PRELIMINARY

HYDROMODIFICATION MANAGEMENT STUDY

FOR

Orchard Hill Subdivision

(Tract No. 5570)

Prepared By:

S H A P O U R I & A S S O C I A T E S

P R O J E C T M A N A G E M E N T S E R V I C E S

E N G I N E E R I N G • A R C H I T E C T U R E • P L A N N I N G

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M.H. Shapouri
RCE No. C52794
Expires 12/31/2014

~~November 25, 2013~~

~~January 10, 2014~~

February 6, 2014

Declaration of Responsible Charge

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with the current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

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R.C.E. No: C52794 Expires: 12/31/2014

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LIST OF ATTACHMENTS

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Maps

Pre-Project Slope Analysis Attached
Post-Project Slope Analysis Attached
Pre-Project Land Use & Drainage Management Area Map Attached
Post-Project Land Use & Drainage Management Area Map Attached

Acronyms

BAHM	**Bay Area Hydrology Model**
BMP	**Best Management Practice**
CASQA	**California Stormwater Quality Association**
CEQA	**California Environmental Quality Act**
FHMC	**Final Hydromodification Management Criteria**
GIS	**Geographical Information System**
HMP	**Hydromodification Management Plan**
HR	**Hydraulic Radius**
HSPF	**Hydrologic Simulation Program FORTRAN, distributed by USEPA**
IMP	**Integrated Management Practices**
IHC	**Interim Hydromodification Criteria**
LID	**Low Impact Development**
LSPC	**Loading Simulation Program in C++**
NOAA	**National Oceanic and Atmospheric Administration**
NPDES	**National Pollutant Discharge Elimination System**
NRCS	**Natural Resource Conservation Service**
Q	**Flow**
RWQCB	**Regional Water Quality Control Board**
SDHM	**San Diego hydrology Model**
SUSMP	**Standard Urban Stormwater Mitigation Plan**
SWMP	**Storm Water Management Plan**
SWWM	**Storm Water Management Model**
USACE	**United States Army Corps of Engineers**
SCCWRP	**Southern California Coastal Water Research Project**
USEPA	**United States Environmental Protection Agency**
USGS	**United States Geological Survey**

SECTION 1

PROJECT DESCRIPTION

Purpose

This Hydromodification Management Plan has been prepared to demonstrate that the proposed project, TM 5570, will comply with the County of San Diego's Hydromodification Management Plan (HMP). The HMP was developed by the County of San Diego, and its NPDES Co-permittees, to address the hydromodification requirements issued by the Regional Water Quality Control Board in Order R9-2007-000 1, Provision D. 1 .g (6). Provision D. 1 .g (6) states, "Each Co-permittee shall collaborate with the other Co-permittees to develop and implement a Hydromodification Management Plan (HMP) to manage increases in runoff discharge rates and durations from all Priority Development Projects, where such increased rates and durations are likely to cause increased erosion of channel beds and banks, sediment pollutant generation, or other impacts to beneficial uses and stream habitat due to increased erosive force. "As required by Permit Order No. R9-2007-0001, each Copermittee shall incorporate the approved HMP into its local Standard Urban Storm Water Mitigation Plan (SUSMP) and implement the HMP for all applicable PDPs by January 8, 2011", so that post-project runoff discharge rates and durations shall not exceed estimated pre-project discharge rates and durations where the increased discharge rates and durations will result in increased potential for erosion or other significant adverse impacts to beneficial uses, attributable to changes in the discharge rates and durations.
"Per final hydromodification management criteria developed for San Diego County, which will be applicable to all Priority Development Projects, results of a hydromodification management analysis must adhere to the following criteria: "

- "For flow rates between the pre-project lower flow thresholds (see below) and the pre-project 10-year runoff event, the post-project discharge rates, and durations may not deviate above the pre-project discharge rates and durations by more than 10 percent over more than 10 percent of the length of the flow duration curve.

- Lower flow thresholds may be determined using the HMP Decision Matrix (located in Chapter 6) along with a critical flow calculator and channel screening tools developed by the Southern California Coastal Water Research Project (SCCWRP), detailed in Chapter 5. These methods identify lower flow thresholds for a range of channel conditions. The critical flow calculator recommends a lower flow value of 0.1Q2, 0.3Q2, or 0.5Q2 dependent on the receiving channel material and dimensions. This value will be compared to the channel susceptibility rating (High, Medium, or Low) as determined

from the SCCWRP screening tools located in Appendix B to determine the final lower flow threshold.

- The lower flow threshold may alternately be determined as 10 percent of the pre-project 2-year runoff event, or 0.1Q2. This approach, which is outlined in the HMP Decision Matrix, is available if the project applicant chooses not to complete the channel screening analysis. "

This report has been prepared in accordance with the, "Hydromodification Management Plan" (HMP)", prepared by Brown and Caldwell for the County of San Diego, dated March, 2011.

Project Description & Summary

The proposed Orchard Hill Project is intended to provide a 20 single residential unit subdivision on a 12.5 acre parcel situated on the northeast side of Richland Road and Tide Way. The project minimum lot size is 15,000 square feet. There is an existing Vista Irrigation Flume that serves as the northern boundary for this project. The project density is 1.6 dwelling units per acre.

The project will be accessed via a central roadway on Richland Road which intersects with Tide Way. This internal subdivision street will provide access to all of the lots and will consist of 52-foot right-of-way with a 32-foot wide pavement width and 10-foot wide parkway on each side. In addition, the project would also construct frontage improvements to Richland Road. Currently Richland Road half street width is 12 feet paved; it is proposed to be widened to 20 feet of pavement width and 10 feet wide parkway. An approximately 32 feet wide Bioretention will be provided along part of the project frontage paralleling Richland Road and will be used for drainage BMP's.

Earthwork quantities are anticipated to be approximately 30,000 cubic yards of balanced grading. The project will be graded in one-phase. Residential unit construction may be developed in phases.

This Hydromodification Management Plan accompanies the Tentative Map for "Orchard Hills Tract No. 5570", and assesses the need for hydromodification Best Management Practices (BMPs) before entering the San Marcos Creek to comply with the HMP. Project completion and permanent post construction BMPs will be implemented. Water quality and erosion control BMPs have been incorporated as needed to address this level of development.

Should a project propose alternative BMPs, or any variation to the assumptions made within this report, then that project will need to provide additional modeling and analysis to demonstrate

that the subdivision as a whole will still be in compliance with the HMP upon completion of the project.

Method of Analysis

The hydromodification analysis within this report utilizes continuous modeling software called San Diego Hydrology Model (SDHM), version dated 10/11/2011, developed by Clear Creek Solutions, Inc. Using rain gauge data specific to the project of interest; SDHM calculates pre-project runoff rates for each water year to compute the pre-project 2- through 25-year flood frequency values. The software then calculates the post-project 2- through 25-year flood frequency values, routing runoff through project BMPs as applicable. The maximum flow value for each water year is selected by the model to compute the pre- and post-project 2- through 25-year flood frequencies. The pre-project 2-year peak flow is multiplied by 10%, or 0.1Q2 to set the lower limit of the erosive flows, in accordance with the FHMC, and the 10-year peak flow is used as the upper limit. The model counts the number of hours that pre project flows exceed each of the flow levels during the entire simulation period. The model does the same analysis for the post-project mitigated flows. A comparison of the pre-project and post-project flow duration curves is conducted for 100 flow levels between the lower limit and the upper limit. If the comparison of the pre-project and post-project flow duration curves yields compliance with the FHMC, the software issues a "pass" for the model, otherwise it issues a "fail".

A basin is modeled within SDHM using land use type and slope, for the pre- and post-project condition. In the post-project condition, the basin can be broken down into multiple sub-basins, if necessary, and each sub-basin can be routed to a different BMP or to no BMP at all. Additionally, the software contains an "auto-pond" component that can automatically size a BMP for the specific basin of interest. This component calculates, through an iterative process, the optimal size of the BMP and the BMP outlet structure. Though this may not ultimately be the detention volume required, it provides a starting point for sizing BMP facilities and assessing the feasibility of satisfying the FHMC.

The pre- and post-project land use and slope values for Orchard Hills are calculated within Section 3 and are illustrated on Exhibits “D” and “E”, also included within that section.

In the post-project condition, the portion of each basin area is anticipated to be detained, or routed through a BMP before entering the existing conveyance system and eventually into the San Marcos Creek further southwest from the project site.

Rainfall Data

The SDHM models within Sections 4 utilize rainfall data from the Escondido gauge (dated April 2009). Per the Rainfall Station Map prepared by Brown & Caldwell, the Escondido rain gauge is located south off the Project site. According to the 85th Percentile Precipitation Isopluvial Map found in Appendix E of the San Diego Hydrology Manual, dated June 2003, the Orchard Hills project is located relatively close to the isopluvial contour, therefore no scaling was consider for this analysis report.

Maintenance of Hydromodification Facilities

The proposed hydromodification facilities at Orchard Hills will fall under second maintenance mechanisms, as defined within the County of San Diego "Standard Urban Storm Water Mitigation Plan Requirements for Development Applications", dated January, 2011. The on-site BMPs constructed during the ultimate build-out will fall under the second category maintenance mechanisms, requiring that a Stormwater Facilities Maintenance Agreement, with Easement and Covenants be entered into between the owner and the County of San Diego, obliging the owner/HOA to maintain the project category two BMPs into perpetuity. Prior to recordation of the agreement, the owner/ developer will provide the County with security to back up the maintenance agreement, which shall remain in place for an interim period of 5 years. The amount of the security shall equal the estimated cost of 2 years of maintenance activities.

Conclusion

The calculations within this report assess the feasibility of satisfying the FHMC and establish detention facility sizes and locations for the project. Based on the detention requirements and the anticipated facility sizes, see section “4” for calculations, the Orchard Hills project will comply with the FHMC. Should a project propose alternative BMPs, or any variation to the assumptions made within this report, then that project will need to provide additional modeling and analysis to demonstrate that the subdivision as a whole will still be in compliance with the FHMC upon completion of the project.

In conclusion, the purpose of San Diego Hydrology Model (SDHM) is to provide a visually-oriented interactive tool to optimally size stormwater control facilities (both water quantity and water quality) to mitigate stormwater and water quality impacts of land use changes on local streams and rivers.

