TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Passerelle TM (Parcel 2)

Prepared For:

Passerelle, LLC

Updated: August 21, 2023

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

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TECHNICAL MEMORANDUM

TO: Passerelle, LLC.

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE, CFM.

DATE: March 10, 2021. Updated: August 21, 2023

RE: Summary of SWMM Modeling for Hydromodification Compliance for Passerelle Parcel 2, County of San Diego, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed residential site in the County of San Diego using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed LID HMP facilities have sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Passerelle Parcel 2 project proposes multifamily residential structures on the currently undeveloped site. Two (2) SWMM models were prepared for this study: the first for the predevelopment and the second for the post-developed conditions. The project site drains to a single Point of Compliance located to within the adjacent Horse Ranch Creek Road to the west of the project site.

Per Section G1.2 in Appendix G of the 2020 County of San Diego BMP Design Manual, the EPA SWMM model was used to perform the continuous hydrologic simulation. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Fallbrook Gage from the Project Clean Water website was used for this study since it is the most representative of the project site precipitation due to elevation and proximity to the project site (see figure included in Attachment 5).

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 6 Evapotranspiration Area (see Attachment 5). Thus, evapotranspiration vales for the site were modeled using Zone 6 average monthly values from Table G.1-1 from the 2020 BMP Design Manual. Per the NRCS web soil survey and site specific geotechnical investigation, the project site is situated upon C soils. Soils have been assumed to be un-compacted in the existing condition to represent the current condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

The current site is an undeveloped lot that drains via overland flow to the western boundary of the project site to the receiving storm drain system located within the adjacent Horse Ranch Creek Road. Table 1 below illustrates the pre-developed area to be redeveloped and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Hydrologic Soil Class	Tributary Area, A (Ac)	Impervious Percentage, Ip(1)
POC-1	DMA-Flat-C	C	7.0323	0%
	DMA-Slope-C	C	1.5437	0%
TOTAL	**--**	**--**	**8.576**	0%

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

DEVELOPED CONDITIONS

Storm water runoff from the proposed project site is routed to the existing discharge location to the south west of the project site at the existing storm drain located within Horse Ranch Creek Road. Runoff from the developed project site is drained to one (1) onsite receiving underground HMP detention system. Once flows are routed via the proposed BMP, developed onsite flows are then conveyed to the aforementioned outlet location. It should be noted that a small portion of the project bypasses the HMP detention facility and drains directly to the POC.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

POC	DMA	Hydrologic Soil Class	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-A-1-C	C	7.7048	77.18%
	DMA-B-1-C	C	0.1414	66.57%
	DMA-C-1-C	C	0.6178	25.0%
	DMA-BYPASS-C	C	0.3098	0.0%
TOTAL	**--**	**--**	**8.7738**	--

An underground detention system comprising of sixty (60) 8’ x 16’ concrete pre-fabricated vaults (7 ft x 15 ft internal dimensions, 8 ft tall) and a base 9” layer of gravel has been designed. This system is to be located within the project site and is responsible for handling hydromodification requirements for the project site. In developed conditions, the total depth of the system inclusive of the gravel foundation will have a ponded depth of 8.75 ft and a riser spillway structure (see dimensions in Table 4). It should be noted that the 8.75 feet include the distance from the bottom of the gravel up to the soffit of the concrete vaults. Flows will then discharge from the basin via a series of outlets within the riser structure. The riser will act as a spillway such that peak flows can be safely discharged to the receiving storm drain.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project will be met by the bio-filtration LID BMPs detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo. For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP BMPs

One (1) HMP BMP underground detention vault is proposed for hydromodification conformance for the project site. Table 4 illustrates the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE BMPs

BMP	Tributary Area (Ac)	DIMENSIONS					
		HMP Area(1), (ft^2)	Depth(5) (ft)	System Volume (ft^3)	Low Flow Invert (ft)(2)	Low Flow Orifice Diameter (in)	Total Depth(4) (ft)
BASIN 1	8.415	7,680	8.75	52,704	0.75-ft	2 – 2 $^3/_{16}$-in	8.75

Notes: (1): Area where detention vaults or similar system will be placed inclusive of the gravel surrounding it.
(2): Depth of ponding beneath LID orifice, assuming 0.0 ft elevation is the base of the sub layer of gravel.
(3): Overflow length of the internal emergency spillway weir.
(4): This total depth includes 9" of gravel foundation.
(5): The depth shown includes 9 inches of gravel foundation below the detention pipes.

TABLE 4 – SUMMARY OF OUTLET STRUCTURE

BASIN	Lower Slot			Middle Slot			Upper Slot			Weir	
	Width (in)	Height (in)	Elev.(1) (ft)	Width (in)	Height (in)	Elev.(1) (ft)	Width (in)	Height (in)	Elev.(1) (ft)	Invert (ft)	Width (ft)
1	67	1.0	3'9"	9	12.0	3'11"	24	1.5	5'0"	7'8"	7.0

Notes: (1): Elevation 0.0 is equal to the base invert of the underlying gravel layer.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for the POC. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. Due to the complexity of the model carried out in pre and post-development conditions, a more accurate value of the Manning's coefficient for pervious areas has been chosen. Taken into consideration the "Handouts on Supplemental Guidance – Handout #2: Manning's "n" Values for Overland Flow Using EPA SWMM V.5" by the County of San Diego (Reference [6]) a more accurate value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between pasture and shrubs and bushes (which is also the value of dense grass) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP BMPs provided for the Passerelle Parcel 2 project site is sufficient to meet the current HMP criteria if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type C Soils is representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

[1] – *"Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista",* May 2012, TRW Engineering.

