Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

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Department of Planning and Land Use
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May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

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Chapter 1
Introduction

1.1 Purpose

The purpose of this sewer basin study is to update the San Diego County's East Otay Mesa Basin No. 6 (EOM-6) backbone sewer system and establish a basis for evaluating fair share costs for the EOM-6 backbone system. The proposed regional facilities of the southern portion of the East Otay Mesa (EOM) basin are necessary to provide sewer service to the proposed Otay Crossings Commerce Park (OCCP), Paragon property, De La Fuente properties, and tributary properties owned by Konladjian, Farida, and the Hawano Corporation. A vicinity map is provided in Figure 1.

Previous sewer studies have been submitted for the OCCP project that resulted in extremely deep sewers at the intersection of Siempre Viva Road and Enrico Fermi Drive in order to connect to the City of San Diego's (City) Otay Mesa Trunk Sewer (OMTS) System. The basin-wide sewer system alternative proposed in this study includes a regional pump station that will avoid the construction of deep sewers and eliminate the need for a pump station on the OCCP site. This study summarizes the basin-wide facilities and lays out the conceptual wastewater collection system for phased development and ultimate build-out conditions within EOM-6.

1.2 East Otay Mesa Basin No. 6 Overview

The tributary properties within EOM-6, shown in Figure 2, are located in Subareas I and II of the 2002 East Otay Mesa Specific Plan (Specific Plan) and lie within the Otay Mesa Drainage Basin within the East Otay Sewer Maintenance District (District) sewer service area. The current land development plans associated with EOM-6 are described below.

OCCP: The OCCP Project is located in the County of San Diego, south of Otay Mesa Road, and east of Alta Road. The southern boundary of OCCP also abuts the United States/Mexico border. The United States Department of Homeland Security has requested that an area be reserved within OCCP (Lot 56) along the border to build a third border crossing facility. The future extension of State Route 11 (SR-11) is also planned to be constructed through OCCP to the border crossing facility as shown on Figure 2. The OCCP site (including the border crossing facility) encompasses approximately 311 acres of which approximately 156 acres will be developed for OCCP and 59 acres have been set aside for the border crossing facility. The remaining acreage includes SR-11 right-of-way, on-site roads and open space. Proposed land use for OCCP is mixed industrial.

Paragon: The Paragon property is located southwest of OCCP and east of Alta Road. The proposed land use for Paragon is mixed industrial. The Paragon site encompasses approximately 162 acres of which approximately 120 acres will be developed. The remaining 42 acres include on-site roads and ancillary areas (future right-of-way, detention basins, and open space).

De La Fuente: The De La Fuente properties are located east of OCCP and have a proposed land use of mixed industrial. The site encompasses approximately 275 acres, of which approximately 190 acres will be developed. The remaining 85 acres are within canyons and mountain areas and are not considered developable area.

Several surrounding areas are also expected to flow into the proposed EOM-6 sewer collection system. These areas include:

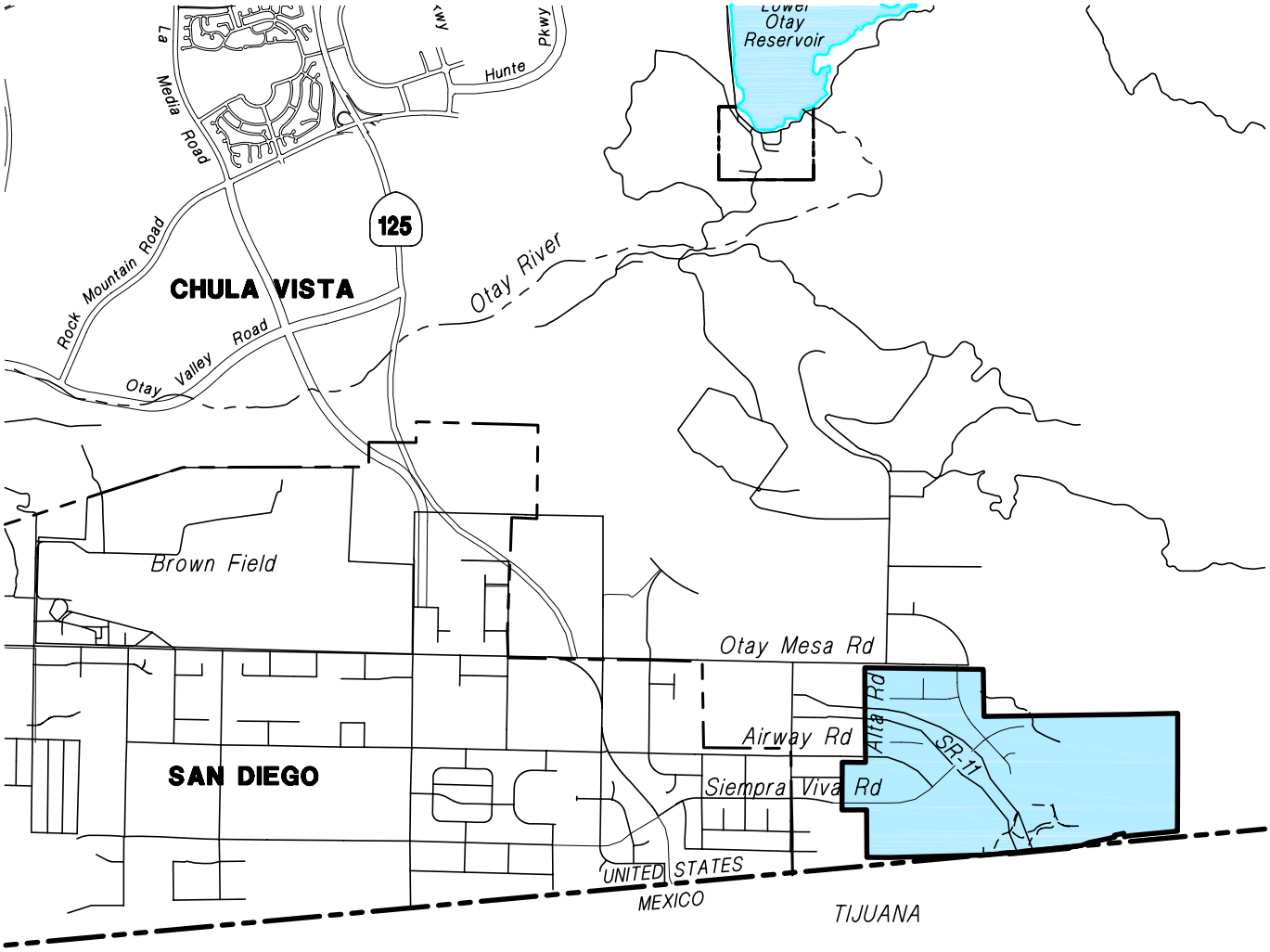
- 18.85 acres west of Alta Road (Konladjian)
- 19.8 acres west of Alta Road (Farida)
- 35.85 acres north of Siempre Viva Road (Hawano A)
- 21.89 acres south of Siempre Viva Road (Hawano B)

Proposed graded elevations range from a low of approximately 500 feet in the southern portion of the Paragon site to a high of 710 feet in the northern portion of the De La Fuente site. Natural drainage on the properties is generally from north to south and from east to west. The northern portion of the OCCP site, north of Airway Road, slopes southwesterly to the intersection of Alta and Airway Roads and the southern portion of OCCP slopes towards the Paragon site.

Wastewater criteria, flow projections, and offsite facility sizing for the District were included as part of the East Otay Mesa Sewer Master Plan Update (EOM Sewer Master Plan Update, November 2006). In the EOM Sewer Master Plan Update, EOM-6 is planned to connect to the City OMTS System as shown in Figure 3. The ultimate OMTS System will consist of gravity sewers and force mains located in Siempre Viva and Otay Mesa roads that will connect to the San Ysidro and South Metro Interceptors west of Interstate 5. Phase 1 and portions of Phase 2 of the OMTS Project have been constructed and include 27-inch and 30-inch diameter gravity sewers in Siempre Viva Road and a 42-inch gravity sewer in Old Otay Mesa Road. Flows conveyed in this sewer are pumped on an interim basis to the existing Otay Valley Trunk Sewer system located north of the Otay Mesa Community Plan Area via a temporary sewer pump station (SPS 23T) located at Siempre Viva and Cactus Roads.

1.3 Otay Mesa Trunk Sewer (OMTS) Phasing Study

The City recently authorized and is currently reviewing the OMTS Refinement and Phasing Report (December 2008). This study provides an update to the 2004 OMTS Master Plan Update and Alignment Study and addresses a revised phasing and facility plan to meet current population projections and land use plans to a planning horizon of 2030. The study evaluated projected development growth and revised average sewer generation rates by land use based on historical records. Based on this analysis, the study determined that SPS 23T would be at capacity (3 mgd) by year 2020 and would require an additional pump to meet buildout flows of 7 mgd by year 2025. In the near term, SPS 23T will be upgraded from a temporary pump station to a permanent pump station and requires emergency storage and forcemain redundancy to meet City compliance standards. Improvements to the OMTS system, including SPS 23T, are currently scheduled in four phases to be completed by year 2025. A financing plan for these facilities is currently being developed and will likely include cost sharing among tributary property owners, including the San Diego County properties that lie within EOM-6.



VICINITY MAP

LEGEND

EOM-6 BASIN STUDY AREA

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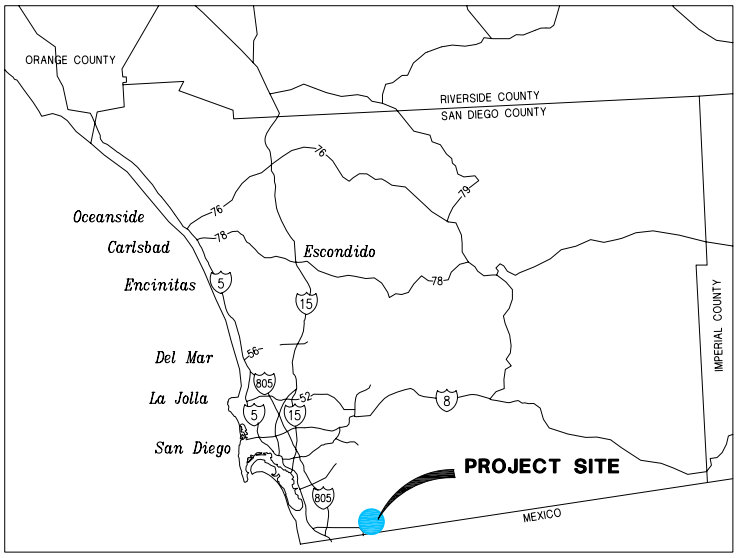
SCALE IN FEET



LOCATION MAP

STUDY AREA

FIGURE 1

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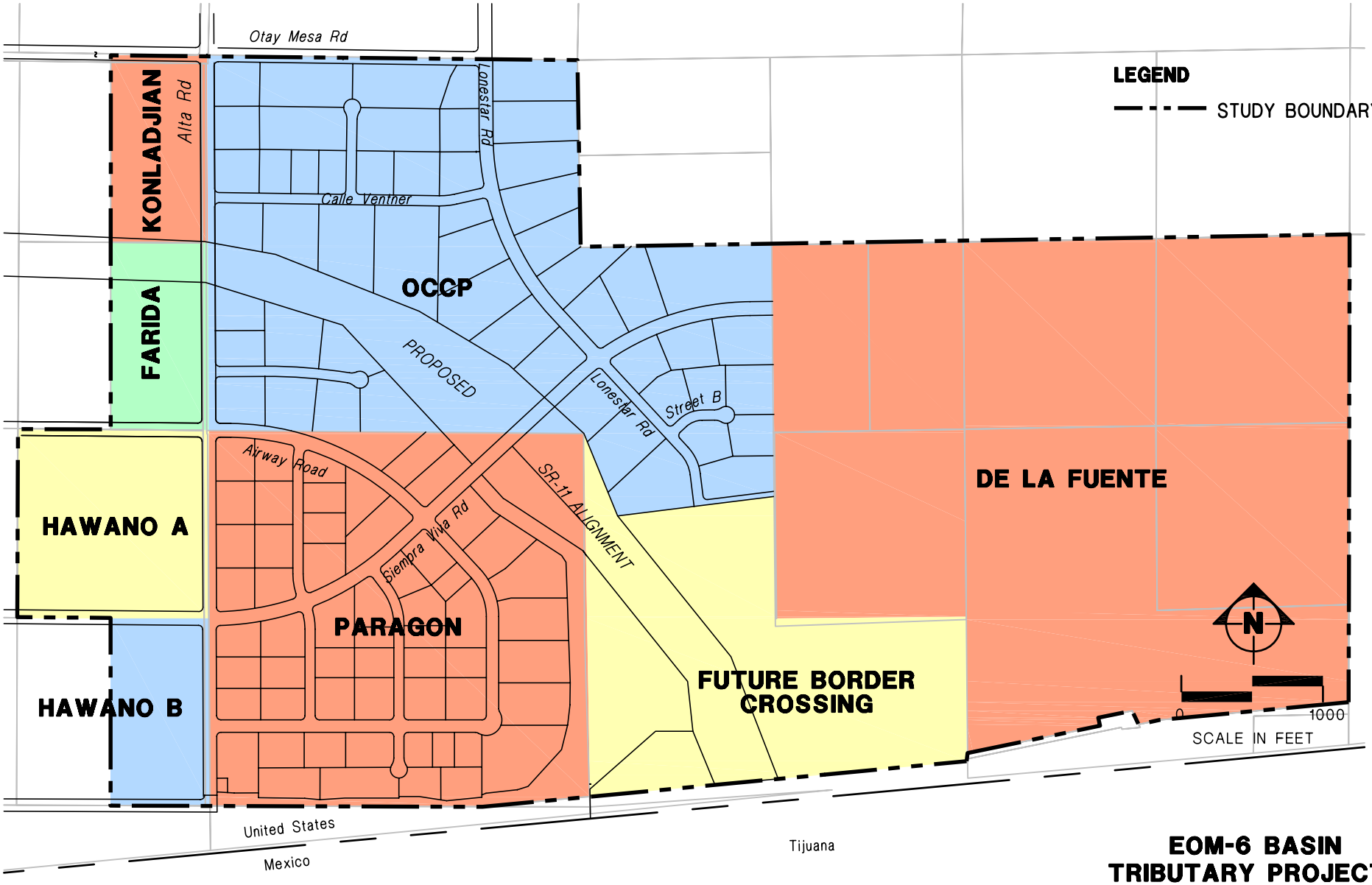

EOM-6 BASIN TRIBUTARY PROJECTS

FIGURE 2

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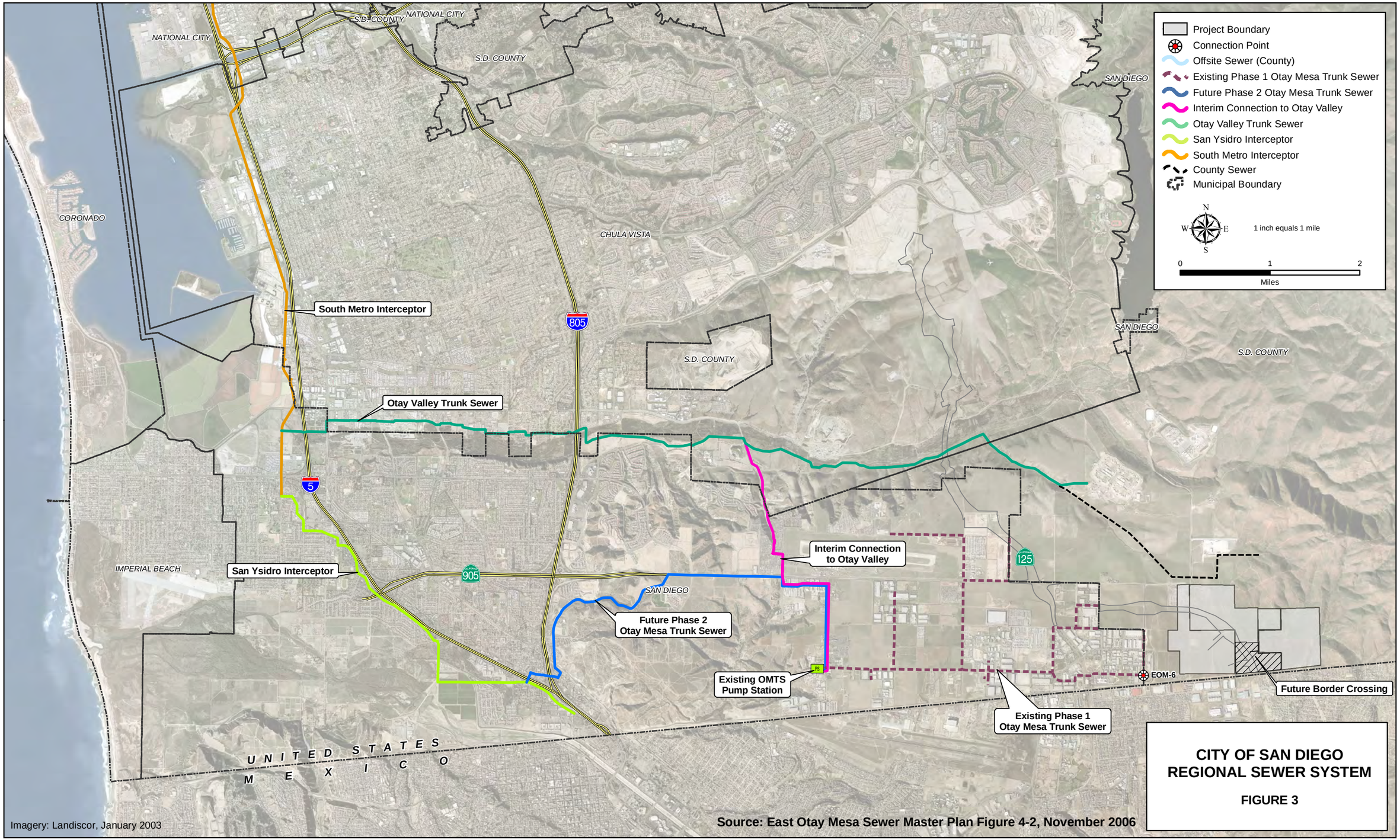

CITY OF SAN DIEGO REGIONAL SEWER SYSTEM

FIGURE 3

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Chapter 2
Wastewater Generation

This chapter presents revised wastewater generation projections for EOM-6. Sewer flows generated in EOM-6 were estimated based on current County planning criteria for the District as specified in the 2006 EOM Sewer Master Plan Update. These average and peak flows are used to size the EOM-6 regional sewer facilities in Chapter 3.

2.1 Wastewater Generation Factors

The EOM Sewer Master Plan Update provides planning criteria to estimate future sewer flows based on land use. The study also takes into consideration buildout and ultimate conditions. The buildout condition refers to the planned level of industrial intensity and wastewater generation based on similar existing developments in the area, which are typically warehouse and distribution use. The ultimate condition includes densification of the area to serve a more intense usage, including technology and research use. The recommended unit wastewater generation rates, based on gross acreage, are listed below in Table 1:

Table 1. EOM Sewer Master Plan Update Unit Generation Rates

Land Use	Buildout Generation Rate	Ultimate Generation Rate
Light Industrial	500 gpd/acre	1,500 gpd/acre
Mixed Industrial	1,000 gpd/acre	1,500 gpd/acre
Business Park	1,500 gpd/acre	1,500 gpd/acre
Border Crossing	580 gpd/acre	1,500 gpd/acre

The EOM Sewer Master Plan Update estimated a buildout and ultimate wastewater generation of 0.98 million gallons per day (mgd) and 1.65 mgd, respectively, for EOM-6, based on the land use and development information available in 2006.

2.2 Wastewater Flow Projections

Table 2 summarizes the average sewage flows generated under buildout and ultimate conditions for the study area. A more detailed breakdown of OCCP and Paragon sewer flows is provided in Appendix B. Based on the criteria presented in the EOM Sewer Master Plan Update and the current land development plans for the tributary properties within EOM-6, average wastewater generation under buildout and ultimate conditions were estimated to be 0.57 mgd and 0.93 mgd, respectively. The estimated flows in this study are lower than those projected in the EOM Sewer Master Plan Update due to the refinement of developable areas within the tributary properties of EOM-6. Following the completion of the EOM Sewer Master Plan Update, several properties originally designated as being within EOM-6 have since been incorporated into the Otay Valley Trunk Sewer collection system and have thus been removed from the EOM-6 Basin.

Table 2. Wastewater Generation for EOM-6

Area	Gross Area (ac)	Land Use	Unit Generation Rate (gpd/ac)		EDU [1]		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
OCCP [2]	155.60	Mixed Industrial	1,000	1,500	648	973	155,600	233,400
Konladjian	18.85	Business Park	1,500	1,500	118	118	28,275	28,275
Farida	19.80	Light Industrial	500	1,500	41	124	9,900	29,700
Paragon [3]	120.11	Mixed Industrial	1,000	1,500	500	751	120,110	180,165
Hawano A	35.85	Light Industrial	500	1,500	75	224	17,925	53,775
De La Fuente [4]	189.55	Mixed Industrial	1,000	1,500	790	1,185	189,550	284,325
Hawano B	21.89	Light Industrial	500	1,500	46	137	10,945	32,835
Development Subtotal	*561.65*				*2,218*	*3,510*	*532,305*	*842,475*
Future Border Crossing	59.10	Border Crossing	580	1,500	143	369	34,278	88,650
Proposed SR-11	23.70	Right-of-Way	0	0	0	0	0	0
Roads	67.49	Roads	0	0	0	0	0	0
Open Space	47.10	Open Space	0	0	0	0	0	0
TOTAL	**759.04**				**2,361**	**3,880**	**566,583**	**931,125**

1. An Equivalent Dwelling Unit (EDU) is equivalent to 240 gpd, per County criteria.
2. OCCP area does not include right-of-way or roads.
3. Paragon area does not include right-of-way or roads.
4. Total developable area.

Chapter 3
Capacity Analysis and Facilities Update

This chapter describes the methodology and procedure for sizing the sewer facilities necessary to serve EOM-6 and a description of the recommended improvements. These recommendations update and supersede the findings of previous sewer studies for the OCCP project to accommodate a regional pump station that serves EOM-6 and avoids the need for a smaller pump station on the OCCP site and deep sewer construction in Siempre Viva Road and Enrico Fermi Drive.

3.1 Design Criteria

The capacity of the recommended EOM-6 sewer facilities is based upon the design criteria and methodology established in the EOM Sewer Master Plan Update. Table 3 summarizes the design criteria used in this study for the gravity sewers and regional pump station.

Table 3. Sewer Design Criteria

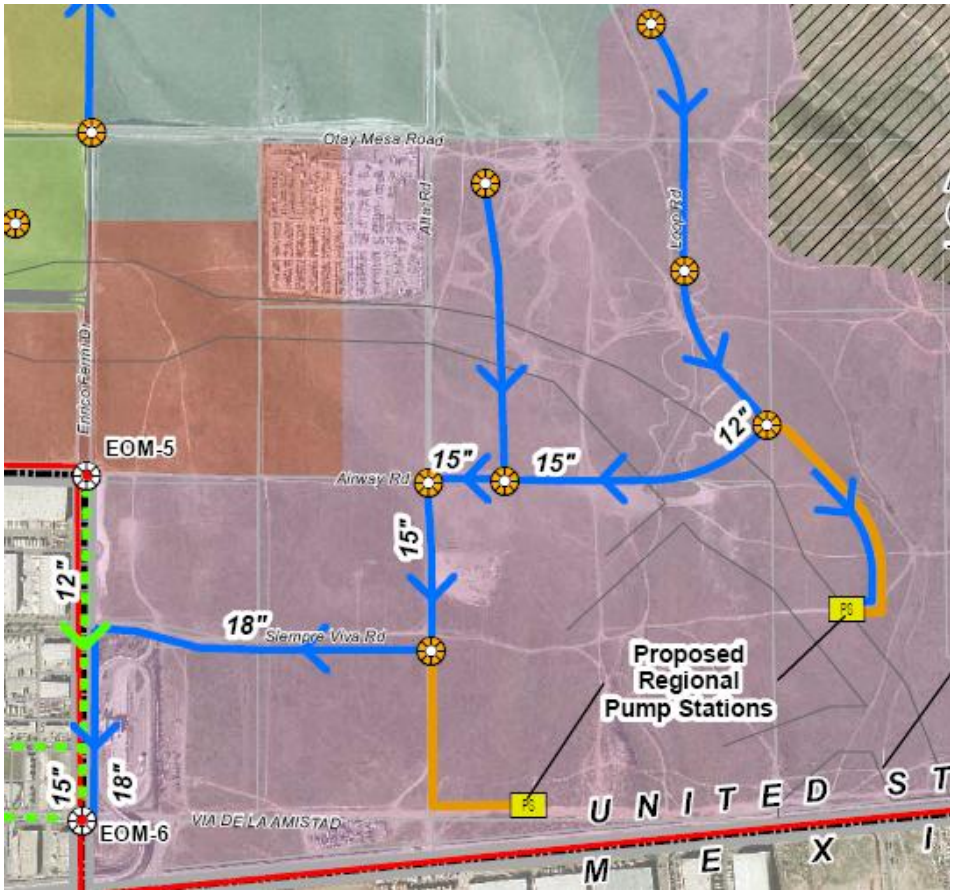
Parameter	Design Criteria
Mannings 'n'	0.013
Minimum Dry Weather Peak Flow Velocity	2 fps (or 1% min slope)
Maximum Velocity	10 fps
Maximum d/D Ratio	0.50 for D $\leq$ 15"
	0.75 for D $\geq$ 18"
Minimum Sewer Size	8-inch diameter
EDU Factor	240 gpd per EDU
Population	Average Dry Weather Flow/80 gpcd
Peaking Factor (PF)	6.2945 x Pop ^ (-0.1342)
Peak Dry Weather Flow (PDWF)	Average Dry Weather Flow x PF
Pump Station Peak Flow (PSPF)	PDWF x 1.3
Force Main Minimum Velocity	4 fps
Force Main Maximum Velocity	8 fps
Force Main Retention Time	4 hours, maximum
Hazen Williams coefficient	C = 120
Emergency storage	6 hours of PWWF

Since the East Otay Sewer Maintenance District connects directly to City of San Diego sewers, the County required that the City's peaking criteria be used for collection system sizing.

3.2 EOM-6 Sewer Facilities

In the EOM Sewer Master Plan Update, recommended sewer facilities for the EOM-6 basin included a large pumped area, with one pump station located in the proposed OCCP and another located near the intersection of Alta Road and Via de la Amistad as shown below. A third private pump station was anticipated to be required for the Border Crossing property sewer flows, which would then be pumped north to connect to the pump station in the OCCP property. The total projected buildout flow for EOM-6 was projected to be 0.98 MGD or 4,083 EDUs, and an ultimate flow was projected to be 1.65 MGD or 6,870 EDUs in the EOM Sewer Master Plan Update.

Several options were considered for sewering this basin based on anticipated topography (road grades) for the area. The preferred alternative would convey sewer flows west in Siempre Viva Road to Enrico Fermi Drive, where it would then parallel the existing 12-inch and 15-inch sewer down to the intersection of Enrico Fermi Drive and Via de la Amistad Roads, as shown below. Due to proposed elevations in the area, a gravity sewer system could not be constructed to meet the existing invert at the intersection of Enrico Fermi Drive and Siempre Viva Road, so a parallel sewer in Enrico Fermi Drive was planned. Additional flows from EOM-5 were then added at this intersection, for a total average buildout flow of 1.09 MGD to the City sewer system.



Source: EOM Sewer Master Plan Update, 2006, Figure 4

Preliminary planning for the OCCP development incorporated the sewer facilities recommended in the EOM Sewer Master Plan Update. However, the gravity sewer in Siempre Viva Road and Enrico Fermi Drive required deep sewer construction, in the range of 25 to 40 feet in depth. County staff concurred that a pump station would be preferable to a deep sewer in these roadways, especially Enrico Fermi Drive which is owned in part by the City of San Diego. However, this alternative allows OCCP to sewer independent of the development plans on the Paragon property to the south. The deep sewer option is shown on Figure 4a.

An alternative alignment of gravity sewer conveying the sewer flows from OCCP and the Border Crossing facility across the Paragon property was considered. To avoid the deep sewer, flows from along Alta Road are now proposed to be conveyed to a single regional pump station at the southern end of Alta Road, on the southwest corner of the Paragon property. This single regional pump station incorporates sewer flows from OCCP, Konladjian, Farida, and Hawano A and B, as well as the southeastern portion of OCCP and De La Fuente that were previously pumped north around the Paragon property and now flow by gravity across the Paragon property to the regional sewer pump station. The private Border Crossing pump station is still necessary to convey sewer flows to the gravity system, upstream of the regional sewer pump station. From the regional pump station, wastewater flows will be pumped to the City OMTS at the intersection of Enrico Fermi Drive and Via de la Amistad. This conceptual alignment eliminates the need for a regional sewer pump station on the OCCP property, but increases the required capacity of the regional pump station on the Paragon property. The alternative sewer layout, including the proposed regional pump station, is shown on Figure 4b.