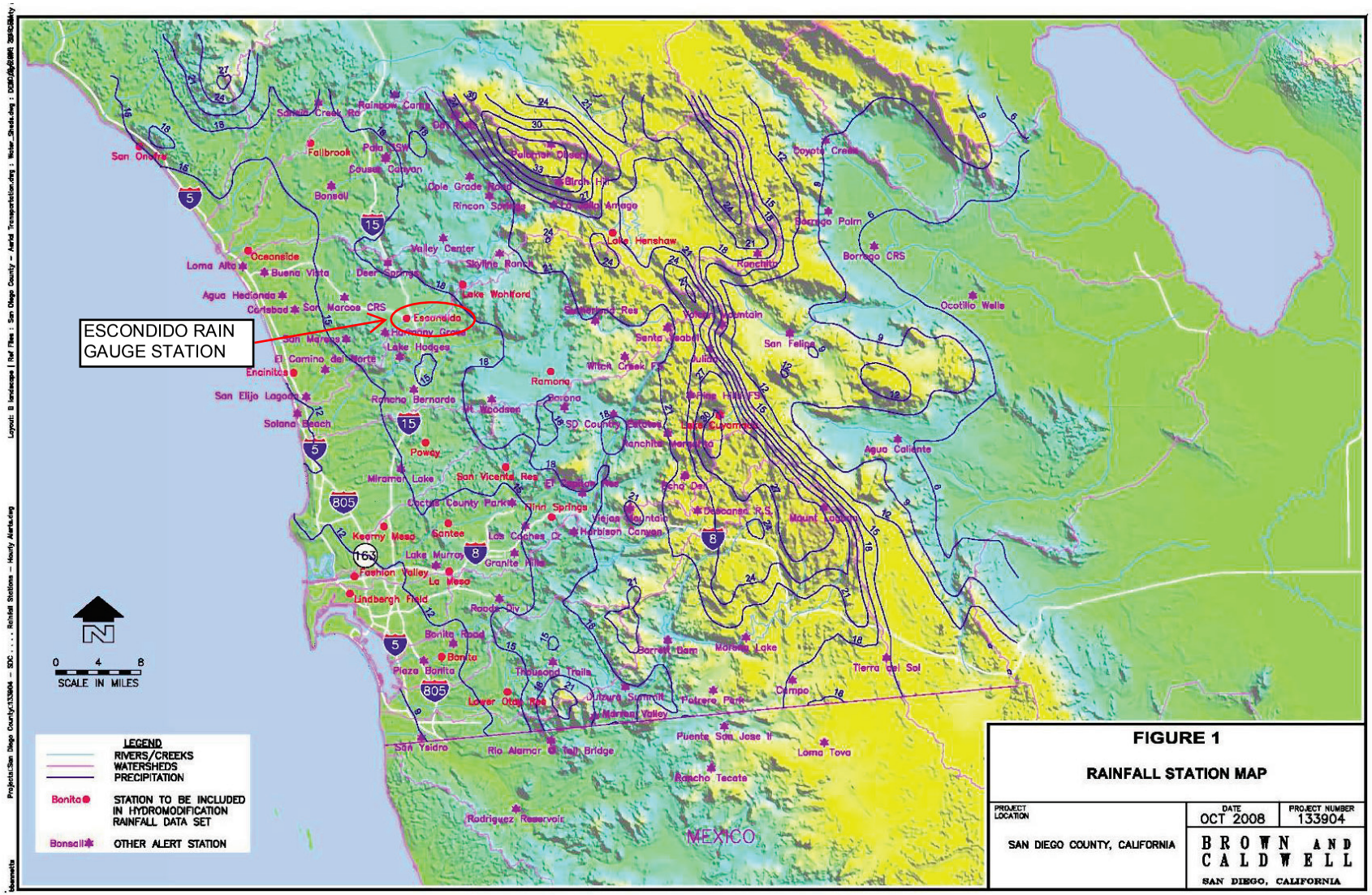

Figure 1-1 Rainfall Station Map

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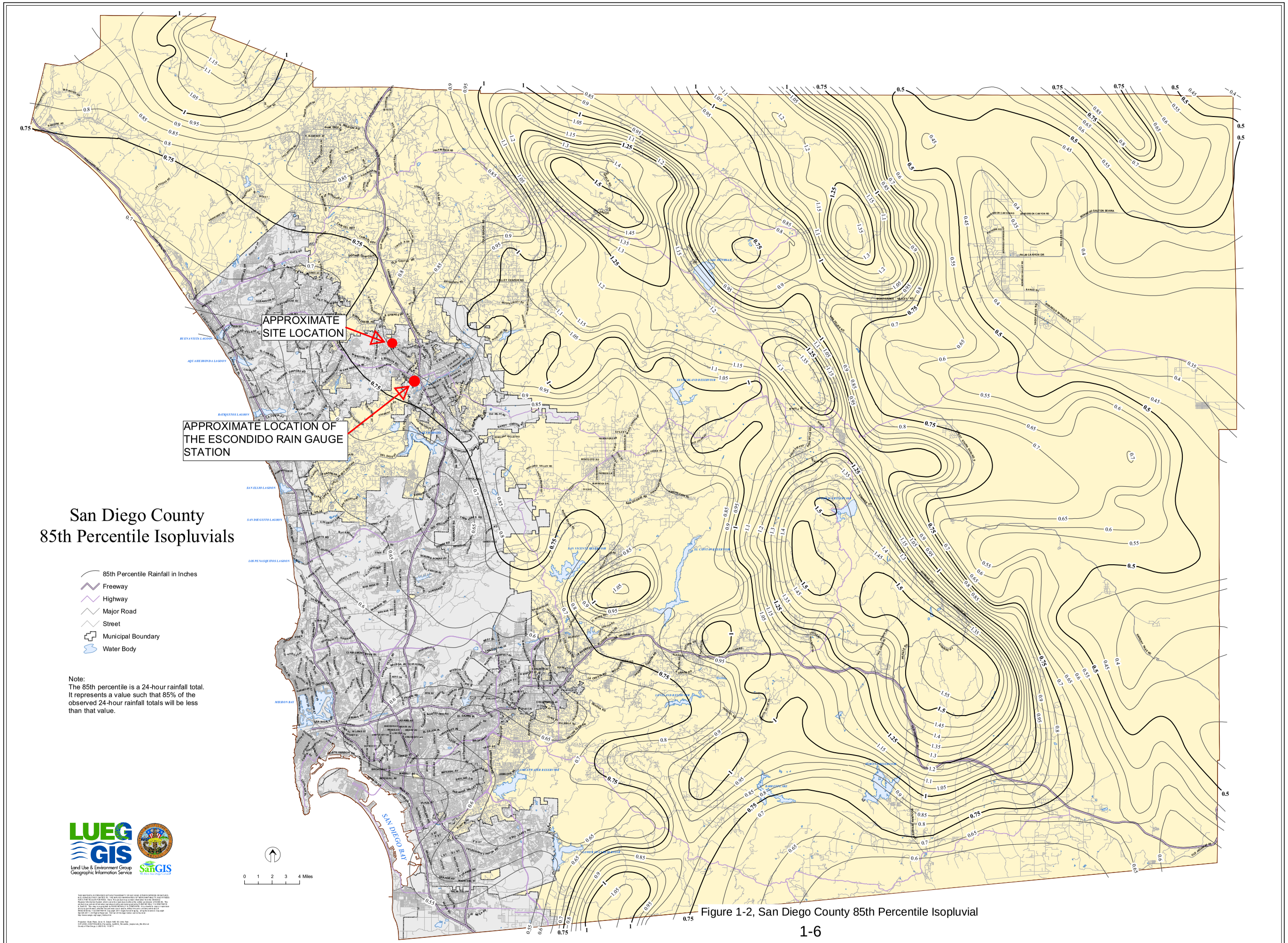

Figure 1-2, San Diego County 85th Percentile Isopluvial

SECTION 2

VICINITY MAP

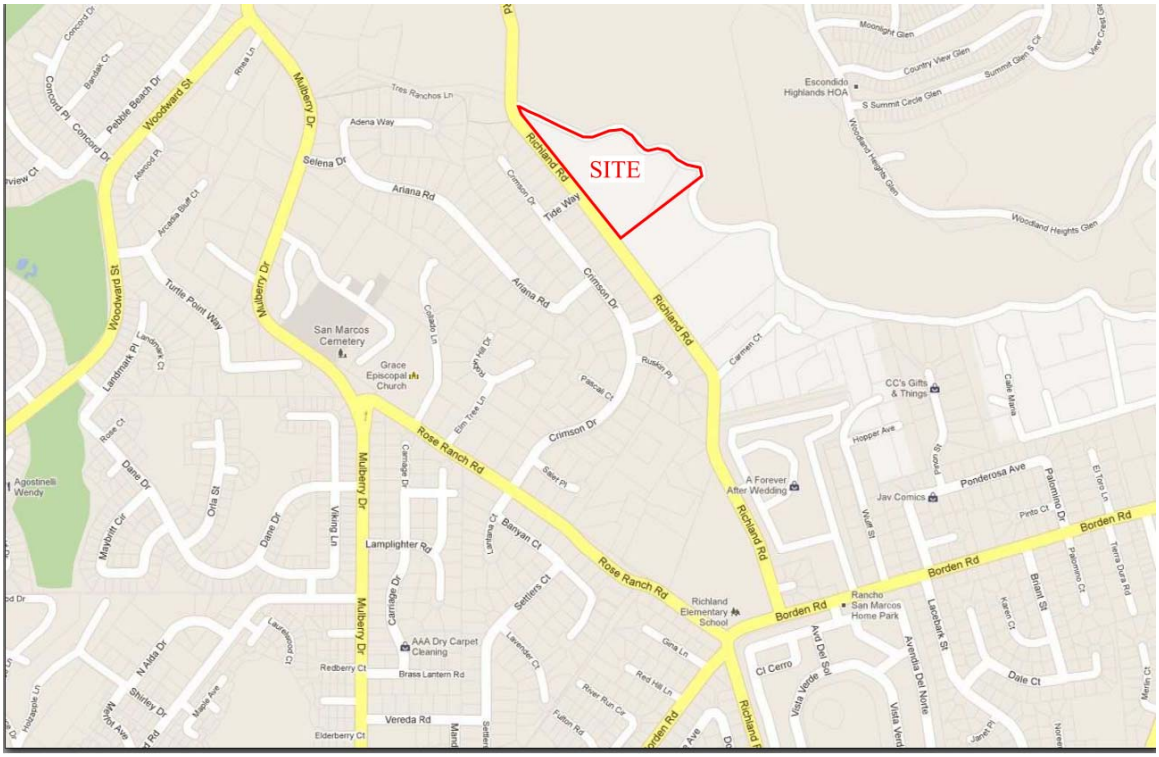

Figure 2-1 - Vicinity map

SECTION 3

LAND USE AREA CALCULATIONS

Pre-Project Condition:

The Project site is located in the southern portion of North County Metro Community Planning Area; in a County island surrounded by the City of Escondido on the north side and City of San Marcos on all other sides. The location is approximately two miles north of Highway 78 and 2.5 miles west of Interstate 15, the northern boundary of the site is defined by the existing Vista Flume, the southern boundary is defined by Richland Road.

Topographically the Site is characterized by gentle and uniform topography with elevations ranging from approximately 785 feet to 900 feet above mean sea level. Currently existing to the west, south and further east are existing single family subdivisions, similar to the proposed project. The site is currently covered with some eucalyptus trees and has had previous agricultural operations; however the extent and the history are unknown. There are no existing buildings or structures on the project site. Overall, the site has a gentle and well defined topography, there are some isolated slopes greater than 25% located on the north east corner of the site.

The Project Site is mostly covered with row crops from previous agricultural activity; a portion of the site is also classified as "Urban/Developed" due to existence of eucalyptus trees. The area is characterized by rolling grassy hills and shrubs. Site soils are mostly classified as fine sandy loams the County Soils Map shows that this site is covered by 2 types of soils, "C" and "D" (Figure "3-1").

For the purpose of this report, the pervious land use was based on soil types: C and D (poor infiltrating soils), the slope categories used are flat (0-5%), moderate (5-10%), and steep (10-20%). The pre-project condition was considered to have no impervious surfaces.

The pre-project condition was model as the same area (approx. 10.82 ac.) of the post-project condition that routes into Bioretention 1, on the south east corner of the site. Discharges from this point enter an existing storm drain system, and eventually further south to the San Marcos Creek (See the Pre-Project land Use Map Exhibit "D" on Section 3).

Project Soils Conditions:

Soils Groups C and D where found on site. For the purpose of this report, no infiltration rates where utilized. Actual percolation rates will be determined after the proposed grading is completed.

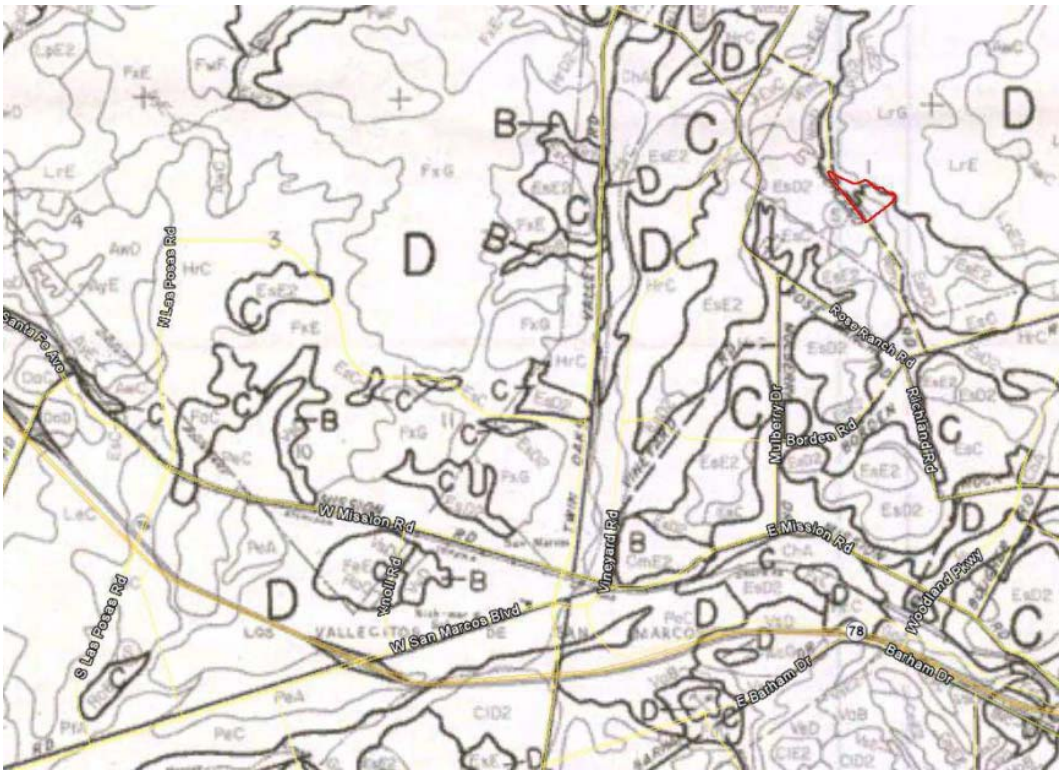

Figure 3-1, Project Site Soils Classification

Post-Project Condition:

In the post-project condition, areas where broken down into appropriate pervious and impervious areas. The proposed Orchard Hill Project is intended to provide a 20 single residential units subdivision of a 12.5 acre parcel situated on the northeast side of Richland Road and Tide Way. The project minimum lot size is 15,000 square feet. In the post-project, the proposed development is anticipated to be detained, and routed through Bioretention 1 (POC 1) and assessing the feasibility to satisfying the FHMC.

For the purpose of this report, the impervious areas within each basin are individually categorized into two types: impervious-flat and impervious-moderate, which consists of roads, roofs, driveways, and sidewalks. The slope categories are flat and moderate. As in the pre-project condition, undeveloped areas within the post-project where categorized in soil types: A (well infiltrating soils), B (moderate infiltrating soils), C and D (poor infiltrating soils), the slope categories used are flat (0-5%), moderate (5-10%), and steep (10-20%). In Addition, proposed landscape area within the development where categorized as soil types: A, B, C and D (Urban).

For the purpose of this "Hydromodification Study", the total area is approximately 10.82 acres and was calculated as a single basin, than routed into Bioretention (POC 1).

The proposed home site pads will capture flows from roof tops and patio areas and routed to Street "B" and into proposed curb inlets (SDRSD D-2). Proposed RCP culverts will carry the majority of Post-development runoff, which is routed to Bioretention 1 (POC 1) along the frontage, running parallel to Richland Rd. and into south east corner of the site , and eventually to the San Marcos Creek further south. Part of Richland Rd. within public right-of-way along the frontage of the project is also routed to the "on-site" Bioretention (POC 1) to mitigate additional runoff that was created due to the proposed improvements.

After water from the drainage management area treated on-site at the proposed Bioretention (POC 1), water outflows to an existing 30" diameter RCP along Richland Road, and then travels underground to an existing Type "F" catch inlet that captures flows from additional landscape and offsite areas (DMA 2). At this point the existing storm drain system travels through streets and eventually to the San Marcos Creek further down.

DMA 2 area is shown in this "Hydromodification Study" as a part of an area within the project as illustrative (area) only, since DMA 2 is a self-treating area, and it is not subjected to comply

with hydromodification analysis. Furthermore, the post-project runoff discharge rates and durations will not exceed estimated pre-project discharge rates and durations because the increased discharge rates and durations, will not result in increased potential for erosion or other significant adverse impacts to beneficial uses, attributable to changes in the discharge rates and durations, since the post-project landscape (undisturbed) areas are the same as the pre-project landscape (undisturbed) areas. As stated in the guidelines of Chapter 4 of the latest "County Of San Diego SUSMP (Standard Urban Stormwater Mitigation Plan requirements) for Development Applications" revised August 2012, where they define self-treating areas as "natural, landscaped, or turf areas that drain directly off site or to the storm drain system. Examples include upslope undeveloped areas that are ditched and drained around a development and grassed slopes that drain offsite to a street or storm drain". (See Exhibit "E" Post-Project Land Use Area Breakdown).

