borrow areas are dominated by upland vegetation communities (chaparral, coastal sage scrub, and non-native grassland). Oak trees in the canyon and elsewhere are an upland vegetation community, and they are distributed in areas of thicker soils or along fractures in rocky soils and among igneous rocks where the root structure of the trees can be accommodated. A few hydrophytic trees and shrubs that also occur in uplands can be found in the canyon, although these are few in numbers and sparsely distributed such that they are not representative of hydrophytic or aquatic vegetation communities. Surface water flows in the canyon are insufficient to support aquatic communities, and groundwater does not support wetland communities within the canyon. Gregory Canyon and the borrow areas are upland habitats that support wildlife characteristic of upland vegetation communities throughout this region. The canyon's thalweg and borrow areas do not create unique habitats characteristic of aquatic or riparian communities influenced by surface water flow or groundwater within the canyon.

Gregory Canyon is currently set within natural vegetation communities on most sides, with the exception of avocado and other orchards to the south (throughout Couser Canyon). The San Luis Rey River floodplain bounds the mouth of the canyon to the north. Urbanizing trends are occurring on adjacent lands east of Gregory Canyon on the Pala Indian Reservation, and additional development may occur to the west, off site of the greater property at some future time. At present time, Gregory Canyon and the borrow areas do not form a unique landscape component that would be considered a corridor from or to major wildlife habitats or within a greater wildlife corridor, although wildlife movement through the canyon and borrow areas is possible and does occur. The rare occurrences of shallow concentrated surface water flow and potential groundwater resources within Gregory Canyon do not support features characteristic of aquatic or riparian communities or habitat within the canyon (or in the borrow areas), and the canyon and borrow areas are dominated by upland habitat that is not supported by drainage patterns within them.

The main portion of Gregory Canyon and the borrow areas do not support threatened or endangered species, and they do not support suitable habitat for such species. The closest likelihood for special status species in the canyon is for arroyo toads to occur in uplands in or near the mouth of the canyon, in or near the 500-year floodplain of the San Luis Rey River during their non-breeding periods. Arroyo toads have been found on the existing road that will transect the proposed landfill facilities areas and the face of the landfill, but they have not been found in the dense non-native grasslands or other habitat within the project footprint where potentially suitable soils occur. Upland arroyo toad habitat on the project area appears to be primarily associated with suitable sandy soils within the 500-year floodplain of the San Luis Rey River. No breeding habitat for arroyo toads occurs within Gregory Canyon or outside of the San Luis Rey River channel in the vicinity of the proposed project area. California gnatcatcher, an upland bird species, has never been found to nest on site, including not being found in either the canyon or borrow areas. Surveys for California gnatcatcher conducted in 2010 did not find them anywhere on the larger property.

Beneficial uses associated with surface water flows or groundwater within Gregory Canyon or the borrow areas are largely absent or de minimus in nature. Wildlife habitat occurs within Gregory Canyon and the borrow areas; however, this is upland habitat that is not influenced by surface water flow or groundwater within the canyon or borrow areas, and is not representative of the WILD beneficial use within the canyon.

The San Luis Rey River forms the major aquatic feature on the greater property. It flows from east to west across the property, north of the proposed landfill site. The river exhibits intermittent or perennial flows, depending upon conditions in a given year. Flows within the greater watershed of the river are controlled by the dam at Lake Henshaw. Riparian vegetation communities are found along the active channel of the river and may extend out to approximately the limits of the 25-year floodplain. Upland vegetation communities extend beyond those limits.

SECTION 3 EFFECTS OF THE PROJECT

3.1 EFFECTS ON BENEFICIAL USES

3.1.1 Evaluation of Effects on Beneficial Uses Designated in the Basin Plan

The Water Quality Control Plan for the San Diego Basin (9) (otherwise referred to as the Basin Plan) lists several designated beneficial uses for the reach of the San Luis Rey River that passes through the greater property (see Table 1). This discussion describes potential effects of the project on these beneficial uses, related to construction of the landfill and the landfill access road bridge. For purposes of this discussion, it is assumed that the beneficial uses for the Gregory Canyon drainage and the borrow areas are the same as those designated for the San Luis Rey River. Note that a discussion of potential effects of the project on hydromodification is provided in Section 3.2 of this report.

Municipal and Domestic Supply (MUN) - This beneficial use includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. This beneficial use is listed for this reach of the San Luis Rey River for both surface and groundwater.

The discharge of dredged or fill material is proposed in the San Luis Rey River for construction of the landfill access road bridge. A total less than 0.8 acres of waters of the U.S. will be filled: less than 0.1 acres from permanent structural discharges (bridge support piers within waters of the U.S.), and less than 0.7 acres for temporary construction access. 2.3 acres of riparian habitat will be created in existing uplands (the existing dairy yard) on the north side of the river at the bridge. MUN uses occur in the San Luis Rey River downstream and upstream of the project site mostly from groundwater, but could include surface water. The proposed discharge of dredged or fill material will not result in the discharge of hazardous material that would adversely affect existing MUN uses. Restoration of temporary impact areas of less than 0.7 acres with riparian vegetation, and creation of an additional 2.3 acres of riparian habitat at the bridge crossing location, will further prevent degradation of this beneficial use by ensuring no adverse change in water quality and enhancement of wetland/riparian treatment capacity of the local system. The permanent fill of less than 0.1 acres of waters of the U.S. for the bridge piers (concrete piers) will not result in a loss or decrease in MUN uses within the river.

Stormwater runoff from the bridge and approach roads will be treated as discussed in Section 3.2 of this report and in the project's stormwater management plan (URS 2007c) and will not be discharged to the San Luis Rey River's channel. Stormwater will be directed to both ends of the bridge and along the approach roads. Stormwater from the combined approach roads and bridge runoff will be directed to a series of energy dissipaters to ambient local ground levels to allow spreading and percolation of runoff in the unconfined basin formed by uplands outside of the San Luis Rey River channel. Therefore, water quality in the San Luis Rey River and groundwater will be protected by best management practices for treatment of stormwater runoff and no adverse effect on beneficial uses in the river will result.

Stormwater runoff as surface water flow in the Gregory Canyon drainage does not occur in most years, and only occurs during extreme rain events. As described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c), changes in stormwater runoff from the canyon are not expected to result in adverse hydromodification results from the project. Under existing conditions,

sediments, nutrients, and potential pollutants in the existing watershed of Gregory Canyon are not transported from the canyon via surface water flow in most years, and such transport only occurs in the rare occasions when shallow concentrated surface flow does occur. Even then, the shallow concentrated flows discharged from Gregory Canyon do not reach the San Luis Rey River in most years. Similar conditions apply to the borrow areas, and no surface water connection to either the creek in Couser Canyon or the San Luis Rey River occur. These patterns will not be changed as a result of this project and there will not be degradation of MUN beneficial uses as a result of this project.

Agricultural Supply (AGR) - This beneficial use includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing. This beneficial use is listed for this reach of the San Luis Rey River for both surface and groundwater. The evaluation of potential impacts on AGR beneficial uses is identical to that described for potential impacts on MUN beneficial uses (see above). Similarly, there will not be degradation of AGR beneficial uses as a result of the discharge of dredged or fill material to waters of the U.S. for the bridge, or as a result of the entire landfill project.

Industrial Services Supply (IND) - This beneficial use includes uses of water for industrial activities that depend primarily on water quality. This beneficial use is listed for this reach of the San Luis Rey River for both surface and groundwater. The evaluation of potential impacts on IND beneficial uses is identical to that described for potential impacts on MUN beneficial uses (see above). Similarly, there will not be degradation of IND beneficial uses as a result of the discharge of dredged or fill material to waters of the U.S. for the bridge, or as a result of the entire landfill project.

Contact Recreation (REC1) - This beneficial use includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs. This beneficial use is listed for surface water. Most of these activities do not currently occur and are not likely to occur within the San Luis Rey River onsite because it is too shallow during base flow conditions, lacks large open pools in most cases, is generally covered by relatively dense riparian vegetation, and does not support reasonably safe opportunities for such activities during periods of high flow. Fishing, body contact through wading or other direct contact is possible in the San Luis Rey River, and ingestion of water is possible, but unlikely to actually occur because access to the river is restricted and conditions onsite are not conducive to these activities. Regardless of the actual use compared to the potential use, construction of the bridge and the rest of the landfill project will not change existing uses or potential uses for this beneficial use in the San Luis Rey River. Construction of the bridge will result in temporary, somewhat increased restricted access to the area of construction; however, the entire property is posted to discourage use by the public and there are little or no existing uses of this type, whether authorized or unauthorized, on the property at this time. Therefore, no loss or overall degradation of this beneficial use will occur in the river in the short or long term because the existing potential and observed uses will not be adversely altered by this project.

As previously described, Gregory Canyon and the borrow areas do not support surface water flows of sufficient frequency of recurrence, magnitude, or duration to support REC1 uses, and such uses are not reasonably expected in Gregory Canyon at most times in most years. It is conceivable that a person could purposely access the site during a brief period of shallow concentrated flow from the canyon and ingest

water, although such ingestion would not be authorized or reasonable. The opportunity to ingest water does not occur in most years because of lack of flow and is limited in availability to during and a very short time after heavy rain events in a few years. The entire property is posted to discourage use by the public. The project will create stormwater management channels and facilities described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c). These stormwater management features are best management practices that will allow continued expression of shallow concentrated surface flows at similar frequencies and durations as currently occur onsite, without degradation of water quality in these flows. Therefore, there will be no substantial change or degradation of REC1 beneficial uses in the canyon as a result of this project.

Non-contact Recreation (REC2) - This beneficial use includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities. Many of these potential uses are feasible in the San Luis Rey River, although they do not currently occur onsite in most cases (the site is generally not used for this type of recreation). Regardless of the actual use compared to the potential use, construction of the bridge and the rest of the landfill project will not change existing uses or potential uses for this beneficial use in the San Luis Rey River. Construction of the bridge will result in temporary, somewhat increased restricted access to the area of construction; however, the entire property is posted to discourage use by the public and there are little or no existing uses of this type whether authorized or unauthorized on the property at this time. Therefore, no loss or overall degradation of this beneficial use will occur in the river in the short or long term because the existing potential and observed uses will not be adversely altered by this project.

As previously described, Gregory Canyon and the borrow areas do not support surface water flows of sufficient frequency of recurrence, magnitude, or duration to support REC2 uses, and such uses are not reasonably expected in Gregory Canyon or the borrow areas at most times in most years. It is conceivable that a person could purposely access the site during a brief period of shallow concentrated flow from the canyon, although this would not be authorized or reasonable. The opportunity to ingest water does not occur in most years because of lack of flow and is limited in availability to during and a very short time after heavy rain events in a few years. The entire property is posted to discourage use by the public. The project will create stormwater management channels and facilities described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c). These stormwater management features are best management practices that will allow continued expression of shallow concentrated surface flows at similar frequencies and durations as currently occur onsite, without degradation of water quality in these flows. Therefore, there will be no substantial change or degradation of REC2 beneficial uses in the canyon as a result of this project.

Warm Freshwater Habitat (WARM) - This beneficial use includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates. The San Luis Rey River provides warm freshwater habitat. Construction of the bridge and the rest of the landfill project will not change existing uses or potential uses for this beneficial use in the San Luis Rey River. The San Luis Rey River will continue to

provide WARM uses without change or degradation as a result of the bridge construction or landfill project.

As previously described, Gregory Canyon and the borrow areas do not support surface water flows of sufficient frequency of recurrence, magnitude, or duration to support WARM uses, and such uses are not reasonably expected in Gregory Canyon at most times in most years. Gregory Canyon and the borrow areas do not provide aquatic features to support WARM uses. The project will create stormwater management channels and facilities described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c). These stormwater management features are best management practices that will allow continued expression of shallow concentrated surface flows at similar frequencies and durations as currently occur onsite, without degradation of water quality in these flows. Therefore, there will be no substantial change or degradation of WARM beneficial uses in the canyon as a result of this project.

Cold Freshwater Habitat (COLD) - This beneficial use includes uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates. This reach of the San Luis Rey River does not support COLD uses; rather, it supports WARM uses. Surveys conducted in 2010 for fish did not find steelhead or suitable conditions for breeding or long term use of the site by steelhead (also, the river is intermittent in this reach). The far upper reaches of the San Luis River, upstream of the site, have potential to support COLD uses. There may have been historic runs of cold water fish (steelhead) through the San Luis Rey River to such upstream areas; however, the dam at Lake Henshaw prevents such uses today. There has been some stocking of trout in and near Lake Henshaw, including immediately downstream; however, trout have not been stocked in or near the project area. Conditions in the San Luis Rey River will continue relative to COLD uses without change or degradation as a result of the bridge construction or landfill project. Steelhead will be able to move upstream or downstream during periods of sufficient flow in the San Luis Rey River after construction of the bridge and landfill project, in the same manner as is currently available.

As previously described, Gregory Canyon and the borrow areas do not support surface water flows of sufficient frequency of recurrence, magnitude, or duration to support COLD uses, and such uses are not reasonably expected in Gregory Canyon or the borrow areas at most times in most years. Gregory Canyon and the borrow areas do not provide aquatic features to support COLD uses, nor do they contribute to COLD uses in the San Luis Rey River in a manner that maintains either COLD uses or even fish migration in the San Luis Rey River. The project will create stormwater management channels and facilities described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c). These stormwater management features are best management practices that will allow continued expression of shallow concentrated surface flows at similar frequencies and durations as currently occur onsite, without degradation of water quality in these flows. Therefore, there will be no substantial change or degradation of COLD beneficial uses in the canyon or borrow areas as a result of this project.

Wildlife Habitat (WILD) - This beneficial use includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources. The San Luis Rey River supports aquatic WILD uses. Construction of the bridge and the rest of the landfill

project will not change existing uses or potential uses for this beneficial use in the San Luis Rey River. Construction of the bridge will result in temporary restricted access to the area of construction, but there will be no loss or overall degradation of this beneficial use in the river in the short or long term. The creation of 2.3 acres of additional riparian habitat at the north side of the river at the bridge will result in improvement and enhancement of WILD uses for the San Luis Rey River.

As previously described, Gregory Canyon and the borrow areas do not support surface water flows of sufficient frequency of recurrence, magnitude, or duration to support WILD uses, and such uses are not reasonably expected in Gregory Canyon or the borrow areas at most times in most years. Gregory Canyon and the borrow areas do not provide aquatic features to support WILD uses. Generally, surface water flow in the canyon is too infrequent and groundwater is too deep to support terrestrial ecosystems through preservation or enhancement of terrestrial habitats, vegetation, wildlife, or wildlife water and food sources, which do not differ from upland areas lacking drainage features. The discussion of potential thermal and microclimate effects, and biological habitat considerations in Section 3.1.2 further documents the absence or very limited expression of WILD beneficial uses in Gregory Canyon and the borrow areas. The project will create stormwater management channels and facilities described in Section 3.2 of this report and the project's stormwater management plan (URS 2007c). These stormwater management features are best management practices that will allow continued expression of shallow concentrated surface flows at similar frequencies and durations as currently occur onsite, without degradation of water quality in these flows. Therefore, there will be no substantial change or degradation of WILD beneficial uses in the canyon as a result of this project.

3.1.2 Other Beneficial Use and Functional Considerations

We have also evaluated several other uses and/or functions that are related to beneficial uses in the San Luis Rey River but that are not part of the designated beneficial uses discussed above. We discuss these additional uses and functions in this section at the request of the San Diego Regional Water Quality Control Board.

Pollutant Removal and Nutrient Cycling - These uses are related to potential changes in the existing system from the project with emphasis on functions provided by Gregory Canyon and the borrow areas. Under existing conditions, rainfall on Gregory Canyon and the borrow areas either percolates to groundwater or is lost from the system through evapotranspiration without the expression of surface water flow in most years or most of the time in the rare years when shallow concentrated surface flow may occur along the canyon's thalweg. Our observations of shallow concentrated surface flow in the canyon during the 2004-2005 rain year (actually in 2005) demonstrated that little sediment was moved during these flow events. Similar patterns were observed in January, 2010. There was localized erosion from the several San Diego County Water Authority and San Diego Gas and Electric access roads on site in 2005 and 2010 that resulted in some deposition of sediments within the canyon (even being deposited in areas with steeper overall slopes, without transport to the canyon bottom or 500-year floodplain of the San Luis Rey River). Runoff water in the canyon observed in 2005 was generally clear without obvious suspended sediment or other material. Most of the runoff water from the canyon quickly percolated into the 500-year floodplain of the San Luis Rey system and did not reach the river. There was no deposition of alluvial fans, mounds, or bars at the mouth of the canyon or in the San Luis Rey River floodplain as a result of these surface flows in the canyon. Similar events occurred in January, 2010 with observed

effects similar to those in 2005, although the great amount of total rainfall during 2004-2005 resulted in higher flows levels in 2005 than occurred in 2010. These observations clearly indicate that there is little hydrologic transport capacity via surface water flow from the canyon, and that the transport of sediments, nutrients, and potential pollutants from the canyon to the San Luis Rey River is absent or de minimus in nature. The proposed project will still allow shallow concentrated surface flows to occur, and those flows will continue to dissipate at the mouth of the canyon and percolate into the sandy soils of the San Luis Rey River floodplain. These flows with the project will not have reduced water quality and will be very similar to the existing condition. Therefore, there will be no adverse change or degradation of existing uses with regard to pollutant removal and nutrient cycling in the canyon. Similar conditions exist and will also apply to the borrow areas during their use. Water does not reach the Couser Canyon creek or the San Luis Rey River from storm events affecting the borrow areas, and there will be no adverse change or degradation of existing uses with regard to pollutant removal and nutrient cycling in the canyon.

Thermal and Microclimate Effects - Riparian vegetation is often associated with the provision of shading along streams that may reduce water temperatures and favor certain types of aquatic life. Additional thermal effects may occur as a result of tributary input to a stream that alters the temperature of the stream. These effects may be most important in cold water systems, where elevated temperatures may adversely affect aquatic life in the stream.

The San Luis Rey River is a warm water system. It also has dense riparian habitat along most areas within the project's reach, and also at the proposed bridge crossing. Although fish may occur in the river, there is no major fishery located here for human or wildlife use (largely due to the dense vegetation in the river, including cattails). The primary aquatic life that may use the flowing waters of the river include arroyo toad and California toad during the breeding period until larvae have emerged. These species are not readily susceptible to thermal stresses that may occur in the river without shading and they are often found in open pools exposed to full sunlight for the duration of their development to terrestrial neonates. Nonetheless, construction of the bridge will only result in temporary removal of shade bearing trees, shrubs, and herbs, and revegetation plus the bridge itself will restore conditions in the river. Therefore, no adverse thermal or microclimate modification will result from construction of the bridge.

Gregory Canyon and the borrow areas do not support surface water in most years or contribute to the maintenance of the San Luis Rey River during the rare years when shallow concentrated flow may occur. As a result of the rare or lack of occurrence of surface water in the canyon and borrow areas, aquatic life is not present and water is not available in sufficient quantities to support hydrophytic plant communities or to provide support to maintain local wildlife populations. Surface water flows from Gregory Canyon do not reach the San Luis Rey River in most years and surface water flows from the borrow areas do not reach the creek in Couser Canyon or the San Luis Rey River, and therefore, these watersheds cannot provide thermal modification, either warming or cooling, in the San Luis Rey River because there is no or negligible input of water to the San Luis Rey River. The project facilities will not alter thermal conditions in the San Luis Rey River and no adverse thermal modification of the San Luis Rey River will result from the project.

Biological Habitat Considerations - The effects of the project on biological habitat have been previously discussed relative to designated beneficial uses. Some primary considerations of water quality to biological habitat and wildlife use include effects on the direct support of aquatic life within an aquatic

ecosystem, support of wetland and some riparian habitat by surface and potentially by groundwater, and provision of water sources for wildlife. Aquatic habitat and wetland and riparian habitats supported by surface and groundwater occur in and along the San Luis Rey River. Aquatic habitat, wetlands, and riparian communities developed and supported by surface and/or groundwater do not occur in Gregory Canyon or the borrow areas. Construction of the bridge and landfill will not reduce or degrade aquatic habitat in the San Luis Rey River, nor will it adversely affect wetlands and riparian habitats or wildlife supported by such habitats. Wildlife movement along the San Luis Rey River and within the greater floodplain of the river will also not be adversely affected.

Gregory Canyon provides upland wildlife habitat that supports upland wildlife without aquatic functions. The thalweg is set within relative low gradient areas in the lower half of the canyon and wildlife, such as deer, coyotes, mountain lions, rabbits, and other wildlife, can move not only along the thalweg, but in all directions from there. The thalweg itself in this portion of the canyon does not provide a unique corridor that supports focused movement from one habitat area of concern to another, nor does it promote or diminish wildlife movement in this area. It is just the same as the rest of the upland habitats that surround it with regard to wildlife movement. The upper portion of the canyon has high landform terraces on both sides of the thalweg. These terraces are sufficiently high to preclude movement of many mammals across the canyon and thus form a barrier to wildlife movement in cross-canyon directions. The upper area is also effectively closed, such that large wildlife entering this incised area will be boxed in. Therefore, the thalweg in the upper canyon does not serve as a corridor to larger wildlife movement to the south along the thalweg. Wildlife corridor support is not provided in Gregory Canyon with regard to consideration of water quality functions and beneficial uses related to Porter Cologne. Consideration of wildlife corridors was also fully addressed during the project's California Environmental Quality Act (CEQA) compliance. Similarly, mitigation of upland vegetation communities, including coast live oak woodland, was also fully addressed during the project's CEQA compliance. The proposed mitigation of upland vegetation communities elsewhere onsite and also potentially offsite has been found to fully compensate for impacts on biological resources during the project's CEQA compliance. The proposed onsite mitigation will also enhance habitat conditions onsite by restoration of the greater San Luis Rey River floodplain to predevelopment conditions (including pre-dairy conditions). For instance, review of 1928 aerial photographs from San Diego County show that the area within the 100 to 500-year floodplain of the San Luis Rey River naturally supported oak woodlands with some inclusion of coastal sage scrub, grasslands, and drier riparian trees such as sycamores (oak woodland dominated wooded areas). These areas onsite are currently developed dairy yard and prior grazed non-native grassland. Creation of oak woodland with transitional sycamore and sage scrub habitats (and native grasses) in these existing disturbed areas will create a substantial continuous and wide native habitat corridor extending through the property along the San Luis Rey River that is continuous with habitats upstream and downstream of the site.

Consideration of Ephemeral, Episodic Drainage Features – The USACE defines intermittent and ephemeral streams at 65FR47:12818 as: 1) *Intermittent stream:* An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow; and 2) *Ephemeral stream:* An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

The San Luis Rey River on the project site is an intermittent stream that is supported by groundwater during most of the times when it has surface water, and it dries up on site and also upstream and downstream of the site for several months in most, if not all years. The drainage and erosion features on the project site, including Gregory Canyon and the borrow areas, are ephemeral in nature because they do not have surface flows maintained by groundwater. Furthermore, there is no surface flow in these drainage and erosion features in most years, and the conditions in a typical year are with no surface flow. Surface flow in some drainage and erosion features, such as the along the main thalweg of Gregory Canyon, may occur during periods of extreme rainfall, such as was observed in 2005 (the third wettest year in 155 years of record for San Diego) and 2010. These rare occasions of surface flow are episodic in nature and the frequency of such flow in the main thalweg of Gregory Canyon is for flow to occur only with 5 to 10 year or greater rain events. The duration of such flows is expected to range from a few hours in most cases to a few days during periods of extreme rain, but not in every or most years. As described above, these types of rare, episodic water flows on site may not and usually do not reach the San Luis Rey River, or tributaries to the San Luis Rey River. Therefore, the potential contribution of surface water from ephemeral drainages on site to the San Luis Rey River is zero in most years and de minimus in the most extreme rain years such that surface flow from the canyon and other drainage features on site is not involved in the maintenance of surface flow in the San Luis Rey River.

The drainage and erosion features on site, including within Gregory Canyon and the borrow areas, support vegetation that is similar to the adjacent land, and are dominated by upland vegetation. The lack of regular surface water flow in these drainage and erosion features results in conditions associated with these drainage features that are not aquatic in nature or otherwise distinct from other upland habitats adjacent to them. The lack of regular surface flow prevents substantial nutrient transport or other watershed services from being expressed in the canyon, borrow areas, or other areas on site. As previously described, the primary sediment movement observed in 2005 and 2010 was not from the natural drainage features on site or the surrounding natural land; rather, there was erosion from the San Diego Gas and Electric and San Diego County Water Authority dirt access roads that was deposited within the canyon's main thalweg without transport to the San Luis Rey River or its greater floodplain. Even leaf litter was largely contained along the canyon thalweg without transport to the lower reaches of the canyon. As evidenced by the lack of demonstrable erosion in vegetated areas across the project site, no erosion and sediment deposition is likely to have occurred in the main canyon thalweg had the dirt access roads not been available as a source of readily erodible material. This situation in 2005, during one of the most extreme rain years on record, demonstrates that the effects rain falling on the canyon, borrow areas, and the other undeveloped areas of the project site are localized to these respective areas and do not provide ecological services that are different from those in uplands adjacent to these drainage and erosion features. There are no substantial aquatic, wetland, or upland functions or services provided by the drainage and erosion features on site.

3.2 HYDROMODIFICATION

3.2.1 Background

The 2007 Municipal Permit requires implementation of hydromodification assessments for priority projects greater than 50 acres. Gregory Canyon Landfill will be subject to these requirements. Following are two sections from the 2007 Municipal Permit relating to the hydromodification requirements

D.1.d (10) Downstream Erosion

"As part of its local SUSMP, each Committee shall develop and apply criteria to Priority Development Projects so that runoff discharge rates, durations, and velocities from Priority Development Projects are controlled to maintain or reduce downstream erosion conditions and protect stream habitat."

D.1.g (1) (c) Require Priority Development Projects to implement hydrologic control measures so that Priority Development Projects' post-project runoff flow rates and durations (1) do not exceed pre-project runoff flow rates and durations for the range of runoff flows identified under section D.1.g.(1)(b), where the increased flow rates and durations will result in increased potential for erosion or other significant adverse impacts to beneficial uses, attributable to changes in the flow rates and durations, and (2) do not result in channel conditions which do not meet the channel standard developed under section D.1.g.(1)(a) for channel segments downstream of Priority Development Project discharge points."

In response to the requirements of the 2007 Municipal Permit, the County of San Diego will prepare a Hydromodification Management Plan (HMP) for review and approval by the RWQCB. In the meantime, the County prepared Interim Hydromodification requirements for use until the HMP is approved. The current Interim Hydromodification requirements are effective as of April, 2010.

3.2.2 Hydromodification Analysis

3.2.2.1 Gregory Canyon and Access Road

This project evaluated potential hydromodification impacts by analyzing pre- and post- project flowrates and hydrograph volumes. Typically hydromodification impacts are evaluated for flowrates and hydrograph volumes less than the 10-year storm event, and are generally evaluated for 2 to 5-year storm events (or a percentage of those storm event flows). However, potential hydromodification impacts from the project were conservatively evaluated using a full range of flowrates and volumes from the 2- to 100-year storm event generated from the canyon. The selection, sizing, and calculations for the stormwater treatment Best Management Practices (BMPs) are detailed in the Stormwater Management Plan for the project (URS 2007c).

The goal of the selected project treatment BMPs was to mimic the existing canyon flows and volumes tributary to the San Luis Rey River to provide both water quality treatment benefits and to minimize the potential for hydromodification impacts. This will be accomplished through the use of bio-swales and natural and/or infiltration areas. Infiltration areas are of adequate size and infiltration capacity to infiltrate the required water quality volume as well as the difference between the pre- and post-project condition hydrograph runoff volumes for the 2- through 100-year storm events. As a result, no adverse hydromodification of the San Luis Rey River is expected. The outfall locations are shown in Figures 3 and 4.

- Outfall 1 - East Desilting Basin: This outfall is the existing main canyon outlet point. Runoff from the eastside landfill operating area will be directed to a desilting basin that will provide both silt removal and some peak flowrate attenuation benefits. Runoff from the upper east canyon will be directed to the outlet in a perimeter drainage channel. To mitigate for the potential for increased flowrates and volumes, discharging the basin and from the perimeter drainage channel

will be directed with energy dissipation to an existing natural depression/infiltration area immediately east of the main canyon thalweg. The existing area has the required volume and infiltration rates to infiltrate proposed flow volumes to mimic natural conditions.

- Outfall 2 - West Desilting Basin: There is currently no existing defined outfall at the outlet from this desilting basin. Runoff from the west side of the landfill will be directed to a desilting basin that will provide both silt removal and peak flowrate attenuation benefits. Runoff from the upper southwest canyon will be directed with energy dissipation to the outlet in a perimeter drainage channel. Flows discharging the basin and from the perimeter drainage channel will be directed to the upland areas to the north and west of the desilting basin. Flows from the desilting basin would be directed to level spreaders/energy dissipaters prior to discharge to the flat, highly permeable upland area. This design will allow for infiltration of all surface runoff from the west side of the landfill prior to reaching the San Luis Rey River.

- Outfall 3 - Site Facilities Area: Within the site facilities area vehicular activities associated with routine operation and the receipt of refuse for disposal could result in trace petroleum hydrocarbons and tracking of sediments onto the paved surfaces of the ancillary facilities area including the queuing area for the fee booths and scales, main haul road, landfill equipment maintenance and re-fueling areas. The source control BMPs to be implemented specific to the ancillary facilities areas would include dry measures such as cleaning the paved surfaces of sediment with a street sweeper and the use of absorbents for leaks and spills from vehicular activities. The equipment maintenance area has been designed to eliminate contact with stormwater by conducting operations in a covered area and diverting flows around the entire ancillary facilities area. In addition, the hazardous waste storage facility, which is located in the ancillary facilities area, would be enclosed with secondary containment. Treatment control BMPs will consist of bio-filters around the draining perimeter of the facility.

  As mentioned above the site facilities area propose the use of bio-swales along the draining perimeter of the facility pad, pending final engineering design evaluation. Currently it is anticipated that bio-swales will be provided along the northwesterly side of the facility. At the time of final grading, bio-swales may be required along the northeasterly sides of the facility. The swales will be designed to treat runoff from the entire facility, assuming runoff will be directed via sheet flow to the swales. Porous pavement was not considered the best BMP solution at this location due to the heavy truck traffic and a fill slope condition along the northwesterly sides of the facility pad where the facility runoff will be draining (infiltration above fill slopes is generally not recommended from a slope stability standpoint). Mechanical treatment with a media filtration device is considered a viable treatment control BMP option, but will be considered only if the swales are not considered feasible during detailed design.

- Outfall 4 - Bridge (South): Runoff from the access road and bridge will be directed to overside drains or pipes that will discharge to energy dissipaters. Flows in excess of the water quality design flow will sheet flow out into the relatively flat floodplain terrace area where infiltration will occur.

- Outfall 5 - Bridge (North): Runoff from the access road and bridge will be directed to overside drains or pipes that will discharge to small energy dissipaters. Flows in excess of the water

quality design flow will sheet flow out into the relatively flat floodplain terrace area where infiltration will occur.

3.2.2.2 Borrow Areas

The borrow areas are isolated from Couser Canyon creek and the San Luis Rey, and they do not have a surface nexus to them. There will be no changes to these existing conditions as a result of use of the borrow areas or upon reclamation of the borrow areas. Use of the borrow areas will not result in hydromodification of Couser Canyon creek or the San Luis Rey River.

3.2.2.3 San Luis Rey River Bridge Crossing

The following discussion is based upon the floodplain and scour calculations and impacts analysis in the Gregory Canyon Landfill EIR (San Diego County 2003) Technical Appendix H.

Construction of the access road/bridge would result in a localized constriction of the San Luis Rey River. However, creation of the new 2.3 acre floodplain outside of the defined OHWM will minimize any increases in 100-year flood elevations, caused by the localized constriction of the San Luis Rey River resulting from bridge construction. The proposed northerly habitat creation and floodplain modifications immediately downstream of the bridge have been designed to maintain the existing channel velocities and flood elevations upstream and downstream of those modifications. Grading of the floodplain will reduce flooding impacts to a less than significant level. Erosion control measures will minimize erosion with scour protection and velocity dissipation BMPs. The project includes modifications to SR76 at the access road entrance to improve sight distance and to facilitate truck turning movements. The proposed widening of SR76 will encroach into the 100-year floodplain at its western limits and was assumed to use 2:1 cut and fill slopes. This encroachment is minimal and would not impact the 100-year flood elevations or channel velocities.

The proposed landfill footprint and borrow/stockpile areas are not located within the designated boundaries of a 100-year floodplain. The access road/bridge would be located within the designated boundaries of the 100-year and 500-year floodplains. The access road/bridge is designed to be above the highest recorded elevation of the 100-year floodplain so that no significant flooding impacts would occur during operations.

To reduce scour effects, rip-rap or other protective material would be used at the bridge abutments. It may also be placed at the low flow culvert at the south end of the bridge structure, and in limited areas along the banks of the access road south of the bridge. The exact location of rip-rap placement would be determined during the final engineering design phase. No significant flooding or scour impacts would occur after implementation of the scour protection measures.

Scour could also affect a segment of the river (both upstream and downstream) of the bridge. Therefore, the proposed bridge and floodplain modifications have been designed to maintain the existing channel velocities and flood elevations upstream and downstream of these modifications. Local scour would occur at bridge piers during high flows but these areas would be filled back in during low flow events due to the highly dynamic nature of sediment transport within the San Luis Rey River. No significant impacts on the beneficial uses of the San Luis Rey River would occur.

SECTION 4 EVALUATION OF MITIGATION MEASURES

The project's impacts are described in the EIR and related documents (San Diego County 2003 and 2007, and URS 2006, 2007a through 2007c). The project will result in the temporary impact of less than 0.7 acres of Federal/State wetlands/waters at the San Luis Rey River for construction of the bridge with an additional less than 0.1 acres of permanent fill for bridge piers. Total impacts on riparian vegetation, including this 0.8 acres of impact and other aspects of the overall project, include 0.4 acres of southern willow scrub, 0.2 acres of cotton-willow riparian forest, and 0.4 acres of disturbed southern-willow scrub. Drainage and erosion features in Gregory Canyon and the borrow areas are generally dominated by upland vegetation and cover a total of 0.94 acres of various drainage and erosion features (0.43 acres of Federal waters of the U.S., 0.32 acres of Federal non-jurisdictional drainages without significant nexus, 0.11 acres of Federal non-jurisdictional upland features without an ordinary high water mark, and 0.08 acres of Federal non-jurisdictional isolated drainages as described in USACE (2010)). This total impact of 1.0 acre of riparian habitats will be compensated for through the creation of 2.3 acres of riparian habitat at the bridge crossing on the north side of the San Luis Rey River, plus 0.61 acres of restored habitat within the temporary construction areas for the bridge. Additional riparian vegetation will be established on 24.1 acres along the San Luis Rey River, and 57.1 acres will be enhanced through removal of weedy species within the existing riparian habitat along the San Luis Rey River. These activities will result in a substantial increase in riparian functions along the San Luis Rey River corridor on the property that will ensure no decrease in populations of least Bell's vireo, southwestern willow flycatcher, and arroyo toad, as well as likely providing improvements that will increase these populations on a local basis. These benefits will also be provided to all wildlife using the San Luis Rey riparian system, including wildlife in the uplands surrounding the corridor. Impacts on these vegetation habitats from the project have been determined to be fully compensated for during CEQA compliance through implementation of the overall mitigation plan described therein.

Most of the project's impacts will occur as a result of development of the landfill, including impacts within Gregory Canyon. As previously discussed, the thalweg of Gregory Canyon is not associated with a well-defined stream that flows in most years, and that can be defined by a bankfull stage, although it provides a path for occasional shallow concentrated flow of water that occurs during extreme rain events. These occasional shallow concentrated flows do not reach the San Luis Rey River, except perhaps in the most extreme rain events. Development of the landfill will result in creation of similar channels around both sides of the landfill to direct occasional shallow concentrated flows past the landfill. The stormwater management plan provides for treatment of this type of stormwater runoff so that it will percolate into the floodplain of the San Luis Rey River as it presently does, without adverse hydromodification of the San Luis Rey River. Drainage swales have been added north and south of the San Luis Rey River at the request of the San Diego Regional Water Quality Control Board to provide drainage/erosion features similar to those that will be disturbed by the landfill and borrow areas (Figure 8). These drainage swales will cover 1.19 acres, which is greater than the disturbance of 0.94 acres of ephemeral drainages, and they will be dominated by upland vegetation communities, as are the drainage and erosion features in the canyon and borrow areas. Additionally, creation of 2.3 acres of wetland/riparian habitat at the bridge crossing provided aquatic functions that exceed overall functional values of drainage and erosion features in the canyon and borrow area. Therefore, no net loss of aquatic or drainage functions in the canyon or borrow areas will result from the project, and a net increase in overall biological function relative to these features will occur.

These and other aspects of the project have been evaluated during CEQA compliance (URS 2006, 2007a through 2007c). Impacts on all biological habitats onsite, including coast live oak woodland (an upland vegetation community), were evaluated during CEQA and fully mitigated. For instance, impacts on coast live oak woodlands will be mitigated onsite through the creation of 131.4 acres of floodplain habitat supporting coast live oak woodland, some sycamore woodland, coastal sage scrub, and native grasses. This creation of habitat in the San Luis Rey River floodplain compensates for impacts on 22.6 acres of coast live oak woodland within Gregory Canyon and the borrow areas by creating habitat contiguous with the San Luis Rey River riparian zone within a broad corridor that would maximize wildlife use of the San Luis Rey River system on the property. Impacts on these vegetation habitats from the project have been determined to be fully compensated for during CEQA compliance through implementation of the overall mitigation plan described therein.

The project design, including mitigation measures, integrate water quality objectives, beneficial uses, and water quality control plans and policies adopted by the State Water Resources Control Board and the Regional Water Quality Control Board. Point sources and nonpoint sources of potential pollution shall be controlled to protect designated beneficial uses of water with incorporation of the project design features, including the stormwater management plan. There will be no changes in the instream beneficial uses, which will be maintained by the project design features, as well as restored and enhanced with the project's mitigation measures.

SECTION 5 REFERENCES

Collins, J.N., E.D. Stein, M. Sutula, R. Clark, A.E. Fetscher, L. Brenier, C. Grosso, and A. Wiskind. 2006. California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas. Version 4.2.3.

National Weather Service. 2005. Public Information Statement, 2005-2005 Rainfall Season Summary. March 5, 2005.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

San Diego County, Department of Environmental Health. 2003. Gregory Canyon Landfill EIR. State Clearinghouse No. 1995061007.

San Diego County, Department of Environmental Health. 2007. Gregory Canyon Landfill Revised Partial Final EIR. State Clearinghouse No. 1995061007.

TXDOT. 2009. Online Hydraulic Design Manual 2009-1. Prepared by the Texas Department of Transportation. http://onlinemanuals.txdot.gov/txdotmanuals/hyd/manual_notice.htm

URS. 2004. Letter Report: Transmittal and Reporting of Hydrology Information for the Gregory Canyon Landfill Project. URS Corporation, San Diego, California.

URS. 2006. Biological Assessment for the Gregory Canyon San Luis Rey River Bridge Replacement.

URS. 2007a. Biological Technical Report for Gregory Canyon Landfill CEQA Update. Revised February 20, 2007.

URS. 2007b. Summary of Arroyo Toad Data for the Gregory Canyon Landfill through 2007.

URS. 2007c. Stormwater Management Plan for Gregory Canyon Landfill. Corporation, San Diego, California.

URS. 2008. Evaluation of Hydrogeomorphology and Beneficial Uses at Gregory Canyon.

USACE. 2004. Review of Ordinary High Water Mark Indicators for Delineating Arid Streams in the Southwestern United States. Edited by Robert W. Lichvar and James S. Wakeley. ERDC TR-04-01.

USACE. 2010. Gregory Canyon Landfill Jurisdicitonal Delineation. Prepared by the Los Angeles District of the U.S. Army Corps of Engineers.

Table 1
Gregory Canyon Hydrology Summary

Storm Frequency	6-hour Storm Rainfall (inches)	24-hour Storm Rainfall (inches)	1993 County Method 6-hour Storm Runoff (cfs)	1993 County Method 24-hour Storm Runoff (cfs)	2003 County Method 24-hour Storm Runoff (cfs)
2-year	1.5	2.4	0	0	0
5-year	2.0	3.5	0	4	5
10-year	2.4	4.1	5	8	31
25-year	2.8	5.1	11	19	129
50-year	3.1	5.6	50	105	423
100-year	3.4	6.2	78	123	-

Table 2
Gregory Canyon Runoff-Frequency Analysis for Downstream Pala Photo

Storm Frequency	1993 County Method 6-hour Storm Runoff (cfs)*	1993 County Method 24-hour Storm Runoff (cfs)*	2003 County Method Nested Storm Runoff (cfs)*	Cross Section 1 High Flow (cfs)**	Cross Section 2 High Flow (cfs)**	Cross Section 3 High Flow (cfs)**
2-year	0	0	0			
5-year	0	4	5			
10-year	5	8	31	31	25	21
25-year	11	19	129			
50-year	50	105	423			

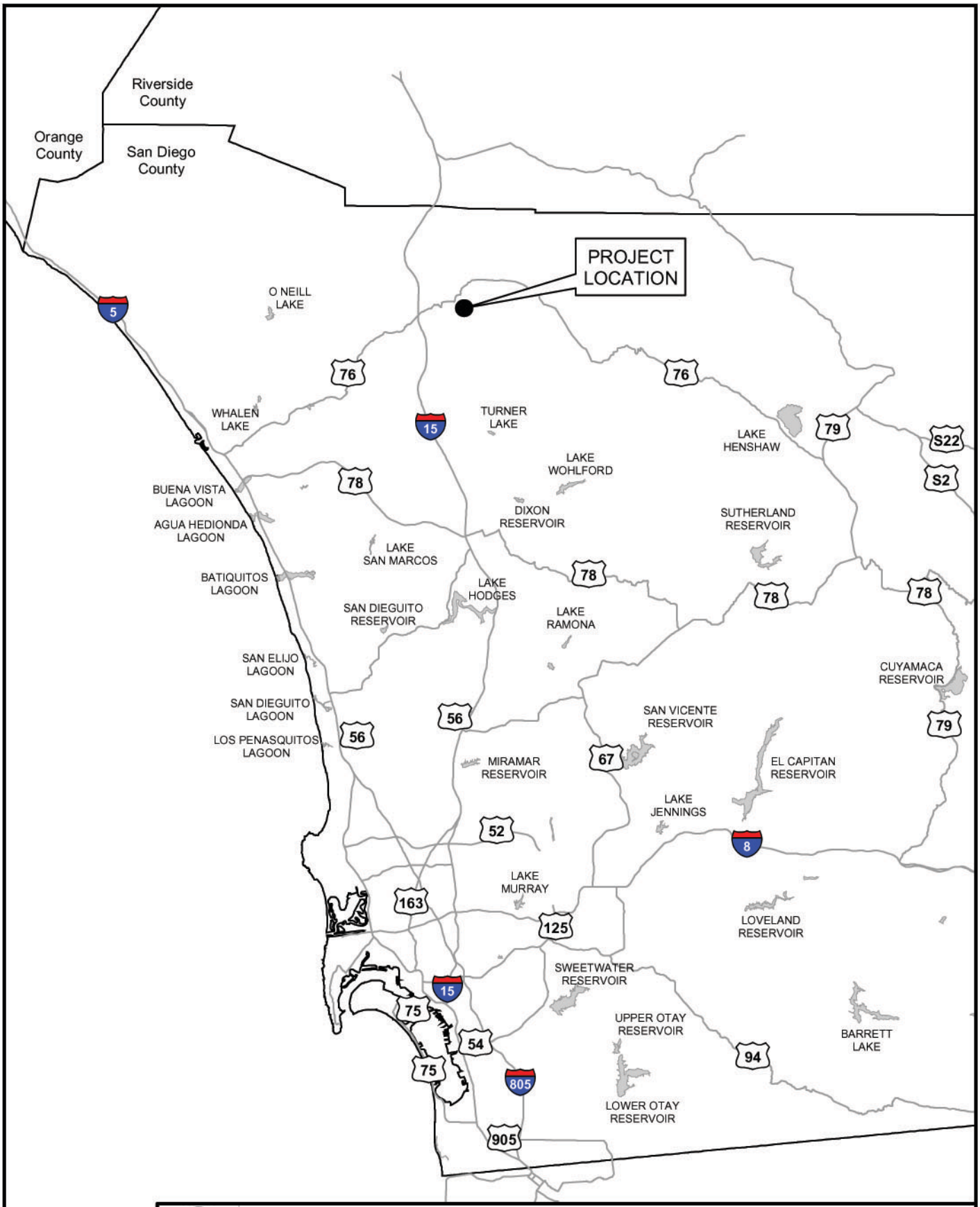
* These values taken from July 19, 2004 URS letter Report and are the HEC-1 model runoff flow rates for Gregory Canyon.
** These values were computed using Manning's Equation with FlowMaster based on field measured cross sections at the outer flood limits shown in the downstream Pala Photo.

Table 3
Designated or Observed Beneficial uses for Inland Surface Waters and Ground Waters

	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters																
Designated San Luis Rey River between Couser Canyon and Gomez Creek	903.21	X	X	X					X	X		X	X	X		
Observed Gregory Canyon Thalweg	Within 903.21															
Observed Borrow Areas	Within 903.21															
Groundwater																
Designated Pala HSA	903.21	X	X	X												
Observed Gregory Canyon	Within 903.21															
Observed Borrow Areas	Within 903.21															

X = Existing Beneficial Use; P = Potential Beneficial Use; Blank = Beneficial Use not present

MUN – Municipal and Domestic Supply; AGR - Agricultural Supply; IND – Industrial Services Supply; PROC – Industrial Process Supply; GWR - Ground Water Recharge; FRESH - Freshwater Replenishment; POW - Hydropower Generation; REC1– Contact Recreation; REC2 – Non-Contact Recreation; BIOL - Preservation of Biological Habitats of Special Significance; WARM – Warm Freshwater Habitat:; COLD - Cold Freshwater Habitat; WILD – Wildlife Habitat; RARE - Rare, Threatened, or Endangered Species; SPWN - Spawning, Reproduction, or Early Development.



SOURCES: SANDAG
(Roads, Lakes, Rivers),
CDFG (Counties Boundaries).

PROJECT LOCATION
GREGORY CANYON LTD. LLC

URS

4.25 0 4.25 8.5 Miles

SCALE: 1" = 8.5 miles (1:538,560)

CHECKED BY: MS	DATE: 9-20-05	FIG. NO:
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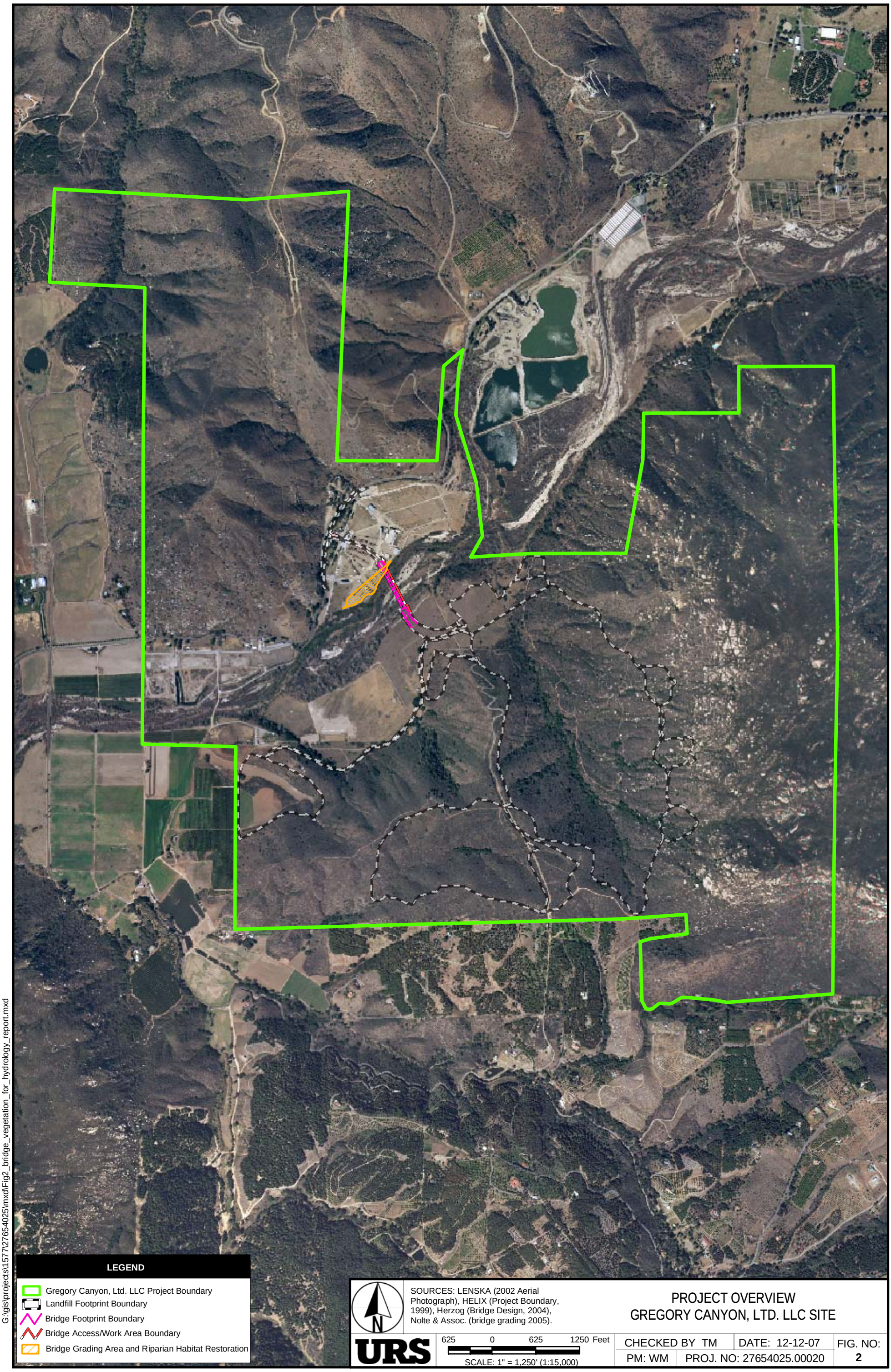

PROJECT OVERVIEW
GREGORY CANYON, LTD. LLC SITE

URS

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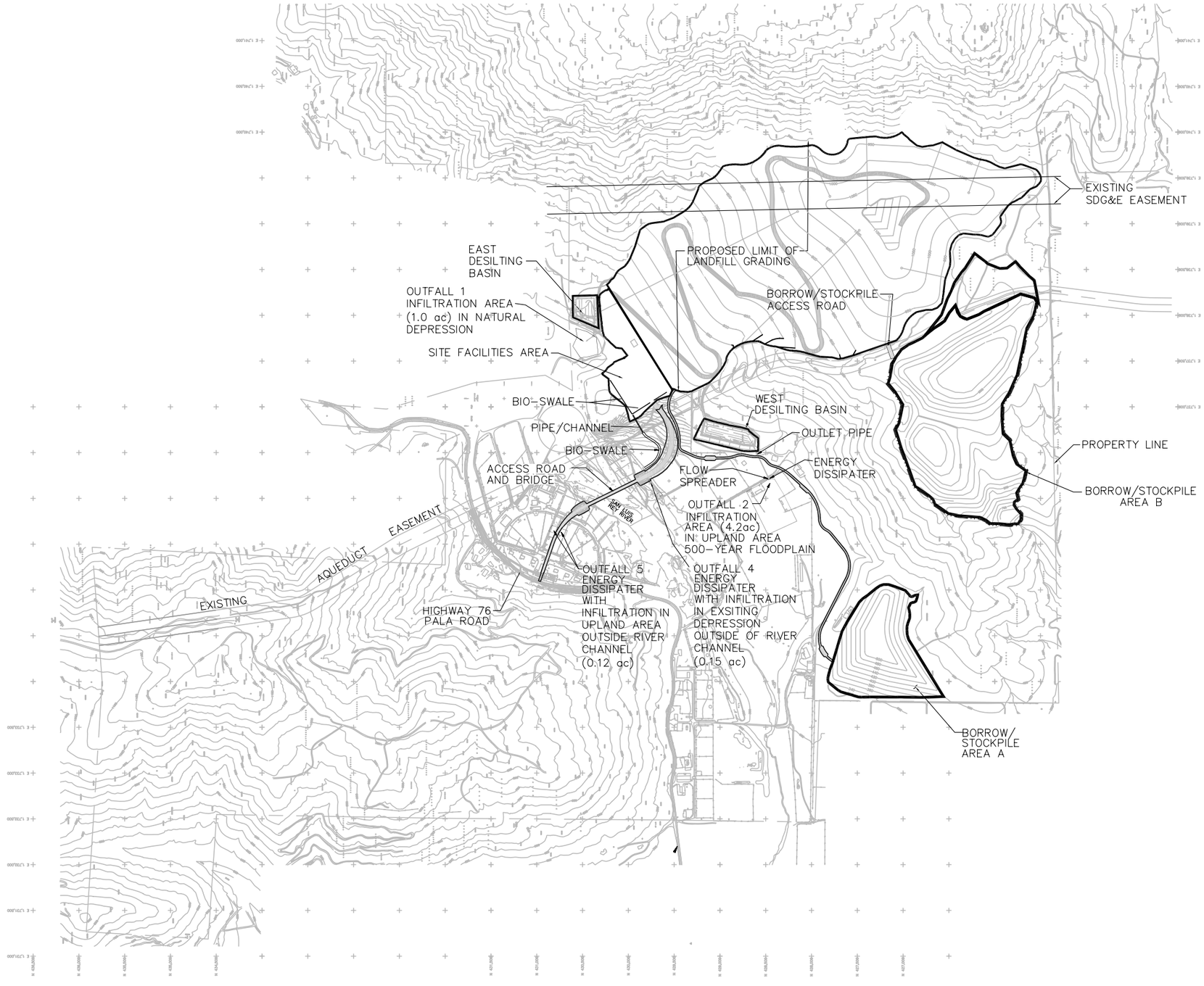


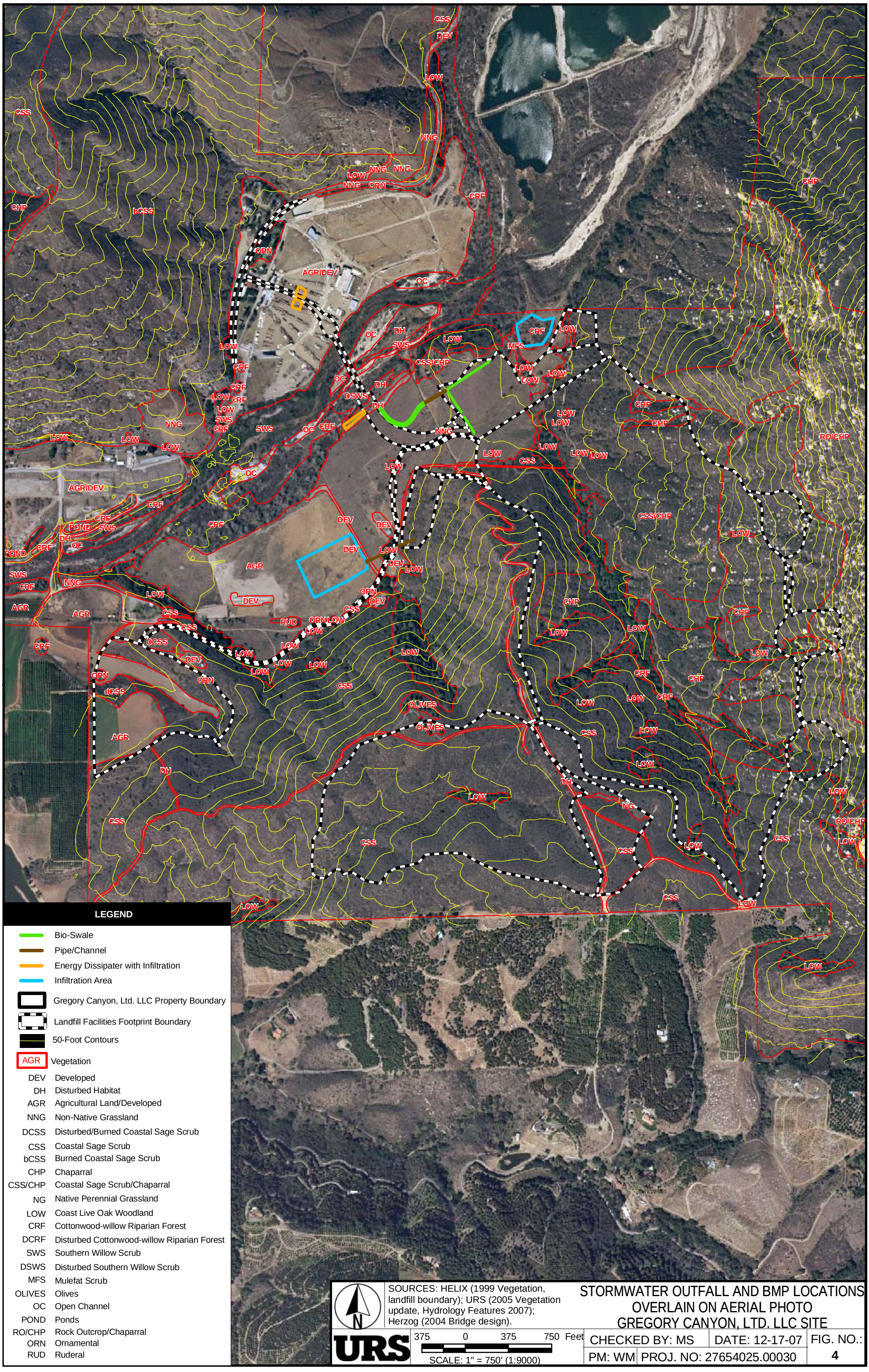
STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON TOPO
GREGORY CANYON, LTD. LLC SITE

URS

600 0 600 1200 Feet
SCALE: 1"= 1200'

CHECKED BY: MM	DATE: 12-11-07	FIG. NO:
PM: WPM	PROJ. NO: 27654025.00020	3

J:\27654025 Gregory Canyon LF 404\040 Technical\Gregory_Cyn_Hydrology\AutoCad\2007\HYDROLOGY.dwg Dec 13, 2007 - 1:35pm



SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).

URS

STORMWATER OUTFALL AND BMP LOCATIONS OVERLAIN ON AERIAL PHOTO
GREGORY CANYON, LTD. LLC SITE

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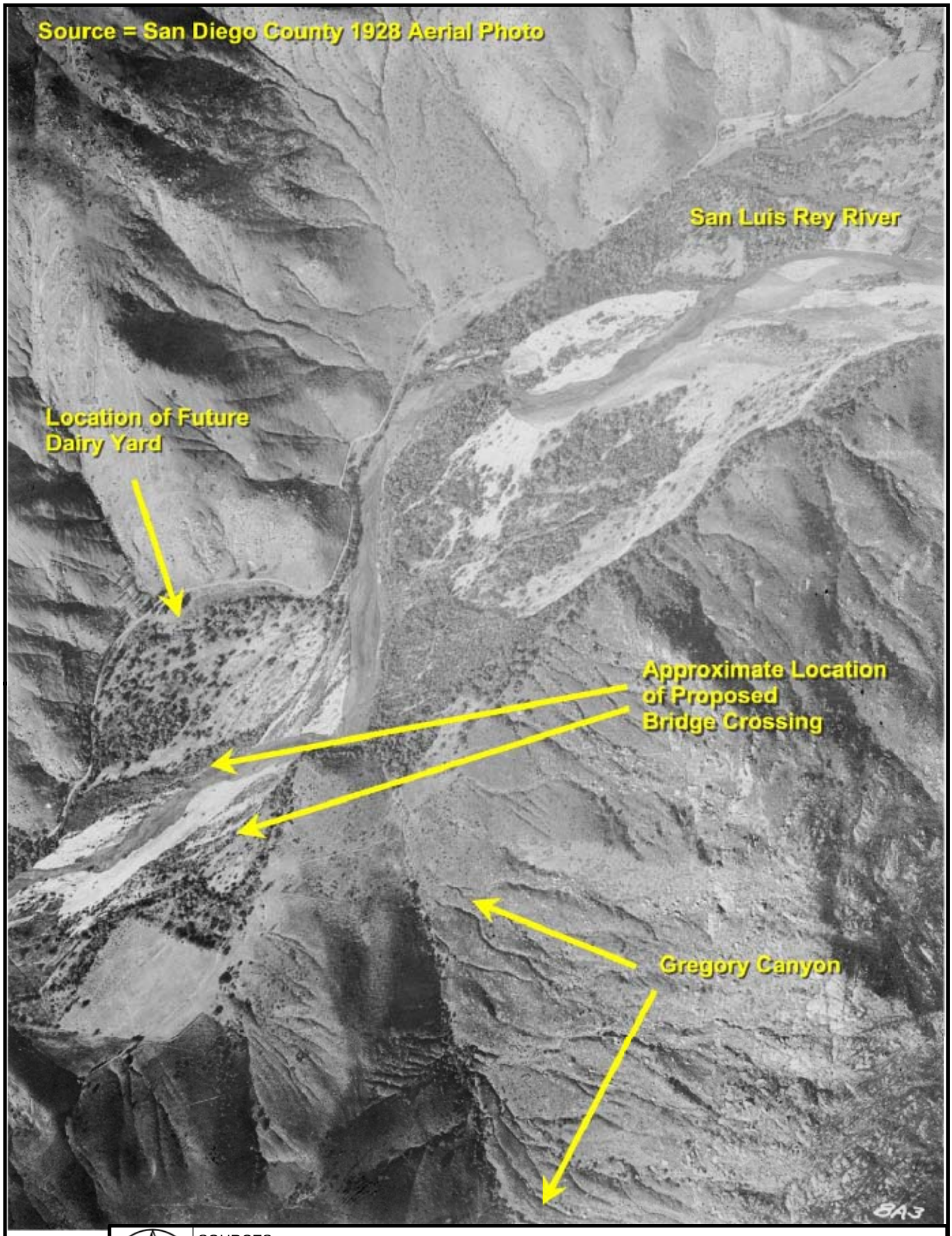

SOURCES:
San Diego County (aerial 1928).

1928 AERIAL PHOTOGRAPH
GREGORY CANYON LTD. LLC

URS

NOT TO SCALE

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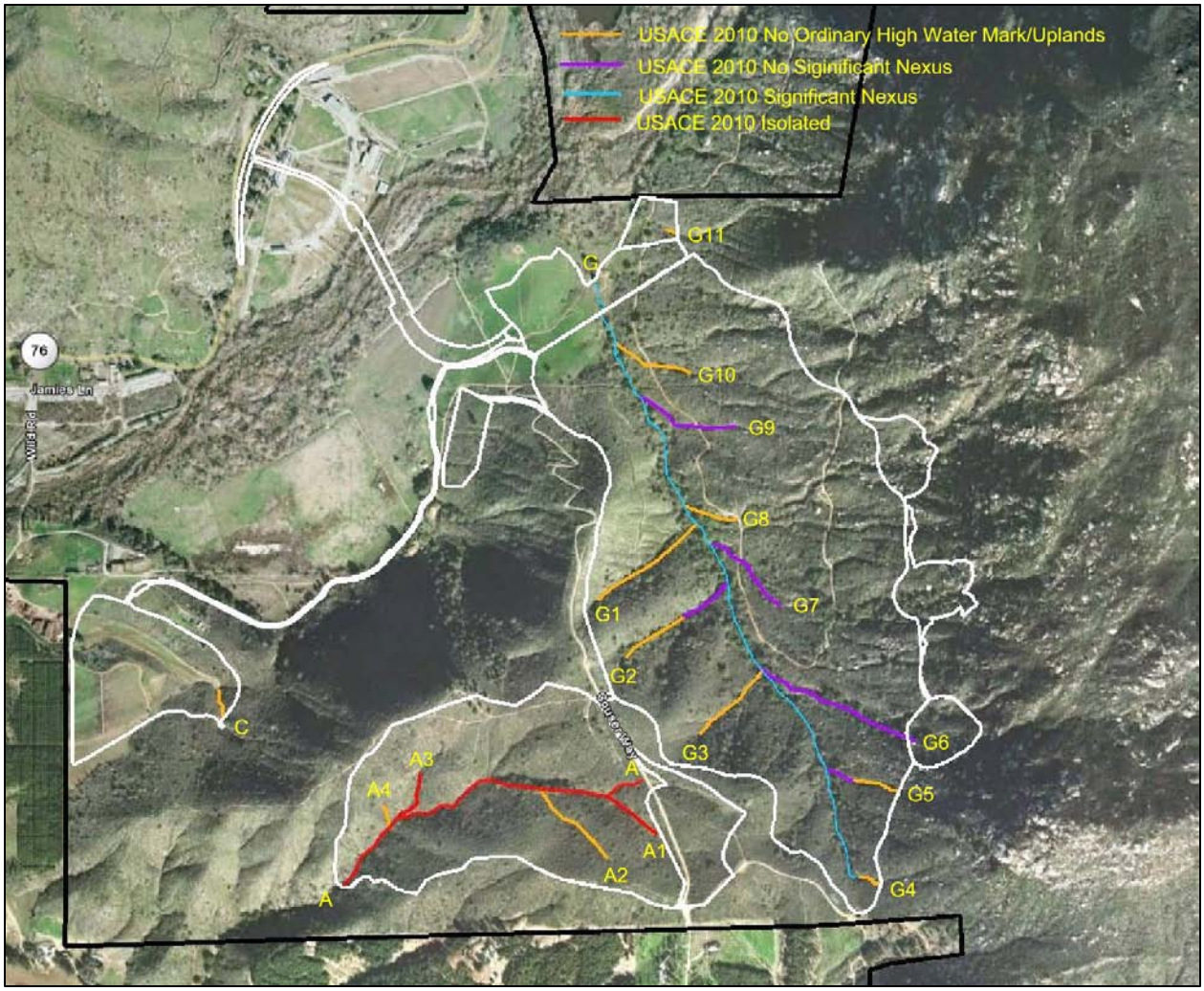


Figure 6. USACE 2010 Drainages

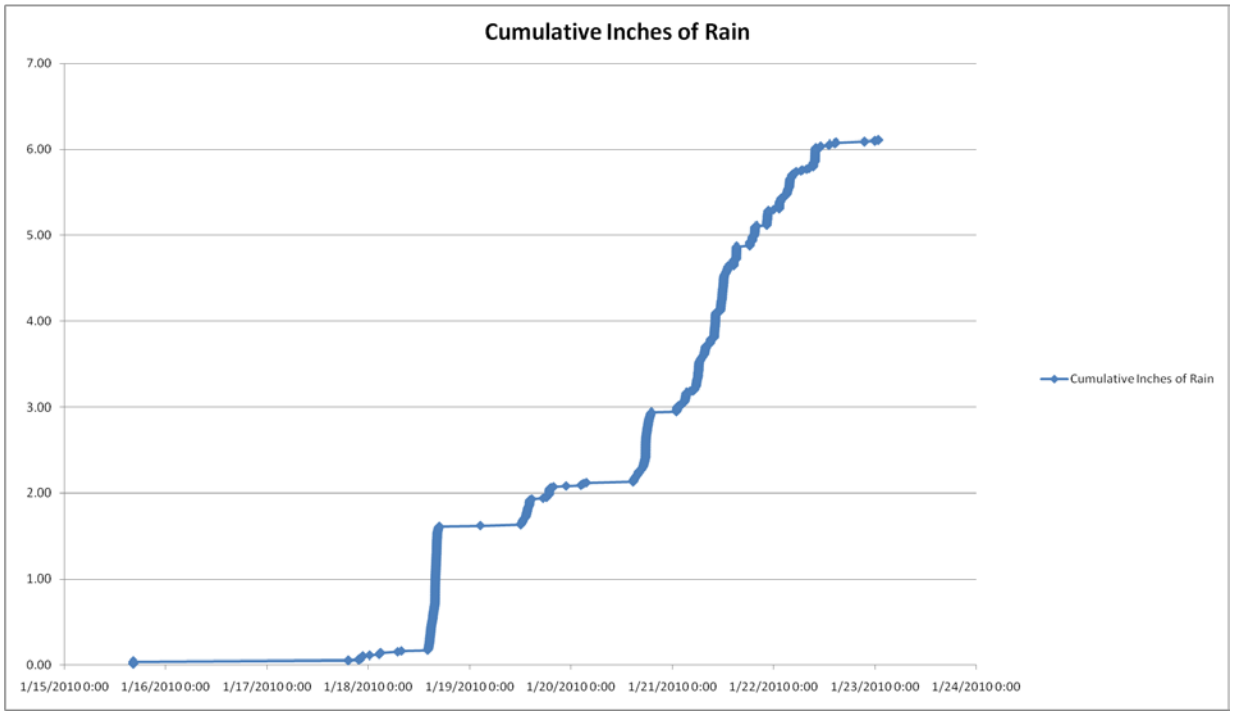


Figure 7. January 2010 Storm Rainfall in Gregory Canyon

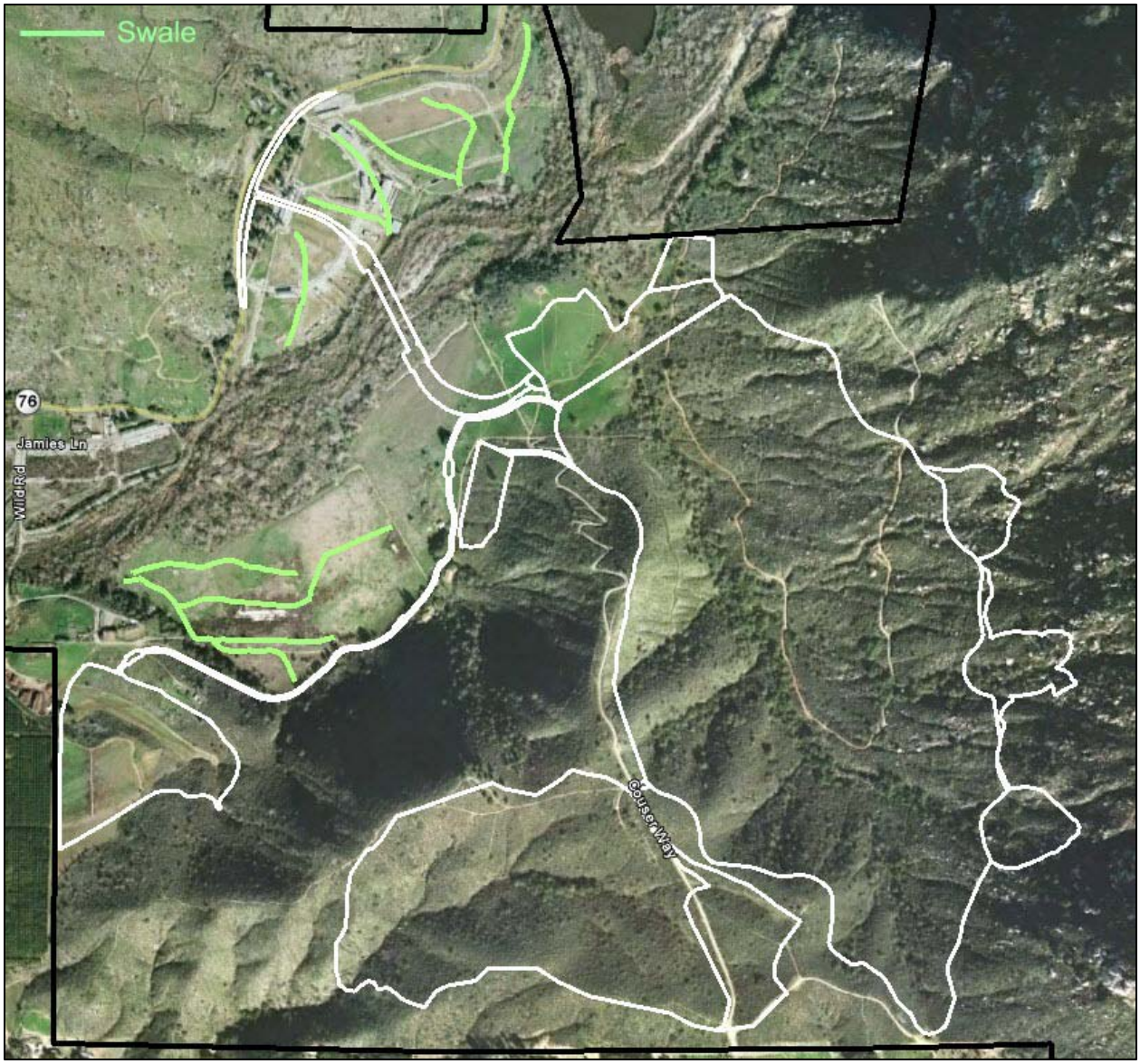


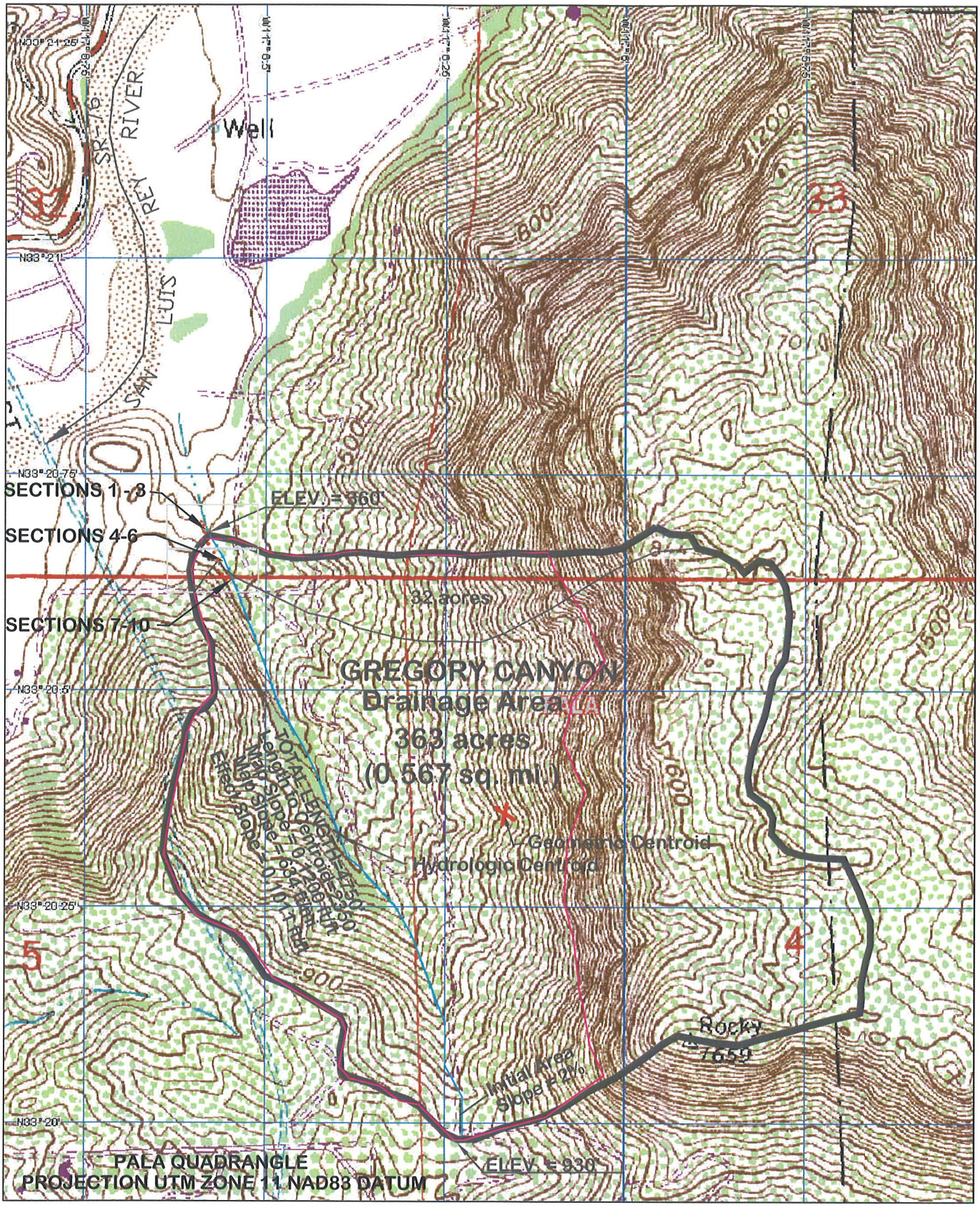
Figure 8. Drainage Swales

APPENDIX A

Data and Calculations for the Cross Section Analysis for Gregory Canyon

Gregory Canyon Landfill
Lower Canyon - Hydraulic Cross Section Analysis Results

Cross Section Label	Runoff Discharge (cfs)	Max. Flow Depth (ft)	Flow Velocity (fps)	Flow Area (sf)	Top Width (ft)	Channel Slope (ft/ft)	Manning's Roughness Coefficient
Section 01 (2005-WP3)- 10yr-06hr	5	0.64	2.93	1.7	4.88	0.015	0.03
Section 01 (2005-WP3)- 25yr-06hr	11	0.88	3.56	3.09	6.6	0.015	0.03
Section 01 (2005-WP3)- 50yr-06hr	50	1.6	5.82	8.6	7.83	0.015	0.03
Section 01 (2005-WP3)- 100yr-06hr	78	1.98	6.73	11.59	7.83	0.015	0.03
Section 02 (2005-WP1)- 10yr-06hr	5	0.76	2.49	2.01	4.67	0.015	0.04
Section 02 (2005-WP1)- 25yr-06hr	11	1.05	3.07	3.58	6.04	0.015	0.04
Section 02 (2005-WP1)- 50yr-06hr	50	1.94	4.76	10.5	8.5	0.015	0.04
Section 02 (2005-WP1)- 100yr-06hr	78	2.38	5.5	14.19	8.5	0.015	0.04
Section 03 (2005-WP2)- 10yr-06hr	5	0.54	2.57	1.95	5.45	0.015	0.035
Section 03 (2005-WP2)- 25yr-06hr	11	0.79	3.19	3.45	6.9	0.015	0.035
Section 03 (2005-WP2)- 50yr-06hr	50	1.55	5.15	9.72	8.67	0.015	0.035
Section 03 (2005-WP2)- 100yr-06hr	78	1.93	5.96	13.08	8.67	0.015	0.035
Section 04 (2007-WP7)- 10yr-06hr	5	0.51	5.16	0.97	2.77	0.05	0.03
Section 04 (2007-WP7)- 25yr-06hr	11	0.76	6.32	1.74	3.63	0.05	0.03
Section 04 (2007-WP7)- 50yr-06hr	50	1.46	8.25	6.06	8.72	0.05	0.03
Section 04 (2007-WP7)- 100yr-06hr	78	1.71	9.22	8.46	10.25	0.05	0.03
Section 05 (2007-WP6)- 10yr-06hr	5	0.45	4.62	1.08	3.86	0.05	0.03
Section 05 (2007-WP6)- 25yr-06hr	11	0.65	5.52	1.99	5.45	0.05	0.03
Section 05 (2007-WP6)- 50yr-06hr	50	1.2	7.42	6.74	11.89	0.05	0.03
Section 05 (2007-WP6)- 100yr-06hr	78	1.42	7.92	9.84	15.85	0.05	0.03
Section 06 (2007-WP5)- 10yr-06hr	5	0.51	5.02	1	3.01	0.05	0.03
Section 06 (2007-WP5)- 25yr-06hr	11	0.77	4.91	2.24	7.28	0.05	0.03
Section 06 (2007-WP5)- 50yr-06hr	50	1.23	6.5	7.69	16.77	0.05	0.03
Section 06 (2007-WP5)- 100yr-06hr	78	1.39	7.2	10.83	20.32	0.05	0.03
Section 07 (2007-WP4)- 10yr-06hr	5	0.39	4.88	1.02	3.28	0.05	0.03
Section 07 (2007-WP4)- 25yr-06hr	11	0.6	6.15	1.79	3.98	0.05	0.03
Section 07 (2007-WP4)- 50yr-06hr	50	1.32	8.99	5.56	6.89	0.05	0.03
Section 07 (2007-WP4)- 100yr-06hr	78	1.62	9.86	7.91	8.59	0.05	0.03
Section 08 (2007-WP3)- 10yr-06hr	4.5	0.42	4.66	0.97	3.38	0.05	0.03
Section 08 (2007-WP3)- 25yr-06hr	10	0.62	5.75	1.74	4.42	0.05	0.03
Section 08 (2007-WP3)- 50yr-06hr	45	1.22	8.42	5.35	7.62	0.05	0.03
Section 08 (2007-WP3)- 100yr-06hr	78	1.54	9.66	8.08	9.36	0.05	0.03
Section 09 (2007-WP2)- 10yr-06hr	4.5	0.24	4.07	1.11	4.77	0.05	0.03
Section 09 (2007-WP2)- 25yr-06hr	10	0.39	5.42	1.84	5.03	0.05	0.03
Section 09 (2007-WP2)- 50yr-06hr	45	0.97	8.96	5.02	6	0.05	0.03
Section 09 (2007-WP2)- 100yr-06hr	78	1.37	10.17	7.67	7.55	0.05	0.03
Section 10 (2007-WP1)- 10yr-06hr	4.5	0.44	5.05	0.89	2.59	0.05	0.03
Section 10 (2007-WP1)- 25yr-06hr	10	0.68	6.32	1.58	3.2	0.05	0.03
Section 10 (2007-WP1)- 50yr-06hr	45	1.41	8.89	5.06	6.22	0.05	0.03
Section 10 (2007-WP1)- 100yr-06hr	78	1.77	10.48	7.44	6.75	0.05	0.03



GREGORY CANYON DRAINAGE MAP

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		PM: BM	PROJ. NO: 27654025	–

Sections 1-3

Date: 10/20/2005

Section 4

Date: 08/07/2007

Section 5

Date: 08/07/2007

Section 6

Date: 08/07/2007

Section 7

Date: 08/07/2007

Section 8

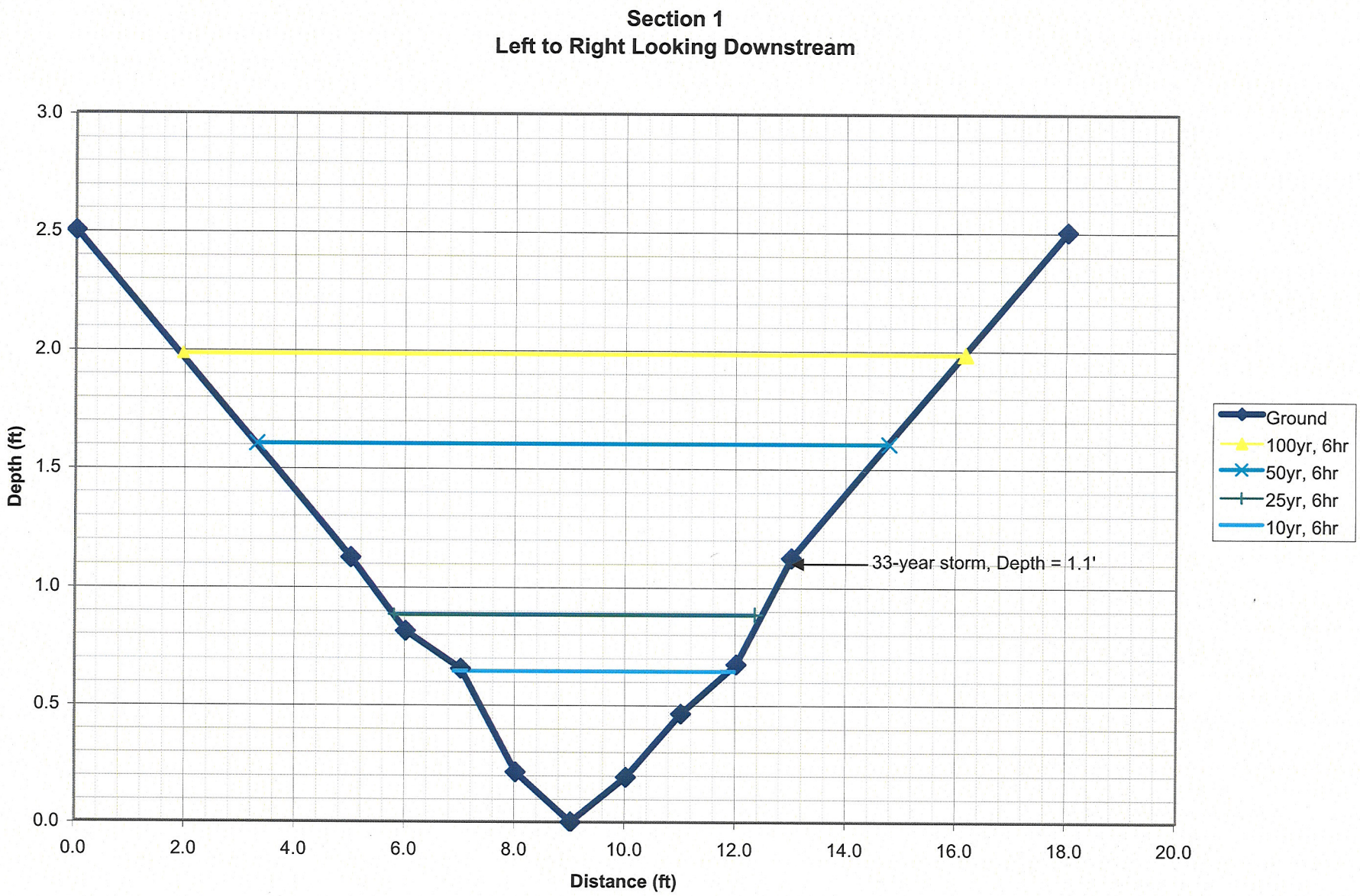
Date: 08/07/2007

Section 9

Date: 08/07/2007

Section 10

Date: 08/07/2007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2.0
1.5
1.0
0.5
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
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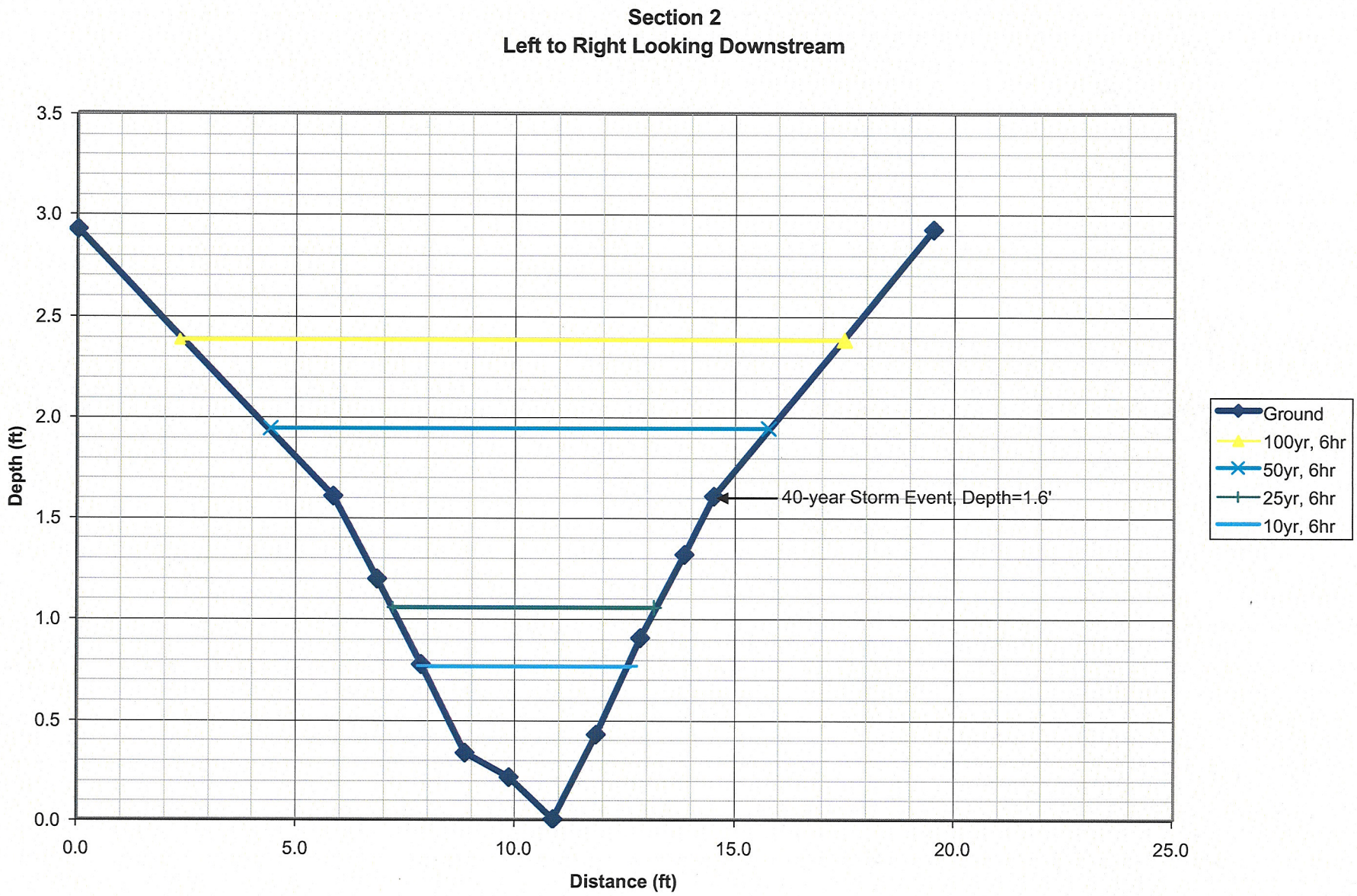
33-year storm, Depth = 1.1'
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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0.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
Distance (ft)
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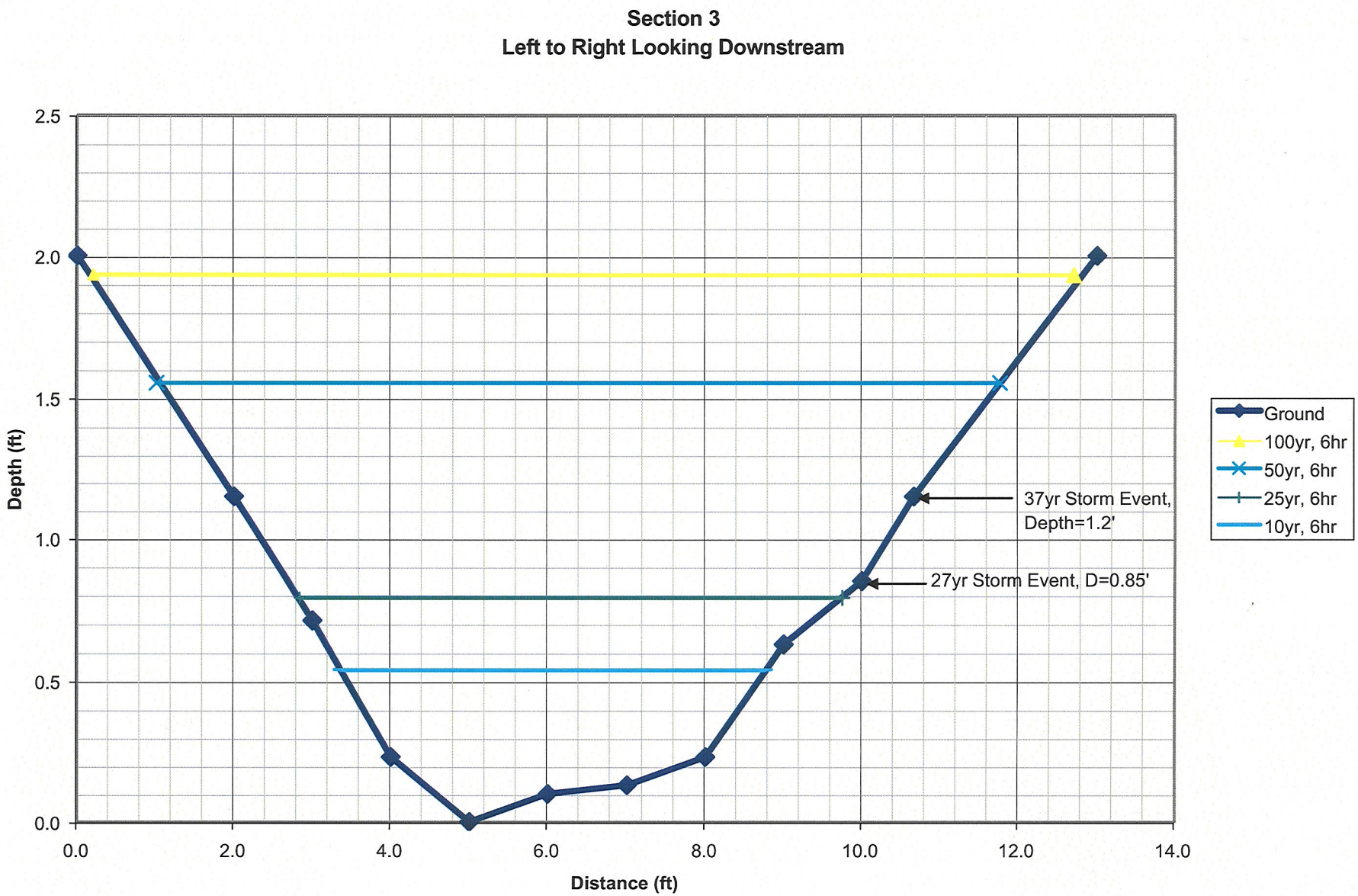
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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Left to Right Looking Downstream
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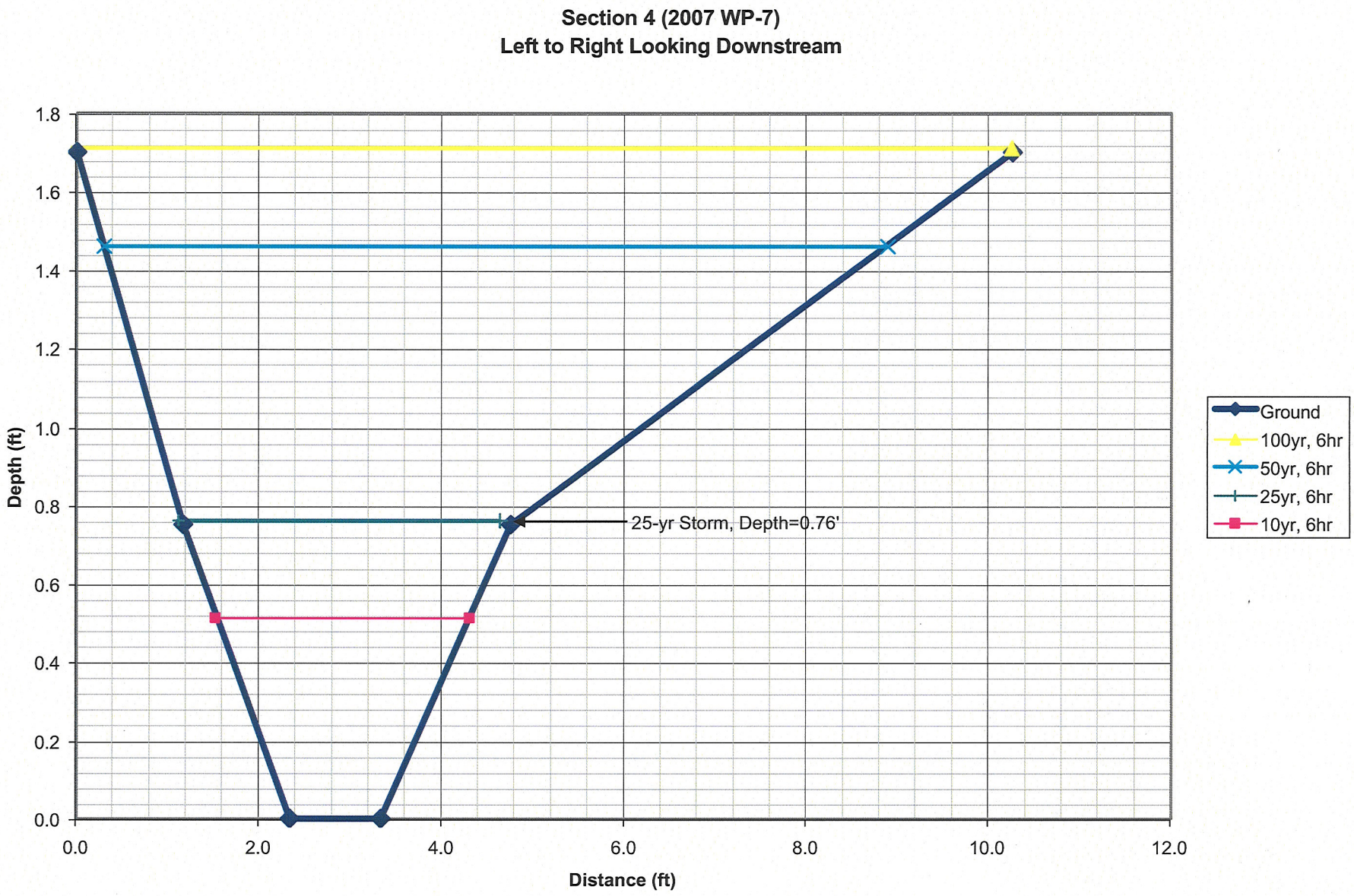
6.0
8.0
10.0
12.0
14.0
Distance (ft)
37yr Storm Event, Depth=1.2'
27yr Storm Event, D=0.85'
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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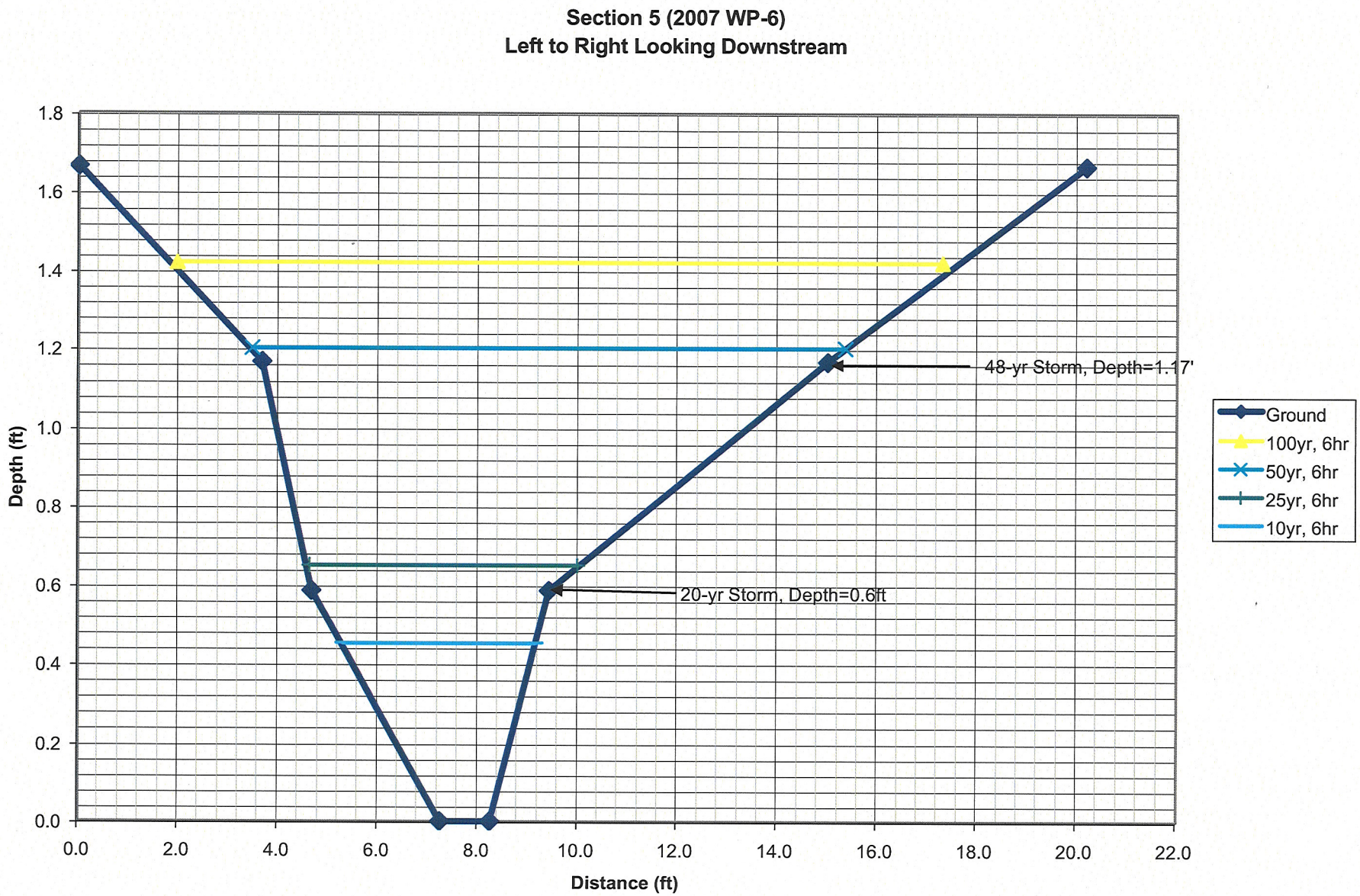
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (ft)
25-yr Storm, Depth=0.76'
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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Depth (ft)
Distance (ft)
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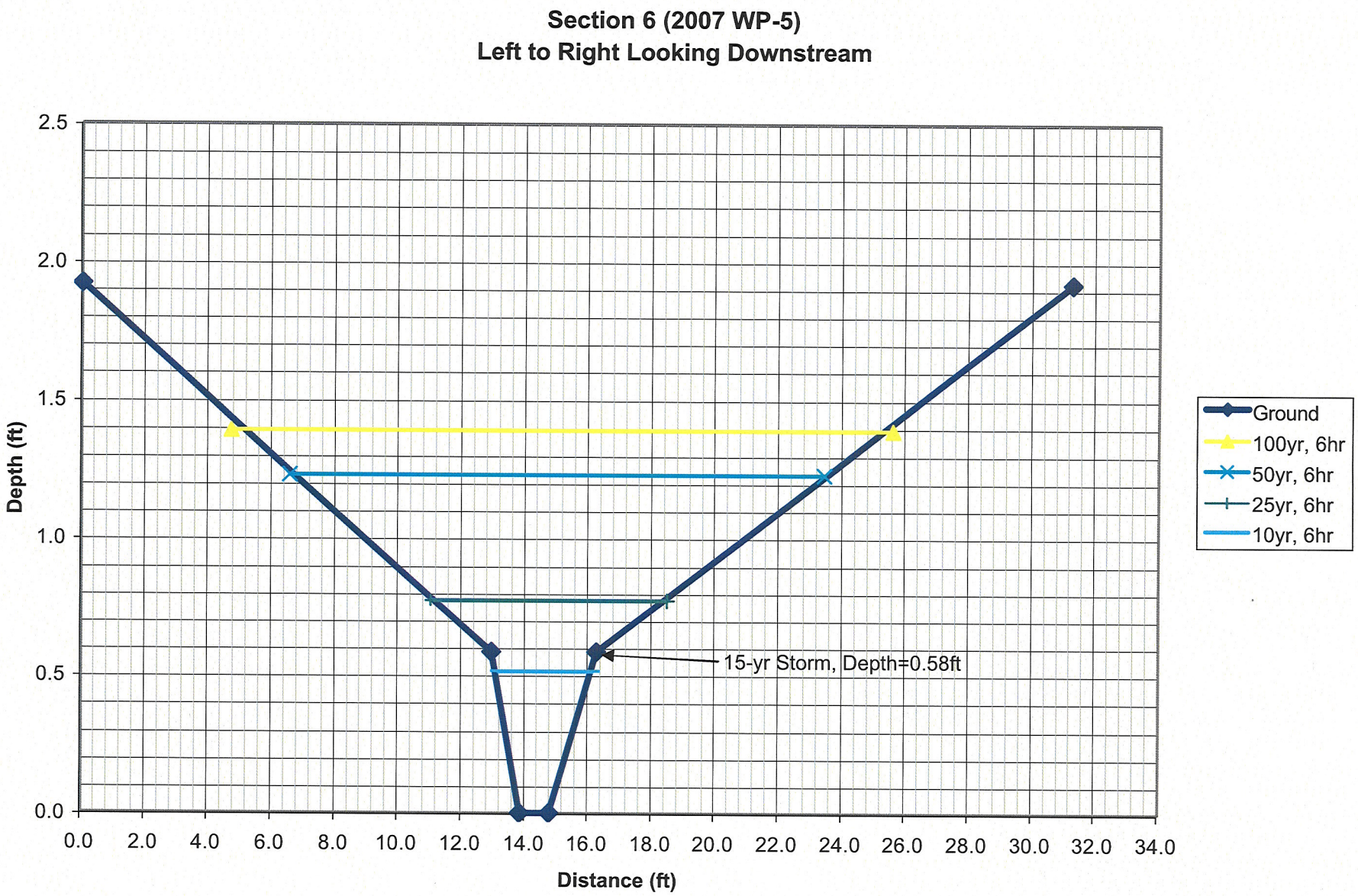
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
48-yr Storm, Depth=1.17'
20-yr Storm, Depth=0.6ft
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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Left to Right Looking Downstream
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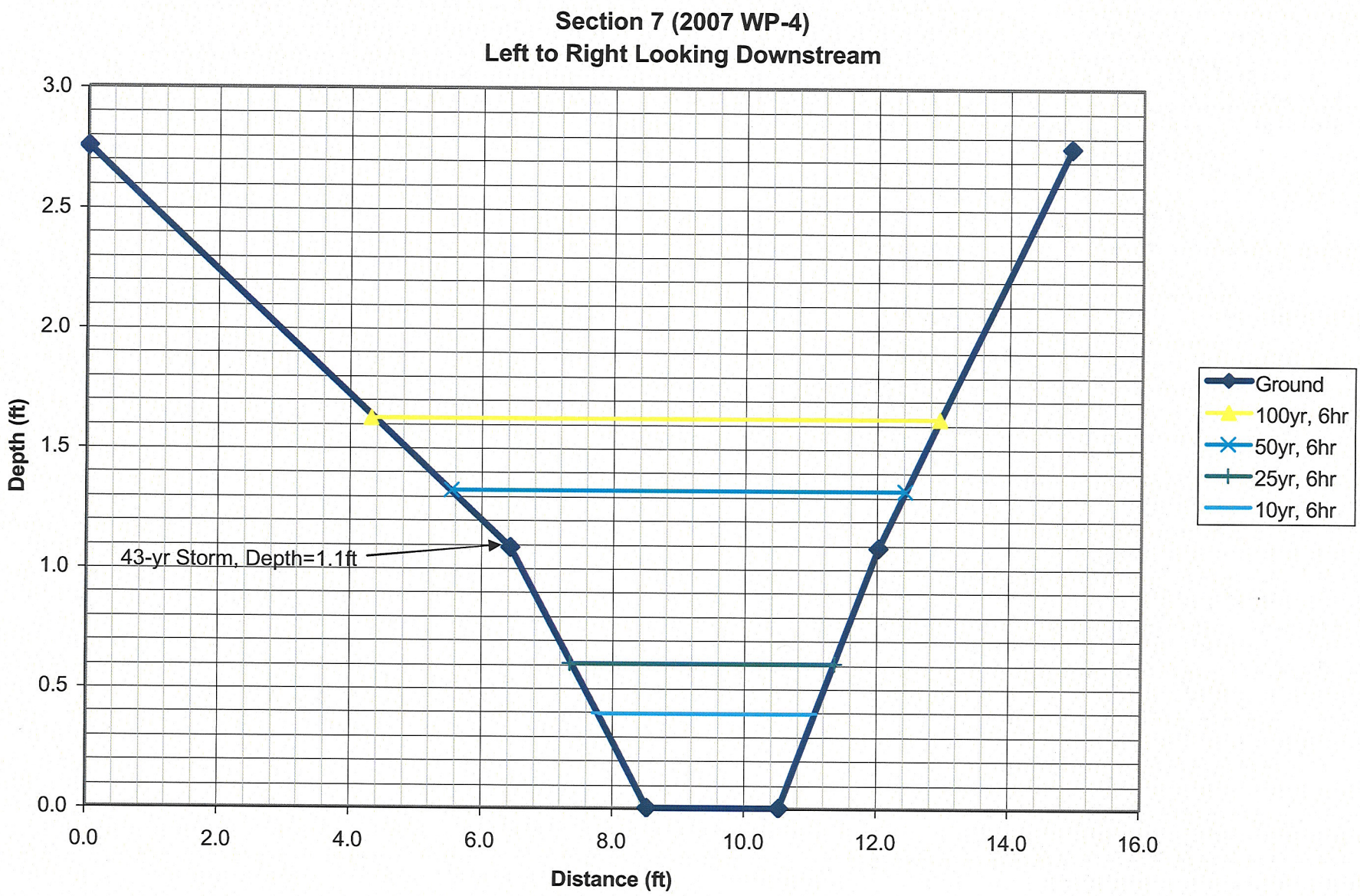
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
Distance (ft)
15-yr Storm, Depth=0.58ft
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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Left to Right Looking Downstream
Depth (ft)
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2.0
1.5
1.0
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0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Distance (ft)
43-yr Storm, Depth=1.1ft
Ground
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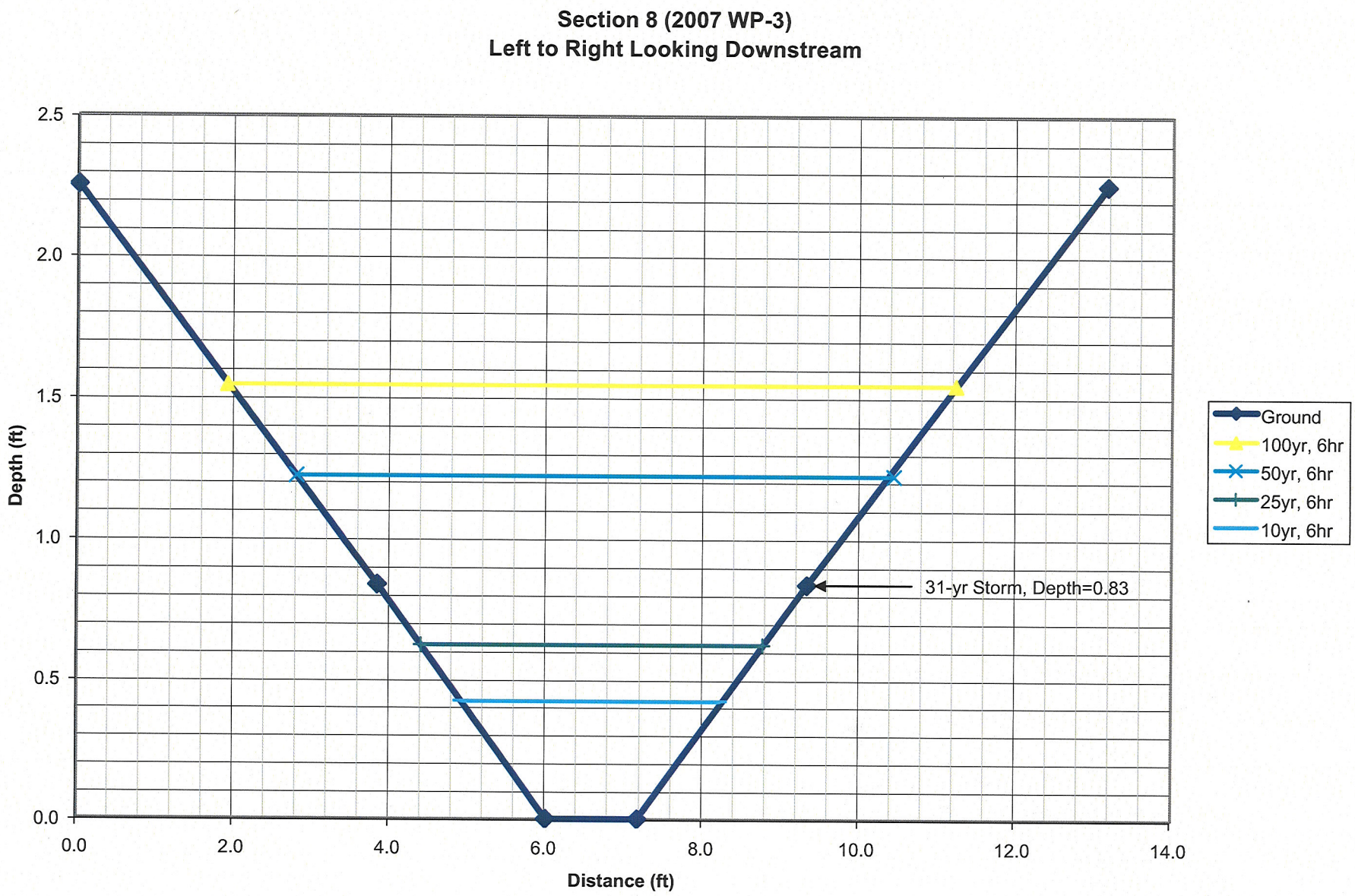
50yr, 6hr
25yr, 6hr
10yr, 6hr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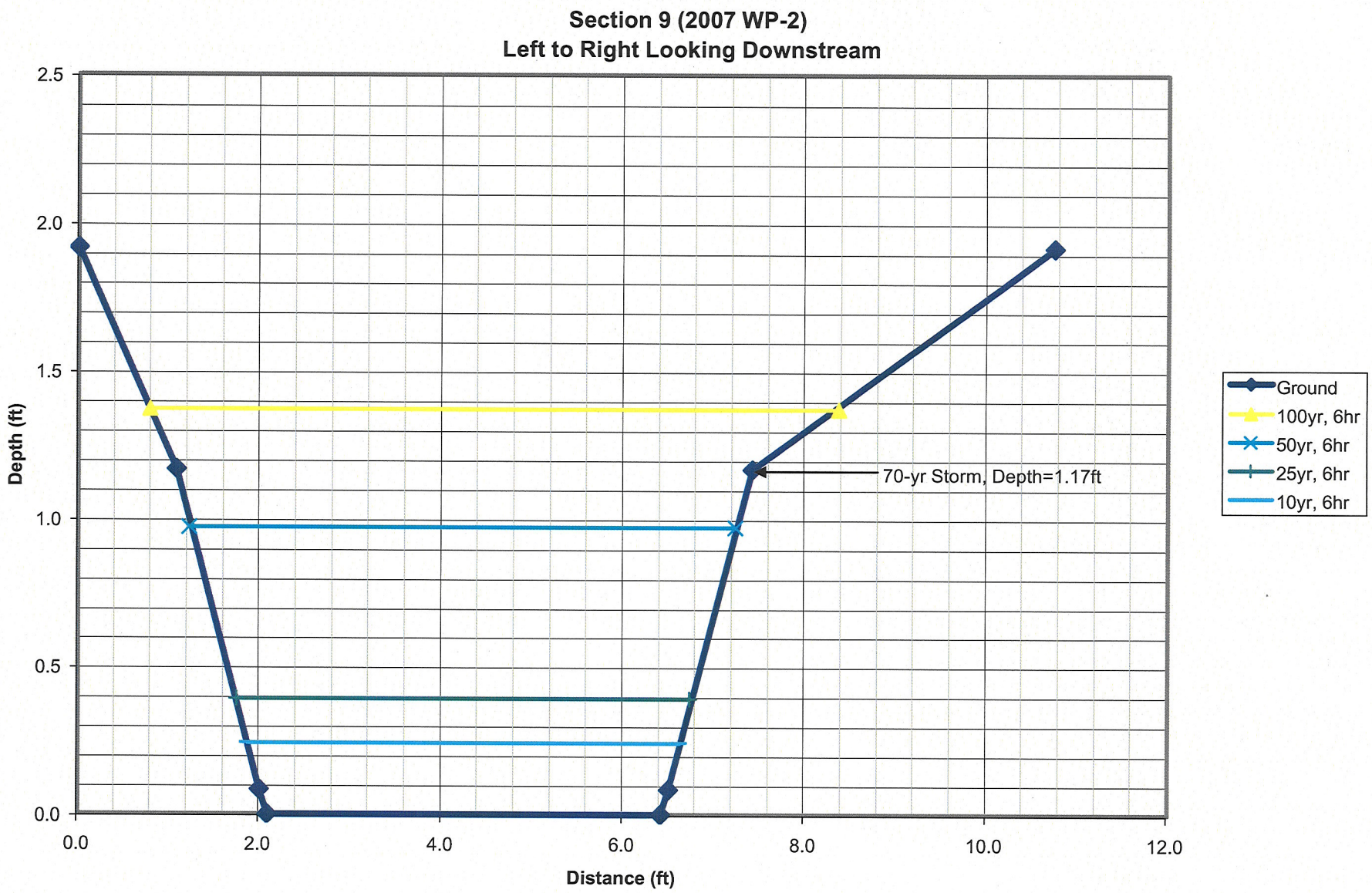
Left to Right Looking Downstream
Depth (ft)
2.5
2.0
1.5
1.0
0.5
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (ft)
31-yr Storm, Depth=0.83
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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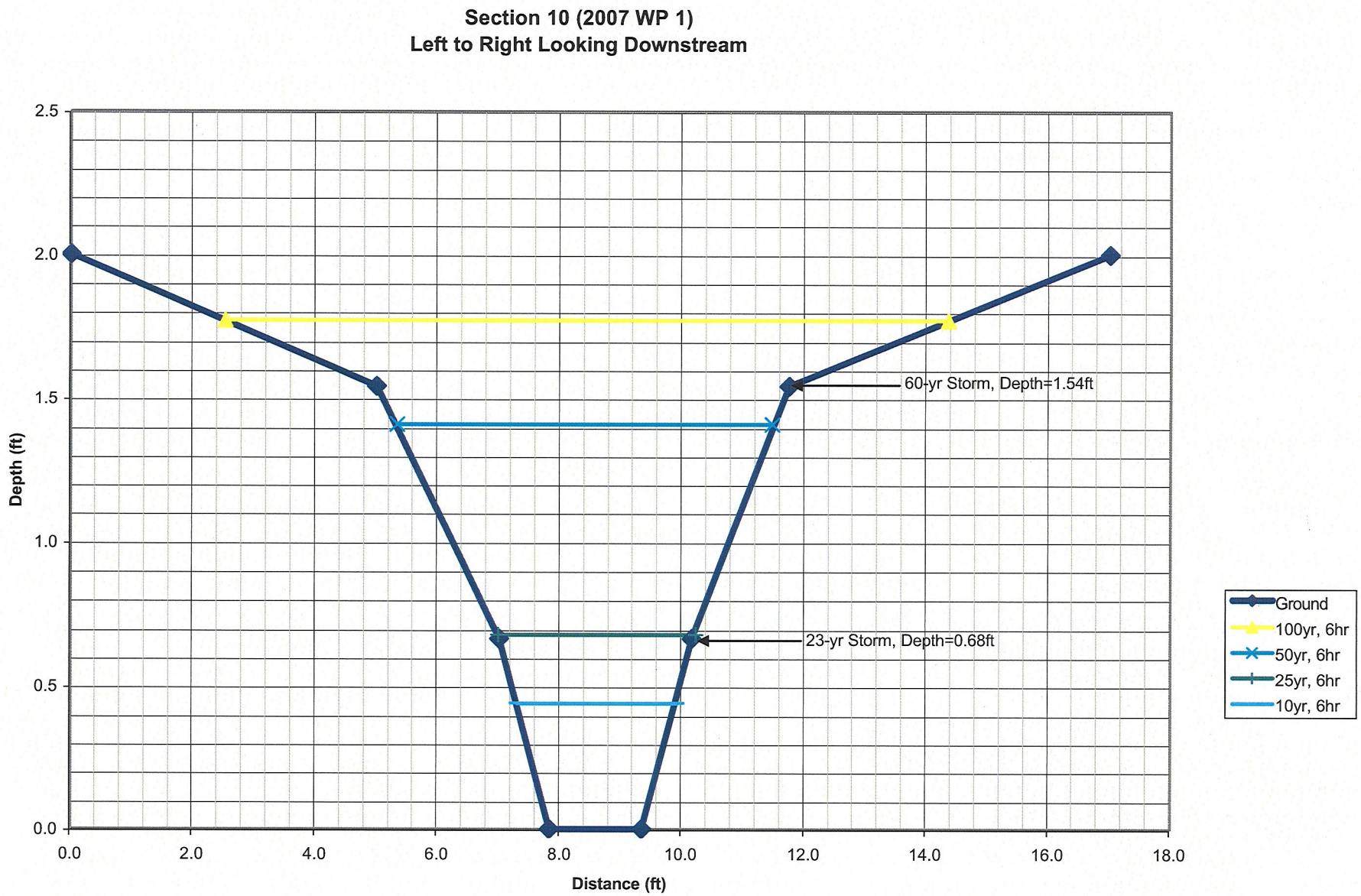
Left to Right Looking Downstream
Depth (ft)
2.5
2.0
1.5
1.0
0.5
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (ft)
70-yr Storm, Depth=1.17ft
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr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Depth (ft)
Distance (ft)
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2.0
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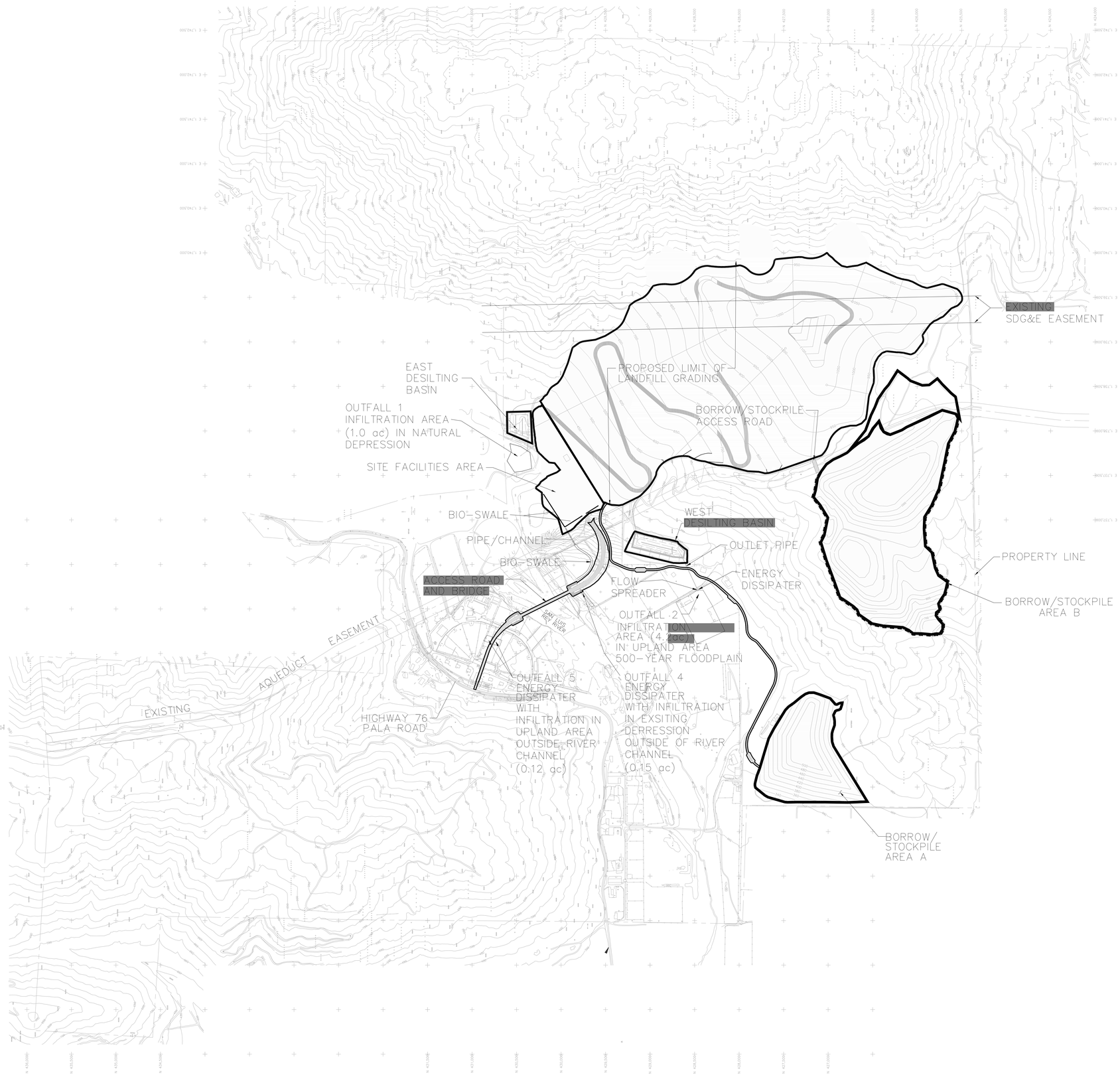
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
60-yr Storm, Depth=1.54ft
23-yr Storm, Depth=0.68ft
Ground
100yr, 6hr
50yr, 6hr
25yr, 6hr
10yr, 6hr



STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON TOPO
GREGORY CANYON, LTD,N LLC

URS

200 0 200 400 Feet
SCALE: 1"= 400'

CHECKED BY: MM	DATE: 12-12-07	PLATE
PM: WPM	PROJ. NO: 27654025.00020	1

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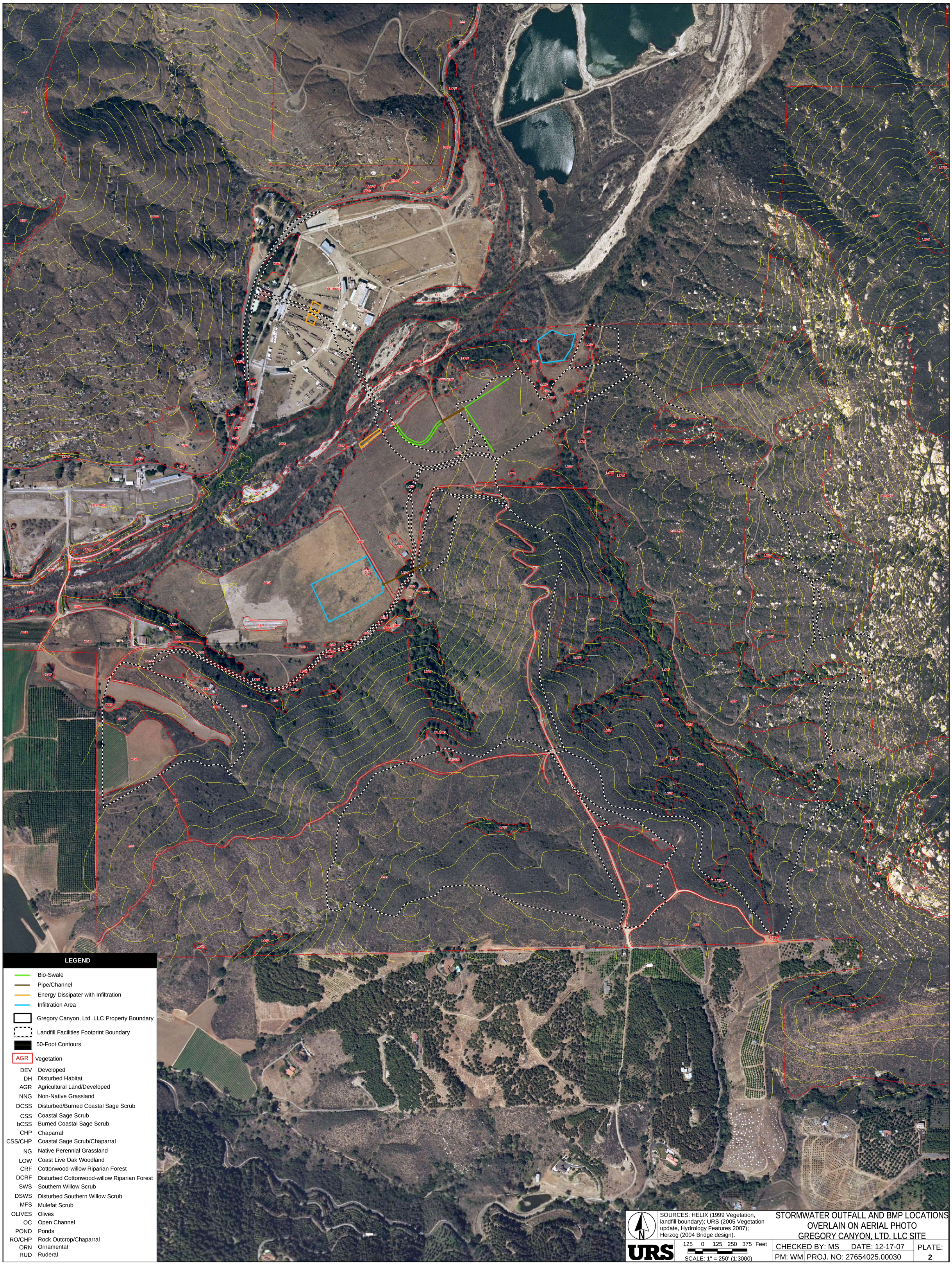

LEGEND
Bio-Swale
Pipe/Channel
Energy Dissipater with Infiltration
Infiltration Area
Gregory Canyon, Ltd. LLC Property Boundary
Landfill Facilities Footprint Boundary
50-Foot Contours
AGR Vegetation
DEV Developed
DH Disturbed Habitat
AGR Agricultural Land/Developed
NNG Non-Native Grassland
DCSS Disturbed/Burned Coastal Sage Scrub
CSS Coastal Sage Scrub
bCSS Burned Coastal Sage Scrub
CHP Chaparral
CSS/CHP Coastal Sage Scrub/Chaparral
NG Native Perennial Grassland
LOW Coast Live Oak Woodland
CRF Cottonwood-willow Riparian Forest
DCRF Disturbed Cottonwood-willow Riparian Forest
SWS Southern Willow Scrub
DSWS Disturbed Southern Willow Scrub
MFS Mulefat Scrub
OLIVES Olives
OC Open Channel
POND Ponds
RO/CHP Rock Outcrop/Chaparral
ORN Ornamental
RUD Ruderal
N
SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).
125 0 125 250 375 Feet
SCALE: 1" = 250' (1:3000)
URS
STORMWATER OUTFALL AND BMP LOCATIONS
OVERLAIN ON AERIAL PHOTO
GREGORY CANYON, LTD. LLC SITE
CHECKED BY: MS
DATE: 12-17-07
PLATE:
PM: WM
PROJ. NO: 27654025.00030
2
G:\gis\projects\1577\27654025\mxd\Plate_2_water_resources.mxd

APPENDIX I-2

BIOLOGICAL ASSESSMENT FOR THE GREGORY CANYON SAN LUIS REY RIVER BRIDGE REPLACEMENT

REPORT

BIOLOGICAL ASSESSMENT FOR THE GREGORY CANYON SAN LUIS REY RIVER BRIDGE REPLACEMENT

Prepared for

Gregory Canyon, Ltd. LLC
249 South Highway 101 #377
Solana Beach, CA 92075

URS Project No. 27654025.00020

August 31, 2006

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619.294.9400 Fax: 619.293.7920

TABLE OF CONTENTS

Section 1 Introduction 1-1

1.1 Description of the Proposed Action 1-1
1.2 ESA Section 7 Consultation 1-2
1.3 Species Evaluated 1-2
1.4 Objectives 1-3

Section 2 Project Description 2-1

2.1 Project Description 2-1

Section 3 Existing Conditions/Environmental Baseline 3-1

3.1 Methods 3-1
3.2 Vegetation Occuring in the Action Area 3-1
3.3 Listed Species and Designated or Proposed Critical Habitat Occurring in the Action Area 3-5

Section 4 Impacts 4-1

4.1 Effects of the Action on Least Bell's Vireo 4-1
4.2 Effects of the Action on Southwestern Willow Flycatcher 4-2
4.3 Effects of the Action on Arroyo Southwestern Toad 4-4
4.4 Effects of the Action on Coastal California Gnatcatcher 4-8
4.5 Effects of the Action on Quino Checkerspot Butterfly 4-11

Section 5 Mitigation and Monitoring 5-1

5.1 Mitigation Measures and Project Design 5-1

Section 6 Conclusion 6-1

Section 7 References 7-1

Tables

Table 1	Vegetation Impacts and Mitigation Requirements
Table 2	Results of URS 2005 Arroyo Toad Surveys Within the Action Area
Table 3	Acreage of Suitable Arroyo Toad Soil Types Based on NRCS Mapping Within the Project Impact Footprint, Including the Landfill and Excluding Riparian Habitat

Figures

Figure 1	Project Location
Figure 2	Project Boundary
Figure 3	Bridge Footprint Overlain on Waters of the United States
Figure 4	Bridge Footprint Overlain on Vegetation Habitats
Figure 5	Conceptual Mitigation Areas Gregory Canyon
Figure 6	Potential Arroyo Toad Upland Impact Areas
Figure 7	Potential Coastal California Gnatcatcher Vegetation Habitat Gregory Canyon Property

Plates

Plate 1	Bridge Footprint Overlain on Waters of the U.S.
Plate 2	Vegetation Habitats on the Gregory Canyon, Ltd. LLC Site
Plate 3	Threatened and Endangered Species and Critical Habitat on the Gregory Canyon, Ltd. LLC Site

SECTION 1 INTRODUCTION

This Biological Assessment (BA) has been prepared for Gregory Canyon, Ltd. LLC (project applicant) in support of a request for formal consultation with the U.S. Army Corps of Engineers (Corps) and U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Federal Endangered Species Act (ESA) regarding the Gregory Canyon San Luis Rey River bridge replacement project (the project). The project site is located in northern San Diego County, on State Route 76 (SR 76), approximately three miles east of Interstate 15 (I-15) and two miles southwest of the community of Pala. This BA has been prepared to evaluate the potential effects (direct, indirect, and cumulative) of the project on five (5) Federally listed endangered or threatened species, and designated and proposed Critical Habitat for three (3) of the listed species, including the southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), arroyo toad (*Bufo californicus*) (aka arroyo southwestern toad), coastal California gnatcatcher (*Polioptila californica californica*), and quino checkerspot butterfly (*Euphydras editha quino*). Two (2) of these species are also State-listed pursuant to the California Endangered Species Act (CESA).

This BA addresses both the immediate project area (the bridge replacement) and the development and operation of the proposed Gregory Canyon Landfill on the property, which collectively comprise the "Federal action area" for purposes of this BA and the Corps Section 404 permit required for construction of the bridge, in an effort to include "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R §402.02; see also USFWS and National Marine Fisheries Service (NMFS) *Endangered Species Consultation Handbook*, March 1998, Figure 4-6, p. 4-18). Figure 1 depicts the location of the bridge replacement project within San Diego County, and Figure 2 delineates the boundary of the entire Gregory Canyon property encompassing the project area and the Gregory Canyon Landfill site.

1.1 DESCRIPTION OF THE PROPOSED ACTION

The action area comprises portions of Section 4 and 5 of Township 10 South and Sections 32 and 33 of Township 9 South, Range 2 West of USGS 7.5' Pala Quadrangle. The action area consists of approximately 1,770 acres owned by Gregory Canyon Ltd., LLC, and an additional approximately 14 acres owned by San Diego Gas & Electric that will be conveyed to Gregory Canyon, Ltd. LLC (collectively "the property").

The proposed project is the construction of a new bridge crossing of the San Luis Rey River to accommodate ingress to and egress from the proposed Gregory Canyon Landfill. This bridge crossing will replace the existing low-flow crossing located downstream. The existing crossing must be replaced with a bridge suitable to allow approved access from SR 76 across the San Luis Rey River to the property and also to Gregory Canyon Landfill for vehicles and equipment associated with construction or operation of the landfill. The existing crossing must remain in place during construction of the new bridge to allow temporary equipment ingress and egress to support construction of the new bridge, and the new bridge must be located at a different location to allow concurrent use of the existing bridge during such construction.

1.2 ESA SECTION 7 CONSULTATION

This BA has been prepared to evaluate the potential effects of the project on listed species, species proposed for listing, candidate species, designated Critical Habitat, and proposed Critical Habitat within the entire action area pursuant to Section 7 of the ESA. As noted above, the proposed Federal action will affect five (5) listed species, and three (3) designated Critical Habitats. Potential effects on these species and designated or proposed Critical Habitat are evaluated in accordance with the requirements set forth under Section 7 of the ESA (16 United States Code [U.S.C.] 1536) and Section 2081 of the California Fish and Game Code.

The effects of the project within the action area on listed species and designated or proposed Critical Habitat include consideration of and implementation of the Mitigation Measures that the County of San Diego has adopted to avoid and/or reduce the environmental effects from the development and operation of the proposed landfill, as documented in the original Environmental Impact Report (EIR) certified in February 2003 (San Diego County Department of Environmental Health 2003) and in the June 2006 Revised Partial Draft Environmental Impact Report (2006 RPDEIR) for the project (San Diego County Department of Environmental Health (2006)). Additionally, certain mitigation measures required in Proposition C, approved by voters in the County of San Diego in1994, as well as court imposed measures resulting from the court's decision in *River Watch v. County of SD Dept of Environmental Health,* October 3, 2005, are included in the discussion of mitigation measures in this BA. The mitigation measures that will avoid or minimize take of listed species and modification of designated Critical Habitat are presented in Section 5.0.

1.3 SPECIES EVALUATED

The following Federally listed species are known to or have the potential to occur in the action area:

- Arroyo southwestern toad (*Bufo californicus*) – Federally endangered; No Critical Habitat onsite; State Species of Special Concern
- Coastal California gnatcatcher (*Polioptila californica californica)* – Federally threatened; Designated and Reopened Critical Habitat onsite; State Species of Special Concern
- Least Bell's vireo (*Vireo bellii pusillus*) – Federally endangered; Critical Habitat onsite; State endangered
- Quino checkerspot butterfly (*Euphydryas editha quino*) – Federally endangered; No Critical Habitat onsite
- Southwestern willow flycatcher (*Empidonax traillii extimus*) – Federally endangered; Critical Habitat onsite; State endangered

Several surveys were conducted on the property between 1989 and 2006. During this time, three Federally endangered and one Federally threatened species were detected. The Federally endangered species that were detected onsite include southwestern willow flycatcher, least Bell's vireo, and arroyo southwestern toad. Single males of the Federally threatened coastal California gnatcatcher were detected during two separate surveys prior to 1999, but have not been confirmed in subsequent surveys. Host plants for the quino checkerspot butterfly (QCB) have been observed on the property; however, no butterflies were detected during several protocol surveys, the most recent of which were conducted in

2005 by URS. Least Bell's vireo and arroyo southwestern toad were re-confirmed as present onsite during recent surveys of the site in 2005 by URS. The property contains designated Critical Habitat for least Bell's vireo and southwestern willow flycatcher. (59 FR 22 and 70 FR 201.) The USFWS has also reopened the public comment period on proposed Critical Habitat for the coastal California gnatcatcher as of April 24, 2003 (68 FR 79); however, only the Critical Habitat designated on October 24, 2000 for coastal California gnatcatcher (65 FR 206), is currently considered to be in effect (USFWS, personal communication). Both the current designated Critical Habitat and proposed Critical Habitat reopened for comment onsite are evaluated in this Biological Assessment. Species accounts are provided in Section 3.3.

1.4 OBJECTIVES

- Identify and describe the biological communities present on the project site.
- Record plant and animal species observed on the project site.
- Evaluate and identify special management status resources and plant and animal species, as well as designated and proposed Critical Habitat that could be affected by project activities.
- Provide conclusions and recommendations.

SECTION 2 PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION

The project is the construction of a new bridge crossing of the San Luis Rey River to accommodate ingress to and egress from the proposed Gregory Canyon Landfill. This bridge crossing will replace an existing low-flow crossing that is located downstream and is not able to support heavier vehicles, including the required equipment and waste delivery vehicles for the landfill. The existing low-flow crossing will be abandoned after construction of the new bridge is completed and no longer used for traffic.

Figure 3 shows the footprint of the proposed new bridge crossing of the San Luis Rey River, including a temporary construction access corridor on the upstream side of the proposed bridge, and the bridge construction area overlain on a map of jurisdictional waters of the United States (U.S.), including wetlands, that has been confirmed by the Corps. Figure 4 shows the footprint of the proposed new bridge crossing of the San Luis Rey River and the bridge construction area overlain on vegetation habitats identified in the RPDEIR for this project. Figure 5 shows the footprint of the proposed new bridge crossing of the San Luis Rey River and the bridge construction area with mitigation areas identified in the RPDEIR. Plate 1 shows the bridge footprint and bridge construction area overlain on waters of the U.S. and Wetlands. Plate 2 shows vegetation habitats identified in the RPDEIR for the entire property. Plate 3 shows information for threatened and endangered species and areas of designated and proposed Critical Habitat pursuant to the ESA on the entire property.

The area of waters of the U.S. that will be cleared for bridge construction is 0.37 acres. Bridge support piers will permanently fill 0.002 aces of the 0.37 acres of wetland habitat. The remaining 0.368 acres will be restored after construction of the bridge. As part of the project, riparian habitat will be created in the bridge grading area in the uplands adjacent to the San Luis Rey River. This will result in 2.3 acres of additional riparian and wetland habitats on site (Figure 4, Plate 1).

The property contains developed and undeveloped land. Dairies have historically operated on the property. Single family homes are located on the property along SR 76, all but one of which is abandoned. South of the river on the property are open fields historically used for grazing and one abandoned residence.

As set forth in the RPDEIR for the Gregory Canyon Landfill, the following methods and measures are components of the project that also serve to avoid or reduce potential impacts on biological resources:

- The existing low-flow crossing will only be used during initial construction during daylight hours and will be abandoned following completion of the bridge.
- Access road and bridge construction will occur during daylight hours when wildlife movement by species such as mammals is less frequent.
- The bridge pilings will be drilled in place, rather than driven, to minimize construction noise.
- Riparian habitat adjacent to the proposed bridge structure will only be cleared beneath and within 30 feet of the east side of the structure.

- The deck of the bridge will be at least 17.5 feet above the river bed allowing for wildlife movement underneath.
- Reflective strips will be used on the inside structure of the bridge. No lighting will be installed on the bridge.
- Removal of riparian habitat prior to construction will occur between October and December.

SECTION 3 EXISTING CONDITIONS/ENVIRONMENTAL BASELINE

3.1 METHODS

Data from previous surveys, the 2003 EIR and the 2006 RPDEIR for the Gregory Canyon Landfill, recent focused surveys performed by URS biologists at the access bridge site in 2005, and subsequent surveys in 2006 were reviewed to determine the existing conditions and potential impacts specifically resulting from construction of the access bridge on the San Luis Rey River and more generally in the action area.

3.1.1 Vegetation Mapping

Vegetation mapping was completed during the 2003 EIR process. This information was digitized into a GIS by URS in 2005. Vegetation was then confirmed and updated by URS biologists using a 2002 aerial photograph base. Wetland areas and Waters of the U.S. were determined from URS surveys in 2004, confirmed by the Corps, mapped in GIS, and acreages of impacts resulting from construction of the access bridge over the San Luis Rey River were then calculated in GIS. Plate 1 depicts the bridge footprint overlain on Waters of the U.S. Plate 2 depicts the vegetation and Plate 3 depicts special management species and Critical Habitat located on the property.

3.1.2 Listed Species Surveys

In addition to analyzing previously recorded data on each of the listed species discussed above, URS biologists updated existing sighting data or performed protocol surveys of listed species. Permitted URS biologists determined habitat quality and performed USFWS protocol surveys for QCB on the property during the 2005 QCB flight season. Surveys were conducted by URS biologists during the breeding seasons of least Bell's vireo and southwestern willow flycatcher while onsite, which included data collection such as vocalizations and direct observations of these species in the riverbed. Similarly, URS biologists permitted to perform USFWS Protocol California gnatcatcher surveys determined habitat value and surveyed the property for this species throughout the California gnatcatcher breeding season. URS biologists visited the arroyo southwestern toad habitat in the San Luis Rey riverbed in and around the location of the replacement bridge location several times throughout 2005. Data including existence of water, level of flow, habitat quality, and arroyo toad observations were recorded during each visit. Additional observations were made during 2006.

The species accounts presented below were extracted from the 2003 EIR and the 2006 RPDEIR, and updated based on current data and recent surveys of the property. Plate 3 depicts sensitive species locations throughout the property.

3.2 VEGETATION OCCURING IN THE ACTION AREA

A total of eight native vegetation communities occur on the property, along with two unvegetated habitats, four non-native communities, and developed land (URS 2006). Native vegetation communities include coastal sage scrub, coastal sage scrub/chaparral, chaparral (including some with rock outcrops), native perennial grassland, coast live oak woodland, cottonwood-willow riparian forest, mule fat scrub, and southern willow scrub. Unvegetated habitats include open channel (a natural condition) and ponds,

and non-native vegetation communities include annual grassland, disturbed habitat, agricultural land, and agricultural land/developed. (San Diego County Department of Environmental Health 2003). As discussed above, the following descriptions of the vegetation were extracted from the 2003 EIR and the 2006 RPDEIR, and the vegetation mapping was confirmed by URS using aerial photography in 2005. Acreages of existing vegetation were extracted from the 2006 RPDEIR (Plate 2, Figure 4).

3.2.1 Coastal Sage Scrub

Coastal sage scrub occurs throughout the property and is characterized by a variety of soft, low, aromatic, drought-deciduous shrubs such as California sagebrush *(Artemisia californica)* and California buckwheat *(Eriogonum fasciculatum)* with scattered evergreen shrubs such as laurel sumac *(Malosma laurina)*. This community supports small inclusions of native grassland dominated by purple needlegrass *(Nassella pulchra)* on the property. Annual species occur between the grass tussocks, including blue-eyed grass *(Sisyrinchium bellum)*, soft chess *(Bromus hordeaceus)*, and virgate cudweed aster *(Corethrogyne filaginifolia var. virgata)*. A total of 897.6 acres of coastal sage scrub occurs on the property, 1.9 acres of which are disturbed and 226.4 acres of which have burned since 1995.

3.2.2 Coastal Sage Scrub/Chaparral

Areas of scrub habitat that could not be easily classified as either coastal sage scrub or chaparral because they supported a heterogeneous mix of species from each association were placed in this category. This habitat type occurs on the lower west-facing slope of Gregory Canyon and on a hill just south of the San Luis Rey River west of the canyon. A total of 73.9 acres of coastal sage scrub/chaparral occurs on the property.

3.2.3 Chaparral

Chaparral is a drought- and fire-adapted community of broad-leaved, evergreen shrubs that frequently form dense, often impenetrable stands. This association develops primarily on mesic north-facing slopes and in canyon bottoms and is characterized by crown- or stump-sprouting shrubs that regenerate following burns or other major disturbances. Chaparral occurs primarily along the high slopes east of Gregory Canyon, where it is dominated by chamise *(Adenostoma fasciculatum)* with lesser amounts of mission manzanita *(Xylococcus bicolor)* and holly-leaf redberry *(Rhamnus ilicifolia)*. A small amount of chaparral also occurs on the western slope of the canyon. The high slopes of Gregory Mountain (including the west-facing slopes of the canyon) also support massive rock outcrops among patches of chaparral vegetation. This mixture of rocks and vegetation has special value to wildlife. A total of 430.5 acres of chaparral occur on the property.

3.2.4 Native Perennial Grassland

Native grassland is characterized by a dense herbaceous cover of perennial, tussock-forming grass species such as foothill stipa *(Nassella lepida)* and purple needlegrass *(Nassella pulchra)*. Native and introduced annuals occur between the grasses, often exceeding them in cover (Holland 1986). In addition to *Nassella* species, indicator species present include brome grasses (*Bromus* spp.), blue-eyed grass, blue dicks *(Dichelostemma capitatum)*, shooting star *(Dodecatheon clevelandii)*, and purple owl's clover *(Castilleja*

exserta), among others. Native grassland occurs at the ridgetop near and within the footprint for the Borrow/Stockpile Area B identified in the 2006 RPDEIR. A total of 0.6 acre of native perennial grassland occurs on the property.

3.2.5 Coast Live Oak Woodland

Coast live oaks *(Quercus agrifolia)* provide moderate canopy cover along the bottom of Gregory Canyon. The understory is dominated by poison oak *(Toxicodendron diversilobum)*, among other species, and is accompanied by a high diversity of herbaceous and shrubby species. Other trees occurring less frequently in Gregory Canyon include Engelmann oak *(Quercus engelmannii)*. Coast live oak woodland occurs throughout the main portion of Gregory Canyon and as stands on the upper slopes of the canyon. Other stands of oak woodland are situated in a minor canyon west of Gregory Canyon, on a slope in the southeastern portion of the property, on a steep slope overlooking the San Luis Rey River Valley, and abutting SR 76. A total of 63.9 acres of coast live oak woodland occur on the property.

3.2.6 Cottonwood-Willow Riparian Forest

This association is a dense, structurally diverse, riparian habitat dominated by black willow *(Salix gooddingii)* and arroyo willow *(Salix lasiolepis)*, with smaller amounts of Fremont cottonwood and western sycamore. The understory consists of mule fat *(Baccharis salicifolia)*, and sandbar willow *(Salix exigua)*. It occurs along the edges of the San Luis Rey River. A total of 27.0 acres of cottonwood-willow riparian forest occur on the property (1.3 acres of which are disturbed).

3.2.7 Mule Fat Scrub

Mule fat scrub is a shrubby, riparian community dominated by mule fat. Mule fat scrub occurs along intermittent streams with a fairly coarse substrate and moderately deep water table (Holland 1986). Understory vegetation is often composed of non-native, weedy species or is lacking altogether. Mule fat scrub occurs in small stands along the drainage channel at the northern end of Gregory Canyon. A total of 0.5 acres of mule fat scrub occur on the property.

3.2.8 Southern Willow Scrub

Southern willow scrub is a winter-deciduous riparian community dominated by willows *(Salix* spp.), with most stands being too dense to allow much understory development. This association occurs on loose, sandy, or fine gravelly alluvium deposited near stream channels during floods (Holland 1986). Dominant willow species include arroyo willow and red willow *(Salix laevigata)*. Other species associated with this community include black willow, mule fat, Fremont cottonwood, and western ragweed *(Ambrosia psilostachya)*. Southern willow scrub occurs along the San Luis Rey River and the drainage channel at the northern end of Gregory Canyon. A total of 33.7 acres of southern willow scrub occur on the property (2.9 acres of the habitat is disturbed).

3.2.9 Open Channel

Open channel refers to areas of the sandy, sparsely vegetated, active floodplain of the San Luis Rey River. Although most of these areas lack vegetation, portions of the San Luis Rey River floodplain supports

riparian plant species in an early successional state. A total of 12.5 acres of open channel occur on the property. The areas of open channel mapped within the project's impact area are not jurisdictional waters of the U.S. These areas would be better described as sand bar or open sand; however, the designation of "open channel" was used in the original 2003 EIR and has been retained to avoid confusion for the reader when comparing the earlier EIR for the landfill project.

3.2.10 Ponds

Ponds are areas of open water that usually lack emergent vegetation, although the shallow margins may support freshwater marsh vegetation. These areas are associated with the former dairies and are surrounded by disturbed habitat. A total of 0.4 acre of pond occurs on the property.

3.2.11 Annual Grassland

Where the native vegetation has been severely or repeatedly degraded by grazing, agriculture, fire, or other perturbation, the native vegetation often becomes annual (non-native) grassland. In these situations, non-native grasses and weeds dominate the vegetation community, and there are few to none of the early successional elements of the former community. Dominant plants in annual grassland include slender wild oat *(Avena barbata)*, brome grasses, and fascicled tarweed *(Hemizonia fasciculata)*. A total of 34.5 acres of annual grassland occur on the property.

3.2.12 Disturbed Habitat

This category includes unpaved roads and areas that have been brushed, graded, or landscaped. These places either support weedy, non-native vegetation, ornamental vegetation, or lack vegetation. A total of 34.0 acres of disturbed habitat occur on the property.

3.2.13 Agricultural Land/Developed

The former dairies on the landfill site were mapped as a combination of agricultural land and developed land and occupy 88.3 acres on the property.

3.2.14 Developed

Developed land is defined as any area that supports permanent man-made structures or human activities that inhibit the succession of native plant communities or the invasion of non-native species. Areas mapped as developed land include paved roads, houses and yards. A total of 6.2 acres of developed land occur on the property.

3.3 LISTED SPECIES AND DESIGNATED OR PROPOSED CRITICAL HABITAT OCCURRING IN THE ACTION AREA

3.3.1 Least Bell's Vireo (*Vireo bellii pusillus*)

3.3.1.1 Status of the Species

The least Bell's vireo is a Federal and State endangered species that occurs in riparian woodlands and riparian scrub containing sunny areas where vegetation is not too dense and contains an understory of dense, young willows or mule fat with a canopy of tall willows.

As described in the 2006 RPDEIR for the landfill project, spring surveys in 1993 and 1995 (Ogden unpub. data, Dudek 1995, as cited in the 2006 RPDEIR) detected from 3 to 4 pairs of breeding least Bell's vireo along the San Luis Rey River on the property. In 1995, two unpaired territorial males were observed in remnant riparian woodland that remained after intensive scouring of the channel during winter and spring flooding. In 1998, four territorial male vireos were identified along the river on the property. In 2000, seven territorial males were identified along the river on the property (Helix Environmental 2002, as cited in the 2003 EIR and 2006 RPDEIR) (Plate 2). Least Bell's vireo were subsequently confirmed in the San Luis Rey River during several surveys of the property by URS in 2004 and 2005.

3.3.1.2 Critical Habitat

Designated Critical Habitat for least Bell's vireo occurs onsite along the San Luis Rey River corridor within Unit 6, Unit Code F (Plate 3). The USFWS (59 FR 22) has determined that the physical and biological habitat features that comprise the primary constituent elements of the Critical Habitat designated for least Bell's vireo are riparian woodland vegetation that generally contains both canopy and shrub layers, and includes some associated upland habitats. The USFWS states that most of the survival and reproductive needs for least Bell's vireo occur with the riparian zone in most areas.

The primary constituent elements for least Bell's vireo Critical Habitat on the greater property onsite are largely contained within the ordinary high water mark (OHWM) of the San Luis Rey River, and in a few areas beyond the OHWM that are usually within the 5- to 10-year floodplain, but may also extend to the approximate 25-year floodplain of the river. Primary constituent elements for least Bell's vireo Critical Habitat are generally not present beyond these limits along the San Luis Rey River. Therefore, although the description of Critical Habitat for least Bell's vireo in 59 FR 22 includes Sections and/or Subsections from USGS quad maps that may extend slightly beyond these areas that are generally within the 25-year floodplain in some cases onsite, the primary constituent elements for the Critical Habitat occur within these areas that are generally within the approximate 25-year floodplain onsite.

3.3.2 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

3.3.2.1 Status of the Species

The southwestern willow flycatcher is a Federal and State endangered species that occurs in dense riparian woodlands of willow, cottonwood, and other deciduous shrubs and trees, usually near freshwater streams. In general, the riparian habitat of this species tends to be in rare, isolated, small, and/or linear patches, separated by vast expanses of arid lands.

As described in the 2006 RPDEIR, three individuals were observed on the property in 1995 (Dudek 1995). These individuals are believed to be migrants because they occurred only during the first two weeks of surveys, and no nesting was observed. This species was not observed during focused surveys in spring/summer 1998; however, two pairs of flycatchers were detected by Jeff Wells (TW Biological Services, as cited in the 2006 RPDEIR) and confirmed by Peter Beck (Ecological Ornithologist at San Diego State University) in July 1998 in the vicinity of the Highway 76/Couser Canyon Road junction west of, but not located on the property. A nest was found for one of the pairs. In 2000, two calling male flycatchers were observed immediately west of the existing low-flow crossing on the property. This species was not detected during 2005 surveys of the property.