3.2.1 Gravity System Analysis

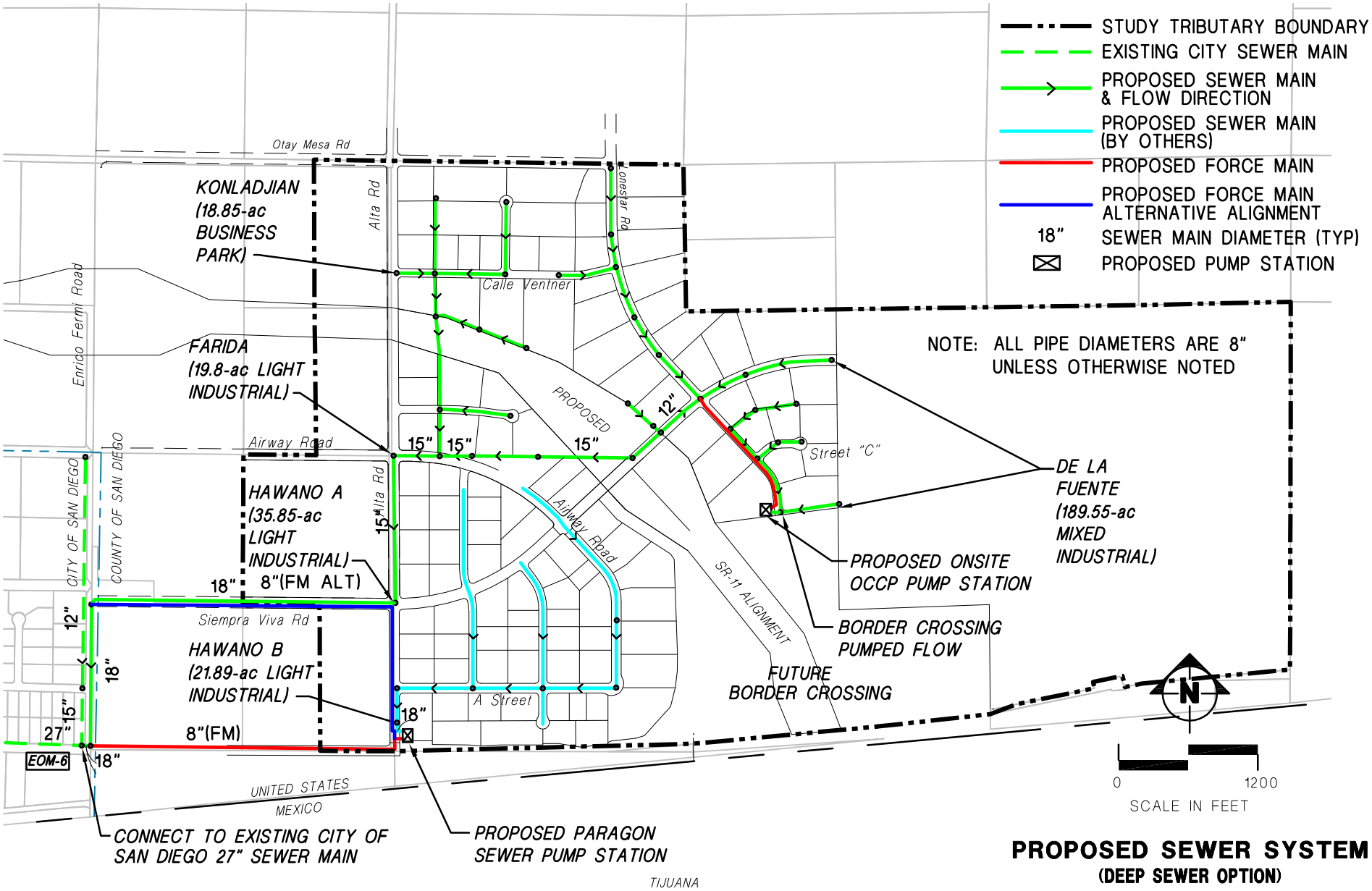
An analysis was performed to size the proposed backbone gravity collection system for buildout and ultimate sewer flows. Gravity mains were sized to convey ultimate flows and then reevaulated under buildout conditions to maintain County criteria at the lower flows. Figure 4b shows the recommended gravity pipeline sizes and indicates where tributary flows are assumed to enter the system. Gravity sewer calculations are presented in Appendix B. A summary of the recommended gravity system is presented in Table 4.

Table 4. Recommended Gravity System Summary

Diameter (in)	Total Length (feet)
8	17,032
10	419
12	1,551
15	1,960
18	1,769

3.2.2 Regional Pump Station Analysis

The regional pump station is located on the Paragon property, as shown in Figure 4b, and will receive wastewater flows from those properties listed in Table 2. It is expected that a private sewer pump station will be constructed to serve the Federal Border Crossing Facility and pump into the gravity sewer system. For the purposes of this study, those flows are assumed to enter the gravity system near the southeast corner of OCCP, as shown in Figure 4a and 4b.



PROPOSED SEWER SYSTEM
(DEEP SEWER OPTION)

FIGURE 4a

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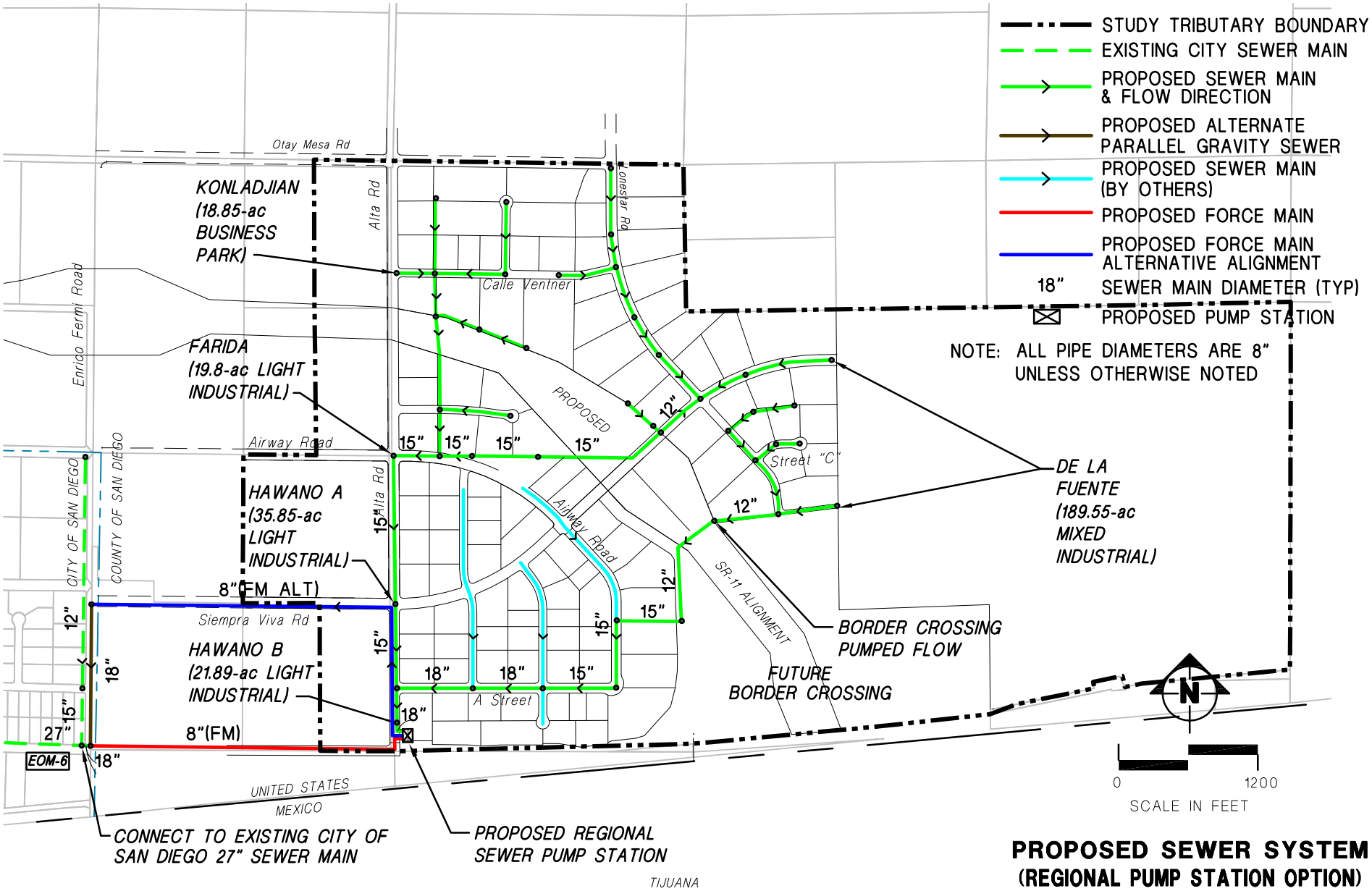

PROPOSED SEWER SYSTEM
(REGIONAL PUMP STATION OPTION)

FIGURE 4b

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PBSJ

Since the OCCP and Paragon properties are likely to develop before the other tributary properties, a phased approach to the regional pump station was analyzed. Table 5 summarizes the estimated regional pump station's design capacity and the recommended force main diameters under buildout and ultimate conditions for Phases 1 and 2. Under Phase 1 buildout conditions, the pump station was sized to convey ultimate sewer flows from just the Paragon and the OCCP properties. Phase 2 includes flows developed from OCCP and Paragon, as well as the remaining tributary developments and the Border Crossing. Pump station design flow rates and force main sizing calculations are provided in Appendix C. The conceptual pump station layout is included in Appendix D. In order to maintain consistency with the wastewater generation projections in the 2008 OMTS Refinement and Phasing Report, this study recommends sizing facilities based on ultimate conditions.

Table 5. Regional Pump Station Design Capacity

Phase	EDU[2]		Pump Station Design Capacity (mgd)[3]		Force Main Diameter[4]	
	Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
Phase 1	1,149	1,723	0.78	1.11	6"	8"
Phase 2 [1]	2,361	3,880	1.55	2.45	8"	10"

1. Phase 2 includes the entire tributary area, including the Border Crossing, as presented in Table 2.
2. EDUs based on 240 gpd/EDU per County Design Guidelines.
3. Design Capacity determined with the City's peaking factor equation and 30% additional flow (Appendix C).
4. Force main diameter determined based on maximum velocity of 8 fps and maximum retention time of 4 hours (Appendix C).

The pump station is conceptually laid out with independent wet and dry wells with the pump and motor rooms on two floors located below grade and the electrical and control room located on the third floor above grade. Emergency storage is sized to hold a minimum of 6 hours of peak wet weather inflow for OCCP, Paragon, and the Border Crossing flows (0.38 MG), as directed by the County. The County may require additional emergency storage for future tributary developments, and construction would be the responsibility of those properties. Space will be provided on the proposed pump station site to accommodate additional storage for the final ultimate condition of 0.34 MG, for a total of 0.72 MG. Detailed calculations are provided in Appendix E. This approach is consistent with discussions with County Engineering staff.

A set of three 275-gpm pumps is proposed for Phase 1 at buildout. The pumps will accommodate lower flows anticipated at the pump station during Phase 1. For Phase 2, the motors would be replaced to provide three 550-gpm pumps. Future phasing of the pumps and/or motors will be determined as development occurs. Approximately 2,750 feet of 8-inch diameter force main will need to be installed to convey pumped flows from the pump station to the EOM-6 connection located at the intersection of Enrico Fermi Drive and Via de la Amistad. The 8-inch diameter force main meets County criteria under Phase 1 ultimate and Phase 2 buildout conditions. Under Phase 1 buildout conditions, the velocity in the 8-inch force main is just below County criteria of 4 fps but will increase to 6 fps once the Phase 2 developments enter the system. Phase 2 ultimate conditions require a 10-inch force main; however ultimate conditions are anticipated beyond the serviceable life of the 8-inch force main and the replacement can be scheduled for future conditions. The pump station phasing will be addressed in more detail during preliminary design.

The proposed force main alignment runs along Via de la Amistad and connects the regional pump station to the existing EOM-6 connection at the intersection of Via de la Amistad and Enrico Fermi Drive. In the event that a force main cannot be constructed in Via de la Amistad, an alternative 4,000-foot force main could be installed from the pump station north on Alta Road, then west across Siempra Vive Road to the intersection of Siempre Viva Road and Enrico Fermi Drive. Flow would then be conveyed in a new parallel 18-inch, 1,500-foot gravity sewer line in Enrico Fermi Drive to the existing EOM-6 connection at Via de la Amistad. The force main alternative alignment is shown on Figure 4.

3.2.3 OMTS Capacity Analysis

As noted in Chapter 1, sewer flows from EOM-6 will be conveyed to the City of San Diego's OMTS System. The 2008 OMTS Refinement and Phasing Report evaluated the capacity of the existing Otay Mesa sewer system and sized future phases of the system. Future phases of the OMTS system will extend the existing sewer westward in Otay Mesa Road and upgrade SPS 23T, based on the EOM Sewer Master Plan Update. County sewer flows to SPS 23T were estimated to be an average of 1.09 mgd at buildout. The 2008 OMTS Refinement and Phasing Report assumed that County peak sewer flows to SPS 23T would be 1.7 mgd in 2030, based on 50 percent buildout of County property in 2030 and a peaking factor of 1.9. This equates to an average flow of 0.9 mgd. If flows from the County exceed this value, an upgrade to the City's pump station (SPS23T) may be required. Table 2 summarizes the updated sewage projections for EOM-6 under buildout conditions, which reduce projected average buildout flows from 0.98 to 0.60 mgd. Assuming the flow from EOM-5 remains consistent with the EOM Sewer Master Plan Update projections of 0.11 mgd, total average sewer flow under buildout conditions to OMTS would be 0.71 mgd, which would not trigger additional upgrades to City facilities through 2030.

3.3 Financing Options

The EOM Sewer Master Plan Update presents alternatives that may be available to developers as financing vehicles to fund capital expansion of the sewer system. Due to the lack of available District funds, it is anticipated that developers will construct most of the District's backbone sewer infrastructure. There are a variety of methods to fund capital improvements including the collection of capacity fees from new developments and external financing such as bonds. Four alternatives discussed in detail in EOM Sewer Master Plan Update include capacity fees, special assessment bonds, infrastructure financing districts, and certificates of participation. Financing options and alternatives will be evaluated and updated during the 2009 EOM Sewer Master Plan Update.

3.4 Recommendations

In order to maintain consistency with the wastewater generation projections in the 2008 OMTS Refinement and Phasing Report, this study recommends sizing facilities based on ultimate flow conditions. The proposed EOM-6 regional sewer system will consist of the following facilities in order to serve the buildout condition:

- Approximately 17,000 feet of 8-inch gravity sewer
- Approximately 420 feet of 10-inch gravity sewer
- Approximately 1,550 feet of 12-inch gravity sewer
- Approximately 1,960 feet of 15-inch gravity sewer
- Approximately 1,800 feet of 18-inch gravity sewer
- 2.45 MGD Regional Pump Station (with pumps initially sized for the Phase 1 buildout condition)
- Approximately 2,750 feet of 8-inch force main from the regional pump station to the existing EOM-6 connection

The regional facilities will connect the tributary properties to the existing City of San Diego sewer system at the intersection of Enrico Fermi Drive and Via de la Amistad. The existing downstream facilities were analyzed in the EOM Sewer Master Plan Update and 2008 OMTS Refinement and Phasing Report and will be upgraded according to the recommendations of those studies. This study has estimated that the average sewer flow to SPS 23T is 0.71 mgd under buildout conditions, which is less than the projected flow of 0.9 mgd from the 2008 OMTS Refinement and Phasing Report, and will not require further improvements to the OMTS system through 2030.

APPENDIX A
CORRESPONDENCE

PBS&J

An employee-owned company

May 15, 2009

Mr. Judd Halenza
Kearny PCCP Otay 311, LLC
500 Stevens Avenue, Suite 208
Solana Beach, CA 92075

SUBJECT: EAST OTAY MESA SEWER BASIN NO. 6 REGIONAL SEWER STUDY – Response to Comments

Dear Mr. Halenza,

PBS&J has reviewed the comments from the County of San Diego Department of Planning and Land Use, the Judd Company, and National Enterprises Incorporated regarding the East Otay Mesa Sewer Basin No. 6 Regional Sewer Study (EOM-6 Regional Study), dated February 2009. Responses to the comments are below:

The Judd Company, via e-mail dated February 18, 2009:

a. Figure 2: The parcel that you label as owned by Fong is owned by Konladjian. In the middle of that parcel there is a very small parcel for the future fire station.

The property previously noted as the Fong property has been corrected in the study figures and text.

b. Figure 2: The parcel that you label as owned by McKany is owned by Farida.

The property previously noted as the McKany property has been corrected in the study figures and text.

c. Table 2: Wastewater generation – where did you get the land uses listed?

The land use categories used in the EOM-6 Regional Study are based on data from the East Otay Mesa Sewer Master Plan Update, dated November 2006.

National Enterprises Incorporated, April 20, 2009:

a. The Report should combine the Rancho Vista Del Mar properties with the Wick property and the combined properties should be labeled: "De La Fuente Properties".

The properties previously noted as Rancho Vista Del Mar and the Wick property have been combined and labeled as the De La Fuente properties in the study figures and text.

b. The Report should be consistent with regard to GPD/AC for each property included in the basin. As such, "Build out" for each property should be 500 EDU's per acre and "Ultimate" should be 1,500 EDU's per acre.

The East Otay Mesa Sewer Master Plan Update, dated November 2006, defined the areas comprising the De La Fuente properties as having a Mixed Industrial land use. The wastewater unit generation rates for Mixed Industrial under Buildout and

Ultimate conditions are 1,000 gpd/acre and 1,500 gpd/acre, respectively, per the 2006 East Otay Mesa Sewer Master Plan Update.

County of San Diego Department of Planning and Land Use, David Williams, February 20, 2009:

a. Page 6, Table 1: "Commercial Land Use Buildout Generation Rate", is noted as 1,500 gpd/acre. In the November 2006 "EOM Sewer Master Plan", "Update" identifies a generation rate of 1,000 gpd/acre for commercial land use. Why the difference?

There is no Commercial land use within this study area. Generation rates for land uses within this study area are consistent with the 2006 East Otay Mesa Sewer Master Plan Update.

b. Page 8, Table 3: "Sewer Design Criteria", revise as noted:

Peak Dry Weather Flow (PDWF)	Average Dry Weather Flow x PF
~~Peak Wet Weather Flow (PWWF)~~ Pump Station Peak Flow (PSPF)	PDWF x 1.3
Force Main Minimum Velocity	~~3.5 fps~~ 4 fps
Force Main Maximum Velocity	8 fps
Force Main Retention Time	4 Hours, Maximum
Hazen Williams Coefficient	C = 120
Emergency Storage	6 Hours of PWWF

Table 3 has been revised as noted.

c. Figure B-1 (Proposed Sewer Pipe and Node Map) and Figure 4 (Proposed Sewer System): Change direction of flow arrow – from southwest to northeast at Pipe Segment P32.

Figures 4 and B-1 have been revised as noted.

d. In the Regional Sewer Study, change the references from "EOM Sewer Master Plan" to "EOM Sewer Master Plan Update".

Revised as noted.

County of San Diego Department of Planning and Land Use, Jack Cohen, February 17, 2009:

a. Page 8, first sentence: Remove the word "provides".

Revised as noted.

b. Page 9, first sentence: Indicate "East Otay Sewer Maintenance District" instead of "East Otay Mesa Sanitation District".

Revised as noted.

c. Page 10, second paragraph, first sentence: Indicate "east of Alta Road" instead of "west of Alta Road".

Revised as noted.

d. Page 10, last paragraph, third sentence: Indicate "Federal Border Crossing Facility" instead of "Federal Border Control Facility".

Revised as noted.

e. Page 12, first sentence: remove the word "be" before the word conveyed.

Revised as noted.

f. Appendix B, Tables B-1 through B-5: Why the flow from future Border Crossing is not include in these tables?

Although not shown in Table B-1, Border Crossing pumped flows are included in subsequent Tables B-2 through B-5. These tables include the note: "Pipes downstream of N38 include peak wet flows from the Border Crossing PS."

g. Appendix B, Tables B-2 through B-5: Use 18-inch diameter pipe instead of 15-inch for those segments where d/D is greater than 0.5.

Revised as noted.

h. Appendix D, page 2 of 5, second sentence: Indicate "peak dry weather flow" instead of "peak inflow".

Revised as noted.

i. Appendix D, page 4 of 5, first paragraph: Indicate "the emergency generator (instead of generators) will be located behind the pump station in an acoustical weatherproof enclosure (instead of enclosures) provided by the generator manufacturer".

Revised as noted.

<u>County of San Diego Department of Planning and Land Use, Milica Kaludjerski, April 6, 2009:</u>

a. It appears that there is discrepancy with numbers. For example, page 7 Table 2 shows 684,237 gpd and 1,130,475 gpd of average daily sewer flow for EOM 6 buildout and ultimate options respectively. Page 9, the project buildout for EOM-6 is 0.98 mgd and ultimate is 1.65 mgd (no explanation where the numbers came from). Appendix C, page 6 says Phase 2 buildout avg flow is 658,250 gpd.

The 0.98 mgd and 1.65 mgd came from the 2006 EOM Sewer Master Plan as stated in the Section 2.2 of the report. Section 3.2 on page 9 also refers to the 2006 EOM Sewer Master Plan. Appendix C has been corrected, as well as any corresponding calculations.

b. First sentence on page 8 needs to be reworded; it is not grammatically correct.

Revised as noted.

c. Page 11: There is no explanation how they came up with 250 and 500 gpm; per their numbers, it appears that all 3 pumps would have to run at the same time. Per today's industry standards a min of one pump shall be on stand-by. Suggest using minimum three 550 gpm pumps for Phase 1 that can accommodate buildout with one pump running and ultimate flows with two pumps running and a third pump would be the stand-by. Similarly, pumps for the phase 2 should be sized at 1,250 gpm each.

It is assumed that one of the three pumps will be in stand-by mode. Pump sizes have

been updated to account for the changes in flow to the station.

d. Appendix C: Forcemain sizing calculation, page 4, in second part of the calculation – Phase 2 should be corrected to Phase 1.

Revised as noted.

e. Appendix D – Figure 4: The check valve should be placed in horizontal position, not in vertical as shown on the drawing.

Revised as noted.

If you have any questions or need additional information documented, please feel free to call me.

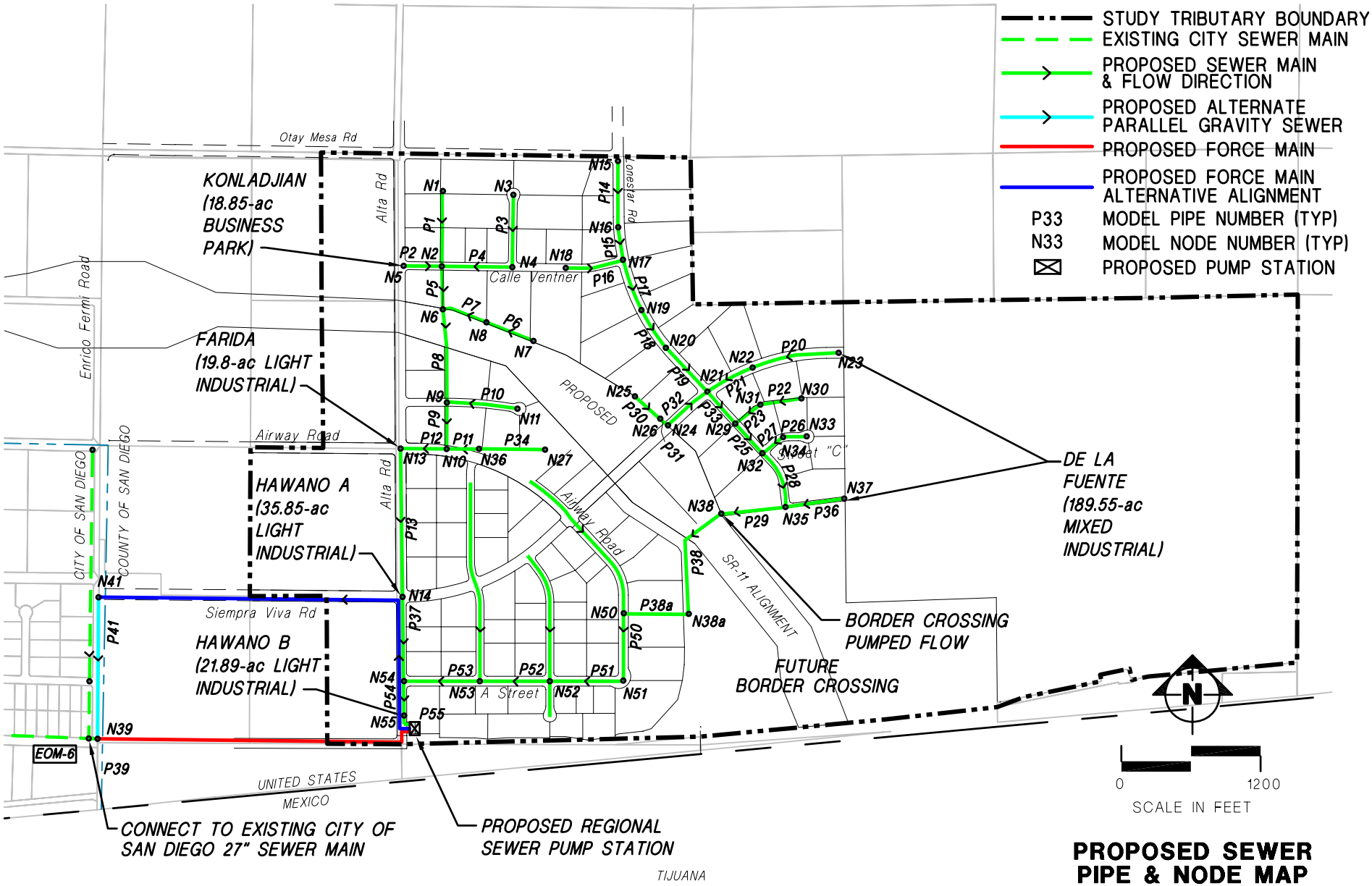
Sincerely,

Leanne M. Abe

Leanne M. Abe, P.E.
Senior Engineer

CC: Tatiana Southard, The Judd Company
Jack Cohen, DPLU
David Williams, DPLU
Jennifer Bileck, PBS&J
Project File - 491115

APPENDIX B
ON-SITE GRAVITY SEWER SIZING CALCULATIONS



PROPOSED SEWER PIPE & NODE MAP

FIGURE B-1

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E-Regional Sewer Study\Reports\Figures\049128501-TributarySewer.dwg May 12, 2009

APPENDIX B - MODEL RESULTS
TABLE B-1 AVERAGE FLOW CALCULATION

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N1	1	2.3	1,000 gpd/ac	1,500 gpd/ac	9.6	14.4	2,300	3,450
	8	4.6	1,000 gpd/ac	1,500 gpd/ac	19.2	28.8	4,600	6,900
Subtotal	**-**	**6.9**	**-**	**-**	**28.8**	**43.1**	**6,900**	**10,350**
N2	2	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	3	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	4	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	5	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
	6	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
	7	4.3	1,000 gpd/ac	1,500 gpd/ac	17.9	26.9	4,300	6,450
Subtotal	**-**	**13.1**			**54.6**	**81.9**	**13,100**	**19,650**
N3	9	4.7	1,000 gpd/ac	1,500 gpd/ac	19.6	29.4	4,700	7,050
	10	4.1	1,000 gpd/ac	1,500 gpd/ac	17.1	25.6	4,100	6,150
Subtotal	**-**	**8.8**			**36.7**	**55.0**	**8,800**	**13,200**
N4	11	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
N5	Konladjian	18.9	1,500 gpd/ac	1,500 gpd/ac	117.8	117.8	28,275	28,275
N6	44	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
	45	2.5	1,000 gpd/ac	1,500 gpd/ac	10.4	15.6	2,500	3,750
Subtotal	**-**	**6.1**			**25.4**	**38.1**	**6,100**	**9,150**
N7	42	7.5	1,000 gpd/ac	1,500 gpd/ac	31.3	46.9	7,500	11,250
N8	43	5.0	1,000 gpd/ac	1,500 gpd/ac	20.8	31.3	5,000	7,500
N9	46	2.1	1,000 gpd/ac	1,500 gpd/ac	8.8	13.1	2,100	3,150
	47	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	53	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
Subtotal	**-**	**7.8**			**32.5**	**48.8**	**7,800**	**11,700**
N10	48	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,700	4,050
	49	3.0	1,000 gpd/ac	1,500 gpd/ac	12.5	18.8	3,000	4,500
Subtotal	**-**	**5.7**			**23.8**	**35.6**	**5,700**	**8,550**
N11	52	2.4	1,000 gpd/ac	1,500 gpd/ac	10.0	15.0	2,400	3,600
N13	Farida	19.8	500 gpd/ac	1,500 gpd/ac	41.3	123.8	9,900	29,700
N15	15	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	16	4.1	1,000 gpd/ac	1,500 gpd/ac	17.1	25.6	4,100	6,150
Subtotal	**-**	**5.7**	**-**	**-**	**23.8**	**35.6**	**5,700**	**8,550**
N16	14	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	17	4.0	1,000 gpd/ac	1,500 gpd/ac	16.7	25.0	4,000	6,000
Subtotal	**-**	**5.9**	**-**	**-**	**24.6**	**36.9**	**5,900**	**8,850**
N17	13	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	18	3.8	1,000 gpd/ac	1,500 gpd/ac	15.8	23.8	3,800	5,700
	19	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
Subtotal	**-**	**9.4**	**-**	**-**	**39.2**	**58.8**	**9,400**	**14,100**
N18	12	2.3	1,000 gpd/ac	1,500 gpd/ac	9.6	14.4	2,300	3,450
N19	20	3.0	1,000 gpd/ac	1,500 gpd/ac	12.5	18.8	3,000	4,500
	40	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
	41	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
Subtotal	**-**	**8.3**	**-**	**-**	**34.6**	**51.9**	**8,300**	**12,450**
N20	21	3.1	1,000 gpd/ac	1,500 gpd/ac	12.9	19.4	3,100	4,650
	39	4.9	1,000 gpd/ac	1,500 gpd/ac	20.4	30.6	4,900	7,350
Subtotal	**-**	**8.0**	**-**	**-**	**33.3**	**50.0**	**8,000**	**12,000**