DMA 1	
POST-PROJECT LAND USE AREA BREAKDOWN & SIZING CALCULATIONS (TREATED) TABLE 3-2	
Land Use Covers	Basin 1 (ac.)
D, Grass Flat (5-10%)	0.37
D, Grass Steep (>10%)	0.45
C, Urban Moderate (5-10%)	4.59
D, Urban Moderate (5-10%)	2.17
Roads Flat (0-5%)	0.56
Roads Moderate (5-10%)	0.84
Sidewalk Flat (0-5%)	0.10
Sidewalk Moderate (5-10%)	0.22
Roof Area (0-5%)	0.95
Driveways Flat (0-5%)	0.22
Driveways Moderate (5-10%)	0.35
Total Basin Area (ac.)	10.82
Drains to LID/BMP Type	Bioretention (BMP 1)
Minimum 4% LID/BMP Area (sqft.)	6,961*
Minimum LID/BMP HMP Area per Study (sqft.)	13,440**
Proposed LID/BMP Area (sqft.)	15,400
Minimum LID/BMP HMP Volume per Study (sqft.)	38,419**
Proposed Volume Total	38,457

DMA 1	
PRE-PROJECT LAND USE AREA BREAKDOWN TABLE 3-1	
Land Use Covers	Basin 1 (ac.)
C, Grass Flat (0-5%)	0.06
C, Grass Moderate (5-10%)	1.91
C, Grass Steep (>10%)	4.58
D, Grass Flat (0-5%)	0.37
D, Grass Moderate (5-10%)	0.54
D, Grass Steep (<10%)	3.02
Roads Moderate (5-10%)	0.34
Total Basin Area (ac.)	10.82

*Minimum Area Based on the County of San Diego SUSMP "Standard Urban Stormwater Management Plan"
**Minimum Area and Volume to meet hydromodification Flows and Durations was Calculated using the Clear Creek Solutions SDHM software, 2011 version.

Project Name:	Orchard Hills
Project #:	Tract No. 5570
Project Location:	Northeast side of Richlan Rd. and Tide Way
APN #:	218-220-10 & 17
Total Project Area:	12.5
Mean Annual Precipitation:	

DMA 1

PERLND No.	Soil Type	Vegetation/Surface/Groundcover	Slope (%)	Area (ft.^{2})	Area (acres)
BASIN 1		Driveway		24899	0.57
BASIN 1		Sidewalk		13733	0.32
BASIN 1		Roads		61040	1.40
BASIN 1	C/D	Urban (Landscape)		294648	6.76
BASIN 1	C/D	Undisturbed (Natural)		35651	0.82
BASIN 1		Roof		41330	0.95
			Total	**471301**	***10.82***

Minimum IMP Area Calculations

Soil Type	IMP Designator
C, D	**BIORETENTION**

DMA #	Area (ft.^{2})	Post-Development Surface Type	Runoff Factor	DMA Area x Runoff Factor (ft.^{2})			
1	24899	Driveway	1	24899			
1	13733	Sidewalk	1	13733			
1	61040	Roads	1	61040			
1	294648	Urban (Landscape)	0.1	29465			
1	35651	Undisturbed (Natural)	0.1	3565			
1	41330	Roof	1	41330	**Imp Sizing Factor**	**Min. Area (ft.^{2})**	**Proposed Area (ft.^{2})**
			Total	**174032**	0.04	**6961***	**15400**

*Minimum Area Based on the County of San Diego SUSMP "Standard Urban Stormwater Management Plan"

DMA 2						
PERLND No.	**Soil Type**	**Vegetation/Surface/Groundcover**	**Slope (%)**	**Area (ft.^{2})**	**Area (acres)**	**IMP Designator**
BASIN 2	C/D	Grass	>10	68985.0	1.58	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
BASIN 2	C	Urban (Landscape)	>10	12202.0	0.28	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
				Total	***1.86***	

SLOPE ANALYSIS AREA FOR PRE-DEVELOPMENT HYDROMODIFICATION STUDY
ORCHARD HILLS - TM 5570

PRE - DEVELOPMENT SLOPE ANALYSIS - BASIN 1

COLOR	RANGE BEGIN (SLOPE%)	RANGE END (SLOPE%)	AREA
	0.00	5.00	0.43 Ac.
	5.00	10.00	2.79 Ac.
	10.00	GREATER	7.60 Ac.
		TOTAL -	10.82 Ac.

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SLOPE ANALYSIS AREA
- EXISTING CONTOURS

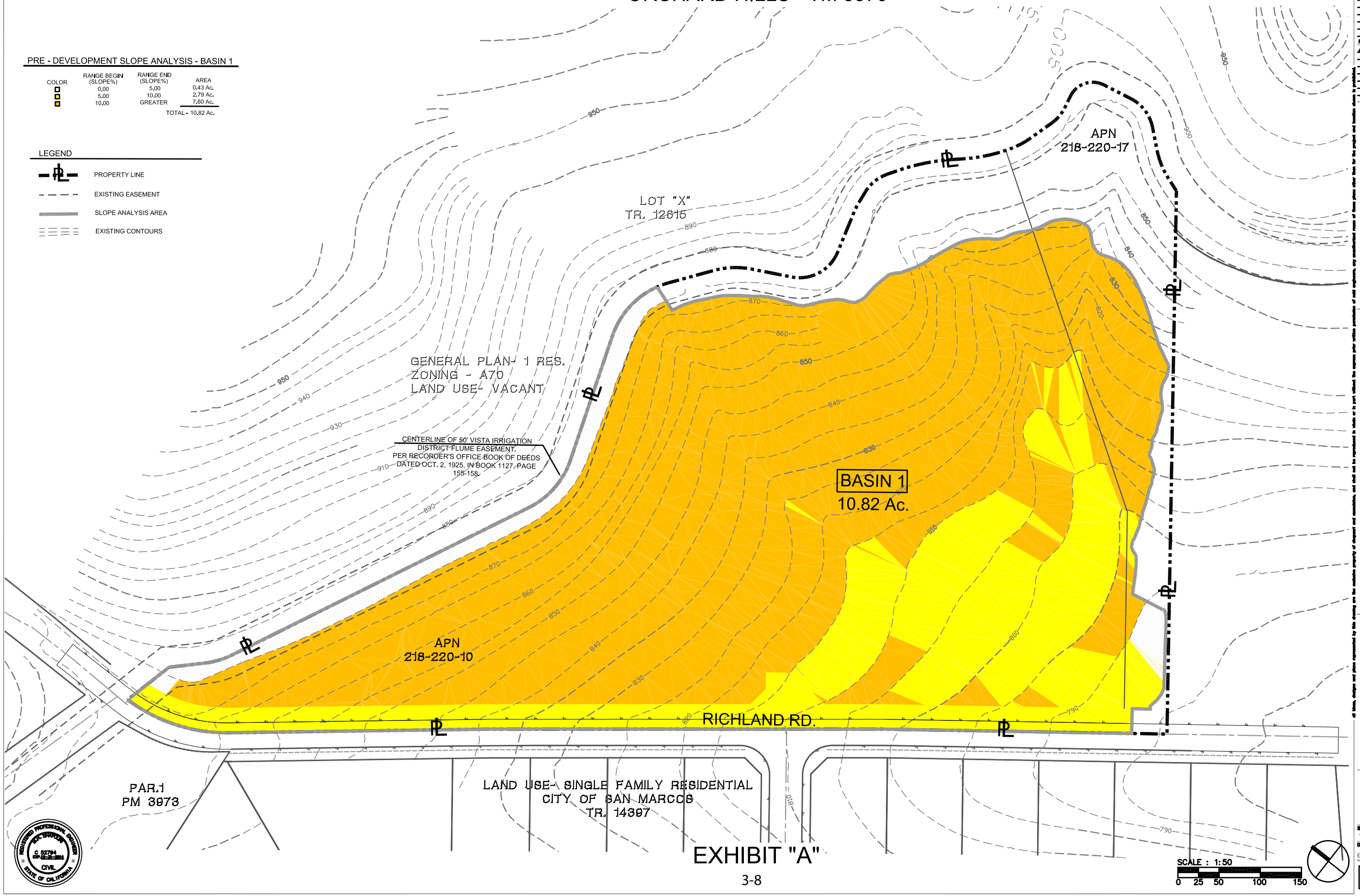

EXHIBIT "A"

JOB NO.
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REVISIONS:

SUBDIVISION TENTATIVE
MAP OF APN 218-220-10 & 17
COUNTY OF SAN DIEGO, CA.
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PRE-DEVELOPMENT SLOPE ANALYSIS
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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PRE-DEVELOPMENT SLOPE ANALYSIS

SHEET TITLE: TM 5570
NO. 1 of 1
DATE PRINTED: 02-03-2014

SLOPE ANALYSIS AREA FOR POST-DEVELOPMENT HYDROMODIFICATION STUDY
ORCHARD HILLS - TM 5570

POST- DEVELOPMENT SLOPE ANALYSIS - BASIN 1

COLOR	RANGE BEGIN (SLOPE%)	RANGE END (SLOPE%)	AREA
	0.00	5.00	6.06 Ac.
	5.00	10.00	1.63 Ac.
	10.00	GREATER	3.13 Ac.
		TOTAL -	10.82 Ac.

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SLOPE ANALYSIS AREA
- EXISTING CONTOURS
- FINISH CONTOURS

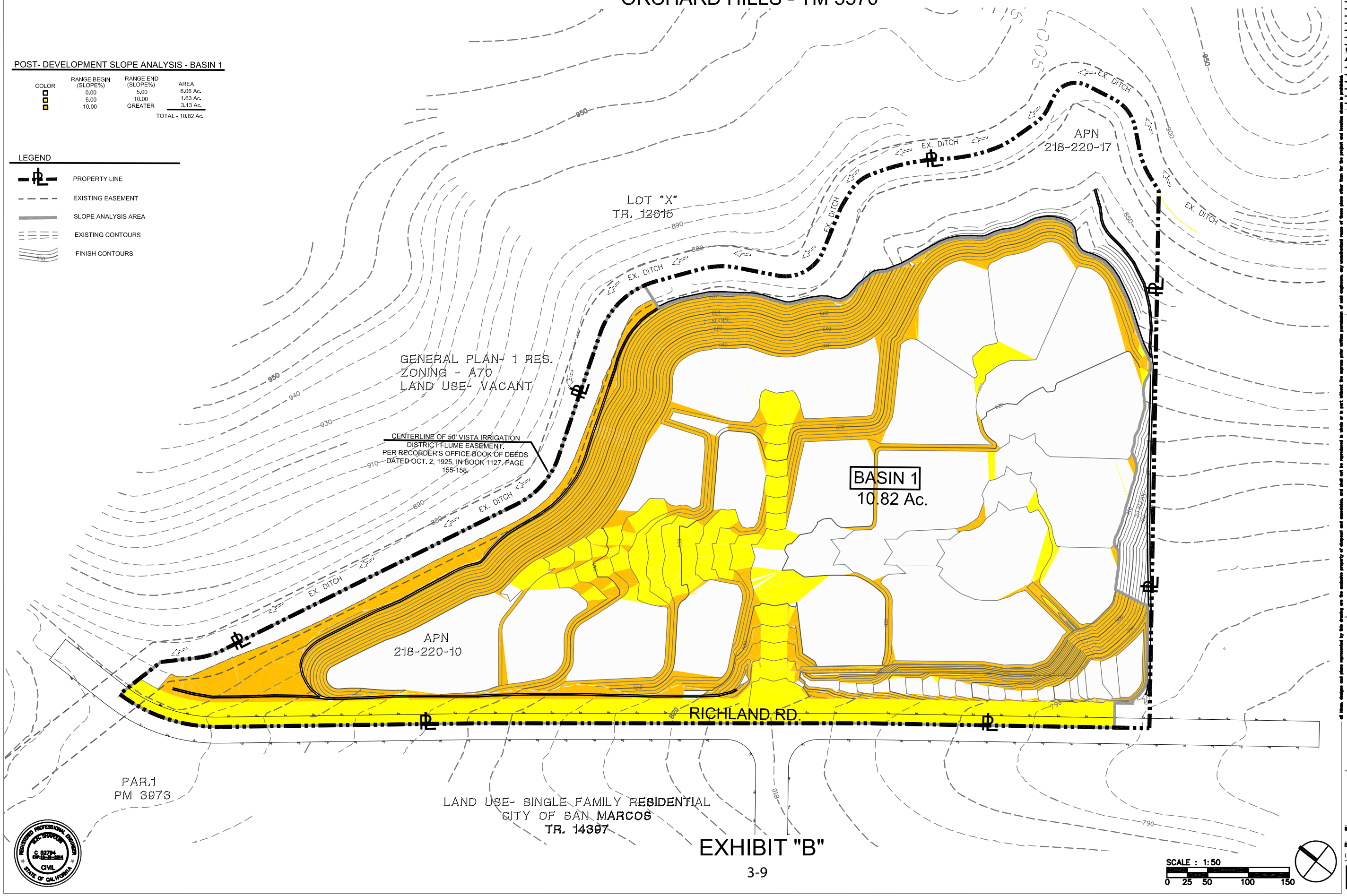

EXHIBIT "B"

JOB NO.
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SUBMITTALS:
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MAP OF APN 218-220-10 & 17
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POST-DEVELOPMENT SLOPE ANALYSIS
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POST-DEVELOPMENT SLOPE ANALYSIS