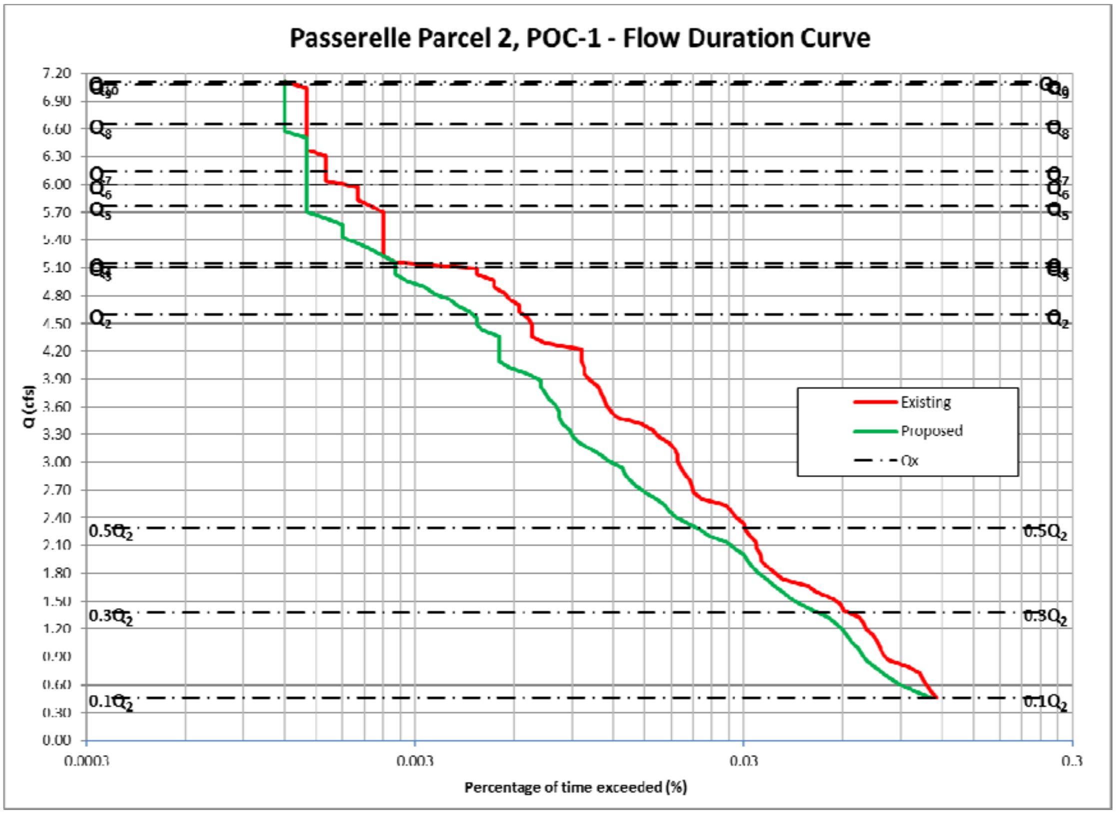
[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-20013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – "*County of San Diego BMP Design Manual*", January 2020.

[6] – "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*", 2016, TRW Engineering.