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N21	22	2.8	1,000 gpd/ac	1,500 gpd/ac	11.7	17.5	2,800	4,200
N22	23	3.9	1,000 gpd/ac	1,500 gpd/ac	16.3	24.4	3,900	5,850
N23	De La Fuente	28.8	1,000 gpd/ac	1,500 gpd/ac	120.0	180.0	28,800	43,200
	24	8.1	1,000 gpd/ac	1,500 gpd/ac	33.8	50.6	8,100	12,150
Subtotal	**-**	**36.9**	**-**	**-**	**153.8**	**230.6**	**36,900**	**55,350**
N24	55	0.9	1,000 gpd/ac	1,500 gpd/ac	3.8	5.6	900	1,350
N25	38	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
N26	37	2.9	1,000 gpd/ac	1,500 gpd/ac	12.1	18.1	2,900	4,350
N27	51	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
N29	27	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	36	3.1	1,000 gpd/ac	1,500 gpd/ac	12.9	19.4	3,100	4,650
Subtotal	**-**	**5.3**	**-**	**-**	**22.1**	**33.1**	**5,300**	**7,950**
N30	25	3.2	1,000 gpd/ac	1,500 gpd/ac	13.3	20.0	3,200	4,800
N31	26	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,700	4,050
N32	28	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	32	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	35	4.0	1,000 gpd/ac	1,500 gpd/ac	16.7	25.0	4,000	6,000
Subtotal	**-**	**7.9**	**-**	**-**	**32.9**	**49.4**	**7,900**	**11,850**
N33	30	2.8	1,000 gpd/ac	1,500 gpd/ac	11.7	17.5	2,800	4,200
	31	1.7	1,000 gpd/ac	1,500 gpd/ac	7.1	10.6	1,700	2,550
Subtotal	**-**	**4.5**	**-**	**-**	**18.8**	**28.1**	**4,500**	**6,750**
N34	29	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
N35	33	2.9	1,000 gpd/ac	1,500 gpd/ac	12.1	18.1	2,900	4,350
	34	4.5	1,000 gpd/ac	1,500 gpd/ac	18.8	28.1	4,500	6,750
Subtotal	**-**	**7.4**	**-**	**-**	**30.8**	**46.3**	**7,400.0**	**11,100.0**
N36	50	2.6	1,000 gpd/ac	1,500 gpd/ac	10.8	16.3	2,600	3,900
N37	De La Fuente	160.8	1,000 gpd/ac	1,500 gpd/ac	669.8	1,004.7	160,750	241,125
N14	Hawano A	35.9	500 gpd/ac	1,500 gpd/ac	74.7	224.1	17,925	53,775
(Paragon	1	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	12.0	1,920	2,880
lots)	2	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
	3	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	4	1.8	1,000 gpd/ac	1,500 gpd/ac	7.7	11.5	1,840	2,760
Subtotal	**-**	**43.4**			**106**	**271**	**25,495**	**65,130**
N50	19	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.8	1,890	2,835
(Paragon	20	2.8	1,000 gpd/ac	1,500 gpd/ac	11.8	17.8	2,840	4,260
lots)	36	0.9	1,000 gpd/ac	1,500 gpd/ac	3.6	5.4	860	1,290
	37	1.8	1,000 gpd/ac	1,500 gpd/ac	7.5	11.3	1,810	2,715
	52	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	17.0	2,720	4,080
	53	2.4	1,000 gpd/ac	1,500 gpd/ac	10.0	15.0	2,400	3,600
	54	2.1	1,000 gpd/ac	1,500 gpd/ac	8.7	13.0	2,080	3,120
	55	2.2	1,000 gpd/ac	1,500 gpd/ac	9.0	13.4	2,150	3,225
	56	2.7	1,000 gpd/ac	1,500 gpd/ac	11.2	16.8	2,680	4,020
	57	1.2	1,000 gpd/ac	1,500 gpd/ac	4.9	7.3	1,170	1,755
	58	4.7	1,000 gpd/ac	1,500 gpd/ac	19.4	29.1	4,650	6,975
	59	4.3	1,000 gpd/ac	1,500 gpd/ac	17.8	26.7	4,270	6,405
Subtotal	**-**	**29.5**			**123**	**185**	**29,520**	**44,280**
N51	33	2.0	1,000 gpd/ac	1,500 gpd/ac	8.2	12.3	1,960	2,940
(Paragon	34	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
lots)	35	2.7	1,000 gpd/ac	1,500 gpd/ac	11.2	16.8	2,690	4,035
	48	3.4	1,000 gpd/ac	1,500 gpd/ac	14.2	21.3	3,400	5,100
	49	3.4	1,000 gpd/ac	1,500 gpd/ac	14.3	21.5	3,440	5,160
	50	3.4	1,000 gpd/ac	1,500 gpd/ac	14.0	21.0	3,360	5,040
	51	3.7	1,000 gpd/ac	1,500 gpd/ac	15.3	22.9	3,660	5,490
	47	5.0	1,000 gpd/ac	1,500 gpd/ac	20.9	31.4	5,020	7,530
Subtotal	**-**	**24.9**			**104**	**156**	**24,930**	**37,395**

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N52	24	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
(Paragon	25	1.4	1,000 gpd/ac	1,500 gpd/ac	5.6	8.4	1,350	2,025
lots)	26	0.9	1,000 gpd/ac	1,500 gpd/ac	3.9	5.9	940	1,410
	27	1.8	1,000 gpd/ac	1,500 gpd/ac	7.5	11.2	1,790	2,685
	28	1.4	1,000 gpd/ac	1,500 gpd/ac	6.0	9.0	1,440	2,160
	29	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.5	1,680	2,520
	30	1.1	1,000 gpd/ac	1,500 gpd/ac	4.4	6.6	1,060	1,590
	31	1.4	1,000 gpd/ac	1,500 gpd/ac	6.0	8.9	1,430	2,145
	32	2.0	1,000 gpd/ac	1,500 gpd/ac	8.4	12.6	2,010	3,015
	41	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	12.0	1,920	2,880
	42	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,710	4,065
	43	1.4	1,000 gpd/ac	1,500 gpd/ac	5.7	8.5	1,360	2,040
	44	1.1	1,000 gpd/ac	1,500 gpd/ac	4.7	7.0	1,120	1,680
	45	0.9	1,000 gpd/ac	1,500 gpd/ac	3.7	5.5	880	1,320
	46	1.1	1,000 gpd/ac	1,500 gpd/ac	4.5	6.8	1,080	1,620
Subtotal	**-**	**22.7**			**94**	**142**	**22,670**	**34,005**
N53	5	1.7	1,000 gpd/ac	1,500 gpd/ac	7.3	10.9	1,740	2,610
(Paragon	6	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
lots)	7	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
	8	1.6	1,000 gpd/ac	1,500 gpd/ac	6.8	10.1	1,620	2,430
	12	2.1	1,000 gpd/ac	1,500 gpd/ac	8.5	12.8	2,050	3,075
	13	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	14	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	15	1.3	1,000 gpd/ac	1,500 gpd/ac	5.3	8.0	1,280	1,920
	16	1.5	1,000 gpd/ac	1,500 gpd/ac	6.1	9.1	1,460	2,190
	17	1.5	1,000 gpd/ac	1,500 gpd/ac	6.2	9.3	1,490	2,235
	18	2.1	1,000 gpd/ac	1,500 gpd/ac	8.5	12.8	2,050	3,075
	21	2.4	1,000 gpd/ac	1,500 gpd/ac	9.8	14.7	2,350	3,525
	22	1.4	1,000 gpd/ac	1,500 gpd/ac	5.6	8.4	1,350	2,025
	23	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	39	1.9	1,000 gpd/ac	1,500 gpd/ac	7.8	11.6	1,860	2,790
	40	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.5	1,680	2,520
Subtotal	**-**	**27.9**			**116**	**174**	**27,850**	**41,775**
N54	9	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.4	1,670	2,505
(Paragon	10	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
lots)	11	1.6	1,000 gpd/ac	1,500 gpd/ac	6.6	9.9	1,590	2,385
Subtotal	**-**	**4.9**			**20**	**30**	**4,860**	**7,290**
N55	Hawano B	21.9	500 gpd/ac	1,500 gpd/ac	45.6	136.8	10,945	32,835
(Paragon)	38	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,710	4,065
Subtotal	**-**	**24.6**			**57**	**154**	**13,655**	**36,900**

APPENDIX B - MODEL RESULTS
TABLE B-2 BUILDOUT DESIGN FLOW AND MANNING'S CALCULATION

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		EOM-6	515.00	507.26		2,744.0		10,624.7		849,975	1.81	1,730,091.4	2.68				

1. Buildout Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-3 ULTIMATE DESIGN FLOW AND MANNING'S CALCULATION

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.88	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		EOM-6	515.00	507.26		2,744.0		10,624.7		849,975	1.81	1,970,427.4	3.05				

1. Ultimate Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-4 BUILDOUT DESIGN FLOW AND MANNING'S CALCULATION
ALTERNATIVE ALIGNMENT

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		N41	554.07			4,016.0		10,624.7		849,975	1.81	1,730,091.4	2.68	0.22			
P41	N41	554.07	547.07	N39	516.00	509.20	7.0	1,489.6	18	10,624.7	0	849,975	1.81	1,730,091.4	2.68	2.54	4.87	0.27	3.8
P39	N39	516.00	509.00	EOM-6	515.00	507.26	7.0	91.0	18	10,624.7	0	849,975	1.81	1,730,091.4	2.68	1.91	4.39	0.24	4.8

1. Buildout Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-5 ULTIMATE DESIGN FLOW AND MANNING'S CALCULATION
ALTERNATIVE ALIGNMENT

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		N41	554.07			4,016.0		10,624.7		849,975	1.81	1,970,427.4	3.05	0.22			
P41	N41	554.07	547.07	N39	516.00	509.20	7.0	1,489.6	18	10,624.7	0	849,975	1.81	1,970,427.4	3.05	2.54	5.20	0.29	3.8
P39	N39	516.00	509.00	EOM-6	515.00	507.26	7.0	91.0	18	10,624.7	0	849,975	1.81	1,970,427.4	3.05	1.91	5.60	0.31	4.8

1. Ultimate Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX C
REGIONAL SEWER PUMP STATION DESIGN FLOW RATE CALCULATIONS
REGIONAL SEWER PUMP STATION FORCE MAIN CALCULATIONS

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

PURPOSE

Determine the Required Design Pump Flow Rate for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions for Phase 1 and 2 Conditions. The Phase 1 Condition only includes the Otay Crossing Commerce Park and Paragon properties. The Phase 2 Condition includes all tributary properties, as listed in Table 2 of this study, and the Border Crossing.

ABBREVIATIONS

EDU - Equivalent Dwelling Unit
fps - feet per second
gpd - gallons per day
mgd - million gallons per day
Pop - Population
Ult Gen Rate - Average Sewage generation for 1 acre of land use under the ultimate buildout condition
Bld Gen Rate - Average Sewage generation for 1 acre of land use under the buildout condition
BX Ult Gen Rate - Average Sewage generation for 1 acre of the Border Crossing Site under the ultimate condition
BX Bld Gen Rate - Average Sewage generation for 1 acre of the Border Crossing Site under the buildout condition
Pop Gen Rate - Average Sewage generation for 1 person
EDU Gen Rate - Average Sewage generation for 1 EDU

CRITERIA

Phase 1 Tributary Area =	286.01	acres	Per Table 2
Phase 2 Tributary Area (Mixed Industrial) =	475.56	acres	Per Table 2
Phase 2 Tributary Area (Light Industrial) =	77.54	acres	Per Table 2
Phase 2 Tributary Area (Business Park) =	18.85	acres	Per Table 2
Proposed Border Crossing =	95.40	acres	Per Table 2
Ult Gen Rate (Mixed Industrial) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Mixed Industrial) =	1,000	gpd/acre	County criteria - Specified in Master Plan
Ult Gen Rate (Light Industrial) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Light Industrial) =	500	gpd/acre	County criteria - Specified in Master Plan
Ult Gen Rate (Business Park) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Business Park) =	1,500	gpd/acre	County criteria - Specified in Master Plan
BX Ult Gen Rate =	1,500	gpd/acre	County criteria - Specified in Master Plan
BX Bld Gen Rate =	580	gpd/acre	See description in Section 2.1
Pop Gen Rate =	80	gpd/person	City criteria - Specified in Master Plan & per City Design Criteria
EDU Generation Rate =	240	gpd/EDU	County criteria - Specified in Master Plan per County Ordinance
Design Pump Rate Peaking Factor (DPF) =	1.30		To account for wet weather peaking
Peak to Average Flow Factor (PF) = 6.2945 x Pop ^ (-0.1342)			City criteria - Specified in Master Plan & per City Design Criteria

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

PROCEDURE

Border Crossing Pump Station Buildout Condition

1. Calculate the Average Daily Flow (ADF) - see Equation 1
2. Calculate the Population (Pop) - see Equation 2
3. Calculate the Peak to Average Flow Factor (PF) - see Equation 3
4. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 4
5. Calculate the Design Pump Rate (Q_D) - see Equation 5
6. Calculate the number of EDUs - see Equation 6

Border Crossing Pump Station Ultimate Condition

7. Calculate the Average Daily Flow (ADF) - see Equation 7
8. Calculate the Population (Pop) - see Equation 8
9. Calculate the Peak to Average Flow Factor (PF) - see Equation 9
10. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 10
11. Calculate the Design Pump Rate (Q_D) - see Equation 11
12. Calculate the number of EDUs - see Equation 12

Phase 1 Buildout Condition

13. Calculate the Average Daily Flow (ADF) - see Equation 13
14. Calculate the Population (Pop) - see Equation 14
15. Calculate the Peak to Average Flow Factor (PF) - see Equation 15
16. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 16
17. Calculate the Design Pump Rate (Q_D) - see Equation 17
18. Calculate the number of EDUs - see Equation 18

Phase 1 Ultimate Condition

19. Calculate the Average Daily Flow (ADF) - see Equation 19
20. Calculate the Population (Pop) - see Equation 20
21. Calculate the Peak to Average Flow Factor (PF) - see Equation 21
22. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 22
23. Calculate the Design Pump Rate (Q_D) - see Equation 23
24. Calculate the number of EDUs - see Equation 24

Phase 2 Buildout Condition

25. Calculate the Average Daily Flow (ADF) - see Equation 25
26. Calculate the Population (Pop) - see Equation 26
27. Calculate the Peak to Average Flow Factor (PF) - see Equation 27
28. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 28
29. Calculate the Design Pump Rate (Q_D) - see Equation 29
30. Calculate the number of EDUs - see Equation 30

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. Calculate the Average Daily Flow (ADF) - see Equation 31
32. Calculate the Population (Pop) - see Equation 32
33. Calculate the Peak to Average Flow Factor (PF) - see Equation 33
34. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 34
35. Calculate the Design Pump Rate (Q_D) - see Equation 35
36. Calculate the number of EDUs - see Equation 36

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

EQUATIONS

Border Crossing Pump Station Buildout Condition

1. ADF = Border Crossing Area x BX Gen Rate - see Calculation 1
2. Pop = ADF / Pop Gen Rate - see Calculation 2
3. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 3
4. Q_P = ADF x PF - see Calculation 4
5. Q_D = Q_P x DPF - see Calculation 5
6. EDU = ADF / EDU Gen Rate - see Calculation 6

Border Crossing Pump Station Ultimate Condition

7. ADF = Border Crossing Area x Ult Gen Rate - see Calculation 7
8. Pop = ADF / Pop Gen Rate - see Calculation 8
9. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 9
10. Q_P = ADF x PF - see Calculation 10
11. Q_D = Q_P x DPF - see Calculation 11
12. EDU = ADF / EDU Gen Rate - see Calculation 12

Phase 1 Buildout Condition

13. ADF = Phase 1 Tributary Area x Bld. Gen Rate - see Calculation 13
14. Pop = ADF / Pop Gen Rate - see Calculation 14
15. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 15
16. Q_P = ADF x PF - see Calculation 16
17. Q_D = Q_P x DPF - see Calculation 17
18. EDU = ADF / EDU Gen Rate - see Calculation 18

Phase 1 Ultimate Condition

19. ADF = Phase 1 Tributary Area x Ult. Gen Rate - see Calculation 19
20. Pop = ADF / Pop Gen Rate - see Calculation 20
21. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 21
22. Q_P = ADF x PF - see Calculation 22
23. Q_D = Q_P x DPF - see Calculation 23
24. EDU = ADF / EDU Gen Rate - see Calculation 24

Phase 2 Buildout Condition

25. ADF = (Phase 1 Trib. Area + Phase 2 Trib. Area) x Bld. Gen Rate - see Calculation 25
26. Pop = ADF / Pop Gen Rate - see Calculation 26
27. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 27
28. Q_P = ADF x PF - see Calculation 28
29. Q_D = DPF x (Q_P + Border Crossing Q_D) - see Calculation 29
30. EDU = ADF / EDU Gen Rate + Border Crossing EDUs - see Calculation 30

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. ADF = (Phase 1 Trib. Area + Phase 2 Trib. Area) x Ult. Gen Rate - see Calculation 31
32. Pop = ADF / Pop Gen Rate - see Calculation 32
33. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 33
34. Q_P = ADF x PF - see Calculation 34
35. Q_D = DPF x (Q_P + Border Crossing Q_D) - see Calculation 35
36. EDU = ADF / EDU Gen Rate + Border Crossing EDUs - see Calculation 36

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

CALCULATIONS

Border Crossing Pump Station Buildout Condition

1. ADF = 95.4 ac x 580 gpd/ac =	55,332	gpd
2. Pop = 55,332 gpd / 80 gpd/person =	692	persons
3. PF = 6.2945 x 692 ^ (-0.1342) =	2.62	
4. Q_P = 55,332 gpd x 2.62 =	144,819	gpd
5. Q_D = 144,819 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.188264	mgd
6. EDU = 55,332 gpd / 240 gpd/EDU =	231	EDU

Border Crossing Pump Station Ultimate Condition

7. ADF = 95.4 ac x 1,500 gpd/ac =	143,100	gpd
8. Pop = 143,100 gpd / 80 gpd/person =	1,789	persons
9. PF = 6.2945 x 1,789 ^ (-0.1342) =	2.30	
10. Q_P = 143,100 gpd x 2.30 =	329,692	gpd
11. Q_D = 329,692 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.428600	mgd
12. EDU = 143,100 gpd / 240 gpd/EDU =	596	EDU

Phase 1 Buildout Condition

13. ADF = 286.01 ac x 1,000 gpd/ac =	286,010	gpd
14. Pop = 286,010 gpd / 80 gpd/person =	3,575	persons
15. PF = 6.2945 x 3,575 ^ (-0.1342) =	2.10	
16. Q_P = 286,010 gpd x 2.10 =	600,469	gpd
17. Q_D = 600,469 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.780610	mgd
18. EDU = 286,010 gpd / 240 gpd/EDU =	1,192	EDU

Phase 1 Ultimate Condition

19. ADF = 286.01 ac x 1,500 gpd/ac =	429,015	gpd
20. Pop = 429,015 gpd / 80 gpd/person =	5,363	persons
21. PF = 6.2945 x 5,363 ^ (-0.1342) =	1.99	
22. Q_P = 429,015 gpd x 1.99 =	853,003	gpd
23. Q_D = 853,003 gpd x 1.3 / 10 ^ 6 gpd/mgd =	1.108904	mgd
24. EDU = 429,015 gpd / 240 gpd/EDU =	1,788	EDU

Phase 2 Buildout Condition

25. ADF = (475.56 ac x 1,000 gpd/ac) + (77.54 ac x 500 gpd/ac) + (18.85 ac x 1,500 gpd/ac) =	542,605	gpd
26. Pop = 542,605 gpd / 80 gpd/person =	6,783	persons
27. PF = 6.2945 x 6,783 ^ (-0.1342) =	1.93	
28. Q_P = 542,605 gpd x 1.93 =	1,045,375	gpd
29. Q_D = 1.3 x (1,045,375 gpd / 10 ^ 6 gpd/mgd) + 0.19 mgd =	1.547251	mgd
30. EDU = 542,605 gpd / 240 gpd/EDU + 231 EDUs =	2,491	EDU

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. ADF = 571.95 ac x 1,500gpd/ac =	857,925	gpd
32. Pop = 857,925 gpd / 80 gpd/person =	10,724	persons
33. PF = 6.2945 x 10,724 ^ (-0.1342) =	1.81	
34. Q_P = 857,925 gpd x 1.81 =	1,554,305	gpd
35. Q_D = 1.3 x (1,554,305 gpd / 10 ^ 6 gpd/mgd) + 0.43 mgd =	2.449197	mgd
36. EDU = 857,925 gpd / 240 gpd/EDU + 596 EDUs =	4,171	EDU

Calculated by: lma
Checked by: JRB
Date: 5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

PURPOSE

Select the force main diameter for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions for Phase 1 and 2 Conditions. The Phase 1 Condition only includes the Otay Crossing Commerce Park and Paragon properties. The Phase 2 Condition includes all tributary properties, as listed in Table 1 of this study, and the Border Crossing.

ABBREVIATIONS

EDU - Equivalent Dwelling Unit
fps - feet per second
gpd - gallons per day
mgd - million gallons per day
cfs - cubic feet per second

CRITERIA

Phase 1 Buildout Condition Design Pump Rate (Q_{IBC}) =	0.78	mgd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Design Pump Rate (Q_{IUC}) =	1.11	mgd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Design Pump Rate (Q_{FBC}) =	1.55	mgd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Design Pump Rate (Q_{FUC}) =	2.45	mgd	Taken from Design Pump Rate Calculation
Minimum Diameter for Solids Handling Pump =	4	inch	Minimum Diameter for Solids handling capability
Hazen Williams Roughness Coefficient (C) =	120		County Criteria
Length of Force main (L) =	2,744.0	feet	Taken from schematic layout
Minimum Velocity for Sewer Force main =	4.0	fps	Direction per County staff
Maximum Velocity for Sewer Force main =	8.0	fps	City of San Diego Design Guide 2004

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

PROCEDURE

Phase 1 Buildout Condition

1. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 1
2. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 2
3. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 3
4. Confirm that the Velocities meet County Criteria
5. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 4
6. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 1 Ultimate Condition

7. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 5
8. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 6
9. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 7
10. Confirm that the Velocities meet County Criteria
11. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 8
12. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 2 Buildout Condition

13. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 9
14. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 10
15. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 11
16. Calculate the Force main Velocity for a 10-inch Diameter Pipe - see Equation 12
17. Confirm that the Velocities meet County Criteria
18. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 13
19. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 2 Ultimate Condition

20. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 14
21. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 15
22. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 16
23. Calculate the Force main Velocity for a 10-inch Diameter Pipe - see Equation 17
24. Calculate the Force main Velocity for a 12-inch Diameter Pipe - see Equation 18
25. Confirm that the Velocities meet County Criteria
26. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 19
27. Select the Pipe Diameter most appropriate and provide justification for selection.

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

EQUATIONS

Phase 1 Buildout Condition

1. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 1
2. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 2
3. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 3
4. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 4 - (V and D to be determined as described in Procedure)

Phase 1 Ultimate Condition

5. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 5
6. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 6
7. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 7
8. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 8 - (V and D to be determined as described in Procedure)

Phase 2 Buildout Condition

9. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 9
10. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 10
11. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 11
12. $V = Q_{IBC}$ / ((PI/4)(10"/12"/ft)^2) - See Calculation 12
13. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 13 - (V and D to be determined as described in Procedure)

Phase 2 Ultimate Condition

14. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 14
15. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 15
16. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 16
17. $V = Q_{IBC}$ / ((PI/4)(10"/12"/ft)^2) - See Calculation 17
18. $V = Q_{IBC}$ / ((PI/4)(12"/12"/ft)^2) - See Calculation 18
19. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 19 - (V and D to be determined as described in Procedure)

Calculated by: lma
Checked by: JRB
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East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

CALCULATIONS

Phase 1 Buildout Condition

1. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	13.84 fps	> 8 fps - Doesn't Conform
2. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	6.15 fps	CONFORMS
3. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	3.46 fps	< 4 fps - Doesn't Conform
4. H_L = 3.02 x 2,744 ft X ((6"/12"/ft) ^ -1.167) (6.15 fps / 120) ^ 1.85 =	76.34 feet	

USE 6-inch Diameter

Phase 1 Ultimate Condition

5. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	19.66 fps	> 8 fps - Doesn't Conform
6. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	8.74 fps	> 8 fps - Doesn't Conform
7. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	4.92 fps	CONFORMS
8. H_L = 3.02 x 2,744 ft X ((8"/12"/ft) ^ -1.167) (4.94 fps / 120) ^ 1.85 =	36.04 feet	

USE 8-inch Diameter

Phase 2 Buildout Condition

9. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	27.43 fps	> 8 fps - Doesn't Conform
10. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	12.19 fps	> 8 fps - Doesn't Conform
11. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	6.86 fps	CONFORMS
12. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(10"/12"/ft)^2) =	4.39 fps	CONFORMS
13. H_L = 3.02 x 2,744 ft X ((8"/12"/ft) ^ -1.167) (6.86 fps / 120) ^ 1.85 =	66.74 feet	

USE 8-inch Diameter

Phase 2 Ultimate Condition

14. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	43.42 fps	> 8 fps - Doesn't Conform
15. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	19.30 fps	> 8 fps - Doesn't Conform
16. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	10.86 fps	> 8 fps - Doesn't Conform
17. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(10"/12"/ft)^2) =	6.95 fps	CONFORMS
18. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(12"/12"/ft)^2) =	4.82 fps	CONFORMS
19. H_L = 3.02 x 2,744 ft X ((10"/12"/ft) ^ -1.167) (6.95 fps / 120) ^ 1.85 =	52.69 feet	

USE 10-inch Diameter

Calculated by:	lma
Checked by:	JRB
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East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

PURPOSE

Determine the maximum retention time in the proposed Phase 1 (8-inch) and Phase 2 (8-inch) Phase force mains for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions.

ABBREVIATIONS

gpd - gallons per day
mgd - million gallons per day
gpm - gallons per minute
min - minute

CRITERIA

Phase 1 Buildout Condition Design Pump Rate (Q_{IBC}) =	0.78	mgd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Design Pump Rate (Q_{IUC}) =	1.11	mgd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Design Pump Rate (Q_{FBC}) =	1.55	mgd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Design Pump Rate (Q_{FUC}) =	2.45	mgd	Taken from Design Pump Rate Calculation
Phase 1 Buildout Condition Average Daily Flow (ADF_{IBC}) =	286,010	gpd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Average Daily Flow (ADF_{IUC}) =	429,015	gpd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Average Daily Flow (ADF_{FBC}) =	542,605	gpd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Average Daily Flow (ADF_{FUC}) =	857,925	gpd	Taken from Design Pump Rate Calculation
Minimum Pump Run Time (PRT) =	5	min	City of San Diego Design Guide 2004
Minimum Flow Factor (MFF) =	0.2		City of San Diego Design Guide 2004
Length of Force main (L) =	2,744.0	feet	Taken from schematic layout
Diameter of Phase 1 Force main (DI) =	8	inches	Taken from Force main Diameter Calculation
Diameter of Phase 2 Force main (DF) =	8	inches	Taken from Force main Diameter Calculation

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

PROCEDURE

Phase 1

1. Calculate the Force main Volume (V_I) for the 8-inch Diameter Pipe - see Equation 1
2. Calculate the number of cycles (NIBC) under the Phase 1 Buildout Condition - see Equation 2
3. Calculate the number of cycles (NIUC) under the Phase 1 Ultimate Condition - see Equation 3
4. Calculate the Minimum Flow under the Phase 1 Buildout Condition (Min QIBC) - see Equation 4
5. Calculate the Minimum Flow under the Phase 1 Ultimate Condition (Min QIUC) - see Equation 5
6. Estimate the Wet Well Volume under the Phase 1 Buildout Condition (WW VIBC) - see Equation 6
7. Estimate the Wet Well Volume under the Phase 1 Ultimate Condition (WW VIBC) - see Equation 7
8. Calculate the Wet Well Filling Time under the Phase 1 Buildout Condition (WWFTIBC) - see Equation 8
9. Calculate the Wet Well Filling Time under the Phase 1 Ultimate Condition (WWFTIBC) - see Equation 9
10. Calculate the Cycle Period under the Phase 1 Buildout Condition (PIBC) - see Equation 10
11. Calculate the Cycle Period under the Phase 1 Ultimate Condition (PIBC) - see Equation 11
12. Calculate the Maximum Retention Time under the Phase 1 Buildout Condition (MRTIBC) - see Equation 12
13. Calculate the Maximum retention Time under the Phase 1 Ultimate Condition (MRTIBC) - see Equation 13

Phase 2

14. Calculate the Force main Volume (V_F) for the 8-inch Diameter Pipe - see Equation 14
15. Calculate the number of cycles (NFBC) under the Phase 2 Buildout Condition - see Equation 15
16. Calculate the number of cycles (NFUC) under the Phase 2 Ultimate Condition - see Equation 16
17. Calculate the Minimum Flow under the Phase 2 Buildout Condition (Min QFBC) - see Equation 17
18. Calculate the Minimum Flow under the Phase 2 Ultimate Condition (Min QFUC) - see Equation 18
19. Estimate the Wet Well Volume under the Phase 2 Buildout Condition (WW VFBC) - see Equation 19
20. Estimate the Wet Well Volume under the Phase 2 Ultimate Condition (WW VFBC) - see Equation 20
21. Calculate the Wet Well Filling Time under the Phase 2 Buildout Condition (WWFTFBC) - see Equation 21
22. Calculate the Wet Well Filling Time under the Phase 2 Ultimate Condition (WWFTFBC) - see Equation 22
23. Calculate the Cycle Period under the Phase 2 Buildout Condition (PFBC) - see Equation 23
24. Calculate the Cycle Period under the Phase 2 Ultimate Condition (PFBC) - see Equation 24
25. Calculate the Maximum Retention Time under the Phase 2 Buildout Condition (MRTFBC) - see Equation 25
26. Calculate the Maximum retention Time under the Phase 2 Ultimate Condition (MRTFBC) - see Equation 26

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

EQUATIONS

Phase 1

1. $V_I = L \times (\pi/4) \times D_I^2$ - see Calculation 1
2. $N_{IBC} = V_I / (Q_{IBC} \times PRT)$ - see Calculation 2
3. $N_{IUC} = V_I / (Q_{IUC} \times PRT)$ - see Calculation 3
4. Min $Q_{IBC} = ADF_{IBC} \times MFF$ - see Calculation 4
5. Min $Q_{IUC} = ADF_{IUC} \times MFF$ - see Calculation 5
6. WW $V_{IBC} = Q_{IBC} \times PRT$ - see Equation 6
7. WW $V_{IUC} = Q_{IUC} \times PRT$ - see Equation 7
8. $WWFT_{IBC}$ = WW V_{IBC} / Min Q_{IBC} - see Equation 8
9. $WWFT_{IUC}$ = WW V_{IUC} / Min Q_{IUC} - see Equation 9
10. $P_{IBC} = WWFT_{IBC} + PRT$ - see Equation 10
11. $P_{IUC} = WWFT_{IUC} + PRT$ - see Equation 11
12. $MRT_{IBC} = N_{IBC} \times P_{IBC}$ - see Equation 12
13. $MRT_{IUC} = N_{IUC} \times P_{IUC}$ - see Equation 13

Phase 2

14. $V_F = L \times (\pi/4) \times D_F^2$ - see Calculation 14
15. $N_{FBC} = V_F / (Q_{FBC} \times PRT)$ - see Calculation 15
16. $N_{FUC} = V_F / (Q_{FUC} \times PRT)$ - see Calculation 16
17. Min $Q_{FBC} = ADF_{FBC} \times MFF$ - see Calculation 17
18. Min $Q_{FUC} = ADF_{FUC} \times MFF$ - see Calculation 18
19. WW $V_{FBC} = Q_{FBC} \times PRT$ - see Equation 19
20. WW $V_{FUC} = Q_{FUC} \times PRT$ - see Equation 20
21. $WWFT_{FBC}$ = WW V_{FBC} / Min Q_{FBC} - see Equation 21
22. $WWFT_{FUC}$ = WW V_{FUC} / Min Q_{FUC} - see Equation 22
23. $P_{FBC} = WWFT_{FBC} + PRT$ - see Equation 23
24. $P_{FUC} = WWFT_{FUC} + PRT$ - see Equation 24
25. $MRT_{FBC} = N_{FBC} \times P_{FBC}$ - see Equation 25
26. $MRT_{FUC} = N_{FUC} \times P_{FUC}$ - see Equation 26

Calculated by: Ima
Checked by: JRB
Date: 5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

CALCULATIONS

Phase 1

1. V_I = 2,744 ft x (π/4) x (8"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) =	7,164	gallons	
2. N_{IBC} = 7,164 gal / (0.78 mgd x 694.44 gpm/mgd x 5 min) =	2.64		
3. N_{IUC} = 7,164 gal / (1.11 mgd x 694.44 gpm/mgd x 5 min) =	1.86		
4. Min Q_{IBC} = 286,010 gpd x 0.2 / 1440 min/day =	39.72	gpm	
5. Min Q_{IUC} = 429,015 gpd x 0.2 / 1440 min/day =	59.59	gpm	
6. WW V_{IBC} = 0.78 mgd x 694.44 gpm/mgd x 5 min =	2710.4	gallons	Only an estimate
7. WW V_{IUC} = 1.11 mgd x 694.44 gpm/mgd x 5 min =	3,850.4	gallons	Only an estimate
8. $WWFT_{IBC}$ = 2,710.4 gal / 39.72 gpm =	68.2	minutes	
9. $WWFT_{IUC}$ = 3,850.4 gal / 59.59 gpm =	64.6	minutes	
10. P_{IBC} = 68.2 min + 5 min =	73.2	minutes	
11. P_{IUC} = 64.6 min + 5 min =	69.6	minutes	
12. MRT_{IBC} = 2.64 x 73.2 min / 60min/hour =	3.23	hours	< 4 hrs - No Chemical Addition Reqd.
13. MRT_{IUC} = 1.86 x 69.6 min / 60min/hour =	2.16	hours	< 4 hrs - No Chemical Addition Reqd.