SHEET TITLE: TM 5570
NO. 1 of 1
DATE PRINTED: 02-03-2014

REGISTERED PROFESSIONAL ENGINEER
C 52794
EXP. 12-31-2014
CIVIL
STATE OF CALIFORNIA

SOILS TYPE MAP FOR
ORCHARD HILLS - TM 5570

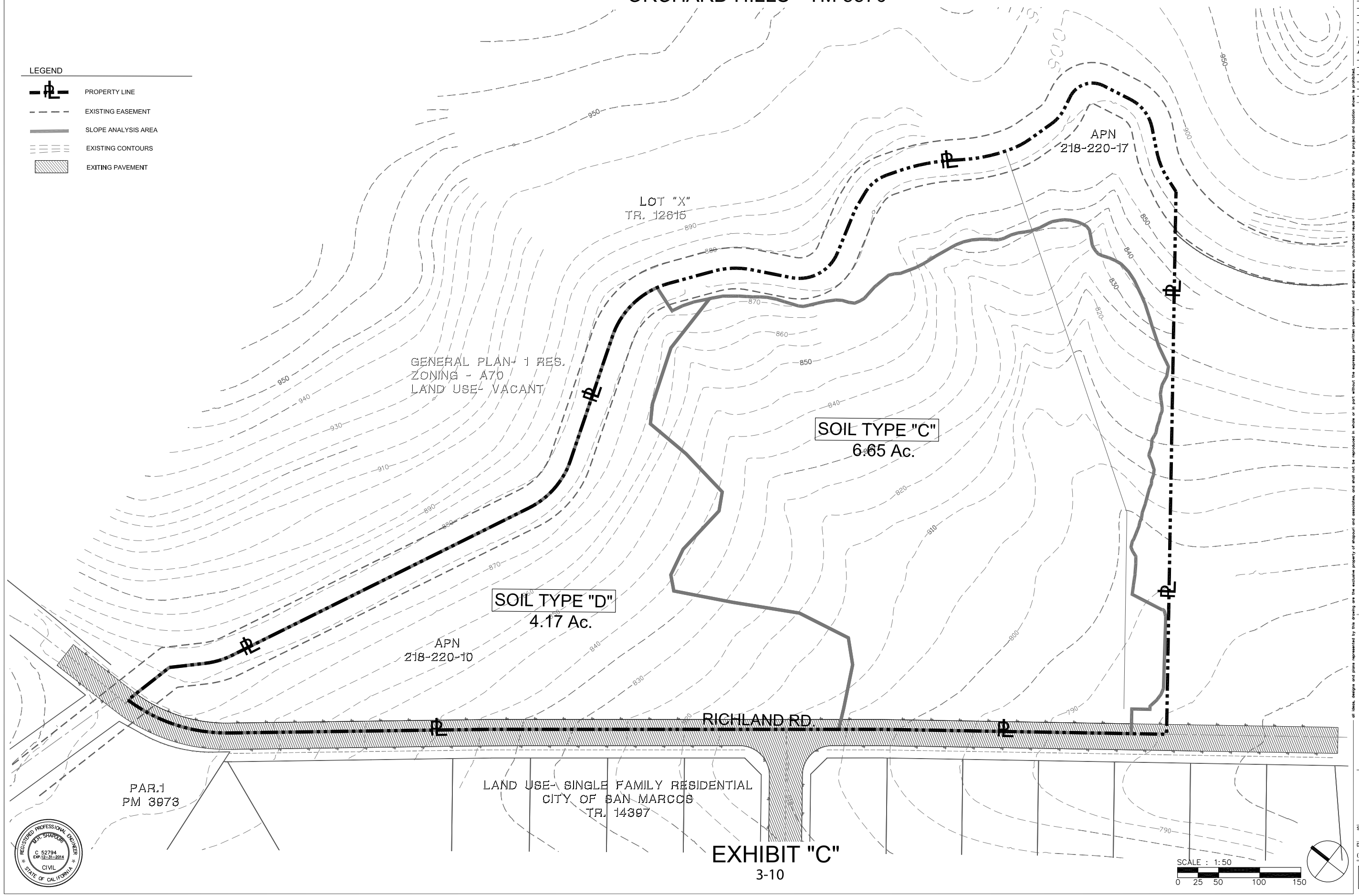

EXHIBIT "C"
3-10

REGISTERED PROFESSIONAL ENGINEER
RAY SHAPOURI
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EXP.12-31-2014
CIVIL
STATE OF CALIFORNIA

JOB NO.
DRAWN:
SUBMITTALS:
REVISIONS:
1

SUBDIVISION TENTATIVE
MAP OF APN 218-220-10 & 17
COUNTY OF SAN DIEGO, CA.
92069

SOILS TYPE MAP
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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SOILS TYPE MAP

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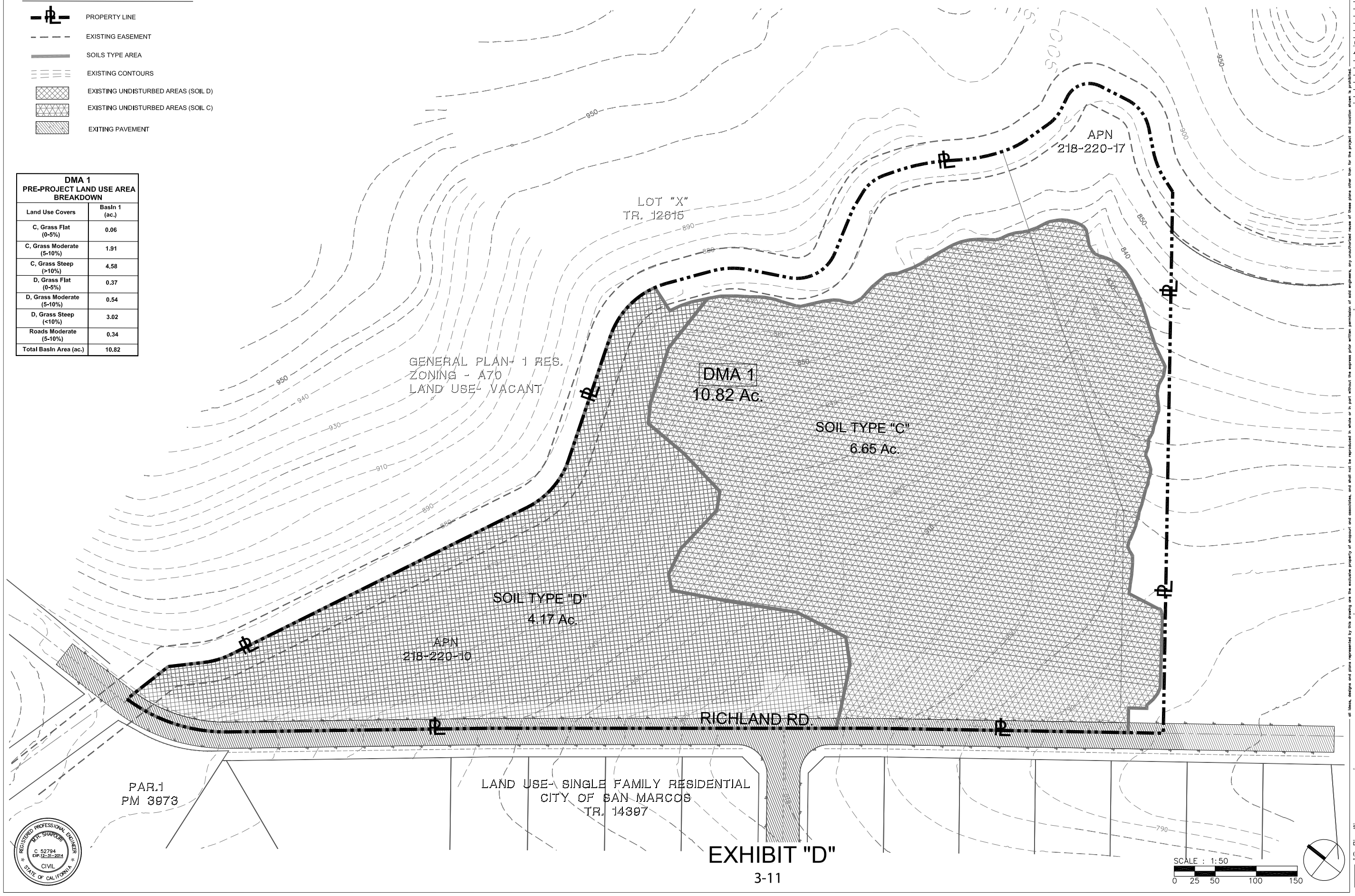
PRE PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS - TM 5570

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SOILS TYPE AREA
- EXISTING CONTOURS
- EXISTING UNDISTURBED AREAS (SOIL D)
- EXISTING UNDISTURBED AREAS (SOIL C)
- EXITING PAVEMENT

DMA 1 PRE-PROJECT LAND USE AREA BREAKDOWN	
Land Use Covers	Basin 1 (ac.)
C, Grass Flat (0-5%)	0.06
C, Grass Moderate (5-10%)	1.91
C, Grass Steep (>10%)	4.58
D, Grass Flat (0-5%)	0.37
D, Grass Moderate (5-10%)	0.54
D, Grass Steep (<10%)	3.02
Roads Moderate (5-10%)	0.34
Total Basin Area (ac.)	10.82



REGISTERED PROFESSIONAL ENGINEER
M.H. SHAPOURI
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EXP. 12-31-2014
CIVIL
STATE OF CALIFORNIA

EXHIBIT "D"

3-11

JOB NO.
DRAWN:
SUBMITTALS:

REVISIONS:

SUBDIVISION TENTATIVE
MAP OF APN 218-220-10 & 17
COUNTY OF SAN DIEGO, CA.
92069

PRE PROJECT LAND USE &
DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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PRE PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP

SHEET TITLE: TM 5570
NO. 1 of 1
DATE PRINTED: 02-03-2014

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POST PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS - TM 5570

DMA 1

PERLND No.	Soll Type	Vegetation/Surface/Groundcover	Slope (%)	Area (ft.²)	Area (acres)
BASIN 1		Driveway		24899	0.57
BASIN 1		Sidewalk		13733	0.32
BASIN 1		Roads		61040	1.40
BASIN 1	C/D	Urban (Landscape)		294648	6.76
BASIN 1	C/D	Undisturbed (Natural)		35651	0.82
BASIN 1		Roof		41330	0.95
			Total	471301	*10.82*

Minimum IMP Area Calculations

DMA #	Area (ft.²)	Post-Development Surface Type	Runoff Factor	DMA Area x Runoff Factor (ft.²)
1	24899	Driveway	1	24899
1	13733	Sidewalk	1	13733
1	61040	Roads	1	61040
1	294648	Urban (Landscape)	0.1	29465
1	35651	Undisturbed (Natural)	0.1	3565
1	41330	Roof	1	41330
			Total	174032

Soll Type	IMP Designator
C, D	BIORETENTION

Imp Sizing Factor	Min. Area (ft.²)	Proposed Area (ft.²)
0.04	6961	15400

DMA 2

PERLND No.	Soll Type	Vegetation/Surface/Groundcover	Slope (%)	Area (ft.²)	Area (acres)	IMP Designator
BASIN 2	C/D	Grass	>10	68985.0	1.58	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
BASIN 2	C	Urban (Landscape)	>10	12202.0	0.28	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
				Total	1.86	

DMA 1 POST-PROJECT LAND USE AREA BREAKDOWN & SIZING CALCULATIONS (TREATED) TABLE 3-2

Land Use Covers	Basin 1 (ac.)
D, Grass Flat (5-10%)	0.37
D, Grass Steep (>10%)	0.45
C, Urban Moderate (5-10%)	4.59
D, Urban Moderate (5-10%)	2.17
Roads Flat (0-5%)	0.56
Roads Moderate (5-10%)	0.84
Sidewalk Flat (0-5%)	0.10
Sidewalk Moderate (5-10%)	0.22
Roof Area (0-5%)	0.95
Driveways Flat (0-5%)	0.22
Driveways Moderate (5-10%)	0.35
Total Basin Area (ac.)	10.82
Drains to LID/BMP Type	Bioretention (BMP 1)
Minimum 4% LID/BMP Area (sqft.)	6,961
Minimum LID/BMP HMP Area per Study (sqft.)	13,440
Proposed LID/BMP Area (sqft.)	15,400
Minimum LID/BMP HMP Volume per Study (sqft.)	38,419
Proposed Volume Total	38,457

LEGEND

- PROJECT BOUNDARY
- BASIN AREAS
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED BIORETENTION (BMP)
- PROPOSED DOWN SPOT TO LANDSCAPE/TREATMENT AREAS (LID 3.6.4)
- PROPOSED LANDSCAPE AREAS (D) (LID 2.2.5)
- PROPOSED LANDSCAPE AREAS (C) (LID 2.2.5)
- PROPOSED ROADS, DRIVEWAYS & SIDEWALK AREAS
- PROPOSED ROOF AREAS
- UNDISTURBED AREAS (SOIL D)
- UNDISTURBED AREAS (SOIL C)
- SURFACE FLOW TO IMP'S/BMP'S
- EXITING PAVEMENT
- EXITING DITCH
- PROPOSED DITCH
- PROPOSED STORM DRAIN SYSTEM
- PROPOSED UNDER SIDEWALK CURB CUT

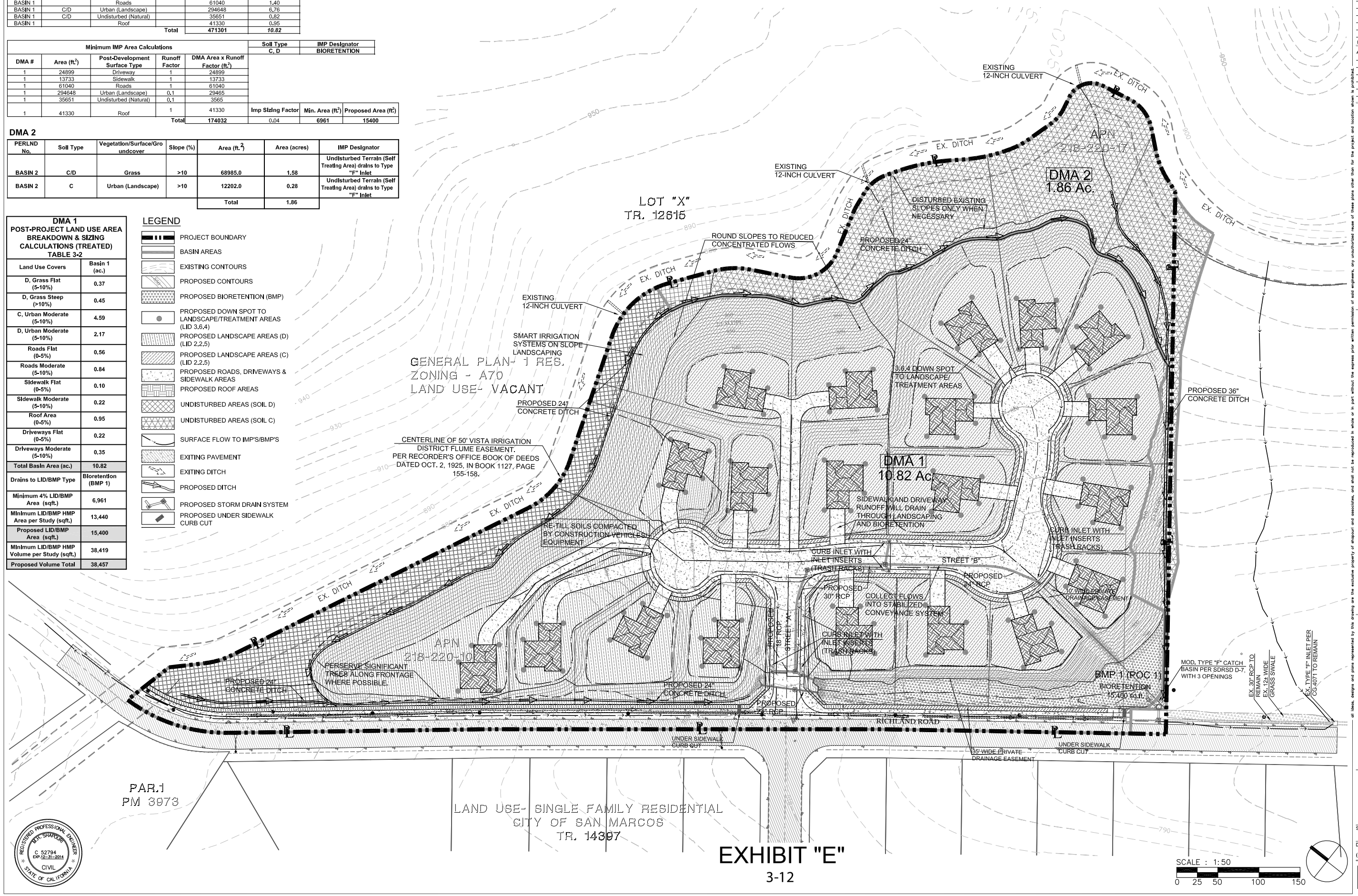

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EXHIBIT "E"