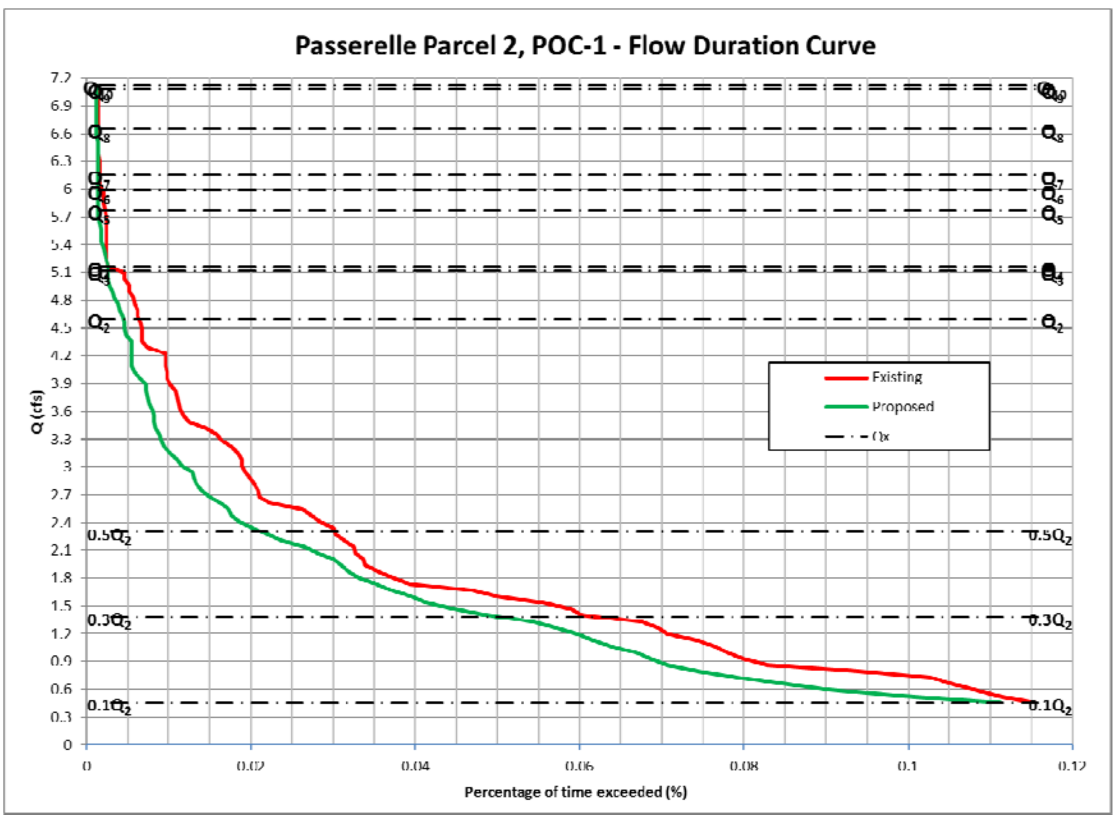


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal “x” scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	4.602	3.563	1.039
3-year	5.116	4.442	0.675
4-year	5.153	4.821	0.332
5-year	5.769	4.963	0.806
6-year	5.991	5.191	0.800
7-year	6.144	5.319	0.825
8-year	6.650	5.845	0.806
9-year	7.080	6.672	0.408
10-year	7.114	7.129	-0.015

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

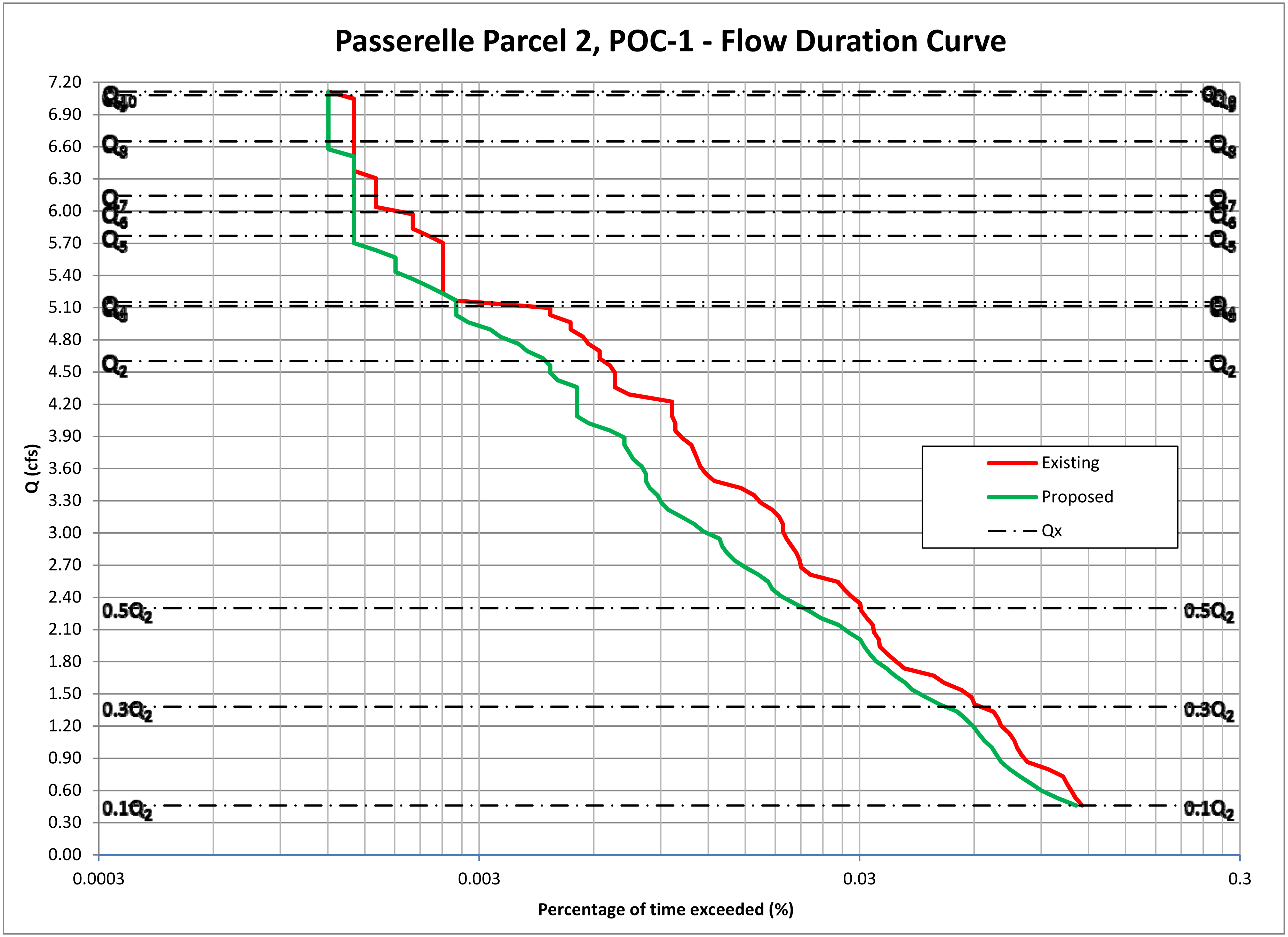
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 – Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