Phase 2

14. V_F = 2,744 ft x (π/4) x (8"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) =	7,164	gallons	
15. N_{FBC} = 7,164 gal / (1.59 mgd x 694.44 gpm/mgd x 5 min) =	1.33		
16. N_{FUC} = 7,164 gal / (2.45 mgd x 694.44 gpm/mgd x 5 min) =	0.84		
17. Min Q_{FBC} = 562,050 gpd x 0.2 / 1440 min/day =	75.36	gpm	
18. Min Q_{FUC} = 828,225 gpd x 0.2 / 1440 min/day =	119.16	gpm	
19. WW V_{FBC} = 1.59 mgd x 694.44 gpm/mgd x 5 min =	5,372.4	gallons	Only an estimate
20. WW V_{FUC} = 2.45 mgd x 694.44 gpm/mgd x 5 min =	8,504.2	gallons	Only an estimate
21. $WWFT_{FBC}$ = 5518.5 gal / 78.06 gpm =	71.3	minutes	
22. $WWFT_{FUC}$ = 8504.2 gal / 115.03 gpm =	71.4	minutes	
23. P_{FBC} = 70.7 min + 5 min =	76.3	minutes	
24. P_{FUC} = 73.9 min + 5 min =	76.4	minutes	
25. MRT_{FBC} = 1.30 x 75.7 min / 60min/hour =	1.70	hours	< 4 hrs - No Chemical Addition Reqd.
26. MRT_{FUC} = 0.84 x 75.7 min / 60min/hour =	1.07	hours	< 4 hrs - No Chemical Addition Reqd.

APPENDIX D
CONCEPTUAL PUMP STATION LAYOUT

An employee-owned company

May 15, 2009

Mr. Judd Halenza
Kearny PCCP Otay 311, LLC
500 Stevens Avenue, Suite 208
Solana Beach, CA 92075

SUBJECT: EAST OTAY MESA SEWER BASIN NO. 6 REGIONAL SEWER PUMP STATION LAYOUT

Dear Mr. Halenza,

PBS&J has prepared the conceptual level layout of the proposed Regional Sewer Pump Station (RSPS). This pump station will collect flows from Otay Crossing Commerce Park (OCCP), Paragon, adjoining property owners, and the planned third border crossing. The purpose of developing the conceptual layout of the sewer facility is to provide a basis for analyzing the potential environmental impacts associated with preparing the East Otay Mesa (EOM) Program EIR.

Background

The proposed RSPS will provide sewer service to OCCP, Paragon, and the proposed Border Crossing, as well as properties owned by De La Fuente, Konladjian, Farida, and the Hawano Corporation. Figure 1 graphically presents the study location and boundaries for the RSPS.

The conceptual layout of the proposed RSPS is intended to illustrate the anticipated configuration of the pump station and identify the key equipment that would be expected in this type of facility for inclusion in the EOM Program EIR. The County of San Diego (County) is the lead agency for the EOM Program EIR and will own and operate the proposed pump station after the facility is constructed.

Location

As shown on Figure 2, the proposed site location of the RSPS is on the southwest end of the Paragon property on Lot 38. The site was chosen to maximize the amount of gravity sewers that could serve the properties.

Proposed Pump Station Capacity

The design of the RSPS is planned to be constructed in two phases. The pump station structure will initially be constructed for buildout flows but only equipped to provide sewer service for OCCP and Paragon. The facility will ultimately receive wastewater flows from the De La Fuente, Konladjian, Farida, and Hawano properties, and the Border Crossing. It is expected that the Border Crossing will construct its own sewer pump station to serve the facility and to convey flows to the RSPS.

Table 1 summarizes the estimated RSPS design capacity and the recommended force main diameters under buildout and ultimate conditions for Phases 1 and 2. Phase 1 only includes OCCP and Paragon flows to the pump station. Phase 2 includes flows from OCCP, Paragon, the Proposed Border Crossing,

and the De La Fuente, Konladjian, Farida, and Hawano properties. The proposed pump station's design flow rate includes an allowance of 30% on top of the peak dry weather flow to account for wet weather conditions and maintenance. Pump station design flow rate and force main sizing calculations are provided in Appendix C of the East Otay Mesa Sewer Basin No. 6 Regional Sewer Study, May 2009.

Table 1. Pump Station Design Capacity

Phase	EDU[2]		Pump Station Design Capacity (mgd)[3]		Force Main Diameter[4]	
	Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
Phase 1	1,198	1,796	0.78	1.11	6"	8"
Phase 2 [1]	2,491	4,171	1.55	2.45	8"	10"

1. Phase 2 includes OCCP, the Border Crossing, Paragon, De La Fuente, Konladjian, Farida, and Hawano properties.
2. EDUs based on 240 gpd/EDU per County Design Guidelines.
3. Design Capacity determined with the City's peaking factor equation and 30% additional flow.
4. Force main diameter determined based on maximum velocity of 8 fps and maximum retention time of 4 hours.

Preliminary Site and Building Layout

The proposed preliminary RSPS site plan is depicted on Figure 3. The RSPS will be located at a proposed pad elevation of approximately 506 feet on Paragon property. Access to the pump station is planned to be provided by two concrete driveways for ingress and egress off of Alta Road. This is provided for adequate turning radius around the building for large trucks and other equipment. A stormwater detention basin is shown on the site plan to collect and store run-off from the pump station site only. This could be eliminated if combined with the drainage facilities planned for the Paragon development. The site perimeter is planned to be fenced with gates at each driveway for security purposes. In-coming electrical facilities including the planned transformer for the facility are planned to be located adjacent to the stand-by generator and pump station building away from the wet well.

The pump station is conceptually laid out with independent wet and dry wells with the pump and motor rooms on two floors located below grade and the electrical and control room located on the third floor above grade. This 3-story facility is illustrated in the pump station section view shown on Figure 4. Emergency storage is sized to hold a minimum of 6 hours of peak wet weather inflow for OCCP, Paragon, and the Border Crossing flows (0.38 MG), as directed by the County. The County may require additional emergency storage for future tributary developments, and construction would be the responsibility of those properties. Space will be provided on the proposed pump station site to accommodate additional storage for the final ultimate condition of 0.34 MG, for a total of 0.72 MG. Detailed calculations are attached. This approach is consistent with discussions with County Engineering staff.

The above grade pump building structure will have an approximate overall dimension of 26 feet by 18 feet and constructed with tilt-up concrete walls and open wood framed gable roof with concrete tiles. The height of the building will be approximately 20-feet above grade. The below grade concrete structure (approximately 25- to 35-feet below grade) will include the motor room, pump room and wet well. The

pump station building's architectural style and materials will blend with the surrounding industrial/ commercial business park.

A conceptual layout of the first floor which houses the electrical switchgear, ventilation equipment, and pump station control equipment is illustrated in Figure 5. The motor room which houses the pump motors is located on the intermediate floor. The elevation of the motor floor is determined based on the wet well influent pipe elevation to protect the motors from being flooded in the event a leak in the wall seals or pipe break in the lower pump room occurs flooding the lower level. The motor room and equipment control room conceptual floor plans are illustrated in Figures 6 and 7, respectively.

Primary Pump Station Equipment

A. Vertical Non-Clog Sewage Pumps

A set of three constant speed 275-gpm pumps will be installed in Phase 1. These pumps will accommodate the lower flows anticipated at the pump station during Phase 1. For Phase 2, the motors would be replaced in order to provide three constant speed 550-gpm pumps to accommodate buildout flows. Future phasing of the pumps and/or motors will be determined as development occurs. All pumps will be vertical non-clog sewage pumps with cast iron construction with hardened wear rings and mechanical seals. Identified in Table 2 are the pumps that were preliminarily selected. Approximately 2,744 feet of 8-inch diameter force main will need to be installed to convey pumped flows from the RSPS to the EOM-6 connection located at the intersection of Enrico Fermi and Via de la Amistad. The 8-inch diameter force main will be used for single pump and dual pump operation, respectively.

Table 2. Pump Selection

Manufacturer	No. of Pumps	Flow (gpm)	TDH (feet)
Fairbanks Morse	3	275	114
Fairbanks Morse	3	550	104

B. Pump Station Piping

1. Discharge Header 8-inches
2. Phase 1 Pump Suction Piping 8-inches
3. Phase 2 Pump Suction Piping 8-inches
4. Buried piping will be epoxy-lined and coated ductile iron pipe. Exposed piping will be epoxy-lined and epoxy-painted ductile iron pipe.

C. Force Main

One 8-inch force main is recommended. The main will terminate at the start of the gravity sewer in Enrico Fermi Drive. The 8-inch diameter force main will be used for single pump and dual pump operation, respectively.

D. Emergency Generator

One emergency diesel generator will be provided and equipped with an automatic transfer switch (ATS). The emergency generator will be sufficiently sized to start all three pumps, station lighting, programmable logic controller, instrumentation, and telemetry. The ATS will automatically transfer the station to back up power in the event of a commercial power failure. The emergency generator will be located behind the pump station in an acoustical weatherproof enclosure provided by the generator manufacturer.

E. Instrumentation and Controls

Electric transformer, switchgear, motor control center (MCC), and SCADA telemetry equipment will be provided.

F. Ventilation

Ventilation, consisting of exhaust fans, shall be provided for the pump station building. Fans will be provided in the pump room, motor control center, and motor room.

G. Acoustics

Noise attenuation devices, including acoustic louvers and doors (necessity, size and layout to be determined) will be provided during the final design. Noise emanating from the pump station will meet the County's noise ordinance requirements.

H. Emergency Storage

Emergency storage is sized to hold a minimum of 6 hours of peak wet weather inflow under the Phase 1 condition, which includes OCCP and Paragon, as well as Border Crossing flows (0.38 MG). The County may require additional emergency storage for the future tributary developments, and construction would be the responsibility of that property. Space will be provided on the proposed pump station site to accommodate additional storage for the final ultimate condition of 0.34 MG, for a total of 0.72 MG. This approach is consistent with discussions with County Engineering staff.

The approximate size and conceptual layout of the proposed pump station was developed with the approach to be conservative since its intended use is for the basis of the EIR impact analysis. It is expected that the facility could be modified, consolidated and simplified depending on acceptance from the County for such modifications.

If you have any questions or need additional information for the EIR document, please feel free to call me.

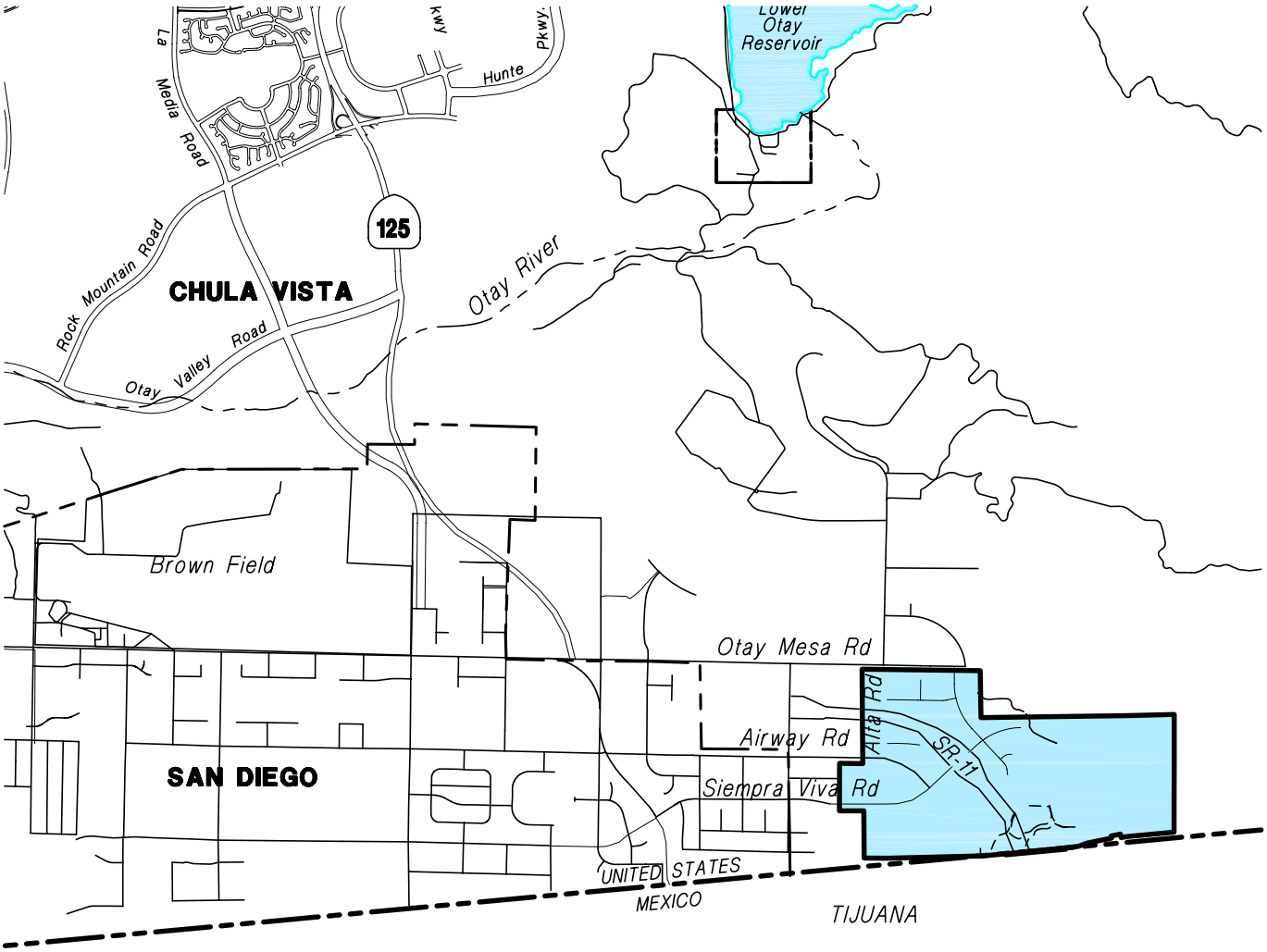
Sincerely,

Jennifer R. Bileck

Jennifer R. Bileck, P.E., C.F.M.
Senior Engineer

Attachments: Figure 1 – Project Location Map
Figure 2 – Project Sewer System Layout
Figure 3 – Typical Sewer Pump Station Site Plan
Figure 4 – Proposed Sewer Pump Station Building Section
Figure 5 – Proposed Sewer Pump Station Equipment Control Room
Figure 6 – Proposed Sewer Pump Station Motor Room
Figure 7 – Proposed Sewer Pump Station Pump Room
Emergency Storage Calculations

CC: Leanne Abe – PBS&J
Project File – 049128501 5000



VICINITY MAP

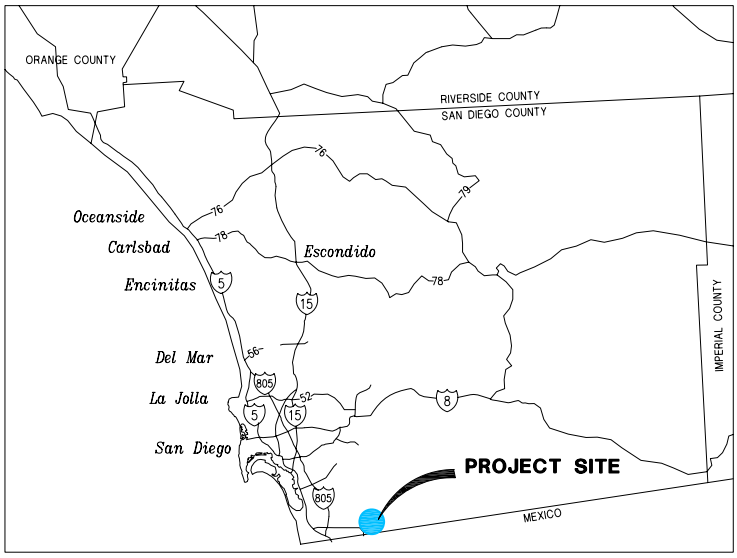
LEGEND

EOM-6 STUDY AREA

N

0 5000

SCALE IN FEET



LOCATION MAP

STUDY AREA

FIGURE 1

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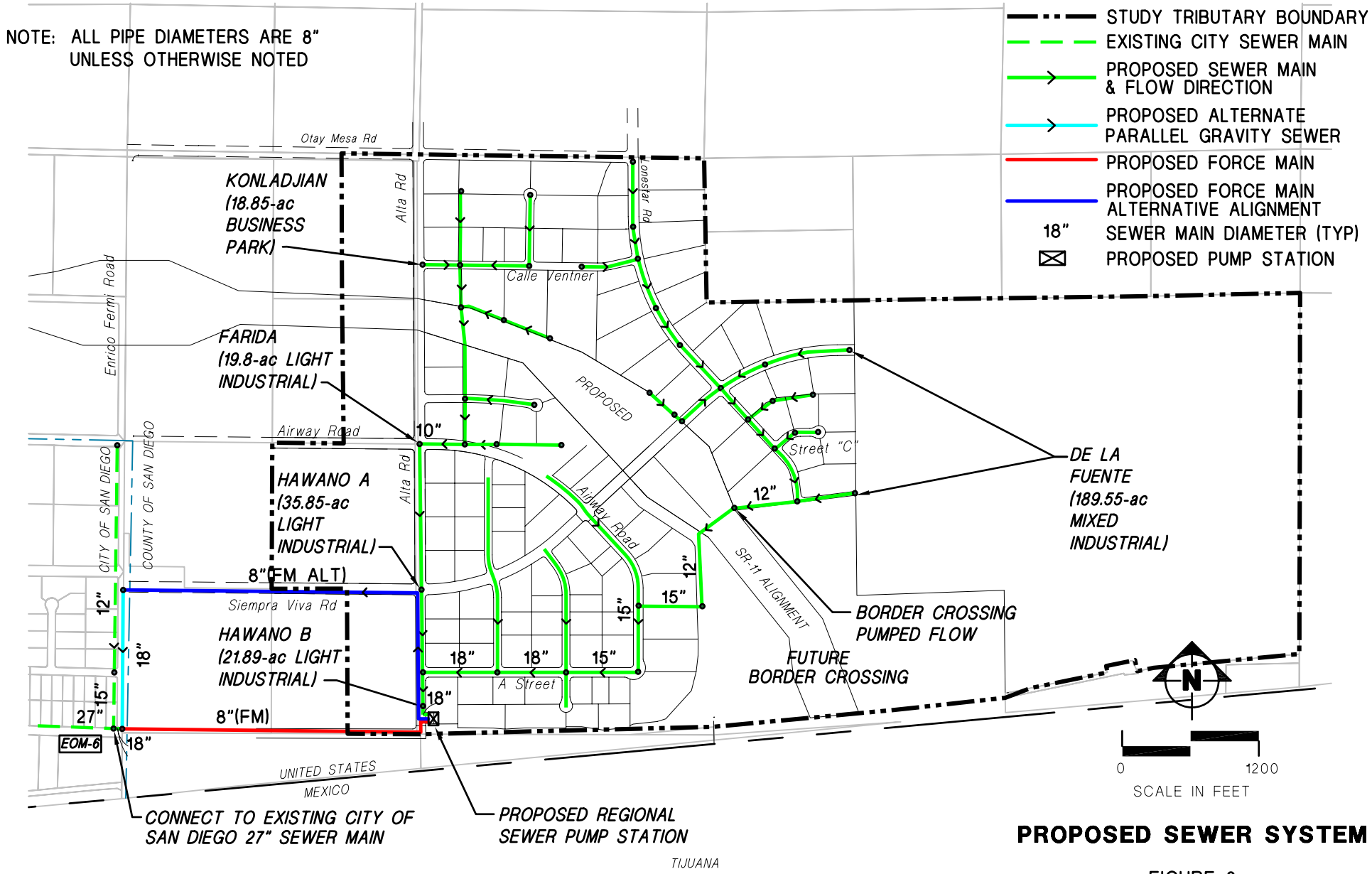
E-Regional Sewer Study\Reports\Figures\049128501vic.dwg May 1, 2009



PROPOSED SEWER SYSTEM

FIGURE 2

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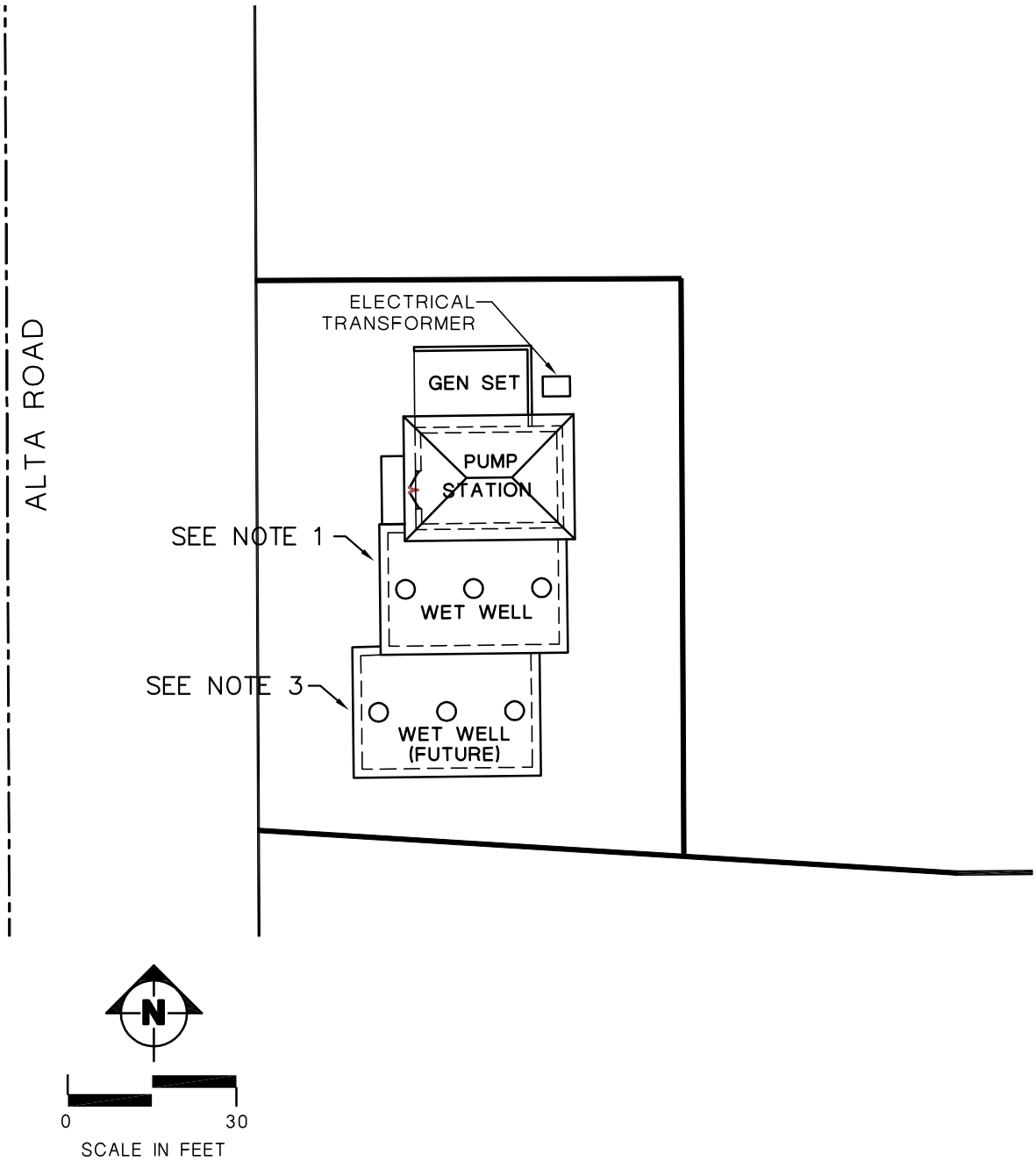
E-Regional Sewer Study\Reports\Figures\049128501-TributarySewer.dwg May 12, 2009



NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG OF EMERGENCY STORAGE.