3.3.2.2 Critical Habitat

Designated Critical Habitat for southwestern willow flycatcher occurs onsite along the San Luis Rey River corridor within the San Luis Rey River complex of the San Diego Management Unit. The USFWS (70 FR 201) has determined primary constituent elements for southwestern willow flycatcher as:

"*The southwestern willow flycatcher currently breeds in relatively dense riparian habitats in all or parts of six southwestern states, from near sea level to over 2438 meters (m) (8000 feet) (USFWS 2002: D-1) (Munzer et al. 2005). The southwestern willow flycatcher breeds in riparian habitats along rivers, streams, or other wetlands, where relatively dense growths of trees and shrubs are established, near or adjacent to surface water or underlain by saturated soil. Habitat characteristics such as dominant plant species, size and shape of habitat patch, canopy structure, vegetation height, and vegetation density vary widely among sites. Southwestern willow flycatchers nest in thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft). Lower-stature thickets (2-4 m or 6-13 ft tall) tend to be found at higher elevation sites, with tall-stature habitats at middle and lower elevation riparian forests. Nest sites typically have dense foliage at least from the ground level up to approximately 4 m (13 ft) above ground, although dense foliage may exist only at the shrub level, or as a low dense canopy. Nest sites typically have a dense canopy. As a neotropical migrant (migrating between Central and South America and the United States), migration stopover areas for the southwestern willow flycatcher, even though not used for breeding, are critically important, (i.e., essential) resources affecting productivity and survival (Sogge et al. 1997b; Yong and Finch 1997; Johnson and O'Brien 1998; McKernan and Braden 1999; and USFWS 2002: E-3 and 19). Use of riparian habitats along major drainages in the Southwest during migration has been documented (Sogge et al. 1997; Yong and Finch 1997; Johnson and O'Brien 1998; McKernan and Braden 1999; Koronkiewicz et al. 2004, McLeod et al. 2005, Munzer et al. 2005). Many of the willow flycatchers found migrating through riparian areas are detected in riparian habitats or patches that would be unsuitable for breeding (e.g., the vegetation structure is too short or sparse, or the patch is too*

small). Migrating flycatchers use a variety of riparian habitats, including ones dominated by native or exotic plant species, or mixtures of both (USFWS 2002: E-3). Willow flycatchers, like most small passerine birds, require food-rich stopover areas in order to replenish energy reserves and continue their northward or southward migration (Finch et al. 2000; USFWS 2002: E-3 and 42). ...

Southwestern willow flycatchers have higher site fidelity than nest fidelity and can move among sites within drainages and between drainages (Kenwood and Paxton 2001). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001). From nearly 300 band recoveries, within-drainage movements generally ranged from 1.6 to 29 kilometers (km) (1 to 18 miles (mi), but were as long as 40 km (25 mi) (E. Paxton, USGS, e-mail). Movements of birds between drainages are more rare, and the distances are more varied. Banding studies have recorded 25 between-drainage movements ranging from 40 km (25 mi) to a single movement of 443 km (275 mi) (average = 130 km or 81 mi) (E. Paxton, USGS, e-mail). ...

All the PCEs of Critical Habitat for the southwestern willow flycatcher are found in the riparian ecosystem within the 100-year floodplain or flood prone area. Southwestern willow flycatchers use riparian habitat for nesting, feeding, and sheltering while breeding, migrating, and dispersing. Because riparian vegetation is prone to periodic disturbance, flycatcher habitat is ephemeral and its distribution is dynamic in nature (USFWS 2002: 17). In other words, riparian trees and shrubs used by flycatchers will be altered by flood waters, drought, or possibly succumb to fire, but will be replaced by new trees or shrubs which grow in their place (but not necessarily in the same location). Sapling riparian trees and shrubs must germinate and grow to reach the appropriate height and structure to be used by flycatchers. After reaching appropriate structure for nesting, flycatcher habitat may become unsuitable for breeding through maturation or disturbance, but suitable for migration or foraging (though this may be only temporary, and patches may cycle back into suitability for breeding) (USFWS 2002: 17). Over a five-year period, southwestern willow flycatcher habitat can, in optimum conditions, germinate, be used for migration or foraging, continue to grow, and eventually be used for nesting. Therefore, the riparian vegetation used by flycatchers is part of a gradually changing system, not only in its rapid growth due to its proximity to water, but its location within the floodplain due to the dynamic riverine environment. As a result of this dynamic riverine environment, it is not realistic to assume that any given breeding habitat patch will remain suitable over the long-term, or persist in the same location (USFWS 2002: 17), or always be used for the same purpose by flycatchers. Feeding sites and migration stopover areas are essential components of the flycatcher's survival, productivity, and health, and they can also be areas where new breeding habitat develops as established nesting sites are lost or degraded (USFWS 2002: 42). Thus, habitat that is not currently suitable for nesting at a specific time, but useful for foraging and/or migration can be essential to the conservation of the flycatcher. Therefore, the germination and growth of riparian vegetation (i.e. succession) in this dynamic environment is integral for developing and maintaining appropriate habitat for use by southwestern willow flycatchers. ...

The natural hydrologic regime (i.e., river flow frequency, magnitude, duration, and timing) and supply of (and interaction between) surface and subsurface water will be a driving factor in the maintenance, growth, recycling, and regeneration of southwestern willow flycatcher habitat (USFWS 2002:16). As streams reach the lowlands, their gradients typically flatten and surrounding terrain open into broader floodplains (USFWS 2002: 32). Combine this setting with the integrity of stream flow frequency, magnitude, duration, and timing (Poff et al. 1997), and conditions will occur that provide for proper river

channel configuration, sediment deposition, periodic inundation, recharged aquifers, lateral channel movement, and elevated groundwater tables throughout the floodplain that develop flycatcher habitat (USFWS 2002:16). Maintaining existing river access to the floodplain when overbank flooding occurs is integral to allow deposition of fine moist soils, water, nutrients, and seeds that provide essential material for plant germination and growth. An abundance and distribution of fine sediments extending farther laterally across the floodplain and deeper underneath the surface retains much more subsurface water, which in turn supplies water for the development of flycatcher habitat and micro-habitat conditions (USFWS 2002:16). The interconnected interaction between groundwater and surface water contributes to the quality of riparian community (structure and plant species), and will influence the germination, density, vigor, composition, and ability to regenerate and maintain itself (AZ Department of Water Resources 1994). ...

Water

Flycatcher nesting habitat is largely associated with perennial (i.e., persistent) stream flow that can support the expanse of vegetation characteristics needed by breeding flycatchers. However, flycatcher nesting habitat can also persist on intermittent (i.e., ephemeral) streams that retain local conditions favorable to riparian vegetation (USFWS 2002: D-12). The range and variety of stream flow conditions (frequency, magnitude, duration, and timing) (Poff et al. 1997) that will establish and maintain flycatcher habitat can arise in different types of both regulated and unregulated flow regimes throughout its range (USFWS 2002: D-12). Also, flow conditions that will establish and maintain flycatcher habitat can be achieved in regulated streams, depending on scale of operation and the interaction of the primary physical characteristics of the landscape (USFWS 2002: D-12).

In the Southwest, hydrological conditions at a flycatcher breeding site can vary remarkably within a season and between years (USFWS 2002: D-12). At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June) (USFWS 2002: D-12). At other sites, vegetation may be immersed in standing water during a wet year, but be hundreds of meters from surface water in dry years (USFWS 2002: D-12). This is particularly true of reservoir sites such as the Kern River at Lake Isabella, CA, Roosevelt Lake, AZ, and Elephant Butte Reservoir, NM (USFWS 2002: D-12). Similarly, where a river channel has changed naturally there may be a total absence of water or visibly saturated soil for several years (Sferra et al. 1997). In such cases, the riparian vegetation and any flycatchers breeding within it may persist for several years (USFWS 2002: D-12).

In some areas, natural or managed hydrologic cycles can create temporary flycatcher habitat, but may not be able to support it for an extended amount of time, or may support varying amounts of habitat at different points in the cycle. Some dam operations create varied situations that allow different plant species to thrive when water is released below a dam, held in a lake, or removed from a lakebed, and consequently, varying degrees of flycatcher habitat are available as a result of dam operations (USFWS 2002: 33).

The riparian vegetation that constitutes southwestern willow flycatcher breeding habitat requires substantial water (USFWS 2002: D-12). Because southwestern willow flycatcher breeding habitat is often where there is slow moving or still water, these slow and still water conditions may also be important in influencing the production of insect prey base for flycatcher food (USFWS 2002: D-12)

Sites for Germination or Seed Dispersal

Subsurface hydrologic conditions may, in some places (particularly at the more arid locations of the Southwest), be equally important to surface water conditions in determining riparian vegetation patterns (Lichivar and Wakely 2004). Where groundwater levels are elevated to the point that riparian forest plants can directly access those waters it can be an area for both breeding, and non-breeding, territorial, dispersing, foraging, and migrating southwestern willow flycatchers, and elevated groundwater helps create moist soil conditions believed to be important for nesting conditions and prey populations (USFWS 2002: 11 and 18), as further discussed below.

Depth to groundwater plays an important part in the distribution of riparian vegetation (AZ Department of Water Resources 1994) and consequently, southwestern willow flycatcher habitat. The greater the depth to groundwater below the land surface, the less abundant the riparian vegetation (AZ Department of Water Resources 1994). Localized perched aquifers (i.e., a saturated area that sits above the main water table) can and do support some riparian habitat, but these systems are not extensive (AZ Department of Water Resources 1994)...

Reproduction and Rearing of Offspring

Southwestern willow flycatchers nest in thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft) (USFWS 2002: D-3). Lower-stature thickets (2-4 m or 6-13 ft tall) tend to be found at higher elevation sites, with tall-stature habitats at middle- and lower-elevation riparian forests (USFWS 2002: D-2). Nest sites typically have dense foliage at least from the ground level up to approximately 4 m (13 ft) above ground, although dense foliage may exist only at the shrub level, or as a low, dense tree canopy (USFWS 2002: D-3).

Riparian habitat characteristics such as dominant plant species, size and shape of habitat patches, tree canopy structure, vegetation height, and vegetation density are essential qualities of southwestern willow flycatcher breeding habitat, although they may vary widely at different sites (USFWS 2002: D-1). The accumulating knowledge of flycatcher breeding sites reveals important areas of similarity which constitute the basic concept of what is suitable breeding habitat (USFWS 2002: D-2). These habitat features are generally discussed below.

Regardless of the plant species composition or height, breeding sites usually consist of dense vegetation in the patch interior, or an aggregate of dense patches interspersed with openings (USFWS 2002: 11). In most cases this dense vegetation occurs within the first 3 to 4 m (10 to 13 ft) above ground (USFWS 2002: 11). These dense patches are often interspersed with small openings, open water or marsh, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense (USFWS 2002: 11).

Common tree and shrub species currently known to comprise nesting habitat include Goodings willow (Salix gooddingii), coyote willow (Salix exigua), Geyers willow (Salix geyerana), arroyo willow (Salix lasiolepis), red willow (Salix laevigata), yewleaf willow (Salix taxifolia), pacific willow (Salix lasiandra), boxelder (Acer negundo), tamarisk (Tamarix ramosissima), and Russian olive (Eleagnus angustifolia) (USFWS 2002: D-2, 11). Other plant species used for nesting have been buttonbush (Cephalanthus occidentalis), cottonwood, stinging nettle (Urtica dioica), alder (Alnus rhombifolia, Alnus oblongifolia, Alnus tenuifolia), velvet ash (Fraxinus velutina), poison hemlock (Conium maculatum), blackberry

(Rubus ursinus), seep willow (Baccharis salicifolia, Baccharis glutinosa), oak (Quercus agrifolia, Quercus chrysolepis), rose (Rosa californica, Rosa arizonica, Rosa multiflora), sycamore (Platinus wrightii), giant reed (Arundo donax), false indigo (Amorpha californica), Pacific poison ivy (Toxicodendron diversilobum), grape (Vitus arizonica), Virginia creeper (Parthenocissus quinquefolia), Siberian elm (Ulmus pumila), and walnut (Juglans hindsii) (USFWS 2002: D-3, 5, and 9). Other species used by nesting southwestern willow flycatchers may become known over time as more studies and surveys occur.

Nest sites typically have a dense tree and/or shrub canopy (USFWS 2002: D-3). Canopy density (the amount of cover provided by tree and shrub branches measured from the ground) at various nest sites ranged from 50 percent to 100 percent.

Southwestern willow flycatcher breeding habitat can be generally organized into three broad habitat types--those dominated by native vegetation (willow and cottonwood), by exotic (i.e., non-native) vegetation (salt cedar), and those with mixed native and exotic plants (salt cedar and willow). These broad habitat descriptors reflect the fact that southwestern willow flycatchers inhabit riparian habitats dominated by both native and non-native plant species. Salt cedar and Russian olive are two exotic plant species used by flycatchers for nest placement and also foraging and shelter (USFWS 2002: D-4). ...

Food

The willow flycatcher is somewhat of an insect generalist (USFWS 2002: 26), taking a wide range of invertebrate prey including flying, and ground-, and vegetation-dwelling species of terrestrial and aquatic origins (Drost et al. 2003). Wasps and bees (Hymenoptera) are common food items, as are flies (Diptera), beetles (Coleoptera), butterflies/moths and caterpillars (Lepidoptera), and spittlebugs (Homoptera) (Beal 1912; McCabe 1991). Plant foods such as small fruits have been reported (Beal 1912; Roberts 1932; Imhof 1962), but are not a significant food during the breeding season (McCabe 1991). Diet studies of adult southwestern willow flycatchers (Drost et al. 1997; DeLay et al. 1999) found a wide range of prey taken. Major prey items were small (flying ants) (Hymenoptera) to large (dragonflies) (Odonata) flying insects, with, Diptera and Hemiptera (true bugs) comprising half of the prey items. Willow flycatchers also took non-flying species, particularly Lepidoptera larvae. From an analysis of southwestern willow flycatcher diet along the South Fork of the Kern River, CA, (Drost et al. 2003) flycatchers consumed a variety of prey from 12 different insect groups. Willow flycatchers have been identified targeting seasonal hatchings of aquatic insects along the Salt River arm of Roosevelt Lake, AZ (E. Paxton, USGS, e-mail).

Southwestern willow flycatcher food availability may be largely influenced by the density and species of vegetation, proximity to and presence of water, saturated soil levels, and microclimate features such as temperature and humidity (USFWS 2002). Flycatchers forage within and above the canopy, along the patch edge, in openings within the territory, over water, and from tall trees as well as herbaceous ground cover (Bent 1960; McCabe 1991). Willow flycatchers employ a ``sit and wait" foraging tactic, with foraging bouts interspersed with longer periods of perching (Prescott and Middleton 1988).

Pursuant to our regulations, we are required to identify the known physical and biological features or PCEs, essential to the conservation of the southwestern willow flycatcher, together with a description of any Critical Habitat that is designated. Based on our current knowledge of the life history, biology, and

ecology of the species and the requirements of the habitat to sustain the essential life history functions of the species, we have determined that the southwestern willow flycatcher's primary constituent elements are: (1) Riparian habitat in a dynamic successional riverine environment (for nesting, foraging, migration, dispersal, and shelter) that comprises: (a) Trees and shrubs that include Gooddings willow (Salix gooddingii), coyote willow (Salix exigua), Geyers willow (Salix geyerana), arroyo willow (Salix lasiolepis), red willow (Salix laevigata), yewleaf willow (Salix taxifolia), pacific willow (Salix lasiandra), boxelder (Acer negundo), tamarisk (Tamarix ramosissima), Russian olive (Eleagnus angustifolia), buttonbush (Cephalanthus occidentalis), cottonwood (Populus fremontii), stinging nettle (Urtica dioica), alder (Alnus rhombifolia, Alnus oblongifolia, Alnus tenuifolia), velvet ash (Fraxinus velutina), poison hemlock (Conium maculatum), blackberry (Rubus ursinus), seep willow (Baccharis salicifolia, Baccharis glutinosa), oak (Quercus agrifolia, Quercus chrysolepis), rose (Rosa californica, Rosa arizonica, Rosa multiflora), sycamore (Platinus wrightii), false indigo (Amorpha californica), Pacific poison ivy (Toxicodendron diversilobum), grape (Vitus arizonica), Virginia creeper (Parthenocissus quinquefolia), Siberian elm (Ulmus pumila), and walnut (Juglans hindsii). (b) Dense riparian vegetation with thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle- and lower-elevation riparian forests; (c) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub level, or as a low, dense tree canopy; (d) Sites for nesting that contain a dense tree and/or shrub canopy (the amount of cover provided by tree and shrub branches measured from the ground) (i.e., a tree or shrub canopy with densities ranging from 50 percent to 100 percent); (e) Dense patches of riparian forests that are interspersed with small openings of open water or marsh, or shorter/sparser vegetation that creates a mosaic that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac); and (2) A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, including: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies/moths and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

The discussion above outlines those physical and biological features essential to the conservation of the southwestern willow flycatcher and presents our rationale as to why those features were selected. The primary constituent elements described above are results of the dynamic river environment that germinates, develops, maintains, and regenerates the riparian forest and provides food for breeding, non-breeding, dispersing, territorial, and migrating southwestern willow flycatchers. Anthropogenic factors such as dams, irrigation ditches, or agricultural field return flow can assist in providing conditions that support flycatcher habitat. Because the flycatcher exists in disjunct breeding populations across a wide geographic and elevation range, and is subject to dynamic events, Critical Habitat river segments described below are essential for the flycatcher to maintain metapopulation stability, connectivity, gene flow, and protect against catastrophic loss. All river segments designated as southwestern willow flycatcher Critical Habitat are within the geographical area occupied by the species and contain at least one of the primary constituent elements. It is important to recognize that the PCEs are present throughout the river segments selected (PCE 1a and 2), but the specific quality of riparian habitat for nesting (PCE 1b, 1c, 1d, 1e), migration (PCE 1), foraging (PCE 1 and 2), and shelter (PCE 1) will not remain constant in their condition or location over time due to succession (i.e., plant germination and growth) and the dynamic environment in which they exist. ..."

Most of the habitat onsite that supports the primary constituent elements for southwestern willow flycatcher is within the approximate 25-year floodplain of the San Luis Rey River. A few areas may extend beyond the approximate 25-year floodplain, but are within the 50- to 100 year floodplains. The designated Critical Habitat onsite for southwestern willow flycatcher is similar to the designated Critical Habitat onsite for least Bell's vireo.

3.3.3 Arroyo Southwestern Toad (*Bufo californicus*)

3.3.3.1 Status of the Species

The arroyo toad is a Federal endangered species, and State Species of Special Concern that is found in shallow pools and open sand and gravel flood terraces of medium- to large-sized intermittent or perennial streams that are flooded on a fairly regular basis. They are known to breed in smaller streams and deep canyons and use upland habitats as juveniles, subadults, and adults (USFWS 1999, as cited in the 2006 RPDEIR).

In 1995 surveys, numerous tadpoles and newly emerged toadlets were observed along the San Luis Rey River and its banks (Dudek 1995). Male toads were also heard calling from the river in and adjacent to the property in 1993 and 1995. Dudek biologists estimated approximately 25 male toads calling in the segment of the San Luis Rey River between Pala and I-15 in a single night, including a breeding population in the Fenton sand mine bordering the property to the east and a male calling from the river at the existing low-flow crossing on the property. The population along this segment of the river is considered a major population on a range-wide level. In 1998, three calling juvenile male toads were observed along the San Luis Rey River on the property, two of which occurred at the project area. In 2000, 3 to 9 toads were observed, the majority of which were observed along the SDCWA aqueduct road south of the San Luis Rey River (San Diego County Department of Environmental Health 2003). Several (7-15) arroyo toads were confirmed in the San Luis River during multiple visits to the property by URS biologists in 2005.

3.3.3.2 Critical Habitat

There is no designated or proposed Critical Habitat onsite or within San Diego County for arroyo toad.

3.3.4 Coastal California Gnatcatcher (*Polioptila californica californica*)

3.3.4.1 Status of the Species

The coastal California gnatcatcher is a Federal threatened species and State Species of Special Concern that has been observed twice on the property, at the proposed landfill site (Plate 2). A single male was seen in late July 1995, north of Highway 76 (Dudek 1995). A second single male was observed on the property on one occasion in April 1998 during protocol surveys in the footprint of Borrow/Stockpile Area B (County of San Diego Department of Environmental Health 2002). Biologists permitted to perform gnatcatcher surveys were subsequently on site in gnatcatcher habitat 6 additional times during the 1998 breeding season and no gnatcatchers were observed or detected. Previous surveys for the gnatcatcher in 1989, 1991, 1992, and 1993 (Butler Roach Group 1990; PSBS 1991; MBA 1992; Ogden unpub. data

1993, as cited in the 2006 RPDEIR) on the property were negative. In 2000, gnatcatcher survey results were also negative (Appendix L of the 2006 RPDEIR). The limited sightings and the absence of nearby core populations (Mock 1993, 1998, 2004) suggest the property is of low to marginal value for gnatcatchers (Ogden 1995) (San Diego County Department of Environmental Health 2002). In 2005, URS biologists permitted to perform gnatcatcher surveys did not detect gnatcatchers while on site during the breeding season and confirmed that the habitat continued to be of low value for gnatcatchers.

3.3.4.2 Critical Habitat

Critical Habitat for the coastal California gnatcatcher that was designated on October 24, 2000 (65 FR 206) occurs onsite (Plate 3). The USFWS reopened proposed Critical Habitat for coastal California gnatcatcher on April 24, 2003 (68 FR 79) for public comment. Pending a final designation after the April 24, 2003 reopening for comment, the USFWS is using the Critical Habitat designated on October 24, 2000 as Critical Habitat. This Biological Assessment shows both the current designated Critical Habitat from October 24, 2000 and the proposed Critical Habitat reopened for comment from April 24, 2003, both of which are within Unit 5, on Plate 3. The USFWS has determined primary constituent elements for coastal California gnatcatcher to include:

"The primary constituent elements for the coastal California gnatcatcher are those habitat components that provide for foraging, nesting, rearing of young, intraspecific communication, roosting, dispersal, genetic exchange, or sheltering (Atwood 1990). Primary constituent elements are provided in undeveloped areas that support, through natural successional processes (e.g., post-fire recovery), various types of sage scrub or chaparral, grassland, and riparian habitats where they may be utilized for biological needs such as breeding, foraging, or dispersal (Atwood et al. 1998; Campbell et al. 1998). Primary constituent elements associated with the biological needs of dispersal are also found in undeveloped areas that provide connectivity or linkage between larger core areas, including open space and ruderal (weedy areas that contain introduced plant species) disturbed areas that may receive only periodic use. Probable dispersing individuals have been documented in vegetation dominated by such species as Brass[chyph]ica spp. (wild mustard), annual grasses, Salsola tragus (Russian thistle), Baccharis salicifolia (mule fat), Salix spp. (willow), and Tamarix spp. (salt cedar) (Campbell et al. 1998). Some of these species may also be used seasonally by territorial birds as coastal sage scrub dessicates during the summer drought (Campbell et al. 1998).

Primary constituent elements include, but are not limited to, the following plant communities: Venturan coastal sage scrub, Diegan coastal sage scrub, maritime succulent scrub, Riversidean sage scrub, Riversidean alluvial fan scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub (Holland 1986; Kirkpatrick and Hutchinson 1977; Westman 1983). Based upon dominant species, these communities have been further divided into series such as black sage, brittlebush, California buckwheat, California buckwheat-white sage, California encelia, California sagebrush, California sagebrush-black sage, California sagebrush-California buckwheat, coast prickly-pear, mixed sage, purple sage, scalebroom, and white sage (Sawyer and Keeler-Wolf 1995). Dominant species within these plant communities include Artemisia californica, Eriogonum fasciculatum, Encelia californica, Salvia mellifera, S. apiana, and S. leucophylla. Other commonly occurring plants include Isocoma menziesii (coast goldenbush), Viguiera laciniata (San Diego sunflower), Baccharis pilularis (coyote brush), Baccharis sarothroides (broom baccharis), Mimulus aurantiacus (bush monkeyflower), Sambucus

mexicana (Mexican elderberry), Isomeris arborea (bladderpod), Lotus scoparius, Malosma laurina (laurel sumac), Rhus integrifolia (lemonadeberry), and Rhus ovata (sugarbush). Species such as Lycium spp. (boxthorn), Euphorbia misera (cliff spurge), Simmondsia chinensis (jojoba), and Opuntia littoralis (prickly pear), O. prolifera (cholla), and Ferocactus viridescens (coast barrel cactus), and Dudleya spp. (live-forever) are represented in maritime succulent scrub, coast prickly-pear scrub, and southern coastal bluff scrubs. In areas of coastal influence, chamise chaparral has also been documented to support breeding pairs (Campbell et al. 1998). Mesic sites dominated by Baccharis salicifolia and other Baccharis species such as Baccharis pilularis and Baccharis sarathroides may also support breeding pairs (Campbell et al. 1998)."

The areas of Critical Habitat onsite designated by the USFWS in 2000 generally contain vegetation types consistent with the primary constituent elements identified by the USFWS, although portions of the areas do not (especially along the San Luis Rey River within the historic grazing areas and lands formerly developed for the dairies, housing, and the like). The areas of proposed Critical Habitat that were reopened for comment in 2003 include the eastern half of the proposed landfill site within Gregory Canyon plus a sizeable portion of Gregory Mountain east of the proposed landfill site (Plate 3). This additional area reopened for comment in 2003 generally lacks the vegetation types consistent with the primary constituent elements identified by the USFWS, and instead, consists of dense chaparral and large areas of rock outcrops on the steep mountainside. Coastal California gnatcatcher have never been observed in these additional areas during prior surveys for the species.

3.3.5 Quino Checkerspot Butterfly (*Euphydryas editha quino*)

3.3.5.1 Status of the Species

Quino checkerspot butterfly is protected as a Federal endangered species. Host plants (dot-seed plantain [*Plantago erecta*] and owl's clover [*Castilleja exserta*]) for the QCB have been observed on the property (Figure 3). However, surveys conducted during the 1998 and 2000 flight seasons determined that QCB is not present on the property (San Diego County Department of Environmental Health 2003). QCB also were not observed at the property during protocol surveys in 2005. Potential habitat existed in very small patches scattered within the survey area as observed by URS in 2005; however, many of the areas were located along the roads and in previously disturbed habitat, and as the butterfly flight season progressed, annual grasses further degraded these potential habitat areas.

3.3.5.2 Critical Habitat

There is no Critical Habitat for quino checkerspot butterfly onsite.

SECTION 4 IMPACTS

This section addresses impacts of the project on listed species and designated Critical Habitat that may result from the project relative to the environmental baseline described in Section 3.0. Direct impacts are those impacts that will occur as a result of constructing and operating the project, including implementation of mitigation measures. Indirect impacts are defined by the USFWS as those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (USFWS 1998). A summary of impacts on vegetation habitats within the action area from URS (2006) and the 2006 RPDEIR is provided in Table 1. Note that the final EIR will be updated to reflect impacts on 0.4 acres of southern willow scrub, 0.4 acres of disturbed southern willow scrub, and 0.2 acres of open channel, which is not jurisdictional waters of the U.S.

Cumulative effects are defined as those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the Federal action area (this definition applies only to Section 7 of the Federal Endangered Species Act and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws) (USFWS 1998). An extensive cumulative effects analysis was prepared in the 2003 EIR and the 2006 RPDEIR (Appendix C) that addressed potential cumulative effects within the Federal action area and a much larger area within the region. This assessment of cumulative effects is considered in the discussion below.

4.1 EFFECTS OF THE ACTION ON LEAST BELL'S VIREO

4.1.1 Direct, Indirect, and Cumulative Impacts

There will be direct impacts within the action area of 0.4 acres of southern willow scrub, 0.2 acres of cottonwood-willow riparian forest, 0.4 acres of disturbed southern willow scrub, and 0.2 acres of open channel (not jurisdictional waters of the U.S.) (Table 1). There will be 0.368 acres of temporary impact and 0.002 acres of permanent impact on wetland waters of the U.S. (0.37 acres total) as a result of bridge construction, which are included within the total of 0.4 acres of southern willow scrub affected by the project. The 0.4 acres of impact on southern willow scrub is derived from rounding 0.37 acres to the nearest 1/10th of an acre. Impact acreage was rounded to the nearest 1/10th of an acre for CEQA review. All of these areas are within Critical Habitat for least Bell's vireo (Plate 3) and are the areas of Critical Habitat that support the primary constituents elements for this species. There will be a total of 0.368 acres of temporary impact and 0.002 acres of permanent impact on Critical Habitat that support the primary constituent elements for least Bell's vireo. The bridge project will also result in the creation of 2.3 acres of riparian habitat, which is a beneficial effect of the project.

The 0.4 acres of southern willow scrub that will be affected by the project has been demonstrated to support least Bell's vireo nesting. Depending upon the location of nesting territories at the time of construction of the bridge, 1 or 2 nesting territories may be affected. Revegetation in the disturbance areas and creation of 2.3 acres of riparian habitat at the bridge will ensure that such effects are temporary and that no nesting territories will be lost in the long term at the bridge.

Temporary impacts on Critical Habitat will be of short duration and revegetation in these riparian areas is expected to occur within 3 to 5 years. The same amount of time is expected to be required to establish

riparian habitat within the 2.3 acres of creation area associated with the bridge. Therefore, the project will result in a net increase in Critical Habitat supporting primary constituent elements for least Bell's vireo onsite.

The project has the potential to indirectly affect least Bell's vireo during construction and operation. However, design features have been incorporated in the project and also recommended by the County of San Diego and incorporated in mitigation measures in the 2006 RPDEIR that will minimize impacts from human activity and the associated noise to avoid adverse effects on least Bell's vireo from construction noise, daily equipment operation, and truck traffic on the access road to the landfill including the bridge. These measures are described in Section 5.0.

The landfill project will also result in increased traffic along SR 76, as addressed in the 2006 RPDEIR and by URS (2006), with increased noise generated by the traffic associated with the landfill. This increase in noise will be an indirect effect of the project and includes the opportunity for a cumulative effect within the Federal action area for the project. The analysis provided within the 2006 RPDEIR and URS (2006) includes consideration of these indirect and/or cumulative effects. The noise contour above 60 dBA L_{eq} resulting from operation of the landfill project and beyond the existing environmental baseline will result in noise impacts on 7.1 acres of riparian habitat (4.0 acres of southern willow scrub and 3.1 acres of cottonwood-willow riparian forest) on the greater landfill property, plus an additional 12.9 acres of riparian habitat offsite between the landfill site and I-15, for a total of 20 acres. Mitigation for these noise effects is described in Section 5.0.

Least Bell's vireo are expected to continue to use the riparian habitat and Critical Habitat in the vicinity of the bridge and within the area of noise impacts along SR 76 at levels that are the same as, or greater than the existing environmental baseline, and no loss of potential to support breeding is expected to occur. The bridge and the landfill will not prevent vireo from using the area or moving through the area along existing migration corridors. Therefore, the project will not result in fragmentation of Critical Habitat or habitat for least Bell's vireo in general and will not contribute to cumulative effects within the action area or region in general. Implementation of the mitigation measures described in Section 5.0 will result in a net benefit to the species as a result of the project; thus, fully compensating for impacts on the species and its Critical Habitat and not jeopardizing the continued existence of the species.

4.2 EFFECTS OF THE ACTION ON SOUTHWESTERN WILLOW FLYCATCHER

4.2.1 Direct, Indirect, and Cumulative Impacts

There will be direct impacts within the action area of 0.4 acres of southern willow scrub, 0.2 acres of cottonwood-willow riparian forest, 0.4 acres of disturbed southern willow scrub, and 0.2 acres of open channel (not jurisdictional waters of the U.S.) (Table 1), which are the same areas described for least Bell's vireo. There will be 0.368 acres of temporary impact and 0.002 acres of permanent impact on wetland waters of the U.S. (0.37 acres total) as a result of bridge construction, which are included within the total of 0.4 acres of southern willow scrub affected by the project. The 0.4 acres of impact on southern willow scrub is derived from rounding 0.37 acres to the nearest 1/10th of an acre. Impact acreage was rounded to the nearest 1/10th of an acre for CEQA review. All of these areas are within Critical Habitat

for southwestern willow flycatcher (Plate 3) and are the areas of Critical Habitat that support the primary constituents elements for this species. There will be a total of 0.368 acres of temporary impact and 0.002 acres of permanent impact on Critical Habitat that support the primary constituent elements for southwestern willow flycatcher. The bridge project will also result in the creation of 2.3 acres of riparian habitat, which is a beneficial effect of the project.

The 0.4 acres of southern willow scrub that will be affected by the project may support southwestern willow flycatcher and one nesting territory may be affected. Revegetation of the disturbance areas and creation of 2.3 acres of riparian habitat at the bridge will ensure that such effects are temporary and that no nesting territories will be lost in the long term at the bridge.

Temporary impacts on Critical Habitat will be of short duration and revegetation in these riparian areas is expected to occur within 3 to 5 years. The same amount of time is expected to be required to establish riparian habitat within the 2.3 acres of creation area associated with the bridge. Therefore, the project will result in a net increase in Critical Habitat supporting primary constituent elements for southwestern willow flycatcher onsite.

The project has the potential to indirectly affect southwestern willow flycatcher during construction and operation. However, design features have been incorporated in the project and also recommended by the County of San Diego and incorporated in mitigation measures in the 2006 RPDEIR that will minimize impacts from human activity and the associated noise to avoid adverse effects on southwestern willow flycatcher from construction noise, daily equipment operation, and truck traffic on the access road to the landfill including the bridge. These measures are described in Section 5.0.

The landfill project will also result in increased traffic along SR 76, as addressed in the 2006 RPDEIR and by URS (2006), with increased noise generated by the traffic associated with the landfill. This increase in noise will be an indirect effect of the project and includes the opportunity for a cumulative effect within the action area for the project. The analysis provided within the 2006 RPDEIR and URS (2006) includes consideration of these indirect and/or cumulative effects. The noise contour above 60 dBA L_{eq} resulting from operation of the landfill project and beyond the existing environmental baseline will result in noise impacts on 7.1 acres of riparian habitat (4.0 acres of southern willow scrub and 3.1 acres of cottonwood-willow riparian forest) on the greater landfill property, plus an additional 12.9 acres of riparian habitat offsite between the landfill site and I-15, for a total of 20 acres. Mitigation for these noise effects is described in Section 5.0.

Southwestern willow flycatcher are expected to continue to use the riparian habitat and Critical Habitat in the vicinity of the bridge and within the area of noise impacts along SR 76 at levels that are the same as, or greater than the existing environmental baseline, and no loss of potential to support breeding is expected to occur. The bridge and the landfill will not prevent vireo from using the area or moving through the area along existing migration corridors. Therefore, the project will not result in fragmentation of Critical Habitat or habitat for southwestern willow flycatcher in general and will not contribute to cumulative effects within the action area or region in general. Implementation of the mitigation measures described in Section 5.0 will result in a net benefit to the species as a result of the project; thus, fully compensating for impacts on the species and its Critical Habitat and not jeopardizing the continued existence of the species.

4.3 EFFECTS OF THE ACTION ON ARROYO SOUTHWESTERN TOAD

4.3.1 Direct, Indirect, and Cumulative Impacts

Information about arroyo toad (*Bufo californicus*) in the Gregory Canyon Landfill 2003 EIR and Final Biological Technical Report was reviewed. Information reviewed included arroyo toad location data, as well as potential impacts on the species. In addition, impacts described in the 2003 EIR were re-evaluated using the same assumptions that were originally used in the 2003 EIR and Final Biological Technical Report to quantify the impacts on the species to arrive at updated arroyo toad impact acreages. The assumptions used in the 2003 EIR and Final Biological Technical Report, and in this review, to quantify impacts on arroyo toad follow guidance from the U.S. Fish and Wildlife Service (USFWS) recovery plan for the arroyo toad (USFWS 1999).

According to the 2003 EIR and Final Biological Technical Report, the quantified direct impacts on arroyo toad resulting from the construction of the landfill are as follows:

"...Direct [significant] *impacts resulting in the loss of approximately 3.1 acres of toad riparian breeding habitat would occur from construction of the bridge. Only 0.005 acre of this would be permanent impact due to bridge pilings..."*

"...Direct significant impacts resulting in the loss of approximately 306 acres of potential toad upland habitat would occur from construction of the landfill and related facilities...These upland habitat impacts were calculated assuming that any upland habitat disturbance within 2.0 kilometers of the river channel on site would be significant..."

"...These upland habitat impacts were calculated assuming that any upland habitat disturbance within 2.0 kilometers of the river channel on site would be significant. However, it should be noted that toads commonly travel up to 0.5 kilometer from the stream and that the distance toads travel from breeding sites depends on topography and the extent of suitable habitat (USFWS 1999). Suitable upland habitats must contain substantial areas of fine sand for burrowing (USFWS 1999c). If only impacts to upland areas within 2.0 kilometers of the river channel that contain fine sand (consisting of Tujunga sand [TuB], Visalia sand loams [VaA and VaB] and Fallbrook sandy loam [FaD2] as depicted in Figure 4.2-4) are considered, the potential loss of toad upland habitat used for burrowing would be reduced to approximately 32 acres. The majority of this acreage would occur primarily in grassland, agricultural, and oak woodland habitats where the access road, facilities area, desilting basins, and parts of Borrow/Stockpile Area A are located..."

Other potential impacts mentioned in the 2003 EIR and Final Biological Technical Report include roadkill because of increased traffic, loss of individuals from implementation of arroyo toad habitat creation/enhancement areas, attraction of arroyo toad predators to the project area, water quality-related impacts, and night lighting-related impacts. Of these, increased traffic and attraction of arroyo toad predators are labeled as potentially significant impacts.

It is important to note that the 2003 EIR and Final Biological Technical Report differentiate between potential arroyo toad upland habitat and suitable arroyo toad upland habitat. According to the 2003 EIR and Final Biological Technical Report, potential arroyo toad upland habitat occurs within 2 kilometers of

the river channel. Suitable arroyo toad upland habitat is defined as areas within 2 kilometers of the stream supporting fine sand. The 2003 EIR and Final Biological Technical Report designate the areas that contain fine sand as being the following soil types: Tujunga sand [TuB], Visalia sand loams [VaA and VaB] and Fallbrook sandy loam [FaD2]. Both potential and suitable arroyo toad upland habitat are addressed in this current evaluation.

URS re-evaluated impacts on arroyo toad using the assumptions from the 2003 EIR and Final Biological Technical Report. The USFWS (1999) states that arroyo toad upland habitat generally refers to non-riparian habitat up to two kilometers away from breeding habitat. According to Table 4.9-4 in the 2003 EIR, the total acreage impacted by the landfill is 308.2 acres. If the riparian-associated vegetation communities that were identified in the 2003 EIR are subtracted from this total, 0.2 acres of mule fat scrub, 2.4 acres of southern willow scrub, and 0.2 acres of open channel, the assumed total arroyo toad upland habitat impacts are 305.4 acres, which if rounded up, appears to correspond to 306 acres of potential arroyo toad habitat referred to in the 2003 EIR and Final Biological Technical Report.

The approximately 306 acres of potential toad upland habitat indicated in the 2003 EIR and Final Biological Technical Report that would be affected by construction of the landfill and related facilities is unlikely to actually represent actively, or even casually used arroyo toad upland habitat. The 2003 EIR and Final Biological Technical Report, which combine data gathered since 1989, do not report arroyo toads as occurring farther than approximately 0.5 miles from the San Luis Rey River. Furthermore, the data from these studies show that the arroyo toad point locations are strongly associated with the soil types mentioned in the 2003 EIR text presented above, in specific locations onsite where the preferred soil conditions are actually present. In addition, surveys conducted by URS in 2005 did not detect arroyo toads in the uplands beyond the San Luis Rey River floodplain (Table 2). Therefore, arroyo toads are most likely distributed within 0.5 miles of the San Luis Rey River where appropriate soils are present as shown in 2003 EIR Exhibit 4.9-2, and Figure 6.

The soils present in the uplands beyond the greater San Luis River floodplain are not suitable for arroyo toad burrowing. Arroyo toads burrow into fine sands to avoid desiccation and predation. According to the NRCS soils map, the soil types present in the majority of these uplands include Acid igneous rock (AcG), Las Posas stony fine sandy loam, 30 to 65 percent slopes (LrG), Cieneba-Fallbrook rocky sandy loams (CnG2), Cieneba coarse sandy loam, 30 to 65 percent slopes, eroded (ClG2), and Cieneba very rock coarse sandy loam, 30 to 75 percent slopes (CmrG). The soil type descriptions indicate these are generally shallow soils in steep areas with a hard texture and numerous rock outcrops (NRCS 1973), which is representative of conditions onsite. URS surveys in the southern portion of the project area generally confirm the NRCS soil descriptions, and observed that dense chaparral and coastal sage scrub vegetation dominates the project area. Mammal burrows were observed in these areas, and "although California toads [*Bufo boreas halophilus*] will use small mammal burrows in areas where soils are compacted, arroyo toads apparently will not." (W.E. Haas *et al. in litt.* 1998, as referenced in USFWS 1999). Therefore, the soil types present in the uplands beyond the greater San Luis Rey River floodplain should not be considered potential arroyo toad upland habitat because these areas are not suitable for burrowing.

URS conducted a GIS analysis to confirm, if possible, the 32 acres of impacts on suitable arroyo toad upland habitat stated in the 2003 EIR and Final Biological Technical Report using the assumptions from

the 2003 EIR and Final Biological Technical Report. The entire project impact footprint exists within two kilometers from the San Luis Rey River. The riparian habitat boundary (i.e., arroyo toad non-upland habitat) associated with the San Luis Rey River was mapped within the property using a 2002 aerial photo. This riparian habitat boundary was excluded from the URS suitable arroyo toad upland habitat acreage total. In addition to the aerial photo, property boundary, and riparian habitat boundary, the NRCS soils map for the project area, and the current project impact footprint were overlaid within the GIS layout. Areas of suitable arroyo toad upland habitat impacts were measured where the project footprint intersects with the suitable arroyo toad soil types as mentioned in the 2003 EIR and Final Biological Technical Report (i.e., Tujunga sand [TuB], Visalia sand loams [VaA and VaB] and Fallbrook sandy loam [FaD2]) outside of the riparian habitat boundary. The sum of these areas is 17.5 acres of suitable arroyo toad upland habitat impacts (Table 3). Figure 6 shows the location of these areas.

We are unable to verify or reproduce the 32 acres stated in the 2003 EIR and Final Biological Technical Report. As shown in Figure 6, the mapped riparian habitat boundary contains little project impact acreage. Therefore, the impact area does not approach the 32 acres even if the riverine and riparian habitat boundary were included in the calculations (there will be 0.0368 acres of temporary impact and 0.0002 acres of permanent impact on waters of the U.S. where bridge pilings will be placed). The impact on potentially suitable arroyo toad upland habitat based on NRCS soil data is 17.5 acres.

Many portions of the suitable arroyo toad upland habitat impact area actually are unsuitable for arroyo toad burrowing because of local soil conditions, and the 17.5 acres is an overestimate of actual suitable arroyo toad upland habitat impacts. Unsuitable areas included in the analysis are existing paved and dirt roads and other developed areas that will be affected by the project. Specifically, a portion of State Route 76 will be realigned, and an access road through the Lucio Dairy and associated buildings will be constructed. These are developed areas that exist within the soil types shown in Table 3, and they are not suitable for arroyo toad burrowing.

Another area included in this analysis that is likely unsuitable arroyo toad upland habitat is found in Borrow Area A in the western portion of the project site (Figure 6). According to the NRCS soils map, a portion of Borrow Area A supports Visalia sandy loam, 0 to 2 percent slopes (VaA), among other non-suitable arroyo toad soil types. Based on field observations in December 2005, Borrow Area A is highly disturbed from prior agricultural use. Topographically, the VaA area exists in a shallow swale that slopes west-northwest towards the San Luis Rey River floodplain. Adjacent to the swale are steeper hills supporting coastal sage scrub to the north, east, and southeast, with agriculture to the west within the San Luis Rey River floodplain. As of the December 2005 visit, the area supported dense ruderal vegetation and the ground showed evidence of historic mechanical plowing or disking. The 2002 aerial used in the GIS analysis shows the area as plowed and devoid of vegetation. The soils were hard and high in fine silt in this area, and generally did not reflect the soil type description for Visalia sandy loam. Therefore, the majority of this area is not suitable as arroyo toad upland habitat based on the degree of disturbance and the fact that the native soils mapped here have been substantially modified by historic uses.

Much of the suitable arroyo toad upland habitat as indicated by the soils in Table 3 is dominated by non-native grassland and ruderal vegetation communities. These vegetation communities are generally considered unsuitable for arroyo toads because the dense grasses and ruderal species may provide a barrier to arroyo toad movement and their roots may make burrowing difficult. Furthermore, according to

the data compiled in the 2003 EIR, it appears that the majority of the arroyo toads detected in the uplands (i.e. outside the riparian habitat) were observed on roads. In our experience, arroyo toads will preferentially move along roads and paths devoid of vegetation during their nocturnal activity period, but cannot burrow into the roads or paths unless the soils are substantially loose and soft with appropriate grain size. The existing roads onsite are generally hard-packed soil that is not suitable for burrowing by arroyo toads. Therefore, it is likely that the 17.5 acres of suitable arroyo toad upland habitat determined based on the NRCS soils maps is an overestimate of actual impacts on arroyo toads. In addition, major portions of these areas supporting dense non-native grassland and ruderal vegetation communities is proposed to be enhanced and preserved onsite to provide more suitable arroyo toad upland habitat. If the suitable arroyo toad upland habitat impacts within developed areas and a portion of Borrow Area A are not included because they are not actually suitable, we estimate the project will more accurately result in impacts on approximately 10.5 acres of suitable arroyo toad upland habitat. This acreage number was attained based on the assumptions provided in 2003 EIR and Final Biological Technical Report, which in turn are based on guidance published in the USFWS recovery plan for the arroyo toad (1999).

In light of the preceding, the acreage of suitable arroyo toad upland habitat impacts is 10.5 acres. Studies to date have not documented use of this upland habitat by arroyo toads, except for a sighting on one of the existing dirt roads onsite. These impacts of 10.5 acres (or even 17.5 acres or 32 acres as described in the 2003 EIR) will be mitigated to a level below significance by habitat enhancement and/or creation planned for 88 acres of upland habitat onsite as described in MM 4.9-4 and Exhibit 4.9-6 of the 2006 RPDEIR. This mitigation of 88 acres would occur in addition to riparian habitat mitigation at the bridge and proposed open space dedication. This mitigation could occur within the 134.5 acres of upland habitat identified as available for creation of vegetation communities onsite and outside of the right of way of the pipelines as part of the current analysis (see Section 2.0). This 88 acres of mitigation is consistent with the level of mitigation provided in the 2003 EIR. In addition, it is our opinion that this level of mitigation fully compensates for impacts on arroyo toad from the project.

Finally, the acreage of riparian toad impacts has been reduced as a result of revisions in the design of the landfill access road bridge, and are now 0.0368 acres, with only 0.002 acres of permanent impact. This is less than the impacts described in the 2003 EIR. These impacts of 0.0368 acres will likewise be mitigated to a level below significance by habitat enhancement and/or creation planned for at least 88 acres of upland habitat onsite and 81.2 acres of riparian habitat as described in MM 4.9-4, and MM 4.9-18, as shown in Exhibit 4.9-6 of the 2006 RPDEIR.

Water quality in the San Luis Rey River was evaluated in the 2006 RPDEIR as a potential long-term issue that could indirectly affect the arroyo southwestern toad. However, during initial landfill construction, the manure associated with the former dairies is being removed, greatly improving the water quality of the river. Furthermore, the landfill is designed to prevent the release of contaminants to surface water and ground water. These and other actions described in the 2006 RPDEIR will minimize potential impacts on water quality in the San Luis Rey River thereby avoiding and mitigating impacts on the arroyo toad (San Diego County Department of Environmental Health 2003). Furthermore, the requirements of the California Integrated Waste Management Board/San Diego County Department of Environmental Health Solid Waste Facility Permit 37-AA-0032, and the pending Regional Water Quality Control Board Waste Discharge Requirements will ensure no degradation of water quality from the landfill.

Another potential indirect impact on the arroyo southwestern toad is the attraction of nuisance animal species to the landfill that could increase rates of toad predation and decrease the toad population. However, the vector control plan and placement of daily cover will mitigate these impacts. Impacts from some species could occur, however, from the riprap associated with the access road bridge, as this riprap could harbor predators of the arroyo toad (USFWS 1999c). However, the mitigation measures provide that gaps in the riprap will be filled with concrete. Moreover, riprap already occurs over a very large area along the river along the Verboom Dairy. This riprap will be removed, thus providing additional mitigation. The mitigation actions described above will result in no adverse affects on southwestern arroyo toad, and the development and operation of the landfill will not jeopardize the continued existence of this species.

The greater landfill project will result in a net beneficial impact on arroyo toad upland habitat through the removal of the dairies onsite and creation of upland habitat that will be suitable for arroyo toad use north of the San Luis Rey River and south of SR 76 onsite. Arroyo toads have not been observed in these areas during prior surveys, and this appears to be the result of a number of factors, including dense soils that are compacted in most locations and unsuitable for burrowing, paved areas, and dense turf grasses and other dense vegetation that render the soils unsuitable for burrowing by adult toads. Restoration of these areas will improve the suitability of the soils to support adult arroyo toads. Construction of mitigation in these areas is not expected to adversely affect arroyo toads because they are not expected to occur within these areas and mitigation measures are provided to survey the area to further ensure that arroyo toads found onsite can be moved out of harms way prior to implementation of habitat restoration in these areas. Similar measures would be implemented in areas subject to potential habitat creation south of the river in the grazing fields as described in Section 5.0. Also, these measures are included for activities for the rest of the landfill project, even though it is highly unlikely that arroyo toads occur within the landfill site, the borrow areas, or other facilities within the greater landfill project.

The bridge will pass the 100-year flood flow, and the entire area under the bridge will allow arroyo toads to move freely upstream and downstream along the primary river corridor. Mitigation measures are described in Section 5.0 to construct toad passages under the access roads so that arroyo toads can move from one side of the access road to the other in upland areas. Therefore, arroyo toads will be able to move along the San Luis Rey River corridor as is the case at the present time, and additional upland habitat will be created onsite to support arroyo toads. Therefore, this project is expected to provide a net benefit for arroyo toads within the Action Area and within the region in general and will not contribute to cumulative effects in the action area or region. Impacts on the species will be fully compensated by mitigation measures, and the project will not jeopardize the continued existence of the species.

4.4 EFFECTS OF THE ACTION ON COASTAL CALIFORNIA GNATCATCHER

4.4.1 Direct, Indirect, and Cumulative Impacts

The development and operation of the landfill will directly impact approximately 224 acres of sage scrub and sage scrub/chaparral habitat types; however, the more recent focused surveys have failed to detect residents of this species on the property (San Diego County Department of Environmental Health 2003). No gnatcatchers were detected during the most recent surveys of the property by URS biologists in 2005.

Furthermore, the coastal sage scrub in the property is considered of low to marginal value for gnatcatchers (Ogden 1995). Because the coastal sage scrub on the property has never been used by resident gnatcatchers, no adverse effects on coastal California gnatcatcher will occur as a result of habitat loss, and the development and operation of the landfill will not jeopardize the continued existence of this species.

The Critical Habitat designated in 2000 approximately covers the western half of the landfill site, the borrow areas, part of the non-native grassland and ruderal vegetation in the cattle grazing field south of the San Luis Rey River, portions of access roads, including existing access roads onsite, and parts of SR 76 and adjacent land that is developed in its existing state (Plate 3). The primary constituent elements for coastal California gnatcatcher are absent in the developed lands onsite and the cattle grazing fields south of the San Luis Rey River. Primary constituent elements superficially appear to be present onsite in the western half of the landfill and portions of the borrow areas that support coastal sage scrub communities (224 acres of impact). However, coastal California gnatcatcher have never been identified as nesting in these areas. There are no human-induced factors that would prevent coastal California gnatcatcher from nesting in these areas, such as human disturbance or severe depression of their population in the local vicinity, and coastal California gnatcatcher would be expected to nest onsite if the habitat were truly suitable. Gregory Canyon is located over three miles east of Interstate 15 in an area that is generally lacking occupation by coastal California gnatcatcher. Suitable sage scrub habitat is present in the project vicinity; however, coastal California gnatcatcher sightings are few and typically consist of single individuals sighted during the post-breeding dispersal period (late summer and fall). The San Diego County Bird Atlas database shows only two recorded coastal California gnatcatcher sightings in the southern survey cell (E10) that also includes the southern half of the project area (P. Mock in Unitt 2004; see attached figure from the bird atlas). There were no coastal California gnatcatcher detections in the northern survey cell (D10) during the atlas study period (1997-2002). The distribution map in the atlas indicates no confirmed breeding in either cell, although cell E10 was categorized as "breeding possible." Most of the atlas survey cells west of the project area have more frequent detections of coastal California gnatcatchers and most survey cells west of the project area are categorized as breeding behavior confirmed or as being highly likely. There are few coastal California gnatcatcher detections east of the project area.

The project area is located in an area that constrains the coastal California gnatcatcher breeding distribution because of highly variable weather conditions. The eastern (uphill) margin of the range approximates an isotherm of January low temperatures of 2.5° C, suggesting that the species' eastern distribution is limited by winter mortality at higher elevations (Mock 1998). Thus, despite the presence of apparently suitable habitat (*Artemisia*-dominated sage scrub) with slope gradients less than 40% (Figure 7), the lack of breeding coastal California gnatcatchers can be explained by the local winter weather pattern that precludes the establishment of a sustainable breeding population near the Gregory Canyon Landfill project area (Mock 1993, 1998, P. Mock in Unitt 2004). The USFWS Habitat Model apparently used regional vegetation data that was not accurate for the Gregory Canyon project vicinity. Approximately 243 acres of the Gregory Canyon project site were incorrectly identified as potentially suitable gnatcatcher habitat by this model, mostly in areas north of the San Luis Rey River. The Habitat Model also used climate data that does not reflect the true winter weather conditions that are relevant to California gnatcatcher distribution limits. The USFWS model used an isotherm of 5 °C (instead of 2.5 °C) as well as precipitation data that was not related to the known gnatcatcher distribution (McKinney 2006,

pers. comm.). Winter precipitation is a relevant factor rather than the annual mean precipitation data used by the USFWS model (Mock 1993, Pattern and Rotenberry 1999). Therefore, the project area does not appear to support all required primary constituent elements for coastal California gnatcatcher, and the areas designated as Critical Habitat onsite that do support coastal sage scrub communities appear to be unsuitable for supporting coastal California gnatcatcher breeding now or in the future without the project.

Construction of the bridge and the greater landfill project is not expected to result in the loss of Critical Habitat that actually supports the primary constituent elements for the species or can support the species at present or the foreseeable future. Therefore, construction and operation of the landfill and the bridge project is not expected to result in a reduction of regional or local populations of coastal California gnatcatcher, even though portions of these areas are within designated Critical Habitat.

The areas of potential Critical Habitat reopened for public comment in 2003 include the eastern one half of the landfill site, in addition to the areas designated as Critical Habitat in 2000. The additional areas onsite within the eastern half of the landfill are mixed coastal sage scrub/chaparral and chaparral habitats that are for the most part less suitable than the coastal sage scrub habitat to the west that has never supported nesting coastal California gnatcatcher. The reopened 2003 proposed Critical Habitat also extends further eastward to include large areas dominated by unvegetated rock outcrops with intersperse chaparral vegetation, and these areas are highly unsuitable for coastal California gnatcatcher. These additional areas within the reopened 2003 proposed Critical Habitat do not currently support coastal California gnatcatcher and lack the primary constituent elements to support coastal California gnatcatcher. Therefore, construction and operation of the landfill and the bridge project is not expected to result in a reduction of regional or local populations of coastal California gnatcatcher, even though portions of these areas are within the reopened 2003 proposed Critical Habitat.

A coastal California gnatcatcher was observed moving through the site in the vicinity of the borrow areas. Indirect effects of the landfill project include the potential to affect movement of coastal California gnatcatcher between areas of suitable habitat in the region. The landfill will result in removal of several large areas of coastal sage scrub habitat onsite; however, other areas alongside these facilities will remain as coastal sage scrub. The areas remaining should serve to allow coastal California gnatcatcher to pass through the areas while providing habitat for resting, foraging while they pass through, and general cover. The landfill and borrow areas themselves should not prevent a barrier or obstacle to movement and coastal California gnatcatcher should be able to move through the area without substantial impedance. Therefore, the bridge and greater landfill project should not result in a take of individual coastal California gnatcatcher or in fragmentation of Critical Habitat or other fragmentation of habitat that would adversely affect the species in the local area or region.

Mitigation measures are described in Section 5.0 that will further avoid, minimize, and compensate for potential effects of the project on coastal California gnatcatcher such that the continued existence of the species will no be jeopardized. These measures include potential preservation of habitat offsite and onsite creation of habitat that will favor the species.

4.5 EFFECTS OF THE ACTION ON QUINO CHECKERSPOT BUTTERFLY

4.5.1 Direct, Indirect, and Cumulative Impacts

Although host plant species exist on the property, the habitat is not suitable for quino checkerspot butterfly. This species has not been detected during numerous focused surveys on site since 1995. Critical Habitat for quino checkerspot butterfly does not occur onsite. No take of quino checkerspot butterfly will result from this project. Therefore, no adverse effects, whether direct, indirect, and/or cumulative, on this species will occur, and the development and operation of the landfill will not jeopardize the continued existence of this species.

SECTION 5 MITIGATION AND MONITORING

5.1 MITIGATION MEASURES AND PROJECT DESIGN

The development and operation of the landfill, including implementation of mitigation measures, will impact listed species through habitat loss, potential loss of individuals, and indirect effects associated with landfill construction and operation activities. The following mitigation measures were developed as part of the 2006 RPDEIR to address the impacts described above, including impacts on Critical Habitat. For completeness, URS has included all of the mitigation measures from the 2006 RPDEIR in their entirety, although many address issues beyond the listed species addressed in this BA. Please note that the 2006 RPDEIR, which was undertaken pursuant to State law, may use different terminology than that used in this BA in describing the areas included in the development and operation of the Gregory Canyon Landfill. The terminology used in this BA was chosen expressly to correspond with definitions contained in the CFR and Federal guidance documents. For instance, under State law the term "project" is used to describe the broader development and operation of the Gregory Canyon Landfill.

Included in the project, 2.3 acres of riparian habitat will be created in the bridge grading area adjacent the San Luis Rey River. This will result in 2.3 acres of additional riparian and wetland habitats onsite as a self-mitigating action. Additionally, mitigation measures required in Section 5N of Proposition C relative to potential biological impacts (Proposition C was approved by voters in the County of San Diego in 1994) are included.

MM 4.9.C5N: All sensitive species and habitat impacted by the project shall be mitigated in accordance with requirements imposed by the USFWS as part of the Section 7 consultation.

MM 4.16.C5C: At least five (5) days each week, the Applicant shall inspect for, and clean up, all litter and illegal dumping which occurs on, or adjacent to, the landfill access road and that portion of Highway 76 between the intersection with Interstate 15 and the site. The clean up team shall consist of at least one truck with a minimum crew of two persons.

Project Design Features

Construction Features:

- Dairy removal will occur as part of the initial construction phase, which will enhance wildlife foraging opportunities, remove a significant cowbird attractant and reduce existing edge effects adjacent to the river.
- Borrow/Stockpile Area A will only be used during the initial construction period and then during landfill closure beginning in approximately year 25 and will be revegetated with native species between use periods and after final landfill closure.
- The haul road to Borrow/Stockpile Area A will only be used during the initial nine-month construction period and at final landfill closure beginning in approximately year 25. No improvements to the internal haul road are required; the only grading will occur where turnouts are proposed on the site plan.

- The low-flow crossing will only be used during initial construction during daylight hours and will be abandoned following completion of the bridge.
- Access road and bridge construction will occur during daylight hours when wildlife movement by species such as mammals is less frequent.
- The bridge pilings will be drilled in place, rather than driven, to minimize construction noise.
- Riparian habitat adjacent to the proposed bridge structure will only be cleared beneath and within 50 feet of the east side of the structure.

Operational Features:

- The dedication of a minimum of 1,313 acres of land for permanent open space will occur prior to operation and the open space will be managed in perpetuity for the protection of sensitive habitat and species.
- Upon final closure, the remaining undedicated portions of the landfill site will be placed in open space in perpetuity.
- Excavation and filling of the landfill will be phased to minimize ground disturbance and will only occur during the operational hours of the landfill.
- Native vegetative cover will be established on disturbed areas, including the borrow/stockpile areas and landfill footprint.
- Landfill perimeter fencing will allow for wildlife movement where topography is the barrier to human access during the life of the landfill. The chain link fencing will be replaced with three to five strand wire fencing at the time of closure of the landfill.
- The block of habitat between the two borrow/stockpile areas will be maintained to provide for riparian to upland movement opportunities for most species.
- The deck of the bridge will be 17.5 feet above the river bed allowing for wildlife movement underneath.
- Reflective strips will be used on the inside structure of the bridge. No lighting will be installed on the bridge.
- Slow traffic speeds will be required on the access road and bridge to reduce potential impacts to wildlife.
- The entire access road (including bridge) will be gated and locked to prevent human access during the non-operational hours of the landfill.
- Low impact, focused, and shielded lighting will be installed at the facilities area for security.
- A minimum of a 100-foot riparian buffer will be maintained between the landfill operations and the river habitat, except where the access road/bridge crosses the river.
- Rock crushing/processing and tire shredding will occur within the landfill footprint at least 1,500 feet from the nearest least Bell's vireo and southwestern willow flycatcher habitat.

- Vector control measures, including the use of daily cover, will be implemented to prevent nuisance species attracted to the landfill to cause predation impacts on native species. The methods for controlling or deterring nuisance species will be compatible with native species protection.
- No permanent sources of standing or flowing water will be produced on site to prevent increased amphibian predation by non-native ants and bullfrogs.
- An 18- to 20-foot berm will be constructed and maintained along the northern edge of the landfill footprint between the facilities area and the landfill footprint to reduce Phase I daily operational noise levels to sensitive habitat.

5.1.1 Additional Mitigation Measures

In addition to the mitigation measure contained in Proposition C, more specific mitigation measures have been developed to reduce potential biological impacts from project implementation identified in the environmental analysis of the 2006 RPDEIR.

Note that the Final EIR will be updated to reflect impacts on 0.4 acres of southern willow scrub, 0.4 acres of disturbed southern willow scrub, and 0.2 acres of open channel.

Impact 4.9-1: The following sensitive resources would be significantly impacted by the landfill project and related activities: 170.8 acres of coastal sage scrub, 1.7 acres of disturbed coastal sage scrub, 51.5 acres of coastal sage scrub/chaparral, 22.6 acres of coastal live oak woodland, 27.4 acres of chaparral, 15.8 acres of non-native grassland, 0.6 acres of native perennial grassland, 0.5 acres of southern willow scrub, 0.1 acres of open channel and 0.2 acres of cottonwood willow riparian forest.

MM 4.9-1a: Impacts to 170.8 acres of coastal sage scrub, 1.7 acres of disturbed coastal sage scrub, and 51.5 acres of coastal sage scrub/chaparral shall be mitigated at a minimum ratio of 2:1 through onsite creation or enhancement of 63.6 acres of coastal sage scrub habitat or coastal sage scrub/chaparral habitat, and the offsite acquisition of 384.4 acres of coastal sage scrub or coastal sage scrub/chaparral habitat. The onsite creation or enhancement of this resource shall be in a dedicated open space area. Offsite acquisitions may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the mitigation area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to any offsite properties for which management practices in accordance with County requirements have not already been established. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs the coastal sage scrub habitat on site or as determined in consultation with the resource agencies.

MM 4.9-1b: Impacts to 22.6 acres of coast live woodland shall be mitigated at a minimum ratio of 3:1 by the onsite creation of 67.8 acres of coast live oak woodland. The onsite creation or enhancement of this resource shall be in a dedicated open space area. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs coast live oak woodland or as determined in consultation with the resource agencies.

MM 4.9-1c: Impacts to 0.6 acres of native perennial grassland shall be mitigated at a minimum ratio of 3:1 through offsite acquisition of 1.8 acres of native perennial grassland. The offsite acquisition may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the mitigation area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to any offsite properties for which management practices in accordance with County requirements have not already been established. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs the native perennial grassland on site or as determined in consultation with the appropriate agencies.

MM 4.9-1d: Impacts to 0.2 acres of southern willow scrub and 0.3 acres of disturbed southern willow scrub shall be mitigated at a minimum ratio of 4:1 by the onsite creation or enhancement of 2.0 acres of southern willow scrub habitat. Onsite creation or enhancement shall be in an area dedicated as open space. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs the southern willow scrub or as determined in consultation with the resource agencies. N*ote that this will be updated in the FEIR to reflect, impacts on 0.4 acres of southern willow scrub and 0.4 acres of disturbed southern willow scrub with mitigation of 3.2 acres onsite creation and/or enhancement.*

MM 4.9-1e: Impacts to 0.1 acre of open channel shall be mitigated through implementation of the Wetland Mitigation and Habitat Enhancement Plan described in MM 4.9-18 to restore habitat in the San Luis Rey River watershed onsite. *Note that this will be updated in the FEIR to reflect impacts on 0.2 acres of open channel, which is not jurisdictional waters of the U.S.*

MM 4.9-1f: Impacts to 0.2 acres of cottonwood willow riparian forest shall be mitigated at a minimum ratio of 4:1 by the onsite creation or enhancement of 0.8 acres of cottonwood willow riparian forest. Onsite creation or enhancement shall be in an area dedicated as open space. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs the cottonwood-willow riparian forest on site, or as determined in consultation with the appropriate agencies.

MM 4.9-1g: Impacts to 27.4 acres of chaparral and 15.8 acres of non-native grassland shall be mitigated at a minimum ratio of 0.5:1 through offsite acquisition of 13.7 acres of chaparral and 7.9 acres of non-native grassland. Offsite acquisitions may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the mitigation area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to any offsite properties for which management practices in accordance with County requirements have not already been established. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs the chaparral or non-native grassland habitat on site or as determined in consultation with the resource agencies.

MM 4.9-1h: Temporary construction fencing shall be erected under the supervision of a qualified biologist outside the delineated boundary of dedicated open space where it interfaces with impact areas and permanent fencing marked with signs shall be installed around the mitigation areas. Where impact areas are adjacent to coast live oak woodland, fencing shall be erected outside the canopy area at a

distance of 1.5 times the canopy radius of the outer trees. This fencing shall be erected prior to commencement of brushing or grading activities. The fencing (for example, strand wire or split rail) shall restrict human and equipment access but shall allow for wildlife movement.

Animal Species

Impact 4.9-2: A total of 25 Engelmann oaks would be directly impacted as a result of the project. Since 100% of the population would be impacted, this impact would be significant.

MM 4.9-2: A 3:1 minimum replacement acreage (based on canopy area) of Engelmann oak trees shall be created by onsite creation or enhancement of this replacement acreage within the same area designated for creation or enhancement of coast live oak woodland, if possible. Otherwise, a separate acquisition of Engelmann oak trees at 3:1 minimum replacement acreage shall be required. Any onsite creation or enhancement shall be in an area dedicated as open space. Offsite acquisitions may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the mitigation area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to any offsite properties for which management practices in accordance with County requirements have not already been established. This acreage shall then be subtracted from the coast live oak woodland mitigation requirement (MM 4.9-1b) to avoid duplicate mitigation. The implementation of this mitigation shall be prior to or concurrent with the first construction that disturbs Engelmann oak or as determined in consultation with the resource agencies.

Impact 4.9-3: The loss of approximately .0002 acre of arroyo southwestern toad riparian breeding habitat from construction of the bridge would be significant.

MM 4.9-3a: In addition to the riparian habitat creation or enhancement described in MM4.9-1d and f, implementation of the Wetland Mitigation and Habitat Enhancement Program described in MM 4.9-18 shall be undertaken to mitigate impacts to arroyo southwestern toad riparian breeding habitat.

MM 4.9-3b: The removal of toad riparian breeding habitat from riparian vegetation clearing and channel excavation for the bridge shall occur from October through December to minimize potential impacts to breeding adults (including potential sedimentation impacts to toad eggs) and disbursing juveniles.

Impact 4.9-4: The project would result in the loss of approximately 17.5 acres of suitable arroyo southwestern toad upland habitat on the project site.

MM 4.9-4: Impacts to the 17.5 acres of suitable arroyo southwestern toad upland habitat on site impacted by the project shall be mitigated at a minimum ratio of 5:1 through on site creation or enhancement of 88 acres of arroyo toad habitat . The onsite creation or enhancement of this resource shall be in a dedicated open space area. The implementation of the mitigation shall be prior to or concurrent with the first construction that impacts the upland arroyo toad habitat on site or as determined in consultation with the resource agencies.

Impact 4.9-5: Individual toads may be lost from construction of the landfill and related facilities and the access road/bridge. In addition, individual toads may be lost from roadkill due to traffic on the access road, haul road to Borrow/Stockpile Area A, and low-flow crossing.

MM 4.9-5a: The construction zone for the bridge shall be fenced with exclusion fencing to prevent toad access to the construction zone. The fencing shall be a silt-screen type barrier comprised of a minimum 24-inch high fence with the remainder (minimum 12 inches) anchored firmly against the ground. The fence may be buried if necessary to exclude toad access. The fence locations shall be identified by a qualified biologist and adjusted as necessary. Exclusion fencing shall be monitored daily by a qualified biologist, and maintained in its original condition by construction personnel for the entire length of the construction period.

MM 4.9-5b: Pre- and post-exclusion fencing surveys within the construction zone for the bridge shall be conducted for arroyo southwestern toads by a biologist permitted by the USFWS to handle the toad. Prior to construction commencement, a minimum of three surveys shall be conducted by this biologist following installation of the fencing. Daily surveys shall be conducted each morning prior to construction activity. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space.

MM 4.9-5c: Exclusion fencing shall be installed along both sides of the access road for its entire length (except where sides of bridge act as barrier) as part of access road construction. The same exclusion fencing shall also wrap around the northern edge of the facilities area and continue east and south around the [1.8]-acre desiltation basin. The fencing shall continue until the topography becomes too steep or rocky on the east side of the landfill footprint as determined by a qualified biologist. The fencing shall be of a corrugated metal or other similar durable material and shall be a minimum of 24 inches high.

MM 4.9-5d: A minimum of three surveys shall be conducted by a biologist permitted by the USFWS to handle the arroyo southwestern toad following installation of the exclusion fencing along the access road and prior to access road use. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space.

MM 4.9-5e: A minimum of three surveys shall be conducted by a biologist permitted by the USFWS to handle the arroyo southwestern toad following installation of exclusion fencing around the facilities area and desiltation basin as described in MM 4.9-5c. Up to three additional surveys shall be conducted if favorable temperature and moisture conditions for toad activity have not already occurred during the first three surveys. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space.

MM 4.9-5f: At least one road undercrossing shall be installed in the fill beneath the access road north and south of the river. The design of the undercrossings shall be approved by the USFWS.

MM4.9-5g: Exclusion fencing of the material and design described in MM 4.9-5c shall be installed on the north side of the haul road to Borrow/Stockpile Area A. The fencing shall be installed prior to initial project construction and shall be removed when initial project construction is complete, and the haul road is no longer in use. The exclusion fencing shall be re-installed prior to the use of Borrow/Stockpile Area

A, which begins again in approximately year 25. The fencing shall be removed once the landfill is completely closed and the haul road is no longer in use.

MM 4.9-5h: A minimum of three surveys shall be conducted by a biologist permitted by the USFWS to handle the arroyo southwestern toad following installation and re-installation of the exclusion fencing along the access road to Borrow/Stockpile Area A prior to its use. Up to three additional surveys shall be conducted during the use period if favorable temperature and moisture conditions for toad movement have not already occurred during the three original surveys. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space.

MM 4.9-5i: Exclusion fencing of the material and design described in MM 4.9-5c shall be installed along both sides of the low-flow crossing until the road connects with the haul road described in MM 4.9-5g. The fencing shall be installed during initial project construction and shall be removed when initial project construction is complete, and the crossing is no longer in use. A minimum of three surveys shall be conducted by a biologist permitted by the USFWS to handle the arroyo southwestern toad following installation of the fencing, and daily surveys shall be conducted each morning prior to use of the low-flow crossing. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space.

Impact 4.9-6: Direct loss of individual toads could occur in association with proposed landfill project mitigation measures to create, restore and/or enhance riparian habitats and riparian/upland transition habitats on the landfill site as described in MM 4.9-18.

MM 4.9-6: The USFWS (1999c) has indicated in the Final Recovery Plan for the species that short-term negative effects to individual toads from such activities may be offset by the long-term positive effects of implementing such a habitat enhancement program. Therefore, the habitat enhancement plan described in MM 4.9-18 shall be implemented. The final plan shall include precautions where possible to avoid impacts to the arroyo southwestern toad.

Impact 4.9-7: Riprap associated with the access road bridge could harbor potential predators of the arroyo toad.

MM 4.9-7: Prior to final design, the bridge abutment design specifications shall indicate that gaps in the riprap be filled with concrete.

Impact 4.9-8: If the northernmost SDG&E transmission tower is replaced during the critical breeding period of the golden eagle (December through May), the eagle may be affected.

MM 4.9-8: The northernmost tower shall be replaced during the period of July through October to avoid the golden eagle breeding season.

Impact 4.9-9: Abandonment of the golden eagle nest site and territory could occur due to the project.

MM 4.9-9a: Access to the Gregory Canyon nesting site(s) shall be restricted to eagle specialists and researchers conducting monitoring.

MM 4.9-9b: Prior to ground disturbance, a pre-construction survey for the eagle pair shall be conducted to determine if and where the eagles are nesting on site. Weekly monitoring of the eagle pair shall be conducted by an eagle specialist during the breeding season (December through May) to confirm the eagle pair is exhibiting reproductive behavior patterns, such as nest building. After one year of construction activity, if the monitoring determines that the eagles have abandoned the site, the applicant shall create a habitat acquisition fund for purchase and preservation of off-site known or potential golden eagle nesting habitat or shall purchase an equivalent amount of golden eagle nesting habitat to be included in the MSCP Preserve. The amount of funding or habitat purchase shall be negotiated with the County.

MM 4.9-9c: Initial landfill construction activity less than 2,000 feet from the eagle's nest shall begin as close to the end of the eagle breeding season in June to allow the eagle pair on site to become conditioned to the activity prior to the next breeding season starting in December.

Impact 4.9-10: Movement of the southernmost SDG&E tower proposed for relocation while the red-tailed hawk nest is active (likely between December and May) will not be allowed under the Migratory Bird Treaty Act. Likewise, removal of any raptor nest while it is active will not be allowed under the act.

MM 4.9-10: The southernmost tower shall be moved during the period of June through November or at any time when the nest is not active. Likewise, any raptor nest removal shall only occur when the nest is inactive. A qualified biologist shall determine whether or not a raptor nest is active.

Impact 4.9-11: Direct impacts to least Bell's vireo and southwestern willow fly catcher habitat including 0.5 acres of southern willow scrub or disturbed southern willow scrub during the breeding season would be significant.

MM 4.9-11a: Removal of any riparian habitat shall only occur from October through December to avoid the breeding seasons of these bird species and to minimize potential impacts to the arroyo southwestern toad.

MM 4.9-11b: Impacts to vireo and flycatcher habitat shall be mitigated through riparian habitat creation as described under MM 4.9-1d. The Wetland Mitigation and Habitat Enhancement Plan described under MM 4.9-18 would also benefit these species.

MM 4.9-11c: The project applicant shall provide funding for cowbird trapping along the San Luis Rey River on the project site for a period of five years from initial landfill operation.

Impact 4.9-12: Initial construction, including the use of the low-flow crossing, and bridge construction could produce short-term construction noise that will potentially exceed the 60 dB(A) L_{eq} threshold during the vireo breeding season (March 15 through September 15) and the southwestern willow flycatcher breeding season (late April through mid-September).

MM 4.9-12a: Daily noise monitoring by a qualified acoustician shall be conducted between March 15 and September 15 during initial construction to verify that noise levels are below 60 dB(A) L_{eq} in vireo and flycatcher habitat. If the 60 dB(A) L_{eq} is exceeded, the acoustician shall work with the construction contractor to make operational changes and/or barriers designed by the acoustician shall be installed prior to March 15 or immediately if during the breeding season, to reduce noise levels during the breeding

season. Weekly noise monitoring shall occur following operational changes and/or installation of barriers to ensure their effectiveness. If ineffective, the acoustician shall work with the construction contractor to make additional operational changes or to install other barriers that will reduce noise to less than 60 dB(A) L_{eq}.

MM 4.9-12b: The low-flow crossing shall only be used between September 15 and March 15. Use of the crossing could occur outside of that time period if daily monitoring by a qualified biologist determines that vireos and flycatchers have not yet arrived on site or have migrated out of the area early, or if operational changes can be made and/or barriers designed by an acoustician can be installed prior to March 15 to reduce noise levels to less than 60 dB(A) L_{eq} in the vireo and flycatcher habitat. Daily noise monitoring shall be conducted in accordance with MM 4.9-12a and noise reduction measures contained in MM 4.9-12a shall be implemented, if necessary.

MM 4.9-12c: Bridge construction shall only occur between September 15 and March 15 unless daily monitoring by a qualified biologist during the breeding season determines that vireos and flycatchers have not yet arrived on site or have migrated out of the area early or if operational changes can be made and/or barriers designed by an acoustician can be installed prior to March 15 to reduce noise levels to less than 60 dB(A) L_{eq} in vireo and flycatcher habitat. Daily noise monitoring shall be conducted in accordance with MM 4.9-12a and noise reduction measures contained in MM 4.9-12a shall be implemented, if necessary.

Impact 4.9-13: Implementation of the riparian habitat creation and restoration and/or enhancement program (required as mitigation to offset direct impacts to the least Bell's vireo and southwestern willow flycatcher) could affect these species through excessive equipment noise if installation occurs during their breeding seasons.

MM 4.9-13: Mitigation activities shall only occur between September 15 and March 15 unless operational changes can be made and/or barriers designed by an acoustician can be installed prior to March 15 to reduce noise levels to less than 60 dB(A) L_{eq} in vireo and flycatcher habitat. Daily noise monitoring shall be conducted between March 15 and September 15 to verify that the measures are effective. If the 60 dB(A) L_{eq} is exceeded, the acoustician shall work with the contractor to make additional operational changes or to install additional barriers that will reduce noise to less than 60 dB(A) L_{eq}.

Impact 4.9-14: A total of 20.0 acres of vireo and flycatcher habitat would be significantly impacted by traffic noise caused by the project.

MM 4.9-14: Indirect impacts to a total of 20.0 acres of vireo and flycatcher habitat caused by project traffic noise shall be mitigated through onsite creation or enhancement of 17.1 acres of vireo and flycatcher habitat, and the offsite acquisition of 2.9 acres of vireo and flycatcher habitat. Onsite and offsite mitigation areas would not be affected by noise levels of 60 dB (A) L_{eq} or greater as a result of project-generated or cumulative traffic. Any onsite creation or enhancement shall be in area dedicated as open space. Any offsite acquisition may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or mitigation credits from a habitat manager, mitigation bank or environmental group. The landfill operator shall prepare and submit for

approval a Habitat Resource Management Plan or equivalent with respect to any offsite properties for which management practices in accordance with County requirements have not already been established. The implementation of this mitigation shall be prior to or concurrent with construction that impacts vireo or flycatcher habitat or as otherwise determined in consultation with the resource agencies.

Impact 4.9-15*:* Noise produced by landfill equipment operating at the closest point to vireo and flycatcher habitat within the landfill footprint and Borrow/Stockpile Area A (approximately 520 feet away) will potentially create noise levels in excess of 60 dB(A) L_{eq} in that habitat, and may affect the vireo and flycatcher during their breeding seasons.

MM 4.9-15a: A temporary 12-foot high wall or berm shall be constructed along the northern edge of Borrow/Stockpile Area A outside the vireo/flycatcher breeding season (March 15 to September 15) and prior to the use of Borrow/Stockpile Area A. The barrier can be removed once topography provides the necessary noise barrier to reduce noise levels in the habitat during the breeding seasons to less than 60 dB(A) L_{eq}.

MM 4.9-15b: Noise monitoring shall be conducted weekly for up to one month by a qualified acoustician to verify that operational noise levels are below 60 dB(A) L_{eq} in vireo and flycatcher habitat. If noise levels equal or exceed 60 dB(A) L_{eq}, a 16-foot high permanent noise wall shall be installed prior to the vireo breeding season (March 15 to September 15, includes flycatcher breeding season) or immediately if during the breeding season. If noise levels exceed 60dB(A) L_{eq} during the breeding season, operational changes shall be made to reduce noise levels to less than 60 dB(A) while the noise wall is being constructed. The noise wall shall be constructed east of the knoll between the internal haul road and the top of slope for the facilities area to block truck noise emanating into the habitat.

General Impacts

Impact 4.9-16: Potential impacts from potential human activities will occur because of the edge effects these activities could create.

MM 4.9-16: Throughout the life of the project, access routes shall be restricted to existing roads, and entry into non-impact areas shall be restricted by the landfill operator. Areas not directly impacted by the project shall be posted with signs precluding access due to habitat sensitivity. A public education program shall be developed by a qualified biologist and shall be implemented to inform landfill staff and visitors about access restrictions and the sensitivity of habitats on site.

Impact 4.9-17: The potential for non-native plant species invasion will increase for the area of channel excavation associated with construction of the bridge and for temporary and permanent slopes.

MM 4.9-17a: Control of invasive, exotic plant species shall occur as described in the habitat enhancement plan presented in MM 4.9-18 and shall include the channel excavation area associated with construction of the bridge.

MM 4.9-17b: Temporary and permanent slopes shall be revegetated with native plant species to inhibit the growth of non-natives.

Impact 4.9-18: Loss of habitats, habitat fragmentation, decreased water quality, night lighting, human activity, and the introduction of non-native plant species are cumulatively significant impacts to which the project would contribute. In addition, during the life of the landfill, cumulatively significant indirect traffic noise impacts that could affect the breeding success of endangered bird species inhabiting this portion of the river could occur. Finally, landfill operations and cell construction could be on-going throughout the Pipeline No. 6 construction period and could lead to periodic cumulative impacts.

MM 4.9-18: The project applicant shall implement a habitat enhancement plan to improve the San Luis Rey River watershed on site as described below and within the enhancement area shown in Exhibit 4.9-6 of this document in accordance with the Wetland Mitigation and Habitat Enhancement Plan set forth in Appendix L, as updated and modified.

Beyond the mitigation obligation associated with compensating for direct and indirect project impacts to vegetation communities, the project applicant for the Gregory Canyon Landfill shall be required to implement a habitat enhancement program for improvements to the San Luis Rey River watershed. In addition to the proposed open space dedication (1,313 acres), the project applicant shall create or enhance 131.4 acres of upland areas and 81.2 acres of riparian areas within the portion of the San Luis Rey River corridor contained on site (Exhibit 4.9-6). The restoration would likely be phased and would not occur all at one time.

The habitat enhancement program shall focus on the restoration of riparian and upland habitats within the San Luis Rey River floodplain on site, in the areas indicated on Exhibit 4.9-6, above and beyond the project's direct mitigation obligations for vegetation community impacts. The San Luis Rey River has been identified as one of the most easily restorable rivers in southern California (ACOE 1981). This portion of the program shall consist of the restoration of lost and/or damaged habitat and water quality caused by the long-term agricultural use of the property and the removal of highly invasive, exotic plant species. The project applicant is proposing to remove the existing Verboom dairy operations and most structures and all equipment associated with the Verboom and Lucio dairies from the site in concert with the initial construction of the landfill. Under this enhancement program, man-made berms and weed seed banks in the river's watershed shall be excavated to restore more historic river flows and invasive, non-native plant species would be replaced with native plantings. The excavation shall be focused on bringing the ground elevations down to a level that would connect the areas hydrologically with the existing groundwater system and to create a series of terraces that taper into the existing upland habitat. The excavation would be done in a manner that would prevent adverse effects on upstream and downstream properties. All upland and drier riparian areas shall be planted with tree species known from the site and hand-seeded to initiate native plant reestablishment. Weed control and monitoring shall be implemented regularly during the first five years of the project to prevent the reestablishment of non-native plant species. The goal of the restoration shall be to provide breeding and upland habitat for endangered species and widen the vegetative buffer around the riparian corridor present on site.

The dedicated open space onsite, including the restored river corridor, shall be managed with a financial contribution provided by the project applicant. The project applicant shall work with the USFWS and the CDFG to identify a qualified conservancy or other non-profit organization to be responsible for implementing long-term management activities for the restored river. The type of management activities shall depend upon the condition of the site, the resources present, and the funds available to manage those

resources. Management activities shall include restriction of vehicular and human access through the installation of fencing and signs, control of exotic species (e.g., brown-headed cowbirds and giant reed (*Arundo donax*)), control of illegal dumping and monitoring endangered species populations. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to onsite dedicated open space, or created or enhanced habitat areas.

Impact 4.9-19: Construction impacts to 9.5 acres of coastal sage scrub and 0.8 acre of coast live oak woodland will occur from relocation of the First San Diego Aqueduct pipelines. In addition, potential impacts could occur during construction to wildlife, in particular the arroyo southwestern toad, least Bell's vireo, and southwestern willow flycatcher.

MM 4.9-19a: The construction easement (minus permanent access road) shall be revegetated with coastal sage scrub immediately following completion of the pipeline relocation on the landfill site. The landscape plans shall incorporate this revegetation requirement.

MM 4.9-19b: Impacts to coastal sage scrub shall be mitigated at a minimum ratio of 2:1 through offsite acquisition of 19.0 acres of coastal sage scrub. The offsite acquisition may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed the mitigation area to permanently protect the resource. Offsite acquisitions may occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to onsite dedicated open space, or created or enhanced habitat areas.

MM 4.9-19c: Coast live oak woodland shall be mitigated at a 2:1 ratio by the off-site acquisition of 1.6 acres of existing coast live oak woodland of like quality. The off-site acquisition shall occur in an unincorporated area of San Diego County. A conservation easement shall be placed across the off-site mitigation area to permanently protect the resource. If possible, individual oak trees shall be salvaged from the impact area and transplanted to appropriate open space habitat on the landfill site. The implementation of this mitigation shall be prior to or concurrent with construction or as otherwise determined in consultation with the County. *Note that the 2006 RPDEIR inadvertently did not update this condition to provide for a 3:1 ratio and 2.4 acres of mitigation. This will be updated in the Final EIR for the project.*

MM 4.9-19d: Temporary construction fencing shall be erected under the supervision of a qualified biologist outside the delineated boundary of dedicated open space (Figure 3b) where it interfaces with impact areas. Where impact areas are adjacent to coast live oak woodland, fencing shall be erected outside the canopy area at a distance of 1.5 times the canopy radius of the outer trees. This fencing shall be erected prior to commencement of brushing or grading activities. The fencing (for example, strand wire or split rail) shall restrict human and equipment access but shall allow for wildlife movement.

MM 4.9-19e: Impacts to potential arroyo southwestern toad upland habitat, including designated Critical Habitat, from the relocation of the pipelines shall be mitigated through the Wetland Mitigation and Habitat Enhancement Plan to be implemented as part of the landfill project.

MM 4.9-19f: Temporary erosion control measures such as silt fencing, sand bags, and straw matting shall be used to reduce potential siltation of drainage courses including the San Luis Rey River.

MM 4.9-19g: The pipeline easement shall be fenced within two kilometers of the San Luis Rey River with exclusion fencing to prevent arroyo southwestern toad access to the construction zone. The fencing shall be a silt-screen type barrier comprised of a minimum 24-inch high fence with the remainder (minimum 12 inches) anchored firmly against the ground. The fence may be buried if necessary to exclude toad access. The fence locations shall be identified by a qualified biologist and adjusted as necessary. Exclusion fencing shall be monitored by a qualified biologist and maintained in its original condition by construction personnel for the entire length of the construction period.

MM 4.9-19h: Pre- and post-exclusion fencing surveys within the construction zone shall be conducted for arroyo southwestern toads by a biologist permitted by the USFWS to handle the toad. Prior to construction commencement, a minimum of three surveys shall be conducted by this biologist following installation of the fencing. Any toads found shall be relocated to appropriate similar habitat outside project impact areas and in dedicated open space on the landfill site.

MM 4.9-19i: The trench dug for relocation of the pipelines shall be securely covered at the end of construction each day such that wildlife does not become trapped in the trench.

MM 4.9-19j: Construction noise shall not result in exceedances of 60 dB(A) L_{eq} on least Bell's vireo and southwestern willow flycatcher habitat between March 15 and September 15 unless noise attenuation measures designed by an acoustician are implemented to reduce noise levels in vireo/flycatcher habitat to below 60 dB(A) L_{eq}.

Implementation of Court's Order. In the event any final judgment is entered determining that the creation or enhancement of habitat on the landfill site within the 1313 acres of dedicated open space provided by Proposition C violates any provision of Proposition C, any of these mitigation measures permitting the creation or enhancement of habitat on-site shall be construed to mandate offsite acquisition of this habitat. The offsite acquisition may occur anywhere within the unincorporated area of San Diego County and a conservation easement shall be placed across the mitigation area to permanently protect the resource. Offsite acquisitions might occur either through a direct purchase or through mitigation credits from a habitat manager, mitigation bank, or environmental group. The landfill operator shall prepare and submit for approval a Habitat Resource Management Plan or equivalent with respect to onsite dedicated open space, or created or enhanced habitat areas.

5.1.2 LEVEL OF SIGNIFICANCE AFTER MITIGATION

The 2006 RPDEIR concluded that with implementation of the mitigation measures for significant impacts to sensitive biological resources including coastal sage scrub, coastal sage scrub/chaparral, southern willow scrub, chaparral, non-native grassland, open channel, coast live oak woodland, native perennial grassland, Engelmann oak, arroyo southwestern toad, least Bell's vireo, southwestern willow flycatcher, and golden eagle, the project impacts to sensitive biological resources would be rendered less than significant since all habitat impacted would be mitigated through creation or enhancement of habitats on site or through offsite acquisition at appropriate mitigation ratios, and precautions would be taken to avoid impacts to sensitive habitat and species. With implementation of MM 4.9-18, onsite creation or enhancement, or offsite acquisition, the project's contribution to cumulative impacts to biological resources would be less than significant.

SECTION 6 CONCLUSION

The proposed development and operation of the landfill is not likely to adversely affect federally listed or State-listed species, including designated or proposed Critical Habitat. The construction of the bridge replacement and the development and operation of the landfill will not jeopardize the continued existence of these species, as impacts to these species and Critical Habitat will be offset with the implementation of the proposed mitigation measures (see Section 5.0).

California gnatcatcher has not occurred on the property in recent years, and QCB have not occurred on the property even though potential habitat exists. Least Bell's vireo, southwestern willow flycatcher, and arroyo southwestern toad occur on the property and are primarily associated with the riparian habitat and aquatic habitat along the San Luis Rey River. Implementation of the proposed mitigation measures will avoid, minimize, and compensate for impacts on these species and/or their Critical Habitat, and the continued existence of these species will not be jeopardized.

SECTION 7 REFERENCES

59 FR 22. 1994. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Least Bell's Vireo. February 2, 1994.

65 FR 206. 2000. Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Coastal California Gnatcatcher. October 24, 2000.

68 FR 79. 2003. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Coastal California Gnatcatcher (Polioptila californica californica) and Determination of District Vertebrate Population Segment for the California Gnatcatcher (Polioptila californica); Proposed Rule. April 24, 2003.

70 FR 201. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwestern Willow Flycatcher (Empidonax traillii extimus); Final Rule. October 19, 2005.

Butler Roach Group. 1990. Draft Environmental Impact Report/Environmental Impact Statement for the proposed North County Class III landfill. Prepared for: County of San Diego Dept. of Public Works and Bureau of Land Management, California Desert District. January 1990.

Dudek and Associates (Dudek). 1995. Biological Resources Report for the Gregory Canyon Landfill Project, San Diego County, California. Prepared for: Gregory Canyon Ltd. August 1995.

Helix Environmental Planning (HELIX). 1998. Biological Resources Assessment for Proposed Gregory Canyon Landfill.

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California, State of California. The Resources Agency. 156 pp.

McKinney, Tony. 2006. USFWS GIS Specialist, Personal Communication, August 2006. Test Description of GIS Methods for the California Gnatcatcher Habitat Evaluation Model.

Michael Brandman Associates (MBA). 1992. Draft Biological Resources Evaluation, Aspen Road and Gregory Canyon proposed Landfill Sites. Prepared for: Butler Roach Group.

Mock, P.J. 1993. Population Viability Analysis for the California Gnatcatcher the MSCP Study Area. Prepared for the City of San Diego MSCP Program.

Mock, P.J. 1998. Energetic constraints to the distribution and abundance of the California Gnatcatcher. Western Birds 29: 413-420.

Mock, P.J. 2004. California Gnatcatcher. Pages 340-343 *in* P. Unitt, *San Diego County Bird Atlas.* Ibis Publishing.

Pacific Southwest Biological Services (PSBS). 1991. Report of a biological assessment of the Gregory Canyon Landfill Site Pala Region, San Diego County, California. Prepared for: Woodward Clyde Consultants. December 1991.

Patten, M.A., and J.T. Rotenberry. 1999. The proximate effects of rainfall on clutch size of the California Gnatcatcher. Condor 101:876-880.

San Diego County Department of Environmental Health. 2003. Gregory Canyon Landfill EIR. State Clearinghouse No. 1995061007.

San Diego County Department of Environmental Health. 2006. Gregory Canyon Landfill Revised Partial Draft EIR. State Clearinghouse No. 1995061007. July 2006.

U.S. Fish and Wildlife Service (USFWS). 1997. Coastal California Gnatcatcher Habitat Model.

U.S. Fish and Wildlife Service (USFWS). 1999. Arroyo Southwestern Toad (*Bufo microscaphus californicus*) Recovery Plan. Portland, Oregon. 119 pp. 1999.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Act Consultation Handbook, Procedures for Conducting Section 7 Consultation and Conferences. March 1998.

URS. 2006. Biology Technical Report for Gregory Canyon Landfill CEQA Update. June 16, 2006.

Table 1
Vegetation Impacts and Mitigation Requirements

Vegetation Type	Acreage of Impacts	Mitigation Ratio	Mitigation Acreage
Agricultural Land	9.9		0.0
Agriculture/Developed	2.5		0.0
Chaparral	27.4	0.5	13.7
Rock Outcrop/Chaparral	1.6		0.0
Coastal Sage Scrub/Chaparral	51.5	2	103.0
Coastal Sage Scrub	170.8	2	341.6
Burned Coastal Sage Scrub	0.0	2	0.0
Disturbed Coastal Sage Scrub	1.7	2	3.4
Coast Live Oak Woodland	22.6	3	67.8
Southern Willow Scrub*	0.4	4	1.6
Cottonwood-willow Riparian Forest	0.2	4	0.8
Disturbed Southern Willow Scrub*	0.4	4	1.6
Open Channel * **	0.2		0.0
Native Perennial Grassland	0.6	3	1.8
Non-Native Grassland	15.8	0.5	7.9
Olives	0.3		0.0
Ornamental	0.4		0.0
Disturbed Habitat	2.3		0.0
Total*	**308.6**	**NA**	**543.2**

* Impact and mitigation areas have been updated from the 2006 RPDEIR, and the values in the 2006 RPDEIR will be updated in the Final EIR.
**Note that "Open Channel" does not indicate jurisdictional waters of the U.S. Open Channel in this sense is the same as open sand.

Table 2
Results of URS 2005 Arroyo Toad Surveys Within the Action Area

Survey Date	16-Mar-05	6-Apr-05	2-May-05	17-May-05
Time Onsite	1950-2200	2120-2340	2100-2330	2040-2130
Survey Conditions	57-52°F clear, winds 0-1 mph	60-57°F, clear, winds 0-1 mph	62-60°F, Overcast, winds 0-2 mph	64°F, clear, winds 0-2 mph
No. of Arroyo Toads Detected*	4	11 to 15**	3	2
Location***	San Luis Rey River	San Luis Rey River	San Luis Rey River	San Luis Rey River

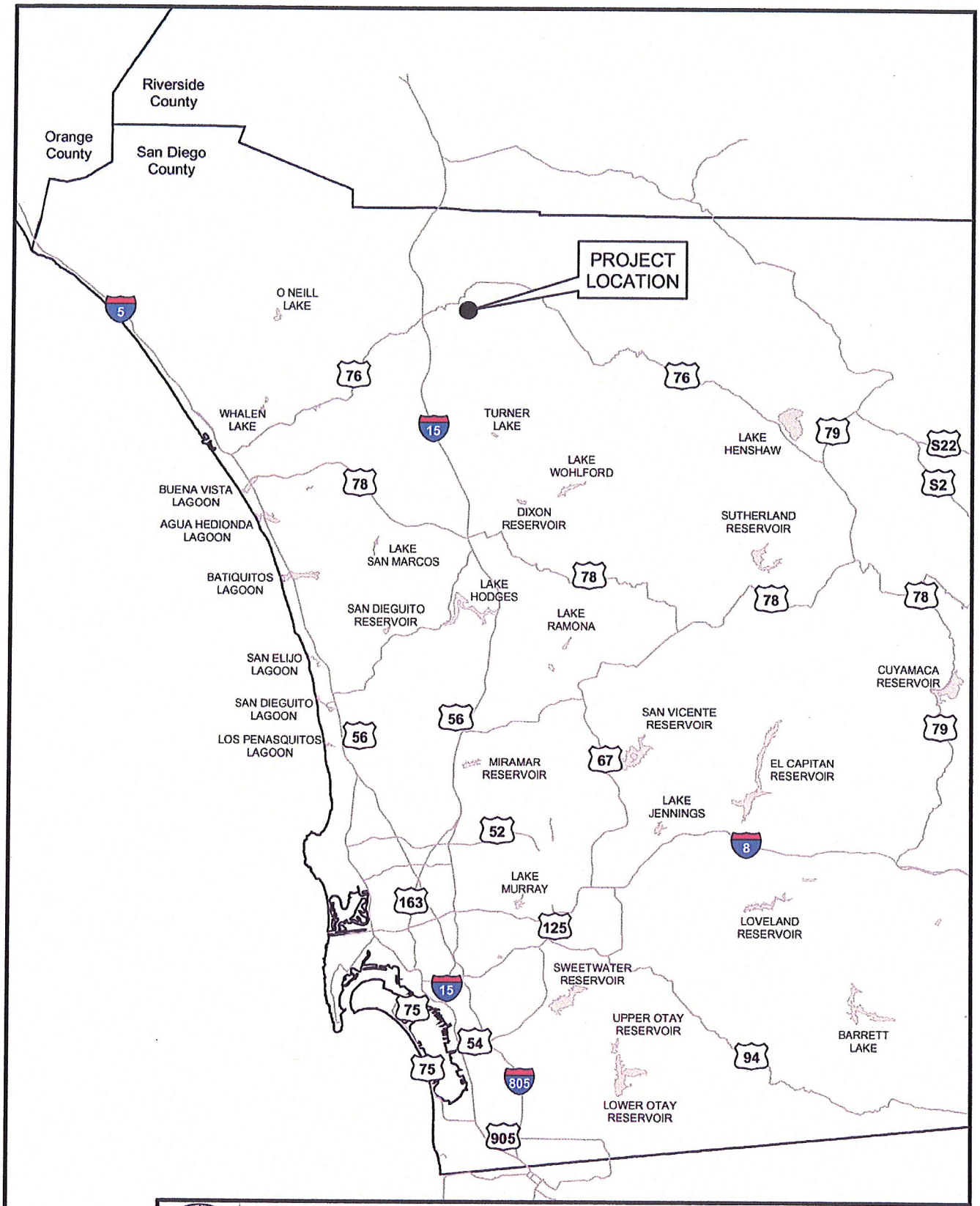
*Includes arroyo toads directly observed and detected aurally.

**A range is provided because an exact number could not be determined based on aural detection.

***Locations of observed toads plotted on Figure 2-1.

Table 3
Acreage of Suitable Arroyo Toad Soil Types Based on NRCS Mapping Within the Project Impact Footprint, Including the Landfill and Excluding Riparian Habitat

Soil Type	Soil Code	Acres
Fallbrook sandy loam, 9 to 15 percent slopes, eroded	FaD2	9.9
Tujunga sand, 0 to 5 percent slopes	TuB	3.5
Visalia sandy loam, 0 to 2 percent slopes	VaA	3.5
Visalia sandy loam, 2 to 5 percent slopes	VaB	0.6
	Total:	**17.5**



SOURCES: SANDAG (Roads, Lakes, Rivers), CDFG (Counties Boundaries).

PROJECT LOCATION
GREGORY CANYON LTD. LLC

URS

4.25 0 4.25 8.5 Miles

SCALE: 1" = 8.5 miles (1:538,560)

CHECKED BY: MS	DATE: 9-20-05	FIG. NO:
PM: BM	PROJ. NO: 27654025.00020	1

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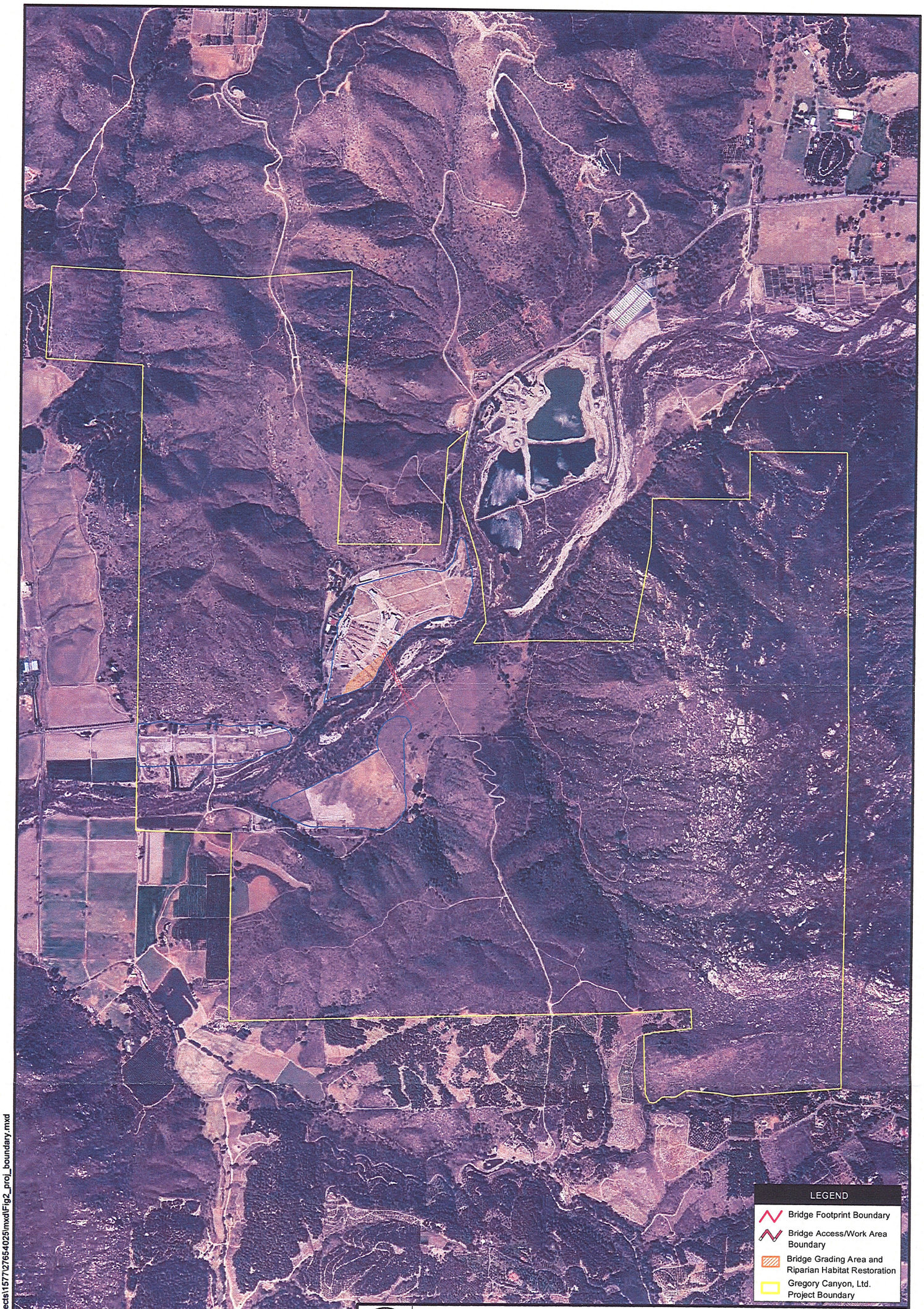

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SOURCES: LENSKA (2002 Aerial Photograph), HELIX (Project Boundary, 1999), Herzog (Bridge Design, 2004); Nolte (Bridge Grading, 2005).

N

625 0 625 1250 Feet

SCALE: 1" = 1,250' (1:15,000)

URS

PROJECT BOUNDARY
GREGORY CANYON LTD. LLC

CHECKED BY TM	DATE: 8-31-06	FIG. NO:
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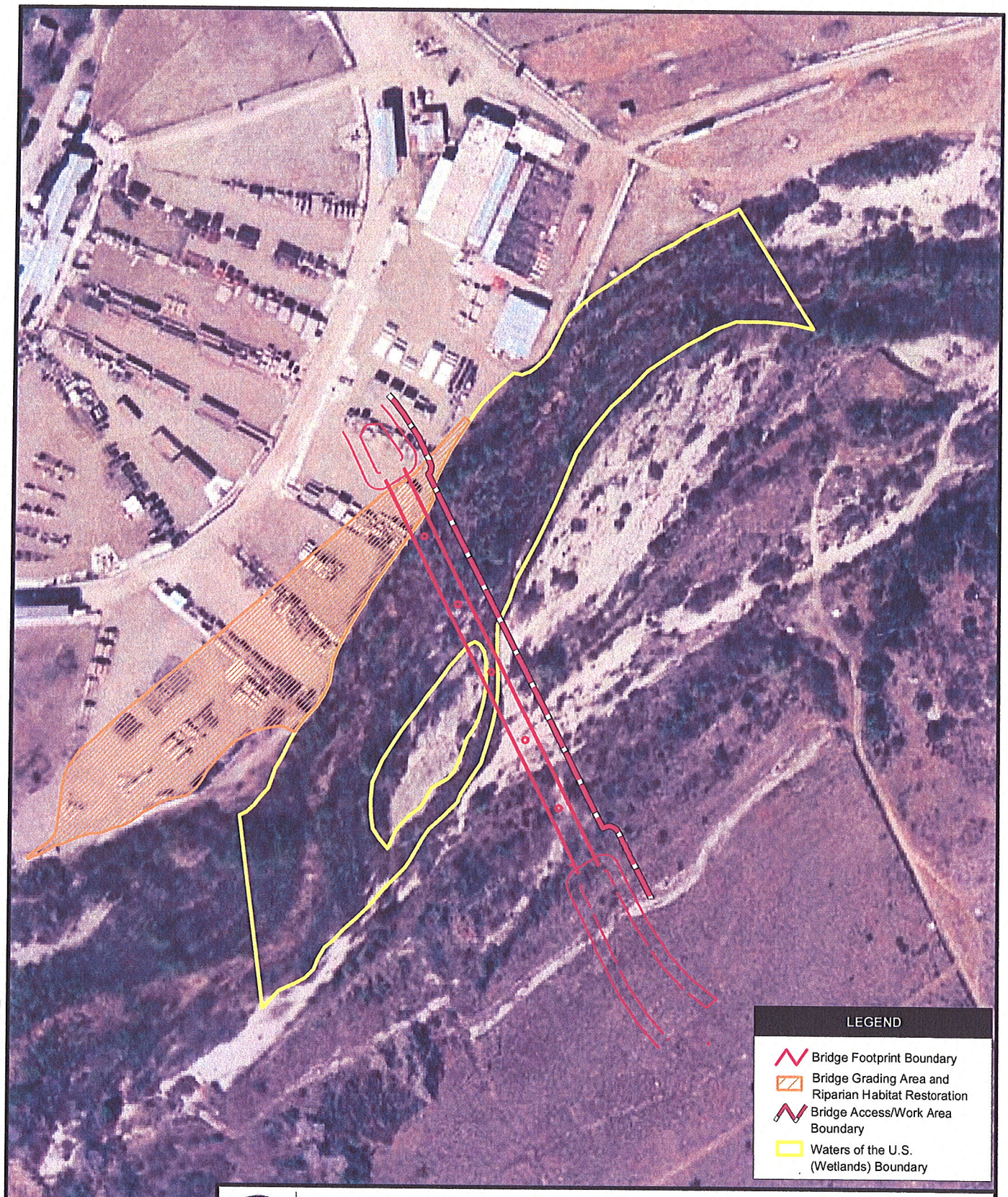

SOURCES: LENSKA (2002 Aerial photograph), Herzog (bridge design, 2004), URS (Waters of the U.S.), Nolte & Assoc. (bridge grading 2005)..

N

BRIDGE FOOTPRINT OVERLAIN ON WATERS OF THE U.S.

URS

100 0 100 200 Feet

SCALE: 1" = 200' (1:2400)

CHECKED BY: CL	DATE: 8-31-06	FIG. NO: 3
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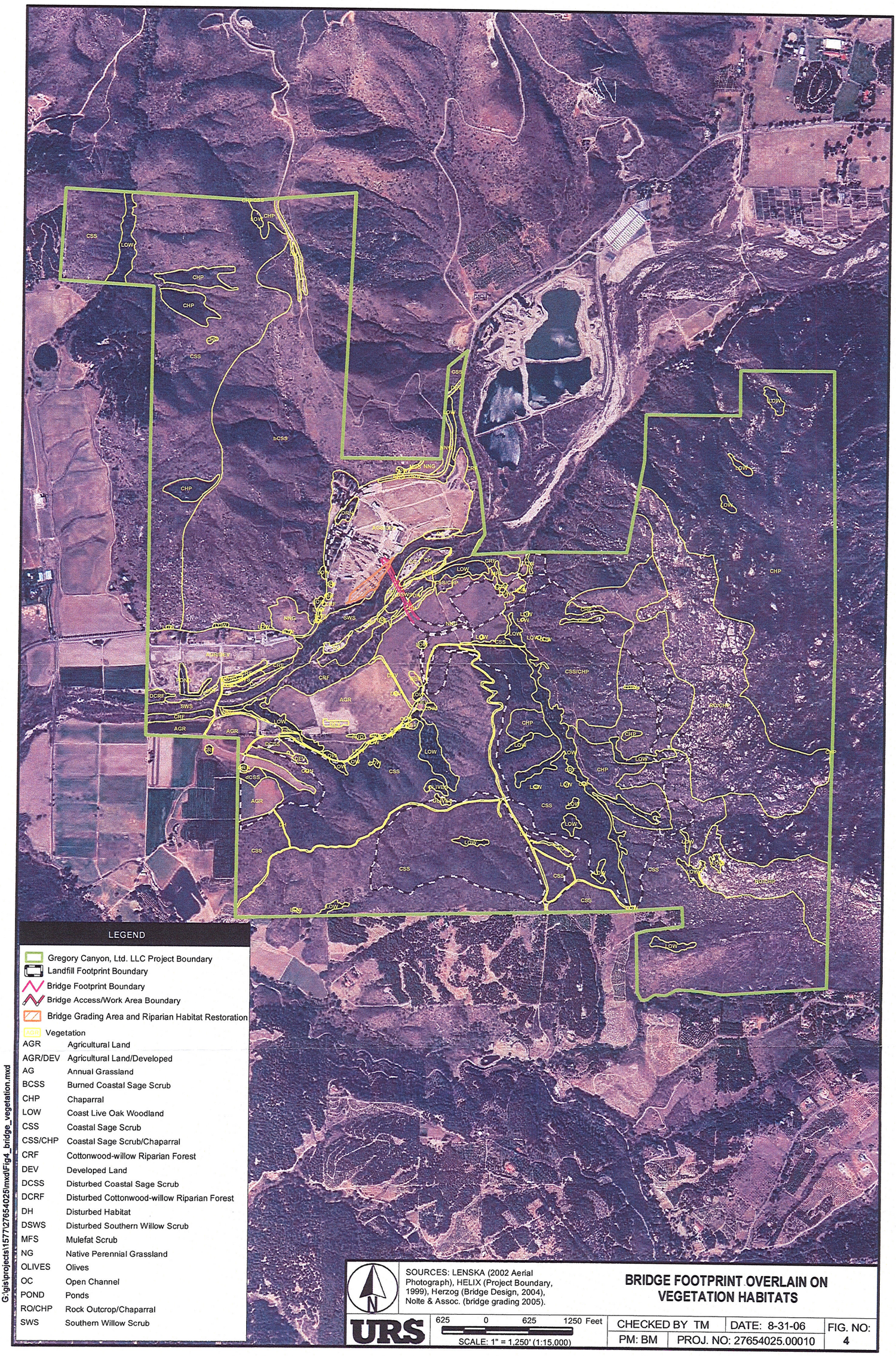

LEGEND

- Gregory Canyon, Ltd. LLC Project Boundary
- Landfill Footprint Boundary
- Bridge Footprint Boundary
- Bridge Access/Work Area Boundary
- Bridge Grading Area and Riparian Habitat Restoration
- Vegetation

AGR	Agricultural Land
AGR/DEV	Agricultural Land/Developed
AG	Annual Grassland
BCSS	Burned Coastal Sage Scrub
CHP	Chaparral
LOW	Coast Live Oak Woodland
CSS	Coastal Sage Scrub
CSS/CHP	Coastal Sage Scrub/Chaparral
CRF	Cottonwood-willow Riparian Forest
DEV	Developed Land
DCSS	Disturbed Coastal Sage Scrub
DCRF	Disturbed Cottonwood-willow Riparian Forest
DH	Disturbed Habitat
DSWS	Disturbed Southern Willow Scrub
MFS	Mulefat Scrub
NG	Native Perennial Grassland
OLIVES	Olives
OC	Open Channel
POND	Ponds
RO/CHP	Rock Outcrop/Chaparral
SWS	Southern Willow Scrub

G:\gis\projects\15777\27654025\mxd\Fig4_bridge_vegetation.mxd

SOURCES: LENSKA (2002 Aerial Photograph), HELIX (Project Boundary, 1999), Herzog (Bridge Design, 2004), Nolte & Assoc. (bridge grading 2005).

N

BRIDGE FOOTPRINT OVERLAIN ON VEGETATION HABITATS

URS

625 0 625 1250 Feet

SCALE: 1" = 1,250' (1:15,000)

CHECKED BY TM	DATE: 8-31-06	FIG. NO: 4
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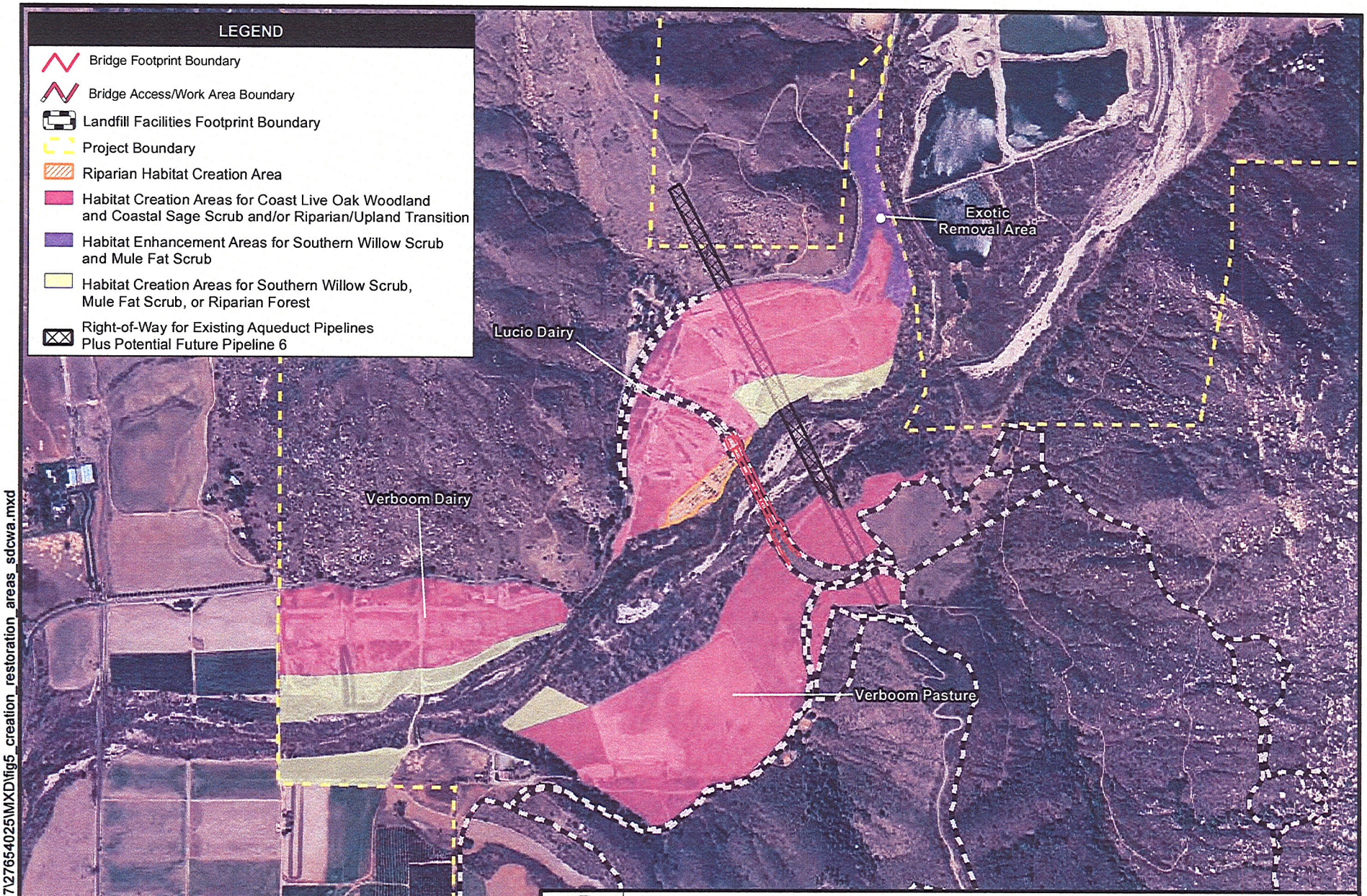

SOURCES: SOURCES: AirPhoto USA (aerial, 2002), Nolte & Associates (Riparian Habitat Creation Area, 2005, SDCWA ROW alignment).

N

URS

500 0 500 1000 Feet

SCALE: 1" = 1000' (1:12,000)

BRIDGE FOOTPRINT AND MITIGATION AREAS GREGORY CANYON

CREATED BY: CL	DATE: 08-31-06	FIG. NO: 5
PM: BM	PROJ. NO: 27654025.00020	

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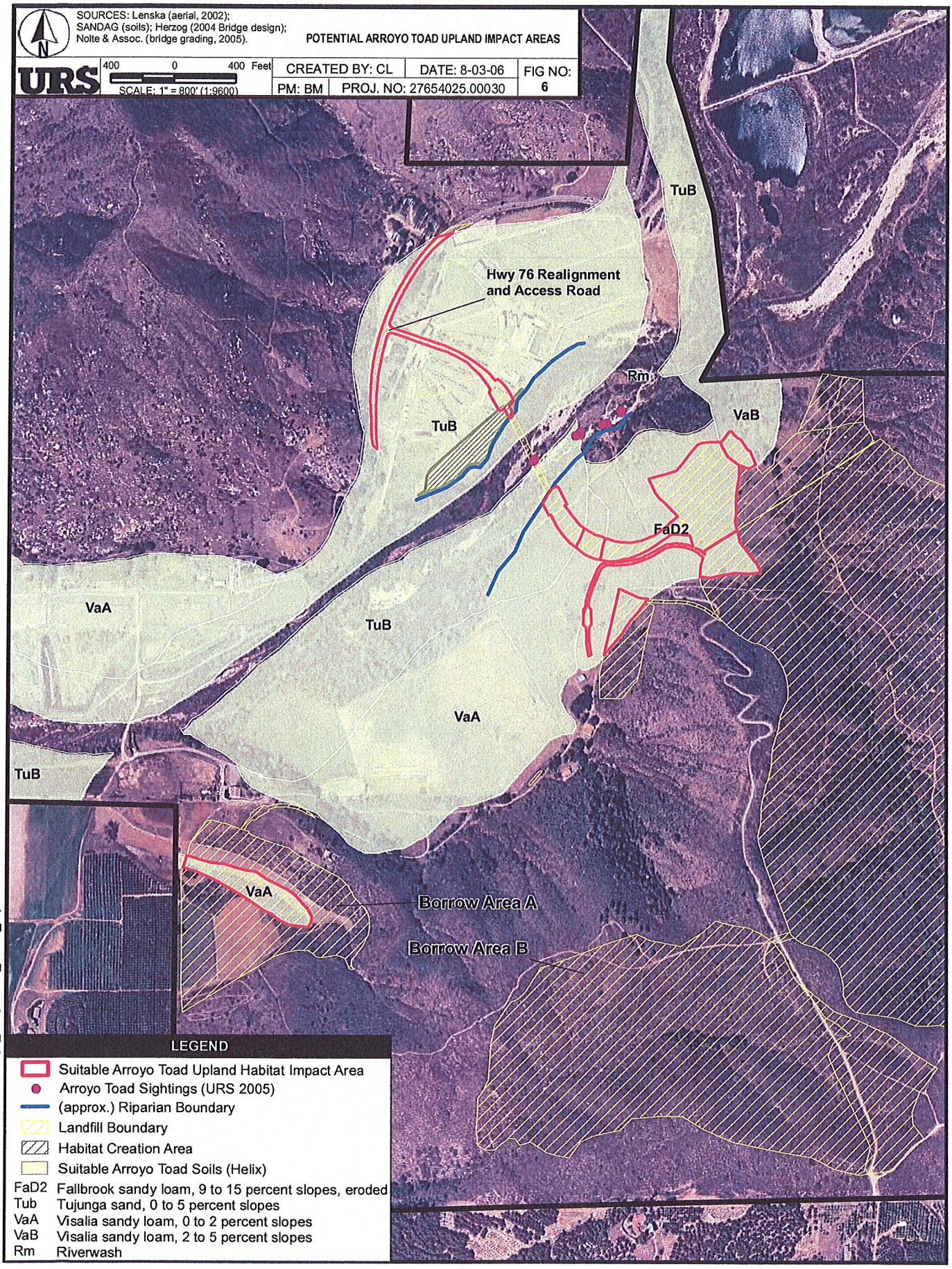
SOURCES: Lenska (aerial, 2002);
SANDAG (soils); Herzog (2004 Bridge design);
Nolte & Assoc. (bridge grading, 2005).

POTENTIAL ARROYO TOAD UPLAND IMPACT AREAS

URS

400 0 400 Feet
SCALE: 1" = 800' (1:9600)

CREATED BY: CL	DATE: 8-03-06	FIG NO:
PM: BM	PROJ. NO: 27654025.00030	6



LEGEND

- Suitable Arroyo Toad Upland Habitat Impact Area
- Arroyo Toad Sightings (URS 2005)
- (approx.) Riparian Boundary
- Landfill Boundary
- Habitat Creation Area
- Suitable Arroyo Toad Soils (Helix)

FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded
Tub	Tujunga sand, 0 to 5 percent slopes
VaA	Visalia sandy loam, 0 to 2 percent slopes
VaB	Visalia sandy loam, 2 to 5 percent slopes
Rm	Riverwash

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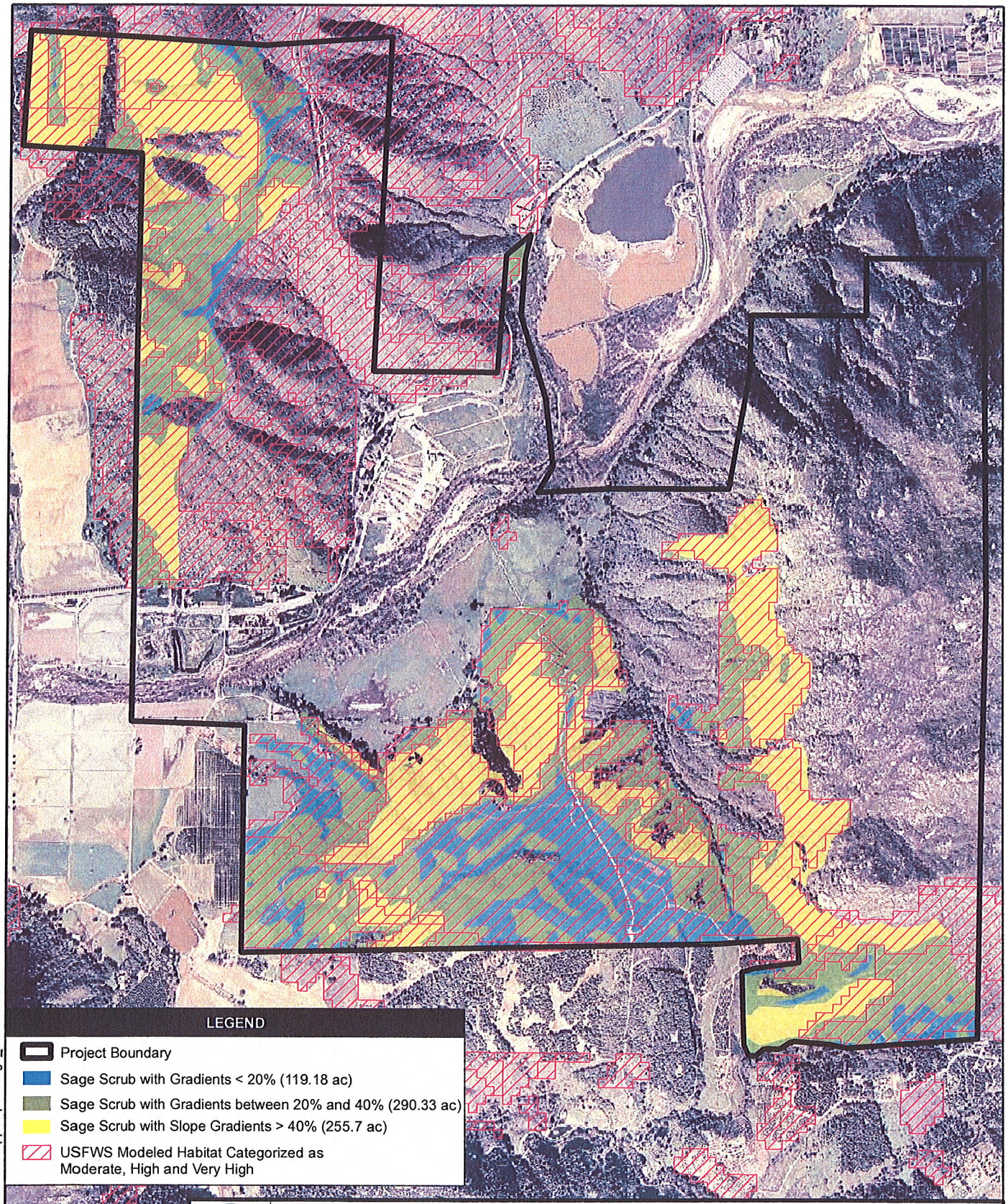

SOURCES: Gnatcatcher Model (USFWS 1997), Slope (SANDAG DEMs, various dates).

N

POTENTIAL COASTAL CALIFORNIA GNATCATCHER VEGETATION HABITAT GREGORY CANYON PROPERTY

URS

750 0 750 1500 Feet

SCALE: 1" = 1500' (1:18,000)

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Diameter of Support
Piers = 10 ft
LEGEND
Wetland\Waters of the U.S. Boundary
Bridge Grading Area and Riparian Habitat Restoration
Bridge Boundary
Bridge Access/Work Area Boundary
SOURCES: AirPhotoUsa (March 2002 Aerial); Herzog (2004 Bridge design).
N
URS
25 0 25 50 75 100 Feet
SCALE: 1" = 50' (1:600)
BRIDGE FOOTPRINT OVERLAIN ON
WATERS OF THE U.S.
GREGORY CANYON, LTD LLC
CHECKED BY: LG
DATE: 08-04-06
PLATE: 1
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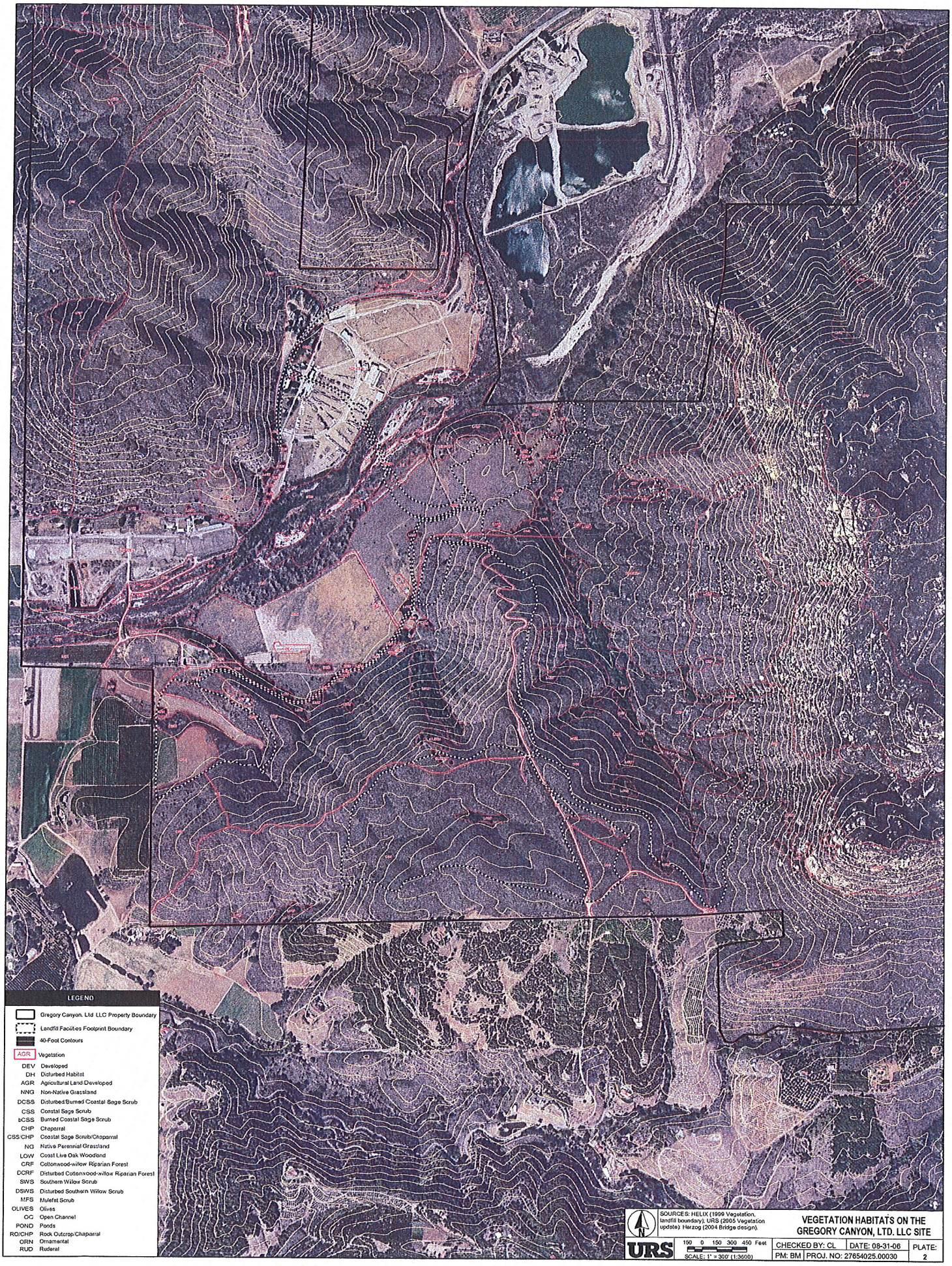
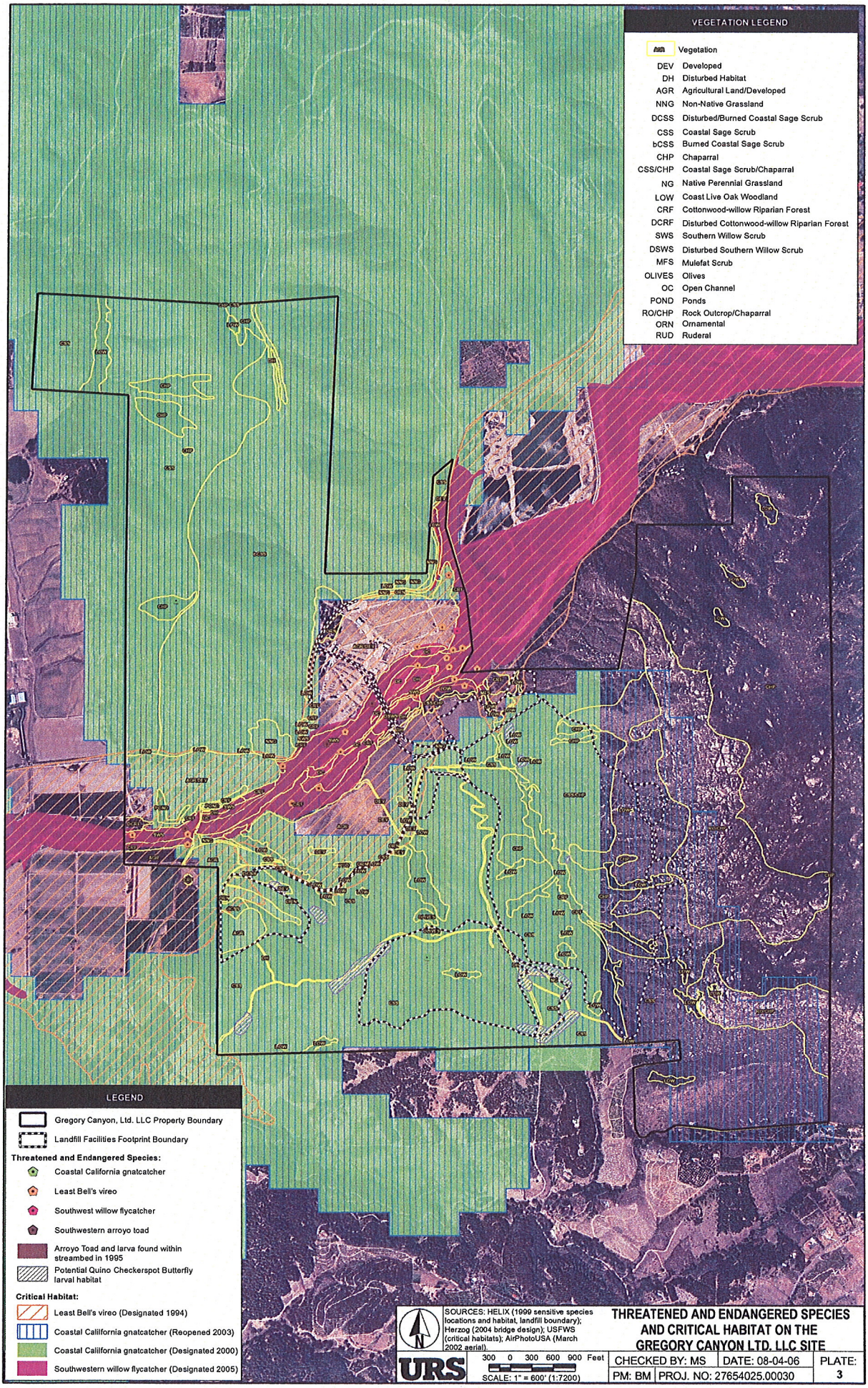

LEGEND
Gregory Canyon, Ltd LLC Property Boundary
Landfill Facilities Footprint Boundary
40-Foot Contours
AGR Vegetation
DEV Developed
DH Disturbed Habitat
AGR Agricultural Land Developed
NNG Non-Native Grassland
DCSS Disturbed/Burned Coastal Sage Scrub
CSS Coastal Sage Scrub
bCSS Burned Coastal Sage Scrub
CHP Chaparral
CSS/CHP Coastal Sage Scrub/Chaparral
NG Native Perennial Grassland
LOW Coast Live Oak Woodland
CRF Cottonwood-willow Riparian Forest
DCRF Disturbed Cottonwood-willow Riparian Forest
SWS Southern Willow Scrub
DSWS Disturbed Southern Willow Scrub
MFS Mulefat Scrub
OLIVES Olives
OC Open Channel
POND Ponds
RO/CHP Rock Outcrop/Chaparral
ORN Ornamental
RUD Ruderal
G:\gis\proj\ccb\15770\25425\mxd\veg_update.mxd
N
SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update); Herzog (2004 Bridge design).
URS
150 0 150 300 450 Feet
SCALE: 1" = 300' (1:3600)
VEGETATION HABITATS ON THE GREGORY CANYON, LTD. LLC SITE
CHECKED BY: CL
DATE: 08-31-06
PM: BM
PROJ. NO: 27654025.00030
PLATE: 2


VEGETATION LEGEND
Vegetation
DEV Developed
DH Disturbed Habitat
AGR Agricultural Land/Developed
NNG Non-Native Grassland
DCSS Disturbed/Burned Coastal Sage Scrub
CSS Coastal Sage Scrub
bCSS Burned Coastal Sage Scrub
CHP Chaparral
CSS/CHP Coastal Sage Scrub/Chaparral
NG Native Perennial Grassland
LOW Coast Live Oak Woodland
CRF Cottonwood-willow Riparian Forest
DCRF Disturbed Cottonwood-willow Riparian Forest
SWS Southern Willow Scrub
DSWS Disturbed Southern Willow Scrub
MFS Mulefat Scrub
OLIVES Olives
OC Open Channel
POND Ponds
RO/CHP Rock Outcrop/Chaparral
ORN Ornamental
RUD Ruderal
LEGEND
Gregory Canyon, Ltd. LLC Property Boundary
Landfill Facilities Footprint Boundary
Threatened and Endangered Species:
Coastal California gnatcatcher
Least Bell's vireo
Southwest willow flycatcher
Southwestern arroyo toad
Arroyo Toad and larva found within streambed in 1995
Potential Quino Checkerspot Butterfly larval habitat
Critical Habitat:
Least Bell's vireo (Designated 1994)
Coastal Calilfornia gnatcatcher (Reopened 2003)
Coastal Calilfornia gnatcatcher (Designated 2000)
Southwestern willow flycatcher (Designated 2005)
G:\gis\projects\15772\27654025\mxd\Plate3_sens_species.mxd
N
SOURCES: HELIX (1999 sensitive species locations and habitat, landfill boundary); Herzog (2004 bridge design); USFWS (critical habitats); AirPhotoUSA (March 2002 aerial).
300 0 300 600 900 Feet
SCALE: 1" = 600' (1:7200)
URS
THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT ON THE GREGORY CANYON LTD. LLC SITE
CHECKED BY: MS
DATE: 08-04-06
PLATE: 3
PM: BM
PROJ. NO: 27654025.00030

APPENDIX I-3

HABITAT RESTORATION AND RESOURCE MANAGEMENT PLAN FOR GREGORY CANYON LANDFILL PROPERTY

RESTORATION PLAN

HABITAT RESTORATION AND RESOURCE MANAGEMENT PLAN FOR GREGORY CANYON LANDFILL PROPERTY

Prepared for

Gregory Canyon Ltd.
249 South Highway 101 #377
Solana Beach, CA 92075

URS Project No. 27654025.00020

October 7, 2008
Final Report

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619.294.9400 Fax: 619.293.7920

RESTORATION PLAN

HABITAT RESTORATION AND RESOURCE MANAGEMENT PLAN FOR GREGORY CANYON LANDFILL PROPERTY

Prepared for

Gregory Canyon Ltd.
249 South Highway 101 #377
Solana Beach, CA 92075

URS Project No. 27654025.00020

Bill Magdych, Ph.D.

Sundeep Amin

Brian Lohstroh

October 7, 2008
Final Report

URS

1615 Murray Canyon Road, Suite 1000
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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Project Description 2-1

2.1 Responsible Party 2-1
2.2 Project Location 2-1
2.3 Brief Summary of Overall Project 2-1
2.4 Jurisdictional Areas Impacted 2-2
2.5 Type, Functions, and Values of Impacted Jurisdictional Areas 2-2

Section 3 Goals of Plan 3-1

3.1 Types of Habitat to be Restored 3-1
3.2 Specific Functions and Values of Habitats to be Preserved, Created, and Enhanced 3-1
3.3 Time Lapse Between Impacts and Restoration Success 3-2
3.4 Estimated Total Cost 3-2
3.5 Other Habitat-Related Activities 3-3

Section 4 Proposed Restoration Site 4-1

4.1 Selection Process 4-1
4.2 Location and Size of Restoration Site 4-1
4.3 Ownership Status 4-1
4.4 Existing Functions and Values of Restoration Site 4-1
4.5 Jurisdictional Delineation 4-2
4.6 Present and Proposed Uses 4-2
4.7 Reference Sites 4-2

Section 5 Implementation of Restoration Plan 5-1

5.1 Rationale for Expecting Implementation Success 5-1
5.2 Responsible Parties 5-1
5.3 Schedule 5-2
5.4 Site Preparation for Habitat Creation 5-2
5.5 Habitat Creation Planting Plan and Specifications 5-5
5.6 Habitat Creation Irrigation Plan 5-7
5.7 Habitat Creation As-Built Conditions 5-8

Section 6 Initial Maintenance of Restoration Areas 6-1

6.1 Maintenance Activities and Responsible Parties 6-1
6.2 Maintenance Schedule 6-3

Section 7 Initial Monitoring Plan for Restoration Areas 7-1

7.1 Performance Standards 7-1
7.2 Target Functions and Values 7-2

TABLE OF CONTENTS

7.3 Target Hydrological Regime 7-2
7.4 Target Acreages to be Preserved, Created, and Enhanced 7-2
7.5 Monitoring Methods 7-3
7.6 Monitoring Schedule 7-6
7.7 Annual Monitoring Reports 7-6
7.8 Conservation Easement 7-7

Section 8 Completion of Habitat Restoration 8-1

8.1 Notification of Completion 8-1
8.2 Agency Confirmation 8-1

Section 9 Contingency Measures 9-1

9.1 Initiating Procedures 9-1
9.2 Alternative Locations for Mitigation 9-1
9.3 Funding Mechanism 9-1
9.4 Responsible Parties 9-1

Section 10 Long Term Maintenance of Restoration Areas and Other On-Site Open Space 10-1

10.1 Non-restored Open Space 10-1
10.2 Restored Open Space 10-1
10.3 Perpetual Maintenance 10-2
10.4 Long-Term Management Issues 10-2

Section 11 Financial Assurances 11-1

11.1 Initial Performance Bond Estimates 11-1
11.2 Adjustments to Performance Bond During Landfill Operating Period 11-2
11.3 Management Endowment 11-3

Section 12 References 12-1

Tables

Table 1	Vegetation Impacts and Mitigation Requirements Identified during CEQA Compliance
Table 2	RFEIR Mitigation Compared to HRRMP Mitigation Acreage
Table 3	Wilderness Gardens Regional Park Reference Site - Riparian/Alluvial Scrub Transect Data
Table 4	Wilderness Gardens Regional Park Reference Site - Oak Woodland Transect Data
Table 5	Wilderness Gardens Regional Park Reference Site - 100-year Floodplain Transect Data
Table 6	Plant Palette for Southern Willow Scrub Creation Area
Table 7	Plant Palette for Cottonwood Riparian Forest Creation Area and Cottonwood Riparian Creation Area/Pond
Table 8	Plant Palette for Oak Woodland with Alluvial Scrub/Native Grassland Understory Creation Area
Table 9	Plant Palette for Coastal Sage Scrub Creation Area
Table 10	Plant Palette for Coastal Sage Scrub (Mesic Alluvial Scrub) Creation Area
Table 11	Plant Palette for Chaparral Creation Area
Table 12	Plant Palette for Native Grassland Creation Area
Table 13	Maintenance/Monitoring Schedule
Table 14	Southern Willow Scrub, Cottonwood Riparian Forest, and Cottonwood Riparian Forest/Pond Creation Area Performance Standards
Table 15	Oak Woodland with Alluvial Scurb/Native Grassland Understory and Coastal Sage Scurb (Mesic Alluvial Scrub) Creation Area Performance Standards
Table 16	Coastal Sage Scrub, Chaparral, and Native Grassland Performance Standards

Figures

Figure 1	Project Area and Existing Vegetation Communities
Figure 2	1928 Aerial Photograph of Gregory Canyon Landfill
Figure 3	Restoration and Enhancement Areas Gregory Canyon Landfill
Figure 4	Least Bell's Vireo/Southwestern Willow Flycatcher Mitigation Areas
Figure 5	Jurisdictional Delineation of the Gregory Canyon Landfill Site
Figure 6	Wilderness Gardens Regional Park Reference Site Transect Locations
Figure 7	Tentative Transect Location Map

Appendices

Appendix A	Property Analysis Record (PAR) Table
Appendix B	Gregory Canyon Landfill Phasing Plan
Appendix C	Sample Qualitative Evaluation Monitoring Sheet
Appendix D	Sample Conservation Easement Template (Corps/CDFG)

Plates

Plate 1 Restoration and Enhancement Areas Gregory Canyon Landfill

CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CNLM	Center for Natural Lands Management
Corps	U.S. Army Corps of Engineers
CPI	Consumer Price Index
CWA	County Water Authority
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
GCLF	Gregory Canyon Landfill
HRRMP	Habitat Restoration and Resource Management Plan
QAL	qualified applicator's license
RFEIR	Revised Final Environmental Impact Report
RWQCB	Regional Water Quality Control Board
SDG&E	San Diego Gas and Electric
SSC	Species of Special Concern
URS	URS Corporation
USFWS	U.S. Fish and Wildlife Service

SECTION 1 INTRODUCTION

This habitat restoration and resource management plan includes restoration and preservation requirements for the U.S. Army Corps of Engineers (Corps) 404 permit, Regional Water Quality Control Board (RWQCB) Section 401 Certification, California Department of Fish and Game (CDFG) Streambed Alteration Agreement, and the San Diego County Environmental Impact Report (EIR). This plan provides methods and success criteria for creating 166.0 acres of upland/transitional habitat [including mitigation for 70.4 acres of oak woodland with alluvial scrub and native grassland understory, 14.3 acres of chaparral, 2.0 acres of native grassland, and 79.3 acres of coastal sage scrub/coastal sage scrub (mesic alluvial scrub)], creating 6.5 acres of riparian habitat (including 2.3 acres of mitigation for riparian vegetative communities at the bridge crossing of the San Luis Rey River consisting of southern willow scrub habitat creation, and 4.2 acres of cottonwood riparian forest and cottonwood riparian forest/pond restoration), and enhancing 75.6 acres of riparian habitat (32.7 acres of which will apply specifically to least Bell's vireo and southwestern willow flycatcher mitigation requirements). These areas are referred to in this plan as the restoration area. These figures are an increase over the previous numbers provided in a conceptual plan included in the 2007 Revised Final Environmental Impact Report (San Diego County 2007) (RFEIR), and are a result of the maximization of land available for restoration outside of the landfill footprint. Utility and aqueduct easement acreage has been taken into account and is excluded from the above totals. This plan also addresses maintenance of the restoration area, as well as maintenance of other areas on the landfill property required to be preserved as open space by the land use entitlement for the project. In accordance with the land use entitlement, the combination of the restoration area and other open space areas must be at least 1,313 acres.

This plan updates and replaces the Draft Wetland Mitigation and Habitat Enhancement Plan prepared by Helix (2000). This plan addresses reductions in impacts on Corps jurisdictional wetlands and combines the restoration and preservation effort for upland habitat as well.

SECTION 2 PROJECT DESCRIPTION

2.1 RESPONSIBLE PARTY

Gregory Canyon Ltd. LLC
Contact: Mr. Richard Chase
249 South Highway 101 #377
Solana Beach, CA 92075

2.2 PROJECT LOCATION

The 1,783 acre Gregory Canyon Landfill (GCLF) property is located approximately 3 miles east of I-15 along SR-76, as shown on Figure 1 (33° 20' 55" W Latitude, 117° 06' 59" N Longitude).

2.3 BRIEF SUMMARY OF OVERALL PROJECT

The GCLF property includes 308.6 acres that will be used for overall landfill activities (*e.g.*, stockpile areas, ancillary facilities, access road, and refuse disposal), of which 183 acres will be used specifically for refuse disposal. The proposed site will be permitted as a Class III landfill. The proposed project area will also include two designated soil stockpile/borrow areas. Borrow/Stockpile Area A will be located west of the proposed landfill footprint adjacent to the western property boundary, and Borrow/Stockpile Area B will be located immediately southwest and adjacent to the proposed landfill footprint. Other project components include the ancillary facilities area, access road and bridge from State Route 76 crossing San Luis Rey River, internal haul road, and installation of environmental monitoring and control systems.

The construction of a new bridge crossing of the San Luis Rey River to handle ingress to and egress from the Gregory Canyon Landfill will result in approximately 0.368 acres of proposed project impacts to Corps and CDFG jurisdictional wetlands (0.002 acre of which are permanent impacts). This bridge crossing will replace an existing crossing that is located downstream, but which will not be able to support the required equipment during operation of the project. The existing crossing will be abandoned after construction of the new bridge is completed.

Implementation of the proposed project will result in a total of 308.6 acres of impacts to various vegetation communities (Table 1). The RFEIR provides that these impacts will require a total of approximately 543.2 acres of mitigation that will be achieved through on-site habitat restoration (including habitat creation or enhancement) and off-site acquisition/preservation. Project phases are described in Appendix B.

Conceptual habitat restoration areas were provided in the RFEIR. This plan elaborates on the implementation of the habitat restoration. This restoration program will consist of the creation/enhancement of lost and/or disturbed habitat, enhancement of water quality effects caused by the long-term agricultural use of the property, and removal of invasive, exotic plant species. This plan will focus on avoiding take of State and federally listed species, with the overall goal of providing a net increase in suitable habitat for these species. Habitat restoration is only one part of the project's complete

biological resources mitigation package. A detailed discussion of the complete mitigation package can be found in the 2003 EIR (San Diego County 2003), and subsequent RFEIR.

2.4 JURISDICTIONAL AREAS IMPACTED

The project will result in the temporary impact of 0.366 acre of Federal/State wetlands/waters at the San Luis Rey River for construction of the bridge with an additional 0.002 acre of permanent fill for bridge piers, for a total impact of 0.368 acre. Total impacts on riparian vegetation, including this 0.368 acre of impact, are 0.4 acre of southern willow scrub, 0.2 acre of cotton-willow riparian forest, and 0.4 acre of disturbed southern willow scrub. This total impact of 1.0 acre of riparian habitats will be compensated for through the creation of 2.3 acres of riparian habitat (specifically southern willow scrub) at the bridge crossing on the north side of the San Luis Rey River, plus restored habitat within the temporary construction areas for the bridge. Additional riparian vegetation will be established as cottonwood riparian forest and cottonwood riparian forest/pond on 4.2 acres along the San Luis Rey River, while 75.6 acres of existing riparian vegetation will be enhanced through removal of exotic species within the existing riparian habitat in and along the San Luis Rey River.

The project will also result in impacts on various upland vegetation communities, and this plan also addresses the restoration of upland vegetation communities. Table 1 provides acreages of impacts by habitat type and the associated mitigation required in the RFEIR. This plan addresses the portion of the mitigation, in the form of restoration, which is proposed on-site. Additional mitigation for habitat impacts will also occur off-site. The project impact area and existing vegetation communities are shown in Figure 1. In addition to project mitigation requirements in the RFEIR, this plan also addresses maintenance of additional on-site open space areas as required by the land use entitlement for the project.

2.5 TYPE, FUNCTIONS, AND VALUES OF IMPACTED JURISDICTIONAL AREAS

The types of jurisdictional areas affected by the bridge construction include Federal wetlands, State wetlands, and other waters of the U.S. The proposed bridge location crosses through southern willow scrub, disturbed southern willow scrub, unvegetated open channel, and disturbed habitat in this portion of the San Luis Rey River, which supports populations of least Bell's vireo, southwestern willow flycatcher, and arroyo toad. The functions provided by the riparian habitat along this portion of the river include foraging and nesting sites for these and other wildlife species. Additionally, the riparian zone associated with the river functions as a wildlife corridor for various species of wildlife including large mammals and birds. This is important in allowing animals and plants to disperse throughout their historic range and maintain population diversity. The impacts on these functions and values for wetlands and waters will be minimal as they are temporary in nature, and they will not be lost as a result of this project. The mitigation for these impacts will result in the creation of 2.3 acres of high quality southern willow scrub habitat, as well as the creation and enhancement of other riparian habitats, which will result in a substantial net increase in these functions and values. These impacted areas, plus upland impact areas and their mitigation are discussed in more detail in the 2007 RFEIR and URS Corporation (URS) California Environmental Quality Act (CEQA) update (2007).

SECTION 3 GOALS OF PLAN

3.1 TYPES OF HABITAT TO BE RESTORED

The goal of the restoration effort is to return the agricultural and developed areas within the property and outside the project impact areas to a state similar to the natural circumstance prior to such land use. Evidence of the natural circumstance can be seen in a 1928 aerial photo of the project site (Figure 2). Based on the photo, much of the area encompassing the project site is undeveloped, with the exception of a relatively small pasture found in what became the Verboom dairy pasture. Overall, the habitat in the valley bottom at the time appears to be subject to, and an artifact of, the occasional flood flows of the San Luis Rey River. Much of the native upland habitat in the area appears to be an open alluvial scrub, with oaks and possibly sycamores dispersed sparsely throughout. Closer to the San Luis Rey River, more mesic vegetation is apparent, possibly including cottonwoods, willows, sycamores, occasional oaks, and other mesic scrub/woodland vegetation.

The habitats to be restored as part of the required mitigation effort to offset impacts of the 308.6-acre landfill and related facilities are chosen in an effort to mimic the area's natural state as depicted in the 1928 aerial photo. Therefore, the following habitat categories are designated to be restored. Sloped and elevated areas in the uplands exhibiting relatively thin soils will be restored to coastal sage scrub, chaparral, and native grassland habitat as appropriate. Gradually sloped, lower areas in the uplands exhibiting thicker, alluvial soils will be restored to oak woodland with an alluvial scrub and native grassland understory. Closer to the San Luis Rey River, the habitat to be restored will transition into mesic alluvial scrub, which is a coastal sage scrub association. In addition, an area near the proposed bridge that was likely filled to support dairy facilities will be graded down in elevation, and 2.3 acre of southern willow scrub habitat will be created in its place. Finally, the entire San Luis Rey River riparian habitat corridor within the property boundaries will be enhanced in the form of exotic species management.

The habitat restoration areas are shown in Figure 3 and Plate 1. Approximate acreages of these areas include creation of 70.4 acres of oak woodland habitat with alluvial scrub and native grassland understory, 14.3 acres of chaparral habitat, 79.3 total acres of coastal sage scrub habitats (including mesic alluvial scrub), 2.0 acres of native grassland habitat, 2.3 acres of southern willow scrub, 4.2 acres of cottonwood riparian forest habitats, and enhancement of 75.6 acres of riverine riparian habitat (Table 2).

3.2 SPECIFIC FUNCTIONS AND VALUES OF HABITATS TO BE PRESERVED, CREATED, AND ENHANCED

The primary goal of the restoration effort is to provide a net benefit to the listed species present within the project area. A large net benefit will result from the creation/enhancement of habitat for arroyo toad, least Bell's vireo, and southwestern willow flycatcher in an area where all three species are already known to occur and can expand into. Least Bell's vireo and southwestern willow flycatcher will specifically benefit from the enhancement of 32.7 acres of existing riparian vegetation in the riverine riparian enhancement area, as well as 2.3 acres of on-site southern willow scrub habitat creation and the enhancement of the remaining 42.9 acres of the riverine riparian habitat enhancement area. The 32.7 acres of riparian area creation/enhancement is directly applicable to least Bell's vireo and southwestern willow flycatcher

mitigation, as the identified areas are both outside of the project facility footprint and cumulative 60 dBA L_{eq} noise contours, and are greater than the 20.0 acres as required in the RFEIR (Figure 4). Exotic invasive plants that have become established in the portions of the San Luis Rey that occur on-site will be cleared, allowing native riparian vegetation to re-colonize, creating improved habitat for both the least Bell's vireo and southwestern willow flycatcher, as well as other riparian species. Arroyo toad will not only benefit from the riparian habitat creation and enhancement, but also from the various upland habitat creation areas as well (specifically 149.7 acres of oak woodland and coastal sage scrub habitats). Currently, the upland areas on-site have ideal sandy alluvial soils for arroyo toad use. However, the dense cover of non-native grasses and annuals, and compaction from decades of agricultural use make these areas unsuitable. Once cleared, controlled for weeds, and planted with sparser native vegetation, these areas will provide excellent upland habitat that arroyo toads can use for foraging and aestivation.