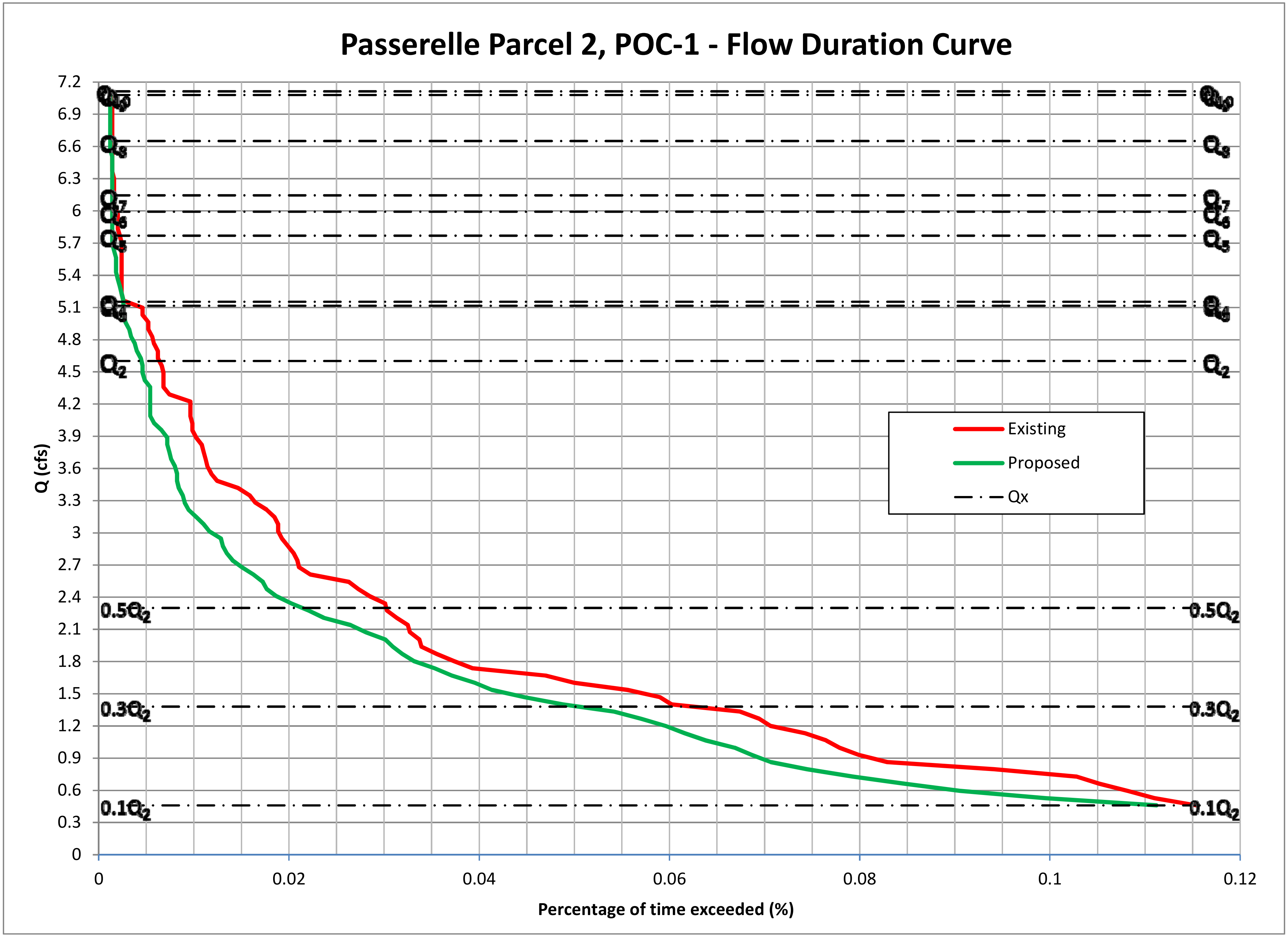
Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the “x” axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the County of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the “y” axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x – Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the “n” largest independent peak flows obtained from the continuous time series.

The largest “n” peak flows are attached in this appendix, as well as the values of Q_i with a return period “i”, from i=2 to 10. The Q_i values are also added into the flow-duration plot.


Passerelle Parcel 2, POC-1 - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
4.20
3.90
3.60
3.30
3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.90
0.60
0.30
0.00
0.0003
0.003
0.03
0.3
Existing
Proposed
Qx
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2



Passerelle Parcel 2, POC-1 - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
7.2
6.9
6.6
6.3
6
5.7
5.4
5.1
4.8
4.5
4.2
3.9
3.6
3.3
3
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
0
0.02
0.04
0.06
0.08
0.1
0.12
Existing
Proposed
Qx
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$