2. TYPICAL PUMP STATION SITE BETWEEN 0.25 ACRES & 0.4 ACRES.

3. SPACE PROVIDED ONSITE FOR ADDITIONAL 0.34 MG OF FUTURE EMERGENCY STORAGE TO BE CONSTRUCTED BY OTHERS.

TYPICAL SEWER PUMP STATION SITE PLAN

FIGURE 3

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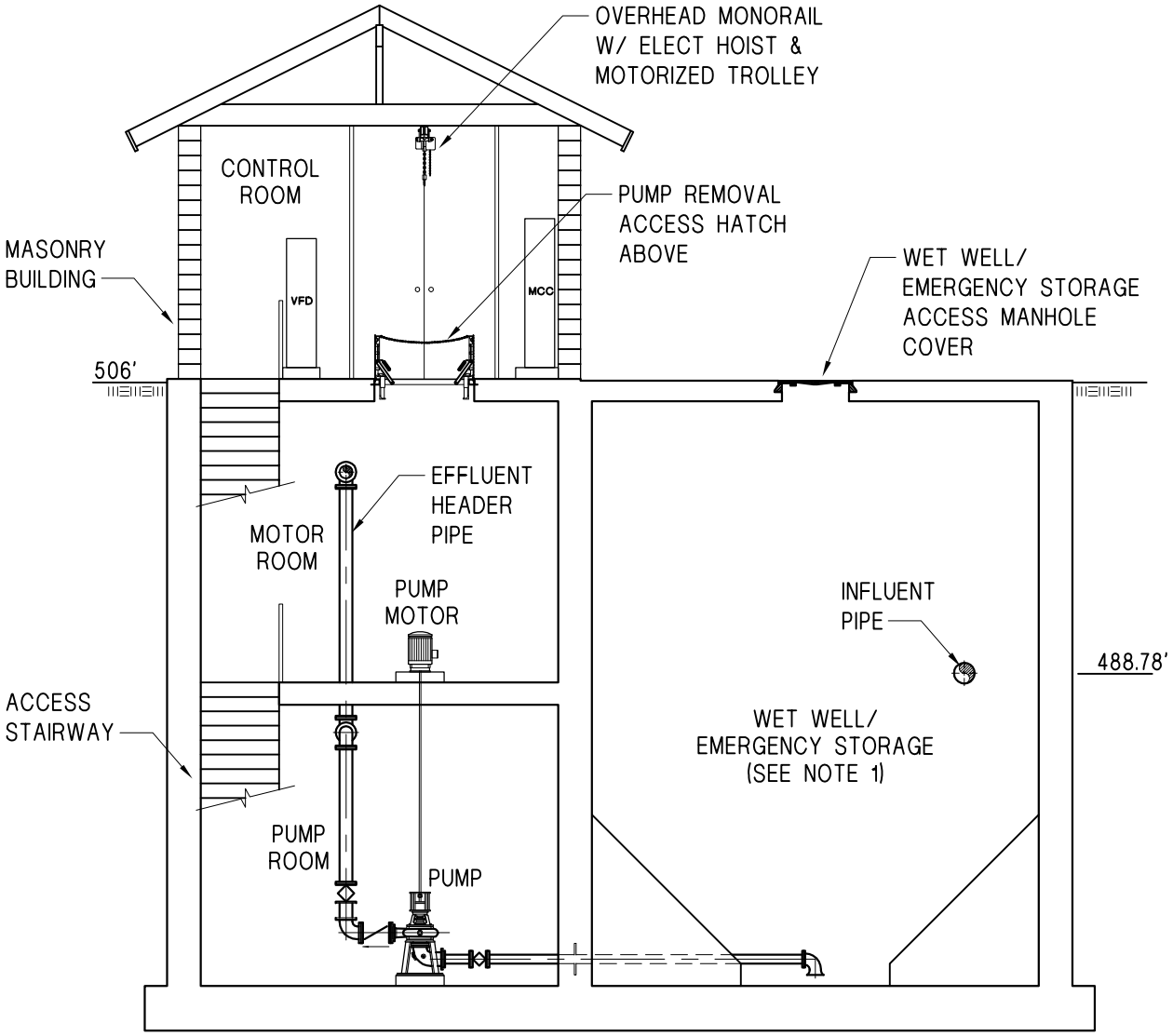
E-RegionalSewerStudy\Reports\Figures\SPS Letter Report February 2009\
049128501sps-SitePlan.dwg May 1, 2009



0 1

1/8"=1'-0"

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION BUILDING SECTION

FIGURE 4

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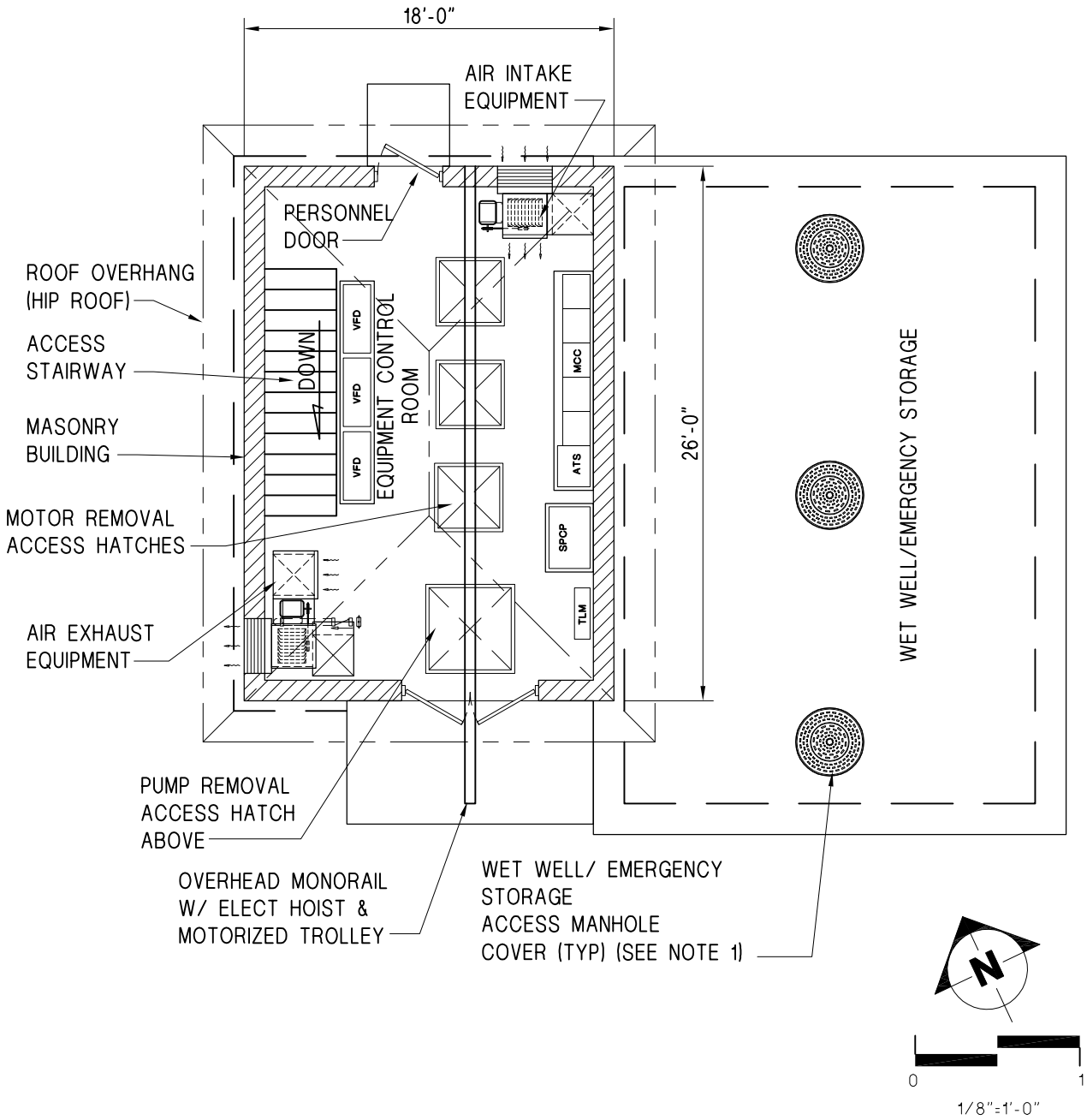
E-RegionalSewerStudy\Reports\Figures\SPS Letter Report February 2009\
049128501-sps.dwg May 12, 2009



NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION CONTROL ROOM

FIGURE 5

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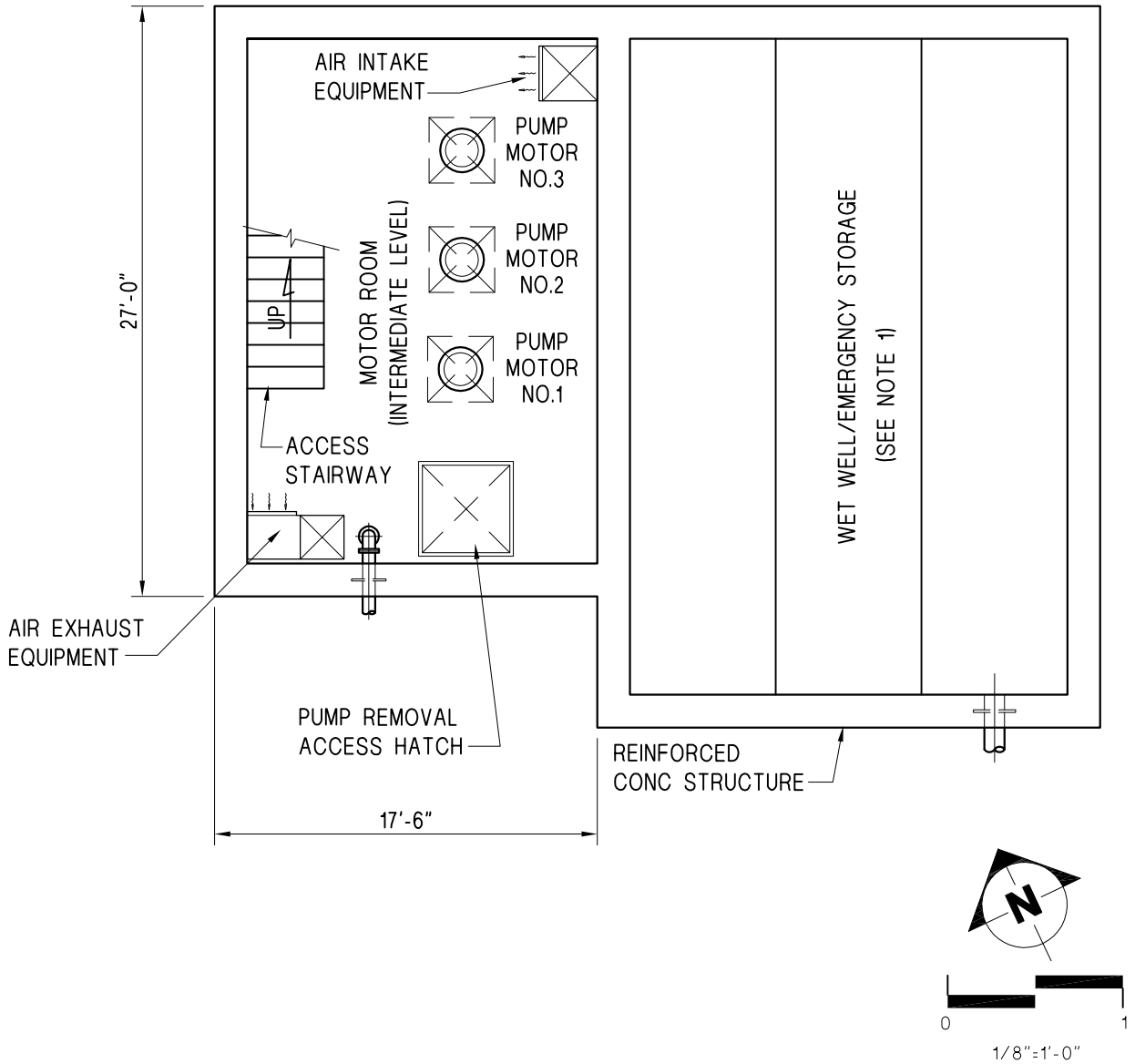

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION MOTOR ROOM (INTERMEDIATE LEVEL)

FIGURE 6

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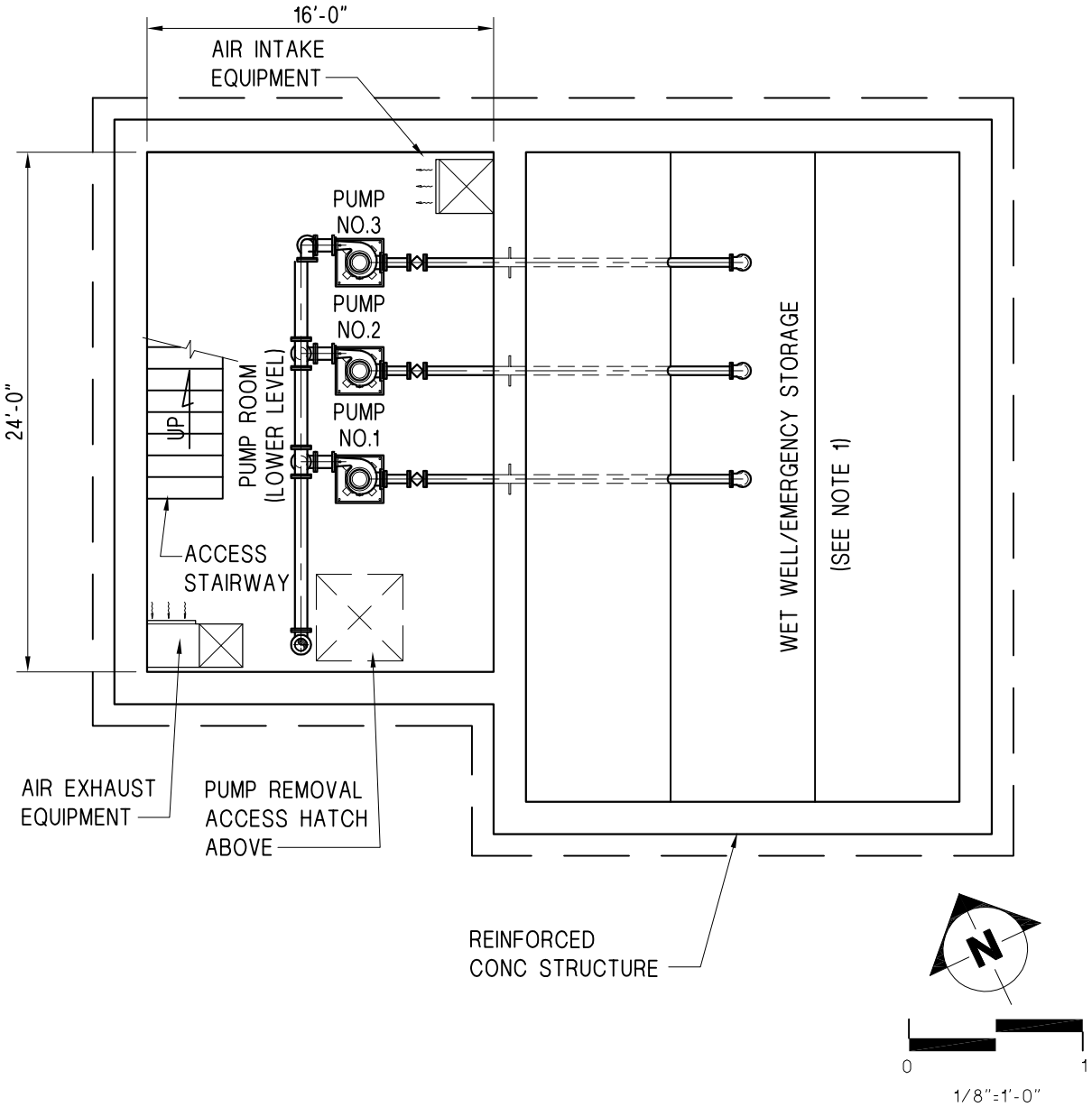
E-RegionalSewerStudy\Reports\Figures\SPS Letter Report February 2009\
049128501-sps.dwg May 12, 2009



NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION PUMP ROOM (LOWER LEVEL)

FIGURE 7

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E-RegionalSewerStudy\Reports\Figures\SPS Letter Report February 2009\
049128501-sps.dwg May 1, 2009

APPENDIX E
EMERGENCY STORAGE CALCULATIONS

Subject: EOM-6 RSPS Emergency Storage		
Comp by: L. Abe Check by: J. Bilecki	Date: 5/15/09 Job Number: 049128501	Sheet Number: 1/2

The County of San Diego has required that the RSPS include emergency storage for the Border Crossing in Phase 1.

Flows, Ultimate Condition:

Phase 1, PWWF = 1,108,904 gpd (App. C-1, Calculation 23)

Border Crossing, pumped flow = 428,600 gpd (App. C-1, Calculation, 11)

1,537,504 gpd

ES_6 = Emergency storage of 6 hours

$= \frac{1,537,504 \text{ gpd}}{24 \text{ hr/d}} \times 6 \text{ hr} = 384,376 \text{ gal.}$

$= \underline{0.38 \text{ MG.}}$

Buildout Storage time:

Phase 1, PWWF = 780,610 gpd (App C-1, Calc. 17)

Border Crossing pumped flow = 188,264 gpd (App C-1, Calc. 5)

968,874 gpd

$ES_x = \frac{968,874 \text{ gpd}}{24 \text{ hr/d}} \times x \text{ hr} = 384,376 \text{ gal}$

$x = 9.5 \text{ hr} > 6 \text{ hr}$ ✓

Subject: EOM-6 RSPS Emergency Storage		
Comp by: J. Abe Check by: J. Bleck	Date: 5/15/09 Job Number: 049128501	Sheet Number: 2/2

Phase 2, Ultimate PWWF = 2,449,197 gpd (App C-1, Calc. 35)

Border Crossing Ult. pumped flow = 428,600 gpd (App C-1, Calc. 11)

2,877,797 gpd

$ES_6 = \frac{2,877,797 \text{ gpd}}{24 \text{ hr/d}} \times 6 \text{ hr} = 719,449 \text{ gal}$

$= 0.72 \text{ MG}$

Future development beyond Phase 1 would be required to build additional volume:

$V = 719,449 \text{ gal} - 384,376 \text{ gal} = 335,073 \text{ gal}$

$= \underline{\underline{0.34 \text{ MG}}}$

Phase 2 Buildout Storage Time:

Phase 2, PWWF 1,547,251 gpd (App C-1, Calc. 29)

Border Crossing pumped flow = 188,264 gpd (App C-1, Calc. 5)

1,735,515 gpd

$ES_z = \frac{1,735,515 \text{ gpd}}{24 \text{ hr/d}} \times z \text{ hr} = 719,449 \text{ gal}$

$z = 9.97 \text{ hr} > 6 \text{ hr}$ ✓

ES_{1ULT} = Emergency Storage for Phase 2 Buildout flows based on Phase 1 Ult. storage

$= \frac{1,735,515 \text{ gpd}}{24 \text{ hr/d}} \times z \text{ hr} = 384,376 \text{ gal}$

$z = 5.3 \text{ hr} < 6 \text{ hr minimum}$

Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123
Contact: Robert Hingtgen
(858) 694-3712

May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

Kearny PCCP Otay 311, LLC

Prepared By:

9275 Sky Park Court, Suite 200
San Diego, CA 92123

REGISTERED PROFESSIONAL ENGINEER
JENNIFER RENE BILECK
No. 69606
Exp. 6/30/10
CIVIL
STATE OF CALIFORNIA

Jennifer R. Bileck, P.E., C.F.M.
Senior Engineer

APPENDIX A
CORRESPONDENCE

PBS&J

An employee-owned company

May 15, 2009

Mr. Judd Halenza
Kearny PCCP Otay 311, LLC
500 Stevens Avenue, Suite 208
Solana Beach, CA 92075

SUBJECT: EAST OTAY MESA SEWER BASIN NO. 6 REGIONAL SEWER STUDY – Response to Comments

Dear Mr. Halenza,

PBS&J has reviewed the comments from the County of San Diego Department of Planning and Land Use, the Judd Company, and National Enterprises Incorporated regarding the East Otay Mesa Sewer Basin No. 6 Regional Sewer Study (EOM-6 Regional Study), dated February 2009. Responses to the comments are below:

The Judd Company, via e-mail dated February 18, 2009:

a. Figure 2: The parcel that you label as owned by Fong is owned by Konladjian. In the middle of that parcel there is a very small parcel for the future fire station.

The property previously noted as the Fong property has been corrected in the study figures and text.

b. Figure 2: The parcel that you label as owned by McKany is owned by Farida.

The property previously noted as the McKany property has been corrected in the study figures and text.

c. Table 2: Wastewater generation – where did you get the land uses listed?

The land use categories used in the EOM-6 Regional Study are based on data from the East Otay Mesa Sewer Master Plan Update, dated November 2006.

National Enterprises Incorporated, April 20, 2009:

a. The Report should combine the Rancho Vista Del Mar properties with the Wick property and the combined properties should be labeled: "De La Fuente Properties".

The properties previously noted as Rancho Vista Del Mar and the Wick property have been combined and labeled as the De La Fuente properties in the study figures and text.

b. The Report should be consistent with regard to GPD/AC for each property included in the basin. As such, "Build out" for each property should be 500 EDU's per acre and "Ultimate" should be 1,500 EDU's per acre.

The East Otay Mesa Sewer Master Plan Update, dated November 2006, defined the areas comprising the De La Fuente properties as having a Mixed Industrial land use. The wastewater unit generation rates for Mixed Industrial under Buildout and

Ultimate conditions are 1,000 gpd/acre and 1,500 gpd/acre, respectively, per the 2006 East Otay Mesa Sewer Master Plan Update.

County of San Diego Department of Planning and Land Use, David Williams, February 20, 2009:

a. Page 6, Table 1: "Commercial Land Use Buildout Generation Rate", is noted as 1,500 gpd/acre. In the November 2006 "EOM Sewer Master Plan", "Update" identifies a generation rate of 1,000 gpd/acre for commercial land use. Why the difference?

There is no Commercial land use within this study area. Generation rates for land uses within this study area are consistent with the 2006 East Otay Mesa Sewer Master Plan Update.

b. Page 8, Table 3: "Sewer Design Criteria", revise as noted:

Peak Dry Weather Flow (PDWF)	Average Dry Weather Flow x PF
~~Peak Wet Weather Flow (PWWF)~~ Pump Station Peak Flow (PSPF)	PDWF x 1.3
Force Main Minimum Velocity	~~3.5 fps~~ 4 fps
Force Main Maximum Velocity	8 fps
Force Main Retention Time	4 Hours, Maximum
Hazen Williams Coefficient	C = 120
Emergency Storage	6 Hours of PWWF

Table 3 has been revised as noted.

c. Figure B-1 (Proposed Sewer Pipe and Node Map) and Figure 4 (Proposed Sewer System): Change direction of flow arrow – from southwest to northeast at Pipe Segment P32.

Figures 4 and B-1 have been revised as noted.

d. In the Regional Sewer Study, change the references from "EOM Sewer Master Plan" to "EOM Sewer Master Plan Update".

Revised as noted.

County of San Diego Department of Planning and Land Use, Jack Cohen, February 17, 2009:

a. Page 8, first sentence: Remove the word "provides".

Revised as noted.

b. Page 9, first sentence: Indicate "East Otay Sewer Maintenance District" instead of "East Otay Mesa Sanitation District".

Revised as noted.

c. Page 10, second paragraph, first sentence: Indicate "east of Alta Road" instead of "west of Alta Road".

Revised as noted.

d. Page 10, last paragraph, third sentence: Indicate "Federal Border Crossing Facility" instead of "Federal Border Control Facility".

Revised as noted.

e. Page 12, first sentence: remove the word "be" before the word conveyed.

Revised as noted.

f. Appendix B, Tables B-1 through B-5: Why the flow from future Border Crossing is not include in these tables?

Although not shown in Table B-1, Border Crossing pumped flows are included in subsequent Tables B-2 through B-5. These tables include the note: "Pipes downstream of N38 include peak wet flows from the Border Crossing PS."

g. Appendix B, Tables B-2 through B-5: Use 18-inch diameter pipe instead of 15-inch for those segments where d/D is greater than 0.5.

Revised as noted.

h. Appendix D, page 2 of 5, second sentence: Indicate "peak dry weather flow" instead of "peak inflow".

Revised as noted.

i. Appendix D, page 4 of 5, first paragraph: Indicate "the emergency generator (instead of generators) will be located behind the pump station in an acoustical weatherproof enclosure (instead of enclosures) provided by the generator manufacturer".

Revised as noted.

<u>County of San Diego Department of Planning and Land Use, Milica Kaludjerski, April 6, 2009:</u>

a. It appears that there is discrepancy with numbers. For example, page 7 Table 2 shows 684,237 gpd and 1,130,475 gpd of average daily sewer flow for EOM 6 buildout and ultimate options respectively. Page 9, the project buildout for EOM-6 is 0.98 mgd and ultimate is 1.65 mgd (no explanation where the numbers came from). Appendix C, page 6 says Phase 2 buildout avg flow is 658,250 gpd.

The 0.98 mgd and 1.65 mgd came from the 2006 EOM Sewer Master Plan as stated in the Section 2.2 of the report. Section 3.2 on page 9 also refers to the 2006 EOM Sewer Master Plan. Appendix C has been corrected, as well as any corresponding calculations.

b. First sentence on page 8 needs to be reworded; it is not grammatically correct.

Revised as noted.

c. Page 11: There is no explanation how they came up with 250 and 500 gpm; per their numbers, it appears that all 3 pumps would have to run at the same time. Per today's industry standards a min of one pump shall be on stand-by. Suggest using minimum three 550 gpm pumps for Phase 1 that can accommodate buildout with one pump running and ultimate flows with two pumps running and a third pump would be the stand-by. Similarly, pumps for the phase 2 should be sized at 1,250 gpm each.

It is assumed that one of the three pumps will be in stand-by mode. Pump sizes have

been updated to account for the changes in flow to the station.

d. Appendix C: Forcemain sizing calculation, page 4, in second part of the calculation – Phase 2 should be corrected to Phase 1.

Revised as noted.

e. Appendix D – Figure 4: The check valve should be placed in horizontal position, not in vertical as shown on the drawing.

Revised as noted.

If you have any questions or need additional information documented, please feel free to call me.

Sincerely,

Leanne M. Abe

Leanne M. Abe, P.E.
Senior Engineer

CC: Tatiana Southard, The Judd Company
Jack Cohen, DPLU
David Williams, DPLU
Jennifer Bileck, PBS&J
Project File - 491115

Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

County of San Diego
Department of Planning and Land Use
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May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

Kearny PCCP Otay 311, LLC

Prepared By:

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STATE OF CALIFORNIA

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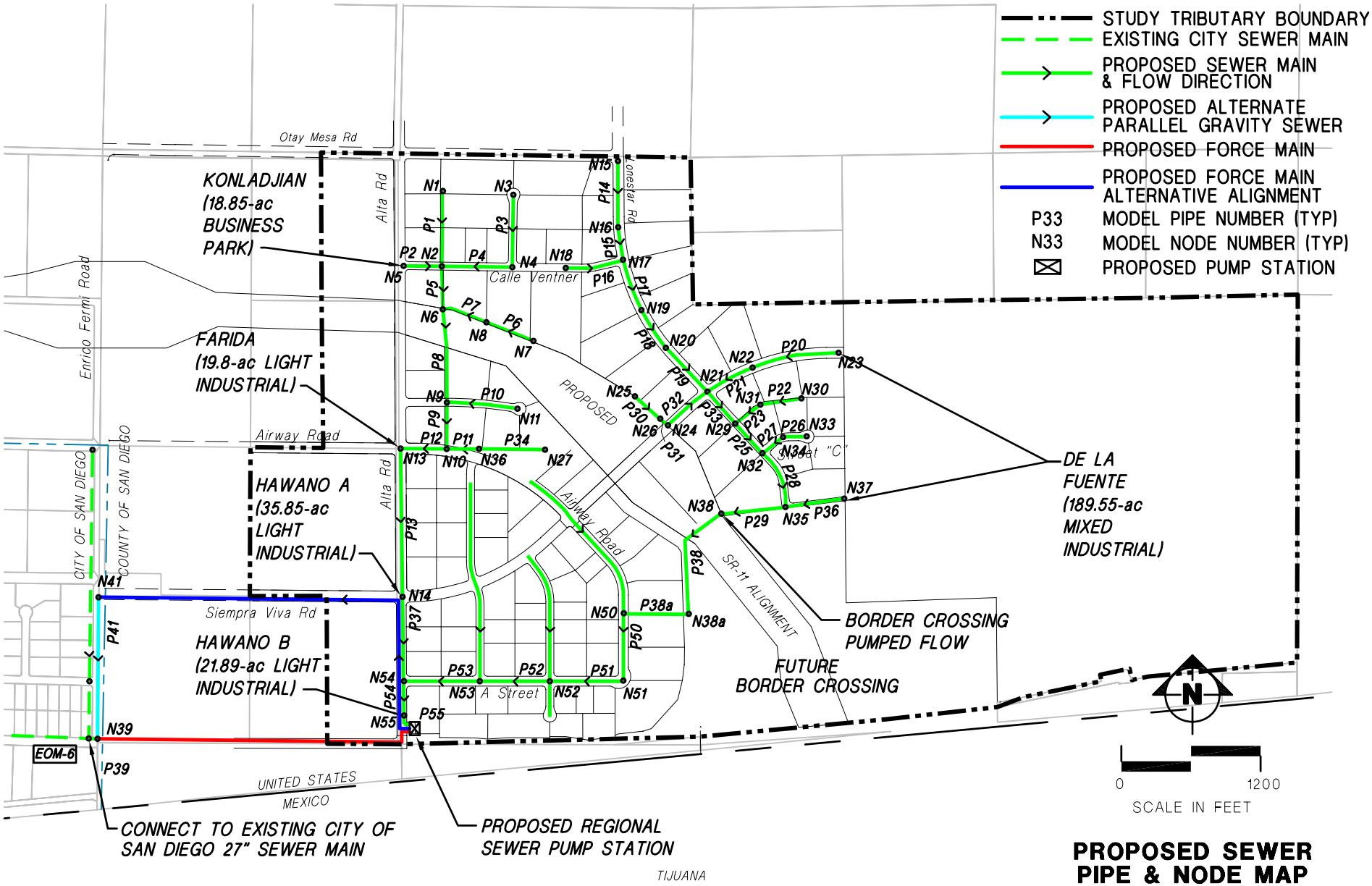
APPENDIX B
ON-SITE GRAVITY SEWER SIZING CALCULATIONS



PROPOSED SEWER PIPE & NODE MAP

FIGURE B-1

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E-Regional Sewer Study\Reports\Figures\049128501-TributarySewer.dwg May 12, 2009

APPENDIX B - MODEL RESULTS
TABLE B-1 AVERAGE FLOW CALCULATION

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N1	1	2.3	1,000 gpd/ac	1,500 gpd/ac	9.6	14.4	2,300	3,450
	8	4.6	1,000 gpd/ac	1,500 gpd/ac	19.2	28.8	4,600	6,900
Subtotal	**-**	**6.9**	**-**	**-**	**28.8**	**43.1**	**6,900**	**10,350**
N2	2	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	3	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	4	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	5	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
	6	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
	7	4.3	1,000 gpd/ac	1,500 gpd/ac	17.9	26.9	4,300	6,450
Subtotal	**-**	**13.1**			**54.6**	**81.9**	**13,100**	**19,650**
N3	9	4.7	1,000 gpd/ac	1,500 gpd/ac	19.6	29.4	4,700	7,050
	10	4.1	1,000 gpd/ac	1,500 gpd/ac	17.1	25.6	4,100	6,150
Subtotal	**-**	**8.8**			**36.7**	**55.0**	**8,800**	**13,200**
N4	11	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
N5	Konladjian	18.9	1,500 gpd/ac	1,500 gpd/ac	117.8	117.8	28,275	28,275
N6	44	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
	45	2.5	1,000 gpd/ac	1,500 gpd/ac	10.4	15.6	2,500	3,750
Subtotal	**-**	**6.1**			**25.4**	**38.1**	**6,100**	**9,150**
N7	42	7.5	1,000 gpd/ac	1,500 gpd/ac	31.3	46.9	7,500	11,250
N8	43	5.0	1,000 gpd/ac	1,500 gpd/ac	20.8	31.3	5,000	7,500
N9	46	2.1	1,000 gpd/ac	1,500 gpd/ac	8.8	13.1	2,100	3,150
	47	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	53	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
Subtotal	**-**	**7.8**			**32.5**	**48.8**	**7,800**	**11,700**
N10	48	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,700	4,050
	49	3.0	1,000 gpd/ac	1,500 gpd/ac	12.5	18.8	3,000	4,500
Subtotal	**-**	**5.7**			**23.8**	**35.6**	**5,700**	**8,550**
N11	52	2.4	1,000 gpd/ac	1,500 gpd/ac	10.0	15.0	2,400	3,600
N13	Farida	19.8	500 gpd/ac	1,500 gpd/ac	41.3	123.8	9,900	29,700
N15	15	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	16	4.1	1,000 gpd/ac	1,500 gpd/ac	17.1	25.6	4,100	6,150
Subtotal	**-**	**5.7**	**-**	**-**	**23.8**	**35.6**	**5,700**	**8,550**
N16	14	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	17	4.0	1,000 gpd/ac	1,500 gpd/ac	16.7	25.0	4,000	6,000
Subtotal	**-**	**5.9**	**-**	**-**	**24.6**	**36.9**	**5,900**	**8,850**
N17	13	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	18	3.8	1,000 gpd/ac	1,500 gpd/ac	15.8	23.8	3,800	5,700
	19	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
Subtotal	**-**	**9.4**	**-**	**-**	**39.2**	**58.8**	**9,400**	**14,100**
N18	12	2.3	1,000 gpd/ac	1,500 gpd/ac	9.6	14.4	2,300	3,450
N19	20	3.0	1,000 gpd/ac	1,500 gpd/ac	12.5	18.8	3,000	4,500
	40	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
	41	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
Subtotal	**-**	**8.3**	**-**	**-**	**34.6**	**51.9**	**8,300**	**12,450**
N20	21	3.1	1,000 gpd/ac	1,500 gpd/ac	12.9	19.4	3,100	4,650
	39	4.9	1,000 gpd/ac	1,500 gpd/ac	20.4	30.6	4,900	7,350
Subtotal	**-**	**8.0**	**-**	**-**	**33.3**	**50.0**	**8,000**	**12,000**