3-12

JOB NO.
DRAWN:
SUBMITTALS:
REVISIONS:

SUBDIVISION TENTATIVE MAP OF APN 218-220-10 & 17 COUNTY OF SAN DIEGO, CA. 92069

POST PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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POST LAND USE & DRAINAGE MANAGEMENT AREA MAP

SHEET TITLE: TM 5570
NO. 1 of 1
DATE PRINTED: 02-03-2014

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SECTION 4

HYDROMODIFICATION ANALYSIS

The hydromodification analysis within this section utilizes the continuous modeling software SDHM, version dated 10/11/2011, developed by Clear Creek Solutions Inc. to model the pre- and post-project condition of each basin. The user inputs the number of acres of appropriate basin land use information. Pervious land use information is in the form of soil, vegetation, and land slope. For example, “A, Grass, Flat” means SCS soil type A, non-turf grassland vegetation, and flat (0-5%) land slope.

There are four basic soil types: A (well infiltrating soils), B (moderate infiltrating soils), C and D (poor infiltrating soils). There are three basic vegetation categories: gravel, grass, dirt (no vegetation), and urban landscaped vegetation. In contrast, the developed landscape will consist of urban vegetation (lawns, flowers, planted shrubs and trees). Urban vegetation is irrigated in the model.

HSPF parameter values in SDHM are adjusted for the different soil, vegetation, and land slope categories. SDHMHSPF soil parameter values take into account the hydrologic effects of land development activities that result from soil compaction when “Urban” is specified. Impervious areas are divided into one type with two different slopes. The area types consider in the impervious areas are: roads, roofs, driveways, sidewalks, and parking. The slope categories are flat and moderate.

Calculations within the software were performed using historical rain gauge data specific to the project. In this case, peak rainfall measurements data was used from the “Escondido" gauge. The basin models were created using the pre- and post-project land use and slope values calculated within Section 3 (Table “3-1” & “3-2”).

BMP (Best Management Practices) facilities are small-scale stormwater control facilities designed to meet hydromodification plan (HMP) flow duration requirements. BMP facilities can be designed in San Diego County, California, using the BMP Sizing Calculator; they can also be designed using the San Diego Hydrology Model (SDHM). SDHM gives the user more control and flexibility than the BMP Sizing calculator in sizing IMP facilities.

For the purposes of these calculations, the continuous modeling software SDHM, version dated 10/11/2011, developed by Clear Creek Solutions Inc. to model the pre- and post-project (mitigated) condition for each basin.

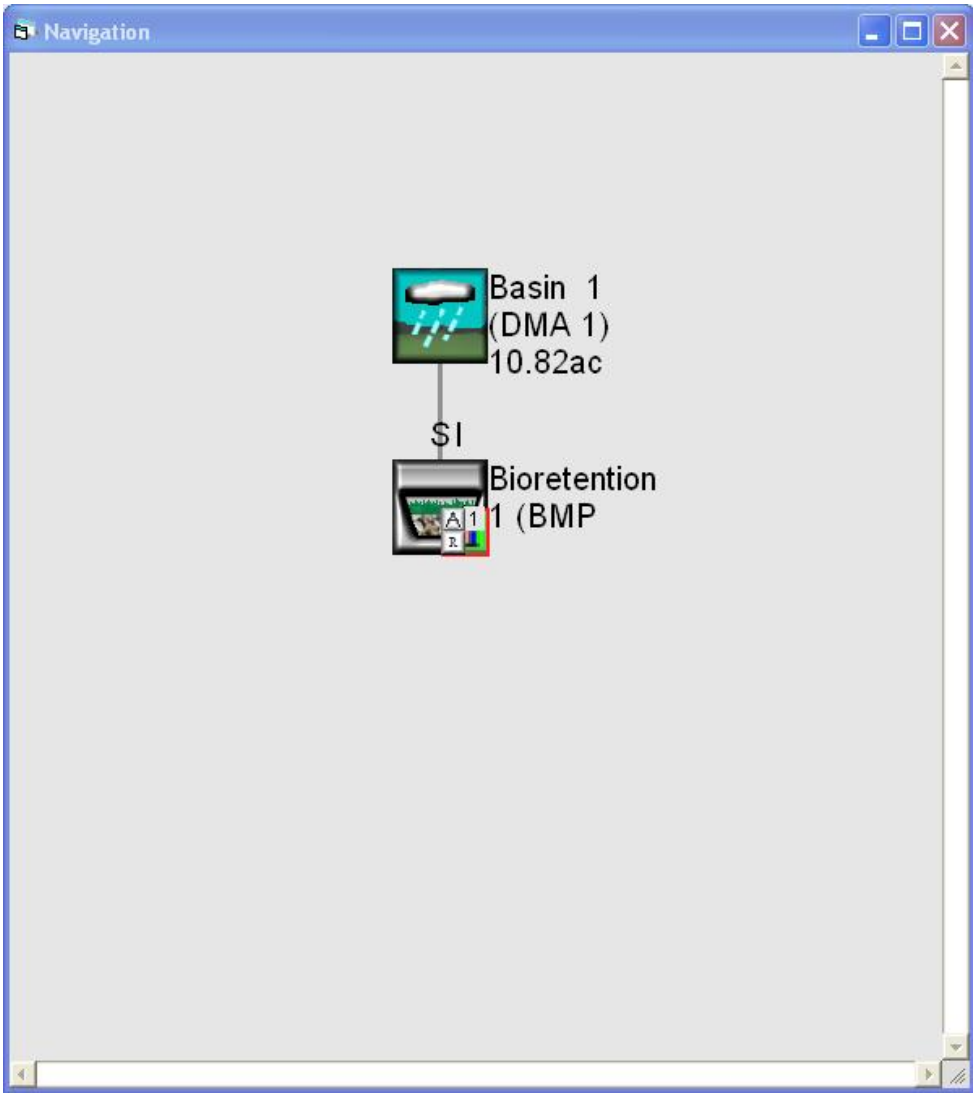

Figure 4-1 – Orchard Hills Post-Project SDHM Diagram (POC1)

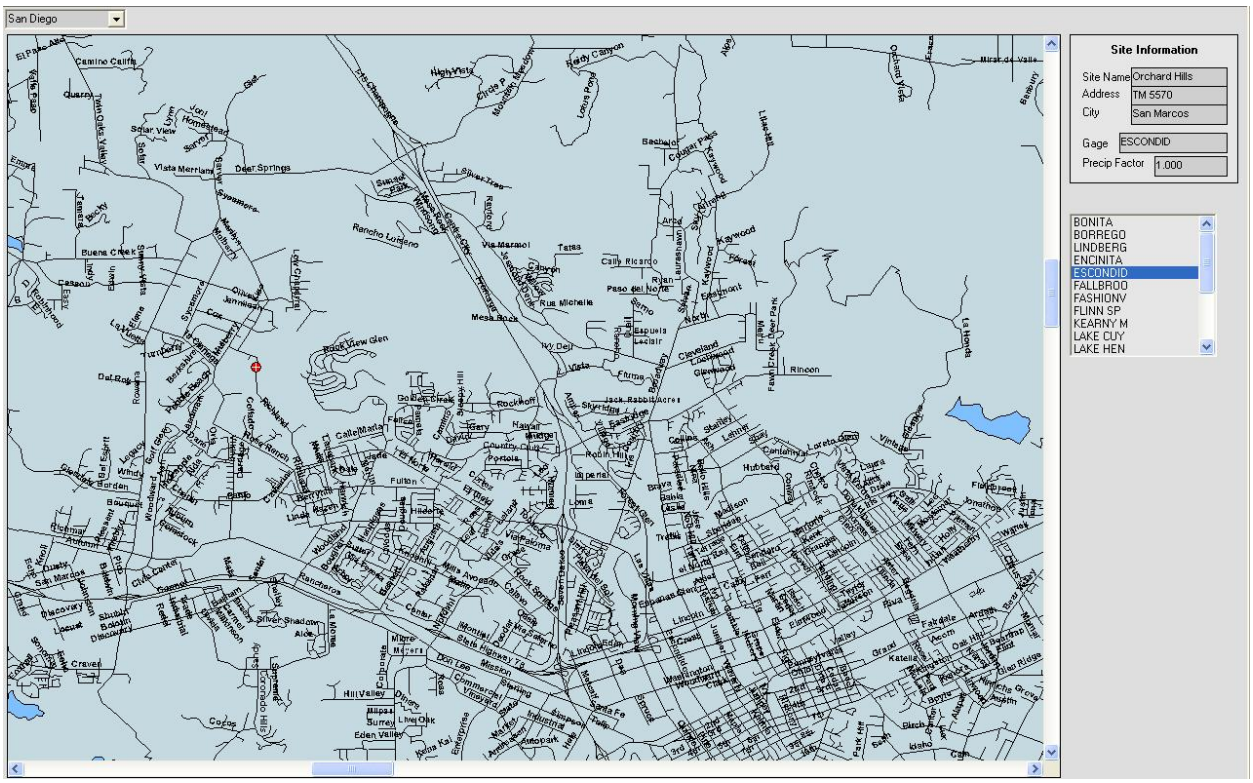

Figure 4-2 – Orchard Hills Post-Project SDHM Site Location

SDHM2011
PROJECT REPORT

Project Name: TM 5570 – ORCHARD HILLS
Site Name : Orchard Hills
Site Address: TM 5570
City : San Marcos
Report Date : 1/31/2014
Gage : ESCONDID
Data Start : 10/01/1964
Data End : 09/30/2004
Precip Scale: 1.00
Version : 2011/10/11

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
D,Grass,STEEP(10-20	3.02
C,Grass,FLAT(0-5%)	.06
C,Grass,MOD(5-10%)	1.91
C,Grass,STEEP(10-20	4.58
D,Grass,FLAT(0-5%)	.37
D,Grass,MOD(5-10%)	.54

Impervious Land Use	Acres
IMPERVIOUS-MOD	0.34

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1 (DMA 1)
Bypass: No

GroundWater: No

Pervious Land Use	Acres
D,Grass,FLAT(0-5%)	.37

D,Grass,STEEP(10-20	**.45**
C,Urban,MOD(5-10%)	**4.59**
D,Urban,MOD(5-10%)	**2.17**

Impervious Land Use	**Acres**
IMPERVIOUS-FLAT	**1.83**
IMPERVIOUS-MOD	**1.41**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Bioretenti Surface1)	Bioretenti Surface1)	

Name : Bioretention 1 (BMP
Bottom Length: 450.00 ft.
Bottom Width : 20.00 ft.
Trench bottom slope 1: 0.04 To 1
Trench Left side slope 0: 3 To 1
Trench right side slope 2: 3 To 1
Material thickness of first layer : 1.5
Pour Space of material for first layer : 0.412
Material thickness of second layer : 4
Pour Space of material for second layer : 0.4
Material thickness of third layer : 0
Pour Space of material for third layer : 0.4
Discharge Structure
Riser Height: 1.6 ft.
Riser Diameter: 30 in.
Notch Type : Rectangular
Notch Width : 1.000 ft.
Notch Height: 0.150 ft.
Orifice 1 Diameter: 1.33 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 2 in. **Elevation:** 0.666 ft.