Flow Duration Curve Data for Passerelle TM Phase 2, POC-1, County of San Diego

Q2 =	4.60	cfs	Fraction	10 %
Q10 =	7.11	cfs		
Step =	0.0672	cfs		
Count =	498239	hours		
	56.84	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.460	575	1.15E-01	554	1.11E-01	96%	Pass
2	0.527	553	1.11E-01	496	9.96E-02	90%	Pass
3	0.595	539	1.08E-01	451	9.05E-02	84%	Pass
4	0.662	524	1.05E-01	422	8.47E-02	81%	Pass
5	0.729	512	1.03E-01	395	7.93E-02	77%	Pass
6	0.796	469	9.41E-02	371	7.45E-02	79%	Pass
7	0.863	413	8.29E-02	352	7.06E-02	85%	Pass
8	0.931	398	7.99E-02	342	6.86E-02	86%	Pass
9	0.998	388	7.79E-02	333	6.68E-02	86%	Pass
10	1.065	381	7.65E-02	318	6.38E-02	83%	Pass
11	1.132	370	7.43E-02	307	6.16E-02	83%	Pass
12	1.199	352	7.06E-02	297	5.96E-02	84%	Pass
13	1.267	346	6.94E-02	284	5.70E-02	82%	Pass
14	1.334	336	6.74E-02	270	5.42E-02	80%	Pass
15	1.401	300	6.02E-02	243	4.88E-02	81%	Pass
16	1.468	294	5.90E-02	223	4.48E-02	76%	Pass
17	1.535	277	5.56E-02	206	4.13E-02	74%	Pass
18	1.603	249	5.00E-02	197	3.95E-02	79%	Pass
19	1.670	234	4.70E-02	185	3.71E-02	79%	Pass
20	1.737	196	3.93E-02	176	3.53E-02	90%	Pass
21	1.804	186	3.73E-02	165	3.31E-02	89%	Pass
22	1.872	177	3.55E-02	159	3.19E-02	90%	Pass
23	1.939	169	3.39E-02	154	3.09E-02	91%	Pass
24	2.006	168	3.37E-02	150	3.01E-02	89%	Pass
25	2.073	163	3.27E-02	140	2.81E-02	86%	Pass
26	2.140	162	3.25E-02	132	2.65E-02	81%	Pass
27	2.208	156	3.13E-02	118	2.37E-02	76%	Pass
28	2.275	151	3.03E-02	110	2.21E-02	73%	Pass
29	2.342	150	3.01E-02	101	2.03E-02	67%	Pass
30	2.409	142	2.85E-02	93	1.87E-02	65%	Pass
31	2.476	136	2.73E-02	88	1.77E-02	65%	Pass
32	2.544	131	2.63E-02	86	1.73E-02	66%	Pass
33	2.611	111	2.23E-02	81	1.63E-02	73%	Pass
34	2.678	105	2.11E-02	75	1.51E-02	71%	Pass
35	2.745	104	2.09E-02	70	1.40E-02	67%	Pass
36	2.812	102	2.05E-02	67	1.34E-02	66%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	2.880	99	1.99E-02	65	1.30E-02	66%	Pass
38	2.947	96	1.93E-02	64	1.28E-02	67%	Pass
39	3.014	94	1.89E-02	58	1.16E-02	62%	Pass
40	3.081	94	1.89E-02	55	1.10E-02	59%	Pass
41	3.148	92	1.85E-02	51	1.02E-02	55%	Pass
42	3.216	88	1.77E-02	47	9.43E-03	53%	Pass
43	3.283	82	1.65E-02	45	9.03E-03	55%	Pass
44	3.350	79	1.59E-02	44	8.83E-03	56%	Pass
45	3.417	73	1.47E-02	42	8.43E-03	58%	Pass
46	3.484	62	1.24E-02	41	8.23E-03	66%	Pass
47	3.552	59	1.18E-02	41	8.23E-03	69%	Pass
48	3.619	57	1.14E-02	40	8.03E-03	70%	Pass
49	3.686	56	1.12E-02	38	7.63E-03	68%	Pass
50	3.753	55	1.10E-02	37	7.43E-03	67%	Pass
51	3.821	54	1.08E-02	36	7.23E-03	67%	Pass
52	3.888	51	1.02E-02	36	7.23E-03	71%	Pass
53	3.955	49	9.83E-03	33	6.62E-03	67%	Pass
54	4.022	49	9.83E-03	29	5.82E-03	59%	Pass
55	4.089	48	9.63E-03	27	5.42E-03	56%	Pass
56	4.157	48	9.63E-03	27	5.42E-03	56%	Pass
57	4.224	48	9.63E-03	27	5.42E-03	56%	Pass
58	4.291	37	7.43E-03	27	5.42E-03	73%	Pass
59	4.358	34	6.82E-03	27	5.42E-03	79%	Pass
60	4.425	34	6.82E-03	24	4.82E-03	71%	Pass
61	4.493	34	6.82E-03	23	4.62E-03	68%	Pass
62	4.560	33	6.62E-03	23	4.62E-03	70%	Pass
63	4.627	31	6.22E-03	22	4.42E-03	71%	Pass
64	4.694	31	6.22E-03	20	4.01E-03	65%	Pass
65	4.761	29	5.82E-03	19	3.81E-03	66%	Pass
66	4.829	28	5.62E-03	17	3.41E-03	61%	Pass
67	4.896	26	5.22E-03	16	3.21E-03	62%	Pass
68	4.963	26	5.22E-03	14	2.81E-03	54%	Pass
69	5.030	23	4.62E-03	13	2.61E-03	57%	Pass
70	5.097	23	4.62E-03	13	2.61E-03	57%	Pass
71	5.165	13	2.61E-03	13	2.61E-03	100%	Pass
72	5.232	12	2.41E-03	12	2.41E-03	100%	Pass
73	5.299	12	2.41E-03	11	2.21E-03	92%	Pass
74	5.366	12	2.41E-03	10	2.01E-03	83%	Pass
75	5.433	12	2.41E-03	9	1.81E-03	75%	Pass
76	5.501	12	2.41E-03	9	1.81E-03	75%	Pass
77	5.568	12	2.41E-03	9	1.81E-03	75%	Pass
78	5.635	12	2.41E-03	8	1.61E-03	67%	Pass
79	5.702	12	2.41E-03	7	1.40E-03	58%	Pass
80	5.770	11	2.21E-03	7	1.40E-03	64%	Pass
81	5.837	10	2.01E-03	7	1.40E-03	70%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	5.904	10	2.01E-03	7	1.40E-03	70%	Pass
83	5.971	10	2.01E-03	7	1.40E-03	70%	Pass
84	6.038	8	1.61E-03	7	1.40E-03	88%	Pass
85	6.106	8	1.61E-03	7	1.40E-03	88%	Pass
86	6.173	8	1.61E-03	7	1.40E-03	88%	Pass
87	6.240	8	1.61E-03	7	1.40E-03	88%	Pass
88	6.307	8	1.61E-03	7	1.40E-03	88%	Pass
89	6.374	7	1.40E-03	7	1.40E-03	100%	Pass
90	6.442	7	1.40E-03	7	1.40E-03	100%	Pass
91	6.509	7	1.40E-03	7	1.40E-03	100%	Pass
92	6.576	7	1.40E-03	6	1.20E-03	86%	Pass
93	6.643	7	1.40E-03	6	1.20E-03	86%	Pass
94	6.710	7	1.40E-03	6	1.20E-03	86%	Pass
95	6.778	7	1.40E-03	6	1.20E-03	86%	Pass
96	6.845	7	1.40E-03	6	1.20E-03	86%	Pass
97	6.912	7	1.40E-03	6	1.20E-03	86%	Pass
98	6.979	7	1.40E-03	6	1.20E-03	86%	Pass
99	7.046	7	1.40E-03	6	1.20E-03	86%	Pass
100	7.114	6	1.20E-03	6	1.20E-03	100%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	7.114	7.129	-0.015
9	7.080	6.672	0.408
8	6.650	5.845	0.806
7	6.144	5.319	0.825
6	5.991	5.191	0.800
5	5.769	4.963	0.806
4	5.153	4.821	0.332
3	5.116	4.442	0.675
2	4.602	3.563	1.039