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N21	22	2.8	1,000 gpd/ac	1,500 gpd/ac	11.7	17.5	2,800	4,200
N22	23	3.9	1,000 gpd/ac	1,500 gpd/ac	16.3	24.4	3,900	5,850
N23	De La Fuente	28.8	1,000 gpd/ac	1,500 gpd/ac	120.0	180.0	28,800	43,200
	24	8.1	1,000 gpd/ac	1,500 gpd/ac	33.8	50.6	8,100	12,150
Subtotal	**-**	**36.9**	**-**	**-**	**153.8**	**230.6**	**36,900**	**55,350**
N24	55	0.9	1,000 gpd/ac	1,500 gpd/ac	3.8	5.6	900	1,350
N25	38	3.7	1,000 gpd/ac	1,500 gpd/ac	15.4	23.1	3,700	5,550
N26	37	2.9	1,000 gpd/ac	1,500 gpd/ac	12.1	18.1	2,900	4,350
N27	51	3.6	1,000 gpd/ac	1,500 gpd/ac	15.0	22.5	3,600	5,400
N29	27	2.2	1,000 gpd/ac	1,500 gpd/ac	9.2	13.8	2,200	3,300
	36	3.1	1,000 gpd/ac	1,500 gpd/ac	12.9	19.4	3,100	4,650
Subtotal	**-**	**5.3**	**-**	**-**	**22.1**	**33.1**	**5,300**	**7,950**
N30	25	3.2	1,000 gpd/ac	1,500 gpd/ac	13.3	20.0	3,200	4,800
N31	26	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,700	4,050
N32	28	2.0	1,000 gpd/ac	1,500 gpd/ac	8.3	12.5	2,000	3,000
	32	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	35	4.0	1,000 gpd/ac	1,500 gpd/ac	16.7	25.0	4,000	6,000
Subtotal	**-**	**7.9**	**-**	**-**	**32.9**	**49.4**	**7,900**	**11,850**
N33	30	2.8	1,000 gpd/ac	1,500 gpd/ac	11.7	17.5	2,800	4,200
	31	1.7	1,000 gpd/ac	1,500 gpd/ac	7.1	10.6	1,700	2,550
Subtotal	**-**	**4.5**	**-**	**-**	**18.8**	**28.1**	**4,500**	**6,750**
N34	29	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
N35	33	2.9	1,000 gpd/ac	1,500 gpd/ac	12.1	18.1	2,900	4,350
	34	4.5	1,000 gpd/ac	1,500 gpd/ac	18.8	28.1	4,500	6,750
Subtotal	**-**	**7.4**	**-**	**-**	**30.8**	**46.3**	**7,400.0**	**11,100.0**
N36	50	2.6	1,000 gpd/ac	1,500 gpd/ac	10.8	16.3	2,600	3,900
N37	De La Fuente	160.8	1,000 gpd/ac	1,500 gpd/ac	669.8	1,004.7	160,750	241,125
N14	Hawano A	35.9	500 gpd/ac	1,500 gpd/ac	74.7	224.1	17,925	53,775
(Paragon	1	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	12.0	1,920	2,880
lots)	2	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
	3	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	4	1.8	1,000 gpd/ac	1,500 gpd/ac	7.7	11.5	1,840	2,760
Subtotal	**-**	**43.4**			**106**	**271**	**25,495**	**65,130**
N50	19	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.8	1,890	2,835
(Paragon	20	2.8	1,000 gpd/ac	1,500 gpd/ac	11.8	17.8	2,840	4,260
lots)	36	0.9	1,000 gpd/ac	1,500 gpd/ac	3.6	5.4	860	1,290
	37	1.8	1,000 gpd/ac	1,500 gpd/ac	7.5	11.3	1,810	2,715
	52	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	17.0	2,720	4,080
	53	2.4	1,000 gpd/ac	1,500 gpd/ac	10.0	15.0	2,400	3,600
	54	2.1	1,000 gpd/ac	1,500 gpd/ac	8.7	13.0	2,080	3,120
	55	2.2	1,000 gpd/ac	1,500 gpd/ac	9.0	13.4	2,150	3,225
	56	2.7	1,000 gpd/ac	1,500 gpd/ac	11.2	16.8	2,680	4,020
	57	1.2	1,000 gpd/ac	1,500 gpd/ac	4.9	7.3	1,170	1,755
	58	4.7	1,000 gpd/ac	1,500 gpd/ac	19.4	29.1	4,650	6,975
	59	4.3	1,000 gpd/ac	1,500 gpd/ac	17.8	26.7	4,270	6,405
Subtotal	**-**	**29.5**			**123**	**185**	**29,520**	**44,280**
N51	33	2.0	1,000 gpd/ac	1,500 gpd/ac	8.2	12.3	1,960	2,940
(Paragon	34	1.4	1,000 gpd/ac	1,500 gpd/ac	5.8	8.8	1,400	2,100
lots)	35	2.7	1,000 gpd/ac	1,500 gpd/ac	11.2	16.8	2,690	4,035
	48	3.4	1,000 gpd/ac	1,500 gpd/ac	14.2	21.3	3,400	5,100
	49	3.4	1,000 gpd/ac	1,500 gpd/ac	14.3	21.5	3,440	5,160
	50	3.4	1,000 gpd/ac	1,500 gpd/ac	14.0	21.0	3,360	5,040
	51	3.7	1,000 gpd/ac	1,500 gpd/ac	15.3	22.9	3,660	5,490
	47	5.0	1,000 gpd/ac	1,500 gpd/ac	20.9	31.4	5,020	7,530
Subtotal	**-**	**24.9**			**104**	**156**	**24,930**	**37,395**

Node	Unit	Area (Acres)	Unit Generation Rate (gpd/ac)		EDU		Avg. Daily Sewer Flow (gpd)	
			Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
N52	24	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
(Paragon	25	1.4	1,000 gpd/ac	1,500 gpd/ac	5.6	8.4	1,350	2,025
lots)	26	0.9	1,000 gpd/ac	1,500 gpd/ac	3.9	5.9	940	1,410
	27	1.8	1,000 gpd/ac	1,500 gpd/ac	7.5	11.2	1,790	2,685
	28	1.4	1,000 gpd/ac	1,500 gpd/ac	6.0	9.0	1,440	2,160
	29	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.5	1,680	2,520
	30	1.1	1,000 gpd/ac	1,500 gpd/ac	4.4	6.6	1,060	1,590
	31	1.4	1,000 gpd/ac	1,500 gpd/ac	6.0	8.9	1,430	2,145
	32	2.0	1,000 gpd/ac	1,500 gpd/ac	8.4	12.6	2,010	3,015
	41	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	12.0	1,920	2,880
	42	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,710	4,065
	43	1.4	1,000 gpd/ac	1,500 gpd/ac	5.7	8.5	1,360	2,040
	44	1.1	1,000 gpd/ac	1,500 gpd/ac	4.7	7.0	1,120	1,680
	45	0.9	1,000 gpd/ac	1,500 gpd/ac	3.7	5.5	880	1,320
	46	1.1	1,000 gpd/ac	1,500 gpd/ac	4.5	6.8	1,080	1,620
Subtotal	**-**	**22.7**			**94**	**142**	**22,670**	**34,005**
N53	5	1.7	1,000 gpd/ac	1,500 gpd/ac	7.3	10.9	1,740	2,610
(Paragon	6	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
lots)	7	1.9	1,000 gpd/ac	1,500 gpd/ac	8.0	11.9	1,910	2,865
	8	1.6	1,000 gpd/ac	1,500 gpd/ac	6.8	10.1	1,620	2,430
	12	2.1	1,000 gpd/ac	1,500 gpd/ac	8.5	12.8	2,050	3,075
	13	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	14	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
	15	1.3	1,000 gpd/ac	1,500 gpd/ac	5.3	8.0	1,280	1,920
	16	1.5	1,000 gpd/ac	1,500 gpd/ac	6.1	9.1	1,460	2,190
	17	1.5	1,000 gpd/ac	1,500 gpd/ac	6.2	9.3	1,490	2,235
	18	2.1	1,000 gpd/ac	1,500 gpd/ac	8.5	12.8	2,050	3,075
	21	2.4	1,000 gpd/ac	1,500 gpd/ac	9.8	14.7	2,350	3,525
	22	1.4	1,000 gpd/ac	1,500 gpd/ac	5.6	8.4	1,350	2,025
	23	1.9	1,000 gpd/ac	1,500 gpd/ac	7.9	11.9	1,900	2,850
	39	1.9	1,000 gpd/ac	1,500 gpd/ac	7.8	11.6	1,860	2,790
	40	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.5	1,680	2,520
Subtotal	**-**	**27.9**			**116**	**174**	**27,850**	**41,775**
N54	9	1.7	1,000 gpd/ac	1,500 gpd/ac	7.0	10.4	1,670	2,505
(Paragon	10	1.6	1,000 gpd/ac	1,500 gpd/ac	6.7	10.0	1,600	2,400
lots)	11	1.6	1,000 gpd/ac	1,500 gpd/ac	6.6	9.9	1,590	2,385
Subtotal	**-**	**4.9**			**20**	**30**	**4,860**	**7,290**
N55	Hawano B	21.9	500 gpd/ac	1,500 gpd/ac	45.6	136.8	10,945	32,835
(Paragon)	38	2.7	1,000 gpd/ac	1,500 gpd/ac	11.3	16.9	2,710	4,065
Subtotal	**-**	**24.6**			**57**	**154**	**13,655**	**36,900**

APPENDIX B - MODEL RESULTS
TABLE B-2 BUILDOUT DESIGN FLOW AND MANNING'S CALCULATION

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		EOM-6	515.00	507.26		2,744.0		10,624.7		849,975	1.81	1,730,091.4	2.68				

1. Buildout Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-3 ULTIMATE DESIGN FLOW AND MANNING'S CALCULATION

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.88	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		EOM-6	515.00	507.26		2,744.0		10,624.7		849,975	1.81	1,970,427.4	3.05				

1. Ultimate Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-4 BUILDOUT DESIGN FLOW AND MANNING'S CALCULATION
ALTERNATIVE ALIGNMENT

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		N41	554.07			4,016.0		10,624.7		849,975	1.81	1,730,091.4	2.68	0.22			
P41	N41	554.07	547.07	N39	516.00	509.20	7.0	1,489.6	18	10,624.7	0	849,975	1.81	1,730,091.4	2.68	2.54	4.87	0.27	3.8
P39	N39	516.00	509.00	EOM-6	515.00	507.26	7.0	91.0	18	10,624.7	0	849,975	1.81	1,730,091.4	2.68	1.91	4.39	0.24	4.8

1. Buildout Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

APPENDIX B - MODEL RESULTS
TABLE B-5 ULTIMATE DESIGN FLOW AND MANNING'S CALCULATION
ALTERNATIVE ALIGNMENT

	Upstream MH			Downstream MH															
Pipe ID	ID	Rim	Inv	ID	Rim	Inv	Depth	Length	Diameter	In-line Pop.	Trib Avg Flow (gpd)[1]	Cumulative Average Flow (gpd)	Peaking Factor	Peak Dry Weather Flow (gpd)[2]	Peak Dry Weather Flow (cfs)	Slope (%)	Normal Depth (inches)	d/D	Velocity (fps)
P1	N1	573.00	566.00	N2	573.72	559.15	7.0	684.9	8	129.4	10,350	10,350	3.28	33,922.8	0.05	1.00	1.14	0.14	1.7
P2	N5	580.37	570.37	N2	573.72	559.15	10.0	412.3	8	353.4	28,275	28,275	2.86	80,980.5	0.13	2.72	1.36	0.17	3.2
P3	N3	591.48	584.48	N4	579.66	574.66	7.0	651.0	8	165.0	13,200	13,200	3.17	41,874.4	0.06	1.51	1.14	0.14	2.1
P4	N4	579.66	574.46	N2	573.72	559.15	5.2	600.1	8	200.6	2,850	16,050	3.09	49,597.1	0.08	2.55	1.09	0.14	2.7
P5	N2	573.72	558.95	N6	570.00	554.28	14.8	377.2	8	929.1	19,650	74,325	2.52	186,975.4	0.29	1.24	2.52	0.32	2.0
P6	N7	570.00	563.00	N8	570.00	558.46	7.0	454.5	8	140.6	11,250	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P7	N8	570.00	558.26	N6	570.00	554.28	11.7	397.4	8	234.4	7,500	18,750	3.03	56,744.1	0.09	1.00	1.46	0.18	2.0
P8	N6	570.00	554.08	N9	545.17	540.17	15.9	846.9	8	1,277.8	9,150	102,225	2.41	246,394.2	0.38	1.64	2.71	0.34	4.0
P9	N9	545.17	539.97	N10	541.00	535.90	5.2	406.7	8	1,469.1	11,700	117,525	2.37	278,019.1	0.43	1.00	3.30	0.41	3.3
P10	N11	555.48	548.48	N9	545.17	540.17	7.0	655.0	8	45.0	3,600	3,600	3.78	13,595.7	0.02	1.27	0.68	0.09	1.4
P11	N36	547.00	541.98	N10	541.00	535.90	5.0	456.5	8	116.3	3,900	9,300	3.32	30,922.1	0.05	1.33	1.01	0.13	1.9
P12	N10	541.00	535.70	N13	545.08	534.53	5.3	419.0	10	1,692.2	8,550	135,375	2.32	314,225.9	0.49	0.28	4.52	0.45	2.1
P13	N13	545.08	534.33	N14	527.00	522.00	10.8	1,345.4	8	2,063.4	29,700	165,075	2.26	373,099.3	0.58	0.92	4.00	0.50	3.3
P14	N15	593.65	586.65	N16	586.00	579.00	7.0	317.2	8	106.9	8,550	8,550	3.36	28,750.9	0.04	2.41	0.85	0.11	2.2
P15	N16	586.00	578.80	N17	575.74	569.41	7.2	395.4	8	217.5	8,850	17,400	3.06	53,189.2	0.08	2.37	1.14	0.14	2.7
P16	N18	581.68	574.68	N17	575.74	569.41	7.0	526.9	8	43.1	3,450	3,450	3.80	13,103.9	0.02	1.00	0.72	0.09	1.3
P17	N17	575.74	569.21	N19	568.00	561.00	6.5	489.0	8	436.9	14,100	34,950	2.78	97,291.0	0.15	1.68	1.68	0.21	2.8
P18	N19	568.00	560.80	N20	562.60	555.76	7.2	489.0	8	592.5	12,450	47,400	2.67	126,661.6	0.20	1.03	2.16	0.27	2.6
P19	N20	562.60	555.56	N21	559.73	538.04	7.0	449.4	8	742.5	12,000	59,400	2.59	153,992.7	0.24	3.90	1.71	0.21	2.0
P20	N23	574.16	564.16	N22	564.00	546.58	10.0	417.6	8	691.9	55,350	55,350	2.62	144,859.6	0.22	4.21	1.63	0.20	3.6
P21	N22	564.00	546.38	N21	559.73	538.02	17.6	836.4	8	765.0	5,850	61,200	2.58	158,024.8	0.24	1.00	2.44	0.31	2.0
P22	N30	550.00	543.00	N31	550.00	539.29	7.0	371.3	8	60.0	4,800	4,800	3.63	17,441.1	0.03	1.00	0.83	0.10	1.5
P23	N31	550.00	539.09	N29	540.10	534.91	10.9	316.4	8	110.6	4,050	8,850	3.35	29,622.3	0.05	1.32	1.00	0.12	1.9
P25	N29	540.10	534.71	N32	540.10	531.71	5.4	371.0	8	1,811.3	7,950	144,900	2.30	333,279.7	0.52	0.81	3.88	0.48	3.1
P26	N33	546.95	539.95	N34	540.00	535.00	7.0	170.3	8	84.4	6,750	6,750	3.47	23,429.7	0.04	2.91	0.74	0.09	2.3
P27	N34	540.00	534.80	N32	540.10	531.71	5.2	275.1	8	114.4	2,400	9,150	3.33	30,489.8	0.05	1.12	1.05	0.13	1.9
P28	N32	540.10	531.51	N35	528.00	522.36	8.6	539.1	8	2,073.8	11,850	165,900	2.26	374,713.1	0.58	1.70	3.36	0.42	2.7
P29	N35	528.00	522.16	N38	541.00	519.00	5.8	586.5	12	5,226.6	11,100	418,125	2.00	834,224.2	1.29	0.54	5.95	0.50	4.5
P30	N25	554.00	549.00	N26	552.00	545.91	5.0	309.2	8	69.4	5,550	5,550	3.56	19,777.2	0.03	1.00	0.87	0.11	1.5
P31	N26	552.00	545.71	N24	551.98	544.86	6.3	85.0	8	123.8	4,350	9,900	3.30	32,642.0	0.05	1.00	1.11	0.14	1.7
P32	N24	551.98	544.66	N21	559.73	540.03	7.3	462.8	8	140.6	1,350	11,250	3.24	36,462.3	0.06	1.00	1.18	0.15	1.8
P33	N21	559.73	539.83	N29	540.10	538.54	19.9	195.1	8	1,700.6	4,200	136,050	2.32	315,581.9	0.49	0.66	3.99	0.50	2.0
P34	N27	555.00	548.00	N36	547.00	542.18	7.0	437.8	8	67.5	5,400	5,400	3.58	19,313.6	0.03	1.33	0.81	0.10	1.6
P36	N37	540.00	531.60	N35	528.00	522.36	8.4	524.8	8	3,014.1	241,125	241,125	2.15	517,966.0	0.80	1.76	4.00	0.50	2.3
P37	N14	527.00	521.80	N54	508.20	489.83	5.2	1,765.6	8	2,877.6	65,130	230,205	2.16	497,593.7	0.77	1.81	3.87	0.48	4.6
P38[3]	N38	541.00	518.80	N38a	507.00	501.33	22.2	965.0	12	5,226.6	0	418,125	2.00	1,262,824.2	1.95	1.81	5.33	0.44	4.6
P38a	N38a	507.00	501.13	N50	515.00	498.60	5.9	683.0	15	5,226.6	0	418,125	2.00	1,262,824.2	1.95	0.37	7.48	0.50	4.6
P50	N50	515.00	498.40	N51	505.20	495.82	16.6	615.0	15	5,780.1	44,280	462,405	1.97	1,338,790.7	2.07	0.42	7.45	0.50	4.5
P51	N51	505.20	495.80	N52	507.00	492.75	9.4	661.9	15	6,247.5	37,395	499,800	1.95	1,402,184.6	2.17	0.46	7.46	0.50	3.7
P52	N52	507.00	492.73	N53	510.00	491.35	14.3	627.8	18	6,672.6	34,005	533,805	1.93	1,459,279.9	2.26	0.22	8.55	0.48	2.6
P53	N53	510.00	491.33	N54	508.20	489.83	18.7	684.3	18	7,194.8	41,775	575,580	1.91	1,528,758.9	2.37	0.22	8.79	0.49	2.6
P54	N54	508.20	489.81	N55	502.20	488.91	18.4	408.1	18	10,163.4	7,290	813,075	1.82	1,912,303.1	2.96	0.22	10.05	0.56	2.8
P55	N55	502.20	488.89	PS	506.00	488.78	13.3	49.2	18	10,624.7	36,900	849,975	1.81	1,970,427.4	3.05	0.22	10.24	0.57	2.9
FM[4]	PS	506.00		N41	554.07			4,016.0		10,624.7		849,975	1.81	1,970,427.4	3.05	0.22			
P41	N41	554.07	547.07	N39	516.00	509.20	7.0	1,489.6	18	10,624.7	0	849,975	1.81	1,970,427.4	3.05	2.54	5.20	0.29	3.8
P39	N39	516.00	509.00	EOM-6	515.00	507.26	7.0	91.0	18	10,624.7	0	849,975	1.81	1,970,427.4	3.05	1.91	5.60	0.31	4.8

1. Ultimate Flow Projections used to determine tributary average flows.
2. Pipes downstream of N38 include peak wet flows from the Border Crossing PS. Peak wet flows are added to the cumulative peak dry flow for all tributary areas that gravity to that node.
3. MH N50 has deep invert to allow sewer to cross under storm drain on Paragon property.
4. Peaking factor and peak flow in the force main (FM) - See Proposed Pump Station Design Capacity Calculation in Appendix C.

Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123
Contact: Robert Hingtgen
(858) 694-3712

May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

Kearny PCCP Otay 311, LLC

Prepared By:

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JENNIFER RENE BILECK
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STATE OF CALIFORNIA

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Senior Engineer

APPENDIX C
REGIONAL SEWER PUMP STATION DESIGN FLOW RATE CALCULATIONS
REGIONAL SEWER PUMP STATION FORCE MAIN CALCULATIONS

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

PURPOSE

Determine the Required Design Pump Flow Rate for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions for Phase 1 and 2 Conditions. The Phase 1 Condition only includes the Otay Crossing Commerce Park and Paragon properties. The Phase 2 Condition includes all tributary properties, as listed in Table 2 of this study, and the Border Crossing.

ABBREVIATIONS

EDU - Equivalent Dwelling Unit
fps - feet per second
gpd - gallons per day
mgd - million gallons per day
Pop - Population
Ult Gen Rate - Average Sewage generation for 1 acre of land use under the ultimate buildout condition
Bld Gen Rate - Average Sewage generation for 1 acre of land use under the buildout condition
BX Ult Gen Rate - Average Sewage generation for 1 acre of the Border Crossing Site under the ultimate condition
BX Bld Gen Rate - Average Sewage generation for 1 acre of the Border Crossing Site under the buildout condition
Pop Gen Rate - Average Sewage generation for 1 person
EDU Gen Rate - Average Sewage generation for 1 EDU

CRITERIA

Phase 1 Tributary Area =	286.01	acres	Per Table 2
Phase 2 Tributary Area (Mixed Industrial) =	475.56	acres	Per Table 2
Phase 2 Tributary Area (Light Industrial) =	77.54	acres	Per Table 2
Phase 2 Tributary Area (Business Park) =	18.85	acres	Per Table 2
Proposed Border Crossing =	95.40	acres	Per Table 2
Ult Gen Rate (Mixed Industrial) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Mixed Industrial) =	1,000	gpd/acre	County criteria - Specified in Master Plan
Ult Gen Rate (Light Industrial) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Light Industrial) =	500	gpd/acre	County criteria - Specified in Master Plan
Ult Gen Rate (Business Park) =	1,500	gpd/acre	County criteria - Specified in Master Plan
Bld Gen Rate (Business Park) =	1,500	gpd/acre	County criteria - Specified in Master Plan
BX Ult Gen Rate =	1,500	gpd/acre	County criteria - Specified in Master Plan
BX Bld Gen Rate =	580	gpd/acre	See description in Section 2.1
Pop Gen Rate =	80	gpd/person	City criteria - Specified in Master Plan & per City Design Criteria
EDU Generation Rate =	240	gpd/EDU	County criteria - Specified in Master Plan per County Ordinance
Design Pump Rate Peaking Factor (DPF) =	1.30		To account for wet weather peaking
Peak to Average Flow Factor (PF) = 6.2945 x Pop ^ (-0.1342)			City criteria - Specified in Master Plan & per City Design Criteria

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

PROCEDURE

Border Crossing Pump Station Buildout Condition

1. Calculate the Average Daily Flow (ADF) - see Equation 1
2. Calculate the Population (Pop) - see Equation 2
3. Calculate the Peak to Average Flow Factor (PF) - see Equation 3
4. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 4
5. Calculate the Design Pump Rate (Q_D) - see Equation 5
6. Calculate the number of EDUs - see Equation 6

Border Crossing Pump Station Ultimate Condition

7. Calculate the Average Daily Flow (ADF) - see Equation 7
8. Calculate the Population (Pop) - see Equation 8
9. Calculate the Peak to Average Flow Factor (PF) - see Equation 9
10. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 10
11. Calculate the Design Pump Rate (Q_D) - see Equation 11
12. Calculate the number of EDUs - see Equation 12

Phase 1 Buildout Condition

13. Calculate the Average Daily Flow (ADF) - see Equation 13
14. Calculate the Population (Pop) - see Equation 14
15. Calculate the Peak to Average Flow Factor (PF) - see Equation 15
16. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 16
17. Calculate the Design Pump Rate (Q_D) - see Equation 17
18. Calculate the number of EDUs - see Equation 18

Phase 1 Ultimate Condition

19. Calculate the Average Daily Flow (ADF) - see Equation 19
20. Calculate the Population (Pop) - see Equation 20
21. Calculate the Peak to Average Flow Factor (PF) - see Equation 21
22. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 22
23. Calculate the Design Pump Rate (Q_D) - see Equation 23
24. Calculate the number of EDUs - see Equation 24

Phase 2 Buildout Condition

25. Calculate the Average Daily Flow (ADF) - see Equation 25
26. Calculate the Population (Pop) - see Equation 26
27. Calculate the Peak to Average Flow Factor (PF) - see Equation 27
28. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 28
29. Calculate the Design Pump Rate (Q_D) - see Equation 29
30. Calculate the number of EDUs - see Equation 30

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. Calculate the Average Daily Flow (ADF) - see Equation 31
32. Calculate the Population (Pop) - see Equation 32
33. Calculate the Peak to Average Flow Factor (PF) - see Equation 33
34. Calculate the Peak Flow to the Pump Station (Qp) - see Equation 34
35. Calculate the Design Pump Rate (Q_D) - see Equation 35
36. Calculate the number of EDUs - see Equation 36

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

EQUATIONS

Border Crossing Pump Station Buildout Condition

1. ADF = Border Crossing Area x BX Gen Rate - see Calculation 1
2. Pop = ADF / Pop Gen Rate - see Calculation 2
3. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 3
4. Q_P = ADF x PF - see Calculation 4
5. Q_D = Q_P x DPF - see Calculation 5
6. EDU = ADF / EDU Gen Rate - see Calculation 6

Border Crossing Pump Station Ultimate Condition

7. ADF = Border Crossing Area x Ult Gen Rate - see Calculation 7
8. Pop = ADF / Pop Gen Rate - see Calculation 8
9. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 9
10. Q_P = ADF x PF - see Calculation 10
11. Q_D = Q_P x DPF - see Calculation 11
12. EDU = ADF / EDU Gen Rate - see Calculation 12

Phase 1 Buildout Condition

13. ADF = Phase 1 Tributary Area x Bld. Gen Rate - see Calculation 13
14. Pop = ADF / Pop Gen Rate - see Calculation 14
15. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 15
16. Q_P = ADF x PF - see Calculation 16
17. Q_D = Q_P x DPF - see Calculation 17
18. EDU = ADF / EDU Gen Rate - see Calculation 18

Phase 1 Ultimate Condition

19. ADF = Phase 1 Tributary Area x Ult. Gen Rate - see Calculation 19
20. Pop = ADF / Pop Gen Rate - see Calculation 20
21. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 21
22. Q_P = ADF x PF - see Calculation 22
23. Q_D = Q_P x DPF - see Calculation 23
24. EDU = ADF / EDU Gen Rate - see Calculation 24

Phase 2 Buildout Condition

25. ADF = (Phase 1 Trib. Area + Phase 2 Trib. Area) x Bld. Gen Rate - see Calculation 25
26. Pop = ADF / Pop Gen Rate - see Calculation 26
27. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 27
28. Q_P = ADF x PF - see Calculation 28
29. Q_D = DPF x (Q_P + Border Crossing Q_D) - see Calculation 29
30. EDU = ADF / EDU Gen Rate + Border Crossing EDUs - see Calculation 30

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. ADF = (Phase 1 Trib. Area + Phase 2 Trib. Area) x Ult. Gen Rate - see Calculation 31
32. Pop = ADF / Pop Gen Rate - see Calculation 32
33. PF = 6.2945 x Pop ^ (-0.1342) - see Calculation 33
34. Q_P = ADF x PF - see Calculation 34
35. Q_D = DPF x (Q_P + Border Crossing Q_D) - see Calculation 35
36. EDU = ADF / EDU Gen Rate + Border Crossing EDUs - see Calculation 36

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

CALCULATIONS

Border Crossing Pump Station Buildout Condition

1. ADF = 95.4 ac x 580 gpd/ac =	55,332	gpd
2. Pop = 55,332 gpd / 80 gpd/person =	692	persons
3. PF = 6.2945 x 692 ^ (-0.1342) =	2.62	
4. Q_P = 55,332 gpd x 2.62 =	144,819	gpd
5. Q_D = 144,819 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.188264	mgd
6. EDU = 55,332 gpd / 240 gpd/EDU =	231	EDU

Border Crossing Pump Station Ultimate Condition

7. ADF = 95.4 ac x 1,500 gpd/ac =	143,100	gpd
8. Pop = 143,100 gpd / 80 gpd/person =	1,789	persons
9. PF = 6.2945 x 1,789 ^ (-0.1342) =	2.30	
10. Q_P = 143,100 gpd x 2.30 =	329,692	gpd
11. Q_D = 329,692 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.428600	mgd
12. EDU = 143,100 gpd / 240 gpd/EDU =	596	EDU

Phase 1 Buildout Condition

13. ADF = 286.01 ac x 1,000 gpd/ac =	286,010	gpd
14. Pop = 286,010 gpd / 80 gpd/person =	3,575	persons
15. PF = 6.2945 x 3,575 ^ (-0.1342) =	2.10	
16. Q_P = 286,010 gpd x 2.10 =	600,469	gpd
17. Q_D = 600,469 gpd x 1.3 / 10 ^ 6 gpd/mgd =	0.780610	mgd
18. EDU = 286,010 gpd / 240 gpd/EDU =	1,192	EDU

Phase 1 Ultimate Condition

19. ADF = 286.01 ac x 1,500 gpd/ac =	429,015	gpd
20. Pop = 429,015 gpd / 80 gpd/person =	5,363	persons
21. PF = 6.2945 x 5,363 ^ (-0.1342) =	1.99	
22. Q_P = 429,015 gpd x 1.99 =	853,003	gpd
23. Q_D = 853,003 gpd x 1.3 / 10 ^ 6 gpd/mgd =	1.108904	mgd
24. EDU = 429,015 gpd / 240 gpd/EDU =	1,788	EDU

Phase 2 Buildout Condition

25. ADF = (475.56 ac x 1,000 gpd/ac) + (77.54 ac x 500 gpd/ac) + (18.85 ac x 1,500 gpd/ac) =	542,605	gpd
26. Pop = 542,605 gpd / 80 gpd/person =	6,783	persons
27. PF = 6.2945 x 6,783 ^ (-0.1342) =	1.93	
28. Q_P = 542,605 gpd x 1.93 =	1,045,375	gpd
29. Q_D = 1.3 x (1,045,375 gpd / 10 ^ 6 gpd/mgd) + 0.19 mgd =	1.547251	mgd
30. EDU = 542,605 gpd / 240 gpd/EDU + 231 EDUs =	2,491	EDU

Calculated by:	Ima
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Design Flow Rate Calculation

Phase 2 Ultimate Condition

31. ADF = 571.95 ac x 1,500gpd/ac =	857,925	gpd
32. Pop = 857,925 gpd / 80 gpd/person =	10,724	persons
33. PF = 6.2945 x 10,724 ^ (-0.1342) =	1.81	
34. Q_P = 857,925 gpd x 1.81 =	1,554,305	gpd
35. Q_D = 1.3 x (1,554,305 gpd / 10 ^ 6 gpd/mgd) + 0.43 mgd =	2.449197	mgd
36. EDU = 857,925 gpd / 240 gpd/EDU + 596 EDUs =	4,171	EDU

Calculated by: lma
Checked by: JRB
Date: 5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

PURPOSE

Select the force main diameter for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions for Phase 1 and 2 Conditions. The Phase 1 Condition only includes the Otay Crossing Commerce Park and Paragon properties. The Phase 2 Condition includes all tributary properties, as listed in Table 1 of this study, and the Border Crossing.