Element Flows To:

Outlet 1	**Outlet 2**

Landscape Swale Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.206	0.000	0.000	0.000
0.0872	0.212	0.007	0.013	0.000
0.1744	0.217	0.015	0.019	0.000
0.2617	0.222	0.023	0.023	0.000
0.3489	0.228	0.031	0.027	0.000
0.4361	0.233	0.039	0.030	0.000

0.5233	0.239	0.048	0.033	0.000
0.6106	0.244	0.056	0.036	0.000
0.6978	0.249	0.065	0.057	0.000
0.7850	0.255	0.074	0.077	0.000
0.8722	0.260	0.084	0.091	0.000
0.9594	0.266	0.093	0.102	0.000
1.0467	0.271	0.103	0.112	0.000
1.1339	0.276	0.112	0.121	0.000
1.2211	0.282	0.123	0.129	0.000
1.3083	0.287	0.133	0.137	0.000
1.3956	0.293	0.143	0.144	0.000
1.4828	0.298	0.154	0.171	0.000
1.5700	0.304	0.164	0.296	0.000
1.6572	0.309	0.175	0.691	0.000
1.7444	0.314	0.186	1.700	0.000
1.8317	0.320	0.197	3.084	0.000
1.9189	0.325	0.208	4.759	0.000
2.0061	0.331	0.220	6.682	0.000
2.0933	0.336	0.231	8.822	0.000
2.1806	0.341	0.243	11.16	0.000
2.2678	0.347	0.255	13.68	0.000
2.3550	0.352	0.267	16.37	0.000
2.4422	0.358	0.280	19.22	0.000
2.5294	0.363	0.292	22.22	0.000
2.6167	0.368	0.305	25.37	0.000
2.7039	0.374	0.318	28.65	0.000
2.7911	0.379	0.331	32.07	0.000
2.8783	0.385	0.345	35.61	0.000
2.9656	0.390	0.358	39.28	0.000
3.0528	0.395	0.372	43.07	0.000
3.1400	0.401	0.386	46.97	0.000
3.2272	0.406	0.400	50.98	0.000
3.3144	0.412	0.414	55.10	0.000
3.4017	0.417	0.429	59.33	0.000
3.4889	0.423	0.443	63.66	0.000
3.5761	0.428	0.458	68.09	0.000
3.6633	0.433	0.473	72.62	0.000
3.7506	0.439	0.488	77.25	0.000
3.8378	0.444	0.504	81.97	0.000
3.9250	0.450	0.520	86.79	0.000
4.0122	0.455	0.535	91.69	0.000
4.0994	0.460	0.551	96.69	0.000
4.1867	0.466	0.567	101.7	0.000
4.2739	0.471	0.584	106.9	0.000
4.3611	0.477	0.600	112.2	0.000
4.4483	0.482	0.617	117.5	0.000
4.5356	0.487	0.634	122.9	0.000
4.6228	0.493	0.651	128.4	0.000
4.7100	0.498	0.668	134.0	0.000
4.7972	0.504	0.686	139.7	0.000
4.8844	0.509	0.704	145.4	0.000
4.9717	0.515	0.722	151.2	0.000
5.0589	0.520	0.740	157.1	0.000

5.1461	0.525	0.758	163.1	0.000
5.2333	0.531	0.776	169.1	0.000
5.3206	0.536	0.795	175.2	0.000
5.4078	0.542	0.814	181.4	0.000
5.4950	0.547	0.833	187.6	0.000
5.5822	0.552	0.881	194.0	0.000
5.6694	0.558	0.929	200.4	0.000
5.7567	0.563	0.978	206.8	0.000
5.8439	0.569	1.028	213.4	0.000
5.9311	0.574	1.077	220.0	0.000
6.0183	0.580	1.128	226.6	0.000
6.1056	0.585	1.179	233.4	0.000
6.1928	0.590	1.230	240.2	0.000
6.2800	0.596	1.282	247.0	0.000
6.3672	0.601	1.334	253.9	0.000
6.4544	0.607	1.387	260.9	0.000
6.5417	0.612	1.440	268.0	0.000
6.6289	0.617	1.493	275.1	0.000
6.7161	0.623	1.548	282.3	0.000
6.8033	0.628	1.602	289.5	0.000
6.8906	0.634	1.657	296.8	0.000
6.9778	0.639	1.713	304.2	0.000
7.0650	0.644	1.769	311.6	0.000
7.1522	0.650	1.825	319.1	0.000
7.2394	0.655	1.882	326.6	0.000
7.3267	0.661	1.940	334.2	0.000
7.4139	0.666	1.998	341.9	0.000
7.5011	0.672	2.056	349.6	0.000
7.5883	0.677	2.115	357.3	0.000
7.6756	0.682	2.174	365.2	0.000
7.7628	0.688	2.234	373.1	0.000
7.8500	0.693	2.294	381.0	0.000

Name : Bioretenti Surface1)
Bottom Length: 0.00 ft.
Bottom Width : 0.00 ft.
Material thickness of first layer : 0
Pour Space of material for first layer : 0
Material thickness of second layer : 0
Pour Space of material for second layer : 0
Material thickness of third layer : 0
Pour Space of material for third layer : 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
Bioretention 1 (BMP

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.945256
5 year	4.410454
10 year	5.053798
25 year	5.52906

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.189255
5 year	3.015014
10 year	3.61674
25 year	5.764236

Yearly Peaks for Predeveloped and Mitigated. POC#1

Year	Predeveloped	Mitigated
1964	0.933	0.066
1965	2.713	3.299
1966	5.531	5.943
1967	0.605	0.167
1968	3.691	1.475
1969	1.259	0.142
1970	3.678	0.147
1971	0.076	0.038
1972	0.768	0.048
1973	0.390	0.081
1974	0.168	0.044
1975	0.686	0.110
1976	0.130	0.042
1977	5.348	5.774
1978	2.965	2.941
1979	4.405	5.007
1980	0.711	0.100
1981	1.604	0.122
1982	4.975	2.506
1983	1.120	0.104
1984	0.069	0.020
1985	4.415	2.203
1986	0.782	0.051
1987	0.486	0.063
1988	0.093	0.043

1989	0.110	0.028
1990	2.481	1.657
1991	2.903	0.213
1992	6.099	3.066
1993	0.681	0.066
1994	5.126	3.304
1995	0.093	0.106
1996	0.481	0.117
1997	4.588	0.535
1998	0.000	0.000
1999	0.063	0.019
2000	0.080	0.032
2001	0.094	0.022
2002	0.246	0.039
2003	0.317	0.072
2004	0.000	0.000

POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1945	632	626	99	Pass
0.2436	505	486	96	Pass
0.2927	440	379	86	Pass
0.3418	396	326	82	Pass
0.3909	354	279	78	Pass
0.4399	330	243	73	Pass
0.4890	310	223	71	Pass
0.5381	285	203	71	Pass
0.5872	267	192	71	Pass
0.6363	252	177	70	Pass
0.6854	244	167	68	Pass
0.7344	233	156	66	Pass
0.7835	224	149	66	Pass
0.8326	214	141	65	Pass
0.8817	206	136	66	Pass
0.9308	197	131	66	Pass
0.9799	186	126	67	Pass
1.0289	184	122	66	Pass
1.0780	178	119	66	Pass
1.1271	166	116	69	Pass
1.1762	161	113	70	Pass
1.2253	153	108	70	Pass
1.2744	141	102	72	Pass
1.3234	128	90	70	Pass

1.3725	122	84	68	Pass
1.4216	113	80	70	Pass
1.4707	101	77	76	Pass
1.5198	93	73	78	Pass
1.5689	89	73	82	Pass
1.6179	85	72	84	Pass
1.6670	84	70	83	Pass
1.7161	80	69	86	Pass
1.7652	77	64	83	Pass
1.8143	74	62	83	Pass
1.8634	67	58	86	Pass
1.9125	62	52	83	Pass
1.9615	62	51	82	Pass
2.0106	58	50	86	Pass
2.0597	57	48	84	Pass
2.1088	55	47	85	Pass
2.1579	51	47	92	Pass
2.2070	50	45	90	Pass
2.2560	47	42	89	Pass
2.3051	45	40	88	Pass
2.3542	44	38	86	Pass
2.4033	43	35	81	Pass
2.4524	42	33	78	Pass
2.5015	40	30	75	Pass
2.5505	38	28	73	Pass
2.5996	37	28	75	Pass
2.6487	37	28	75	Pass
2.6978	37	28	75	Pass
2.7469	36	26	72	Pass
2.7960	35	25	71	Pass
2.8450	33	23	69	Pass
2.8941	31	23	74	Pass
2.9432	30	22	73	Pass
2.9923	28	21	75	Pass
3.0414	27	19	70	Pass
3.0905	27	17	62	Pass
3.1395	27	16	59	Pass
3.1886	27	16	59	Pass
3.2377	27	16	59	Pass
3.2868	26	15	57	Pass
3.3359	26	13	50	Pass
3.3850	26	11	42	Pass
3.4340	25	11	44	Pass
3.4831	25	11	44	Pass
3.5322	25	10	40	Pass
3.5813	25	10	40	Pass
3.6304	25	10	40	Pass
3.6795	23	9	39	Pass
3.7285	21	9	42	Pass
3.7776	21	9	42	Pass
3.8267	20	9	45	Pass
3.8758	20	9	45	Pass
3.9249	19	8	42	Pass

3.9740	19	8	42	Pass
4.0230	18	8	44	Pass
4.0721	17	7	41	Pass
4.1212	16	7	43	Pass
4.1703	15	7	46	Pass
4.2194	14	7	50	Pass
4.2685	14	7	50	Pass
4.3175	13	6	46	Pass
4.3666	13	6	46	Pass
4.4157	12	6	50	Pass
4.4648	9	6	66	Pass
4.5139	9	6	66	Pass
4.5630	9	6	66	Pass
4.6120	8	5	62	Pass
4.6611	8	5	62	Pass
4.7102	6	5	83	Pass
4.7593	6	5	83	Pass
4.8084	6	5	83	Pass
4.8575	6	5	83	Pass
4.9065	6	5	83	Pass
4.9556	6	5	83	Pass
5.0047	5	5	100	Pass
5.0538	4	4	100	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

Perlnd and Implnd Changes
No changes have been made.

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Drawdown Analysis Results

BMP 1 – Bioretention 1

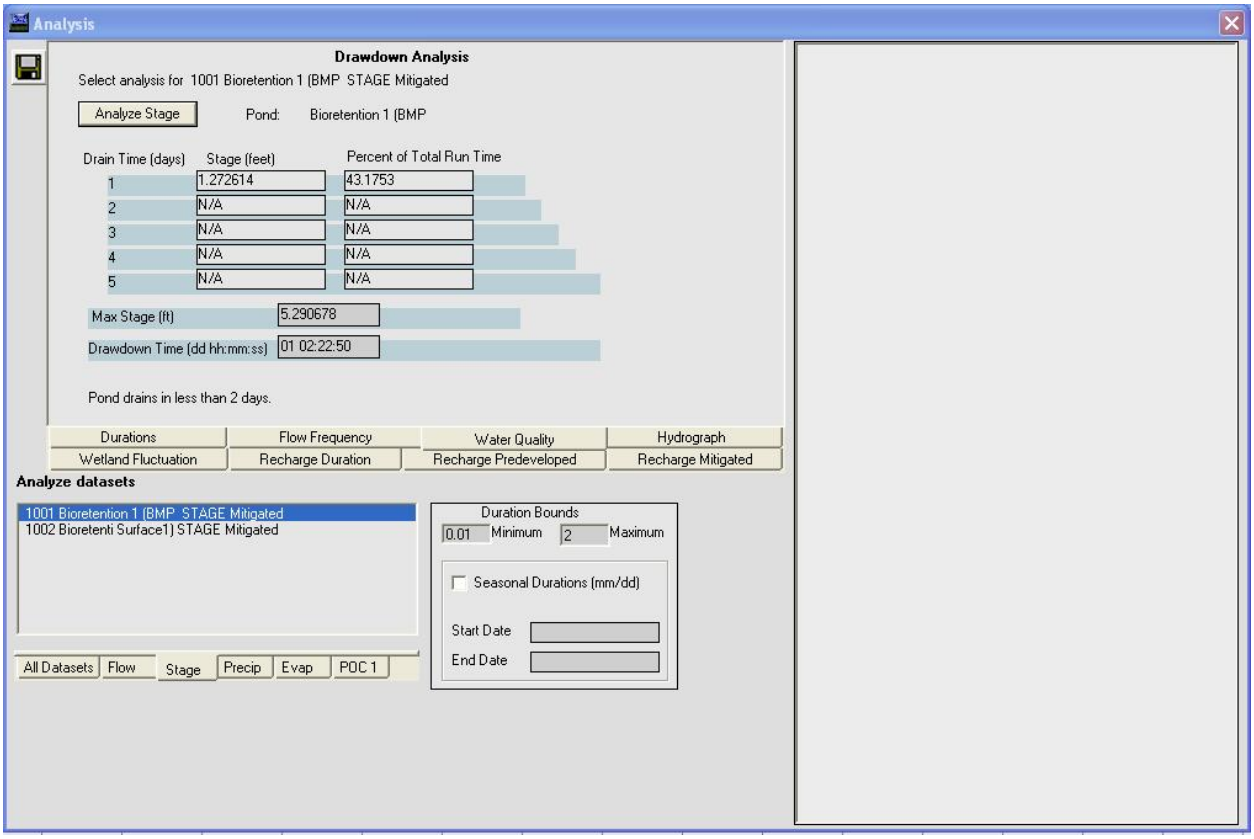
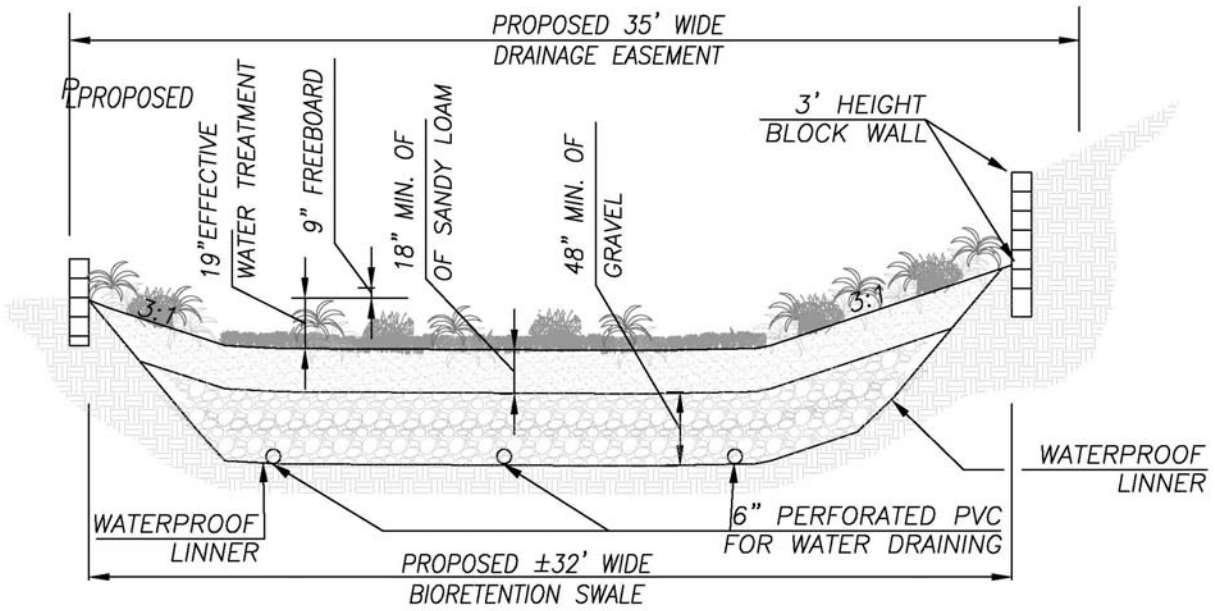