ATTACHMENT 3

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of Q2 and Q10 (Pre-Development)

Passerelle TM Phase 2 POC1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**7.114**	**7.13**
9	**7.080**	**7.10**
8	**6.65**	**6.87**
7	**6.14**	**6.25**
6	**5.99**	**6.00**
5	**5.77**	**5.79**
4	**5.15**	**5.15**
3	**5.12**	**5.12**
2	**4.60**	**4.60**

Note:
Cunnane is the preferred method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
3.4316	1/18/1973	57	1.02	1.01
3.4316	1/29/1983	56	1.04	1.03
3.433	1/16/1973	55	1.05	1.05
3.4355	1/25/1969	54	1.07	1.07
3.5159	10/20/2004	53	1.09	1.09
3.5176	1/22/1964	52	1.12	1.11
3.5229	12/18/1967	51	1.14	1.13
3.5971	2/15/1986	50	1.16	1.15
3.6054	1/16/1993	49	1.18	1.18
3.6571	1/29/1981	48	1.21	1.20
3.7365	3/11/1995	47	1.23	1.23
3.8132	11/30/2007	46	1.26	1.25
3.8692	1/11/2001	45	1.29	1.28
3.8753	2/6/1969	44	1.32	1.31
3.8792	2/14/1980	43	1.35	1.34
3.9035	2/8/1993	42	1.38	1.38
3.9173	11/14/1972	41	1.41	1.41
4.0804	11/15/1952	40	1.45	1.44
4.2487	1/15/1979	39	1.49	1.48
4.2554	12/29/1965	38	1.53	1.52
4.2673	3/24/1983	37	1.57	1.56
4.2684	2/15/1992	36	1.61	1.61
4.2749	6/10/1990	35	1.66	1.65
4.2837	11/22/1965	34	1.71	1.70
4.2874	2/25/1969	33	1.76	1.75
4.3012	12/6/1966	32	1.81	1.81
4.3022	12/5/1966	31	1.87	1.87
4.5528	1/9/1998	30	1.93	1.93
4.6015	2/12/1992	29	2.00	2.00
4.6227	1/14/1993	28	2.07	2.07
4.7324	2/12/1978	27	2.15	2.15
4.7424	2/22/2004	26	2.23	2.23
4.8003	1/18/1955	25	2.32	2.33
4.8672	2/19/1980	24	2.42	2.42
4.8718	2/11/1973	23	2.52	2.53
5.0226	1/29/1980	22	2.64	2.65
5.1096	2/20/1980	21	2.76	2.78
5.1156	3/17/1982	20	2.90	2.92
5.117	1/11/1980	19	3.05	3.08
5.1301	2/16/1980	18	3.22	3.25
5.1356	9/10/1976	17	3.41	3.45
5.1502	11/24/1983	16	3.63	3.67
5.1509	2/18/1980	15	3.87	3.92
5.1583	2/23/1998	14	4.14	4.21
5.1647	1/4/1978	13	4.46	4.54
5.7573	2/11/1959	12	4.83	4.93
5.836	2/10/1963	11	5.27	5.40
5.9901	3/16/1986	10	5.80	5.96
6.0059	3/5/1995	9	6.44	6.65
6.3532	2/10/1978	8	7.25	7.53
7.0687	1/4/1995	7	8.29	8.67
7.1209	1/20/1982	6	9.67	10.21
7.1766	4/5/1967	5	11.60	12.43
7.7602	1/10/1978	4	14.50	15.89
9.4661	10/1/1983	3	19.33	22.00
11.2057	1/16/1978	2	29.00	35.75
11.2189	1/1/1982	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Passerelle TM Phase 2 POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)	Peaks (cfs)	Date	Posit	Period of Return (Years) Weibull	Period of Return (Years) Cunnane
10	**7.13**	**7.29**					
9	**6.67**	**6.89**	2.298	1/16/1952	57	1.02	1.01
8	**5.84**	**6.20**	2.33	2/6/1969	56	1.04	1.03
7	**5.32**	**5.34**	2.337	5/8/1977	55	1.05	1.05
6	**5.19**	**5.22**	2.354	2/22/2004	54	1.07	1.07
5	**4.96**	**4.97**	2.387	2/16/1980	53	1.09	1.09
4	**4.82**	**4.82**	2.392	2/23/2005	52	1.12	1.11
3	**4.44**	**4.45**	2.419	10/20/2004	51	1.14	1.13
2	**3.56**	**3.56**	2.43	2/2/1960	50	1.16	1.15
			2.553	2/8/1993	49	1.18	1.18
			2.602	1/26/1956	48	1.21	1.20
			2.646	3/17/1982	47	1.23	1.23
			2.657	12/24/1971	46	1.26	1.25
			2.684	3/1/1991	45	1.29	1.28
			2.692	1/6/1979	44	1.32	1.31
			2.708	3/1/1970	43	1.35	1.34
			2.711	12/6/1997	42	1.38	1.38
			2.797	11/29/1985	41	1.41	1.41
			2.803	1/18/1955	40	1.45	1.44
			2.88	2/10/1978	39	1.49	1.48
			2.953	1/11/2001	38	1.53	1.52
			2.974	11/29/1970	37	1.57	1.56
			2.993	3/27/1991	36	1.61	1.61
			3.034	1/11/2005	35	1.66	1.65
			3.108	1/6/1993	34	1.71	1.70
			3.141	1/20/1962	33	1.76	1.75
			3.197	2/14/1980	32	1.81	1.81
			3.253	1/9/2005	31	1.87	1.87
			3.254	4/5/1967	30	1.93	1.93
			3.563	9/10/1976	29	2.00	2.00
			3.674	1/15/1978	28	2.07	2.07
			3.737	3/8/1968	27	2.15	2.15
			3.889	2/19/1980	26	2.23	2.23
			3.893	2/15/1986	25	2.32	2.33
			3.95	1/25/1969	24	2.42	2.42
			3.967	1/11/1980	23	2.52	2.53
			3.97	1/16/1993	22	2.64	2.65
			4.376	11/30/2007	21	2.76	2.78
			4.414	3/11/1995	20	2.90	2.92
			4.467	11/22/1965	19	3.05	3.08
			4.582	2/25/1969	18	3.22	3.25
			4.649	1/9/1998	17	3.41	3.45
			4.789	12/6/1966	16	3.63	3.67
			4.816	2/23/1998	15	3.87	3.92
			4.834	12/5/1966	14	4.14	4.21
			4.92	3/16/1986	13	4.46	4.54
			4.957	2/21/1980	12	4.83	4.93
			4.995	3/5/1995	11	5.27	5.40
			5.185	2/18/1980	10	5.80	5.96
			5.289	1/29/1980	9	6.44	6.65
			5.365	1/4/1978	8	7.25	7.53
			6.52	2/10/1963	7	8.29	8.67
			7.227	1/20/1982	6	9.67	10.21
			7.571	1/4/1995	5	11.60	12.43
			7.679	10/1/1983	4	14.50	15.89
			7.733	1/10/1978	3	19.33	22.00
			9.907	1/1/1982	2	29.00	35.75
			10.773	1/16/1978	1	58.00	95.33