Other species that may benefit from the habitat creation, enhancement, and preservation include various California Species of Special Concern (SSC), and species that do not currently occur on-site, such as California gnatcatcher (*Polioptila californica*).

3.3 TIME LAPSE BETWEEN IMPACTS AND RESTORATION SUCCESS

Implementation of the creation of southern willow scrub, cottonwood riparian forest and cottonwood riparian forest/pond, oak woodland with alluvial scrub and native grassland understory, coastal sage scrub and coastal sage scrub (mesic alluvial scrub), chaparral, and native grassland will be phased to match the phased construction of the landfill. However, all riverine riparian enhancement activities will take place at the initial implementation of the plan. The proximity of the water table to the finished grade of the creation areas will ensure the rapid establishment of the target vegetation. In addition to natural rain and groundwater, the use of temporary supplemental irrigation will quickly germinate native seed, and help rapidly establish the plants to ensure success as soon as possible. All container stock (native trees) will also receive temporary supplemental irrigation via an overhead system as described in Section 5.6, although other methods, such as drip irrigation or DriWater® may also be used, if appropriate. Under ideal conditions, three years of supplemental irrigation from a temporary above-ground system should be adequate to germinate seed and establish native vegetation. However, continued irrigation may be necessary beyond three years if sufficient progress is not being made, as noted from annual monitoring. If this is the case, the site/area will have to be self-reliant for two years without supplemental irrigation to be considered successful, which may then be longer than five years in total. This situation is not likely, and should not be an issue with proper site preparation and maintenance. After the sites have established themselves, the temporary irrigation system will be removed from the site. The entire habitat creation may not be completed until the landfill reaches full build-out in approximately 16 years because of the phased installation of each creation area (project phases are described in Appendix B). With that understanding, each of the above creation areas should be self-sustaining within 5-7 years after installation.

3.4 ESTIMATED TOTAL COST

The total cost of the Habitat Restoration and Resource Management Plan implementation is approximately $18.6 million, and includes maintenance and monitoring of the restoration area for a period of five years after implementation of habitat creation/enhancement, maintenance of the restoration

area for a period of twenty five years thereafter, and maintenance of other open space areas on the property for thirty years. See Section 11 and Appendix A for more detail about the overall cost of implementation, monitoring, and maintenance.

3.5 OTHER HABITAT-RELATED ACTIVITIES

Habitat restoration is considered only part of the activities proposed by the applicant. Other portions of the landfill property will be preserved as open space, and approximately 377 acres of habitat will be preserved off-site (the exact acreage will be determined through consultation with the County, based on EIR mitigation requirements). A second option, as an alternative to acquiring off-site properties, would enable Gregory Canyon Ltd. LLC to pay San Diego County a fee that would be paid in lieu of acquiring the off-site acreage. In the event off-site properties are required, the applicant will submit a revised Habitat Restoration and Resource Management Plan.

SECTION 4 PROPOSED RESTORATION SITE

4.1 SELECTION PROCESS

Conceptual restoration areas were selected during the project's RFEIR process.

4.2 LOCATION AND SIZE OF RESTORATION SITE

The restoration areas are situated along the San Luis Rey River in formerly developed agricultural areas on-site (Figure 3 and Plate 1). The restoration plan includes creating approximately 166.0 acres of upland/transitional habitat and 6.5 acres of riparian habitat. Another 75.6 acres of riparian habitat will be enhanced through exotic plant species management.

4.3 OWNERSHIP STATUS

Gregory Canyon, Ltd. owns the project site, which includes the restoration areas. Easements for the County Water Authority (CWA) and San Diego Gas and Electric (SDG&E) exist on-site (Figure 1).

4.4 EXISTING FUNCTIONS AND VALUES OF RESTORATION SITE

4.4.1 Existing Vegetation Communities

The areas planned for restoration include developed areas, degraded and disturbed native habitat, and habitat supporting non-native species, such as non-native grassland. These areas are consistent with the agricultural/dairy operations that have occurred on-site for several decades. A map showing the current vegetation, and areas planned for creation and enhancement is provided in Figure 3 and Plate 1. The area planned for enhancement supports various riparian habitat communities, such as southern willow scrub and cottonwood riparian forest, along with disturbed versions of some of these habitats. The disturbed riparian habitats often support invasive, exotic species such as giant reed (*Arundo donax*) and tamarisk (*Tamarix* sp.).

4.4.2 Special Status Species

The property supports populations of least Bell's vireo (*Vireo bellii pusillus*, State listed as Endangered [SE], federally listed as Endangered [FE]), southwestern willow flycatcher (*Empidonax traillii extimus*, SE, FE), and arroyo toad (*Bufo californicus,* FE). These species breed in the riparian habitat associated with the San Luis Rey River, and the arroyo toad also uses the upland habitat adjacent to the river for foraging and aestivation. As mentioned in the previous section, creation/enhancement activities are aimed at a net increase of suitable habitat for the above-mentioned species. Specifically, the creation and enhancement of riparian habitat is aimed at increasing suitable habitat for least Bell's vireo and southwestern willow flycatcher and increasing arroyo toad breeding habitat, while replacing the developed/non-native grasslands with oak woodland and alluvial coastal sage scrub habitat will provide additional foraging and burrowing habitat for the arroyo toad.

4.5 JURISDICTIONAL DELINEATION

A jurisdictional delineation was completed by URS (2004), and is shown on Figure 5.

4.6 PRESENT AND PROPOSED USES

4.6.1 Restoration Site

Although much of the property currently supports native vegetation communities, the low-lying areas adjacent to the San Luis Rey River have been used for agricultural purposes since the early 1920s and currently contain the remnant fields and structures associated with that land use. Prior to acquisition by the project proponent, these areas were developed into two dairies, complete with large pastures. No longer grazed by cattle, these fallow pastures have transitioned to large non-native grasslands that will be one of the focal points of this restoration plan. The other areas slated for restoration include the developed areas associated with the dairy facilities. These areas will be restored to an upland/transitional habitat and remain undeveloped as dedicated open space.

The riparian habitat associated with the San Luis Rey River supports State and federally-listed species, however, there is a portion of this habitat within the property that supports invasive plant species such as giant reed and tamarisk. This area is slated for habitat enhancement, which will include removal of these invasive plant species. Once the invasive species are removed, native vegetation is expected to naturally re-colonize this area. This area will then remain undeveloped as dedicated open space.

4.6.2 Adjacent Areas

Several native vegetation communities occur on the property (Figure 1), including chaparral, coastal sage scrub, coast live oak woodland, native perennial grassland, southern willow scrub, mule fat scrub, and riparian forest. Other vegetation communities present on-site include agriculture, non-native grassland, ruderal habitat, disturbed habitat, and developed areas. A detailed discussion of these vegetation communities is provided in the 2003 EIR, RFEIR, and URS CEQA Update (2007).

4.7 REFERENCE SITES

A primary point of reference for tracking the progress of the restoration plan will be the 1928 aerial photograph (Figure 2). This photo provides evidence of the site prior to the widespread agricultural development that occurred on-site after this photo was taken. Based on the photograph, the areas currently occupied by development appear to have consisted of an oak woodland and alluvial scrub habitat in the floodplain areas, with sycamores and cottonwoods possibly occurring in the actual flood channel. Additionally, URS biologists used the Wilderness Gardens Regional Park upstream of the project as a reference site to determine the presence of similar habitat, and to come up with a plant palette representative of actual species that occur in the immediate area along a relatively undisturbed stretch of the San Luis Rey River. The specific habitats encountered at the reference site were oak woodland, upland scrub in the 100-year floodplain, and riparian alluvial scrub. Five point-intercept transects were sampled in each habitat community for a total of 15 transects (Figure 6). These communities closely mimic the proposed habitat creation communities and the data collected on the species diversity and composition were considered when creating site specific plant palettes for the project (Tables 3 through 5) (see Section 5.5.1.3).

SECTION 5 IMPLEMENTATION OF RESTORATION PLAN

5.1 RATIONALE FOR EXPECTING IMPLEMENTATION SUCCESS

The restoration areas chosen for this effort support the appropriate hydrological regime and soils with minimal grade modification required. A soils investigation conducted by Geologic Associates (2000) reported that groundwater was present within 7.5-8.5 feet of the surface according to borings conducted at the dairies and within the Verboom pasture. In addition, very little organic content was found near the soil surface (1.17%-4.08%) at these boring locations, indicating that the current soil properties at the site are similar to the original native condition. This low organic content will favor native upland and riparian species, which are adapted to such conditions.

The goal of the restoration plan is to return the site to a condition similar to its native condition, prior to the agricultural development that has been present at the site since the early 1900s. The 1928 aerial photograph (County of San Diego) indicates that much of the uplands on-site were an open, alluvial scrubland with oaks and sycamores. This photograph will help ensure implementation success by guiding the restoration effort, ensuring that the various vegetation communities are planted in the proper areas on-site.

Once the restoration and enhancement efforts are complete, the overall goal of providing a net increase of suitable habitat for the listed species on-site will also be attained. Removing invasive plant species in the riparian habitat will provide more suitable habitat for least Bell's vireo and southwestern willow flycatcher, and replacing large areas of non-native grassland with open oak woodland and alluvial coastal sage scrub habitat associations will provide increased foraging and burrowing habitat for arroyo toad. Increasing the amount of suitable habitat for these species should allow for their populations to expand.

5.2 RESPONSIBLE PARTIES

The restoration team for the project will consist of a qualified biologist and landscape contractor. As necessary, a qualified biologist will work with the project landscape architect to develop landscape construction documents for the proposed habitat creation areas. A qualified biologist will supervise site preparation, plant and irrigation installation (where required), and habitat maintenance, and oversee the five-year maintenance and monitoring period. A qualified biologist and landscape contractor will be responsible for site preparation and exotic species removal, seeding/planting, and irrigation plans (where required) based on this plan. The landscape contractor should have revegetation experience and have successfully completed native habitat revegetation elsewhere in southern California. A qualified biologist will also oversee the habitat enhancement activities within the riparian habitat.

Habitat creation and enhancement activities will be coordinated with the U.S. Fish and Wildlife Service (USFWS) and CDFG within habitat potentially occupied by special status species such as arroyo toad, least Bell's vireo, and southwestern willow flycatcher. The restoration team, as well as other personnel involved with the restoration activities will be familiar with arroyo toad identification and behavior, or will complete a training session given by a qualified biologist detailing with these aspects prior to starting work on this project.

5.3 SCHEDULE

Restoration and enhancement activities in riparian habitat that would adversely affect least Bell's vireo, southwestern willow flycatcher, or arroyo toad will generally be limited to fall and winter months (specifically September 15 through March 15) to avoid disturbing the breeding activities of the special status species present within the project area.

5.3.1 Habitat Creation Schedule

Habitat creation activities will be implemented in phases prior to and/or concurrent with disturbance. The estimated timing and extent of each phase is described in the document entitled Phased Landfill Development Description, Design Features and Mitigations related to Biological Resources, which is included as Appendix B. Reasonable efforts will be made to initiate subsequent restoration phases as far as possible (up to five years) in advance of the disturbance, where practicable, considering ongoing construction and operation of the landfill. The phasing schedule may be altered depending on the volume of waste receipts. Seed application and container planting will be performed in the late summer through early spring, with fall months being preferable. The time of seeding may need to be adjusted by a qualified biologist in response to seasonal variability and weather conditions to help ensure the ultimate success of the restoration effort.

5.3.2 Habitat Enhancement Schedule

Habitat enhancement activities consist of exotic species removal in and around the San Luis Rey River, specifically the Riverine Riparian Management Enhancement Area and Southern Willow Scrub Creation Area. Exotic plant species removal within the entire 75.6 acre riverine riparian management area will take place upon the initial implementation of the restoration plan, and thereafter on an annual basis for a duration of five years, with dead exotic removal conducted on the sixth year, if necessary. If exotic species continue to persist beyond the allowable success criteria percentage, removal will continue until that component of the success criteria is achieved and agency approval is met (Section 9). Active removal activities will take place during the fall months to avoid the breeding season of special status species present within the area. Initial removal will take place in one phase, beginning upstream and moving downstream to minimize seed dispersal.

Habitat enhancement activities will be reported to the agencies as part of the reporting program for the habitat restoration. Reported items will include mapping of areas were specific exotic removal activities were conducted, methodology used (*e.g.,* hand tools vs. herbicide application), an evaluation of the success of the enhancement program, and photo-documentation.

5.4 SITE PREPARATION FOR HABITAT CREATION

5.4.1 Initial Preparation

Initial site preparation will involve removing fences, unnecessary power poles, structures, and concrete reinforced areas such as foundations and other dairy-related paved areas. The use of herbicide will be the most cost efficient and effective means of control because of the large concentration of non-native grasses

and other ruderal species in the fallow pastures, along with the equally large seed bank as a result of decades of agricultural use. Again, it is recommended that several (at least two if not more) "grow-and-kill" cycles be implemented to help reduce the exotic species seed bank in the restoration areas because of the large seed bank and ability to phase installation of the restoration areas. Other methods that may be used include hand removal, mowing, goat grazing, or similar methods. Removal of dead vegetation will be conducted by a combination of raking, mowing, or similar activities with a focus on minimizing seed dispersal.

As development begins, the soil seed bank of undisturbed, native habitat will be conserved where possible by stockpiling topsoil from areas that will be developed. Stockpiling and spreading the topsoil on areas that will be revegetated will conserve mycorrhizal fungi, bacteria, and other beneficial soil micro-organisms that help promote plant establishment and growth.

Measures to minimize take of the listed species during the restoration activities will be evaluated and implemented by the restoration and monitoring biologists. Factors considered will include timing of exotic removal in the riparian habitat to avoid take of least Bell's vireo, southwestern willow flycatcher, and other nesting birds; the minimization of the use of herbicides in riparian areas to avoid negative effects on aestivating arroyo toads; evaluating the need to use alternative means of vegetation clearing such as goat grazing; and evaluation of the need to install arroyo toad exclusionary fencing in areas that will require mechanical disturbance.

Arroyo toad exclusionary fence installation can be an effective means of safely excluding the species from areas that will be cleared of non-native plant species through mechanical means. The fence is comprised of a silt screen type barrier at least 24 inches high and partially buried to exclude toad access via burrowing. Surveys conducted by a biologist permitted to handle the species are conducted subsequent to fence installation to remove any toads that are found within the exclusion area. The fence will remain installed until after necessary mechanical disturbance is completed. Surveys will be conducted during appropriate climatic conditions and during the appropriate time of day or night to minimize the likelihood of encountering arroyo toads. If climatic conditions are not appropriate for arroyo toad movement during the surveys, a qualified biologist may attempt to illicit a response from the arroyo toads, during nights (*i.e.,* at least one hour after sunset) with temperatures above 50 degrees Fahrenheit, by spraying the project area with water to simulate a rain event.

Areas that have a higher potential to support arroyo toads, and therefore, may require exclusionary fencing include the riparian habitat creation areas, as well as the upland/transitional habitat creation areas on the south side of the San Luis Rey River. The Verboom and Lucio Dairy facilities on the north side of the river have lower potential to support arroyo toads given the developed nature of these areas. Exclusionary fences may be required along the riparian corridor, however, to keep arroyo toads out of these habitat creation areas during the mechanical clearing of the developed areas.

5.4.2 Weed Eradication

Competition from invasive, non-native plant species can hinder the re-establishment of native vegetation. Non-native species can out-compete native species, reduce diversity, and degrade the habitat for wildlife. Undesirable exotic plants will be eradicated either during initial site clearing or prior to site preparation. If clearing precedes planting by more than a few months, it will be necessary and advantageous to re-

grown plants, except those known to be non-host species, may be inoculated with mycorrhizal fungi prior to delivery to the job site.

5.5 HABITAT CREATION PLANTING PLAN AND SPECIFICATIONS

5.5.1 Habitat Creation

Habitat creation within the designated areas on the property will entail the use of three different revegetation methods, including seeding, container plant installation, and planting of cuttings. Emphasis will be placed on the use of on-site plant materials, then local, then regional materials. Seed not procured on-site will be purchased from a qualified native plant nursery using material sourced from the local or regional Southern California area because of the lack of sufficient donor material on-site or because of the lack of similar existing on-site habitat in relation to the target habitat. To the extent practicable, plant material will be derived from the native species on-site before the site is graded, or from the dedicated open space area as available.

5.5.1.1 Container Plant Procurement

Container plantings will be used where appropriate for habitat creation. Container plantings for the project will consist mainly of tree species, and possibly willow and mulefat shrubs. Plant sources from the Southern California region will be used, with an emphasis on using material derived from the native species on-site where practicable. Container plants will be grown at a qualified native plant nursery into container stock for future planting on-site. All container plants will be inspected for pests and diseases prior to installation into any restoration area, preferably immediately after delivery. Plants that are found to be diseased or infested with pests will be immediately removed from the site. The density of plantings should follow the recommendations in Tables 6, 7, 8, and 10. Temporary supplemental irrigation will be installed in appropriate areas to help ensure the establishment and growth of the container stock. Irrigation soil supplements (*e.g.,* DriWater®) will be used with container plants in areas not irrigated.

The potential to transplant existing mature oak trees onsite from within the disturbance areas to habitat creation areas will be evaluated. Transplantation of large oak trees can be very difficult with limited success in optimal conditions. It is necessary that oak trees to be moved be located in deeper soils and that the trees not be too large to allow the use of a tree spade that can collect a suitable root ball. Most of the oak trees on-site in disturbance areas are within shallow, fractured rocky soils or bedrock on steep slopes, and most trees are very large such that transplantation may be difficult, especially successful transplantation.

5.5.1.2 Seed Sources and Procurement

Seed from native species within the restoration areas will be collected as practicable to promote establishment of desired species on-site. Seed not collected on-site will be purchased from a qualified native plant nursery or native seed supplier site using material sourced from the general Southern California area. Additional seed may be needed after the initial seeding/planting and can be sourced from outside the project site (within the Southern California area) for additional plant material that may be

needed during the five-year maintenance program. Seed will be used for direct seeding of designated areas and will also be germinated and grown in containers for use as container plantings on-site.

For on-site collection, seed would be collected by hand in the fall and placed in moisture resistant, breathable collection bags, labeled by species and collection date. Collections would be made from as many different individuals as possible within each species to help ensure genetic diversity in the collected sample. No more than 25% of the seed would be removed from any individual plant to help ensure the viability of the natural population, except in areas slated for development, in which case most of the seed would be harvested.

5.5.1.3 Revegetation Plant Palette

The plant palettes for the Gregory Canyon restoration effort were selected after extensive research, local reference site surveys, and site-specific native habitat composition observed on-site. The palettes (Tables 6 through 12) are organized by vegetation community within the restoration area and include native trees, grasses, forbs, subshrubs, and riparian species that occur locally. These palettes include container plantings and cuttings, and comprise a complete revegetation plan for the project. A qualified biologist may make substitutions to any palette as necessary, depending on availability of plant material and/or variability of site conditions.

5.5.1.4 Plant Distribution and Layout

Container plantings and cuttings should be distributed more or less evenly over the restoration areas, except as otherwise specified or directed by a qualified biologist. Crowding of plants must be avoided. The mature size of each species and their normal distribution and associations in nature should be considered before installation. Plant species should be located where favorable conditions are present, recognizing that this could have some impact on even distribution. A qualified biologist may follow the methods found most efficient, but one method is to begin with the species that are to be planted in the smallest quantities followed by the species to be planted in larger quantities.

5.5.1.5 Container Plant Installation Procedure

The planting hole will be of sufficient depth so that the top of the root ball is set one-inch above finish grade. The sides and bottom of the planting hole should be scarified as necessary to aid future root penetration. Plants should be removed from containers without damage. It may be necessary to wash some or the entire growing medium from the roots with some plants. Plants should not be left out of containers long enough to damage roots. If the root mass can be flattened along one plane without damage, the roots can be spread out on one (lower) side of the planting hole (which should be scarified as necessary to aid future root penetration) to mimic the normal pattern of the root system as if it were not grown in a container. The planting hole will be backfilled with native soil to proper planting depth, and compacted as necessary to firm the soil sufficiently to keep the plant erect.

A three-inch high, compacted earthen berm approximately 36 inches in diameter will then be constructed around each container plant. This watering basin will be maintained until the plants are no longer irrigated. Mulch may be applied as a top dressing 2 to 3 inches thick, but must not harm the stem of the plant.

Immediately upon planting, the container stock will be watered. If sufficient compaction has not been done, a muddy condition may result, in which case, additional soil and compaction may be necessary after the surplus free water has drained. Additional water should be applied upon completion to settle the disturbed soil in the planting area. The entire planting operation must be completed quickly and without interruption.

5.5.1.6 Cutting Installation Procedure

Cuttings of mulefat and willows will be planted in the riparian habitat creation areas. Source material will compose of mature shrubs and trees found close to the restoration site, as they are adapted to site conditions. Planting should take place at sites that have an appropriate amount of soil moisture to support either mulefat or willow, such as after winter rains have moistened the soils or if the water table is close to the ground surface. Mulefat can generally tolerate drier conditions than willows.

Specific stem cutting procedures include taking cuttings that are as straight as possible and at least 1½ feet long, and from ½ to 1-inch in diameter. If cuttings are substantially longer, they may be re-cut to smaller lengths. However, cuttings placed in or near the groundwater table should be sufficiently long enough to reach the water table. A few cuttings can be taken from an individual shrub or tree, however, over-pruning should be avoided. The stems should be cut so that the bottom end is at an angle, to help identify which end to put into the ground. Cuttings will be stripped of leaves to keep the cutting from drying out. If the cuttings will not be planted right away, they can be stored in a bucket of water for one to two weeks.

5.5.1.7 Seeding Specifications and Techniques

The seeding of native plants should take place in the fall, before the onset of the rainy season, immediately after site preparation. Once applied, the seed should be raked in by hand to conform to the existing ground surface. The seed should also be lightly compacted to provide continuity between soil and seed, and reduce erosion.

5.6 HABITAT CREATION IRRIGATION PLAN

With the slight contouring lowering appropriate restoration areas, there should be enough water present to sustain healthy plant establishment. As such, temporary supplemental irrigation will only be used to water the seeded areas and container plants until they are established. Excessive irrigation should be avoided to prevent disease, excessive growth and competing weeds. The landscape contractor will be responsible for the ongoing maintenance and repair of irrigation of components during the monitoring and plant establishment periods. The irrigation system will be installed above-ground so that it can be removed without damaging vegetation.

Certain areas slated for habitat creation/enhancement may not be suitable for irrigation because of the presence of special status species or physical site conditions. Non-irrigated areas will rely on seasonal rainfall and groundwater access. Other methods of watering could be considered for use to specifically target the container plantings if necessary, such as drip irrigation or DriWater®. A single quart of DriWater® will provide enough water to sustain a small shrub for up to three months, depending on the type of plant, extent of its root structure and specific existing soil and climatic conditions. The DriWater®

consist of application via a backpack or other sprayer, and/or the cut/paint technique (cutting of the plant, followed by immediate direct application of herbicide to the freshly cut stump). No herbicide will be applied to native riparian vegetation.

Removed and trimmed exotic vegetation, including stalks, roots, flowering structures, and seeds will be removed from the area and disposed of properly off site or in the landfill to avoid further exotic species dispersal within the riparian corridor. Dead exotic plant remnants that have undergone herbicide treatment will be removed by the following year, if they persist. This will facilitate recolonization of native riparian species while allowing for some erosion control in the meantime. If deemed necessary, native species cuttings will be planted in areas cleared of exotic species. Cuttings will not be planted in active flow zones, or in areas that may support arroyo toad breeding.

SECTION 6 INITIAL MAINTENANCE OF RESTORATION AREAS

The purpose of this maintenance program is to ensure the success of the habitat creation plantings. Maintenance will occur over the first five years after implementation of each restoration area or until success criteria/performance standards are met. A qualified biologist will monitor all aspects of the revegetation in an effort to detect problems at an early state. Potential problems could arise from irrigation failure, erosion, vandalism, competition from weeds and invasive species, and unacceptable levels of disease and predation.

These maintenance guidelines are specifically tailored for native plant establishment. The maintenance personnel will be fully informed regarding the habitat establishment program so they understand the goals of the effort and the maintenance requirements. A landscape contractor with experience and knowledge in native plant habitat restoration will supervise all maintenance personnel. Damage to plants, irrigation systems, and other facilities occurring as a result of unusual weather or vandalism will be repaired or replaced immediately.

6.1 MAINTENANCE ACTIVITIES AND RESPONSIBLE PARTIES

6.1.1 Irrigation System Maintenance

The landscape contractor will be responsible for the regular maintenance and repair of all aspects of the irrigation system. Poorly functioning or non-functioning parts will be replaced immediately so as not to endanger the plantings.

General system checks will be conducted no less than weekly for the first month after installation to assure the system is functioning correctly and monthly thereafter, except during periods when the irrigation system is not in operation as recommended by a qualified biologist. The irrigation system will be removed at the conclusion of the initial maintenance period such that vegetation and soils are not damaged or substantially disturbed.

6.1.2 Weed Control

The restoration areas will be weeded continuously during the entire maintenance period. Weed eradication will minimize competition that could prevent the establishment of native species. All maintenance personnel will be trained to distinguish weed species from native vegetation to ensure only weedy species are removed or sprayed with herbicide.

As weeds become evident, they should be immediately removed by hand or controlled with an appropriate herbicide as determined by a properly licensed landscape contractor. A qualified biologist will be consulted and approve herbicide application in advance. Weed debris will be removed from the project area as it accumulates and disposed of as permitted by law.

Weeds should be manually removed or sprayed before they can attain a height of three-inches (3") at intervals of not more than 30 days for the first two years following planting. If manually removed, all portions of the plant will be removed, including the roots. A qualified biologist will direct the landscape

contractor regarding the selection of target weed species, their location, and the timing and method of weed control operations to ensure that native plants are avoided to the extent possible.

A cleared space should be maintained 18 inches from the base of each container plant to minimize competition from other plant species. Mulch, two-inches thick within the watering basin, may be applied throughout the maintenance period to achieve this. Leaf, branch drop, and organic debris of native species, will be left in place.

6.1.3 Plant Replacement

The landscape contractor will be responsible for replacing all container stock plants terminally diseased or dead for 120 days after plant installation as recommended by a qualified biologist. Replacement plants should conform to the species, size requirements, and spacing as specified for the plants being replaced, unless unavailable. The replacement plants will be purchased from inventory at the same native plant nursery as were the contract-grown plant stock. Furthermore, if sufficient density/cover values are not being met based on monitoring data, additional container plants may be replanted to compensate.

6.1.4 Erosion Control

The loss of soil or sediment to erosion should be minimized with the use of silt fencing, fiber rolls, jute matting and/or straw bales where necessary (*e.g.,* high velocity flow areas, steep slopes). The need for erosion control is expected to be limited given the relatively flat terrain in the habitat creation areas. Erosion control will focus on sloped areas and areas that potentially support water flow.

6.1.5 Horticultural Treatments

6.1.5.1 Pest Control

Young shrubs will be monitored for signs for disease, insect and/or herbivory damage, and treated as necessary. Badly damaged plants will be pruned to prevent spreading of the pestilence or replaced in kind if removed. Excessive foraging by herbivorous animals may necessitate protective screening around plants. A qualified biologist will be consulted on pest control measures to be implemented if this becomes an issue.

6.1.5.2 Fertilization

If nutrient deficiencies are observed during site monitoring, a qualified biologist may specify applications of slow-release pellet fertilizer or soil amendments to speed initial growth or as a remedial measure. These applications will occur at the onset of the rainy season following the manufacturer's recommendations. Fertilizer will not be applied other than under the explicit direction of a qualified biologist.

6.1.5.3 Pruning

No pruning is necessary unless otherwise specified by a qualified biologist. Dead wood will be left on shrubs or where it has fallen as it plays an important role in micro-habitat creation and soil biogeochemistry.

6.1.6 Site Protection

The site will be adequately protected from disturbance, such as trampling/trespassing/vandalism by humans. In some instances, this may be achieved with the installation of a fence or posting of signs around restoration areas.

6.1.6.1 Vandalism

The landscape contractor will deal with vandalism issues in coordination with a qualified biologist. Corrective and preventative actions could include additional fencing, placement of vehicle barriers, and posting of signs.

6.1.6.2 Trash and Debris Removal

The restoration areas will be well-maintained in order to deter vandalism and dumping of trash. The contractor is responsible for avoiding impacts to plantings during trash removal activities. The landscape contractor will, during routine maintenance, manually remove weeds, liter, trash, and debris from the restoration site and dispose of as permitted by law. Woody debris will be left in place in the revegetation areas.

6.2 MAINTENANCE SCHEDULE

After the initial non-native species eradication and associated planting effort has been completed, both habitat creation and enhancement areas within the restoration site will be monitored for non-native species and trash on a monthly basis. A proposed schedule of maintenance activities discussed above is provided in Table 13, covering the projected five-year duration of the initial maintenance.

SECTION 7 INITIAL MONITORING PLAN FOR RESTORATION AREAS

7.1 PERFORMANCE STANDARDS

The success of habitat restoration is defined as the restoration of a functional ecosystem. Success is usually measured by percent coverage by target species. Natural habitats rarely exhibit 100-percent coverage; but rather, include a considerable proportion of open spaces. While this monitoring program uses percent coverage criteria, it is noted that determination of successful coverage is expected to be relative to other similar native habitats typical of the region. Existing on-site native habitat patches adjacent to restoration areas will be used to assess riparian habitat restoration success. Restoration success for habitats not adequately represented by adjacent areas on-site, such as alluvial coastal sage scrub, will be assessed using suitable off-site areas such as Wilderness Gardens County Park. Initial transects of relatively intact native habitat patches will be collected to verify the quantitative cover criteria proposed in this plan. Localized adjustments in the cover criteria can be made so that the restoration areas will blend in with the adjacent intact native habitat patches.

The means of determining successful restoration for this site will be through a series of measurements for species composition/diversity, exotic species cover, container plant survival, and cover by native species as described in Tables 14-16. All of these, except non-native species cover, should increase over time. Cover by non-native species should decrease with time, particularly because one of the primary goals of the project is to substantially reduce or eliminate non-native species from the restoration site.

Target cover values and community diversity requirements for each area are based on reference information gathered from the Wilderness Gardens County Park (Tables 3-5). Target cover values differ between areas to reflect the differing vegetation density associated with each distinct area and was corroborated with the data gathered at the reference site. Diversity requirements are also included to ensure ultimate success will reflect some measure of long term diversity after success criteria are met rather than allowing an area to be deemed successful if a monoculture of a native species met the cover success criteria. A monoculture of one native species might meet the cover success criteria, but not provide the functional benefits of a diversity of species and is to be avoided. Container plantings to be used on-site consist solely of tree species in order to speed up the establishment of these larger, slower growing plants. Because it is unreasonable to expect significant overall cover contributions from trees that have only had five years to grow, high container plant (tree) survival numbers will be required (Tables 14 and 15). This will help make certain that adequate numbers of trees are present after cover and diversity success criteria have been met to allow for areas such as the oak woodland and cottonwood riparian forest creation areas to progress from an initial scrub habitat to their long term woodland/forest habitat goals.

In the event that plantings should fail to meet the specified requirements, compliance will be ensured by the performance of either or both of the following remedial procedures by the contractor on an as-needed basis as directed by a qualified biologist: (1) replacing unsuccessful plantings with appropriate-sized stock or seed mixes to meet stated cover or survival requirements, and/or (2) performing maintenance procedures to ensure the site conditions are appropriate (*e.g.,* non-native species removal). Remedial actions in planting areas will be based on detailed investigations (such as soil tests and excavations of failed plantings to examine root development) to determine causes of failure.

The success of each restoration area will be assessed individually to accommodate the phased nature of the installation, the various times each area may take to reach success. In general, exotic species should not exceed 10 percent cover during the monitoring period. The highly invasive species, giant reed, tamarisk, pampas grass (*Cortaderia* species), castor bean (*Ricinus communis*), and tree tobacco (*Nicotiana glauca*) will be continuously monitored for and removed on a periodic basis. Replacement plantings and reseeding will be done by the landscape contractor each year as directed by a qualified biologist to achieve an acceptable survival rate for years 2-5 (Tables 14-16).

7.2 TARGET FUNCTIONS AND VALUES

The overall restoration goal is to create native habitat similar to that shown in the 1928 aerial photo, aside from the minimal agriculture that is visible (Figure 2). Attaining this goal will result in a net increase in suitable habitat for arroyo toad, least Bell's vireo, and southwestern willow flycatcher.

The restoration in the uplands will primarily provide additional suitable habitat for arroyo toad, but other species are expected to benefit as well. Arroyo toads have not been found in the dense non-native grasslands on-site (URS, 2007), and their replacement with an open, alluvial scrub is expected to create more arroyo toad upland habitat. Other special status species that would potentially benefit from the open alluvial scrub habitat creation include orange throated whiptail (*Cnemidophorus hyperythrus*) western spadefoot (*Spea hammondii*), and California Gnatcatcher (*Polioptila californica*).

Riparian habitat creation and enhancement will provide additional suitable habitat for many riparian bird species, including least Bell's vireo and southwestern willow flycatcher. Additional suitable habitat will be created from the on-site riparian habitat creation, as well as from the exotic plant species removal within the larger riverine riparian habitat management enhancement area. The exotic species that will be removed will be replaced with native species, and, in the short term, provide natural herbaceous openings, which is a habitat constituent element of the southwestern willow flycatcher (USFWS 2005).

7.3 TARGET HYDROLOGICAL REGIME

The hydrological regime will remain the same in the restoration and enhancement areas, with the exception of the 2.3 acre southern willow scrub creation area. This area will be graded down in elevation closer to the water table to promote the establishment and growth of riparian plant species. This graded area will likely be subject to occasional flooding consistent with the typical flood cycle of the San Luis Rey River. Upon completion, this area is expected to qualify as Corps jurisdictional wetlands.

7.4 TARGET ACREAGES TO BE PRESERVED, CREATED, AND ENHANCED

Target creation acreages include 70.4 acres of oak woodland with alluvial scrub and native grassland understory, 14.3 acres of chaparral, 2.0 acres of native grassland, and 79.3 acres of coastal sage scrub/coastal sage scrub (mesic alluvial scrub) habitats. In addition, 2.3 acres of southern willow scrub habitat and 4.2 acres of cottonwood riparian habitat will be created on-site, and 75.6 acres of riparian habitat will be enhanced.

7.5 MONITORING METHODS

Monitoring for purposes of documenting compliance with success criteria will be conducted by a qualified biologist. Continuity within the personnel and methodology of monitoring will be maintained as much as possible to ensure comparable assessments throughout the duration of the monitoring. Special management status species monitoring will begin pre-disturbance, continuing through landfill construction, mitigation implementation, and the five-year post-implementation monitoring period. Habitat monitoring will commence with mitigation implementation, continuing through the five-year post-installation monitoring period following the schedule outlined in Table 13. Long term habitat and special management status species monitoring after the five-year period is addressed in Section 10. There may be parts of the restoration that are staggered because of the phased nature of the construction of the landfill. However, each staggered phase will still go through a similar five-year monitoring period. The monitoring program will emphasize qualitative and quantitative assessments of the status of the restoration plan. Records of mortality and other problems will be kept, such as insect damage, herbivory, weed infestation, and soil loss, will be identified by a qualified biologist. Monitoring will assess the attainment of annual and final success criteria, and identify the need to implement adaptive measures to assure ultimate success, or contingency measures in the event of failure.

7.5.1 Qualitative Assessment

Qualitative assessments will be conducted to assess the overall condition of the restoration areas, and determine the effectiveness of irrigation, the weed eradication program, and general development of the habitat. Qualitative assessments will be conducted on a monthly basis for the first year, bimonthly for the second year, and quarterly thereafter for the remainder of the monitoring period. Qualitative surveys will be completed during each monitoring visit, and will consist of a site walkover and general habitat characterization. General observations, such as fitness and health of the planted species, pest problems, herbivory, weed establishment, mortality, and drought stress, will be noted during each site walkover. A qualified biologist will also note observations of wildlife use and native plant recruitment for the purpose of later discussion in the annual reports. Records will be kept of mortality and other problems such as insect damage, weed infestation, and soil loss. A qualified biologist will determine remedial measures necessary to facilitate compliance with performance standards. A qualified biologist will relay these findings to the landscape contractor after each visit, as necessary, to address and correct problems as soon as they are discovered. All remedial measures undertaken will be referenced in the annual monitoring report to the agencies. A sample of a qualitative evaluation monitoring sheet is provided in Appendix C.

7.5.2 Quantitative Special Management Status Species Monitoring

7.5.2.1 Observed Injury or Mortality

During the initial monitoring period, animals found injured or dead on-site will be reported to the project biologist immediately. The project biologist will determine whether or not the animal was a special management status species. If it is a listed species, it will be documented as potential take, and reported to the appropriate agencies. Efforts will be made to determine the cause of the mortality. Death resulting from events unrelated to the landfill will be reported, but will not be considered a take by the project.

7.5.2.2 Pre-Disturbance/Implementation Monitoring

Protocol special management status species surveys will be conducted by a qualified biologist in areas that will potentially affect such special management status species' habitat because of initial construction activities to determine presence/absence of species prior to disturbance.

7.5.2.2.1 Coastal California Gnatcatcher

A qualified biologist will conduct in-season presence/absence protocol surveys to detect individuals within the landfill footprint prior to disturbance. If individuals are found, monitoring will continue until it is determined whether the individual(s) is(are) migrating through or nesting. If the individual is migrating through the site, a biological monitor will be present and construction may continue. If the individual is nesting, then the appropriate resource agencies will be notified to re-open Section 7 consultation. Because development of the landfill footprint is phased, these surveys will occur at a frequency of every one to two years for approximately 16 years, based on the current phasing plan and anticipated waste receipts.

7.5.2.2.2 Arroyo Toad

Pre-disturbance mitigation measures for arroyo toad will occur exclusively at the time of initial landfill construction (bridge installation and access road construction to the facilities area), because this is the only time when suitable habitat as delineated through NRCS soil mapping would be disturbed. However, installation of some exclusion fencing will be permanent.

If temporally feasible, a qualified biologist will conduct protocol surveys in the wet season prior to disturbance to establish density and limits of arroyo toad occupation in the construction and mitigation areas. Prior to work in suitable arroyo toad habitat as established during the survey, temporary/permanent exclusion fencing will be erected and areas within the fence (demolition/construction/implementation areas) will be re-surveyed for arroyo toad. Arroyo toad found during these exclusion surveys will be moved to a suitable location outside of the excluded area. Areas that will need arroyo toad exclusion fencing include the northern bank of the river, to prevent arroyo toads from entering the demolition areas and eventual mitigation areas (the fencing will be removed once demo is complete and mitigation on this side of the river is installed); across the river channel up to the banks during bridge construction; along both sides of the landfill access road for its entire length except where the sides of the bridge act as a barrier (this fencing will be permanent to minimize the potential of arroyo toads being injured by landfill related vehicular traffic); along the northern edge of the landfill facilities area and east desiltation basin (this fencing will be permanent to keep arroyo toad out of active use areas); the south side of the river along the boundary of existing suitable habitat to allow implementation work on the mitigation areas here (this fencing will be removed once mitigation areas on this side of the river are installed); and along the northern side of the borrow/stockpile area A haul road (this fencing will be removed once use of borrow/stockpile area A ceases following initial construction, and then re-installed once use is re-initiated in approximately year 25). Temporary arroyo toad exclusion fencing will consist of a silt screen type barrier approximately 24 inches high and partially buried to exclude toad access via burrowing. Permanent arroyo toad exclusion fencing will be made from a suitable material or structure that will persist in the long term without the need for extensive maintenance (for instance, silt fencing would not be suitable for permanent fencing, however, some type of concrete curb structure might suffice).

A biological monitor will be present when digging the trenches required to properly install the exclusion fencing in case an arroyo toad is found or accidentally harmed during this process. Thereafter, a biological monitor will inspect temporary construction-related exclusion fencing three times a week and see that repairs are made in a timely manner as needed.

7.5.2.2.3 Least Bell's Vireo/Southwestern Willow Flycatcher

Pre-disturbance measures for least Bell's vireo and southwestern willow flycatcher will occur exclusively at the time of initial landfill construction (specifically the bridge construction) as this is the only time when suitable habitat within the San Luis Rey River channel would be disturbed. No surveys are necessary if work is done outside of the breeding season from September to March. Work done to grub the river channel for bridge construction will take place during this period. The biological monitor present for arroyo toad during this work will also monitor for these species at the same time. If work is done during the March to September breeding season, a qualified biologist will conduct presence/absence surveys, and monitoring will be performed until it is determined that these species are not present. Thereafter, daily noise monitoring will occur to assure that noise levels do not exceed 60 dBA L_{eq}, either before or after installation of noise barriers.

7.5.2.3 Five-Year Monitoring Period

This monitoring would occur within the habitat restoration area and consist of annual monitoring for arroyo toad, least Bell's vireo, and southwestern willow flycatcher during the five-year monitoring period. This monitoring would commence upon the completion of restoration activities, and continue for five years or until achieving restoration success criteria, whichever occurs later.

A qualified biologist will conduct annual protocol surveys for each of the above species. Relative numbers of species observed during monitoring will be evaluated to demonstrate whether or not the mitigation is attracting special management status species or not. For instance, numbers of arroyo toads and the locations observed, and nesting pairs and the locations of least Bell's vireo and southwestern willow flycatcher will be recorded for use in this relative assessment. These relative estimates will be used to assist in monitoring potential take of species. Directly monitored take will also be reported (*e.g.*, potential sighting of a dead animal). Note also that extreme weather years or other factors out of the control of the project proponent will also cause numbers to be higher or lower than expected. Such factors include prolonged drought, fire, increased development in the surrounding area, flooding, and the like. It is important to take this information into account when determining whether the project is within take authorization, or if other conditions are decreasing the relative numbers of special management status species on-site.

7.5.3 Quantitative Habitat Monitoring Techniques

Quantitative habitat analysis will be conducted during the late spring or early summer of every year, ideally between April and June, to coincide with the blooming periods of the greatest number of plants. Measurements that will determine the total plant cover and species composition within each restoration area will be conducted along established transects. The means of these measurements will be evaluated against the criteria presented in Tables 14-16.

Quantitative sampling within the restoration site will be performed using approximate 60- to 900-foot point-intercept transects that will be placed throughout the site to ensure representative sampling. A

tentative placement of transects is shown in Figure 7 (Tentative Transect Location Map). Final placement will be noted in the as-built report. Five 60-foot transects will be placed in the Southern Willow Scrub Creation Area; three 60-foot transects will be placed in remnant native vegetation near the face of the landfill; six 300-foot transects in the Chaparral Creation Area; fifteen 300-foot transects in the Coastal Sage Scrub (Mesic Alluvial Scrub) Creation Area; five 300-foot transects in the Coastal Sage Scrub Creation Area; fifteen 300-foot transects in the Oak Woodland Creation Area; four 300-foot transects in the Native Grassland Creation Area; two 300-foot transects in the Cottonwood Riparian Forest Creation Area; two 300-foot transects in the Cottonwood Riparian Forest/Pond Creation Area; and eleven 900-foot transects throughout the non-restored open space in the northwestern and southwestern portions of the property. The extreme topography of the eastern portion of the site presents access challenges which will prevent the quantitative monitoring of the open space in this area. In lieu of quantitative monitoring here, qualitative monitoring will be sufficient as this area is remote and undisturbed. Vegetative cover will be estimated by species present at three- to thirty-foot intervals depending on transect length using the point-intercept method, and recorded on a data sheet. Species observed during the sampling that does not fall along the transect line will be recorded and included on the list of species observed at each transect location. Transects may also be altered by number, method, length, number of points taken, or both length and number of points taken if the results show that an adjustment will better describe actual species compositions found in the field. This determination will be made by a qualified biologist, and changes in methods will be documented in the annual monitoring report.

7.5.4 Photo-documentation

Photographs will be taken to document the progress of the restoration areas throughout the five-year monitoring period and geo-referenced when possible. Photo-documentation locations will be established prior to commencement of the habitat restoration. Photographs will be taken from similar angles and locations so that comparisons can be made through time. Formal photo-documentation will occur before the restoration activities, immediately following the restoration activities, and at least every six months for the remainder of the five-year monitoring period.

7.6 MONITORING SCHEDULE

A monitoring program spanning five years will be conducted by a qualified biologist in conjunction with the initial habitat maintenance program. The schedule for each type of monitoring is set forth in Sections 7.5.2 and 7.5.3 above (see also, Table 13). If the site does not meet the final success criteria after the fifth year, additional monitoring following the same schedule will be necessary until the site meets final success criteria and is signed off by the appropriate agencies (Sections 8 and 9). The monitoring program is intended to document the progress of the restoration effort as well as to fulfill the requirements of any permit conditions. The monitoring program is designed to gather information on the success of plant establishment and habitat development and to recommend remedial actions. Annual reports for submittal to the pertinent regulatory agencies will also be prepared.

7.7 ANNUAL MONITORING REPORTS

Quarterly progress reports and annual technical reports will be provided as part of the monitoring program. The quarterly progress reports will detail the results of the qualitative assessments and will be submitted to the client in the form of a brief letter report. These reports will include information on problems with irrigation, pests, vandalism, mortality, and weeds that have been identified during the

qualitative inspections. Proposed remedial actions will also be discussed as a part of these reports and will be summarized in memo format to be sent to the landscape contractor for implementation.

Annual technical reports describing the results of the quantitative sampling will be submitted to the agencies at the end of each monitoring year (December). Annual reports will include 1) a list of names, titles, and organizations of all persons who prepared the content of the annual report and participated in the monitoring activities for the year; 2) analyses of all quantitative monitoring data in relation to the success criteria (success, failure, and remedial action) and special management status species survey results; 3) monitoring photographs; and 4) maps identifying transect locations and locations of special management status species found during surveys. Details of necessary replacement plantings will also be included. Comments about the monitoring program or site conditions from the agencies should be submitted to a qualified biologist for review and appropriate remedial action, if required. The final annual report at the end of year five will summarize the results of the entire restoration effort, thereby providing the agencies with a basis for comprehensive evaluation of the restoration project.

The first annual report will be submitted after the first growing season following the initial weed eradication, seeding, and container planting.

Reporting of the enhancement activities will also be included as a separate section in the annual reports. Reported items will include mapping of areas where specific exotic removal activities were conducted, methodology used (*e.g.,* hand tools vs. herbicide application), an evaluation of the success of the enhancement program, and photo-documentation.

7.8 CONSERVATION EASEMENT

Prior to commencement of initial construction of those features of the landfill and ancillary facilities described in Table B-2, GCLF will execute and record a Conservation Easement in a form acceptable to the Corps, USFWS, CDFG and/or the County, and consistent with CEQA mitigation measures and Proposition C. A suitable land management agency, such as the Corps, CDFG, or the County would be the Grantee of the Conservation Easement. A copy of the most recent multi-agency (Corps/CDFG) mitigation bank Conservation Easement Deed Template is provided in Appendix D, to indicate the general format and typical terms and conditions for the Conservation Easement. The Conservation Easement will be subject to all pre-existing and known future encumbrances on the GCLF property, such as utility easements, subject to separate approval of those projects by all agencies with jurisdiction, and implementation of appropriate mitigation measures or compensation by the proponents of those projects. The specific language of the Conservation Easement shall be submitted to the appropriate governmental agencies for final approval prior to official recordation.

SECTION 8 COMPLETION OF HABITAT RESTORATION

8.1 NOTIFICATION OF COMPLETION

The project proponent will notify the resource agencies upon completion of the restoration effort through the submittal of the final monitoring report. This report will include analysis of quantitative sampling data that will show that the success criteria have been met. After completion of the creation and enhancement effort, ongoing management activities such as those described in Sections 10.2 and 10.3 will continue.

8.2 AGENCY CONFIRMATION

The resource agencies may inspect the restoration areas after the final monitoring report has been submitted. Confirmation that the success criteria have been met will be provided by the resource agencies to the project proponent in writing.

SECTION 9 CONTINGENCY MEASURES

If an annual performance criterion is not met for all or a portion of the restoration areas in any year, or if the final success criteria are not met, the biologist will prepare an analysis of the cause(s) of failure and, propose remedial action for approval with the appropriate resource agencies. Remedial actions may include supplemental site grading/manipulation, planting, changes to the plant palette, or adjustments to the management of the areas. If the restoration area or portion thereof has not met the performance criterion, and remedial actions are necessary, the responsible party's initial maintenance and monitoring obligations as described in Sections 6 and 7 will continue beyond five years of monitoring and maintenance until final success criteria are achieved.

9.1 INITIATING PROCEDURES

If the Corps, USFWS, or CDFG determine upon receipt of an annual monitoring report that the restoration efforts are not meeting the success criteria, the respective agency will notify the project proponent in writing that the effort will require augmentation. The project proponent will have 30 days to respond to the notifying agency with a description of the measures enacted or to be enacted.

9.2 ALTERNATIVE LOCATIONS FOR MITIGATION

No alternative locations are proposed for this restoration effort. If setbacks occur because of unforeseen circumstances (*e.g.,* flooding washes away much of the plantings or fires wipe out the mitigation site), then the project proponent will work with the resource agencies to reformulate a new schedule or solution.

9.3 FUNDING MECHANISM

The project proponent will be responsible for funding the costs associated with implementation of restoration measures (Section 11).

9.4 RESPONSIBLE PARTIES

The project proponent will be the responsible party for the contingency measures.

SECTION 10 LONG TERM MAINTENANCE OF RESTORATION AREAS AND OTHER ON-SITE OPEN SPACE

After completion of the restoration plan on the restoration area, and for other open space on the landfill property, long term maintenance and monitoring tasks will be put into action to ensure the maintenance of the entire site in perpetuity. Long term maintenance and management tasks will focus on maintaining the site in a natural state. The overall site open space can be split into two distinct areas where maintenance and management differ in complexity and effort, non-restored open space and restored open space. Some of the components of the maintenance and management are described below, but may be amended in the future to account for potential future conditions and costs that will be best determined when the site is transferred to a third party. The focus and scope of the long term management plan may also be revised every five to ten years if long term monitoring data show that site conditions are changing and require adaptive management.

10.1 NON-RESTORED OPEN SPACE

The non-restored open space area will be managed during the operating period of the landfill (estimated at 30 years) in the same manner it will thereafter be managed in perpetuity. The non-restored open space area makes up the majority (over 1,000 acres) of the overall open space on the project site. Although the size of the area is large, minimal maintenance activities will need to be undertaken to maintain this area, as it currently exists in a natural and self-sustaining state. Maintenance and management tasks for this area will primarily consist of monthly site inspections for access control, fence inspection, and recording of new infestations of invasive plant species. During inspections, the area will also be checked for human-related issues such as illegal dumping and illegal recreational use (i.e. creating new trails and/or use of all terrain vehicles such as quads or motorcycles). Weed control, wildlife control, fire management, general habitat monitoring, special management status species monitoring, and annual reporting requirements will also be addressed as part of the long term management plan. Each long term management issue is discussed in detail below.

10.2 RESTORED OPEN SPACE

The bulk of the maintenance and management effort will focus on the restored area as this area will need to be monitored more closely to ensure continued self-sustainability. Once the initial five-year maintenance and monitoring period is complete and a restoration area meets success criteria, the objective of the effort will shift from restoration to maintenance during the remainder of the operating period of the landfill. Maintenance and management tasks in this area will include at minimum, monthly site inspections to check for weed control, wildlife control, fire management, refuse removal, and human-related disturbance issues. The bulk of the habitat and special management status species monitoring will take place in the restored open space because of the presence of suitable special management status species habitat in this area. Each long term management issue is discussed below, along with the long term habitat and special management status species monitoring programs, and annual reporting requirements.

10.3 PERPETUAL MAINTENANCE

After the landfill ceases operation at the end of approximately 30 years, perpetual maintenance activities will be initiated through a qualified land manager selected by Gregory Canyon Ltd. LLC following consultation with the County, the USFWS, and CDFG. Maintenance activities during this period are expected to continue as it will when the open space areas enter the maintenance period as described above. These activities will consist of monthly site inspections to check access control, weed control measures, wildlife control, fire management, and refuse removal. Habitat monitoring and special management status species monitoring will also occur in perpetuity as described below.

10.4 LONG-TERM MANAGEMENT ISSUES

10.4.1 Annual Reporting

Long term management issues will be summarized and reported to the USFWS on a yearly basis. The report will summarize the work done on the site for the year broken down by management issue, as well as the proposed work to be performed in the upcoming year. The locations of exotic plant infestations will be noted, methods used to remove exotic species will be described, and effectiveness of the results will be discussed. Remedial actions undertaken during the monitoring year, and/or recommended in the immediate future will be noted. Updates of remedial actions completed in the previous year will be analyzed to evaluate effectiveness for future use. A summary of the financial status of the management budget will also be provided. Specifically, the income generated by the endowment will be compared to actual expenses incurred while performing site management to ensure the long term funding will be sufficient. Additionally, site photos will be taken within six months of the submittal of the annual report to provide photo documentation of the site. Qualitative and quantitative data collected during the habitat and special management status species monitoring will also be included in each report as described in the respective monitoring plan sections below. Qualitative data will include plant and animal species lists observed on-site during the monthly inspections and monitoring events, if applicable. Because quantitative monitoring will only take place every three years for habitat, and every other year for special management status species, qualitative data will be reported in years where no quantitative data is collected. When quantitative data is collected, the locations of each special management status species will be described and mapped. Estimated numbers of individuals or pairs will be reported and territory locations will be mapped if applicable. The report will be due by February following the year for which the report is being written for to allow for remedial measures to be discussed, approved, and implemented in the spring following the monitoring year.

10.4.2 Observed Injury or Mortality

During the long term maintenance period and into perpetuity, animals found injured or dead on-site will be reported to the project biologist immediately. The project biologist will determine whether or not the animal was a special management status species. If it is a listed species, it will be documented as potential take, and reported to the appropriate agencies. Efforts will be made to determine the cause of the mortality. Death resulting from events unrelated to the landfill will be reported, but will not be considered a take by the project.

10.4.3 Special Management Status Species Monitoring

Special management status species monitoring will take place on all portions of the landfill property. Long-term monitoring for arroyo toad, least Bell's vireo, and southwestern willow flycatcher will commence after the completion of the five-year monitoring described in Section 7.5.2. Long-term monitoring for coastal California gnatcatcher and steelhead trout will commence upon the initiation of project operation. The purpose of long-term monitoring is to track the relative numbers of special management status species on-site and document take related to long-term maintenance of the project site in perpetuity.

10.4.3.1 Coastal California Gnatcatcher

A qualified biologist will conduct protocol surveys for coastal California gnatcatcher in areas of suitable habitat to determine presence/absence. If present, the number of nests or breeding pairs will be quantified and mapped. Results will be documented in the annual report. Surveys conducted every other year will provide adequate information to determine the rise or decline of the relative number of coastal California gnatcatcher on-site.

10.4.3.2 Arroyo Toad

A qualified biologist will conduct an appropriate number of nocturnal surveys (6-10) in suitable habitat during the active season to determine the number of toads in the uplands and river on-site. Ideally, surveys will take place during the breeding season (March to June), however, if the rainy season begins early, up to four surveys can take place between November and February, with the remainder occurring from March to June. If present, the number of individuals will be quantified and mapped. Results will be documented in the annual report. Surveys conducted every other year will provide adequate information to determine the rise or decline of the relative number of arroyo toad on-site.

10.4.3.3 Least Bell's Vireo/Southwestern Willow Flycatcher

A qualified biologist will conduct protocol surveys during breeding season to determine the number of breeding pairs in suitable habitat on-site. If present, territories of pairs found on-site will be quantified and mapped. Results will be documented in the annual report. Surveys conducted every other year will provide adequate information to determine the rise or decline of the relative number of least Bell's vireo and southwestern willow flycatcher on-site.

10.4.3.4 Steelhead Trout

Monitoring for steelhead trout will involve inspecting the river channel for un-natural obstructions that would prevent the trout from potentially moving upstream through the river channel on-site. Plant litter and debris normally found in a river system would not be removed. The focus of this monitoring is the removal of man-made obstructions, namely large items of trash or similar debris, should such obstructions originate on-site from project activities. This monitoring will occur annually in spring immediately after the rainy season, and can be done in conjunction with regular site inspections.

10.4.4 Habitat Monitoring

Habitat monitoring will take place on all portions of the landfill property subject to a conservation easement. Long-term monitoring of general site conditions and vegetation within the restored open space area will commence after the completion of the five-year monitoring described above. Long-term monitoring of general site conditions and vegetation within the non-restored open space area will commence upon the initiation of project operation. The purpose of long-term monitoring is to track the stability of vegetation communities on the project site in perpetuity.

General site condition monitoring will consist of compiling monthly weather data (temperature, wind, precipitation, etc.) for documentation in the annual report. Vegetation monitoring will consist of qualitative and quantitative monitoring. Qualitative monitoring will take place annually and consist of visual inspections of the various vegetation communities. Photo-documentation will also take place to provide a visual picture of the various communities over time. Photographs will be taken from the same locations each year to allow pictures to be compared year to year. Quantitative monitoring will take place every three years and be accomplished by conducting vegetation transects throughout the site (Figure 7, Tentative Transect Location Map). Point-intercept transects ranging in length from 60 to 900 feet will be sampled as described in Section 7.5.3. Information collected during the year will be presented in an annual monitoring report. Based on information collected during qualitative surveys and data in the annual report, the USFWS and land manager may increase the frequency of quantitative monitoring to every other year if necessary to properly monitor changes regarding the vegetation.

10.4.5 Weed Control

The complete elimination of all exotic species from the project area is not feasible and not the goal of long term weed control. The goals of long term weed control on-site are to keep weed cover in restored open space areas at similar levels to those observed at reference sties in Wilderness Gardens Park, to identify and control new weed infestations discovered in the non-restored open space area, and to pay special attention to the detection of invasive exotic species. The non-restored open space area will not be held to a minimum weed cover standard as this area is to be managed as is, in its current natural state. This area will be inspected as described in Section 10.4.4 and newly discovered infestations of exotic species will be removed within 30 days. Additionally, special attention will be given to invasive exotic weed species throughout the site. These species include, but are not limited to, giant reed, tamarisk, pampas grass, castor bean, and tree tobacco. To the extent practicable, these species should be completely removed from the site within 30 days of detection.

10.4.6 Wildlife Control

Nuisance wildlife species that have the potential to directly or indirectly impact the relative number of special management status species on-site will be inspected for and dealt with accordingly. Control measures will be implemented if nuisance species populations increase or if new nuisance species enter the area that would or are adversely affecting the relative number of listed species or desired habitats onsite relative to pre-project conditions.

10.4.7 Refuse Removal

To avoid the attraction of nuisance species which may also potentially prey upon or otherwise indirectly affect special management status species on-site, trash and other man-made debris will be inspected for and removed on a monthly basis. Dead limbs, tree fall, and other organic debris originating from native vegetation on-site will be left in place. Weed debris will be removed from the project area and disposed of legally.

10.4.8 Access Control

In order to control unauthorized access of the site, a wildlife compatible barbwire fence will be installed around areas where the public has easy access to the site. Additionally, signs will be posted to identify the site as an open space reserve. Dirt roads leading to the site will be gated, otherwise obstructed, or removed to control unauthorized vehicle use. Fencing will be inspected monthly to ensure it is intact and will be repaired as needed. It is anticipated that on-going monthly inspections of the site will also serve to deter trespassing.

10.4.9 Fire Management

Fire management tasks chiefly involve the removal of potentially hazardous accumulations of non-native vegetation to reduce the likelihood of brush fires from starting and propagating on-site. Native vegetation is accustomed to routine fires that occur on a semi-regular basis. These fires typically move quickly through the vegetation as there is normally little to no dry understory vegetation. By moving through the vegetation quickly, the plants are damaged less and are able to recover quicker. When there is a prevalence of dried understory vegetation (usually associated with non-native annuals and/or grasses), fires typically burn longer and hotter, increasing the damage to native shrubs, and delaying recovery if the native vegetation is not completely killed. Areas that have a prevalence of dried non-native vegetation will be noted during monthly site inspections and cleared before the onset of the fire season (late summer through early fall). Weeding of these areas in the spring will also reduce the amount of dry fuel in the summer.

SECTION 11 FINANCIAL ASSURANCES

Gregory Canyon Ltd. LLC will fund all activities related to implementation of the Habitat Restoration and Resource Management Plan and management of both on-site and off-site (to the extent applicable) open space. During the period of landfill operation, which is anticipated to last approximately 30 years, these activities will be budgeted and funded as part of the cost of operating and maintaining the landfill, and funding assurances will be provided in the form of a Performance Bond. Because of the jurisdictions and subsequent enforcement ability of different public agencies over different mitigation areas, the Performance Bond will be split into two bonds. One bond, in the amount of $300,000 will be held by the Corps and will cover impacts to Federal wetlands/waters of the U.S. caused by the construction of the access bridge, which is mitigated by the 2.3 acre Southern Willow Scrub creation area. The second bond, in the amount of $18.3 million will be held by a public agency to be determined in cooperation with the County, USFWS, and CDFG, and will cover the mitigation proposed for remainder of the impacts on-site. The total face-value of the Performance Bonds at the time of initial habitat disturbance will be approximately $18.6 million. This amount is the estimated cost of the Habitat Restoration and Resource Management Plan implementation; maintenance and monitoring until the restoration areas attain success (five years), along with follow up management of restoration areas for an additional 25 years; and management of other non-restored open space areas for 30 years. This includes activities that will not commence for many years because of the phased nature of the Habitat Resource Management Plan. The face amount of the Performance Bonds would be adjusted every three years to account for inflation and the completion of on-site activities, as more fully discussed below, and on an ongoing basis to account for anticipated maintenance costs of any off-site open space acquired.

When Gregory Canyon Ltd. LLC leaves the site at the conclusion of the landfill operating period, the bonds will expire and funding for ongoing management of all open space portions of the landfill property (including both the restoration areas and other non-restored open space areas, approximately 1,300 acres total) will be provided through a $7.3 million endowment established by Gregory Canyon Ltd. LLC to be held in an independent trust account. The endowment will be initiated at the time of initial habitat disturbance, with deposits by Gregory Canyon Ltd. LLC at the end of the landfill operating period adequate to generate full funding of the endowment (Section 11.3).

11.1 INITIAL PERFORMANCE BOND ESTIMATES

To determine the appropriate initial amount of the Performance Bonds, Gregory Canyon Ltd. LLC estimated the cost of implementing all of the anticipated plan activities to take place on the landfill property during the landfill operating period, assuming immediate implementation of all plan elements.

This approach is conservative, because implementation of the Habitat Resource Management Plan will proceed in phases over a period of years.

Based on the projected costs of the identified tasks, the total amount of both Performance Bonds were estimated at approximately $18.6 million. This estimate includes approximately $9.3 million for implementation of the Habitat Resource Management Plan and $9.3 million for habitat management.

11.1.1 Restoration Plan Implementation

The total cost of restoration and initial monitoring and maintenance is approximately $11.6 million. This total includes:

- $260,000 for creation of 6.5 acres of riparian vegetative communities such as southern willow scrub and cottonwood riparian forest;
- $6.3 million for creation of 166.0 acres of oak woodland, coastal sage scrub, chaparral, and native grassland communities;
- $440,000 for enhancement of 75.6 acres of existing riparian vegetative communities; and
- $2.3 million for maintenance and monitoring of restoration areas for five years.

This total does NOT include costs associated with removing existing structures, utilities, or major grading. Enhancement/creation costs reflect direct implementation costs and do not reflect costs associated with supporting tasks and administration/contingency costs. A detailed cost breakdown is provided in Appendix A.

11.1.2 Long-Term Habitat Management Costs

Total management costs on the landfill property during the landfill operating period are estimated at approximately $6.9 million for 25 years of post-restoration management of the restoration areas and 30 years of maintenance of non-restored open space outside of the restoration area. The cost of implementing long-term habitat management activities on the landfill property were estimated as follows:

- Reports prepared by the Center for Natural Lands Management (CNLM) for comparable management programs were reviewed to determine the number of hours per task and/or total expenditure per year for management tasks.
- For tasks involving qualitative evaluations and biological surveys, labor costs were estimated using a rate of $100/hour. Manual labor costs were estimated at $50/hour.
- An additional 10% was allocated for annual work program contingencies.
- The amount of the changed circumstances reserve is 25% of the cost of the land management tasks (*i.e.,* only tasks involving resource protection and management).

A detailed cost breakdown is provided in Appendix A.

11.2 ADJUSTMENTS TO PERFORMANCE BOND DURING LANDFILL OPERATING PERIOD

11.2.1 Periodic Review of On-Site Costs Estimates and Fund Allocations

Gregory Canyon Ltd. LLC will review the cost estimates and allocations for on-site activities every three years, commencing on the date of initial disturbance. Where appropriate, the estimates and allocations will be adjusted as necessary to ensure implementation of and adequate funding for on-site activities. All

such adjustments will require the approval of San Diego County as part of the administration of the Habitat Restoration and Resource Management Plan.

11.2.2 Cost Estimates and Fund Allocation for Off-Site Open Space

Whenever Gregory Canyon Ltd. LLC proposes to acquire off-site open space, its submittal of a revised Habitat Restoration and Resource Management Plan to San Diego County will include an estimate for habitat management costs during the operating period of the landfill, based on the same criteria used to establish estimates for management of on-site non-restored open space. The cost estimates will require the approval of San Diego County as part of the administration of the Habitat Restoration and Resource Management Plan. Upon approval, the amount of the Performance Bond will be adjusted to account for these management costs. As a second option, with approval from the County, an agreed-upon fee may be paid to the County by Gregory Canyon Ltd. LLC in lieu of acquiring off-site properties.

11.2.3 Reduction of the Performance Bond

Gregory Canyon Ltd. LLC will have the option of reducing the face value of the Performance Bond every three years, on the same cycle as the cost estimates and fund allocations review, in accordance with the following procedures:

- Gregory Canyon Ltd. LLC's actual expenditures for implementation activities will be deducted from the face-value of the bond; and
- To account for inflation, the remaining face value of the bond will be increased by changes in the Consumer Price Index (CPI) since the initial date of disturbance or the most recent adjustment in bond amount, as the case may be.

This adjusted amount will become the required face value of the Performance Bond for the next succeeding three-year period, or until Gregory Canyon Ltd. LLC proposes to acquire additional off-site open space, whichever occurs first. To ensure adequate funding at all times, including management in perpetuity, the minimum face value of the Performance Bond shall be $1,000,000 plus the difference between $7.3 million and the principal of the endowment trust as of the date of bond adjustment. This adjustment also will ensure that the Performance Bond is maintained at a level adequate to fund the endowment if Gregory Canyon Ltd. LLC should leave the site prior to the end of the operating period.

11.3 MANAGEMENT ENDOWMENT

To determine the amount required to fund perpetual management of on-site (restoration area and open space outside of restoration area) and off-site open space after Gregory Canyon, Ltd. LLC leaves the site, Gregory Canyon Ltd. LLC:

- Identified the habitat management tasks (including remedial measures and responses to changed circumstances) that would be necessary after the impacts of the Landfill Project ceased;
- Calculated the annual costs of those tasks in 2008 dollars; and

- Projected the annual cost of those measures at the end of the landfill operating based on an assumed CPI of 3% per annum.

The identified ongoing management tasks include access control, weed control measures, wildlife control, fire management, refuse removal, habitat monitoring, species monitoring, administrative costs, and an additional 10% for remedial measures/contingencies. Annual ongoing management costs were estimated at approximately $146,000 in 2008 dollars (per year total, Section 3.9 of Appendix A). With CPI (3% per year) factored into the costs over the 30-year operating period, there would need to be approximately $7.3 million in an interest-bearing account (5% for this calculation) at the end of the 30-year operating period to create enough interest income to provide for annual management and contingencies. Because the costs will be covered by interest alone, without utilization of the principal, the endowment will be non-wasting.

To fund the management endowment, Gregory Canyon Ltd. LLC will establish the interest-bearing account at the time of initial habitat disturbance and make deposits sufficient to provide full funding by the end of the 30-year landfill operating period. If, at the end of the landfill operating period, the endowment account does not contain $7.3 million, Gregory Canyon Ltd. LLC will fund the difference. If Gregory Canyon Ltd. LLC is unable to fully fund the endowment at the time full funding is needed for long-term management of on-site or off-site open space, the Performance Bond shall be used to complete funding of the endowment.

The amount of the endowment will be adjusted every three years commencing on the date of initial habitat disturbance to account for management costs related to any off-site open space that is acquired, and differences in actual inflation from the assumed 3%.

The intended use of the endowment funds is the perpetual management of all on-site and off-site open space after Gregory Canyon Ltd. LLC leaves the site. If Gregory Canyon Ltd. LLC leaves the site prior to the end of the landfill operating period, adequate funding for long-term management (including full funding of the endowment) will be provided through enforcement of the Performance Bond.

The amount of funds in the account will be reported to San Diego County annually as part of the administration of the Habitat Restoration and Resource Management Plan. In addition, every three years Gregory Canyon Ltd. LLC will report to San Diego County on inflation levels, interest levels and yield over the previous three years. The purpose of this report will be to determine whether the account would likely grow to the required amount. Gregory Canyon Ltd. LLC will designate an entity to administer the funds for implementation after Gregory Canyon Ltd. LLC leaves the site. San Diego County will approve the entity designated to administer the funds and will oversee use of the funds as part of the administration of the Habitat Resource Management Plan.

SECTION 12 REFERENCES

DriWater Inc. 2004. Website http://www.driwater.com/.html.

Geologic Associates. 2000. Biological Enhancement Investigation Report, Gregory Canyon Landfill, San Diego County, California. March 30.

Grime, J.P. 1978. Interpretation of Small-scale Patterns in the Distribution of Plant Species in Space and Time. A. J. H. Freysen, and J. W. Wodendorp. Structure and Functioning of Plant Populations, edited by A. J. H. Freysen. Elsevier Press.

Grime, J.P., and R. Hunt. 1975. Relative Growth Rate: Its Range and Adaptive Significance in a Local Flora. *J. Ecology* 63:393-422.

Lym, R. G., K. Sedivec, and D. Kirby. 1997. Leafy spurge control with angora goats and herbicides. *Journal of Range Management* 50(2):123-128.

San Diego County Department of Environmental Health. 2003. Gregory Canyon Landfill EIR. State Clearinghouse No. 1995061007.

San Diego County Department of Environmental Health. 2007. Gregory Canyon Landfill Revised Final EIR. State Clearinghouse No. 1995061007. March.

San Diego County Department of Environmental Health. 2007. Gregory Canyon Landfill Revised Final EIR. State Clearinghouse No. 1995061007. March.

U.S. Fish and Wildlife Service. 2005. Southwestern Willow Flycatcher Critical Habitat Designation. Southwest Region. Frequently Asked Questions and Answers. October.

URS. 2004. Field Report to Map Potential Waters of the United States for the Gregory Canyon Landfill Project. May 18.

URS. 2007. Biological Technical Report for Gregory Canyon Landfill CEQA Update. July 2006, revised February 20.

Table 1
Vegetation Impacts and Mitigation Requirements
Identified during CEQA Compliance

Vegetation Type	Acreage of Impacts	Mitigation Ratio	Mitigation Acreage
Agricultural Land	9.9	-	0.0
Agriculture/Developed	2.5	-	0.0
Chaparral	27.4	0.5	13.7
Rock Outcrop/Chaparral	1.6	-	0.0
Coastal Sage Scrub/Chaparral	51.5	2	103.0
Coastal Sage Scrub	170.8	2	341.6
Burned Coastal Sage Scrub	0.0	2	0.0
Disturbed Coastal Sage Scrub	1.7	2	3.4
Coast Live Oak Woodland	22.6	3	67.8
Southern Willow Scrub*	0.4	4	1.6
Cottonwood-willow Riparian Forest	0.2	4	0.8
Disturbed Southern Willow Scrub*	0.4	4	1.6
Open Channel* **	0.2	-	0.0
Native Perennial Grassland	0.6	3	1.8
Non-Native Grassland	15.8	0.5	7.9
Olives	0.3	-	0.0
Ornamental	0.4	-	0.0
Disturbed Habitat	2.3	-	0.0
Total	**308.6**	**NA**	**543.2**

*Impact and mitigation areas have been updated from the 2007 RFEIR.

**Note that "Open Channel" does not indicate jurisdictional water of the U.S. Open Channel in this sense is the same as open sand.

Table 2
RFEIR Mitigation Compared to HRRMP Mitigation Acreage

Habitat Resource Management Plan Habitat Classification	EIR Vegetation Type	EIR Required Mitigation Acreage	Proposed On-Site Creation/Enhancement Acreage (HRRMP)	Off-Site Acquisition Acreage (HRRMP)	Total Creation or Acquisition Acreage (HRRMP)
Chaparral Creation Area	Chaparral	13.7	14.3	-	**14.3**
Coastal Sage Scrub (Mesic Alluvial Scrub) and Coastal Sage Scrub Creation Areas	Coastal Sage Scrub/Chaparral	103.0	79.3 [1] (70.8 Coastal Sage Scrub [Mesic Alluvial Scrub] + 8.5 Coastal Sage Scrub)	368.7	**448.0**
	Coastal Sage Scrub	341.6			
	Disturbed Coastal Sage Scrub	3.4			
Oak Woodland with Alluvial Scrub/Native Grassland Understory Creation Area	Coast Live Oak Woodland	67.8	70.4	-	**70.4**
Native Grassland Creation Area	Non-Native Grassland	7.9	-	7.9	**7.9**
	Native Perennial Grassland	1.8	2.0 [2]	-	**2.0**
Southern Willow Scrub Creation Area	Southern Willow Scrub	1.6	2.3 [3]	-	**2.3**
	Disturbed Southern Willow Scrub	1.6		-	
Cottonwood Riparian Forest Creation Area and Cottonwood Riparian Forest Creation Area/Pond	Cottonwood-Willow Riparian Forest	0.8	4.2 (1.3 Cottonwood Riparian Forest + 2.9 Cottonwood Riparian Forest/Pond)	-	**4.2**
	Total	**543.2**	**172.5**[4]	**376.6**	**549.1**
Riverine Riparian Management Enhancement Area (including LBV/SWWF area)[5]	Restoration of riparian habitat within the San Luis Rey River floodplain	57.1	75.6		**75.6**
Upland and riparian habitat creation[6]	Direct mitigation creation obligations for vegetation community impacts	155.5	172.5		**172.5**
	Total	**212.6**	**248.1**		**248.1**[7]

Table 2
RFEIR Mitigation Compared to HRRMP Mitigation Acreage
(Continued)

Species Specific Mitigation	EIR Required Mitigation Acreage	Proposed On-Site Mitigation Acreage	Off-Site Mitigation Acreage	Total Mitigation Acreage (HEP)
Arroyo Toad	88.0	149.7 [8]	-	**149.7**
Least Bell's Vireo/Southwestern Willow Flycatcher	20.0	32.7 [9]	-	**32.7**

Notes:

[1] The on-site mitigation shown for coastal sage scrub (mesic alluvial scrub) and coastal sage scrub creation areas does not include alluvial scrub understory in oak woodland with alluvial scrub/native grassland understory creation area, which is treated as part of the oak woodland habitat.

[2] The on-site mitigation shown for native perennial grassland does not include native grassland understory in oak woodland with alluvial scrub/native grassland understory creation area, which is treated as part of the oak woodland habitat.

[3] On-site mitigation includes dedicated southern willow scrub creation area only; this area does not include southern willow scrub in the riverine riparian enhancement area, cottonwood riparian forest creation area, or cottonwood riparian forest creation area/pond areas. However, southern willow scrub and cottonwood willow vegetation communities are made up of many of the same species, and serve virtually the same habitat functions.

[4] No riverine riparian management (restoration) activities are proposed to satisfy this RFEIR mitigation obligation, per RFEIR MM 4.9-18.

[5] See RFEIR page 4.9-17 for breakdown between habitat creation and habitat enhancement.

[6] See RFEIR page 4.9-17 for breakdown between habitat creation and habitat enhancement. This category includes habitat creation activities.

[7] Total combined upland habitat creation/restoration is 172.5 acres (creation – 172.5 ac.), RFEIR requirement in MM 4.9-18 is 131.4 acres. Total combined riparian habitat creation/restoration is 82.1 acres (creation – 2.3 ac. + 4.2 ac.; restoration – 75.6 ac.), RFEIR requirement in MM 4.9-18 is 81.2 acres. Per MM 4.9-18, the restoration (management/enhancement) activities on 75.6 acres are above and beyond mitigation (creation or acquisition) for direct project impacts on vegetation communities.

[8] On-site mitigation includes coastal sage scrub creation, coastal sage scrub (mesic alluvial scrub), and oak woodland creation areas, which all provide suitable habitat for arroyo toad.

[9] Includes habitat creation and enhancement areas outside of both cumulative 60 dBA L_{eq} noise contours and facility operational 60 dBA L_{eq} noise contour. This area also excludes acreage occupied by the SDCWA right-of-way.

Table 3
Wilderness Gardens Regional Park Reference Site - Riparian/Alluvial Scrub Transect Data

Layer	Species	Average % Coverage
Herb	native herbs	25
	non-native grasses	25
	bare ground	6
	Phacelia distans	3
	Moss	2
	Cryptantha sp.	1
	Plagiobothrys collinus var. gracilis	1
Shrub	*Eriogonum fasciculatum*	10
	Pellaea mucronata	2
	Lepidospartum squamatum	1
	Dudleya edulis	1
	Adolphia californica	1
	Dudleya lanceolata	1
	Croton californica	1
	Marah macrocarpus	1

Table 4
Wilderness Gardens Regional Park Reference Site - Oak Woodland Transect Data

Layer	Species	Average % Coverage
Herb	non-native grasses	93
	Moss	6
	Sonchus oleraceus	2
	Lupinus truncatus	1
	Raphanus sativus	1
	Ambrosia acanthicarpa	1
Shrub	*Isocoma menziesii*	4
	Opuntia littoralis	3
	Toxicodendron diversilobum	3
	Marah macrocarpus	2
	Eriogonum fasciculatum	2
	Lepidospartum squamatum	1
Tree	*Quercus agrifolia*	65

Table 5
Wilderness Gardens Regional Park Reference Site - 100-year Floodplain Transect Data

Layer	Species	Average % Coverage
Herb	non-native grasses	14
	Lupinus truncates	1
	Lichens	1
	Moss	1
	native herbs	1
Shrub	*Isocoma menziesii*	26
	Adenostoma fasciculatum	17
	Quercus dumosa	6
	Eriogonum fasciculatum	3
	Marah macrocarpus	3
	Artemisia californica	2

Table 6
Plant Palette for Southern Willow Scrub Creation Area

Scientific Name	Common Name	Number Per Acre
Baccharis salicifolia	Mulefat	150 cuttings
Populus fremontii	Fremont's Cottonwood	40 one-gallon containers
Salix exigua	Narrow-leaved Willow	100 cuttings
Salix gooddingii	Black Willow	150 cuttings
Salix laevigata	Red Willow	150 cuttings
Salix lasiolepis	Arroyo Willow	150 cuttings
Salix lucida ssp. lasiandra	Lance-leaved Willow	75 cuttings
Total		**815 plants per acre**
Scientific Name	**Common Name**	**Lbs. Per Acre**
Ambrosia psilostachya	Western Ragweed	2
Amsinckia menziesii var. *intermedia*	Common Fiddleneck	1
Artemisia douglasiana	Mugwort	2
Eriogonum fasciculatum	California buckwheat	6
Lasthenia californica	Goldfields	1
Mimulus aurantiacus	Red-bush Monkeyflower	1
Plantago erecta	Dot-seed Plantain	4
Sisyrinchium bellum	Blue-eyed Grass	3
Totals		**20**
Optional Alternate Species		
Baccharis pilularis	Coyotebrush	
Baccharis sarothroides	Broom Baccharis	
Croton californica	California Croton	
Dichelostemma capitatum	Wild Hyacinth	
Encelia californica	California Sunflower	
Phacelia distans	Distant Phacelia	
Scrophularia californica	California Bee Plant	

Table 7
Plant Palette for Cottonwood Riparian Forest Creation Area and Cottonwood Riparian Creation Area/Pond

Scientific Name	Common Name	Number Per Acre
Baccharis salicifolia	Mulefat	75 cuttings
Populus fremontii	Fremont's Cottonwood	30 one-gallon containers
Platanus racemosa	Western Sycamore	10 one-gallon containers
Salix exigua	Narrow-leaved Willow	50 cuttings
Salix gooddingii [1]	Black Willow	75 cuttings
Salix laevigata	Red Willow	75 cuttings
Salix lasiolepis	Arroyo Willow	75 cuttings
Salix lucida ssp. lasiandra	Lance-leaved Willow	40 cuttings
Total		**430 plants per acre**
Scientific Name	**Common Name**	**Lbs. Per Acre**
Ambrosia psilostachya	Western Ragweed	2
Amsinckia menziesii var. *intermedia*	Common Fiddleneck	1
Artemisia douglasiana	Mugwort	2
Eriogonum fasciculatum	California buckwheat	6
Lasthenia californica	Goldfields	1
Marah macrocarpus	Wild Cucumber	2
Mimulus aurantiacus	Red-bush Monkeyflower	1
Phacelia distans	Distant Phacelia	1
Plantago erecta	Dot-seed Plantain	4
Totals		**20**
Optional Alternate Species		
Baccharis pilularis	Coyotebrush	
Baccharis sarothroides	Broom Baccharis	
Croton californica	California Croton	
Dichelostemma capitatum	Wild Hyacinth	
Lotus scoparius	Deerweed	
Lupinus truncatus	Collar Lupine	
Sisyrinchium bellum	Blue-eyed Grass	

[1] Use salix gooddingii only at the edge of ponds or near water table.

Table 8
Plant Palette for Oak Woodland with Alluvial Scrub/Native Grassland Understory Creation Area

Scientific Name	Common Name	Number Per Acre
Platanus racemosa	Western Sycamore	30 one-gallon
Quercus agrifolia	Coast Live Oak	45 one-gallon
Quercus engelmannii	Engelmann Oak	75 one-gallon
Total		**150 plants per acre**
Scientific Name	**Common Name**	**Lbs. Per Acre**
Ambrosia psilostachya	Western Ragweed	2
Amsinckia menziesii var. *intermedia*	Common Fiddleneck	1
Artemisia californica	California sagebrush	3
Artemisia douglasiana	Mugwort	2
Eriogonum fasciculatum	California buckwheat	6
Encelia californica	California Sunflower	2
Isocoma menziesii	Goldenbush	3
Lupinus truncatus	Collar Lupine	3
Mimulus aurantiacus	Red-bush Monkeyflower	1
Nassella lepida	Foothill Needlegrass	4
Nassella pulchra	Purple Needlegrass	6
Phacelia distans	Distant Phacelia	1
Plantago erecta	Dot-seed Plantain	4
Totals		**38**
Optional Alternate Species		
Adenostoma fasciculatum	Chamise	
Baccharis pilularis	Coyotebrush	
Baccharis sarothroides	Broom Baccharis	
Croton californica	California Croton	
Dichelostemma capitatum	Wild Hyacinth	
Lotus scoparius	Deerweed	
Malosma laurina	Laurel Sumac	
Opuntia littoralis	Coast prickly pear	
Rhus integrifolia	Lemonadeberry	
Sisyrinchium bellum	Blue-eyed Grass	
Toxicodendron diversilobum	Poison Oak	

Table 9
Plant Palette for Coastal Sage Scrub Creation Area

Scientific Name	Common Name	Lbs. Per Acre
Ambrosia psilostachya	Western Ragweed	2
Artemisia californica	California sagebrush	3
Artemisia douglasiana	Mugwort	2
Croton californica	California Croton	2
Encelia californica	California Sunflower	2
Eriogonum fasciculatum	California buckwheat	6
Heteromeles arbutifolia	Toyon	4
Isocoma menziesii	Goldenbush	3
Lotus scoparius	Deerweed	3
Nassella pulchra	Purple Needlegrass	6
Plantago erecta	Dot-seed Plantain	4
Salvia apiana	White Sage	2
Totals		**39**
Optional Alternate Species		
Baccharis pilularis	Coyotebrush	
Dichelostemma capitatum	Wild Hyacinth	
Leymus condensatus	Giant Wild Rye	
Malcothamnus fasciculatus	Bushmallow	
Malosma laurina	Laurel Sumac	
Mirabilis californica	Wishbone Bush	
Opuntia littoralis	Coast prickly pear	
Rhus integrifolia	Lemonadeberry	
Solanum xanti	Chaparral Nightshade	

Table 10
Plant Palette for Coastal Sage Scrub (Mesic Alluvial Scrub) Creation Area

Scientific Name	Common Name	Number Per Acre
Platanus racemosa	Western Sycamore	15 one-gallon
Total		**15 plants per acre**
Scientific Name	**Common Name**	**Lbs. Per Acre**
Ambrosia psilostachya	Western Ragweed	2
Artemisia californica	California sagebrush	3
Artemisia douglasiana	Mugwort	2
Baccharis sarothroides	Broom Baccharis	2
Encelia californica	California Sunflower	2
Eriogonum fasciculatum	California buckwheat	6
Heteromeles arbutifolia	Toyon	4
Isocoma menziesii	Goldenbush	3
Lotus scoparius	Deerweed	3
Nassella pulchra	Purple Needlegrass	6
Plantago erecta	Dot-seed Plantain	4
Salvia apiana	White Sage	2
Totals		**39**
Optional Alternate Species		
Baccharis pilularis	Coyotebrush	
Dichelostemma capitatum	Wild Hyacinth	
Leymus condensatus	Giant Wild Rye	
Malcothamnus fasciculatus	Bushmallow	
Malosma laurina	Laurel Sumac	
Mirabilis californica	Wishbone Bush	
Opuntia littoralis	Coast prickly pear	
Rhus integrifolia	Lemonadeberry	
Solanum xanti	Chaparral Nightshade	

Table 11
Plant Palette for Chaparral Creation Area

Scientific Name	Common Name	Lbs. Per Acre
Ambrosia psilostachya	Western Ragweed	2
Adenostoma fasciculatum	Chamise	1
Cerocarpus betuloides	Mountain Mahogany	6
Eriogonum fasciculatum	California buckwheat	6
Heteromeles arbutifolia	Toyon	4
Lotus scoparius	Deerweed	3
Malcothamnus fasciculatus	Bushmallow	4
Malosma laurina	Laurel Sumac	2
Nassella pulchra	Purple Needlegrass	6
Plantago erecta	Dot-seed Plantain	4
Totals		**38**
Optional Alternate Species		
Croton californica	California Croton	
Dichelostemma capitatum	Wild Hyacinth	
Isocoma menziesii	Goldenbush	
Isomeris arborea	Bladderpod	
Leymus condensatus	Giant Wild Rye	
Mirabilis californica	Wishbone Bush	
Opuntia littoralis	Coast prickly pear	
Rhus integrifolia	Lemonadeberry	
Solanum xanti	Chaparral Nightshade	

Table 12
Plant Palette for Native Grassland Creation Area

Scientific Name	Common Name	Lbs. Per Acre
Amsinckia menziesii var. *intermedia*	Common Fiddleneck	1
Bromus carinatus	California Brome	6
Calandrinia ciliata	Red Maids	1
Dichelostemma capitatum	Wild Hyacinth	1
Elymus glaucus	Blue Wild Rye	6
Lasthenia californica	Goldfields	1
Leymus condensatus	Giant Wild Rye	4
Lupinus truncatus	Collar Lupine	3
Nassella cernua	Nodding Needlegrass	3
Nassella lepida	Foothill Needlegrass	4
Nassella pulchra	Purple Needlegrass	6
Phacelia distans	Distant Phacelia	1
Plantago erecta	Dot-seed Plantain	4
Sisyrinchium bellum	Blue-eyed Grass	3
Totals		**44**

Table 13
Maintenance/Monitoring Schedule

Task	Year				
	1	2	3	4	5
Biological Monitoring	**Monthly**	**Bimonthly**	**Quarterly**	**Quarterly**	**Quarterly**
Plant Inspection	Monthly first 12 months	Monthly through 18th month; quarterly thereafter	Quarterly	Quarterly	Quarterly
Irrigation System Inspection	Monthly, or more frequently if required	Monthly	As Required	N/A	N/A
Trash and Debris Removal	Monthly	Monthly	Monthly	Monthly	Monthly
Weed Control	Minimum of Monthly	Monthly	Monthly	Monthly	Monthly
Pest Control	Monthly	Bi-monthly	Quarterly	Quarterly	Quarterly
Plant Replacement	Annually	Annually	Annually	Annually	Annually
Fertilization (if necessary)	Annually	Annually	N/A	N/A	N/A

Table 14
Southern Willow Scrub, Cottonwood Riparian Forest, and Cottonwood Riparian Forest/Pond Creation Area Performance Standards

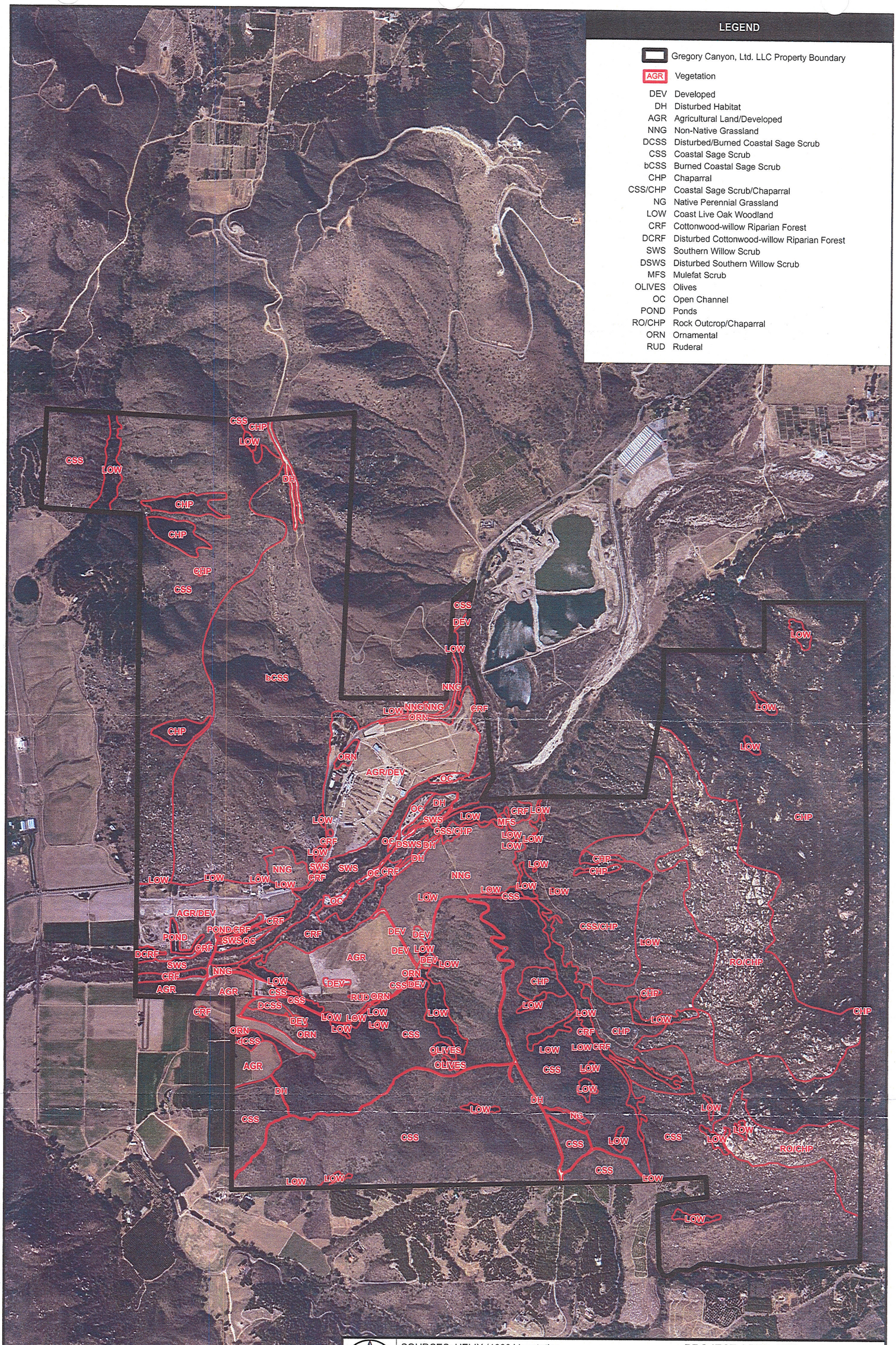
Milestone	Assessment Criteria	Maintenance Action
Year 1	Native plants (seeds, container plantings, cuttings) to achieve 30% absolute cover and 90% survivorship of container stock (cuttings not included). Weed cover less than 10%.	If target plant materials experience mortality and do not meet first year success criteria, plants will be replaced to bring densities up to 100% of the original planting density.
Year 2	Native plants (seeds, container plantings, cuttings) to achieve 40% absolute cover and 85% survivorship of container stock (cuttings not included). Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 3	Native plants (seeds, container plantings, cuttings) to achieve 50% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 80% survivorship of container stock (cuttings not included). Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 4	Native plants (seeds, container plantings, cuttings) to achieve 60% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 75% survivorship of container stock (cuttings not included). Weed cover less than 10%. Supplemental irrigation is discontinued at the beginning of the 4th year.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 5	Native plants (seeds, container plantings, cuttings) to achieve 75% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 70% survivorship of container stock (cuttings not included). Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.

Table 15
Oak Woodland with Alluvial Scurb/Native Grassland Understory and Coastal Sage Scurb (Mesic Alluvial Scrub) Creation Area Performance Standards

Milestone	Assessment Criteria	Maintenance Action
Year 1	Native plants (seeds, container plantings, cuttings) to achieve 25% absolute cover and 90% survivorship of container stock. Weed cover less than 10%.	If target plant materials experience mortality and do not meet first year success criteria, plants will be replaced to bring densities up to 100% of the original planting density.
Year 2	Native plants (seeds, container plantings, cuttings) to achieve 35% absolute cover and 90% survivorship of container stock. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 3	Native plants (seeds, container plantings, cuttings) to achieve 50% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 85% survivorship of container stock. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 4	Native plants (seeds, container plantings, cuttings) to achieve 60% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 80% survivorship of container stock. Weed cover less than 10%. Supplemental irrigation is discontinued at the beginning of the 4th year.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.
Year 5	Native plants (seeds, container plantings, cuttings) to achieve 65% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each, and 75% survivorship of container stock. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding and planting will be done. If necessary, container plantings will be replaced to bring numbers up to survivorship percentage requirements.

Table 16
Coastal Sage Scrub, Chaparral, and Native Grassland Performance Standards

Milestone	Assessment Criteria	Maintenance Action
Year 1	Native plants (seeds) to achieve 30% absolute cover. Weed cover less than 10%.	If target plant materials do not meet first year success criteria, supplemental seeding will be done.
Year 2	Native plants to achieve 40% absolute cover. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding will be done.
Year 3	Native plants to achieve 50% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding will be done.
Year 4	Native plants to achieve 60% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each. Weed cover less than 10%. Supplemental irrigation is discontinued at the beginning of the 4th year.	If plants do not meet coverage criteria, additional seeding will be done.
Year 5	Native plants to achieve 70% absolute cover, with at least two dominant native species at 15-20% cover each, and at least two subdominant native species at 5-10% cover each. Weed cover less than 10%.	If plants do not meet coverage criteria, additional seeding will be done.



SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).

N

URS

600 0 600 1200 Feet

1 inch = 1200 feet

PROJECT AREA AND EXISTING VEGETATION COMMUNITIES GREGORY CANYON, LTD. LLC SITE

CHECKED BY: MS	DATE: 5-06-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	1

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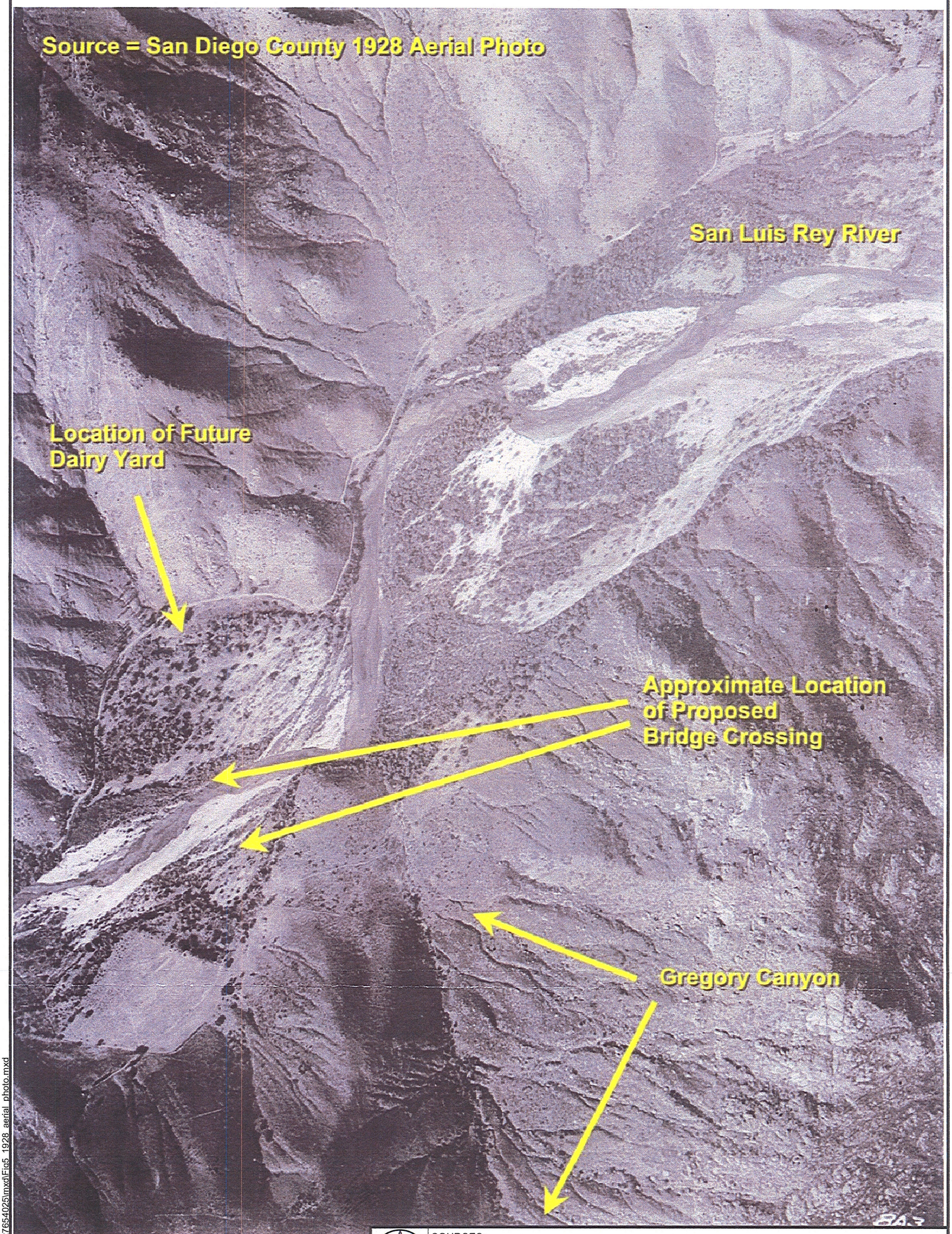

SOURCES:
San Diego County (aerial 1928).

1928 AERIAL PHOTOGRAPH
GREGORY CANYON LTD. LLC

URS

NOT TO SCALE

CHECKED BY: MS	DATE: 12-12-07	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	2

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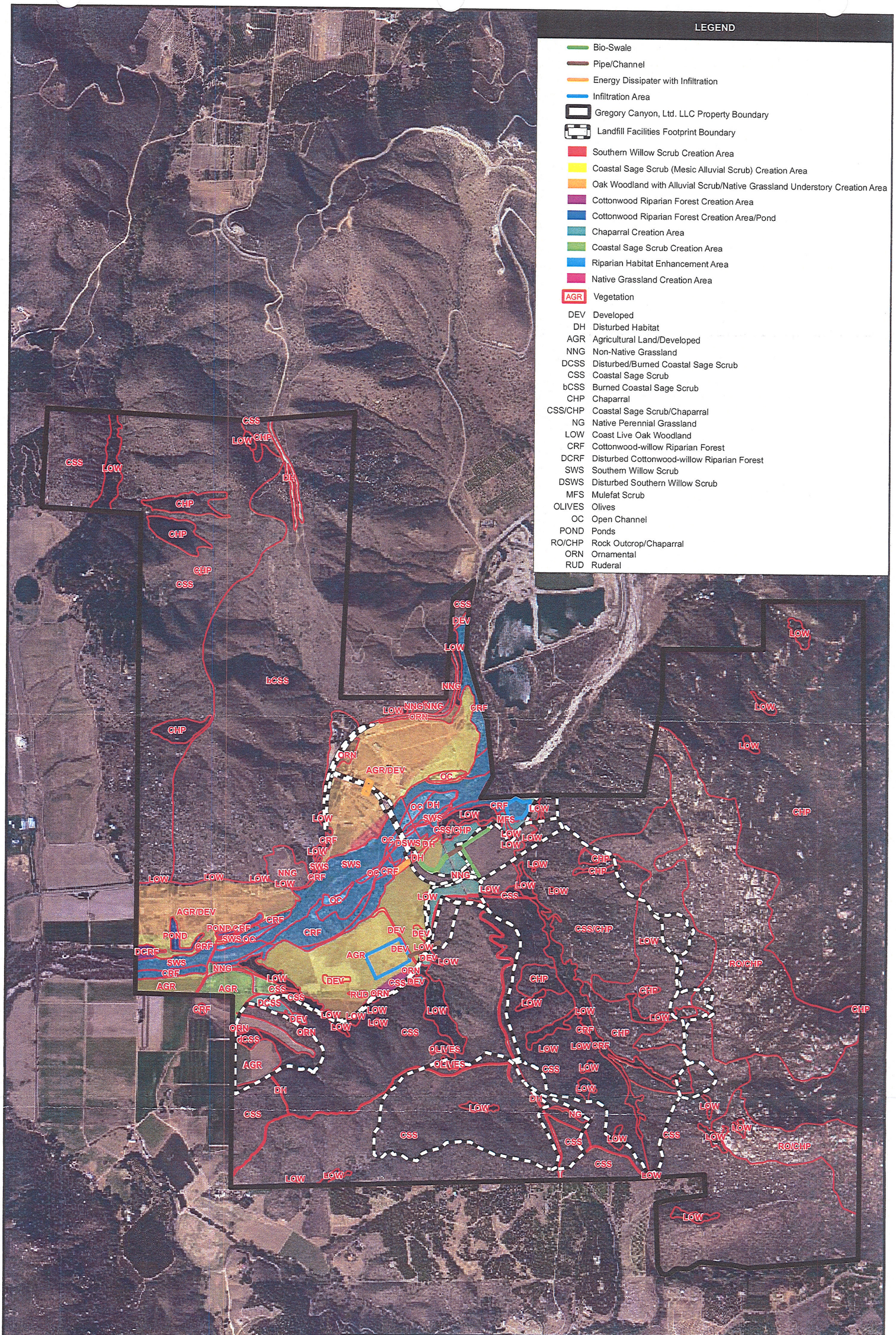


SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).

N

URS

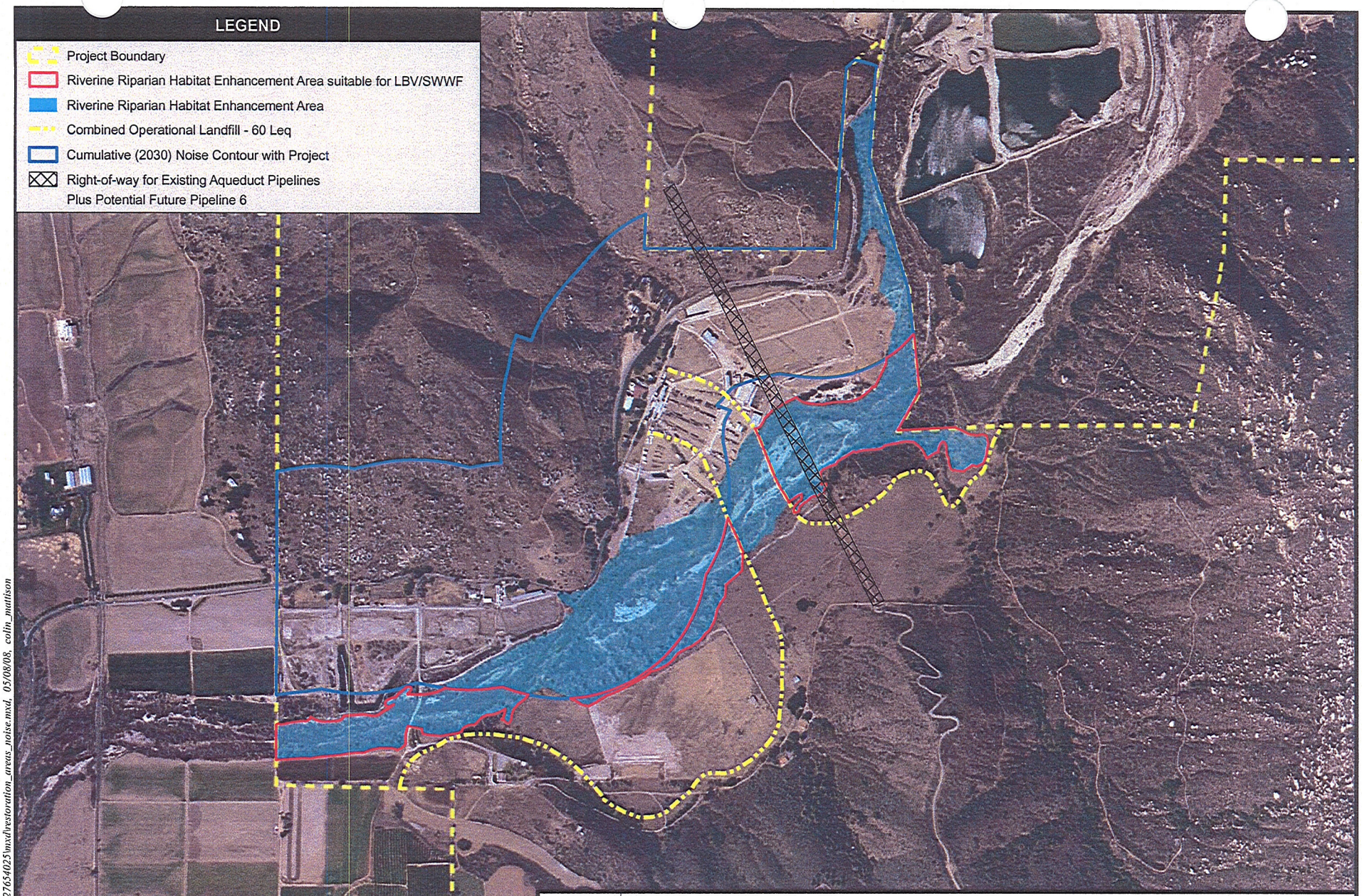
600 0 600 1200 Feet

1 inch = 1200 feet

RESTORATION AND ENHANCEMENT AREAS
GREGORY CANYON, LTD. LLC SITE

CHECKED BY: CM	DATE: 5-06-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	3

G:\gis\projects\1577\27654025\mxd\restoration_area_11x17.mxd



SOURCES: SOURCES: AirPhoto USA (aerial, 2002), Nolte & Associates (Riparian Habitat Creation Area, 2005, SDCWA ROW alignment).

N

URS

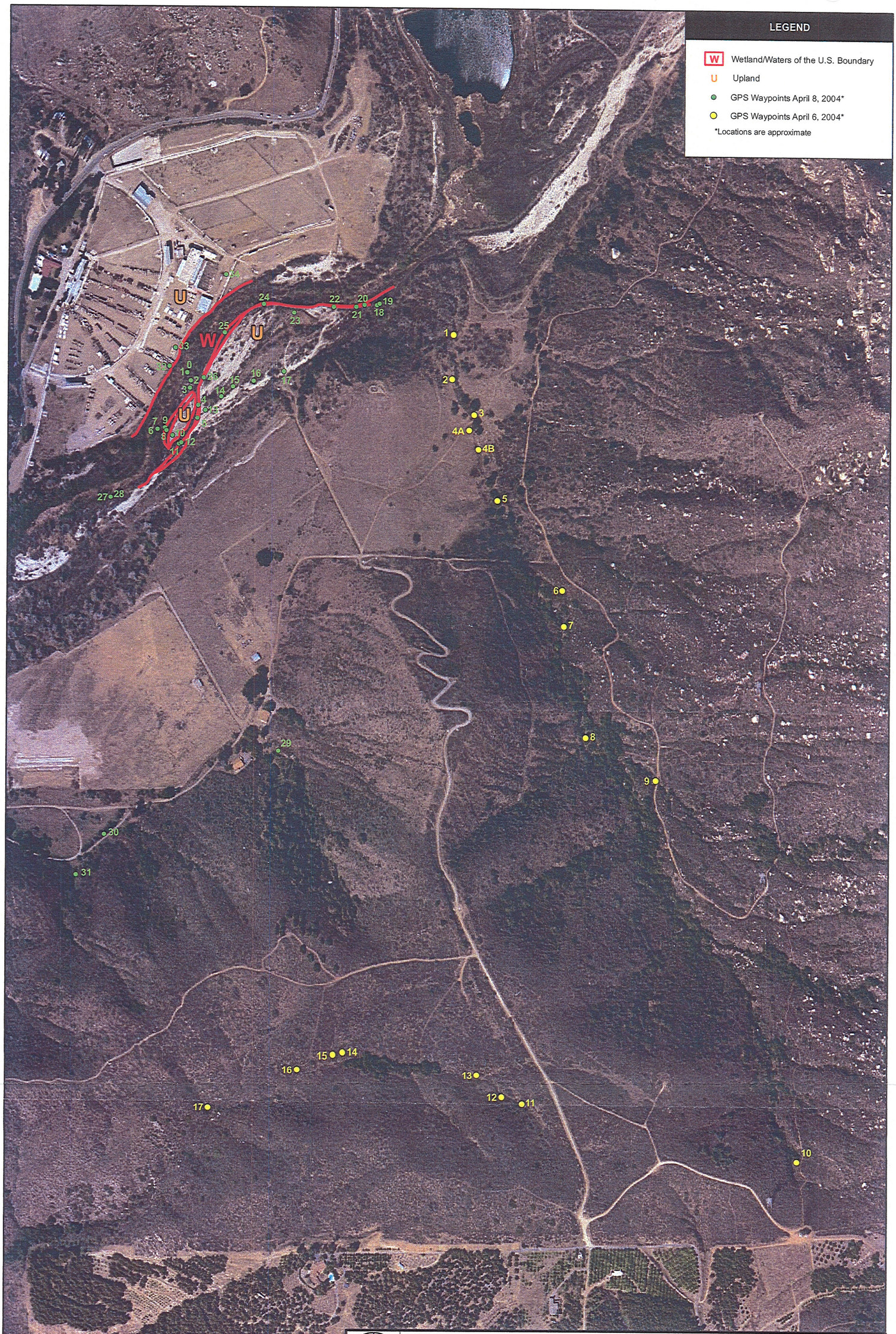
500 0 500 1000 Feet

SCALE: 1" = 1000' (1:12,000)

LEAST BELL'S VIREO/SOUTHWESTERN WILLOW FLYCATCHER MITIGATION AREAS
GREGORY CANYON, LTD. LLC SITE

CREATED BY: CM	DATE: 05-06-08	FIG. NO:	
PM: BM	PROJ. NO: 27654025.00020	4	

Path: G:\gis\projects\1577\27654025\mxd\restoration_areas_noise.mxd, 05/08/08, colin_mattison



SOURCES:
AirphotoUSA (March 2002 Aerial).

JURISDICTIONAL DELINEATION OF THE GREGORY CANYON LANDFILL SITE GREGORY CANYON, LTD. LLC SITE

URS

250 0 250 500 Feet
1 inch = 500 feet

CHECKED BY: MS	DATE: 3-14-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	5

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LEGEND

Transect Locations

SOURCES:
AerialExpress (aerial March 2007);
URS (transects).

N

URS

75 0 75 150 Feet

1 inch = 150 feet

WILDERNESS GARDENS REGIONAL PARK
REFERENCE SITE TRANSECT LOCATIONS
GREGORY CANYON, LTD. LLC SITE

CHECKED BY: MS	DATE: 5-06-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	6

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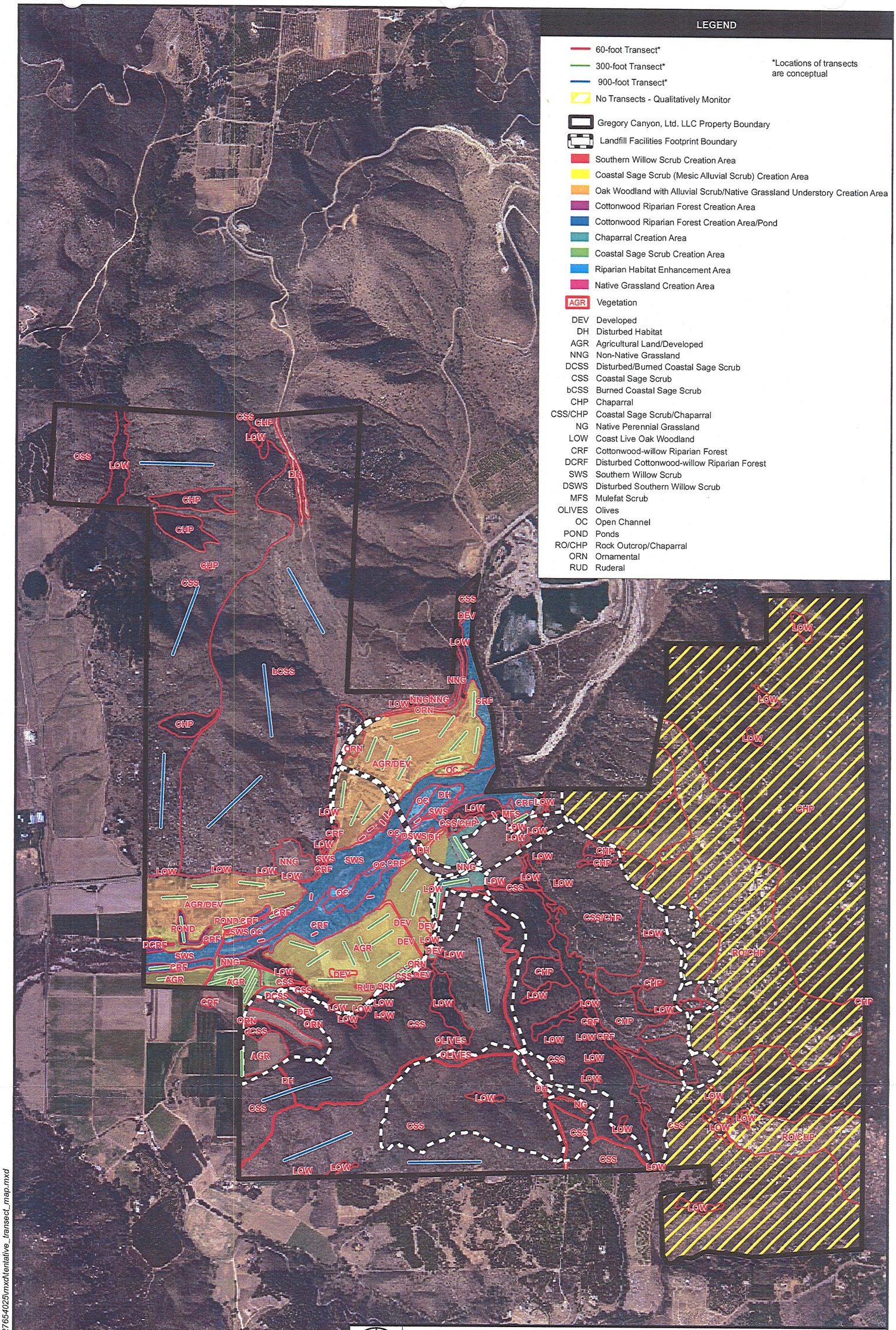

SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).

N

URS

600 0 600 1200 Feet

1 inch = 1200 feet

TENTATIVE TRANSECT LOCATION MAP
GREGORY CANYON, LTD. LLC SITE

CHECKED BY: CM	DATE: 9-15-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00020	7

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1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
1.1 SITE CONSTRUCTION/MAINTENANCE						
Fence, installed	Hi-vis and t-posts	Feet	10000	$ 2.00	1	$ 20,000.00
Subtotal						**$ 20,000.00**
1.2 BIOTIC SURVEYS						
Restoration Biologist	Project management, supervise implementation	Hours	200	$ 100.00	1	$ 20,000.00
Restoration Biologist	Baseline field survey to delineate sensitive areas	Hours	160	$ 100.00	1	$ 16,000.00
Wildlife Biologist	Baseline wildlife survey to delineate sensitive areas	Hours	160	$ 100.00	1	$ 16,000.00
Monitor Climate	Local resource	Hours	25	$ 100.00	1	$ 2,500.00
Subtotal						**$ 54,500.00**
1.3 HABITAT RESTORATION	**SOUTHERN WILLOW SCRUB CREATION AREA (2.3 acres)***					
Organic Debris Removal	Remove weeds to landfill	Hours	16	$ 50.00	1	$ 800.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	16	$ 50.00	1	$ 800.00
Seed Procurement	native seed	Acre	1	$ 842.00	1	$ 842.00
Plant Procurement	Native trees, gallon size	Acre	1	$ 120.00	1	$ 120.00
Plant Procurement	Cuttings	Hours	14	$ 50.00	1	$ 700.00
Revegetation	flag plant locations	Hours	8	$ 50.00	1	$ 400.00
Revegetation	plant installation	Hours	40	$ 50.00	1	$ 2,000.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00
Plant Protection Device, installed	plastic mesh or wire	Item	40	$ 1.45	1	$ 58.00
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	80	$ 50.00	1	$ 4,000.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00
Subtotal per acre						$ 41,352.00
Overall area subtotal						**$ 95,109.60**

* Does not include cost of grading. Grading will be included with bridge construction.

1.4 HABITAT RESTORATION	COTTONWOOD RIPARIAN FOREST CREATION AREA AND COTTONWOOD RIPARIAN FOREST CREATION AREA/POND (4.2 acres)*					
Organic Debris Removal	Remove weeds to landfill	Hours	16	$ 50.00	1	$ 800.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	16	$ 50.00	1	$ 800.00
Seed Procurement	native seed	Acre	1	$ 899.00	1	$ 899.00
Plant Procurement	Native trees, gallon size	Acre	1	$ 120.00	1	$ 120.00
Plant Procurement	Cuttings	Hours	8	$ 50.00	1	$ 400.00
Revegetation	flag plant locations	Hours	4	$ 50.00	1	$ 200.00
Revegetation	plant installation	Hours	20	$ 50.00	1	$ 1,000.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00
Plant Protection Device, installed	plastic mesh or wire	Item	40	$ 1.45	1	$ 58.00
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	80	$ 50.00	1	$ 4,000.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00
Subtotal per acre						$ 39,909.00
Overall area subtotal						**$ 167,617.80**

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
1.5 HABITAT RESTORATION	**OAK WOOODLAND WITH ALLUVIAL SCRUB/NATIVE GRASSLAND UNDERSTORY CREATION AREA (70.4 acres)**					
Soil Preparation	Rip or till soil as directed	Hours	4	$ 50.00	1	$ 200.00
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Seed Procurement	native seed	Acre	1	$ 1,652.00	1	$ 1,652.00
Plant Procurement	Native trees, gallon size	Acre	1	$ 585.00	1	$ 585.00
Revegetation	flag plant locations	Hours	2	$ 50.00	1	$ 100.00
Revegetation	plant installation	Hours	8	$ 50.00	1	$ 400.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00
Plant Protection Device, installed	plastic mesh or wire	Item	150	$ 1.45	1	$ 217.50
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	52	$ 50.00	1	$ 2,600.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00
Subtotal per acre						$ 38,386.50
Overall area subtotal						**$ 2,702,409.60**
1.6 HABITAT RESTORATION	**CHAPARRAL CREATION AREA (14.3 acres)**					
Soil Preparation	Rip or till soil as directed	Hours	4	$ 50.00	1	$ 200.00
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Seed Procurement	native seed	Acre	1	$ 1,288.00	1	$ 1,288.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	52	$ 50.00	1	$ 2,600.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00
Subtotal per acre						$ 36,720.00
Overall area subtotal						**$ 525,096.00**

1.7 HABITAT RESTORATION	COASTAL SAGE SCRUB (MESIC ALLUVIAL SCRUB) AND COASTAL SAGE SCRUB CREATION AREAS (79.3 acres)					
Soil Preparation	Rip or till soil as directed	Hours	4	$ 50.00	1	$ 200.00
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Seed Procurement	native seed	Acre	1	$ 2,676.00	1	$ 2,676.00
Plant Procurement	Native trees, gallon size	Acre	1	$ 45.00	1	$ 45.00
Revegetation	flag plant locations	Hours	1	$ 50.00	1	$ 50.00
Revegetation	plant installation	Hours	2	$ 50.00	1	$ 100.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00
Plant Protection Device, installed	plastic mesh or wire	Item	15	$ 1.45	1	$ 21.75
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	52	$ 50.00	1	$ 2,600.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
Subtotal per acre						$ 38,324.75
Overall area subtotal						**$ 3,039,152.68**
1.8 HABITAT RESTORATION	**NATIVE GRASSLAND CREATION AREA (2.0 acres)**					
Soil Preparation	Rip or till soil as directed	Hours	4	$ 50.00	1	$ 200.00
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Seed Procurement	native seed	Acre	1	$ 1,754.00	1	$ 1,754.00
Revegetation	Hand seeding, raking, and tamping	Hours	40	$ 50.00	1	$ 2,000.00
Irrigation System, temp	Overhead system	Acre	1	$ 26,000.00	1	$ 26,000.00
Irrigation System	Maintenance, labor	Hours	16	$ 70.25	1	$ 1,124.00
Exotic Plant Control	Hand removal	Hours	52	$ 50.00	1	$ 2,600.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	16	$ 50.00	1	$ 800.00
Other	misc. supplies	Item	1	$ 250.00	1	$ 250.00
Subtotal per acre						$ 37,186.00
Overall area subtotal						**$ 74,372.00**
1.9 HABITAT RESTORATION	**RIVERINE RIPARIAN MANAGEMENT ENHANCEMENT AREA (75.6 acres)**					
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Exotic Plant Control	Hand removal	Hours	52	$ 50.00	1	$ 2,600.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	1	$ 1,458.00	1	$ 1,458.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	14	$ 50.00	1	$ 700.00
Other	misc. supplies	Item	1	$ 100.00	1	$ 100.00

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
Subtotal per acre						$ 5,858.00
Overall area subtotal						**$ 442,864.80**
1.10 REPORTING						
Database Management	data input	Hours	160	$ 100.00	1	$ 16,000.00
GIS/CAD Management	data management	Hours	40	$ 100.00	1	$ 4,000.00
Photodocumentation	field survey	Hours	160	$ 100.00	1	$ 16,000.00
Aerial photos	flight	Item	1	$ 1,000.00	1	$ 1,000.00
Agency Report	As-Built report	Hours	60	$ 100.00	1	$ 6,000.00
Report Production	labor	Hours	20	$ 100.00	1	$ 2,000.00
Subtotal						**$ 45,000.00**
OFFICE MAINTENANCE	Part of Landfill operation costs					
FIELD EQUIPMENT	Part of Landfill operation costs					
OPERATIONS	Part of Landfill operation costs					
SUBTOTAL	(using the Overall Area Subtotal values where applicable)					**$ 7,166,122.48**

1.0 Initial and Capital Tasks and Costs (section 8 of PAR)

Task List	Specifications	unit	number	cost/unit	interval	Total
1.11 CONTINGENCY & ADMINISTRATION						
Contingency	10% of total					$ 716,612.25
Administration	20% of total					$ 1,433,224.50
Subtotal						**$ 2,149,836.74**
SECTION 1.0 GRAND TOTAL						**$ 9,315,959.22**

2.0 Ongoing Tasks and Costs (section 9 of PAR) for FIVE YEAR MONITORING/MAINTENANCE PERIOD (for restoration area, ~248.1 acres)*

Task List	Specifications	unit	number	cost/unit	interval	Total
2.1 SITE CONSTRUCTION/MAINTENANCE						
Fence, maintenance	Check and repair fencing as needed	Hours	160	$ 50.00	1	$ 8,000.00
Subtotal						**$ 8,000.00**
2.2 BIOTIC SURVEYS						
Restoration Biologist	Project Management	Hours	100	$ 100.00	1	$ 10,000.00
Restoration Biologist	Annual monitoring	Hours	140	$ 100.00	1	$ 14,000.00
Wildlife Biologist	Annual monitoring	Hours	140	$ 100.00	1	$ 14,000.00
Restoration Biologist	Field survey	Hours	120	$ 100.00	1	$ 12,000.00
Wildlife Biologist	Field survey	Hours	120	$ 100.00	1	$ 12,000.00
Botanist	Outside expert	Hours	40	$ 100.00	1	$ 4,000.00
Monitor Climate	Local resource	Hours	8	$ 100.00	1	$ 800.00
Subtotal						**$ 66,800.00**

* Costs are calculated per year, total by year and cumulative total appears at the end of this section.

2.0 Ongoing Tasks and Costs (section 9 of PAR) for FIVE YEAR MONITORING/MAINTENANCE PERIOD (for restoration area, ~248.1 acres)*

Task List	Specifications	unit	number	cost/unit	interval	Total
2.3 HABITAT RESTORATION						
Supplemental Planting	Replacement planting if needed	Hours	80	$ 50.00	1	$ 4,000.00
Seed Procurement	native seed	Acre	172.5	$ 75.00	1	$ 12,937.50
Plant Procurement	Native trees, gallon size	Item	600	$ 3.00	1	$ 1,800.00
Plant Procurement	Cuttings	Hours	12	$ 50.00	1	$ 600.00
Plant Protection Device	collar & screen or wire, or tube	Item	600	$ 1.50	1	$ 900.00
Other	misc. supplies	Item	1	$ 2,500.00	1	$ 2,500.00
Subtotal						**$ 22,737.50**
2.4 HABITAT MAINTENANCE						
Organic Debris Removal	Remove weeds to landfill	Hours	100	$ 50.00	1	$ 5,000.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	100	$ 50.00	1	$ 5,000.00
Erosion Control	Check for erosion control problems	Hours	100	$ 50.00	1	$ 5,000.00
Irrigation System	Maintenance, labor	Hours	100	$ 50.00	1	$ 5,000.00
Exotic Plant Control	Hand removal	Hours	1400	$ 50.00	1	$ 70,000.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	20	$ 1,458.00	1	$ 29,160.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	200	$ 50.00	1	$ 10,000.00
Exotic Plant Control	weed whip	Hours	200	$ 50.00	1	$ 10,000.00
Pest Control	Check for insect and animal pest/damage	Hours	100	$ 50.00	1	$ 5,000.00
Other	misc supplies	item	1	$ 2,500.00	1	$ 2,500.00
Subtotal						**$ 146,660.00**

2.0 Ongoing Tasks and Costs (section 9 of PAR) for FIVE YEAR MONITORING/MAINTENANCE PERIOD (for restoration area, ~248.1 acres)*

Task List	Specifications	unit	number	cost/unit	interval	Total
2.5 REPORTING						
Database Management	data input	Hours	60	$ 100.00	1	$ 6,000.00
GIS/CAD Management	data management	Hours	60	$ 100.00	1	$ 6,000.00
Photodocumentation	field survey	Hours	80	$ 100.00	1	$ 8,000.00
Agency Report	annual report	Hours	80	$ 100.00	1	$ 8,000.00
Monitoring Reports	monitoring documentation	Hours	80	$ 100.00	1	$ 8,000.00
Report Production	labor	Hours	20	$ 100.00	1	$ 2,000.00
Subtotal						**$ 38,000.00**
SUBTOTAL						**$ 282,197.50**
2.6 CONTINGENCY & ADMINISTRATION						
Contingency	10% of total					$ 28,219.75
Administration	20% of total					$ 56,439.50
Changed Circumstances Reserve	25% of total					$ 70,549.38
Subtotal						**$ 155,208.63**
TOTAL	Year 1					**$ 437,406.13**
	Year 2					**$ 450,528.31**
	Year 3					**$ 464,044.16**
	Year 4					**$ 477,965.48**
	Year 5					**$ 492,304.45**
SECTION 2.0 GRAND TOTAL	Five years					**$ 2,322,248.52**

3.0 Ongoing Tasks and Costs (section 9 of PAR) for THIRTY YEAR LANDFILL OPERATING PERIOD (for all open space, ~1,300 acres)

Task List	Specifications	unit	number	cost/unit	interval	Total
3.1 SITE CONSTRUCTION/MAINTENANCE						
Fence, maintenance	Check and repair fencing as needed	Hours	192	$ 50.00	1	$ 9,600.00
Subtotal						**$ 9,600.00**
3.2 BIOTIC SURVEYS						
Restoration Biologist	Project Management	Hours	20	$ 100.00	1	$ 2,000.00
Restoration Biologist	Habitat monitoring	Hours	80	$ 100.00	1	$ 8,000.00
Wildlife Biologist	Species monitoring	Hours	80	$ 100.00	1	$ 8,000.00
Botanist	Outside expert	Hours	40	$ 100.00	1	$ 4,000.00
Monitor Climate	Local resource	Hours	10	$ 100.00	1	$ 1,000.00
Subtotal						**$ 23,000.00**
3.3 HABITAT MAINTENANCE						
Organic Debris Removal	Remove weeds to landfill	Hours	10	$ 50.00	1	$ 500.00
Non-organic Debris Removal	Remove garbage to landfill	Hours	10	$ 50.00	1	$ 500.00
Erosion Control	Check for erosion control problems	Hours	10	$ 50.00	1	$ 500.00
Exotic Plant Control	Hand removal	Hours	320	$ 50.00	1	$ 16,000.00
Exotic Plant Control	Herbicide (such as Rodeo, Roundup Pro or Fusilade)	Acre	5	$ 1,458.00	1	$ 7,290.00
Exotic Plant Control	Herbicide application (such as tractor or backpack)	Hours	50	$ 50.00	1	$ 2,500.00
Exotic Plant Control	weed whip	Hours	40	$ 50.00	1	$ 2,000.00
Wildlife Control	Check for insect and animal pest/damage	Hours	10	$ 50.00	1	$ 500.00
Brush Management	fuel modification zones	Hours	40	$ 50.00	1	$ 2,000.00
Brush Hog Tractor Mower	mowing	week	2	$ 750.00	1	$ 1,500.00
Other	misc supplies	item	1	$ 2,000.00	1	$ 2,000.00
Subtotal						**$ 35,290.00**

3.0 Ongoing Tasks and Costs (section 9 of PAR) for THIRTY YEAR LANDFILL OPERATING PERIOD (for all open space, ~1,300 acres)

Task List	Specifications	unit	number	cost/unit	interval	Total
3.4 PUBLIC SERVICES						
Patrolling	patrol	Hours	240	$ 50.00	1	$ 12,000.00
Other	misc. supplies	Item	1	$ 1,000.00	1	$ 1,000.00
Subtotal						**$ 13,000.00**
3.5 REPORTING						
Database Management	data input	Hours	15	$ 100.00	1	$ 1,500.00
GIS/CAD Management	data management	Hours	10	$ 100.00	1	$ 1,000.00
Photodocumentation	field survey	Hours	30	$ 100.00	1	$ 3,000.00
Aerial photos	flight	Item	1	$ 1,000.00	0.2	$ 200.00
Agency Report	annual report	Hours	40	$ 100.00	1	$ 4,000.00
Fire Management Plan	report	Hours	20	$ 100.00	1	$ 2,000.00
Report Production	labor	Hours	10	$ 100.00	1	$ 1,000.00
Subtotal						**$ 12,700.00**
3.6 OFFICE MAINTENANCE						
Administrative	operations	Hours	40	$ 100.00	1	$ 4,000.00
Telephone Charges, Annual	phone charges	Month	0.5	$ 2,520.00	0.5	$ 630.00
Office Supplies, Year	supplies	Month	0.5	$ 1,140.00	1	$ 570.00
Other	misc supplies	Item	1	$ 500.00	1	$ 500.00
Subtotal						**$ 5,700.00**
3.7 FIELD EQUIPMENT						
GPS, Rover & Base Unit	gps w. mapping capability	item	1	$ 400.00	0.2	$ 80.00
Vehicle	pickup truck	item	1	$ 20,000.00	0.1	$ 2,000.00

3.0 Ongoing Tasks and Costs (section 9 of PAR) for THIRTY YEAR LANDFILL OPERATING PERIOD (for all open space, ~1,300 acres)

Task List	Specifications	unit	number	cost/unit	interval	Total
Vehicle	mileage	mile	5000	$ 0.59	1	$ 2,925.00
Vehicle Insurance	insurance	year	1	$ 2,000.00	1	$ 2,000.00
Camera 35mm lens	digital	item	1	$ 300.00	0.2	$ 60.00
Other	misc. supplies	item	1	$ 500.00	1	$ 500.00
Subtotal						**$ 7,565.00**
3.8 OPERATIONS						
Audit	CPA audit	Hours	20	$ 50.00	1	$ 1,000.00
Contracts	produce contracts	Hours	20	$ 100.00	1	$ 2,000.00
Endowment	process endowment	Hours	20	$ 100.00	1	$ 2,000.00
Other	misc items	Item	1	$ 500.00	1	$ 500.00
Subtotal						**$ 5,500.00**
SUBTOTAL						**$ 112,355.00**
3.9 CONTINGENCY & ADMINISTRATION						
Contingency	10% of total					$ 11,235.50
Administration	20% of total					$ 22,471.00
Subtotal						**$ 33,706.50**
TOTAL	Per year					**$ 146,061.50**
SECTION 3.0 GRAND TOTAL	30 years, with 3% inflation					**$ 6,948,912.79**
OVERALL GRAND TOTAL	for Entire Restoration Plan, PAR Sections 1.0, 2.0, and 3.0					**$18,587,120.53**

GREGORY CANYON LANDFILL

PHASED LANDFILL DEVELOPMENT DESCRIPTION, DESIGN FEATURES AND MITIGATIONS RELATED TO BIOLOGICAL RESOURCES

1. Description of Landfill Development

The Gregory Canyon Landfill will provide landfill capacity to meet a portion of the total disposal needs of San Diego County. The landfill development is located along SR 76 approximately 3½ miles east of I-15. The landfill development is located on approximately 1,783 acres owned by or optioned to Gregory Canyon Ltd. LLC. The landfill facilities will comprise approximately 308 acres, including the landfill footprint, ancillary facilities, storm water management facilities, two borrow-stockpile areas, a landfill access road and bridge, and internal access roads. The landfill development includes the construction of new transmission tower pads and relocation of the current SDG&E power transmission lines. The landfill development could have both direct and indirect impacts to threatened or endangered species, both on the landfill property and along certain transportation corridors. To prevent jeopardy, the landfill development includes the permanent preservation of at least 1,313 acres of open space within the landfill property, and implementation of habitat creation and habitat enhancement on approximately 216 acres within the 1,313 acres, including long-term management. The landfill development also includes acquisition of between approximately 410 to 651 acres of off-site property for habitat preservation, or contribution to a mitigation bank, including long-term management.

An overlay of the three stages of phase one on an aerial photo showing vegetation communities is presented in Figure B-1 of this appendix. An overlay of the remaining landfill phases on a topographic map are presented in Figures B-2 to B-4. Impacts on vegetation communities from Phase 1 of the landfill footprint development are shown in Table B-1 table below. Phase 1, Stage 1 is part of initial landfill construction, with development of Phase 1, Stages 2 and 3 estimated to occur in Operating Years 1-6. Impacts associated with landfill startup, which include the Phase 1, Stage 1 landfill footprint and all other landfill features that would be part of initial construction, are shown in Table B-2 below.

Table B-1
Phase 1 Vegetation Impacts by Vegetation Community and Stage

Vegetation Communities Impacted	Stage 1	Stage 2	Stage 3	Total Impacted Acreage by Habitat
Chaparral	1.9	0	0.7	**2.6**
Coastal Sage Scrub [1]	33.1	11.5	28.8	**73.4**
Coast Live Oak Woodland	2.8	0.1	3.6	**6.5**
Disturbed Habitat	0.2	0	0	**0.2**
Non-native Grassland	3.3	0	0	**3.3**
Total Impacted Acreage by Stage	**41.3**	**11.6**	**33.1**	**86**

[1] Includes Coastal Sage Scrub/Chaparral community also.

Table B-2
Initial Landfill Operation Construction Impacts by Vegetation Community and Construction Activity

Vegetation Communities Impacted	Phase 1 Stage 1	Stockpile Area A	Facilities Area	Sediment Basins (incl. access road)	Access Road (incl. bridge)	Haul Road to Stockpile Area A	Highway 76 Re-alignment	Total Impact Acreage by Vegetation Community
Agricultural Land	0	9.9	0	0	0	0.1	0	**10**
Agricultural/Developed	0	0.1	0	0	1.1	0.6	1.3	**3.1**
Chaparral	1.9	0	0	0	0	0	0	**1.9**
Coastal Sage Scrub [1]	33.1	10.4	2.6	5.4	0	0.5	< 0.05	**52.0**
Coast Live Oak Woodland	2.8	0	0.3	0.3	0	0.2	< 0.05	**3.6**
Developed	0	0	0	0	0	< 0.05	0	**< 0.05**
Disturbed Habitat	0.2	< 0.05	0	< 0.05	0.3	0	0	**0.5**
Non-Native Grassland	3.3	0	9.1	0.6	2.3	0.7	0	**16.0**
Open Channel	0	0	0	0	0.1	0	0	**0.1**
Ornamental	0	0.2	0	0	0	0.1	0.1	**0.4**
Southern Willow Scrub [2]	0	0	0	0	0.5	0	0	**0.5**
Total Impact Acreage by Construction Activity	**41.3**	**20.6**	**12**	**6.3**	**4.3**	**2.2**	**1.4**	**88.1**

[1] Includes Coastal Sage Scrub/Chaparral, Disturbed Coastal Sage Scrub, Burned Coastal Sage Scrub vegetation communities as well.

[2] Includes Disturbed Southern Willow Scrub vegetation community also.

Implementation of mitigation may be phased in proportion to impact areas per each phase. Enhancement within the San Luis Rey River riparian zone will be initiated at the beginning of the on-site mitigation. Implementation of mitigation south of the river will also occur upfront. Implementation of mitigation north of the river may be phased.

A. Overview of landfill facilities.

Landfill Footprint: 183 acres
Relocated Power Pads: 13 acres
Ancillary Facilities/Desilting Basins: 17 acres
Landfill Access Road/Borrow-Stockpile Area A Road/Borrow-Stockpile Area B Road: 8 acres
Borrow/Stockpile Areas: 87 acres

Total: 308 acres

Projected operating life: 30-32 years

2. Initial Construction – Year 0 (1)

A. Extent of disturbed area (approx.):

See Table B-2

(1) Initial construction is within a portion of the Phase I development area.

(2) Landfill footprint area includes both lined disposal area and stormwater management facilities.

B. Design Features and Mitigation Measures to protect biological resources applicable to initial construction period.

Design Feature (DF) or Mitigation	EIR Mitigation Measure/ DF
Include removal of dairies as part of initial construction.	DF
Approved Wetland Mitigation and Habitat Enhancement Plan for on-site mitigation areas; approved Habitat Resource Management Plan for on-site areas; funding for long-term management.	MM 4.9-1a; 4.9-1b; 4.9-1d; 4.9-1e; 4.9-1f; 4.9-2; 4.9-4; 4.9-14; 4.9-18
Approved Habitat Resource Management Plan for off-site mitigation areas; funding for long-term management.	MM 4.9-1a; 4.9-1c; 4.9-1g; 4.9-2; 4.9-14
Implement on-site habitat creation or enhancement, acquire off-site mitigation parcels, or contribute to mitigation bank, as needed to mitigate acreage impacts to vegetation and endangered species from initial construction.	MM 4.9-1a through 4.9-1g; 4.9-2; 4.9-3a; 4.9-4; 4.9-11b; 4.9-14; 4.9-18
Mitigation activities limited to September 15 to March 15, unless operational changes or noise barriers document noise levels less than 60 dBA L_{eq}.	MM 4.9-13

Design Feature (DF) or Mitigation	EIR Mitigation Measure/ DF
Pre-construction meeting with biologist and construction personnel to explain restrictions, emphasize importance of staying within construction areas, and consequences of violating restrictions.	MM 4.9a
Construction hours limited to 7 am – 6 pm Monday through Friday, 8 am – 5 pm on Saturday.	MM 4.6-1b
Access road and bridge construction limited to daylight hours.	DF
Install temporary fencing where construction areas interface with open space, install permanent fencing marked with signs around open space.	MM 4.9-1h
Remove arroyo toad riparian breeding habitat between October and December.	MM 4.9-3b; 4.9-11a
Riparian vegetation removal for bridge construction limited to 50 foot width underneath and along east side of structure.	DF
Arroyo toad exclusion fencing around bridge construction zone; daily monitoring by biologist and daily repair by construction personnel, as needed.	MM 4.9-5a
Arroyo toad surveys pre- and post- installation of exclusion fencing in bridge construction area, relocation of toads within exclusion area.	MM4.9-5b
Bridge construction limited to September 15 to March 15, unless operational changes or noise barriers document noise levels less than 60 dBA L_{eq}.	MM 4.9-12c
Arroyo toad exclusion fencing along both sides of landfill access road; and at designated locations around ancillary facilities area and desilting basin.	MM 4.9-5c
Arroyo toad surveys following installation of exclusion fencing along landfill access road, relocation of toads within exclusion area.	MM 4.9-5d
Arroyo toad surveys following installation of exclusion fencing around ancillary facilities area and desilting basin, relocation of toads within exclusion area.	MM 4.9-5e
Borrow-Stockpile Area A will only be used during initial construction and for landfill closure, revegetated with native species between use periods.	DF
Arroyo toad exclusion fencing along north side of Borrow-Stockpile Area A road; remove and reinstall as needed.	MM 4.9-5g
Arroyo toad surveys following installation or re-installation of exclusion fencing along north side of Borrow-Stockpile Area A road, relocation of toads within exclusion area.	MM 4.9-5h
Construct temporary noise barrier along north side of Borrow-Stockpile Area A prior to use, between September 15 and March 15, remove upon determination that noise levels during breeding season are reduced to 60 dBA L_{eq}.	MM 4.9-15a
Arroyo toad exclusion fencing along both sides of low-flow crossing, remove when use completed. Arroyo toad surveys following installation of exclusion fencing including daily surveys when low-flow crossing in to be used, relocation of toads within exclusion area.	MM 4.9-5i
Use low-flow crossing only between September 15 and March 15 unless surveys or operational changes to reduce noise.	MM 4.9-12b
Daily or weekly noise monitoring between September 15 and March 15 in vireo and flycatcher habitat, and operational changes to reduce noise levels.	MM 4.9-12a
Any gaps in bridge abutment riprap will be filled with concrete.	MM 4.9-7

Design Feature (DF) or Mitigation	EIR Mitigation Measure/ DF
At least one landfill access road undercrossing for arroyo toad on both the north and south sides of river.	MM 4.9-5f
Bridge abutments to be drilled in place, rather than driven.	DF
Bridge deck will be 17.5 feet above river bed.	DF
Install reflective strips along inside structure of bridge, no lighting on bridge.	DF
Pre-construction survey for golden eagle, follow up weekly monitoring between December and May for one year following construction activity.	MM 4.9-9b
Construction activity within 2,000 feet of eagle's nest to be scheduled as close as possible to June.	MM 4.9-9c
Access to eagle's nests restricted to eagle specialists and researchers.	MM 4.9-9a
Limit construction of recycled water facilities at OMWD to February 15 through August 31, or noise reduction.	MM 4.9-20

3. Prior to Initial Operation – Year 0

A. Design Features and Mitigation Measures to protect biological resources required prior to initial operation.

Mitigation	EIR Mitigation Measure
Dedicate or create open-space easement for at least 1,313 acres on-site, funding for long-term management.	MM 4.1-2
Plant large riparian trees and associated understory along access road to shield landfill development, consistent with habitat creation and enhancement activities.	MM 4.13-5
Plant mature tree groupings adjacent to ancillary facilities area; place any rock outcrops removed from the landfill footprint around the ancillary facilities area.	MM 4-13-6a; 4.13-6b
Revegetate Borrow-Stockpile Area A following initial use with native plant species.	MM 4.13-8c

4. Operation – Years 1 to 30-32

A. Extent of Disturbed Area (est.)

Borrow-Stockpile Area B: 65 acres (3)
Borrow-Stockpile Area B road: 1 acre

Total: 66 acres

(3) Use of Borrow-Stockpile Area B will be phased over the operating life of the landfill.

B. Design Features and Mitigation Measures to protect biological resources applicable to landfill operations.

Design Feature (DF) or Mitigation	EIR Mitigation Measure/DF
Maintain arroyo toad exclusion fencing along landfill access road, ancillary facilities area and desilting basin.	MM 4.9-5c
Approved Habitat Resource Management Plan for off-site mitigation areas; funding for long-term management.	MM 4.9-1a; 4.9-1c; 4.9-1g; 4.9-2; 4.9-14
Implement on-site habitat creation or enhancement, acquire off-site mitigation parcels, or contribute to mitigation bank, as needed to mitigate acreage impacts to vegetation and endangered species from initial construction.	MM 4.9-1a through 4.9-1g, 4.9-2; 4.9-4
If needed, treat and dispose of any contaminated water detected in monitoring wells, treat contaminated groundwater to background levels	MM 4.3-1b
Tire shredding and rock crushing will not occur at the same time.	MM 4.6-2a
Noise monitoring at initiation of tire shredding operations, noise reduction measures if needed.	MM 4.6-2b
Rock crushing and tire shredding to occur on landfill footprint at least 1,500 feet from LBV and SWF habitat.	DF
Noise monitoring and verification at flare station prior to operation.	MM 4.6-3
Weekly noise monitoring of landfill operations for one month, construction of permanent noise barrier and operational changes if needed.	MM 4.9-15b
Restrict access routes to existing roads, restrict access to non-impact open space areas, post signs, public education program.	MM 4.9-16
Provide funding for cowbird trapping along San Luis Rey River for 5 years following commencement of initial landfill operation.	MM 4.9-11c
Inspect for and clean up litter and illegally dumped materials along landfill access road and SR 76.	MM 4.9.C5C; 4.16.C5C
Establish native vegetation cover on disturbed areas, including landfill footprint and borrow-stockpile areas.	DF
Revegetate temporary and permanent slopes with native seed mix and container stock around the edges.	MM 4.9-17b; 4.13-2c
Plant native or indigenous trees or shrub species along south side of SR 76 to shield views.	MM 4.13-2a
Revegetate areas within public view within 2 years of commencement of operation with oak woodlands or riparian plantings, consistent with habitat creation and enhancement activities.	MM 4.13-4
Excavation and filling of landfill will be phased to minimize ground disturbance and will only occur during operational hours	DF
Landfill perimeter fencing will allow for wildlife movement where topography is a barrier to human access.	DF
Block of open space between borrow-stockpile areas will be maintained.	DF

Design Feature (DF) or Mitigation	EIR Mitigation Measure/DF
Require slow traffic speeds (15 mph) on access road.	DF
Use low-impact, focused lighting in facilities area.	DF
Implement vector control measures to minimize nuisance species.	DF
Prevent any sources of standing or flowing water on landfill facilities.	DF
Diversion structure placement to prevent debris flows will not occur during eagle breeding season.	DF
Maintain 100-foot buffer between landfill operations and river habitat, except where landfill access road/bridge crosses the river.	DF

5. Completion of Phase I (Stages 2 and 3) Construction – Years 1-6

A. Extent of Disturbed Area (approx.)

Landfill Footprint/ North Power Pad: 49 acres (4)

(4) Landfill footprint area includes both lined disposal area and stormwater management facilities. Exact timing of construction activities depends on volume of waste receipts.

B. Design Features and Mitigation Measures to protect biological resources applicable to completion of Phase I construction.

Mitigation	EIR Mitigation Measure/DF
Approved Habitat Resource Management Plan for off-site mitigation areas; funding for long-term management.	MM 4.9-1a; 4.9-1c; 4.9-1g; 4.9-2; 4.9-14
Implement on-site habitat creation or enhancement; or acquire off-site mitigation parcels; as needed to mitigate acreage impacts to vegetation and endangered species from disturbance.	MM 4.9-1a through 4.9-1g; 4.9-2; 4.9-4
Construction hours limited to 7 am – 6 pm Monday through Friday, 8 am – 5 pm on Saturday.	MM 4.6-1b
Install temporary fencing where construction areas interface with open space, install permanent fencing marked with signs around open space.	MM 4.9-1h
Pre-construction survey for golden eagle, follow up weekly monitoring between December and May for one year following construction activity.	MM 4.9-9b
Access to eagle's nests restricted to eagle specialists and researchers.	MM 4.9-9a
Daily or weekly noise monitoring between September 15 and March 15 in vireo and flycatcher habitat, and operational changes to reduce noise levels.	MM 4.9-12a

6. Phase II Construction – Years 6-13

A. Extent of Disturbed Area (approx.):

Landfill Footprint/ Central and South Power Pads: 79 acres (4)

(4) Landfill footprint area includes both lined disposal area and stormwater management facilities. Exact timing of construction activities depends on volume of waste receipts.

B. Design Features and Mitigation Measures to protect biological resources applicable to Phase II construction.

Mitigation	EIR Mitigation Measure/DF
Approved Habitat Resource Management Plan for off-site mitigation areas; funding for long-term management.	MM 4.9-1a; 4.9-1c; 4.9-1g; 4.9-2; 4.9-14
Implement on-site habitat creation or enhancement, acquire off-site mitigation parcels, or contribute to mitigation bank, as needed to mitigate acreage impacts to vegetation and endangered species from initial construction.	MM 4.9-1a through 4.9-1g, 4.9-2; 4.9-4
Construction hours limited to 7 am – 6 pm Monday through Friday, 8 am – 5 pm on Saturday.	MM 4.6-1b
Install temporary fencing where construction areas interface with open space, install permanent fencing marked with signs around open space.	MM 4.9-1h
Pre-construction survey for golden eagle, follow up weekly monitoring between December and May for one year following construction activity.	MM 4.9-9b
Access to eagle's nests restricted to eagle specialists and researchers.	MM 4.9-9a
Daily or weekly noise monitoring between September 15 and March 15 in vireo and flycatcher habitat, and operational changes to reduce noise levels.	MM 4.9-12a

7. Relocation of SDG&E Power Line ROW – Years 8-10

A. Extent of disturbed area: NONE (5)

(5) Exact timing of relocation depends on volume of waste receipts.

B. Design Features and Mitigation Measures to protect biological resources applicable to relocation of SDG&E power line ROW.

Design Feature (DF) or Mitigation	EIR Mitigation Measure/DF
Relocated transmission lines will be parallel to topography of Gregory County to avoid indirect impacts to eagles and other raptors.	DF
Northern power line tower will be replaced between July through October.	MM 4.9-8
Southern power line tower will be replaced between June through November, or when any red-tailed hawk or raptor nests are inactive.	MM 4.9-10

8. Phase III and IV Construction – Years 14-25

A. Extent of Disturbed Area (approx.):

Landfill Footprint: 29 acres (6)

(6) Landfill footprint area includes both lined disposal area and stormwater management facilities. Exact timing of construction activities depends on volume of waste receipts.

B. Design Features and Mitigation Measures to protect biological resources applicable to Phase III and IV construction.

Mitigation	EIR Mitigation Measure/DF
Approved Habitat Resource Management Plan for off-site mitigation areas; funding for long-term management.	MM 4.9-1a; 4.9-1c; 4.9-1g; 4.9-2; 4.9-14
Implement on-site habitat creation or enhancement, acquire off-site mitigation parcels, or contribute to mitigation bank, as needed to mitigate acreage impacts to vegetation and endangered species from initial construction.	MM 4.9-1a through 4.9-1g; 4.9-2; 4.9-4
Construction hours limited to 7 am – 6 pm Monday through Friday, 8 am – 5 pm on Saturday.	MM 4.6-1b
Install temporary fencing where construction areas interface with open space, install permanent fencing marked with signs around open space.	MM 4.9-1h
Pre-construction survey for golden eagle, follow up weekly monitoring between December and May for one year following construction activity.	MM 4.9-9b

Mitigation	EIR Mitigation Measure/DF
Access to eagle's nests restricted to eagle specialists and researchers.	MM 4.9-9a
Daily or weekly noise monitoring between September 15 and March 15 in vireo and flycatcher habitat, and operational changes to reduce noise levels.	MM 4.9-12a

9. Landfill Closure – Years 30-32 (closure), and 30 additional years for post-closure maintenance.

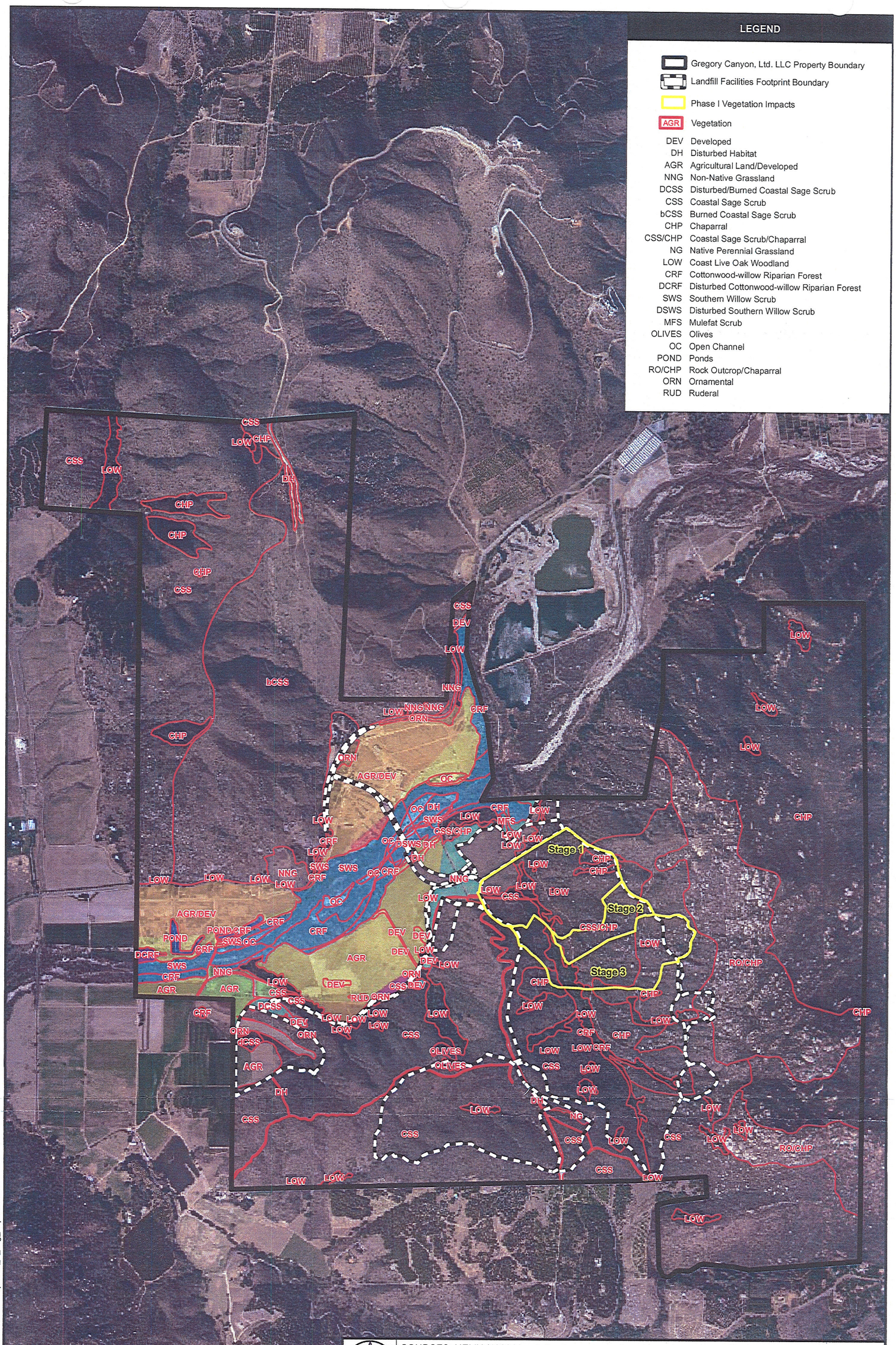
A. Extent of Disturbed Area (approx.): (7)

Borrow-stockpile Area A re-opened: 22 acres

(7) Exact timing of landfill closure depends on volume of waste receipts.