Figure 4-3 – Drawndown Analysis at POC1

Bioretention Section

BMP 1 – Bioretention 1 – 450' Long x 32' Wide



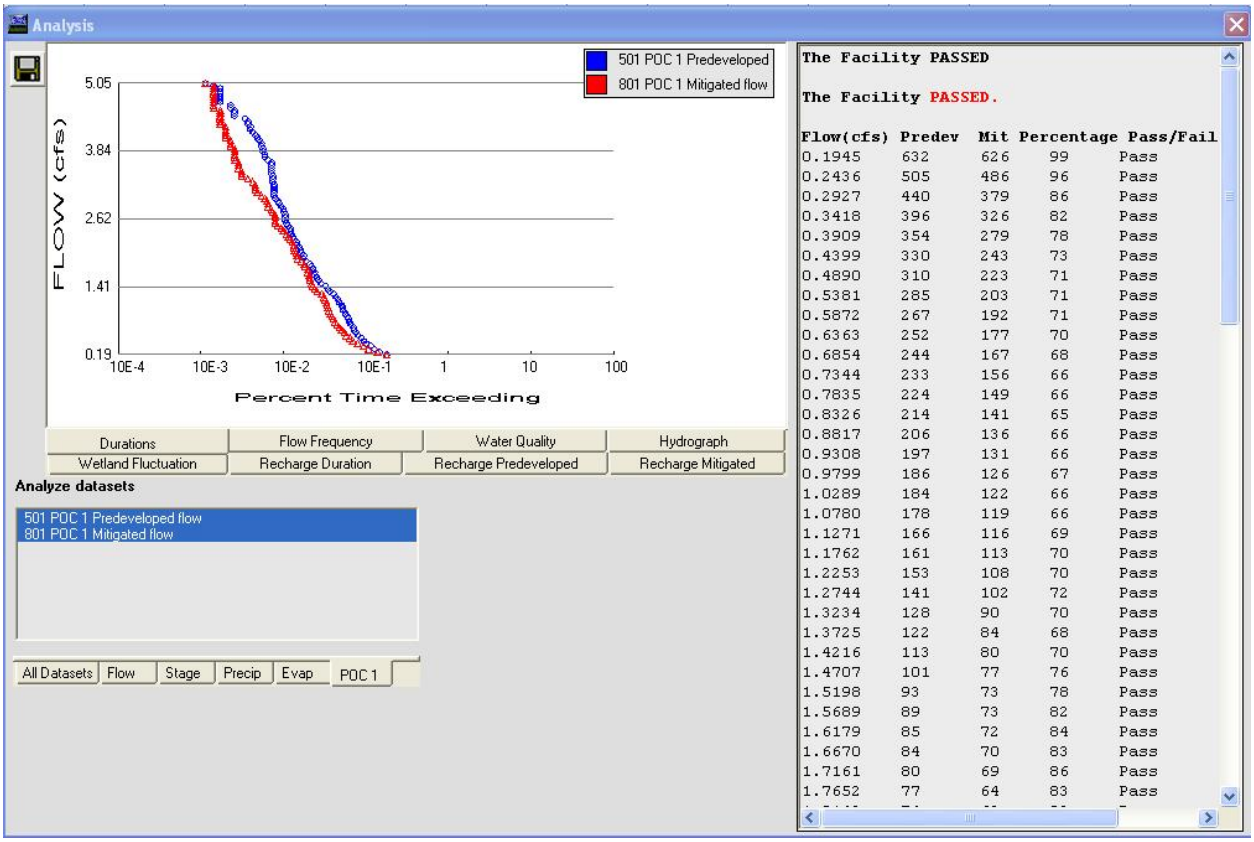


Figure 4-4 – Duration Analysis at POC1

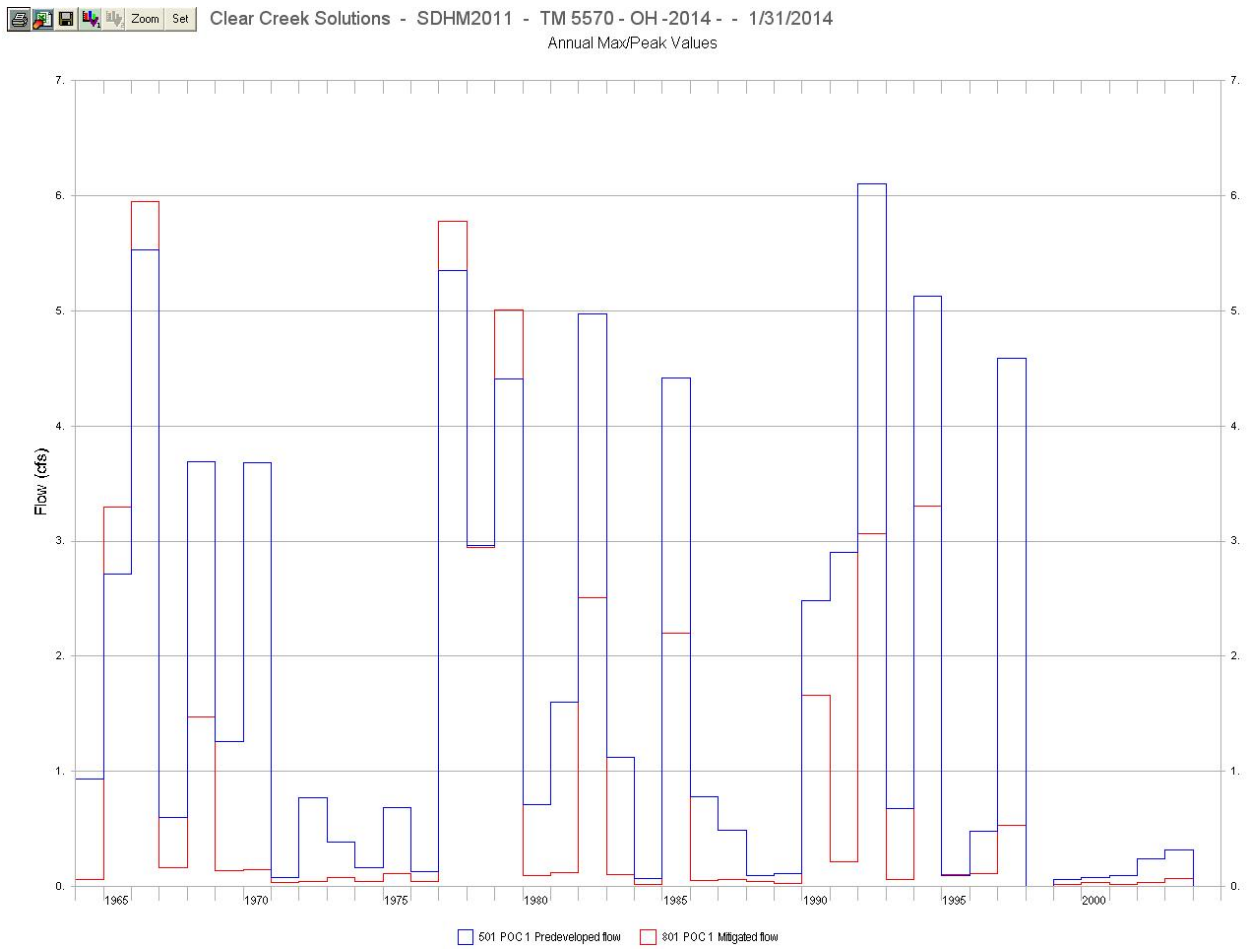


Figure 4-5 – Yearly Peak Values

ATTACHMENTS

Maps

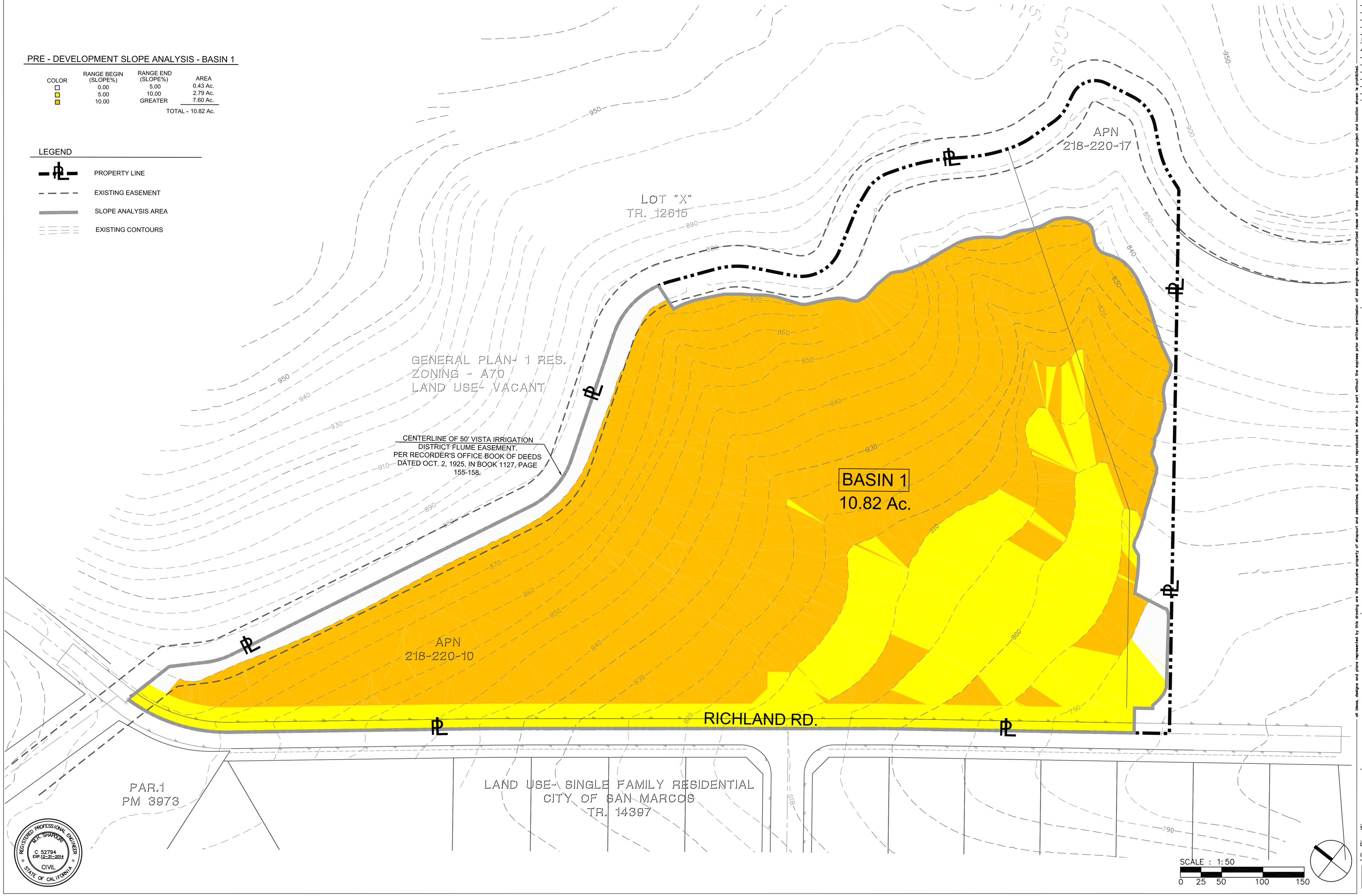
SLOPE ANALYSIS AREA FOR PRE-DEVELOPMENT HYDROMODIFICATION STUDY
ORCHARD HILLS - TM 5570

PRE - DEVELOPMENT SLOPE ANALYSIS - BASIN 1

COLOR	RANGE BEGIN (SLOPE%)	RANGE END (SLOPE%)	AREA
	0.00	5.00	0.43 Ac.
	5.00	10.00	2.79 Ac.
	10.00	GREATER	7.60 Ac.
		TOTAL -	10.82 Ac.

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SLOPE ANALYSIS AREA
- EXISTING CONTOURS



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PRE-DEVELOPMENT SLOPE ANALYSIS
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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PRE-DEVELOPMENT SLOPE ANALYSIS

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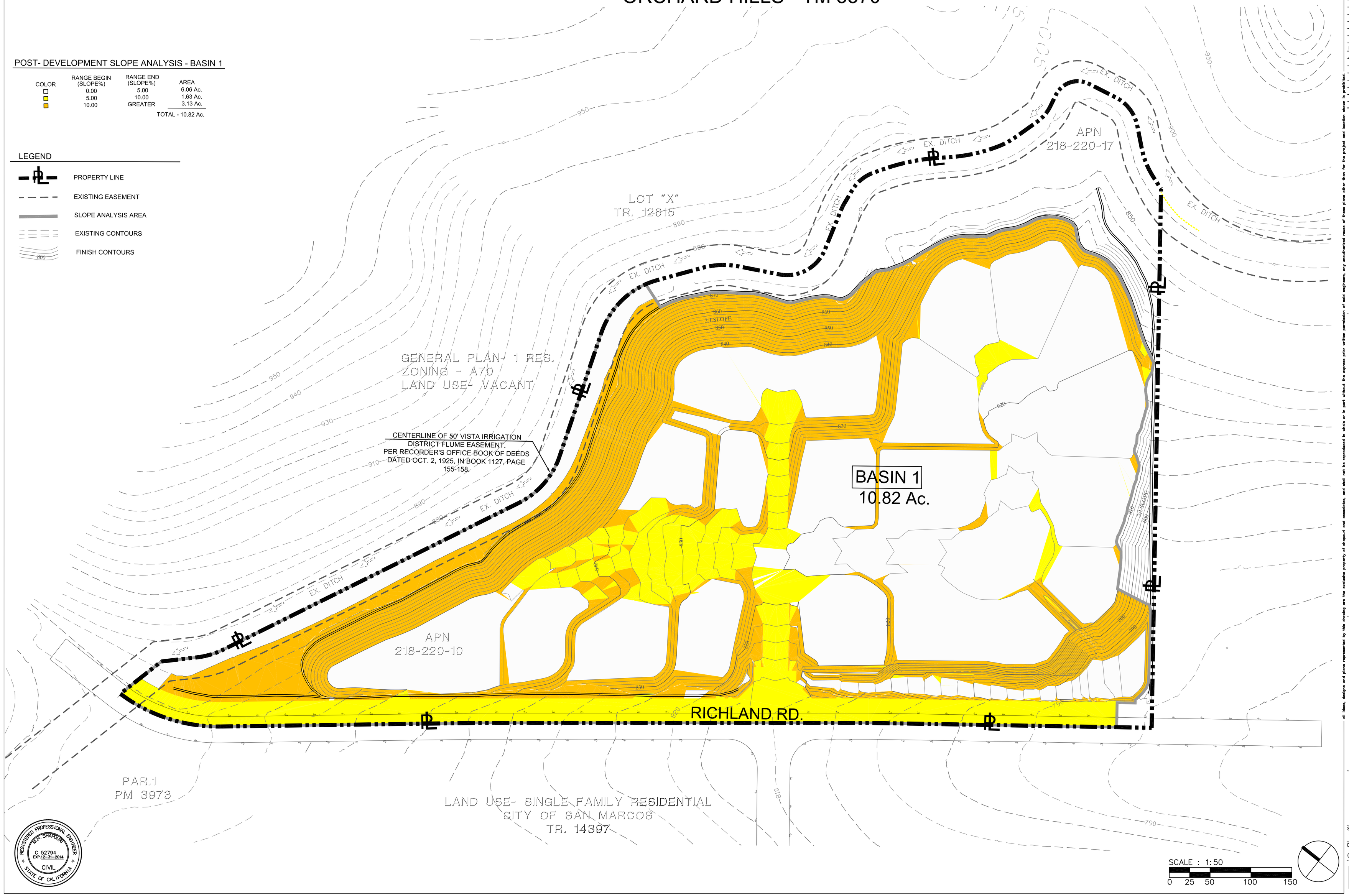
SLOPE ANALYSIS AREA FOR POST-DEVELOPMENT HYDROMODIFICATION STUDY
ORCHARD HILLS - TM 5570

POST- DEVELOPMENT SLOPE ANALYSIS - BASIN 1

COLOR	RANGE BEGIN (SLOPE%)	RANGE END (SLOPE%)	AREA
	0.00	5.00	6.06 Ac.
	5.00	10.00	1.63 Ac.
	10.00	GREATER	3.13 Ac.
			TOTAL - 10.82 Ac.