Note:
Cunnane is the preferred method by the HMP permit.

ATTACHMENT 4

AREA VS ELEVATION

The storage provided by the StormTech detention vault is entered into the Detention Module within SWMM – please refer to Attachment 7 for further information. A stage-storage relationship is provided on the following page for verification.

DISCHARGE VS ELEVATION

The orifices have been selected to maximize their size while still restricting flows to conform with the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While REC acknowledges that these orifices are small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to further reduce the risk of blockage of the orifices, regular maintenance of the riser and orifices must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this memorandum.

The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Surface drawdown calculations are provided on the following pages for reference and proof of draining within 24 hours. It is assumed the basin is full to the invert of the first surface outlet structure such that the only discharge mechanism available is the LID orifice.

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \quad (1)$$

2) Slot:

As an orifice: $$Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)} \quad (2.a)$$

As a weir: $$Q_s = C_W \cdot B_s \cdot H^{3/2} \quad (2.b)$$

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $$Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)} \quad (3.a)$$

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \ T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}\,; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})]\,;$$

$$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})]$$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Outlet structure for Discharge of Underground System

Discharge vs Elevation Table

Low orifice	2.1875	"	Lower slot			Upper Slot:		
Number of orif:	2		# of slots:	1		# of slot:	1	
Cg-low:	0.61		Invert:	3.000	ft	Invert:	4.25	ft
			B	5.583	ft	B:	2.000	ft
Middle orifice	1.875	"	h_{slot}	0.083	ft	h_{slot}	0.125	ft
Number of orif:	0							
Cg-middle:	0.61		Middle slot			Emergency weir		
invert elev:	0.000	ft	# of slots:	1		Invert:	6.917	ft
			Invert:	3.167	ft	W:	7.000	ft
			B:	0.750	ft			
			h_{slot}	1.000	ft			

*Note: h = head above the invert of the lowest surface discharge opening.