ABBREVIATIONS

EDU - Equivalent Dwelling Unit
fps - feet per second
gpd - gallons per day
mgd - million gallons per day
cfs - cubic feet per second

CRITERIA

Phase 1 Buildout Condition Design Pump Rate (Q_{IBC}) =	0.78	mgd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Design Pump Rate (Q_{IUC}) =	1.11	mgd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Design Pump Rate (Q_{FBC}) =	1.55	mgd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Design Pump Rate (Q_{FUC}) =	2.45	mgd	Taken from Design Pump Rate Calculation
Minimum Diameter for Solids Handling Pump =	4	inch	Minimum Diameter for Solids handling capability
Hazen Williams Roughness Coefficient (C) =	120		County Criteria
Length of Force main (L) =	2,744.0	feet	Taken from schematic layout
Minimum Velocity for Sewer Force main =	4.0	fps	Direction per County staff
Maximum Velocity for Sewer Force main =	8.0	fps	City of San Diego Design Guide 2004

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

PROCEDURE

Phase 1 Buildout Condition

1. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 1
2. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 2
3. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 3
4. Confirm that the Velocities meet County Criteria
5. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 4
6. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 1 Ultimate Condition

7. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 5
8. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 6
9. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 7
10. Confirm that the Velocities meet County Criteria
11. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 8
12. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 2 Buildout Condition

13. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 9
14. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 10
15. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 11
16. Calculate the Force main Velocity for a 10-inch Diameter Pipe - see Equation 12
17. Confirm that the Velocities meet County Criteria
18. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 13
19. Select the Pipe Diameter most appropriate and provide justification for selection.

Phase 2 Ultimate Condition

20. Calculate the Force main Velocity for a 4-inch Diameter Pipe - see Equation 14
21. Calculate the Force main Velocity for a 6-inch Diameter Pipe - see Equation 15
22. Calculate the Force main Velocity for an 8-inch Diameter Pipe - see Equation 16
23. Calculate the Force main Velocity for a 10-inch Diameter Pipe - see Equation 17
24. Calculate the Force main Velocity for a 12-inch Diameter Pipe - see Equation 18
25. Confirm that the Velocities meet County Criteria
26. Calculate the Head Loss for only Pipe Diameters that meet the County Criteria - see Equation 19
27. Select the Pipe Diameter most appropriate and provide justification for selection.

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

EQUATIONS

Phase 1 Buildout Condition

1. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 1
2. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 2
3. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 3
4. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 4 - (V and D to be determined as described in Procedure)

Phase 1 Ultimate Condition

5. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 5
6. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 6
7. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 7
8. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 8 - (V and D to be determined as described in Procedure)

Phase 2 Buildout Condition

9. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 9
10. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 10
11. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 11
12. $V = Q_{IBC}$ / ((PI/4)(10"/12"/ft)^2) - See Calculation 12
13. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 13 - (V and D to be determined as described in Procedure)

Phase 2 Ultimate Condition

14. $V = Q_{IBC}$ / ((PI/4)(4"/12"/ft)^2) - See Calculation 14
15. $V = Q_{IBC}$ / ((PI/4)(6"/12"/ft)^2) - See Calculation 15
16. $V = Q_{IBC}$ / ((PI/4)(8"/12"/ft)^2) - See Calculation 16
17. $V = Q_{IBC}$ / ((PI/4)(10"/12"/ft)^2) - See Calculation 17
18. $V = Q_{IBC}$ / ((PI/4)(12"/12"/ft)^2) - See Calculation 18
19. H_L = 3.02 L (D ^ -1.167) (V/C) ^ 1.85 - See Calculation 19 - (V and D to be determined as described in Procedure)

Calculated by: lma
Checked by: JRB
Date: 5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Conceptual Force Main Sizing Calculation

CALCULATIONS

Phase 1 Buildout Condition

1. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	13.84 fps	> 8 fps - Doesn't Conform
2. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	6.15 fps	CONFORMS
3. V = (0.78 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	3.46 fps	< 4 fps - Doesn't Conform
4. H_L = 3.02 x 2,744 ft X ((6"/12"/ft) ^ -1.167) (6.15 fps / 120) ^ 1.85 =	76.34 feet	

USE 6-inch Diameter

Phase 1 Ultimate Condition

5. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	19.66 fps	> 8 fps - Doesn't Conform
6. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	8.74 fps	> 8 fps - Doesn't Conform
7. V = (1.11 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	4.92 fps	CONFORMS
8. H_L = 3.02 x 2,744 ft X ((8"/12"/ft) ^ -1.167) (4.94 fps / 120) ^ 1.85 =	36.04 feet	

USE 8-inch Diameter

Phase 2 Buildout Condition

9. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	27.43 fps	> 8 fps - Doesn't Conform
10. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	12.19 fps	> 8 fps - Doesn't Conform
11. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	6.86 fps	CONFORMS
12. V = (1.55 mgd x 1.547 cfs/mgd) / ((PI/4)(10"/12"/ft)^2) =	4.39 fps	CONFORMS
13. H_L = 3.02 x 2,744 ft X ((8"/12"/ft) ^ -1.167) (6.86 fps / 120) ^ 1.85 =	66.74 feet	

USE 8-inch Diameter

Phase 2 Ultimate Condition

14. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(4"/12"/ft)^2) =	43.42 fps	> 8 fps - Doesn't Conform
15. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(6"/12"/ft)^2) =	19.30 fps	> 8 fps - Doesn't Conform
16. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(8"/12"/ft)^2) =	10.86 fps	> 8 fps - Doesn't Conform
17. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(10"/12"/ft)^2) =	6.95 fps	CONFORMS
18. V = (2.45 mgd x 1.547 cfs/mgd) / ((PI/4)(12"/12"/ft)^2) =	4.82 fps	CONFORMS
19. H_L = 3.02 x 2,744 ft X ((10"/12"/ft) ^ -1.167) (6.95 fps / 120) ^ 1.85 =	52.69 feet	

USE 10-inch Diameter

Calculated by:	lma
Checked by:	JRB
Date:	5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

PURPOSE

Determine the maximum retention time in the proposed Phase 1 (8-inch) and Phase 2 (8-inch) Phase force mains for the Proposed Regional Sewer Pump Station under Buildout and Ultimate conditions.

ABBREVIATIONS

gpd - gallons per day
mgd - million gallons per day
gpm - gallons per minute
min - minute

CRITERIA

Phase 1 Buildout Condition Design Pump Rate (Q_{IBC}) =	0.78	mgd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Design Pump Rate (Q_{IUC}) =	1.11	mgd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Design Pump Rate (Q_{FBC}) =	1.55	mgd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Design Pump Rate (Q_{FUC}) =	2.45	mgd	Taken from Design Pump Rate Calculation
Phase 1 Buildout Condition Average Daily Flow (ADF_{IBC}) =	286,010	gpd	Taken from Design Pump Rate Calculation
Phase 1 Ultimate Condition Average Daily Flow (ADF_{IUC}) =	429,015	gpd	Taken from Design Pump Rate Calculation
Phase 2 Buildout Condition Average Daily Flow (ADF_{FBC}) =	542,605	gpd	Taken from Design Pump Rate Calculation
Phase 2 Ultimate Condition Average Daily Flow (ADF_{FUC}) =	857,925	gpd	Taken from Design Pump Rate Calculation
Minimum Pump Run Time (PRT) =	5	min	City of San Diego Design Guide 2004
Minimum Flow Factor (MFF) =	0.2		City of San Diego Design Guide 2004
Length of Force main (L) =	2,744.0	feet	Taken from schematic layout
Diameter of Phase 1 Force main (DI) =	8	inches	Taken from Force main Diameter Calculation
Diameter of Phase 2 Force main (DF) =	8	inches	Taken from Force main Diameter Calculation

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

PROCEDURE

Phase 1

1. Calculate the Force main Volume (V_I) for the 8-inch Diameter Pipe - see Equation 1
2. Calculate the number of cycles (NIBC) under the Phase 1 Buildout Condition - see Equation 2
3. Calculate the number of cycles (NIUC) under the Phase 1 Ultimate Condition - see Equation 3
4. Calculate the Minimum Flow under the Phase 1 Buildout Condition (Min QIBC) - see Equation 4
5. Calculate the Minimum Flow under the Phase 1 Ultimate Condition (Min QIUC) - see Equation 5
6. Estimate the Wet Well Volume under the Phase 1 Buildout Condition (WW VIBC) - see Equation 6
7. Estimate the Wet Well Volume under the Phase 1 Ultimate Condition (WW VIBC) - see Equation 7
8. Calculate the Wet Well Filling Time under the Phase 1 Buildout Condition (WWFTIBC) - see Equation 8
9. Calculate the Wet Well Filling Time under the Phase 1 Ultimate Condition (WWFTIBC) - see Equation 9
10. Calculate the Cycle Period under the Phase 1 Buildout Condition (PIBC) - see Equation 10
11. Calculate the Cycle Period under the Phase 1 Ultimate Condition (PIBC) - see Equation 11
12. Calculate the Maximum Retention Time under the Phase 1 Buildout Condition (MRTIBC) - see Equation 12
13. Calculate the Maximum retention Time under the Phase 1 Ultimate Condition (MRTIBC) - see Equation 13

Phase 2

14. Calculate the Force main Volume (V_F) for the 8-inch Diameter Pipe - see Equation 14
15. Calculate the number of cycles (NFBC) under the Phase 2 Buildout Condition - see Equation 15
16. Calculate the number of cycles (NFUC) under the Phase 2 Ultimate Condition - see Equation 16
17. Calculate the Minimum Flow under the Phase 2 Buildout Condition (Min QFBC) - see Equation 17
18. Calculate the Minimum Flow under the Phase 2 Ultimate Condition (Min QFUC) - see Equation 18
19. Estimate the Wet Well Volume under the Phase 2 Buildout Condition (WW VFBC) - see Equation 19
20. Estimate the Wet Well Volume under the Phase 2 Ultimate Condition (WW VFBC) - see Equation 20
21. Calculate the Wet Well Filling Time under the Phase 2 Buildout Condition (WWFTFBC) - see Equation 21
22. Calculate the Wet Well Filling Time under the Phase 2 Ultimate Condition (WWFTFBC) - see Equation 22
23. Calculate the Cycle Period under the Phase 2 Buildout Condition (PFBC) - see Equation 23
24. Calculate the Cycle Period under the Phase 2 Ultimate Condition (PFBC) - see Equation 24
25. Calculate the Maximum Retention Time under the Phase 2 Buildout Condition (MRTFBC) - see Equation 25
26. Calculate the Maximum retention Time under the Phase 2 Ultimate Condition (MRTFBC) - see Equation 26

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

EQUATIONS

Phase 1

1. $V_I = L \times (\pi/4) \times D_I^2$ - see Calculation 1
2. $N_{IBC} = V_I / (Q_{IBC} \times PRT)$ - see Calculation 2
3. $N_{IUC} = V_I / (Q_{IUC} \times PRT)$ - see Calculation 3
4. Min $Q_{IBC} = ADF_{IBC} \times MFF$ - see Calculation 4
5. Min $Q_{IUC} = ADF_{IUC} \times MFF$ - see Calculation 5
6. WW $V_{IBC} = Q_{IBC} \times PRT$ - see Equation 6
7. WW $V_{IUC} = Q_{IUC} \times PRT$ - see Equation 7
8. $WWFT_{IBC}$ = WW V_{IBC} / Min Q_{IBC} - see Equation 8
9. $WWFT_{IUC}$ = WW V_{IUC} / Min Q_{IUC} - see Equation 9
10. $P_{IBC} = WWFT_{IBC} + PRT$ - see Equation 10
11. $P_{IUC} = WWFT_{IUC} + PRT$ - see Equation 11
12. $MRT_{IBC} = N_{IBC} \times P_{IBC}$ - see Equation 12
13. $MRT_{IUC} = N_{IUC} \times P_{IUC}$ - see Equation 13

Phase 2

14. $V_F = L \times (\pi/4) \times D_F^2$ - see Calculation 14
15. $N_{FBC} = V_F / (Q_{FBC} \times PRT)$ - see Calculation 15
16. $N_{FUC} = V_F / (Q_{FUC} \times PRT)$ - see Calculation 16
17. Min $Q_{FBC} = ADF_{FBC} \times MFF$ - see Calculation 17
18. Min $Q_{FUC} = ADF_{FUC} \times MFF$ - see Calculation 18
19. WW $V_{FBC} = Q_{FBC} \times PRT$ - see Equation 19
20. WW $V_{FUC} = Q_{FUC} \times PRT$ - see Equation 20
21. $WWFT_{FBC}$ = WW V_{FBC} / Min Q_{FBC} - see Equation 21
22. $WWFT_{FUC}$ = WW V_{FUC} / Min Q_{FUC} - see Equation 22
23. $P_{FBC} = WWFT_{FBC} + PRT$ - see Equation 23
24. $P_{FUC} = WWFT_{FUC} + PRT$ - see Equation 24
25. $MRT_{FBC} = N_{FBC} \times P_{FBC}$ - see Equation 25
26. $MRT_{FUC} = N_{FUC} \times P_{FUC}$ - see Equation 26

Calculated by: Ima
Checked by: JRB
Date: 5/11/2009

East Otay Mesa Sewer Basin No. 6 Regional Sewer Study
Maximum Retention Time within Force Main Calculation

CALCULATIONS

Phase 1

1. V_I = 2,744 ft x (π/4) x (8"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) =	7,164	gallons	
2. N_{IBC} = 7,164 gal / (0.78 mgd x 694.44 gpm/mgd x 5 min) =	2.64		
3. N_{IUC} = 7,164 gal / (1.11 mgd x 694.44 gpm/mgd x 5 min) =	1.86		
4. Min Q_{IBC} = 286,010 gpd x 0.2 / 1440 min/day =	39.72	gpm	
5. Min Q_{IUC} = 429,015 gpd x 0.2 / 1440 min/day =	59.59	gpm	
6. WW V_{IBC} = 0.78 mgd x 694.44 gpm/mgd x 5 min =	2710.4	gallons	Only an estimate
7. WW V_{IUC} = 1.11 mgd x 694.44 gpm/mgd x 5 min =	3,850.4	gallons	Only an estimate
8. $WWFT_{IBC}$ = 2,710.4 gal / 39.72 gpm =	68.2	minutes	
9. $WWFT_{IUC}$ = 3,850.4 gal / 59.59 gpm =	64.6	minutes	
10. P_{IBC} = 68.2 min + 5 min =	73.2	minutes	
11. P_{IUC} = 64.6 min + 5 min =	69.6	minutes	
12. MRT_{IBC} = 2.64 x 73.2 min / 60min/hour =	3.23	hours	< 4 hrs - No Chemical Addition Reqd.
13. MRT_{IUC} = 1.86 x 69.6 min / 60min/hour =	2.16	hours	< 4 hrs - No Chemical Addition Reqd.

Phase 2

14. V_F = 2,744 ft x (π/4) x (8"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) =	7,164	gallons	
15. N_{FBC} = 7,164 gal / (1.59 mgd x 694.44 gpm/mgd x 5 min) =	1.33		
16. N_{FUC} = 7,164 gal / (2.45 mgd x 694.44 gpm/mgd x 5 min) =	0.84		
17. Min Q_{FBC} = 562,050 gpd x 0.2 / 1440 min/day =	75.36	gpm	
18. Min Q_{FUC} = 828,225 gpd x 0.2 / 1440 min/day =	119.16	gpm	
19. WW V_{FBC} = 1.59 mgd x 694.44 gpm/mgd x 5 min =	5,372.4	gallons	Only an estimate
20. WW V_{FUC} = 2.45 mgd x 694.44 gpm/mgd x 5 min =	8,504.2	gallons	Only an estimate
21. $WWFT_{FBC}$ = 5518.5 gal / 78.06 gpm =	71.3	minutes	
22. $WWFT_{FUC}$ = 8504.2 gal / 115.03 gpm =	71.4	minutes	
23. P_{FBC} = 70.7 min + 5 min =	76.3	minutes	
24. P_{FUC} = 73.9 min + 5 min =	76.4	minutes	
25. MRT_{FBC} = 1.30 x 75.7 min / 60min/hour =	1.70	hours	< 4 hrs - No Chemical Addition Reqd.
26. MRT_{FUC} = 0.84 x 75.7 min / 60min/hour =	1.07	hours	< 4 hrs - No Chemical Addition Reqd.

Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123
Contact: Robert Hingtgen
(858) 694-3712

May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

Kearny PCCP Otay 311, LLC

Prepared By:

9275 Sky Park Court, Suite 200
San Diego, CA 92123

REGISTERED PROFESSIONAL ENGINEER
JENNIFER RENE BILECK
No. 69606
Exp. 6/30/10
CIVIL
STATE OF CALIFORNIA

Jennifer R. Bileck, P.E., C.F.M.
Senior Engineer

APPENDIX D
CONCEPTUAL PUMP STATION LAYOUT

An employee-owned company

May 15, 2009

Mr. Judd Halenza
Kearny PCCP Otay 311, LLC
500 Stevens Avenue, Suite 208
Solana Beach, CA 92075

SUBJECT: EAST OTAY MESA SEWER BASIN NO. 6 REGIONAL SEWER PUMP STATION LAYOUT

Dear Mr. Halenza,

PBS&J has prepared the conceptual level layout of the proposed Regional Sewer Pump Station (RSPS). This pump station will collect flows from Otay Crossing Commerce Park (OCCP), Paragon, adjoining property owners, and the planned third border crossing. The purpose of developing the conceptual layout of the sewer facility is to provide a basis for analyzing the potential environmental impacts associated with preparing the East Otay Mesa (EOM) Program EIR.

Background

The proposed RSPS will provide sewer service to OCCP, Paragon, and the proposed Border Crossing, as well as properties owned by De La Fuente, Konladjian, Farida, and the Hawano Corporation. Figure 1 graphically presents the study location and boundaries for the RSPS.

The conceptual layout of the proposed RSPS is intended to illustrate the anticipated configuration of the pump station and identify the key equipment that would be expected in this type of facility for inclusion in the EOM Program EIR. The County of San Diego (County) is the lead agency for the EOM Program EIR and will own and operate the proposed pump station after the facility is constructed.

Location

As shown on Figure 2, the proposed site location of the RSPS is on the southwest end of the Paragon property on Lot 38. The site was chosen to maximize the amount of gravity sewers that could serve the properties.

Proposed Pump Station Capacity

The design of the RSPS is planned to be constructed in two phases. The pump station structure will initially be constructed for buildout flows but only equipped to provide sewer service for OCCP and Paragon. The facility will ultimately receive wastewater flows from the De La Fuente, Konladjian, Farida, and Hawano properties, and the Border Crossing. It is expected that the Border Crossing will construct its own sewer pump station to serve the facility and to convey flows to the RSPS.

Table 1 summarizes the estimated RSPS design capacity and the recommended force main diameters under buildout and ultimate conditions for Phases 1 and 2. Phase 1 only includes OCCP and Paragon flows to the pump station. Phase 2 includes flows from OCCP, Paragon, the Proposed Border Crossing,

and the De La Fuente, Konladjian, Farida, and Hawano properties. The proposed pump station's design flow rate includes an allowance of 30% on top of the peak dry weather flow to account for wet weather conditions and maintenance. Pump station design flow rate and force main sizing calculations are provided in Appendix C of the East Otay Mesa Sewer Basin No. 6 Regional Sewer Study, May 2009.

Table 1. Pump Station Design Capacity

Phase	EDU[2]		Pump Station Design Capacity (mgd)[3]		Force Main Diameter[4]	
	Buildout	Ultimate	Buildout	Ultimate	Buildout	Ultimate
Phase 1	1,198	1,796	0.78	1.11	6"	8"
Phase 2 [1]	2,491	4,171	1.55	2.45	8"	10"

1. Phase 2 includes OCCP, the Border Crossing, Paragon, De La Fuente, Konladjian, Farida, and Hawano properties.
2. EDUs based on 240 gpd/EDU per County Design Guidelines.
3. Design Capacity determined with the City's peaking factor equation and 30% additional flow.
4. Force main diameter determined based on maximum velocity of 8 fps and maximum retention time of 4 hours.

Preliminary Site and Building Layout

The proposed preliminary RSPS site plan is depicted on Figure 3. The RSPS will be located at a proposed pad elevation of approximately 506 feet on Paragon property. Access to the pump station is planned to be provided by two concrete driveways for ingress and egress off of Alta Road. This is provided for adequate turning radius around the building for large trucks and other equipment. A stormwater detention basin is shown on the site plan to collect and store run-off from the pump station site only. This could be eliminated if combined with the drainage facilities planned for the Paragon development. The site perimeter is planned to be fenced with gates at each driveway for security purposes. In-coming electrical facilities including the planned transformer for the facility are planned to be located adjacent to the stand-by generator and pump station building away from the wet well.

The pump station is conceptually laid out with independent wet and dry wells with the pump and motor rooms on two floors located below grade and the electrical and control room located on the third floor above grade. This 3-story facility is illustrated in the pump station section view shown on Figure 4. Emergency storage is sized to hold a minimum of 6 hours of peak wet weather inflow for OCCP, Paragon, and the Border Crossing flows (0.38 MG), as directed by the County. The County may require additional emergency storage for future tributary developments, and construction would be the responsibility of those properties. Space will be provided on the proposed pump station site to accommodate additional storage for the final ultimate condition of 0.34 MG, for a total of 0.72 MG. Detailed calculations are attached. This approach is consistent with discussions with County Engineering staff.

The above grade pump building structure will have an approximate overall dimension of 26 feet by 18 feet and constructed with tilt-up concrete walls and open wood framed gable roof with concrete tiles. The height of the building will be approximately 20-feet above grade. The below grade concrete structure (approximately 25- to 35-feet below grade) will include the motor room, pump room and wet well. The

pump station building's architectural style and materials will blend with the surrounding industrial/ commercial business park.

A conceptual layout of the first floor which houses the electrical switchgear, ventilation equipment, and pump station control equipment is illustrated in Figure 5. The motor room which houses the pump motors is located on the intermediate floor. The elevation of the motor floor is determined based on the wet well influent pipe elevation to protect the motors from being flooded in the event a leak in the wall seals or pipe break in the lower pump room occurs flooding the lower level. The motor room and equipment control room conceptual floor plans are illustrated in Figures 6 and 7, respectively.

Primary Pump Station Equipment

A. Vertical Non-Clog Sewage Pumps

A set of three constant speed 275-gpm pumps will be installed in Phase 1. These pumps will accommodate the lower flows anticipated at the pump station during Phase 1. For Phase 2, the motors would be replaced in order to provide three constant speed 550-gpm pumps to accommodate buildout flows. Future phasing of the pumps and/or motors will be determined as development occurs. All pumps will be vertical non-clog sewage pumps with cast iron construction with hardened wear rings and mechanical seals. Identified in Table 2 are the pumps that were preliminarily selected. Approximately 2,744 feet of 8-inch diameter force main will need to be installed to convey pumped flows from the RSPS to the EOM-6 connection located at the intersection of Enrico Fermi and Via de la Amistad. The 8-inch diameter force main will be used for single pump and dual pump operation, respectively.

Table 2. Pump Selection

Manufacturer	No. of Pumps	Flow (gpm)	TDH (feet)
Fairbanks Morse	3	275	114
Fairbanks Morse	3	550	104

B. Pump Station Piping

1. Discharge Header 8-inches
2. Phase 1 Pump Suction Piping 8-inches
3. Phase 2 Pump Suction Piping 8-inches
4. Buried piping will be epoxy-lined and coated ductile iron pipe. Exposed piping will be epoxy-lined and epoxy-painted ductile iron pipe.

C. Force Main

One 8-inch force main is recommended. The main will terminate at the start of the gravity sewer in Enrico Fermi Drive. The 8-inch diameter force main will be used for single pump and dual pump operation, respectively.

D. Emergency Generator

One emergency diesel generator will be provided and equipped with an automatic transfer switch (ATS). The emergency generator will be sufficiently sized to start all three pumps, station lighting, programmable logic controller, instrumentation, and telemetry. The ATS will automatically transfer the station to back up power in the event of a commercial power failure. The emergency generator will be located behind the pump station in an acoustical weatherproof enclosure provided by the generator manufacturer.

E. Instrumentation and Controls

Electric transformer, switchgear, motor control center (MCC), and SCADA telemetry equipment will be provided.

F. Ventilation

Ventilation, consisting of exhaust fans, shall be provided for the pump station building. Fans will be provided in the pump room, motor control center, and motor room.

G. Acoustics

Noise attenuation devices, including acoustic louvers and doors (necessity, size and layout to be determined) will be provided during the final design. Noise emanating from the pump station will meet the County's noise ordinance requirements.

H. Emergency Storage

Emergency storage is sized to hold a minimum of 6 hours of peak wet weather inflow under the Phase 1 condition, which includes OCCP and Paragon, as well as Border Crossing flows (0.38 MG). The County may require additional emergency storage for the future tributary developments, and construction would be the responsibility of that property. Space will be provided on the proposed pump station site to accommodate additional storage for the final ultimate condition of 0.34 MG, for a total of 0.72 MG. This approach is consistent with discussions with County Engineering staff.

The approximate size and conceptual layout of the proposed pump station was developed with the approach to be conservative since its intended use is for the basis of the EIR impact analysis. It is expected that the facility could be modified, consolidated and simplified depending on acceptance from the County for such modifications.

If you have any questions or need additional information for the EIR document, please feel free to call me.