B. Design Features and Mitigation Measures to protect biological resources applicable to landfill closure.

Design Feature (DF) or Mitigation	EIR Mitigation Measure/DF
Borrow-Stockpile Area A road will only be used during initial construction and for landfill closure.	DF
Reinstall arroyo toad exclusion fencing along north side of Borrow-Stockpile Area A road.	MM 4.9-5g
Arroyo toad surveys following re-installation of exclusion fencing along north side of Borrow-Stockpile Area A road, relocation of toads within exclusion area.	MM 4.9-5h
Construct temporary noise barrier along north side of Borrow-Stockpile Area A prior to use, between September 15 and March 15, remove upon determination that noise levels during breeding season are reduced to 60 dBA L_{eq}.	MM 4.9-15a
Revegetate Borrow-Stockpile Area A following initial use with native plant species.	MM 4.13-8c
Establish native vegetation cover on disturbed areas, including slopes, landfill footprint and borrow-stockpile Areas A and B.	DF; MM 4.9-17b; 4.13-2c
Establish native vegetation on any areas on final landfill cover requiring repair.	MM 4.13-11



SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).

PHASE I VEGETATION IMPACTS
GREGORY CANYON, LTD. LLC SITE

URS

600 0 600 1200 Feet
1 inch = 1200 feet

CHECKED BY: CM	DATE: 9-04-08	FIG. NO:
PM: WM	PROJ. NO: 27654025.00030	B-1

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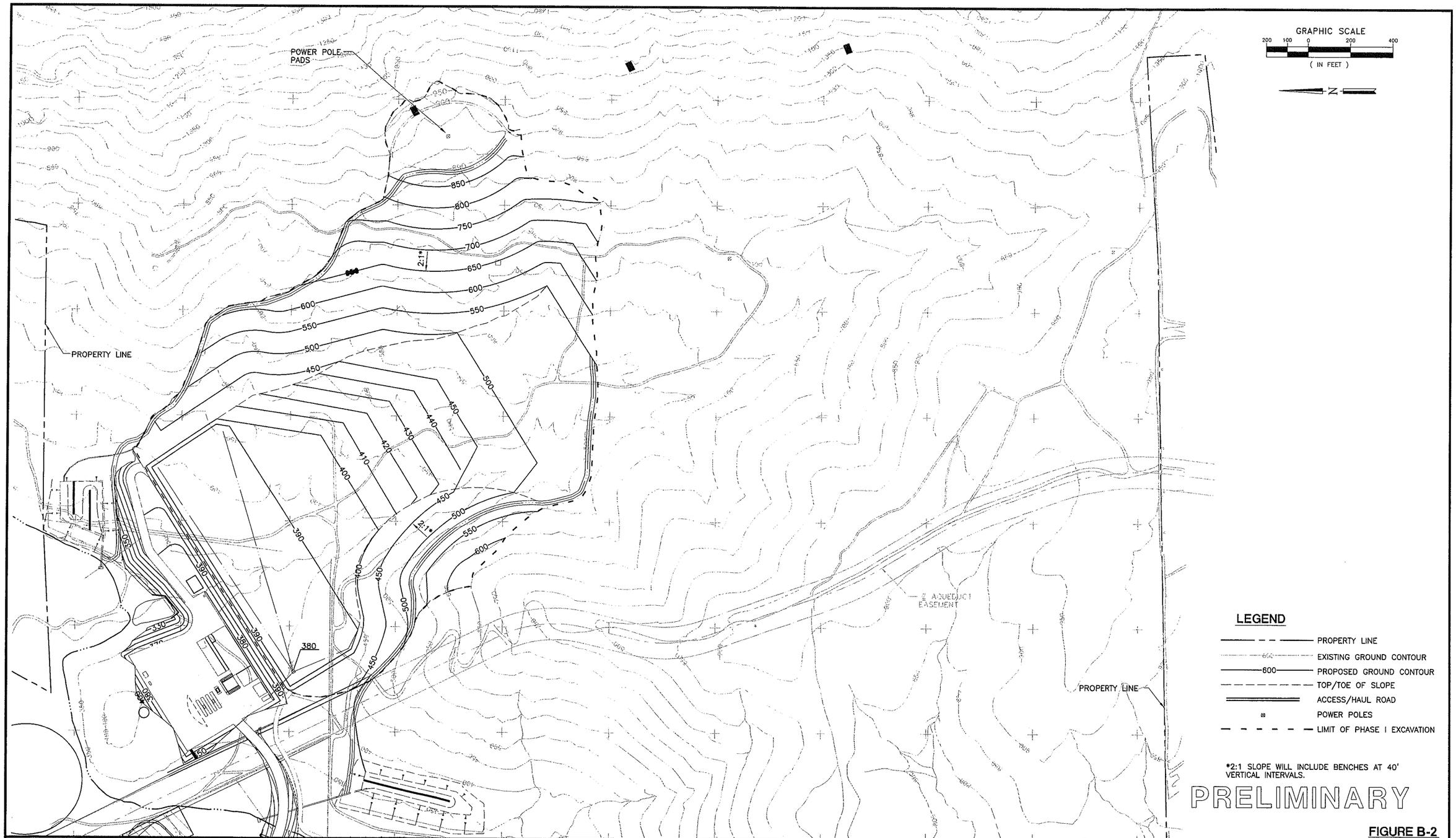

FIGURE B-2

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
PHASE I EXCAVATION PLAN

DESIGNED BY : T.W.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 6-2001	FILE NO. 171039DB.DWG
CHECKED BY :	DATE :	DRAWING 9
APPROVED BY :	DATE :	

H:\dwg\gregory\2001\171039DB.dwg XREFs: H:\dwg\gregory\98\32040db.dwg; H:\dwg\gregory\2001\45118db.dwg; H:\dwg\gregory\2001\45038DB.DWG 05/21/2003 10:34

FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

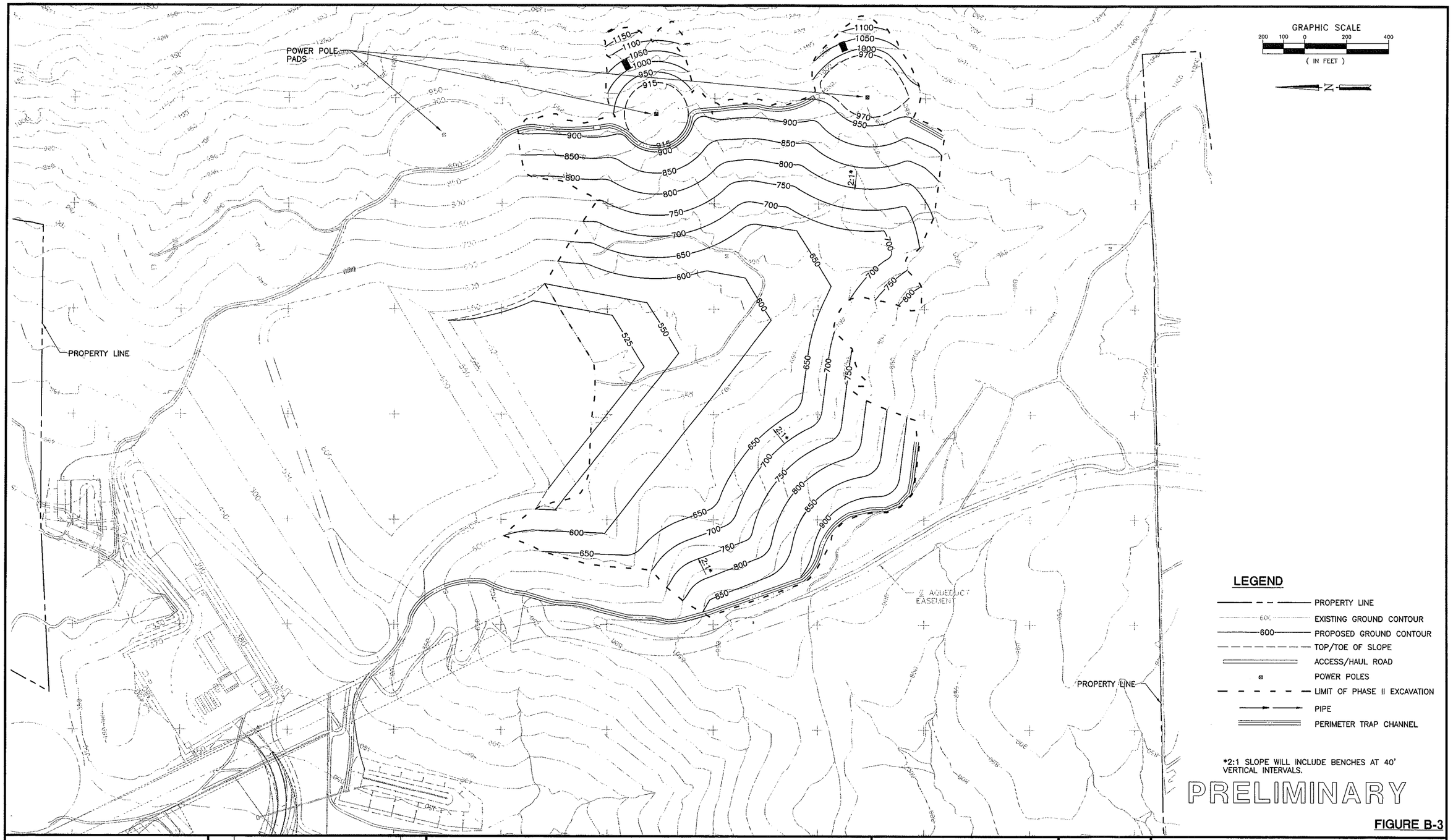

FIGURE B-3

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
PHASE II EXCAVATION PLAN

DESIGNED BY : T.W.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 6-2001	FILE NO. 171048DB.DWG
CHECKED BY :	DATE :	DRAWING 12
APPROVED BY :	DATE :	

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FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

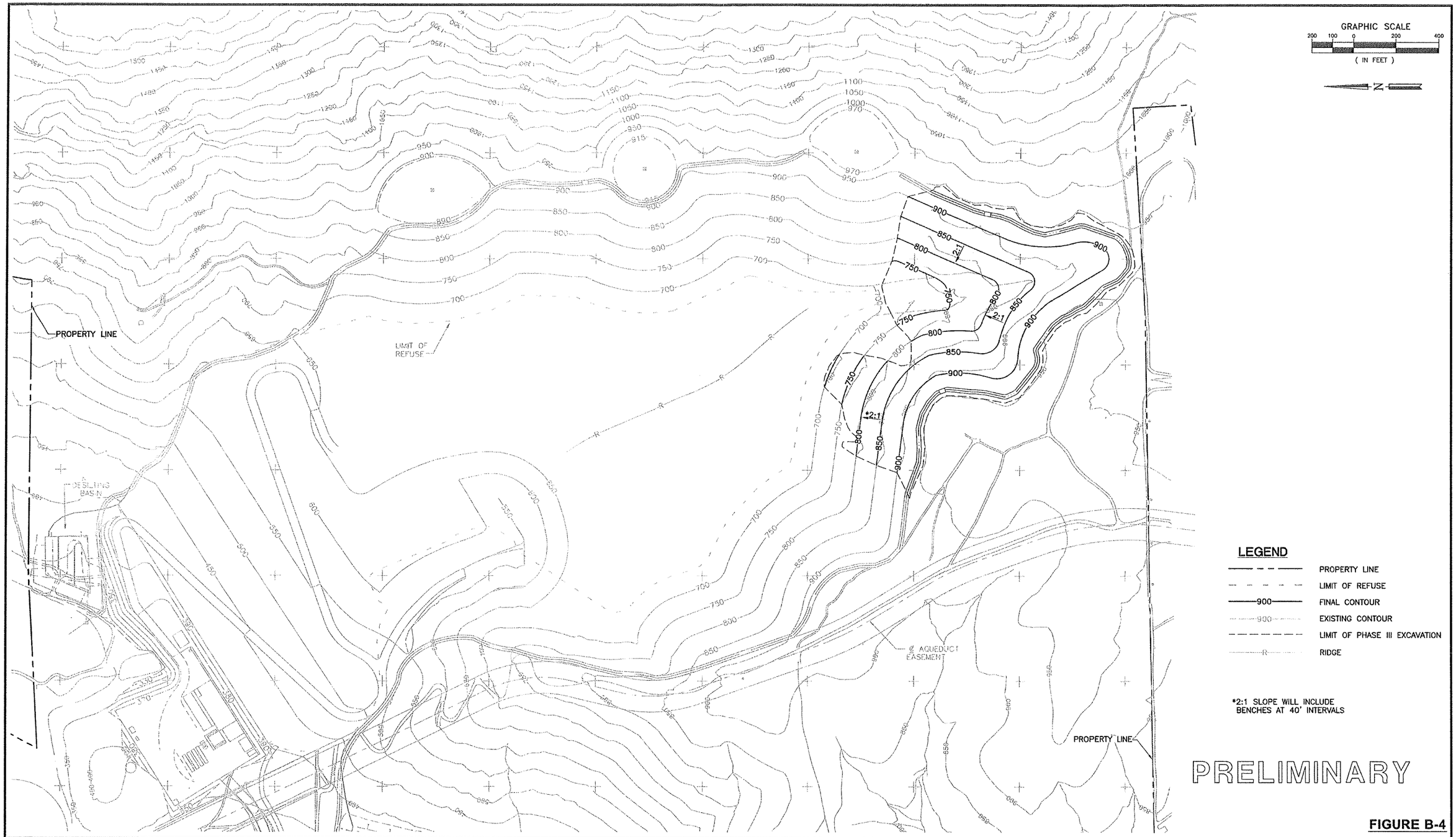

FIGURE B-4

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
PHASE III EXCAVATION

DESIGNED BY : E.L.S.	SCALE : AS SHOWN	
DRAWN BY : M.T.B.	DATE : 8-2000	FILE NO.: 28038DB.DWG
CHECKED BY :	DATE :	DRAWING 14
APPROVED BY :	DATE :	

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FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

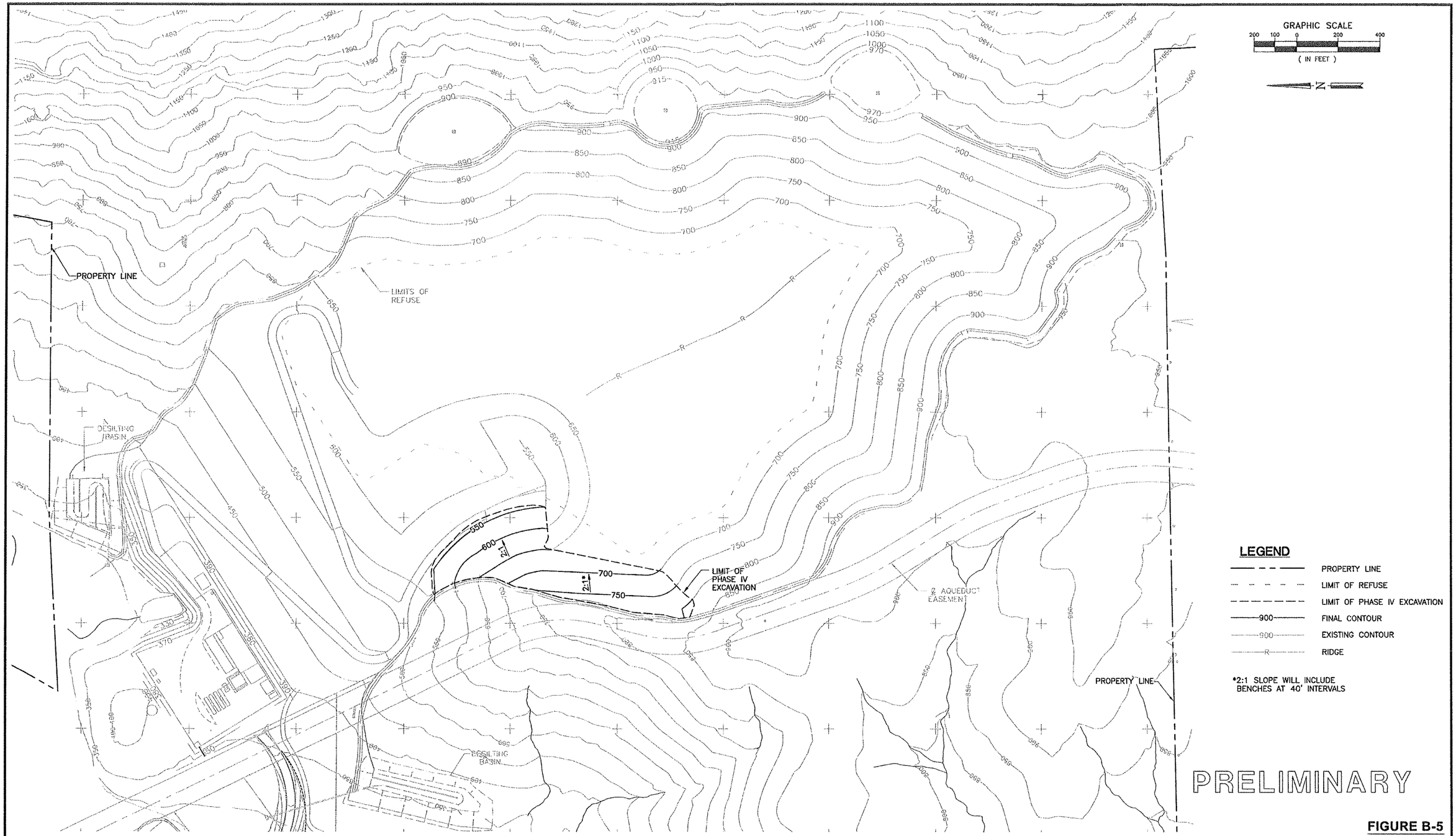

FIGURE B-5

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
PHASE IV EXCAVATION

DESIGNED BY : E.L.S.	SCALE : AS SHOWN	
DRAWN BY : M.T.B.	DATE : 7-2000	FILE NO.: 28039DB.DWG
CHECKED BY :	DATE :	DRAWING 15
APPROVED BY :	DATE :	

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FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

MONITORING SHEET - QUALITATIVE EVALUATION

Project Name: _____
Date: _____
Recorders: _____

Plant Health - General
Are there visible signs of nutrient/water deficiencies? If yes, then describe:

Are there signs of regeneration/reseeding?

Is vandalism harming plant health or project success?

Are there any signs of herbivory?:

Other:

Container Stock
Provide visual estimation percent survival of container stock:

Are watering basins intact?:

Is mulch from original installation still present? Is there litter development?:

Seeded Species
Are all intended native species present? If not, then what is missing?:

Are there any occurrences of volunteer native species?:

Are there any unvegetated areas? Should these be remediated?:

Weeds
Is excessive competition from weeds affecting desired species?:

Is there adequate maintenance/weed clearing?:

Other:

Soils
Are there any signs of soil development?:

Are there any signs of erosion or other potential adverse soil disturbance?:

Other:

Irrigation System
Are irrigation heads functioning properly?:

Are there any signs of rodent damage to irrigation system?:

Are there any signs of vandalism to the irrigation system/controller box?:

Are there any signs of excessive runoff?:

Does irrigation frequency and volume require adjustment?

Other:

Is there any indication that wildlife is using the site?
What species were specifically noted?:

Recommendations for Remediation:

PLEASE NOTE:
The following Conservation Easement Deed is provided by the multi-agency Project Delivery Team as a standardized template document for Mitigation and Conservation Banks in California. Any modifications to this template shall be identified using tracked changes or other electronic comparison and explained in a memorandum.
(Template Version Date: May 2008)

RECORDING REQUESTED BY AND
WHEN RECORDED MAIL TO:

[***Fill in Grantee Name/Address***]
Grantee Name
Grantee Address
City, State ZIP
Attn: _____

_____
Space Above Line for Recorder's Use Only

CONSERVATION EASEMENT DEED
[***Insert Bank Name***]

THIS CONSERVATION EASEMENT DEED ("Conservation Easement") is made as of the _____ day of _____, 20____, by [***insert full legal name(s) of Grantor:*** _____] ("Grantor"), in favor of [***insert Grantee's full legal name:*** _____] [***if CDFG is Grantee insert:*** the State of California] ("Grantee"), with reference to the following facts:

RECITALS

A. Grantor is the sole owner in fee simple of certain real property containing approximately _____ acres, located in the City of [***insert City name***], County of [***insert County name***], State of California, and designated Assessor's Parcel Number(s) [***insert Assessor's Parcel Number(s)***] (the "Bank Property"). The Bank Property is legally described and depicted in **Exhibit A** attached to this Conservation Easement and incorporated in it by this reference.

B. The Bank Property possesses wildlife and habitat values of great importance to Grantee, the people of the State of California and the people of the United States. The Bank Property will provide high quality natural, restored and/or enhanced habitat for [***specify listed and sensitive plant and/or animal species***] and contain [***list habitats; native and/or non-native***], [***include the following phrase only if there are jurisdictional wetlands:*** and restored, created, enhanced and/or preserved jurisdictional waters of the United States]. Individually and collectively, these wildlife and habitat values comprise the "Conservation Values" of the Bank

Property.

C. The California Department of Fish and Game ("CDFG") has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants and the habitat necessary for biologically sustainable populations of these species pursuant to California Fish and Game Code Section 1802. CDFG is authorized to hold easements for these purposes pursuant to California Civil Code Section 815.3, Fish and Game Code Section 1348, and other provisions of California law.

D. The United States Fish and Wildlife Service (the "USFWS"), an agency within the United States Department of the Interior, has jurisdiction over the conservation, protection, restoration and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of these species within the United States pursuant to the federal Endangered Species Act, 16 U.S.C. Section 1531, *et seq.*, the Fish and Wildlife Coordination Act, 16 U.S.C. Sections 661-666c, the Fish and Wildlife Act of 1956, 16 U.S.C. Section 742(f), *et seq.*, and other provisions of federal law.

E. [***Remove/modify this recital as appropriate when USEPA or USACE is not a signatory to the BEI or CBA.***] The U.S. Environmental Protection Agency ("USEPA") and U.S. Army Corps of Engineers ("USACE") have jurisdiction over waters of the United States pursuant to the federal Clean Water Act, 33 U.S.C. Section 1251, *et seq.*

F. [***Use this version of Recital F when qualified nonprofit organization is Grantee.***] Grantee is authorized to hold this conservation easement pursuant to California Civil Code Section 815.3 and Government Code Section 65965. Specifically, Grantee is (i) a tax-exempt nonprofit organization qualified under section 501(c) (3) of the Internal Revenue Code of 1986, as amended, and qualified to do business in California; (ii) a "qualified organization" as defined in section 170(h) (3) of the Internal Revenue Code; and (iii) an organization which has as its primary and principal purpose and activity the protection and preservation of natural lands or resources in its natural, scenic, agricultural, forested, or open space condition or use.

[***Use this version of Recital F when governmental entity is Grantee.***] Grantee is authorized to hold this conservation easement pursuant to California Civil Code Section 815.3. Specifically, Grantee is a governmental entity identified in Civil Code Section 815.3 (b) and otherwise authorized to acquire and hold title to real property.

G. [***Modify this recital as appropriate when CDFG, USFWS, USEPA or USACE is not a signatory to the BEI or CBA.***] This Conservation Easement is granted pursuant to the [***insert the appropriate term:*** Mitigation Bank Enabling Instrument (the "BEI") ***or*** Conservation Bank Agreement (the "CBA")], by and between [***insert Bank Sponsor name(s)***], [***insert Bank Property Owner name(s)***], and [***insert Region name***] CDFG, CDFG Tracking No. [***insert number***], the [***insert Field Office name***] of the USFWS, USFWS File No. [***insert number***], the [***insert District name***] District of USACE, USACE File No. [***insert number***], and Region IX of the USEPA, entered into concurrently with this Conservation Easement, and the Bank Development Plan (the "Development Plan"), and the Interim Management Plan and Long-Term

Management Plan (as applicable, the "Management Plan") created under the [***insert:*** BEI ***or*** CBA]. [***Remove reference to any agency that is not a party to the BEI or CBA***] CDFG, USFWS, USACE, and USEPA are together referred to in this Conservation Easement as the "Signatory Agencies".

A final, approved copy of the [***insert:*** BEI ***or*** CBA], the Development Plan and the Management Plan, and any amendments thereto approved by the Signatory Agencies, shall be kept on file at the respective offices of the Signatory Agencies. If Grantor, or any successor or assign, requires an official copy of the [***insert:*** BEI ***or*** CBA], the Development Plan or the Management Plan, it should request a copy from one of the Signatory Agencies at its address for notices listed in Section 12 of this Conservation Easement.

The [***insert:*** BEI ***or*** CBA], the Development Plan and the Management Plan are incorporated by this reference into this Conservation Easement as if fully set forth herein.

H. All section numbers referred to in this Conservation Easement are references to sections within this Conservation Easement, unless otherwise indicated.

COVENANTS, TERMS, CONDITIONS AND RESTRICTIONS

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and pursuant to the laws of the United States and the State of California, including California Civil Code Section 815, *et seq.*, Grantor hereby voluntarily grants and conveys to Grantee a conservation easement in perpetuity over the Bank Property.

1. Purposes.

The purposes of this Conservation Easement are to ensure that the Bank Property will be retained forever in its natural, restored, or enhanced condition as contemplated by the [***insert:*** BEI ***or*** CBA], the Development Plan, and the Management Plan, and to prevent any use of the Bank Property that will impair or interfere with the Conservation Values of the Bank Property. Grantor intends that this Conservation Easement will confine the use of the Bank Property to activities that are consistent with such purposes, including, without limitation, those involving the preservation, restoration and enhancement of native species and their habitats implemented in accordance with the [***insert:*** BEI ***or*** CBA], the Development Plan and the Management Plan.

2. Grantee's Rights.

To accomplish the purposes of this Conservation Easement, Grantor hereby grants and conveys the following rights to Grantee:

(a) To preserve and protect the Conservation Values of the Bank Property.

(b) To enter the Bank Property at reasonable times, in order to monitor compliance with and otherwise enforce the terms of this Conservation Easement, the [***insert:*** BEI ***or*** CBA], the Development Plan and the Management Plan and to implement at Grantee's sole

discretion Development Plan and Management Plan activities that have not been implemented, provided that Grantee shall not unreasonably interfere with Grantor's authorized use and quiet enjoyment of the Bank Property.

(c) To prevent any activity on or use of the Bank Property that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features of the Bank Property that may be damaged by any act, failure to act, or any use or activity that is inconsistent with the purposes of this Conservation Easement.

(d) To require that all mineral, air and water rights as Grantee deems necessary to preserve and protect the biological resources and Conservation Values of the Bank Property shall remain a part of and be put to beneficial use upon the Bank Property, consistent with the purposes of this Conservation Easement.

(e) All present and future development rights appurtenant to, allocated, implied, reserved or inherent in the Bank Property; such rights are hereby terminated and extinguished, and may not be used on or transferred to any portion of the Bank Property, nor any other property adjacent or otherwise.

3. Prohibited Uses.

Any activity on or use of the Bank Property that is inconsistent with the purposes of this Conservation Easement is prohibited. Without limiting the generality of the foregoing, the following uses and activities by Grantor, Grantor's agents, and third parties are expressly prohibited:

(a) Unseasonable watering; use of fertilizers, pesticides, biocides, herbicides or other agricultural chemicals; weed abatement activities; incompatible fire protection activities; and any and all other activities and uses which may impair or interfere with the purposes of this Conservation Easement [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(b) Use of off-road vehicles and use of any other motorized vehicles except on existing roadways [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(c) Agricultural activity of any kind [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***] except grazing for vegetation management as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(d) Recreational activities, including, but not limited to, horseback riding,

biking, hunting or fishing except for personal, non-commercial, recreational activities of the Grantor, so long as such activities are consistent with the purposes of this Conservation Easement and specifically provided for in the Management Plan.

(e) Commercial, industrial, residential, or institutional uses.

(f) Any legal or de facto division, subdivision or partitioning of the Bank Property.

(g) Construction, reconstruction, erecting or placement of any building, billboard or sign, or any other structure or improvement of any kind [***include the following language only if the Development Plan or Management Plan specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(h) Depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other materials.

(i) Planting, introduction or dispersal of non-native or exotic plant or animal species.

(j) Filling, dumping, excavating, draining, dredging, mining, drilling, removing or exploring for or extracting minerals, loam, soil, sand, gravel, rock or other material on or below the surface of the Bank Property, or granting or authorizing surface entry for any of these purposes.

(k) Altering the surface or general topography of the Bank Property, including but not limited to any alterations to habitat, building roads or trails, paving or otherwise covering the Bank Property with concrete, asphalt or any other impervious material except for those habitat management activities specified in the Development Plan or Management Plan.

(l) Removing, destroying, or cutting of trees, shrubs or other vegetation, except as required by law for (i) fire breaks, (ii) maintenance of existing foot trails or roads, or (iii) prevention or treatment of disease [***include the following language only if the Development Plan or Management Plan specifies such an exception:***]; and except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(m) Manipulating, impounding or altering any natural water course, body of water or water circulation on the Bank Property, and any activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or sub-surface waters [***include the following language only if the Development Plan or Management Plan specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(n) Without the prior written consent of Grantee, which Grantee may

withhold, transferring, encumbering, selling, leasing, or otherwise separating the mineral, air or water rights for the Bank Property; changing the place or purpose of use of the water rights; abandoning or allowing the abandonment of, by action or inaction, any water or water rights, ditch or ditch rights, spring rights, reservoir or storage rights, wells, ground water rights, or other rights in and to the use of water historically used on or otherwise appurtenant to the Bank Property, including but not limited to: (i) riparian water rights; (ii) appropriative water rights; (iii) rights to waters which are secured under contract with any irrigation or water district, to the extent such waters are customarily applied to the Bank Property; and (iv) any water from wells that are in existence or may be constructed in the future on the Bank Property.

(o) Engaging in any use or activity that may violate, or may fail to comply with, relevant federal, state, or local laws, regulations, or policies applicable to Grantor, the Bank Property, or the use or activity in question.

4. Grantee's Duties.

(a) To ensure that the purposes of this Conservation Easement as described in Section 1 are being accomplished, Grantee and its successors and assigns shall:

(1) Perform, at a minimum on an annual basis, compliance monitoring inspections of the Bank Property; and

(2) Prepare reports on the results of the compliance monitoring inspections, and provide these reports to the Signatory Agencies on an annual basis.

(b) In the event that the Grantee's interest in this easement is held by, reverts to, or is transferred to the State of California, Section 4(a) shall not apply.

5. Grantor's Duties.

Grantor shall undertake all reasonable actions to prevent the unlawful entry and trespass by persons whose activities may degrade or harm the Conservation Values of the Bank Property or that are otherwise inconsistent with this Conservation Easement. In addition, Grantor shall undertake all necessary actions to perfect and defend Grantee's rights under Section 2 of this Conservation Easement, and to observe and carry out the obligations of Grantor under the [***insert:*** BEI ***or*** CBA], the Development Plan and the Management Plan.

6. Reserved Rights.

Grantor reserves to itself, and to its personal representatives, heirs, successors, and assigns, all rights accruing from Grantor's ownership of the Bank Property, including the right to engage in or permit or invite others to engage in all uses of the Bank Property that are not prohibited or limited by, and are consistent with the purposes of, this Conservation Easement.

7. Grantee's Remedies.

If Grantee determines that a violation of this Conservation Easement has occurred or is threatened, Grantee shall give written notice to Grantor of such violation and demand in writing the cure of such violation ("Notice of Violation"). If Grantor fails to cure the violation within thirty (30) days after receipt of a Notice of Violation, or if the cure reasonably requires more than thirty (30) days to complete and Grantor fails to begin the cure within the thirty (30)-day period or fails to continue diligently to complete the cure, Grantee may bring an action at law or in equity in a court of competent jurisdiction for any or all of the following: to recover any damages to which Grantee may be entitled for violation of the terms of this Conservation Easement or for any injury to the Conservation Values of the Bank Property; to enjoin the violation, *ex parte* as necessary, by temporary or permanent injunction without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies; to pursue any other legal or equitable relief, including but not limited to, the restoration of the Bank Property to the condition in which it existed prior to any violation or injury; or to otherwise enforce this Conservation Easement. Without limiting the liability of Grantor, Grantee may apply any damages recovered to the cost of undertaking any corrective action on the Bank Property.

If Grantee, in its sole discretion, determines that circumstances require immediate action to prevent or mitigate injury to the Conservation Values of the Bank Property, Grantee may pursue its remedies under this Conservation Easement without prior notice to Grantor or without waiting for the period provided for cure to expire. Grantee's rights under this section apply equally to actual or threatened violations of this Conservation Easement.

Grantor agrees that Grantee's remedies at law for any violation of this Conservation Easement are inadequate and that Grantee shall be entitled to the injunctive relief described in this section, both prohibitive and mandatory, in addition to such other relief to which Grantee may be entitled, including specific performance of this Conservation Easement, without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies. Grantee's remedies described in this section shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity, including but not limited to the remedies set forth in California Civil Code Section 815, *et seq.* The failure of Grantee to discover a violation or to take immediate legal action shall not bar Grantee from taking such action at a later time.

(a) Costs of Enforcement.

All costs incurred by Grantee, where Grantee is the prevailing party, in enforcing the terms of this Conservation Easement against Grantor, including, but not limited to, costs of suit and attorneys' and experts' fees, and any costs of restoration necessitated by negligence or breach of this Conservation Easement, shall be borne by Grantor.

(b) Grantee's Discretion.

Enforcement of the terms of this Conservation Easement by Grantee shall be at the discretion of Grantee, and any forbearance by Grantee to exercise its rights under this Conservation Easement in the event of any breach of any term of this Conservation Easement shall not be deemed or construed to be a waiver of such term or of any subsequent breach of the

same or any other term of this Conservation Easement or of any rights of Grantee under this Conservation Easement. No delay or omission by Grantee in the exercise of any right or remedy shall impair such right or remedy or be construed as a waiver.

(c) Acts Beyond Grantor's Control.

Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury to or change in the Bank Property resulting from (i) any natural cause beyond Grantor's control, including, without limitation, fire not caused by Grantor, flood, storm, and earth movement, or any prudent action taken by Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Bank Property resulting from such causes; or (ii) acts by Grantee or its employees.

(d) Enforcement; Standing.

All rights and remedies conveyed to Grantee under this Conservation Easement shall extend to and are enforceable by [***insert if State of California is Grantee:*** CDFG and] the Third-Party Beneficiaries (as defined in Section 14(m)). These enforcement rights are in addition to, and do not limit, the rights of enforcement under the [***insert:*** BEI ***or*** CBA], the Development Plan or the Management Plan. If at any time in the future Grantor uses, allows the use, or threatens to use or allow use of, the Bank Property for any purpose that is inconsistent with or in violation of this Conservation Easement then, despite the provisions of California Civil Code Section 815.7, the California Attorney General and the Third-Party Beneficiaries each has standing as an interested party in any proceeding affecting this Conservation Easement.

(e) Notice of Conflict.

If Grantor receives a Notice of Violation from Grantee or a Third-Party Beneficiary with which it is impossible for Grantor to comply consistent with any prior uncured Notice(s) of Violation, Grantor shall give written notice of the conflict (hereinafter "Notice of Conflict") to the Grantee and Third-Party Beneficiaries. In order to be a valid, a Notice of Conflict shall be given within fifteen (15) days of the date Grantor receives a conflicting Notice of Violation, shall include copies of the conflicting Notices of Violation, and shall describe the conflict with specificity, including how the conflict makes compliance with the uncured Notice(s) of Violation impossible. Upon issuing a valid Notice of Conflict, Grantor shall not be required to comply with the conflicting Notices of Violation until such time as the entity or entities issuing said conflicting Notices of Violation issue(s) revised Notice(s) of Violation that resolve the conflict. Upon receipt of a revised Notice of Violation, Grantor shall comply with such notice within the time period(s) described in the first grammatical paragraph of this Section. The failure of Grantor to issue a valid Notice of Conflict within fifteen (15) days of receipt of a conflicting Notice of Violation shall constitute a waiver of Grantor's ability to claim a conflict.

(f) [***Add if nonprofit organization is Grantee***] Reversion.

If the Signatory Agencies determine that Grantee is not holding, monitoring or managing this Conservation Easement for conservation purposes in the manner specified in this Conservation Easement or in the [***insert:*** BEI ***or*** CBA], the Development Plan or the Management Plan then, pursuant to California Government Code Section 65965(c), this Conservation Easement shall revert to the State of California, or to another public agency or

nonprofit organization qualified pursuant to Civil Code Section 815.3 and Government Code Section 65965 (and any successor or other provision(s) then applicable) and approved by the Signatory Agencies.

8. Access.

This Conservation Easement does not convey a general right of access to the public.

9. Costs and Liabilities.

Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Bank Property. Grantor agrees that neither Grantee nor Third-Party Beneficiaries shall have any duty or responsibility for the operation, upkeep or maintenance of the Bank Property, the monitoring of hazardous conditions on it, or the protection of Grantor, the public or any third parties from risks relating to conditions on the Bank Property. Grantor remains solely responsible for obtaining any applicable governmental permits and approvals required for any activity or use permitted by this Conservation Easement [***insert if CDFG or another government entity is Grantee:*** , including permits and approvals required from Grantee acting in its regulatory capacity], and any activity or use shall be undertaken in accordance with all applicable federal, state, local and administrative agency laws, statutes, ordinances, rules, regulations, orders and requirements.

(a) Taxes; No Liens.

Grantor shall pay before delinquency all taxes, assessments (general and special), fees, and charges of whatever description levied on or assessed against the Bank Property by competent authority (collectively "Taxes"), including any Taxes imposed upon, or incurred as a result of, this Conservation Easement, and shall furnish Grantee with satisfactory evidence of payment upon request. Grantor shall keep the Bank Property free from any liens (other than a security interest that is expressly subordinated to this Conservation Easement, as provided in Section 14(k)), including those arising out of any obligations incurred by Grantor for any labor or materials furnished or alleged to have been furnished to or for Grantor at or for use on the Bank Property.

(b) Hold Harmless.

(1) Grantor shall hold harmless, protect and indemnify Grantee and its directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a "Grantee Indemnified Party" and collectively, "Grantee's Indemnified Parties") from and against any and all liabilities, penalties, costs, losses, damages, expenses (including, without limitation reasonable attorneys' fees and experts' fees), causes of action, claims, demands, orders, liens or judgments (each a "Claim" and, collectively, "Claims"), arising from or in any way connected with: (i) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Bank Property, regardless of cause, except that this indemnification shall be inapplicable to any Claim due solely to the negligence of Grantee or any of its employees; (ii) the obligations specified in Sections 5, 9 and 9(a); and (iii) the existence or administration of this Conservation Easement. If any action or proceeding is

brought against any of the Grantee's Indemnified Parties by reason of any such Claim, Grantor shall, at the election of and upon written notice from Grantee, defend such action or proceeding by counsel reasonably acceptable to the Grantee's Indemnified Party [***insert if CDFG is grantee:*** or reimburse Grantee for all charges incurred for services of the California Attorney General in defending the action or proceeding].

(2) Grantor shall hold harmless, protect and indemnify Third-Party Beneficiaries and their respective directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a "Third-Party Beneficiary Indemnified Party" and collectively, "Third-Party Beneficiary Indemnified Parties") from and against any and all Claims arising from or in any way connected with: (i) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Bank Property, regardless of cause and (ii) the existence or administration of this Conservation Easement. *Provided, however,* that the indemnification in this Section 9 (b) (2) shall be inapplicable to a Third-Party Beneficiary Indemnified Party with respect to any Claim due solely to the negligence of that Third-Party Beneficiary Indemnified Party or any of its employees. If any action or proceeding is brought against any of the Third-Party Beneficiary Indemnified Parties by reason of any Claim to which the indemnification in this Section 9 (b) (2) applies, then at the election of and upon written notice from the Third-Party Beneficiary Indemnified Party, Grantor shall defend such action or proceeding by counsel reasonably acceptable to the applicable Third-Party Beneficiary Indemnified Party or reimburse the Third-Party Beneficiary Indemnified Party for all charges incurred for services of the California Attorney General or the U.S. Department of Justice in defending the action or proceeding.

(c) Extinguishment.

If circumstances arise in the future that render the preservation of Conservation Values, [***include this phrase only if there are jurisdictional wetlands:*** including wetland functions and values,] or other purposes of this Conservation Easement impossible to accomplish, this Conservation Easement can only be terminated or extinguished, in whole or in part, by judicial proceedings in a court of competent jurisdiction.

(d) Condemnation.

[***Use the appropriate paragraph:***]

[***If CDFG or other state agency is Grantee:***] Condemnation. This Conservation Easement is a "wildlife conservation easement" acquired by a State agency, the condemnation of which is prohibited except as provided in California Fish and Game Code Section 1348.3.

[***All other Grantees:***] Condemnation. The purposes of this Conservation Easement are presumed to be the best and most necessary public use as defined at California Code of Civil Procedure Section 1240.680 notwithstanding Code of Civil Procedure Sections 1240.690 and 1240.700.

10. Transfer of Conservation Easement or Bank Property.

(a) Conservation Easement.

This Conservation Easement may be assigned or transferred by Grantee upon written approval of the Signatory Agencies, which approval shall not be unreasonably withheld or delayed, but Grantee shall give Grantor and the Signatory Agencies at least sixty (60) days prior written notice of the proposed assignment or transfer. Grantee may assign or transfer its rights under this Conservation Easement only to an entity or organization: (i) authorized to acquire and hold conservation easements pursuant to California Civil Code Section 815.3 and Government Code Section 65965 (and any successor or other provision(s) then applicable), or the laws of the United States; and (ii) otherwise reasonably acceptable to the Signatory Agencies. Grantee shall require the assignee to record the assignment in the county where the Bank Property is located. The failure of Grantee to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforcement in any way. Any transfer under this section is subject to the requirements of Section 11.

(b) Bank Property.

Grantor agrees to incorporate the terms of this Conservation Easement by reference in any deed or other legal instrument by which Grantor divests itself of any interest in all or any portion of the Bank Property, including, without limitation, a leasehold interest. Grantor agrees that the deed or other legal instrument shall also incorporate by reference the [***insert:*** BEI ***or*** CBA], the Development Plan, the Management Plan, and any amendment(s) to those documents. Grantor further agrees to give written notice to Grantee and the Signatory Agencies of the intent to transfer any interest at least sixty (60) days prior to the date of such transfer. Grantee or the Signatory Agencies shall have the right to prevent any transfers in which prospective subsequent claimants or transferees are not given notice of the terms, covenants, conditions and restrictions of this Conservation Easement (including the exhibits and documents incorporated by reference in it). The failure of Grantor to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforceability in any way. Any transfer under this section is subject to the requirements of Section 11.

11. Merger.

The doctrine of merger shall not operate to extinguish this Conservation Easement if the Conservation Easement and the Bank Property become vested in the same party. If, despite this intent, the doctrine of merger applies to extinguish the Conservation Easement then, unless Grantor, Grantee, and the Signatory Agencies otherwise agree in writing, a replacement conservation easement or restrictive covenant containing the same protections embodied in this Conservation Easement shall be recorded against the Bank Property.

12. Notices.

Any notice, demand, request, consent, approval, or other communication that Grantor or Grantee desires or is required to give to the other shall be in writing, with a copy to each of the Signatory Agencies, and served personally or sent by recognized overnight courier that guarantees next-day delivery or by first class United States mail, postage fully prepaid, addressed as follows:

To Grantor: [Grantee name]
[Grantee address]
Attn: _____

To Grantee: [***insert the appropriate Grantee information:***]

[Department of Fish and Game]
[Region name] Region
[REGION ADDRESS]
[Attn: Regional Manager]

OR

[Grantee name]
[Grantee address]

[***Remove/modify the following blocks as appropriate when CDFG or the USFWS are not signatories to the BEI or CBA or third-party beneficiaries to the CE.***]

To CDFG: [Department of Fish and Game]
[Region name] Region
[REGION ADDRESS]
[Attn: Regional Manager]

With a copy to: Department of Fish and Game
Office of General Counsel
1416 Ninth Street, 12th Floor
Sacramento, CA 95814-2090
Attn: General Counsel

To USFWS: United States Fish and Wildlife Service
[Field Office name] Field Office
[FIELD OFFICE ADDRESS]
Attn: Field Supervisor

[***Remove/modify these blocks as appropriate when USEPA or USACE are not signatories to the BEI or CBA or third-party beneficiaries to the CE.***]

To USACE: U.S. Army Corps of Engineers
[District name] District
[DISTRICT ADDRESS]
Attn: Chief, Regulatory Branch

To USEPA: U.S. Environmental Protection Agency, Region IX

75 Hawthorne Street
San Francisco, CA 94105
Attn: Director, Water Division

or to such other address a party or a Signatory Agency shall designate by written notice to Grantor, Grantee and the Signatory Agencies. Notice shall be deemed effective upon delivery in the case of personal delivery or delivery by overnight courier or, in the case of delivery by first class mail, three (3) days after deposit into the United States mail.

13. Amendment.

This Conservation Easement may be amended only by mutual written agreement of Grantor and Grantee and written approval of the Signatory Agencies, which approval shall not be unreasonably withheld or delayed. Any such amendment shall be consistent with the purposes of this Conservation Easement and California law governing conservation easements, and shall not affect its perpetual duration. Any such amendment shall be recorded in the official records of the county in which the Bank Property is located, and Grantee shall promptly provide a conformed copy of the recorded amendment to the Grantor and the Signatory Agencies.

14. Additional Provisions.

(a) Controlling Law.

The interpretation and performance of this Conservation Easement shall be governed by the laws of the United States and the State of California, disregarding the conflicts of law principles of such state.

(b) Liberal Construction.

Despite any general rule of construction to the contrary, this Conservation Easement shall be liberally construed to effect the purposes of this Conservation Easement and the policy and purpose of California Civil Code Section 815, *et seq.* [***add if Grantee is nonprofit organization:*** and Government Code Section 65965]. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Conservation Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

(c) Severability.

If a court of competent jurisdiction voids or invalidates on its face any provision of this Conservation Easement, such action shall not affect the remainder of this Conservation Easement. If a court of competent jurisdiction voids or invalidates the application of any provision of this Conservation Easement to a person or circumstance, such action shall not affect the application of the provision to any other persons or circumstances.

(d) Entire Agreement.

This document (including its exhibits and the [***insert:*** BEI ***or*** CBA], the Development Plan, and the Management Plan incorporated by reference in this document) sets forth the entire agreement of the parties and the Signatory Agencies with respect to the

Conservation Easement and supersedes all prior discussions, negotiations, understandings, or agreements of the parties relating to the Conservation Easement. No alteration or variation of this Conservation Easement shall be valid or binding unless contained in an amendment in accordance with Section 13.

(e) No Forfeiture.

Nothing contained in this Conservation Easement will result in a forfeiture or reversion of Grantor's title in any respect.

(f) Successors.

The covenants, terms, conditions, and restrictions of this Conservation Easement shall be binding upon, and inure to the benefit of, the parties and their respective personal representatives, heirs, successors, and assigns, and shall constitute a servitude running in perpetuity with the Bank Property.

(g) Termination of Rights and Obligations.

A party's rights and obligations under this Conservation Easement terminate upon transfer of the party's interest in the Conservation Easement or Bank Property, except that liability for acts, omissions or breaches occurring prior to transfer shall survive transfer.

(h) Captions.

The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon its construction or interpretation.

(i) No Hazardous Materials Liability.

(1) Grantor represents and warrants that it has no knowledge or notice of any Hazardous Materials (defined below) or underground storage tanks existing, generated, treated, stored, used, released, disposed of, deposited or abandoned in, on, under, or from the Bank Property, or transported to or from or affecting the Bank Property.

(2) Without limiting the obligations of Grantor under Section 9 (b), Grantor hereby releases and agrees to indemnify, protect and hold harmless the Grantee's Indemnified Parties (defined in Section 9 (b) (1)) from and against any and all Claims (defined in Section 9 (b)(1)) arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, released in, from or about, or otherwise associated with the Bank Property at any time, except any Hazardous Materials placed, disposed or released by Grantee or any of its employees. This release and indemnification includes, without limitation, Claims for (A) injury to or death of any person or physical damage to any property; and (B) the violation or alleged violation of, or other failure to comply with, any Environmental Laws (defined below). If any action or proceeding is brought against any of the Grantee's Indemnified Parties by reason of any such Claim, Grantor shall, at the election of and upon written notice from the applicable Grantee Indemnified Party, defend such action or proceeding

by counsel reasonably acceptable to the Grantee Indemnified Party [***add if CDFG is Grantee:*** or reimburse Grantee for all charges incurred for services of the California Attorney General in defending the action or proceeding].

(3) Without limiting the obligations of Grantor under Section 9 (b), Grantor hereby releases and agrees to indemnify, protect and hold harmless the Third-Party Beneficiary Indemnified Parties (defined in Section 9 (b)(2)) from and against any and all Claims arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, released in, from or about, or otherwise associated with the Bank Property at any time, except that this release and indemnification shall be inapplicable to a Third-Party Beneficiary Indemnified Party with respect to any Hazardous Materials placed, disposed or released by that Third-Party Beneficiary Indemnified Party or any of its employees. This release and indemnification includes, without limitation, Claims for (A) injury to or death of any person or physical damage to any property; and (B) the violation of alleged violation of, or other failure to comply with, any Environmental Laws. If any action or proceeding is brought against any of the Third-Party Beneficiary Indemnified Parties by reason of any such Claim, Grantor shall, at the election or and upon written notice from the applicable Third-Party Beneficiary Indemnified Party, defend such action or proceeding by counsel reasonably acceptable to the Third-Party Beneficiary Indemnified Party for all charges incurred for services of the California Attorney General or the U.S. Department of Justice in defending the action or proceeding.

(4) Despite any contrary provision of this Conservation Easement, the parties do not intend this Conservation Easement to be, and this Conservation Easement shall not be, construed such that it creates in or gives to Grantee or any Third-Party Beneficiaries any of the following:

(A) The obligations or liability of an "owner" or "operator," as those terms are defined and used in Environmental Laws (defined below), including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. § 9601, *et seq.*; hereinafter, "CERCLA"); or

(B) The obligations or liabilities of a person described in 42 U.S.C. § 9607(a)(3) or (4); or

(C) The obligations of a responsible person under any applicable Environmental Laws; or

(D) The right to investigate and remediate any Hazardous Materials associated with the Bank Property; or

(E) Any control over Grantor's ability to investigate, remove, remediate or otherwise clean up any Hazardous Materials associated with the Bank Property.

(5) The term "Hazardous Materials" includes, without limitation, (a) material that is flammable, explosive or radioactive; (b) petroleum products, including by-

products and fractions thereof; and (c) hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in CERCLA, the Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6901, *et seq.*; hereinafter, "RCRA"); the Hazardous Materials Transportation Act (49 U.S.C. §5101, *et seq.*; hereinafter, "HTA"); the Hazardous Waste Control Law (California Health & Safety Code § 25100, *et seq.*; hereinafter, "HCL"); the Carpenter-Presley-Tanner Hazardous Substance Account Act (California Health & Safety Code § 25300, *et seq.*; hereinafter "HSA"), and in the regulations adopted and publications promulgated pursuant to them, or any other applicable Environmental Laws now in effect or enacted after the date of this Conservation Easement.

(6) The term "Environmental Laws" includes, without limitation, CERCLA, RCRA, HTA, HCL, HSA, and any other federal, state, local or administrative agency statute, ordinance, rule, regulation, order or requirement relating to pollution, protection of human health or safety, the environment or Hazardous Materials. Grantor represents, warrants and covenants to Grantee and Third-Party Beneficiaries that activities upon and use of the Bank Property by Grantor, its agents, employees, invitees and contractors will comply with all Environmental Laws.

(j) Warranty.

Grantor represents and warrants that Grantor is the sole owner of the Bank Property. Grantor also represents and warrants that, except as specifically disclosed to and approved by the Signatory Agencies pursuant to the Bank Property Assessment and Warranty signed by Grantee and attached as an exhibit to the [***insert:*** BEI ***or*** CBA], [***choose applicable statement:*** there are no outstanding mortgages, liens, encumbrances or other interests in the Bank Property (including, without limitation, mineral interests) which may conflict or are inconsistent with this Conservation Easement ***or*** the holder of any outstanding mortgage, lien, encumbrance or other interest in the Bank Property (including, without limitation, mineral interest) which conflicts or is inconsistent with this Conservation Easement has expressly subordinated such interest to this Conservation Easement by a recorded Subordination Agreement approved by Grantee and the Signatory Agencies].

(k) Additional Interests.

Grantor shall not grant any additional easements, rights of way or other interests in the Bank Property (other than a security interest that is expressly subordinated to this Conservation Easement), nor shall Grantor grant, transfer, abandon or relinquish (each a "Transfer") any mineral, air, or water right or any water associated with the Bank Property, without first obtaining the written consent of Grantee and the Signatory Agencies. Such consent may be withheld if Grantee or the Signatory Agencies determine(s) that the proposed interest or Transfer is inconsistent with the purposes of this Conservation Easement or will impair or interfere with the Conservation Values of the Bank Property. This Section 14(k) shall not limit the provisions of Section 2(d) or 3(n), nor prohibit transfer of a fee or leasehold interest in the Bank Property that is subject to this Conservation Easement and complies with Section 10. Grantor shall provide a copy of any recorded or unrecorded grant or Transfer document to the Grantee and Signatory Agencies.

(l) Recording.

Grantee shall record this Conservation Easement in the Official Records of the County in which the Bank Property is located, and may re-record it at any time as Grantee deems necessary to preserve its rights in this Conservation Easement.

(m) Third-Party Beneficiary.

Grantor and Grantee acknowledge that the [***include the agencies that will be third-party beneficiaries:*** CDFG, USFWS, USACE, and USEPA] (the "Third-Party Beneficiaries") are third party beneficiaries of this Conservation Easement with the right of access to the Bank Property and the right to enforce all of the obligations of Grantor including, but not limited to, Grantor's obligations under Section 14, and all other rights and remedies of the Grantee under this Conservation Easement.

(n) Funding.

Endowment funding for the perpetual management, maintenance and monitoring of the Bank Property is specified in and governed by the [***insert:*** BEI ***or*** CBA] and the Management Plan.

IN WITNESS WHEREOF Grantor has executed this Conservation Easement Deed the day and year first above written.

GRANTOR:

BY: _____

NAME: _____

TITLE: _____

DATE: _____

Approved as to form:

[***Remove or modify the approval block as appropriate, i.e., Grantee's legal counsel if CDFG is not Grantee.***]

General Counsel
State of California
Department of Fish and Game

BY: _____
Ann S. Malcolm
General Counsel

[***Delete this page if CDFG will not be Grantee. If the Grantee will be a government agency, that agency must include its own Certificate of Acceptance.***]

CERTIFICATE OF ACCEPTANCE

This is to certify that the interest in real property conveyed by the Conservation Easement Deed by _____, dated _____, 20____, to the State of California, Grantee, acting by and through its Department of Fish and Game, a governmental agency (under Government Code § 27281), is hereby accepted by the undersigned officer on behalf of the Grantee pursuant to the Fish and Game Code.

GRANTEE:

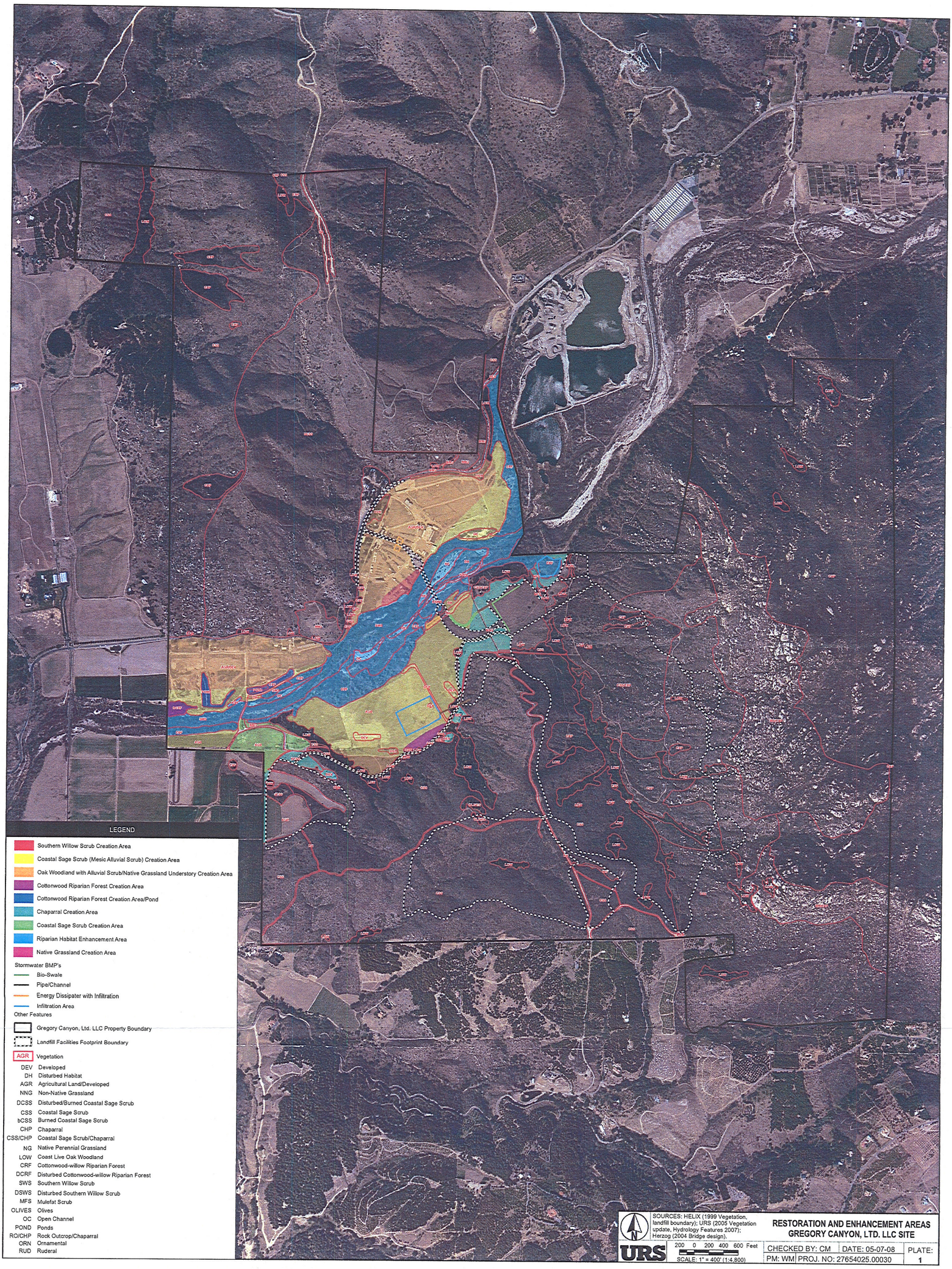
[***Remove or modify the approval block as appropriate if CDFG is not Grantee.***]

STATE OF CALIFORNIA, by and through its
DEPARTMENT OF FISH AND GAME

By: _____

Title: _____
Authorized Representative

Date: _____


LEGEND
Southern Willow Scrub Creation Area
Coastal Sage Scrub (Mesic Alluvial Scrub) Creation Area
Oak Woodland with Alluvial Scrub/Native Grassland Understory Creation Area
Cottonwood Riparian Forest Creation Area
Cottonwood Riparian Forest Creation Area/Pond
Chaparral Creation Area
Coastal Sage Scrub Creation Area
Riparian Habitat Enhancement Area
Native Grassland Creation Area
Stormwater BMP's
Bio-Swale
Pipe/Channel
Energy Dissipater with Infiltration
Infiltration Area
Other Features
Gregory Canyon, Ltd. LLC Property Boundary
Landfill Facilities Footprint Boundary
AGR Vegetation
DEV Developed
DH Disturbed Habitat
AGR Agricultural Land/Developed
NNG Non-Native Grassland
DCSS Disturbed/Burned Coastal Sage Scrub
CSS Coastal Sage Scrub
bCSS Burned Coastal Sage Scrub
CHP Chaparral
CSS/CHP Coastal Sage Scrub/Chaparral
NG Native Perennial Grassland
LOW Coast Live Oak Woodland
CRF Cottonwood-willow Riparian Forest
DCRF Disturbed Cottonwood-willow Riparian Forest
SWS Southern Willow Scrub
DSWS Disturbed Southern Willow Scrub
MFS Mulefat Scrub
OLIVES Olives
OC Open Channel
POND Ponds
RO/CHP Rock Outcrop/Chaparral
ORN Ornamental
RUD Ruderal
G:\gis\projects\1577\27654025\mxd\Plate_2_water_resources.mxd
SOURCES: HELIX (1999 Vegetation, landfill boundary); URS (2005 Vegetation update, Hydrology Features 2007); Herzog (2004 Bridge design).
URS
200 0 200 400 600 Feet
SCALE: 1" = 400' (1:4,800)
RESTORATION AND ENHANCEMENT AREAS
GREGORY CANYON, LTD. LLC SITE
CHECKED BY: CM
DATE: 05-07-08
PLATE: 1
PM: WM
PROJ. NO: 27654025.00030

APPENDIX J

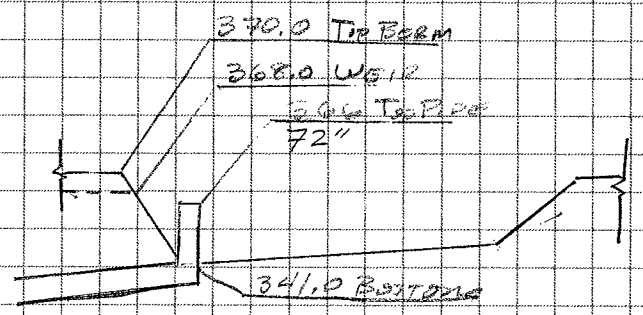
DRAINAGE CALCULATIONS

BAS
(909) 860-7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB: GREGORY HYDROLOGY/HYDRAULICS
SHEET NO. 1 OF 4
CALCULATED BY: CHM DATE: 10-4-2004
CHECKED BY: DATE:
SCALE: N.A.

EASTERN DESILTING

AREA @ 368.0 = 62,890 SF



PURPOSE: CALCULATE THE UNGAGED AREA THAT COULD BE SERVED TO THE EASTERN BASIN DESIGN AREA LAYOUT. USE MEDIUM SILT PARTICLE CRITERIA (0.02 mm).

CRITERIA: BASIN EFFICIENCY EQUATION

$$A_S = \frac{1.2\ Q_{10}}{V_S}$$

WHERE:

Q_{10} - 10-YEAR PEAK RUNOFF (CFS)

V_S - SETTLING VELOCITY (FPS)

A_S - BASIN AREA (SF)

A_U - AREA UNGAGED (SF)

RATIONAL METHOD

$Q_{10} = CIA$

$$Q_{10} = \frac{(0.00096)(62{,}890)}{1.2} = 50.3\ \text{CFS}$$

$$A_{UE} = \frac{50.3\ \text{CFS}}{1.1\ \text{CFS/AC}} = \underline{44.8\ \text{AC}}$$

Q_{10} 3.00 - 3.03 = 88.85 CFS

Σ AREA = 79.2 ACRES

$$A_{10}\ \text{CFS/AC} = \frac{88.9}{79.2} = 1.1\ \frac{\text{CFS}}{\text{AC}}$$

BAS
(909) 860-7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB: GREGORY CANYON HYDROLOGY/HYDRAULICS
SHEET NO. 2 OF 4
CALCULATED BY: CHM DATE: 10-4-2000
CHECKED BY: DATE:
SCALE:

EASTERN BASIN (CONT)

PURPOSE: DETERMINE SPILLWAY & INLET PIPE SIZE TO CONVEY 100-YEAR 24-HOUR RUNOFF

CRITERIA: $Q = CLH^{3/2}$ WEIR $\quad Q = CA(2gh)^{1/2}$ ORIFICE

WHERE: $Q = Q_{100}$
$C = (3.5)$ KING'S HANDBOOK
L = LENGTH OF WEIR
H = HEIGHT OF RUNOFF ABOVE WEIR

WHERE: $Q = Q_{100}$
$C = 0.6$ (KINGS)
A = AREA OF ORIFICE
g = GRAVITY $32.2\ FT/S^2$
h = HEIGHT OF RUNOFF ABOVE ORIFICE

$Q_{100} = 3.00 - 3.03 = 148.3$ CFS

SPILLWAY WEIR: $L = \dfrac{Q_{100}}{C\,H^{3/2}} = \dfrac{148.3}{(3.5)(2)^{3/2}} = 14.9$ FT

USE 15 FT

STANDPIPE INLET ORIFICE: $A = \dfrac{Q_{100}}{C(2gh)^{1/2}} = 21.8\ FT^2$

$21.8 = \pi \dfrac{D^2}{4} = 5.2$ FT

72" > 5.2 FT O.K.

CHECK WEIR RESTRICTION

$L = D\pi = 18.8$ FT

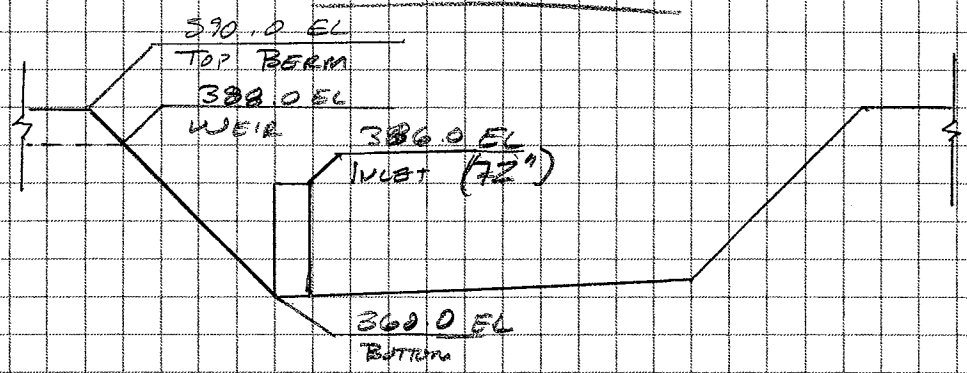
$Q = 3.5(18.8)(2)^{3/2}$

$= 186$ CFS > 148 CFS O.K.

BAS
[909] 860-7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB: GREGORY CANYON HYDROLOGY/HYDRAULICS
SHEET NO. 3 OF 4
CALCULATED BY: CHM DATE: 10-4-2004
CHECKED BY: DATE:
SCALE: N.A.

WESTERN BASIN



PURPOSE: CALCULATE THE UNCOVERED AREA THAT COULD BE SERVED BY THE WESTERN BASIN DESIGN AREA. LAYOUT. USE MEDIUM SILT PARTICLE CRITERIA (0.02mm, 0.00096 FPS)

CRITERIA: BASIN EFFICIENCY EQUATION

$$A_s = \frac{1.2\,Q_{10}}{V_s}$$

$\Sigma Q_{10} \rightarrow 2.00 - 2.09 = 89.7$ CFS

$V_s = 0.00096$ FPS

$A_s = 77{,}500$ SF

$$Q_{10} = \frac{(0.00096)(77{,}500)}{1.2} = 62 \text{ CFS}$$

Σ AREA = 122.7 ACRE

$CI = 0.7 \frac{CFS}{ACRE}$

$$A_{uw} = \frac{62}{0.7} = 84.8 \text{ ACRES}$$

TOTAL $A_u = A_{uW} + A_{uE} = \underline{129.6 \text{ ACRES}}$

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1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB Gregory Canyon Hydrology/Hydraulics
SHEET NO. 4 OF 4
CALCULATED BY CHM DATE 10/4/2004
CHECKED BY DATE
SCALE N.A.

WESTERN BASIN (Cont)

PURPOSE: DETERMINE SPILLWAY & INLET PIPE SIZE TO CONVEY 100-YR 24-HR RUNOFF

CRITERIA: $Q = CLH^{3/2}$ WEIR $Q = CA(2gh)^{1/2}$

$Q_{100} \Rightarrow 2.00 - 2.09 = 150.1$ cfs

SPILLWAY WEIR: $L = \frac{150.1}{(3.5)(2)^{3/2}} = 15.2$ FT

USE 16.0 FT

STANDPIPE INLET ORAFICE: $A = \frac{Q_{100}}{C(2gh)^{1/2}} = \frac{150.1}{0.6(128.8)^{1/2}} = 22.0$ SF

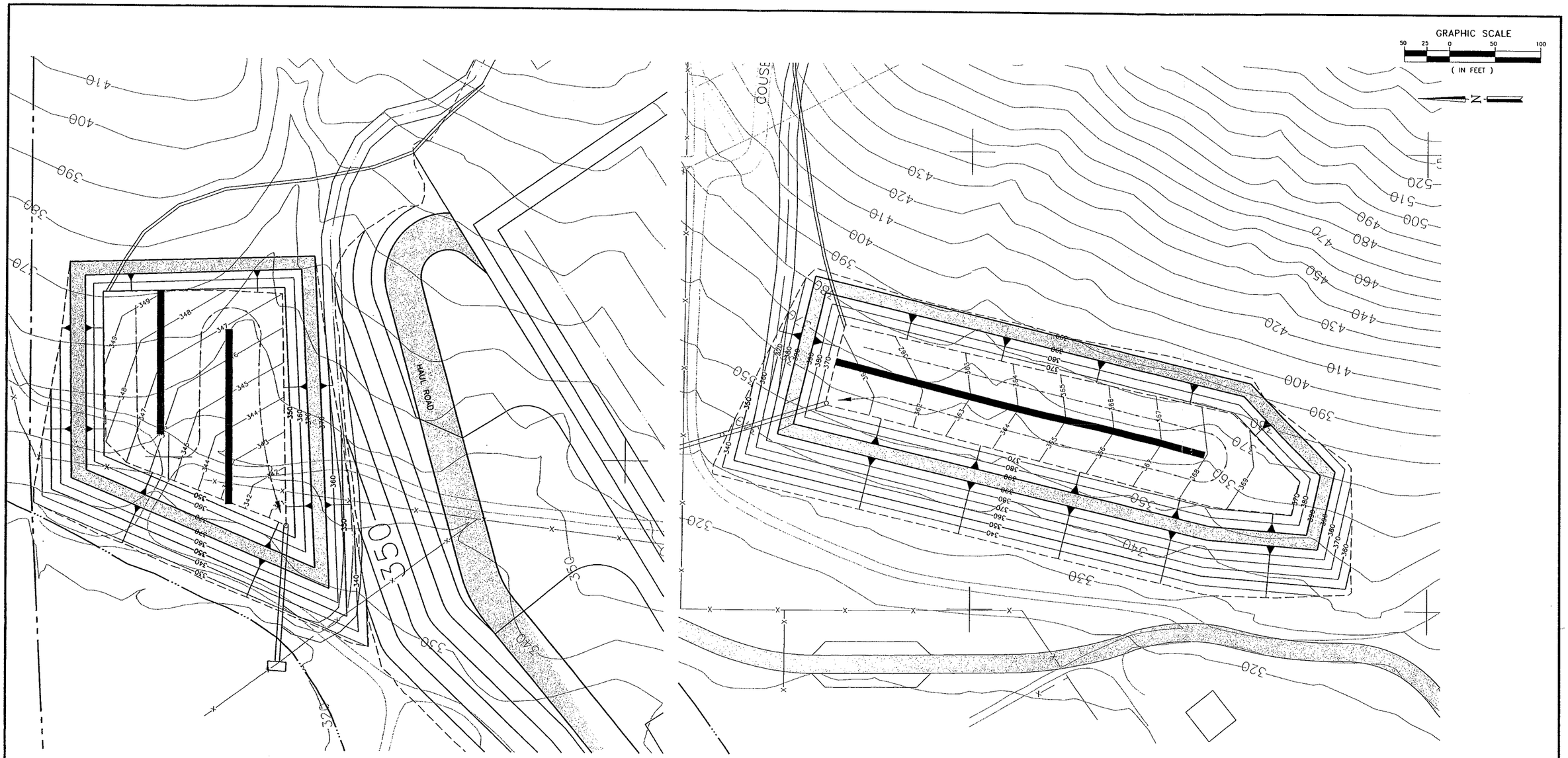
$22.0 = \pi \frac{D^2}{4} \Rightarrow D = \left(\frac{22.0(4)}{\pi}\right)^{1/2} = 5.3$ FT

72" > 64" O.K.

CHECK WEIR CONTROL OF STANDPIPE: $L = D\pi = 18.8$ FT

$Q = 3.5(18.8)(2)^{3/2} = 186$ cfs > 150.1 cfs

O.K.



LEGEND

- PROPERTY LINE
- LIMIT OF REFUSE/PHASE I EXCAVATION
- TOP/TOE OF SLOPE
- 900 FINAL CONTOUR
- 900 EXISTING CONTOUR
- ACCESS/HAUL ROAD

PRELIMINARY

FIGURE 20

NO.	REVISION DESCRIPTION	BY:

BAS
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CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
(909) 860-7777

GREGORY CANYON LANDFILL
DESILTING BASIN GRADING PLAN

DESIGNED BY : E.L.S.	SCALE : AS SHOWN	
DRAWN BY : M.T.B.	DATE : 11-1999	FILE NO.: 27498DB.DWG
CHECKED BY :	DATE :	DRAWING 26
APPROVED BY :	DATE :	

FOR PERMIT PURPOSES ONLY - NOT FOR CONSTRUCTION

967

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CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

JOB GREGORY CANYON LANDFILL
SHEET NO. 1 OF 1
CALCULATED BY CHM DATE 11/03/2004
CHECKED BY DATE
SCALE N.A.

WEST PSD (CHANNEL)

THE WESTERN TRAPEZOIDAL CHANNEL MUST BE DESIGNED TO CONVEY:

- 100-YEAR 24-HOUR PEAK RUNOFF = 147 CFS
- SIMULTANEOUS PIPE BURSTS FLOW;
  - PIPE 1 = 90 CFS
  - PIPE 2 = 90 CFS
  - PIPE 6 = 1000 CFS (PIPE 6 IS IN THE PLANNING STAGES & MAY NOT EVER REACH FULL CAPACITY)

PIPES 1, 2 & 6 ARE ALL GRAVITY FLOW PIPES FROM LAKE SKINNER & THE FLOW IS REGULATED NOT TO EXCEED THE DESIGN CAPACITY.

THE MOST CRITICAL REACH FOR THE CHANNEL IS BETWEEN NODES 4.07 & 4.08. WHERE THE BASIC DEMENSIONS ARE.

S = 0.0325
Z = 1
B = 4.0'
D = 5.5'

THE STEADY STATE DEPTH DEPTH OF FLOW = 4.5'
∴ THE CHANNEL DEPTH SHOULD BE = 5.5'

THE STANDARD CHANNEL FOR THE PERIMETER WILL BE AS SHOWN ON FIGURE 19 DETAIL 1/20

THE ALLIGNMENT, SHOWN ON THE DEVELOPED HYDROLOGY PLAN, OF THE WATER EASEMENT SHOWS THAT THE FIRST REACH THAT THE POSSIBLE BURSTED PIPES COULD REACH IS THAT OF 4.07 TO 4.08.

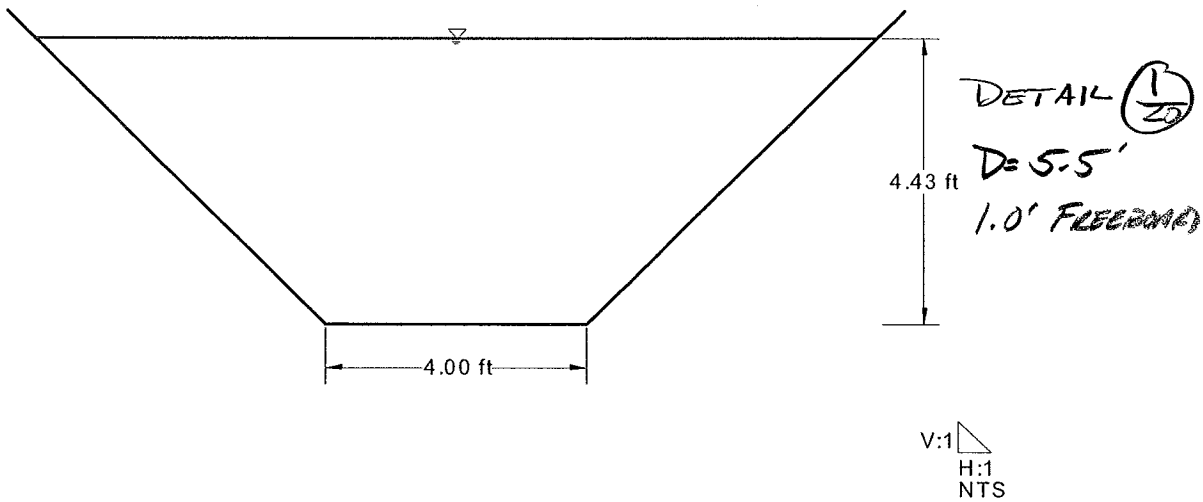
NOTE: FLOW INFORMATION PROVIDED BY METROPOLITAN WATER DISTRICT.

Project Description	Gregory Canyon Landfill
Worksheet	4.08 Q100 PIPES 1,2&6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.032500	ft/ft
Depth	4.43	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	4.00	ft
Discharge	1,327.00	cfs

Q_{100} @ 4.08 = 147 CFS

* Q_{PIPE} 1 = 90 CFS 2 = 90 CFS **6 = 1000 CFS

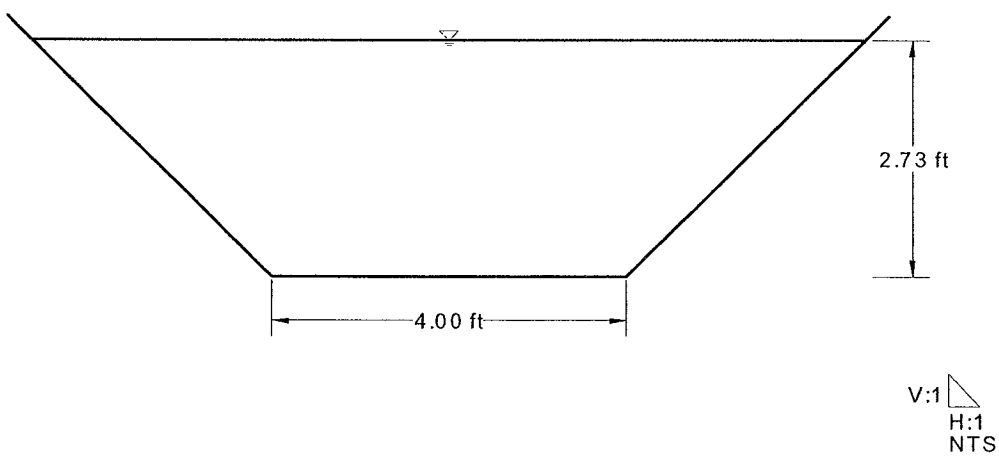


* PIPES 1, 2 & 6 ARE GRAVITY FLOW PIPES WITH RESTRICTED FLOW & CAPACITY.
** PIPE 6 IS CURRENTLY IN PLANNING STAGES TO BE AT FULL CAPACITY (1000 CFS) IN 2020.

Project Description	Gregory Canyon Landfill
Worksheet	4.09 Q100 PIPES 1,2&6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

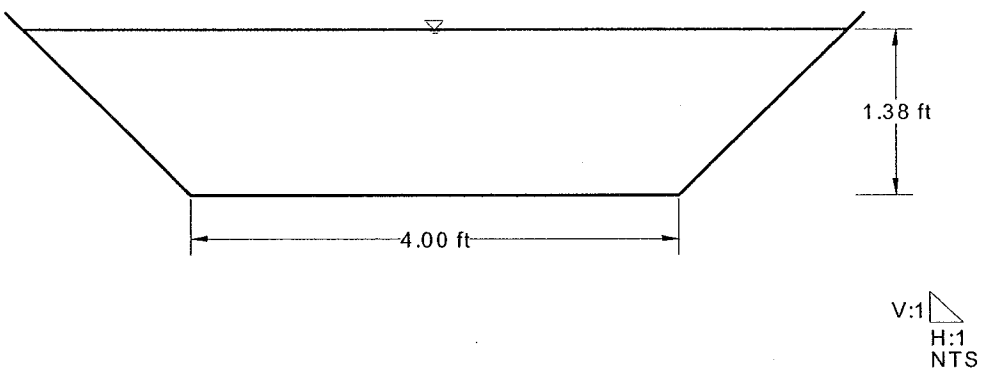
Section Data	
Mannings Coefficient	0.013
Slope	0.220000 ft/ft
Depth	2.73 ft
Left Side Slope	1.00 H : V
Right Side Slope	1.00 H : V
Bottom Width	4.00 ft
Discharge	1,327.00 cfs

CALCULATED TO VERIFY CAPACITY



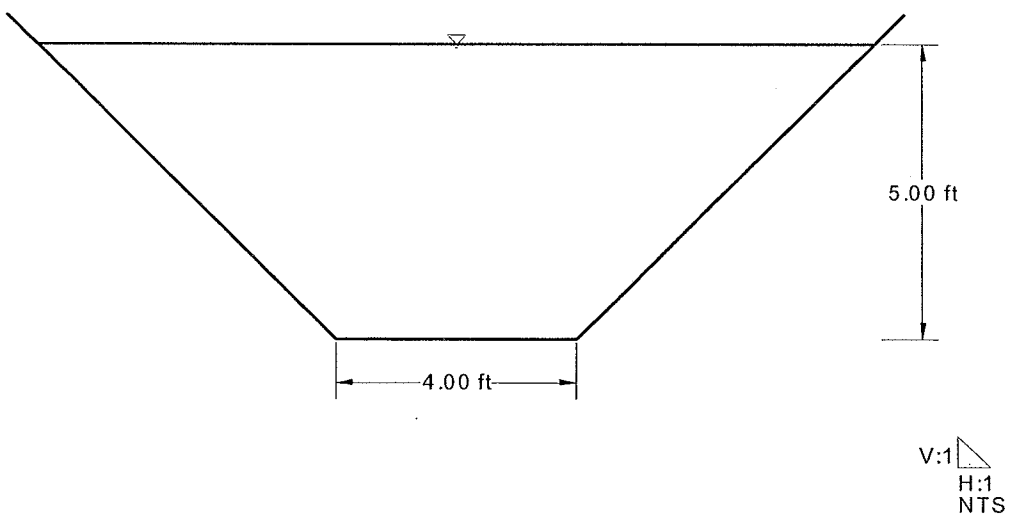
Project Description	Gregory Canyon Landfill
Worksheet	4.08 Q100 ← @ NODE 4.08
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.032	ft/ft
	500	
Depth	1.38	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	4.00	ft
Discharge	147.0	cfs
	0	



Project Description	Gregory Canyon Landfill
Worksheet	4.08 Max.
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

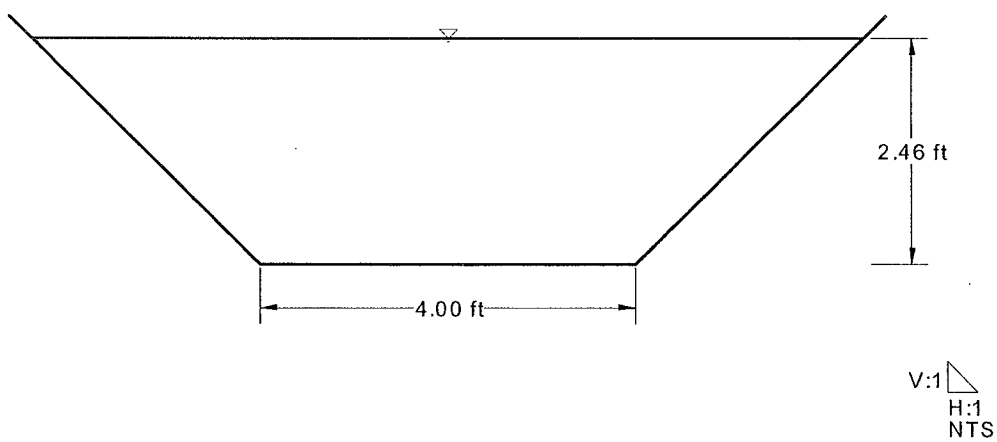
Section Data		
Mannings Coefficient	0.013	
Slope	0.032 500	ft/ft
Depth	5.00	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	4.00	ft
Discharge	1,699. 11	cfs



Project Description	Gregory Canyon Landfill
Worksheet	4.07 Q100
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.004000	ft/ft
Depth	2.46	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	4.00	ft
Discharge	147.00	cfs

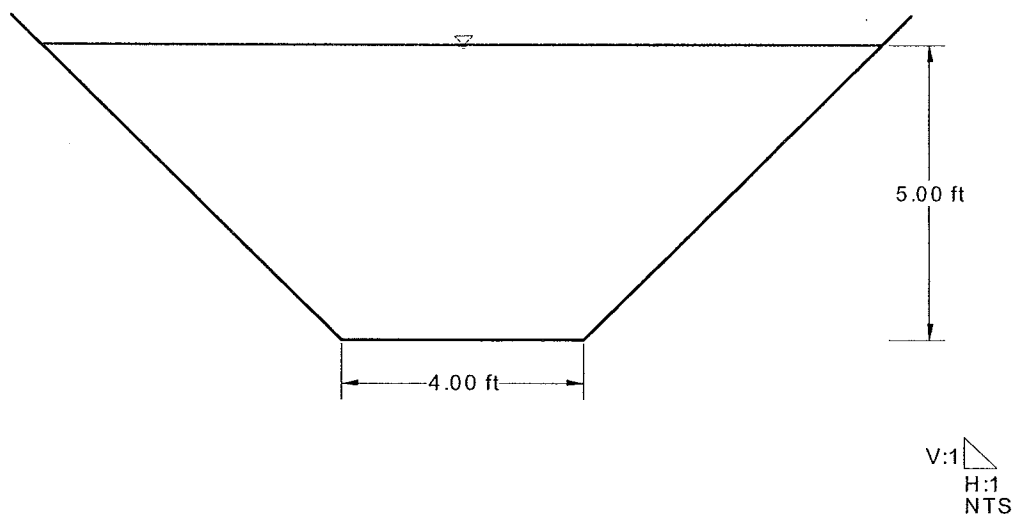
CALCULATED TO VERIFY CAPACITY AT THE MINIMUM GRADE FOR THE WESTERN TRAPEZOIDAL CHANNEL.



Project Description	Gregory Canyon Landfill
Worksheet	4.07 Max
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.013	
Slope	0.004000	ft/ft
Depth	5.00	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	4.00	ft
Discharge	596.09	cfs

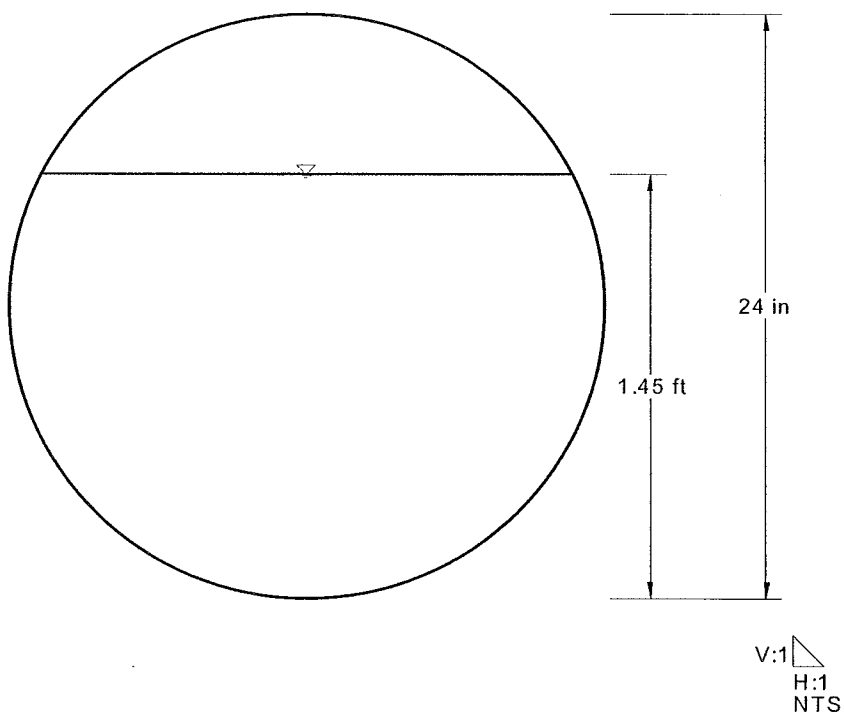
CALCULATED TO VERIFY MAXIMUM CAPACITY



Project Description	Gregory Canyon Landfill
Worksheet	3.03
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.010	
Slope	0.330000	ft/ft
Depth	1.45	ft
Diameter	24	in
Discharge	148.00	cfs

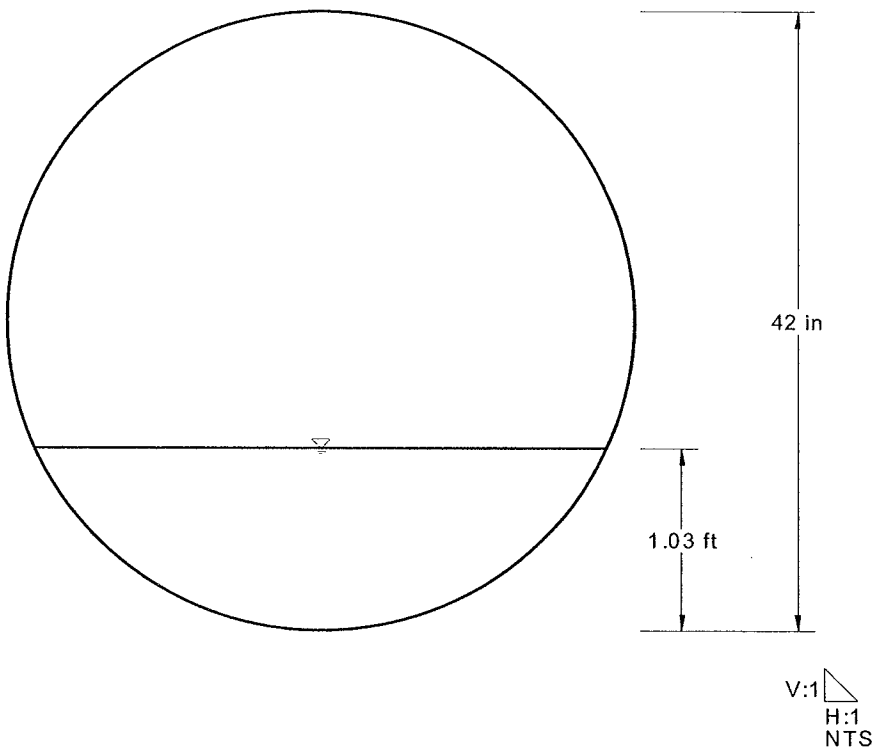
CALCULATED TO VERIFY CAPACITY



Project Description	Gregory Canyon Landfill
Worksheet	2.08
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.010	
Slope	0.200000	ft/ft
Depth	1.03	ft
Diameter	42	in
Discharge	110.00	cfs

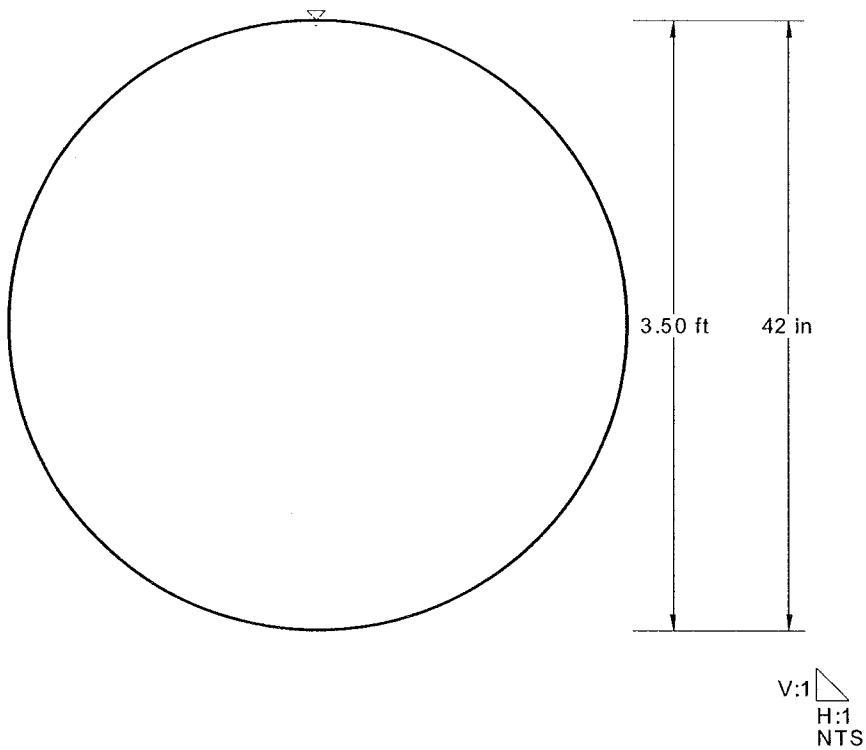
CALCULATED TO VERIFY CAPACITY



Project Description	Gregory Canyon Landfill
Worksheet	2.07
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.010	
Slope	0.004000	ft/ft
Depth	3.50	ft
Diameter	42	in
Discharge	82.72	cfs

CALCULATED TO VERIFY MAXIMUM CAPACITY



APPENDIX K

EXCERPTS FROM EVALUATION OF AIR TOXICS HEALTH RISKS - FINAL REPORT (DAMES & MOORE, JANUARY, 1999)

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

Evaluation of Air Toxics Health Risks – Final Report

Gregory Canyon Landfill

Prepared by:

Dames & Moore
9665 Chesapeake Drive, Suite 201
San Diego, California 92123
Project No. 38724-002-131

Prepared for:

David Evans & Associates
23382 Mill Creek Drive, Site 225
Laguna Hills, California 92653

January 7, 1999

979

Table of Contents

1.0 INTRODUCTION **1**

2.0 ESTIMATION OF PROJECT AIR TOXICS EMISSIONS **3**

2.1 Landfill Gas and Flare Emissions 5
2.2 Dust and Equipment Exhaust Emissions 13
2.3 Year 11 and Year 29 Emission Scenarios 20

3.0 DISPERSION MODELING TO SUPPORT RISK CALCULATIONS – THE ISCST3 MODEL **24**

3.1 ISCST3 Model Attributes 24
3.2 Meteorological Inputs 24
3.3 Emissions Inputs 26
3.4 Receptor Inputs 26

4.0 RISK QUANTIFICATION – THE ACE2588 PROGRAM **29**

5.0 ESTIMATED HEALTH RISK EFFECTS **31**

6.0 REFERENCES **35**

FIGURES

2-1 LAYOUT OF PROPOSED FACILITIES – GREGORY CANYON LANDFILL PROJECT 4
2-2 LAYOUT OF PROJECT EMISSION SOURCES FOR LANDFILL OPERATIONAL YEAR 11 21
2-3 LAYOUT OF PROJECT EMISSION SOURCES FOR LANDFILL OPERATIONAL YEAR 29 22
3-1 1995 ANNUAL WIND ROSE FOR MIRAMAR NAS 25
3-2 MODEL RECEPTOR GRID USED FOR GREGORY CANYON LANDFILL PROJECT HEALTH RISK ASSESSMENT 27
5-1 CALCULATED RESULTANT CANCER RISKS FROM THE GREGORY CANYON LANDFILL DURING YEAR 11 OPERATION 32
5-2 CALCULATED RESULTANT CANCER RISKS FROM THE GREGORY CANYON LANDFILL DURING YEAR 29 OPERATION 33

980

TABLES

2-1 CALCULATION OF UNCONTROLLED METHANE GAS GENERATION FOR THE PROPOSED GREGORY CANYON LANDFILL – 2 PAGES 7
2-2 AP-42 LIST OF TOXIC AIR COMPOUNDS IN LANDFILL GAS 9
2-3 LANDFILL GAS TOXIC COMPOUND CONCENTRATIONS USED IN THE GREGORY CANYON HEALTH RISK ASSESSMENT 12
2-4 CALCULATED AIR POLLUTANT EMISSION RATES FOR GREGORY CANYON LANDFILL GAS AND FLARE 14
2-5 METALS CONCENTRATIONS FROM SAMPLES AT FIVE SAMPLING LOCATIONS WITHIN THE GREGORY CANYON LANDFILL SITE 16
2-6 SUMMARY OF ESTIMATED TOXIC AIR CONTAINMENT EMISSIONS FROM DUST-PRODUCING SOURCES OF THE OPERATIONAL GREGORY CANYON LANDFILL 18
2-7 SUMMARY OF ESTIMATED TOXIC AIR CONTAINMENT EMISSIONS FROM EQUIPMENT EXHAUST SOURCES OF THE OPERATIONAL GREGORY CANYON LANDFILL 19
2-8 EMISSIONS-GENERATING ACTIVITIES ASSUMED FOR YEAR 11 AND YEAR 29 SIMULATIONS 23
2-9 MODEL REPRESENTATION OF SPECIFIC SOURCE ACTIVITIES FOR MODELED OPERATIONAL SCENARIOS 23

ATTACHMENTS

1 LANDFILL GAS SAMPLING AND ANALYSIS REPORTS
2 STATEMENT OF BRYAN A STIRRAT & ASSOCIATES ON LANDFILL GAS COLLECTION EFFICIENCY FOR THE GREGORY CANYON LANDFILL
3 LANDFILL SITE AREA DUST SAMPLING AND ANALYSIS REPORTS
4 ESTIMATED TOXIC AIR CONTAMINANT EMISSIONS FOR SPECIFIC VEHICLE EXHAUST AND DUST PRODUCING SOURCES ASSOCIATED WITH OPERATION OF THE GREGORY CANYON LANDFILL
5 ISCST3 INPUT FILES FOR YEAR 11 SIMULATIONS: GREGORY CANYON LANDFILL
6 ISCST3 INPUT FILES FOR YEAR 29 SIMULATIONS: GREGORY CANYON LANDFILL
7 ACE2588 INPUT FILES FOR YEAR 11 SIMULATIONS: GREGORY CANYON LANDFILL
8 ACE2588 INPUT FILES FOR YEAR 29 SIMULATIONS: GREGORY CANYON LANDFILL

pollutants. Landfill gas generation will initially be very small, but will increase throughout the period over which waste is accepted and decrease thereafter. The rise and fall of emissions from the flare will linearly track the gas generation rate. On the other hand, excavation activities, which will coincide with the maximum dust and equipment exhaust emissions from the project, will occur primarily during several periods relatively early in the lifetime of the landfill.

Since these different source categories will generate different sets of toxic air pollutant emissions at different times and in different locations within the project area, we have elected to evaluate the risks from all project sources for two separate emission scenarios. In the first scenario, we estimate health risks for Year 11 of the landfill's operational lifetime, when dust and equipment exhaust emissions are near their highest levels and landfill gas generation is at 45% of the maximum rate. The second scenario is for Year 29, when the generation of landfill gas will reach its maximum level and dust generation will be lower due to prior completion of earth excavation and stockpiling activities. No other years of landfill operation are expected to produce higher total emissions throughout the facility's lifetime.

Subsections 2.1 and 2.2 describe the methods and assumptions used to develop TAC emissions estimates for the landfill gas/flare sources and the fugitive dust/equipment exhaust sources, respectively. Section 2.3 presents the manner in which these source emissions were represented for input to the dispersion and risk modeling analyses.

2.1 Landfill Gas and Flare Emissions

The basic approach used to estimate landfill gas emission rates of TACs for the proposed Gregory Canyon Landfill follows the guidance in Section 2.4, Municipal Solid Waste Landfills, from EPA Document AP-42, *Compilation of Air Pollutant Emission Factors* (USEPA 1998a). This section of AP-42 has been revised twice during 1998.

The first step in estimating TAC emissions for the landfill and flare involves estimation of the uncontrolled landfill methane generation rate for each year of the facility's lifetime using the formula:

$$Q_{CH4} = L_o R (e^{-kc} - e^{-kt}) \qquad \text{(Equation 2-1)}$$

where:

Q_{CH4}	=	Methane generation rate at time t (m^3/year);
Lo	=	Methane generation rate potential (m3 CH4 per Mg refuse);
R	=	Average annual refuse acceptance rate during active life (Mg/year);
e	=	Base log (unitless);
k	=	Methane generation rate constant (year-1);
c	=	Time since landfill closure (years) (c = 0 for active landfills);
t	=	Time since the initial refuse placement (years).

982

Table 2-1 shows the parameter values used to calculate annual methane generation volumes for the first 70 years of the landfill's existence. The table indicates that maximum gas production will increase each year until the 29th year of operation and will decline steadily thereafter as waste receipts are discontinued. The highest predicted methane gas generation rate in Year 29 is 42.1 million cubic meters (10^6 m^3/yr), while the average rate over the full 70 years is 26.5 x 10^6 m^3/yr. The methane generation rate in the analysis year chosen to represent maximum dust and equipment exhaust emission conditions (Year 11) is 18.9 x 10^6 m^3/yr.

Equation 2-2 is used to estimate emissions of individual TACs contained within the landfill gas.

$$Q_P = 1.82\ Q_{CH4} \times C_P/(1.0 \times 10^6) \qquad \text{(Equation 2-2)}$$

where:

Q_P	=	Emission rate of pollutant P (m^3/yr);
QCH4	=	Methane generation rate (m3/year);
CP	=	Concentration of P in the landfill gas (ppmv);
1.82	=	Multiplication factor to convert from methane to total landfill gas volume (assumes approximately 55% of landfill gas is methane and 45% is CO2, N2 and other constituents).

The EPA AP-42 document provides lists of toxic compounds that may be found in landfill gas and default concentrations for the individual constituents. These compounds and the corresponding default landfill gas concentrations specified in AP-42 are shown in Table 2-2.

The AP-42 document encourages the use of site-specific data over the default information when available. For this health risk assessment, most of the default concentrations were assumed to be applicable to the gas emissions that will be generated by the Gregory Canyon landfill. However, in the case of acrylonitrile, an exception was made, because all available evidence points to an expectation of much lower levels of this compound than indicated by the AP-42 default value. This evidence includes the following:

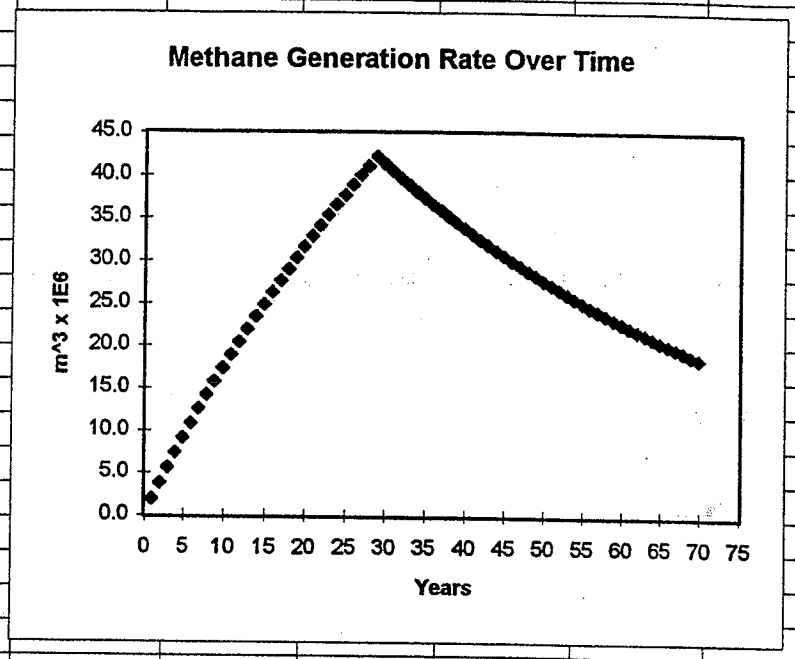
- Discussions with EPA staff responsible for the development of the relevant AP-42 section
- Discussions with staff of the South Coast Air Quality Management District who oversee that agency's landfill gas sampling program and a laboratory with extensive landfill gas speciation experience; and
- Samples collected on behalf of the proposed Gregory Canyon project at two operating Southern California municipal landfills.

983

Table 2-1

Uncontrolled Methane Generation Rate Calculation for Gregory Canyon Landfill (1 of 2)

QCH4=Lo * R * (e^-kc - e^-kt)			
Lo (m^3/Mg) =		100	(100 from AP-42 for most landfills)
k (1/yr) =		0.02	(0.02 from AP-42 for drier areas, less than 25 inches of rain per year)
R (Mg/yr) =		9.57E+05	
c (yrs)	t (yrs)	QCH4 (1E6 m^3/yr)	
0	1	1.9	
0	2	3.8	
0	3	5.6	
0	4	7.4	
0	5	9.1	
0	6	10.8	
0	7	12.5	
0	8	14.2	
0	9	15.8	
0	10	17.4	
0	11	18.9	
0	12	20.4	
0	13	21.9	
0	14	23.4	
0	15	24.8	
0	16	26.2	
0	17	27.6	
0	18	28.9	
0	19	30.3	
0	20	31.6	
0	21	32.8	
0	22	34.1	QCH4: Methane generation rate at time t, m^3/yr
0	23	35.3	Lo: Methane generation potential, m^3 CH4/Mg refuse
0	24	36.5	R: Average annual refuse acceptance rate during active life, Mg/yr
0	25	37.7	e: Base log, unitless
0	26	38.8	k: Methane generation rate constant, 1/yr
0	27	39.9	c: Time since landfill closure, yrs (c=0 for active landfills
0	28	41.0	t: Time since the initial refuse placement, years
0	29	42.1	
1	30	41.3	
2	31	40.5	Assumed:
3	32	39.7	Landfill collects 30.6E6 tons of refuse
4	33	38.9	Landfill collects refuse for 29 years
5	34	38.1	Landfill gas (steady state) 40% vol CO2, 55% vol CH4, 5% vol N2
6	35	37.4	
7	36	36.6	
8	37	35.9	
9	38	35.2	
10	39	34.5	Ave QCH4 (1E6 m^3/yr) = 26.5
11	40	33.8	
12	41	33.1	



984

Table 2-1
Uncontrolled Methane Generation Rate Calculation for Gregory Canyon Landfill (2 of 2)

13	42	32.5							
14	43	31.8							
15	44	31.2							
16	45	30.6							
17	46	30.0							
18	47	29.4							
19	48	28.8							
20	49	28.2							
21	50	27.7							
22	51	27.1							
23	52	26.6							
24	53	26.1							
25	54	25.6							
26	55	25.0							
27	56	24.6							
28	57	24.1							
29	58	23.6							
30	59	23.1							
31	60	22.7							
32	61	22.2							
33	62	21.8							
34	63	21.3							
35	64	20.9							
36	65	20.5							
37	66	20.1							
38	67	19.7							
39	68	19.3							
40	69	18.9							
41	70	18.6							

Table 2-2
AP-42 List of Toxic Compounds in Landfill Gas

Pollutant	Molecular Weight	Default Landfill Gas Concentrations
1,1,1-Trichloroethane	133.41	0.48
Tetrachloroethane	167.85	1.11
1,1-dichloroethane	98.97	2.35
1,1-dichloroethene	96.94	0.2
1,2-dichloroethane	98.96	0.41
1,2-dichloropropane	112.99	0.18
2-Propanol	60.11	50.1
Acetone	58.08	7.01
Acrylonitrile	53.06	6.33
Benzene	78.11	1.91
Bromodichloromethane	163.83	3.13
Butane	58.12	5.03
Carbon disulfide	76.13	0.58
Carbon Monoxide	28.01	141
Carbon tetrachloride	153.84	0.004
Carbonyl sulfide	60.07	0.49
Chlorobenzene	112.56	0.25
Chlorodifluoromethane	86.47	1.3
Chloroethane	64.52	1.25
Chloroform	119.39	0.03
Chloromethane	50.49	1.21
Dichlorobenzene (p-: HA	147	0.21
Dichlorodifluoromethane	120.91	15.7

Pollutant	Molecular Weight	Default Landfill Gas Concentrations
Dichlorofluoromethane	102.92	2.62
Methylene chloride	84.94	14.3
Dimethyl sulfide	62.13	7.82
Ethane	30.07	889
Ethanol	46.08	27.2
Ethyl mercaptan	62.13	2.28
Ethylbenzene	106.16	4.61
Ethylene dibromide	187.88	0.001
Fluorotrichloromethane	137.38	0.76
Hexane	86.18	6.57
Hydrogen sulfide	34.08	35.5
Mercury	200.61	0.000292
MEK	72.11	7.09
MIBK	100.16	1.87
Methyl mercaptan	48.11	2.49
Pentane	72.15	3.29
Tetrachloroethylene	165.83	3.73
Propane	44.09	11.1
t-1,2-dichloroethene	96.94	2.84
Toluene	92.13	39.3
Trichloroethylene	131.4	2.82
Vinyl chloride	62.5	7.34
Xylenes	106.16	12.1
NMOC (AP-42 8/98)	86.18	595

Because of the high cancer unit risk value assigned to acrylonitrile by the State Office of Environmental Health Hazard Assessment (OEHHA), this compound would dominate the calculation of cancer risk for the landfill project if the default acrylonitrile concentration value in AP-42 were used. Research into the basis for the EPA factor shows that this value was actually derived from only four samples collected in different U.S landfills. (USEPA, 1998b). The range of these four values was 0.81 to 28.3 ppmv, with the geometric mean value of 6.33 used as the default value. The documentation for this supporting data states that the high value of 28.3 ppmv, which is higher than the other three individual samples by a factor of from 3 to 35, was obtained at a landfill in the Eastern US.

Staff of the SDAPCD who were contacted regarding the history of landfill gas sampling and speciation for waste disposal facilities in San Diego stated that they are unaware of any analysis having been conducted for acrylonitrile at local landfills. A more comprehensive program of routine landfill gas sampling and analysis is conducted in the South Coast Air Quality Management District (SCAQMD) pursuant to that agency's Rule 1150.1. Accordingly, SCAQMD staff were also contacted regarding acrylonitrile emissions from Southern California landfills.

Mr. Ron Meyers of EPA, who participated in the preparation of Section 2.4 of AP-42, stated that most of the TACs for landfill gas (including acrylonitrile) have been placed in landfills as components of the waste from specific industrial processes, and are not produced in the landfill by the biodegradation process that generates methane (Meyers, 1998). He also said that the presence or absence of some of these compounds sometimes depends on the age of the landfill, since the types of wastes accepted by municipal solid waste facilities have become much more restricted over the last several years. Thus compounds that have been found in the gases of older landfills may not be present in newer facilities. Mr. Meyers also pointed out that sometimes sampling programs that detect high values of a compound like acrylonitrile have been conducted expressly because of an expectation that the compound is present due to the nature of the facility waste stream. According to the 1985 Kirk-Ohmer Encyclopedia of Chemicals, acrylonitrile is used primarily in the production of acrylic fibers, copolymer resins, adiponitrile and barrier resins.

Mr. Rod Millican and Mr. Joe Tramma are engineers with AQMD specializing in landfill permit issues. In a series of telephone conversations with Dames & Moore staff working on this health risk assessment, Mr. Millican related that the AQMD's in-house laboratory has never detected acrylonitrile in the relatively few instances when they have analyzed landfill gas for this compound. Acrylonitrile is one of the second-tier compounds listed in AQMD Rule 1150.1, for which sampling may be required if the District has reason to believe they will be found in appreciable quantities (Millican, 1998). Mr. Tramma told Dames & Moore that to his knowledge they have never had reason to require sampling for any of the compounds on the second-tier list (Tramma, 1998). On the recommendation of Mr. Millican, Dames & Moore also contacted Mr. Mike Porter, a

987

Principal of AtmAA, Inc a laboratory with extensive experience in the chemical analysis of landfill gas for toxic compounds. Mr. Porter confirmed that he has virtually never tested for acrylonitrile, but has occasionally seen its signature on the gas chromatograph trace in ppb levels when analyzing for other compounds, including acetylnitrile (Porter, 1998).

Because of the importance of the acrylonitrile concentration in determining the cancer risk associated with the Gregory Canyon landfill, a series of samples at the gas collection systems of two active landfills in the South Coast AQMD were collected by specialists of Bryan A. Stirrat & Associates (BAS) on December 15, 1998. These samples were specifically analyzed for acrylonitrile and vinyl chloride, another compound with a relatively high unit risk factor, to obtain an idea of the levels found in Southern California landfills. The concentrations of the two target compounds found in the two samples collected in the gas of both landfills were:

	Acrylonitrile	Vinyl Chloride
Landfill 1	< 3 ppbv, < 3 ppbv	137 ppbv, 131 ppbv
Landfill 2	< 3 ppbv, < 3 ppbv	331 ppbv, 394 ppbv
AP-42 Default	6.33 ppmv	7.34 ppmv

Clearly, these measured values, which were obtained in the gas collection system for landfills deliberately chosen for their similarity to the proposed Gregory Canyon facility, are far below the default concentrations specified in AP-42. Descriptions of the sampling and analysis methods utilized for the development of the landfill data are provided in Attachment 1.

Table 2-3 shows the TAC constituent concentrations assumed for the Gregory Canyon landfill gas. For acrylonitrile we have used the detection level of 3 ppbv as a conservative precaution, although the actual concentration is known to be below this threshold value. For vinyl chloride, the highest concentration measured by BAS, 394 ppbv, was assumed. These raw concentrations have been corrected in the table to account for air intrusion into the gas collection systems, as specified in AP-42. Based on the information provided by all the knowledgeable individuals who have been contacted, these acrylonitrile and vinyl chloride measurements are more indicative of the concentrations that will occur in the Gregory Canyon landfill gas than the EPA default values. The EPA values have been used for all other landfill gas constituents, however.

988

Table 2-3

List of Landfill Gas Toxic Compound Concentrations Used in the Gregory Canyon Health Risk Assessment

Pollutant	Molecular Weight	Assumed Landfill Gas Concentrations (ppmv)	Pollutant	Molecular Weight	Assumed Landfill Gas Concentrations (ppmv)
1,1,1-Trichloroethane	133.41	0.48	Dichlorofluoromethane	102.92	2.62
Tetrachloroethane	167.85	1.11	Methylene chloride	84.94	14.3
1,1-dichloroethane	98.97	2.35	Dimethyl sulfide	62.13	7.82
1,1-dichloroethene	96.94	0.2	Ethane	30.07	889
1,2-dichloroethane	98.96	0.41	Ethanol	46.08	27.2
1,2-dichloropropane	112.99	0.18	Ethyl mercaptan	62.13	2.28
2-Propanol	60.11	50.1	Ethylbenzene	106.16	4.61
Acetone	58.08	7.01	Ethylene dibromide	187.88	0.001
Acrylonitrile	53.06	0.003103	Fluorotrichloromethane	137.38	0.76
Benzene	78.11	1.91	Hexane	86.18	6.57
Bromodichloromethane	163.83	3.13	Hydrogen sulfide	34.08	35.5
Butane	58.12	5.03	Mercury	200.61	0.000292
Carbon disulfide	76.13	0.58	MEK	72.11	7.09
Carbon Monoxide	28.01	141	MIBK	100.16	1.87
Carbon tetrachloride	153.84	0.004	Methyl mercaptan	48.11	2.49
Carbonyl sulfide	60.07	0.49	Pentane	72.15	3.29
Chlorobenzene	112.56	0.25	Tetrachloroethylene	165.83	3.73
Chlorodifluoromethane	86.47	1.3	Propane	44.09	11.1
Chloroethane	64.52	1.25	t-1,2-dichloroethene	96.94	2.84
Chloroform	119.39	0.03	Toluene	92.13	39.3
Chloromethane	50.49	1.21	Trichloroethylene	131.4	2.82
Dichlorobenzene (p-: HA	147	0.21	Vinyl chloride	62.5	0.2552
Dichlorodifluoromethane	120.91	15.7	Xylenes	106.16	12.1
			NMOC (AP-42 8/98)	86.18	595

For purposes of the emissions calculations used in this assessment of health risks, it is assumed that all of the gas generated by the landfill is either collected by the gas collection system or finds its way to the atmosphere through cracks or other openings in the landfill surface. Based on information provided by the landfill design engineers, a gas collection efficiency of 90% has been assumed. This level of collection efficiency is feasible for a landfill design that utilizes a cup-shaped configuration and a sufficiently dense network of gas collection wells. A confirming statement on the validity of the 90% collection efficiency has been provided by BAS, the project design engineering firm, and is included as Attachment 2 to this report.

It is thus assumed that 10 percent of the generation rates for total landfill gas and of the individual toxic constituents therein will be emitted directly from the landfill surface. The remaining gas will be sent to the flare, where the assumed destruction efficiencies for this gas stream are 99.2% for non-methane organic compounds and 98% for halogenated organics (EPA AP-42). Calculated toxic air contaminant emissions for landfill gas and flare emissions in both selected modeling years are shown in Table 2-4.

As noted previously, annual average and maximum hourly emissions were used for the risk modeling conducted for this study. In response to instructions from staff of the APCD regarding interpretation of District Rule 1200, maximum annual emissions were used for the chronic health effects calculations. Specifically, the calculated average emission rates calculated by means of Equation 2-2 for Year 29 of the proposed facility's operation were used to represent maximum annual TAC emissions associated with landfill gas generation. Maximum hourly landfill gas emissions were assumed to be well approximated by the same emission rates, since there is no basis for determining short-term variations in landfill gas generation. Annual and maximum hourly TAC emissions data for landfill gas were similarly generated for the Year 11 model simulation by scaling the Year 29 rates by the ratio of methane gas generation for the two years.

2.2 Dust and Equipment Exhaust Emissions

Sources of fugitive dust associated with the operational Gregory Canyon landfill will include the following:

- Travel of waste hauling trucks and smaller vehicles to and from the landfill on paved roads and on unpaved areas within the landfill to and from waste offloading areas;
- Excavation of soil to create the landfill volume for waste placement and construction of the associated clay liner;
- Hauling and dumping of excavated soil in stockpiles;
- Operation of landfill equipment to spread, compact and cover received wastes.
- Periodic drilling, blasting and rock crushing;
- Windblown dust from stockpiles and exposed surfaces.

990

Table 2-4
Calculated Toxic Air Pollutant Emission Rates for Gregory Canyon Landfill Gas and Flare

Pollutant	Landfill Operational Year 29				Landfill Operational Year 11			
	Landfill Gas		Flare		Landfill Gas		Flare	
	Annual (lb/yr)	Max Hrly (lb/hr)	Annual (lb/yr)	Max Hrly (lb/hr)	Annual (lb/yr)	Max Hrly (lb/hr)	Annual (lb/yr)	Max Hrly (lb/hr)
1,1,1-Trichloroethane	4.427E+01	5.05E-03	7.969E+00	9.097E-04	1.988E+01	2.269E-03	3.578E+00	4.084E-04
1,1-dichloroethene	1.34E+01	1.53E-03	2.413E+00	2.754E-04	6.018E+00	6.869E-04	1.083E+00	1.236E-04
1,2-dichloroethane	2.81E+01	3.20E-03	5.049E+00	5.764E-04	1.259E+01	1.438E-03	2.267E+00	2.588E-04
Acrylonitrile	1.14E-01	1.30E-05	8.196E-03	9.356E-07	5.110E-02	5.833E-06	3.679E-03	4.200E-07
Benzene	1.03E+02	1.18E-02	7.426E+00	8.478E-04	4.630E+01	5.286E-03	3.334E+00	3.806E-04
Carbon tetrachloride	4.25E-01	4.86E-05	7.658E-02	8.742E-06	1.910E-01	2.180E-05	3.438E-02	3.924E-06
Chlorobenzene	1.95E+01	2.22E-03	3.502E+00	3.998E-04	8.734E+00	9.970E-04	1.572E+00	1.795E-04
Chlorodifluoromethane	7.77E+01	8.87E-03	1.399E+01	1.597E-03	3.489E+01	3.983E-03	6.280E+00	7.169E-04
Chloroethane	5.58E+01	6.37E-03	1.004E+01	1.146E-03	2.503E+01	2.857E-03	4.506E+00	5.143E-04
Chloroform	2.48E+00	2.83E-04	4.457E-01	5.088E-05	1.112E+00	1.269E-04	2.001E-01	2.284E-05
Dichlorobenzene (p-: HAP)	2.13E+01	2.44E-03	3.842E+00	4.385E-04	9.581E+00	1.094E-03	1.725E+00	1.969E-04
Dichlorodifluoromethane	1.31E+03	1.50E-01	2.362E+02	2.697E-02	5.892E+02	6.726E-02	1.061E+02	1.211E-02
Dichlorofluoromethane	1.86E+02	2.13E-02	3.356E+01	3.831E-03	8.369E+01	9.554E-03	1.506E+01	1.720E-03
Methylene chloride	8.40E+02	9.59E-02	1.512E+02	1.726E-02	3.770E+02	4.304E-02	6.786E+01	7.746E-03
Ethylene dibromide	1.30E-01	1.48E-05	9.352E-03	1.068E-06	5.831E-02	6.657E-06	4.199E-03	4.793E-07
Fluorotrichloromethane	7.22E+01	8.24E-03	1.299E+01	1.483E-03	3.241E+01	3.699E-03	5.833E+00	6.659E-04
Hydrogen sulfide	8.36E+02	9.55E-02	6.022E+01	6.875E-03	3.755E+02	4.287E-02	2.704E+01	3.086E-03
Mercury	4.05E-02	4.62E-06	3.645E-01	4.161E-05	1.818E-02	2.075E-06	1.636E-01	1.868E-05
Tetrachloroethylene	4.28E+02	4.88E-02	7.697E+01	8.787E-03	1.920E+02	2.192E-02	3.456E+01	3.945E-03
Toluene	2.50E+03	2.86E-01	1.802E+02	2.057E-02	1.124E+03	1.283E-01	8.091E+01	9.236E-03
Trichloroethylene	2.56E+02	2.92E-02	4.611E+01	5.264E-03	1.150E+02	1.313E-02	2.070E+01	2.363E-03
Vinyl chloride	1.10E+01	1.26E-03	1.985E+00	2.266E-04	4.950E+00	5.651E-04	8.911E-01	1.017E-04
Xylenes	8.88E+02	1.01E-01	6.394E+01	7.299E-03	3.987E+02	4.551E-02	2.871E+01	3.277E-03
Hydrogen Chloride	N/A	N/A	2.823E+04	3.222E+00	N/A	N/A	1.267E+04	1.447E+00

APPENDIX L

SOIL LOSS ANALYSIS

UNIVERSAL SOIL LOSS ANALYSIS

AVERAGE DENSITY OF SOIL (PCF) = 100

STUDY AREA	AREA (ACRES)	R FACTOR	K FACTOR	LS FACTOR	C FACTOR	P FACTOR	TONS PER ACRE	ANNUAL SOIL LOSS (TONS/YEAR)	VOLUME (CY)
A	12.4	50	0.26	8.0	0.03	0.60	1.9	23.2	17.19
B	7.5	50	0.26	8.0	0.03	0.60	1.9	14.0	10.40
C	9.8	50	0.26	8.0	0.03	0.60	1.9	18.3	13.59
D	8.6	50	0.26	8.0	0.03	0.60	1.9	16.1	11.93
E	74.9	50	0.26	8.0	0.03	0.60	1.9	140.2	103.86
F	17.0	50	0.26	8.0	0.03	0.60	1.9	31.8	23.57
G	42.1	50	0.26	8.0	0.03	0.60	1.9	78.8	58.38
H	8.0	50	0.26	8.0	0.03	0.60	1.9	15.0	11.09
I	9.3	50	0.26	8.0	0.03	0.60	1.9	17.4	12.90
J	4.2	50	0.26	8.0	0.03	0.60	1.9	7.9	5.82
TOTAL	*193.8*		*AVERAGE VALUE (tons/acre/year)=*				*1.9*	*362.8*	*268.7*

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DEPTH OF SOIL LOSS CALCULATION

DATE	02/11/99	**JOB**	GREGORY CANYON LANDFILL
CALC BY	GVN		

CRITERIA

AVERAGE SOIL LOSS (TONS/YR/ACRE)	1.90
DENSITY OF SILT (LBS/CF)	100
AREA OF LANDFILL TO BE COVERED (AC)	196.3
NUMBER OF YEARS	30
TOTAL DEPTH OF FINAL COVER (INCHES)	48

AVERAGE ANNUAL SOIL LOSS DEPTH

TONNAGE	373.0
VOLUME OF SOIL LOSS (CY)	276.3
DEPTH OF SOIL LOSS (INCHES)	1.05E-02

TOTAL DEPTH OVER 30-YEARS

TONNAGE	11,189
VOLUME OF SOIL LOSS (CY)	8,288
DEPTH OF SOIL LOSS (INCHES)	0.31
Ratio of Soil Loss to Final Cover (percent)	0.7%

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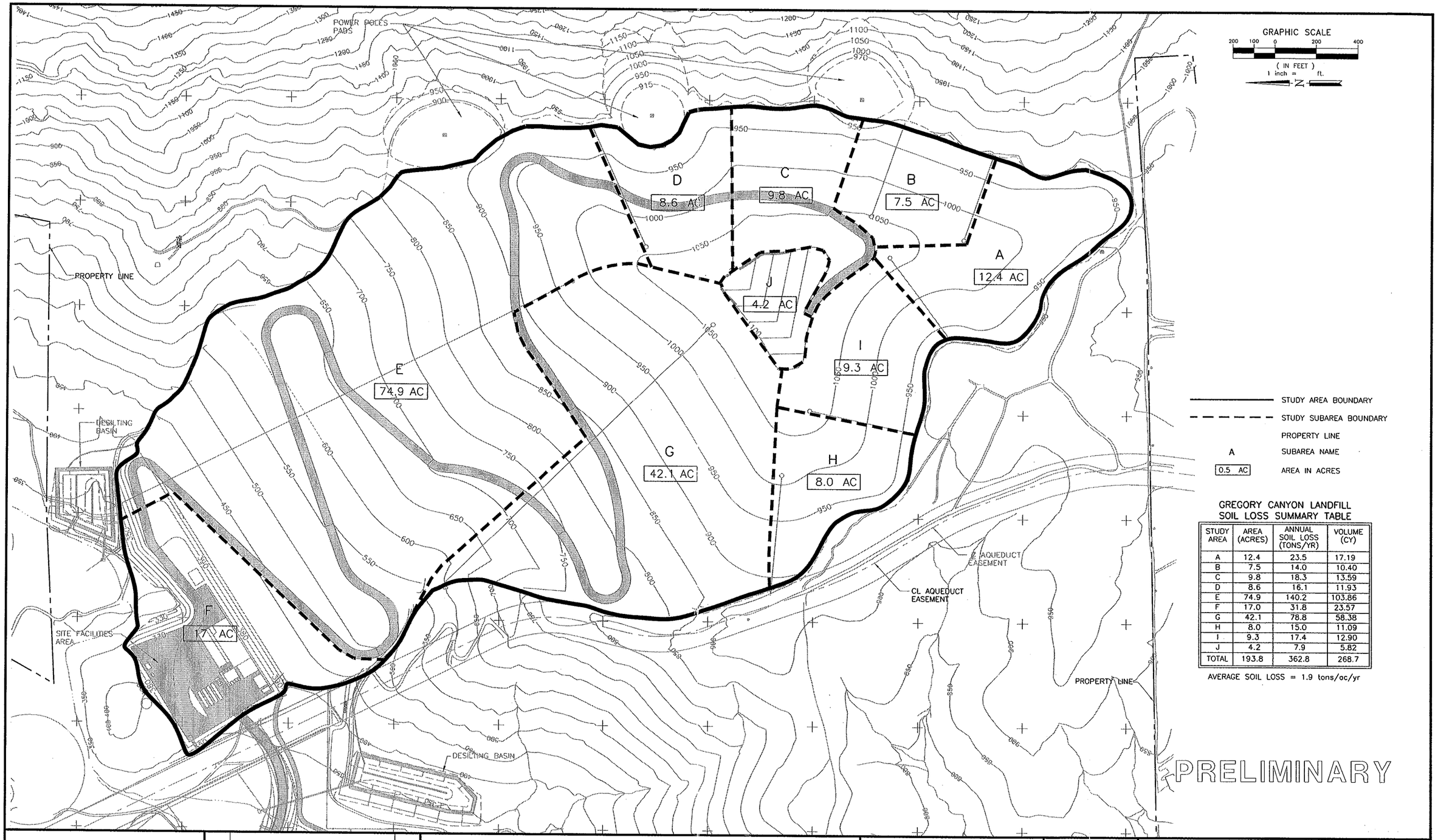

GREGORY CANYON LANDFILL SOIL LOSS SUMMARY TABLE

STUDY AREA	AREA (ACRES)	ANNUAL SOIL LOSS (TONS/YR)	VOLUME (CY)
A	12.4	23.5	17.19
B	7.5	14.0	10.40
C	9.8	18.3	13.59
D	8.6	16.1	11.93
E	74.9	140.2	103.86
F	17.0	31.8	23.57
G	42.1	78.8	58.38
H	8.0	15.0	11.09
I	9.3	17.4	12.90
J	4.2	7.9	5.82
TOTAL	193.8	362.8	268.7

AVERAGE SOIL LOSS = 1.9 tons/ac/yr

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS
1360 E. VALLEY VISTA DRIVE
DIAMOND BAR, CALIFORNIA 91765
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GREGORY CANYON LANDFILL SOIL LOSS ANALYSIS MAP

DESIGNED BY : G.V.N.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 6-2001	FILE NO.: 44027DB.DWG
CHECKED BY :	DATE :	DRAWING 25
APPROVED BY :	DATE :	

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SOIL LOSS ANALYSIS – PRE-DEVELOPED CONDITION

SUMMARY OF SOIL LOSS ANALYSIS
EXISTING CONDITION WITHIN PROPOSED LANDFILL FOOTPRINT

SOIL LOSS CALCULATION

The Universal Soil Loss Equation (USLE) is as follows:

$$A = RKLSCP$$

Where A=Average soil loss, in tons per acre, for the time period used for factor R (e.g., annual)
R=rainfall and runoff erosivity index
K=soil erodibility factor
L=slope-length factor
S=slope-steepness factor
C=cover/management factor
P=practice factor

Factor R

Factor R is equal to the pertinent rainfall erosion index and is predictable from meteorological data for the area of concern. This factor is the same for the pre- and post-development condition.

Factor K

Generally it has been found that K is affected by particle-size distribution (percent sand, silt, and clay), organic-matter content, soil structure, and permeability. The K factor is estimated to be approximately 2.5 times greater for the post development condition than for the pre-development condition. This is because it is estimated that excavation and compaction of the native soil material for landfill will reduce the soil particle size and become more susceptible to erosion.

Factors L and S

The length and steepness of the canyon side-slopes and canyon bottom have a significant impact on soil erosion. The pre-development condition has long continuous slope runs, whereas the post-development landfill condition will have slope benches to water velocity, and its ability to transport soil, as it flows down the slope. Consequently, the LS factor is estimated to be 2.5 times greater for the pre-development condition than for the post-development condition.

Factor C

The amount of ground cover in the pre-development will vary from year to year since it is dependent on natural conditions. For the soil loss estimate it is assumed that, on the average, approximately 70 percent of the site in the pre-development condition has established grass or other ground cover. The vegetation for the post-development condition will be maintained and therefore it is estimated that the site will have, on the average, 80 percent coverage of grass or other ground cover. In order to minimize soil loss during the time when the vegetation is becoming established, other erosion control practices such as mulching will be implemented. Further, the sedimentation basins constructed as part of landfill operations will be maintained during post-closure and will reduce off-site transport of soil from the site.

Factor P

Supporting practices include soil compaction, ongoing slope and special drainage features such as drainage diversion berms, and drainage ditches are included in this factor. The post-development site will be maintained while the pre-development site is not. Therefore this P factor for the pre-development condition is approximately 1.5 times higher than for the post-development condition.

RESULTS

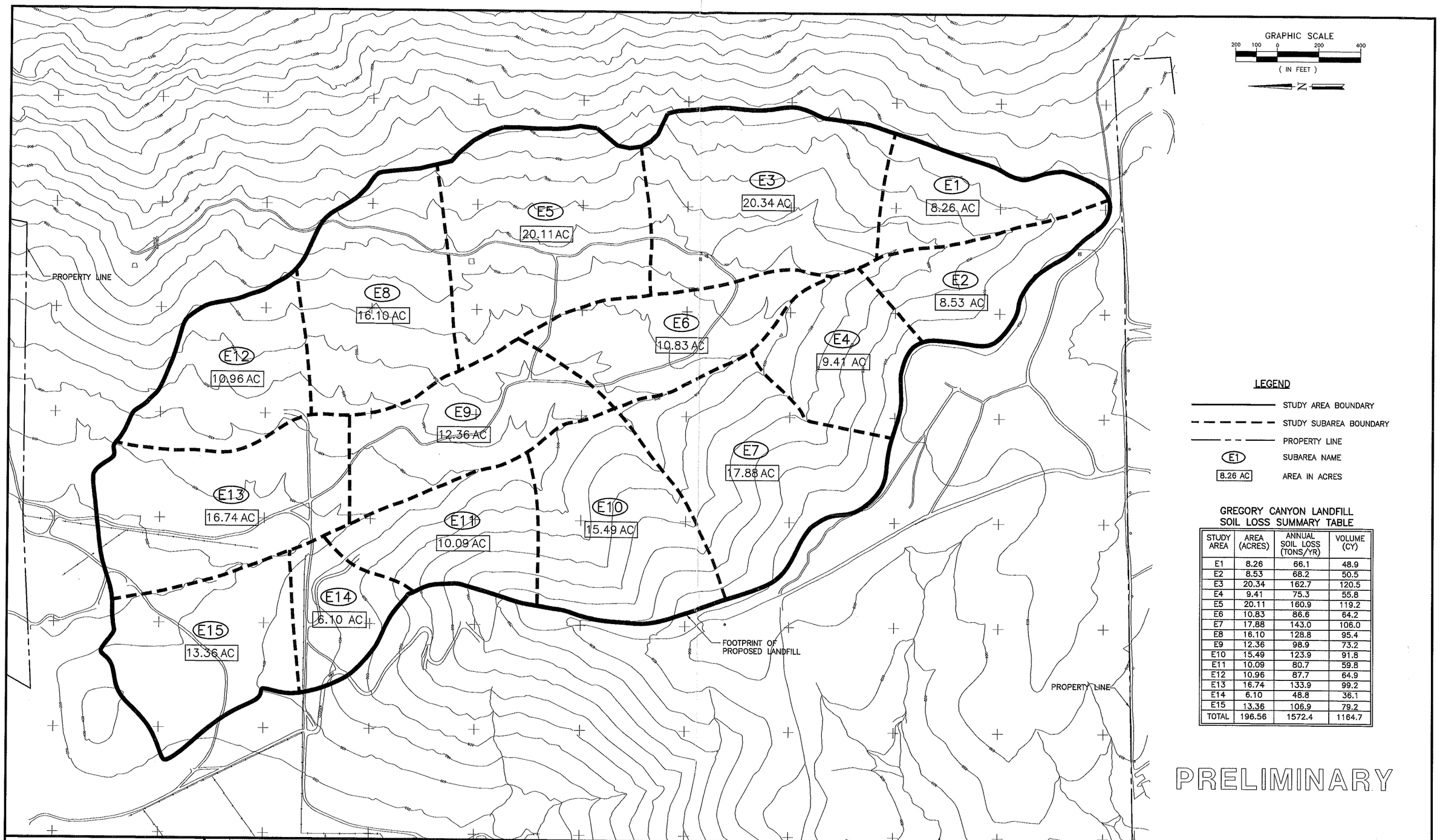
Based on the above assessment the soil loss for the existing, pre-development condition is calculated to be approximately 4 tons per acre per year. This is approximately twice the calculated 1.96 tons per acre per year soil loss quantity for the final closed landfill post-development condition. Tables 1 and 2 present the calculated annual soil loss per acre for the pre- and post-development conditions respectively.

UNIVERSAL SOIL LOSS ANALYSIS
PRE-DEVELOPMENT CONDITION

JOB NAME GREGORY CANYON LANDFILL
DATE 3/26/01
CALC BY ACR

AVERAGE DENSITY OF SOIL (PCF) = 100

STUDY AREA	AREA (ACRES)	R FACTOR	K FACTOR	LS FACTOR	C FACTOR	P FACTOR	TONS PER ACRE	ANNUAL SOIL LOSS (TONS/YEAR)	VOLUME (CY)
E1	8.2	50	0.10	20.0	0.04	1.0	4.0	32.8	24.3
E2	8.4	50	0.10	20.0	0.04	1.0	4.0	33.6	24.9
E3	20.0	50	0.10	20.0	0.04	1.0	4.0	80.0	59.3
E4	9.3	50	0.10	20.0	0.04	1.0	4.0	37.2	27.6
E5	19.8	50	0.10	20.0	0.04	1.0	4.0	79.2	58.7
E6	10.6	50	0.10	20.0	0.04	1.0	4.0	42.4	31.4
E7	17.6	50	0.10	20.0	0.04	1.0	4.0	70.4	52.1
E8	15.9	50	0.10	20.0	0.04	1.0	4.0	63.6	47.1
E9	12.2	50	0.10	20.0	0.04	1.0	4.0	48.8	36.1
E10	15.3	50	0.10	20.0	0.04	1.0	4.0	61.2	45.3
E11	10.0	50	0.10	20.0	0.04	1.0	4.0	40.0	29.6
E12	10.8	50	0.10	20.0	0.04	1.0	4.0	43.2	32.0
E13	16.5	50	0.10	20.0	0.04	1.0	4.0	66.0	48.9
E14	6.0	50	0.10	20.0	0.04	1.0	4.0	24.0	17.8
E15	13.2	50	0.10	20.0	0.04	1.0	4.0	52.8	39.1
TOTAL	*193.8*				*AVERAGE VALUE (tons/acre/year)=*		*4.0*	*775.2*	*574.2*



GREGORY CANYON LANDFILL
SOIL LOSS SUMMARY TABLE

STUDY AREA	AREA (ACRES)	ANNUAL SOIL LOSS (TONS/YR)	VOLUME (CY)
E1	8.26	66.1	48.9
E2	8.53	68.2	50.5
E3	20.34	162.7	120.5
E4	9.41	75.3	55.8
E5	20.11	160.9	119.2
E6	10.83	86.6	64.2
E7	17.88	143.0	106.0
E8	16.10	128.8	95.4
E9	12.36	98.9	73.2
E10	15.49	123.9	91.8
E11	10.09	80.7	59.8
E12	10.96	87.7	64.9
E13	16.74	133.9	99.2
E14	6.10	48.8	36.1
E15	13.36	106.9	79.2
TOTAL	196.56	1572.4	1164.7

PRELIMINARY

NO.	REVISION DESCRIPTION	BY:

BAS
BRYAN A. STIRRAT & ASSOCIATES
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GREGORY CANYON LANDFILL
POTENTIAL SOIL LOSS MAP
EXISTING NATURAL CONDITION

DESIGNED BY : A.C.R.	SCALE : AS SHOWN	
DRAWN BY : J.P.J.	DATE : 6-2001	FILE NO.: 44028DB.DWG
CHECKED BY :	DATE :	SHEET - OF -
APPROVED BY :	DATE :	

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APPENDIX M

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE FINAL COVER SYSTEM

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE FINAL COVER SYSTEM AT GREGORY CANYON LANDFILL

Prepared for:

Bryan A. Stirrat & Associates
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GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE FINAL COVER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS

SECTION		PAGE
1.0	**INTRODUCTION**	**1**
1.1	Project Requirements	2
2.0	**RESPONSIBLE PARTIES AND DEFINITIONS**	**2**
2.1	Responsible Parties	2
2.2	Definitions	3
3.0	**GEOTECHNICAL CQA ORGANIZATION**	**5**
3.1	Geotechnical CQA Project Director	6
3.2	Geotechnical CQA Officer	6
3.3	Geotechnical CQA Monitors	7
3.3.1	Field Engineer/Field Geologist	7
3.3.2	Geotechnical CQA Field Technicians	7
3.4	Independent Testing Laboratory	9
4.0	**MEETINGS**	**9**
4.1	Pre-Construction Meetings	9
4.2	Progress Meetings	10
4.3	Special Meetings	10
5.0	**GEOTECHNICAL CQA MONITORING FOR EARTH MATERIALS**	**11**
5.1	General	11
5.2	Compacted Fill Placement	11
5.3	Excavation and Processing	11
5.4	Acceptance Criteria	11
5.4.1	General	11
5.4.2	Moisture Content and Density	12
5.4.3	Lift Thickness and Processing	12
5.4.4	Geosynthetic Material Subgrade	13

TABLE OF CONTENTS (Cont'd)

SECTION **PAGE**

6.0 GEOTECHNICAL CQA MONITORING FOR GEOSYNTHETICS 13
6.1 Geocomposite 13
6.1.1 Geocomposite Delivery 14
6.1.2 Geocomposite Conformance Testing 14
6.1.2.1 Tests 14
6.1.2.2 Sampling Procedures 15
6.1.2.3 Test Results 15
6.1.3 Geocomposite Installation 15
6.1.3.1 Surface Preparation 15
6.1.3.2 Placement 16
6.2 Geomembrane (LLDPE) 17
6.2.1 LLDPE Manufacturing 17
6.2.2 Geomembrane Delivery 17
6.2.2.1 Transportation and Handling 18
6.2.2.2 Geomembrane Storage 18
6.2.3 LLDPE Conformance Testing 19
6.2.3.1 Tests 19
6.2.3.2 Sampling and Testing Frequency 19
6.2.3.3 Sampling Procedures 19
6.2.3.4 Test Results 19
6.2.4 LLDPE Installation 20
6.2.4.1 Earthwork 20
6.2.4.2 LLDPE Placement 21
6.2.4.3 Field Seaming 23
6.2.5 Construction Testing 25
6.2.5.1 Nondestructive Seam Testing 25
6.2.5.2 Destructive Seam Testing 27
6.2.5.3 Sampling Procedures 27
6.2.5.4 Size of Samples 28
6.2.5.5 Field Testing 28
6.2.5.6 Laboratory Testing 28

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE FINAL COVER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS (Cont'd)

SECTION **PAGE**

6.2.6 Defects and Repairs 29
6.2.6.1 Identification 29
6.2.6.2 Repair Procedures 30
6.2.6.3 Seam Test Summary 30
6.2.7 Wrinkles 30
6.2.8 Anchor Trench 31
6.2.9 LLDPE Acceptance 31
6.2.10 Liner Materials 31

7.0 DOCUMENTATION 32
7.1 Daily Summary Report 32
7.1.1 Daily Field Inspection Report 32
7.1.2 Daily Test Summary Report 33
7.2 Acceptance Reports 33
7.3 Photo Documentation 33
7.4 As-Built Documentation 34

INTRODUCTION

A Construction Quality Assurance (CQA) program consists of selected testing, inspection and documentation of a final construction product in order to provide the Owner/Agencies an evaluation of whether the end product is of the specified quality of materials and workmanship. Because of possible conflicts of interest, the Contractor should not undertake the CQA function directly. Rather, CQA inspection and testing should be left under the objective authority of a single team of design and inspection professionals.

A Construction Quality Control (CQC) program consists of selected tests and inspections performed by the Contractor during production, which can assist the Contractor in producing the quality product required. While the CQC function is the sole responsibility of the Contractor, the Project Manager may, at his/her discretion, provide information regarding the ongoing CQA monitoring for the Contractor's use in implementing his/her CQC function. Release of the CQA data to the Contractor would be for convenience only and would, in no way, relieve the Contractor from the responsibility to fulfill the project requirements.

Construction of final cover improvements for the Gregory Canyon Landfill consist of constructing individual discrete layers of earth and synthetic materials which will function as a unit to form the containment system for the waste management area. As proposed, the final cover for the Gregory Canyon Landfill will consist of from bottom to top: placement of a 2-foot thick foundation layer composed of random soil materials; installation of LLDPE geomembrane over prepared subgrade; installation of a geocomposite drainage media on relatively flat deck areas; and placement of a two (2)-foot thick vegetative soil layer.

Each of these components functions as an integral part of the final cover system and consequently must become a finished project during the course of construction. As a result, it is important that each layer or component of the cover system be completed to the design specifications prior to construction of successive or overlying layers. For this reason, it is both inefficient and impractical to withhold CQA testing until completion of the cover and it is necessary to conduct an ongoing CQA program during construction to verify a quality end product.

This document presents the geotechnical CQA criteria for construction of the earthwork and geosynthetic portions of the final cover system for the Gregory Canyon Landfill in San Diego County, California. This CQA Plan is to be used in conjunction with the Project Drawings and Specifications to ensure that the proposed final cover system is constructed in accordance with applicable regulatory guidelines.

1.1 PROJECT REQUIREMENTS

As currently proposed, final cover improvements for the Gregory Canyon Landfill will be composed of the following elements:

- Placement of a two (2) foot thick foundation layer composed of random soil materials;
- A 60-mil linear low-density polyethylene (LLDPE) geomembrane placed over prepared subgrade;
- A geocomposite drainage media placed over the LLDPE on relatively flat deck areas; and
- A two (2)-foot thick vegetative cover soil layer composed of approved on-site soil materials.

All materials used to construct the final cover must meet or exceed the criteria established for each particular layer of the system as indicated on the Project Drawings and Specifications. Any deviation from the Specifications must be pre-approved by the Geotechnical Consultant and/or Engineer.

2.0 RESPONSIBLE PARTIES AND DEFINITIONS

2.1 RESPONSIBLE PARTIES

The responsible parties for all post-closure construction activities, as set forth herein, are as follows:

<u>Landfill Owner/Operator</u>
Gregory Canyon Ltd.
160 Industrial Street, Suite 200
San Marcos, California 92708
Phone: (760) 471-2365

<u>Landfill Engineer</u>
Bryan A. Stirrat & Associates
1360 Valley Vista Drive
Diamond Bar, California 91765
Phone: (909) 860-7777

<u>Geotechnical CQA Consultant</u>
GeoLogic Associates
16885 W. Bernardo Drive, Suite 305
San Diego, California 92127
Phone: (858) 451-1136

2.2 DEFINITIONS

"Construction Manager" – Person(s) or firm(s) authorized by the Owner to manage and oversee the administration of the Construction Contract. All CQA functions will be under the direct authority of the Construction Manager. All coordination, reporting and issues related to non-compliance will be directed through the Construction Manager. In addition, he/she will participate with the Landfill Engineer and Geotechnical CQA Consultant in all decisions related to design issues, which arise during the course of construction.

"Contract or Contract Documents" - The Contract or Contract Documents shall consist of the Notice Inviting Bids, Instructions to Bidders, Proposal, Agreement, Faithful Performance Bond, Labor and Material Payment Bond, General Conditions, Supplementary General Conditions, Special Provisions, and drawings or plans.

"Contractor" - The firm responsible for all elements of construction. In this regard, the Contractor's responsibility includes but is not limited to: overexcavation and subgrade preparation; preparation of the supporting surfaces (generally soil) for the geosynthetic installation; installation of the geosynthetics; and placing earth materials over the installed synthetic systems. The Contractor is further responsible for all activities of Subcontractors including but not limited to the geosynthetics Subcontractor.

"Geomembrane" - An essentially impermeable synthetic material used as an integral part of a cover system. It is sometimes referred to as a FML, sheet, or panel. For this project, the geomembrane consists of 60 mil LLDPE.

"Geosynthetics" - A generic classification given to synthetic (man-made plastic and fabric) materials used in geotechnical and construction applications. Included are geomembrane liners, geotextiles, geosynthetic clay liner (GCL), geocomposites, geogrids, geocomposites and geocells. For this project, the term geosynthetics is used to refer to the geomembrane, geocomposite and geotextiles.

"Geosynthetic Subcontractor" - The firm, if other than the Prime Contractor, responsible for handling, storing, placing, seaming, and other aspects of the installation of the geosynthetics included in the cover system.

"Geotechnical CQA Consultant" - Geotechnical firm responsible for the design and specifications for earthwork and geosynthetic elements of the Project Drawings and Specifications. The Geotechnical CQA Consultant or his/her representative is also responsible for observing, testing, and documenting activities related to quality assurance for all geotechnical and geosynthetic aspects of construction except for engineering and survey control. All completed geotechnical work is subject to approval by the Geotechnical CQA Consultant.

"Geotechnical CQA Monitors" - The individuals working under the direction of the Geotechnical CQA Officer who are routinely involved in the construction process. Such personnel include "Geotechnical Technicians", "Field Engineers" and "Field Geologists" representing the Geotechnical CQA Consultant. CQA Monitors shall be experienced in landfill construction monitoring, compaction observation and testing during grading operations, and geosynthetic material observation, monitoring and documentation.

"Geotechnical CQA Officer" - The individual or firm serving under the direction of the Geotechnical CQA Consultant and responsible for the day to day geotechnical Construction Quality Assurance (CQA). The Geotechnical CQA Officer shall be a California registered civil engineer or a certified engineering geologist with specific experience in managing landfill final cover construction projects.

"Geotechnical CQA Project Director" - Geological/geotechnical professional registered in the State of California who, under the employ of the Geotechnical CQA Consultant is responsible for earthwork observation, monitoring and testing.

"Geotechnical Construction Quality Assurance for Earthwork" - The protocols to be followed in evaluating the adequacy of the Contractor's work with regard to all elements of earthworks construction with the exception of line and grade (survey) control. Said work shall include but need not be limited to all CQA activities delineated herein and in the Specifications. Geotechnical CQA is to be provided by a party independent of the Contractor.

"Geotechnical Quality Assurance for Geosynthetics" - The protocols to be followed in evaluating the quality of the Contractor's work with regard to all elements of geosynthetic installation with the exception of line and grade (survey) control. Said work shall include but need not be limited to all CQA activities delineated herein. Geotechnical CQA for geosynthetics is to be provided by a party independent of the liner manufacturer, Contractor and liner Subcontractor.

"Geotextile" - A permeable synthetic textile used with soil, rock, sand, gravel or any other similar materials as an integral part of the composite liner system. It can provide protection to other systems or serve to separate different materials.

"Independent Testing Laboratory" - The firm responsible for conducting selected tests of materials and/or products used for the project, such as conformance and destructive seam testing. The laboratory shall be independent of the Owner, County, Manufacturer, Geosynthetics Subcontractor and any party involved with the manufacture and/or installation of any product to be tested.

"Landfill Engineer" - The firm responsible for the design and preparation of the Project Drawings and Specifications. The Engineer or his representative is also responsible for observing, testing, and documenting activities related to quality

assurance for all aspects of construction. All completed work is subject to approval by the Engineer.

"Liner Manufacturer" - Firm(s) responsible for the production of the geosynthetic material.

"Liner Subcontractor" - The firm responsible for handling, storing, placing, seaming, and other aspects of the installation of the geosynthetics included in the project.

"Lot" - A quantity of relatively uniform geosynthetic material produced using a specific, identifiable constituent mix. For instance, the geomembrane manufacturer receives a specific resin batch from his/her supplier and produces from it a specific "Lot" of finished product.

"Owner" - The owner of the site, in this case Gregory Canyon Ltd.

"Project Documents" - All Contractor submittals, Construction Drawings, Record Drawings, "As-Built" Plans, Construction Specifications, CQA Plan, Health and Safety Plan and Project Schedule.

"Project Manager" - The Owner's designated representative responsible for the Project.

"Quality Assurance" - Actions taken by the Owner or his representative(s) necessary to evaluate whether the earthen and geosynthetic materials and workmanship meet the requirements of the Project Drawings and Specifications.

"Quality Control" - Actions taken by the Contractor, Subcontractors and/or Liner Manufacturer(s) to ensure that the earthen and geosynthetic materials and workmanship meet the requirements of the Project Drawings and Specifications.

"Work" - All tools, equipment, supervision, labor, and materials or supplies necessary to complete the project as specified herein and as shown on the Project Drawings.

3.0 GEOTECHNICAL CQA ORGANIZATION

The Geotechnical CQA Team will consist of design and field personnel with specific experience in the inspection and CQA monitoring of earthwork and geosynthetic materials and installation related to landfill cover construction. The principal categories of personnel assigned to the CQA team are presented below.

3.1 GEOTECHNICAL CQA PROJECT DIRECTOR

The Geotechnical Project Director shall be a representative of the Geotechnical CQA Consultant and shall have overall responsibility for all geotechnical CQA activities and have specific experience in managing landfill final cover construction projects.

The Geotechnical Project Director shall be a California registered civil engineer or certified engineering geologist and will be responsible for reviewing all earth material or excavation issues, which may arise during construction. The Geotechnical CQA Project Director's approval will be required for any earth or geosynthetic material modifications or for any design modifications, which may impact the performance of the earth or geosynthetic materials.

3.2 GEOTECHNICAL CQA OFFICER

The Geotechnical CQA Officer will serve as the Geotechnical Project Director's representative. All geotechnical CQA functions will be his/her direct responsibility. All coordination, reporting and issues related to non-compliance will be directed from the Geotechnical CQA Officer through the Construction Manager. In addition, the CQA Officer will participate with the Landfill Engineer and Geotechnical Project Director in all decisions related to design issues, which arise during the course of construction.

The Geotechnical CQA Officer shall be responsible for overall review of observation, sampling, and testing activities during construction. The CQA Officer shall have prior experience serving as the CQA Officer on similar final cover construction projects. Specific duties of the CQA Officer include, but are not limited to the following:

- Review of all Designs, Project Drawings, Specifications and Contractor Submittals.
- Implementation of the Geotechnical CQA Plan including assignment and management of CQA personnel; review of field reports; and geotechnical review of CQA related issues.
- Review of design changes and coordination of such changes with the Landfill Engineer.
- Familiarization of all Geotechnical CQA Monitors with the site and the Geotechnical CQA requirements.
- Attendance at all CQA related meetings, (i.e., preconstruction, progress and special meetings as required).
- Coordination of all field testing, sampling, and laboratory testing.
- Review of all field and laboratory test results and provide recommendations as appropriate.
- Review all Geotechnical CQA Monitors daily reports and logs for completeness and documentation.

- Notation of any on-site activities or conditions that could jeopardize the quality or function of the final cover system and reporting of these activities or conditions to the Construction Manager.
- Designation of a Senior Geotechnical CQA Monitor to act on his/her behalf at the site while he/she is absent and operations are ongoing.
- Reporting of any unresolved issues and/or deviations from the Geotechnical CQA Plan to the Construction Manager and/or the Landfill Engineer as appropriate.
- Preparation of the final "As-Built" report for all completed earthwork construction activities.
- Participation in the preparation of the Record Drawings.

3.3 GEOTECHNICAL CQA MONITORS

3.3.1 FIELD ENGINEER/FIELD GEOLOGIST

The Field Engineer/Field Geologist will be a representative of the Geotechnical CQA Consultant and will be assigned to monitor and evaluate earth materials conformance with the requirements of the Project Drawings and Specifications. Each Field Engineer/Field Geologist will have specific experience in landfill construction monitoring, compaction observation and testing during grading operations, and geosynthetic material observation, monitoring and documentation. Duties of the Field Engineer/Field Geologist typically include the following:

- Subgrade inspection, review, testing and documentation.
- Review of the adequacy of all clearing, grubbing, stripping and preparation of areas to receive fill.
- Monitoring and evaluation of any soil blending, mixing and processing operations.
- Evaluation of the engineering characteristics of the processed and constructed earth materials.
- Observation and evaluation of all excavations which may be impacted by geologic conditions.