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SLOPE ANALYSIS AREA
- EXISTING CONTOURS
- FINISH CONTOURS



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POST-DEVELOPMENT SLOPE ANALYSIS
ORCHARD HILLS
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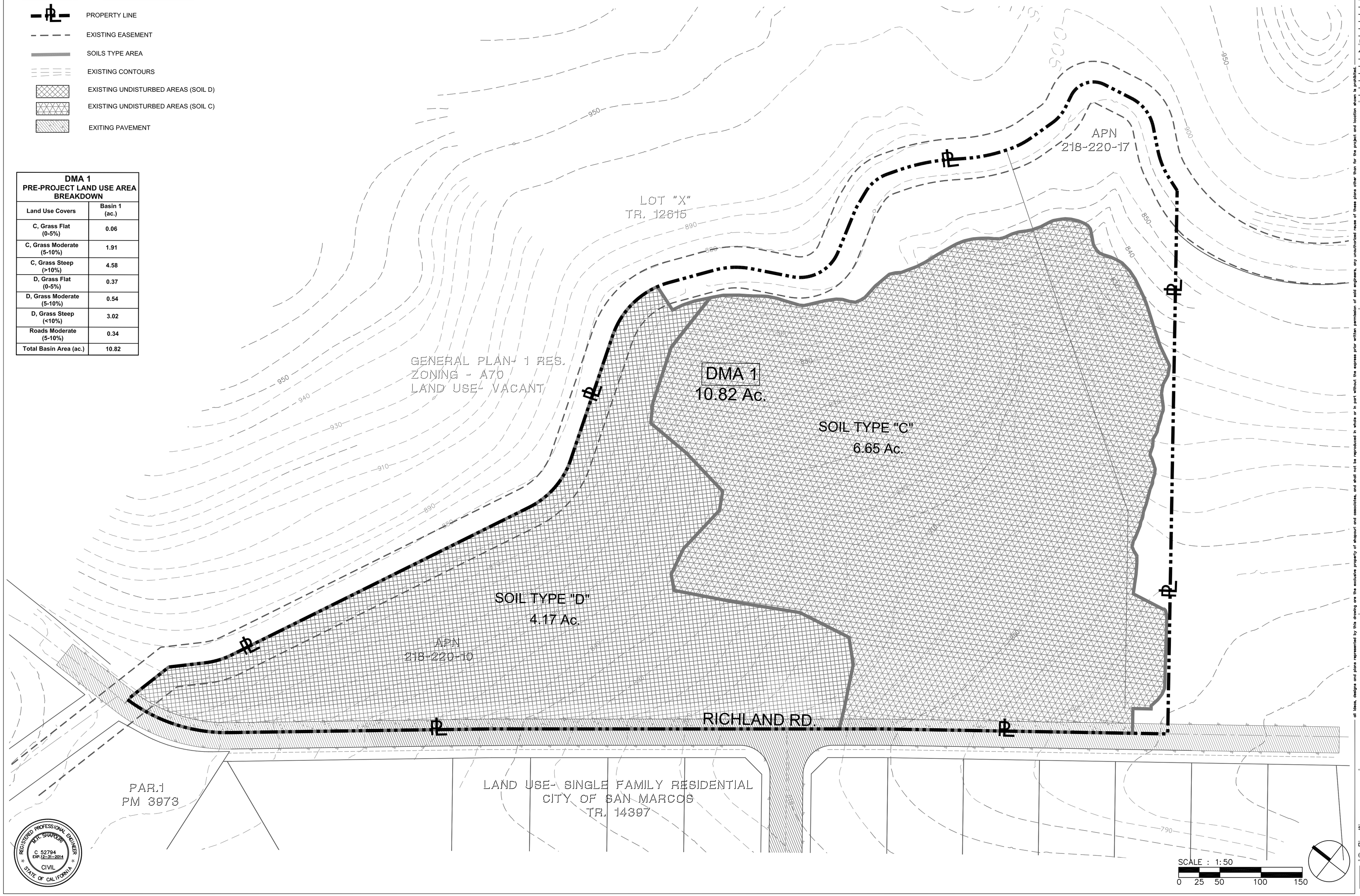
PRE PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS - TM 5570

LEGEND

- PROPERTY LINE
- EXISTING EASEMENT
- SOILS TYPE AREA
- EXISTING CONTOURS
- EXISTING UNDISTURBED AREAS (SOIL D)
- EXISTING UNDISTURBED AREAS (SOIL C)
- EXITING PAVEMENT

DMA 1
PRE-PROJECT LAND USE AREA BREAKDOWN

Land Use Covers	Basin 1 (ac.)
C, Grass Flat (0-5%)	0.06
C, Grass Moderate (5-10%)	1.91
C, Grass Steep (>10%)	4.58
D, Grass Flat (0-5%)	0.37
D, Grass Moderate (5-10%)	0.54
D, Grass Steep (<10%)	3.02
Roads Moderate (5-10%)	0.34
Total Basin Area (ac.)	10.82



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PRE PROJECT LAND USE &
DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS
RESIDENTIAL DEVELOPMENT

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PRE PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP

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POST PROJECT LAND USE & DRAINAGE MANAGEMENT AREA MAP
ORCHARD HILLS - TM 5570

DMA 1

PERLND No.	Soil Type	Vegetation/Surface/Groundcover	Slope (%)	Area (ft.^{2})	Area (acres)
BASIN 1		Driveway		24899	0.57
BASIN 1		Sidewalk		13733	0.32
BASIN 1		Roads		61040	1.40
BASIN 1	C/D	Urban (Landscape)		294648	6.76
BASIN 1	C/D	Undisturbed (Natural)		35651	0.82
BASIN 1		Roof		41330	0.95
			Total	471301	10.82

Minimum IMP Area Calculations

DMA #	Area (ft.^{2})	Post-Development Surface Type	Runoff Factor	DMA Area x Runoff Factor (ft.^{2})
1	24899	Driveway	1	24899
1	13733	Sidewalk	1	13733
1	61040	Roads	1	61040
1	294648	Urban (Landscape)	0.1	29465
1	35651	Undisturbed (Natural)	0.1	3565
1	41330	Roof	1	41330
			Total	174032

Soil Type	IMP Designator
C, D	BIORETENTION

Imp Sizing Factor	Min. Area (ft.^{2})	Proposed Area (ft.^{2})
0.04	6961	15400

DMA 2

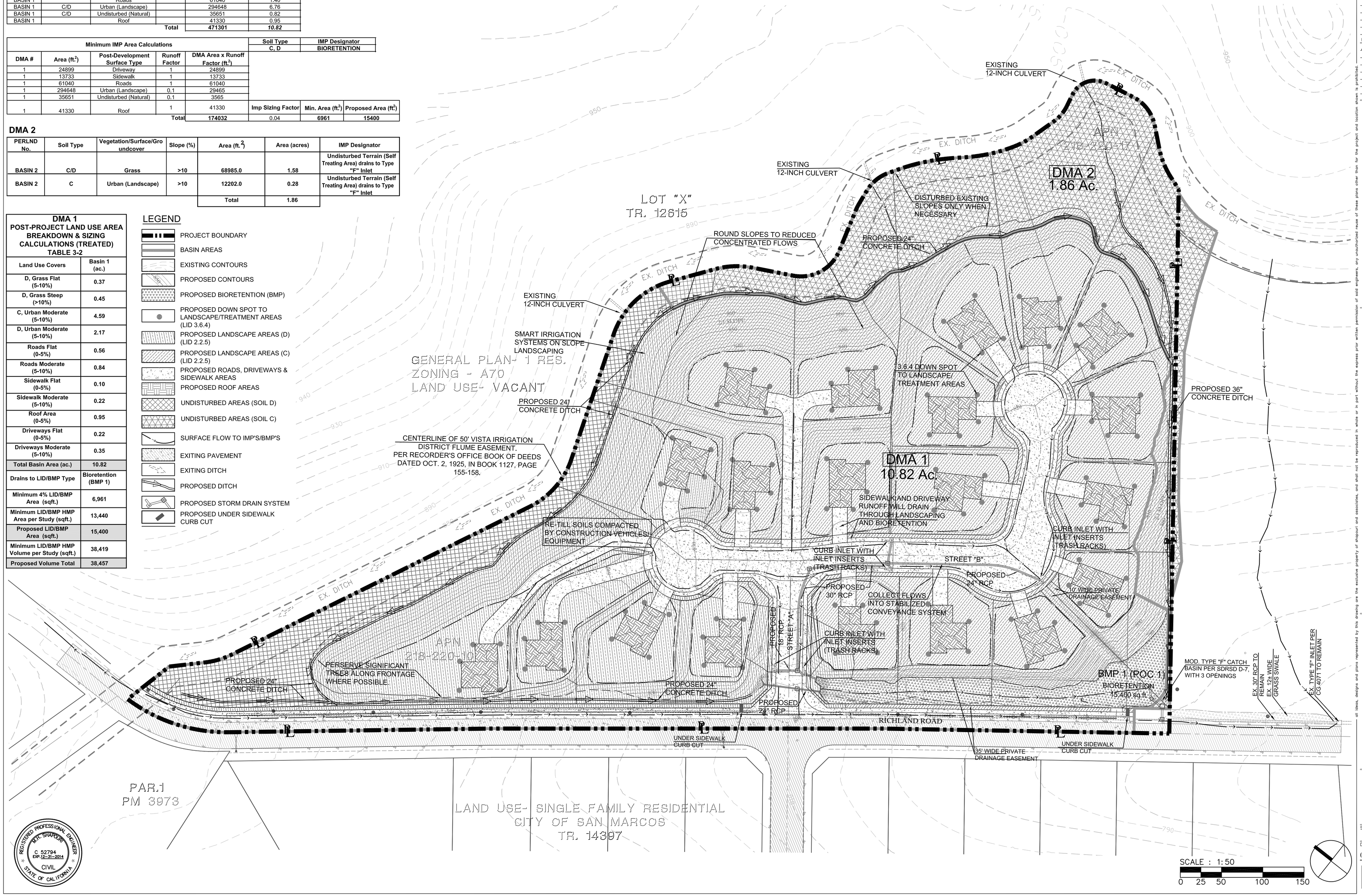
PERLND No.	Soil Type	Vegetation/Surface/Groundcover	Slope (%)	Area (ft.^{2})	Area (acres)	IMP Designator
BASIN 2	C/D	Grass	>10	68985.0	1.58	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
BASIN 2	C	Urban (Landscape)	>10	12202.0	0.28	Undisturbed Terrain (Self Treating Area) drains to Type "F" Inlet
				Total	1.86	

DMA 1 POST-PROJECT LAND USE AREA BREAKDOWN & SIZING CALCULATIONS (TREATED) TABLE 3-2

Land Use Covers	Basin 1 (ac.)
D, Grass Flat (5-10%)	0.37
D, Grass Steep (>10%)	0.45
C, Urban Moderate (5-10%)	4.59
D, Urban Moderate (5-10%)	2.17
Roads Flat (0-5%)	0.56
Roads Moderate (5-10%)	0.84
Sidewalk Flat (0-5%)	0.10
Sidewalk Moderate (5-10%)	0.22
Roof Area (0-5%)	0.95
Driveways Flat (0-5%)	0.22
Driveways Moderate (5-10%)	0.35
Total Basin Area (ac.)	10.82
Drains to LID/BMP Type	Bioretention (BMP 1)
Minimum 4% LID/BMP Area (sqft.)	6,961
Minimum LID/BMP HMP Area per Study (sqft.)	13,440
Proposed LID/BMP Area (sqft.)	15,400
Minimum LID/BMP HMP Volume per Study (sqft.)	38,419
Proposed Volume Total	38,457

LEGEND

- PROJECT BOUNDARY
- BASIN AREAS
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED BIORETENTION (BMP)
- PROPOSED DOWN SPOT TO LANDSCAPE/TREATMENT AREAS (LID 3.6.4)
- PROPOSED LANDSCAPE AREAS (D) (LID 2.2.5)
- PROPOSED LANDSCAPE AREAS (C) (LID 2.2.5)
- PROPOSED ROADS, DRIVEWAYS & SIDEWALK AREAS
- PROPOSED ROOF AREAS
- UNDISTURBED AREAS (SOIL D)
- UNDISTURBED AREAS (SOIL C)
- SURFACE FLOW TO IMP'S/BMP'S
- EXITING PAVEMENT
- EXITING DITCH
- PROPOSED DITCH
- PROPOSED STORM DRAIN SYSTEM
- PROPOSED UNDER SIDEWALK CURB CUT



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POST LAND USE & DRAINAGE MANAGEMENT AREA MAP

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