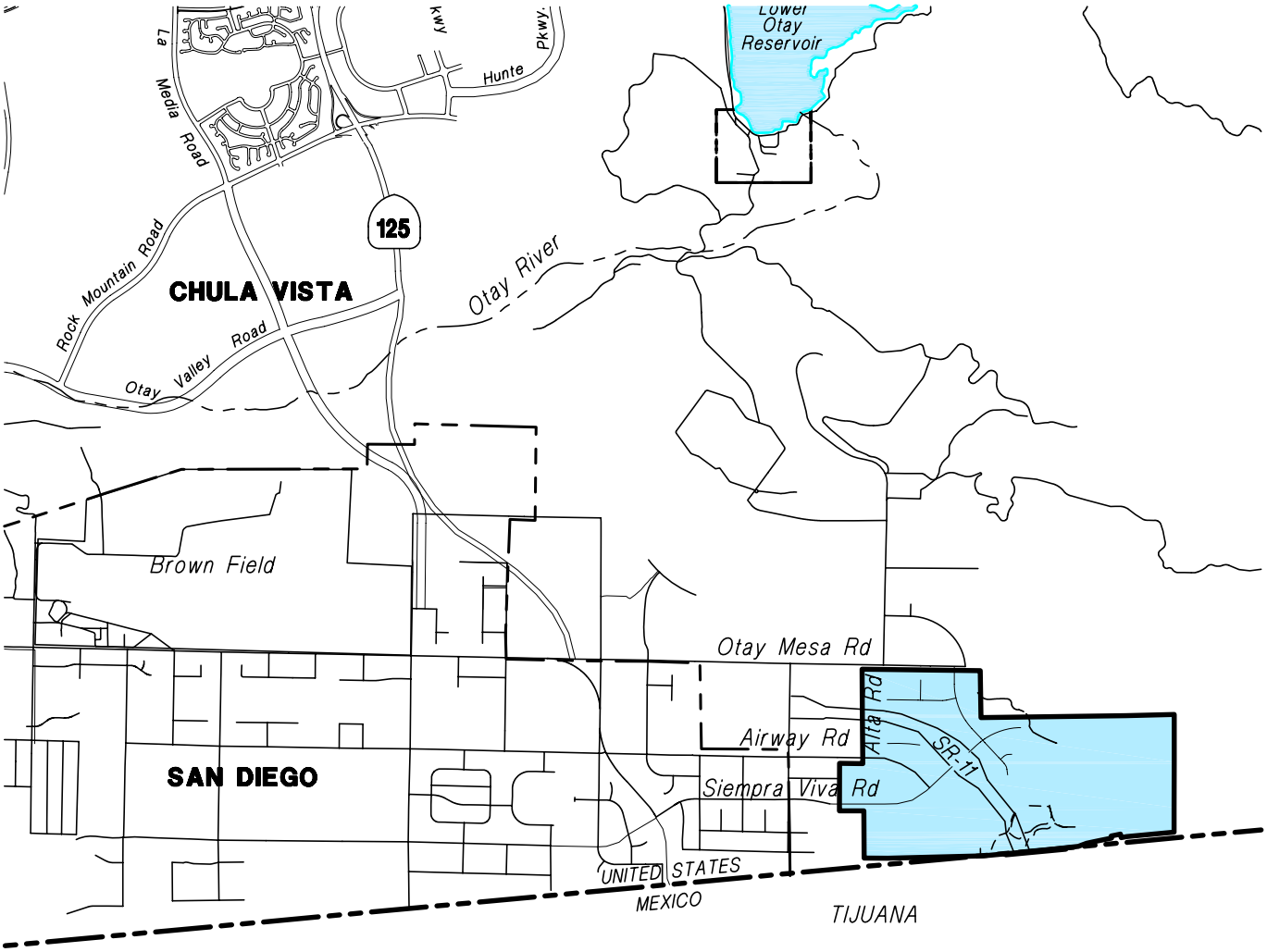
Sincerely,

Jennifer R. Bileck

Jennifer R. Bileck, P.E., C.F.M.
Senior Engineer

Attachments: Figure 1 – Project Location Map
Figure 2 – Project Sewer System Layout
Figure 3 – Typical Sewer Pump Station Site Plan
Figure 4 – Proposed Sewer Pump Station Building Section
Figure 5 – Proposed Sewer Pump Station Equipment Control Room
Figure 6 – Proposed Sewer Pump Station Motor Room
Figure 7 – Proposed Sewer Pump Station Pump Room
Emergency Storage Calculations

CC: Leanne Abe – PBS&J
Project File – 049128501 5000



VICINITY MAP

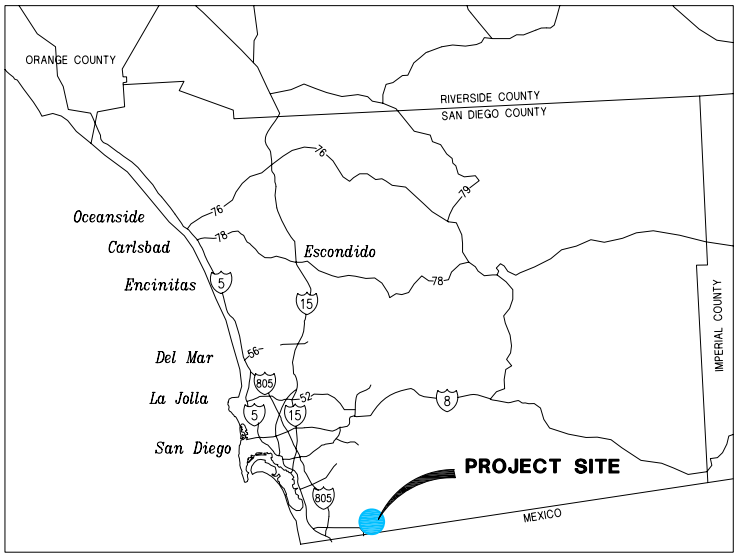
LEGEND

EOM-6 STUDY AREA

N

0 5000

SCALE IN FEET



LOCATION MAP

STUDY AREA

FIGURE 1

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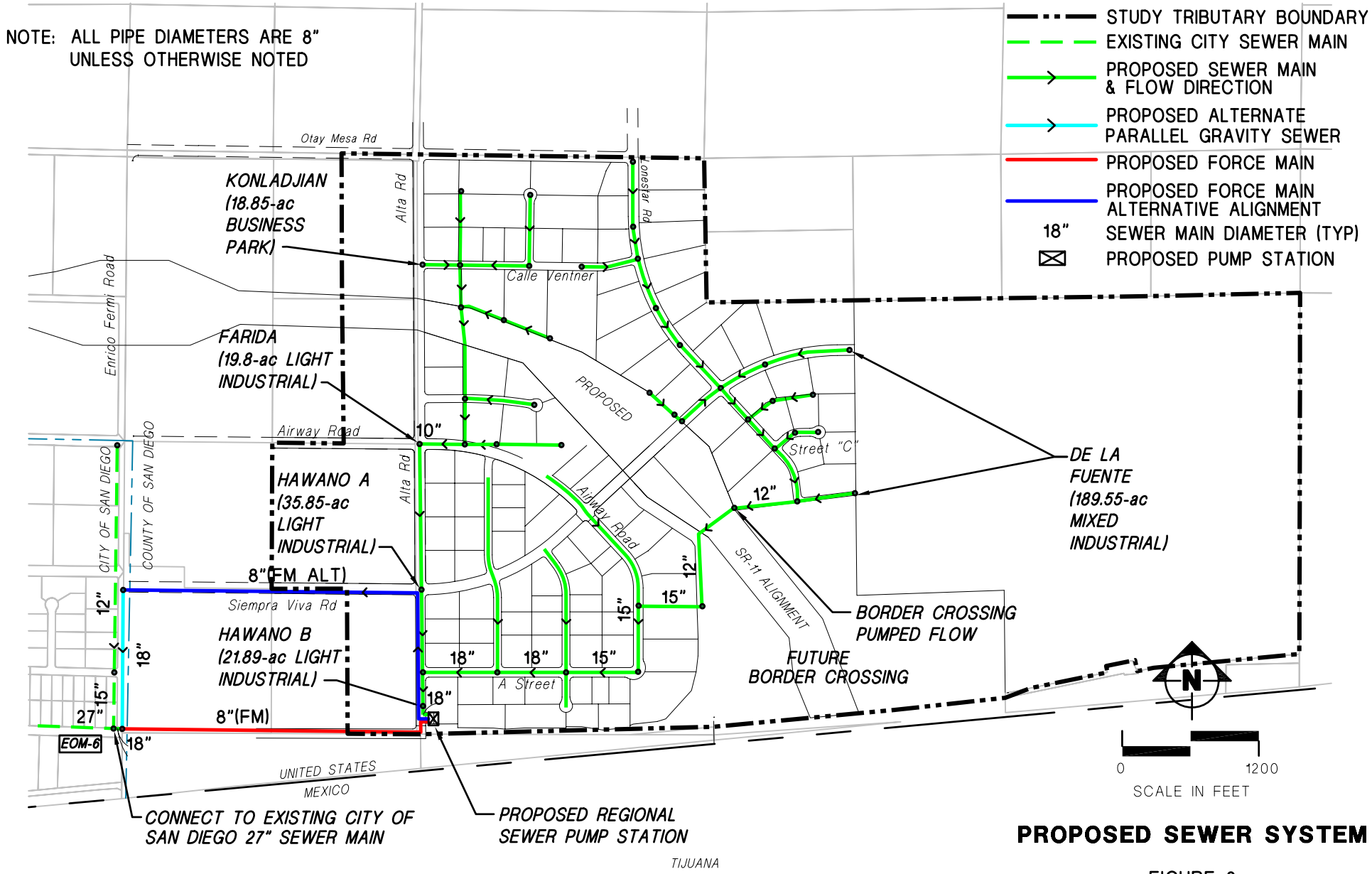

PROPOSED SEWER SYSTEM

FIGURE 2

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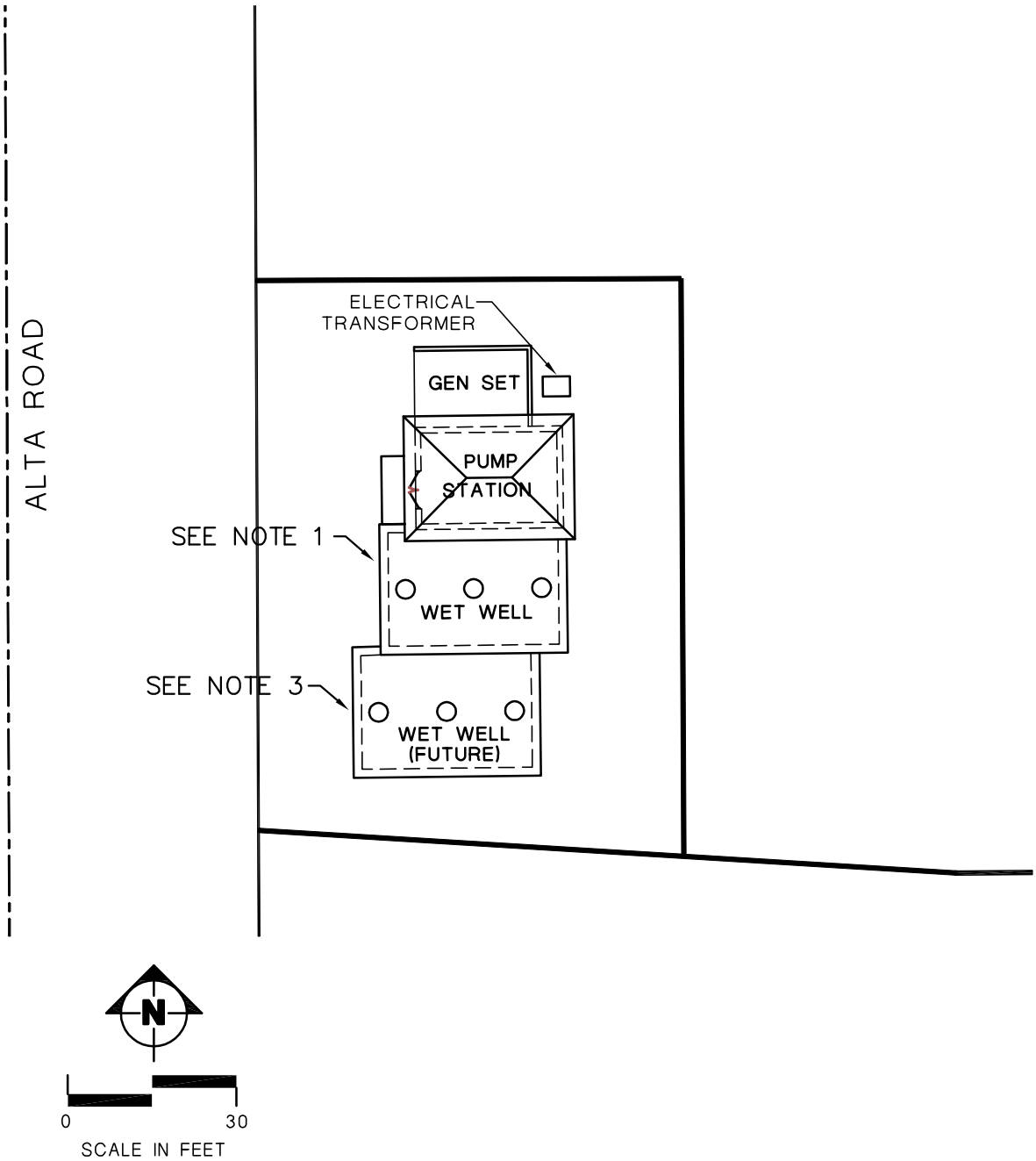

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG OF EMERGENCY STORAGE.

2. TYPICAL PUMP STATION SITE BETWEEN 0.25 ACRES & 0.4 ACRES.

3. SPACE PROVIDED ONSITE FOR ADDITIONAL 0.34 MG OF FUTURE EMERGENCY STORAGE TO BE CONSTRUCTED BY OTHERS.

TYPICAL SEWER PUMP STATION SITE PLAN

FIGURE 3

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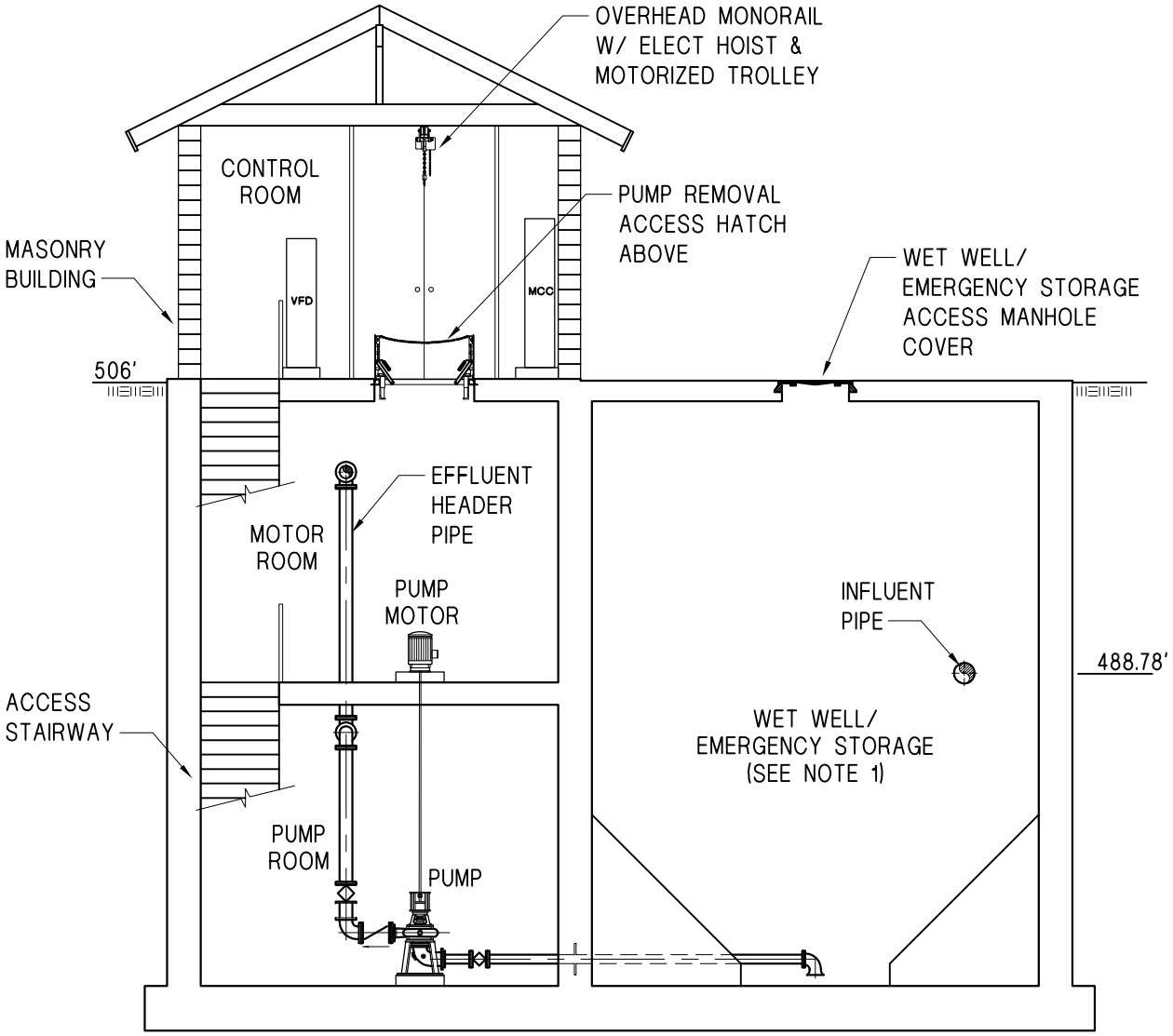

0 1

1/8"=1'-0"

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION BUILDING SECTION

FIGURE 4

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E-RegionalSewerStudy\Reports\Figures\SPS Letter Report February 2009\
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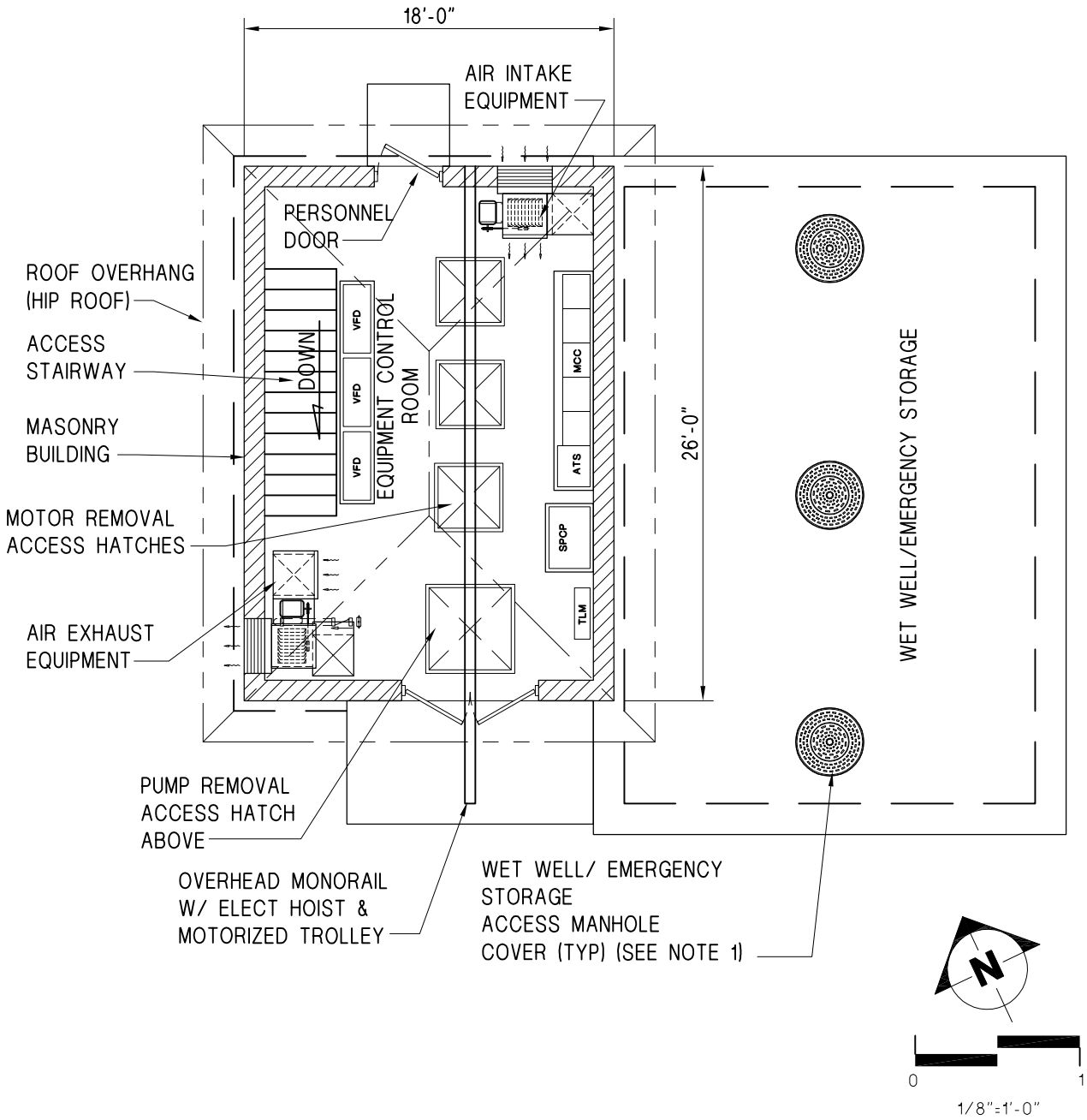

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION CONTROL ROOM

FIGURE 5

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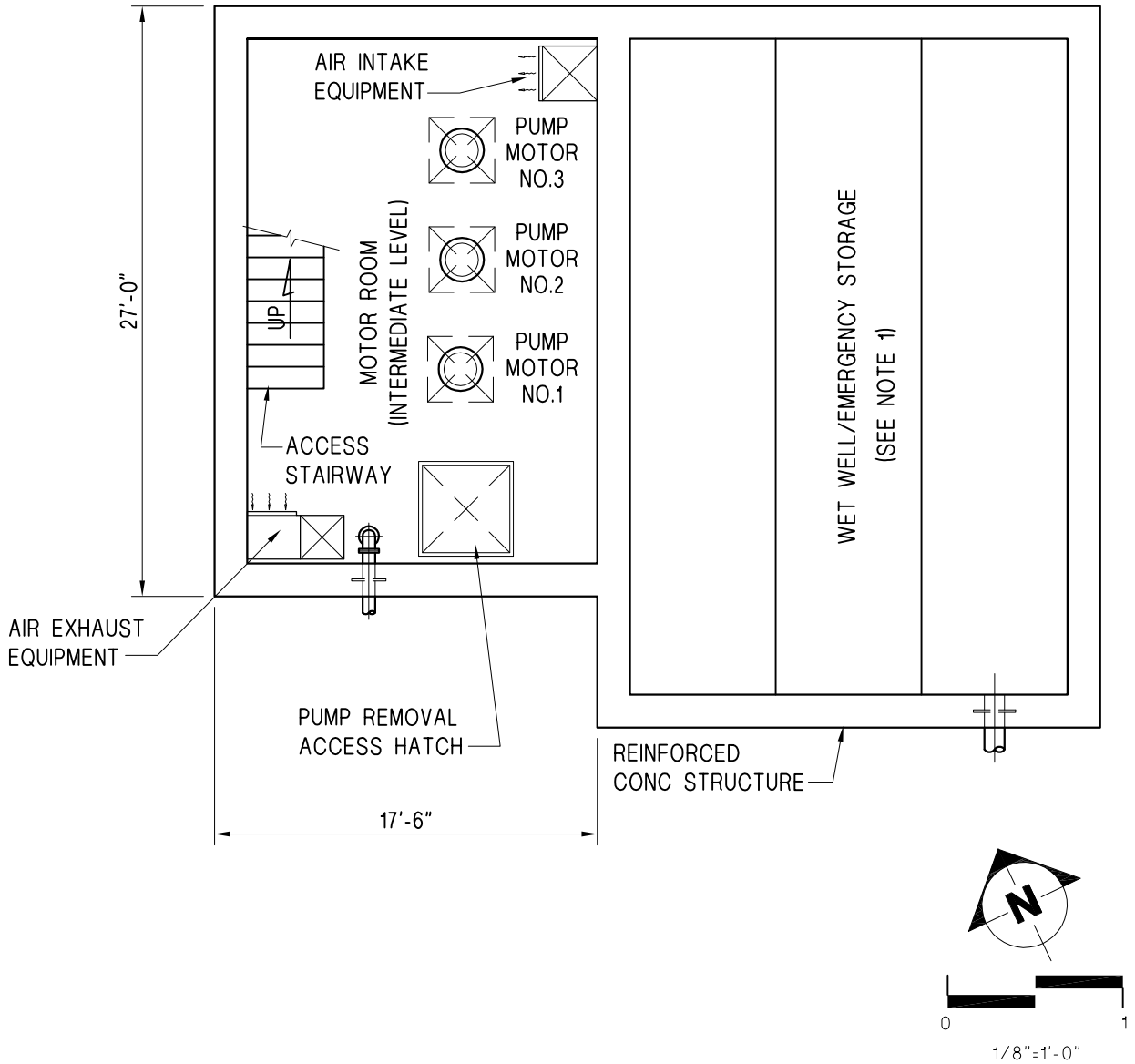

NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION MOTOR ROOM (INTERMEDIATE LEVEL)

FIGURE 6

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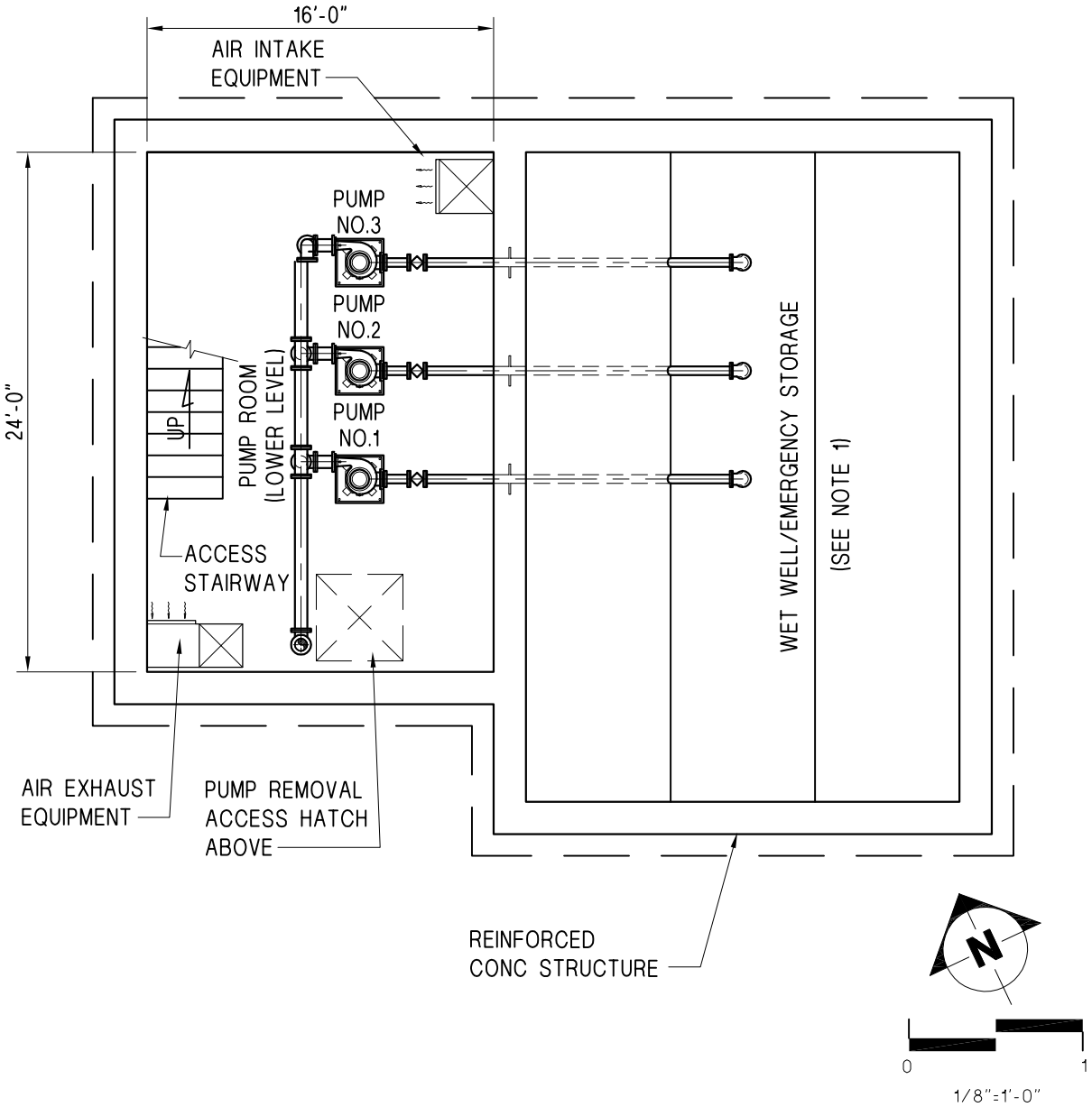
049128501-sps.dwg May 12, 2009



NOTE:

1. COMBINED WET WELL VOLUME TO BE SIZED FOR OPERATIONAL STORAGE PLUS 0.38 MG EMERGENCY STORAGE.

PROPOSED SEWER PUMP STATION PUMP ROOM (LOWER LEVEL)

FIGURE 7

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049128501-sps.dwg May 1, 2009

Otay Crossings Commerce Park

APPENDIX J

REGIONAL SEWER STUDY AND
CONCEPTUAL SEWER STUDY /
CONCEPTUAL SEWER PUMP STATION LAYOUT

to the

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT REPORT

EIR 93-19-006Q, TM 5405RPL[7]
SCH No. 2006041039

Lead Agency:

County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123
Contact: Robert Hingtgen
(858) 694-3712

May 2010

COUNTY OF SAN DIEGO

EAST OTAY MESA BASIN NO. 6 REGIONAL SEWER STUDY

May 2009

PBS&J Project No.: 049128501 5000
TM #5405 RPL7
Log No. 93-19-006Q

Prepared For:

Kearny PCCP Otay 311, LLC

Prepared By:

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APPENDIX E
EMERGENCY STORAGE CALCULATIONS

Subject: EOM-6 RSPS Emergency Storage		
Comp by: L. Abe Check by: J. Bilecki	Date: 5/15/09 Job Number: 049128501	Sheet Number: 1/2

The County of San Diego has required that the RSPS include emergency storage for the Border Crossing in Phase 1.

Flows, Ultimate Condition:

Phase 1, PWWF = 1,108,904 gpd (App. C-1, Calculation 23)

Border Crossing, pumped flow = 428,600 gpd (App. C-1, Calculation, 11)

1,537,504 gpd

ES_6 = Emergency storage of 6 hours

$= \frac{1,537,504 \text{ gpd}}{24 \text{ hr/d}} \times 6 \text{ hr} = 384,376 \text{ gal.}$

$= \underline{0.38 \text{ MG.}}$

Buildout Storage time:

Phase 1, PWWF = 780,610 gpd (App C-1, Calc. 17)

Border Crossing pumped flow = 188,264 gpd (App C-1, Calc. 5)

968,874 gpd

$ES_x = \frac{968,874 \text{ gpd}}{24 \text{ hr/d}} \times x \text{ hr} = 384,376 \text{ gal}$

$x = 9.5 \text{ hr} > 6 \text{ hr}$ ✓

Subject: EOM-6 RSPS Emergency Storage		
Comp by: J. Abe Check by: J. Bleck	Date: 5/15/09 Job Number: 049128501	Sheet Number: 2/2

Phase 2, Ultimate PWWF = 2,449,197 gpd (App C-1, Calc. 35)

Border Crossing Ult. pumped flow = 428,600 gpd (App C-1, Calc. 11)

2,877,797 gpd

$ES_6 = \frac{2,877,797 \text{ gpd}}{24 \text{ hr/d}} \times 6 \text{ hr} = 719,449 \text{ gal}$

$= 0.72 \text{ MG}$

Future development beyond Phase 1 would be required to build additional volume:

$V = 719,449 \text{ gal} - 384,376 \text{ gal} = 335,073 \text{ gal}$

$= \underline{\underline{0.34 \text{ MG}}}$

Phase 2 Buildout Storage Time:

Phase 2, PWWF 1,547,251 gpd (App C-1, Calc. 29)

Border Crossing pumped flow = 188,264 gpd (App C-1, Calc. 5)

1,735,515 gpd

$ES_z = \frac{1,735,515 \text{ gpd}}{24 \text{ hr/d}} \times z \text{ hr} = 719,449 \text{ gal}$

$z = 9.97 \text{ hr} > 6 \text{ hr}$ ✓

ES_{1ULT} = Emergency Storage for Phase 2 Buildout flows based on Phase 1 Ult. storage

$= \frac{1,735,515 \text{ gpd}}{24 \text{ hr/d}} \times z \text{ hr} = 384,376 \text{ gal}$

$z = 5.3 \text{ hr} < 6 \text{ hr minimum}$