3.3.2 GEOTECHNICAL CQA FIELD TECHNICIANS

Geotechnical CQA Technicians will be representatives of the Geotechnical CQA Consultant and will monitor and observe grading operations and geosynthetic installation to provide a basis for concluding that construction has been carried out in conformance with the Project Drawings and Specifications. Duties typically include, but are not necessarily limited to:

- Observation of subgrade surface preparation.
- Verification that cover soils are derived from appropriate sources.
- Visual evaluation of the soils physical properties for consistency with the Project Drawings and Specifications.

- Evaluation of all moisture conditioning and processing operations to evaluate uniformity of material and moisture content.
- Evaluation of the constructed engineered fill material for conformance with the Project Drawings and Specifications.
- Identification of deleterious materials or other deficiencies in soil characteristics to minimize the possibility that these materials are incorporated into the cover system.
- Monitoring of activities for the removal and/or disaggregation of all oversize material.
- Observation of uniformity of coverage of compaction equipment, especially at fill edges, turnaround areas and on slope faces.
- Monitoring of lift thickness.
- Observation of the active fill pad at the beginning of each grading day and establishment of requirements for wetting/drying and/or processing of exposed surfaces prior to placement of additional fill.
- Undertaking field tests including but not limited to field moisture/density testing at the minimum frequencies noted herein or at any time that a deficiency is suspected.
- Recovery of samples for laboratory testing.
- Evaluation and documentation of laboratory and field testing of the in-place moisture content and density of engineered fill materials in accordance with the requirements of the Specifications (including retests, if necessary).
- Confirmation that the test results are in accordance with the Project Specifications (including retests of any previously failed areas).

The operations to be monitored for geosynthetics typically include, but are not necessarily limited to:

- Material delivery.
- Unloading and on-site transport and storage.
- Placement/deployment operations.
- Joining and/or seaming operations.
- Repair operations.

Specifically, the seaming operations to be monitored include:

- Trial seams.
- Seam preparation.
- Seaming.
- Nondestructive seam testing.
- Sampling for destructive seam testing.
- Laboratory test sample marking.
- Repair operations.
- Reviewing the final certification of seams.

In addition to these specific duties, the Geotechnical CQA Technicians shall be responsible for:

- Observing the condition of geosynthetic materials as placed.
- Selecting samples for conformance testing by the Independent Testing Laboratory.
- Marking samples for conformance testing.
- Notation of any on-site activities that could result in damage to the geosynthetics.

All observations shall be reported in a timely manner to the Construction Manager.

3.4 INDEPENDENT TESTING LABORATORY

The Independent Testing Laboratory shall perform all conformance testing of geosynthetics and all destructive laboratory testing of field seams. The Independent Testing Laboratory shall be experienced in the performance of all conformance tests required by the CQA Plan and certified by the Geosynthetic Accreditation Institute (GAI) for each test required for the project.

4.0 MEETINGS

In order to facilitate construction of the final cover system, close coordination between the Project/Construction Manager, Landfill Engineer, Geotechnical CQA Consultant, Contractor (including appropriate Subcontractors) and Geotechnical CQA personnel is essential. To this end, the following meetings are typically scheduled:

4.1 PRE-CONSTRUCTION MEETINGS

A Pre-construction Meeting will be held at the site. At a minimum, the meeting should be attended by the Owner (or designated representative), the Construction Manager, the Landfill Engineer, the Geotechnical CQA Consultant (or designated representative), the Contractor and appropriate Geotechnical CQA staff.

In addition to the typical contract related agenda items, the following CQA specific items may also be reviewed:

- Any appropriate modifications to the Geotechnical CQA requirements.
- Development of a format for site specific documentation.
- Review of the CQA responsibilities of each individual or firm.
- Review of the lines of CQA authority and communication.
- Review of work area security and safety protocol.
- Review of the procedures for CQA project documentation and reporting, and distribution of documents and reports.

- Review of procedures for CQA submittals.
- Review of the Contractor's proposed methods of construction, (including equipment), with specific emphasis on the methods of select grading, soil mixing, stockpiling, processing, moisture conditioning and compaction.
- Review of the procedures for field and laboratory CQA testing.
- Establishment of procedures for correcting and documenting construction deficiencies.
- Conducting an initial site inspection to discuss work areas, stockpile areas, mixing tables, laydown areas, access roads, haul roads, and related items.

The meeting shall be documented by the Construction Manager and minutes shall be distributed to all parties.

4.2 PROGRESS MEETINGS

Progress Meetings shall be held in accordance with the Project Specifications. At a minimum, these meetings should be attended by the Owner (or designated representative), the Construction Manager, the Geotechnical CQA Officer and/or the Geotechnical CQA Monitors, and the Contractor. Progress meetings shall be documented by the Construction Manager or his/her representative and minutes shall be distributed to all parties. The purpose of these meetings is to:

- Discuss any health and safety related issues.
- Review scheduled work activities.
- Discuss project related problems.
- Review laboratory and field test data.
- Discuss the Contractor's personnel and equipment assignments.
- Review the previous week's activities/accomplishments and review/discuss work planned for the following week.

4.3 SPECIAL MEETINGS

Special meetings may be conducted as required to discuss problems or deficiencies. At a minimum, these meetings should be attended by the Construction Manager, appropriate Geotechnical CQA staff and the Contractor. If correction of a problem requires a design modification, the Landfill Engineer and the Geotechnical Project Director will also be present. The purpose of these meetings is to:

- Define and discuss any problems or deficiencies in the Project.
- Review possible corrective actions or solutions.
- Implement an action plan to resolve the problems or deficiencies.

Special meetings shall be documented by the Construction Manager or his/her representative and minutes shall be distributed to all parties.

5.0 GEOTECHNICAL CQA MONITORING FOR EARTH MATERIALS

5.1 GENERAL

Construction of the final cover system shall be performed in accordance with the Project Drawings and Specifications and shall be monitored, observed, and routinely sampled and tested by the Geotechnical CQA Monitors for the physical parameters described in this section.

The testing frequency presented herein is a minimum. Additional tests will be conducted by the Geotechnical CQA Monitor at any time that in the opinion of the Geotechnical CQA Monitor, additional testing is required and/or a deficiency is suspected. Retests of previously failed areas will be performed at the discretion of the Geotechnical CQA Monitor when, in his/her opinion, sufficient reworking of the area has been performed to warrant a retest.

5.2 COMPACTED FILL PLACEMENT

Material for compacted fills shall be obtained from approved borrow areas and conditioned as necessary to meet the requirements of the Project Specification. All fills shall be moisture conditioned as necessary and to the requirements of the Project Specifications, and compacted to a minimum of 90 percent compaction relative to ASTM D1557. Maximum Density/Optimum Moisture Content Testing (ASTM D1557) will be conducted at least every 5,000 c.y. or as deemed necessary by the Engineer. Field compaction testing will be conducted by nuclear gauge at a minimum frequency of four (4) test per 1,000 c.y. and evaluated by sand cone methods at a minimum frequency of one per 1,000 c.y. placed.

5.3 EXCAVATION AND PROCESSING

Selectively excavated on-site soils or approved import materials shall be screened (if necessary), to exclude particles in excess of one (1)-inch within one (1)-foot of the geosynthetics and three (3)-inches throughout the remainder of the fill. Fill soils will be dried, and/or moisture conditioned as necessary until uniformly blended material characteristics and moisture condition are attained. Processed, blended and moisture conditioned materials will then be used as engineered fill. No soils other than those approved by the Geotechnical CQA Consultant are to be used for the project.

5.4 ACCEPTANCE CRITERIA

5.4.1 GENERAL

Where test results indicate that the lift thickness, maximum particle size, homogeneity of material, moisture content or density of any portion of the work is below the project requirements, that particular portion shall be reworked or

replaced until the required condition has been attained and the resulting product meets or exceeds the requirements of the Project Specifications. No additional fill shall be placed over an area until the existing fill has been tested horizontally and vertically and determined by the Geotechnical CQA Monitor to meet the Project Earthwork Specifications. The area to be reworked will be verified by survey if in the opinion of the Geotechnical CQA Monitor conditions warrant.

5.4.2 MOISTURE CONTENT AND DENSITY

If in the opinion of the Geotechnical CQA Officer or designated representative, engineered fill materials which have been placed and/or are ready to be placed, do not visually have a uniform and homogeneous moisture content throughout the material in question, these materials will be removed, without testing, and will be reprocessed and/or reworked until, in the opinion of the Geotechnical CQA Officer or his/her designated representative, they meet the Project Specifications.

For all compacted fill materials placed, if test results indicate a relative dry density of less than that required or a moisture content outside the specified limits, then the area will be considered inadequate and will be reworked or replaced. Any reworked areas will be retested by the Geotechnical CQA Monitor to verify the reworked area meets the density and moisture content requirements.

The following table lists the minimum moisture/density requirements for compacted fill materials placed. The in-place moisture content and dry density requirements are relative to the maximum dry density and optimum moisture content as determined by ASTM D1557.

FILL TYPE	MINIMUM COMPACTION (percent)	MOISTURE CONTENT
Foundation Soil Layer	90	Optimum ± 2%
Vegetative Soil Layer	90	Optimum ± 2%

5.4.3 LIFT THICKNESS AND PROCESSING

If at any time the CQA Monitor observes an uncompacted lift thickness in excess of eight inches or observes material being placed without meeting the requirements for processing, stockpiling and curing, the Contractor shall immediately discontinue placing additional fills in that area. For an over thick lift, the Contractor shall immediately blade the surface to reduce the lift thickness to the Project Specifications prior to compaction. If inadequately mixed materials are placed, the Contractor shall immediately remove these materials and return them to the stockpile/processing area where they will be reprocessed.

5.4.4 GEOSYNTHETIC MATERIAL SUBGRADE

The CQA Monitor, the Contractor and the Geosynthetic installer will observe and approve the geosynthetic material subgrade prior to material deployment. The finished surface shall be free of abrupt breaks, sharp objects, or other foreign material which may damage the overlying geosynthetic. The subgrade shall be unyielding, smooth and uniform and the surface shall not be pebbly or tracked and rutted by equipment.

6.0 GEOTECHNICAL CQA MONITORING FOR GEOSYNTHETICS

6.1 GEOCOMPOSITE

The Contractor/Liner Manufacturer shall provide the Construction Manager with the following documentation:

- A properties sheet which includes all specified properties measured using test methods indicated in the Specifications.
- A description of the sampling procedure and appropriate test results.
- A certification that values given in the properties sheet are guaranteed by the Liner Manufacturer.

The Geotechnical CQA Officer shall verify that:

- The property values certified by the Liner Manufacturer meet or exceed the Project Specifications.
- The measurement of properties by the Liner Manufacturer is properly documented and the test methods used are acceptable.

Prior to shipment, the Contractor/Liner Manufacturer shall provide the Construction Manager with a quality control certificate for each roll of geocomposite. The quality control certificate shall be signed by a responsible person employed by the Liner Manufacturer, and shall include roll number and identification.

The Geotechnical CQA Officer shall:

- Verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls to be delivered.
- Review the quality control certificates and verify that the certified roll properties meet the Project Specifications.

6.1.1 GEOCOMPOSITE DELIVERY

The Contractor/Liner Subcontractor shall submit for approval by the Construction Manager, method(s) for handling and storage of geocomposite material(s) prior to installation. The Geotechnical CQA Monitor shall observe that:

- Equipment used to unload the rolls will not damage the geocomposite.
- Care is used to unload the rolls.
- All documentation required by the Specifications has been received.

Upon delivery at the site, the Geotechnical CQA Monitors shall conduct a surface inspection of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Monitors shall indicate to the Geotechnical CQA Officer any rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.

Any damaged rolls shall be rejected and removed from the site or stored at a location, designated by the Construction Manager separate from accepted rolls. All rolls which do not have proper documentation from the manufacturer shall also be stored at a separate geocomposite material(s) received shall be maintained by the Geotechnical CQA Monitors.

The Construction Manager shall designate storage space in a location (or several locations) on-site. Storage space shall be protected by the Contractor from theft, vandalism, damage from the actions of man, weather, animals and other sources. The Geotechnical CQA Monitors shall observe that the material is not stored directly in the ground and that storage of the geocomposite provides protection against damage pursuant to ASTM D4873.

6.1.2 GEOCOMPOSITE CONFORMANCE TESTING

6.1.2.1 Tests

Upon delivery of the geocomposite, the Geotechnical CQA Monitor shall ensure that samples are obtained and forwarded to a GAI Certified Independent Laboratory for testing of conformance with the design specifications. Conformance sampling and testing will be conducted in accordance with the Project Specifications.

- Thickness (ASTM D1777)
- Mass per unit area (ASTM D3776)
- Hydraulic Transmissivity (ASTM D4716)
- Carbon Black Content (ASTM D1603)
- Tensile strength (machine direction; ASTM D1682)

Where optional procedures are noted in the test method, the requirements of the Specifications shall prevail. Updated or alternative ASTM Test Methods may be used to determine the physical properties of the geocomposite materials at the discretion of the Construction Manager.

The results of Conformance Testing will be documented by the Geotechnical CQA Officer.

6.1.2.2 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first three (3) feet. Unless otherwise specified, samples shall be three (3) feet long by the roll width. The Geotechnical CQA Monitor shall mark the machine direction on the samples with an arrow and the Manufacturer's roll identification number.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 square feet, whichever results in the greater number of samples.

6.1.2.3 Test Results

The Geotechnical CQA Officer shall examine all results from the laboratory conformance testing. All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the geocomposite material represented by the sample shall be considered nonconformant with the Specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and the geotextile material can be accepted. If the second test fails, the Contractor/Liner Subcontractor shall remove all material represented by the sample from the work area. The decision of the Construction Manager shall be final.

6.1.3 GEOCOMPOSITE INSTALLATION

6.1.3.1 Surface Preparation

Prior to installation, the Construction Manager and Geotechnical CQA Monitors shall observe that:

- All lines and grades have been verified.
- The subgrade has been prepare din accordance with the Project Specifications and the supporting surface does not contain rocks or irregular surfaces which could damage the geocomposite.
- There are no excessively soft areas, which could result in damage to the geocomposite.

- All construction stakes and hubs have been removed.
- The Contractor/Liner Subcontractor has certified in writing that the surface on which the geocomposite will be installed is acceptable.

6.1.3.2 Placement

The Contractor/Subcontractor shall give each geocomposite panel an identification number, which shall be agreed to and used by the Geotechnical CQA Monitors and the Contractor/Liner Subcontractor. The Geotechnical CQA Monitor shall establish a chart showing correspondence between roll numbers, certification reports, and panel numbers.

During panel placement, the Geotechnical CQA Monitor shall:

- Observe the geocomposite as it is placed and record all defects and disposition of the defects (panel rejected, patch installed, etc.). All repairs are to be made in accordance with the Specifications.
- Observe that equipment used does not damage the geocomposite by handling, traffic, leakage of hydrocarbons, or other means.
- Observe that people working during installation of geocomposite do not smoke, wear shoes that could damage the geocomposite, or engage in other activities that could damage the geocomposite.
- Observe that the geocomposite is anchored to prevent movement by the wind.
- Observe that adjacent panels of geocomposite are overlapped a minimum of 18 inches where the fabric is not seamed (welded or sewn). When seamed, a three (3)-inch minimum overlap will be required.

The Geotechnical CQA Monitors shall inform both the Contractor/Liner Subcontractor and the Geotechnical CQA Officer if the above minimum conditions are not met.

The Contractor/Liner Subcontractor shall provide the Construction Manager with a panel layout plan, and shall update this plan daily as the job proceeds. No geocomposite shall be placed until the panel layout plan has been approved by the Construction Manager. During geocomposite placement, the Geotechnical CQA Monitors shall observe that:

- The geocomposite is cut only with an approved cutter, and is not torn or ripped.
- Geocomposite seaming equipment meet the Project requirements.
- The panels are being overlapped or joined in accordance with the Project Plans and Specifications.
- Any damaged roll of geocomposite is removed and replaced.

6.2 GEOMEMBRANE (LLDPE)

Delivery of geomembrane to the site will not be allowed until all required documentation and/or certifications are approved by the CM/Geotechnical CQA Team. It is the responsibility of the Contractor/Subcontractor to ensure that all required documentation and/or certifications are approved prior to shipment.

6.2.1 LLDPE MANUFACTURING

Prior to the delivery of any geosynthetic material, the Liner Manufacturer shall provide the Construction Manager with the following:

- A properties sheet for the rolls to be delivered including all specified properties measured using test methods indicated in the specifications.
- The sampling procedure and results of testing.
- A certification for each roll stating that property values given in the properties sheet are guaranteed by the Liner Manufacturer.
- The Geotechnical CQA Officer shall verify that:
  - The property values certified by the Liner Manufacturer meet the project specifications.
  - The measurements of properties by the Liner Manufacturer are properly documented and that the test methods used are acceptable.

- Prior to shipment, the Liner Manufacturer shall provide the Construction Manager with a quality control certificate for each roll of geomembrane. The quality control certificate(s) shall be signed by a responsible person employed by the Liner Manufacturer and shall include:
  - Lot and roll numbers and identification.
  - Sampling procedures and results of quality control tests. At a minimum, results shall be given for those properties identified in the Project Specifications.
  - The Geotechnical CQA Officer shall verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.
  - Review the quality control certificates and verify that the certified roll properties meet the specifications.

6.2.2 GEOMEMBRANE DELIVERY

Prior to delivery, all individual roll manufacturer certifications required by this document and/or the Project Specifications must be received and approved by the Construction Manager. Delivery of any unapproved roll will not be allowed and unapproved rolls will be transported off-site at the Contractors expense.

6.2.2.1 Transportation and Handling

All transportation and on-site handling of the geomembrane is the responsibility of the Contractor and Liner Subcontractor.

The Geotechnical CQA Officer shall observe the handling equipment used on the site and provide comment on whether it poses any risk of damage to the geomembrane. The Geotechnical CQA Officer will also observe the Contractor and Liner Subcontractor personnel's handling of the geomembrane and provide comment on whether appropriate care is being taken. Finally, the Geotechnical CQA monitor shall verify that all documentation required upon delivery has been received.

Upon delivery at the site, the Contractor, Liner Subcontractor and the Geotechnical CQA Monitor shall complete a surface observation of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Officer shall report the following to the Construction Manager:

- Rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.
- Rolls which visually include minor repairable flaws.

Any damaged rolls shall be rejected and removed from the site or be stored at a location separate from accepted rolls as designated by the Construction Manager. All rolls which do not have proper Liner Manufacturer's documentation shall be removed from the site at the Contractors expense until all required documentation has been received and approved.

A log of all LLDPE received shall be maintained by the Geotechnical CQA Monitors.

6.2.2.2 Geomembrane Storage

The Contractor and Liner Subcontractor shall be responsible for storage of the LLDPE on-site and shall ensure the storage is consistent with the Manufacturer's recommendations. The Contractor shall coordinate with the Construction Manager to ensure that storage space is provided in a location (or several locations) such that on-site transportation and handling are minimized. Storage space shall be protected by the Contractor and Liner Subcontractor from theft, vandalism, and damage from actions of man, weather, animals and other sources. The Geotechnical CQA Monitors shall observe that the materials are not stored directly on the ground and storage of the LLDPE is completed in a fashion that protects against damage.

6.2.3 LLDPE CONFORMANCE TESTING

6.2.3.1 Tests

Upon delivery of the LLDPE, the Contractor or Liner Subcontractor shall ensure that conformance samples are obtained and forwarded to the Independent Testing Laboratory at the frequency required for testing to ensure conformance with the Project Specifications. All conformance samples will be obtained in the presence of the Geotechnical CQA Monitor or his/her designated representative.

At a minimum, conformance tests will include determination of the following characteristics for the LLDPE:

- Density (ASTM D1505A).
- Tear Resistance (ASTM D1004 Die C).
- Carbon black content (ASTM D1603).
- Thickness (ASTM D5994).
- Tensile characteristics (yield strength, elongation at yield, break strength, elongation at break) (ASTM D638).
- Puncture resistance (ASTM D4833).

Where optional procedures are noted in the test method, the requirements of the Project Specifications shall prevail.

6.2.3.2 Sampling and Testing Frequency

Unless otherwise specified, conformance samples shall be taken and tested at a rate of one per lot or one per 100,000 square feet, whichever results in the greater number of tests.

6.2.3.3 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be 3 feet long by the roll width. The Geotechnical CQA Monitors shall mark the machine direction on the samples with an arrow, and the Liner Manufacturer's roll identification number.

6.2.3.4 Test Results

The results of Conformance Testing will be documented on appropriate forms. The Geotechnical CQA Officer shall examine all conformance test results and shall report any non-conformance to the Construction Manager, the Contractor and the Lining Subcontractor.

The Geotechnical CQA Officer shall examine all results from the laboratory conformance testing. All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the material represented by the sample shall be considered nonconformant with the Specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and the LLDPE material can be accepted. If the second test fails, the Liner Subcontractor shall remove all material represented by the sample from the work area.

All conformance test results must be approved by the Construction Manager prior to the LLDPE represented by the test being approved for deployment/installation. The decision of the Construction Manager shall be final.

6.2.4 LLDPE INSTALLATION

6.2.4.1 Earthwork

Surface Preparation

The Contractor shall be responsible for preparing the supporting soil according to the Project Specifications prior to installation of the LLDPE.

Prior to liner installation, the Contractor, Liner Subcontractor, Construction Manager and Geotechnical CQA Officer, shall verify that:

- All lines and grades have been checked by survey and approved by the Construction Manager.
- The subgrade has been prepared in accordance with the Project Specifications.
- The surface has been rolled and compacted to be free of surface irregularities, loose soil, and protrusions.
- The supporting soil surfaces are property prepared and contain no sharp protrusions that could damage the LLDPE.
- There are no excessively soft areas, which could result in LLDPE damage.
- All construction stakes, hubs or other items used for grade control and/or verification have been removed.
- All certification and testing of the underlying soils is complete and approved.
- The Liner Subcontractor has certified in writing that the surface on which the LLDPE will be installed is acceptable.

The certificate of acceptance shall be given by the Liner Subcontractor to the Contractor and the Construction Manager prior to commencement of LLDPE installation in the area under consideration. The Geotechnical CQA Monitors shall have a copy of this certificate before installation of LLDPE commences in any given area.

After the supporting surface has been accepted by the Contractor and Liner Subcontractor, it shall be the Contractor and Liner Subcontractor's responsibility to indicate to the Construction Manager any change in the condition of the supporting surface that may require repair work. If the Construction Manager concurs with the Contractor and Liner Subcontractor, then the Construction Manager shall coordinate the repair of the supporting surface. The subject area will also be observed by the Geotechnical CQA Monitors who shall have the authority to reject an area even after it has been accepted by the Contractor and Liner Subcontractor.

Anchor Trench

Anchor trenches shall be excavated to the lines and widths shown on the Project Drawings, prior to LLDPE placement. The Geotechnical CQA Monitors shall observe that the anchor trenches have been constructed according to the project documents.

Slightly rounded corners shall be provided where the LLDPE adjoins the trench so as to avoid sharp bends in the LLDPE. No loose soil shall be allowed to underlie the LLDPE in the anchor trench.

Anchor trench backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557) as outlined in the Specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geotechnical CQA Monitors shall observe the backfilling operation and advise the Construction Manager of any problems.

6.2.4.2 LLDPE Placement

Field Panel Identification

A field panel (sheet) is a discrete and integral area of geomembrane which is to be seamed in the field along the edges to other field panels (i.e., a field panel is a roll or a single portion of a single roll). The Contractor or Liner Subcontractor shall assign each panel over 25 ft square feet an identification code, which shall be agreed to and used by the Geotechnical CQA Monitors, Construction Manager, Contractor and the Liner Subcontractor. The Contractor or Liner Subcontractor shall locate the code with identifying roll number near the middle of panels less than 50 feet in length and at both ends of any panel over 50 feet in length. The Geotechnical CQA Monitors shall establish a chart showing correspondence between roll numbers, certification reports, and the panel identification code. The field panel identification code shall be used for all Geotechnical CQA records. A geomembrane panel placement log will be maintained by the Geotechnical CQA Monitors.

Field Panel Placement

The Geotechnical CQA Monitors shall record the identification code, location and date of installation of each field panel.

During panel placement, the Geotechnical CQA Monitors shall:

- Verify that field panels are installed in general accordance with the panel layout plan, as approved or modified by the Construction Manager/Landfill Engineer.
- Observe the panel surface as it is deployed and record all panel defects and disposition of the defects. All repairs are to be made in accordance with the Specifications.
- Observe that the equipment used does not damage the LLDPE by handling, trafficking, leakage of hydrocarbons, or by other means.
- Observe that the surface beneath the LLDPE has not deteriorated since previous acceptance.
- Observe that there are no stones, construction debris, or other items beneath the LLDPE, which could cause damage.
- Observe that the LLDPE is not dragged across an unprepared surface. If the LLDPE is dragged across an unprepared surface, it shall be inspected for scratches and repaired or rejected, if necessary.
- Observe that the method used to unroll the panels does not cause scratches or crimps in the LLDPE and does not damage the supporting soil surface.
- Record weather conditions including temperature, wind, and humidity. The LLDPE shall not be deployed in the presence of excess moisture (fog, dew, mist, etc.), high winds and extreme temperatures as determined by the Geotechnical CQA Officer.
- Observe that people working during the installation of LLDPE do not smoke, wear shoes, or engage in activities that could damage the LLDPE.
- Observe that the method used to deploy the panel minimizes wrinkles and that the panels are anchored to prevent movement by the wind.
- Observe that direct contact with the LLDPE is minimized; (i.e., the LLDPE is protected by geotextiles, extra LLDPE, or other suitable materials, in areas where excessive traffic may be expected).

The Geotechnical CQA Monitors shall inform the Contractor, the Liner Subcontractor and the Construction Manager if the above conditions are not met.

After placement and prior to seaming, the Geotechnical CQA Monitors shall inspect each panel for damage. The Geotechnical CQA Monitors shall advise the Construction Manager which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected shall be marked and their removal from the work area recorded by the Geotechnical CQA Monitors.

6.2.4.3 Field Seaming

The Contractor shall provide the Construction Manager and Geotechnical CQA Officer with a seam and panel layout plan and shall update this plan daily as the job proceeds. No panels shall be seamed until the panel layout plan has been approved by the Construction Manager. A seam numbering system shall be agreed to by the Geotechnical CQA Monitors, Construction Manager, Contractor and Liner Subcontractor prior to the start of seaming operations.

Prior to seaming, each seaming apparatus (welder) shall be tested in accordance with the Specifications to determine if the equipment is functioning properly. The Geotechnical CQA Monitors shall observe all trial weld operations and record the results. It is important that the trial welds be completed under conditions similar to those under which the panels will be seamed. If at any time the Geotechnical CQA Monitor believes that an operator or seaming apparatus is not functioning properly, a test shall be performed on a trial weld. If there are large changes in temperature, humidity, or wind speed, the trial weld test shall be repeated. Laboratory tests may be carried out at the discretion of the Geotechnical CQA Monitors to verify field test results.

During seaming operations the Geotechnical CQA Monitors shall observe that:

- The Liner Subcontractor has the number of welders and spare parts agreed to in the pre-construction meeting.
- Equipment used for seaming will not damage the LLDPE.
- The extruder is purged prior to beginning a seam until all the heat-degraded extrudate is removed (extrusion welding only).
- Seam grinding has been completed less than 1 hour before seam welding (extrusion welding only).
- The ambient temperature measured 6 inches above the LLDPE surface is between 40 and 105 degrees Fahrenheit and relative humidity is less than 80 percent.
- The end of welds more than 5 minutes old, are ground to expose new material before restarting a weld (extrusion welding only).
- The weld is free of dust and other debris.
- For cross seams, the seam is ground to a smooth incline prior to welding.
- The seams are overlapped in a downgradient direction with a minimum overlap of 4 inches.
- No solvents or adhesives are present in the seam area.
- The procedure used to temporarily hold the panels together does not damage the panels and does not preclude Geotechnical CQA testing.
- The panels are being seamed in accordance with the Project Plans and Specifications using approved equipment with gauges giving applicable temperatures.
- There is no free moisture in the weld area.

- The electric generator is placed on a smooth base such that no damage occurs to the LLDPE.
- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after use.
- The geomembrane is protected from damage in heavily trafficked areas.

The Geotechnical CQA Monitors shall log all appropriate temperatures and conditions, and shall log and report to the Geotechnical CQA Officer any non-compliance.

Trial Seams

Trial seam samples are not removed from installed seams, but are made along side the seaming work area by the Liner Subcontractor using a fragment of the same LLDPE sheet and the same installation procedures as for the LLDPE installation itself. As such, they are considered nondestructive samples. Such trial seams shall be made at the beginning of each seaming period (start of day, mid-day, and anytime the equipment is shut down or the seaming operation is suspended for more than 1/2 hour) for each piece of seaming equipment used that day. In addition, each welder shall make at least one trial seam each day. Trial seams shall be made under the same conditions as those anticipated for actual seams.

The trial seam sample shall be at least 3 ft. long by 1 ft. plus the seam width wide (after seaming) with the seam centered lengthwise. Seam overlap shall be as per the Specifications.

Two opposite specimens, each 1-inch wide, shall be cut from the trial seam sample by the Contractor and/or Liner Subcontractor. Under the observation of a Geotechnical CQA Monitor, the specimens shall be tested by the Liner Subcontractor in shear and peel using a field tensiometer to verify that seams satisfy peel and tensile strength requirements. If a specimen fails, the seaming equipment and seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full trial welds are achieved. After completing a successful trial/nondestructive sample, the Contractor and/or Liner Subcontractor shall cut a 2' x 2' remnant from the sample and mark the welder number, date, time, ambient temperature, welder temperature, and speed and submit it to the Geotechnical CQA Monitor who will assign an identification number and enter the information on the non-destructive sample form.

The results of field tests carried out on trial seams shall be documented by the Geotechnical CQA Monitors.

General Seaming Procedure

Unless otherwise specified, the general seaming procedure to be used by the Contractor and/or Liner Subcontractor shall be as follows:

- All LLDPE seams shall be overlapped a minimum of four (4) inches.
- "Fishmouths" or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut "fishmouths" or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same LLDPE extending a minimum of 6 inches beyond the cut in all directions. All corners of the patch shall be rounded with a 1-inch minimum radius.
- Adjacent to anchor trenches, seaming shall extend up the panels a minimum of 12 inches past the crest of the anchor trench.
- All cross seams shall be offset at least two feet from the cross seam of the adjacent panel and be extrusion or wedge welded where they intersect.

The Geotechnical CQA Monitors shall observe that the above seaming procedures are followed, and shall inform the Construction Manager if they are not.

6.2.5 CONSTRUCTION TESTING

6.2.5.1 Nondestructive Seam Testing

The Contractor and/or Liner Subcontractor shall non-destructively test all field seams over their full length using a vacuum test unit, spark detector, or an air pressure test (for double wedge fusion seams only), as described below. The purpose of nondestructive tests is to check the continuity of seams. It does not provide any information on seam strength. Continuity testing shall be carried out as the seaming work progresses, not at the completion of field seaming.

Visual Inspection

All seams shall be visually evaluated by the Contractor and/or Liner Subcontractor as the installation progresses and again at completion of the installation. Defective and questionable sections shall be clearly marked and repaired as necessary.

Vacuum Box Testing

If the fillet weld, extrusion lap weld or single hot-wedge fusion lap weld technique is used to weld seams, the Contractor and/or Liner Subcontractor shall further test all seams and repairs in the LLDPE by vacuum box. The vacuum box shall be an American Vacuum Seam Tester, Series A100 as manufactured by American Parts and Service Company, Alhambra, California, or an approved equal. All vacuum box testing shall be done in the presence of the Geotechnical

CQA Monitor. The area to be tested shall be cleaned of all dust, debris, dirt and other foreign matter. A soap solution shall be applied to the test area with a brush, paint roller or spray bottle and a minimum vacuum of 10 inches of mercury (Hg) (5 psi) shall be induced and held as long as necessary to visually inspect and mark for repair any suspicious areas as evidenced by bubbles in the soap solution.

Spark Testing

If the fillet weld is used to weld seams, the Contractor and/or Liner Subcontractor may, in lieu of vacuum box testing, test all seams and repairs in the LLDPE liner by using a high voltage spark detector, similar to Tinker and Rasor Holiday Detector (Model AP-W). The setting of the detector shall be 20,000 volts. In order to conduct this test, all seams to be tested shall be provided with 24-30 gauge copper wires properly embedded in the seams and grounded. All spark testing shall be done in the presence of the Geotechnical CQA Monitor. All defective areas shall be marked for repair.

Air Pressure Test

If the double hot-wedge welding technique is used, the Contractor and/or Liner Subcontractor shall further test all seams in the LLDPE lining by using the air pressure test which consists of inserting a needle with gauge in the air space between welds. Air shall be pumped to 40 psi within the weld void and held for at least 5 minutes. If the pressure loss exceeds 2 psi within the weld void during air pressure testing, the outside weld edge (not free edge) shall be sprayed with a soap solution and visually examined for bubbles. If no bubbles appear, the problem is with the inside weld and the seam is acceptable. If any bubbles appear, the defect shall be repaired by extrusion welding and tested by vacuum box and spark detector.

If pressure loss is not more than 2 psi, the opposite end of the seam will be punctured to release the air. If a blockage is present, it will be located and tests on both sides of the blockage will be completed. All penetration holes created during testing shall be sealed by patching and extrusion welding.

Responsibilities of the Geotechnical CQA Monitors

The Geotechnical CQA Monitor/Manager shall:

- Observe and record the continuity of all testing.
- Record the location seam/panel number, date, time, equipment number, Geotechnical CQA Monitor name, test number, welding technician's name, weld, sheet and ambient temperatures and results of all testing.
- Mark the failed areas with a waterproof marker compatible with the lining material and inform the Contractor and/or Liner Subcontractor and the Construction Manager of any required repairs.

- Observe that all testing is completed in accordance with the Project Specifications.
- Observe that all repairs are completed and tested in accordance with the Project Specifications.

6.2.5.2 Destructive Seam Testing

Destructive seam tests shall be performed at selected locations. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

Destructive sampling involves samples that have been removed from the installed field seams by the Contractor/Liner Subcontractor. Test locations shall be determined at the discretion of the Geotechnical CQA Monitors and the Contractor/Liner Subcontractor shall not be informed in advance of the locations where the seam samples will be made or will be removed.

Destructive samples shall be delivered to the Geotechnical CQA Officer by the Contractor/Liner Subcontractor and shipped to the Independent Testing Laboratory. All costs associated with the collection, repair, shipping and testing of destructive samples will be borne by the Contractor/Liner Subcontractor.

A minimum of <u>one destructive sample per 500 feet of field seam</u> shall be obtained. This average frequency will be used for the entire installation with the actual frequency of samples based on performance as determined by the Geotechnical CQA Officer.

Additional samples may be removed if the Geotechnical CQA Monitor observes a suspect seam.

6.2.5.3 Sampling Procedures

Samples shall be made or removed by the Contractor/Liner Subcontractor at locations selected by the Geotechnical CQA Monitors as the seaming operation progresses. The Geotechnical CQA Monitor shall:

- Observe making and/or removal of samples.
- Mark each sample with an identifying number, which contains the seam number. (For nondestructive samples the seam number welded just prior to making a sample will be marked on the sample).
- Record sample location on the panel layout drawing and enter the information on a Destructive Sample Log Form.
- Record the sample location, date and time taken, weather conditions, and reason the sample was made and/or taken (e.g., random sample, visual appearance, result of a previous failure, etc.).

- Mark sample identifying number on LLDPE adjacent to the location where the sample was taken.

All holes in the LLDPE resulting from destructive seam sampling shall be immediately repaired in accordance with repair procedures described herein. The continuity of the new seams in the repaired area shall be tested according to procedures described herein.

6.2.5.4 Size of Samples

Two types of samples shall be made or removed at each location. First, two samples shall be removed for field testing. Each of these samples shall be 1-inch wide with a length of 12 inches plus the seam width. For destructive sampling, the sample shall be taken perpendicular to the seam and the distance between these two samples shall be 38 inches. Samples designated for laboratory testing shall be that portion of seam located between the two samples taken for field testing. The samples for laboratory testing shall be 36 inches long with a width of 12 inches plus the seam width. The seam shall be centered lengthwise. The samples for laboratory testing shall be cut into three equal parts and distributed as follows:

- One part for the Independent Testing Laboratory for testing.
- One part to the Contractor/Liner Subcontractor.
- One part to the Construction Manager for archive storage.

6.2.5.5 Field Testing

The two 1-inch wide samples shall be tested in the field for peel adhesion and bonded seam strength (shear) by the Contractor/Liner Subcontractor, and shall not fail in the seam, but shall have a film tearing bond (FTB). If one or both of the samples fails in either peel or shear, the Contractor/Liner Subcontractor can, at his/her discretion, (1) reconstruct or cap strip the seam between passed test locations, or (2) take two additional test samples 10 feet on either side of the point of the failed test and repeat this procedure. If the second test passes, the Contractor/Liner Subcontractor shall reconstruct or cap strip the same between the two passed test locations. If subsequent tests fail, the procedure is repeated until the length of the poor quality seam is established. Repeated failures indicate that either the seaming equipment and/or operator is not performing properly, and appropriate action shall be taken.

6.2.5.6 Laboratory Testing

Once the field tests have passed, a sample shall be recovered from between passing field sample locations for testing by the GAI approved Independent Testing Laboratory. Destructive test samples shall be packaged and shipped to the laboratory by the Geotechnical CQA Monitors and will be handled in a

manner which will not damage the test sample. The Construction Manager will be responsible for storing the archive samples.

All specimens of a field weld sample tested by the Independent Testing Laboratory shall pass. If any specimen fails, the entire sample shall be considered as a failure, and the field weld shall be rejected. In this event, the field seam(s) shall be rejected as being nonconformant with the Specifications, and corrective measures shall be implemented.

For destructive samples that have failed, corrective measures shall include a rerun of the weld test using the same sample. If the second test passes, the Geotechnical CQA Monitor may assume an error was made in the first test and the field seam may be accepted. If the second test fails, the Contractor/Liner Subcontractor shall reconstruct or cap strip the field seam between any two previous passed seam locations, which include the failed seam or shall go on both sides of the failed seam location (10-feet minimum), take another sample each side and test both in the independent laboratory.

If both samples pass, the Contractor/Liner Subcontractor shall reconstruct or cap strip the field seam between the two passing locations. If either fails, the Contractor/Liner Subcontractor shall repeat the process of taking samples for testing by the Independent Testing Laboratory. In all cases, acceptable field seams must be bounded by two passed test locations. In cases involving more than 50 feet of reconstructed or cap stripped seam, the reconstructed or cap stripped seam shall also be tested. The results of the Independent Testing Laboratory govern seam acceptance. In no case shall field testing of installed seams be used for final acceptance.

Testing shall include peel adhesion and bonded seam strength (shear; ASTM D6392). At least five specimens each shall be tested for peel and sheer. Minimum test values are presented in the Specifications. The Independent Testing Laboratory shall provide test results within 24 hours after receipt of samples for testing. Certified test results shall be provided within 5 days. The Geotechnical CQA Monitor shall document all test results on appropriate forms and shall immediately notify the Geotechnical CQA Officer, Construction Manager and/or Contractor/Liner Subcontractor in the event of a failed test.

The Contractor/Liner Subcontractor's laboratory test results shall be presented to the Geotechnical CQA Officer for comments.

6.2.6 DEFECTS AND REPAIRS

6.2.6.1 Identification

All seams and non-seam areas of the LLDPE shall be examined by the Geotechnical CQA Monitors for identification of defects, holes, blisters,

undispersed raw materials and any sign of contamination by foreign matter. Because light reflected by the LLDPE helps to detect defects, the surface of the LLDPE shall be clean at the time of examination. The LLDPE surface shall be cleaned by the Contractor/Liner Subcontractor if the amount of dust or mud inhibits examination.

Each suspect location as identified by the Geotechnical CQA Monitors, both in seam and non-seam areas, shall be non-destructively tested using the methods described herein, as appropriate. Each location which fails the nondestructive testing shall be marked by the Geotechnical CQA Monitor and then repaired and re-tested by the Contractor/Liner Subcontractor. Work shall not proceed with any materials that will cover locations that have been repaired until laboratory test results with passing values have been obtained.

6.2.6.2 Repair Procedures

Any portion of the LLDPE with a flaw or which fails a nondestructive or destructive test shall be repaired in accordance with the Specifications. The Geotechnical CQA Monitor shall locate and describe all repairs on the appropriate forms. Repair procedures include:

- Patching - used to repair large holes, tears, large panel defects, and destructive sample locations that are less than 25 ft^2 in total area.
- Extrusion - used to repair relatively small defects in panels and seams.
- Capping - used to repair failed welds or liner seams where welds cannot be non-destructively tested.
- Removal - used to replace areas with large defects where the preceding methods are not appropriate. Also used to remove excess material (wrinkles) from the installed LLDPE.

6.2.6.3 Seam Test Summary

Documentation of all nondestructive and destructive seam testing results, including repairs, shall be summarized by the Geotechnical CQA Officer.

6.2.7 WRINKLES

When placing soil or drain materials over the LLDPE, temperature changes or creep may cause wrinkles to develop in the LLDPE. Any wrinkles that can fold over shall be repaired either by cutting out excess material or, if possible, allowing the LLDPE to contract due to temperature reduction. In no case shall material be placed over the LLDPE that could result in the LLDPE folding. All folded LLDPE shall be removed. No material shall be placed in areas where liner is not in contact with the supporting subgrade.

6.2.8 ANCHOR TRENCH

The anchor trench shall be adequately drained to prevent ponding or softening of the adjacent soils while the trench is open. The anchor trench shall be backfilled and compacted as outlined in the Specifications. Fill soils shall consist of on-site granular soil essentially free of organic and deleterious material and approved by the Geotechnical CQA Monitor and Construction Manager. The material shall have a maximum particle size of 1 inch.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geotechnical CQA Monitor shall observe the bottom of the trenches prior to fill placement to ensure they are free of loose and disturbed materials. The Geotechnical CQA Monitor shall also observe the backfilling and compaction operation, and shall notify the Geotechnical CQA Officer and the Construction Manager of work performed not in accordance with the Project Specifications.

6.2.9 LLDPE ACCEPTANCE

The Contractor/Liner Subcontractor shall retain all ownership and responsibility for the LLDPE until acceptance by the Owner. The LLDPE shall be accepted by the Owner when:

- The installation is finished and approved.
- All seams have been inspected and approved.
- All required laboratory tests have been completed and approved.
- All required Contractor/Liner Subcontractor supplied documentation has been received and approved.
- All record drawings have been completed and approved.

6.2.10 LINER MATERIALS

The Geotechnical CQA procedures indicated in this section are intended to allow the installation of materials in contact with the geosynthetics without causing damage to the LLDPE.

Important points for Quality Assurance of materials in contact with LLDPE include:

- A geotextile or drainage medium approved by the Construction Manager shall be installed above the LLDPE.
- Equipment used for placing soil shall not be driven directly on the LLDPE.
- In heavily trafficked areas, such as access ramps, soil thickness should be at least three (3) feet.
- Placement of soils, gravels, sand or other types of earth materials on top of the LLDPE shall not be performed until all destructive and nondestructive testing

has been performed and accepted. Placement of overlying earth materials shall be performed in a manner to minimize wrinkles. Equipment operators shall be briefed on methods of placement relative to thermal expansion and contraction of the LLDPE.

- Soil material(s) placed on top of the LLDPE shall be stockpiled and displaced off the stockpile to create a cascading effect of the material on top of the LLDPE.

The Geotechnical CQA Monitors shall inform the Geotechnical CQA Officer if the above conditions are not fulfilled.

7.0 DOCUMENTATION

To provide evidence of satisfactory work performance, all stages of liner construction shall be documented. The information shall be recorded on a standardized form or in a bound field logbook.

7.1 DAILY SUMMARY REPORTS

The purpose of daily summary report is to provide a chronological framework for identifying and recording all other reports. Inspection data sheets will record construction activities, including: results of continuous visual observations; laboratory/field test data; sampling; review of test results; repairs; problems; solutions; and general field activity. The daily summary report will include a daily field inspection report and a daily test summary report, as discussed below.

7.1.1 DAILY FIELD INSPECTION REPORT

The Geotechnical CQA Monitor(s) shall keep a daily field inspection report of project activities. At a minimum, this report shall include the following:

- Date and project identification.
- Field activity and work locations.
- Summaries of field communications.
- Summary of equipment used and personnel performing work (i.e. superintendent, welders, etc.).
- Work activity monitored, its general location on-site, and any related test results.
- Record of material sampling and testing activities.
- Any variance from specified methods and standards.
- Estimated quantities of material placed and compacted.
- Unusual events.
- Actions regarding acceptance/rejection of work.
- Identification of construction problems and their solution or disposition summarized into a corrective measures report.

- Weather conditions.
- Signature of person preparing the report.

The corrective measures report will include detailed descriptions of materials and /or workmanship that do not meet a specified design and will be cross referenced to the specific inspection data sheets where the problem was identified and corrected.

7.1.2 DAILY TEST SUMMARY REPORT

A daily test summary report of the field and laboratory tests conducted for the CQA of the earth materials portion of the cover will be prepared under the direction of the Geotechnical CQA Officer. The daily test summary report will include:

- Locations and results of all field and laboratory tests with pass/fail comment.
- Results of all retests for failed areas with remarks showing the corrective action taken before the retests. If retest(s) also show a rejection, final corrective action shall be noted.

Both the daily field inspection report and the daily test summary report shall be reviewed by the Geotechnical CQA Officer and shall be submitted to the Construction Manager. One complete set of both the daily reports and test summary report shall be kept on-site by CQA personnel at all times.

7.2 ACCEPTANCE REPORTS

Acceptance Reports shall be prepared by the Geotechnical CQA Officer and submitted to the Construction Manager. Each Acceptance Report shall include the above daily reports (Section 7.1) and summarize the work activities, deficiencies, and corrective action implemented. These reports will indicate that the materials and construction processes have been completed according to the specified design. These reports will be included in the project files and available to regulatory agencies upon request.

7.3 PHOTO DOCUMENTATION

A photographic record shall be prepared by the Construction Manager as part of the construction control activities. Photographs shall be in color and shall include photographs of construction activities, problem areas, corrective actions, and final constructed features. Photographs shall be identified with the landfill site designation, the date taken, the location, and a description of the activity covered by the photograph.

7.4 AS-BUILT DOCUMENTATION

As the work is completed, a final Geotechnical As-Built report shall be prepared under the direction of the Geotechnical CQA Consultant utilizing the results of tests and observations completed during construction to document that the CQA Plan was implemented as proposed and that construction proceeded in accordance with design criteria, plans and specifications. This As-Built report shall include a laboratory test results summary and documentation of typical construction conditions and procedures. The As-Built report will be signed by the CQA Officer, who is a registered civil engineer or certified engineering geologist and submitted to the Owner. Upon completion, the facility will store all original documents so that they are protected from damage throughout the post-closure maintenance period, yet can be readily accessed.

APPENDIX N

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE LINER SYSTEM

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE COMPOSITE LINER SYSTEM AT GREGORY CANYON LANDFILL

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GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE COMPOSITE LINER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS

SECTION		PAGE
1.0	**INTRODUCTION**	**1**
1.1	Project Requirements	2
2.0	**RESPONSIBLE PARTIES AND DEFINITIONS**	**3**
2.1	Responsible Parties	3
2.2	Definitions	4
3.0	**GEOTECHNICAL CQA ORGANIZATION**	**6**
3.1	Geotechnical Project Director	6
3.2	Geotechnical CQA Officer	7
3.3	Geotechnical CQA Monitors	8
3.3.1	Field Engineer/Field Geologist	8
3.3.2	Geotechnical CQA Technicians	9
3.4	Independent Testing Laboratory	10
4.0	**MEETINGS**	**11**
4.1	Pre-Construction Meetings	11
4.2	Weekly Progress Meetings	12
4.3	Special Meetings	12
4.4	Geosynthetic Material Pre-Installation Meeting	12
4.5	Daily Progress Meetings (if necessary)	13
4.6	Manufacturing Plant Visit(s)	14
5.0	**GEOTECHNICAL CQA MONITORING FOR EARTH MATERIALS**	**14**
5.1	General	14
5.2	Low Permeability Materials	15
5.3	Demonstration Fill (Test Fill Pad)	15
5.4	Low Permeability Fill Placement	17
5.5	Acceptance Criteria	17
5.5.1	General	17
5.5.2	Moisture Content and Density	17

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE COMPOSITE LINER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS (CONT'D)

SECTION **PAGE**

5.5.3 Permeability 18
5.5.4 Lift Thickness and Processing 18
5.5.5 Geomembrane Subgrade 19

6.0 GEOTECHNICAL CQA MONITORING FOR GEOSYNTHETICS 19

6.1 Geomembrane (HDPE) 19
6.1.1 HDPE Manufacturing 19
6.1.2 Geomembrane Delivery 20
6.1.2.1 Transportation and Handling 20
6.1.2.2 Geomembrane Storage 21
6.1.3 HDPE Conformance Testing 21
6.1.3.1 Tests 21
6.1.3.2 Sampling and Testing Frequency 22
6.1.3.3 Sampling Procedures 22
6.1.3.4 Test Results 22
6.1.4 HDPE Installation 23
6.1.4.1 Earthwork 23
6.1.4.2 HDPE Placement 24
6.1.4.3 Field Seaming 26
6.1.5 Construction Testing 29
6.1.5.1 Nondestructive Seam Testing 29
6.1.5.2 Destructive Seam Testing 31
6.1.5.3 Sampling Procedures 31
6.1.5.4 Size of Samples 32
6.1.5.5 Field Testing 32
6.1.5.6 Laboratory Testing 33

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE COMPOSITE LINER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS (CONT'D)

SECTION **PAGE**

6.1.6 Defects and Repairs 34
6.1.6.1 Identification 34
6.1.6.2 Repair Procedures 34
6.1.6.3 Seam Test Summary 35
6.1.7 Wrinkles 35
6.1.8 Anchor Trench 35
6.1.9 HDPE Acceptance 35
6.1.10 Liner Materials 36
6.2 Geosynthetic Clay Liner (GCL) 36
6.2.1 GCL Delivery 37
6.2.2 GCL Conformance Testing 38
6.2.2.1 Tests 38
6.2.2.2 Sampling Procedures 38
6.2.2.3 Test Results 38
6.2.3 GCL Installation 39
6.2.3.1 Surface Preparation 39
6.2.4 Repairs 40
6.3 Geotextiles 40
6.3.1 Geotextile Delivery 41
6.3.2 Geotextile Conformance Testing 42
6.3.2.1 Tests 42
6.3.2.2 Sampling Procedures 42
6.3.2.3 Test Results 43
6.3.3 Geotextile Installation 43
6.3.3.1 Surface Preparation 43
6.3.3.2 Placement 43
6.3.4 Repairs 44

GEOTECHNICAL CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE COMPOSITE LINER SYSTEM AT GREGORY CANYON LANDFILL

TABLE OF CONTENTS (CONT'D)

SECTION **PAGE**

6.4 Geocomposite 45
6.4.1 Geocomposite Delivery 45
6.4.2 Geocomposite Conformance Testing 46
6.4.2.1 Tests 46
6.4.2.2 Sampling Procedures 46
6.4.2.3 Test Results 47
6.4.3 Geocomposite Installation 47
6.4.3.1 Surface Preparation 47
6.4.3.2 Placement 47
6.4.4 Repairs 48

7.0 DOCUMENTATION 49
7.1 Daily Summary Reports 49
7.2 Observation and Test Data Reports 49
7.3 Construction Corrective Measures Reports 50
7.4 Design and Specification Revisions 50
7.5 Photographs 50
7.6 As-Built Plans 51
7.7 Final Certification Report 51

1.0 INTRODUCTION

A Construction Quality Assurance (CQA) program consists of selected testing, inspection and documentation of a final construction product in order to provide the Owner/Agencies an evaluation of whether the end product is of the specified quality of materials and workmanship. Because of possible conflicts of interest, the Contractor should not undertake the CQA function directly. Rather, CQA inspection and testing should be left under the objective authority of a single team of inspection professionals.

A Construction Quality Control (CQC) program consists of selected tests and inspections performed by the Contractor during production which can assist the Contractor in producing the quality product required. While the CQC function is the sole responsibility of the Contractor, the Project Manager may, at his/her discretion, provide information regarding the ongoing CQA monitoring for the Contractor's use in implementing his/her CQC function. Release of the CQA data to the Contractor is for convenience only and, in no way, relieves the Contractor from their responsibility to fulfill the project requirements.

The composite liner system proposed for the GCLF consists of individual discrete layers of earth and synthetic materials which will function as a unit to form the containment system for the waste management area. A geocomposite drainage layer and additional layers of GCL and geomembrane will also be installed on benches and under the LCRS mainline as shown on the Project Drawings.

Each of these components functions as an integral part of the composite liner system and consequently must become a finished product during the course of construction. As a result, it is important that each layer or component of the composite liner be completed to the design specifications prior to construction of successive or overlying layers. For this reason, it is both inefficient and impractical to withhold CQA testing until completion of the liner and it is necessary to conduct an ongoing CQA program during construction.

This document presents the geotechnical Construction Quality Assurance (CQA) Plan for installation of the earthwork and geosynthetic components of the composite liner system for the Gregory Canyon Landfill (GCLF) in San Diego County, California. This CQA Plan is to be used in conjunction with the Preliminary Engineering Design and Phased Development Plans (September 2001) and Specifications prepared for the GCLF.

This plan includes:

- A Quality Assurance Program to be implemented during earthwork and geosynthetic material construction; including field observation, laboratory and field testing, and acceptance criteria for constructed work;

- Recording and documentation procedures to be employed for demonstrating that the constructed earthwork and geosynthetic liner components meet the requirements of the Project Plans and Specifications;

- Lines of communication, responsibilities and roles of the Construction Quality Assurance team and other related Project Personnel.

1.1 PROJECT REQUIREMENTS

In order to satisfy the requirements established by the governing regulatory agencies, the following composite liner system design has been proposed for the GCLF.

In floor areas (gradient less than 5:1 horizontal:vertical), the composite liner system designs will be composed of the following elements:

- Subgrade prepared to the requirements of the Project Documents;
- A one-foot thick subdrain gravel layer composed of select drainage gravel materials;
- A twelve (12)-ounce per square yard non-woven geotextile fabric;
- A minimum two (2) foot thick compacted soil liner yielding a permeability of less than 1.0×10^{-7} cm/sec;
- A 60-mil thick double-sided textured HDPE geomembrane;
- A sixteen (16) ounce per square yard non-woven geotextile fabric;
- A nine-inch minimum thickness gravel or equivalent drainage layer;
- A sixteen (16) ounce per square yard non-woven geotextile fabric;
- A 60-mil thick double-sided textured HDPE geomembrane;
- A geosynthetic clay liner (GCL);
- An 80-mil thick double-sided textured HDPE geomembrane;
- A sixteen (16) ounce per square yard non-woven geotextile fabric;
- A one (1) foot thick leachate collection layer composed of select drainage gravel materials;
- A twelve (12) ounce per square yard non-woven geotextile fabric;
- A two (2) foot thick protective cover soil layer (operations layer) composed of select on-site soil materials. Said materials shall be screened to exclude particles in excess of one-inch in maximum dimension.

In slope areas (gradient steeper than 5:1 horizontal:vertical) the liner system will be composed of the following elements:

- Subgrade prepared to the requirements of the Project Documents;
- A minimum two (2) foot thick compacted soil liner yielding a permeability of less than 1.0×10^{-7} cm/sec;
- A 60-mil thick double-sided textured HDPE geomembrane;
- A geosynthetic clay liner (GCL);
- A 60-mil thick single-sided textured HDPE geomembrane (textured side placed down);
- A sixteen (16) ounce per square yard non-woven geotextile placed immediately on top of the geomembrane;
- A minimum two (2) foot thick protective soil cover (operations layer) composed of select on-site soil materials. Said materials shall be screened to exclude particles in excess of one-inch in maximum dimension.

All materials used to construct the composite liner system must meet or exceed the criteria established in this CQA document and the Project Plans and Specifications. Any deviation from these criteria must be pre-approved by the Engineer and the Geotechnical CQA Consultant.

2.0 RESPONSIBLE PARTIES AND DEFINITIONS

2.1 RESPONSIBLE PARTIES

The responsible parties for all composite liner system construction activities at the GCLF, as set forth herein, are as follows:

<u>Landfill Owner/Operator:</u>

Gregory Canyon Ltd.
160 Industrial Street, Suite 200
San Marcos, California 92708
Phone: (760) 471-2365

Landfill Engineer:

Bryan A. Stirrat & Associates
1360 Valley Vista Drive
Diamond Bar, California 91765
Phone: (909) 860-7777

Construction Manager:

To Be Determined

Geotechnical CQA Consultant:

To Be Determined

2.2 DEFINITIONS

"Construction Manager" - Person(s) or firm(s) authorized by the Owner to manage and oversee the administration of the Construction Contract. The Construction Manager shall be responsible for evaluating lines and grades (survey control) for the individual liner elements as well as verification of payment request, submittal acceptance, and change orders.

"Contractor" - The firm responsible for all elements of construction of the containment system. In this regard, the Contractor's responsibilities includes but are not limited to: preparation of subgrade and supporting surfaces (generally soil) for the geosynthetic installation; installation of the HDPE and geosynthetics; and placing earth and granular materials over the installed synthetic systems. The Contractor is further responsible for all activities of Subcontractors including but not limited to the geosynthetics Subcontractor.

"Geosynthetics" - A generic classification given to synthetic (man-made plastic and fabric) materials used in geotechnical and construction applications. Included are geomembrane or flexible membrane liners (i.e., HDPEs), geotextiles, geosynthetic clay liner (GCL), geonets, geogrids, geocomposites and geocells. At the GCLF, the term geosynthetics is used to refer to the HDPE, GCL, geocomposites and geotextiles.

"Geosynthetic Subcontractor" - The firm responsible for handling, storing, placing, seaming, and other aspects of the installation of the geosynthetics included in the composite liner system.

"Geotechnical CQA Officer" - The individual or firm serving under the direction of the Geotechnical Project Director and responsible for day to day geotechnical Construction Quality Assurance (CQA).

"Geotechnical CQA Monitors" - The individuals working under the direction of the Geotechnical CQA Officer who are routinely involved in the construction process. Such personnel include "Technicians", "Field Engineers" and "Field Geologists" representing the Geotechnical Consultant. CQA Monitors responsible for the geosynthetics and earthwork, shall be experienced in landfill construction monitoring, geosynthetic material installation, low-permeability soil construction and testing, and compaction testing during grading operations.

"Geotechnical Consultant" - Geotechnical firm responsible for the design and specifications for the earthwork and geosynthetic elements of the Project Plans and Specifications. The Geotechnical Consultant or his/her representative is also responsible for observing, testing, and documenting activities related to quality assurance for all geotechnical and geosynthetic aspects of construction except for engineering and survey control. All completed geotechnical work is subject to approval by the Geotechnical Consultant.

"Geotechnical Project Director" - Geological/geotechnical professional registered in the State of California who, under the employ of the Geotechnical Consultant is responsible for earthwork observation, monitoring and testing.

"Geotechnical Construction Quality Assurance for Earthwork" - The protocols to be followed in evaluating the adequacy of the Contractor's work with regard to all elements of earthworks construction with the exception of line and grade (survey) control. Said work shall include but need not be limited to all CQA activities delineated herein and in the Specifications. Geotechnical CQA is to be provided by a party independent of the Contractor.

"Geotextile" - A permeable synthetic fabric used with soil, rock, sand, gravel or any other similar materials as an integral part of the composite liner system. It can provide protection to other systems or serve to separate different materials.

"Independent Testing Laboratory" - The firm responsible for conducting selected tests of materials and/or products used for the project, such as conformance testing. The laboratory shall be independent of the Manufacturer, Contractor, Geosynthetics Subcontractor and any party involved with the manufacture and/or installation of any product to be tested.

"Landfill Engineer" - The firm responsible for the design and preparation of the Project Plans and Specifications including the containment system that fulfills the regulatory and operational requirements of the permitting agencies and Owner,

respectively. The Landfill Engineer, also known as the Engineer, is also responsible to modify or change the design if unexpected or unanticipated site conditions are encountered during construction.

"Project Documents" - Project Documents include all Construction Drawings, Record Drawings, Construction Specifications, CQA Plans, Health and Safety Plans and Project Schedules and Contractor Submittals.

"Project Manager" - The Owner's designated representative responsible for the Project.

"Project Drawings and Specifications" - All project related Drawings and Specifications including Design Modifications and Record Drawings.

"Quality Assurance" - Actions taken by the Owner or his representative necessary to evaluate whether the earthen and geosynthetic materials and workmanship meet the requirements of the Project Plans and Specifications.

"Quality Control" - Actions taken by the Contractor, Subcontractors and/or Liner Manufacturer(s) to ensure that the earthen and geosynthetic materials and workmanship meet the requirements of the Project Plans and Specifications.

"Work" - All tools, equipment, supervision, labor, and materials or supplies necessary to complete the project as specified herein and as shown on the Project Drawings.

3.0 GEOTECHNICAL CQA ORGANIZATION

The Geotechnical CQA Team for composite liner system construction will be composed of design and field personnel with specific experience in the inspection and Geotechnical CQA monitoring of earthwork, low-permeability liner soils and geosynthetic materials specifically related to landfill liner construction. The principal categories of personnel assigned to the Geotechnical CQA Team are presented below.

3.1 GEOTECHNICAL PROJECT DIRECTOR

The Geotechnical Project Director shall be a representative of the Geotechnical CQA Consultant and shall have overall responsibility for all geotechnical CQA activities and have specific experience in managing landfill liner construction projects.

The Geotechnical Project Director will be responsible for reviewing all earthwork or geosynthetic issues which may arise during construction. The Geotechnical Project Director's approval will be required for any earth or geosynthetic material modifications or for any design modifications which may impact the performance of the earth or geosynthetic materials.

3.2 GEOTECHNICAL CQA OFFICER

The Geotechnical CQA Officer will serve as the Geotechnical Project Director's on-site representative. All Geotechnical CQA functions will be his/her direct responsibility. All coordination, reporting and issues related to earthwork and/or geosynthetics non-compliance will be directed through the CQA Officer. In addition, he/she will participate with the Landfill Engineer and Geotechnical Project Director in all decisions related to design issues which arise during the course of construction.

The Geotechnical CQA Officer shall be responsible for overall review, observation, sampling, and testing of activities utilized for Construction Quality Assurance (CQA). The Geotechnical CQA Officer shall have prior experience serving as the CQA Officer on similar liner construction projects. Specific duties of the CQA Officer include:

- Review of all designs, Project Plans, and Specifications;
- Implementation of the Geotechnical CQA program including: assignment and management of all Geotechnical CQA personnel; review of all field reports; and review of all Geotechnical CQA related issues;
- Review of design changes and coordination of such changes with the Engineer;
- Serving as the on-site representative of the Geotechnical Project Director;
- Familiarization of all Geotechnical CQA Monitors with the site and the Geotechnical CQA requirements of the project;
- Attendance at Geotechnical CQA related meetings (i.e., preconstruction, progress, and special meetings as required);
- Review of all Liner Manufacturer and Liner Subcontractor certifications and documentation and development of appropriate recommendations;
- Designation of a senior Geotechnical CQA Monitor to act on his/her behalf at the site while he/she is absent and operations are ongoing;
- Notation of any on-site activities that could result in damage to the geosynthetics;

- Review of the Liner Subcontractor's personnel qualifications for conformance with project requirements;
- Selection of locations for destructive test sampling;
- Oversight of the ongoing preparation of "As-Built" Plan(s);
- Review of all Geotechnical CQA Monitors daily reports and logs;
- Reporting to the Construction Manager and logging in his/her daily report any relevant observations reported to him by the Geotechnical CQA Monitors;
- Oversight of the marking, packaging and shipping of all laboratory test samples;
- Review of the results of laboratory testing and presentation of appropriate recommendations;
- Preparation of a monthly summary of Geotechnical CQA activities;
- Reporting of any unresolved deviations from the Geotechnical CQA Plan to the Construction Manager;
- Preparation of the final "As-Built" report for all completed geosynthetic construction activities;

3.3 GEOTECHNICAL CQA MONITORS

3.3.1 FIELD ENGINEER/FIELD GEOLOGIST

The Field Engineer/Field Geologist will be a representative of the Geotechnical CQA Consultant and will be responsible for evaluating whether earth and/or synthetic materials conform to the requirements of the Project Drawings and Specifications. The Field Engineer/Field Geologist will have specific experience in landfill construction monitoring, compaction observation and testing during grading operations, and geosynthetic material observation, monitoring and documentation. Duties of the Field Engineer/Field Geologist will include the following:

- Subgrade inspection, review, testing and documentation.
- Review of the adequacy of all clearing, grubbing, stripping and preparation of areas to receive fill.
- Monitoring and evaluation of any soil blending, mixing and processing operations.

- Evaluation of the engineering characteristics of the processed and constructed earth materials.

- Observation and evaluation of all cuts which may be impacted by geologic conditions.

3.3.2 GEOTECHNICAL CQA TECHNICIANS

Geotechnical CQA Technicians will be representatives of the Geotechnical CQA Consultant and will continuously observe all grading and geosynthetic operations to provide a basis for concluding that construction is carried out in conformance with the Project Drawings and Specifications. The duties of the Geotechnical CQA Technicians include monitoring, observing and testing all earthwork as well as monitoring, logging and documenting all geosynthetic installation operations.

The operations to be monitored observed and/or tested for the earthwork include:

- Observation of subgrade surface preparation.

- Verification that liner soils are derived from appropriate sources.

- Visual evaluation of the soil physical properties for consistency with the Project Drawings and Specifications.

- Evaluation of all moisture conditioning and processing operations to evaluate uniformity of material and moisture content.

- Evaluation of the constructed low-permeability liner material for conformance with the Project Drawings and Specifications.

- Identification of deleterious materials or other deficiencies in soil characteristics to minimize the possibility that these materials are incorporated into the composite liner system.

- Monitoring of activities for the removal and/or disaggregation of oversize material.

- Observation of uniformity of coverage of compaction equipment, especially at fill edges, turnaround areas and on slope faces.

- Monitoring of lift thickness.

- Observation of the active fill pad at the beginning of each grading day and establishment of requirements for wetting/drying and/or processing of exposed surfaces prior to placement of additional fill.

- Undertaking field tests including but not limited to BAT permeability and field moisture/density testing at the minimum frequencies noted herein or at any time that a deficiency is suspected.

- Recovery of samples for laboratory testing.

- Completion, evaluation and/or documentation of laboratory testing of the permeability, grain size distribution, Atterberg Limits, in-place moisture content and density of the low-permeability layer materials in accordance with the requirements of the Specifications (including retests, if necessary).

- Confirmation that the test results are in accordance with the Project Specifications (including retests of any previously failed areas).

The operations to be observed and monitored for all geosynthetics include:

- Material delivery.
- Unloading and on-site transport and storage.
- Placement/deployment operations.
- Joining and/or seaming operations.
- Repair operations.

Specifically, the seaming operations to be monitored include:

- The condition of panels as placed.
- Trial seams.
- Seam preparation.
- Seaming.
- Nondestructive seam testing.
- Sampling for destructive seam testing.
- Laboratory test sample marking.
- Repair operations.
- Reviewing the final certification of seams.

All observations shall be reported in a timely manner to the CQA Officer and the Construction Manager.

3.4 INDEPENDENT TESTING LABORATORY

The Independent Testing Laboratory shall be certified by the Geosynthetic Accreditation Institute (GAI) in the specific tests to be performed and will perform all conformance testing of geosynthetics and all destructive laboratory testing of field seams.

4.0 MEETINGS

In order to facilitate construction of the composite liner system, close coordination between the Construction Manager, Engineer, Geotechnical CQA Consultant, Contractor, Liner Subcontractor and Geotechnical CQA personnel is essential. To this end the following meetings will be scheduled.

4.1 PRE-CONSTRUCTION MEETINGS

A Pre-construction Meeting will be held at the site. At a minimum, the meeting shall be attended by the Owner (or designated representative), the Construction Manager, the Landfill Engineer, the Geotechnical Consultant (or designated representative), the Contractor and appropriate Geotechnical CQA staff. Specific items to be considered at this meeting will include:

- Any appropriate modifications to the Geotechnical CQA requirements.
- Development of a format for site specific documentation.
- Review of the responsibilities of each party.
- Review of the lines of authority and communication.
- Review of work area security and safety protocol.
- Review of the procedures for project documentation and reporting, and distribution of documents and reports.
- Review of procedures for submittals, change orders and extra work efforts.
- Review of the Contractor's proposed methods of construction, (including equipment), with specific emphasis on methods of select grading, soil mixing, stockpiling, processing, moisture conditioning and compaction.
- Review of the procedures for field and laboratory CQA testing.
- Establishment of procedures for correcting and documenting construction deficiencies.
- Conducting an initial site inspection to discuss work areas, stockpile areas, mixing tables, laydown areas, access roads, haul roads, and related items.
- Review of the project schedule.

The meeting shall be documented by the Construction Manager and minutes shall be distributed to all parties.

4.2 WEEKLY PROGRESS MEETINGS

Progress Meetings shall be held weekly. At a minimum, these meetings shall be attended by the Owner (or designated representative), the Construction Manager, the Geotechnical CQA Officer and/or the Geotechnical CQA Monitors, and the Contractor. Weekly progress meetings shall be documented by the Construction Manager or his/her representative and minutes shall be distributed to all parties. The purpose of these meetings is to:

- Discuss any health and safety related issues.
- Review scheduled work activities.
- Discuss project related problems.
- Review laboratory and field test data.
- Discuss the Contractor's personnel and equipment assignments.
- Review the previous week's activities and accomplishments.

4.3 SPECIAL MEETINGS

Special meetings will be conducted as required to discuss any problems or deficiencies. At a minimum, these meetings will be attended by the Owner (or designated representative), Construction Manager, appropriate Geotechnical CQA staff and the Contractor. If correction of a problem requires a design modification, the Landfill Engineer and the Geotechnical Project Director will also be present. The purpose of these meetings is to:

- Define and discuss any problems or deficiencies in the Project.
- Review possible corrective actions or solutions.
- Implement an action plan to resolve the problems or deficiencies.

Special meetings shall be documented by the Construction Manager or his/her representative and minutes shall be distributed to all parties.

4.4 GEOSYNTHETIC MATERIAL PRE-INSTALLATION MEETING

A Geosynthetic Material Pre-installation Meeting shall be held at the site before installation of the geosynthetics. At a minimum, the meeting shall be attended by the Construction Manager, the Engineer, the Contractor, the Liner Subcontractor, and Geotechnical CQA staff. The Pre-Installation Meeting will not be conducted until all Manufacturer Certifications required by the Project Specifications and this document are received, reviewed and approved.

Specific items to be addressed at this meeting include:

- Submittal and review of relevant documents.
- Definition of appropriate modifications to the Geosynthetic Geotechnical CQA requirements.
- Development of a format for site specific documentation.
- Definition of the responsibilities of each party.
- Definition of lines of authority and communication.
- Review of work area security and safety protocol.
- Definition of methods for documenting and reporting, including distributions.
- Selection of welding equipment and procedures.
- A field welded seam(s) demonstration.
- Identification of testing equipment and procedures, including peel and shear tests, and procedures for communicating laboratory test results.
- Identification of procedures for correcting and documenting construction deficiencies.
- A site inspection to discuss storage areas, work areas, storage areas and protocols, laydown areas, access roads, haul roads, and related items.
- Review of the project schedule.

The meeting shall be documented by the Construction Manager and minutes shall be distributed to all parties.

4.5 DAILY PROGRESS MEETINGS (if necessary)

Daily Progress Meeting shall be held in the field before the start of work each day. At a minimum, this meeting shall be attended by the Geotechnical CQA Officer or his/her representative, Geotechnical CQA Monitors, the Contractor and the Liner Subcontractor. The purpose of this meeting is to:

- Review and coordinate scheduled work activities between the Geotechnical CQA monitors and the Liner Subcontractor's crew.
- Discuss any problems.
- Review test data.

- Discuss the Liner Subcontractor's personnel and equipment assignments for the day.

- Review the previous day's activities, accomplishments and/or deficiencies.

4.6 MANUFACTURING PLANT VISIT(S)

The Liner Subcontractor shall make arrangements with the Liner Manufacturer(s) to allow the Geotechnical CQA Officer or his/her designee to visit the geosynthetics manufacturing plant(s) during manufacture of the liner material for this project and to observe manufacturing methods and quality control of manufactured materials. If appropriate, the Geotechnical CQA Officer or his/her designee shall review the manufacturing process, quality control, laboratory facilities and testing procedures.

During the plant visit, those visiting shall:

- Observe that the geosynthetic properties presented in the Liner Manufacturer's certification documents meet the Project Specifications.

- Verify that the measurements of properties by the Liner Manufacturer are properly documented and test methods used are acceptable.

- Spot inspect some of the geomembrane rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter.

- Review packaging and transportation procedures to verify that these procedures are not damaging the geosynthetics.

- Observe that roll packages have a label indicating the name of the Liner Manufacturer, type of geosynthetic, its roll/panel number and other required information.

- Verify that extrusion rods and/or beads are derived from the same base resin type as the geomembrane.

5.0 GEOTECHNICAL CQA MONITORING FOR EARTH MATERIALS

5.1 GENERAL

Construction of the earth materials portion of the composite liner system shall be performed in accordance with the Project Drawings and Specifications and shall be continuously observed, and routinely sampled and tested by the Geotechnical CQA Monitors for the physical parameters described in this section.

The testing frequency presented herein is a minimum. Additional tests will be conducted by the Geotechnical CQA Monitor for retests and at any time that in the opinion of the Geotechnical CQA Monitor, additional testing is required and/or a deficiency is suspected. Retests of previously failed areas will be performed at the discretion of the Geotechnical CQA Monitor when, in his/her opinion, sufficient reworking of the area has been performed to warrant a retest.

5.2 LOW-PERMEABILITY MATERIALS

The low-permeability layer of the composite liner system will be constructed with on-site or import soils derived from a source approved by the Geotechnical Consultant. Low-permeability liner materials will be evaluated by the Geotechnical Consultant according to the following minimum testing schedule in order to characterize material properties:

Low-Permeability Import Material Testing Type and Frequency

Test Description	Test Designation	Minimum Test Frequency
Particle Size Analysis	ASTM D422	One per 2000 yds^3 stockpiled or one per production day (minimum)
Atterberg Limits	ASTM D4318	One per 2000 yds^3 stockpiled or one per production day (minimum)
Classification of Soils for Engineering Purposes	ASTM D2487	One per 2000 yds^3 stockpiled or one per production day (minimum)
Processed Moisture Content (following moisture conditioning)	ASTM D4643 (microwave) or ASTM D2216 (oven)	Two per construction day
Laboratory Permeability	ASTM D5084/EPA 9100 or USBR Modified E-13	One per 10,000 c.y
Moisture/Density Relationship	ASTM D1557	One per 10,000 c.y.
Visual Inspection	ASTM D2488	Daily while stockpiling

No soils other than those obtained from the approved borrow source and/or approved by the Geotechnical Consultant are to be used in liner construction.

5.3 DEMONSTRATION FILL (TEST FILL PAD)

A Demonstration Fill (Test Fill Pad) will be constructed prior to actual liner construction to evaluate both the low-permeability soil proposed for liner construction and the Contractor's equipment and methods for constructing and maintaining the integrity of the low-permeability liner soils. The Demonstration Fill will be constructed by the Contractor selected to complete liner construction and as specified in the Project Specifications. Construction of the Demonstration Fill shall be completed a minimum of two weeks prior to the actual low-permeability liner construction. The Contractor shall construct the Demonstration Fill using the same earthwork equipment and Specifications to be used for liner construction to determine if the specified density/moisture content/hydraulic conductivity relationships determined in the laboratory can be achieved in the field with the compaction equipment to be used and at the specified lift thickness.

Soil sampling will be performed by the Geotechnical CQA Monitor(s) during and after construction of the Demonstration Fill to provide data regarding soil properties obtainable using the proposed design and construction methods. All criteria for Demonstration Fill construction, including low-permeability material processing, amount of compaction, moisture content, etc., will be the same as those required and anticipated for actual liner construction.

The purpose of the Demonstration Fill is to: 1) evaluate the performance of the construction equipment to be used for soil blending, processing, placement and maintaining the low-permeability soils under actual construction conditions; 2) evaluate the field performance of the low-permeability soil material through laboratory and field tests; 3) compare field (BAT) and laboratory permeability test results; and 4) develop a database of test results and performance standards prior to full-scale liner construction in order to substantiate the Construction Specifications. If necessary, the results from the Demonstration Fill construction and testing program will be used to modify the Project Specifications for low-permeability liner construction.

The Demonstration Fill will measure roughly 150 feet by 50 feet and will consist of an approximately 24-inch thick section of blended, processed, cured and compacted low-permeability soils, placed on slope and floor areas. The Demonstration Fill shall be constructed using the methods, materials and equipment to be employed during construction of the actual low-permeability layer. Processed low-permeability materials will be placed in six to eight inch lifts. Construction will be continuously observed and tested by the Geotechnical CQA Monitor and/or his/her representative.

The testing frequency used in construction and monitoring of the Demonstration Fill will be more stringent than that to be maintained during construction of the actual liner. Minimum testing requirements for Demonstration Fill construction will include:

1. Full-Time observation.
2. Density tests (ASTM D1556, D2937, or D2922) taken at a rate of at least one (1) test per 100 cubic yards of fill placed or one (1) per 6 inches of fill thickness. At a minimum, ten (10) in-place moisture/density tests will be completed.
3. At least two (2) maximum density tests (ASTM D1557) will be completed.
4. Five (5) in-situ BAT permeability tests will be conducted.
5. Five (5) laboratory permeability tests on relatively undisturbed samples (Modified USBR E-13 or ASTM D5084) will be conducted including at least one triaxial cell permeability test (ASTM D5084).
6. Five (5) Atterberg Limit tests (ASTM D4318) and five (5) grain size analyses (ASTM D422) will be completed.

5.4 LOW-PERMEABILITY FILL PLACEMENT

Select low-permeability liner soils shall be screened (if necessary), dried, and/or moisture conditioned until uniformly blended material characteristics and moisture condition are attained. Moisture conditioning, if required will allow for a minimum 48-hour curing period. Field and laboratory testing for moisture content, in-place dry density, and other engineering properties including saturated hydraulic conductivity during construction of the low-permeability layer of the liner system will be completed according to the following minimum schedule:

Low-Permeability Fill Testing Type and Frequency

Test Description	Test Designation	Minimum Test Frequency
Processed Moisture Content (following moisture conditioning)	ASTM D4643 (microwave) or ASTM D2216 (oven)	Two per construction day
Moisture-Density Relationship	ASTM D1557	One per 5,000 cubic yards or per change in material type
In-Place Moisture-Density (Nuclear and/or Drive Ring)	ASTM D2922 ASTM D3017 ASTM D2937	One per 250 cubic yards placed
In-Place Density and Moisture Content (Sand-Cone)	ASTM D1556	One per 1,000 cubic yards placed or 20 percent of total In-Place tests (whichever is greater)
Particle Size Analysis	ASTM D422	One per 5,000 yd^3 (conducted on samples retrieved for laboratory permeability testing)
Atterberg Limits	ASTM D4318	One per 5,000 yd^3 (conducted on samples retrieved for laboratory permeability testing)
Laboratory Permeability	ASTM D5084/EPA 9100 or USBR Modified E-13	One per 5,000 cubic yards placed
BAT Permeability		One per 2,500 cubic yards placed
Visual Inspection	ASTM D2488	Daily

5.5 ACCEPTANCE CRITERIA

5.5.1 GENERAL

Where test results indicate that the lift thickness, maximum particle size, homogeneity of material, cure time, moisture content, density, or permeability of any portion of the work is below the project requirements, that particular portion shall be retested and/or reworked or replaced until the required condition has been attained and the resulting product meets or exceeds the requirements of the Project Specifications. No additional fill shall be placed over an area until the existing fill has been tested horizontally and vertically and determined by the Geotechnical CQA Monitor to meet the Project Earthwork Specifications. The area to be reworked will be verified by survey if in the opinion of the Geotechnical CQA Monitor conditions warrant.

5.5.2 MOISTURE CONTENT AND DENSITY

If in the opinion of the Geotechnical CQA Officer or the Senior Geotechnical CQA Technician, low-permeability materials which have been placed and/or are

ready to be placed, do not visually have a uniform and homogeneous moisture content throughout the material in question, these materials will be removed, without testing, and will be reprocessed and/or reworked until, in the opinion of the Geotechnical CQA Officer or his/her designated representative, they are uniform in appearance.

For all fill materials placed, if test results indicate a relative dry density of less than that required or a moisture content outside the limits specified, then the area will be considered inadequate and will be reworked. Any reworked areas will be retested by the Geotechnical CQA Monitor to verify the reworked area meets the density and moisture content requirements.

The following table lists the minimum moisture/density requirements for fill materials placed. The in-place moisture content and dry density requirements are relative to the maximum dry density and optimum moisture content as determined by ASTM D1557.

Fill Type	Minimum Density (percent)	Moisture Content
Low-Permeability Layer Material	90	2 – 4% above optimum
Unclassified Fill	90	Optimum to 2% above
Protective Cover Soil	85	Optimum ± 2%

5.5.3 PERMEABILITY

If a BAT or laboratory permeability test results in a value exceeding the defined maximum of 1.0 E-07 cm/sec, two (2) additional tests of the same type will be taken in the immediate vicinity. [At the discretion of the Geotechnical CQA Consultant, BAT permeability tests may be taken in lieu of failed laboratory tests to expedite the CQA testing procedure.] If either of the additional tests fails to meet the minimum requirements, the area represented by the test will be considered inadequate and will be removed or reprocessed and recompacted.

5.5.4 LIFT THICKNESS AND PROCESSING

If at any time the CQA Monitor observes an uncompacted lift thickness in excess of eight inches or observes material being placed without meeting the requirements for processing, stockpiling and curing, the Contractor shall immediately discontinue placing additional fills in that area. For an over thick lift, the Contractor shall immediately blade the surface to reduce the lift thickness to the Project Specifications prior to compaction. If inadequately mixed materials are placed, the Contractor shall immediately remove these materials and return them to the stockpile/processing area where they will be reprocessed.

5.5.5 GEOMEMBRANE SUBGRADE

The CQA Monitor and the geomembrane installation Contractor will observe and approve the geomembrane subgrade prior to geosynthetic material deployment. The finish surface shall be free of abrupt breaks, sharp objects, or other foreign material which may damage the overlying geomembrane. The subgrade shall be unyielding, smooth and uniform and the surface shall not be pebbly or tracked and rutted by equipment.
Immediately prior to geomembrane deployment, all subgrade surfaces (i.e., floor and slopes), will be proof-rolled with a steel drum roller weighting not less than 200 pounds per lineal inch of drum width.

Geomembrane deployment shall not proceed until the surface has been approved by the CQA Monitor and accepted by the geomembrane installation Contractor.

6.0 GEOTECHNICAL CQA MONITORING FOR GEOSYNTHETICS

6.1 GEOMEMBRANE (HDPE)

Delivery of geomembrane to the site will not be allowed until all required documentation and/or certifications are approved by the CM/Geotechnical CQA Team. It is the responsibility of the Contractor/Subcontractor to ensure that all required documentation and/or certifications are approved prior to shipment.

6.1.1 HDPE MANUFACTURING

Prior to the delivery of any geosynthetic material, the Liner Manufacturer shall provide the Construction Manager with the following:

- A properties sheet for the rolls to be delivered including all specified properties measured using test methods indicated in the specifications.
- The sampling procedure and results of testing.
- A certification for each roll stating that property values given in the properties sheet are guaranteed by the Liner Manufacturer.

The Geotechnical CQA Officer shall verify that:

- The property values certified by the Liner Manufacturer meet the project specifications.
- The measurements of properties by the Liner Manufacturer are properly documented and that the test methods used are acceptable.

Prior to shipment, the Liner Manufacturer shall provide the Construction Manager with a quality control certificate for each roll of geomembrane. The quality control certificate(s) shall be signed by a responsible person employed by the Liner Manufacturer and shall include:

- Lot and roll numbers and identification.
- Sampling procedures and results of quality control tests. At a minimum, results shall be given for those properties identified in the Project Specifications.

The Geotechnical CQA Officer shall:

- Verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.
- Review the quality control certificates and verify that the certified roll properties meet the specifications.

6.1.2 GEOMEMBRANE DELIVERY

Prior to delivery, all individual roll manufacturer certifications required by this document and/or the Project Specifications must be received and approved by the Construction Manager. Delivery of any unapproved roll will not be allowed and unapproved rolls will be transported off-site at the Contractors expense.

6.1.2.1 Transportation and Handling

All transportation and on-site handling of the geomembrane is the responsibility of the Contractor and Liner Subcontractor.

The Geotechnical CQA Officer shall observe the handling equipment used on the site and provide comment on whether it might pose a risk of damage to the geomembrane. The Geotechnical CQA Officer will also observe the Contractor and Liner Subcontractor personnel's handling of the geomembrane and provide comment on whether appropriate care is being taken. Finally, the Geotechnical CQA monitor shall verify that all documentation required upon delivery has been received.

Upon delivery at the site, the Contractor, Liner Subcontractor and the Geotechnical CQA Monitor shall complete a surface observation of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Officer shall report the following to the Construction Manager:

- Rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.

- Rolls which visually include minor repairable flaws.

Any damaged rolls shall be rejected and removed from the site or be stored at a location separate from accepted rolls as designated by the Construction Manager. All rolls which do not have proper Liner Manufacturer's documentation shall be removed from the site at the Contractors expense until all required documentation has been received and approved.

A log of all HDPE received shall be maintained by the Geotechnical CQA Monitors and recorded on an appropriate form (Form B-1 attached).

6.1.2.2 Geomembrane Storage

The Contractor and Liner Subcontractor shall be responsible for storage of the HDPE on-site and shall ensure the storage is consistent with the Manufacturer's recommendations. The Contractor shall coordinate with the Construction Manager to ensure that storage space is provided in a location (or several locations) such that on-site transportation and handling are minimized. Storage space shall be protected by the Contractor and Liner Subcontractor from theft, vandalism, and damage from actions of man, weather, animals and other sources. The Geotechnical CQA Monitors shall observe that the materials are not stored directly on the ground and storage of the HDPE is completed in a fashion that protects against damage.

6.1.3 HDPE CONFORMANCE TESTING

6.1.3.1 Tests

Upon delivery of the HDPE, the Contractor or Liner Subcontractor shall ensure that conformance samples are obtained and forwarded to the Independent Testing Laboratory at the frequency required for testing to ensure conformance with the Project Specifications. All conformance samples will be obtained in the presence of the Geotechnical CQA Monitor or his/her designated representative.

At a minimum, conformance tests will include determination of the following characteristics for the HDPE:

- Density (ASTM D1505A).

- Environmental Stress Crack (ASTM D5397).

- Tear Resistance (ASTM D1004 Die C).

- Carbon black content (ASTM D1603).
- Thickness (ASTM D5199).
- Tensile characteristics (yield strength, elongation at yield, break strength, elongation at break) (ASTM D638).
- Interface shear strength testing as described in the Project Specifications. Direct shear testing for interface strength shall be carried out in accordance with ASTM D-5321 "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method." Issues and procedures related to soil preparation shall be governed by ASTM D3080.
- Puncture resistance (ASTM D4833).

Where optional procedures are noted in the test method, the requirements of the Project Specifications shall prevail.

6.1.3.2 Sampling and Testing Frequency

Unless otherwise specified, conformance samples shall be taken and tested at a rate of one per lot or one per 100,000 square feet, whichever results in the greater number of tests. Testing for interface shear will be conducted at a rate of one per 200,000 square feet.

6.1.3.3 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be 3 ft. long by the roll width. The Geotechnical CQA Monitors shall mark the machine direction on the samples with an arrow, and the Liner Manufacturer's roll identification number.

6.1.3.4 Test Results

The results of Conformance Testing will be documented on the appropriate forms and the Geotechnical CQA Officer shall examine all conformance testing results and report any non-conformance to the Construction Manager, the Contractor and the Lining Subcontractor.

All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the material represented by the sample shall be considered nonconformant with the Specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and

the HDPE material can be accepted. If the second test fails, the Liner Subcontractor shall remove all material represented by the sample from the work area.

All conformance test results must be approved by the Construction Manager prior to the HDPE represented by the test being approved for deployment/installation. The decision of the Construction Manager shall be final.

6.1.4 HDPE INSTALLATION

6.1.4.1 Earthwork

Surface Preparation

The Contractor shall be responsible for preparing the supporting soil according to the Project Specifications.

Prior to liner installation, the Contractor and Liner Subcontractor shall verify and the Construction Manager and Geotechnical CQA Monitor shall observe that:

- All lines and grades have been checked by survey and approved by the Construction Manager.
- The subgrade has been prepared in accordance with the Project Specifications.
- The surface has been rolled and compacted to be free of surface irregularities, loose soil, and protrusions.
- The supporting soil surfaces do not contain stones or other sharp protrusions which could damage the HDPE.
- There are no excessively soft areas which could result in HDPE damage.
- All construction stakes, hubs or other items used for grade control and/or verification have been removed.
- The Liner Subcontractor has certified in writing that the surface on which the HDPE will be installed is acceptable using an appropriate form (Form B-3 attached).

The certificate of acceptance shall be given by the Liner Subcontractor to the Contractor and the Construction Manager prior to commencement of HDPE installation in the area under consideration. The Geotechnical CQA Monitors shall have a copy of this certificate before installation of HDPE commences in any given area.

After the supporting surface has been accepted by the Contractor and Liner Subcontractor, it shall be the Contractor and Liner Subcontractor's responsibility to indicate to the Construction Manager any change in the supporting soil condition that may require repair work. If the Construction Manager concurs with the Contractor and Liner Subcontractor, then the Construction Manager shall coordinate the repair of the supporting surface. The subject area will also be observed by the Geotechnical CQA Monitors who shall have the authority to reject an area even after it has been accepted by the Contractor and Liner Subcontractor.

Anchor Trench

Anchor trenches shall be excavated to the lines and widths shown on the Project Drawings, prior to HDPE placement. The Geotechnical CQA Monitors shall observe that the anchor trenches have been constructed according to the project documents.

Slightly rounded corners shall be provided where the HDPE adjoins the trench so as to avoid sharp bends in the HDPE. No loose soil shall be allowed to underlie the HDPE in the anchor trench.

Anchor trench backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557) as outlined in the Specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geotechnical CQA Monitors shall observe the backfilling operation and advise the Construction Manager of any problems.

6.1.4.2 HDPE Placement

Field Panel Identification

A field panel (sheet) is a discrete and integral area of HDPE which is to be seamed in the field along the edges to other field panels (i.e., a field panel is a roll or a single portion of a single roll). The Contractor or Liner Subcontractor shall assign each panel over 25 sq. feet an identification code which shall be agreed to and used by the Geotechnical CQA Monitors, Construction Manager, Contractor and the Liner Subcontractor. The Contractor or Liner Subcontractor shall locate the code with identifying roll number near the middle of panels less than 50 feet in length and at both ends of any panel over 50 feet in length. The Geotechnical CQA Monitors shall establish a chart showing correspondence between roll numbers, certification reports, and the panel identification code. The field panel identification code shall be used for all Geotechnical CQA records. An HDPE panel placement log will be maintained by the Geotechnical CQA Monitors on appropriate forms (Forms B-4 and B-5 attached).

Field Panel Placement

The Geotechnical CQA Monitors shall record the identification code, location and date of installation of each field panel.

During panel placement, the Geotechnical CQA Monitors shall:

- Verify that field panels are installed in general accordance with the panel layout plan, as approved or modified by the Construction Manager/Engineer.
- Observe the panel surface as it is deployed and record all panel defects and disposition of the defects. All repairs are to be made in accordance with the Specifications.
- Observe that the equipment used does not damage the HDPE by handling, trafficking, leakage of hydrocarbons, or by other means.
- Observe that the surface beneath the HDPE has not deteriorated since previous acceptance.
- Observe that there are no stones, construction debris, or other items beneath the HDPE which could cause damage.
- Observe that the HDPE is not dragged across an unprepared surface. If the HDPE is dragged across an unprepared surface, it shall be inspected for scratches and repaired or rejected, if necessary.
- Observe that the method used to unroll the panels does not cause scratches or crimps in the HDPE and does not damage the supporting soil surface.
- Record weather conditions including temperature, wind, and humidity. The HDPE shall not be deployed in the presence of excess moisture (fog, dew, mist, etc.), high winds and extreme temperatures as determined by the Geotechnical CQA Officer.
- Observe that people working during the installation of HDPE do not smoke, wear shoes which could damage the HDPE, or engage in activities which could damage the HDPE.
- Observe that the method used to deploy the HDPE panels minimizes wrinkles and that the panels are anchored to prevent movement by the wind.
- Observe that direct contact with the HDPE is minimized; (i.e., the HDPE is protected by geotextiles, extra HDPE, or other suitable materials, in areas where excessive traffic may be expected).

The Geotechnical CQA Monitors shall inform the Contractor, the Liner Subcontractor and the Construction Manager if the above conditions are not met.

After placement and prior to seaming, the Geotechnical CQA Monitors shall inspect each panel for damage. The Geotechnical CQA Monitors shall advise the Construction Manager which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels which have been rejected shall be marked and their removal from the work area recorded by the Geotechnical CQA Monitors.

6.1.4.3 Field Seaming

The Contractor shall provide the Construction Manager and Geotechnical CQA Officer with a seam and panel layout plan and shall update this plan daily as the job proceeds. No panels shall be seamed until the panel layout plan has been approved by the Construction Manager. A seam numbering system shall be agreed to by the Geotechnical CQA Monitors, Construction Manager, Contractor and Liner Subcontractor prior to the start of seaming operations.

Prior to seaming, each seaming apparatus (welder) shall be tested in accordance with the Specifications to determine if the equipment is functioning properly. The Geotechnical CQA Monitors shall observe all trial weld operations and record the results. It is important that the trial welds be completed under conditions similar to those under which the panels will be seamed. If at any time the Geotechnical CQA Monitor believes that an operator or seaming apparatus is not functioning properly, a test shall be performed on a trial weld. If there are large changes in temperature, humidity, or wind speed, the trial weld test shall be repeated. Laboratory tests may be carried out at the discretion of the Geotechnical CQA Monitors to verify field test results.

During seaming operations the Geotechnical CQA Monitors shall observe that:

- The Liner Subcontractor has the number of welders and spare parts agreed to in the pre-construction meeting.
- Equipment used for seaming will not damage the HDPE.
- The extruder is purged prior to beginning a seam until all the heat-degraded extrudate is removed (extrusion welding only).
- Seam grinding has been completed less than 1 hour before seam welding (extrusion welding only).
- The ambient temperature measured 6 inches above the HDPE surface is between 40 and 105 degrees Fahrenheit and relative humidity is less than 80 percent.

- The end of welds more than 5 minutes old, are ground to expose new material before restarting a weld (extrusion welding only).
- The weld is free of dust and other debris.
- For cross seams, the seam is ground to a smooth incline prior to welding.
- The seams are overlapped in a downgradient direction with a minimum overlap of 4 inches.
- No solvents or adhesives are present in the seam area.
- The procedure used to temporarily hold the panels together does not damage the panels and does not preclude Geotechnical CQA testing.
- The panels are being seamed in accordance with the Project Plans and Specifications using approved equipment with gauges giving applicable temperatures.
- There is no free moisture in the weld area.
- The electric generator is placed on a smooth base such that no damage occurs to the HDPE.
- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after use.
- The geomembrane is protected from damage in heavily trafficked areas.

The Geotechnical CQA Monitors shall log all appropriate temperatures and conditions, and shall log and report to the Geotechnical CQA Officer any non-compliance.

Trial Seams

Trial seam samples are not removed from installed seams, but are made along side the seaming work area by the Liner Subcontractor using a fragment of the same HDPE sheet and the same installation procedures as for the HDPE installation itself. As such, they are considered nondestructive samples. Such trial seams shall be made at the beginning of each seaming period (start of day, mid-day, and anytime the equipment is shut down or the seaming operation is suspended for more than 1/2 hour) for each piece of seaming equipment used that day. In addition, each welder shall make at least one trial seam each day. Trial seams shall be made under the same conditions as those anticipated for actual seams.

The trial seam sample shall be at least 3 ft. long by 1 ft. plus the seam width wide (after seaming) with the seam centered lengthwise. Seam overlap shall be as per the Specifications.

Two opposite specimens, each 1 inch wide, shall be cut from the trial seam sample by the Contractor and/or Liner Subcontractor. Under the observation of a Geotechnical CQA Monitor, the specimens shall be tested by the Liner Subcontractor in shear and peel using a field tensiometer to verify that seams satisfy peel and tensile strength requirements. If a specimen fails, the seaming equipment and seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full trial welds are achieved. After completing a successful trial/nondestructive sample, the Contractor and/or Liner Subcontractor shall cut a 2' x 2' remnant from the sample and mark the welder number, date, time, ambient temperature, welder temperature, and speed and submit it to the Geotechnical CQA Monitor who will assign an identification number and enter the information on the non-destructive sample form.

The results of field tests carried out on trial seams shall be documented by the Geotechnical CQA Monitors on appropriate form (Form B-6 attached).

General Seaming Procedure

Unless otherwise specified, the general seaming procedure to be used by the Contractor and/or Liner Subcontractor shall be as follows:

- All HDPE seams shall be overlapped a minimum of four (4) inches.
- "Fishmouths" or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut "fishmouths" or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same HDPE extending a minimum of 6 inches beyond the cut in all directions. All corners of the patch shall be rounded with a 1-inch minimum radius.
- Adjacent to anchor trenches, seaming shall extend up the panels a minimum of 12 inches past the crest of the anchor trench.
- All cross seams shall be offset at least two feet from the cross seam of the adjacent panel and be extrusion or wedge welded where they intersect.

The Geotechnical CQA Monitors shall observe that the above seaming procedures are followed, and shall inform the Construction Manager if they are not.

6.1.5 CONSTRUCTION TESTING

6.1.5.1 Nondestructive Seam Testing

The Contractor and/or Liner Subcontractor shall non-destructively test all field seams over their full length using a vacuum test unit, spark detector, or an air pressure test (for double wedge fusion seams only), as described below. The purpose of nondestructive tests is to check the continuity of seams. It does not provide any information on seam strength. Continuity testing shall be carried out as the seaming work progresses, not at the completion of field seaming.

Visual Inspection

All seams shall be visually evaluated by the Contractor and/or Liner Subcontractor as the installation progresses and again at completion of the installation. Defective and questionable sections shall be clearly marked and repaired as necessary.

Vacuum Box Testing

If the fillet weld, extrusion lap weld or single hot-wedge fusion lap weld technique is used to weld seams, the Contractor and/or Liner Subcontractor shall further test all seams and repairs in the HDPE by vacuum box. The vacuum box shall be an American Vacuum Seam Tester, Series A100 as manufactured by American Parts and Service Company, Alhambra, California, or an approved equal. All vacuum box testing shall be done in the presence of the Geotechnical CQA Monitor. The area to be tested shall be cleaned of all dust, debris, dirt and other foreign matter. A soap solution shall be applied to the test area with a brush, paint roller or spray bottle and a minimum vacuum of 10 inches of mercury (Hg) (5 psi) shall be induced and held as long as necessary to visually inspect and mark for repair any suspicious areas as evidenced by bubbles in the soap solution.

Spark Testing

If the fillet weld is used to weld seams, the Contractor and/or Liner Subcontractor may, in lieu of vacuum box testing, test all seams and repairs in the HDPE liner by using a high voltage spark detector, similar to Tinker and Rasor Holiday Detector (Model AP-W). The setting of the detector shall be 20,000 volts. In order to conduct this test, all seams to be tested shall be provided with 24-30 gauge copper wires properly embedded in the seams and grounded. All spark testing shall be done in the presence of the Geotechnical CQA Monitor. All defective areas shall be marked for repair.

Air Pressure Test

If the double hot-wedge welding technique is used, the Contractor and/or Liner Subcontractor shall further test all seams in the HDPE lining by using the air pressure test which consists of inserting a needle with gauge in the air space between welds. Air shall be pumped to 40 psi within the weld void and held for at least 5 minutes. If the pressure loss exceeds 2 psi within the weld void during air pressure testing, the outside weld edge (not free edge) shall be sprayed with a soap solution and visually examined for bubbles. If no bubbles appear, the problem is with the inside weld and the seam is acceptable. If any bubbles appear, the defect shall be repaired by extrusion welding and tested by vacuum box and spark detector.

If pressure loss is not more than 2 psi, the opposite end of the seam will be punctured to release the air. If a blockage is present, it will be located and tests on both sides of the blockage will be completed. All penetration holes created during testing shall be sealed by patching and extrusion welding.

Electrical Leak Location Survey

To aid in CQA monitoring of the geomembrane construction, an independent contractor will conduct an electrical leak location survey as part of the final quality control for the geomembrane installation. The method is designed to identify holes in the geomembrane liner after the LCRS gravel, or LCRS gravel and operations layer soil, has been placed. The leak location survey contractor will make point-by-point electrical measurements on the soil above and below the liner. By this process, because the geomembrane liner is an electrical insulator, current will flow only through leaks in the liner, producing localized anomalous areas of high current density near the leaks. Any identified electrical anomaly will be investigated and the liner repaired as described in Section 6.1.6, as necessary.

Responsibilities of the Geotechnical CQA Monitors

The Geotechnical CQA Monitor/Officer shall:

- Observe and record the continuity of all testing.
- Record the location seam/panel number, date, time, equipment number, Geotechnical CQA Monitor name , test number, welding technician's name, weld, sheet and ambient temperatures and results of all testing on appropriate forms (Form B-7 attached).
- Mark the failed areas with a waterproof marker compatible with the lining material and inform the Contractor and/or Liner Subcontractor and the Construction Manager of any required repairs.

- Observe that all testing is completed in accordance with the Project Specifications.

- Observe that all repairs are completed and tested in accordance with the Project Specifications.

6.1.5.2 Destructive Seam Testing

Destructive seam tests shall be performed at selected locations. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

Destructive sampling involves samples which have been removed from the installed field seams by the Contractor/Liner Subcontractor. Test locations shall be determined at the discretion of the Geotechnical CQA Monitors and the Contractor/Liner Subcontractor shall not be informed in advance of the locations where the seam samples will be made or will be removed.

Destructive samples shall be delivered to the Geotechnical CQA Officer by the Contractor/Liner Subcontractor and shipped to the Independent Testing Laboratory. All costs associated with the collection, repair, shipping and testing of destructive samples will be borne by the Contractor/Liner Subcontractor.

A minimum of one destructive sample per 500 feet of field seam shall be obtained. This average frequency will be used for the entire installation with the actual frequency of samples based on performance as determined by the Geotechnical CQA Officer.

Additional samples may be removed if the Geotechnical CQA Monitor observes a suspect seam.

6.1.5.3 Sampling Procedures

Samples shall be made or removed by the Contractor/Liner Subcontractor at locations selected by the Geotechnical CQA Monitors as the seaming operation progresses. The Geotechnical CQA Monitor shall:

- Observe making and/or removal of samples.

- Mark each sample with an identifying number which contains the seam number. (For nondestructive samples the seam number welded just prior to making a sample will be marked on the sample).

- Record sample locations on the panel layout drawing and enter the information on a Destructive Sample Log Form.

- Record the sample location, date and time taken, weather conditions, and reason the sample was made and/or taken (e.g., random sample, visual appearance, result of a previous failure, etc.).

- Mark sample identifying number on HDPE adjacent to the location where the sample was taken.

All holes in the HDPE resulting from destructive seam sampling shall be immediately repaired in accordance with repair procedures described herein. The continuity of the new seams in the repaired area shall be tested according to procedures described herein.

6.1.5.4 Size of Samples

Two types of samples shall be made or removed at each location. First, two samples shall be removed for field testing. Each of these samples shall be 1 inch wide with a length of 12 inches plus the seam width. For destructive sampling, the sample shall be taken perpendicular to the seam and the distance between these two samples shall be 38 inches. Samples designated for laboratory testing shall be that portion of seam located between the two samples taken for field testing. The samples for laboratory testing shall be 36 inches long with a width of 12 inches plus the seam width. The seam shall be centered lengthwise. The samples for laboratory testing shall be cut into three equal parts and distributed as follows:

- One part for the Independent Testing Laboratory for testing.
- One part to the Contractor/Liner Subcontractor.
- One part to the Construction Manager for archive storage.

6.1.5.5 Field Testing

The two 1 inch wide samples shall be tested in the field for peel adhesion and bonded seam strength (shear) by the Contractor/Liner Subcontractor, and shall not fail in the seam, but shall have a film tearing bond (FTB). If one or both of the samples fails in either peel or shear, the Contractor/Liner Subcontractor can, at his/her discretion, (1) reconstruct or cap strip the seam between passed test locations, or (2) take two additional test samples 10 feet on either side of the point of the failed test and repeat this procedure. If the second test passes, the Contractor/Liner Subcontractor shall reconstruct or cap strip the same between the two passed test locations. If subsequent tests fail, the procedure is repeated until the length of the poor quality seam is established. Repeated failures indicate that either the seaming equipment and/or operator is not performing properly, and appropriate action shall be taken.

6.1.5.6 Laboratory Testing

Once the field tests have passed, a sample shall be recovered from between passing field sample locations for testing by the Independent Testing Laboratory. Destructive test samples shall be packaged and shipped to the laboratory by the Geotechnical CQA Monitors and will be handled in a manner which will not damage the test sample. The Construction Manager will be responsible for storing the archive samples.

All specimens of a field weld sample tested by the Independent Testing Laboratory shall pass. If any specimen fails, the entire sample shall be considered as a failure, and the field weld shall be rejected. In this event, the field seam(s) shall be rejected as being nonconformant with the Specifications, and corrective measures shall be implemented.

For destructive samples which have failed, corrective measures shall include a rerun of the weld test using the same sample. If the second test passes, the Geotechnical CQA Monitor may assume an error was made in the first test and the field seam may be accepted. If the second test fails, the Contractor/Liner Subcontractor shall reconstruct or cap strip the field seam between any two previous passed seam locations which include the failed seam or shall go on both sides of the failed seam location (10-feet minimum), take another sample each side and test both in the independent laboratory.

If both samples pass, the Contractor/Liner Subcontractor shall reconstruct or cap strip the field seam between the two passing locations. If either fails, the Contractor/Liner Subcontractor shall repeat the process of taking samples for testing by the Independent Testing Laboratory. In all cases, acceptable field seams must be bounded by two passed test locations. In cases involving more than 50 feet of reconstructed or cap stripped seam, the reconstructed or cap stripped seam shall also be tested. The results of the Independent Testing Laboratory govern seam acceptance. In no case shall field testing of installed seams be used for final acceptance.

Testing shall include peel adhesion and bonded seam strength (shear; ASTM D6392). At least five specimens each shall be tested for peel and sheer. Minimum test values are presented in the Specifications. The Independent Testing Laboratory shall provide test results within 24 hours after receipt of samples for testing. Certified test results shall be provided within 5 days. The Geotechnical CQA Monitor shall document all test results on an appropriate form (Form B-8 attached) and shall immediately notify the Geotechnical CQA Officer, Construction Manager and/or Contractor/Liner Subcontractor in the event of a failed test.

The Contractor/Liner Subcontractor's laboratory test results shall be presented to the Geotechnical CQA Officer for comments.

6.1.6 DEFECTS AND REPAIRS

6.1.6.1 Identification

All seams and non-seam areas of the HDPE shall be examined by the Geotechnical CQA Monitors for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. Because light reflected by the HDPE helps to detect defects, the surface of the HDPE shall be clean at the time of examination. The HDPE surface shall be cleaned by the Contractor/Liner Subcontractor if the amount of dust or mud inhibits examination.

Each suspect location as identified by the Geotechnical CQA Monitors, both in seam and non-seam areas, shall be non-destructively tested using the methods described herein, as appropriate. Each location which fails the nondestructive testing shall be marked by the Geotechnical CQA Monitor and then repaired and re-tested by the Contractor/Liner Subcontractor. Work shall not proceed with any materials which will cover locations which have been repaired until laboratory test results with passing values have been obtained.

6.1.6.2 Repair Procedures

Any portion of the HDPE with a flaw or which fails a nondestructive or destructive test shall be repaired in accordance with the Specifications. The Geotechnical CQA Monitor shall locate and describe all repairs on the appropriate forms. Repair procedures include:

- Patching - used to repair large holes, tears, large panel defects, and destructive sample locations which are less than 25 sq. feet in total area.
- Extrusion - used to repair relatively small defects in panels and seams.
- Capping - used to repair failed welds or liner seams where welds cannot be non-destructively tested.
- Removal - used to replace areas with large defects where the preceding methods are not appropriate. Also used to remove excess material (wrinkles) from the installed HDPE.

6.1.6.3 Seam Test Summary

Documentation of all nondestructive and destructive seam testing results, including repairs, shall be summarized by the Geotechnical CQA Officer on Form B-9 attached.

6.1.7 WRINKLES

When placing soil or drain materials over the HDPE, temperature changes or creep may cause wrinkles to develop in the HDPE. Any wrinkles which can fold over shall be repaired either by cutting out excess material or, if possible, allowing the HDPE to contract due to temperature reduction. In no case shall material be placed over the HDPE which could result in the HDPE folding. All folded HDPE shall be removed. No material shall be placed in areas where liner is not in contact with the supporting subgrade.

6.1.8 ANCHOR TRENCH

The anchor trench shall be adequately drained to prevent ponding or softening of the adjacent soils while the trench is open. The anchor trench shall be backfilled and compacted as outlined in the Specifications. Fill soils shall consist of on-site granular soil essentially free of organic and deleterious material and approved by the Geotechnical CQA Monitor and Construction Manager. The material shall have a maximum particle size of 1 inch.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geotechnical CQA Monitor shall observe the bottom of the trenches prior to fill placement to ensure they are free of loose and disturbed materials. The Geotechnical CQA Monitor shall also observe the backfilling and compaction operation, and shall notify the Geotechnical CQA Officer and the Construction Manager of work performed not in accordance with the Project Specifications.

6.1.9 HDPE ACCEPTANCE

The Contractor/Liner Subcontractor shall retain all ownership and responsibility for the HDPE until acceptance by the Owner. The HDPE shall be accepted by Owner when:

- The installation is finished and approved.
- All seams have been inspected and approved.
- All required laboratory tests have been completed and approved.

- All required Contractor/Liner Subcontractor supplied documentation has been received and approved.

- All record drawings have been completed and approved.

6.1.10 LINER MATERIALS

The Geotechnical CQA procedures indicated in this section are intended to allow the installation of materials in contact with the HDPE without causing damage to it.

Important points for Quality Assurance of materials in contact with HDPE include:

- A geotextile or drainage medium approved by the Construction Manager shall be installed above the HDPE.

- Equipment used for placing soil shall not be driven directly on the HDPE/geotextile.

- In heavily trafficked areas, such as access ramps, soil thickness should be at least three (3) feet over the geosynthetics.

- Placement of soils, gravels, sand or other types of earth materials on top of the HDPE/geotextile shall not be performed until all destructive and nondestructive testing has been performed and accepted.

- Placement of overlying earth materials shall be performed in a manner to minimize wrinkles. Equipment operators shall be briefed on methods of placement relative to thermal expansion and contraction of the HDPE.

- Soil material(s) placed on top of the HDPE/geotextile shall be stockpiled and displaced off the stockpile to create a cascading effect of the material on top of the HDPE/geotextile.

The Geotechnical CQA Monitors shall inform the Geotechnical CQA Officer if the above conditions are not fulfilled.

6.2 GEOSYNTHETIC CLAY LINER (GCL)

The Contractor/GCL Manufacturer shall provide the Construction Manager with the following documentation:

- A properties sheet for geotextile and bentonite materials which includes all specified properties measured using test methods indicated in the Project Specifications.

- Certificates for raw bentonite and geotextile materials which indicate that materials provided meet or exceed all applicable specification requirements.

- Manufacturer's Quality Control Certificates.

- Internal shear strength certificate in accordance with specification requirements.

- A panel placement plan.

The Geotechnical CQA Officer shall verify that:

- The property values certified by the GCL Manufacturer meet or exceed the Project Specifications.

- The measurement of properties by the GCL Manufacturer are properly documented and the test methods used are acceptable.

Prior to shipment, the Contractor/GCL Manufacturer shall provide the Construction Manager with a quality control certificate for each GCL roll which is intended for use on the project. The quality control certificate(s) shall be signed by a responsible person employed by the Manufacturer, and shall include roll numbers and identification.

The Geotechnical CQA Officer shall:

- Verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls to be delivered.

- Review the quality control certificates and verify that the certified roll properties meet the Project Specifications.

6.2.1 GCL DELIVERY

The Contractor/GCL Subcontractor shall submit for approval by the Construction Manager, method(s) for handling and storage of GCL material(s) prior to installation. The Geotechnical CQA Monitor shall observe that:

- Equipment used to unload the rolls will not damage the material.
- Care is used to unload the rolls.
- All documentation required by the specifications has been received.

Upon delivery at the site, the Geotechnical CQA Monitor(s) shall conduct a surface inspection of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Monitor(s) shall report to the Construction

Any damaged rolls shall be rejected and removed from the site or stored at a location, designated by the Construction Manager separate from accepted rolls. All rolls which do not have proper documentation from the Manufacturer shall also be stored at a separate location until all documentation has been received and approved. A log of the GCL material(s) received shall be maintained by the Geotechnical CQA Monitor(s).

The Construction Manager shall designate storage space in a location (or several locations) on-site. Storage space shall be protected by the Contractor from theft, vandalism, damage from the actions of Manufacturer, weather, animals and other sources. The Geotechnical CQA Monitor(s) shall observe that the materials are stored in accordance with Manufacturers recommendations and are protected against damage pursuant to ASTM D4873.

6.2.2 GCL CONFORMANCE TESTING

6.2.2.1 Tests

Upon delivery of the GCL material(s), the Geotechnical CQA Monitor shall ensure that the Contractor obtains and forwards samples to the approved Independent Testing Laboratory for testing of conformance with the design specifications. Conformance tests, including interface direct shear, will be performed as detailed in the Project Specifications.

Where optional procedures are noted in the test method, the requirements of the specifications shall prevail. Updated or alternative test methods may be used to determine the physical properties of the GCL materials at the discretion of the Construction Manager.

The results of Conformance Testing will be documented by the Geotechnical CQA Officer.

6.2.2.2 Sampling Procedures

Samples shall be taken across the entire width of the roll(s) and shall not include the first three feet. Unless otherwise specified, samples shall be three (3) feet long by the roll width. The Geotechnical CQA Monitor shall mark the machine direction on the samples with an arrow, and the Manufacturers roll identification number.

6.2.2.3 Test Results

The Geotechnical CQA Officer shall examine all results from the laboratory conformance testing. All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the GCL

material represented by the sample shall be considered non-conformant with the specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and the GCL material can be accepted. If the second test fails, the Contractor/GCL Subcontractor shall remove all material represented by the sample from the work area. The decision of the Construction Manager shall be final.

6.2.3 GCL INSTALLATION

6.2.3.1 Surface Preparation

Prior to installation, the Construction Manager and Geotechnical CQA Monitor(s) shall observe that:

- All lines and grades have been verified by the project surveyor.
- The supporting surface does not contain rocks or irregular surfaces which could damage the GCL.
- There are no excessive soft spots or ponded water which could result in damage to the GCL.
- The Contractor/GCL Subcontractor has certified in writing that the surface on which the GCL will be installed is acceptable.
- The Contractor/GCL Subcontractor shall give each GCL panel an identification number which shall be agreed to and used by the Geotechnical CQA Monitor(s) and the Contractor/GCL Subcontractor. The Geotechnical CQA Monitor shall establish a chart showing correspondence between roll numbers, certification reports and panel numbers.

During placement, the Geotechnical CQA Monitor(s) shall:

- Observe the GCL as it is placed and record all defects and disposition of the defects (panel rejects, patch installed, etc.). All repairs are to be made in accordance with the Project Specifications.
- Observe that Manufacturer's defects do not exceed that allowed by the Project Specifications.
- Observe that equipment used does not damage the GCL by handling, traffic, leakage of hydrocarbons, or other means.

- Observe that people working during installation of the GCL do not smoke, wear shoes that could damage the GCL, or engage in other activities that could damage the GCL.

- Observe that the GCL is anchored to prevent movement by the wind.

- Observe that adjacent panels of GCL are properly overlapped and the proper amount and type of bentonite is installed along the full length of all seams.

- Observe that the number of panels deployed are covered and protected from moisture at the end of the work day.

The Geotechnical CQA Monitor(s) shall inform both the Contractor/GCL Subcontractor and the Construction Manager if the above minimum conditions are not met.

The Contractor/GCL Subcontractor shall provide the Construction Manager with a panel layout plan, and shall update this plan daily as the job proceeds. No GCL shall be placed until the panel layout plan has been approved by the Construction Manager. During panel placement, the Geotechnical CQA Monitor(s) shall also observe the following:

- That GCL material is cut with an approved GCL cutter, and is not torn or ripped.

- The bentonite to be used on all seams meets the requirements of the Project Specifications.

- That the panels are overlapped and sealed in accordance with the Project Plans and Specifications.

6.2.4 REPAIRS

Any necessary repairs to the GCL shall be made with approved GCL material, using approved overlaps, materials, equipment and techniques. The patch size shall be 12 inches or larger in all directions than the area to be patched.

6.3 GEOTEXTILES

The Contractor/Liner Manufacturer shall provide the Construction Manager with the following documentation:

- A properties sheet which includes all specified properties measured using test methods indicated in the specifications.

- A description of the sampling procedure and appropriate test results.

- A certification that values given in the properties sheet are guaranteed by the Liner Manufacturer.

The Geotechnical CQA Officer shall verify that:

- The property values certified by the Liner Manufacturer meet or exceed the project specifications.

- The measurement of properties by the Liner Manufacturer are properly documented and the test methods used are acceptable.

Prior to shipment, the Contractor/Liner Manufacturer shall provide the Construction Manager with a quality control certificate for each roll of geotextile. The quality control certificate shall be signed by a responsible person employed by the Liner Manufacturer, and shall include roll number and identification.

The Geotechnical CQA Officer shall:

- Verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls to be delivered.

- Review the quality control certificates and verify that the certified roll properties meet the project specifications.

6.3.1 GEOTEXTILE DELIVERY

The Contractor/Liner Subcontractor shall submit for approval by the Construction Manager, method(s) for handling and storage of geotextile material(s) prior to installation. The Geotechnical CQA Monitor shall observe that:

- Equipment used to unload the rolls will not damage the geotextile.
- Care is used to unload the rolls.
- All documentation required by the Specifications has been received.

Upon delivery at the site, the Geotechnical CQA Monitors shall conduct a surface inspection of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Monitors shall indicate to the Geotechnical CQA Officer any rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws. These rolls shall be clearly marked as rejected.

Any damaged rolls shall be rejected and removed from the site or stored at a location, designated by the Construction Manager separate from accepted rolls. All rolls which do not have proper documentation from the manufacturer shall also be stored at a separate location until all documentation has been received and

approved. A log of the geotextile material(s) received shall be maintained by the Geotechnical CQA Monitors on an appropriate form (Form B-10 attached).

The Construction Manager shall designate storage space in a location (or several locations) on-site. Storage space shall be protected by the Contractor from theft, vandalism, damage from the actions of man, weather, animals and other sources. The Geotechnical CQA Monitors shall observe that the material is not stored directly on the ground and that storage of the geotextile provides protection against damage pursuant to ASTM D4873.

6.3.2 GEOTEXTILE CONFORMANCE TESTING

6.3.2.1 Tests

Upon delivery of the geotextile, the Geotechnical CQA Monitor shall ensure that samples are obtained and forwarded to an Independent Laboratory for testing of conformance with the design specifications. As a minimum, the following tests will be performed to ensure that geotextile materials are in conformance with the design specifications.

- Thickness (ASTM D1777)
- Mass per unit Area (ASTM D3776)
- Burst Strength (ASTM D3786)
- Puncture Strength (ASTM D4833)
- Permittivity (ASTM D4491)
- Grab Tensile Tests (ASTM D4632)
- Apparent Opening Size (ASTM D4751)
- Appropriate interface shear testing as noted of the Specifications

Where optional procedures are noted in the test method, the requirements of the Specifications shall prevail. Updated or alternative ASTM Test Methods may be used to determine the physical properties of the geotextile materials at the discretion of the Construction Manager.

The results of Conformance Testing will be documented by the Geotechnical CQA Officer on an appropriate form (Form B-11 attached).

6.3.2.2 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be three feet long by the roll width. The Geotechnical CQA Monitor shall mark the machine direction on the samples with an arrow, and the Manufacturer's roll identification number.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 square feet, whichever results in the greater number of samples.

6.3.2.3 Test Results

The Geotechnical CQA Officer shall examine all results from the laboratory conformance testing. All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the geotextile material represented by the sample shall be considered nonconformant with the Specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and the geotextile material can be accepted. If the second test fails, the Contractor/Liner Subcontractor shall remove all material represented by the sample from the work area. The decision of the Construction Manager shall be final.

6.3.3 GEOTEXTILE INSTALLATION

6.3.3.1 Surface Preparation

Prior to installation, the Construction Manager and Geotechnical CQA Monitors shall observe that:

- All lines and grades have been verified.
- The subgrade has been prepared in accordance with the Project Specifications and the supporting surface does not contain rocks or irregular surfaces which could damage the geotextile.
- There are no excessively soft areas which could result in damage to the geotextile.
- The Contractor/Liner Subcontractor has certified in writing that the surface on which the geotextile will be installed is acceptable.

6.3.3.2 Placement

The Contractor/Subcontractor shall give each geotextile panel an identification number which shall be agreed to and used by the Geotechnical CQA Monitors and the Contractor/Liner Subcontractor. The Geotechnical CQA Monitor shall establish a chart showing correspondence between roll numbers, certification reports, and panel numbers on an appropriate form (Form B-12 attached).

During panel placement, the Geotechnical CQA Monitor shall:

- Observe the geotextile as it is placed and record all defects and disposition of the defects (panel rejected, patch installed, etc.). All repairs are to be made in accordance with the Specifications.

- Observe that equipment used does not damage the geotextile by handling, traffic, leakage of hydrocarbons, or other means;

- Observe that people working during installation of geotextile do not smoke, wear shoes that could damage the geotextile, or engage in other activities that could damage the geotextile

- Observe that the geotextile is anchored to prevent movement by the wind.

- Observe that adjacent panels of geotextile are overlapped a minimum of 18 inches where the fabric is not seamed (welded or sewn). When seamed, a three inch minimum overlap will be required.

The Geotechnical CQA Monitors shall inform both the Contractor/Liner Subcontractor and the Geotechnical CQA Officer if the above minimum conditions are not met.

The Contractor/Liner Subcontractor shall provide the Construction Manager with a panel layout plan, and shall update this plan daily as the job proceeds. No geotextile shall be placed until the panel layout plan has been approved by the Construction Manager. During geotextile placement, the Geotechnical CQA Monitors shall observe that:

- The geotextile is cut only with an approved geotextile cutter, and is not torn or ripped.

- The thread and sewing machinery meet the Project requirements (if sewing is the elected method of joining panels).

- The panels are being overlapped or joined in accordance with the Project Plans and Specifications.

- Any roll of geotextile with a tear exceeding 10 percent of roll width is removed and replaced.

6.3.4 REPAIRS

Any necessary repairs to the geotextile shall be made with the geotextile material itself, using approved overlaps or sewing systems, equipment and techniques. The patch size shall be 18 inches or larger in all directions than the area to be patched and all corners shall be rounded.

6.4 GEOCOMPOSITE

The Contractor/Liner Manufacturer shall provide the Construction Manager with the following documentation:

- A properties sheet which includes all specified properties measured using test methods indicated in the specifications.
- A description of the sampling procedure and appropriate test results.
- A certification that values given in the properties sheet are guaranteed by the Liner Manufacturer.

The Geotechnical CQA Officer shall verify that:

- The property values certified by the Liner Manufacturer meet or exceed the project specifications.
- The measurement of properties by the Liner Manufacturer are properly documented and the test methods used are acceptable.

Prior to shipment, the Contractor/Liner Manufacturer shall provide the Construction Manager with a quality control certificate for each roll of geocomposite. The quality control certificate shall be signed by a responsible person employed by the Liner Manufacturer, and shall include roll number and identification.

The Geotechnical CQA Officer shall:

- Verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls to be delivered.
- Review the quality control certificates and verify that the certified roll properties meet the project specifications.

6.4.1 GEOCOMPOSITE DELIVERY

The Contractor/Liner Subcontractor shall submit for approval by the Construction Manager, method(s) for handling and storage of geocomposite material(s) prior to installation. The Geotechnical CQA Monitor shall observe that:

- Equipment used to unload the rolls will not damage the geocomposite.
- Care is used to unload the rolls.
- All documentation required by the Specifications has been received.

Upon delivery at the site, the Geotechnical CQA Monitors shall conduct a surface inspection of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damage are found or suspected. The Geotechnical CQA Monitors shall indicate to the Geotechnical CQA Officer any

rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.

Any damaged rolls shall be marked as rejected and removed from the site or stored at a location, designated by the Construction Manager separate from accepted rolls. All rolls which do not have proper documentation from the manufacturer shall also be stored at a separate location until all documentation has been received and approved. A log of the geocomposite material(s) received shall be maintained by the Geotechnical CQA Monitors.

The Construction Manager shall designate storage space in a location (or several locations) on-site. Storage space shall be protected by the Contractor from theft, vandalism, damage from the actions of man, weather, animals and other sources. The Geotechnical CQA Monitors shall observe that the material is not stored directly on the ground and that storage of the geocomposite provides protection against damage pursuant to ASTM D4873.

6.4.2 GEOCOMPOSITE CONFORMANCE TESTING

6.4.2.1 Tests

Upon delivery of the geocomposite, the Geotechnical CQA Monitor shall ensure that samples are obtained and forwarded to a GAI certified Independent Laboratory for testing of conformance with the design specifications. Conformance sampling and testing will be conducted in accordance with Section D of the Project Specifications.

- Thickness (ASTM D1777)
- Mass per unit area (ASTM D3776)
- Hydraulic Transmissivity (ASTM D4716
- Carbon Black Content (ASTM D1603)
- Tensile Strength (machine direction; ASTM D1682)

Where optional procedures are noted in the test method, the requirements of the Specifications shall prevail. Updated or alternative ASTM Test Methods may be used to determine the physical properties of the geocomposite materials at the discretion of the Construction Manager.

The results of Conformance Testing will be documented by the Geotechnical CQA Officer.

6.4.2.2 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be three feet long by the

roll width. The Geotechnical CQA Monitor shall mark the machine direction on the samples with an arrow, and the Manufacturer's roll identification number.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 square feet, whichever results in the greater number of samples.

6.4.2.3 Test Results

The Geotechnical CQA Officer shall examine all results from the laboratory conformance testing. All specimens tested shall pass. If any specimen fails, the entire sample shall be considered as a failure and rejected. In this event, the geocomposite material represented by the sample shall be considered nonconformant with the Specifications, and corrective measures shall be implemented. Corrective measures shall include a rerun of the conformance testing using a portion of the same sample. If the second test passes, the Geotechnical CQA Officer may assume an error was made in the first test and the geotextile material can be accepted. If the second test fails, the Contractor/Liner Subcontractor shall remove all material represented by the sample from the work area. The decision of the Construction Manager shall be final.

6.4.3 GEOCOMPOSITE INSTALLATION

6.4.3.1 Surface Preparation

Prior to installation, the Construction Manager and Geotechnical CQA Monitors shall observe that:

- All lines and grades have been verified.
- The subgrade has been prepared in accordance with the Project Specifications and the supporting surface does not contain rocks or irregular surfaces which could damage the geocomposite.
- There are no excessively soft areas which could result in damage to the geocomposite.
- All construction stakes and hubs have been removed.
- The Contractor/Liner Subcontractor has certified in writing that the surface on which the geocomposite will be installed is acceptable.

6.4.3.2 Placement

The Contractor/Subcontractor shall give each geocomposite panel an identification number which shall be agreed to and used by the Geotechnical CQA Monitors and the Contractor/Liner Subcontractor. The Geotechnical CQA Monitor shall establish a chart showing correspondence between roll numbers, certification reports, and panel numbers.

During panel placement, the Geotechnical CQA Monitor shall:

- Observe the geocomposite as it is placed and record all defects and disposition of the defects (panel rejected, patch installed, etc.). All repairs are to be made in accordance with the Specifications.
- Observe that equipment used does not damage the geocomposite by handling, traffic, leakage of hydrocarbons, or other means.
- Observe that people working during installation of geocomposite do not smoke, wear shoes that could damage the geocomposite, or engage in other activities that could damage the geocomposite.
- Observe that the geocomposite is anchored to prevent movement by the wind.
- Observe that adjacent panels of geocomposite are overlapped a minimum of 18 inches where the fabric is not seamed (welded or sewn). When seamed, a three inch minimum overlap will be required.

The Geotechnical CQA Monitors shall inform both the Contractor/Liner Subcontractor and the Geotechnical CQA Officer if the above minimum conditions are not met.

The Contractor/Liner Subcontractor shall provide the Construction Manager with a panel layout plan, and shall update this plan daily as the job proceeds. No geocomposite shall be placed until the panel layout plan has been approved by the Construction Manager. During geocomposite placement, the Geotechnical CQA Monitors shall observe that:

- The geocomposite is cut only with an approved cutter, and is not torn or ripped.
- Geocomposite seaming equipment meet the Project requirements.
- The panels are being overlapped or joined in accordance with the Project Plans and Specifications.
- Any damaged roll of geocomposite is removed and replaced.

6.4.4 REPAIRS

Any necessary repairs to the geocomposite shall be made with the geocomposite material itself, using approved overlaps or seaming systems, equipment, and techniques. The patch size shall be 18 inches or larger in all directions than the area to be patched and all corners shall be rounded.

7.0 DOCUMENTATION

The Geotechnical CQA Plan depends on thorough monitoring and documentation of all construction activities. Therefore, the Geotechnical CQA Officer shall document that all Geotechnical CQA requirements have been addressed and satisfied. Documentation shall consist of daily reports, construction problem reports, photographs, design and specification revisions, and a certification report.

7.1 DAILY SUMMARY REPORTS

Daily summary reports provide a chronological framework for identifying and recording all other reports and shall consist of field notes, summary of the daily meeting with the Contractor/Liner Subcontractor, observation and data sheets (including a record of field and/or laboratory tests) and construction corrective measures reports. This information shall be submitted daily to the Geotechnical CQA Officer for review and approval. The summary of the daily meeting with the Contractor/Liner Subcontractor shall include:

- Date, project name, and location.
- Names of parties attending.
- Scheduled activities.
- Items discussed.
- Signature of Geotechnical CQA Monitor.

The corrective measures report will include detailed descriptions of materials and/or workmanship that do not meet a specified design and will be cross referenced to the specific inspection data sheets where the problem was identified and corrected.

7.2 OBSERVATION AND TEST DATA REPORTS

Observation and test data reports shall include:

- Date, project name, and location.
- Weather data.
- A reduced scale site plan showing work areas, including sample and test locations.
- A description of ongoing construction.

- A summary of test results identified as passing, failing, or, in the event of a failed test, retest.
- Test equipment calibrations, if applicable.
- A summary of decisions regarding acceptance of the work and/or corrective actions taken.
- The signature of the Geotechnical CQA Monitor.

A summary of observation and test data reports shall be submitted on a schedule mutually agreeable to the Construction Manager and Geotechnical CQA Officer.

7.3 CONSTRUCTION CORRECTIVE MEASURES REPORTS

These reports identify and document construction problems and solutions. They are intended to document problems involving significant rework, and are not intended to document problems which are easily corrected unless the problems are recurring. Each report shall include:

- A detailed description of the problem.
- The location and cause of the problem
- The solution to the problem.
- The personnel involved.
- Signatures of the Geotechnical CQA Officer and Construction Manager.

7.4 DESIGN AND SPECIFICATION REVISIONS

Design and specification revisions may be required during construction. In such cases, the Geotechnical CQA Officer shall notify the Construction Manager. Design and specification revisions shall become official only after written approval of the Construction Manager.

7.5 PHOTOGRAPHS

Construction activities will be photographed, including significant problems and remedial actions. The photographs will be identified by location, time, date, and photographer.

7.6 AS-BUILT PLANS

As-built plans shall be prepared by the Contractor/Subcontractor from surveying and base maps prepared by a Registered Land Surveyor. The Geotechnical CQA Monitors shall observe that the "As-Built" plans include:

- Dimensions of all field panels;
- Location of each panel relative to the surveyor's plan;
- Identification of all panels and seams (including manufacturer's roll identification numbers);
- Location of all patches and repairs;
- Location of all nondestructive and destructive test sampling;
- Identification of problems or unusual conditions.

7.7 FINAL CERTIFICATION REPORT

At completion of the work, the Geotechnical CQA Officer shall prepare and submit a final certification report. This report shall render an opinion as to whether the work was performed in compliance with the project plans and specifications.

As a minimum, the final certification report shall include:

- A summary of all construction activities;
- Laboratory and field test results;
- Observation and test data sheets;
- Sampling and testing location plans;
- A description of significant construction problems and the solutions of these problems;
- A list of revisions from the construction plans and specifications, and the justification for these revisions;
- A certification statement signed and sealed by a Civil Engineer or Certified Engineering Geologist registered in the State of California.

Upon completion of construction, the facility will store all original documents so that they are protected from damage throughout the post-closure maintenance period, yet can be readily accessed.

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-1
FML RECEIVED

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date Received	QA Monitor	Roll Number	Lot Number (Railcar)	AREA					CQC Doc. Received	CQA Sample Sent to Lab	CQA Test Received	CQA Test Result	Status I/P/F
				Length feet	Width feet	Area sq. ft.	Cumm. Sq. Ft. Rcvd. By Lot	Cumm. Sq. Ft. Rcvd. Total					

Manufacturer:

Type:

CQC – Construction Quality Control
CQA – Construction Quality Assurance

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

B-1A
GCL RECEIVED

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date Received	QA Monitor	Roll Number	Lot Number (Railcar)	AREA					CQC Doc. Received	CQA Sample Sent to Lab	CQA Test Received	CQA Test Result	Status I/P/F
				Length feet	Width feet	Area sq. ft.	Cumm. Sq. Ft. Rcvd. By Lot	Cumm. Sq. Ft. Rcvd. Total					

Manufacturer:

Type:

CQC – Construction Quality Control
CQA – Construction Quality Assurance

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-1B
GEOCOMPOSITE RECEIVED

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date Received	QA Monitor	Roll Number	Lot Number (Railcar)	AREA					CQC Doc. Received	CQA Sample Sent to Lab	CQA Test Received	CQA Test Result	Status I/P/F
				Length feet	Width feet	Area sq. ft.	Cumm. Sq. Ft. Rcvd. By Lot	Cumm. Sq. Ft. Rcvd. Total					

Manufacturer:

Type:

CQC – Construction Quality Control
CQA – Construction Quality Assurance

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-2
FML CONFORMANCE TEST

1100

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Test Number	Date	Roll Number	Lot Number (Railcar)	Type								Roll Length feet	Roll Width feet	Material Represented Sq.Ft.	Status I/P/F	Remarks
FML Specification																
Acceptable Limits																

Manufacturer:

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

1011

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-2A
GCL CONFORMANCE TEST

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Test Number	Date	Roll Number	Lot Number (Railcar)	Type								Roll Length feet	Roll Width feet	Material Represented Sq.Ft.	Status I/P/F	Remarks
Acceptable Limits																

Manufacturer:

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

B-2B

GeoLogic Associates
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GEOCOMPOSITE CONFORMANCE TEST

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Test Number	Date	Roll Number	Lot Number (Railcar)	Type								Roll Length feet	Roll Width feet	Material Represented Sq.Ft.	Status I/P/F	Remarks
Acceptable Limits																

Manufacturer:

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

B-4

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

FML PANEL PLACEMENT LOG SUMMARY

1103

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date	QA Monitor	Panel Number	Location (Work Area)	Roll Number	Lot/ Batch Number	AREA					REPAIRS				Date Covered	Remarks
						Length 1	Length 2	Width	Sq. Ft.	Cumm. Feet	Y/N	Date Repaired	Date Tested	P/F		

Manufacturer:

Type:

Notes:

Checked By:

ACCEPTANCE OF SOIL SUBGRADE FOR THE SUPPORT OF GEOSYNTHETIC LINER (FML)

PROJECT NAME: GREGORY CANYON LANDFILL
COMPOSITE LINER SYSTEM CONSTRUCTION

LINER CONTRACTOR:
AREA APPROVED: _____

_____

_____

I, the undersigned, duly authorized representative of the LINER CONTRACTOR, accept the soil subgrade for the support of the geosynthetic liner in the aforementioned area. I shall be responsible for maintaining its integrity and suitability, in accordance with the project specifications from this date to completion of the installation in this area. I do not accept any responsibility for the conditions or character of the subsurface soil.

NAME (PRINT)	SIGNATURE	TITLE	DATE

ACKNOWLEDGED BY QA MONITOR

NAME (PRINT)	SIGNATURE	COMPANY/TITLE	DATE

B-4A

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

GCL PANEL PLACEMENT LOG SUMMARY

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date	QA Monitor	Panel Number	Location (Work Area)	Roll Number	Lot/ Batch Number	AREA					REPAIRS				Date Covered	Remarks
						Length 1	Length 2	Width	Sq. Ft.	Cumm. Feet	Y/N	Date Repaired	Date Tested	P/F		

Manufacturer:

Type:

Notes:

Checked By:

B-4B

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

GEOCOMPOSITE PANEL PLACEMENT LOG SUMMARY

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date	QA Monitor	Panel Number	Location (Work Area)	Roll Number	Lot/ Batch Number	AREA					REPAIRS				Date Covered	Remarks
						Length 1	Length 2	Width	Sq. Ft.	Cumm. Feet	Y/N	Date Repaired	Date Tested	P/F		

Manufacturer:

Type:

Notes:

Checked By:

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-5
FML PANEL PLACEMENT LOG

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

CAP REPAIRED TESTED CHK'D BY: _____

PATCH REPAIRED TESTED EXTRUDATE REPAIRED TESTED

DATE: TIME: QA MONITOR: AMB: PANEL # ROLL #	REMARKS

107

B-6

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

FML SEAM TRIAL WELDS

1108

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Sample Number (Daily)	Date Completed	Welder Number	Technician	Time (AM/PM)	Temperature				Test Results						Remarks
					Ambient	Wedge	Extrudate	Preheat	Peel FTB	Strength (lbs/in)	Shear FTB	Strength (lbs/in)	Mills	QA Monitor	

B-7

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

FML SEAMING LOG SUMMARY

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Seam Number	Date Seamed	Seam Length feet	Equipment Number	Tech	Time Seamed	Wind Speed m.p.h.	Temperature Sheet Deg. F	Temperature Amb Deg. F	Non-Destructive Tests Probe/ V1	Non-Destructive Tests VT.	Non-Destructive Tests ST.	Non-Destructive Tests AP.	Repairs Yes/No	Repairs Date Repaired	Repairs Date Tested	Destructive Sample Sample Number	Destructive Sample P/F	Destructive Sample Date Repaired	Destructive Sample Date Tested	Status I/P/F/A

NOTES:

VT – Vaccum Test
ST – Spark Test
AP – Air Pressure Test
VI – Visual Inspection

STATUS:

I – In Progress
P – Pass
F – Fail
A – As built In

Checked By: _____

Seam Length:

This page _____

Total previous page(s) _____

Grand Total: _____

B-8

GeoLogic Associates
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FML DESTRUCTIVE TEST SUMMARY

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Sample Number	Seam Type (wedge/ extrusion)	Date Seamed	Equipment Number	Tech	Seam Number	Ambient Temperature (Deg. F) at time seamed	Bonded Seam Strength		P/F	Seam Peel Adhesion		P/F	Remarks
							FTB	Strength (lbs./inch)		FTB/ (FTB+Peel)	Adhesion (lbs./inch)		

Type:

FTB – Film Tear Bond

Notes:

Checked By:

B-9

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

FML SEAMING LOG SUMMARY

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Seam Number	Seam Type	Date Seamed	Seam Length feet		Equipment		Tech	Time Seamed	Wind Speed	Temperature		Non-Destructive Tests			Repairs				Destructive Sample				Status I/P/F/A	QA Monitor
			Init.	As blt.	Number	Temp.		am/pm	m.p.h.	Sheet Deg. F	Amb Deg. F	Type*	Date	P/F	Y/N	Date Repaired	Date Tested	P/F	Sample Number	P/F	Date Repaired	Date Tested		

Seam Number	Seam Type	Date Seamed	Seam Length feet		Equipment		Tech	Time Seamed	Wind Speed	Temperature		Non-Destructive Tests			Repairs				Destructive Sample				Status I/P/F/A	QA Monitor
			Init.	As blt.	Number	Temp.		am/pm	m.p.h.	Sheet Deg. F	Amb Deg. F	Type*	Date	P/F	Y/N	Date Repaired	Date Tested	P/F	Sample Number	P/F	Date Repaired	Date Tested		

Seam Number	Seam Type	Date Seamed	Seam Length feet		Equipment		Tech	Time Seamed	Wind Speed	Temperature		Non-Destructive Tests			Repairs				Destructive Sample				Status I/P/F/A	QA Monitor
			Init.	As blt.	Number	Temp.		am/pm	m.p.h.	Sheet Deg. F	Amb Deg. F	Type*	Date	P/F	Y/N	Date Repaired	Date Tested	P/F	Sample Number	P/F	Date Repaired	Date Tested		

* – Note what type of test was used:

VT – Vaccum Test
ST – Spark Test
AP – Air Pressure Test

STATUS:

I – In Progress
P – Pass
F – Fail
A – As built In

SEAM TYPE:

EW – Extrusion Weld Seam
WW – Wedge Weld Seam

Checked By: _____

Seam Length (this page): _____

Total (previous pages): _____

Grand Total: _____

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-10
GEOTEXTILE RECEIVED

1112

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date Received	QA Monitor	Roll Number	Lot/Batch Number	AREA				CQC Doc. Received	CQA Sample Sent to Lab	CQA Test Received	CQA Test Result	Status I/P/F
				Length feet	Width feet	Area sq. ft.	Cumulative Sq. Ft. Rcvd.					

Manufacturer:

Type:

CQC – Construction Quality Control
CQA – Construction Quality Assurance

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-11
GEOTEXTILE CONFORMANCE TEST

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Test Number	Date	Roll Number	Lot Number (Railcar)	Type								Roll Length feet	Roll Width feet	Material Represented Sq. ft.	Status I/P/F	Remarks
Specification																
Acceptable Limits																

Manufacturer:

Status:

I – In progress
P – Pass
F – Fail

Notes:

Checked By:

GeoLogic Associates
Geologists, Hydrogeologists and Engineers

B-12
GEOTEXTILE PLACEMENT LOG

PROJECT NO.: 9539 PROJECT: GREGORY CANYON LANDFILL, COMPOSITE LINER SYSTEM CONSTRUCTION LOCATION: SAN DIEGO COUNTY, CA

Date	QA Monitor	Panel Number	Location (Work Area)	Roll Number	Lot/ Batch Number	AREA					REPAIRS			Date Covered	Remarks
						Length 1	Length 2	Width	Sq. Ft.	Cumm. Ft.	Yes/No	Date Repaired	Date Tested		

Manufacturer:

Type:

Notes:

Checked By:

APPENDIX O

POST-CLOSURE MAINTENANCE AND MONITORING FORMS

FORM A
GREGORY CANYON LANDFILL
LANDFILL GAS PERIMETER MONITORING CALIBRATION FORM

Technician _____
Date_____ Time _____

METER NAME MODEL	SERIAL NUMBER	STANDARD USED	(PRE-SAMPLING) INITIAL METER READING	CALIBRATED METER READING	(POST SAMPLING) FINAL METER READING	ADDITIONAL INFORMATION OBSERVATION

* CALIBRATED METER READING AFTER ADJUSTING SPAN CONTROLS.

(L:\Gregory\97139\Reports\Jtd:Form-A:2/18/99)

1116

FORM B
GREGORY CANYON LANDFILL
LANDFILL GAS PROBE MONITORING DATA SHEET

Technician _____

Date _____ **Time** _____

PROBE NUMBER		A	B	C
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			
		to	to	to
Time:	Pressure inches of water			
	Gas (%)			
	Gas (PPM)			

(L:\Gregory\97139\Reports\Jtd:Form-B:2/18/99)

FORM C
GREGORY CANYON LANDFILL
GROUNDWATER MONITORING WELL MAINTENANCE RECORD

DATE: _____

WELL I.D.# _____

W.O.#: _____

TYPE OF WORK

- Seal ☐
- Casing ☐
- Discharge Piping ☐
- Valves ☐

WORK PERFORMED: _____

SKETCH:

SIGNED BY: _____

(L:\Greogry\97139\Reports\Jtd:FORM-C.XLS:2/18/99)

1118

FORM D
GREGORY CANYON LANDFILL
RECORD OF DISPOSAL AREA SURVEY MONUMENTATION MONITORING

Disposal Area Survey Monument	Completion of Closure Construction		5th Year		10th Year		15th Year		20th Year		25th Year		30th Year	
	Elevation	Location	Elevation	Location	Elevation	Location	Elevation	Location	Elevation	Location	Elevation	Location	Elevation	Location

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119

FORM E
GREGORY CANYON LANDFILL
DRAINAGE INSPECTION REPORT

PROJECT DESCRIPTION _____

CREW MEMBERS _____

WEATHER CONDITIONS _____

DATE _____

	YES	NO
TEST FOR GASES		
TEST FOR OXYGEN		
VENTILATION REQ'D		
RESPIRATORS REQ'D.		
CONTINUOUS INSP.		
SPOT INSP.		

DESCRIPTION & LOCATION OF DEFICIENCY	DATE REPAIRED

INSPECTOR

(L:\Gregory\97139\Reports\Jtd:FORM-E.XLS:2/18/99)

1120

APPENDIX P

FINANCIAL ASSURANCE DOCUMENTATION

CalRecycle

DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY

801 K STREET, MS 19-01, SACRAMENTO, CALIFORNIA 95814 • (916) 322-4027 • WWW.CALRECYCLE.CA.GOV

December 14, 2010

Law Offices of
E. William Hutton, P.C.
6303 Owensmouth Avenue, 10th Floor
Woodland Hills, CA 91367

RE: Approval of Financial Assurance Demonstration for Gregory Canyon Landfill.
Facility No.37-AA-0032

Dear Mr. Hutton:

Staff of the Department of Resources Recycling and Recovery (CalRecycle) reviewed the financial assurance demonstration submitted for Gregory Canyon Landfill. As a result of this review, CalRecycle finds that Trust Agreement No. 80583800, held by Wells Fargo Bank, National Association, established for closure, postclosure maintenance, and corrective action costs meets the requirements of Title 27, California Code of Regulations (CCR), Division 2, Subdivision 1, Chapter 6, section 22240 and as such, is approved by CalRecycle.

CalRecycle recently adopted amended financial assurance requirements for postclosure maintenance and corrective action costs. The amended requirements were effective on July 1, 2010. The regulations will change the manner in which all operators must provide financial assurance demonstrations during the operating life of their landfill, and will impact access to financial assurance demonstrations during postclosure maintenance of closed landfills. For additional information about this regulatory package, please visit CalRecycle's webpage at: http://www.calrecycle.ca.gov/Laws/Rulemaking/Postclosure/

If you have any questions regarding this determination, please contact Elizabeth Castañeda of the Financial Assurances Unit at (916) 341-6323, or at elizabeth.castaneda@calrecycle.ca.gov.

Sincerely,

Mark De Bie,
Branch Manager
Permitting & Assistance Branch

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TRUST AGREEMENT

Trust Account Number:

80583800

This Trust Agreement (Agreement) is entered into as of October 18 2010 by and between:
(Date)

GRANTOR	TRUSTEE
Operator Name: Gregory Canyon , Ltd., limited liability company	Trustee Name: Wells Fargo Bank, National Association
Address: 160 Industrial Street, Suite 200 San Marcos, CA 92078	Address: 707 Wilshire Boulevard, 17th Floor, Los Angeles, California 90017 Phone Number: (213) 614-4117
X Corporation ☐ Association ☐ Partnership ☐ Proprietorship In the State of ~~California~~	Incorporated in the State N/A X A National Bank

TERMS OF AGREEMENT

WHEREAS, the Department of Resources Recycling and Recovery (CalRecycle) has established regulations applicable to the Grantor in Title 27, California Code of Regulations, Division 2, Subdivision 1, Chapter 6, requiring that an operator of a solid waste disposal facility shall provide assurance that funds will be available when needed for closure and/or postclosure maintenance and/or corrective action and/or third party operating liability claims of the facility, and

WHEREAS, the Grantor has elected to establish a trust to provide all or part of such financial assurance for the facilities identified herein, and

WHEREAS, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this agreement, and the Trustee is willing to act as trustee,

NOW THEREFORE, the Grantor and Trustee agree as follows:

Section 1. Definitions. As used in this Agreement:

(a) The term "Grantor" means the operator who enters into this Agreement and any successors or assigns of the Grantor.

(b) The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee.

(c) The term "CalRecycle" means State of California, Department of Resources Recycling and Recovery or its designee.

(d) The term "Beneficiary" means (1) CalRecycle when this Agreement is used for closure, postclosure maintenance, and/or corrective action and (2) a third party claimant injured or damaged by accidental occurrences arising from the operation of the covered facility when this Agreement is used for operating liability.

Section 2. Identification of Facilities Cost Estimates and Coverage Amounts. This Agreement pertains to the facilities, cost estimates, and determination of primary or excess coverage identified on attached Schedule A (for each facility identified in Schedule A, list the solid waste information system number, name, address, the current closure and/or postclosure cost estimates and/or corrective action cost estimates and/or operating liability coverage (indicate the closure and postclosure amounts and corrective action and operating liability coverage amounts separately), or portions thereof for which financial assurance is demonstrated by this Agreement).

Section 3. Establishment of Fund for Closure and/or Postclosure and/or Corrective Action and/or operating liability. The Grantor and the Trustee hereby establish a trust fund, the "Fund," for the benefit of the Beneficiary. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by the Beneficiary.

Section 3a. Establishment of Fund for Operating Liability. The Grantor and the Trustee hereby establish a trust fund, hereinafter the Fund for the benefit of any and all third parties injured or damaged by accidental occurrences arising from operation of the facility(ies) covered by this trust agreement, in the amounts of ____NA___ per occurrence and ___NA____ annual aggregate for accidental occurrences, except that the Fund is not established for the benefit of third parties for the following:

(a) "Bodily injury" or "property damage" expected or intended from the standpoint of the Grantor. This exclusion does not apply to "bodily injury" resulting from the use of reasonable force to protect persons or property.

(b) "Bodily injury" or "property damage" for which the Grantor is obligated to pay damages by reason of the assumption of liability in a contract or agreement. This exclusion does not apply to liability for damages that the Grantor would be obligated to pay in the absence of the contract or agreement.

(c) Any obligation of the Grantor under a workers' compensation, disability benefits, or unemployment compensation law or any similar law.

(d) "Bodily injury" to:

(1) An employee of the Grantor arising from, and in the course of, employment by the Grantor; or

(2) The spouse, child, parent, brother, or sister of an employee as a consequence of (1) above.

This exclusion applies:

(1) Whether the Grantor may be liable as an employer or in any other capacity; and

(2) To any obligation to share damages with or repay another person who must pay damages because of the injury.

(e) "Bodily injury" or "property damage" arising out of the ownership, maintenance, use, or entrustment to others of any aircraft, "auto", or watercraft owned or operated by or rented or loaned to the Grantor. Use includes operation and loading and unloading. This exclusion does not apply to:

(1) Parking an "auto" on, or on the ways next to, premises the Grantor owns or rents, provided the "auto" is not owned by or rented or loaned to the Grantor.

(2) "Bodily injury" or "property damage" arising out of the operation of any of the equipment listed in paragraph (F)2. or (F)3. of the definition of "mobile equipment" (27 CCR, Division 2, Subdivision 1, Chapter 6).

(f) "Property damage" to:

(1) Any property owned, rented, or occupied by the Grantor;

(2) Premises that are sold, given away, or abandoned by the Grantor if the "property damage" arises out of any part of those premises;

(3) Property loaned to the Grantor;

(4) Personal property in the care, custody, or control of the Grantor;

(5) That particular part of real property on which the Grantor or any contractors or subcontractors working directly or indirectly on behalf of the Grantor are performing operations, if the "property damage" arises out of these operations; or

(6) That particular part of any property that must be restored, repaired or replaced because the Grantor's work was incorrectly performed on it.

Section 4. Payment for Closure and/or Postclosure Maintenance and/or Corrective Action. The Trustee shall make payments from the Fund as CalRecycle shall direct, in writing, to provide for the payment of the costs of closure and/or postclosure maintenance and/or corrective action of the facilities covered by this Agreement. The Trustee shall make disbursements to the Grantor or other persons as specified by CalRecycle from the Fund for closure and/or postclosure and/or corrective action expenditures in such amounts as CalRecycle shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as CalRecycle specifies in writing. Upon refund, such funds shall not constitute part of the Fund as defined herein.

Section 4a. Payment for Bodily Injury or Property Damage. The Trustee shall satisfy a third party liability claim by making payments from the Fund only on receipt of one of the following documents: NA

(a) Certification from the Grantor and the third party claimant that the liability claim should be paid. The certification must be worded as follows:

CERTIFICATION OF VALID CLAIM

The undersigned, as parties [Grantor] and [Name and Address of third party claimant(s)], hereby certify that the claim of bodily injury and/or property damage caused by an accidental occurrence arising from the operation of [Grantor's] solid waste facility should be paid in the amount of $ NA

Grantor's Signature	Notary	Date / /
Claimant(s) Signature	Notary	Date / /

(b) A valid final court order establishing a judgment against the grantor for bodily injury or property damage caused by accidental occurrences arising from the operation of the Grantor's facility or group of facilities.

Section 5. Payments Comprising the Fund. Payments made to the Trustee for the Fund shall consist of cash or securities acceptable to the Trustee.

Section 6. Trustee Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines that the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his or her duties with respect to the trust fund solely in the interest of the Beneficiary and with the care, skill, prudence and diligence under the circumstances then prevailing that persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; except that:

(i) Securities or other obligations of the Grantor, or any other operator or owner of the landfills, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or State Government.

(ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State Government; and

(iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion:

(a) To transfer from time to time any or all of the assets of the Fund to any common, commingled or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

(b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-1 et seq., including one that may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretion conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

(a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition;

(b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

(c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depositary even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depositary with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve Bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;

(d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State Government; and

(e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation. The Trustee shall annually, at least 30 days prior to the anniversary date of establishment of the Fund, furnish to the Grantor and CalRecycle a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days prior to the anniversary date of establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and to CalRecycle shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to matters disclosed in the statement.

Section 11. Advice of Counsel. The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting on the advice of counsel.

Section 12. Trustee Compensation. The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.

Section 13. Successor Trustee. The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If, for any reason, the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, CalRecycle, and the present Trustee by certified mail ten days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are designated in the attached Exhibit A or such other designees as the Grantor may designate by amendment to Exhibit A. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by CalRecycle to the Trustee shall be in writing, signed by CalRecycle designees, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or CalRecycle hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or CalRecycle, except as provided for herein.

Section 15. Notice of Nonpayment. The Trustee shall notify the Grantor, and CalRecycle, by either registered or certified mail, within 10 days following the expiration of the 30-day period after the anniversary of the establishment of the Trust, if no payment is received from the Grantor during that period. After the pay-in period is completed, the Trustee shall not be required to send a notice of nonpayment.

Section 15a. Notice of Nonpayment. If a payment for bodily injury or property damage is made under Section 4a of this trust, the Trustee shall notify the Grantor of such payment and the amount(s) thereof within five (5) working days. The Grantor shall, within one year of such payment, either make payments to the trustee in amounts sufficient to cause the trust to return to its value immediately prior to the payment of claims under Section 4a, or shall provide written proof to the Trustee that other financial assurance for operating liability coverage has been obtained equaling the amount necessary to return the trust to its value prior to the payment of claims. If the Grantor does not either make payments to the Trustee or provide the Trustee with such proof, the Trustee shall, within 10 working days after the anniversary date of the payment, provide a written notice of nonpayment to CalRecycle.

Section 16. Amendment of Agreement. This agreement may be amended by an instrument in writing executed by the Grantor, Trustee, and CalRecycle, or by the Trustee and CalRecycle if the Grantor ceases to exist.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 16, this Trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and CalRecycle, or by the Trustee and CalRecycle, if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor. CalRecycle will agree to termination of the trust when the operator substitutes alternate financial assurance or is released as specified in 27 CCR, Division 2, Subdivision 1, Chapter 6.

Section 18. Immunity and Indemnification. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or CalRecycle issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act in conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 19. Choice of Law. This Agreement shall be administered, construed, and enforced according to the laws of the State of California.

Section 20. Interpretation. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written. The parties below certify and sign under the laws of the State of California that the information in this document is true and correct to the best of his or her knowledge, and is being executed in accordance with the requirements of 27 CCR, Division 2, Subdivision 1, Chapter 6.

Signature of Grantor:	Title: Authorized Representative
Typed or Printed Name of Person Signing: James Simmons	Seal:
Attest: Title LAURIE KEATON	
Signature of Trustee:	Title: VICE PRESIDENT
Typed or Printed Name of Person Signing: TOM ORLINA	Seal:
Attest: Title Sandy Chan Vice President	

PRIVACY STATEMENT

The Information Practices Act (California Civil Code Section 1798.17) and the Federal Privacy Act (5 U.S.C. 552a(e)(3)) require that this notice be provided when collecting personal information from individuals.

AGENCY REQUESTING INFORMATION: California Department of Resources Recycling and Recovery (CalRecycle).

UNIT RESPONSIBLE FOR MAINTENANCE OF FORM: Financial Assurances Section, California Department of Resources Recycling and Recovery (CalRecycle), 801 "K" Street, P.O. Box 4025, Sacramento, California 95812-4025. Contact the Manager, Financial Assurances Section, at (916) 341-6000.

AUTHORITY: Public Resources Code section 43600 et seq.

PURPOSE: The information provided will be used to verify adequate financial assurance of solid waste disposal facilities listed.

REQUIREMENT: Completion of this form is mandatory. The consequence of not completing this form is denial or revocation of a permit to operate a solid waste disposal facility.

OTHER INFORMATION: After review of this document, you may be requested to provide additional information regarding the acceptability of this mechanism.

ACCESS: Information provided in this form may be provided to the U.S. Environmental Protection Agency, State Attorney General, Air Resources Board, California Department of Toxic Substances Control, Energy Resources Conservation and Development Commission, Water Resources Control Board, and California Regional Water Quality Control Boards. For more information or access to your records, contact the California Department of Resources Recycling and Recovery (CalRecycle), 801 "K" Street, P.O. Box 4025, Sacramento, California 95812-4025, (916) 341-6000.

EXHIBIT A

TRUST AGREEMENT BY AND BETWEEN Gregory Canyon Ltd., limited liability company

AND THE Wells Fargo Bank, National Association

As provided for in Section 14 of the Trust Agreement, the persons, other than the officials of CalRecycle identified in Section 14 of the Trust Agreement, who, until this Exhibit A is amended, shall have the authority to make orders, requests, and instructions to the Trustee are:

Officials of the Grantor.

Officials of the Grantor who have authority to give instructions are:

Name: James Simmons

Title: Authorized Representative

EXHIBIT A

Any orders, requests or instructions by the Grantor to the Trustee, pursuant to the foregoing Agreement, may be signed by any one or more of the following persons:

Name: James Simmons

Title: Authorized Representative

TRUST AGREEMENT/DEPOSITORY TRUST

SCHEDULE A

This Agreement demonstrates financial assurance for the following cost estimate(s) and/or operating liability for the following facility(ies):

Solid Waste Information System Number	Name of Facility(ies)	Address of Facility(ies)	Cost Estimates and or operating liability coverage For Which Financial Assurance is Being Demonstrated by This Agreement
37-AA-0032	Gregory Canyon Landfill	9708 Pala Road, Pala, California 92059	Closure: $26,037,130 Postclosure: $29,555,100 Corrective Action: $7,618,060 Per Occurrence: -0- Annual Aggregate: -0- Total: $63,210,290

The cost estimates listed here were last adjusted on January 26, 2011
Date

TRUST AGREEMENT (ONLY)

SCHEDULE B

The fund is established initially as consisting of the following:

$ $0 ~~Zero dollars~~

(Spell out dollar amount)

as evidenced by ~~N/A~~

(Name of institution drawn on)

Check Number N/A.

Dated N/A

I hereby certify that funds have been received and deposited.

Authorized Signature: N/A	Title:
Typed or Printed Name of Person Signing:	Address: Phone Number of Person Signing:

DEPOSITORY TRUST AGREEMENT (ONLY)

SCHEDULE B

List of Property Comprising Trust Fund

None at the time of trust establishment. Funding of this Depository Trust Agreement is contingent upon drafts against that primary,

(Surety Bond or Letter of Credit) number and issued by

the (Issuing Institution) on (Date)

in accordance with the terms of that

(Surety Bond or Letter of Credit)

APPENDIX Q

SAN LUIS REY MUNICIPAL WATER DISTRICT AGREEMENT
DATED APRIL 1996
AND
FIRST SUPPLEMENT
DATED JUNE 2004

SAN LUIS REY MUNICIPAL WATER DISTRICT AGREEMENT
DATED APRIL 1996

AGREEMENT

THIS AGREEMENT ("Agreement") is entered into on April 15, 1996 (the "Effective Date"), by and between the SAN LUIS REY MUNICIPAL WATER DISTRICT ("SLRMWD"); Dorothy E. Leavey, J.T. and K.L. McCarthy; Edgar E. and Elizabeth S. Pankey Trust; Pankey Farms; Pankey Ranch, A California Limited Partnership; Blanche Pope, Trustee U/D/T Pope Family Trust ("Signing District Members") on the one hand, and North San Diego County Development Co., a California General Partnership ("Current Owner"); Gregory Canyon, Ltd., a California Limited Liability Company, ("Development Company") on the other hand.

RECITALS

This Agreement is entered into with reference to and in reliance upon the following facts:

A. The SLRMWD is a municipal water district representing the property owners on the San Luis Rey River from the Pala Indian Reservation on the east to highway I-15 on the

west. The SLRMWD maintains and defends the vested water rights of landowners within the boundaries of the SLRMWD, maintains and defends the rights of the SLRMWD, and develops plans for maintenance of a reliable water supply for the future. The SLRMWD comprises the real property shown in Exhibit A as of the Effective Date. The Signing District Members respectively own the real property described on Exhibit B, as of the Effective Date, including appurtenant riparian and appropriative water rights as of the Effective Date.

B. Development Company holds an option (the "Option") to purchase from Current Owner approximately 1600 acres in northern San Diego County, generally known as Gregory Canyon, (the "Gregory Canyon Property") on which it proposes to construct a Class III (solid waste) or Municipal Solid Waste Landfill ("MSWL") and recycling center (collectively "Gregory Canyon Facility"). Some of the Gregory Canyon Property is within the SLRMWD and some of the Gregory Canyon Property is not within the SLRMWD. Development Company wishes to obtain the necessary permits required for the development and operation of the Gregory Canyon Facility. Current Owner has vested water rights as a landowner. Current Owner, through its general partner, has filed an Application to Appropriate Water By Permit with the State Water Resources Control Board ("Application No. 30038) to obtain the right to use Pala Basin water in the construction and operation of the Gregory Canyon Facility. Development Company's

option to acquire the Gregory Canyon Property includes the transfer of Application No. 30038.

C. Approximately 388 acres of the Gregory Canyon Property are within the boundaries of the SLRMWD. The historical production of water from that portion of the Gregory Canyon Property within the SLRMWD totalled in excess of 470 acre-feet per year, which was used primarily for domestic, dairy and agricultural irrigation purposes. It is Development Company's best estimate that the amount of water reasonably necessary for use during the construction phase of the Gregory Canyon Facility is approximately 150,000 gallons of water per day or approximately 180 acre-feet per year, and that during operation of the Gregory Canyon Facility, the amount of water reasonably necessary for use is approximately 50,000 gallons per day or approximately 60 acre-feet per year. Development Company is willing to limit its water usage under any permit granted pursuant to Application No. 30038 to the quantity reasonably necessary for construction and operation of the Gregory Canyon Facility.

D. SLRMWD and the Signing District Members have expressed certain concerns about locating the Gregory Canyon Facility at the Gregory Canyon site. Those concerns include the need to prevent degradation of the Pala Basin due to the construction, operation or closure of the Gregory Canyon Facility

and maintaining an adequate water supply for present and future beneficial uses.

E. Development Company is willing to develop the Gregory Canyon Facility in a manner that will help protect the Pala Basin and quality of water in the Pala Basin. Development Company is further willing to acknowledge that water rights appurtenant to land owned as of the Effective Date by the Signing District Members as described in Exhibit B and water rights held by SLRMWD as of the Effective Date are superior to any appropriative water rights granted pursuant to Application No. 30038. There are landowners within SLRMWD who are not Signing District Members. Development Company is willing to acknowledge that riparian and appropriative water rights appurtenant to land that is owned by others than Signing District Members as of the Effective Date and that is within the boundaries of SLRMWD as shown on Exhibit A are superior to any appropriative water rights granted pursuant to Application No. 30038.

F. SLRMWD and the Signing District Members are willing to consent to the siting of the Gregory Canyon Facility and use of Pala Basin water for construction and operation of the Gregory Canyon Facility under certain terms and conditions.

NOW, THEREFORE, the parties hereto agree as follows:

1. This Agreement relates to the SLRMWD with respect to that property within the boundaries described in Exhibit A and the water rights appurtenant thereto as of the Effective Date. This Agreement does not apply to additional real property and water rights appurtenant thereto that may be annexed to the SLRMWD after the Effective Date or to any water rights otherwise acquired by SLRMWD after the Effective Date. However, if any groundwater rights appurtenant to real property shown in Exhibit A are assigned to SLRMWD, the terms of the Agreement shall apply, but only to that quantity of groundwater usage actually exercised by the assignor as of the Effective Date.

2. This Agreement also relates to Signing District Members Dorothy E. Leavey, J.T. and K.L. McCarthy; Edgar E. and Elizabeth S. Pankey Trust; Pankey Farms; Pankey Ranch, A California Limited Partnership; Blanche Pope, Trustee U/D/T Pope Family Trust with respect to that property, and the water rights appurtenant thereto, described in Exhibit B owned by the respective Signing District Members as of the Effective Date and no other. This Agreement does not apply to any property acquired by any Signing District Member after the Effective Date or to any water rights appurtenant to such after-acquired property. This Agreement also applies to any water rights issued to a Signing District Member pursuant to an application for appropriative rights for water historically used on property

described on Exhibit B by the Signing District Member under an imperfect riparian claim. This Agreement does not apply to any water rights acquired after the Effective Date.

3. Definitions:

a. "CIWMB" means the California Integrated Waste Management Board, the lead agency for implementing the California Municipal Solid Waste Permit Program.

b. "SWRCB" means the State Water Resources Control Board.

c. "RWQCB" means the Regional Water Quality Control Board, Region 9.

d. "LEA" means the San Diego County Department of Environmental Health, the local enforcement agency that has been delegated by the California Integrated Waste Management Board to issue solid waste facility permits in San Diego County.

e. "Gregory Canyon Property" means approximately 1,600 acres in northern San Diego County owned by North San Diego Development Co., generally known as Gregory Canyon.

f. "Gregory Canyon Facility" means a Class III (solid waste) or Municipal Solid Waste Landfill ("MSWL") and recycling center to be constructed on the Gregory Canyon Property.

g. "EIR" means the environmental impact report required for the Gregory Canyon Facility by the California Environmental Quality Act.

h. "Operator" means the owner of the Gregory Canyon Property or other person who through a lease, franchise agreement or other arrangement with the owner of the Gregory Canyon Property becomes legally responsible to the state for including, but not limited to, the following requirements for the Gregory Canyon Facility:

i. Obtaining a solid waste facilities' permit,

ii. Complying with all applicable federal, state and local requirements,

iii. The physical operation of the site, or

iv. Closing and maintaining the site during the post closure maintenance period.

i. "Pala Basin" means that portion of the San Luis Rey River contained within the boundaries of the SLRMWD as shown on Exhibit A.

j. "Foreign Water" means water brought into the Pala Basin from a different watershed.

k. "Foreign Water Storage" means temporary storage of Foreign Water in the Pala Basin with permission of all holders of water rights in the Pala Basin for use within the Pala Basin or for the purpose of returning the Foreign Water to its owner(s) for beneficial uses.

l. "Excess Storage Capacity" means the capacity of the Pala Basin to accept and store Foreign Water.

m. To the extent that terms are not defined in this Agreement, they shall be given the same definition as those set forth in Title 14, California Code of Regulations, section 17761. To the extent that terms used in this Agreement are not defined in 14 CCR § 17761, they shall be given the definitions found in Title 23, California Code of Regulations, section 2601. If the same word is defined differently in 14 CCR § 17761 and 23 CCR § 2601, the definition in 14 CCR § 17761 shall control.

4. Acknowledgement of Superior Water Rights.

a. Development Company hereby acknowledges that water rights held as of the Effective Date by the SLRMWD, landowners within SLRMWD, and the Signing District Members that are appurtenant to that property described in Exhibits A and B, and no other, are superior to any appropriative water rights granted pursuant to Application No. 30038. This acknowledgement does not apply to any real property or water rights acquired after the Effective Date. This Agreement is not intended to and shall not affect any appurtenant riparian, appropriative or other water rights of the Gregory Canyon Property other than any appropriative water rights granted pursuant to Application No. 30038.

b. Development Company agrees to insert as a condition of any permit that may be granted pursuant to Application No. 30038 that if at any time in the future, investigation by SLRMWD or any of the Signing District Members demonstrates that the amount of water available in the Pala Basin is insufficient to meet the reasonable and beneficial needs of the SLRMWD or any of the Signing District Members based upon the reasonable water demands of the SLRMWD or any of the Signing District Members based upon water rights as they existed on the Effective Date as set forth in paragraphs 1 and 2, within the boundaries depicted in Exhibit A or the property described in Exhibit B, then Development Company will reduce diversion of the

water under any permit or license granted pursuant to Application No. 30038 for use on the Gregory Canyon Facility to the extent necessary to eliminate the insufficiency.

c. Development Company agrees to identify an alternative water supply for the construction and operation of the Gregory Canyon Facility and agrees to use the alternative water supply to the extent necessary in the event that the SLRMWD or any of the Signing District Members demonstrates that the amount of water available in the Pala Basin is insufficient to meet the reasonable and beneficial needs of the SLRMWD or any of the Signing District Members based upon the reasonable water demands of the SLRMWD or any of the Signing District Members based upon water rights as they existed on the Effective Date as set forth in paragraphs 1 and 2, within the boundaries depicted in Exhibit A or the property described in Exhibit B.

5. Groundwater Quality Monitoring Plan.

a. Hydrogeological Investigation. Development Company has retained I^3 as its EIR consultant. I^3 and its subcontractors will perform an investigation of the hydrogeological conditions at the Gregory Canyon Facility site as part of the EIR. Development Company agrees to provide SLRMWD with a copy of all final reports generated by its EIR consultants for the Gregory Canyon Facility within ten days of receipt of such report by Development Company.

b. Groundwater Monitoring During Operations. Development Company agrees to install monitoring stations to monitor for the movement of leachate from the Gregory Canyon Facility toward the San Luis Rey River and to monitor the groundwater for constituents of MSWL leachate throughout the operating life of the Gregory Canyon Facility. Development Company shall consult with SLRMWD about the number, specifications, location of, and the frequency of data collection of the monitoring stations. The final decision regarding the need for and adequacy of the number, specifications, location of and frequency of data collection of such monitoring stations shall be made by the RWQCB and/or the CIWMB and/or the LEA and/or any other government agency having the power to require or regulate groundwater monitoring.

c. Data From Groundwater Monitoring Stations. Development Company agrees to provide to SLRMWD simultaneously with the submission to the RWQCB, LEA or CIWMB, data collected from the groundwater monitoring program and shall provide to SLRMWD and its consultants split samples from any groundwater monitoring station upon reasonable notice given before the next regularly scheduled sampling to enable SLRMWD to verify the data collected.

d. SLRMWD, the Signing District Members and Development Company agree to meet regularly to exchange information, communicate concerns and attempt to fashion

solutions to any problems arising out of the construction or operation of the Gregory Canyon Facility.

6. Closure Plan and Post Closure Maintenance Plan.

a. Development Company will comply with all laws and regulations concerning the preparation of a closure plan and a post closure maintenance plan as currently required by 14 CCR § 17782 and hereby agrees that it has a contractual obligation to SLRMWD and the Signing District Members to fully comply with the requirements of 14 CCR § 17782.

b. Development Company agrees to research various means of providing an alternative water supply for the SLRMWD and the Signing District Members, including treatment of Pala Basin water at the wellhead, in the event that and to the extent that the Pala Basin water quality in the SLRMWD is degraded by the construction, operation or closure of the Gregory Canyon Facility so that it cannot be used for domestic uses or for irrigation. The baseline for the water quality of the Pala Basin water in the SLRMWD shall be the background level established by the RWQCB as part of the issuance of Water Discharge Requirements for the Gregory Canyon Facility.

c. Development Company will construct and maintain a reverse osmosis treatment facility as part of the leachate containment system for the Gregory Canyon Facility.

7. Storage of Foreign Water.

The San Diego County Water Authority ("SDCWA") has done a preliminary study on the Excess Storage Capacity of the Pala Basin and has estimated that the Excess Storage Capacity is 16,000 acre feet. The SDCWA would have to contract with the SLRMWD and/or the Signing District Members and with other holders of water rights in the Pala Basin to obtain the right to store Foreign Water in the Pala Basin. SLRMWD is also currently evaluating options for Foreign Water Storage. SLRMWD has done a preliminary study on the Excess Storage Capacity of the Pala Basin and has estimated that the Excess Storage Capacity is 17,694 acre-feet. The Excess Storage Capacity of the Pala Basin therefore has prospective economic value to the SLRMWD, the Signing District Members and other holders of water rights in the Pala Basin. The parties agree that it is not possible at this time to determine whether the SDCWA or anyone else will contract with SLRMWD and/or the Signing Members for the storage of Foreign Water in the Pala Basin or will be able to gain the permission needed from all other holders of water rights to store Foreign Water in the Pala Basin.

8. Liability for Damage.

a. If the construction, operation or closure of the Gregory Canyon Facility causes degradation of the quality of the Pala Basin water or quality of Foreign Water stored in the Pala Basin for use within the Pala Basin so that it cannot be used for domestic uses and for irrigation, Development Company shall be liable to SLRMWD for the extent of any degradation of the quality of Pala Basin water or quality of Foreign Water stored in the Pala Basin caused by the construction, operation or closure of the Gregory Canyon Facility, including the cost of remediating the degradation of water quality attributable to the construction, operation or closure of the Gregory Canyon Facility, or if such remediation is not technologically and economically feasible, of providing an alternative water supply. If remediation is technologically and economically feasible, Development Company shall be liable for providing the affected Signing District Members a temporary alternative water supply pending permanent remediation measures to the extent necessary to meet the affected Signing District Members' reasonable needs for domestic and irrigation uses. Liability under this paragraph 8a with respect to Foreign Water Storage shall be limited to remediation of a maximum of 17,694 acre-feet.

b. In the event that the construction, operation or closure of the Gregory Canyon Facility causes

degradation of the water quality in the Pala Basin to the extent that such degradation renders the Pala Basin unusable for Foreign Water Storage, and the SLRMWD or any of the Signing District Members are economically damaged thereby, Development Co. agrees to remediate the water quality in the Pala Basin to the extent that any such degradation is caused by the construction, operation or closure of the Gregory Canyon Facility if such remediation is technologically and economically feasible. If such remediation is not technologically or economically feasible, Development Co. agrees to compensate the SLRMWD and the Signing District Members for the economic loss actually caused them in the event that the Pala Basin cannot be used for Foreign Water Storage due to degradation of water quality in the Pala Basin caused by the construction, operation or closure of the Gregory Canyon Facility. The parties acknowledge that the technology of remediation will evolve over the life of this Agreement and hereby agree that any dispute over what is technologically and economically feasible shall be resolved by arbitration pursuant to paragraph 10 herein. Liability under this paragraph 8b shall be limited to remediation of 17,694 acre-feet of Foreign Water.

c. In the event that any person or entity makes a claim against or sues SLRMWD and/or the Signing District Members for damage to the Pala Basin water quality, supply, or Foreign Water Storage capability allegedly caused by the construction, operation and/or closure of the Gregory Canyon Facility and as a result of the SLRMWD and/or the Signing

District Members having executed this Agreement, Development Company shall indemnify SLRMWD and/or the Signing District Members from such claims, including providing SLRMWD and/or the Signing District Members with a legal defense by competent lawyers of Development Company's choice.

d. Development Company, SLRMWD and the Signing District Members hereby agree that each has standing to seek damages for the failure to perform any portion of this Agreement or to seek a mandatory injunction compelling the performance of any duty imposed by statute, regulation or this Agreement upon any of them. This Agreement does not confer any rights upon any person or entity who is not a party to it. There are no intended or known third-party beneficiaries to this Agreement.

e. Development Company agrees to notify SLRMWD and each of the Signing District Members of any request to modify or to be released from the requirements of the closure plan or the post closure maintenance plan for the Gregory Canyon Facility.

9. Financial Assurances.

a. Prior to the commencement of construction of the Gregory Canyon Facility (i.e., grading), Development Company agrees to prepare and to provide to SLRMWD

(1) an estimate of the cost to monitor groundwater during the operational life of the Gregory Canyon Facility, (2) an estimate of the cost to do the closure and post closure monitoring required by 14 CCR § 17782, and (3) an estimate of the cost to operate and maintain the reverse osmosis facility to be constructed pursuant to paragraph 6c. Development Company agrees to provide SLRMWD and the Signing District Members with evidence of sufficient financial resources to fully implement all groundwater monitoring required during the operational life of the Gregory Canyon Facility and during its closure and post closure and to operate and maintain the reverse osmosis facility. Development Company shall demonstrate to SLRMWD and the Signing District Members its financial ability to perform groundwater monitoring and to operate and maintain the reverse osmosis facility by use of a trust fund, letter of credit, surety bond or satisfaction of the financial means test set forth in 14 CCR § 18289 or by any other mechanism allowed by existing or future regulations on Class III or MSWL facilities.

b. Remediating the water quality in the Pala Basin, or providing an alternative water supply, as described in paragraphs 8a and 8b shall be a part of the closure plan and part of the cost estimate required by 14 CCR § 17782. However, whether or not the responsible regulatory agencies include such measures in the closure plan, Development Company shall establish and maintain a mitigation fund in accordance with

all of the terms set forth in Exhibit C attached hereto and incorporated herein by reference.

10. Disputes.

In the event of any dispute arising out of this Agreement or any of the substantive issues covered herein, the SLRMWD, the Signing District Members and Development Company agree to submit the dispute to binding arbitration in accordance with California Code of Civil Procedure section 1280, et seq. If the dispute arises out of those portions of this Agreement involving monitoring, water quality degradation, water quality or quantity restoration, availability of water, technological or economic feasibility or other technical (as opposed to legal) issue, the SLRMWD, the Signing District Members and Development Company agree that arbitration shall be conducted by two hydrogeologists or other technically competent persons and one lawyer familiar with California water law. The SLRMWD and Signing District Members shall choose one of the technical arbitrators and Development Company shall choose the other. The two technical arbitrators shall jointly choose the lawyer.

11. Cooperation.

a. The SLRMWD, the Signing District Members and Development Company shall use their best efforts to cooperate to allow the full performance of this Agreement. SLRMWD and the

Signing District Members hereby confirm that this Agreement satisfies their concerns regarding the potential impact of the Gregory Canyon Facility on the quality and quantity of Pala Basin water and Foreign Water, and on the Excess Storage Capacity of the Pala Basin. Each of the parties is authorized to provide a copy of this Agreement to any public agency or private party. The SLRMWD, the Signing District Members and Development Company shall each make their respective consultants available promptly to consult with one another for any discussions on technical matters envisioned by this Agreement.

b. The SLRMWD, the Signing District Members and Development Company agree that this Agreement shall be incorporated into the mitigation measures to be adopted in the Gregory Canyon Facility EIR to the extent that the LEA allows, and shall also be incorporated into the project plans and specifications.

c. The SLRMWD and the Signing District Members hereby agree that they shall not object to, testify against or oppose the Gregory Canyon Facility during the EIR or permitting process with respect to the issues of water quality and quantity in the Pala Basin. The SLRMWD and the Signing District Members shall withdraw all protests filed in opposition to Application No. 30038 upon the Effective Date.

12. This Agreement shall be binding on any and all successors and assigns of SLRMWD, the Signing District Members and Development Company. In the event that Development Company or its assigns exercise the Option, this Agreement shall only bind Development Company, its successors and assigns and shall not in any way bind or limit Current Owner, or its successors or assigns.

13. In the event that Development Company does not exercise the Option and Current Owner applies for permits to develop the Gregory Canyon Facility within five years of notice that the Option will not be exercised or within five years of the expiration of the Option, whichever first occurs, Current Owner hereby agrees to perform all duties of Development Company set forth in this Agreement. The provisions of this Paragraph 13 shall be binding on all successors and assigns of Current Owner.

14. This Agreement shall terminate in the event that Development Company does not exercise the Option and Current Owner does not apply for permits to develop the Gregory Canyon Facility within five years of notice that the Option will not be exercised or within five years of the expiration of the Option, whichever first occurs.

15. All notices or other communications required or permitted hereunder shall be in writing, and shall be personally delivered or sent by first class mail, postage

prepaid, to the respective parties at the addresses listed in Exhibit D and shall be deemed received upon the earlier of (i) if personally delivered, the date of delivery to the address of the designee to receive such notice; or (ii) if mailed, four (4) business days after the date of posting by the United States Post Office. All oral notices of other communications must be confirmed within forty-eight (48) hours by letter mailed or delivered in accordance with the foregoing.

Dated: 12 Jan '96

SAN LUIS REY MUNICIPAL WATER DISTRICT

By: Robert V. Pankey
President, Board of Directors

Dated: ~~Rodney~~ 12 Jan 96

Attest: Rodney Guild

Rodney Guild, Secretary

Dated: 4-15-96

DOROTHY E. LEAVEY, J.T. AND K.L. McCARTHY, GENERAL PARTNERS

By: Kathleen L. McCarthy
Kathleen L. McCarthy, General Partner

Dated: 10 Apr 96

EDGAR E. and ELIZABETH S. PANKEY TRUST

By: Edgar E. Pankey Tr
Edgar E. Pankey, Trustee

[signatures continued on next page]

Dated: 4-4-96

PANKEY FARMS

By: _____
Victor S. Pankey, General Partner

Dated: 1-12-96

PANKEY RANCH
a California Limited Partnership

By: _____
William H. Pankey, General Partner

Dated: April 5, 1996

POPE FAMILY TRUST

By: _____
Blanche Pope, Trustee

Dated: 3/15/96

GREGORY CANYON LTD.

By: _____
Jerry A. Riessen, President

Dated: _____

NORTH SAN DIEGO DEVELOPMENT COMPANY

By: _____
Waste Management of California, Inc., Its General Partner

Dated: _____ PANKEY FARMS

By: _____
Victor S. Pankey, General Partner

Dated: 1-12-96 PANKEY RANCH
a California Limited Partnership

By: William H. Pankey
William H. Pankey, General Partner

Dated: _____ POPE FAMILY TRUST

By: _____
Blanche Pope, Trustee

Dated: _____ GREGORY CANYON LTD.

By: _____
Jerry A. Riessen, President

Dated: 3-1-96 NORTH SAN DIEGO DEVELOPMENT COMPANY

By: Marian King
Waste Management of California, Inc., Its General Partner

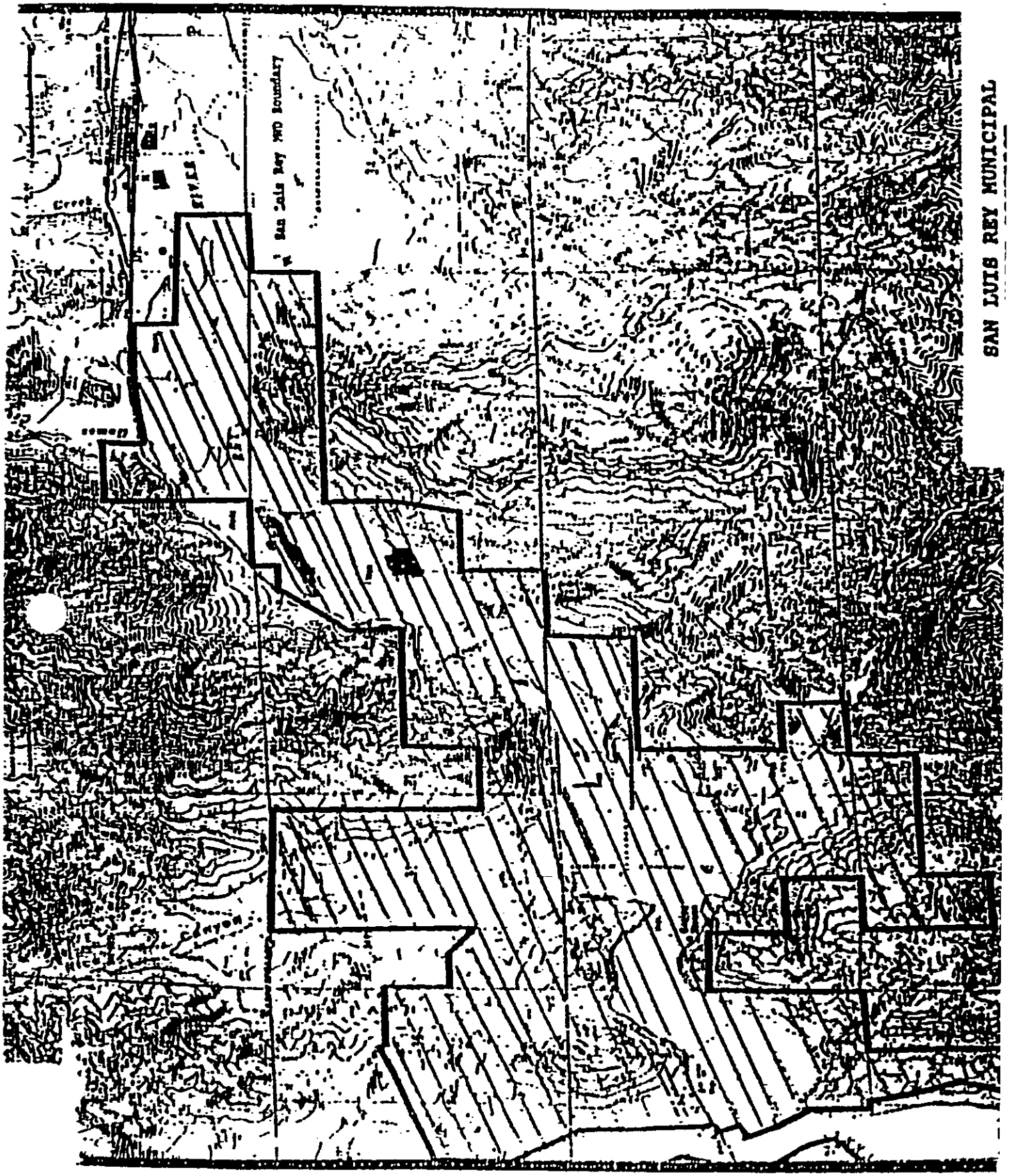

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Exhibit A

DOROTHY E. LEAVEY,
J.T. AND K.L. McCARTHY

PROPERTY DESCRIPTION

PARCEL 1

THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER; THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER; AND PORTIONS OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER AND OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER, IN SECTION 6; ALSO THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER, AND THE EAST HALF OF THE NORTHWEST QUARTER IN SECTION 7, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, AS SHOWN ON RECORD OF SURVEY MAPS NO. 703 AND NO. 731, RECORDS OF SAN DIEGO COUNTY, THE AFOREMENTIONED LAND BEING DESCRIBED AS A WHOLE AS FOLLOWS:

COMMENCING AT THE CORNER COMMON TO SECTIONS 5, 6, 7 AND 8 IN SAID TOWNSHIP 10 SOUTH, RANGE 2 WEST; THENCE NORTH 0°25'29" EAST, 1343.43 FEET; THENCE SOUTH 89°56'19" WEST, 1328.62 FEET TO THE TRUE POINT OF BEGINNING, BEING THE SOUTHEAST CORNER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 6; THENCE NORTH 0°31'21" EAST ALONG THE EAST LINE OF SAID NORTHWEST QUARTER OF THE SOUTHEAST QUARTER, 1035.91 FEET (RECORD 1026.96 FEET) TO A 1" CAPPED IRON PIPE WITH A COPPER DISK MARKED L.S. 1439, BEING THE MOST SOUTHERLY CORNER OF A PARCEL OF LAND CONVEYED TO JOHN HOFFMAN, BY DEED DATED JANUARY 15, 1884 AND RECORDED IN BOOK 45, PAGE 448 OF DEEDS; THENCE NORTH 55° WEST ALONG THE SOUTHERLY LINE OF SAID LAND CONVEYED TO HOFFMAN, 1613.35 FEET, MORE OR LESS, TO THE COUNTY ROAD KNOWN AS LILAC ROAD RUNNING THROUGH THE APPROXIMATE MIDDLE OF SAID SECTION 6; THENCE SOUTH TO A COPPER DISK MARKED R.E.919 SET IN A 1 INCH IRON PIPE, WHICH COPPER DISK WAS SET FOR THE CENTER OF SAID SECTION 6; THENCE NORTH 88°54'59" WEST ALONG THE EAST AND WEST CENTER LINE OF SAID SECTION 1313.81 FEET TO A COPPER DISK SET IN A 1 INCH IRON PIPE MARKED R.E. 919 AT THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION; THENCE SOUTH 0°24'10" EAST ALONG THE WEST LINE OF SAID NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, 1340.70 FEET TO THE SOUTHWEST CORNER THEREOF, BEING MARKED BY A COPPER DISK SET IN A 1 INCH IRON PIPE; THENCE SOUTH 88°03'51" EAST ALONG THE SOUTH LINE OF SAID NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, 1312.26 FEET TO A COPPER DISK SET IN A 1 INCH IRON PIPE ON THE NORTH AND SOUTH CENTER LINE OF SAID SECTION 6; THENCE SOUTH 0°18'37" EAST ALONG SAID CENTER LINE, 1360.17 FEET TO THE QUARTER CORNER COMMON TO SAID SECTIONS 6 AND 7; THENCE NORTH 87°12'54" WEST ALONG THE COMMON LINE BETWEEN SAID SECTIONS, 1311.00 FEET TO A COPPER DISK

Exhibit B

MARKED R.E. 919 SET IN A 1 INCH IRON PIPE IN A ROCK MOUND AT THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 7; THENCE SOUTH 0°26'57" WEST ALONG THE WEST LINE OF THE EAST HALF OF SAID NORTHWEST QUARTER, 2596.16 FEET TO A COPPER DISK MARKED R.E. 919 SET ON THE SOUTH LINE OF SAID NORTHWEST QUARTER IN A LARGE GRANITE BOULDER WHICH IS 50 FEET SOUTH AND 200 FEET WEST FROM U.S.G.S. STATION "LANCASTER"; THENCE SOUTH 89°03'28" EAST ALONG SAID SOUTH LINE OF SAID NORTHWEST QUARTER, 1306.86 FEET TO THE NORTH AND SOUTH CENTER LINE OF SAID SECTION 7; THENCE NORTH 0°31'07" EAST ALONG SAID CENTER LINE, 1276.93 FEET TO A COPPER DISK MARKED R.E. 919 SET IN A 1 INCH IRON PIPE AT THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION; THENCE NORTH 89°52'50" EAST ALONG THE SOUTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER, 1290.12 FEET TO A COPPER DISK MARKED R.E. 919 SET IN A GRANITE BOULDER, SAID POINT BEING THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER; THENCE NORTH 0°13'03" EAST ALONG THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER, 1300.96 FEET TO A COPPER DISK MARKED R.E. 919 SET IN A 1 INCH IRON PIPE, WHICH POINT WAS SET FOR THE SOUTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 6; THENCE NORTH 0°03'01" EAST ALONG THE EAST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER, 1334.49 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL 2

ALL THAT PART OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SAID SECTION 6 AS SHOWN ON RECORD OF SURVEY MAP NO. 731, AND ALSO ON RECORD OF SURVEY MAPS NOS. 703 AND 548; THENCE RUNNING NORTH 0°25'29" EAST 1343.43 FEET TO A POINT; THENCE SOUTH 89°56'19" WEST 964.14 FEET TO A POINT IN THE COUNTY ROAD COMMONLY KNOWN AS LILAC ROAD OR COUSER'S ROAD, AS RELOCATED IN 1927, SAID POINT BEING THE POINT OF BEGINNING OF THIS DESCRIPTION; THENCE ALONG THE APPROXIMATE CENTER LINE OF SAID ROAD THE FOLLOWING THREE COURSES, TO WIT: NORTH 33°23'41" WEST 288.9 FEET; NORTH 41°28'41" WEST 206.7 FEET; NORTH 62°37'41" WEST 72.8 FEET TO THE BOUNDARY LINE DESCRIBED IN "AGREEMENT SETTLING BOUNDARY LINE" DATED 12-23-39, MADE BY AND BETWEEN DON C. PORTER ET UX AND CALIFORNIA LANDS INC., AND RECORDED IN BOOK 988, PAGE 16 OF RECORDS OF SAN DIEGO COUNTY; THENCE SOUTH 0°31'21" WEST ALONG SAID BOUNDARY LINE 429.91 FEET TO THE SOUTH END OF SAID BOUNDARY LINE, SAID POINT BEGIN MARKED BY A 1 1/2" IRON PIPE WITH COPPER DISC MARKED "LS 1439"; THENCE NORTH

89°56'19" EAST 364.48 FEET TO THE POINT OF BEGINNING, CONTAINING 2.075 ACRES, MORE OR LESS.

PARCEL 3

PARCEL A: THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 7, THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 5, AND THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 6, ALL IN TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTING THEREFROM THAT PORTION CONVEYED IN THAT DEED FROM THOMAS E. LEAVEY AND DOROTHY E. LEAVEY, HUSBAND AND WIFE, TO RODNEY GUILD AND JOYCE GUILD, HUSBAND AND WIFE, DATED NOVEMBER 5, 1969 AND RECORDED NOVEMBER 17, 1969, AS DOCUMENT NO. 210735 OF OFFICIAL RECORDS IN THE COUNTY RECORDER'S OFFICE OF SAN DIEGO COUNTY, CALIFORNIA.

PARCEL B: ALL EASEMENTS AND RIGHTS OF WAY OF RECORD APPURTENANT TO PARCEL 3A ABOVE INCLUDING THAT EASEMENT AND RIGHT OF WAY RESERVED IN THAT DEED FROM THOMAS E. LEAVEY AND DOROTHY E. LEAVEY, HUSBAND AND WIFE, TO RODNEY GUILD AND JOYCE GUILD, HUSBAND AND WIFE, DATED NOVEMBER 5, 1969 AND RECORDED NOVEMBER 17, 1969 AS DOCUMENT NO. 210735 OF OFFICIAL RECORDS IN THE COUNTY RECORDER'S OFFICE OF SAN DIEGO COUNTY, CALIFORNIA.

PARCEL 4

PARCEL A: LOT 2 (THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER) OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO U.S. GOVERNMENT SURVEY APPROVED JUNE 30, 1875.

PARCEL B: THAT PORTION OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 6, AND OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, LYING NORTHERLY OF A LINE (AND ITS PROLONGATION) DESCRIBED AS FOLLOWS: BEGINNING AT A POINT IN THE EASTERLY LINE OF SAID NORTHWEST QUARTER OF THE SOUTHEAST QUARTER DISTANT ALONG SAID LINE NORTH 0°31'21" EAST 1035.91 FEET FROM THE SOUTHEASTERLY CORNER OF SAID NORTHWEST QUARTER OF THE SOUTHEAST QUARTER, SAID POINT OF BEGINNING BEING THE NORTHEASTERLY CORNER OF THAT PARCEL OF LAND DESCRIBED IN DEED TO THOMAS E. LEAVEY ET UX, RECORDED MAY 22, 1940 AS DOCUMENT NO. 24496 IN BOOK 1031, PAGE 228 OF OFFICIAL RECORDS; THENCE ALONG THE NORTHEASTERLY LINE OF SAID LEAVEY LAND NORTH 55° WEST 1613.35 FEET, MORE OR LESS, TO THE NORTHWESTERLY CORNER OF SAID LEAVEY LAND, IN THE NORTH AND SOUTH CENTER LINE OF

SAID SECTION 6, SAID ABOVE DESCRIBED LINE BEING SHOWN ON RECORD OF SURVEY NO. 731.

PARCEL C: THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO U.S. GOVERNMENT SURVEY APPROVED JUNE 30, 1875.

PARCEL D: THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

EXCEPTING THEREFROM THAT PORTION DESCRIBED IN DEED TO THOMAS E. LEAVEY, ET UX, RECORDED MAY 3, 1940 AS DOCUMENT NO. 21228 IN BOOK 1016, PAGE 489 OF OFFICIAL RECORDS.

PARCEL 5

THOSE PORTIONS OF THE SOUTH HALF OF LOT 3, AND THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE SOUTHERLY LINE OF THE NORTHWEST QUARTER OF SAID SECTION 6, DISTANT THEREON NORTH 88°25'24" WEST, 1000.00 FEET FROM THE SOUTHEASTERLY CORNER THEREOF; THENCE ALONG SAID SOUTHERLY LINE SOUTH 88°25'24" EAST, 1000.00 FEET TO SAID SOUTHEASTERLY CORNER; THENCE ALONG THE EASTERLY LINE OF SAID NORTHWEST QUARTER, NORTH 00°39'37" EAST, 2003.57 FEET TO THE NORTHEAST CORNER OF THE SOUTH HALF OF SAID LOT 3; THENCE ALONG THE NORTHERLY LINE OF SAID SOUTH HALF NORTH 88°55'31" WEST, 536.11 FEET TO AN INTERSECTION WITH THE CENTER LINE OF COUNTY HIGHWAY COMMISSION ROUTE 18, DIVISION 2, AS SHOWN ON SHEET 1 OF A PLAN OF SAID HIGHWAY ON FILE IN THE OFFICE OF THE COUNTY ENGINEER OF SAN DIEGO COUNTY; THENCE ALONG SAID CENTER LINE OF HIGHWAY AS FOLLOWS: SOUTH 07°52'19" WEST, 47.59 FEET TO THE BEGINNING OF A TANGENT 1500.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY; SOUTHWESTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 07°01'54", A DISTANCE OF 184.09 FEET; TANGENT TO SAID CURVE, SOUTH 14°54'13" WEST, 102.05 FEET TO THE BEGINNING OF A TANGENT 800.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY; SOUTHWESTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 09°58'10", A DISTANCE OF 139.20 FEET; TANGENT TO SAID CURVE SOUTH 24°52'23" WEST, 58.26 FEET TO THE BEGINNING OF A TANGENT 300.00 FOOT RADIUS CURVE, CONCAVE EASTERLY; SOUTHERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 33°05'10", A DISTANCE OF 173.24 FEET; TANGENT TO SAID CURVE, SOUTH 08°12'47" EAST, 87.76 FEET TO THE BEGINNING OF A TANGENT 275.00 FOOT RADIUS CURVE CONCAVE WESTERLY,

SOUTHERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 29°12'20", A DISTANCE OF 140.18 FEET; TANGENT TO SAID CURVE SOUTH 20°59'33" WEST, 4.20 FEET TO THE BEGINNING OF A TANGENT 300.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY; SOUTHWESTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 22°01'40", A DISTANCE OF 115.34 FEET; TANGENT TO SAID CURVE, SOUTH 43°01'13" WEST, 1.97 FEET TO THE BEGINNING OF A TANGENT 110.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY; AND SOUTHWESTERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 26°33'45", A DISTANCE OF 51.00 FEET TO A POINT HEREIN DESIGNATED AS POINT "A", BEING ALSO A POINT ON A LINE BEARING NORTH 12°35'00" EAST FROM THE POINT OF BEGINNING; THENCE SOUTH 12°35'00" WEST, 975.39 FEET TO THE POINT OF BEGINNING.

EDGAR E. AND ELIZABETH S. PANKEY TRUST

PROPERTY DESCRIPTION

THAT PORTION OF THE RANCHO MONSERATE IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, IN BOOK 1, PAGE 108 OF PATENTS, DESCRIBED AS FOLLOWS:

BEGINNING AT AN ANGLE POINT IN THE EASTERLY BOUNDARY OF THE TRACT OF LAND CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED IN BOOK 3026, PAGE 490 OF OFFICIAL RECORDS FORMED BY THE COURSES "SOUTH 44°25'30" WEST 814.80 FEET" AND "SOUTH 0°44'30" WEST 1856.81 FEET"; THENCE SOUTH 0°44'30" WEST 1856.81 FEET; THENCE SOUTH 4°58'08" EAST 301.50 FEET; THENCE SOUTH 0°44'30" WEST 816.15 FEET TO THE NORTHWESTERLY LINE CONVEYED TO DOUGLAS GRAHAM SHEARER AND WIFE, BY DEED RECORDED IN BOOK 3444, PAGE 457 OF OFFICIAL RECORDS; THENCE ALONG SAID NORTHWESTERLY LINE NORTH 45°25'30" EAST 3024.78 FEET; THENCE NORTH 25°30'45" EAST 1152.79 FEET TO POINT "A" OF THIS DESCRIPTION; THENCE NORTH 26°39' WEST 591.28 FEET; THENCE NORTH 46°13' WEST 102.01 FEET; THENCE NORTH 57°48' WEST 360.41 FEET; THENCE NORTH 33°42'30" WEST 120.42 FEET; THENCE NORTH 4°01'30" WEST 302.11 FEET; THENCE NORTH 20°45' EAST 117.71 FEET TO THE CENTER LINE OF HIGHWAY COMMISSION COUNTY ROAD, ROUTE 18, DIVISION 1 BEING POINT "B" OF THIS DESCRIPTION; THENCE ALONG SAID CENTER LINE SOUTH 66°47' 909.01 FEET TO THE BEGINNING OF A TANGENT 700.00 FOOT RADIUS CURVE CONCAVE SOUTHEASTERLY; THENCE SOUTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 22°35'00" A DISTANCE OF 275.91 FEET; THENCE TANGENT TO SAID CURVE SOUTH 44°25'30" WEST 509.32 FEET TO SAID EASTERLY BOUNDARY OF THE STATE OF CALIFORNIA LAND; THENCE ALONG SAID BOUNDARY SOUTH 43°34'30" EAST 50.00 FEET AND SOUTH 44°25'30" WEST 814.80 FEET TO THE POINT OF BEGINNING.

EXCEPTING THOSE PORTIONS CONDEMNED TO THE STATE OF CALIFORNIA BY FINAL ORDER OF CONDEMNATION RECORDED MARCH 21, 1973 AS FILE NO. 73-073740 OF OFFICIAL RECORDS.

ALSO EXCEPTING THOSE PORTIONS GRANTED TO THE STATE OF CALIFORNIA IN PARCEL 1 BY DEED RECORDED FEBRUARY 19, 1975 AS SERIES/INSTRUMENT NO. 75-036967.

PANKEY FARMS

PROPERTY DESCRIPTION

PARCEL 1

THAT PORTION OF THE RANCHO MONSERATE, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, IN BOOK 1, PAGE 108 OF PATENTS, DESCRIBED AS FOLLOWS:

BEGINNING AT CORNER NO. 3 OF THE EXTERNAL SURVEY OF SAID RANCHO MONSERATE; THENCE ALONG THE BOUNDARY OF LAND DESCRIBED IN DEED TO STEPTOE RANCH CO., RECORDED DECEMBER 1, 1961 AS FILE NO. 208836 AS FOLLOWS: NORTH 00°28'58" WEST, 1179.19 FEET (RECORD - NORTH 0°33'00" WEST, 1179.00 FEET); NORTH 89°58'10" WEST, 149.20 FEET (RECORD - 149.41 FEET) TO A POINT ON THE ARC OF A 232.15 FOOT RADIUS CURVE (RECORD - 225.00 FOOT RADIUS CURVE) CONCAVE WESTERLY, A RADIAL LINE OF SAID CURVE BEARS NORTH 84°11'11" EAST TO SAID POINT; NORTHERLY ALONG THE ARC OF SAID CURVE THROUGH A CENTRAL ANGLE OF 38°26'02", A DISTANCE OF 155.73 FEET (RECORD - 156.08 FEET); TANGENT TO SAID CURVE NORTH 44°14'51" WEST, 51.05 FEET (RECORD - NORTH 44°44'51" WEST); NORTH 89°58'10" WEST, 51.72 FEET (RECORD - 52.07 FEET); NORTH 42°24'00" EAST, 1200.00 FEET; SOUTH 47°36'00" EAST, 1425.00 FEET TO AN ANGLE POINT THEREIN; NORTH 86°49'57" EAST, 1054.02 FEET (RECORD - NORTH 86°53'09" EAST, 1051.98 FEET) TO AN INTERSECTION WITH THE EASTERLY BOUNDARY OF SAID RANCHO MONSERATE; AND ALONG THE EASTERLY AND SOUTHERLY BOUNDARY OF SAID RANCHO AS FOLLOWS: SOUTH 00°11'45" EAST, 1194.93 FEET (RECORD - SOUTH 0°09'42" EAST) TO CORNER NO. 2 OF SAID RANCHO AND SOUTH 86°51'45" WEST, 2610.72 FEET (RECORD - SOUTH 86°53'09" WEST, 2606.39 FEET) TO THE POINT OF BEGINNING.

PARCEL 2

AN EASEMENT AND RIGHT OF WAY FOR A WATER COURSE OVER A STRIP OF LAND 100.00 FEET IN WIDTH, LYING WITHIN RANCHO MONSERATE, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, IN BOOK 1, PAGE 108 OF PATENTS, THE SOUTHEASTERLY LINE OF SAID STRIP BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST NORTHERLY CORNER OF PARCEL 1 HEREINABOVE DESCRIBED; THENCE ALONG THE NORTHWESTERLY LINE OF SAID PARCEL 1, SOUTH 42°24'00" WEST, 1164.91 FEET.

Exhibit B

PANKEY RANCH, A CALIFORNIA LIMITED PARTNERSHIP

PROPERTY DESCRIPTION

PARCEL 1

THAT PORTION OF THE RANCHO MONSERATE, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF RECORDED IN BOOK 1, PAGE 108 OF PATENTS, RECORDS OF SAN DIEGO COUNTY, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF THE SOUTHEAST QUARTER OF FRACTIONAL SECTION 36, TOWNSHIP 9 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN; THENCE ALONG THE WESTERLY LINE OF SAID SOUTHEAST QUARTER, SOUTH 0°26'07" WEST 1273.20 FEET TO THE SOUTHERLY LINE OF THE NORTH HALF OF SAID SOUTHEAST QUARTER; THENCE ALONG THE WESTERLY PROLONGATION OF SAID SOUTHERLY LINE, SOUTH 89°40'14" WEST 1259.67 FEET TO THE SOUTHEAST CORNER OF THE LAND DESCRIBED IN DEED TO DAON CORPORATION, RECORDED MARCH 27, 1981 AS FILE NO. 81-092782 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID DAON CORPORATION LAND, NORTH 26°42'12" WEST 32.25 FEET; THENCE NORTH 0°03'30" EAST 1327.93 FEET; THENCE NORTH 65°22'28" EAST 681.37 FEET; THENCE LEAVING SAID BOUNDARY, SOUTH 61°29'03" EAST 754.61 FEET TO THE POINT OF BEGINNING.

RESERVING THEREFROM IN FAVOR OF THE GRANTOR AN EASEMENT AND RIGHT OF WAY FOR INGRESS AND EGRESS, ROAD AND UTILITY PURPOSES, INCLUDING BUT NOT LIMITED TO ELECTRIC POWER, TELEPHONE, GAS, WATER, SEWER AND CABLE TELEVISION LINES AND APPURTENANCES THERETO, OVER, UNDER, ALONG AND ACROSS THOSE PORTIONS LYING WITHIN PARCEL 13 BELOW, PRIOR TO THE EXCEPTION.

SAID EASEMENT IS HEREBY DECLARED TO BE APPURTENANT TO AND FOR THE USE AND BENEFIT OF THE PRESENT AND FUTURE OWNER OR OWNERS OF ALL OR ANY PORTION OF THE GRANTOR'S REMAINING LAND.

PARCEL 2

THOSE PORTIONS OF RANCHO MONSERATE, ACCORDING TO MAP THEREOF RECORDED IN BOOK 1, PAGE 108 OF PATENTS, RECORDS OF SAN DIEGO COUNTY, AND OF FRACTIONAL SECTION 36, TOWNSHIP 9 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, ACCORDING TO OFFICIAL PLAT THEREOF, ALL IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID FRACTIONAL SECTION 36; THENCE ALONG THE WESTERLY LINE OF THE

NORTHEAST QUARTER OF SAID FRACTIONAL SECTION, NORTH 0°26'07" EAST 90.00 FEET TO THE NORTHWEST CORNER OF THE LAND DESCRIBED IN DEED TO PANKEY RANCH, RECORDED APRIL 13, 1981 AS FILE NO. 81-112045 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID PANKEY RANCH, NORTH 65°02'26" EAST 1269.34 FEET; THENCE NORTH 71°58'58" EAST 200.00 FEET; THENCE LEAVING SAID BOUNDARY, NORTH 2°17'43" WEST 970.00 FEET; THENCE SOUTH 67°06'45" WEST 863.63 FEET; THENCE SOUTH 87°42'17" WEST 500.00 FEET TO THE MOST EASTERLY ANGLE POINT OF THE LAND DESCRIBED IN DEED TO DAON CORPORATION, RECORDED MARCH 27, 1981 AS FILE NO. 81-092782 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID DAON CORPORATION LAND, SOUTH 47°45'53" WEST 221.16 FEET; THENCE SOUTH 49°10'58" WEST 663.73 FEET; THENCE SOUTH 14°12'21" WEST 123.41 FEET; THENCE SOUTH 6°09'01" EAST 239.79 FEET; THENCE LEAVING SAID BOUNDARY, SOUTH 61°29'03" EAST 754.61 FEET TO THE POINT OF BEGINNING.

RESERVING THEREFROM IN FAVOR OF THE GRANTOR AN EASEMENT AND RIGHT OF WAY FOR INGRESS AND EGRESS, ROAD AND UTILITY PURPOSES, INCLUDING BUT NOT LIMITED TO ELECTRIC POWER, TELEPHONE, GAS, WATER, SEWER AND CABLE TELEVISION LINES AND APPURTENANCES THERETO, OVER, UNDER, ALONG AND ACROSS THAT PORTION LYING WITHIN PARCEL 2B BELOW, PRIOR TO THE EXCEPTION.

SAID EASEMENT IS HEREBY DECLARED TO BE APPURTENANT TO AND FOR THE USE AND BENEFIT OF THE PRESENT AND FUTURE OWNER OR OWNERS OF ALL OR ANY PORTION OF THE GRANTOR'S REMAINING LAND.

PARCEL 3

THAT PORTION OF FRACTIONAL SECTION 36, TOWNSHIP 9 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO OFFICIAL PLAT THEREOF, BEING DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID FRACTIONAL SECTION 36; THENCE ALONG THE WESTERLY LINE OF THE NORTHEAST CORNER OF SAID FRACTIONAL SECTION, NORTH 0°26'07" EAST 90.00 FEET TO THE NORTHWEST CORNER OF THE LAND DESCRIBED IN DEED TO PANKEY RANCH, RECORDED APRIL 13, 1981 AS FILE NO. 81-112045 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID PANKEY RANCH, NORTH 65°02'26" EAST 1269.34 FEET; THENCE NORTH 71°58'58" EAST 200.00 FEET; THENCE LEAVING SAID BOUNDARY, NORTH 2°17'43" WEST 970.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE RETRACING SOUTH 2°17'43" EAST 970.00 FEET; THENCE CONTINUING ALONG THE BOUNDARY OF SAID PANKEY RANCH, NORTH 71°58'58" EAST 461.44 FEET; THENCE SOUTH 24°09'39" EAST 868.73 FEET; THENCE SOUTH 28°57'51" EAST 730. 31 FEET; THENCE SOUTH 49°14'33" WEST 1015.39 FEET; THENCE NORTH 87°46'48" WEST 200.00 FEET; THENCE SOUTH 2°13'12" WEST 400.00 FEET; THENCE SOUTH 87°46'48" EAST 1150.00 FEET TO THE

EASTERLY LINE OF THE SOUTHEAST QUARTER OF SAID FRACTIONAL SECTION; THENCE ALONG SAID EASTERLY LINE, NORTH 2°13'12" EAST 1750.00 FEET TO THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID FRACTIONAL SECTION; THENCE ALONG THE EASTERLY LINE OF SAID NORTHEAST QUARTER, NORTH 2°17'43" WEST 2777.01 FEET TO THE NORTHEAST CORNER OF SAID FRACTIONAL SECTION; THENCE ALONG THE NORTHERLY LINE THEREOF, SOUTH 87°38'06" WEST 1850.30 FEET TO THE CENTER LINE OF THAT CERTAIN STRIP OF LAND DESCRIBED AS EASEMENT PARCEL 5 IN DEED TO WILLIAM B. BUCK, ET AL, RECORDED OCTOBER 31, 1978 AS FILE NO. 78-471499 OF OFFICIAL RECORDS; THENCE LEAVING SAID NORTHERLY LINE AND ALONG SAID CENTER LINE, SOUTH 13°36'00" WEST (SOUTH 13°35'04" WEST PER DEED) 373.08 FEET; THENCE SOUTH 18°39'45" WEST (SOUTH 18°38'41" WEST PER DEED) 240.70 FEET; THENCE LEAVING SAID CENTER LINE, SOUTH 82°37'00" EAST 694.71 FEET; THENCE SOUTH 2°17'43" EAST 410.00 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL 4

THOSE PORTIONS OF RANCHO MONSERATE, ACCORDING TO MAP THEREOF RECORDED IN BOOK 1, PAGE 108 OF PATENTS, RECORDS OF SAN DIEGO COUNTY, AND OF FRACTIONAL SECTION 36, TOWNSHIP 9 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, ACCORDING TO OFFICIAL PLAT THEREOF, ALL IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID FRACTIONAL SECTION 36; THENCE ALONG THE NORTHERLY LINE THEREOF, SOUTH 87°38'06" WEST 1850.30 FEET TO THE CENTER LINE OF THAT CERTAIN STRIP OF LAND DESCRIBED AS EASEMENT PARCEL 5 IN DEED TO WILLIAM B. BUCK, ET AL, RECORDED OCTOBER 31, 1978 AS FILE NO. 78-471499 OF OFFICIAL RECORDS, BEING THE TRUE POINT OF BEGINNING; THENCE LEAVING SAID NORTHERLY LINE AND ALONG SAID CENTER LINE, SOUTH 13°36'00" WEST (SOUTH 13°35'04" WEST PER DEED) 373.08 FEET; THENCE SOUTH 18°39'45" WEST (SOUTH 18°38'41" WEST PER DEED) 240.70 FEET; THENCE LEAVING SAID CENTER LINE, SOUTH 82°37'00" EAST 694.71 FEET; THENCE SOUTH 2°17'43" EAST 410.00 FEET; THENCE SOUTH 67°06'45" WEST 863.63 FEET; THENCE SOUTH 87°42'17" WEST 500.00 FEET TO THE MOST EASTERLY ANGLE POINT OF THE LAND DESCRIBED IN DEED TO DAON CORPORATION, RECORDED MARCH 27, 1981 AS FILE NO. 81-092782 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID DAON CORPORATION LAND, NORTH 24°37'32" WEST 1589.35 FEET TO THE BOUNDARY OF SAID RANCHO MONSERATE; THENCE ALONG SAID BOUNDARY, SOUTH 87°27'51" EAST 675.96 FEET TO CORNER NO. 21 OF THE EXTERNAL SURVEY OF SAID RANCHO, BEING THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID FRACTION SECTION; THENCE ALONG THE NORTHERLY LINE THEREOF, NORTH 87°38'06" EAST 742.21 FEET TO THE TRUE POINT OF BEGINNING.

RESERVING THEREFROM IN FAVOR OF THE GRANTOR AN EASEMENT AND RIGHT OF WAY FOR INGRESS AND EGRESS, ROAD AND UTILITY PURPOSES, INCLUDING BUT NOT LIMITED TO ELECTRIC POWER, TELEPHONE, GAS, WATER, SEWER AND CABLE TELEVISION LINES AND APPURTENANCES THERETO, OVER, UNDER, ALONG AND ACROSS THOSE PORTIONS LYING WITHIN PARCEL 4B BELOW, PRIOR TO THE EXCEPTION.

SAID EASEMENT IS HEREBY DECLARED TO BE APPURTENANT TO AND FOR THE USE AND BENEFIT OF THE PRESENT AND FUTURE OWNER OR OWNERS OF ALL OR ANY PORTION OF THE GRANTOR'S REMAINING LAND.

PARCEL 5

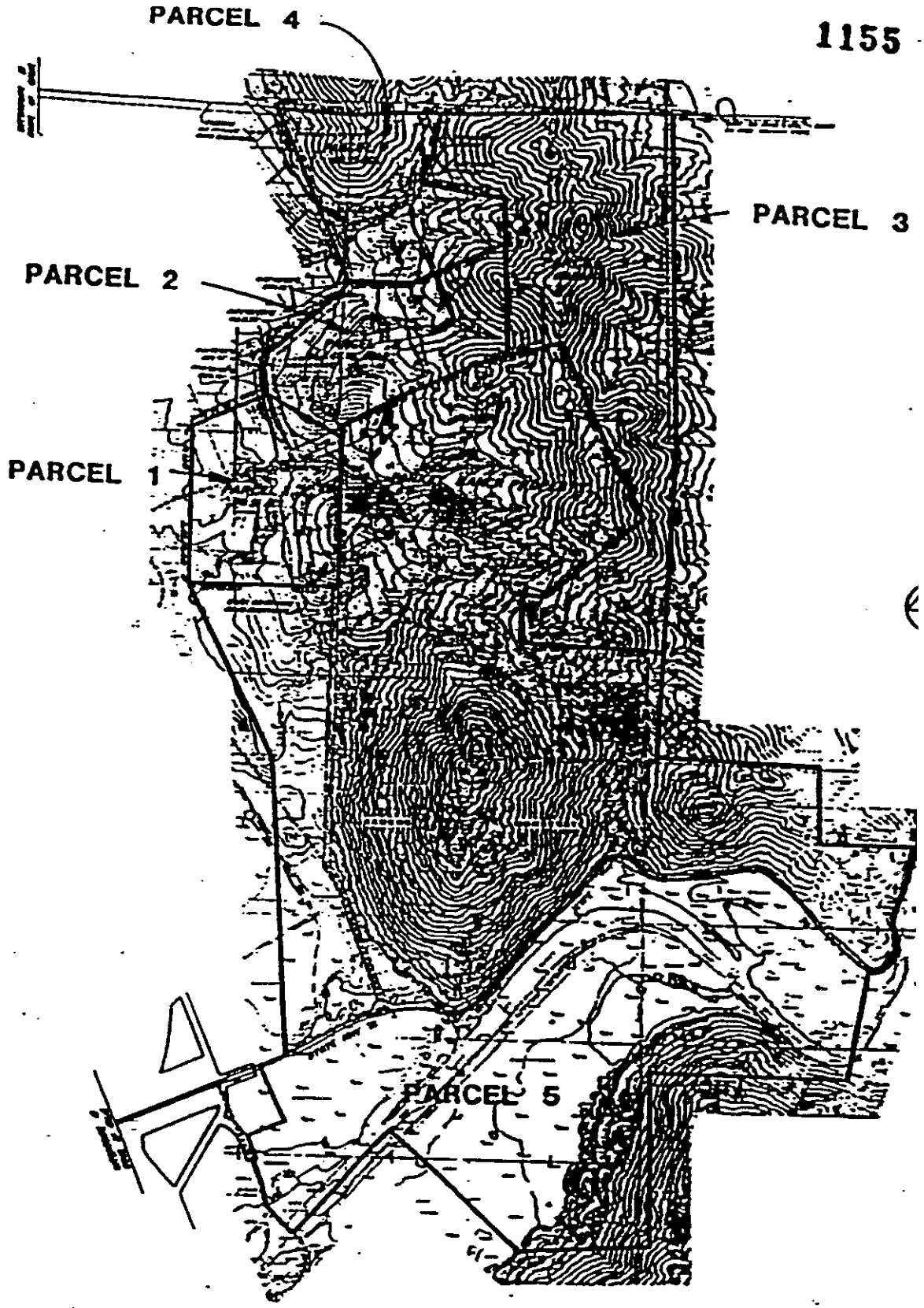
THAT PORTION OF THE EAST HALF OF SECTION 36, TOWNSHIP 9 SOUTH, RANGE 3 WEST, SAN BERNARDINO MERIDIAN, ACCORDING TO OFFICIAL PLAT THEREOF; THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 6, TOWNSHIP 10 SOUTH, RANGE 2 WEST, SAN BERNARDINO MERIDIAN, ACCORDING TO OFFICIAL PLAT THEREOF; AND THAT PORTION OF THE MONSERATE RANCHO, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF THE RECORDER OF SAN DIEGO COUNTY IN BOOK 1, PAGE 108 OF PATENTS, ALL IN THE UNINCORPORATED AREA OF THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS A WHOLE AS FOLLOWS:

COMMENCING AT AN ANGLE POINT ON THE EASTERLY BOUNDARY OF LAND DESCRIBED IN DEED TO THE STATE OF CALIFORNIA, RECORDED JUNE 6, 1973 AS DOCUMENT NO. 73-186085; THENCE ALONG SAID BOUNDARY SOUTH 0°33'08" WEST 1378.56 FEET TO AN INTERSECTION WITH THE WESTERLY PROLONGATION OF THE SOUTH LINE OF THE NORTH HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE ALONG SAID PROLONGATION, NORTH 89°40'14" EAST 1644.36 FEET TO POINT "A" OF THIS DESCRIPTION; THENCE CONTINUING ALONG SAID PROLONGATION, NORTH 89°40'14" EAST 1259.67 FEET TO THE SOUTHWEST CORNER OF THE NORTH HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE ALONG THE BOUNDARY OF THE SOUTHEAST QUARTER OF SAID SECTION 36 AS FOLLOWS: NORTH 0°26'07" EAST 1273.20 FEET TO THE NORTHWEST CORNER THEREOF; AND ALONG THE NORTH LINE OF SAID SOUTHEAST QUARTER, NORTH 88°59'31" 2136.38 FEET TO POINT "B" OF THIS DESCRIPTION; THENCE CONTINUING ALONG SAID NORTH LINE NORTH 88°59'31" EAST 586.19 FEET TO THE NORTHEAST CORNER OF SAID SOUTHEAST QUARTER; THENCE ALONG THE EAST LINE OF SAID SOUTHEAST QUARTER SOUTH 2°13'12" WEST 1750.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE LEAVING SAID EAST LINE OF SAID SOUTHEAST QUARTER NORTH 87°46'48" WEST 1150.00 FEET; THENCE NORTH 2°13'12" EAST 400.00 FEET; THENCE SOUTH 87°46'48" EAST 200.00 FEET; THENCE NORTH 49°14'33" EAST 1015.39 FEET TO A POINT IN THE NORTH LINE OF LAND DESCRIBED IN DEED TO PANKEY RANCH, RECORDED APRIL 13, 1981 AS FILE NO. 81-112045 OF OFFICIAL RECORDS; THENCE ALONG THE BOUNDARY OF SAID PANKEY RANCH, NORTH 28°57'51" WEST 730.31 FEET TO SAID POINT "B"; THENCE NORTH 24°09'39" WEST 868.73 FEET; THENCE SOUTH 71°58'58" WEST 661.44

FEET; THENCE SOUTH 65°02'26" EAST 1269.34 FEET TO AN INTERSECTION WITH THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 36, SAID INTERSECTION BEING NORTH 0°26'07" EAST 90.00 FEET FROM THE SOUTHWEST CORNER OF SAID NORTHEAST QUARTER; THENCE ALONG THE WEST LINE OF SAID NORTHEAST QUARTER AND SOUTHEAST QUARTER SOUTH 0°26'07" WEST 1363.20 FEET TO THE SOUTHWEST CORNER OF THE NORTH HALF OF SAID SOUTHEAST QUARTER; THENCE ALONG THE WESTERLY PROLONGATION OF THE SOUTH LINE OF THE NORTH HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 36 SOUTH 89°40'14" WEST 1259.67 FEET TO SAID POINT "A"; THENCE SOUTH 26°42'12" EAST 1561.47 FEET; THENCE SOUTH 3°49'46" EAST 2479.80 FEET TO AN INTERSECTION WITH THE CENTERLINE OF STATE HIGHWAY 11, SD-76, SAID POINT OF INTERSECTION BEING A POINT ON A 3729.02-FOOT RADIUS CURVE CONCAVE NORTHWESTERLY, THE RADIAL LINE TO SAID POINT BEARS SOUTH 24°35'25" EAST; THENCE ALONG SAID CENTER LINE AND SOUTHWESTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 2°12'31" A DISTANCE OF 143.75 FEET; THENCE TANGENT TO SAID CURVE, SOUTH 67°37'06" WEST 75.76 FEET; THENCE LEAVING SAID CENTERLINE, SOUTH 26°00'27" EAST 507.05 FEET; THENCE SOUTH 65°31'33" WEST 356.67 FEET TO THE EASTERLY SIDE LINE OF COUNTY ROAD SURVEY NO. 1219; THENCE ALONG SAID SIDE LINE, SOUTH 23°16'27" EAST 188.03 FEET; THENCE SOUTH 66°43'33" WEST 25.00 FEET TO THE CENTERLINE OF SAID COUNTY ROAD SURVEY NO. 1219; THENCE ALONG SAID CENTERLINE AS FOLLOWS: SOUTH 23°16'27" EAST 229.73 FEET TO THE BEGINNING OF A TANGENT 280-FOOT RADIUS REVERSE CURVE CONCAVE WESTERLY; THENCE SOUTHERLY ALONG SAID CURVE THROUGH AN ANGLE OF 19°03'12" A DISTANCE OF 93.11 FEET TO THE BEGINNING OF A 100-FOOT RADIUS REVERSE CURVE CONCAVE EASTERLY; THENCE SOUTHERLY ALONG SAID CURVE THROUGH AN ANGLE OF 40°02'34" A DISTANCE OF 69.89 FEET; AND TANGENT TO SAID CURVE, SOUTH 44°15'49" EAST 297.81 FEET TO THE BOUNDARY OF LAND DESCRIBED IN DEED TO PANKEY RANCH, RECORDED JULY 3, 1974 AS DOCUMENT NO. 74-179396; THENCE ALONG SAID BOUNDARY AS FOLLOWS: NORTH 42°53'02" EAST 1188.03 FEET; THENCE SOUTH 47°06'58" EAST 1423.93 FEET; THENCE NORTH 87°22'01" EAST 1054.17 FEET TO THE EASTERLY BOUNDARY OF SAID MONSERATE RANCHO; THENCE ALONG SAID EASTERLY BOUNDARY, NORTH 0°18'36" EAST 1445.20 FEET TO THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SAID SECTION 6; THENCE ALONG THE SOUTH LINE OF SAID NORTHWEST QUARTER, SOUTH 88°25'47" EAST 1637.76 FEET TO THE SOUTHEASTERLY CORNER OF LAND DESCRIBED IN PARCEL 2 OF DEED TO PANKEY RANCH, RECORDED JULY 3, 1974 AS DOCUMENT NO. 74-179394; THENCE ALONG THE BOUNDARY OF SAID LAND AS FOLLOWS: NORTH 12°35'00" EAST 974.62 FEET TO A POINT ON A 110 FEET RADIUS CURVE CONCAVE NORTHWESTERLY, THE RADIAL LINE TO SAID POINT BEARS SOUTH 20°33'30" EAST; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 26°25'17" A DISTANCE OF 50.73 FEET; THENCE TANGENT TO SAID CURVE, NORTH 43°01'13" EAST 1.97 FEET TO THE BEGINNING OF A TANGENT 300-FOOT RADIUS CURVE CONCAVE NORTHWESTERLY; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 22°01'40" A DISTANCE OF 115.34 FEET; THENCE TANGENT TO

SAID CURVE, NORTH 20°59'33" EAST 4.20 FEET TO THE BEGINNING OF A TANGENT 275-FOOT RADIUS CURVE CONCAVE WESTERLY; THENCE NORTHERLY ALONG SAID CURVE THROUGH AN ANGLE OF 29°12'20" A DISTANCE OF 140.18 FEET; THENCE TANGENT TO SAID CURVE, NORTH 8°12'47" WEST 87.76 FEET TO THE BEGINNING OF A TANGENT 300-FOOT RADIUS CURVE CONCAVE EASTERLY; THENCE NORTHERLY ALONG SAID CURVE THROUGH AN ANGLE OF 33°05'10" A DISTANCE OF 173.24 FEET; THENCE TANGENT TO SAID CURVE, NORTH 24°52'23" EAST 58.26 FEET TO THE BEGINNING OF A TANGENT 800-FOOT RADIUS CURVE CONCAVE NORTHWESTERLY; THENCE NORTHEASTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 9°58'10" A DISTANCE OF 139.20 FEET; THENCE TANGENT TO SAID CURVE, NORTH 14°54'13" EAST 102.05 FEET TO THE BEGINNING OF A TANGENT 1500-FOOT RADIUS CURVE CONCAVE WESTERLY; THENCE NORTHERLY ALONG SAID CURVE THROUGH AN ANGLE OF 7°01'54" A DISTANCE OF 184.09 FEET; THENCE TANGENT TO SAID CURVE, NORTH 7°52'19" EAST 47.59 FEET TO THE NORTH LINE OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 6; THENCE ALONG SAID NORTH LINE, NORTH 88°55'31" WEST 764.77 FEET TO THE WEST LINE OF SAID NORTHEAST QUARTER OF NORTHWEST QUARTER; THENCE ALONG SAID WEST LINE, NORTH 0°24'44" EAST 672.06 FEET TO THE NORTH LINE OF THE NORTHWEST QUARTER OF SAID SECTION 6; THENCE ALONG SAID NORTH LINE, NORTH 89°25'43" WEST 1349.38 FEET TO THE NORTHWEST CORNER OF SAID SECTION 6 AND THE SOUTHEAST CORNER OF SAID SECTION 36; THENCE ALONG THE EAST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 36, NORTH 2°13'12" EAST 863.25 FEET MORE OR LESS TO THE TRUE POINT OF BEGINNING.

Exhibit B



EXISTING LEGAL PARCELS

1995

Exhibit B

BLANCHE POPE, TRUSTEE
U/D/T POPE FAMILY TRUST

PROPERTY DESCRIPTION

PARCEL 1A

THAT PORTION OF THE WEST HALF OF THE NORTHEAST QUARTER AND THE WEST HALF OF THE SOUTHEAST QUARTER OF FRACTIONAL SECTION 12, TOWNSHIP 10 SOUTH, RANGE 3 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO AN OFFICIAL PLAT OF SAID LAND FILED IN THE DISTRICT LAND OFFICE, DESCRIBED AS FOLLOWS:

BEGINNING AT CORNER NO. 3 OF RANCHO MONSERATE, ACCORDING TO MAP ON FILE IN BOOK 1, PAGE 108 OF PATENTS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, CORNER NO. 4 OF SAID RANCHO BEARS SOUTH 01°09'12" WEST; THENCE ALONG THE EASTERLY LINE OF THE LAND DESCRIBED IN DEED TO SAN LUIS REY MUNICIPAL WATER DISTRICT RECORDED OCTOBER 7, 1983 AS FILE NO. 83-362222 OF OFFICIAL RECORDS OF SAID COUNTY, SOUTH 15°17'40" EAST 353.44 FEET; THENCE SOUTH 36°54'40" EAST 794.97 FEET; THENCE SOUTH 48°29'40" EAST 131.24 FEET; THENCE SOUTH 63°08'56" WEST 628.53 FEET; THENCE SOUTH 09°32'38" EAST 269.68 FEET; THENCE SOUTH 02°27'28" WEST 435.12 FEET; THENCE SOUTH 48°45'30" EAST 124.20 FEET; THENCE SOUTH 64°34'34" WEST 122.99 FEET; THENCE SOUTH 13°55'40" EAST 269.26 FEET; THENCE SOUTH 03°25'58" EAST 250.80 FEET; THENCE SOUTH 21°28'44" EAST 260.00 FEET; THENCE SOUTH 05°32'22" WEST 325.96 FEET; THENCE SOUTH 32°36'02" EAST 1711.92 FEET TO THE EASTERLY LINE OF THE WEST HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 12; THENCE LEAVING THE EASTERLY LINE OF SAID SAN LUIS REY MUNICIPAL WATER DISTRICT ALONG THE EASTERLY LINE OF THE WEST HALF OF THE SOUTHEAST QUARTER AND THE EASTERLY LINE OF THE WEST HALF OF THE NORTHEASTERLY QUARTER OF SAID SECTION 12 NORTH 01°26'07" EAST 4764.55 FEET TO THE SOUTHERLY LINE OF SAID RANCHO MONSERATE; THENCE ALONG SAID SOUTHERLY LINE SOUTH 87°21'37" WEST 1303.19 FEET TO THE POINT OF BEGINNING.

SUBJECT TO THE RESERVATION OF THE LAND DESCRIBED IN DEED TO THE COUNTY OF SAN DIEGO RECORDED AUGUST 21, 1940 IN BOOK 1047, PAGE 495 OF OFFICIAL RECORDS OF SAID COUNTY, AS SAME IS SHOWN ON ROAD SURVEY NO. 837 ON FILE IN THE OFFICE OF THE COUNTY ENGINEER OF SAID COUNTY.

PARCEL 1B

AN EASEMENT FOR ROAD AND UTILITY PURPOSES 50 FEET WIDE, THE CENTER LINE OF WHICH IS DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE CENTER LINE OF THE LAND DESCRIBED IN DEED TO THE COUNTY OF SAN DIEGO RECORDED AUGUST 21, 1940 IN BOOK 1047, PAGE 495 OF OFFICIAL RECORDS OF SAID COUNTY, AS SAME IS SHOWN ON ROAD SURVEY NO. 837 ON FILE IN THE OFFICE OF THE COUNTY ENGINEER OF SAID COUNTY, SAID POINT OF BEGINNING BEARS NORTH 08°18'36" EAST, 25.00 FEET FROM THE SOUTHERLY TERMINUS OF SAID COUNTY LAND; THENCE SOUTH 08°18'36" WEST 25.00 FEET ALONG THE CENTER LINE OF SAID COUNTY LAND; THENCE LEAVING SAID COUNTY LAND SOUTH 17°57'25" EAST 862.96 FEET TO A POINT OF INTERSECTION WITH A LINE THAT IS PARALLEL WITH AND 25.00 FEET WESTERLY OF THAT BOUNDARY BETWEEN CORNER NO. 3 AND CORNER NO. 4 OF SAID RANCHO MONSERATE, SAID POINT OF INTERSECTION ALSO BEING ON A LINE THAT IS PARALLEL WITH AND 25.00 FEET SOUTHERLY OF THAT BOUNDARY BETWEEN CORNER NO. 3 AND CORNER NO. 2 OF SAID RANCHO MONSERATE; THENCE ALONG SAID PARALLEL LINE NORTH 87°21'37" EAST 25.06 FEET TO THE EASTERLY BOUNDARY OF SAID RANCHO MONSERATE; THENCE CONTINUING ALONG SAID PARALLEL LINE NORTH 87°21'37" EAST 7.27 FEET TO THE WESTERLY LINE OF PARCEL A HEREIN DESCRIBED.

THE SIDE LINES OF SAID EASEMENT TO BE SHORTENED OR PROLONGED SO AS TO TERMINATE ON THE WESTERLY LINE OF PARCEL A HEREIN DESCRIBED.

PARCEL 1C

A NON-EXCLUSIVE EASEMENT FOR INGRESS AND EGRESS FROM THE NEAREST DEDICATED COUNTY ROAD OVER PARCELS 1 AND 3 AS DESCRIBED IN THAT CERTAIN CERTIFICATE OF COMPLIANCE FILED FOR RECORD WITH THE COUNTY RECORDER ON OCTOBER 17, 1984 AS FILE NO. 84-392858 OF OFFICIAL RECORDS, AND THE RIGHT TO WITHDRAW FROM AND TO UTILIZE WATER FOR ANY PURPOSE WHATSOEVER FROM THE EXISTING WATER WELLS LOCATED WITHIN THE SAN LUIS REY FLOODWAY AT THE NORTHEASTERLY CORNER OF SAID PARCEL 1 AND AN EXCLUSIVE EASEMENT OVER SAID PARCEL 1 FOR EXISTING WATER PUMPING FACILITIES, WATER PIPELINES AND APPURTENANCES, AND ELECTRIC POWER POLES AND OVERHEAD LINES THAT ARE USED FOR CONVEYANCE OF WATER AND ELECTRIC POWER TO PARCELS A AND B HEREINABOVE DESCRIBED.

RESERVING THE RIGHT OF PRESENT OR FUTURE OWNERS OF SAID PARCELS 1 AND 3 TO RELOCATE THE ABOVE DESCRIBED INGRESS AND EGRESS EASEMENTS, WATER WELLS, WATER PUMPING FACILITIES AND APPURTENANCES, AND ELECTRIC POWER POLES AND OVERHEAD LINES, AND TO PROVIDE SPECIFIC EASEMENTS FOR THE RELOCATED FACILITIES.

NOTE: THE ROUTE OR LOCATION OF THE ABOVE NON-EXCLUSIVE EASEMENT CANNOT BE DETERMINED FROM THE RECORD.

PARCEL 2

THAT PORTION OF THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 13, TOWNSHIP 10 SOUTH, RANGE 3 WEST, SAN BERNARDINO MERIDIAN, ACCORDING TO OFFICIAL PLAT THEREOF, TOGETHER WITH THAT PORTION OF RANCHO MONSERATE, ACCORDING TO MAP NO. 827 ON FILE IN BOOK 1, PAGE 108 OF PATENTS IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, SAID PORTIONS DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWESTERLY TERMINUS OF COURSE (18) DESCRIBED "SOUTH 25°19'17" EAST, 966.73 FEET" IN PARCEL 1 OF DEED TO THE STATE OF CALIFORNIA RECORDED JANUARY 9, 1973 AS FILE NO. 73-006174 OF OFFICIAL RECORDS OF SAID COUNTY, BEING ON THE NORTHEASTERLY BOUNDARY OF LAND DESCRIBED IN SAID DEED; THENCE SOUTHEASTERLY ALONG SAID BOUNDARY THE FOLLOWING SIX COURSES:

(1) SOUTH 25°19'17" EAST, 966.73 FEET; (2) SOUTH 32°16'10" EAST, 1730.07 FEET; (3) SOUTH 53°14'24" EAST, 277.31 FEET; (4) SOUTH 18°47'54" WEST, 290.00 FEET; (5) SOUTH 27°12'38" EAST, 632.65 FEET; (6) SOUTH 19°54'22" EAST 1622.82 FEET TO A POINT ON THE SOUTHERLY LINE OF SAID NORTHEAST QUARTER OF THE NORTHWEST QUARTER, DISTANT ALONG SAID SOUTHERLY LINE SOUTH 89°21'28" WEST, 180.00 FEET FROM THE SOUTHEASTERLY CORNER OF SAID NORTHEAST QUARTER OF THE NORTHWEST QUARTER; THENCE (7), LEAVING SAID BOUNDARY ALONG SAID SOUTHERLY LINE SOUTH 89°21'28" WEST, 50.00 FEET; THENCE (8) LEAVING SAID SOUTHERLY LINE NORTH 28°33'34" WEST, 549.16 FEET; THENCE (9) NORTH 16°10'12" WEST, 1168.64 FEET; THENCE (10) NORTH 26°18'09" WEST, 385.75 FEET; THENCE (11) NORTH 39°46'51" WEST, 141.49 FEET; THENCE (12) SOUTH 62°05'09" WEST, 12.47 FEET; THENCE (13) NORTH 33°40'50" WEST, 455.28 FEET; THENCE (14) NORTH 31°58'13" WEST 817.03 FEET; THENCE (15) NORTH 31°54'15" WEST, 618.45 FEET; THENCE (16) ALONG A TANGENT CURVE TO THE RIGHT, HAVING A RADIUS OF 6600.00 FEET, THROUGH A CENTRAL ANGLE OF 04°42'53", AN ARC LENGTH OF 543.10 FEET; THENCE (17) NORTH 62°48'38" EAST, 24.24 FEET; THENCE (18) NORTH 25°22'25" WEST, 46.96 FEET; THENCE (19) SOUTH 74°04'43" WEST, 24.68 FEET; THENCE (20) NORTH 25°34'26" WEST, 428.53 FEET; THENCE (21) ALONG A TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 180.00 FEET, THROUGH A CENTRAL ANGLE OF 64°13'13", AN ARC LENGTH OF 201.75 FEET; THENCE (22) NORTH 50°25'00" EAST 326.26 FEET TO THE POINT OF BEGINNING.

PARCEL 3

THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER AND ALSO THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER IN SECTION 13,

TOWNSHIP 10 SOUTH, RANGE 3 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO OFFICIAL PLAT THEREOF.

EXCEPTING FROM THE SAID NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 13, THAT PORTION THEREOF, DESCRIBED AS PARCEL 1 IN THE FINAL ORDER OR DECREE OF CONDEMNATION, RECORDED OCTOBER 18, 1948 IN BOOK 2987, PAGE 83 OF OFFICIAL RECORDS.

ALSO EXCEPT THEREFROM THAT PORTION LYING WITHIN LAND DESCRIBED IN A DEED TO THE STATE OF CALIFORNIA, RECORDED JANUARY 9, 1973 AS FILE NO. 73-006174 OF OFFICIAL RECORDS.

ALSO EXCEPTING FROM SAID NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 13, ONE-HALF OF ANY ROYALTY RECEIVED FOR ANY OIL, GAS OR HYDROCARBON SUBSTANCES NOW IN OR UNDER THE ABOVE DESCRIBED PROPERTY OR WHICH AT ANY TIME MAY BE DEVELOPED, EXTRACTED OR PRODUCED FROM SAID LANDS, AS RESERVED BY WILLIAM G. GROSS IN DEED RECORDED MARCH 3, 1926 IN BOOK 1203, PAGE 119 OF DEEDS.

PARCEL 4

THAT PORTION OF MONSERATE RANCHO, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDER OF SAN DIEGO COUNTY IN BOOK 1, PAGE 108 OF PATENTS, DESCRIBED AS FOLLOWS:

BEGINNING AT CORNER NO. 4 OF SAID RANCHO; THENCE NORTH 0°40′45" EAST ALONG THE EASTERLY BOUNDARY OF SAID RANCHO, 5218.03 FEET, MORE OR LESS, TO CORNER NO. 3 OF SAID RANCHO; THENCE LEAVING SAID BOUNDARY LINE, NORTH 0°33′ WEST 1354.00 FEET; THENCE NORTH 89°58′10" WEST 660.00 FEET; THENCE SOUTH 25°30′45" WEST 1500.21 FEET, MORE OR LESS, TO A POINT THAT BEARS NORTH 89°56′10" WEST 1320.00 FEET FROM CORNER NO. 3 OF SAID RANCHO; THENCE SOUTH 0°40′30" WEST 3909.50 FEET, MORE OR LESS, TO INTERSECTION WITH A LINE THAT IS PARALLEL WITH AND DISTANT 1319.74 FEET NORTHERLY (MEASURED AT RIGHT ANGLES) FROM THE SOUTHERLY BOUNDARY OF SAID RANCHO; THENCE ALONG SAID PARALLEL LINE SOUTH 89°32′ WEST 3954.44 FEET, MORE OR LESS, TO INTERSECTION WITH A LINE BEARING NORTH 0°40′30" EAST FROM THE NORTH QUARTER CORNER OF SECTION 14, TOWNSHIP 10 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN; THENCE SOUTH 0°40′30" WEST 1320.00 FEET TO SAID NORTH QUARTER CORNER OF SAID SECTION 14, SAID POINT BEING IN THE SOUTHERLY BOUNDARY LINE OF SAID MONSERATE RANCHO; THENCE ALONG SAID SOUTHERLY BOUNDARY NORTH 89°32′ EAST 5274.34 FEET, MORE OR LESS, TO CORNER NO. 4 OF SAID RANCHO AND THE POINT OF BEGINNING.

EXCEPTING THAT PORTION THEREOF, DESCRIBED AS FOLLOWS:

BEGINNING AT CORNER NO. 3 OF SAID RANCHO FROM SAID POINT OF BEGINNING CORNER NO. 4 OF SAID RANCHO BEARS SOUTH 0°40'45" WEST; THENCE NORTH 0°33' WEST 1179.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE CONTINUING NORTH 0°33' WEST 175.00 FEET; THENCE NORTH 89°58'10" WEST TO THE NORTHEASTERLY LINE OF ROAD SURVEY NO. 837, AS DESCRIBED IN DEED TO THE COUNTY OF SAN DIEGO, RECORDED AUGUST 21, 1940 IN BOOK 1047, PAGE 495 OF OFFICIAL RECORDS; THENCE SOUTHEASTERLY ALONG SAID NORTHEASTERLY LINE TO THE INTERSECTION WITH A LINE BEARING NORTH 89°58'10" WEST FROM THE TRUE POINT OF BEGINNING; THENCE SOUTH 89°58'10" EAST TO THE TRUE POINT OF BEGINNING.

ALSO EXCEPT THEREFROM THAT PORTION THEREOF, LYING WESTERLY OF THE EASTERLY LINE OF CALIFORNIA STATE HIGHWAY, AS SAID HIGHWAY IS DESCRIBED UNDER PARCEL 2 IN THE FINAL ORDER OR DECREE OF CONDEMNATION, RECORDED OCTOBER 18, 1948 IN BOOK 2987, PAGE 83 OF OFFICIAL RECORDS.

ALSO EXCEPT THEREFROM THAT PORTION LYING WITHIN LAND DESCRIBED IN A DEED TO THE STATE OF CALIFORNIA, RECORDED JANUARY 9, 1973 AS FILE NO. 73-006174 OF OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM THAT PORTION LYING WITHIN COUNTY OF SAN DIEGO TRACT NO. 4249, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP NO. 11877, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, AUGUST 1987.

ALSO EXCEPTING THEREFROM ALL THAT PORTION OF LOTS 1 THROUGH 211 OF COUNTY OF SAN DIEGO TRACT 4249-2, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 12710, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, SEPTEMBER 20, 1990.

ALSO, EXCEPTING THEREFROM, ALL THAT PORTION OF LOTS 1 THROUGH 348 OF COUNTY OF SAN DIEGO TRACT 4249-3, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 12848, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JULY 25, 1991.

PARCEL 5

THE WEST HALF OF THE NORTHEAST QUARTER AND ALSO THE WEST HALF OF THE SOUTHEAST QUARTER OF SECTION 12, TOWNSHIP 10 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO OFFICIAL PLAT THEREOF. EXCEPTING THEREFROM THAT PORTION DESCRIBED AS FOLLOWS:

BEGINNING AT CORNER NO. 3 OF RANCHO MONSERATE, ACCORDING TO MAP ON FILE IN BOOK 1, PAGE 108 OF PATENTS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, CORNER NO. 4 OF SAID RANCHO BEARS SOUTH 01°09'12" WEST; THENCE ALONG THE EASTERLY LINE OF THE LAND DESCRIBED IN DEED TO SAN LUIS REY MUNICIPAL WATER DISTRICT RECORDED OCTOBER 7, 1983 AS FILE NO. 83-362222 OF OFFICIAL RECORDS OF SAID COUNTY SOUTH 15°17'40" EAST 353.44 FEET; THENCE SOUTH 36°54'40" EAST 794.97 FEET; THENCE SOUTH 48°29'40" EAST 131.24 FEET; THENCE SOUTH 63°08'56" WEST 628.53 FEET; THENCE SOUTH 09°32'38" EAST 269.68 FEET; THENCE SOUTH 02°27'28" WEST 435.12 FEET; THENCE SOUTH 48°45'30" EAST 124.20 FEET; THENCE SOUTH 64°34'34" WEST 122.99 FEET; THENCE SOUTH 13°55'40" EAST 269.26 FEET; THENCE SOUTH 03°25'58" EAST 250.80 FEET; THENCE SOUTH 21°28;44" EAST 260.00 FEET; THENCE SOUTH 05°32'22" WEST 325.96 FEET; THENCE SOUTH 32°36'02" EAST 1711.92 FEET TO THE EASTERLY LINE OF THE WEST HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 12; THENCE LEAVING THE EASTERLY LINE OF SAID SAN LUIS REY MUNICIPAL WATER DISTRICT ALONG THE EASTERLY LINE OF THE WEST HALF OF THE SOUTHEAST QUARTER AND THE EASTERLY LINE OF THE WEST HALF OF THE NORTHEASTERLY QUARTER OF SAID SECTION 12 NORTH 01°26'07" EAST 4765.55 FEET TO THE SOUTHERLY LINE OF SAID RANCHO MONSERATE; THENCE ALONG SAID SOUTHERLY LINE SOUTH 87°21'37" WEST 1303.19 FEET TO THE POINT OF BEGINNING.

ALSO EXCEPTING THEREFROM THAT PORTION LYING WITHIN COUNTY OF SAN DIEGO TRACT NO. 4249, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP NO. 11877, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, AUGUST 11, 1987.

ALSO EXCEPTING THEREFROM THAT PORTION OF LOTS 1 THROUGH 211 OF COUNTY OF SAN DIEGO TRACT NO. 44249-2, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 12710, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, SEPTEMBER 20, 1990.

PARCEL 6

LOTS 1 THROUGH 211 INCLUSIVE OF COUNTY OF SAN DIEGO TRACT NO. 4249-2, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 12710, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, SEPTEMBER 20, 1990.

PARCEL 7

LOTS 1 THROUGH 348 OF COUNTY OF SAN DIEGO TRACT 4249-3, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 12848, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JULY 25, 1991.

EXHIBIT "C"

Gregory Canyon Facility Mitigation Fund

The mitigation fund to be established and maintained pursuant to Section 9b will consist of a trust fund and a letter of credit.

A. Trust Fund.

1. Structure. Prior to commencement of operation of the Gregory Canyon Facility, a trust fund or third party custodial account (the "Trust Fund") shall be established, maintained and administered for the benefit of the San Luis Rey Municipal Water District ("SLRMWD") and the Signing District Members in accordance with the terms of a trust agreement or third party custodial agreement approved by SLRMWD and the Signing District Members, which agreement shall be similar to the trust agreement referenced at 14 C.C.R. § 18284(b). The trustee shall be an institution acceptable to SLRMWD and the Signing District Members. All costs of opening, maintaining and administering the Trust Fund shall be borne by Development Company and Development Company shall bear the entire risk of any investment losses incurred by the trustee in investing and reinvesting the monies in the Trust Fund.

2. Amount. The Trust Fund amount will total $2,520,000 in today's dollars (the "Fund Amount"). The Fund Amount will be increased annually in accordance with the greater of (i) the increase in the Engineering News Record ("ENR") Building Cost Index for the area including the San Diego metropolitan area or (ii) revised cost estimates for the remediation pursuant to paragraphs 8a and 8b of the Agreement approved by Development Company, SLRMWD, and the Signing District Members (or by arbitration pursuant to paragraph 10 of the Agreement in the absence of such approval) in order to ensure that the Fund Amount is sufficient to achieve the purpose of the Trust Fund.

3. Manner of Funding. SLRMWD and the Signing District Members agree that the Fund Amount can be funded over a period of 10 years through quarterly payments, initially in the amount of $63,000, due and payable January 1, April 1, July 1 and October 1. The amount of the quarterly payments shall increase as necessary if the Fund Amount increases pursuant to paragraph 2. Interest earnings on the amounts in the Trust Fund will be retained until the Fund Amount, as increased from time to time, is attained. Excess interest earnings will be paid to Development Company. If withdrawals are made by SLRMWD or the Signing District Members from the Trust Fund pursuant to the conditions for drawing on the Trust Fund described below,

Development Company shall replenish the Trust Fund to the full Fund Amount until and to the extent funding is assured to complete the remediation pursuant to paragraphs 8a and 8b of the Agreement.

4. Conditions for Draw. SLRMWD or the Signing District Members will be entitled to draw on the Trust Fund upon the determination of a qualified engineer that the Gregory Canyon Facility's leachate containment system has failed, resulting in or creating an imminent threat of degradation of Pala Basin water, Foreign Water, and/or the Excess Storage Capacity as described in paragraphs 8a and 8b of the Agreement. Amounts drawn from the Trust Fund will be available for use by SLRMWD or the Signing District Members to fund remediation pursuant to paragraphs 8a and 8b of the Agreement. Disputes concerning the propriety of any withdrawal from the Trust Fund shall be submitted to binding arbitration in accordance with the provisions of paragraph 10 of the Agreement.

5. Conditions for Release. The monies in the Trust Fund will be released to Development Company 10 years after closure of the Gregory Canyon Facility, provided that SLRMWD and the Signing District Members have received a certificate from a qualified engineer selected by them to the effect that the water quality of the Pala Basin has not been degraded by the Gregory

Canyon Facility so that it cannot be used for domestic uses and for irrigation. The selected engineer shall use generally accepted objective criteria in his/her determination. Disputes concerning whether the conditions for release of the Trust Fund have been satisfied shall be submitted to binding arbitration in accordance with the provisions of paragraph 10 of the Agreement. If the arbitrators conclude that the conditions for release have been satisfied by objective standards, the arbitrators shall have the power and authority to order release of the Trust Fund to Development Company.

B. Letter of Credit.

1. Structure and Amount. Prior to the commencement of construction (i.e., grading) of the Gregory Canyon Facility, Development Company will provide to SLRMWD and the Signing District Members an irrevocable letter of credit (the "Letter of Credit") in the amount of $840,000. The Letter of Credit will be in a form and issued by an institution acceptable to SLRMWD and the Signing District Members. The Letter of Credit shall be automatically renewed annually for the full amount required under paragraph B.3 below unless terminated by the issuing institution upon written notice to SLRMWD and the Signing District Members at least 30 days prior to its expiration. The form of the Letter of Credit shall be substantially similar to that referenced in 14

C.C.R. § 18287. Development Company shall bear all costs associated with obtaining and maintaining the Letter of Credit.

2. Conditions for Draw. SLRMWD or the Signing District members will be entitled to draw on the Letter of Credit in total upon any of the following circumstances:

a. Development Company's failure to establish the Trust Fund prior to the commencement of operation of the Gregory Canyon Facility;

b. Development Company's failure to make a scheduled quarterly deposit in the Trust Fund in the appropriate amount;

c. in the event and to the extent the Trust Fund is insufficient to fund remediation pursuant to paragraphs 8a and 8b of the Agreement; or

d. during the 10 days immediately preceding the then current expiration date after receipt of 30 days notice of termination of the Letter of Credit from the issuing institution and Development Company's failure to substitute a new Letter of Credit.

Amounts drawn on the Letter of Credit may be applied by SLRMWD or the Signing District Members to enforce any and all of their rights under the Agreement, to compel Development Company to perform its obligations under the Agreement or to mitigate damages to SLRMWD and the Signing District Members as a result of Development Company's failure to perform such obligations. A draw on the Letter of Credit or the Trust Fund shall not relieve Development Company of any of its obligations under the Agreement.

3. Reduction in Amount. Each time the Letter of Credit is to be renewed, the Letter of Credit may be reduced to an amount which, when added to the amount of money in the Trust Fund following the previous quarterly payment, equals or exceeds the Fund Amount, subject to written verification of the trustee of the Trust Fund and approval of SLRMWD and the Signing District Members.

4. Termination of Letter of Credit. The Letter of Credit shall terminate once the Trust Fund contains the full Fund Amount.

EXHIBIT "D"

Address List

SAN LUIS REY MUNICIPAL WATER DISTRICT

Mr. Robert H. Pankey
San Luis Rey Municipal Water District
5328 Highway 76
Bonsall, California 92003

DOROTHY E. LEAVEY, J.T. AND K.L. MCCARTHY

Kathleen McCarthy
10449 Bainbridge Avenue
Los Angeles, California 90024

EDGAR E. AND ELIZABETH S. PANKEY TRUST

Edgar E. and Elizabeth S. Pankey
320 West Main Street
Tustin, California 92680

PANKEY RANCH, A CALIFORNIA LIMITED PARTNERSHIP

Mr. William H. Pankey
Pankey Ranch
5328 Highway 76
Bonsall, California 92003

PANKEY FARMS

Victor S. Pankey
Pankey Farms
3264 Shearer Crossing
Bonsall, California 92003

BLANCHE POPE, TRUSTEE U/D/T POPE FAMILY TRUST

Mrs. Blanche Pope
3501 Garrison Street
San Diego, California 92106

NORTH SAN DIEGO DEVELOPMENT COMPANY

North San Diego Development Company
c/o Waste Management of California, Inc., General Partner
Waste Management Inc., West Group
18500 Von Karman, Suite 900
Irvine, California 92715

Attn: Marian King, Vice President & General Counsel

GREGORY CANYON, LTD.

Mr. Richard W. Chase
Taconic Resources
15025 Paso Del Sol
Del Mar, California 92014

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

1169

State of California
County of San Diego

On January 12, 1996 (DATE) before me, Phyllis Gale Rumsey, Notary (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared Robert H. Pankey (NAME(S) OF SIGNER(S))

☒ personally known to me - OR - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

Phyllis Gale Rumsey
Comm. 1055[illegible]
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
My Comm. Expires Jan 23, 1997

WITNESS my hand and official seal.

Phyllis Gale Rumsey
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

☐ PARTNER(S) ☐ LIMITED ☐ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
■ OTHER: President of the Board of Directors

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
San Luis Rey Municipal Water District

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, William H. Pankey, Blanche Pope, Kathleen L. McCarthy, Edgar E. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of San Diego

On January 12, 1996 (DATE) before me Phyllis Gale Rumsey Notary (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC"),

personally appeared Rodney Guild (NAME(S) OF SIGNER(S)),

☐ personally known to me - OR - ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

Phyllis Gale Rumsey
Comm. #1059421
Notary Public - California
San Diego County

WITNESS my hand and official seal.

Phyllis Gale Rumsey
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

☐ PARTNER(S) ☐ LIMITED ☐ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
■ OTHER: Secretary to the Board of Directors

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
San Luis Rey Municipal Water District

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

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NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, William H. Pankey, Blanche Pope, Kathleen L. McCarthy, Edgar E. Pankey, Robert H. Pankey
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT 1171

State of California
County of Los Angeles

On 4/15/96 (DATE) before me, Gary M. Gold. Notary Public (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared Kathleen L. McCarthy (NAME(S) OF SIGNER(S))

☐ personally known to me - OR - ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

GARY M. GOLD
COMM # 984735
Notary Public — California
LOS ANGELES COUNTY
My Comm. Expires FEB 15, 1997

SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

■ PARTNER(S) ☐ LIMITED
■ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER:

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Dorothy E. Leavey, J.T. and K.L. McCarthy, General Partners

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, William H. Pankey, Blanche Pope, Edgar E. Pankey, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

1172

State of California
County of ORANGE

On April 10, 1996 (DATE) before me, B. Ryan, notary public (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared Edgar E. Pankey (NAME(S) OF SIGNER(S))

☐ personally known to me - OR - ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

ASE1 B. RYAN COMM. #980552 NOTARY PUBLIC-CALIFORNIA ORANGE COUNTY My Comm. Expires Dec. 21, 1996 ASE1

WITNESS my hand and official seal.

B. Ryan
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

☐ PARTNER(S) ☐ LIMITED ☐ GENERAL
☐ ATTORNEY-IN-FACT
■ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER:

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Edgar E. and Elizabeth S. Pankey Trust

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, William H. Pankey, Blanche Pope, Kathleen L. McCarthy, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

1173

State of California
County of SAN DIEGO

On APRIL 4, 1996 (DATE) before me, NATHAN C. MILLS (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared Victor S. Pankey (NAME(S) OF SIGNER(S))

☐ personally known to me - OR - ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

NATHAN C. MILLS
COMM. # 1059[illegible]
Notary Public — California
SAN DIEGO COUNTY
My Comm. Expires JUL 1[illegible], 1999

WITNESS my hand and official seal.

NATHAN C. MILLS
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

■ PARTNER(S) ☐ LIMITED
■ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER:

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Pankey Farms

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., William H. Pankey, Blanche Pope, Kathleen L. McCarthy, Edgar E. Pankey, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

1174

State of California
County of San Diego

On January 12, 1996 (DATE) before me, Phyllis Gale Rumsey, Notary (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared William H. Pankey (NAME(S) OF SIGNER(S))

☒ personally known to me - OR - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

Phyllis Gale Rumsey
Comm. #053461
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY

WITNESS my hand and official seal.

Phyllis Gale Rumsey
SIGNATURE OF NOTARY

OPTIONAL

ough the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent attachment of this form.

CAPACITY CLAIMED BY SIGNER

INDIVIDUAL
CORPORATE OFFICER

TITLE(S)

PARTNER(S) ☐ LIMITED
☒ GENERAL
ATTORNEY-IN-FACT
TRUSTEE(S)
GUARDIAN/CONSERVATOR
OTHER: _____

GNER IS REPRESENTING:
(NAME OF PERSON(S) OR ENTITY(IES))
ankey Ranch, a California Limited Partnership

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, Edgar E. Pankey, Blanche Pope, Kathleen L. McCarthy, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of San Diego

1175

On April 5 1996 (DATE) before me, David Reiff, Notary Public (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC")

personally appeared Blanche Pope (NAME(S) OF SIGNER(S))

☐ personally known to me - OR - ☑ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

OFFICIAL SEAL
DAVID REIFF
NOTARY PUBLIC-CALIFORNIA
COMM. NO. 1075601
SAN DIEGO COUNTY
MY COMM. EXP. OCT. 22, 1999

WITNESS my hand and official seal.

David Reiff
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER

TITLE(S)

☐ PARTNER(S) ☐ LIMITED
☐ GENERAL
☐ ATTORNEY-IN-FACT
■ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER:

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Pope Family Trust

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Waste Management of Cal., Victor S. Pankey, William H. Pankey, Edgar E. Pankey, Kathleen L. McCarthy, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of Orange

1176

On March 7, 1996 before me, Tobi Marshall, Notary Public
DATE — NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC"

personally appeared Marian King
NAME(S) OF SIGNER(S)

☑ personally known to me - OR - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

TOBI MARSHALL
COMM. # 1059395
Notary Public — California
ORANGE COUNTY
My Comm. Expires MAY 21, 1999

WITNESS my hand and official seal.

Tobi Marshall
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☑ CORPORATE OFFICER
Vice President and General Counsel
TITLE(S)

☐ PARTNER(S) ☐ LIMITED
☐ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER: _____

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
North San Diego Development Company/
Waste Management of California, Inc.

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Jerry A. Riessen, Victor S. Pankey,
William H. Pankey, Edgar E. Pankey,
Blanche Pope, Kathleen L. McCarthy,
Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT 1177

State of CALIFORNIA
County of SAN FRANCISCO

On March 14, 1996 before me, MELANIE WALLACE
DATE NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC"

personally appeared Jerry A. Riessen
NAME(S) OF SIGNER(S)

☒ personally known to me - OR - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signatures(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

PWR1 MELANIE WALLACE Comm. # 1001945 NOTARY PUBLIC - CALIFORNIA City and County of San Francisco My Comm. Expires Aug. 22, 1997 PWR1

WITNESS my hand and official seal.

Melanie Wallace
SIGNATURE OF NOTARY

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
■ CORPORATE OFFICER

President
TITLE(S)

☐ PARTNER(S) ☐ LIMITED
☐ GENERAL
☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☐ OTHER: _____

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Gregory Canyon, Ltd.

DESCRIPTION OF ATTACHED DOCUMENT

Agreement
TITLE OR TYPE OF DOCUMENT

50
NUMBER OF PAGES

DATE OF DOCUMENT

Waste Management of Cal., Victor S. Pankey, William H. Pankey, Edgar E. Pankey, Blanche Pope, Kathleen L. McCarthy, Robert H. Pankey, Rodney Guild
SIGNER(S) OTHER THAN NAMED ABOVE

San Luis Rey Municipal Water District
5328 Highway 76
Bonsall, California 92003
(619) 728-1434

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JUL 1 1 32 PM '96
HEAL... ...ICES

JUL 02 1996
DEH
DIRECTOR'S OFFICE

Directors
...Pasley, President
...Pasley, Vice President
...Guild, Secretary
...gs, Director
...Autcom Director

District Engineer
Langdon W. Owen

District Legal Counsel
Susan M. Taylor

June 27, 1996

ORIGINAL COPY

Ir. Daniel J. Avera, Director
ounty of San Diego
nvironmental Health Services
ost Office Box 85261
an Diego, CA 92186-5261

Subject: Gregory Canyon Landfill Project

Dear Mr. Avera:

On April 15, 1996, the enclosed Gregory Canyon Landfill Mitigation Agreement "Agreement") was executed by the proponents of the Gregory Canyon landfill project, the ublic water district in which a portion of the landfill would be located, and several private andowners whose wells are just downstream of the proposed landfill site. The purpose of the Agreement is to ensure that the construction, operation and closure of the Gregory Canyon andfill project are carried out in a manner that will help protect the Pala Basin of the San Luis Rey River and the quality of water in the Pala Basin. The parties to the Agreement are the San Luis Rey Municipal Water District ("SLRMWD"), certain property owners within the boundaries of the San Luis Rey Municipal Water District ("Signing District Members"), North San Diego County Development Co., a California General Partnership ("Current Owner"), and Gregory Canyon Ltd., a California Limited Liability Company ("Development Company").

The Agreement resolves for the parties issues of the impacts to water quality and quantity in the Pala Basin that could result from the construction, operation and closure of the Gregory Canyon landfill.

The purpose of this letter is to ask you to include the provisions of the Agreement, as outlined below, in any permits, licenses or approvals issued by your agency. A summary of the Agreement provisions follows:

THE LANDFILL OWNER'S AND OPERATOR'S OBLIGATIONS

The landfill owners and operators have agreed:

- to acknowledge that the riparian and appropriative water rights appurtenant to the landowners' properties and water rights held by the District are superior to any appropriative water rights that may be granted by the State Water Resources Control Board to Waste Management, Inc. of California under its Application to Appropriate No. 30038 (Agreement Section 4.a.);

- to reduce diversion of the water under any permit or license granted pursuant to Application No. 30038 if at any time in the future investigation by the District or any landowner demonstrates that the amount of water available in the Pala Basin is insufficient to meet the reasonable and beneficial needs of the District or any signing member based upon water rights as they existed when the Agreement became effective (Agreement Section 4.b.);

- to use an alternate water supply for construction and operation of the landfill if the District or any of the landowners demonstrate that the amount of water in the Pala Basin is insufficient to meet their reasonable and beneficial needs (Agreement Section 4.c.)

- to have hydrogeological studies performed in connection with the preparation of the Environmental Impact Report ("EIR") for the landfill project and to share copies of the investigations with the District (Agreement Section 5.a.);

- to install monitoring stations to monitor for the movement of leachate from the landfill toward the San Luis Rey River during the operational life of the landfill, to consult with the District about the best locations for the monitoring stations, and to provide the District with the data collected from the monitoring stations (Agreement Section 5.b. and c.);

- to construct and maintain a reverse osmosis treatment facility as part of the leachate containment system for the Gregory Canyon landfill in order to provide immediate treatment of any contaminants that escape the containment system to the San Luis Rey River at the mouth of the landfill before the contamination reaches production wells downstream (Agreement Section 6.c.);

- to remedy any degradation of the Basin resulting from the construction, operation or closure of the Gregory Canyon landfill or, if remediation is not feasible, to provide an alternate water supply and to compensate the District and landowners if such degradation renders the Pala Basin unusable for storage of foreign water and the District and landowners are thereby economically damaged (Agreement Section 8 a. and b.); and

- to establish and maintain a mitigation fund in the form of a trust fund and a letter of edit in specified amounts before beginning construction of the landfill in order to ensure the ility to remediate the landfill's water quality impacts to the Pala Basin or provide an alternate ater supply should it become necessary. The trust fund will be funded over a ten-year period nd will total $2,520,000 in today's dollars. The fund amount will increase annually based on stablished criteria in order to ensure that the fund amount is sufficient to achieve the purpose f the trust fund (Agreement Section 9.b and Exhibit "C").

All of the parties have agreed that the Agreement's provisions are to be incorporated into e mitigation measures to be adopted in connection with the landfill project EIR, to the extent at the Local Enforcement Agency will allow, and that the provisions will also be incorporated nto the project plans and specifications for the landfill project (Agreement Section 11.b). As a esult, this letter is intended to advise you of this Agreement and its provisions so that you, as n agency responsible for reviewing and/or approving the Gregory Canyon landfill project, will nclude the provisions of the Agreement among the conditions of your approval of the landfill roject.

Thank you for your consideration.

Sincerely,

SAN LUIS REY MUNICIPAL WATER DISTRICT

Robert H. Pankey

Robert H. Pankey, President

RHP:hjb
cc: Jan Driscoll, Esq.

PLEASE COMPLETE THIS INFORMATION

RECORDING REQUESTED BY:

Susan M. Trager

AND WHEN RECORDED MAIL TO:

SAN LUIS REY MUNICIPAL WATER DISTRICT
c/o MICHELE A. STAPLES, ESQ.
LAW OFFICES OF SUSAN M. TRAGER
2100 S.E. MAIN STREET, SUITE 104
IRVINE, CALIFORNIA 92714

DOC # 1996-0234450
08-MAY-1996 12:17 PM

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AGREEMENT BETWEEN
THE SAN LUIS REY MUNICIPAL WATER DISTRICT;
DOROTHY E. LEAVEY, J.T. AND K.L. MCCARTHY;
EDGAR E. AND ELIZABETH S. PANKEY TRUST;
PANKEY FARMS; PANKEY RANCH;
BLANCHE POPE, TRUSTEE U/D/T POPE FAMILY TRUST;
NORTH SAN DIEGO COUNTY DEVELOPMENT CO.;
AND GREGORY CANYON, LTD.

Title of Document

APN numbers for the following properties:

Leavey (McCarthy): 128-010-08
128-010-29
128-020-28
128-070-02
128-070-03
128-420-01
128-420-02
128-420-03
128-420-05

Pankey Ranch: 108-120-53
108-121-11
108-122-03
108-122-09
108-122-10
108-122-11
125-061-04
125-061-05
125-061-06
125-062-02
125-062-03
128-010-33
128-010-34

Pankey Family Irrevocable Trust: 108-120-54

Pankey Farms: 125-063-

Edgar E. and Elizabeth S. Pankey Trust: 125-063-
125-063-
125-100-

Blanche Pope, Trustee: 125-100-
125-100-

North San Diego County Development Co.: 128-470-
128-470-
128-470-
128-470-
128-470-
128-470-
128-470-
110-150-
110-150-
110-150-
110-150-
110-150-
110-150-
110-362-

FIRST SUPPLEMENT
DATED JUNE 2004

FIRST SUPPLEMENT TO
AGREEMENT BETWEEN THE
SAN LUIS REY MUNICIPAL WATER DISTRICT;
DOROTHY E. LEAVEY AND J.T. AND K.L. MCCARTHY;
EDGAR E. AND ELIZABETH S. PANKEY TRUST;
PANKEY FARMS; PANKEY RANCH;
BLANCHE POPE, TRUSTEE U/D/T POPE FAMILY TRUST;
NORTH SAN DIEGO COUNTY DEVELOPMENT CO.; AND
GREGORY CANYON, LTD.

THIS FIRST SUPPLEMENT ("First Supplement") is made effective June 30, 2004 by and between the San Luis Rey Municipal Water District ("SLRMWD"), a special district organized under the Municipal Water District Act of 1911, and Gregory Canyon Ltd., a California Limited Liability Company ("Gregory Canyon"), and supplements that instrument recorded on May 8, 1996, entitled "Agreement between the San Luis Rey Municipal Water District; Dorothy E. Leavey and J.T. and K.L. McCarthy; Edgar E. and Elizabeth S. Pankey Trust; Pankey Farms; Pankey Ranch; Blanche Pope, Trustee U/D/T Pope Family Trust; North San Diego County Development Co.; and Gregory Canyon, Ltd." ("1996 Agreement").

SLRMWD and Gregory Canyon are sometimes referred to herein individually as a "Party" and collectively as "Parties".

RECITALS

A The Parties, among others, entered into the 1996 Agreement for the purpose of setting forth measures that would be taken by Gregory Canyon, its predecessors-in-interest and its successors to protect groundwater resources within the boundaries of the SLRMWD.

B. Gregory Canyon has acquired all rights in the Gregory Canyon real property from North San Diego Development Company, a signatory to the 1996 Agreement, and is its successor in interest.

C. The San Diego County Local Enforcement Agency ("LEA") of the Department of Environmental Health, acting as the Lead Agency under the California Environmental Quality Act (Public Resources Code sections 21000, et seq. ("CEQA")), prepared a draft environmental impact report ("EIR") for an approximately 300-acre landfill (including the waste disposal area and borrow/stockpile areas) to be placed on approximately 1,770 acres of land owned by Gregory Canyon (the "Project" or "Project Site"). The Project

1124

Site is located in the unincorporated area of North San Diego County, described with particularity in Proposition C adopted by the voters of San Diego County in a County wide election in November 1994. A portion of the Project Site is located within the jurisdictional boundaries of the SLRMWD.

D. By letter dated April 28, 1999 to the LEA, the SLRMWD requested that certain of the measures contained in the 1996 Agreement be incorporated in the EIR and the Mitigation Monitoring and Reporting Program ("MMRP") for the Project.

E. The LEA incorporated certain measures referenced in the April 29, 1999 letter in the Final EIR for the Project. The LEA certified the Final EIR for the Project on February 6, 2003.

F. SLRMWD contends that the Final EIR, specifically Table 10-1 of the MMRP, identifies the SLRMWD as a CEQA "Responsible Party" charged with monitoring compliance with Project mitigation measures MM 4.3-1a through MM 4.3-1j.

G. Following the LEA's certification of the Final EIR, the SLRMWD requested the LEA to require that Gregory Canyon provide funding to make it feasible for the SLRMWD to carry out the responsibilities assigned to it in the Final EIR, including monitoring the mitigation measures delegated to it by the LEA in MM 4.3-1a through MM 4.3-1j, as well as to implement other measures designed to protect groundwater resources. The SLRMWD has also asked the LEA to consult with it, and with the California Regional Water Quality Control Board, San Diego Region ("RWQCB") to develop appropriate protocols to assist the SLRMWD in carrying out its CEQA responsibilities and to monitor compliance with these Project mitigations. In carrying out these activities, SLRMWD believes that it is a Responsible Agency as defined in CEQA. Gregory Canyon takes no position on that issue.

H. The SLRMWD on June 16, 2004, at a regularly scheduled and agendized meeting of the Board of Directors, acting as a CEQA Responsible Agency, by a 4-0 vote (with one absence) declined to approve the Final EIR for the landfill project on the grounds that it was inadequate as a matter of law, that the project would result in significant unmitigated water quality impacts for which no Statement of Overriding Considerations was made, for which mitigation was infeasible to carry out, and that adverse environmental impacts would result because of the SLRMWD's refusal to accept the responsibilities delegated to it by the LEA under the MMRP as written and approved by the LEA.

I. Gregory Canyon hereby agrees to pay SLRMWD's costs of meeting its mitigation monitoring responsibilities as described in the Final EIR, to purchase a policy or policies of insurance acceptable to SLRMWD to address issues of environmental investigation, clean up and remediation, to pay the costs of construction quality assurance during construction of the landfill, as well as for other items, in accordance with the terms and conditions set forth herein and in terms and conditions to be developed and memorialized in future amendments, modifications and/or supplements to the 1996 Agreement.

J. This First Supplement sets for the terms agreed to between the SLRMWD and Gregory Canyon as to the assistance Gregory Canyon will furnish to the SLRMWD to monitor the mitigation requirements set forth in the 1996 Agreement and MM 4.3-1a through MM 4.3-1j, as well as additional mitigation measures and other matters. By entering into this First Supplement, SLRMWD takes no position on the suitability of the project site for municipal landfill purposes.

NOW, THEREFORE, for good and valuable consideration, the receipt of which is acknowledged, the Parties agree as follows:

1. Agreement Remains in Effect.

   1.1 All terms and conditions of the 1996 Agreement remain in effect, as supplemented by this First Supplement.

2. Feasibility of Mitigation Measures.

   2.1 Upon agreement by Gregory Canyon to fully fund performance of the SLRMWD's duties under the Final EIR, including monitoring compliance with Mitigation Measures MM 4.3-1a through MM 4.3-1j, the SLRMWD acting as a CEQA Responsible Agency will reconsider the matter of its approval of the Final EIR at a specially scheduled meeting of its Board of Directors on June 30, 2004, at 1:30 p.m. at its offices in Fallbrook.

1126

3. Periodic Review.

3.1 The Parties recognize the importance of periodic review and amendment, modification and/or supplement of the 1996 Agreement throughout the life of the landfill and during its closure and post-closure period. The Parties recognize and agree that on certain matters, they will work in good faith to reach agreement on matters which are too premature to agree on in required detail at this time. The Parties agree to meet annually or more frequently to discuss performance under the 1996 Agreement, the First Supplement, and any future amendments, modifications and/or supplements; any accounting matters; payment or billing issues; and performance protocols, and to coordinate with each other and the regulatory agencies. In the event no agreement can be reached regarding disputes between the SLRMWD and Gregory Canyon as to Gregory Canyon's compliance with Joint Technical Document ("JTD") requirements and Waste Discharge Requirements ("WDRs") and the SLRMWD's duties under the Final EIR, the Parties agree that the SLRMWD may seek to enforce the provisions of the JTD and WDRs as they affect water quality in the appropriate California court to the full extent provided under applicable law. SLRMWD has standing to enforce the JTD and WDRs in the appropriate California court to the full extent provided under applicable law.

4. Payment by Gregory Canyon of the SLRMWD's Mitigation Monitoring Expenses.

4.1. Gregory Canyon agrees to pay the SLRMWD's reasonable costs for consultants, engineers and attorneys engaged by the SLRMWD to assist it in evaluating and performing its CEQA mitigation monitoring requirements, and advising the District on insurance matters arising from the purchase of insurance consistent with this First Supplement. Such costs include the preparation of this First Supplement, attorneys' costs incurred in relation to the procurement of insurance, and coordination with regulatory agencies to develop protocols to monitor compliance with project mitigation measures MM 4.3-1a through MM 4.3-1j.

4.2 Gregory Canyon will deposit with the SLRMWD the initial sum of $75,000 on July 15, 2004, against which estimated attorneys' and experts' fees incurred in developing this First Supplement will be billed. Should actual fees and costs exceed the amount deposited, SLRMWD will bill the reasonable costs to Gregory Canyon for payment, which Gregory Canyon agrees to pay. If the deposit

1127

exceeds actual costs the surplus will be refunded to Gregory Canyon. On August 1, 2004, and annually thereafter until post-closure actions have been completed, Gregory Canyon will deposit a sum expected to cover SLRMWD's reasonable costs for the remainder of the year plus a reserve of $25,000 out of which technical consultants' fees, attorneys' fees and costs incurred in carrying out mitigation responsibilities for the year, will be paid. Such deposit due August 1, 2004 will be in the initial sum of $45,000 per year, including $20,000 for the first year of monitoring and development of protocols, and $25,000 reserve. Funds remaining as of August 1, 2005 will be carried over. In the event reasonable costs incurred exceed funds on deposit and reserved, Gregory Canyon agrees to pay such reasonable costs and fees. A copy of the project mitigation measures is attached hereto as Exhibit A.

4.3 At the end of the first year in which waste is accepted for disposal at the Gregory Canyon Landfill, the Parties will commence negotiations about Gregory Canyon's payment of monitoring costs of the SLRMWD during the landfill's closure and post-closure period, as provided for in Section 4.2.

4.4 Disputes, if any, which arise concerning reasonableness of costs incurred by the SLRMWD are not subject to resolution by the binding arbitration provisions of Section 10 of the 1996 Agreement. The Parties agree that any dispute will be resolved through informal mediation, and if unresolved after passage of a reasonable time, in the California court system judicially. The SLRMWD agrees to make available for inspection by Gregory Canyon statements from technical consultants for professional services, and will provide summaries or redacted versions of statements for professional services submitted by its attorneys. In making such statements and summaries available for Gregory Canyon's review, the SLRMWD does not waive the attorney-client privilege, the attorney work product doctrine or any provision of law protecting the confidentiality of its communications with its attorneys and/or other consultants or their work product. The SLRMWD will require documentation from its attorneys and consultants prior to payment.

4.5 The SLRMWD will furnish documentation to Gregory Canyon by the fifteenth (15th) day following the end of each calendar quarter for expenses incurred during the previous calendar quarter. Funds deposited which have not been spent or which have not been earmarked for incurred expenses will be carried forward to

the next year. SLRMWD may keep a reserve of up to $25,000. Unspent funds in excess of $25,000 will be refunded.

5. Funding of Construction Quality Contractor.

5.1 The Parties have agreed that Gregory Canyon will pay the costs of engagement of a Construction Quality Contractor ("CQC") who will perform as provided for in 27 California Code of Regulations ("CCR") 20323 and 27 CCR 20324.

5.1.1 Prior to initiating construction, Gregory Canyon shall enter into a binding agreement with the RWQCB to provide funding to allow the RWQCB to engage the CQC to undertake Construction Quality Assurance ("CQA") consistent with 27 CCR 20323 and 27 CCR 20324. In addition to the requirements of 27 CCR 20324, the design professional preparing the CQA shall have at least five years experience as a registered civil engineer or certified engineering geologist working on landfills in California. The firm selected will be required to procure a policy of insurance, the terms and amounts of which must be acceptable to the SLRMWD.

5.1.2 CQA activities will be undertaken in accordance with procedures set forth in 27 CCR 20323 and 27 CCR 20324, including the JTD prepared by Gregory Canyon and submitted to and approved by the LEA and the RWQCB, as it may be amended from time to time. The CQC will report to the RWQCB.

5.1.3 In the event the RWQCB is unable to accept funding for the CQC or is otherwise unable to retain the CQC, the Parties agree to negotiate in good faith to identify another agency that may engage the CQC to perform the activities contemplated by this First Supplement.

5.1.4 Copies of reports, notes of field observations, testing results and all other documents prepared by the CQC will be provided to both the SLRMWD and Gregory Canyon when submitted by the CQC to RWQCB, at no cost to the SLRMWD.

1129

5.1.5 Gregory Canyon may engage its own contractor to provide CQA services, or may rely on the CQC engaged by RWQCB in meeting CQA requirements in applicable law, regulations or permits.

6. Groundwater Sampling and Analysis.

6.1 Maintaining water quality of the San Luis Rey River and its basins for the beneficial use of water users in the SLRMWD is a priority of both Parties. The Parties acknowledge that the RWQCB has designated the water within the SLRMWD to have the beneficial use for drinking water purposes. The Parties recognize that the groundwater monitoring system to be included in the WDRs and/or JTD will address background monitoring, detection monitoring, and surface water monitoring. Starting upon issuance of the WDRs, and completing not less than one hundred twenty (120) days prior to commencing the receipt of waste at the landfill, the Parties shall develop a protocol for the sampling, handling and analysis of groundwater samples to be collected from monitoring wells at the landfill (and other wells to be monitored), as required by the WDRs and/or JTD. The Parties agree that the protocol will be consistent with applicable federal and state law and regulations governing solid waste landfills, including but not limited to the requirements of 27 CCR 20415. The protocol will include a determination of the constituents to be analyzed, and a method for adjusting the constituents to be analyzed based on future monitoring of leachate collected from Gregory Canyon's leachate collection and removal system. The LEA and the RWQCB will be consulted in the development of the protocol. In the event of disagreement regarding any provisions of the protocol, the determination of the RWQCB will be controlling.

6.2 Within fifteen (15) days from the date of final completion of the protocol, the SLRMWD will select one or more State Certified contractors to provide sampling, handling and laboratory analytical services at a State Certified laboratory with respect to groundwater samples collected in accordance with the requirements of the WDRs and/or JTD. Gregory Canyon agrees to promptly enter into arrangements for payment of the selected contractor or contractors for providing these services without interruption until completion of post-closure activities. The contractor(s) will be selected in consultation with the LEA and the RWQCB, and any contractor providing laboratory analytical services must be State-certified.

1130

6.3 The SLRMWD may, in its reasonable judgment, select new contractor(s) referred to in Section 6.2 to substitute for any of the contractor(s) initially selected, and upon such occurrence Gregory Canyon agrees to promptly make arrangements for the payment of such new contractor(s). However, any selection of new substitute contractor(s) that occurs following initiation of an Evaluation Monitoring Program conducted pursuant to 27 CCR 20385(a)(2) or (3) will not become effective until the completion of the Evaluation Monitoring Program.

7. Water Service by the SLRMWD.

7.1 Gregory Canyon agrees to purchase water and water service from the SLRMWD (if available) for use in a service area to be determined by Gregory Canyon in quantities and at pressures, adequate for construction and operation as set forth in the EIR, subject to the approval (if required) of the San Diego County Local Agency Formation Commission ("LAFCO"). The terms and conditions of service are to be negotiated and set forth in a service agreement to be finalized among the Parties in sufficient time to furnish service of initial construction water. Gregory Canyon agrees to pay all costs of the SLRMWD's furnishing of water service Gregory Canyon agrees to notify the SLRMWD on or before October 1, 2004, of its construction and project build out plans to allow the SLRMWD to commence arrangements for service, at which time a Readiness to Serve Fee will be levied by SLRMWD. The SLRMWD will arrange to undertake all required studies, including environmental and engineering studies, at Gregory Canyon's expense, to initiate service.

7.2 Subject to water availability and approval of LAFCO (if required) the SLRMWD will provide both potable and non-potable water to those portions of the Project site as designated by Gregory Canyon in such quantities and at such pressures as requested by Gregory Canyon, which water is to be made available during construction and throughout its operation, and during closure, and post-closure period as appropriate.

7.3 Gregory Canyon will support any proceedings involving the SLRMWD before LAFCO, if asked to do so by the SLRMWD, including but not limited to, changes of the boundaries of SLRMWD's service area to include the entire Gregory Canyon ownership.

7.4 Gregory Canyon will support and not oppose the imposition of the SLRMWD's annual water availability charge on lands within the boundaries of the SLRMWD.

7.5 Gregory Canyon will support formation of an improvement district within the SLRMWD, if requested, consistent with the provisions of California Water Code sections 71000 et seq., and other laws to which the SLRMWD is subject, which formation will be in the sole determination of the SLRMWD, for the purpose of providing water service to those portions of the Project site within the SLRMWD for which the operator requires water service .

8. Water Rights.

8.1 Gregory Canyon will convey to the SLRMWD any and all water rights it holds, whether or not currently exercised, in a form satisfactory to the SLRMWD, the election of which will be at the SLRMWD's sole discretion. The conveyed water rights will be used by the SLRMWD to furnish water within SLRMWD's service area at locations designated by Gregory Canyon, to Gregory Canyon and for other beneficial uses, including but not limited to, fire flow. Gregory Canyon will use its best efforts to preserve and defend its claimed water rights, and not lose them through non-use, prescription, or lapse of administrative proceedings.

8.2 Gregory Canyon will resume processing its Application to Appropriate Water No. A30038 now pending before the State Water Resources Control Board, to affirm the property's historic water supply, and to allow appropriation of water to lands not riparian to the San Luis Rey River.

8.3 Any water reasonably surplus to the needs of Gregory Canyon will be transferred in a form satisfactory to the SLRMWD, for beneficial use.

8.4 Gregory Canyon will furnish the SLRMWD historic records of pumping at the landfill property, including volume, place of use, point of diversion, type of pump, power records, water facility construction, repair and maintenance records, prior filings, if any, with the State Water Resources Control Board, and records of proceedings regarding Application to Appropriate No. A30038, to the extent available. These records should be furnished as soon as possible, so that the SLRMWD can study water supply options for the Gregory Canyon Landfill.

9. Hold Harmless, Indemnification and Insurance.

9.1 Gregory Canyon agrees to defend (with counsel of Gregory Canyon's choice, subject to SLRMWD's approval), indemnify and hold the SLRMWD harmless in any claims, suits, proceedings, investigations, and judgments arising from or in connection with (a) the exercise of Gregory Canyon's water rights; (b) the furnishing of any water and/or water related services by SLRMWD to Gregory Canyon's property and operations; (c) the furnishing of water by SLRMWD to any other water user within SLRMWD; (d) the consumption or use of any water from the San Luis Rey River or its groundwater claimed to be contaminated; (e) the carrying out of SLRMWD's monitoring duties under CEQA (except to the extent of the gross negligence or willful misconduct of SLRMWD, its representatives, consultants, officers, agents, employees, and volunteers); and (f) the administration of this First Supplement.

9.2 The Parties further recognize that SLRMWD's service of water is regulated by state and federal law. In the event that a "Contaminant", as defined below, is detected (a) in a Gregory Canyon monitoring well; or (b) in a SLRMWD production well, and the RWQCB makes a finding that the Contaminant is traceable to the Project; or (c) in, on, or under any property under the jurisdiction of the SLRMWD from which water is pumped, and the RWQCB makes a finding that the Contaminant is traceable to the Project, Gregory Canyon shall be responsible for all liabilities, damages, claims and costs resulting therefrom, including but not limited to any liability Gregory Canyon may have under state and federal law and including, but not limited to, the following:

(i) Costs of investigation and remediation of the soil, sediment, groundwater and surface water, and costs of natural resource damages and property damage to the extent required by applicable laws and the requirements of governmental authorities including costs of defense of any associated damage suit brought against, or judgment entered against the SLRMWD by any person regardless of merit or outcome;

(ii) Removal of the Contaminant from the drinking water to the extent required by applicable laws if the Contaminant is found in a production well, through well-head treatment or other treatment system acceptable to SLRMWD;

1133

(iii) Costs incurred by SLRMWD to require the clean up of unpermitted releases of Contaminants by Gregory Canyon associated with the operation and maintenance of treatment facilities until remediation is complete, pursuant to applicable laws and the requirements of governmental authorities;

(iv) Costs, fines and penalties due to violations or alleged violations by Gregory Canyon of applicable laws relating to the environment or health and safety;

(v) Costs of liabilities for alleged or actual personal injury, including costs of defense of any claim against, suit brought against, or judgment entered against the SLRMWD by any person arising from the ingestion of or exposure to water claimed to be contaminated by the Gregory Canyon Landfill; and

(vi) Losses, liabilities, damages, costs (including but not limited to investigatory and response costs) and expenses (including but not limited to reasonable attorneys' and consultants' fees and any and all expenses whatsoever reasonably incurred in investigating, responding to, preparing, defending or settling any claim or action or in invoking or obtaining the benefits of insurance covering SLRMWD (including the insurance contemplated in this section 9), in respect of any loss against which SLRMWD would otherwise be indemnified hereunder.

"Contaminant" means any constituent which exceeds action levels for drinking water supplies established by state and/or federal law, including but not limited to, Title 22 of California Code of Regulations or any substance that gives rise to liability, imposes duties, or requires the incurrence of costs under any environmental health or health and safety law. The Parties agree to confer and cooperate with the RWQCB in the determination of required actions, as appropriate.

1134

9.3 The Parties recognize that the San Luis Rey River and its groundwater basins are the sole source of supply to the water users in the SLRMWD, and that the geology and hydrology of the river and its basins allow for the storage of water, the conjunctive use of ground and surface water, and the carry over of water to meet the demands of customers through dry, and multiple dry year periods. In recognition of the importance of this natural resource, Gregory Canyon agrees to purchase and maintain for the duration of the operation, closure and post closure periods, policies of environmental insurance covering claims for injuries to persons or damage to property (including natural resources damage) and the release and remediation of contaminants into the environment, which may arise from or in connection with the design, construction, closure operation, expansion, modification and repair of the landfill by Gregory Canyon, its successors, its agents, representatives, employees, or assigns issued by acceptable insurance companies, as determined by the SLRMWD, which are (1) qualified to do the business of insurance in California, (2) maintain an agent for service of process within the State, and (3) are rated not less than "A VII" according to the latest Best's Key Rating Guide, covering the liabilities set forth in Sections 9.1 and 9.2, and all liabilities and claims related to the release of Contaminants resulting in any way from the operations of Gregory Canyon, claims for violations of health, safety or environmental laws, third party claims against the SLRMWD, tort claims, clean up and remediation claims and costs, trespass claims, nuisance claims, and claims for catastrophic acts, including acts of domestic and foreign terrorism. The insurance coverage shall cover the SLRMWD, its employees, directors, agents and volunteers.

(a) The policy or policies and related endorsements are to be received and approved by the SLRMWD, in its reasonable discretion before the commencement of landfill construction. The polices of insurance are to contain or be endorsed to contain, without limitation, the following provisions and are to meet the following requirements; provided, however, that if the coverage provided for set forth in this First Supplement is not available at commercially reasonable terms, then the parties shall negotiate to replace the terms as set forth in this First Supplement with comparable terms acceptable to the SLRMWD that meet the goals of the SLRMWD as set forth in this First Supplement:

1135

(i) The SLRMWD, its representatives, consultants, directors, officers, agents, and employees, and volunteers are to be covered as Named Insureds under the policies, including but not limited to, as respects: liability arising out of the activities performed by or on behalf of Gregory Canyon; products and completed operations of Gregory Canyon; and premises owned, leased, or used by Gregory Canyon.

(ii) Gregory Canyon's insurance coverage shall be primary insurance as respects: the SLRMWD, its representatives, consultants, officers, agents, employees, and volunteers. Any insurance or self-insurance maintained by the SLRMWD, its representatives, and their directors, officers, employees, consultants, or volunteers shall be in excess of Gregory Canyon's insurance and shall not contribute to it.

(iii) Any failure to comply with the reporting provisions of the policy shall not affect coverage provided to the SLRMWD, its representatives, consultants, officers, agents, employees, and volunteers.

(iv) Coverage shall state Gregory Canyon's insurance and shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(v) The insurance coverage shall contain no special limitations on the scope of protection afforded to the SLRMWD, its officers, officials, employees, agents or volunteers.

(b) All Coverage: Each insurance policy required by the SLRMWD shall be endorsed to state that coverage shall not be suspended, voided, canceled by either Party, reduced in coverage or in limits except after sixty (60) days prior to written notice by certified mail, return receipt required, has been given to the SLRMWD.

1136

(c) Proof of Insurance: Gregory Canyon shall, not less than 45 (forty-five) days prior to the initiation of landfill construction, furnish the SLRMWD with original policies and endorsements evidencing coverage required by this section of the Supplement. The policy or policies and related endorsements are to be signed by the person authorized by that insurer to bind coverage on its behalf. SLRMWD must be provided complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by these specifications.

(d) Certificate of Insurance: Gregory Canyon shall, at least thirty (30) days prior to the expiration of any insurance policy required by this Agreement, file a signed and completed "Certificate of Insurance" (listing all policy endorsements and provisions called for by this Agreement) with the SLRMWD stating that such insurance policy has been renewed or extended. Should Gregory Canyon be unable to renew or extend any insurance policy or policies required by this First Supplement, Gregory Canyon shall deliver a letter of credit in the amount of the aggregate limits of the policy or policies that Gregory Canyon was unable to extend or renew. The letter of credit shall be available to fund the matters contemplated in this First Supplement. If such letter of credit is not available to Gregory Canyon, as demonstrated to SLRMWD by Gregory Canyon, Gregory Canyon shall have delivered to SLRMWD such security or other financial instruments having at least equal value to the amount of such letter of credit, such security and financial instruments that meet the goals of the SLRMWD as set forth in this First Supplement, as determined by the SLRMWD in its reasonable discretion.

(e) Amount: The insurance policy shall be in the sum of at least $100,000,000 per occurrence in 2004 dollars. Gregory Canyon will furnish the SLRMWD with certificates of insurance annually. The SLRMWD will have the right to require Gregory Canyon to switch carriers if the rating of the insurer declines. This policy of insurance shall be in addition to other financial arrangements required by the RWQCB, the State Water Resources Control Board, and the California Integrated Waste Management Board, and as outlined in the 1996 Agreement.

10. Delay or Termination of Landfill Project.

10.1 Even in the event of a delay of initiation of construction or operation for any reason, or in the event of a voter approval of any land use initiative which, if approved, would change the zoning for the property owned by Gregory Canyon to prohibit the use of the property for landfill purposes, Gregory Canyon will, nevertheless, reimburse the SLRMWD any actual costs incurred by SLRMWD to initiate water service to Gregory Canyon, and for actual costs to modify, supplement and update the 1996 Agreement to allow the SLRMWD to implement the mitigation measures delegated to it by the LEA. Notwithstanding the above, the any transfer of water rights under Section 8 would not become effective until such times as the Parties enter into a water service agreement and Gregory Canyon's water rights are transferred in a form acceptable to SLRMWD.

11. Cooperation Regarding Amendment of JTD and WDRs.

11.1 The Parties recognize that the 1996 Agreement will be amended from time to time, and that this First Supplement is an interim agreement. The parties agree that this First Supplement, and future supplements, will be made a part of the JTD and placed before the LEA or the California Integrated Waste Management Board for their consideration, as appropriate. In addition, the Parties agree to request that this agreement become a part of the WDRs for the project, either directly or through incorporation in the JTD. The parties will cooperate to ensure that this First Supplement becomes an integral part of the Gregory Canyon JTD, as the 1996 Agreement is from time to time amended, modified and/or supplemented, and that the Parties will cooperate with each other in such amendment, modification and/or supplement process.

12. Binding on Successors and Assigns.

12.1 This First Supplement is binding on the successors and assigns of the Parties.

13. Requisite Action. The Parties represent and warrant to each other that they have taken all requisite action to approve, authorize, execute and deliver this First Supplement and that each person executing this First Supplement on their behalf has all requisite power and authority to execute this First Supplement and to bind the Parties to the provision of this First Supplement.

IN WITNESS WHEREOF, the Parties have executed this First Supplement effective as of the day and year first above written.

Dated: June 30, 2004

SAN LUIS REY MUNICIPAL WATER DISTRICT

By: _____
President, Board of Directors

Dated: June 30, 2004

Attest: _____
Assistant Secretary

Dated: _____

GREGORY CANYON LTD., a California Limited Liability Company

By: _____
Richard Chase, Project Manager

1139

13. Requisite Action. The Parties represent and warrant to each other that they have taken all requisite action to approve, authorize, execute and deliver this First Supplement and that each person executing this First Supplement on their behalf has all requisite power and authority to execute this First Supplement and to bind the Parties to the provision of this First Supplement.

IN WITNESS WHEREOF, the Parties have executed this First Supplement effective as of the day and year first above written.

Dated: _____

SAN LUIS REY MUNICIPAL WATER DISTRICT

By: _____
President, Board of Directors

Dated: _____

Attest: _____
Secretary

Dated: 6/30/2004

GREGORY CANYON LTD., a California Limited Liability Company

By: Richard Chase
Richard Chase, Project Manager

1140

EXHIBIT A

MITIGATION MONITORING MEASURES RELATED TO SLRMWD AGREEMENT

MITIGATION MEASURE NO.	MITIGATION MEASURE	METHOD OF VERIFICATION	TIMING OF VERIFICATION	RESPONSIBLE PARTY
MM 4.3-1a	For the purpose of providing additional environmental assurance to the San Luis Rey Municipal Water District, in addition to the 13 monitoring wells surrounding the landfill, the water quality monitoring shall include at a minimum monitoring of two production wells (downgradient SLRMWD well #34 and upgradient Lucio well #2), upgradient alluvial monitoring well GMW-3, and downgradient alluvial monitoring well GLA-16 located within the project boundary).	Written report by applicant's hydrogeologist	Annually	San Luis Rey Municipal Water District
MM 4.3-1b	If contamination is detected in any monitored well, the landfill operator shall be responsible for treatment and disposal of contaminated water. The landfill operator shall ensure that impacted water is treated to acceptable water quality standards, consistent with existing background water quality as provided in CCR Title 27, Section 20400 (a)(1). Adequate treatment shall be implemented to maintain background levels established by the RWQCB at the time of issuance of the waste discharge requirements.	Field inspection and monitoring by applicant's hydrogeologist	If contamination is detected	Regional Water Quality Control Board and San Luis Rey Municipal Water District
MM 4.3-1c	The Applicant shall provide to the San Luis Rey Municipal Water District simultaneously with the submission to the RWQCB data collected from the groundwater monitoring program and shall provide to the District and its consultants split samples from any groundwater monitoring station upon reasonable notice given before the next regularly scheduled sampling to enable the District to verify the data collected.	Data prepared by applicant's hydrogeologist	Simultaneously with submission to Regional Water Quality Control Board	San Luis Rey Municipal Water District

Mitigation Measure No.	Mitigation Measure	Method of Verification	Timing of Verification	Responsible Party
MM 4.3-1d	Prior to the commencement of Phase I construction project grading, the Applicant shall provide the San Luis Rey Municipal Water District and the other parties to the Mitigation agreement with an irrevocable letter of credit in accordance with Section 9 and Exhibit C of the Mitigation Agreement. The Letter of Credit shall be automatically renewed annually.	Irrevocable letter of credit	Prior to commencement of Phase 1 construction grading	San Luis Rey Municipal Water District and other parties to the agreement [1]
MM 4.3-1e	Prior to commencement of project operation, the Applicant shall establish, maintain, and administer a trust fund or third party custodial account for the benefit of the San Luis Rey Municipal Water District and the other parties to the Mitigation Agreement in accordance with Section 9 and Exhibit C of the Mitigation Agreement.	Verification of establishment of trust fund	Prior to commencement of operation	San Luis Rey Municipal Water District and other parties to the agreement
MM 4.3-1f	As a condition of any water rights appropriation permit that may be granted by the State Water Resources Control Board, the Applicant shall reduce its diversion of water if the amount of groundwater available within the San Luis Rey Municipal Water District based upon water rights as they existed on April 15, 1996 within the boundaries defined in the Mitigation Agreement, is insufficient to meet the reasonable and beneficial needs of the District or any of the landowners within the District.	Written verification of water usage	If groundwater supply is deemed to be insufficient	San Luis Rey Municipal Water District and other parties to the agreement
MM 4.3-1g	The Applicant shall identify and use an alternate water supply for construction and operation of the project if the amount of groundwater available within the San Luis Rey Municipal Water District is insufficient to meet the reasonable and beneficial needs of the District or any of the landowners within the District.	Written verification of alternate supply	If groundwater supply is deemed to be insufficient	San Luis Rey Municipal Water District

[1] The Agreement is between the San Luis Rey Municipal Water District, certain surrounding landowners, and Gregory Canyon, Ltd.

Mitigation Measure No.	Mitigation Measure	Method of Verification	Timing of Verification	Responsible Party
MM 4.3-1h	If the construction, operation, or closure of the landfill causes degradation of the Pala Basin water or quality of foreign water stored in the Pala Basin for use within the Pala Basin so that it cannot be used for domestic uses and for irrigation, the Applicant shall be liable to the San Luis Rey Municipal Water District to the extent of any degradation of the quality of Pala Basin water or the quality of foreign water stored in the Pala Basin caused by the construction, operation or closure of the landfill, including the cost of remediating the degradation of water quality attributable to the construction, operation or closure of the landfill, or if such remediation is not technologically or economically feasible, of providing an alternative water supply pending permanent remediation measures to the extent necessary to meet the reasonable needs for domestic and irrigation uses of the parties who signed the Mitigation Agreement. The applicant's liability with respect to foreign water shall be limited to remediation of a maximum of 17,694 acre-feet. Remediating the water quality of the Pala Basin or providing an alternative water supply, shall be part of the closure plan and part of the cost estimate required by 14 CCR § 17782.	Testing as required by RWQCB after consultation with SLRMWD	Reporting as required by RWQCB or SLRMWD Agreement	Regional Water Quality Control Board; San Luis Rey Municipal Water District
MM 4.3-1i	The Applicant shall notify the San Luis Rey Municipal Water District and each of the parties to the Mitigation Agreement of any request to modify or to be released from the requirements of the closure plan or the post closure maintenance plan for the project.	Copy of request	At time of request	San Luis Rey Municipal Water District and other parties to SLRMWD Agreement
MM 4.3-1j	The Applicant shall consult with the San Luis Rey Municipal Water District concerning the number, specifications, location, and frequency of data collection at the monitoring stations. The final decision regarding the need for and adequacy of the number, specifications, location of and frequency of data collection from the monitoring stations will be made by the RWQCB.	Discussion with SLRMWD	During discussions of monitoring with RWQCB	Regional Water Quality Control Board; San Luis Rey Municipal Water District

1143

APPENDIX R

CLOSURE AND POST-CLOSURE COST ESTIMATE BACK-UP INFORMATION

Back Up Materials

- Tables – Detail Breakdown of Noted Items
- Rate Sheets
- Bid Comparisons
- Contracts
- General Prevailing Wages – Director of Industrial Relations
- Caltrans Labor Surcharge and Equipment Rates

Detail Breakdown of Item No. 2 - Final Cover Construction Quality Assurance Monitoring and Testing

(Gregory Canyon Landfill 2010 Closure Cost Estimate)

Item	Estimated Quantity		Labor		DIR Basic Hourly Rate	Labor Wage per Hour	Unit Price (monthly)	Total	Notes
DIR Category: Building/Construction Inspector and Field Soils and Material Tester (Field Personnel & Reporting)*	12	Months	50	hrs/wk	$34.43	$100.00	$22,409.05	$268,908.64	Labor Wage is including a multiplier (overhead cost)
Administration & Reporting (Project Manager)	12	Months	4	hrs/wk		$162.00	$2,904.21	$34,850.56	Rate for BAS PM
Laboratory Work	12	Months	1	LS			$6,406.23	$76,874.76	1,204 lab tests needed based on Preliminary CQA Plan
						Total ** =	**$31,719**	**$380,634**	

*Approximate Unit Rate based on an industry standard of 3.0 multiplier.
**Total Cost is rounded to the nearest dollar amount.

	Lab Work Required				*Total*	***GLA Current Rates (2010)	Total Estimated Cost
Particle Size Analysis =	1 test per	5,000	CY		197	$144.80	$28,124.10
Atterberg Limit =	1 test per	5,000	CY		197	$237.88	$46,203.88
					393		**$74,328**

Estimated Total Earthwork at FRB (CY) = 982,810

***Geo-Logic Associates (GLA)

Detail Breakdown of Item No. 9 - Construction Management

(Gregory Canyon Landfill 2010 Closure Cost Estimate)

Labor Category	Const. Manager	Engineer\Const. Mgr.	Sr. CADD Operator	Project Coordinator	Total Hours	Total Labor Cost	Reimburseables (as % of Labor $)	Company Vehicle (Budget $)	Per Diem (3)	TOTAL	Unit Cost Per Month
Unit	hr.	hr.	hr.	hr			%	$/Month	$		
Billing Rates*	$155	$108	$86	$100			5	800	140		
Construction Management	175	2900		96	3171	$349,925	$17,496	14	290	$419,221	$34,935
Review Record Drawings	8	40	32	32	112	$11,512	$576			$12,088	
Project Administration	60			20	80	$11,300	$565			$11,865	$989
Total Estimated Hours	243	2940	32	148	3363						
Total Estimated Cost	$37,665	$317,520	$2,752	$14,800		$372,737	$18,637	$11,200	$40,600	$443,174	

(1) A working day is defined as 10 hours per day Monday through Friday. The actual days worked may vary depending on the Contractor's activities.

(2) Fee estimate is based on 290 (14 months) working days as stated in Closure Implementation Schedule (included in the October 2010 JTD for Gregory Canyon Landfill).

(3) Per diem estimated at $40 per day for meals and $100 for room.

*Based on current BAS rates

Detail Breakdown of Item No. 1 - Landfill Gas Control System/Condensate Monitoring and Maintenance

(Gregory Canyon Landfill Annual Postclosure Maintenance and Monitoring Cost Estimate)

Item Description	*Labor & Material*		*System/Landfill*		Frequency	*2010 Annual Post-Closure Maintenance & Monitoring*			
	Hours	Cost/Hr	Amount	Type		Quantity		Unit Price	Total
Flare Station Operation & Maintenance	40	$78			Weekly	52	weekly	$3,120	$162,240
System Monitoring (Well Field Monitoring)	0.15	$78	223	Wells	Monthly	12	Month	$2,609	$31,308
Condensate System Monitoring and Maintenance (Hourly costs includes materials)	6	$95			Weekly	52	weekly	$570	$29,640
Installation of additional gas extraction wells as needed (Assume one well per year with an approximate depth of 100 ft)						100	ft	$100	$10,000
Gas Control System Maintenance/Replacement (replacement of piping, valves, miscellaneous repair calls, etc.)						1	LS	$100,000	$100,000
									$333,188

Detail Breakdown of Item No. 2 - Landfill Gas Migration/Vadose Zone Monitoring System Monitoring and Maintenance

(Gregory Canyon Landfill Annual Postclosure Maintenance and Monitoring Cost Estimate)

Item Description	*Labor & Material*	*System/Landfill*		Frequency	*Lab Work*		*2010 Annual Post-Closure Maintenance & Monitoring*			
	Cost	Amount	Type		Cost/Sample	Samples Req'd	Quantity		Unit Price	Total
Gas Migration Monitoring System Monitoring @ four casings/probe	$50	10	Probes	Monthly	$414	1	12	Month	$914	$10,968
Probe Maintenance/Replacement (Assume one probe per year at a depth of 100 feet)							100	ft	$100	$10,000
Instantaneous Surface Monitoring (Assume 50,000 sqft/grid per AQMD Rule 1150.1)	$19	161	Grid	Quarterly			4	Quarterly	$3,059	$12,236
Integrated Surface Sampling	$19	161	Grid	Quarterly	$414	2	4	Quarterly	$3,887	$15,548
Flare Source Testing							1	LS	$25,000	$25,000
Gas Collection System Sampling	$103	1	Hr	Monthly	$414	1	12	Month	$517	$6,204
Ambient Air Sampling	$310	4	Hr	Monthly	$414	4	12	Month	$2,896	$34,752
										$114,708

Detail Breakdown of Item No. 4 - Surface Water Monitoring

(Gregory Canyon Landfill Annual Postclosure Maintenance and Monitoring Cost Estimate)

Item	Estimated Quantity		DIR Basic Hourly Rate	Unit Price (hours)	Total**	Notes
DIR Category: Building/Construction Inspector and Field Soils and Material Tester (Field Personnel & Reporting)*	32	hours	$35.61	$103.43	$3,310	Labor Wage is including a multiplier and equipment cost
Analysis	4	events/year		$206.85	$827	4 qualifying events per year
				Total =	**$4,137**	

*Approximate Unit Rate based on an industry standard of 3.0 multiplier.
**Total Cost Column is rounded to the nearest dollar amount.

Detail Breakdown of Item No. 9 - Access Road Maintenance

(Gregory Canyon Landfill Annual Postclosure Maintenance and Monitoring Cost Estimate)

Gregory Canyon Landfill Access Road Calculations

Width	15	FT
Length	9,617	FT
Total	*144,255*	*SF*

GC Access Road Total (SF)	2-inch AC Overlay Unit Cost*/**	Annual Cost at 10% overlay of the total access road
144,255	$1.14/SF	**$16,445**

*From Olinda Alpha LF Pavement Rehabilitation Project
**2008 Unit cost updated by CalRecycle 2010 inflationary increase

RATE SHEETS

Bryan A. Stirrat & Associates

And

Geo-Logic & Associates

BRYAN A. STIRRAT & ASSOCIATES
1360 Valley Vista Drive
Diamond Bar, California 91765
(909) 860-7777

SCHEDULE OF CHARGES

PERSONNEL	HOURLY RATE
Principal (P)	$237
Principal Engineer (PRE)	$202
Principal Solid Waste Planner	$191
Division Engineer (DE)	$190
Principal Administrator (PA)	$182
Senior Project Manager (SM)/Chief Engineer (CE)	$178
Project Manager (PM)	$167
Project Engineer (PE) / Administrator (PAD)	$150
Engineer V (E-V)	$135
Engineer IV (E-IV)	$123
Engineer III (E-III)	$115
Engineer II (E-II)	$108
Engineer I (E-I)	$92
Engineer (E)	$86
Senior Project Designer (SPD)	$146
Project Designer (PD)	$133
Senior Designer (SDD)	$123
CADD Designer/Drafter (CD)	$119
Designer (DD)	$114
Senior Drafter (SD)	$106
Drafter (D)	$92
Senior CADD Operator (SCO)	$86
CADD Operator (CO)	$71
Regulatory Compliance Manager (RCM)	$140
Senior Regulatory Compliance Specialist (SRS)	$132
Regulatory Compliance Specialist (RS)	$110
Senior Environmental Scientist (SNS)	$139
Senior Environmental Specialist (SES)	$122
Environmental Specialist II (ES-II)	$111
Environmental Specialist I (ES-I)	$98
Environmental Specialist (ES)	$87
Estimator (E)/Specification Writer (SW)	$116
Landscape Architect (LA)	$113
Project Accountant/Analyst (AA)	$80
Senior Project Coordinator (SPC)	$116
Project Coordinator (PC)	$100
Senior Technical Editor (STE)	$85
Administrative Assistant (ADA)	$89
Data (DP)/Word Processing Secretary (WP) (including equipr	$79
Office Services Clerk (OS)	$77
General Clerk (C)/Typist (Y)	$60
Data Analyst (DA)	$88
Construction Manager (CM)	$155
Construction Supervisor (CS)	$131
Construction Engineering Technician (CET)	$123
Chief Engineering Technician (CT)	$113
Engineering Technician V (ET-V)	$100
Engineering Technician IV (ET-IV)	$89
Engineering Technician III (ET-III)	$78
Engineering Technician II (ET-II)	$68
Engineering Technician I (ET-I)	$57
Engineering Technician (ET)	$37
Chief of Survey Parties (CSP)	$127
3-Man Survey Party (SP-3M)	$279
2-Man Survey Party (SP-2M)	$231
1-Man Survey Party with GPS (1M-GPS)	$178
Court Appearance (Expert Witness, Deposition, etc)	1.5 x hourly rate

Overtime Premium is 50% of Personnel Hourly Rate
(Effective October 1, 2009 - September 30, 2010)

BRYAN A. STIRRAT & ASSOCIATES
1360 Valley Vista Drive
Diamond Bar, California 91765
(909) 860-7777

REIMBURSABLE CHARGES

(Effective October 1, 2009 to September 30, 2010)

In addition to the above charges for professional services (including routine expenses), we require reimbursement for the following items:

A. IN-HOUSE EXPENSES

Reproduction/Plotting:	Xerox Copies	$0.10/page
	Color Copies	$0.50/page
	Wide Format Copies	$0.30/sq. ft.
	Blueprints	$0.50/sq. ft.
	Bond Plotting -- Black & White	$2.00/sq. ft.
	Bond Plotting -- Color	$4.00/sq. ft.
	Vellum Plotting	$4.00/sq. ft.
	Mylar Plotting	$5.00/sq. ft.
Telefax (Outgoing only):		$2.00/page
Mileage:	Personal Vehicle	$0.60/mile
	Company Vehicle	$0.70/mile

OR

5% OF TOTAL PERSONNEL FEES

B. OTHER EXPENSES

Company Vehicles	$15.00/hour
Survey Vehicles	$15.00/hour
Other Out-of-Pocket Expenses/Supplies/Travel	Cost + 15%
Equipment Usage	See Attached Schedule
Consultants/Outside Services	Cost + 15%
Construction Services	Cost + 15%
Per Diem for Living Expenses	Federal Rates
CADD Computer Usage	$10.00/hour
Field Computer Services	$40.00/week
GPS Survey Equipment Services	$40.00/hour

BRYAN A. STIRRAT & ASSOCIATES
1360 Valley Vista Drive
Diamond Bar, California 91765
(909) 860-7777

EQUIPMENT RENTAL RATES
(Effective October 1, 2009 to September 30, 2010)

TYPE OF EQUIPMENT	DAY	WEEK	MONTH
4 Gas Range Meter CH4, H2S, CO, O2 (Sentinel 44)	$75	$200	$500
Alpha - 1 Personal Sampling Pump	$75	$200	$500
Disposable Bailer	$20/each	n/a	n/a
CO2 Calorimetric Analysis Tubes	$40	$125	$250
Downhole Camera	$75/hr	n/a	n/a
Dupont Dosimeter Mark-3 (Personal Sample Pump)	$50	$150	$300
Flow Calibrator (Gilian)	$50	$150	$300
Gas Extraction Monitor (GEM 500 / 2000 / 2000 Plus)	$125	$350	$900
Lung Sampler (Nutech 218)	$100	$300	$800
Mini-Ram Data Logger	$40	$125	$250
Mini-Ram Dust Meter	$50	$150	$300
Organic Vapor Analyzer (OVA128)	$125	$400	$1,000
Photo Ionization Detector (OVM580B)	$125	$400	$1,000
Sample Train (Gas Extraction Pump)	$50	$150	$300
Soil Auger/Sampler	$30	$90	$180
Sounder (Liquid Level Indicator)	$40	$125	$250
Horiba Meter	$50	$200	$400
MiniRae 2000	$75	$200	$500
GT Surveyor	$75	$200	$500
Groundwater Samping Equipment	$30/hour	n/a	n/a
Company Vehicle	$120	$480	$1,250
Field Sampling Supplies:	100/day	n/a	n/a
LEVEL C (Per Person) Respirator with Cartridge (full or half faced) Tyvek Coveralls Outer Gloves Glove Liners Neoprene Boots	$150	n/a	n/a

PERSONNEL CHARGES

PROFESSIONAL STAFF:

Staff Engineering Geologist/Hydrogeologist/Engineer	93.00/Hour
Project Engineering Geologist/Hydrogeologist/Engineer	115.00/Hour
Senior Engineering Geologist/Hydrogeologist/Engineer	148.00/Hour
Supervising Engineering Geologist/Hydrogeologist/Engineer	165.00/Hour
Principal Engineering Geologist/Hydrogeologist/Engineer	185.00/Hour
Court Appearance (Expert Witness, Deposition, etc.)	1.5 x HourlyR ate

FIELD STAFF:

Field Technician I	62.00/Hour
Field Technician II	79.00/Hour
Senior Field Technician	95.00/Hour
Prevailing Wage	95.00/Hour Min.

SUPPORT STAFF:

Laboratory Technician	95.00/Hour
CADD/Designer Draftsperson	95.00/Hour
Geotechnical Draftsperson	62.00/Hour
Geotechnical Clerk/Typist	50.00/Hour
Word Processor	65.00/Hour

*Overtime Premium is 35% of PERSONNEL CHARGE

*A surcharge of 20% of PERSONNEL CHARGES is applicable to personnel working in hazardous materials environments to compensate for costs associated with hazardous materials operations training and personnel medical examinations.

EQUIPMENT CHARGES

BAT Permeameter	included in vehicle
Nuclear Gauge	included in vehicle
Slope Inclinometer	350.00/Day

EXPENSES

Vehicle Use for Field Services (added to appropriate "PERSONNEL CHARGE")	10.00/Hour
Groundwater Sampling Vehicle and Hardware for Wells with Dedicated Pumps	20.00/Hour
Groundwater Sampling Vehicle and Hardware for Wells with Non-Dedicated Pumps	40.00/Hour
Per Diem	Local Government Rate
Outside Services (Consultants, Surveys, Chemical lab Tests, etc.)	Cost + 15%
Reimbursables (Maps, Photos, Permits, Expendable Supplies, etc.)	Cost + 15%
Outside Equipment (Drill Rig, Backhoe, Monitoring Equipment, etc.)	Cost + 15%

PERMITS, FEES AND BONDS

The costs of all permits, fees, and performance bonds required by government agencies are to be paid by the Client, unless stated otherwise in an accompanying proposal.

INSURANCE

GeoLogic Associates, Inc. carries workers' compensation, comprehensive general liability and automobile with policy limits normally acceptable to most clients. The cost for this insurance is covered by the fees listed in this schedule. Cost of any special insurance required by the Client, including increases in policy limits, adding additional insured parties and waivers of subrogation, are charged at cost plus 15%. Unless otherwise stated, such charges are in addition to the estimated or maximum charges stated in any accompanying proposal.

 (Continued on Reverse)

LABORATORY TESTING

California Bearing Ratio (excluding moisture-density curve)	$135.00/Point
Chloride Content	55.00/Test
Corrosivity Series (resistivity, Ph, Sulfate, Chloride)	135.00/Test
Consolidation Test (without rate data – up to 8 loading increments)	130.00/Test
Consolidation Test (single point)	90.00/Test
Consolidation Test Rate Data (per load increment)	65.00/each
Direct Shear Test (at natural moisture)	48.00/Point
Direct Shear Test (saturated – strain rate 0.0084 inch/min.)	58.00/Point
Direct Shear Test (saturated, recycled – strain rate 0.0084 inch/min.)	110.00/Point
Direct Shear Test (ASTM 3080 – consolidated drained)	115.00/Point
Direct Shear Test (ASTM 3080 – consolidated drained, residual)	265.00/Point
Durability Index - Coarse	120.00/Test
Durability Index – Fine	110.00/Test
Expansion Index Test	110.00/Test
Grain-Size Analysis - Sand-Clay, including Hydrometer	140.00/Test
Grain-Size Analysis - Gravel-Clay, including Hydrometer	190.00/Test
Liquid Limit	63.00/Test
Los Angeles Abrasion Test (500 revolutions)	135.00/Test
Los Angeles Abrasion Test (1000 revolutions)	150.00/Test
Mechanical Analysis - ASTM D1140 (wash 200 sieve)	53.00/Test
Mechanical Analysis - Sand or Gravel (dry sieve)	63.00/Test
Mechanical Analysis Sand and Gravel (wash sieve)	140.00/Test
Mechanical Analysis Sand or Gravel (wash sieve)	90.00/Test
Moisture Content	10.00/Test
Moisture-Density Curve for Compacted Fill (4-inch Mold)	130.00/Test
Moisture-Density Curve for Compacted Fills (6-inch Mold)	160.00/Test
Moisture-Density Single Point	65.00/Test
Moisture-Density Curve (Calif. 216)	135.00/Test
Organic Matter	50.00/Test
Permeability (falling head)	140.00/Test
Permeability (flexible wall - ASTM)	265.00/Test
Permeability (rigid wall – constant head pressure)	225.00/Test
Plastic Limit	60.00/Test
Plasticity Index	115.00/Test
Resistance Value	190.00/Test
Resistance Value (lime or cement-treated)	230.00/Test
Resistivity & pH Test (Calif. 532 or 643)	85.00/Test
Sand Equivalent	55.00/Test
Soil Matrix Potential – Fine Grained Soil	600.00/Test
Soil Matrix Potential – Coarse Grained Soil	360.00/Test
Specific Gravity and Absorption - Gravel	67.00/Test
Specific Gravity - Fine-Grained Soils	72.00/Test
Sulfate Content	45.00/Test
Triaxial Compression Test (CD with pore pressure)	550.00/Test
Triaxial Compression Test (CU with pore pressure)	400.00/Test
Triaxial Compression Test (UU)	110.00/Test
Unconfined Compression Test (undisturbed sample)	68.00/Test
Unit Dry Weight and Moisture Content (undisturbed sample)	17.50/Test

Special Sample Preparation and Laboratory Testing not listed above will be charged at applicable personnel rates.

TERMS

Payment is due upon presentation of invoice and is past due thirty (30) days from invoice date. Past due accounts are subject to a finance charge of one and one-half percent (1-1/2%) per month, or the maximum rate allowed by law.

PROPOSAL PERIOD

Unless otherwise stated, a proposal accompanying this schedule is effective for sixty (60) days. If authorization to proceed is not received within this period, GeoLogic Associates, Inc. reserves the right to renegotiate the fee.

Schedule 2008-A ..... Effective through 08/31/08

BID COMPARISONS

Santiago Canyon Bid Tabulation

Item No.	Description of Work	Estimated Quantity	Unit	Based on Inflation Factor - CIWMB 2008 Unit Price	Total Cost
1	Mobilization	1	LS	$439,991.85	$439,991.85
2	Demo Exist. Oper. Office/Furnish and Install New Field Office	1	LS	$165,646.73	$165,646.73
3	General/Supplemental Condition Requirements	1	LS	$244,763.68	$244,763.68
4	Survey	1	LS	$93,826.08	$93,826.08
5	Clear and Grub/Misc. Demo	1	LS	$191,834.70	$191,834.70
6	Demolition-Scale House/Salvage Scales	1	LS	$25,350.52	$25,350.52
7	Reconsolidate PGM	27,215	CY	$4.55	$123,867.41
8	Recover and Reconsolidate Soil	188,800	CY	$3.40	$642,008.14
9	Refuse Removal and Re-consolidation (Adj. To Road/Storm Drain)	25,000	CY	$7.14	$178,619.21
10	Refuse Removal as Directed by Engineer	T&M	LS	$0.00	$34,966.24
11	Develop Foundation Layer/Mono Fill Subgrade Preparation	5,131,792	SF	$0.07	$373,832.23
12	Final Cover Layer (On-site Material)	188,100	CY	$4.30	$808,989.42
13	Final Cover Layer (FRB Import)	525,000	CY	$11.12	$5,836,083.99
14	Top Deck Berm (3/DI)	4,593	LF	$16.38	$75,214.31
15	Geocomposite Drainage Net	18,000	SF	$1.66	$29,896.14
16	4" HDPE Drain w/ 1 CF Aggregate Drain (2/D2)	1,115	LF	$12.97	$14,457.81
17	4" HDPE Drain w/ 2 CF Aggregate Drain (5/D6)	80	LF	$19.52	$1,561.83
18	Top Deck Berm (3/DI)	5	EA	$1,748.31	$8,741.56
19	AC V-Ditch (2/D8)	380	LF	$44.29	$16,830.42
20	Down Drain per Std. Plan 1321	200	LF	$20.98	$4,195.95
21	Terrace Drain per Std. Plan 1321	2,326	LF	$16.32	$37,954.69
22	Terrace Drain/Down Drain Intersect per Std. Plan 1321	7	EA	$576.65	$4,036.56
23	Down Drain Trapezoidal Channel {1x1.5x1} (5/D1)	3,453	LF	$50.99	$176,076.87
24	Down Drain Trapezoidal Channel {1x1.5x1.5} (5/D1)	1,346	LF	$38.17	$51,378.81
25	Down Drain Trapezoidal Channel {2x1.5x} (5/D1)	321	LF	$48.95	$15,713.83
26	Down Drain Trapezoidal Channel {5x2x2} (5/D1)	105	LF	$71.39	$7,495.89
27	Down Drain Bench Crossing (4/D1)	24	EA	$2,447.64	$58,743.28
28	Down Drain to Pipe Transition (3/D2)	4	EA	$1,531.23	$6,124.92
29	Down Drain to Road Transition and Crossinginc. AC Berm (6/D3)	4	EA	$1,826.99	$7,307.94
30	Bench/Perimeter Access Road Transition (1/D4)	9	SF	$610.16	$5,491.45
31	Splash Wall 1.5 ft (2/D3)	620	LF	$26.66	$16,530.29
32	Splash Wall 2.0 ft (2/D3)	374	LF	$35.69	$13,349.82
33	Splash Wall 2.5 ft (2/D3)	486	LF	$41.52	$20,179.89
34	Splash Wall 3.0 ft (2/D3)	40	LF	$61.63	$2,465.12
35	Splash Wall 1.5 ft w/ continuous back drain (2/D3)	372	LF	$34.67	$12,899.05
36	Splash Wall 2.0 ft (2/D3 2/D6) w/ Ween Holes and Sandbags	2,418	LF	$39.05	$94,412.34
37	Splash Wall (Var. Hgt) (2/D3 3/D6) w/ Ween Holes and Sandbags	153	SF	$38.46	$5,884.82
38	Channel Modification S/E (1/D6)	1,612	LF	$90.33	$145,611.08
39	Channel Modification N/E 1.5 ft (6/D6)	154	LF	$102.57	$15,795.42
40	Channel Modification N/E 2.5 ft (6/D6)	344	LF	$106.94	$36,786.82
41	Channel Transition (1/D8)	1	EA	$6,241.77	$6,241.77
42	Drainage Inlet Transition (2D8)	3	EA	$2,164.99	$6,494.98
43	Junction Structure Type II Per Std. Plan 1311	1	EA	$3,569.47	$3,569.47
44	24" HDPE Corrugated Pipe, Smooth Interior (Mainline)	508	LF	$69.20	$35,155.64
45	24" HDPE Corrugated Pipe, Smooth Interior (Lateral)	216	LF	$74.59	$16,112.44
46	24" HDPE Inlet (10/D1)	11	EA	$1,241.30	$13,654.32
47	36" Concrete Collar Per Std. Plan 330-1	1	EA	$888.73	$888.73
48	36" RCP	119	LF	$149.77	$17,822.88
49	Trans. Strut Inlet {D86-B, Trap. Channel, Splash Wall (5/D3)}	1	LS	$8,595.87	$8,595.87
50	36" HDPE Corrugated Pipe, Smooth Interior	928	LF	$82.17	$76,254.38
51	42" HDPE Corrugated Pipe, Smooth Interior	1,996	LF	$98.20	$196,000.93
52	42" Concrete Collar Per Std. Plan 330-1	3	EA	$996.54	$2,989.61
53	Join Existing Headwall (4/D4)	1	EA	$2,366.05	$2,366.05
54	Manhole Per Std. Plan 320-0	9	EA	$4,574.75	$41,172.75
55	Manhole Per Std. Plan 321-0	1	EA	$4,662.17	$4,662.17
56	Road Crossing/Channel Inlet Inc. Curb (4/D5)	1	EA	$6,731.00	$6,731.00
57	Slope Anchors per Std. Plan 1333	8	EA	$961.57	$7,692.57
58	Access Bridge Crossing (3/D4)	1	EA	$25,918.73	$25,918.73
59	Masonry Retaining Wall per Std. Plan 618-1	146	LF	$176.29	$25,738.07
60	Paving (4" AC over 6" CAB)	306,600	SF	$2.36	$724,537.21
61	6" AC Slope Paving	19,600	SF	$6.47	$126,787.59
62	6" Shotcrete Slope Protection	396	SF	$13.40	$5,307.88
63	6" PCC Drainage Ditch Road Crossing (4/D8)	3	EA	$4,028.40	$12,085.21
64	2" AC Overlay	250,100	SF	$0.73	$182,917.43
65	8" AC Curb	6,100	LF	$3.65	$22,271.46
66	Remove/Replace Existing A.C per CM	2,000	SF	$5.39	$10,781.26
67	Traffic Striping	1	LS	$3,814.53	$3,814.53
68	A.C. Berm per Section A/A (6/D6)	175	LF	$22.44	$3,926.42
69	Settlement Monument (4/D3)	3	EA	$1,389.91	$4,169.72
70	Remove/Salvage/Reinstall Pump Vaults per (1/D5-2/D5)	5	LS	$3,678.74	$18,393.70
71	Remove Existing Extraction Well Piping (2/D5)	1	LS	$11,684.55	$11,684.55
72	Install 2" Extr. Water Line, Compressed Air Line and Aux. Line	374	LF	$73.28	$27,408.00
73	Remove/Salvage/Reconstruct Stair Access	1	LS	$12,442.15	$12,442.15
74	Alluvial Removal at Rip-Rap Channel	1,000	CY	$25.35	$25,350.52
75	Grouted Rip-Rap Channel inc. Geotextile/Filter Rock (9/D1)	1	LS	$90,365.88	$90,365.88
76	Rip-Rap Pad (13/D7)	1	EA	$2,870.15	$2,870.15
77	Adjust MW to Grade	2	LS	$917.86	$1,835.73
78	Construct HDPE Flared End Inlet (6/D8)	1	LS	$1,585.14	$1,585.14
79	Furnish and Install 4-Strand Barbed Wire Fence per Caltrans A86	13,940	LF	$10.78	$150,209.49
80	Furnish and Install 12'Mesh Gate per Caltrans Std. Plan A-86	5	EA	$1,098.52	$5,492.61
81	Re-Construct Spillway at Borrow Area, Join Exist Drain	1	LS	$6,760.14	$6,760.14
82	Construct Stockpile Desilting Basin	1	LS	$9,382.61	$9,382.61
83	Salvage, Abandon and Oper. LFG System During Closure	1	LS	$183,062.54	$183,062.54
84	Provide Add. HDPE Pipe as Approved by CM (Material Only)	As Approved		$0.00	$34,966.24
85	Drilling LFG Wells	3,325	VF	$48.08	$159,861.28
86	LFG Well Completion	3,325	VF	$33.80	$112,387.32
87	Well Heads	75	EA	$1,093.57	$82,017.69
88	Install Final Gas System	1	LS	$477,289.18	$477,289.18
89	Int. Eros. & Stormwater Control (Stormwater Mgt. Plan Imp.)	1	LS	$82,753.43	$82,753.43
90	Erosion Control Final, Sandbag Chevrons (1D9)	164	EA	$68.18	$11,182.20
91	Erosion Control Final, Sandbag Sedimentation Barrier (2/D9)	15	EA	$83.63	$1,254.41
92	Erosion Control Final, Sandbag Sed. Traps (2 rows at each outlet)	10	EA	$32.34	$323.44
93	Erosion Control, Final, Straw Rolls (4/D9)	30,000	LF	$2.72	$81,733.59
94	Erosion Control Final, Hydroseed Slopes	2,959,100	SF	$0.09	$275,916.27
95	Erosion Control Final, Drill Seed Deck Areas	1,233,400	SF	$0.05	$64,691.04
96	Erosion Control Final, Hydroseed Borrow Areas	1,711,500	SF	$0.06	$109,715.32
97	Relocate Existing Entrance Gate, Sandblast and Paint	1	LS	$3,642.32	$3,642.32
			Subtotal	*$2,138,959.87*	*$13,684,155.04*
	Total for Construction of Final Closure for Santiago Canyon Landfill				**$13,684,155.04**

	Site Area	*118*	*AC*	
		Total Cost	**Cost/Acre**	Cost for Gregory Canyon Landfill (185 AC)
Drainage Control		$574,159.94	$4,873.62	$901,619.80
LFG		$1,049,584.25	$8,909.15	$1,648,192.22
Demolition		$190,997.26		

BID SCHEDULE
PHELAN SANITARY LANDFILL
FINAL CLOSURE CONSTRUCTION PLAN

Item No.	DESCRIPTION OF WORK	ESTIMATED QUANTITY	UNIT	Average Bid UNIT PRICE	Average Bid TOTAL COST
1	Mobilization	1	LS	$524,500.00	$524,500.00
2	Time and Material Allocation	1	T&M	$150,000.00	$150,000.00
3	Construction Support Tasks	1	LS	$100,833.33	$100,833.33
3A	Office Facility (Deletable)	1	LS	$14,933.33	$14,933.33
4	Survey	1	LS	$86,000.00	$86,000.00
5	Clear and Grub, Fence Removal, Saw-cut AC, Demolition, etc	50	AC	$996.67	$49,833.33
6	Demolish Remove and Reconsolidate Existing Scale	1	LS	$10,333.33	$10,333.33
7	Reconsolidate Refuse and Place Minimum 1 Foot Interim Cover to Subgrade Contours Per Plan.	3,000	CY	$8.76	$26,280.00
8	Soil Recovery (Includes place as unclassified fill and/or transport to screening area)	16,000	CY	$4.04	$64,693.33
9	Unclassified Fill	266,000	CY	$2.89	$767,853.33
10	Subgrade/Foundation Layer Preparation	1,758,000	SF	$0.20	$357,460.00
11	Screening	836,000	SF	$0.57	$479,306.67
11A	**Rock Raking of On-Site Deck Area Stockpile Material for Final Cover**	675,000	SF	$0.20	$137,250.00
12	Monolithic Soil Final Cover (Per Detail 1/D-1)	1,511,000	SF	$0.59	$894,008.33
13	Final Cover Stockpile (Screened)	10,000	CY	$7.83	$78,333.33
14	Access Road 3" AC on 6" CMB (Per Detail 2/D1)	27,600	SF	$3.60	$99,452.00
15	6" AC Curb (Per Detail 2/D1)	1,180	LF	$7.76	$9,156.80
16	Top Deck Berm (Per Detail 3/D1)	3,590	LF	$6.93	$24,890.67
17	Top Deck Drainage Inlet (Per Detail 3/D1)	4	EA	$3,102.97	$12,411.87
18	Concrete Apron Around Culverts (Per Detail 4/D1)	3,250	SF	$7.69	$25,003.33
19	Remove Culvert (Per Detail 4/D1) [illegible]	1,000	LF	$58.34	$58,341.67
20	Culvert Inlet (Per Detail 4/D1) [illegible]	85	LF	$61.92	$5,262.92
21	Rip Rap Pad (Per Detail 4/D2)	520	SF	$11.45	$5,954.00
22	Install Class 1 Flexible Post Delineators Per Caltrans STD Plan A-74-A @ 50' OC	26	EA	$96.75	$2,515.50
23	Survey/Settlement Monument (Per Detail 2/D2)	2	EA	$2,980.00	$5,960.00
24	6' Chain Link Fence Per APWA STD Plan 600-1	2,260	LF	$20.00	$45,200.00
25	15 foot Wide Swing Gate	3	EA	$1,835.83	$5,507.50
26	LFG Probe (Per Detail 4/D2)	7	EA	$8,883.33	$62,183.33
27	Adjust to Grade	12	EA	$2,212.86	$26,554.36
28	Remove and Salvage Existing 24"x24"x72" Concrete Blocks Re-Use (Per Detail 5/D2)	1	LS	$7,191.67	$7,191.67
29	Embankment Protection (Per Detail 5/D2)	985	LF	$196.50	$193,552.50
30	Embankment Protection (Alternate Section Per Detail 5/D2)	170	LF	$230.17	$39,128.33
31	Embankment Protection (Per Detail 6/D2)	1,715	LF	$214.17	$367,295.83
32	12" x 12" Tapered AC Edge at Access Road/Drainage Apron	115	LF	$21.91	$2,519.65
33	6" Thick AC Apron at Top Deck Berm	1	EA	$3,185.68	$3,185.68
34	Hydroseed Per Project Specifications	19.7	AC	$3,205.00	$63,138.50
35	Drill Seed Per Project Specifications	16.9	AC	$1,578.33	$26,673.83
36	Fiber Roll (Per Details 2/D3 and 4/D3)	12,550	LF	$2.37	$29,701.67
37	Silt Fence (Per Detail 4/D3)	7,650	LF	$4.27	$32,640.00
38	Sandbag Chevrons (Per Detail 1/D3)	48	EA	$60.67	$2,912.00
	CONSTRUCTION OF FINAL CLOSURE PHELAN SANITARY LANDFILL	TOTAL PRICE:			$ 4,897,951.98

Site Area	*50*	*AC*
	Total Cost	**Cost/Acre**
Drainage Control	$174,610.00	$3,492.20
Erosion Control	$69,625.00	$1,392.50

BID SCHEDULE
OLINDA ALPHA LANDFILL
PAVEMENT REHABILITATION PROJECT

ITEM NO.	DESCRIPTION OF WORK	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	$20,000	$20,000
2	General and Supplemental Conditions	1	LS	$5,000	$5,000
3	Saw-Cut, Demolition, and Removal of Existing AC/CMB (Sheets 14 & 18)	1,200	SF	$0.25	$296
4	Variable Cold Plane Existing A.C. Pavement (0.17' max)	23,000	SF	$1.00	$23,000
5	Subgrade Preparation Including Rough Grading, Compaction, Finish Grading of IWMD Rough Graded Areas (Sheet 4, 11, 12, 13, 14)	58,000	SF	$0.50	$29,000
6	Subgrade Preparation Including Excavation, Grading, Compaction, Finish Grading (New 6"/12" Limits on Sheet 10)	6,000	SF	$1.10	$6,600
7	Demo AC @ Existing Inlet, Place and Compact Soil Berm, Place 4 inches of AC Pavement at Existing Inlet	1	LS	$2,000.00	$2,000
8	Asphalt Concrete Leveling Course	625	TN	$100.00	$62,500
9	2-Inch Asphalt Concrete Overlay (Including overlay at Drain Inlets)	226,000	SF	$1.10	$248,600
10	4-inch Asphalt Concrete on Existing CMB, or	37,000	SF	$2.20	$81,400
11	6-inch Asphalt Concrete on 12-inch CMB	30,000	SF	$5.00	$149,850
12	6-inch Asphalt Concrete Berm	390	LF	$20.00	$7,800
13	24-inch Deep Asphalt Concrete V-Ditch	270	LF	$50.00	$13,500
14	12-foot Wide Speed Bump (Per Note 7A)	1,700	SF	$2.00	$3,400
15	Remove Existing AC Berm and AC Fillet Adjacent to Existing Trapezoidal Channel	140	LF	$2.00	$280
16	Cold Plane Existing Asphalt Concrete to Develop New Flow Line Adjacent to Trapezoidal Channel (As-Necessary)	17,500	SF	$1.00	$17,500
17	3-inch Asphalt Concrete Over Cold Planed and/or	17,500	SF	$1.50	$26,250
18	8-inch Asphalt Concrete Berm	1,400	LF	$9.00	$12,600
19	Install Type D Markers on AC Berm Adjacent to Channel at 25' OC	60	EA	$70.00	$4,200
20	Construct AC Water Bars	3	EA	$200.00	$600
21	4-inch Double Yellow Line w/Raise Markers	5,800	LF	$3.00	$17,400
22	4-inch Single White Line	7,800	LF	$1.75	$13,650
23	4-inch Skip White Line	2,700	LF	$1.55	$4,185
24	6-inch Pavement Markers	24	EA	$5.00	$120
25	Paint Speed Bumps	1,700	SF	$1.25	$2,125
26	Type Q Markers on Road Surface	110	EA	$100.00	$11,000
27	Cattle Crossing Drainage Improvements (Deletable Item)	1	LS	$40,000.00	$40,000
28	Demobilization and Contract Closeout Requirements (Minimum of 5% of Total Bid)	1	LS	$40,000.00	$40,000
	10 % Contingency				$80,286
			Total Bid	$923,142	

SECURITY [illegible] AND FENCING AT
COYOTE CANYON LANDFILL
BID RESULTS

		ENGINEER'S ESTIMATE				R. A. MOBLE				TERRA PAVE, INC				EXCEL PAVING				Highest/Lowest Cost and Units of All Bids							
ITEM NO.	DESCRIPTION OF WORK	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	Min Units	Min Units		Max Unit Cost	Min Unit Cost	Average Units		Avg Unit Cost
1	Mobilization	1	LS	$20,000	$20,000.00	1	LS	8,250.00	$8,250.00	1	LS	3,500.00	$3,500.00	1	LS	10,000.00	$10,000.00	1.00	1.00	LS	$13,000.00	$3,500.00	1.00	LS	$8,750.00
2	Control and Environmental Conditions	1	LS	$15,000	$15,000.00	1	LS	1,250.00	$1,250.00	1	LS	1,500.00	$1,500.00	1	LS	1,000.00	$1,000.00	1.00	1.00	LS	$16,500.00	$400.00	1.00	LS	$4,950.00
3	Authorized Time and Material Work	1	T&M	$20,000	$20,000.00	1	T&M	20,000.00	20,000.00	1	T&M	20,000.00	20,000.00	1	T&M	20,000.00	20,000.00	1.00	1.00	LS	$20,000.00	$20,000.00	1.00	LS	$20,000.00
4	Clearing, Demolition, and Removals	1	LS	$10,000	$10,000.00	1	LS	24,000.00	$24,000.00	1	LS	17,525.00	$17,525.00	1	LS	12,000.00	$12,000.00	1.00	1.00	LS	$20,000.00	$12,000.00	1.00	LS	$16,000.00
5	Place 3-Inch AC Pavement over 4-inch Grade	16,200	SF	$1.25	$20,250.00	16,200	SF	2.90	$46,980.00	16,200	SF	2.85	$46,170.00	16,200	SF	2.75	$44,550.00	16,200.00	16,200.00	LS	$3.25	$2.60	16,200.00	LS	$2.75
6	Place 1-Inch AC Overlay Over Existing AC/Chip Seal (Per Detail 1/C and 4/C)	3,100	SF	$1.00	$3,100.00	3,100	SF	0.65	$2,015.00	3,100	SF	1.00	$3,100.00	3,100	SF	0.50	$1,550.00	3,100.00	3,100.00	LS	$3.20	$0.50	3,100.00	LS	$1.37
7	Cold Milling Existing AC Pavement	3,100	SF	$1.00	$3,100.00	3,100	SF	1.35	$4,185.00	3,100	SF	0.90	$2,790.00	3,100	SF	1.00	$3,100.00	3,100.00	3,100.00	EA	$3.20	$0.90	3,100.00	EA	$1.42
8	Furnish and Install New Cable Guard Fencing - East and South Canyon (Detailed Item)	3,000	LF	$35.00	$105,000.00	3,000	LF	6.75	$20,250.00	3,000	LF	7.50	$22,500.00	3,000	LF	6.00	$18,000.00	3,000.00	3,000.00	EA	$8.25	$6.00	3,000.00	EA	$7.21
9	Remove and Replace Existing 6 ft High Chain Link Double Gate and 4 ft Panel Segments (Per Detail 1/C)	1	LS	$3,500	$3,500.00	1	LS	1,750.00	$1,750.00	1	LS	3,100.00	$3,100.00	1	LS	2,520.00	$2,520.00	1.00	1.00	LF	$3,300.00	$1,750.00	1.00	LF	$2,802.50
10	Remove 10 ft Segment of Existing Chain Link Fence and Install New 6 ft Chain Link Fence and 3 ft Wide Gate (Per Detail 3/C)	1	LS	$1,200	$1,200.00	1	LS	1,600.00	$1,600.00	1	LS	2,500.00	$2,500.00	1	LS	2,500.00	$2,500.00	1.00	1.00	LF	$3,695.00	$1,600.00	1.00	LF	$2,256.43
11	Remove and Replace Existing 10 ft Wide Double Gate (Per Detail 2/C)	2	EA	$2,000	$4,000.00	2	EA	1,750.00	$3,500.00	2	EA	2,700.00	$5,400.00	2	EA	2,500.00	$5,000.00	2.00	2.00	LF	$2,700.00	$1,750.00	2.00	LF	$2,350.00
12	Remove and Replace Existing 6 ft High Chain Link Gate & Link Fence (Per Detail 4/C)	600	LF	$25.00	$15,000.00	600	LF	20.50	$12,300.00	600	LF	33.00	$19,800.00	600	LF	33.00	$19,800.00	600.00	600.00	EA	$34.00	$18.00	600.00	EA	$25.00
					$261,050.00				$141,345.00				$143,880.00				$144,667.00								

		BEAVER CONST.				NPL, INC				JPR, INC				HARDY & HARPER			
ITEM NO.	DESCRIPTION OF WORK	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	13,000.00	$13,000.00	1	LS	10,000.00	$10,000.00	1	LS	10,000.00	$10,000.00	1	LS	1,500.00	$1,500.00
2	Control and Environmental Conditions	1	LS	2,000.00	$2,000.00	1	LS	10,000.00	$10,000.00	1	LS	20,000.00	$20,000.00	1	LS	800.00	$800.00
3	Authorized Time and Material Work	1	T&M	20,000.00	$20,000.00	1	T&M	20,000.00	$20,000.00	1	T&M	20,000.00	$20,000.00	1	T&M	20,000.00	$20,000.00
4	Clearing, Demolition, and Removals	1	LS	10,000.00	$10,000.00	1	LS	15,000.00	$15,000.00	1	LS	45,000.00	$45,000.00	1	LS	18,000.00	$18,000.00
5	Place 3-Inch AC Pavement over 4-inch Grade	16,200	SF	1.25	$22,275.00	16,200	SF	2.41	$39,042.00	16,200	SF	2.50	$40,500.00	16,200	SF	2.35	$37,485.00
6	Place 1-Inch AC Overlay Over Existing AC/Chip Seal (Per Detail 1/C and 4/C)	3,100	SF	0.75	$2,325.00	3,100	SF	1.30	$4,030.00	3,100	SF	1.30	$4,030.00	3,100	SF	1.20	$3,720.00
7	Cold Milling Existing AC Pavement	3,100	SF	1.00	$3,100.00	3,100	SF	0.95	$2,945.00	3,100	SF	1.00	$3,100.00	3,100	SF	1.20	$3,720.00
8	Furnish and Install New Cable Guard Fencing - East and South Canyon (Detailed Item)	3,000	LF	7.50	$22,500.00	3,000	LF	7.50	$22,500.00	3,000	LF	7.00	$21,000.00	3,000	LF	8.25	$24,750.00
9	Remove and Replace Existing 6 ft High Chain Link Double Gate and 4 ft Panel Segments (Per Detail 1/C)	1	LS	2,200.00	$2,200.00	1	LS	2,500.00	$2,500.00	1	LS	2,000.00	$2,000.00	1	LS	3,300.00	$3,300.00
10	Remove 10 ft Segment of Existing Chain Link Fence and Install New 6 ft Chain Link Fence and 3 ft Wide Gate (Per Detail 3/C)	1	LS	1,600.00	$1,600.00	1	LS	3,495.00	$3,495.00	1	LS	1,450.00	$1,450.00	1	LS	2,000.00	$2,000.00
11	Remove and Replace Existing 10 ft Wide Double Gate (Per Detail 2/C)	2	EA	3,750.00	$3,500.00	2	EA	2,250.00	$4,500.00	2	EA	2,000.00	$4,000.00	2	EA	2,750.00	$5,500.00
12	Remove and Replace Existing 6 ft High Chain Link Gate & Link Fence (Per Detail 4/C)	600	LF	21.00	$12,600.00	600	LF	19.65	$11,790.00	600	LF	20.00	$12,000.00	600	LF	34.00	$20,400.00
					$143,700.00				$140,302.00				$175,080.00				$188,675.00

PHASE 1B STAGE 1 COMPOSITE LINER SYSTEM AT THE VICTORVILLE SANITARY LANDFILL CONTRACTORS BIDS DATED JANUARY 18, 2008

CONST NOTE	ITEM NO.	DESCRIPTION OF WORK	ESTIMATED QUANTITY	UNIT	AVERAGE COST
	1	Mobilization	1	LS	$213,513.31
	2	Construction Support Tasks	1	LS	$125,859.67
	3	Survey	1	LS	$90,445.96
	4	Time and Material Allocation	1	T&M	$250,000.00
	5	Clear, Grub, Demolition, Removals	1	LS	$21,711.52
1	6	Unclassified Excavation	263,000	CY	$2.04
2	7A	Unclassified Fill (3-inch Minus)	50,000	CY	$3.71
2	7B	Unclassified Fill (8-inch Minus)	105,000	CY	$0.96
7	8	Compacted/Screened 1" Minus Material Floor	170,000	SF	$0.44
7	9	Geosynthetic Clay Liner (GCL) Floor	170,000	SF	$0.82
	10A	60-mil Geomembrane (Textured Both Sides) Lower Geomembrane Floor	160,000	SF	$0.77
	10B	60-mil Geomembrane (Textured Both Sides) Upper Geomembrane Floor	160,000	SF	$0.78
7	11	Geotextile 12-ounce (Floor)	170,000	SF	$0.29
7	12	LCRS Drainage Layer (Floor)	170,000	SF	$1.36
7	13	Geotextile 8-ounce (Floor)	170,000	SF	$0.23
8	14	Geosynthetic Clay Liner (GCL) Slopes and Benches	438,000	SF	$0.82
8	15	60 Mil Geomembrane (Single-Sided) Slopes and Benches	438,000	SF	$0.77
8	16	16 oz Geotextile Slopes and Benches	438,000	SF	$0.35
29	17	Plastic Liner Cover with Tied Sandbag Ballast (Per Detail 6/D-4)	438,000	SF	$0.43
7	18	Protective Cover Soil (Floor)	170,000	SF	$0.77
8	19	Protective Cover Soil (Slopes, First 12' Vertical)	43,000	SF	$0.81
11, 15	20	Protective Cover Soil (Benches)	56,000	SF	$1.19
14	21	Perimeter Road/ PCS Berm (Per Detail 5/D1)	600	LF	$18.29
11	22	Bench Liner Termination at Existing Landfill (Per Detail 1/D3) (Anchor at existing Refuse)	1,000	LF	$27.24
11, 14, 15	23	Bench Anchor (Per Detail 5/D1, 6/D1, 1/D3, 5/D4)	4,750	LF	$19.80
20	24	Base Liner Termination (Per Detail 3/D1) including anchor, flap, BF, cover material outside of liner limit	300	LF	$31.62
21	25	Slope Liner Termination (Per Detail 9/D1)	500	LF	$26.90
28	26	Anchor Trench on East Berm (Per Detail 5/D4)	680	LF	$19.28
9	27	LCRS Header Piping (Per Detail 1/D2, 2/D2)	1,650	LF	$20.77
10	28	LCRS Lateral Piping (Per Detail 1/D2)	750	LF	$20.52
12, 16, 24	29	Solid HDPE LCRS Riser w/support (Per Detail 4/D3)	1,750	LF	$16.84
19	30	3" Corrugated Storm Drain, Including Connection and Plug (Per Detail 4/D2, 5/D2)	265	LF	$25.31
13	31	LCRS Bench Collector (Per Details 10/D1 and 8/D1)	3,280	LF	$24.67
19	32	LCRS Bench Crossing (Per Details 5/D2 and 3/D2)	7	EA	$2,691.68
23	33	LCRS Bench Interceptor Berm (Per Detail 6/D2)	3	EA	$1,017.75
17	34	2" LFG Lateral (Per Detail 5/D2, 2/D4, 3/D3)	1,700	LF	$9.29
17	35	LFG Well Heads and Supports (Per Details 1/D4, 2/D4, 3/D4)	6	EA	$1,818.72
22,16	36	LCRS Test Port w/ Riser and Outlet (Per Details 4/D3,3/D3 and 8/D3)	3	EA	$2,836.97
26	37	Wrapped Gravel (Per Detail 7/D3)	150	LF	$243.12
25	38	Temporary LCRS Storage Tank (Per Detail 6/D3)	1	LS	$29,993.74
	39	24" Corrugated Smooth Interior Wall HDPE Pipe	170	LF	$73.90
	40	36" Corrugated Smooth Interior Wall HDPE Pipe	145	LF	$112.55
	41	Headwall, Endwall and Warped Wingwalls (24" Pipe) Per CALTrans STD. D-86B	2	EA	$7,889.97
	42	Headwall, Endwall and Warped Wingwalls (36" Pipe) Per CALTrans STD. D-86B	2	EA	$8,908.93
	43	Rip Rap Pad	600	SF	$12.42
	44	Rip Rap Slope Protection	265	LF	$103.13
	45	Leak Location Testing	1	LS	$44,604.00

Victorville
Phase 1B Groundwater Protection System Construction Project

FAIRMEAD LANDFILL
SUMMARY OF BIDS - CONSTRUCTION OF UNIT 3, CELL 2

				Average	
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Amount**
1	Mobilization	LS	1	$55,368.89	$55,368.89
2	Construction Support Tasks	LS	1	$34,836.29	$34,836.29
3	Project Survey	LS	1	$36,611.60	$36,611.60
4	Time and Materials Work	T&M	1	$0.00	$0.00
5	Clear and Grub	LS	1	$4,210.42	$4,210.42
6	Unclassified Excavation	CY	120,000	$2.33	$279,600.00
7	Engineered Fill	CY	800	$4.16	$3,324.80
8	Subgrade Preparation (Base)	SF	140,500	$0.18	$25,852.00
9	Subgrade Preparation (Slope)	SF	34,000	$0.33	$11,356.00
10	40-mil HDPE Geomembrane Textured (Floor)	SF	140,500	$0.56	$78,118.00
11	40-mil HDPE Geomembrane Textured (Slope)	SF	37,600	$0.59	$22,259.20
12	Gundseal with 60-mil HDPE Geomembrane backing Textured or equivalent (Floor)	SF	140,500	$1.34	$188,832.00
13	Gundseal with 60-mil HDPE Geomembrane backing Textured or equivalent (Slope)	SF	34,000	$1.35	$46,036.00
14	Anchor Trench	LF	205	$22.77	$4,668.26
15	Base Liner Termination w/HDPE Flap	LF	1010	$23.99	$24,229.90
16	Slope Liner Termination	LF	150	$26.10	$3,915.60
17	Base Liner Join	LF	760	$23.43	$17,809.84
18	Slope Liner Join	LF	220	$22.79	$5,013.80
19	Geocomposite Drainage Layer (Base + 4' up slope)	SF	141300	$0.78	$109,648.80
20	LCRS HDPE 8" Header Piping and Trench	LF	820	$45.04	$36,932.80
21	LCRS HDPE 6" Lateral Piping and Trench	LF	740	$44.19	$32,697.64
22	HDPE LCRS 18" Riser Pipe	LF	160	$121.51	$19,441.60
23	HDPE LCRS 8" Unsaturated Zone Riser pipes (total for 2)	LF	320	$43.79	$14,013.44
24	Operation Layer (Base)	SF	136,700	$0.38	$52,492.80
25	Operation Layer (Slope)	SF	6,800	$0.77	$5,263.20
26	Class 2 Permeable (above designated LCRS trenches)	SF	4200	$7.54	$31,659.60
27	Leak Location Testing	LS	1	$29,035.26	$29,035.26
28	T-Posts	EA	16	$39.80	$636.80
26	Permanent LCRS & Unsaturated Zone Sumps	LS	1	$28,135.99	$28,135.99
	Total Bid				$1,202,000.54

MERCED COUNTY DEPARTMENT OF PUBLIC WORKS - ROAD DIVISION

BID ITEM SUMMARY FOR: Highway 59 Landfill New Vehicle Weighing and Processing Facility

BID DATE: Thursday, May 13, 2010 BID TIME: 3:00 PM 0 % DBE

CONTRACT AWARDED TO: Teichert Construction, Inc. FOR: $4,957,987.60

CHECKED BY: Randy Bardini STRUCTURE COST/SF: N/A ROADWAY COST/SF: N/A

					Engineers Estimate		Teichert Const. P.O. Box 3367 Turlock, CA 95380 (209) 632-6600 F: (209) 632-6688		Deide Construction, Inc. 12393 N. Highway 99 Lodi, CA 95240 (209) 369-8255 F: (209) 368-0600		Lewis C. Nelson & Sons 3400 McCall Ave., Ste. 100 Selma, CA 93657 (559) 896-1443 F: (559) 896-8609		Granite Construction 2716 Granite Ct. Fresno, CA 93706 (559) 441-5700 F: (559) 441-5791		RGW Construction, Inc. 550 Greenville Road Livermore, CA 94550 (925) 606-2400 F: (925) 961-1925	
No.	Item Code	Item Description	Unit	Estimated Quantity	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount
1		MOBILIZATION / DEMOBILIZATION	LS	1	LUMP SUM	$75,000.00	LUMP SUM	$495,000.00	LUMP SUM	$33,945.00	LUMP SUM	$100,000.00	LUMP SUM	$251,000.00	LUMP SUM	$550,000.00
2		GENERAL / SUPPLEMENTAL CONDITIONS	LS	1	LUMP SUM	$175,000.00	LUMP SUM	$25,000.00	LUMP SUM	$202,377.90	LUMP SUM	$375,000.00	LUMP SUM	$50,000.00	LUMP SUM	$110,000.00
3		CLEARING, GRUBBING AND DEMOLITION	LS	1	LUMP SUM	$40,000.00	LUMP SUM	$10,000.00	LUMP SUM	$21,900.00	LUMP SUM	$20,000.00	LUMP SUM	$222,000.87	LUMP SUM	$18,000.00
4		PROJECT SURVEY	LS	1	LUMP SUM	$75,000.00	LUMP SUM	$10,000.00	LUMP SUM	$12,264.00	LUMP SUM	$10,400.00	LUMP SUM	$10,000.00	LUMP SUM	$30,000.00
5		RECORD DRAWINGS	LS	1	LUMP SUM	$10,000.00	LUMP SUM	$500.00	LUMP SUM	$1,095.00	LUMP SUM	$3,000.00	LUMP SUM	$1.00	LUMP SUM	$1,500.00
6		GROSS EARTHWORK - CUT	CY	11,936	$2.00	$23,872.00	$7.30	$87,132.80	$12.27	$146,454.72	$3.50	$41,776.00	$15.00	$179,040.00	$4.00	$47,744.00
7		GROSS EARTHWORK - FILL	CY	19,203	$2.00	$38,406.00	$2.00	$38,406.00	$6.34	$121,747.02	$1.00	$19,203.00	$0.01	$192.03	$7.00	$134,421.00
8		5 1/2" AC OVER 6 1/2" CAB OVER 15 1/2" SUB-BASE (PG 64-10 AC)	SF	163,750	$6.36	$1,041,450.00	$4.00	$655,000.00	$4.19	$686,112.50	$3.80	$622,250.00	$5.00	$818,750.00	$4.50	$736,875.00
9		5 1/2" AC OVER 6 1/2" CAB OVER 15 1/2" SUB-BASE (PG 70-10 AC)	SF	102,300	$6.42	$656,766.00	$4.05	$414,315.00	$4.16	$425,568.00	$3.80	$388,740.00	$5.00	$511,500.00	$4.50	$460,350.00
10		2" AC OVER 4" CAB	SF	11,414	$2.40	$27,393.60	$1.30	$14,838.20	$2.19	$24,996.66	$2.00	$22,828.00	$3.00	$34,242.00	$1.50	$17,121.00
11		26' WIDE CONCRETE VALLEY GUTTER W/CAB	LF	90	$300.00	$27,000.00	$170.00	$15,300.00	$167.78	$15,100.20	$149.00	$13,410.00	$165.00	$14,850.00	$215.00	$19,350.00
11A		8' WIDE CONCRETE VALLEY GUTTER W/CAB	LF	50	$85.00	$4,250.00	$90.00	$4,500.00	$56.06	$2,803.00	$61.00	$3,050.00	$65.00	$3,250.00	$104.50	$5,225.00
12		12' WIDE CONCRETE VALLEY GUTTER W/CAB	LF	540	$127.50	$68,850.00	$90.00	$48,600.00	$122.02	$65,890.80	$80.00	$43,200.00	$125.00	$67,500.00	$69.50	$37,530.00
13		25' X 4" SQUARE LIGHT POLE PER DETAIL 3/C32	EA	1	$3,000.00	$3,000.00	$4,000.00	$4,000.00	$5,672.10	$5,672.10	$3,500.00	$3,500.00	$3,380.00	$3,380.00	$3,000.00	$3,000.00
14		DRY WHEEL DIRT REMOVAL STRUCTURE	LS	1	LUMP SUM	$75,000.00	LUMP SUM	$100,000.00	LUMP SUM	$68,520.72	LUMP SUM	$75,000.00	LUMP SUM	$85,000.00	LUMP SUM	$81,000.00
15		PCC CURB PER (1/C34) OVER 6" CAB AND 15 1/2" SUB-BASE	LF	3,743	$4.31	$16,132.33	$13.00	$48,659.00	$34.00	$127,262.00	$16.50	$61,759.50	$12.00	$44,916.00	$12.00	$44,916.00
16		IES NEPTUNE 3600 WHEEL WASH SYSTEM WITH 35,000 GALLON SETTLEMENT TANK	LS	1	LUMP SUM	$200,000.00	LUMP SUM	$325,000.00	LUMP SUM	$372,271.53	LUMP SUM	$290,000.00	LUMP SUM	$310,000.00	LUMP SUM	$350,000.00
17		LOCKING REMOVEABLE BOLLARD PER DETAIL 4/C32	EA	4	$489.57	$1,958.28	$700.00	$2,800.00	$458.26	$1,833.04	$625.00	$2,500.00	$1,000.00	$4,000.00	$750.00	$3,000.00
18		10" THICK CONCRETE PAD PER DETAIL 2/C34	SF	4,390	$3.50	$15,365.00	$9.00	$39,510.00	$11.02	$48,377.80	$14.00	$61,460.00	$12.00	$52,680.00	$16.80	$73,752.00
19		36" WIDE CONCRETE V-DITCH PER DETAIL 7/C32	LF	1,898	$25.00	$47,450.00	$32.00	$60,736.00	$43.02	$81,651.96	$30.00	$56,940.00	$20.00	$37,960.00	$36.50	$69,277.00
20		SCALE PIT STORM DRAINS	LS	1	LUMP SUM	$4,500.00	LUMP SUM	$10,000.00	LUMP SUM	$32,302.50	$29,500.00	$29,500.00	LUMP SUM	$10,000.00	LUMP SUM	$13,000.00
21		12" DUAL WALL (CORRUGATED & SMOOTH) HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C34	LF	97	$21.58	$2,093.26	$25.00	$2,425.00	$21.90	$2,124.30	$20.00	$1,940.00	$40.00	$3,880.00	$50.00	$4,850.00
22		18" DUAL WALL (CORRUGATED & SMOOTH) HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C34	LF	70	$40.07	$2,604.90	$45.00	$3,150.00	$32.85	$2,299.50	$30.00	$2,100.00	$50.00	$3,500.00	$74.00	$5,180.00
23		24" DUAL WALL (CORRUGATED & SMOOTH) HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C24	LF	31	$68.90	$2,135.90	$75.00	$2,325.00	$65.13	$2,019.03	$59.00	$1,829.00	$60.00	$1,860.00	$113.00	$3,503.00
24		30" RCP PIPE STUB WITH BRICK AND MORTAR PLUGS, EXCAVTION AND BACKFILL PER DETAIL	LF	8	$130.11	$1,040.88	$150.00	$1,200.00	$213.53	$1,708.24	$195.00	$1,560.00	$150.00	$1,200.00	$38.00	$304.00
25		DUAL 48" DUAL WALL HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C34	LF	353	$300.00	$105,900.00	$205.00	$72,365.00	$185.06	$65,326.18	$169.00	$59,657.00	$155.00	$54,715.00	$170.00	$60,010.00
26		48" DUAL WALL (CORRUGATED & SMOOTH) HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C34	LF	1,985	$150.00	$297,750.00	$90.00	$178,650.00	$84.66	$168,447.10	$77.00	$152,845.00	$100.00	$198,500.00	$95.00	$188,575.00
27		THRUST BLOCK PER MERCED COUNTY STD. DWG. SU-14	EA	1	$156.00	$156.00	$300.00	$300.00	$328.50	$328.50	$300.00	$300.00	$250.00	$250.00	$217.00	$217.00
28		TRAPEZOIDAL CHANNEL B=6', D=3' PER 2/C26	LF	1,578	$140.00	$220,920.00	$90.00	$142,020.00	$103.08	$162,660.24	$110.00	$173,580.00	$105.00	$165,690.00	$69.00	$108,882.00
29		TRAPEZOIDAL TO DUAL 48" HDPE PIPE TRANSITION STRUCTURE PER CALTRANS STD D86B & 1/C26, 3/C26	EA	1	$8,000.00	$8,000.00	$15,000.00	$15,000.00	$10,402.50	$10,402.50	$10,150.00	$10,150.00	$16,000.00	$16,000.00	$17,500.00	$17,500.00
30		DUAL 30" RCP PIPE TO HDPE 48" HDPE PIPE TRANSITION STRUCTURE PER CALTRANS STD D86B & 1/C26, 3/C26	EA	1	$8,000.00	$8,000.00	$15,000.00	$15,000.00	$17,520.00	$17,520.00	$16,000.00	$16,000.00	$15,000.00	$15,000.00	$13,500.00	$13,500.00
31		48" HDPE PIPE TO TRAPEZOIDAL CHANNEL TRANSITION STRUCTURE PER CALTRANS STD D86B & 4/C27	EA	1	$5,000.00	$5,000.00	$10,000.00	$10,000.00	$9,033.75	$9,033.75	$8,000.00	$8,000.00	$15,000.00	$15,000.00	$11,600.00	$11,600.00
32		STORM DRAIN MANHOLD TYPE 1 PER MERCED COUNTY STD. DWG. SD-11	EA	2	$1,945.71	$3,891.42	$1,400.00	$2,800.00	$3,832.50	$7,665.00	$3,500.00	$7,000.00	$2,800.00	$5,600.00	$4,990.00	$9,980.00
33		CONSTRUCT 24" CSP RISER STAND PIPE DRAINAGE INLET PER 1/C27	EA	10	$500.00	$5,000.00	$2,000.00	$20,000.00	$3,285.00	$32,850.00	$3,000.00	$30,000.00	$4,000.00	$40,000.00	$2,350.00	$23,500.00
34		BROOKS 2424 36B DRAINAGE INLET	EA	1	$1,500.00	$1,500.00	$1,200.00	$1,200.00	$1,752.00	$1,752.00	$1,600.00	$1,600.00	$2,500.00	$2,500.00	$850.00	$850.00
35		ADS 1210NP 12" PLASTIC FLARED END SECTION	EA	1	$83.75	$83.75	$500.00	$500.00	$547.50	$547.50	$500.00	$500.00	$500.00	$500.00	$108.00	$108.00
36		STROM DRAIN OUTLET TYPE 2 PER MERCED COUNTY STD. DWG. SD-09	EA	1	$40.41	$40.41	$4,000.00	$4,000.00	$9,307.50	$9,307.50	$8,500.00	$8,500.00	$2,500.00	$2,500.00	$2,300.00	$2,300.00
37		ADS 4864AN65B 48"x 12" DUAL REDUCING TEE	EA	1	$1,308.13	$1,308.13	$1,400.00	$1,400.00	$1,642.50	$1,642.50	$1,500.00	$1,500.00	$1,750.00	$1,750.00	$1,250.00	$1,250.00
38		CONSTRUCT TRAPEZOIDAL CHANNEL PER DETAIL 4/C34	LF	362	$65.00	$23,530.00	$20.00	$7,240.00	$60.84	$22,024.08	$57.00	$20,634.00	$40.00	$14,480.00	$75.30	$27,258.60
39		ADS 4866AN65B 48" x 18" DUAL WALL REDUCING TEE	EA	7	$1,408.75	$9,861.25	$1,800.00	$12,600.00	$2,080.50	$14,563.50	$1,900.00	$13,300.00	$2,000.00	$14,000.00	$1,585.00	$11,095.00
40		ADS 4867AN65B 48" x 24" DUAL WALL REDUCING TEE	EA	1	$1,505.00	$1,505.00	$2,300.00	$2,300.00	$2,737.50	$2,737.50	$2,500.00	$2,500.00	$2,750.00	$2,750.00	$2,000.00	$2,000.00
41		12' x 4' PRECAST REINFORCED BOX CULVERT	EA	1	$350.00	$350.00	$16,000.00	$16,000.00	$16,972.50	$16,972.50	$1,500.00	$1,500.00	$7,500.00	$7,500.00	$10,500.00	$10,500.00
42		TRAPEZOIDAL CHANNEL TO RCB TRANSITION STRUCTURE PER CALTRANS STD D86B & 5/C27	EA	2	$8,000.00	$16,000.00	$6,000.00	$12,000.00	$10,402.50	$20,805.00	$9,500.00	$19,000.00	$15,000.00	$30,000.00	$6,900.00	$13,800.00
43		EVAPOTRANSPIRATION BED PER SHEET C23, 4" CONTECH A-2000 SEWER PIPE, CASING PIPE PER 1/C23, TRENCHING AND BEDDING, JENSEN PRECAST SEPTIC T JENSEN PRECAST DISTRIBUTION BOX MODEL D6B, 4" CONTECT A-2000 PERFORATED SEWER PIPE, CLEANOUT PER 1/C22	LS	1	LUMP SUM	$55,000.00	LUMP SUM	$20,000.00	LUMP SUM	$55,297.50	LUMP SUM	$50,500.00	LUMP SUM	$48,000.00	LUMP SUM	$24,000.00
44		CONSTRUCT FLEXIBLE POST DELINEATOR PER CALTRANS STD PLAN A73C TYPE G	EA	15	$40.20	$603.00	$45.00	$675.00	$49.28	$739.20	$45.00	$675.00	$45.00	$675.00	$45.00	$675.00
44A		CONSTRUCT INLET STRUCTURE PER C33	LS	1	LUMP SUM	$15,000.00	LUMP SUM	$15,000.00	LUMP SUM	$15,330.00	$14,000.00	$14,000.00	LUMP SUM	$1,600.00	LUMP SUM	$25,000.00
45		CONSTRUCT 12" CMB OVER COMPACTED SUBGRADE	SF	3,487	$2.60	$9,066.20	$2.00	$6,974.00	$1.63	$5,683.81	$2.00	$6,974.00	$1.50	$5,230.50	$1.20	$4,184.40
46		CONSTRUCT 6" C-900 PVC DR-18 PIPE, TRENCHING AND BACKFILL PER DETAIL 3/C34, INCLUDING WARNING TAPE	LF	1,350	$2.46	$3,321.00	$15.00	$20,250.00	$18.62	$25,137.00	$17.00	$22,950.00	$25.00	$33,750.00	$28.00	$37,800.00
47		CONSTRUCT 3" SDR-17 HDPE PIPE, TRENCHING AND BACKFILL PER DETAIL 3/C34	LF	3,163	$0.10	$316.30	$7.00	$22,141.00	$9.31	$29,447.53	$8.50	$26,885.50	$12.00	$37,956.00	$13.00	$41,119.00
48		BROOKS METER BOX MODEL 33 MB WITH TRAFFIC RATED COVER	EA	6	$124.75	$748.50	$125.00	$750.00	$246.38	$1,478.28	$225.00	$1,350.00	$500.00	$3,000.00	$270.00	$1,620.00
49		CONSTRUCT 2" SCH 80 PVC PIPE, TRENCHING AND BEDDING.	LF	139	$2.28	$316.92	$14.00	$1,946.00	$8.21	$1,141.19	$7.50	$1,042.50	$10.00	$1,390.00	$24.00	$3,336.00
50		CONSTRUCT 2" GATE VALVE	EA	3	$209.00	$627.00	$75.00	$225.00	$438.00	$1,314.00	$400.00	$1,200.00	$300.00	$900.00	$66.00	$198.00
51		CONSTRUCT 2" CONDUIT	LF	133	$17.07	$2,270.31	$14.00	$1,862.00	$8.80	$1,170.40	$8.00	$1,064.00	$31.00	$4,123.00	$10.00	$1,330.00
52		CONSTRUCT 1" SCH 80 PVC PIPE, TRENCHING AND BEDDING	LF	341	$1.05	$358.05	$9.00	$3,069.00	$7.12	$2,427.92	$6.50	$2,216.50	$10.00	$3,410.00	$10.00	$3,410.00
53		CONSTRUCT 3" CHECK VALVE	EA	1	$150.00	$150.00	$450.00	$450.00	$6,296.25	$6,296.25	$5,750.00	$5,750.00	$1,200.00	$1,200.00	$550.00	$550.00
54		STUB CONDUIT FOR FUTURE EQUIPMENT PER 6/C32	EA	4	$150.00	$600.00	$800.00	$3,200.00	$328.50	$1,314.00	$300.00	$1,200.00	$712.00	$2,848.00	$500.00	$2,000.00
55		10"x10"x6" NEMA ENCLOSURE INSTALL 120V DUPLEX OUTLET IN "AE1-C1" ENCLOSURE	EA	2	$40.00	$80.00	$500.00	$1,000.00	$547.50	$1,095.00	$585.00	$1,170.00	$310.00	$620.00	$310.00	$620.00
56		INSTALL RF JUNCTION BOX PROVIDED IN ITEM 112 J-BOX ON LIGHT POLE	EA	1	$500.00	$500.00	$250.00	$250.00	$2,409.00	$2,409.00	$400.00	$400.00	$625.00	$625.00	$125.00	$125.00
57		6" HIGH 4" DIA. CAMERA BOLLARD	EA	1	$1,200.00	$1,200.00	$600.00	$600.00	$2,190.00	$2,190.00	$425.00	$425.00	$700.00	$700.00	$450.00	$450.00
58		10'6" HIGH 4" DIA. BOLLARD INCLUDING INSTALLATION OF DRIVER ENCLOSURE AND HOOD PROVIDED IN ITEM 113	EA	1	$2,000.00	$2,000.00	$700.00	$700.00	$3,832.50	$3,832.50	$775.00	$775.00	$1,000.00	$1,000.00	$800.00	$800.00
59		6' HIGH 4" DIA. BOLLARD	EA	1	$1,500.00	$1,500.00	$600.00	$600.00	$383.25	$383.25	$425.00	$425.00	$700.00	$700.00	$450.00	$450.00
60		6' HIGH 4" DIA. BOLLARD WITH RED/BREEN LED SIGNAL AND TUNNELS	EA	1	$1,200.00	$1,200.00	$600.00	$600.00	$3,175.50	$3,175.50	$425.00	$425.00	$1,750.00	$1,750.00	$3,500.00	$3,500.00
61		6' HIGH X 24' CHAIN LINK FENCE PER MCDPW SEC 10.04 AND STP PLAN MS-07	LS	1	$1,200.00	$1,200.00	$2,500.00	$2,500.00	LUMP SUM	$2,124.30	LUMP SUM	$2,450.00	$2,600.00	$2,600.00	LUMP SUM	$840.00
62		1" GATE VALVE	EA	1	$144.85	$144.85	$22.00	$22.00	$328.50	$328.50	$300.00	$300.00	$200.00	$200.00	$25.00	$25.00
63		PORTABLE CONCRETE BARRIER (TYPE 60K) PER CALTRANS STD PLAN A63A	EA	2	$563.29	$1,126.58	$1,400.00	$2,800.00	$1,824.27	$3,648.54	$1,300.00	$2,600.00	$2,000.00	$4,000.00	$1,600.00	$3,200.00
64		4" THICH PCC WITH 6"X6"X#10X#10 WWM OVER COMPACTED SUBGRADE	SF	176	$12.00	$2,112.00	$4.00	$704.00	$11.81	$2,078.56	$7.00	$1,232.00	$6.00	$1,056.00	$9.00	$1,584.00
65		8" THICK PCC OVER 12" CAB WITH #5 BARS @ 8" OC EACH WAY	SF	480	$6.50	$3,120.00	$14.00	$6,720.00	$18.77	$9,009.60	$13.00	$6,240.00	$14.00	$6,720.00	$18.20	$8,736.00
66		8" x 6" PVC TEE	EA	1	$12.50	$12.50	$400.00	$400.00	$301.13	$301.13	$275.00	$275.00	$1,000.00	$1,000.00	$240.00	$240.00
66A		FIRE DEPARTMENT CONNECTION	LS	1	LUMP SUM	$2,000.00	LUMP SUM	$4,000.00	LUMP SUM	$985.50	LUMP SUM	$900.00	LUMP SUM	$500.00	LUMP SUM	$3,500.00
67		4" WIDE DOUBLE YELOW STRIPE PER DETAIL 21 ON CALTRANS STD PLAN A20A	LF	4,597	$3.00	$13,791.00	$0.80	$3,677.60	$0.88	$4,045.36	$0.80	$3,677.60	$0.80	$3,677.60	$0.80	$3,677.60

MERCED COUNTY DEPARTMENT OF PUBLIC WORKS - ROAD DIVISION

BID ITEM SUMMARY FOR: **Highway 59 Landfill New Vehicle Weighing and Processing Facility**

BID DATE: Thursday, May 13, 2010 BID TIME: 3:00 PM 0 % DBE

CONTRACT AWARDED TO: **Teichert Construction, Inc.** FOR: **$4,957,987.60**

CHECKED BY: Randy Bardini STRUCTURE COST/SF: N/A ROADWAY COST/SF: N/A

					Engineers Estimate		Teichert Const. P.O. Box 3367 Turlock, CA 95380 (209) 632-6600 F: (209) 632-6688		Deide Construction, Inc. 12393 N. Highway 99 Lodi, CA 95240 (209) 369-8255 F: (209) 368-0600		Lewis C. Nelson & Sons 3400 McCall Ave., Ste. 100 Selma, CA 93657 (559) 896-1443 F: (559) 896-8609		Granite Construction 2716 Granite Ct. Fresno, CA 93706 (559) 441-5700 F: (559) 441-5791		RGW Construction, Inc. 550 Greenville Road Livermore, CA 94550 (925) 606-2400 F: (925) 961-1925	
No.	Item Code	Item Description	Unit	Estimated Quantity	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount	Item Price	Amount
68		"STOP" SIGN PER MERCED COUNTY STD. DWG. MS 11	EA	2	$400.00	$800.00	$220.00	$440.00	$240.90	$481.80	$220.00	$440.00	$220.00	$440.00	$220.00	$440.00
69		1'-0" WIDE WHITE LIMIT LINE PER CALTRANS STD PLAN A24E.	LF	98	$3.00	$294.00	$13.00	$1,274.00	$14.24	$1,395.52	$13.00	$1,274.00	$13.00	$1,274.00	$13.00	$1,274.00
70		"SPEED LIMIT" R2-1 (15) SIGN PER CALIFORNIA MUTCD	EA	9	$300.00	$2,700.00	$220.00	$1,980.00	$240.90	$2,168.10	$220.00	$1,980.00	$220.00	$1,980.00	$220.00	$1,980.00
71		OBJECT MARKER OM-3R PER CALIFORNIA MUTCD	EA	2	$70.00	$140.00	$85.00	$170.00	$93.08	$186.16	$85.00	$170.00	$85.00	$170.00	$85.00	$170.00
72		ADVANCED SIGNING PER MCDPW STD. DRAWING MS-12A	EA	12	$500.00	$6,000.00	$220.00	$2,640.00	$240.90	$2,890.80	$220.00	$2,640.00	$220.00	$2,640.00	$220.00	$2,640.00
73		END OF ROADWAY MARKER OM4-2 PER CALIFORNIA MUTCD	EA	1	$70.00	$70.00	$220.00	$220.00	$240.90	$240.90	$220.00	$220.00	$220.00	$220.00	$220.00	$220.00
74		4" WIDE WHITE STRIPE PER DETAIL 27B ON STD. PLAN A20B	LF	9,925	$1.75	$17,368.75	$0.40	$3,970.00	$0.44	$4,367.00	$0.40	$3,970.00	$0.40	$3,970.00	$0.40	$3,970.00
75		OBJECT MARKER OM-3L PER CALIFORNIA MUTCD	EA	1	$70.00	$70.00	$85.00	$85.00	$93.08	$93.08	$85.00	$85.00	$85.00	$85.00	$85.00	$85.00
76		8" WIDE WHITE STRIPE PER DEATIL 38A ON STD. PLAN A20D	LF	2,096	$1.55	$3,248.80	$1.00	$2,096.00	$1.10	$2,305.60	$1.00	$2,096.00	$1.00	$2,096.00	$1.00	$2,096.00
77		MEDIAN STRIPING PER (1/C42)	LF	1,066	$1.55	$1,652.30	$2.00	$2,132.00	$2.19	$2,334.54	$2.00	$2,132.00	$2.00	$2,132.00	$2.00	$2,132.00
78		"LANE ENDS MERGE LEFT" W9-2 SIGN PER CALIFORNIA MUTCD	EA	1	$500.00	$500.00	$220.00	$220.00	$240.90	$240.90	$220.00	$220.00	$220.00	$220.00	$220.00	$220.00
79		TYPE VI ARROWS PER CALTRANS STD. PLAN A24A	EA	5	$300.00	$1,500.00	$170.00	$850.00	$183.96	$919.80	$168.00	$840.00	$168.00	$840.00	$168.00	$840.00
80		TYPE IV (L) ARROW PER CALTRANS STD. PLAN A24/	EA	1	$300.00	$300.00	$60.00	$60.00	$65.70	$65.70	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00
81		TYPE III (L) ARROW PER CALTRANS STD. PLAN A24E	EA	1	$300.00	$300.00	$170.00	$170.00	$183.96	$183.96	$168.00	$168.00	$168.00	$168.00	$168.00	$168.00
82		"STOP AHEAD" W3-1 A SIGN PER MUTCD (STANDARD HIGHWAY SIGNS" BOOK	EA	1	$400.00	$400.00	$220.00	$220.00	$240.90	$240.90	$220.00	$220.00	$220.00	$220.00	$220.00	$220.00
83		PARKING STALLS, STRIPING, ADA SIGNS AND WHEEL STOPS	LS	1	LUMP SUM	$700.00	$850.00	$850.00	$913.23	$913.23	$834.00	$834.00	LUMP SUM	$834.00	LUMP SUM	$834.00
84		REINFORCED CONCRETE SPEEK BUMP PER (1/C31)	EA	5	$4,000.00	$20,000.00	$7,000.00	$35,000.00	$4,828.95	$24,144.75	$4,800.00	$24,000.00	$3,000.00	$15,000.00	$7,900.00	$39,500.00
85		APRON PER (A/C31)	EA	3	$5,000.00	$15,000.00	$3,000.00	$9,000.00	$4,221.23	$12,663.69	$1,760.00	$5,280.00	$2,250.00	$6,750.00	$7,750.00	$23,250.00
86		REINFORCED CONCRETE APRON WITH INTEGRAL SPEED BUMP PER (2/C31)	EA	3	$8,000.00	$24,000.00	$3,000.00	$9,000.00	$4,828.95	$14,486.85	$3,400.00	$10,200.00	$3,200.00	$9,600.00	$8,100.00	$24,300.00
87		GATE OPERATOR, LOOP DETECTORS, PCC PADS, APPURTENANCES	EA	2	$6,500.00	$13,000.00	$7,300.00	$14,600.00	$6,351.00	$12,702.00	$8,500.00	$17,000.00	$8,000.00	$16,000.00	$7,750.00	$15,500.00
88		PIPE GATE PER SPPWC STD. PLAN 602-2	EA	1	$2,500.00	$2,500.00	$7,700.00	$7,700.00	$3,285.00	$3,285.00	$4,000.00	$4,000.00	$4,300.00	$4,300.00	$4,527.00	$4,527.00
89		4' HIGH 8: DIA. BOLLARD	EA	4	$1,500.00	$6,000.00	$500.00	$2,000.00	$602.25	$2,409.00	$475.00	$1,900.00	$800.00	$3,200.00	$600.00	$2,400.00
90		ADA PAINT STRIPING FOR LOADING, AISLE, WALKS, ENTRANCE/EXIT	LS	1	LUMP SUM	$1,500.00	LUMP SUM	$1,300.00	LUMP SUM	$1,384.08	LUMP SUM	$1,256.00	LUMP SUM	$1,246.00	LUMP SUM	$1,245.00
91		TRANSITION VALLEY GUTTER TO TRAPEZOIDAL PER (5/C34)	LF	45	$105.00	$4,725.00	$110.00	$4,950.00	$81.20	$3,654.00	$50.00	$2,250.00	$75.00	$3,375.00	$140.00	$6,300.00
92		6' X 4' CUSTOM DIRECTIONAL SIGN PER PLAN	EA	2	$400.00	$800.00	$900.00	$1,800.00	$980.03	$1,960.06	$895.00	$1,790.00	$895.00	$1,790.00	$895.00	$1,790.00
93		4' HIGH CUSTOM ROADWAY MARKINGS PER PLAN	EA	3	$100.00	$300.00	$200.00	$600.00	$219.00	$657.00	$200.00	$600.00	$200.00	$600.00	$200.00	$600.00
94		CHAIN LINK GATE PER CALTRANS STD. A85. MATCH EXISTIN G HEIGHT	LF	74	$890.00	$65,860.00	$100.00	$7,400.00	$65.70	$4,661.80	$105.00	$7,770.00	$115.00	$8,510.00	$82.50	$6,105.00
95		3" SHUT-OFF NON RISING STEM GATE VALVE IN TRAFFIC RATED VALVE CAN WITH CONCRETE COLLAR	EA	2	$500.00	$1,000.00	$750.00	$1,500.00	$711.75	$1,423.50	$650.00	$1,300.00	$350.00	$700.00	$109.00	$218.00
96		CHAIN LINK FENCE PER CALTRANS STD. A85. MATCH EXISTING HEIGHT	LF	428	$10.98	$4,699.44	$18.00	$7,704.00	$27.38	$11,718.64	$17.75	$7,597.00	$19.00	$8,132.00	$25.25	$10,807.00
97		MASONRY RETAINING WALL TYPE B PER APWA STD. 618-1 AND PER (1-4/C35)	LF	211	$18.00	$3,798.00	$210.00	$44,310.00	$161.70	$34,118.70	$164.00	$34,604.00	$150.00	$31,650.00	$324.00	$68,364.00
98		2' WIDE, 6" DEEP CONCRETE V-DITCH PER (2/C35)	LF	212	$16.00	$3,392.00	$32.00	$6,784.00	$38.87	$8,240.44	$25.00	$5,300.00	$25.00	$5,300.00	$30.00	$6,360.00
99		36" WIDE CONCRETE RIBBON GUTTER PER (3/C35)	LF	270	$32.00	$8,640.00	$30.00	$8,100.00	$35.73	$9,647.10	$31.00	$8,370.00	$50.00	$13,500.00	$132.00	$35,640.00
100		CONSTRUCT WATER FILL STAND INLET PER (1/C19)	EA	2	$1,500.00	$3,000.00	$2,500.00	$5,000.00	$2,463.75	$4,927.50	$2,250.00	$4,500.00	$2,500.00	$5,000.00	$2,000.00	$4,000.00
101		CONSTRUCT PCC CURB ISLAND PER 1/C13 INCLUDING INSTALLATION OF ONE (1) RF JUNCTION BOX PROVIDED IN ITEM 113	LS	1	LUMP SUM	$4,000.00	LUMP SUM	$1,000.00	LUMP SUM	$2,409.00	LUMP SUM	$1,500.00	LUMP SUM	$2,000.00	LUMP SUM	$1,100.00
102		FIBER OPTIC CABLE AND 2" HDPE CONTINUOUS LENGTH CONDUIT WITH SEAL-OFFS. INSTALL PULL BOXES PER MANUFACTURER'S RECOMMENDATIONS. PIPE, EXCAVATION AND BACKFILL PER 3/C34.	LF	1,600	$3.00	$4,800.00	$35.00	$56,000.00	$31.24	$49,984.00	$45.00	$72,000.00	$35.00	$56,000.00	$34.00	$54,400.00
103		GRADE WELL WATER FILL STATION SWALE AND PLACE CMB PER A/C5	LS	1	LUMP SUM	$1,300.00	LUMP SUM	$1,600.00	LUMP SUM	$1,423.50	LUMP SUM	$2,400.00	LUMP SUM	$6,000.00	LUMP SUM	$2,500.00
104		INSTALL THREE (3) EXTERIOR AND SEVEN (7) INTERIOR CAMERAS, CONDUIT, RG59/U & 18/2 CABLING AT OWNER DETERMINED LOCATION	LS	1	LUMP SUM	$15,000.00	LUMP SUM	$10,000.00	LUMP SUM	$10,950.00	LUMP SUM	$44,500.00	LUMP SUM	$64,000.00	LUMP SUM	$8,750.00
105		TRUCK SCALE, FOUNDATION, APRONS AND SPEED HUMP	EA	3	$140,000.00	$420,000.00	$100,000.00	$300,000.00	$70,925.71	$212,777.13	$115,000.00	$345,000.00	$75,000.00	$225,000.00	$75,000.00	$225,000.00
106		SCALEHOUSE8" PROTECTIVE BOLLARDS	EA	4	$1,200.00	$4,800.00	$500.00	$2,000.00	$350.40	$1,401.60	$525.00	$2,100.00	$650.00	$2,600.00	$600.00	$2,400.00
107		SCALEHOUSE AND GENERATOR ENCLOSURE	LS	1	LUMP SUM	$350,000.00	LUMP SUM	$240,000.00	LUMP SUM	$35,248.05	LUMP SUM	$455,000.00	LUMP SUM	$307,000.00	LUMP SUM	$260,000.00
108		OVERHEAD SIGN	LS	1	LUMP SUM	$40,000.00	LUMP SUM	$70,000.00	LUMP SUM	$66,836.61	LUMP SUM	$31,000.00	LUMP SUM	$56,000.00	LUMP SUM	$43,400.00
109		EMERGENCY GENERATOR, TRANSFER SWITCH, ENCLOSURE, FUEL SKID AND ASSOCIATED EQUIPMENT	LS	1	LUMP SUM	$80,000.00	LUMP SUM	$58,000.00	LUMP SUM	$54,469.68	LUMP SUM	$55,000.00	LUMP SUM	$66,000.00	LUMP SUM	$56,200.00
110		ELECTRICAL	LS	1	LUMP SUM	$400,000.00	LUMP SUM	$595,000.00	LUMP SUM	$846,000.29	LUMP SUM	$855,000.00	LUMP SUM	$1,019,000.00	LUMP SUM	$1,040,000.00
111		PLUMBING	LS	1	LUMP SUM	$27,000.00	LUMP SUM	$20,000.00	LUMP SUM	$22,502.25	LUMP SUM	$14,300.00	LUMP SUM	$25,000.00	LUMP SUM	$24,000.00
112		MECHANICAL	LS	1	LUMP SUM	$20,000.00	LUMP SUM	$25,000.00	LUMP SUM	$26,718.00	LUMP SUM	$24,400.00	LUMP SUM	$25,000.00	LUMP SUM	$24,000.00
113		FEE COLLECTION SYSTEM INCLUDING LICENSES, CUSTOMIZATIONS, HARDWARD AND VIDEO SYSTEM PER TECHNICAL SPECIFICATIONS 13510	LS	1	LUMP SUM	$325,000.00	LUMP SUM	$325,000.00	LUMP SUM	$325,000.00	LUMP SUM	$325,000.00	LUMP SUM	$325,000.00	LUMP SUM	$325,000.00
114		FEE COLLECTION SYSTEM MARK-UP		%*	5%	$16,250.00	5%	$16,250.00	7%	$22,750.00	5%	$16,250.00	1%	$3,250.00	5%	$16,250.00
115		CONSTRUCT CLEANOUT (SHEETS C18 & C19)	EA	3	$400.00	$1,200.00	$375.00	$1,125.00	$355.88	$1,067.64	$325.00	$975.00	$325.00	$975.00	$80.00	$240.00
		TOTAL				**$5,385,236.61**		**$4,957,987.60**		**$5,104,116.54**		**$5,334,104.60**		**$5,811,495.00**		**$5,847,288.60**

																	Average:
19		36" WIDE CONCRETE V-DITCH PER DETAIL 7/C32	LF	1,898	$25.00	$47,450.00	$32.00	$60,736.00	$43.02	$81,651.96	$30.00	$56,940.00	$20.00	$37,960.00	$36.50	$69,277.00	$31.09
38		CONSTRUCT TRAPEZOIDAL CHANNEL PER DETAIL 4/C34	LF	362	$65.00	$23,530.00	$20.00	$7,240.00	$60.84	$22,024.08	$57.00	$20,634.00	$40.00	$14,480.00	$75.30	$27,258.60	
28		TRAPEZOIDAL CHANNEL B=6', D=3' PER 2/C26	LF	1,578	$140.00	$220,920.00	$90.00	$142,020.00	$103.08	$162,660.24	$110.00	$173,580.00	$105.00	$165,690.00	$69.00	$108,882.00	
		Average of trap channel sizes			102.5		55		81.96		83.5		72.5		72.15		$77.94
33		CONSTRUCT 24" CSP RISER STAND PIPE DRAINAGE INLET PER 1/C27	EA	10	$500.00	$5,000.00	$2,000.00	$20,000.00	$3,285.00	$32,850.00	$3,000.00	$30,000.00	$4,000.00	$40,000.00	$2,350.00	$23,500.00	$2,522.50
26		48" DUAL WALL (CORRUGATED & SMOOTH) HDPE PIPE, EXCAVATION AND BACKFILL PER 3/C34	LF	1,985	$150.00	$297,750.00	$90.00	$178,650.00	$84.86	$168,447.10	$77.00	$152,845.00	$100.00	$198,500.00	$95.00	$188,575.00	$99.48

CONTRACTS

REPORT/RECOMMENDATION TO THE BOARD OF SUPERVISORS OF SAN BERNARDINO COUNTY, CALIFORNIA AND RECORD OF ACTION

File
Signed Contract

January 23, 2007

FROM: **PATRICK J. MEAD**, Director
Department of Public Works – **Solid Waste Management Division**

SUBJECT: **CONTRACT FOR CONSTRUCTION MANAGEMENT SERVICES - FINAL CLOSURE CONSTRUCTION PROJECT PHELAN SANITARY LANDFILL**

RECOMMENDATION: Approve an **Agreement No. 07-27** with Bryan A. Stirrat & Associates in the amount of $220,467 to provide Construction Management Services for the Final Closure Construction Project at the Phelan Sanitary Landfill.

BACKGROUND INFORMATION: The Phelan Sanitary Landfill (PSL) is an inactive Class III Landfill located in an unincorporated area of San Bernardino County, approximately 2 miles northwest of the community of Phelan. The site encompasses 80 acres, of which 33 acres were used for waste disposal and 6 acres were used as a former burn area for a total of approximately 39 acres. Landfilling operations began in 1961 and ceased at this site on December 31, 1997. Title 27 of the California Code of Regulations (CCR) requires that upon cessation of operations of a Class III Municipal Landfill Solid Waste Facility the landfill receive placement of a final cover cap within a stipulated time line.

The proposed final closure construction at PSL will consist of placing a 2-foot thick monolithic soil alternative cover over a minimum of 1-foot of existing foundation soils over the refuse footprint for a total cover thickness of 3 feet. Final closure construction will require the placement of approximately 266,000 cubic yards of unclassified fill and 112,000 cubic yards of select final cover soils. The proposed borrow source of the final cover soils is the existing on-site borrow pit. In addition to the placement of the final closure soils, construction activities will also include final drainage improvements, landfill gas monitoring systems, and site security. The construction of final closure is tentatively scheduled to commence by February 15, 2007.

On October 17, 2006, the Solid Waste Management Division (SWMD) issued a Request for Proposals (RFP) to provide Construction Management Services for various landfill construction projects. As a result of this RFP process, the Board of Supervisors (on January 9, 2007) approved the use of the following consulting engineering firms to provide Construction Management services on landfill construction projects through December 31, 2008, as needed: 1) Advanced Earth Sciences of Irvine, 2) Bryan A. Stirrat & Associates of Diamond Bar, 3) Dudek of Encinitas, and 4) Vector Engineering of Grass Valley. SWMD plans to use the services of these four firms on a rotational basis.

cc: PW/Solid-Wulman w/agreement
Contractor c/o PW/Solid w/agreement
Auditor-Accounts payable manager w/agreement
IDS-w/agreement
Risk Management
PW/Solid-Mead
CC-Jocks
CAO-Forster
File-w/agreement

Rev 08/06

ml (01/25/07)

Record of Action of the Board of Supervisors

Agreement No. 07-27

APPROVED (CONSENT CALENDAR)
BOARD OF SUPERVISORS
COUNTY OF SAN BERNARDINO

MOTION	AYE	AYE	AYE	MOVE	SECOND
	1	2	3	4	5

DENA M. SMITH, CLERK OF THE BOARD

BY _____

DATED: January 23, 2007

ITEM 018

ORIGINAL

County of San Bernardino

F A S

STANDARD CONTRACT

FOR COUNTY USE ONLY

X New / Change / Cancel	Vendor Code: BRYANAS702	SC	Dept. SWM	A	Contract Number: 07-27
County Department: DPW – Solid Waste Management Division	Dept. SWM	Orgn. PHLN	Contractor's License No.	
County Department Contract Representative: Peter H. Wulfman, Division Manager	Telephone: 386-8703		Total Contract Amount: $220,467	

Contract Type: ☐ Revenue ☐ Encumbered ☒ Unencumbered ☐ Other:

If not encumbered or revenue contract type, provide reason: The Solid Waste Management Division (SWMD) prefers to not encumber this contract. Since this contract is based upon time and materials, not encumbering this contract allows SWMD greater flexibility in the payment of amounts due under the contract.

Commodity Code	Contract Start Date	Contract End Date	Original Amount	Amendment Amount
	Jan. 23, 2007	See Para. 6	$220,467	

Fund	Dept.	Organization	Appr.	Obj/Rev Source	GRC/PROJ/JOB No.	Amount
EAB	SWM	PHLN	200	2445	83R19283	$220,467

Project Name: Proj. No. 20500036 CM Services for Final Closure Construction at the Phelan landfill

Contract Type – 2(a)

Estimated Payment Total by Fiscal Year

FY	Amount	I/D	FY	Amount	I/D

THIS CONTRACT is entered into in the State of California by and between the County of San Bernardino, hereinafter called the County, and

Name: Bryan A. Stirrat & Associates

hereinafter called CONSULTANT

Address: 1360 Valley Vista Drive

Diamond Bar, California 91765

Telephone: (909) 860-7777 Federal ID No. 95-3983702

IT IS HEREBY AGREED AS FOLLOWS:

(Use space below and additional bond sheets. Set forth service to be rendered, amount to be paid, manner of payment, time for performance or completion, determination of satisfactory performance and cause for termination, other terms and conditions, and attach plans, specifications, and addends, if any.)

1. Project.

Consultant shall perform consulting services for the project described as Construction Management Services for the Final Closure Construction Project at the Phelan Sanitary Landfill.

2. Retention of Consultant.

County hereby retains the Consultant, as an independent contractor, to perform the required services within the time limits hereinafter specified.

Consultant herein designates Richard Genzel to be the Project Manager. Consultant shall not change the primary contact without written acknowledgment to the County. The Project Manager or designee must respond to County inquiries within two (2) business days. If the Project

COUNTY OF ORANGE

Date: 01/29/08

PRICE AGREEMENT

VENDOR INFORMATION:
PHONE: 909-860-7777
TERMS: 1 - NET 30
F.O.B:

TAX CODE:

P/A NUMBER: N1000009536

SEE DELIVERY LOCATION(S) WITHIN PRICE AGREEMENT

START DATE: 02/01/08
END DATE: 01/31/09
DELIVERY WITHIN 000 DAYS

VENDOR CODE: X00935
BRYAN A STIRRAT & ASSOCIATES
ATTN: PAUL MITCHELL
1360 VALLEY VISTA DR

DIAMOND BAR CA 91765-3910

P/A NOT TO EXCEED: 1,700,000.00
RENEWABLE FOR: TWO ADDITIONAL YEARS
LEGEND CODE: WQ
PA TYPE: 299
MASTER PA:
FOLDER NUMBER: 596456
PB:
PIGGYBACK PA:
PA REPLACES: N1000006764
PER MINUTE ORDER: 01/29/08 / / / / / /

BILLING INSTRUCTIONS:
1. INVOICE COUNTY OF ORANGE AND SEND INVOICES IN DUPLICATE TO: BILLING ADDRESS AS INDICATED BELOW.
   INVOICES MUST BE IN DUPLICATE REFERENCED TO THE ORDER NUMBER AND ITEMIZED QUANTITIES, DESCRIPTION OF MERCHANDISE, UNIT AND UNIT COST.
2. VENDOR CODE, ORDER NUMBER AND PRICE AGREEMENT NUMBER (IF APPLICABLE) MUST APPEAR ON ALL INVOICES, SHIPPING PAPERS, PACKAGES & INQUIRIES.
3. CASH DISCOUNTS, IF OFFERED, WILL BE TAKEN WITHIN TIME LIMITATION AND WILL BE TAKEN ON THE TOTAL AMOUNT (INCLUDING TAX) UNLESS OTHERWISE STATED.
4. AUTHORIZED FREIGHT CHARGES MUST BE PREPAID AND ADDED TO INVOICE. INCLUDE PROOF OF PAYMENT FOR FREIGHT CHARGES OVER $25..
5. YOU ARE REQUIRED TO INCLUDE YOUR TAXPAYER I.D NUMBER ON ALL INVOICES SUBMITTED FOR PAYMENT. THIS WILL ENSURE COMPLIANCE WITH IRS REQUIREMENTS AND EXPEDITE PAYMENT PROCESSING. OUT OF STATE VENDORS MUST INCLUDE CALIFORNIA SALES TAX PERMIT NUMBER.

THE VENDOR ACKNOWLEDGES THAT HE HAS READ AND AGREED TO ALL TERMS AND CONDITIONS INCLUDING THOSE PRINTED ON ATTACHED TERMS AND CONDITIONS PAGE. THE ONLY TERMS AND CONDITIONS THAT WILL BE APPLICABLE TO THE INTERPRETATION OF THIS CONTRACT ARE THOSE ISSUED BY THE COUNTY OF ORANGE VENDOR IS REQUIRED TO PROVIDE A COMPLETED MSDS (MATERIAL SAFETY DATA SHEET) FOR HAZARDOUS SUBSTANCES AS REQUIRED BY LABOR CODE SECTION 6390, GENERAL INDUSTRIAL SAFETY ORDER SECTION 5194 AND CALIFORNIA ADMINISTRATION CODE TITLE 8. MSDS SHEET FOR EACH SPECIFIED ITEM SHALL BE SENT TO PLACES OF SHIPMENT.

P/A FOR: LANDFILL GAS SERVICES FOR THE FRB LANDFILL

SERVICES TO BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING TERMS AND CONDITIONS, SCOPE OF WORK, ATTACHMENTS AND EXHIBITS. ANNUAL AMOUNT NOT TO EXCEED $1,700,000 FOR THE FIRST YEAR, RENEWABLE WITH BOARD OF SUPERVISOR APPROVAL FOR TWO ADDITIONAL ONE-YEAR TERMS AT $1,700,000/YEAR UNDER THE SAME TERMS AND CONDITIONS AND SCOPE OF WORK.

VENDOR TO REFERENCE THE APPROPRIATE RELEASE ORDER NUMBER (PG) FOR ROUTINE SERVICES:

PG 299 RON00000013 2/1/08 - 6/30/08 $155,195
PG 299 RON00000014 7/1/08 - 1/31/09 $217,273

LN	COMMODITY CODE	DISCOUNT	QUANTITY	UNIT	UNIT COST	P/A LINE AMOUNT
001	98846 LANDFILL SERVICES	0.00	0.00		0.0000	0.00

AUTHORIZED SIGNATURE

ADDRESS QUESTION(S) REGARDING THIS PURCHASE DOCUMENT TO THE PURCHASING CONTACT: CHRIS CRUZ

VENDOR

FEB 6 2008

COUNTY OF ORANGE

Date: 11/21/07

PRICE AGREEMENT

2008-0059
FRB GW

VENDOR INFORMATION:
PHONE: 909-860-7777
TERMS: 1 - NET 30
F.O.B:

TAX CODE:

P/A NUMBER: N2000008619

SEE DELIVERY LOCATION(S)
WITHIN PRICE AGREEMENT

START DATE: 04/01/08
END DATE: 03/31/09
DELIVERY WITHIN 000 DAYS

VENDOR CODE: X00935
BRYAN A STIRRAT & ASSOCIATES
ATTN: PAUL MITCHELL
1360 VALLEY VISTA DR

DIAMOND BAR CA 91765-3910

P/A NOT TO EXCEED: 100,000.00
RENEWABLE FOR: ONE ADDITIONAL YEAR
LEGEND CODE: WQ PA TYPE: 299
MASTER PA: FOLDER NUMBER: 596312
PB: PIGGYBACK PA:
PA REPLACES: N1000008619
PER MINUTE ORDER: 03/27/07 / / / / / /

BILLING INSTRUCTIONS:
1. INVOICE COUNTY OF ORANGE AND SEND INVOICES IN DUPLICATE TO: BILLING ADDRESS AS INDICATED BELOW.
   INVOICES MUST BE IN DUPLICATE REFERENCED TO THE ORDER NUMBER AND ITEMIZED QUANTITIES, DESCRIPTION OF MERCHANDISE, UNIT AND UNIT COST.
2. VENDOR CODE, ORDER NUMBER AND PRICE AGREEMENT NUMBER (IF APPLICABLE) MUST APPEAR ON ALL INVOICES, SHIPPING PAPERS, PACKAGES & INQUIRIES.
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THE VENDOR ACKNOWLEDGES THAT HE HAS READ AND AGREED TO ALL TERMS AND CONDITIONS INCLUDING THOSE PRINTED ON ATTACHED TERMS AND CONDITIONS PAGE.
THE ONLY TERMS AND CONDITIONS THAT WILL BE APPLICABLE TO THE INTERPRETATION OF THIS CONTARACT ARE THOSE ISSUED BY THE COUNTY OF ORANGE VENDOR IS REQUIRED TO PROVIDE A COMPLETED MSDS (MATERIAL SAFETY DATA SHEET) FOR HAZARDOUS SUBSTANCES AS REQUIRED BY LABOR CODE SECTION 6390, GENERAL INDUSTRIAL SAFETY ORDER SECTION 5194 AND CALIFORNIA ADMINISTRATION CODE TITLE 8. MSDS SHEET FOR EACH SPECIFIED ITEM SHALL BE SENT TO PLACES OF SHIPMENT.

P/A FOR: O&M FOR LANDFILL GROUNDWATER & LEACHATE COLLECTION SYSTEMS

SERVICES TO BE PROVIDED FOR SECOND YEAR TERM IN AN AMOUNT NOT TO EXCEED $100,000.

PAYABLE UPON SUBMISSION OF INVOICES; PARTIALLY ENCUMBERED PRICE AGREEMENT.

INVOICES SHALL REFERENCE THE APPROPRIATE RELEASE ORDER NUMBER FOR ROUTINE SERVICES:

PG 299 RON00000009 4/1/08 - 6/30/08 $4750] MONTHLY
PG 299 RON00000010 7/1/08 - 3/31/09 $6750

NOV 30 2007

INDIVIDUAL RELEASE ORDER NUMBERS SHALL BE PROVIDED FOR ALL OTHER SERVICES PROVIDED AGAINST THIS PRICE AGREEMENT.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

PRICE AGREEMENT MONETARY LIMITS:
1 ST YR FROM 4/1/07 TO 3/31/08 $100,000

AUTHORIZED SIGNATURE: Diane Dodson

ADDRESS QUESTION(S) REGARDING THIS PURCHASE DOCUMENT TO THE PURCHASING CONTACT: DIANE DODSON

VENDOR

Date Inspected

INITIAL SERVICE
REGULAR SERVICE
EXTRA SERVICE

TERMINIX

COMMERCIAL SERVICE AND INSPECTION REPORT

ACCT.	ACCOUNT	RT.	TELEPHONE	GRID	S. DAY	P.	T.	PRODUCTION	TIME IN	TIME OUT

SERVICE PROPERTY AT:

BRANCH:

OPERATOR NAME & CERTIFICATION NUMBER

SUPERVISOR NAME & CERTIFICATION NUMBER

Pest ☐ German Cockroaches ☐ Dermestid Area ☐ Flies ☐ Drosophila Maggots
Pests ☐ American Cockroaches ☐ Anopheles Area ☐ Ants ☐ Stored Product Pests
☐ Oriental Cockroaches ☐ Fire Ants ☐ Termites ☐ Other
☐ Other Cockroaches ☐ Other Ants ☐ Fleas ☐ Other

Pest Control Materials Used

		EPA Reg. #	T/O	E/O	Amount
23	Advance Granular Ant Bait (Abamectin B1) 0.01%	499-370			
85	Advance Outdoor Indoor Ant Bait (Abamectin B1) 0.01%	499-496			
115	Advance Liquid Ant Bait (Abamectin B1) 0.01%	499-370			
102	Avert Roach Bait Stations (Abamectin) 0.05%	499-407			
165	Advion Insecticide Ant Gel Bait (Fipronil) 0.01%	100-1098			
20	Boric Dust Orthoboric acid 99%	9444-30			
15	Demand CS (Lambda-cyhalothrin) ☐ 0.015% ☐ 0.03% ☐ 0.06%	100-1066			
110	Maxforce Gel (Imidacloprid) 0.05%	432-1259			
56	Niche Roach Bait (Sodium Salt 40% (Fipronil) 1.0%	499-474			
41	Talstar G (Bifenthrin) 0.05%	279-3151			
140	Talstar Mini Blocks Bait (Bifenthrin) 0.0025%	7173-218			
1	Generation Bait Mini Blocks Bait (Deltamethrin) 0.0025%	7173-230			
3	Talstar Granular Bait (Bifenthrin 5GR) 5.0%	279-9-2			
113	Kicker T/O (Fipronil) ☐ 0.05% ☐ 0.1% ☐ 0.6%	432-1149			
190	Top Flex II Bait (Fipronil) Bait or (Diphenthiuron) 0.105%	12455-61			
108	Maxforce F/O Fipronil Bait Stations (Fipronil) 0.05%	432-1257			
191	Maxforce F/O Ant Bait Stations (Fipronil) 0.01%	432-1258			
157	Maxforce F/O Ant Gel Bait (Fipronil) 0.001%	432-1264			
154	Maxforce F/O Select Roach Bait Gel (Fipronil) 0.01%	432-1269			
164	Maxforce F/O Insect Bait Gel (Fipronil/Pyrethrin) 1.0%	432-1202			
49	Avid EC (Fipronil/Vitamin) ☐ 0.015% ☐ 0.02%	11715-107-57076			
101	PT Cy-Kick Aerosol (Cyfluthrin) 0.1%	499-370			
70	PT Cy-Kick US (Cyfluthrin) ☐ 0.007 5% ☐ 0.025% ☐ 0.05% ☐ 0.1%	499-304			
112	PT Avert Ant Bait (Abamectin B1) 0.05%	499-416			
99	PT 565 Plus XLO Aerosol (Pyrethrins) 0.5%	499-290			
159	PT 1406 Aerosol (Silica Aerogel) 4.1% (Pyrethrins) 0.5%	499-405			
81	Tempo Ultra WP (Cyfluthrin) ☐ 0.020% ☐ 0.05% ☐ 0.1%	432-1304			
83	Tempo SC Ultra (Cyfluthrin) ☐ 0.025% ☐ 0.05% ☐ 0.1%	432-1363			
91	ULD BP 100 ULV (Pyrethrins) 1.0%	499-152/11540-9			
92	ULD BP 300 ULV (Pyrethrins) 3.0%	499-150/11540-1			

Materials

	# Used		# Used
460 Inks/Ids		020 WING-UP TRAPS	
400 Insect Monitors		010 TIN CATS	
410 Pheromone Traps		045 Rat Bait Stations	
605 Glue Traps		040 Mouse Bait Stations	
630 Vole Traps		065 Liquid Bait Stations	

Areas Inspected and/or Treated

Pest Control materials used as noted by Order from list at left

☐ Food Areas
☐ Dining Areas
☐ Other
☐ Food Prep. Areas
☐ Food Packed Rooms
☐ Food Storage Areas
☐ Laundry/Boiler Room
☐ Warehouse Areas
☐ Warehousing Areas
☐ Patient Rooms
☐ Guest Rooms
☐ Basement
☐ Attic
☐ Exterior Perimeter
☐ Landscaped Areas
☐ Loading Dock/Dumpster
☐ Other

Precautions

Keep out of reach of children and pets.
May cause eye, nose, throat, or skin irritation.
Avoid breathing vapors, mists, or dusts. Harmful if swallowed.
Thoroughly wash hands to activate.
Do not tamper with insecticide dispensers.
Do not touch to room and other surfaces.
Remain in treated areas until dry.
For bait treatments, remove all treated area in a minimum of four hours or until dry.

Treatment Code (T/O): G = Gnats & Gnats/Ph. V = Vole O = Other
B = Bee BT = Tick DG = Drosophila/Gnats D = Yellow Dust SK = Skunk
IN = Inspection

Equipment Code (E/O): GS = Gring Air Sprayer T = Tyvek
DS = Dust Station HD = Hand Duster AN = Aerosol
BB = Bait Gun FT = Fly Tek Fogger F = DUS

Posting Service Sticker? ☐ Yes ☐ No

Supervisor's Comments:

Prior Balance:
Case Amt.
Pay Charge

SPECIAL SERVICE INSTRUCTIONS

CUSTOMER'S SIGNATURE

SERVICE TECHNICIAN'S SIGNATURE	DATE

AMOUNT PAID

	CASH
	CHECK

Total Due

UNRESOLVED PROBLEMS?
CALL 1-800-TERMINIX (1-800-837-6464)

TERMINIX COMMERCIAL

625-8625

Pest Control - New Account Information Sheet

START ON OR B4 FEB 15, 2008

Service Information	
Business Name	COYOTE CANYON LANDFILL
Address	5973 COYOTE CANYON ROAD
City/State/Zip	IRVINE, CA 92603
Contact Names #1	WAYNE HSIAO
#2	
Phone	714-834-4152
Second Phone	
Fax	714-834-4136
E-mail	wayne.hsiao@iwmd.ocgov.com
Grid #	

Start Date	3/19
Start Day	Wednesday
Start Time	3/19 8
Service Technician	1-01
Route #	Bryan Estes
Start Arranged With	Dave Lon 7-8-08
FIVE STEP Program	YES ✓ NO
Log Book Location	
Gate/Key/Alarm	

Target Pests Covered: Ants ☐ Roaches ☐ Spiders ☐ Crickets ☐ Silverfish ☐ Earwigs ☐ Fleas ☐ Flies ☐ Stored Product Pests ☐ Mice ✓ Rats ✓ Gophers ☐ Ground Squirrels ☐ Pigeons ☐ Sparrows ☐ Starlings ☐ Gulls ☐

Other Pests:

Target Pest Locations: RODENTS

Equipment Needed:
Exterior Bait Stations # 150 ✓ Rock Cafe Station # Wilco Squirrel Station #
Tin Cat # Kech-All # MousoMaster #
Rat Snap # Mouse Snap # Rat Glueboard # Mouse Glueboard #
Insect Light Traps (ILT's) # Model
Ladder(Height) Drill Vacuum Heat Gun Fogger Avitrol Feeder #
Generator Extension Cord Spray Rig
Other:

Attachments/ Requirements: MSDS Book ☐ Sighting Log ☐ Graph ☐ Bait Station Site Map ☐ Service Ticket ✓ Service Agreement ✓ Key

Areas Covered: Exterior Perimeter ✓ Greenbelt Area ☐ Exterior Storage ☐ Courtyard ☐ Pool/Spa Area ☐ Walkways ☐ Trash Area ☐ Patio/Outside Dining ☐ Loading Dock ☐ Kitchen ☐ Restroom ☐ Break Room ☐ Dining Room ☐ Warehouse ☐ Office ☐ Storage ☐ Halls ☐ Lobby ☐ Laundry ☐
Other:

Remarks/ Special Instructions: INSTALL EXTERIOR BAIT STATIONS AROUND LANDFILL PERIMETER TO CONTROL RODENTS.

Billing Information

AP Special Instructions:

Billing Information	
Billing Name	IWMD / COYOTE CANYON LANDFILL
Billing Address	320 N. FLOWER ST. SUITE 400
City/State/Zip	SANTA ANA, CA 92703
Phone	714-834-4152
Fax	714-834-4136
E-mail	wayne.hsiao@iwmd.ocgov.com
Contact Person	WAYNE HSIAO

Salesman	HANSEN
Sales ID	4021
Lead Source	CROSS
SIC Code	4119
Purchase Order #	
PO Expiration Date	
Check # / $	# / $

Initial $ 1,850 Service Charge $ 146 Annual Contract Value $ 10,628

Service Frequency: One-time ☐ Quarterly ✓ Bi-monthly ☐ Monthly ☐ Semi-monthly ☐ 1x/Week ☐ 2x/Week ☐ Other ☐

Regular service: Week #'s Day of the week: Time:

Account Upgrade: Account # From $ to $

Frequency change: None ☐ From To

General Prevailing Wages

For

San Diego County

From

Director of Industrial Relations

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #BUILDING/CONSTRUCTION INSPECTOR AND FIELD SOILS AND MATERIAL TESTER

DETERMINATION: SD-23-63-3-2009-2D
ISSUE DATE: August 22, 2009
EXPIRATION DATE OF DETERMINATION: June 30, 2010* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Division of Labor Statistics and Research at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
LOCALITY: All localities within San Diego County

		Employer Payments					Straight-Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday[a]	Training	Other Payments	Hours	Total Hourly Rate	Daily 1 1/2X[b]	Saturday 1 1/2X[c]	Sunday/ Holiday 2X
Group 1	$37.61	8.20	5.55	2.82	0.65	0.22	8	55.050	73.855	73.855	92.660
Group 2	39.39	8.20	5.55	2.82	0.65	0.22	8	56.830	76.525	76.525	96.220
Group 3	41.39	8.20	5.55	2.82	0.65	0.22	8	58.830	79.525	79.525	100.220

# Indicates an apprenticeable craft. Effective as of July 1, 2008, the determination, issuance and publication of the prevailing wage apprentice schedules/apprentice wage rates have been reassigned by the Department of Industrial Relations from the Division of Labor Statistics and Research to the Division of Apprenticeship Standards. To obtain any apprentice schedules/apprentice wage rates, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.
[a] Includes an amount withheld for supplemental dues.
[b] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.
[c] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

Classifications

Group 1
Field Soils and Material Tester
Field Asphaltic Concrete (Soils and Material Tester)
Field Earthwork (Grading Excavation and Filling)
Roof Inspector
Water Proofer

Group 2
AWS-CWI Welding Inspector
Building/Construction Inspector
Licensed Grading Inspector
Reinforcing Steel
Reinforcing Concrete
Pre-Tension Concrete
Post-Tension Concrete
Structural Steel and Welding Inspector
Glue-Lam and Truss Joints
Truss-Type Joint Construction
Shear Wall and Floor Systems used as diaphragms
Concrete Batch Plant
Spray-Applied Fireproofing
Structural Masonry

Group 3
Nondestructive Testing (NDT)

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Holiday provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the Travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Travel and/or Subsistence provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #BUILDING/CONSTRUCTION INSPECTOR AND FIELD SOILS AND MATERIAL TESTER (SPECIAL SHIFT)

DETERMINATION: SD-23-63-3-2009-2D1
ISSUE DATE: August 22, 2009
EXPIRATION DATE OF DETERMINATION: June 30, 2010* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Division of Labor Statistics and Research at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
LOCALITY: All localities within San Diego County

		Employer Payments					Straight-Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday[a]	Training	Other Payments	Hours	Total Hourly Rate	Daily 1 1/2X[b]	Saturday 1 1/2X[c]	Sunday/ Holiday 2X
Group 1	$38.11	8.20	5.55	2.82	0.65	0.22	8	55.550	74.605	74.605	93.660
Group 2	39.89	8.20	5.55	2.82	0.65	0.22	8	57.330	77.275	77.275	97.220
Group 3	41.89	8.20	5.55	2.82	0.65	0.22	8	59.330	80.275	80.275	101.220

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[a] Includes an amount withheld for supplemental dues.
[b] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.
[c] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

Classifications

Group 1
Field Soils and Material Tester
Field Asphaltic Concrete (Soils and Material Tester)
Field Earthwork (Grading Excavation and Filling)
Roof Inspector
Water Proofer

Group 2
AWS-CWI Welding Inspector
Building/Construction Inspector
Licensed Grading Inspector
Reinforcing Steel
Reinforcing Concrete
Pre-Tension Concrete
Post-Tension Concrete
Structural Steel and Welding Inspector
Glue-Lam and Truss Joints
Truss-Type Joint Construction
Shear Wall and Floor Systems used as diaphragms
Concrete Batch Plant
Spray-Applied Fireproofing
Structural Masonry

Group 3
Nondestructive Testing (NDT)

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Holiday provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the Travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Travel and/or Subsistence provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #BUILDING/CONSTRUCTION INSPECTOR AND FIELD SOILS AND MATERIAL TESTER (MULTI-SHIFT)

DETERMINATION: SD-23-63-3-2009-2D2
ISSUE DATE: August 22, 2009
EXPIRATION DATE OF DETERMINATION: June 30, 2010* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Division of Labor Statistics and Research at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
LOCALITY: All localities within San Diego County

		Employer Payments					Straight-Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday[a]	Training	Other Payments	Hours[b]	Total Hourly Rate	Daily 1 1/2X[c]	Saturday 1 1/2X[d]	Sunday/ Holiday 2X
Group 1	$38.61	8.20	5.55	2.82	0.65	0.22	8	56.050	75.355	75.355	94.660
Group 2	40.39	8.20	5.55	2.82	0.65	0.22	8	57.830	78.025	78.025	98.220
Group 3	42.39	8.20	5.55	2.82	0.65	0.22	8	59.830	81.025	81.025	102.220

# Indicates an apprenticeable craft. Effective as of July 1, 2008, the determination, issuance and publication of the prevailing wage apprentice schedules/apprentice wage rates have been reassigned by the Department of Industrial Relations from the Division of Labor Statistics and Research to the Division of Apprenticeship Standards. To obtain any apprentice schedules/apprentice wage rates, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.
[a] Includes an amount withheld for supplemental dues.
[b] The third-shift shall work 6.5 hours, exclusive of meal period, for which 8 hours straight-time shall be paid at the non-shift rate, Monday through Friday.
[c] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.
[d] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

Classifications

Group 1
Field Soils and Material Tester
Field Asphaltic Concrete (Soils and Material Tester)
Field Earthwork (Grading Excavation and Filling)
Roof Inspector
Water Proofer

Group 2
AWS-CWI Welding Inspector
Building/Construction Inspector
Licensed Grading Inspector
Reinforcing Steel
Reinforcing Concrete
Pre-Tension Concrete
Post-Tension Concrete
Structural Steel and Welding Inspector
Glue-Lam and Truss Joints
Truss-Type Joint Construction
Shear Wall and Floor Systems used as diaphragms
Concrete Batch Plant
Spray-Applied Fireproofing
Structural Masonry

Group 3
Nondestructive Testing (NDT)

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Holiday provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the Travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Travel and/or Subsistence provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: # OPERATING ENGINEER

DETERMINATION: SD-23-63-3-2009-2
ISSUE DATE: August 22, 2009
EXPIRATION DATE OF DETERMINATION: June 30, 2010* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Division of Labor Statistics and Research at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
LOCALITY: All localities within San Diego County

Classification (Journeyperson)	Basic Hourly Rate	Employer Payment: Health and Welfare	Pension	Vacation/ Holiday[a]	Training[b]/ Other	Straight-Time: Hours	Total Hourly Rate	Overtime Hourly Rate: Daily 1 1/2X[d]	Saturday 1 1/2X[e]	Sunday/ Holiday 2X
CLASSIFICATION GROUPS[c]										
Group 1	$36.83	8.20	5.55	2.82	0.87	8	54.270	72.685	72.685	91.100
Group 2	37.61	8.20	5.55	2.82	0.87	8	55.050	73.855	73.855	92.660
Group 3	37.90	8.20	5.55	2.82	0.87	8	55.340	74.290	74.290	93.240
Group 4	39.39	8.20	5.55	2.82	0.87	8	56.830	76.525	76.525	96.220
Group 6	39.61	8.20	5.55	2.82	0.87	8	57.050	76.855	76.855	96.660
Group 8	39.72	8.20	5.55	2.82	0.87	8	57.160	77.020	77.020	96.880
Group 10	39.84	8.20	5.55	2.82	0.87	8	57.280	77.200	77.200	97.120
Group 12	40.01	8.20	5.55	2.82	0.87	8	57.450	77.455	77.455	97.460
Group 13	40.11	8.20	5.55	2.82	0.87	8	57.550	77.605	77.605	97.660
Group 14	40.14	8.20	5.55	2.82	0.87	8	57.580	77.650	77.650	97.720
Group 15	40.22	8.20	5.55	2.82	0.87	8	57.660	77.770	77.770	97.880
Group 16	40.34	8.20	5.55	2.82	0.87	8	57.780	77.950	77.950	98.120
Group 17	40.51	8.20	5.55	2.82	0.87	8	57.950	78.205	78.205	98.460
Group 18	40.61	8.20	5.55	2.82	0.87	8	58.050	78.355	78.355	98.660
Group 19	40.72	8.20	5.55	2.82	0.87	8	58.160	78.520	78.520	98.880
Group 20	40.84	8.20	5.55	2.82	0.87	8	58.280	78.700	78.700	99.120
Group 21	41.01	8.20	5.55	2.82	0.87	8	58.450	78.955	78.955	99.460
Group 22	41.11	8.20	5.55	2.82	0.87	8	58.550	79.105	79.105	99.660
Group 23	41.22	8.20	5.55	2.82	0.87	8	58.660	79.270	79.270	99.880
Group 24	41.34	8.20	5.55	2.82	0.87	8	58.780	79.450	79.450	100.120
Group 25	41.51	8.20	5.55	2.82	0.87	8	58.950	79.705	79.705	100.460

# Indicates an apprenticeable craft. Effective as of July 1, 2008, the determination, issuance and publication of the prevailing wage apprentice schedules/apprentice wage rates have been reassigned by the Department of Industrial Relations from the Division of Labor Statistics and Research to the Division of Apprenticeship Standards. To obtain any apprentice schedules/apprentice wage rates, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.
[a] Includes an amount withheld for supplemental dues.
[b] Training amount is $0.65.
[c] For classifications within each group, see pages 26 and 27.
[d] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.
[e] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

NOTE: For Special Shift and Multi-Shift, please see pages 27A and 27B.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Holiday provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/DLSR/PWD. Travel and/or subsistence requirements for each craft, classification or type of worker may be obtained from the Prevailing Wage Unit at (415) 703-4774.

DETERMINATION: **SD-23-63-3-2009-2**

GROUP 1
Bargeman
Brakeman
Compressor Operator
Ditch Witch, With Seat Or Similar Type Equipment
Elevator Operator – Inside
Engineer-Oiler
Generator Operator
Generator, Pump Or Compressor Plant Operator
Heavy Duty Repairman Helper
Pump Operator
Signalman
Switchman

GROUP 2
Asphalt-Rubber Plant Operator (Nurse Tank Operator)
Concrete Mixer Operator - Skip Type
Conveyor Operator
Fireman
Hydrostatic Pump Operator
Oiler Crusher (Asphalt Or Concrete Plant)
PJU Side Dump Jack
Rotary Drill Helper (Oilfield)
Screening and Conveyor Machine Operator (or Similar Types)
Skiploader (Wheel Type Up To ¾ Yd. Without Attachment)
Tar Pot Fireman
Temporary Heating Plant Operator
Trenching Machine Oiler

GROUP 3
Asphalt-Rubber Blend Operator
Skid Steer (Loader)
Equipment Greaser (Rack)
Ford Ferguson (With Dragtype Attachments)
Helicopter Radioman (Ground)
Stationary Pipe Wrapping And Cleaning Machine Operator

GROUP 4
Asphalt Plant Fireman
Backhoe Operator (Mini-Max Or Similar Type)
Boring Machine Operator
Boring System Electronic Tracking Locator
Boxman Or Mixerman (Asphalt Or Concrete)
Chip Spreading Machine Operator
Concrete Cleaning Decontamination Machine Operator
Concrete Pump Operator (Small Portable)
Drilling Machine Operator, Small Auger Types (Texoma Super Economatic, Or Similar Types - Hughes 100 Or 200, Or Similar Types - Drilling Depth Of 30' Maximum)
Excavator Track/Rubber Tired (Operating weight under 21,000 lbs)
Guard Rail Post Driver Operator
Highline Cableway Signalman
Horizontal Directional Drilling Machine
Hydra-Hammer-Aero Stomper
Micro Tunneling Operator (Above Ground Tunnel)
Power Concrete Curing Machine Operator
Power Concrete Saw Operator
Power - Driver Jumbo Form Setter Operator
Power Sweeper Operator
Rock Wheel Saw/Trencher
Roller Operator (Compacting)
Screed Operator (Asphalt Or Concrete)
Trenching Machine Operator (Up To 6 Ft.)
Vacuum or Muck Truck

GROUP 5 (for multi-shift rate, see page 27-B)
Equipment Greaser (Grease Truck / Multi-Shift)

GROUP 6
Articulating Material Hauler
Asphalt or Concrete Plant Engineer
Batch Plant Operator
Bit Sharpener
Central Batch Plant – Cement Silo
Concrete Joint Machine Operator (Canal And Similar Type)
Concrete Planer Operator
Dandy Digger
Deck Engine Operator
Deck Engineer
Derrickman (Oilfield Type)
Drilling Machine Operator, Bucket Or Auger Types (Calweld 100 Bucket Or Similar Types - Watson 1000 Auger Or Similar Types - Texoma 330, 500 Or 600 Auger Or Similar Types - Drilling Depth Of 45' Maximum)
Drilling Machine Operator (Including Water Wells)
Equipment Greaser (Grease Truck)
Hydrographic Seeder Machine Operator (Straw, Pulp Or Seed) / Jackson Track Maintainer, Or Similar Type / Kalamazoo Switch Tamper, Or Similar Type
Machine Tool Operator
Maginnis Internal Full Slab Vibrator
Mechanical Berm, Curb Or Gutter (Concrete Or Asphalt)
Mechanical Finisher Operator (Concrete, Clary-Johnson-Bidwell Or Similar)
Micro Tunnel System Operator (Below Ground)
Pavement Breaker Operator - Truck Mounted
Road Oil Mixing Machine Operator
Roller Operator (Asphalt Or Finish)
Rubber-Tired Earth Moving Equipment (Single Engine, Up To And Including 25 Yds. Struck)
Self-Propelled Tar Pipelining Machine Operator
Skiploader Operator (Crawler And Wheel Type, Over ¾ Yd. And Up To And Including 1 ½ Yds.)
Slip Form Pump Operator (Power Driven Hydraulic Lifting Device For Concrete Forms)
Tractor Operator - Bulldozer, Tamper-Scraper (Single Engine, Up To 100 H.P. Flywheel And Similar Types, Up To And Including D-5 And Similar Types)
Tugger Hoist Operator (1 Drum)
Ultra High Pressure Waterjet Cutting Tool System Operator
Vacuum Blasting Machine Operator
Volumetric Mixer Operator
Welder – General

GROUP 7 (for multi-shift rate, see page 27-B)
Welder - General (Multi-Shift)

GROUP 8
Asphalt Or Concrete Spreading Operator (Tamping Or Finishing)
Asphalt Paving Machine Operator (Barber Greene Or Similar Type)
Asphalt-Rubber Distributor Operator
Backhoe Operator (Up To And Including ¾ Yd.) Small Ford, Case Or Similar
Backhoe Operatior (Over ¾ yd and up to 5 cu. yds. M.R.C.)
Cast In Place Pipe Laying Machine Operator
Combination Mixer And Compressor Operator (Gunite Work)
Compactor Operator - Self Propelled
Concrete Mixer Operator – Paving
Crushing Plant Operator
Drill Doctor
Drilling Machine Operator, Bucket Or Auger Types (Calweld 150 Bucket Or Similar Types - Watson 1500, 2000, 2500 Auger Or Similar Types – Texoma 700, 800 Auger Or Similar Types - Drilling Depth Of 60' Maximum)
Elevating Grader Operator
Excavator Track/Rubber Tired (Operating weight 21,000 lbs-100,000 lbs)
Global Positioning System/GPS (or technician)
Grade Checker
Gradall Operator
Grouting Machine Operator
Heavy Duty Repairman
Heavy Equipment Robotics Operator
Kalamazoo Balliste Regulator Or Similar Type
Kolman Belt Loader And Similar Type
Le Tourneau Blob Compactor Or Similar Type
Loader Operator (Athey, Euclid, Sierra And Similar Types)
Master Environmental Maintenance Mechanic
Ozzie Padder or Similar Types
P.C. 490 Slot Saw
Pneumatic Concrete Placing Machine Operator (Hackley-Presswell Or Similar Type)
Pumpcrete Gun Operator
Rotary Drill Operator (Excluding Caison Type)
Rubber-Tired Earth Moving Equipment Operator (Single Engine, Caterpillar, Euclid, Athey Wagon, And Similar Types With Any And All Attachments Over 25 Yds. And Up To And Including 50 Cu. Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator (Multiple Engine – Up To And Including 25 Yds. Struck)
Rubber-Tired Scraper Operator (Self-Loading Paddle Wheel Type - John Deere, 1040 And Similar Single Unit)
Self-Propelled Curb And Gutter Machine Operator
Shuttle Buggy
Skiploader Operator (Crawler And Wheel Type Over 1½ Yds. Up To And Including 6½ Yds.)
Soil Remediation Plant Operator (CMI, Envirotech or Similar)
Soil Stabilizer and Reclaimer
Somero SXP Laser Screed
Surface Heaters And Planer Operator
Tractor Compressor Drill Combination Operator
Tractor Operator (Any Type Larger Than D-5 - 100 Flywheel H.P. And Over, Or Similar - Bulldozer, Tamper, Scraper And Push Tractor, Single Engine)
Tractor Operator (Boom Attachments)
Traveling Pipe Wrapping, Cleaning And Bending Machine Operator

DETERMINATION: **SD-23-63-3-2009-2**

Trenching Machine Operator (Over 6 Ft. Depth Capacity, Manufacturer's Rating)
Trenching Machine with Road Miner Attachment (Over 6 Ft. Depth Capacity, Manufacturer's Rating – Oiler or Journeyman-Trainee required)
Ultra High Pressure Waterjet Cutting Tool System Mechanic
Water Pull (compaction)

GROUP 9 (for multi-shift rate, see page 27-B)
Heavy Duty Repairman (Multi-Shift)

GROUP 10
Backhoe Operator (Over 5 cu. yds. M.R.C.)
Drilling Machine Operator, Bucket Or Auger Types (Calweld 200 B Bucket Or Similar Types - Watson 3000 Or 5000 Auger Or Similar Types – Texoma 900 Auger Or Similar Types - Drilling Depth Of 105' Maximum)
Dual Drum Mixer
Dynanic Compactor LDC 350 or Similar types
Heavy Duty Repairman-Welder Combination
Monorail Locomotive Operator (Diesel, Gas Or Electric)
Motor Patrol - Blade Operator (Single Engine)
Multiple Engine Tractor Operator (Euclid And Similar Type – Except Quad 9 Cat.)
Pneumatic Pipe Ramming Tool and Similar Types (4" and above)
Pre-Stressed Wrapping Machine Operator
Rubber -Tired Earth Moving Equipment Operator (Single Engine, Over 50 Yds. Struck)
Rubber -Tired Earth Moving Equipment Operator (Multiple Engine, Euclid, Caterpillar And Similar - Over 25 Yds. And Up To 50 Yds. Struck)
Tower Crane Repairman
Tractor Loader Operator (Crawler And Wheel-Type Over 6½ Yds.)
Welder - Certified
Woods Mixer Operator (And Similar Pugmill Equipment)

GROUP 11 (for multi-shift rate, see page 27-B)
Heavy Duty Repairman-Welder Combination (Multi-Shift)
Welder-Certified (Multi-Shift)

GROUP 12
Auto Grader Operator
Automatic Slip Form Operator
Backhoe Operation (Over 7 cu. yds. M.R.C.)
Drilling Machine Operator, Bucket Or Auger Types (Calweld, Auger 200 CA Or Similar Types - Watson, Auger 6000 Or Similar Types-Hughes Super Duty, Auger 200 Or Similar Types - Drilling Depth Of 175' Maximum)
Excavator Track/Rubber Tired (Operating weight 100,000 lbs-200,000 lbs)
Hoe Ram Or Similar With Compressor
Mass Excavator Operator - Less Than 750 Cu. Yds.
Mechanical Finishing Machine Operator
Mobile Form Traveler Operator
Motor Patrol Operator (Multi-Engine)
Pipe Mobile Machine Operator
Rubber-Tired Earth Moving Equipment Operator (Multiple Engine, Euclid, Caterpillar And Similar Type, Over 50 Cu. Yds. Struck)
Rubber-Tired Self-Loading Scraper Operator (Paddle-Wheel-Auger Type Self Loading-Two Or More Units)

GROUP 13
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Single Engine, Up To And Including 25 Yds. Struck)

GROUP 14
Canal Liner Operator
Canal Trimmer Operator
Remote Controlled Earth Moving Equipment Operator ($1.00 Per Hour Additional To Base Rate)
Wheel Excavator Operator (Over 750 Cu. Yds. Per Hour)

GROUP 15
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Single Engine, Caterpillar, Euclid, Athey Wagon, And Similar Types With Any And All Attachments Over 25 Yds. And Up To And Including 50 Cu. Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Multiple Engine - Up To And Including 25 Yds. Struck)

GROUP 16
Excavator Track/Rubber Tired (Operating weight exceeding 200,000 lbs)
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Single Engine, Over 50 Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Multiple Engine, Euclid, Caterpillar And Similar, Over 25 Yds. And Up To 50 Yds. Struck)

GROUP 17
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Push-Pull System (Multiple Engine, Euclid, Caterpillar And Similar Type, Over 50 Cu. Yds. Struck)
Tandem Tractor Operator (Operating Crawler Type Tractors In Tandem - Quad 9 And Similar Type)

GROUP 18
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Single Engine, Up To And Including 25 Yds. Struck)

GROUP 19
Rotex Concrete Belt Operator (Or Similar Type)
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Single Engine, Caterpillar, Euclid, Athey Wagon, And Similar Types With Any And All Attachments Over 25 Yds. And Up To And Including 50 Cu. Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Multiple Engine, Up To And Including 25 Yds. Struck)

GROUP 20
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Single Engine, Over 50 Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Multiple Engine, Euclid, Caterpillar And Similar, Over 25 Yds. And Up To 50 Yds. Struck)

GROUP 21
Rubber-Tired Earth Moving Equipment Operator, Operating In Tandem (Scrapers, Belly Dumps, And Similar Types In Any Combination, Excluding Compaction Units - Multiple Engine, Euclid, Caterpillar And Similar Type, Over 50 Cu. Yds. Struck)

GROUP 22
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Tandem Push-Pull System (Single Engine, Up To And Including 25 Yds. Struck)

GROUP 23
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Tandem Push-Pull System (Single Engine, Caterpillar, Euclid, Athey Wagon, And Similar Types With Any And All Attachments Over 25 Yds. And Up To And Including 50 Cu. Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With Tandem Push-Pull System (Multiple Engine, Up To And Including 25 Yds. Struck)

GROUP 24
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Tandem Push-Pull System (Single Engine, Over 50 Yds. Struck)
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The With The Tandem Push-Pull System (Multiple Engine, Euclid, Caterpillar And Similar, Over 25 Yds. And Up To 50 Yds. Struck)

GROUP 25
Concrete Pump Operator-Truck Mounted
Pedestal Concrete Pump Operator
Rubber-Tired Earth Moving Equipment Operator, Operating Equipment With The Tandem Push-Pull System (Multiple Engine, Euclid, Caterpillar And Similar Type, Over 50 Cu. Yds. Struck)

Miscellaneous provisions:

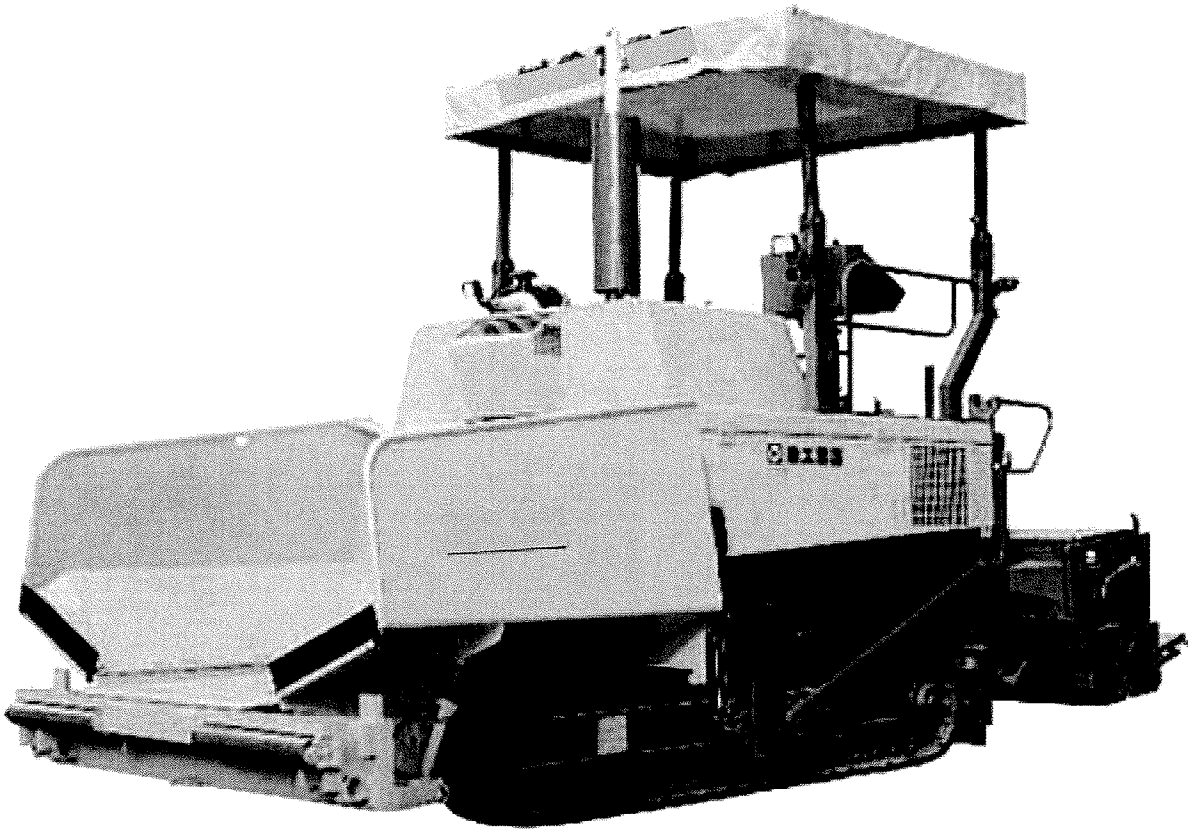
1. Operators on hoists with three drums shall received fifteen cents (15¢) per hour additional pay to the regular rate of pay. The additional pay shall be added to the regular rate and become the base rate for the entire shift.
2. All heavy duty repairmen and heavy duty repairman-welder combination shall receive fifty cents (50¢) per hour tool allowance in addition to their regular rate of pay and this shall become their base rate of pay.
3. Employees required to suit up and work in a hazardous material environment, shall receive Two Dollars ($2.00) per hour in addition to their regular rate of pay; and that rate shall become the basic hourly rate of pay.

State of California
Business, Transportation, and Housing Agency

Department of Transportation
Division of Construction

Labor Surcharge and Equipment Rental Rates

(Cost of Equipment Ownership)



Effective April 1, 2010 through March 31, 2011

Caltrans

Caltrans Metric

USER'S GUIDE
FOR LABOR SURCHARGE AND EQUIPMENT RENTAL RATES
April 1, 2010 - March 31, 2011

Equipment Rental Rates are available on the Internet at:

http://www.dot.ca.gov/hq/construc/equipmnt.html

Miscellaneous Equipment Rental Rates are available on the Internet at:

http://www.dot.ca.gov/hq/construc/misceqrr/index.htm

The miscellaneous listing is updated daily.

Changes

Books are no longer available in hard copy and should be downloaded from the internet and printed.
Changes to the equipment rates in the April 1, 2010 book are the result of: 1) fuel costs decreased; 2) interest rates decreased; 3) Producers' Price Index increased; 4) no change in sales tax; and 5) no change in freight (F.O.B.) rates.

Labor Surcharge

The labor surcharge compensates the contractor for statutory payroll items stipulated by various governmental agencies. The six items included are Workers' Compensation, Social Security, Medicare, Federal Unemployment, State Unemployment, and State Training taxes. The general rate is an average of the job classifications common to Caltrans projects. Changes to the labor surcharge in the April 1, 2010 book were the result of an increase in Worker's Compensation rates. The rates were derived from using the pure premium rate approved by the Insurance Commissioner effective January 1, 2010 and increasing it by the historical statewide average expense. In the calculation of the labor surcharge for overtime work, the Worker's Compensation is not included on the premium portion of overtime, as provided by Worker's Compensation regulations.

The surcharge percentage to be applied to the actual wages paid as provided in Section 9-1.03A(1b) of the Standard Specifications will **be 11 percent for regular time (RT)** and **11 percent for overtime (OT)**.

Exceptions to the general rate are listed below. The classifications were chosen because of very high Workers' Compensation Insurance costs. Questions, regarding worker's compensation rating and proper labor surcharge usage, will be forwarded to the rental rate personnel in the Division of Construction.

EXCEPTIONS

Type of Work Performed	Labor Surcharge Percent	
	RT	OT
Concrete Construction - Bridge	14	13
Drilling	16	14
Fence & Guardrail Construction	13	12
Erection of structural metal for metal bridges, excluding sign bridge	15	14
Landscape Gardener	11	11
Mobil Crane & Hoist Service	14	13
Painting Steel Structures or Bridges	16	14
Pile Driving, not including drilled, cast-in-place concrete piles	13	12
Sign Erection or Repair	15	14
Wrecking & Demolition	13	12

For work that is determined by the Engineer to be covered by Longshoreman and Harbor Worker's Act, an appropriate labor surcharge will be established by the Division of Construction.

Background

By the authority described in Standard Specifications Section 9-1.03A, compensation for extra work is determined to be the total of the direct equipment costs (rental rate) plus a 15 percent markup for all overhead not included as direct costs. The direct costs include fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance, depreciation, storage, cost of facilities capital, overhaul and all incidentals. The labor costs required to provide the above listed items are also included. The operator cost is not included in the equipment rate.

The calculated rate represents the cost of owning and operating the equipment, which is likely to be lower than the rate charged by a rental yard. The rental yard rate may include additional overhead and profit as well as a premium for short-term rentals. In certain situations, factors are applied to the calculated rates to provide ownership-only rates for delay situations or operating-only rates for overtime situations. The rates are calculated using factors for the direct cost items described above. The factors represent an average and are applied to all makes and models of equipment within the class. **All rates are hourly, unless stated otherwise.**

Overtime and Multiple Shifts

Certain equipment costs are fixed on an annual basis, no matter how many hours are worked. Once an estimate of the costs and hours of use is made, a rate can be determined. When more than the estimated number of hours are worked (Overtime or Multiple Shift), a duplication of payment occurs on the fixed cost portion of the equipment rate.
In order to avoid this duplication, Caltrans uses a reduced rate for the Overtime or Multiple Shift situations. The definition of the Overtime or Multiple Shift periods will be:

Overtime hours occur after the equipment has worked at force account, eight hours per day (or after the daily equivalent of forty hours per week for special work schedules - 4/10 or 9/80). Multiple shift hours will be paid at the same rate as overtime hours.

The hours shown on the Daily Extra Work Bill will determine when the Overtime and Multiple Shift is to be used. **When the hours worked on force account are eight or less, straight time rates will be used**. When the hours worked on force account are more than eight, Overtime and Multiple Shifts rates will be used. Saturday, Sunday or holiday work will be paid at the overtime rate except in those cases where these days are considered working days in the special provisions.

Be advised the computed overtime rates are no longer rounded and now equal the product of the straight time rate and overtime factor. The Overtime and Multiple Shift Factors are recalculated annually to reflect changes in the operating costs.

APPENDIX S

TENTATIVE WASTE DISCHARGE REQUIREMENTS AND MONITORING AND REPORTING PROGRAM ORDER NO. R9-2009-004

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

TENTATIVE ORDER NO. R9-2009-004

WASTE DISCHARGE REQUIREMENTS
FOR THE
GREGORY CANYON LTD.
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY

The California Regional Water Quality Control Board, San Diego Region (hereinafter Regional Board), finds that:

1. **DISCHARGER.** Gregory Canyon Limited, hereinafter the Discharger, a California limited liability company, submitted a Joint Technical Document ("JTD") containing a Report of Waste Discharge (ROWD) dated June 4, 2003, and applied for waste discharge requirements to construct and operate the Gregory Canyon Landfill, a new municipal solid waste landfill having a design capacity of 46 million cubic yards (or 31.1 million tons). The JTD was deemed complete on March 1, 2005.

2. **FACILITY LOCATION.** The Gregory Canyon Landfill will be located in Sections 4 and 5, T10S, R2W; and Sections 32 and 33, T9S, R2W from the San Bernardino Baseline Meridian (SBB&M). The site is located approximately three miles east of Interstate 15, and two miles southwest of the community of Pala, California. A location map is provided in **Attachment No. 1** to this Order.

3. **WASTE DESCRIPTION.** Wastes proposed to be disposed at the Gregory Canyon Landfill include: putrescible and non-putrescible solid and semi-solid wastes, commercial waste, industrial wastes, construction and demolition wastes, treated wood, sewage sludge, contaminated soil, decommissioned waste, and other nonhazardous or inert waste.

4. **THREAT TO WATER QUALITY.** Municipal solid wastes (MSW), and their degradation products (e.g., landfill gases), contain a wide variety of inorganic and organic constituents in concentrations that present a significant threat to water quality in the San Luis Rey River watershed, if those wastes are not properly managed by the Discharger.

5. **LEGAL AUTHORITY.** This Order is issued pursuant to the California Water Code (Division 7 commencing with §13000) and implements the: (1) federal Resource Conservation and Recovery Act (RCRA), including regulations found in the Code of Federal Regulations, Title 40, Part 258 (hereinafter CFR Title 40, Part 258) adopted by the U.S. Environmental Protection Agency (USEPA) implementing requirements of RCRA Subtitle

D; (2) regulations and policies adopted by the State Water Resources Control Board (SWRCB) in California Code of Regulations (CCR) Titles 23 and 27, and SWRCB Resolution No. 93-62; and (3) applicable provisions of the California Health and Safety Code Division 20, Chapter 6.5 (Hazardous Waste Control).

6. **LOCAL HYDROGEOLOGY.** The overall direction of groundwater flow within Gregory Canyon is to the north, toward the alluvial aquifer and surface waters in the San Luis Rey River. The local hydrogeology of Gregory Canyon includes an alluvial aquifer and a fractured bedrock aquifer.

   a. **Alluvial Aquifer.** In the lower area of Gregory Canyon, a thin veneer of unconsolidated residual soils, colluvial, and alluvial deposits covers a substrate of weathered tonalite. Topsoils vary in thickness from six inches to three feet and are composed of silty sand, silty sand with clay, and silty sand with cobbles and boulders.

   b. **Fractured Bedrock Aquifer.** The upper area of Gregory Canyon is comprised of two distinct bedrock units:

      i. An upper weathered bedrock unit that contains weathered igneous rocks (*i.e.*, tonalite and leucogranodiorite); and

      ii. An underlying unweathered fractured bedrock unit that contains fractured igneous rocks (*i.e.*, tonalite and leucogranodiorite) forming the basement rock of most of the canyon.

7. **GROUNDWATER USE.** Approximately 17 domestic wells and 31 irrigation wells are located within one mile of the Gregory Canyon Landfill. The majority of irrigation wells are located in the alluvial basin of the San Luis Rey River where orchards exist in Rice and Couser Canyons.

8. **COMPLIANCE WITH FEDERAL SITING REQUIREMENTS.** The CFR Title 40, Part 258, Subparts B, D and E contain applicable location restrictions, design criteria, and water quality monitoring requirements, respectively, for the Gregory Canyon Landfill. The location of the Gregory Canyon Landfill is not restricted pursuant to the location restrictions of CFR Title 40 Part 258, Subpart B.

9. **CLASSIFICATION OF UNIT.** The Gregory Canyon Landfill is classified as a Class III Waste Management Unit (WMU) based on the geologic siting criteria and construction standards, in accordance with CCR Title 27 §20240 and §20260.

10. **CONTAINMENT STRUCTURE.** As a containment structure, construction of a double composite liner, a primary leachate collection and removal system (LCRS), secondary LCRS, and a subdrain is reasonable and appropriate for the protection of water quality.

a. **DOUBLE COMPOSITE LINER.** The JTD includes the following design for a double composite liner system at the Gregory Canyon Landfill:

Bottom Liner Design (from top to bottom)

(i). Minimum 24-inch thick protective soil cover layer (operations layer)
(ii). 12 ounce non-woven geotextile
(iii). 12-inch thick primary LCRS gravel layer (including a dendritic leachate collection piping system)
(iv). 16 ounce non-woven geotextile
(v). 80-mil high density polyethylene (HDPE) geomembrane (textured on both sides)
(vi). Non-woven geosynthetic clay liner (GCL)
(vii). 60-mil HDPE geomembrane (textured on both sides)
(viii). 16 ounce non-woven geotextile
(ix). 9-inch minimum thickness gravel or equivalent secondary leak detection/drainage layer (including a dendritic leachate collection piping system)
(x). 16 ounce non-woven geotextile
(xi). 60-mil HDPE geomembrane (textured on both sides)
(xii). 24 -inch thick layer of low hydraulic conductivity material (less than 1×10^{-7} cm/sec)
(xiii). 12 ounce non-woven geotextile

Sideslope Liner Design (from top to bottom)

(i). Minimum 24-inch thick protective soil cover layer (operations layer)
(ii). 16 ounce non-woven geotextile
(iii). 80-mil HDPE geomembrane (single-sided textured, textured side down)
(iv). Non-woven GCL
(v). 60-mil HDPE geomembrane (textured on both sides)
(vi). 24 -inch thick layer of low hydraulic conductivity material (less than 1×10^{-7} cm/sec)

b. **PRIMARY LEACHATE COLLECTION AND RECOVERY SYSTEM (LCRS) – BOTTOM.** The primary LCRS will be comprised of a one-foot thick continuous gravel blanket (constructed above a 16 ounce non-woven geotextile overlying the 80-mil bottom

geomembrane textured on both sides) and an integrated dendritic network of 6 inch slotted HDPE drainage pipes made up of lateral collectors and a mainline pipe to convey the leachate from the WMU to the leachate collection sump. The LCRS conveyance pipes will be placed in V-shaped trenches filled with gravel and constructed within the top of the liner system. To minimize the potential for clogging and bio-fouling, 85 percent of the gravel will be larger than the diameter of the perforations in the pipe.

c. **PRIMARY LEACHATE COLLECTION AND RECOVERY SYSTEM (LCRS) – SIDESLOPES.** The LCRS for the sideslopes will be comprised of gravel pipe collectors wrapped with a geotextile filter fabric placed on the interior benches along the slopes. Slotted HDPE pipe will be placed on the interior benches to allow for collection of leachate and conveyance of the liquid to the LCRS mainlines. The bench piping system will be connected to the bottom area LCRS network. The dendritic laterals and bench collection LCRS piping will convey the leachate into a mainline down the center of the landfill.

d. **SECONDARY LCRS.** The secondary LCRS will be comprised of a 9 inch thick continuous gravel blanket (constructed above a 16 ounce non-woven geotextile overlying the 60-mil bottom geomembrane textured on both sides) and an integrated dendritic network of 4 inch slotted HDPE drainage pipes. The secondary LCRS will also function as a leak detection system, and an engineered alternative to the prescriptive requirements for vadose zone monitoring pursuant to CCR Title 27 §20415(d). The proposed leak detection/drainage layer located between the upper and lower composite liner systems is intended to transmit any liquid in the layer by gravity to the LCRS tank by way of an inspection/sampling sump. Leachate collected in the LCRS tank will be transported off-site for treatment and disposal.

e. **SUBDRAIN SYSTEM.** The subdrain system will be placed beneath the composite liner and will consist of a one-foot thick gravel blanket and gravel filled trenches with slotted collector pipes in the floor areas. The subdrain system helps to ensure long-term integrity of the engineered liner system, by providing adequate separation between the bottom of the double composite liner system and the groundwater beneath the WMU. Groundwater collected in the subdrain would be discharged to one of the two 10,000 gallon above ground storage tanks for the Gregory Canyon Landfill.

Since the design capacity of the subdrain system greatly exceeds the storage capacity for water collected from the subdrain, a

requirement that the Discharger develop a contingency plan for testing and management of volumes of groundwater in excess of 10,000 gallons in one day is reasonable and appropriate for this Order. The groundwater collected in the subdrain will be treated at the landfill (as necessary) prior to discharge or transported offsite for disposal.

11. **OPERATIONS LAYER.** The operations layer for the Gregory Canyon Landfill will consist of a maximum two-foot thick sand or soil layer. The operations layer is placed over the liner system to provide protection of the double composite liner system against any damage *i.e.*, by puncture, from the disposal of municipal solid waste, and provide long-term protection for the LCRS against clogging (due to the accumulation of fine grained soils).

12. **BORROW/STOCKPILE SOILS:** Excavated colluvium and weathered bedrock will be stockpiled for use during the operation and closure of the landfill in Borrow/Stockpile Areas A and B (shown on **Attachment No. 2** to this Order). Slope stability analyses for these two areas resulted in calculated static factors of safety ranging between 1.5 and 1.9 for six critical cross-sections. These values equal or exceed the factor of safety of 1.5 required under CCR Title 27. The management of borrow/stockpile soils includes two components:

    a. Borrow/Stockpile Area A is approximately 22 acres and will be located west of the WMU footprint and will be excavated to depths ranging between 10 to 65 feet below the existing ground surface. Approximately 1.3 million cubic yards (mcy) of soil will be excavated and stockpiled in Borrow/Stockpile Area A. Area A will be graded to promote proper drainage and re-vegetated with native plant species. The JTD indicates that the material in Borrow/ Stockpile Area A will not be used again until operational year 25 when it will be used for daily cover.

    b. Borrow/Stockpile Area B is approximately 65 acres and will be located immediately southwest and adjacent to the WMU footprint. Borrow/Stockpile Area B will drain southwest into a natural drainage course. A desilting basin will be constructed at the western end of Borrow/Stockpile Area B to minimize the flow of silt from the borrow/stockpile area. Approximately 3.2 mcy of soil will be stored in Borrow/Stockpile Area B.

    Construction and operation of the borrow/stockpile areas, including the drainage facilities, will be conducted in accordance with the Best Management Practices (BMPs) developed as part of the Storm Water Pollution Prevention Plan (SWPPP).

13. **ALTERNATIVE DAILY COVER:** Approximately 8.4 mcy of soil will be available for use as on-site cover, leaving a shortfall of 4.3 mcy over the life of the project, including final closure. This shortfall will be offset by the use of Alternative Daily Cover (ADC). ADC will be used at the Gregory Canyon Landfill to reduce refuse-to-daily/intermediate cover ratios from 4:1 to 7:1. Geosynthetic blankets will be used initially in conjunction with soil. Geosynthetic blankets will be used as specified in CCR Title 27 §20690(b)(1).

14. **CONTINGENCY WATER TREATMENT SYSTEM:** The purpose of the contingency water treatment system is to provide a groundwater treatment facility in the event of a release of waste constituents from the Unit. The contingency water treatment system will consist of a granulated active carbon (GAC) system and a reverse osmosis (RO) system. The GAC system will treat volatile organic constituents and will consist of an influent tank, a pre-filtration system, two 2,000-pound GAC vessels and an effluent surge tank. The GAC system is expected to operate under pressure and treated water will be transferred directly to an effluent surge tank or an effluent transfer pump. The treated effluent will then be pumped to a 50-gallon per minute RO system that will remove total dissolved solids and/or volatile organic constituents (VOCs). Treated water will be stored in a tank and may be used on-site or discharged to the San Luis Rey River. Brine from the RO system will be collected in a tank and hauled offsite to an appropriate facility for disposal.

15. **INDUSTRIAL AND CONSTRUCTION STORM WATER DISCHARGES:** The Discharger has prepared a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the requirements of Order No. 1997-03-DWQ, National Pollutant Discharge Elimination System (NPDES) Permit No. CAS000001 (General Permit), *Waste Discharge Requirements (WDRs) for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities* and Order No. 1999-08-DWQ National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, *Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity.* A copy of the SWPPP is attached to this Order, but is expected to be amended pursuant to Order Nos. 1997-03-DWQ and 1999-08-DWQ whenever there is a change in operations which may affect the discharge of pollutants to waters of the United States as required by that Permit.

16. **STORM WATER CONVEYANCE SYSTEM:** The storm water conveyance system is in compliance with precipitation and drainage control requirements contained in CCR Title 27 §20365. The system for the Gregory Canyon Landfill consists of:

    a. A surficial conveyance system that collects and conveys storm water from undisturbed areas. The system for conveying water from

undisturbed areas will collect and convey run-on from the surrounding areas as well as runoff from the undisturbed areas within the WMU footprint. This system will consist of above-ground perimeter drainage channels (*i.e.,* the eastern and western perimeter channels) and energy dissipaters; and

b. A subsurface conveyance system that collects and conveys storm water from the disturbed areas of the WMU. The storm water conveyance system for the disturbed area will include deck and slope area grading, earthen berms, and downdrains designed to discharge into buried perimeter drainage pipes, which empty to the desilting basins.

c. Two desilting basins to be located east and west of the ancillary facilities. The desilting basins are designed to control the rate of storm water discharge and the amount of silt/fines discharged from the facility. Both of the desilting basins (east and west basins) will discharge directly into the San Luis Rey River.

17. **GROUNDWATER DETECTION MONITORING LIMITATIONS.** Groundwater monitoring must comply with the performance requirements of CCR Title 27 [as required by CCR Title 27 §20415(b) and §20420(b)] and CFR Title 40 Part 258 [§258.51(a)(2)] for detecting a release/discharge of waste constituents from the WMU into the groundwater within the fractured rock aquifer.

18. **SURFACE WATER MONITORING LIMITATIONS.** The surface water monitoring network must comply with the applicable performance requirements [CCR Title 27, §20415(c)(2)(B)], in particular, the requirement that the system provides the "best assurance of the earliest possible detection of a release from the Unit".

19. **REPLACEMENT WATER CONTINGENCY PLAN.** Development by the Discharger of a contingency plan to provide replacement water to all private and public well owners, and other parties affected by the release of wastes or waste constituents from the WMU is appropriate because:

a. There will always be some level of uncertainty associated with detecting a release from the WMU (**Finding 17** of this Order), by the Detection Monitoring Program that must comply with applicable State [CCR Title 27 §20415(b)(1)(B) and §20420(b)] and federal [CFR Title 40 §258.51(a)(2)] performance standards for groundwater detection monitoring systems at MSW landfills.

b. The San Luis Rey River watershed contains sensitive beneficial uses of groundwater.

c. The groundwater resources in the Pala Basin (HSA 903.21) may qualify for designation as a "sole source aquifer" (Basin Plan page 4-102); although the Regional Board is not currently aware of a formal designation being made by the USEPA.

d. The San Luis Rey Municipal Water District, the City of Oceanside, and the County Water Authority have plans and objectives for the long-term groundwater development in the San Luis Rey watershed.

20. **WATER QUALITY CONTROL PLAN.** The **Water Quality Control Plan for the San Diego Basin (9)** (hereinafter Basin Plan), was adopted by this Regional Board on September 8, 1994, and subsequently approved by the SWRCB on December 13, 1994. Subsequent revisions to the Basin Plan have also been adopted by the Regional Board and approved by the SWRCB. The Basin Plan designates beneficial uses, narrative and numerical water quality objectives, and waste discharge prohibitions that are applicable to the discharges regulated under this Order.

21. **BENEFICIAL USES AND WATER QUALITY OBJECTIVES.** The Gregory Canyon Landfill is located in the Pala Hydrologic Subarea (903.21) of the Monserate Hydrologic Area (HA 903.20) of the San Luis Rey River watershed. The Basin Plan establishes the designated beneficial uses of surface water and groundwater resources (see Tables 2-2 and 2-5 in the Basin Plan),and the applicable water narrative and numeric water quality objectives (see Chapter 3 in the Basin Plan) for the protection of beneficial uses of water resources in the Pala Hydrologic Subarea.

22. **CALIFORNIA ENVIRONMENTAL QUALITY ACT.** On May 31, 2007, the County of San Diego certified a Revised Final Environmental Impact Report (consisting of the 2003 Draft EIR and the Revised Partial EIR) for the Gregory Canyon Landfill in accordance with the California Environmental Quality Act (CEQA) Public Resources Code §21000 *et seq.*).[1] The County of San Diego is the lead agency for purposes of CEQA. The Regional Board is a responsible agency for purposes of CEQA. Consistent with CEQA Guidelines section 15096, the Regional Board has considered the EIR prepared by the County of San Diego and has considered the environmental impacts of the project. The EIR did not identify any significant effect on the environment with respect to water quality. The EIR stated that the Discharger must comply with waste discharge requirements issued by the Regional Board. Because the EIR did not identify significant environmental impacts with respect to water quality, the CEQA Guidelines do not require the Regional Board to make findings under CEQA Guidelines section 15091. This Order requires

[1]The EIR has been challenged in court, but is now a final document. See Staff Report for details about the court proceedings.

compliance with all applicable water quality requirements, including Title 27 CCR Division 2 and the Basin Plan and compliance with those requirements will be protective of water quality. The project as approved by the Regional Board will not have a significant impact on water quality.

23. **FINANCIAL ASSURANCES.** The Discharger is required and intends to comply with applicable financial assurance requirements of CCR Title 27 §22112(a) by ensuring that the funds associated with the financial assurances, established pursuant to **Provision H.4** of this Order, can be made directly available to the Regional Board when it finds that the Discharger has failed or refuses to implement closure, post-closure monitoring and maintenance, or corrective actions in response to a reasonable foreseeable release from the Gregory Canyon Landfill. Financial assurance instruments that do not provide the Regional Board direct access to funds are unacceptable.

24. **ANNUAL FEES.** The discharge of waste or waste constituents into groundwater or surface waters could cause the long-term loss of the designated/actual municipal and domestic (MUN), and agricultural (AGR) beneficial uses of water resources. The Gregory Canyon Landfill is ranked as Threat to Water Quality (TTWQ) category "1". The complexity (CPLX) ranking is established at category "B", which is the complexity ranking required for Class III landfills (per factors established in CCR Title 23 §2200). As an operating/active unit, the Gregory Canyon Landfill is required to pay annual fees (tipping fees) pursuant to the Public Resources Code §48000 *et seq.* and shall not be required to pay the annual fee imposed pursuant to subdivision (d) of §13260 of the Water Code (or CCR Title 23 §2200) for the same discharge.

25. **WATER QUALITY CERTIFICATION.** Where the construction of the waste management unit (*i.e.*, landfill) is subject to requirements of the federal Clean Water Act §404, the project is also subject to the Clean Water Act §401 - Water Quality Certification standard.

    a. Pursuant to 33 CFR § 323.2, the term "discharge of fill material" means the addition of fill material into waters of the United States (U.S.). The term generally includes, without limitation, the following activities: Placement of fill that is necessary for the construction of any structure in a water of the United States; the building of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection and/or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments; beach nourishment; levees; fill for structures such as sewage treatment facilities, intake and outfall

pipes associated with power plants and subaqueous utility lines; and artificial reefs."

b. Gregory Canyon, Ltd. submitted an application for 401 Water Quality Certification on September 29, 2005 for the discharge of fill material (3 bridge piers) to surface waters of the U.S. (San Luis Rey River). The project will result in the discharge of fill into 0.370-acre surface waters of the U.S. as follows:

Surface waters of the U.S. – San Luis Rey River	Permanent Impacts (Acre)	Temporary Impacts (Acre)	Total Impacts (Acre)
Vegetated surface waters (Southern willow scrub)	0.002	0.368	0.370

c. Pursuant to the Water Code §13050(d), waste "includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers of whatever nature prior to, and for purposes of, disposal ". The discharge of dredged or fill material may constitute a discharge of waste that could affect the quality of waters of the State.

d. Pursuant to the Water Code §13050(e), waters of the State is defined as "any surface water or groundwater, including saline waters, within the boundaries of the State."

e. The Corps of Engineers has determined the ephemeral stream in the bottom of Gregory Canyon is not a surface water of the U.S. Waters of the U.S. is a subset of waters of the State. The Regional Board has determined that the ephemeral stream in the bottom of Gregory Canyon is considered (non-Federal) surface waters of the State.

f. Gregory Canyon, Ltd. submitted an Application/Report of Waste Discharge on September 29, 2005 for discharge of waste (a landfill and associated infrastructure) to surface waters of the state. The project will result in the discharge of waste into 0.955-acre surface waters of the state as follows:

Surface waters of the State –	Permanent and Temporary Impacts (Acre)
Vegetated surface waters (Southern willow scrub)	0.030
Vegetated surface waters (disturbed Southern willow scrub)	0.400
Vegetated surface waters (Cottonwood-willow riparian forest)	0.200
Open channel	0.200
Ephemeral stream (Gregory Canyon stream)	0.125
Total Impacts to surface waters of the State	0.955

g. The mitigation for proposed project impacts will consist of restoration and enhancement of 4.0 acres of surface waters of the U.S. and the state, consisting of 3.2-acres of Southern willow scrub and 0.8-acre of cottonwood-willow riparian forest in the nearby San Luis Rey River floodplain (Pala hydrologic subarea 903.21). The overall mitigation ratio will be 3.02:1 (mitigation to impacts).

h. Measures to mitigate for impacts to water quality and beneficial uses resulting from the placement of fill in surface waters of the state are contained in Section F. Fill Specifications of this Order.

i. The *Restoration and Enhancement Plan* dated May 23, 2008 (prepared by URS and submitted by Gregory Canyon Ltd.) proposes measures to compensate for impacts to surface waters of the U.S. and/or State associated with the discharge of fill and waste material.

j. This Order specifies waste discharge requirements (WDRs) that are necessary to adequately address impacts to water quality standards resulting from the filling of surface waters of the U.S. and/or State, to meet the objectives of the State Wetlands Conservation Policy (Executive Order W-59-93), and to accommodate and require appropriate changes over implementation of the project and its construction.

k. The Discharger has avoided and minimized impacts to surface waters of the U.S. consistent with the requirements of the Basin

Plan, and has offered compensatory mitigation in accordance with the State Wetlands Conservation Policy (Executive Order W-59-93). The project, as described in this Order, will not result in State Water Quality Standards being exceeded.

l. Adoption of this Order acts as Clean Water Act §401 Water Quality Certification (Certification No. 05C-095) that the proposed discharge from the Gregory Canyon Landfill will comply with the applicable provisions of sections 301 ("Effluent Limitations"), 302 ("Water Quality Related Effluent Limitations"), 303 ("Water Quality Standards and Implementation Plans"), 306 ("National Standards of Performance"), and 307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the applicants' project description and (b) on compliance with all applicable requirements of the Regional Board's Basin Plan.

26. **RECYCLED WATER.** The proposed project will make use of recycled water consistent with the goals of Water Code, Division 7, Chapter 7, Water Recycling Law, and with the standards, policies, and regulations established in the Basin Plan for the achievement of water quality objectives.

27. **LOCAL AGENCY APPROVAL.** The Regional Board has not been notified [pursuant to CCR Title 27 §21720(d)][2] that all requisite approvals from all local agencies with jurisdiction to regulate land use, solid waste disposal, air pollution, and to protect public health have approved use of the site for discharges of waste to land.

28. **WATER RESOURCE FACTORS.** The Regional Board has considered all water resource related environmental factors associated with the discharge of wastes associated with the Gregory Canyon Landfill.

29. **PUBLIC PARTICIPATION.** The Regional Board has notified interested agencies, and all interested parties known to the Regional Board, of its intent to prescribe WDRs and Section 401 Water Quality Certification for the Gregory Canyon Landfill.

    a. On May 19, 2005, the Regional Board convened a public workshop to acquire public input regarding the Gregory Canyon Landfill. In

[2] WDRs for new Units shall not be effective until the Regional Board is notified that all local agencies with jurisdiction to regulate land use, solid waste disposal, air pollution, and to protect public health have approved use of the site for discharges of waste to land [CCR Title 27 § 21720(d)].

addition, the Regional Board has complied with the applicable public participation requirements of CCR Title 27, §21730.

b. In a public hearing convened on October 14, 2009, the Regional Board in a public meeting heard and considered all public comments pertaining to the Gregory Canyon Landfill.

IT IS HEREBY ORDERED, that Gregory Canyon Ltd. (hereinafter Discharger) shall comply with the following:

A. PROHIBITIONS

1. The discharge of waste shall not:

   a. Cause the occurrence of coliform or pathogenic organisms in waters of the state;

   b. Cause the occurrence of objectionable tastes and odors in waters of the state;

   c. Cause waters of the state to foam;

   d. Cause the presence of toxic materials in waters of the state;

   e. Cause the pH of waters of the state to fall below 6.0 or rise above 9.0;

   f. Cause this Regional Board's objectives for waters of the state, as established in the Basin Plan, to be exceeded; or

   g. Cause pollution, contamination or nuisance or adversely affect beneficial uses of waters of the state as established in the Basin Plan.

2. Odors, vectors, landfill gas/vapors, and other nuisances of waste origin that occur beyond the limits of the landfill property boundary are prohibited.

3. The discharge of wastes shall not create conditions that violate any waste discharge prohibitions in the Basin Plan.

4. The discharge of waste to areas of the Gregory Canyon Landfill without a prescriptive liner or engineered alternative liner, except as authorized by WDRs or the terms described in Water Code §13264, is prohibited.

5. The discharge of wastes, which have the potential to reduce or impair the integrity of the containment structure or which, if commingled with other wastes, could produce violent reactions, heat or pressure, fire or explosion, toxic byproducts, or reaction products are prohibited.

6. The discharge of the following wastes into the Gregory Canyon Landfill is prohibited:

   a. The discharge of any hazardous wastes, as defined in CCR Title 22, Division 4.5.

   b. The discharge of liquid or semi-solid waste (*i.e.*, waste containing less than 50 percent solids) other than dewatered sewage or water treatment sludge as described in CCR Title 27 §20220(c).

   c. The disposal of designated wastes, as defined by Water Code §13173 and CCR Title 27 §20210, unless otherwise authorized by this Order.

   d. The disposal of wastes containing greater than one percent (>1%) friable asbestos.

   e. The disposal of shredded automobile bodies, household appliances, and sheet metals (shredder waste).

   f. The disposal of containerized liquids.

   g. The disposal of decommissioned material/wastes from decommissioned sites into Class III and unclassified WMUs.

   h. The disposal of any other waste that fails to satisfy the conditions prescribed in Sections B and C of this Order.

7. The discharge of waste shall not exceed the acreages, volumes, and locations specified in Finding Nos. 25.b, 25.f, and 25.g.

8. The project shall not cause significant adverse impacts upon the quality of surface waters in a local, state, or federal wildlife preserve or sanctuary, or other surface waters of significant local, regional, statewide, or national importance.

B. GENERAL DISCHARGE SPECIFICATIONS[3]

[3] For wastes other than recycled water

1. The discharge of wastes shall not cause the concentration of any Constituent of Concern or Monitoring Parameter to exceed its respective background value in any monitored medium at any Monitoring Point.

2. Only nonhazardous wastes and inert wastes as defined in CCR Title 27 §20220 and §20230 may be discharged into the WMU.

3. The discharge of wastes shall be confined to the designated disposal area, underlain by the liner system prescribed by **Landfill Construction Specification E.6** of this Order.

4. The Discharger is responsible for accurate characterization of wastes [in compliance with CCR Title 27 §20200(c)], including: determinations of whether or not wastes will be compatible with containment features and other wastes, and whether or not wastes are required to be managed as hazardous wastes under CCR Title 22, Division 4.5 §66300 *et seq.*

5. The discharge of solid waste containing free liquid or moisture shall not cause the moisture holding capacity of the WMU to be exceeded.

C. DISCHARGE SPECIFICATIONS FOR SPECIFIC TYPES OF WASTE

1. **TREATED WOOD.** The Discharger shall manage and dispose of treated wood in accordance with all requirements of California Health and Safety Code §25143.1.5 and §25150.7.

2. **SEWAGE SLUDGE.** Unless the California Department of Toxic Substances Control (DTSC) determines that the waste must be managed as a hazardous waste, dewatered sludge disposed into the WMU shall contain at least 20 percent solids (by weight) if primary sludge, or at least 15 percent solids if secondary sludge, mixtures of primary and secondary sludge, or water treatment sludge. A minimum solids-to-liquid ratio of 5:1 by weight shall be maintained to ensure that the co-disposal will not exceed the initial moisture holding capacity of the non-hazardous solid waste [per CCR Title 27 §20220(c)].

3. **LANDFILL LEACHATE AND CONDENSATE.** The discharge of leachate or landfill gas condensate must comply with CCR Title 27 §20340(g), CFR Title 40 §258.28, and the following conditions:

   a. The landfill gas condensate or leachate is being returned to the WMU that produced it; and

   b. Any discharge of leachate or landfill condensate wastes must be into a WMU that is equipped with a prepared foundation/subgrade

and waste containment system meeting the requirements of **Landfill Construction Specifications E.5 and E.6** of this Order.

4. **CONTAMINATED SOILS.** The discharge of contaminated soils at the WMU shall comply with the following:

   a. Samples of waste soils shall be collected in accordance with sampling guidelines set forth in the 1996 edition of *"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, SW-846"*, USEPA. At a minimum, for quantities of soil less than or equal to 500 cubic yards, four samples shall be collected per 100 cubic yards of waste soil. For quantities of soil between 500 to 5,000 cubic yards, an additional sample shall be collected for every 500 cubic yards.

   b. Waste soils may be utilized for daily landfill cover if approved for such use by the appropriate agencies.

   c. All soil wastes received for disposal at the Gregory Canyon Landfill must be certified as California non-hazardous pursuant to the criteria found in CCR Title 22, Division 4.5.

   d. The Gregory Canyon Landfill may accept soil wastes containing the following waste constituents: petroleum hydrocarbons, organic and inorganic compounds, metals, and pesticides, which could pose a threat to water quality if discharged in an uncontrolled manner. In addition, those waste soils must also meet all of the following criteria for disposal at the WMU:

      (1) Soil wastes, containing concentrations of metals and pesticides, organic and inorganic compounds, shall not exceed the applicable hazardous waste classifications as determined using the waste extraction test (WET) (per CCR Title 22 §66261.24, as amended).

      (2) Soil wastes, containing non-hazardous concentrations of metals, pesticides, organic and inorganic compounds, shall not exceed maximum concentrations of contaminants using the Toxicity Characteristic Leaching Procedure (TCLP) analysis (per CCR Title 22 §66261.24, as amended).

      (3) The concentrations of metals in wastes discharged into the WMU shall be below the applicable threshold concentrations for non-hazardous wastes established in Division 4.5 of CCR Title 22.

(4) The maximum concentration levels for waste soils containing non-hazardous concentrations of pesticides, and organic and inorganic compounds are contained in **Attachment Nos. 3 and 4** to this Order and shall be used to determine if waste soils containing the above-referenced constituents are acceptable for disposal.

(5) The following maximum concentration limits shall be used to determine if waste soils containing petroleum hydrocarbons are acceptable for disposal into the Unit.

Petroleum Hydrocarbon Contaminant	**Maximum Concentration Limits**	
Gasoline and lighter end hydrocarbons (C_4 -C_{12})	1,000 ppm TPH	1,000 -5,000 ppm TPH w/RCI and 96 hour bioassay
Diesel fuel, Kerosene Oil, Jet Fuel, (C_8-C_{22}) heavy end hydrocarbons	3,000 ppm TPH	3,000 -15,000 ppm TPH w/RCI and 96 hour bioassay
Hydraulic Oil, Cutting and Grinding Oil, Virgin Motor Oil, Waste Oil (C_8-C_{40} heavy end hydrocarbons)	3,000 ppm TRPH	3,000 -15,000 ppm TPH w/RCI and 96 hour bioassay

ppm = in units of mg/kg
TPH - Total Petroleum Hydrocarbon
TRPH - Total Recoverable Petroleum Hydrocarbon
RCI - Hazardous Waste Criteria for Reactivity, Corrosivity, Ignitability and 96-Hour Acute Bioassay as established by CCR 22

e. Test Methods for Waste Soils Containing Petroleum Hydrocarbons:

The following test methods shall be performed for waste soils containing Petroleum Hydrocarbons:

Petroleum Constituent	TPH (8015B) Gas	TPH (8015B Diesel	TRPH (EPA 418.1)	BTEX (8021B)	Lead (TCLP)	Metals (Cd, Cr, Pb, Ni, Zn), OX, and PCBs	Semi-Volatile Organics (8270C or EPA 625)	Volatile organics (8260B)	Metals (CAM 17), and PCBs
Leaded Gasoline	■			■	■				
Unleaded gasoline	■			■	*				
Kerosene Oil		■		■					
Jet Fuel		■		■					
Diesel Fuel		■		■					
Hydraulic Oil		■	■	■		■			
Cutting and Grinding Oil		■	■	■		■			
Virgin Motor Oil		■	■	■			■		
Waste Oil		■	■	■			■	■	■

BTEX – Benzene, Toluene, Ethylbenzene and Xylene
PCBs- Polychlorinated Biphenyls
* with documentation that only unleaded gas was historically on site

f. Test Methods for Waste Soils Containing Metals and Pesticides

The analyses can include, but are not limited to, the following methodologies:

418.1 (TRPH)
6010 (CAM 17 metals)
7420 (Organic lead)
8015B (Nonhalogenated Volatiles)
8021B (Aromatic and halogenated volatiles)
8081 (Chlorinated pesticides)
8082 (Polychlorinated biphenyls)
8151A (herbicides)
8260B (Volatile Organics - VOC)
8270C (Semi-VOCs)
TCLP Analysis (8 RCRA metals)

5. **RECYCLED WATER.** The discharge and use of recycled water at the Gregory Canyon Landfill shall comply with the following conditions:

a. All recycled water shall be treated in conformance with all applicable provisions of CCR, Title 22, Division 4, Chapter 3 (Water Recycling Criteria) by a Recycled Water Agency regulated with WDRs and, at a minimum, meet disinfected secondary-23 recycled water standards as prescribed by §60307(b).

b. The discharge of recycled water containing waste constituents in excess of the following effluent limitations is prohibited:

Discharge Specifications Based on Groundwater Quality Objectives

Constituent	Units	12-Month Average[a]
Total Dissolved Solids	mg/L	900
Chloride	mg/L	300
Sulfate	mg/L	500
Nitrate Nitrogen (as NO_3)	mg/L	15
Iron	mg/L	0.3
Manganese	mg/L	0.03

[a] The 12-month average effluent limitation shall apply to the arithmetic mean of the results of all samples collected during the current calendar month and the preceding 11 calendar months.

c. Prior to providing recycled water to a new use site, the Discharger shall arrange for a complete cross-connection shut down test performed by a certified cross-connection specialist of the San Diego County Department of Environmental Health (DEH) in the presence of an adequately trained and qualified designated use site supervisor. This cross-connection shut down test shall be conducted to ensure that the use site is adequately supplied with recycled water and supervised by a qualified staff.

d. The Discharger shall designate a recycled water supervisor who is responsible for the proper installation, operation, and maintenance of the recycled water system; the prevention of potential hazards; and preservation of the recycled water distribution system plans in "as built" form. Designated recycled water supervisors shall obtain instruction in the use of recycled water from an institution approved by the California Department of Public Health and DEH. Additional guidance regarding recycled water supervisor responsibilities and instruction requirements is provided in Attachments 17 and 18 of the *Recycled Water Plan Check and Inspection Manual* developed by the DEH, which are incorporated herein by reference.

e. All recycled water storage facilities shall be protected against erosion, overland runoff, and other impacts resulting from a 100-year, 24-hour frequency storm.

f. All recycled water storage facilities owned and/or operated by recycled water users shall be protected against 100-year frequency peak stream flows as defined by the San Diego County Flood Control District.

g. Irrigation with disinfected tertiary recycled water shall not take place within 50 feet of any domestic water supply well and/or storage of recycled water within 100 feet of any domestic water supply well unless approved by the Department of Public Health.

h. Impoundment of disinfected tertiary recycled water shall not occur within 100 feet of any domestic water supply well.

i. Irrigation with, or impoundment of, disinfected secondary-2.2 or disinfected secondary-23 recycled water shall not take place within 100 feet of any domestic water supply well.

j. Irrigation with, or impoundment of, undisinfected secondary recycled water shall not take place within 150 feet of any domestic water supply well.

k. Recycled water facilities shall be operated in accordance with best management practices (BMPs) to prevent direct human consumption of reclaimed water and to minimize misting, ponding, or runoff. BMPs shall be implemented that will minimize both public contact and discharge onto areas not under customer control.

l. All windblown spray and surface runoff of recycled water applied for irrigation onto property not owned or controlled by the Discharger or reclaimed water user shall be prevented by implementation of BMPs.

m. Irrigation with recycled water shall be during periods of minimal human use of the service area. Consideration shall be given to allow an adequate dry-out time before the irrigated area will be used by the public.

n. All drinking fountains located within the approved use area shall be protected by location and/or structure from contact with recycled water spray, mist, or runoff. Protection shall be by design, construction practice, or system operation.

o. Facilities that may be used by the public, including but not limited to eating surfaces and playground equipment, and located within the approved use areas, shall be protected to the maximum extent possible by siting and/or structure from contact by irrigation with recycled water spray, mist, or runoff. Protection shall be by design, construction practice, or system operation.

p. Spray irrigation with recycled water, other than disinfected tertiary recycled water, shall not take place within 100 feet of the property line of a residence or a place where public exposure could be similar to that of a park, playground, or school yard.

q. All use areas where recycled water is used and that are accessible to the public shall be posted with conspicuous signs, in a size no less than 4 inches by 8 inches, that include the following wording and picture in a size no less than 4 inches high by 8 inches wide: "RECYCLED WATER - DO NOT DRINK". The sign(s) shall be of a size easily readable by the public. The prescribed wording should also be translated into Spanish and other appropriate languages and included in the required signs.

r. No physical connection shall be made or allowed to exist between any recycled water system and any separate system conveying potable water.

s. The recycled water piping system shall not include any hose bibs. Quick couplers that are different from that used on the potable water system may be used.

t. The public water supply shall not be used as a backup or supplemental source of water for a recycled water system unless the connection between the two systems is protected by an air gap separation which complies with the requirements of §7602(a) and §7603(a) of CCR Title 17 and the approval of the public water system has been obtained. If a "Swivel-ell" type connection is used it must be used in accordance with the provisions of the Department of Public Health Policy Memo 95-004. Approved backflow prevention devices shall be provided, installed, tested, and maintained by the recycled water user in accordance with the applicable provisions of CCR Title 17, Division 1, Chapter 5, Subchapter 1, Group 4, Article 2.

u. All recycled water piping and appurtenances in new installations and appurtenances in retrofit installations shall be colored purple or distinctively wrapped with purple tape in accordance with Chapter 7.9, §4049.54 of the Health and Safety Code.

v. Any backflow prevention device installed to protect the public water system shall be inspected and maintained in accordance with §7605 of CCR Title 17.

D. LANDFILL OPERATION SPECIFICATIONS

1. **METHANE AND OTHER LANDFILL GASES.** Methane and other landfill gases shall be adequately vented, removed from the WMU, or otherwise controlled to prevent the danger of explosion, adverse health effects, nuisance conditions, or the impairment of beneficial uses of water due to migration of waste constituents through the vadose (unsaturated) zone.

2. **LOAD CHECKING PROGRAM.** The Discharger shall implement an approved load checking program in compliance with CCR Title 27 §20870, at the Gregory Canyon Landfill.

3. **WATER USE.** Water used for facility maintenance shall be limited to the minimum volume necessary for dust control and shall only be applied: a) by spraying; b) on covered areas and not on trash; and c) in quantities not to exceed those necessary to reduce immediate dust hazards.

4. **VERTICAL SEPARATION.** The Discharger shall maintain at least 5 feet of vertical separation between the groundwater and waste material at all times.

5. **SURPLUS SOILS.** The discharge or placement of "surplus soils" (*e.g.*, stockpiled soils associated with landfill construction projects, used in landfill operations, or closure of a WMU) shall not cause or contribute to the failure of engineered slopes on cut or fill material, or natural ground, or create adverse impacts upon the integrity or performance of the WMU's foundation, liner system, waste containment structures, or the structures which control leachate, surface drainage, erosion or gas.

6. **SURFACE DRAINAGE.** The following measures shall be implemented to control surface drainage at the WMU:

   a. During the rainy season, the WMU shall be operated and graded to minimize infiltration of precipitation/surface drainage into the WMU, by implementing measures, including, but not limited to, limiting the working face of the landfill to one day of operation at a time. Any precipitation that falls on the working face of the landfill and comes in contact with the waste (contact water) shall be treated as leachate and discharged in accordance with Discharge Specification C.3.

   b. Non-contact surface water runoff within the boundary of the WMU (*i.e.*, precipitation that falls on the WMU) shall be collected by the storm water conveyance system and discharged to the desiltation basins.

   c. Annually, prior to the anticipated rainy season but no later than **October 31**, the Discharger shall implement any necessary erosion control measures, and shall complete any necessary construction, maintenance, or repairs of precipitation and drainage control facilities to prevent erosion, ponding, flooding, or to prevent surface drainage from contacting or percolating through wastes at the WMU. This specification shall not preclude the Discharger from performing maintenance, and repairs necessitated by changing site conditions at any time during the rainy season. By **January 30** of each year, the Discharger shall submit an annual report describing measures taken to comply with this specification.

   d. Surface drainage from outside of the WMU shall be diverted from the Unit via the perimeter storm drain system.

e. Precipitation and drainage control facilities shall be constructed and maintained to effectively divert sheet flow runoff laterally, or via the shortest distance, into the drainage and collection facilities.

f. The Discharger shall not allow the accumulations of surface water (*i.e.,* ponding) or accumulations of groundwater, to cause or contribute to adverse impacts upon the integrity or performance of the WMU's foundation, liner system, or the structures which control leachate, surface water drainage, erosion, or landfill gas.

g. Sediments shall be removed from the desiltation basins whenever the volume of the basin has been reduced by 25 percent of the basin's design capacity.

7. **EROSION CONTROL.** The following measures shall be implemented at the WMU to control erosion:

a. The Discharger must implement and maintain the following Construction BMPs as proposed in the *Storm Water Pollution Prevention Plan for Gregory Canyon Landfill (GCLF).*

b. The Discharger must implement and maintain the following post-construction BMPs as proposed in the *Storm Water Management Plan for GCLF, dated September 22, 2008.*

c. Post-construction BMPs must be installed and functional prior to planned use of project areas.

d. At the time maintenance responsibility for post-construction BMPs is legally transferred, the Discharger must submit to the Regional Board a copy of such documentation.

e. At the time maintenance responsibility for post-construction BMPs is legally transferred, the Discharger must provide the transferee with a copy of a long-term BMP maintenance plan that complies with manufacturer specifications.

f. The Discharger assumes responsibility for the inspection and maintenance of all post-construction structural BMPs until such responsibility is legally transferred to another entity.

g. The Discharger or their designated party must inspect and maintain structural BMPs per the manufacturers' specifications, engineering design specifications, and in accordance with the most recent California Storm Water Quality Association guidance.

h. Where surface flows result in erosive flow velocities, erosion control material shall be used for protection of drainage conveyance features. Effective erosion control BMPs shall be implemented on interim bench ditches to control erosion when necessary.

i. Where high surface water flow velocities occur at terminal ends of downchutes or where downchutes cross the landfill cover access roads, effective erosion control, and surface water conveyance BMPs shall be implemented by the Discharger.

j. All areas, including surface drainage courses shall be maintained to minimize erosion.

k. The landfill cover shall be maintained to minimize percolation of liquids through wastes.

8. **LEACHATE COLLECTION AND REMOVAL SYSTEM**

a. The primary LCRS and secondary LCRS shall function without clogging throughout the active life of the WMU and the post-closure maintenance period. The Discharger shall perform annual testing of the primary LCRS, and secondary LCRS, to demonstrate proper operation. Results from the annual testing shall be compared with earlier tests made under comparable conditions [pursuant to CCR Title 27 §20340(d)].

b. Leachate production from the primary LCRS shall not exceed 85 percent of the design capacity of the primary LCRS or sump pump. If leachate generation exceeds this value,and/or if the depth of fluid in the LCRS sump exceed 24 inches, then the Discharger shall immediately cease the discharge of sludge and other high-moisture wastes to the landfill unit and shall notify the Regional Board in writing within **seven days**. Notification shall include a timetable for a corrective action necessary to reduce leachate production.

c. The depth of fluid in any LCRS sump shall be kept at or below six inches, the minimum needed to ensure efficient pump operation.

d. Landfill leachate shall be discharged to an appropriate onsite and/or offsite liquid waste management facility in compliance with all applicable federal, state and local requirements.

e. The Discharger shall collect and remove pumpable liquids in the secondary LCRS sumps to minimize the head on the bottom liner.

E. LANDFILL CONSTRUCTION SPECIFICATIONS

1. **PRECIPITATION AND DRAINAGE CONTROL.** At a minimum, the precipitation and drainage control system shall be constructed to accommodate precipitation from a 24-hour storm with a 100-year return frequency [per CCR Title 27 §20260(c) and Table 4.1: Title 27 - Construction Standards for Units]. All diversion and drainage facilities shall be designed, constructed and maintained to take into account the:

   a. Expected final contours for closed portions of Units including its planned drainage pattern;

   b. Drainage pattern for operating Units at any given time;

   c. Possible effects of the WMU's drainage pattern on and by the regional watershed; and

   d. Design capacity of the drainage systems of downstream and adjacent properties by providing for the gradual release of retained water downstream in a manner that does not exceed the expected peak flow rate at the point of discharge as if the WMU were not constructed.

2. **SUBDRAIN.** The bottom liner system of the WMU shall be underlain by a dendritic array of subdrain collection trenches lined with 12-ounce geotextile and filled with gravel. The gravel shall be designed to prevent clogging over the service life of the subdrain system and protect the integrity of the liner system during the operating life, closure and post-closure maintenance period of the WMU. The Discharger shall collect and test subdrain effluents for waste constituents and manage the effluent in compliance with all applicable federal, state and local requirements.

3. **LINER MATERIALS.** Materials used to construct liners shall have appropriate physical and chemical properties to ensure containment of discharged wastes over the operating life, closure, and post-closure maintenance period of the WMU.

4. **SLOPE STABILITY.** The following measures shall be implemented to maintain slope stability at the WMU:

   a. All landfill units, including the foundation, final slopes and containment systems, shall be designed and constructed to withstand the maximum credible earthquake (MCE) without damage to the foundation, waste containment structures, or to the structures which control leachate, surface drainage, erosion, or landfill gas.

b. All interim cut and/or fill slopes shall be designed, constructed and maintained to prevent adverse impacts upon the integrity or performance of the WMU's foundation, liner system, waste containment structures, or the structures which control leachate, surface drainage, erosion, or landfill gas.

c. The design of temporary cut and/or fill slopes shall be approved by a California registered civil engineer, or a certified engineering geologist [CCR Title 27 §20310(e)]. All temporary cut and/or fill slopes shall be designed, constructed and maintained to prevent slopes from adversely impacting the integrity or performance of the Unit's foundation, liner system, waste containment structures, or the structures which control leachate, surface drainage, erosion, or gas. All temporary slopes must comply with this specification throughout the range of weather and hydrogeological conditions experienced during the existence of the temporary slope.

d. The Discharger shall design, construct and maintain all containment structures so they are capable of containing wastes, waste constituents, and degradation products of wastes so as to prevent degradation of waters of the state, as a result of discharging waste into the WMU.

e. All final cut and fill slopes must be designed to have a minimum dynamic factor of safety of at least 1.5 or meet the alternative design requirements as required by CCR Title 27 §21750(f)(5).

f. The WMU slopes shall not exceed a horizontal-to-vertical ratio of 1.5:1, without benching, to ensure slope stability. Other areas with slopes greater than ten percent, surface drainage courses, and areas subject to erosion by wind or water shall be designed and constructed to prevent such erosion.

5. **FOUNDATION/SUBGRADE.** The following measures shall be implemented to maintain the integrity of the foundation/subgrade of the WMU:

a. The WMU shall have a foundation or base capable of providing support for the structures and capable of withstanding hydraulic pressure gradients to prevent failure or settlement, compression, or uplift and all effects of ground motions resulting from the MCE as certified by either a registered civil engineer or a certified engineering geologist in accordance with CCR 27 §20240(d).

b. The subgrade shall be rolled to a smooth and level surface. The surface of the subgrade shall be free of stones greater than 0.5-inch in diameter, organics and other deleterious material.

6. **LINER SYSTEM.** The following measures shall be implemented to maintain the integrity of the liner system at the WMU:

   a. **The engineered alternative liner used for sideslope areas** (*e.g.*, "steep" sections with gradients greater than 5:1) shall consist of the components contained in Finding 10.a of this Order. The GCL component shall be installed in a manner that ensures complete long-term coverage, including a minimum overlap of at least 24-inches (2 feet) with adjacent GCL panels, regardless of the effects of shrinkage or stretching of the GCL panels. The geomembranes (both 60-mil and 80-mil) shall provide complete coverage on the surface of the underlying liner system component.

   b. **The engineered alternative liner used for the bottom of the WMU** (and slopes with gradients less than 5:1) shall consist of the components contained in Finding 10.a of this Order. The GCL component shall be installed in a manner that ensures complete long-term coverage, including an adequate overlap with adjacent GCL panels, regardless of the effects of shrinkage or stretching of the GCL panels. The geomembranes (both 60-mil and 80-mil) shall provide complete coverage on the surface of the underlying liner system component.

   c. Pursuant to CCR Title 27 §20330(d), the Discharger shall ensure that the required liner system covers all natural geologic materials that are likely to be in contact with waste (including landfill gas or leachate).

   d. The Discharger shall ensure that the junction(s) between the bottom liner system components and sideslope liner system components (at the base of the slopes), the junction between the sideslope liner system and the anchor trenches/tie-downs (at the top of slopes), and junctions between adjacent panels of geosynthetic materials are constructed in a manner that do not:

      (1) Provide a pathway for the migration and release of wastes, waste constituents, or degradation products (leachate, landfill gas, *etc.*), or

      (2) Cause, threaten to cause or contribute to adverse impacts upon: WMU's ability to contain waste constituents, the integrity and performance of the WMU's foundation, liner system, or the structures which control leachate, surface water drainage, erosion or gas.

e. Geomembranes used in the liner system shall meet the following minimum performance requirements:

(1). Be designed and constructed to contain the fluid, including landfill gas, waste and leachate as required by CCR Title 27 §20240 and §20310), and limit the infiltration of liquid, to the greatest extent possible;

(2). Control landfill gas emissions;

(3). Be stable under the range of stresses and ambient environmental conditions at the site; and

(4). Have a service life that extends throughout the post-closure maintenance period and for as long as the wastes pose a potential threat to water quality.

7. **CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL.** The following measures shall be implemented to ensure that Title 27 construction quality assurance/quality control requirements are achieved:

a. The WMU containment structures shall be designed and constructed by or under the direct supervision of a California registered civil engineer, or a certified engineering geologist [CCR Title 27 §20324(b)(1) and §20310(e)], and shall be certified by that individual as meeting the prescriptive standards (except where exempt or approved as an engineered alternative design herein) and performance goals of Title 27. In the case of an engineered alternative, the registered civil engineer or certified engineering geologist must certify that the WMU has been constructed in accordance with approved plans and specifications. All design documents shall include a Construction Quality Assurance Plan (CQA Plan), for the purpose of:

(1) Demonstrating that the WMU has been constructed according to the specifications and plans approved by the Regional Board; and

(2) Providing quality control on the material and construction practices used to construct the WMU and prevent the use of inferior products and/or materials that do not meet the approved design plans and specifications.

b. Hydraulic conductivity of soils used in containment structures, as determined through laboratory methods (CCR Title 27 §20320), shall be confirmed using applicable field-testing methods (CCR Title 27 §20324 *et seq.*) and the results shall be submitted to the

Regional Board in a final CQA Report prior to the placement of waste.

c. After completing installation of a geomembrane component and the LCRS gravel, or LCRS gravel and operations layer, the Discharger shall:

(1) Complete an electrical leak location survey (ELLS), using it to check the integrity of all bottom and sideslope areas covered by the geomembrane component,

(2) Take necessary steps to identify and repair all defects located in the geomembrane component, and

(3) Include the results from the ELLS and any repairs to the geomembrane in the relevant CQA report including: text discussions of field activities, daily logs of defect repairs, results from all testing performed to assess the integrity of patches/repairs made to the geomembrane, separate site plot plan indicating location(s) of all defects/repairs performed for each geomembrane layer – these site plot plans shall be made to the same scale to facilitate comparison between geomembrane layers, and supporting photographs- of all defective areas and repairs made to the geomembrane component.

d. The Discharger must provide the Regional Board with an acceptable CQA Report including a technical demonstration that the proposed sideslope liner design can be constructed and remain stable and functional on the interior cut slopes of the WMU.

e. A technically qualified third party, independent of both the Discharger and the construction contractor, shall perform all the construction quality assurance monitoring and testing during the construction of the liner system. The third party shall certify that the liner system was constructed in compliance with all applicable plans and engineering specifications.

8. **LEACHATE COLLECTION AND REMOVAL SYSTEM.** The following measures shall be implemented to ensure proper construction of the primary and secondary LCRS for the WMU:

a. All containment systems shall include a LCRS that shall effectively convey all leachate that reaches the liner, to a lined sump or other lined collection area.

b. Materials used to construct the primary LCRS and secondary LCRS shall have appropriate physical and chemical properties, and strength to ensure the required transmission of leachate/liquid over the operational life of the WMU and throughout the post-closure maintenance period.

c. The primary LCRS shall be designed, constructed, and maintained to collect twice the anticipated daily volume of leachate generated by the WMU, and to ensure that there is no buildup of hydraulic head on the underlying liner [per CCR Title 27 §20340(c)].

d. The secondary LCRS must be capable of detecting, collecting and removing leaks of waste constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period. At a minimum, the Discharger shall ensure the secondary LCRS is:

(1) Constructed with a bottom slope of one percent or more,

(2) Constructed of granular drainage materials with a hydraulic conductivity of $1x10^{-2}$ cm/sec or more and a thickness of 9 inches (23 centimeters) or more;

(3) Constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated and of sufficient strength and thickness to prevent collapse under the pressure exerted by the overlying waste cover materials and equipment used at the landfill; and

(4) Constructed with sumps and liquid removal methods (e.g. pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method of measuring and recording the volume of liquids present in the sump and liquids removed.

e. The WMU shall be equipped with in-fill landfill gas extraction systems. Landfill gas shall also be removed from the primary LCRS and secondary LCRS when present at detectable levels.

9. **OPERATIONS LAYER.**

a. The Operations layer shall meet the following minimum requirements:

(1) Be free of debris, roots, scrap material, asphalt, concrete, vegetation, untreated refuse, and other deleterious, or objectionable material.

(2) Be comprised of gravel, sands, clays and/or silts and have a minimum lab permeability of 0.01 cm/s.

(3) May not contain asphalt, concrete, limestone or other material that could adversely react with landfill leachate.

b. A 12-ounce nonwoven geotextile fabric layer shall be installed over the primary LCRS gravel on the bottom, prior to placement of the operations layer.

10. **LANDFILL COVER.**

a. Units with intermediate cover (as defined in CCR Title 27 §20700), which have been/will be exposed for longer than two years from the time the intermediate cover was installed, shall have a minimum of two-feet of soil cover maintained over the landfill unit. All intermediate cover(s) shall be designed and constructed to minimize percolation of liquids through wastes pursuant to CCR Title 27 §20705.

b. The Discharger may use the following alternative daily covers (ADC) for the WMU, provided the use of ADC is approved by the LEA, and the use of that material does not create or contribute to conditions of pollution or nuisance:

(1) Geosynthetic blankets, or

(2) Processed green wastes.

c. The Discharger may propose the use of other ADC materials, pursuant to CCR Title 27 §20690 *et seq*. The Discharger must demonstrate that any proposed ADC materials meet the performance requirements of CCR Title 27 §20705(b) and the minimum requirements of CCR Title 27 §20705(e). The Regional Board and LEA must approve the use of any additional ADC, before the Discharger uses it at the Gregory Canyon Landfill.

F. FILL SPECIFICATIONS

1. The Discharger must fully implement the *Restoration and Enhancement Plan* prepared for Gregory Canyon Ltd. by URS, dated May 23, 2008.

2. The *Restoration and Enhancement Plan* must be consistent with Monitoring and Reporting Program No. R9-2008-017.

3. If mitigation areas do not meet their interim and/or ultimate success criteria, as defined within the *Restoration and Enhancement Plan*, the Discharger shall prepare remedial measures, acceptable to the Regional Board, to be fully implemented within one year following the determination that success criteria were not reached.

4. The Discharger shall provide certification no later than 10 days prior to the start of construction that personnel have been trained on the provisions and prohibitions of this Order as well as the management responsibilities detailed in each of the mitigation and monitoring plans.

5. Within 90 days of the issuance of this certification, the Discharger must provide the Regional Board a draft preservation mechanism (e.g. deed restriction, conservation easement, etc.) that will protect all mitigation areas and their buffers in perpetuity. Within one year of the issuance of this certification, the Discharger must submit proof of a completed preservation mechanism that will protect all mitigation areas and their buffers in perpetuity. Construction of the site must not be initiated until a completed preservation mechanism is received. The conservation easement, deed restriction, or other legal limitation on the mitigation property must be adequate to demonstrate that the site will be maintained without future development or encroachment on the site which could otherwise reduce the functions and values of the site for the variety of beneficial uses of waters of the U.S. that it supports. The legal limitation must prohibit, without exception, all residential, commercial, industrial, institutional, and transportation development, and any other infrastructure development that would not maintain or enhance the wetland and streambed functions and values of the site. The preservation mechanism must clearly prohibit activities that would result in soil disturbance or vegetation removal, other than the removal of non-native vegetation. Other infrastructure development to be prohibited includes, but is not limited to, additional utility lines, maintenance roads, and areas of maintained landscaping for recreation. The legal limitations shall be set forth in a land use covenant that indicates that the restrictions run with the land and may not be lifted without approval by the Regional Board and such covenant shall be recorded in the County of San Diego Recorder' s Office with notice to the Regional Board that it has been recorded.

6. The Discharger shall submit an as-built report within 60 days after complete installation of each restoration phase. The as-built report shall contain final grade and topography elevations, planted areas and palette.

7. The Discharger shall submit copies of all necessary approvals and/or permits for the project and mitigation projects from applicable government agencies, including, but not limited to, the California Department of Fish and Game, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers, prior to the start of clearing/grading.

G. CLOSURE AND POST-CLOSURE SPECIFICATIONS

1. The closure of the Gregory Canyon Landfill shall be in accordance with CCR Title 27 Chapter 3, Subchapter 5, Articles 1 and 2, §21710(d), and conducted by, or under the direct supervision of, a California registered civil engineer or certified engineering geologist.

2. At closure, the Gregory Canyon Landfill shall receive a final cover, which is designed and constructed to function with minimum maintenance, and consists of, at a minimum, a 2-foot thick foundation layer (which may contain waste materials), overlain by a 2-foot thick clay liner having a permeability of 1×10^{-6} cm/sec or less, overlain by a one-foot vegetation layer or an engineered equivalent final cover approved by the Regional Board pursuant to CCR Title 27 §20800(b) and (c).

3. At closure, the Gregory Canyon Landfill shall be graded to achieve a 3 percent grade on slopes and the cover shall be maintained to prevent ponding and infiltration.

4. Cover materials shall be graded to divert precipitation from the WMU, to prevent ponding of surface water over wastes, and to resist erosion as a result of precipitation events with a return frequency specified in this Order. Any drainage layer in the final cover shall be designed and constructed to intersect with the final drainage system for the Unit in a manner promoting free drainage from all portions of the cover [per CCR Title 27 §20365(f)].

5. The post-closure maintenance period shall continue until the Regional Board determines that remaining wastes in the WMU no longer have the potential to threaten water quality [CCR Title 27 §20950(a)(1)].

6. Vegetation used at the site shall be selected to require minimum irrigation and maintenance, and shall not impair the integrity of the landfill cover or containment structures, and meet the requirements of CCR Title 27, §21090(a)(3)(A)(1).

7. The Discharger shall comply with all applicable requirements of CCR Title 27, Subchapter 5, Article 2 for Closure and Post-Closure maintenance of the Gregory Canyon Landfill.

H. PROVISIONS

1. **GENERAL PROVISION.** The wastes discharged at the **Gregory Canyon WMU** shall not cause or contribute to a condition of pollution, contamination, or nuisance, as defined by §13050 of the Water Code.

2. **DUTY TO COMPLY.** Any noncompliance with this Order constitutes a violation of the Water Code and is grounds for: (a) enforcement action and (b) termination, revocation and re-issuance, or modification of this Order.

3. **CORRECTIVE ACTION.** The Discharger shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this Order, including such accelerated or additional monitoring as may be necessary to determine the nature and impact of the noncompliance.

4. **FINANCIAL ASSURANCES FOR CLOSURE, POST-CLOSURE AND CORRECTIVE ACTION.** Within **one year** of the effective date of this Order, the Discharger shall establish and maintain adequate and acceptable assurances of financial responsibility for closure, post-closure monitoring and maintenance, or implementation of corrective action in response to a release of waste constituents from the WMU.

   Initially, the Discharger shall establish financial assurances in the minimum amount of **$33,735,123**. The financial assurances shall cover the costs estimated for closure, post-closure maintenance, and corrective actions for reasonably foreseeable releases from the waste management units at the Gregory Canyon Landfill:

TASK	Estimated Cost	Source of Estimate
Closure	$20,681,897	JTD (2004) Volume 1, Page F.1-3
Post-Closure Maintenance and Monitoring	$8,219,910	JTD (2004), Volume 1, Page F.1-9
Corrective Actions for reasonably foreseeable releases	$4,833,316	JTD (2004), Volume 1, Page B.5-22
Total =	**$33,735,123**	

   The Discharger shall update the financial assurances, as necessary to ensure that adequate funds are available, to cover the cost of closure, post closure monitoring and maintenance, and corrective actions in response to a reasonably foreseeable release from the Gregory Canyon Landfill.

The Discharger shall ensure that their selected financial assurance instrument meets the following minimum criteria:

a. The financial assurance instrument names the Regional Board as beneficiary to ensure that funds are made directly available to the Regional Board upon a finding by the Regional Board that the Discharger has failed or refuses to implement closure, post-closure monitoring and maintenance, or conduct corrective actions in response to a release of waste constituents from the waste management unit.

b. The amount of the financial assurances are regularly updated, at least every five (5) years, to ensure that adequate funds can be made directly available to the Regional Board for implementation of closure, post-closure monitoring and maintenance, or corrective action.

When the Discharger notifies the Regional Board of a transfer of ownership (per **Provision H.7** and **Reporting Requirement I.7**), the notification shall include a proposed schedule for the succeeding owner to provide evidence of acceptable financial assurance responsibility to the Regional Board.

5. **PROPER OPERATION AND MAINTENANCE.** The Discharger shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with conditions of this Order. Proper operation and maintenance includes effective performance, adequate laboratory and process controls including appropriate quality assurance procedures.

6. **REVISION OF WASTE DISCHARGE REQUIREMENTS.** This Order may also be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this Order;

b. Obtaining this Order by misrepresentation or failure to disclose fully all relevant facts;

c. A change in any condition that requires a temporary or permanent modification, reduction, or elimination of the authorized discharge; or

d. A material change in the discharge of wastes into the WMU.

The filing of a request by the Discharger for the modification, revocation and reissuance, or termination of this Order or notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

7. **CHANGE IN OWNERSHIP.** This Order is not transferable to any person except after notice to the Regional Board. The Regional Board may require modification or revocation and re-issuance of this Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the Water Code. The Discharger shall submit notice of any proposed transfer of this Order's responsibility and coverage under **Reporting Requirement I.7.** The Discharger shall also inform the transferee of the status of the Dischargers' annual fee account.

8. **PROPERTY RIGHTS.** This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the Discharger from liability under federal, State, or local laws, nor create a vested right for the owner and operator to continue the regulated activity.

9. **ENTRY AND INSPECTION.** Under the authority of Water Code section 13267, the Discharger shall allow the Regional Board, or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:

   a. Enter upon the Discharger premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;

   b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;

   c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order;

   d. Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order or as otherwise authorized by the Water Code, any substances or parameters at any location; and

   e. To photograph or videotape any structures, facilities, activities, or other conditions that could result in adverse impacts to water quality and that are pertinent to compliance with this Order.

10. **REPOSITORY FOR WASTE DISCHARGE REQUIREMENTS.** A complete and correct copy of this Order shall be maintained at the facility, and shall be available to operating personnel at all times.

11. **SEVERABILITY.** The provisions of this Order are severable, and if any provision of this Order, or the application of any provision of this Order to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Order, shall not be affected thereby.

12. **REPLACEMENT WATER FOR WATER SUPPLY WELLS.** In the event of a release of waste constituents and/or waste degradation products from the WMU that affects beneficial uses of groundwater, the Discharger shall provide replacement water to all affected private and public well owners, and to all affected parties. The replacement water provided shall meet all applicable federal, State, and local drinking water standards, and shall have comparable quality to that pumped by the public water system or private well owner prior to the discharge of waste. The Discharger shall provide the Regional Board with a Water Replacement Contingency Plan **within 1 year** of completing construction of the waste containment features for Phase 1 of the WMU.

    Within **90-days** of determining that there has been a release of waste constituents or waste degradation products from the WMU, the Discharger shall amend the Water Replacement Contingency Plan to include:

    a. An updated list of local private and public well owners.

    b. A Public Participation Plan, including the following elements:

        (1) Methods to identify interested parties (including private parties, public agencies, and environmental groups), and to maintain an interested parties list to facilitate public participation.

        (2) Proposed methods and procedures to ensure adequate public notification of the release.

        (3) Proposed plans to inform and involve the public during the investigation of the nature and extent of the release and implementation of corrective actions.

        (4) Schedule for reporting implementation of public notification and public participation tasks to the Regional Board and updating the operating record for the facility.

    c. Proposed methods and schedules for:

(1) Testing potentially affected private and public water supply wells for waste constituents detected in the release.

(2) Identification of preferred methods to provide replacement water, including evaluation of importation of potable water, installation and maintenance of wellhead treatment systems, and other methods to provide affected parties with replacement potable water supplies.

(3) Reporting implementation of water replacement contingency actions to the Regional Board and updating the operating record for the facility.

13. **DISCHARGE OF DECOMMISSIONED MATERIALS.** A moratorium on the disposal of material from decommissioned sites into Class III and unclassified waste management units is established under Executive Order D-62-02. This moratorium shall remain in effect until both of the following conditions are satisfied:

a. Department of Public Health completes its assessment of the public health and environmental safety risks associated with the disposal of decommissioned materials and its regulations setting dose standards for decommissioning take effect; and,

b. The Regional Board rescinds Cleanup and Abatement Order No. R9-2002-0330.

14. **HAZARDOUS SUBSTANCES.** Except for a discharge which is in compliance with these waste discharge requirements, any person who, without regard to intent or negligence, causes of permits any hazardous substance, or sewage to be discharged in or on any waters of the state, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the state, shall as soon as (a) that person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, notify the Office of Emergency Services, the SWRCB or the Regional Board. This provision does not require reporting of any discharge of less than a reportable quantity as provided under §13271 subdivision (f) and (g), of the Water Code, unless the Discharger is in violation of a prohibition in the applicable Water Quality Control Plan [Water Code §13271(a)]. This provision does not authorize a violation of the Clean Water Act section 301 or Water Code section 13260.

15. **PETROLEUM RELEASES.** Except for a discharge which is in compliance with these waste discharge requirements, any person who, without regard to intent or negligence, causes of permits any petroleum

product to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall as soon as (a) that person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, notify the Office of Emergency Services, the SWRCB or the Regional Board. This provision does not require reporting of any discharge of less than 42 gallons, unless the discharge must be reported pursuant to §311 of the Clean Water Act or the discharge is in violation of a prohibition in the applicable Water Quality Control Plan [Water Code §13272]. This provision does not authorize a violation of the Clean Water Act section 301 or Water Code section 13260.

16. **HAZARDOUS WASTE EXCLUSION PROGRAM.** The Discharger shall implement a hazardous waste exclusion program pursuant to CCR Title 27 §20870 and CFR Title 40 §258.20, and comply with any additional load inspection requirements imposed by the LEA with jurisdiction over the facility.

17. **SECTION 401 WATER QUALITY CERTIFICATION.**

    a. Every certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code §13330 and CCR Title 23 §3867.

    b. Certification is not intended and shall not be construed to apply to any activity involving a hydroelectric facility and requiring a federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to CCR Title 23 §3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

    c. Certification is conditioned upon total payment of any fee required pursuant to CCR Title 23 §3833 and owed by the Discharger.

    d. The Discharger must, at all times, fully comply with the engineering plans, specifications and technical reports submitted to the Regional Board, to support this 401 Water Quality Certification and all subsequent submittals required as part of this certification. The conditions within this certification must supersede conflicting provisions within such plans submitted prior to the certification action. Any modifications thereto, would require notification to the Regional Board and reevaluation for individual WDRs and/or certification amendment.

e. The Discharger must, at all times, maintain appropriate types and sufficient quantities of materials onsite to contain any spill or inadvertent release of materials that may cause a condition of pollution or nuisance if the materials reach waters of the U.S. and/or state.

f. In response to a suspected violation of any condition of this certification, the Regional Board may require the holder of any permit or license subject to this certification to furnish, under penalty of perjury, any technical or monitoring reports the Regional Board deems appropriate, provided that the burden, including costs, of the reports must bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports.

g. In response to any violation of the conditions of this certification, the Regional Board may add to or modify the conditions of this certification as appropriate to ensure compliance.

h. Any proposed change in construction that may alter flow patterns and/or change the approved impact footprint is prohibited without Regional Board approval. Not later than 30 days prior to the beginning of any proposed change, the Discharger shall submit, acceptable to the Regional Board, detailed plans and specifications showing the proposed change in relationship to the approved project.

i. Discharges of concentrated flow during construction or after completion must not cause downstream erosion or damage to properties or stream habitat.

j. Water containing mud, silt, or other pollutants from equipment washing or other activities, must not be discharged to waters of the U.S. and/or the state or placed in locations that may be subjected to storm flows. Pollutants discharged to areas within a stream diversion area must be removed at the end of each work day or sooner if rain is predicted.

k. All surface waters, including ponded waters, must be diverted away from areas undergoing grading, construction, excavation, vegetation removal, and/or any other activity which may result in a discharge to the receiving water. Diversion activities must not result in the degradation of beneficial uses or exceedance of water quality objectives of the receiving waters. Any temporary dam or other artificial obstruction constructed must only be built from materials such as clean gravel which will cause little or no siltation.

Normal flows must be restored to the affected stream immediately upon completion of work at that location.

l. All areas that will be left in a rough graded state must be revegetated with native species no later than one week after completion of grading. The revegetation palette must not contain any plants listed on the California Invasive Plant Council Invasive Plant Inventory, which can be found online at http://www.cal-ipc.org/ip/inventory/weedlist.php.

m. All surface waters of the U.S. and state that are to be preserved shall be fenced no less than 10 days prior to the start of any project activities. A qualified biologist shall show all preservation areas to all appropriate construction personnel and shall explain the conditions of this Order and other permits regarding impacts.

n. The Discharger shall staff a qualified biologist on site during project construction to ensure compliance with the certification requirements. The biologist shall be given the authority to stop all work onsite if a violation occurs or has the potential to occur. No later than 30 days prior to the start of the project, the Discharger shall submit, acceptable to the Regional Board, the name(s) and qualification(s) of the qualified biologist(s) (defined as possessing a college degree in the biological sciences and at least 5 years restoration experience in southern California) responsible for compliance with the requirements of this Order.

o. The Discharger shall notify the Regional Board in writing at least 15 days prior to actual start dates for each project component (e.g., bridge construction, grading and filling Gregory Canyon Creek, installation of mitigation, etc.).

p. This Certification is valid only until the expiration of the associated U.S. Army Corps of Engineers Clean Water Act §404 individual and/or Nationwide permit.

18. **MITIGATION.**

a. The Discharger must fully implement the *Restoration and Enhancement Plan* prepared for Gregory Canyon Ltd. by URS, dated May 23, 2008.

b. The Restoration and Enhancement Plan must be consistent with Monitoring and Reporting Program No. R9-2009-0004.

c. The proposed mitigation must commence before impacts to waters of the State occur, and be completed no later than 9 months following the initial discharge of waste into waters of the State. Delays in implementing mitigation must be compensated by increased mitigation of 0.01-acre for each day of delay of commencement or completion.

d. The Discharger must notify the Regional Board in writing at least **5 days prior** to the actual commencement of mitigation installation, and completion of mitigation installation.

e. If mitigation areas do not meet their interim or ultimate success criteria (once established), as defined within the *Restoration and Enhancement Plan*, the discharger shall prepare remedial measures, acceptable to the Regional Board, to be fully implemented within one year following the Regional Board's determination that success criteria were not reached.

f. The Discharger shall provide certification no later than **5 days prior** to the start of construction that personnel have been trained on the provisions and prohibitions of this Order as well as the management responsibilities detailed in each of the mitigation and monitoring plans.

g. No later than **60 days following** the completion of the installation of the mitigation areas, the discharger shall submit final conservation easements or deed restrictions for all mitigation and preservation areas.

h. The Discharger shall submit an as-built report within **60 days after** complete installation of each restoration phase. The as-built report shall contain final grade and topography elevations, planted areas and palette.

i. During the mitigation monitoring and maintenance phase, mitigation areas must be maintained free of perennial exotic plant species including, but not limited to, pampas grass, giant reed, tamarisk, sweet fennel, tree tobacco, castor bean, and pepper tree. Annual exotic plant species must not occupy more than 5 percent of the mitigation areas.

j. If at any time during the implementation and establishment of the mitigation area(s), and prior to verification of meeting success criteria, a catastrophic natural event (e.g., fire, flood) occurs and impacts the mitigation area, the Discharger is responsible for repair and replanting of the damaged area(s).

k. For the purpose of determining mitigation credit for the removal of exotic/invasive plant species, only the actual area occupied by exotic/invasive plant species must be counted to comply with mitigation requirements.

l. For purposes of this Order and Certification, creation is defined as the creation of vegetated or unvegetated waters of the U.S./State where they have never been documented or known to occur (e.g., conversion of nonnative grassland to freshwater marsh). Restoration is defined as the creation of waters of the U.S./State where they previously occurred (e.g., removal of fill material to restore a drainage). Enhancement is defined as modifying existing waters of the U.S./State to enhance functions and values (e.g., removal of exotic plant species from jurisdictional areas and replacing with native species).

19. **DISCHARGES TO NAVIGABLE WATERS.** Any person discharging or proposing to discharge to navigable waters from a point source (except for discharge of dredged or fill materials subject to §404 of the Clean Water Act and discharges subject to a general NPDES permit) must file an NPDES permit application with the Regional Board.

20. **EFFECTIVE DATE.** This Order becomes effective on the date of adoption by the Regional Board provided that the Regional Board has been notified [pursuant to CCR Title 27 §21720(d)] of all requisite approvals from all local agencies with jurisdiction to regulate land use, solid waste disposal, air pollution, and to protect public health have approved use of the site for discharges of waste to land.

I. REPORTING REQUIREMENTS

1. **REPORT OF WASTE DISCHARGE/JOINT TECHNICAL DOCUMENT AMENDMENT.** The Discharger shall file a new Report of Waste Discharge/amendment to the Joint Technical Document at least 120 days prior to the following:

a. An increase in area or depth to be used for solid waste disposal beyond that specified in waste discharge requirements;

b. A significant change in the disposal method, location or volume (*e.g.*, change from land disposal to land treatment);

c. A change in the type of waste being accepted for disposal;

d. The addition of a major industrial waste discharge to a discharge of essentially domestic waste, or the addition of a new process or product by an industrial facility resulting in a change in the character or type of waste being discharged;

e. Any planned change in the regulated facility or activity, which may result in noncompliance with this Order.

f. As required for implementation of an Evaluation Monitoring Program (pursuant to CCR Title 27 §20425) and/or for a Corrective Action Program (pursuant to CCR Title 27 §20430).

2. **GENERAL REPORTING REQUIREMENT.** The Discharger shall furnish to the Regional Board, within a reasonable time, any information which the Regional Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order. The Discharger shall also furnish, upon request by the Regional Board, copies of records required by this Order.

3. **PRELIMINARY DESIGN REPORT.** At least 120 days prior to the beginning of construction for each new construction phase, a preliminary Design Report shall be submitted to Regional Board and shall include, but not limited to, the engineered design plans, engineering specifications, and descriptions for all liners and other containment structures, leachate collection and removal components, leak detection system components, precipitation and drainage control facilities, interim covers, and description of ancillary facilities, and all information pursuant to CCR Title 27 §21760(a)(1).

4. **FINAL CONSTRUCTION REPORT.** A final construction report shall be submitted to the Regional Board after each phase of construction and prior to the discharge of waste into the constructed cell. At a minimum, the final construction report shall include the following components:

   a. Final Design Report, including but not be limited to, as-built plans, specifications, and descriptions for all liners and other containment structures, LCRS components, leak detection system components, precipitation and drainage control facilities, interim covers, and description of ancillary facilities pursuant to CCR Title 27 §21760(a)(1).

   b. Final Construction Quality Assurance (CQA) Report with a written summary of the CQA program and all test results, analyses, and copies of the inspector's original field notes, and a certification as described in CCR Title 27, §20324 *et seq.*

5. **SIGNIFICANT MAINTENANCE ACTIVITY WORKPLAN.** The Discharger shall submit a workplan prior to any significant maintenance activities that

could alter existing surface drainage patterns or change existing slope configurations. These activities may include, but not be limited to, significant grading activities, the importation of fill material, the design and installation of soil borings, groundwater monitoring wells, and other devices for site investigation purposes. Unless otherwise directed by the Regional Board, the Discharger may initiate the activities proposed in the workplan after expiration of thirty (30) days of compliance with this Reporting Requirement, unless otherwise directed in writing by this Regional Board.

6. **ON-SITE RECORD KEEPING**. The Discharger must retain and have available for review by this Regional Board during normal business hours at a location at or near the WMU the following documents and records:

   a. Inspection records, training procedures, and notification procedures required by this Order and CFR Title 40 §258.20;

   b. Any WMU design documentation for placement of leachate or gas condensate as authorized by this Order and CFR Title 40 §258.28(a)(2);

   c. Any demonstration, certification, finding, monitoring, testing, or analytical data as required by this Order, CCR Title 27, and CFR Title 40 Subpart E §258.50 *et. seq.*;

   d. Closure and post-closure care plans and any monitoring, testing, or analytical data as required by this Order, CCR Title 27 and CFR Title 40 §258.60 and §258.61;

   e. Any cost estimates and financial assurance documentation required by this Order, CCR Title 27, and CFR Title 40 Subpart G §258.70 *et. seq.*;

   f. Certifications from the generator that the analyses submitted are representative of the material to be disposed;

   g. Analytical data or Material and Safety Data Sheets representing the waste stream;

   h. The Chain-of-Custody form showing the sample's integrity was not compromised;

   i. The approximate volume (in cubic yards) of the waste(s) and the transporter information;

   j. Documentation that, the Discharger obtain authorization, when required, for the discharge of solid wastes, containing elevated

concentrations of selected metals (lead, copper, or nickel) through a variance issued by the DTSC and a Solid Waste Facility Permit from the LEA [pursuant to California Health and Safety Code §25157.8(a)] or other applicable statutory requirements;

k. Any information required by CFR Title 40, Part 258 §258.29(a)(4) [placement of leachate or landfill gas condensate as allowed by CFR Title 40, Part 258, §258.28(a)(2) and this Order], §258.29(a)(6) [closure and post-closure plans and monitoring, testing, or analytical data as required by CFR Title 40, Part 258, §258.60 and §258.61], and §258.29(a)(7) [any cost estimates and financial assurance documentation required by CFR Title 40, Subpart G];

l. Notifications from the Discharger required pursuant to CCR Title 27 §21710(a)(4) and §21710(c), and this Order;

m. Records required to be kept in compliance with CCR Title 27 §21710(f); and

n. The JTD and any amendments thereto prepared pursuant to CCR Title 27 §21585(a)(4); and any additional records and certifications required to be kept in compliance with this Order.

Any other information that is necessary to comply with CFR Title 40, Part 258, CCR Title 27, and this Order, notify the Regional Board **within 14 days** of updating the information in the Operating Record for the facility.

7. **CHANGE IN OWNERSHIP.** The Discharger shall notify the Regional Board, in writing, at least **30 days** in advance of any transfer of this Order's responsibility and coverage between the current owner and new owner for construction, operation, closure, or post-closure maintenance of a landfill. This agreement shall include an acknowledgement that the existing owner is liable for violations up to the date of transfer of ownership and that the new owner is liable after the date that ownership of the property transfers. The agreement shall include an acknowledgement that the new owners shall accept responsibility for compliance with this Order, including obtaining such financial assurances as the State may require, for implementation of closure and post-closure maintenance/monitoring for the WMU.

8. **INCOMPLETE REPORTS.** Where the Discharger becomes aware that it failed to submit any relevant facts in a Report of Waste Discharge or submitted incorrect information in a Report of Waste Discharge or in any report to the Regional Board, it shall promptly submit such facts or information. The Discharger shall notify the Regional Board of any changes in information submitted to the Regional Board under the

applicable SWRCB-promulgated requirements of CCR Title 27 [pursuant to CCR Title 27 §21710(a)(4].

9. **ENDANGERMENT OF HEALTH AND ENVIRONMENT.** The Discharger shall report any noncompliance, which may endanger human health or the environment. Any such information shall be provided orally to the Regional Board **within 24 hours** from the time the owner becomes aware of the circumstances. A written submission shall also be provided **within five days** of the time the owner becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue, and steps taken or planned to reduce, eliminate, or prevent recurrence of the noncompliance. The Regional Board, or an authorized representative, may waive the written report on a case-by-case basis if the oral report has been received within 24-hours.

10. **NOTIFICATION OF SLOPE FAILURE.** The Discharger shall notify the Regional Board immediately, upon a determination that a slope failure is occurring or has occurred at the facility. The Discharger shall promptly repair any slope failure that affects or threatens the integrity or the performance of the foundation, liner system, waste containment structures, or the structures which control leachate, surface drainage, erosion or gas at the WMU. Any temporary slope, constructed as part of an engineering measure to mitigate slope stability, must comply with requirements in **Landfill Construction Specifications E.4.b, E.4.c and E.4.f** of this Order.

11. **NOTIFICATION OF SEEPAGE.** The Discharger shall immediately report by telephone or e-mail a discovery of any previously unreported seepage of liquid from any active, inactive, or closed WMU at the Gregory Canyon Landfill and shall comply with reporting requirements in **Section G of Monitoring and Reporting Program No. R9-2008-017.**

12. **NOTIFICATION OF LEACHATE PRODUCTION CHANGE.** The Discharger shall notify the Regional Board within **seven days** if fluid is detected in a previously dry LCRS (including the secondary LCRS in the liner system), or unsaturated zone monitoring system, or if a progressive increase is detected in the volume of fluid in a LCRS [CCR Title 27 §21710(c)(3)].

13. **NOTIFICATION OF CLOSURE.** The Discharger shall notify the Regional Board that the WMU is to be closed and provide such notice either at the same time as the California Integrated Waste Management Board (pursuant to CCR Title 27 §21110) or **180 days** prior to beginning final closure activities (for the entire Unit or portion thereof), whichever is

sooner. The Discharger shall include a statement that all closure activities will conform to the most recently approved closure plan and that the plan provides for site closure in compliance with all applicable federal and State regulations. The Discharger shall notify the Regional Board within 30 days of completing all closure activities for a Unit, or portion thereof, in the case of incremental closure under CCR Title 27 §21090(b)(1)(D). The Discharger shall certify under penalty of perjury that all closure activities were performed in accordance with the most recently approved closure plan and in accordance with all applicable regulations. The Discharger shall certify that closed units shall be maintained in accordance with an approved post-closure maintenance plan.

14. **NOTIFICATION OF MATERIAL CHANGE.** Any proposed material change in operation shall be reported to the Regional Board at least 30 days in advance of the proposed implementation of any change. This shall include, but not be limited to, all significant new soil disturbances, all proposed expansion of development, or any change in drainage characteristics at the project site. For the purpose of this Order, this includes any proposed change in the boundaries of the wetland/surface waters of the U.S. fill sites.

15. **SECTION 401 WATER QUALITY CERTIFICATION REPORTING.**

    a. The Discharger shall submit copies of all necessary approvals and/or permits for the project and mitigation from applicable government agencies, including, but not limited to, the California Department of Fish and Game, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers, prior to the start of clearing/grading.

    b. The Discharger must submit Geographic Information System (GIS) shape files of the impact and mitigation areas within 30 days of project impacts and the mitigation area within 30 days of mitigation installation. All impact and mitigation areas shapefiles must be polygons. Two global positioning system (GPS) readings (points) must be taken on each line of the polygon and the polygon must have a minimum of 10 points. GIS metadata must also be submitted.

    c. The Discharger must submit a report to the Regional Board within 30 days of completion of the project. The report should include as-built drawings no bigger than 11" x 17" and photos of the completed project including post-construction BMPs.

16. **MONITORING AND REPORTING PROGRAM.** The Discharger shall comply with the attached **Monitoring and Reporting Program No. R9-2009-0004.** The Regional Board issues this Monitoring and Reporting Program (MRP) pursuant to Water Code section 13267 and CCR Title 27,

Chapter 2. Failure to comply with this MRP may subject the Discharger to civil liability pursuant to Water Code section 13268.

17. **MONITORING WELLS.** The Discharger or persons employed by the Discharger shall comply with all notice and reporting requirements of the California Department of Water Resources with regard to the construction, alteration, destruction, or abandonment of all monitoring wells used for compliance with this Order or with Monitoring and Reporting Program No. R9-2009-004, as required by §13750 through §13755 of the Water Code.

8 **REPORT DECLARATION.** All applications, reports, or information submitted to the Regional Board shall be signed and certified as follows:

a. The Report of Waste Discharge/amendment to the Joint Technical Document shall be signed as follows:

(1) **For a corporation** – by a principal executive officer of at least the level of vice president.

(2) **For a partnership or sole proprietorship** – by a general partner or the proprietor, respectfully.

(3) **For a municipality, state, federal, or other public agency** – by either a principal executive officer or ranking elected official.

b. All other reports required by this Order and other information required by the Regional Board shall be signed by a person designated in paragraph (a) of this provision, or by a duly authorized representative of that person. An individual is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in paragraph (a) of this provision;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity; and

(3) The written authorization is submitted to the Regional Board.

c. Any person signing a document under this Order shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

d. **Duty to Use Registered Professionals**. Pursuant to CCR Title 27 §21710(d), any report submitted in compliance with CCR Title 27 and this Order, which proposes a design or design change (or which notes occurrences) that might affect the WMU's containment features or monitoring systems shall be approved by a registered civil engineer or a certified engineering geologist appropriately licensed by the State of California.

The Discharger shall provide documentation that plans and reports required under this Order are prepared by or under the direction of, appropriately qualified professionals. CCR Title 27 §20324(b) and §21090(b)(1)(C); and California Business and Professions Code §6735, §7835 and §7835.1 all require that engineering and geologic evaluations and judgments be performed by or under the direction of registered professionals. A statement of qualifications and registration numbers of the responsible lead professionals shall be included in all plans and reports submitted by the Discharger. The lead professional shall sign and affix their registration stamp to the report, plan or document.

19. **REGIONAL BOARD ADDRESS.** The Discharger shall submit all paper copies of reports and notifications required under this Order and other information requested by the Regional Board to:

Executive Officer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

J. NOTIFICATIONS

1. PENALTIES FOR INVESTIGATION, MONITORING OR INSPECTION VIOLATIONS.

a. **Enforcement Discretion.** The Regional Board reserves its right to take any enforcement action authorized by law for violations of the terms and conditions of this Order.

b. **Enforcement Notification.** The Water Code §13268 provides that any person failing or refusing to furnish technical or monitoring program reports, as required by the Regional Board, or falsifying any information provided in the monitoring reports is guilty of a misdemeanor. Under those conditions, the Regional Board may administratively impose a civil liability of up to 1,000 dollars per day of the violation.

The Water Code commencing with Chapter 5, Enforcement and Implementation, §13350 provides that:

i. Any person who in violation of any waste discharge requirement, waiver condition, certification, or other order or prohibition issued or reissued, or amended by a Regional Board, discharges waste, or causes or permits waste to be deposited where it is discharged, into the waters of the state;

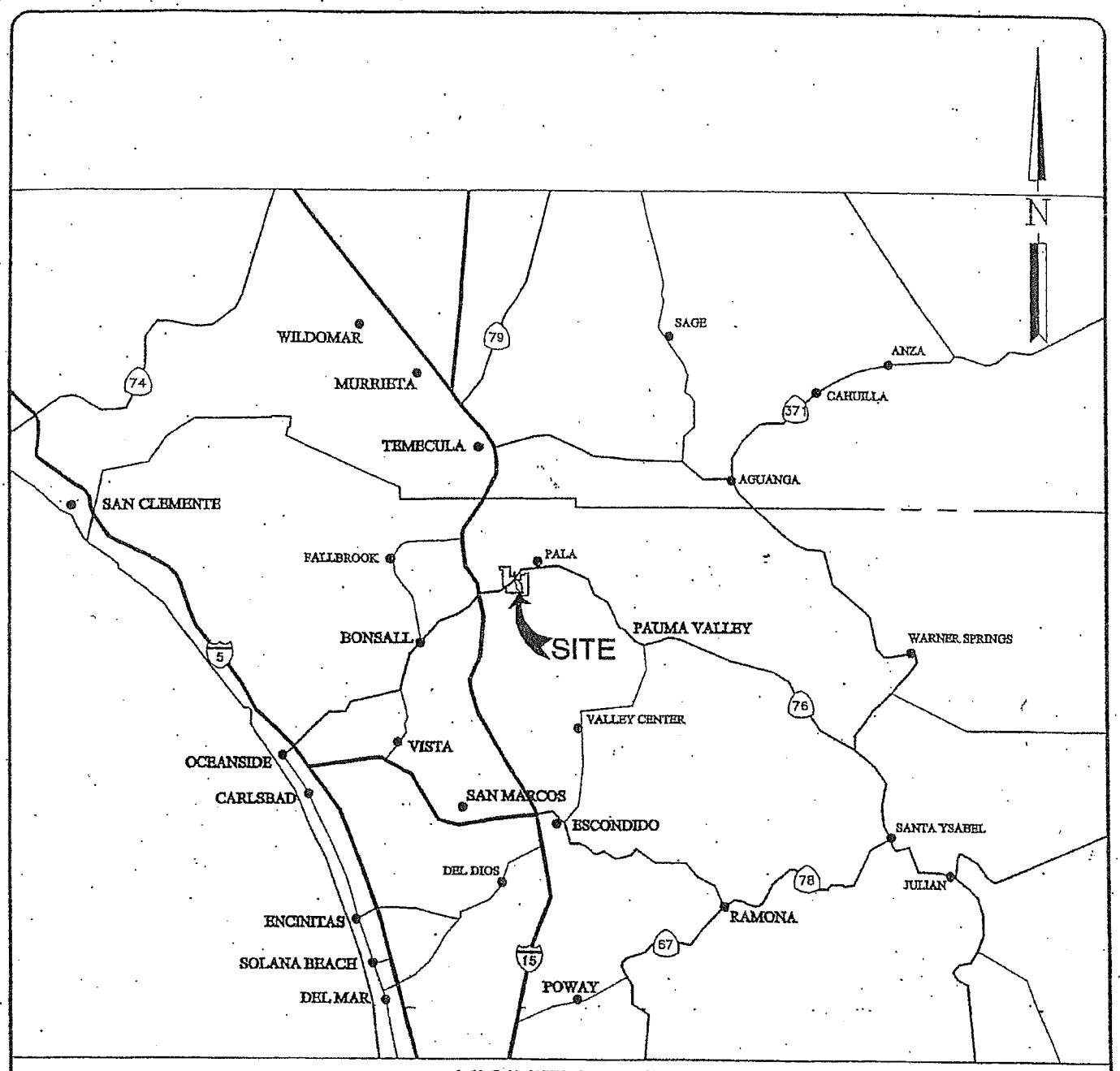
ii. Any person who, without regard to intent or negligence, causes of permits any hazardous substance to be discharged in or on any of the waters of the state, except in accordance with waste discharge requirements or other provisions of this division, shall be strictly liable civilly in accordance with §13350(d) or §13350(e); or

iii. Persons i n violation of Water Code §13350 may be assessed administrative civil liability by the Regional Board for violating a cleanup and abatement order in an amount not to exceed $5,000 for each day the violation occurs, or on a per gallon basis, not to exceed $10 for each gallon of waste discharged. Alternatively the court may impose civil liability in an amount not to exceed $15,000 for each day the violation occurs, or on a per gallon basis, not to exceed $20 for each gallon of waste discharged. Water Code §13308, provides that if there is a threatened or continuing violation of a cleanup and abatement order, the Regional Board may issue a Time Schedule Order prescribing a civil penalty in an amount not to exceed $10,000 per day for each day compliance is not achieved in accordance with that time schedule.

2. **CCR TITLE 27 DEFINITIONS.** Definitions of terms used in this Order shall be as set forth in the CCR Title 27 §20164.

I, John H. Robertus, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Diego Region, on _____.

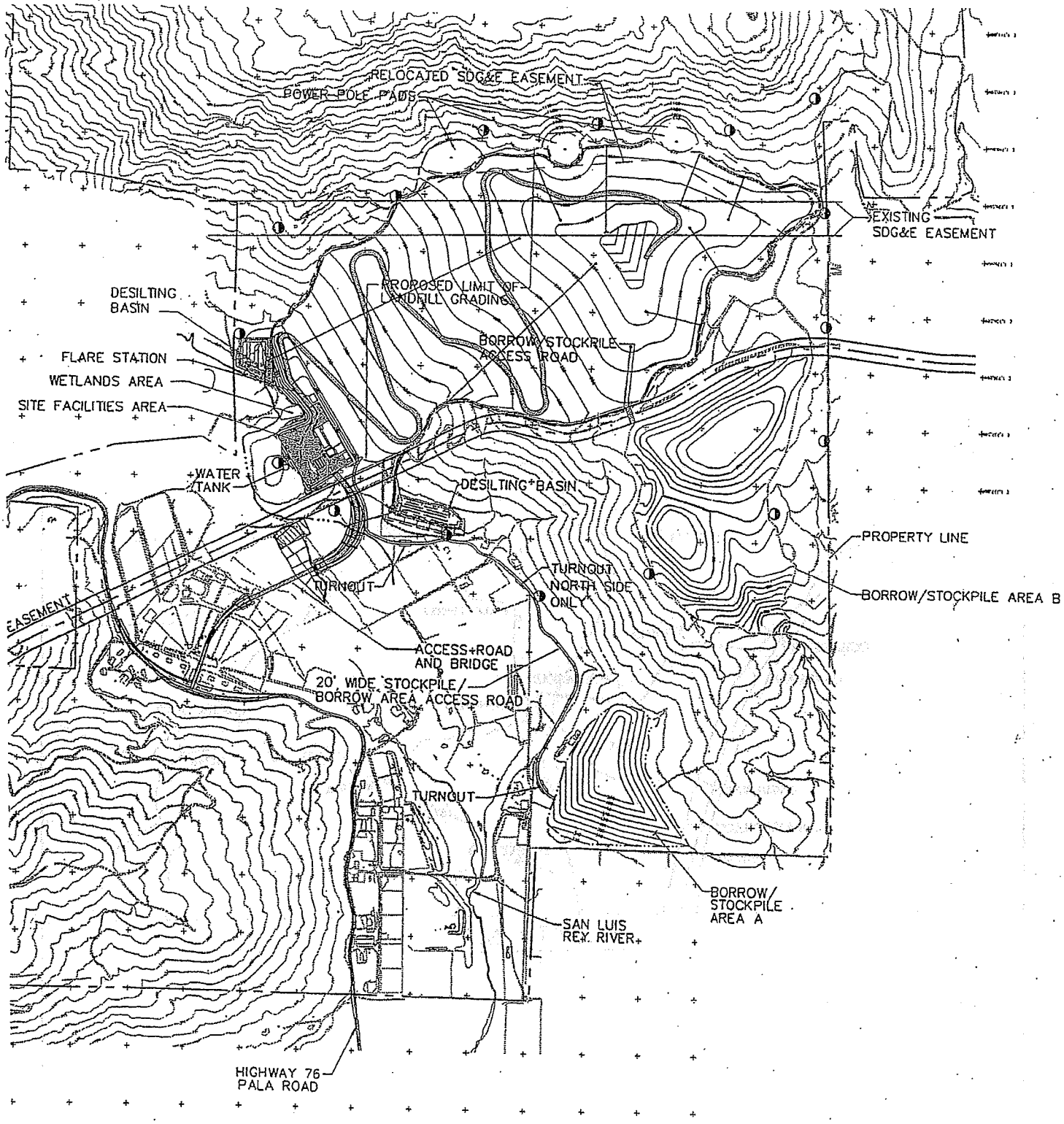
TENTATIVE
JOHN H. ROBERTUS
Executive Officer



VICINITY MAP

NTS

Attachment No. 1 to
Order No. R9-2009-004



Attachment No. 2 to
Order No. R9-2009-004

ATTACHMENT NO. 3 TO
ORDER NO. R9-2009-0004

Table 1. Maximum Concentration Limits for Soils Containing Nonhazardous Concentrations of Metals, Pesticides, Organic and Inorganic Compounds. (Reference: CCR title 22, Section 66261.24 as Amended).

Contaminant (CAM 17*)	Maximum Concentration Limits STLC**
Antimony	15 mg/l
Arsenic	5.0 mg/l
Barium	100 mg/l
Beryllium	0.75 mg/l
Cadmium	1.0 mg/l
Chromium	5.0 mg/l
Cobalt	80 mg/l
Copper	25 mg/l
Lead	5.0 mg/l
Mercury	0.2 mg/l
Molybdenum	350 mg/l
Nickel	20 mg/l
Selenium	1.0 mg/l
Silver	5.0 mg/l
Thallium	7.0 mg/l
Vanadium	24 mg/l
Zinc	250 mg/l
Contaminant	**STLC**
Aldrin	0.14 mg/l
Chlordane	0.25 mg/l
DDT, DDE, DDD	0.1 mg/l
2,4-Dichlorophenoxyacetic acid	10 mg/l
Dieldrin	0.8 mg/l
Dioxin (2,3,7,8-TCDD)	0.001 mg/l
Endrin	0.02 mg/l
Heptachlor	0.47 mg/l
Kepone	2.1 mg/l
Lead compounds, organic	-
Lindane	0.4 mg/l
Methoxychlor	10 mg/l
Mirex	2.1 mg/l
Pentachlorophenol	1.7 mg/l
Polychlorinated biphenyls (PCBs)	5.0 mg/l
Toxaphene	0.5 mg/l
Trichloroethylene	204 mg/l
2,4,5-Trichlorophenoxypropionic acid	1.0 mg/l

*California Metals 22 CCR Section 66261.24
** STLC - Soluble threshold Limit Concentration

ATTACHMENT NO. 4 TO
ORDER NO. R9-2009-0004

Table 2. Maximum Concentration Limits for Soils Containing Nonhazardous Concentrations of Metals, Pesticides, Organic and Inorganic Compounds using toxicity Characteristic Leaching Procedure (TCLP) analysis. (Reference: CCR Title 22 Section 66261.24 as Amended).

Contaminant	Maximum Concentration Limits Regulatory Level
Arsenic	5.0 mg/l
Barium	100 mg/l
Benzene	0.5 mg/l
Cadmium	1.0 mg/l
Carbon tetrachloride	0.5 mg/l
Chlordane	0.03 mg/l
Chlorobenzene	100 mg/l
Chloroform	6.0 mg/l
Chromium	5.0 mg/l
o-Cresol	200 mg/l
m-Cresol	200 mg/l
p-Cresol	200 mg/l
Cresol, total	200 mg/l
2,4-D	10 mg/l
1,4-Dichlorobenzene	7.5 mg/l
1,2-Dichloroethane	0.5 mg/l
1,1-Dichloroethylene	0.7 mg/l
2,4-Dinitrotoluene	0.13 mg/l
Endrin	0.02 mg/l
Heptachlor (and its epoxide)	0.008 mg/l
Hexachlorobenzene	0.13 mg/l
Hexachlorobutadiene	0.5 mg/l
Hexachloroethane	3.0 mg/l
Lead	5.0 mg/l
Lindane	0.4 mg/l
Mercury	0.2 mg/l
Methoxychlor	10 mg/l
Methyl ethyl ketone	200 mg/l
Nitrobenzene	2.0 mg/l
Pentachlorophenol	100 mg/l
Pyridine	5.0 mg/l
Selenium	1.0 mg/l
Silver	5.0 mg/l
Tetrachloroethylene	0.7 mg/l
Toxaphene	0.5 mg/l
Trichloroethylene	0.5 mg/l
2,4,5-Trichlorophenol	400 mg/l
2,4,6-Trichlorophenol	2.0 mg/l
2,4,5-TP (Silvex)	1.0 mg/l
Vinyl Chloride	0.2 mg/l

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

TENTATIVE MONITORING AND REPORTING PROGRAM
NO. R9-2009-0004
FOR THE
GREGORY CANYON LANDFILL
SAN DIEGO COUNTY

A. MONITORING PROVISIONS

1. All analyses shall be performed in a laboratory certified to perform such analyses by the California Department of Public Health or a laboratory approved by the California Regional Water Quality Control Board, San Diego Region (Regional Board). Specific methods of analysis must be identified. If methods other than U.S. Environmental Protection Agency (USEPA) approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the Regional Board prior to use. The director of the laboratory whose name appears on the certification shall supervise all analytical work in his/her laboratory and shall sign all reports of such work submitted to the Regional Board.

2. If the Discharger monitors any waste constituents more frequently than required by this Monitoring and Reporting Program (M&RP), using the most recent version of standard USEPA Methods, or as specified in this M&RP, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharger's monitoring report. The increased frequency of monitoring shall also be reported.

3. The Discharger shall report all instances of noncompliance not reported under **Reporting Requirement I.8, I.9, I.10, I.11, and I.12** of Order No. R9-2009-004 at the time monitoring reports are submitted. The reports shall contain the information listed in **Reporting Requirement I.9** of Order No. R9-2009-004.

4. Sample collection, storage, and analysis shall be performed according to the applicable protocols included in the USEPA, *SW-846: Test Methods for Evaluating Solid Wastes Physical/Chemical Methods* (Version 6, dated November 2004) and Title 40, Code of Federal Regulations (CFR), Part 136, *Guidelines Establishing Test Procedures for Analysis of Pollutants Under the Clean Water Act* and in accordance with an approved sampling and analysis plan.

5. All monitoring instruments and equipment shall be properly calibrated and maintained as necessary to ensure accuracy of measurements.

6. The Discharger shall retain paper copies of records for all monitoring information, including all calibration and maintenance records and copies of all

reports required by this Order. These records shall be maintained for a minimum of **five years** from the date of the sample, measurement, report or application; with the following exceptions:

a. The operating record shall permanently retain notifications issued pursuant to 40 CFR §258.10(b) and §258.55(g)(1)(iii), and/or California Code of Regulations (CCR) Title 27 §20420(j)(2).

b. This record retention period has not been extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board.

c. At the beginning of the post-closure maintenance period, the Discharger shall provide the Regional Board with copies of all records concerning the volumes and types of each waste discharged at each Unit, and the manner and location of the discharge [pursuant to CCR Title 27 §21720(f)].

7. Records of monitoring information shall include:

a. The date, identity of sample, Monitoring Point from which it was collected, and time of sampling or measurement;

b. The individual(s) who performed the sampling or measurements, chain-of-custody documentation;

c. Date and time that analyses were started and completed, and the name of the personnel performing each analysis;

d. The analytical techniques or method used, including method of preserving the sample and the identity and volumes of reagents used;

e. Calculation of results;

f. Results of analyses, the method detection limit (**MDL**) and the practical quantitation limit (**PQL**) for each parameter;

g. Laboratory quality assurance (*e.g.*, percent recovery and response factor) and quality control results; and

h. Legible records of the volume and type of each waste discharged at each Unit and the manner and location of the discharge. Such records shall be on forms approved by the SWRCB or Regional Board and shall be maintained at the waste management facility until the beginning of the post-closure period.

8. The monitoring reports shall be signed by an authorized person as required by **Reporting Requirement I.18.c** of Order No. R9-2009-004.

9. The Discharger shall ensure that the laboratory analysis of all samples collected from Compliance Monitoring Points are consistent with the following conditions:

   a. The methods of analysis and the detection limits used shall be appropriate for the expected concentrations. For detection monitoring of any constituent or parameter that is found in concentrations which produce more than 90 percent non-numerical determinations (*i.e.*, "trace" or "ND") in data from each Monitoring Point for that medium, the analytical method having the lowest method detection limit (MDL) shall be selected from among those methods which would provide valid results in light of any matrix effects involved;

   b. Analytical results between the MDL and the PQL shall be reported as "trace" and shall by accompanied both by the (nominal or estimated) MDL and PQL values for that analytical run;

   c. The laboratory shall derive MDLs and PQLs for each analytical procedure, according to State of California laboratory accreditation procedures. These nominal MDLs and PQLs shall reflect the detection and quantitation capabilities of the specific analytical procedure and equipment used by the lab, rather than simply being quoted from USEPA analytical method manuals;

   d. If the lab suspects that, due to a change in matrix or other effects, the true detection limit or quantitation limit for a particular analytical run differs significantly from the laboratory-derived nominal MDL/PQL values, the results shall be flagged accordingly, along with estimates of the detection limit and quantitation limit actually achieved. The MDL shall always be calculated such that it represents a concentration associated with a 99 percent reliability of a non-zero result. The PQL shall always be calculated such that it represents the lowest constituent concentration at which a numerical value can be assigned with reasonable certainty that it represents the constituent's actual concentration in the sample;

   e. All Quality Assurance/Quality Control (**QA/QC**) data shall be reported, along with the sample results to which it applies, including the method, equipment, and analytical detection and quantitation limits, the recovery rates, an explanation for any recovery rate that is less than 80%, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name and quantification of the person(s) performing the analyses. Sample results shall be reported unadjusted for blank results or spike

recovery. In cases where contaminants are detected in QA/QC samples *(i.e.,* field, trip or lab blanks), the accompanying sample results shall be appropriately flagged;

f. Upon receiving written concurrence from the Regional Board, an alternative statistical or non-statistical procedure may be used for determining the contaminant (*e.g.*, methylene chloride, acetone, diethylhexyl phthalate, and di-n-octyl phthalate) during any given Reporting Period in which QA/QC samples show evidence of laboratory contamination for that constituent. Nevertheless, analytical results involving detection of these analytes in any background or downgradient sample shall be reported and flagged for easy reference by the Regional Board;

g. Unidentified peaks on chromatograms shall be reported, along with an estimate of the concentration of the unknown analyte. When unidentified peaks are encountered on chromatograms, second column or second method confirmation procedures shall be performed to attempt to identify and more accurately quantify the unknown analyte; and

h. The MDL and PQL shall be determined in accordance with the definitions of those terms in the **CCR** Title 27. In the event that a Monitoring Parameter (**MPar**)'s MDL and or PQL change, the Discharger shall highlight the change in the laboratory report's summary and the report shall also include an explanation for the change that is written and signed by the owner of the analytical laboratory.

10. A list containing definitions of terms and acronyms are contained in **Appendix A** attached to this Monitoring and Reporting Program (**M&RP**).

11. The Discharger shall submit any reports required by this Order electronically, in accordance with CCR Title 23, Division 3 §3890 *et. seq*. The Discharger shall also continue to provide complete paper copies of all required reports to this Regional Board.

12. The Discharger shall upload a complete copy of all reports in PDF format into the SWRCB's on-line database (currently Geotracker), which provides the public with on-line access to environmental data. The electronic copy is intended to be used for all public information requests, regulatory review, and compliance /enforcement activities.

B. DETECTION MONITORING PROGRAM

1. The groundwater monitoring network for the waste management unit (WMU) includes background wells (GLA-4, GLA-5, GLA-11 and GLA-18) and compliance wells (GMW-1, GLA-2, GLA-12, GLA-13, GLA-14, GLA-A, GLA-B, GLA-C, GLA-D, GLA-E, GLA-F and GLA-G) for the fractured bedrock aquifer. For the alluvial aquifer, the background well is Lucio #2R; compliance wells are GMW-3 and the sentry wells are GLA-16 and SLRMWD #34R. The locations of all of these groundwater monitoring wells are shown on **Attachment No. 1** to this M&RP.

2. Water samples shall be collected, analyzed, and results reported for constituents shown in the following table:

MONITORING PARAMETERS	UNITS	SAMPLING FREQUENCY
PH	pH	Quarterly
Total Dissolved Solids (TDS)	mg/l	Quarterly
Chloride	mg/l	Quarterly
Sulfate	mg/l	Quarterly
Nitrate as Nitrogen	mg/l	Quarterly
Calcium	mg/l	Quarterly
Magnesium	mg/l	Quarterly
Sodium	mg/l	Quarterly
Appendix II Constituents [1]	µg/l	Quarterly

Note: mg/l = milligrams/liter and µg/l = micrograms/liter

[1] Appendix II to 40 CFR 258 and any other constituents subsequently amended to the MPar List per ***Detection Monitoring Program B.12, Detection Monitoring Specifications C.4, C.5, C.7 and/or C.8*** of this Monitoring and Reporting Program.

3. The Discharger shall establish and maintain groundwater wells at the WMU site to be used as part of the water quality monitoring program.

4. Prior to purging monitoring wells for purposes of groundwater sampling, the static water level shall be measured in each well. The Discharger shall determine groundwater flow rate and direction **at least quarterly**, including the times of expected highest and lowest elevations of the water level for the respective groundwater body. Groundwater elevations for all compliance wells in a given aquifer shall be measured within a period of time short enough to avoid temporal variations in groundwater. This information shall be included in the semi-annual monitoring reports.

5. For any given medium, samples shall be collected (1) from all Compliance Monitoring Points to satisfy the data analysis requirements for a given Reporting Period; (2) during the latter third of the Reporting Period within a span not exceeding **30 days**; and (3) in a manner that ensures sample independence to the greatest extent feasible. Sample procurement shall be carried out as late in the Reporting Period as feasible, considering the time needed to analyze the samples, analyze the resulting data, and to prepare and submit the monitoring report within **30 days** after the end of the Reporting Period.

6. Prior to sampling monitoring wells, the presence of a floating immiscible layer in all wells shall be evaluated at the beginning of each sampling event. This shall be done prior to any other activity that may disturb the surface of the water in a well, *e.g.,* water level measurements. If an immiscible layer is found, the Discharger shall notify the Regional Board by telephone and facsimile within **24 hours**.

7. Groundwater sampling shall include an accurate determination of the groundwater surface elevation and field parameters (temperature, electrical conductivity and turbidity) for each Compliance Point [CCR Title 27 §20415(e)(13)].

8. Surface Water Monitoring

   Surface water monitoring shall be conducted in compliance with general monitoring requirements specified in CCR Title 27 §20415(c)(1) through (2)(B). Surface water monitoring shall be conducted **quarterly** at SLRSW-1 (upgradient) and sampling stations SLRSW-2 and GCSW-2 (downgradient) (when there is sufficient water to collect a sample). Surface water samples shall be analyzed for all the monitoring parameters specified in ***Detection Monitoring Program B.2.*** The locations of these sampling points are shown on **Attachment No. 1** to this M&RP.

9. Secondary Leachate Collection and Removal System (LCRS): Leak Detection Monitoring

   Once the WMU is in operation and the secondary LCRS is generating liquid, the liquid in the sump shall be monitored (with a properly calibrated electric probe for pH and electric conductivity to monitor for changes that indicate the liquid is leachate as opposed to rainwater or construction water) [**weekly until leachate is indicated**] (also metered during pumping). The Discharger shall ensure that all liquid removed from the secondary LCRS is properly managed and disposed in compliance with all applicable federal, state and local requirements.

   a. Once the liquid in the secondary LCRS sump is established as leachate:

i. The Discharger shall notify the Regional Board **within three days** that liquid was first observed.

ii. The Discharger shall implement the same monitoring and reporting for leachate constituents, CFR Title 40, Part 258 Appendix II constituents and methyl tertiary butyl ether (MTBE), as required for leachate samples collected from the primary LCRS in **Detection Monitoring Program B.11**.

b. The Discharger shall implement the following requirements for management of landfill gas in the secondary LCRS:

i. Vapor pressure, methane, carbon dioxide and oxygen shall be monitored at no less than three locations in the secondary LCRS piping [**weekly**].

ii. If landfill gas is detected in the secondary LCRS, vapor samples will be collected in a SUMMA canister and analyzed for volatile constituents using USEPA Method TO-14 [quarterly].

iii. Pressure changes in the secondary LCRS will be monitored every 3 minutes for the first 3 hours that landfill gas is extracted from the primary LCRS.

iv. Results from management of landfill gas in the secondary LCRS shall be summarized, tabulated and discussed in each semi-annual monitoring report.

10. Subdrain Monitoring

If the secondary LCRS is determined to contain liquid leachate, or waste constituents in vapor/gas samples collected from the secondary LCRS, then the subdrain shall be monitored **quarterly** for the same constituents of concern (COCs) developed from the procedures listed in **Detection Monitoring Program Section B.11**. If sampling results indicate the possibility of a release from the landfill, the Discharger shall conduct a retest to determine the presence of any waste constituent(s). If the Discharger determines that a release from the landfill has occurred, the Discharger shall notify the Regional Board by telephone, e-mail, or FAX within **24 hours** and submit a written report within **5 days** of determination, and shall immediately begin carrying out the applicable general requirements for **Response to a Release D.1.**

11. Primary Leachate Collection and Removal System (LCRS) Monitoring

Once the WMU is in operation and the primary LCRS is generating liquid, the liquid in the sump shall be monitored (with a properly calibrated electric probe for pH and electric conductivity to monitor for changes that indicate the liquid is leachate as opposed to rainwater or construction water) [**weekly until leachate is indicated**].

Once the liquid in the primary LCRS is established to be leachate, the following leachate monitoring and reporting requirements shall apply:

a. Every **October,** the Discharger shall sample the leachate from the LCRS tank and analyze the sample for Appendix II constituents and MTBE. The Discharger shall continue to monitor for Appendix II constituents and MTBE until a COC list for the WMU has been developed. The analytes shall consist of each constituent listed in Appendix II, and MTBE, and shall be added to the COC list if it is both:

i. Detected in a sample of the landfill's leachate.

The Discharger shall submit the analytical results to the Regional Board by **January 31**, including identification of all detected Appendix II constituents and MTBE, that are not currently on the COC list (non-COCs); and

ii. Also detected in a retest leachate sample collected the following **April.**

The Discharger shall submit a report to the Regional Board by **August 1**. This report must identify all constituents that were detected in both the previous calendar year's October sample and in the April retest sample. The report shall also include an updated COC list that includes the Appendix II constituents that are newly detected in both the **October** and **April** leachate samples. If a volatile organic constituent has been detected and verified in leachate, the constituent shall be added to the MPar list. In addition, the revised COC list must be noted in the operating record within **14 days**, permanently add these constituents to the Unit's COC list. The report shall also include an updated COC list that includes the Appendix II constituents and MTBE that are newly detected in both the **October** and **April** leachate samples. Within **seven days** of amending the Facility's Operating Record pursuant to this section, the Discharger shall also provide written notification to the Regional Board indicating that they have made the amendment.

b. For each Appendix II constituent, and MTBE, that is added to the Unit's COC list (as described above), the Discharger shall establish a reference background value in groundwater following the procedures required in ***Detection Monitoring Specifications C.4.*** Once this reference set of background data is collected, the Discharger shall include it as a separate item in the next monitoring report submittal.

c. The Discharger shall implement the following requirements for management of landfill gas in the primary LCRS:

i. Vapor pressure, methane, carbon dioxide and oxygen shall be monitored at no less than three locations in the primary LCRS piping [**weekly**]. The presence of landfill gas in the LCRS requires that the Discharger startup a regularly scheduled effort to extract landfill gas from the primary LCRS. The specific procedures and schedule for implementing extraction of landfill gas from the primary LCRS shall be discussed and summarized in the semi-annual reports.

ii. Vapor pressure shall be monitored in a series of pressure probes placed in the primary LCRS material on the side slopes to determine intrinsic permeability and measure vacuum levels [**weekly**].

iii. Collected data and results from management of landfill gas from the primary LCRS shall be summarized, tabulated and discussed in each semi-annual monitoring report.

12. Report of Results from Five-Yearly COC Scan

The Discharger shall monitor all **COCs** and submit a report (**COC Report**) as follows:

a. The Discharger shall sample all Monitoring Points and Background Monitoring Points for each monitored medium for all **COCs every fifth year**, beginning with the year the WMU accepts waste, with subsequent COC monitoring efforts being carried **out every fifth year thereafter** alternately in the **Fall (Reporting Period ends September 30)** and **Spring (Reporting Period ends March 30)**. The COC Report may be combined with any Semi-annual Monitoring Report or Annual Summary Report [required under **J. Reporting Schedule** of this M&RP] having a Reporting Period that ends at the same time. The COC Report shall meet the minimum requirements of **H. Reports to be Filed with the Regional Board** of this M&RP.

i. A minimum of one sample from each background and compliance monitoring well must be collected and analyzed during each COC scanning event. If a COC is detected (including trace value) that is not yet on the MPar list, the Discharger shall, within **30 days**, resample collecting a single sample from the indicating well(s) and analyze it only for the newly-detected constituent(s).

ii. Any COC detected in samples collected from a groundwater monitoring well, and verified by a retest, automatically becomes part of the MPar list for the facility. The Discharger shall notify the Regional Board of any such change **within 3 days**, via phone, facsimile, or e-mail, shall add the newly detected constituents to the facility's MPar list, and shall note prominently the constituent(s) added to the MPar list in the next scheduled monitoring report, along with a listing of which well(s) were involved in this detection and verification. In addition, the updated MPar list must be noted in the Facility's Operating Record within **14 days** of verification, permanently adding these constituents to the landfill's MPar list. Within **seven days** of amending the Facility's Operating Record pursuant to this section, the Discharger shall also provide written notification to the Regional Board indicating that they have made the amendment.

13. Site Inspections

a. At a minimum, a site inspection shall be conducted **quarterly** and include an evaluation of all waste containment structures and monitoring systems including, but not limited to, the landfill gas collection system, condensate and leachate containment structures, sumps, monitoring wells, and run-on and runoff drainage control structures. The inspection reports shall contain information on the site condition and a discussion of any significant observations with regard to:

i. General site condition;
ii. The condition of the cover system including the top deck, intermediate benches and side slopes;
iii. The effectiveness of the run on/run off control facilities;
iv. The effectiveness of erosion control BMPs;
v. The effectiveness of the leachate control facilities;
vi. The water quality monitoring networks, including the leak detection/drainage layer sampling sump;
vii. The landfill gas monitoring and control system(s);
viii. Maintenance activities performed at the site; and
ix. Condition of temporary soil stockpiles/borrow areas at the site.

b. All deficiencies shall be identified, and photographed and shall be recorded in a permanent log.

c. The monthly total volume of leachate liquid [CCR Title 27 §20340(h)] collected from each containment structure shall be recorded **quarterly**.

d. The WMU shall be evaluated to determine its effectiveness in complying with this Order.

e. During dry weather conditions, the effectiveness of the drainage control system shall be evaluated on the basis of its conformance to the as-built drawings, or revisions thereto, for the system.

f. The quarterly inspection reports shall be included with the next semi-annual monitoring report.

14. Waste Placement

The Discharger shall submit a waste placement map with the semiannual report. The map shall show where waste has been disposed of since the previous monitoring report was submitted. The Discharger shall also state the quantities and types or waste disposed at the WMU since the last monitoring report was submitted.

C. DETECTION MONITORING SPECIFICATIONS

1. The Discharger shall comply with the requirements of CCR Title 27 §20415 for any water quality monitoring program developed to satisfy CCR Title 27 §20420 and the requirements of this Order.

a. The groundwater monitoring shall meet the applicable requirements of CCR Title 27 §20415 and 40 CFR §258.51(a, c, and d);

b. The surface water quality monitoring program shall meet the requirements of CCR Title 27 §20415(c) and shall be conducted in accordance with ***Detection Monitoring Program B.8.*** In addition, whenever possible, the Discharger shall measure volumetric flow – or, at a minimum, visually estimate the flow rate – for all surface water monitoring points with flowing water.

c. All monitoring and data analysis shall be in accordance with the general monitoring requirements of CCR Title 27 §20415(e) or other options as provided in this Order.

d. The Discharger shall conduct water quality monitoring at the WMU in accordance with CCR Title 27 §20420 (Detection Monitoring Program,

or DMP), 40 CFR §258.54 (DMP), and Detection Monitoring Specifications pursuant to this Order.

e. The Discharger shall not field filter groundwater samples prior to laboratory analysis in accordance with CFR 40 §258.53(b).

f. The Discharger shall notify the Regional Board in writing within **seven days** after the WMU begins to generate leachate and provide the date when they will initiate the annual leachate monitoring requirements of this Order.

2. Water Quality Protection Standard

The five parts of the Water Quality Protection Standard [Standard] of CCR Title 27 §20390 are as follows:

a. Constituents of Concern (COC) [CCR Title 27 §20395]

The Constituents of Concern list will be generated based upon leachate monitoring results (***Detection Monitoring Program B.11*** of this M&RP). Under this M&RP, statistical and non-statistical data analysis is limited to those COCs that are on the current MPar list by virtue of their being present in detectable levels in groundwater.

b. Concentration Limits [CCR Title 27 §20400]

The concentration limit for any given well/MPar pair is its applicable background data set, as determined or updated pursuant to ***Detection* Monitoring Specifications C.5 or C.7** of this M&RP.

c. POC & Monitoring Wells [CCR Title 27 §20405]

The point of compliance (POC) and compliance wells are shown in **Attachment No. 1** to this M&RP.

d. Monitoring Points and Background Monitoring Points for Detection Monitoring [CCR Title 27 §20405]

The Monitoring Points for the WMU are identified in ***Detection Monitoring Program B.1*** of this M&RP. These monitoring points are also shown on **Attachment No. 1** to this M&RP.

e. Compliance Period [CCR Title 27 §20410]

The minimum compliance period for the WMU is 32 years. However, the landfill post-closure maintenance period shall continue until the Regional Board determines that remaining wastes in all waste

management units (WMUs) will not threaten water quality [CCR Title 27 §20950(a)(1)] and **Closure and Post-Closure Specification G.5** of this Order.

3. The Regional Board may consider alternative monitoring parameters that meet the requirements of both CCR Title 27 §20380 *et seq.*, and 40 CFR §258.54. The Regional Board may also consider alternative statistical or non-statistical methods that meet the requirements of CCR Title 27 §20415(e) and 40 CFR §258.53.

4. Establishing Initial COC Data

   a. For any COC that does not have at least 16 data points at any given compliance well (*e.g.*, for a new COC established under ***Detection Monitoring Program B.11***), the Discharger shall establish the prevailing concentration of that constituent at each such data-deficient well by collecting and analyzing one sample quarterly at each data-deficient background and downgradient monitoring point until each such well has at least 16 data points.

   b. For any upgradient or downgradient well installed after the effective date of this M&RP, the Discharger shall establish the prevailing concentration for each COC by sampling **quarterly for four years**. These data shall be used, as described in ***Detection Monitoring Specification C.5 (a through c),*** in the event that the COC becomes an MPar. For any constituent for which quarterly sampling would be too frequent to obtain reasonably independent data, even using the post-sampling purge approach described in CCR Title 27 §20415(e)(12)(B), the Discharger shall include, for Regional Board approval, a proposed date for completion of data procurement and a well- and constituent-specific technical validation for any delay of more than one month between successive sampling dates.

5. Statistical Data Analysis Methodology

   a. Intra-well Comparisons are Standard – Except as otherwise provided in ***Detection Monitoring Specification C.5.a.i.3 (a & b),*** intra-well comparison methods shall be used at all compliance wells for all MPars that are subject to data analysis under this Order and shall be used to test individual "background" (*e.g.*, upgradient) wells regarding unexpected increases in man-made constituents (*e.g.*, VOCs) as follows:

      i. Pre-Detection Background Data Set – Initially, except as otherwise provided in ***Detection Monitoring Specification C.5.a.i(3)(a) and (b) or C.7***, for each given MPar at a given downgradient monitoring well (well/MPar pair), the proposed

background data set shall consist of all validated data from that compliance well and parameter, for the period of four years after adoption of this Monitoring and Reporting Program. The Discharger shall collect quarterly samples for a period of four years. Then, every two years as part of the annual monitoring summary report [see CCR Title 27 §20415(e)(14)], the Discharger shall add data to the background data set for each well/MPar pair after validating (via a method approved by the Regional Board), that the new data does not contain results indicating an increase over the existing background data concentrations. The Discharger shall retire the well/MPar's oldest two years of background data (after 16 background data points have been collected), thereby producing a data set covering the then-previous four years (16 data points). The Discharger shall validate the proposed intra-well background data set as follows for each MPar at each well (initially) or, subsequently, at a new well or for a new MPar at an existing well. The Discharger shall report the validated or updated background data set, for each affected well/MPar pair, in the next scheduled monitoring report. Initial background data validation shall be as follows:

(1) Accelerated Background Data Procurement – if there are less than 16 pre-detection monitoring data points available, for a given MPar at any compliance well, the Discharger shall implement the accelerated data procurement effort described in ***Detection Monitoring Specification C.4*** to achieve that minimum background sample size (16 data points per well) prior to initiating the intra-well background data set validation procedure described below;

(2) Validate Upgradient Data for Synthetic MPars – for any MPar that is a non-metallic Appendix II constituent (*i.e.*, artificially produced or synthetic), the initial intra-well data validation, under ***Detection Monitoring Specification D.5.a.i(3),*** shall utilize only data from those upgradient (or cross-gradient) compliance wells whose pre-detection monitoring data, for that constituent, exceeds the constituent's method detection limit in less than 10 percent of the well's data. Such synthetic constituents should not be detectable at upgradient wells except in error (around 1 percent of the time) or because the constituent comes either from the WMU or from another source. For any upgradient well rejected pursuant to this paragraph, for a given MPar, where the Discharger has not already explained the constituent's presence at that well to the satisfaction of the Regional Board, the

Discharger shall conduct an investigation under ***Detection Monitoring Specification C.7***. If there are one or more rejected background wells, the Discharger shall use its data to validate each well/MPar pair's proposed intra-well background data set, under ***Detection Monitoring Specification C.5.a.i(3)***; and

(3) Intra-well Background Validation for New Well/MPar Pairs – for all compliance wells initially and, subsequently, for new wells or a new MPar at an existing well, to determine whether the existing data for that MPar at the well can be used as its intra-well comparison background data set:

(a) Commonly Quantified Constituents – for determining the "naturally occurring" or "background" groundwater conditions (*i.e.*, pre-landfill conditions) of any MPar that may commonly be detected in groundwater at concentrations exceeding the constituent's PQL, the Discharger shall validate the proposed intra-well data from each compliance well by comparing that well's data set to a pooled box-and-whiskers plot, for that particular MPar, from all "background" wells (*i.e.*, upgradient or cross-gradient wells) completed in the same water bearing zone of the groundwater aquifer. If any such constituent's median concentration (for a downgradient well) exceeds the pooled background plot's 75th percentile (the upper boundary of the box in a box-and-whisker's plot), then that compliance well's existing data cannot be used as the intra-well comparison background data set for that well/MPar pair. That well/MPar shall be tested, beginning no later than the next scheduled reporting period, using an inter-well comparison data analysis method [against the applicable background well(s)], that meets the requirements of CCR Title 27 §20415(e)(9). For wells/MPar pairs whose existing data's median is less than the pooled background plot's 75th percentile, the existing data shall be used as the initial background data set for intra-well comparisons for that well/MPar pair; or

(b) Rarely Quantified Constituents – for determining the "naturally occurring" or "background" groundwater conditions (*i.e.*, pre-landfill conditions) for an MPar that would rarely be detected in groundwater

(*e.g.*, non-metallic Appendix II constituents), the Discharger shall identify the highest value from the pooled data set from all background wells that have passed validation under ***Detection Monitoring Specification C.5.a.i(2)*** or, in a case where all applicable upgradient well data is non-detect, the MDL. The Discharger shall use this value as a basis of comparison to validate the data points in the proposed intra-well background data set. The initial intra-well background data set for that downgradient well shall consist of all data points in the proposed intra-well background data set that are less than this value.

ii. **Post-Detection Background Data Set —** For any constituent that is in "tracking mode" [***Detection Monitoring Program Specification C.5.e.ii***], at a given well, its background data set shall be the background data set that was in effect when the well/MPar pair exhibited a measurably significant increase.

b. Performance Standards – All data analysis methods (statistical or non-statistical) shall meet the applicable requirements of CCR Title 27 §20415(e)(9).

c. Retest is Part of the Method – If an approved data analysis method provides a preliminary indication that a given MPar has displayed a measurably statistically significant increase in concentration at a given well, then the Discharger shall perform a discrete retest, in accordance with CCR Title 27 §20415(e)(8)(E) for verification. The retest is part of the data analysis method; therefore, a measurably significant increase exists only if either or both of the retest samples validate the preliminary indication.

d. Limited Retest Scope – For any given groundwater monitoring point, the Discharger shall perform the verification procedure only for those MPars that have shown a measurably significant increase in that well for that reporting period.

e. Water Quality Monitoring Approach – The monitoring approach used for each well/MPar pair shall be controlled by whether the MPar has exhibited a measurably significant increase in that well. Therefore, the Discharger shall monitoring each well/MPar pair in one of two modes, as follows:

i. Detection Mode – For an MPar that has not produced a measurably significant increase at that well, the purpose of monitoring for that well/MPar pair is to watch for the MPar's

arrival at that well in a concentration that triggers a measurably significant indication of a release using an appropriate statistical or non-statistical data analysis method; or

ii. Tracking Mode - For an MPar that has produced a measurably significant increase at that well, the purpose of monitoring for that well/MPar pair is to track changes in the concentration of the MPar at that well via an evolving concentration-versus-time plot.

f. Detection Mode Data Analyses – The following applies to all detection mode data analyses (i.e., this paragraph does not apply to the scans required under ***Detection Monitoring Program B.11 and B.12***):

i. MPars Readily Detectable in Background – At any given monitoring point, the Discharger shall apply an approved statistical analysis for each detection mode MPar that exceeds its respective MDL in **10 percent or more** of the applicable background data set. For each well/MPar pair (separately), an approved statistical analysis is a method, other than Analysis of Variance (**ANOVA**), that meets the performance standards of CCR Title 27 §20415(e)(9). If using SANITAS®, the Discharger shall use the "CA Standards" and "CA Retest" settings. Otherwise:

(1) For any such well/MPar pair that, as of the effective date of this Order, does not have an approved statistical analysis method, the Discharger shall propose and substantiate an appropriate statistical method within **30 days** of the adoption of this Order;

(2) For any new MPar that qualifies for statistical analysis by meeting the above 10 percent rule at a given well, the Discharger shall propose and substantiate an appropriate statistical method for that well/MPar pair as part of the background data validation under ***Detection Monitoring Specification C.5.a.i.(3)***.

ii. MPars Not Readily Detectable in Background – For any monitoring point at which one or more MPars exceed their respective MDL in **less than 10 percent** of the applicable background data set, the Discharger shall analyze the data for these MPars via the California Non-statistical Data Analysis Method (CNSDAM) test described in ***Detection Monitoring Specification C.6.***

6. CALIFORNIA NON-STATISTICAL DATA ANALYSIS METHOD

a. Non-Statistical Method for Detection Mode MPars Seldom Found in Background – For any given compliance (downgradient) well, the Discharger shall use this data analysis method, jointly, for all constituents on the "scope list" below (or, for each retest sample, the modified scope list of paragraph D.6.b.ii. below).

i. Scope List – Create a current "scope list" showing each detection mode MPar, at that well, that exceeds its MDL in **less than 10 percent** of its background data (see ***Detection Monitoring Specification C.5.f.i***).

ii. Two Triggers – From the scope list made under paragraph C.6.a.i. above, for an initial test [or, for a retest, the modified scope list under paragraph b., below], identify each MPar in the current sample from that well that exceeds its respective MDL or PQL. The Discharger shall conclude that these identified MPars provide a preliminary indication [or, for a retest, provide a measurably significant indication], at that well, of a release if either:

(1) Two or more of the MPars exceed their respective MDL; or

(2) At least one MPar equals or exceeds its respective PQL.

b. Discrete Retest [CCR Title 27 §20415(e)(8)(E)]:

i. In the event that the Discharger concludes (pursuant to paragraph C.7.a.ii. above) that there is a tentative indication of a release, then the Discharger shall immediately notify the Regional Board by phone or e-mail within **3 days** and, within **30 days** of such indication, shall collect two new (retest) samples from the indicating compliance well.

ii. For any given compliance well retest sample the Discharger shall include, in the retest analysis, only the laboratory analytical results for those constituents indicated in that well's original test, under paragraph C.6.a.ii. above, and these indicated constituents shall comprise the well's "modified scope list". As soon as the retest data are available, the Discharger shall apply the same test [under paragraph C.6.a.ii. above, but using this modified scope list] to separately analyze each of the two suites of retest data at that compliance well.

iii. If either (or both) of the retest samples trips either (or both) of the triggers under paragraph C.6.a.ii above, then a measurable

significant increase at that well for the constituent(s) indicated in the validating retest sample(s) has occurred. Furthermore, thereafter, the Discharger shall monitor the indicated constituent(s) in tracking mode (instead of detection mode; see ***Detection Monitoring Specification C.5.e.ii*** above) at that well, shall remove the constituent(s) from the scope list created (under paragraph C.6.a.i. above) for that well, and shall highlight this conclusion and these changes in the next scheduled monitoring report.

7. Frequent Detections of a Synthetic Constituent in a Background Well – Any time an (upgradient or cross-gradient) compliance well exhibits an excessive frequency or proportion of trace-level or numerical concentration data for any MPar (under ***Detection Monitoring Specification C.5 or C.8***) or COC (under ***Detection Monitoring Program B.12 or Detection Monitoring Specification C.4***) that is a non-metallic Appendix II constituent or MTBE, the Discharger shall conduct an investigation under this paragraph. For such a constituent: an "excessive proportion" constitutes a condition, under ***Detection Monitoring Specification C.5.a.i.(2)***, where 10 percent or more of the data from that background well exceeds the MPar's MDL; and an "excessive frequency" constitutes a condition, under ***Detection Monitoring Specification C.8***, in which new data at the background well exceeds the constituent's MDL for two successive samples. Given either condition, the Discharger shall notify the Regional Board **within 3 days** by phone or e-mail and shall, within **180 days** thereafter, submit a report, acceptable to the Regional Board, that examines the possibility that this constituent originated from the WMU (*e.g.*, using a concentration gradient analysis and other methods as appropriate) and proposes appropriate changes to the monitoring program. If, after reviewing this report:

   a. The Regional Board concludes that the evidence indicates the synthetic constituent originated from a source other than the WMU, then the Regional Board may make appropriate changes to the monitoring program; or

   b. The Regional Board is unable to conclude that the evidence indicates the detected synthetic constituent came from a source other than the WMU, then the Discharger shall:

      i. List the constituent as a MPar, if it is not already listed, in the next scheduled monitoring report and shall note this change prominently in the report's summary;

      ii. Include this background well as part of the release, for that MPar and thereafter, shall address this well/MPar pair in tracking mode (*i.e.*, as part of the release), in spite of the well being a

"background" (*i.e.*, upgradient or cross-gradient) well, beginning with the next scheduled monitoring report; and

iii. If there is not at least one other "background" (*i.e.*, upgradient or cross-gradient) well unaffected by this constituent, shall, within **90 days**, install a new upgradient or cross-gradient "background" well in a portion of the aquifer that will provide data representative of background conditions for the WMU's compliance wells.

8. Ongoing Background Well Testing – Although most data analysis will be via intra-well comparisons, the Discharger shall continue to monitor "background" (*i.e.*, upgradient or cross-gradient) wells, for each MPar and COC, each time that MPar or COC is monitored at downgradient wells. Each year that there is new "background" well data for a constituent (*i.e.*, annually for MPars and every five years for non-MPar COCs), the Discharger shall include the new data in the annual monitoring summary report [see CCR Title 27 §20415(e)(14)] as a time-versus-concentration plot for that "background" well and constituent. Any time such a plot (for a given well and constituent) shows two successive data points in excess of the MDL for any non-metallic Appendix II constituent or MTBE that has not already been investigated at that well, under ***Detection Monitoring Specification C.7***, the Discharger shall notify the Regional Board within **3 days** by phone, FAX or e-mail and shall initiate an investigation under ***Detection Monitoring Specification C.7*** within **30 days** of noting this condition.

D. RESPONSE TO A RELEASE

1. If the Discharger determines that there is significant statistical evidence of a release (*i.e.*, the initial statistical comparison or non-statistical comparison indicates, for any Constituent of Concern (COC) or monitoring parameter (MPar), that a release is tentatively identified), the Discharger shall:

   a. Notify the Regional Board within **3 days**, by phone, FAX or e-mail, as to the monitoring point(s) involved, shall provide written notification by certified mail within seven days of such determination, and shall carry out a discrete retest [see ***Detection Monitoring Specification C.5*** (statistical method) or ***C.6*** (non-statistical method) of this M&RP].

   b. Within **30 days**, collect additional sample(s) for the indicated COCs or MPars at each indicating monitoring point [per CCR Title 27 §20420(k)(1)], collecting at least as many samples per suite as were used for the initial test. Re-sampling of the background monitoring points is optional. Samples shall be analyzed using the same analytical methods that produced the original data indicating the tentative evidence of a release. Sample data shall be analyzed using the same

statistical procedure or non-statistical procedure that provided the tentative evidence of a release.

As soon as the data are available, the Discharger shall rerun the statistical or non-statistical method separately upon each suite of retest data. For any indicated monitoring parameter or COC at an affected monitoring point, if the test results of either (or both) of the retest data suites confirm the original indication; the Discharger shall conclude that a release has been discovered.

All retests shall be carried out only for the monitoring point(s) for which a release is tentatively indicated, and only for the COC or MPars, which triggered the indication there, as follows:

i. If an ANOVA method was used for the original data, the retest shall involve only a repeat of the multiple comparison procedure, carried out separately on each of the two new suites of samples collected from the indicating monitoring point.

ii. If the Method of Proportions was used for the original data, the retest shall consist of a full repeat of the statistical test for the indicated constituent or parameter, performed separately on each of the new sample suites from the indicating monitoring point.

iii. If the non-statistical method was used for the original data, the retest shall consist of only those constituents that triggered the retest.

c. If this conclusion is not based upon "direct monitoring" of the COCs, then the Discharger shall, within **30 days**, sample for all COCs at all monitoring points in the affected medium for the WMU, and submit them for laboratory analysis. Within **seven days** of receiving the laboratory analytical results, the Discharger shall notify the Regional Board, by certified mail, of the concentration of all COCs at each monitoring point in the affected medium. Because this scan is not statistically tested against background, only a single datum is required for each COC at each monitoring point.

2. If the Discharger concludes that a release has been discovered:

a. The Discharger shall, within **90 days** of discovering the release, submit an amended Joint Technical Document (*i.e.*, amended Joint Technical Document/Report of Waste Discharge) proposing an Evaluation Monitoring Program, meeting the requirements of CCR Title 27 §20420(k)(5) and §20425, and an Assessment Monitoring Program pursuant to requirements in CFR Title 40 §258.55.

b. The Discharger shall, within **180 days** of discovering the release, submit to the Regional Board a preliminary engineering feasibility study meeting the requirements of CCR Title 27 §20420(k)(6).

c. Within **14 days** of completing an individual step in this section (***Response to Release D.2.a or D.2.b***) the Discharger shall amend the Facility's Operating Record with any results from their evaluation, testing, re-testing, or any technical reports submitted to the Regional Board. Within **seven days** of making an amendment to the Facility's Operating Record pursuant to this section, the Discharger shall also provide written notification to the Regional board indicating that they have amended the Operating Record.

3. If the Discharger determines that there is significant physical evidence of a release, the Discharger shall notify the Regional Board by telephone within 24 hours and by certified mail within seven days. The Discharger shall carry out the requirements of ***Response to Release D.2*** for all potentially affected monitored media.

E. RESPONSE TO DETECTION OF VOLATILE ORGANIC CONSTITUENTS (VOCs) IN BACKGROUND (or any other constituent which is expected to be "non-detectable concentrations" in background and not amenable to statistical analysis)

1. Except as provided in ***Response to Detection of Volatile Organic Constituents E.3*** below, any time the laboratory analysis of a sample from a background monitoring point or detection monitoring point, sampled for VOCs shows either:

   a. Two or more VOCs at or above their respective MDLs, or

   b. One VOC at or above its respective PQL, then the Discharger shall:

      i. Document each affected monitoring point, identify monitoring parameters, and COCs that indicate evidence of a release; and notify the Regional Board by telephone and facsimile within **3 days**.
      ii. Follow up with written notification by certified mail within **seven days**.
      iii. Obtain two new independent VOC samples from that background monitoring point.
      iv. Send the samples for laboratory analysis of all detectable VOCs within **30 days**.

2. If either or both of the new samples validates the presence of VOC(s), using the above procedure, the Discharger shall:

   a. Notify the Regional Board by telephone and facsimile within **3 days**.
   b. Follow up with written notification by certified mail within **seven days**.
   c. Within **180 days** of validation, submit a report that evaluates the possibility that the detected VOC(s) originated from the WMU and proposing appropriate changes to the monitoring program.

3. If the Regional Board determines, after reviewing the report submitted under ***Response to Detection of Volatile Organic Constituents E.2.c*** above, that the VOC(s) detected originated from a source other than the waste management unit, the Regional Board may make appropriate changes to the monitoring program.

4. If the Regional Board determines, after reviewing the report submitted under ***Response to Detection of Volatile Organic Constituents E.2.c*** above, that the detected VOC(s) most likely originated from the WMU, the Discharger shall assume that a release has been detected and shall immediately begin carrying out the applicable general requirements for ***Response to Release D.2*** above).

F. RESPONSE TO LEACHATE SEEP

1. The Discharger shall report by telephone and facsimile within **three days**, the discovery of any previously unreported seepage of liquid waste or water from the WMU. A written report shall be filed with the Regional Board within **seven days**, containing at least the following information:

   a. A map showing the location(s) of seepage;

   b. An estimate of the flow rate of the seepage;

   c. A description of the nature of the discharge (*e.g.*, all pertinent observations and analyses);

   d. Corrective measures implemented and/or proposed for consideration by the Regional Board; and

   e. A workplan for sampling and laboratory analysis and reporting of results for the seepage(s).

G. RELEASE BEYOND THE FACILITY BOUNDARY

1. Pursuant to CFR Title 40 §258.55(g)(1)(iii), any time the Discharger concludes that a release from the WMU has proceeded beyond the facility boundary, the Discharger shall notify all persons who either own or reside upon the land that

directly overlies any part of the plume (affected persons). In addition, the Discharger shall also notify all adjacent property owners and residents located within 2,000 feet of the boundary of the facility (interested persons).

2. Initial notification to interested and/or affected persons shall be accomplished within **14 days** of making this conclusion and shall include a description of the Discharger's current knowledge of the nature and extent of the release.

3. The Discharger shall provide updates to all interested and/or affected persons, including any persons newly affected by a change in the boundary of the release, within **14 days** of concluding there has been any material change in the nature or extent of the release.

4. Each time the Discharger sends a notification to interested and/or affected persons, the Discharger shall provide the Regional Board within **seven days** of sending such notification, with copies of the notification and an updated current mailing list of affected persons.

5. Each time the Discharger sends a notification to interested and/or affected persons and the Regional Board, within **14 days** of sending the notification the Discharger shall amend the Facility's Operating Record to include that notification and any attachments thereto. Within **seven days** of making an amendment to the Facility's Operating Record pursuant to this section, the Discharger shall also provide written notification to the Regional Board indicating that they have amended the Operating Record for the Facility.

H. REPORTS TO BE SUBMITTED TO THE REGIONAL BOARD

All reports shall be submitted electronically no later than one month following the end of their respective Reporting Period. The reports shall be comprised of at least the following in addition to the specific contents listed for each respective report type:

1. Transmittal Letter

   A letter summarizing the essential points shall be submitted with each report. The transmittal letter shall include:

   a. A discussion of any requirement violations found since the last such report was submitted and shall describe actions taken or planned for correcting those violations. If the Discharger has previously submitted a detailed time schedule for correcting said requirement violations, a reference to the correspondence transmitting such schedule will be satisfactory. If no violations have occurred since the last submittal, this shall be stated in the transmittal letter; and

b. A statement certifying that, under penalty of perjury, that to the best of the signer's knowledge the report is true, complete, and correct. This statement shall be signed by an individual meeting the requirements contained in **Reporting Requirement I.16** of Order No. R9-2009-004.

2. Semi-Annual Report

The semi-annual report shall contain, but not be limited to, a compliance evaluation summary of the groundwater data obtained. The summary shall include the following information:

a. Monitoring Parameters;
b. Detection limit of monitoring equipment;
c. Measured concentrations of MPars determined from samples collected during the current sampling event;
d. A map (or copy of an aerial photograph) which indicates the locations of observation stations, Monitoring Points, and Compliance Wells, and groundwater flow rate/direction and graphical presentation (*e.g.*, arrow on a map);
e. Monitoring well information, method and time of groundwater level measurement, and a description of the method of purging used both before and after sampling;
f. Sampling information, type of pump used and its vertical placement, detailed description of sampling procedure, QA/QC;
g. Leachate and run-on/off control statement regarding the condition and performance of any leachate monitoring and control facilities and of the run-on/off control facilities;
h. Site inspection reports;
i. Waste placement and type – the quantity and types of wastes discharged and the locations in the WMU where the waste has been placed since submittal of the last monitoring report;
j. Measured concentrations of MPars determined in liquid or vapor samples collected from secondary leak detection system;
k. The total volume of leachate collected each month, reported separately as volume from the Primary LCRS and volume from Secondary LCRS, since the last semiannual monitoring report[1]; and
l. A summary and tabulation of monitoring data including a written technical evaluation of vapor/gas management from the Primary and/or Secondary LCRS.

3. Annual Summary Report

The annual summary report, covering the previous monitoring year, shall contain the following information:

[1] Pursuant to CCR Title 27 §20340(h).

a. For each compliance-monitoring well, the Discharger shall submit a graphical display [per CCR Title 27 §20415(e)(14)] for all data collected within at least the previous five calendar years. Each graph shall plot the concentration of one or more constituents over time for a given monitoring point, at a scale appropriate to show trends or variations in water quality. The graphs shall plot each datum, rather than plotting mean values. For any given constituent or parameter, the scale for background plots shall be the same as that used to plot downgradient data. On the basis of any aberrations noted in the plotted data, the Regional Board may direct the Discharger to carry out a preliminary investigation, the results of which will determine whether or not a release is indicated. The report shall include analysis of trends that have been identified over the last monitoring year, and analysis of any newly identified trends, significant changes in a known trend, or trend reversals identified in the data collected for groundwater, surface water (including seeps and springs), and vadose zone monitoring points (subdrains, lysimeters, or landfill gas wells);

b. A comprehensive discussion of the compliance record, and of any corrective actions taken or planned, which may be needed to bring the Discharger into full compliance with this Order;

c. A written summary of the monitoring results and monitoring system(s), indicating any changes made or observed since the previous annual report;

d. A topographic map at appropriate scale, showing the direction of groundwater flow at the WMU and showing the area in which waste filling has been completed in the previous year;

e. A written summary of monitoring results and monitoring system(s) indicating any changes made or observed since the previous report;

f. A written evaluation of the effectiveness of the leachate control/ monitoring systems, pursuant to CCR Title 27 §20340(b, c, & d). This evaluation may be submitted under separate cover;

g. A copy of the Storm Water Pollution Prevention Plan, or as amended, under a separate cover; and

h. A complete historical tabulation of monitoring data for vapor/gas in the Primary and/or Secondary LCRS, including a written technical evaluation and recommendations for management of vapor/gas from the Primary and/or Secondary LCRS.

4. Mitigation Report

Mitigation monitoring reports must be submitted annually until mitigation has succeeded. Annual monitoring reports must be submitted prior to December 1 of each year. Monitoring reports must include, but not be limited to, the following:

a. Names, qualifications, and affiliations of the persons contributing to the report;
b. Tables presenting the raw data collected in the field as well as analyses of the physical and biological data, including at a minimum;
   i. Topographic complexity characteristics at each mitigation site;
   ii. Upstream and downstream habitat and hydrologic connectivity;
   iii. Source of hydrology;
   iv. Width of native vegetation buffer around the entire mitigation site;
   v. Qualitative and quantitative comparisons of current mitigation conditions with pre-construction conditions and previous mitigation monitoring results;
c. Photodocumentation from established reference points;
d. A Survey report documenting boundaries of mitigation area; and
e. Other items specified in the final *Restoration and Enhancement Plan* prepared for Gregory Canyon Ltd. by URS, dated May 23, 2008.

5. Leachate Report

The Discharger shall submit the leachate monitoring results each **January 31**, taken from the previous October, including an identification of all detected Appendix II constituents and MTBE that are not on the most current version of the COC list for the WMU.

For leachate sampling requiring a retest, a report shall be submitted to the Regional Board by **August 1**. This report must identify all constituents that were detected in both the previous calendar year's October sample and confirmed in the April retest sample, and must permanently add these constituents to the COC list for the WMU. The report shall also include an updated COC list with any Appendix II constituents and MTBE that are newly detected in both the October and April leachate samples.

6. Constituents of Concern Report (every 5 years)

The Discharger shall monitor all constituents of concern (COCs) and submit a COC Report [CCR Title 27 §20420(g)] as follows:

a. The Discharger shall sample all compliance wells for each monitored medium for all COCs every fifth year. The first COC report is due in Spring (after the WMU accepts waste). Subsequent COC reports shall

be submitted **every fifth year thereafter alternately in the Fall (Reporting Period ends September 30) and Spring (Reporting Period ends March 31)**. The COC report may be combined with any Monitoring Report or any Annual Summary Report having a reporting period that ends at the same time. The COC Report shall meet the minimum monitoring report requirements as described in ***Detection Monitoring Program*** B.*12;*

b. Analytical results for COCs include the constituents listed in CFR Title 40 Part 258, Appendix II and MTBE. The Discharger shall monitor for all COCs in accordance with this Section, provided that such monitoring need only encompass those COCs that do not also serve as monitoring parameters; and

c. The COC Report shall include a complete tabulation of analytical results, laboratory QA/QC datasheets, a technical discussion of results, and conclusions regarding the integrity of the WMU.

7. The Construction Quality Assurance Plan (Plan), shall be submitted as required by CCR Title 27 §20323.

8. The Final Construction Quality Assurance Report (CQA Final Report) shall be submitted as required by CCR Title 27 §20324. The final CQA Report must provide the Regional Board with acceptable results from all of the following information:

a. All of the CQA information required by CCR Title 27 §20324;

b. The results from field testing [using a combination laboratory and field testing methods, including results from test pads as required by CCR Title 27 §20324(e) through §20324(g), to demonstrate and document that the liner components can be built to comply with the construction, performance standards, and stability requirements in this Order;

c. Final Design Report and Operations Plan containing information specified in CCR Title 27 §21760(a) and §21760(b); and

d. CQA Report Appendices: Contingency Plans

The Discharger must provide its contingency plans for testing and management of all effluents from the following sources:

i. A contingency plan for management of effluents from groundwater seeps from the bedrock unit(s) underlying the liner system.

ii. A contingency plan for testing and management of effluents from the subdrain system (**Landfill Construction Specification E.2** of this Order).

iii. A contingency plan for monitoring, testing and managing "*non-leachate*" effluent (*e.g.*, construction dewatering effluents) from the primary and secondary LCRS (**Landfill Construction Specification E.8** of this Order).

9. A complete copy of the Final Engineering Specifications for the preparation of the WMU foundation/subgrade and construction of all components of the liner system for the Unit.

10. The Discharger shall include a plan for implementation of BMPs for controls of storm water conveyance, soil erosion and sediment discharge in the SWPPP for the Gregory Canyon Landfill.

11. Pursuant to **Provision H.12** of this Order, the Discharger must provide the Regional Board with a "Water Replacement Contingency Plan" to provide replacement water to all private and public well owners, and other parties affected by a release of wastes or waste constituents from the WMU.

12. To ensure compliance with **Provision H.19** of this Order, the Discharger must provide the Regional Board with a contingency plan for completing all required permitting (*e.g.*, NPDES permit), including procedures for collection and analysis of effluent samples from any water treatment system (*e.g.*, the reverse osmosis (RO) treatment system), prior to initiating discharges of treated water to the San Luis Rey River.

13. Pursuant to ***Finding No. 17*** of this Order, the Discharger shall provide the Regional Board with a plan for expanding and improving the coverage of the existing groundwater monitoring network. The required plan shall include the following minimum information:

    a. Additional well locations and analyses to improve the groundwater monitoring network for the weathered fractured rock aquifer and meet the minimum performance requirements of CCR Title 27 §20415(b)(1)(A and B), §20415(b)(4); and §20420(a and b).

    b. Additional well locations and analyses to improve the groundwater monitoring network for the unweathered fractured rock aquifer and meet the minimum performance requirements of CCR Title 27 §20415(b)(1)(A and B), §20415(b)(4); and §20420(a and b).

c. A plan for conducting an evaluation and reporting results for an analysis of wellhead protection areas[2] for all known existing water supply wells located inside the property boundary and water supply wells located within 2,300 feet of the facility boundary.

d. A plan for performing any additional technical analyses, and/or collecting additional data from field investigations, as may be required for the Discharger to complete the analysis/report required by H.12(c) above, including additional evaluations of site-specific geological, geophysical and/or water quality/geochemical data as necessary. The Discharger shall use this, and other relevant information, to provide the Regional Board with an acceptable technical demonstration that the enhanced groundwater monitoring network will meet all the required performance criteria for a Detection Monitoring Program [see CCR Title 27 §20415(b)(1)(A and B), §20415(b)(4); and §20420(a and b)] for each of the aquifer system (*e.g.*, weathered fractured rock aquifer, unweathered fractured rock aquifer, and alluvial aquifer).

e. Report the results from all tasks required to comply with ***Reports to be Filed with the Regional Board H.12(c) and H.12(d)*** pursuant to the ***J. Reporting Schedule*** of this M&RP.

14. Pursuant to ***Finding No. 18*** of this Order, the Discharger shall provide the Regional Board with a workplan for expanding and improving the performance of the existing surface water monitoring network to comply with applicable requirements of CCR Title 27 §20415(c)(2)(B).

I. RECYCLED WATER MONITORING AND REPORTING

1. The discharger shall submit an annual recycled water report containing the following information:

a. Name of Agency and Facility that supplied the recycled water during the reporting period.

b. The total volume of recycled water supplied during the reporting period.

c. An assessment of compliance of the discharge of recycled water with Discharge Specifications for Specific Types of Waste, C.5.b of Order No. R9-2009-004 by demonstrating that the onsite reverse osmosis

[2] Guidance on performing analysis of Wellhead Protection Areas is published by U.S. Environmental Protection Agency as: "Delineation of Wellhead Protection Areas in Fractured Rocks", publication number EPA 570/9-91-009, dated June 1991; and "Guidelines for Delineation of Wellhead Protection Areas", dated June 1987.

(RO) treatment unit was operating effectively during the reporting period to remove, if necessary, the annual loading of constituents in the recycled water supplied to the landfill that exceeded the annual limitations. The assessment shall apply the following formula, using the monitoring data collected pursuant to Requirement I.2.

$$Q_B C_B \geq Q_R C_R - Q_R C_L \text{ or}$$
$$C_B \geq [Q_R / Q_B]\,[C_R - C_L]$$

where: Q_R is the volume of recycled water supplied during the year of the reporting period (million gallons/year)
C_L is the limitations specified for the constituents listed in Discharge Specifications for Specific Types of Waste C.5.b.
C_R is concentration of the constituents with prescribed limitations in the recycled water supplied during the reporting period
Q_B is the volume of brine hauled from the site during the reporting period (million gallons/year)
C_B is the concentration of the constituents in the brine hauled from the site during the reporting period

d. The results of the monitoring conducted in accordance with Discharge Specifications for Specific Types of Waste C.5.b with the applicable supporting information as specified under Monitoring Provision A.7.

e. A statement certifying the status of compliance of the discharge with Reports to be Submitted to the Regional Board H.1.b. The statement shall verify that the Discharger has reviewed the requirements, shall identify any issues related to these requirements, and shall discuss how these issues were addressed related to these requirements during the reporting period.

2. For the constituents/parameters listed in the following table and at the frequency specified, the Discharger shall monitor the quantity (Q_R) and quality (C_R) of the recycled water supplied to the site and/or submit monitoring data for the specified constituents that was collected during the reporting period by the Agency supplying the recycled water, and shall monitor the quantity (Q_B) and quality (C_B) of the brine hauled from the site.

CONSTITUENT/ PARAMETER	UNIT	TYPE OF SAMPLE	SAMPLING FREQUENCY	REPORTING FREQUENCY
Flow Volume	Unit	NA[a]	NA[b]	Annually
Total Dissolved Solids	mg/L	Grab	Quarterly[c]	Annually
Nitrate Nitrogen (as N)	mg/L	Grab	Quarterly[c]	Annually
Chloride	mg/L	Grab	Quarterly[c]	Annually
Sulfate (SO_4)	mg/L	Grab	Quarterly[c]	Annually
Iron (Fe)	mg/L	Grab	Quarterly[c]	Annually
Manganese (Mn)	mg/L	Grab	Quarterly[c]	Annually

[a] Flow volume may be measured by number and volume of liquid in tanker trucks
[b] Flow volume shall be recorded monthly and reported annually
[c] Quarterly sampling or at least four samples per year that are scheduled based upon volume of demand.

J. REPORTING SCHEDULE

All technical and monitoring reports shall be submitted electronically in accordance with the following reporting schedule:

Report Type	Report Frequency	Report Period	Report Due	Referemce
Water Quality Monitoring	Semi-Annual	April – September	October 30	H.2
Water Quality Monitoring	Semi-Annual	October – March	April 30	H.2
Water Quality Monitoring	Annual	April – March	April 30	H.3
Storm Water Pollution Prevention Plan	Annual	April – March	April 30	H.3
Mitigation Monitoring	Annual	December - November	December 1	H.4
Leachate Monitoring	Annual	November – October	January 31	B.11.a
Leachate Retest*	Annual	April	August 1	B.11.a.ii, H.5
COC Report[1]	First Five Years	October – March	April 30**	B.12.a
COC Report[1]	Second five years	April – September	October 30***	B.12.a
Final Engineering Specifications	One time with addenda as necessary	-	At least 60-days prior to beginning construction of Unit(s)	H.9
CQA Final Report	One time with addenda as necessary	-	Within 60 days of completing construction of Unit(s)	H.8
Final Engineering Specifications for foundation/subgrade and liner system	As necessary	-	Within 60 days of completing construction of Unit(s)	H.9
CQA Plan	As needed	-	With JTD amendment for new construction of Unit(s)	H.7
Erosion Control Report for Implementation of BMPs	Annual	October 31 to April 30	January 30	H.10
Replacement Water Contingency Plan	One time	-	Within 1 year of completing construction of the waste containment system for WMU Phase 1	H.11
Work plan for Improving Groundwater Detection Monitoring Program	One time	-	Within 90-days of Adoption of this Order	H.13

Report Type	Report Frequency	Report Period	Report Due	Reference
Work plan for Improving Surface Water Detection Monitoring Program	One time	-	Within 90-days of Adoption of this Order	H.14
Report on Analysis of Wellhead Protection Areas	One time	-	Within 180-days of Adoption of this Order	H.13.c
Contingency Plan for management /and NPDES permitting of discharges of treated water	One time	-	Within 1 year of initiating construction of the waste containment system for Phase 1 of the WMU	H.12
Recycled Water	Annual	April - March	April 30	I.1

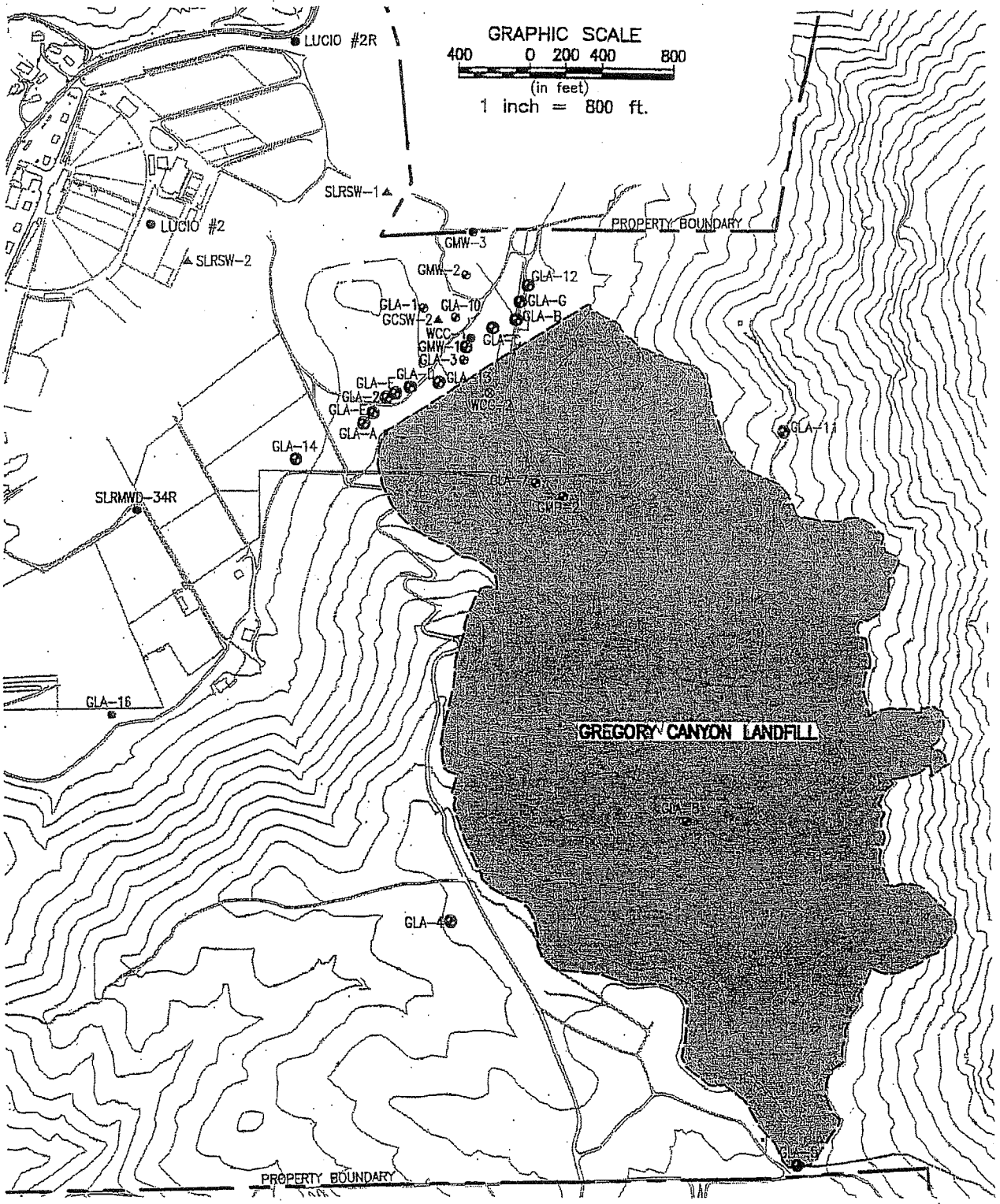
* = If necessary
** = after the WMU begins accepting waste.
*** = five years after the first COC report has been submitted.
[1] COC Reports are due at alternating intervals to account for potential seasonal variations in these data (*i.e.,* every other report is due in April of the reporting year).

Complete paper copies of all required technical and monitoring reports shall be submitted to:

Executive Officer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Ordered by:

TENTATIVE
JOHN H. ROBERTUS
Executive Officer



EXPLANATION:

- ALLUVIAL/COLLUVIAL WELL
- BEDROCK WELL
- WELL SCREENED ACROSS ALLUVIUM AND BEDROCK
- BEDROCK WATER QUALITY MONITORING WELL
- SURFACE WATER SAMPLING LOCATION

N

Attachment No. 1 to
Monitoring and Reporting
Program No. R9-2009-004

APPENDIX T

MEMORANDUM – TRASH BMPs FOR BRIDGE

Memorandum

SAN DIEGO REGIONAL
WATER QUALITY
CONTROL BOARD
2009 NOV 12 P 12: 20

To: Mike Porter, San Diego Regional Water Quality Control Board
From: Matt Moore, URS Corporation
November 12, 2009

Subject: Trash BMPs for Bridge – Gregory Canyon Landfill

The purpose of this memorandum is to provide a response to the San Diego Regional Water Quality Control Board (RWQCB) regarding inquires on documentation of trash control Best Management Practices (BMPs) for the proposed Gregory Canyon Landfill (GCLF) bridge.

The Construction Storm Water Pollution Prevention Plan (URS, 2008a) and Stormwater Quality Management Plan (URS, 2008b) provide information on construction and post-construction stormwater quality measures proposed for implementation of the landfill and associated bridge crossing of the San Luis Rey River. Both of these documents are on file with the RWQCB, and were part of the application package for the 401 certification.

Trash and debris generated during the construction phase of the project will be addressed with appropriate BMPs identified in the construction phase Storm Water Pollution Prevention Plan (SWPPP) for the project. The Stormwater Management Plan (SWMP) for the project lists trash/debris as pollutants that are anticipated to be generated from the project (SWMP Section 4, Table 7) during the operation phase of the project. .

Anticipated wind blown trash BMPs for the project consist of fencing along the bridge to capture wind blown trash from entering the river on the bridge. Figure 1 belows shows a typical trash capture fence for landfill applications that could be utilized along the bridge for the project. Note that the height of the fence will be approximately 12 feet above a 3 foot concrete barrier on the bridge for a total height of 15 feet. The fence will be curved in towards the bridge deck to assist with trapping wind blown trash.

References:

URS 2008a. Storm Water Pollution Prevention Plan for Gregory Canyon Landfill, March 10, 2008. Prepared by URS Corporation.

URS 2008b. Stormwater Management Plan for Gregory Canyon Landfill, September 22, 2008. Prepared by URS Corporation.

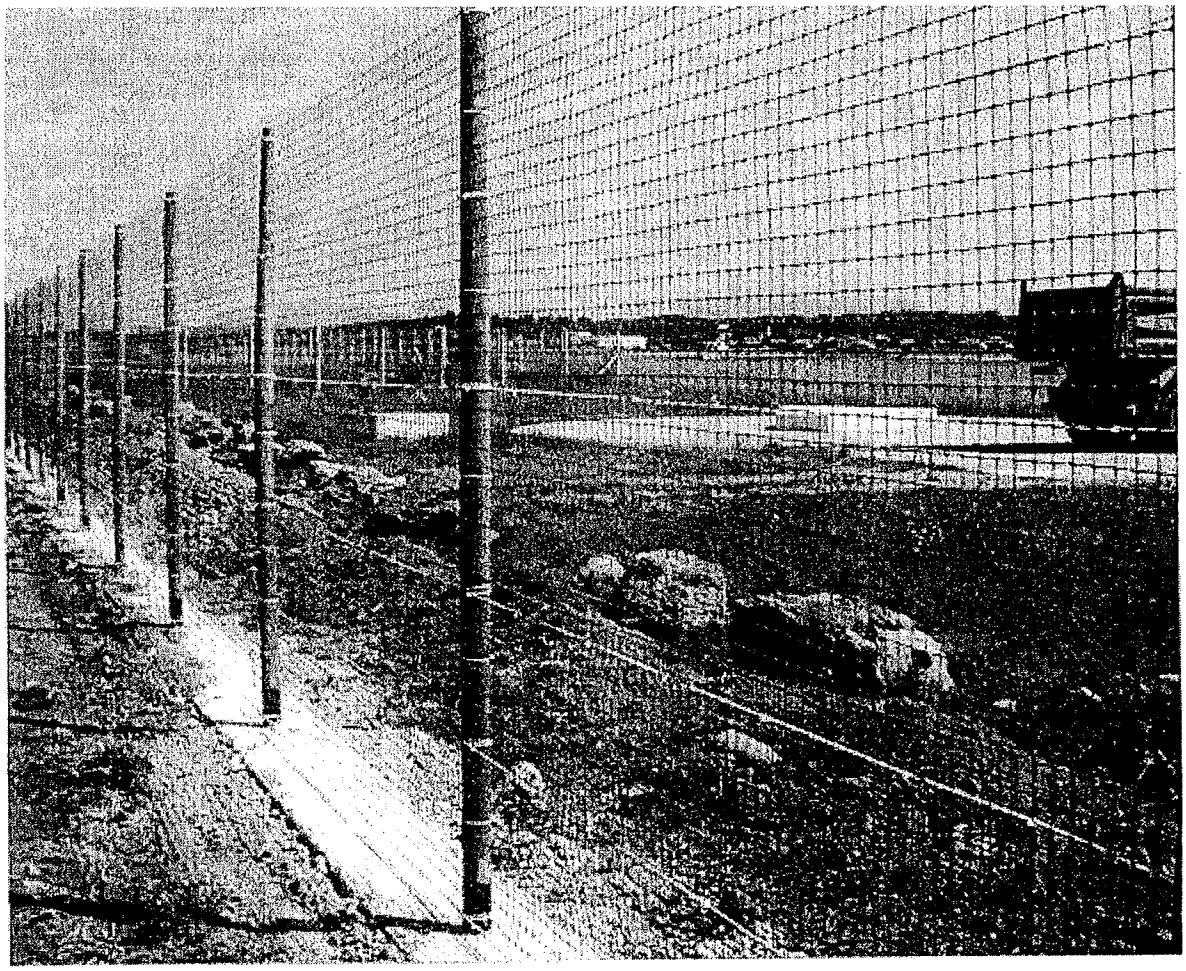


Figure 1. Typical Trash Control Fence for Landfill Applications.
Note: Height to be 12 feet above a 3 foot concrete barrier on the bridge for a total height of 15 feet. Top of fence to be curved inward to assist with trash collection.
Source: http://www.us-fence.com/HTML/trash.html

APPENDIX U

SITE CAPACITY

Bryan A. Stirrat & Associates
Civil And Environmental Engineers
A TETRA TECH COMPANY
1360 VALLEY VISTA DRIVE • DIAMOND BAR, CA 91765

Job:	Gregory Canyon Landfill		
Sheet No.:	1	of	1
Calculated by:	LHT/BM	Date	12/20/10
Check by:	JMW	Date	1/11/11
Scale:			

Gross Capacity as of January 1, 2011
Aerial Survey dated 1991
Gross Airspace is 59.5 mcy per Site Capacity Dec 2010, 44-0007VOL.dwg (Grid Method)

Net Capacity = gross capacity less liner, daily/intermediate cover, and final cover volumes, therefore:

Gross Airspace:	59.5 mcy
- Liner:	1.6
- Daily/Int Cover	11.4
- Final Cover	0.9
Net Capacity :	45.6 mcy

Current regulations require that a registered civil engineer or a registered geologist prepare and certify the volumetric calculations. The Gregory Canyon Landfill Volumetric Calculations have been calculated via CADD software by comparing various surfaces and calculating the volumes between the surfaces. The volumes and above calculations are hereby certified by Mr. Bryan A. Stirrat, a California Registered Civil Engineer, Registration Number C 22631.

Respectively Submitted:

REGISTERED PROFESSIONAL ENGINEER
BRYAN A. STIRRAT
22631
Exp. 12-31-11
CIVIL
STATE OF CALIFORNIA

Bryan A. Stirrat, P.E.
R.C.E. No. C 22631