h*	H/D-low	H/D-mid	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	$Q_{slot-low}$	$Q_{slot-mid}$	$Q_{slot-up}$	Qemerg	Qtot
(ft)	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.125	0.686	0.800	0.047	0.039	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039
0.250	1.371	1.600	0.102	0.118	0.102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.102
0.375	2.057	2.400	0.136	0.181	0.136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.136
0.500	2.743	3.200	0.163	0.199	0.163	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.163
0.750	4.114	4.800	0.207	0.385	0.207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.207
1.000	5.486	6.400	0.244	2.436	0.244	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.244
1.250	6.857	8.000	0.275	2.751	0.275	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.275
1.500	8.229	9.600	0.303	3.033	0.303	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.303
1.750	9.600	11.200	0.329	3.291	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.329
2.000	10.971	12.800	0.353	3.530	0.353	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.353
2.250	12.343	14.400	0.375	3.754	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375
2.500	13.714	16.000	0.397	3.966	0.397	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.397
2.750	15.086	17.600	0.417	4.167	0.417	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.417
3.000	16.457	19.200	0.436	4.358	0.436	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.436
3.167	17.371	20.267	0.448	4.481	0.448	0.000	0.000	0.000	0.805	0.000	0.000	0.000	1.253
3.250	17.829	20.800	0.454	4.541	0.454	0.000	0.000	0.000	1.040	0.056	0.000	0.000	1.550
3.500	19.200	22.400	0.472	4.718	0.472	0.000	0.000	0.000	1.542	0.447	0.000	0.000	2.461
3.750	20.571	24.000	0.489	4.888	0.489	0.000	0.000	0.000	1.917	1.036	0.000	0.000	3.442
4.000	21.943	25.600	0.505	5.052	0.505	0.000	0.000	0.000	2.230	1.769	0.000	0.000	4.504
4.250	23.314	27.200	0.521	5.211	0.521	0.000	0.000	0.000	2.504	2.622	0.000	0.000	5.646
4.500	24.686	28.800	0.537	5.365	0.537	0.000	0.000	0.000	2.751	3.352	0.530	0.000	7.168
4.750	26.057	30.400	0.552	5.515	0.552	0.000	0.000	0.000	2.977	3.821	0.809	0.000	8.159
5.000	27.429	32.000	0.566	5.661	0.566	0.000	0.000	0.000	3.187	4.239	1.015	0.000	9.008
5.250	28.800	33.600	0.580	5.804	0.580	0.000	0.000	0.000	3.385	4.620	1.185	0.000	9.770
5.500	30.171	35.200	0.594	5.943	0.594	0.000	0.000	0.000	3.571	4.971	1.334	0.000	10.470
5.750	31.543	36.800	0.608	6.078	0.608	0.000	0.000	0.000	3.748	5.299	1.467	0.000	11.123
6.000	32.914	38.400	0.621	6.211	0.621	0.000	0.000	0.000	3.917	5.608	1.590	0.000	11.737
6.250	34.286	40.000	0.634	6.341	0.634	0.000	0.000	0.000	4.080	5.901	1.703	0.000	12.318
6.500	35.657	41.600	0.647	6.469	0.647	0.000	0.000	0.000	4.236	6.180	1.810	0.000	12.872
6.750	37.029	43.200	0.659	6.594	0.659	0.000	0.000	0.000	4.386	6.447	1.911	0.000	13.403
6.955	38.153	44.512	0.669	6.694	0.669	0.000	0.000	0.000	4.506	6.658	1.989	0.163	13.985
7.125	39.086	45.600	0.678	6.777	0.678	0.000	0.000	0.000	4.602	6.828	2.052	2.063	16.224
7.250	39.771	46.400	0.684	6.837	0.684	0.000	0.000	0.000	4.672	6.950	2.097	4.176	18.580
7.500	41.143	48.000	0.696	6.955	0.696	0.000	0.000	0.000	4.809	7.188	2.185	9.668	24.546
7.750	42.514	49.600	0.707	7.071	0.707	0.000	0.000	0.000	4.942	7.419	2.269	16.508	31.845
8.000	43.886	51.200	0.719	7.186	0.719	0.000	0.000	0.000	5.072	7.643	2.350	24.468	40.251

Diversion Structure: 3 pipes - PARCEL 2

Discharge vs Elevation Table

Low orifice	4.000	"	Lower slot			Upper Slot:		
Number of orif:	2		# of slots:	0		# of slot:	0	
Cg-low:	0.61		Invert:	3.000	ft	Invert:	5.00	ft
			B	0.000	ft	B:	0.000	ft
Middle orifice	30.000	"	h_{slot}	0.000	ft	h_{slot}	0.000	ft
Number of orif:	1							
Cg-middle:	0.61		Middle slot			Emergency weir		
invert elev:	1.000	ft	# of slots:	0		Invert:	7.000	ft
			Invert:	4.000	ft	W:	0.000	ft
			B:	0.000	ft			
			h_{slot}	0.000	ft			

*Note: h = head above the invert of the lowest surface discharge opening.

h*	H/D-low	H/D-mid	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	$Q_{slot\text{-}low}$	$Q_{slot\text{-}mid}$	$Q_{slot\text{-}up}$	Qemerg	Qtot
(ft)	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.125	0.375	0.000	0.000	0.057	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.057
0.250	0.750	0.000	0.247	0.205	0.205	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.205
0.375	1.125	0.000	0.390	0.401	0.390	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.390
0.500	1.500	0.000	0.493	0.600	0.493	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.493
0.750	2.250	0.000	0.653	0.861	0.653	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.653
1.000	3.000	0.000	0.780	0.906	0.780	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.780
1.250	3.750	0.100	0.889	1.181	0.889	0.000	0.339	0.339	0.000	0.000	0.000	0.000	1.228
1.500	4.500	0.200	0.987	2.960	0.987	0.000	1.312	1.312	0.000	0.000	0.000	0.000	2.298
1.750	5.250	0.300	1.075	8.634	1.075	0.000	2.876	2.876	0.000	0.000	0.000	0.000	3.951
2.000	6.000	0.400	1.157	11.568	1.157	0.000	4.982	4.982	0.000	0.000	0.000	0.000	6.138
2.250	6.750	0.500	1.233	12.332	1.233	0.000	7.575	7.575	0.000	0.000	0.000	0.000	8.808
2.500	7.500	0.600	1.305	13.051	1.305	12.015	10.596	10.596	0.000	0.000	0.000	0.000	11.901
2.750	8.250	0.700	1.373	13.732	1.373	16.991	13.982	13.982	0.000	0.000	0.000	0.000	15.356
3.000	9.000	0.800	1.438	14.381	1.438	20.810	17.668	17.668	0.000	0.000	0.000	0.000	19.106
3.167	9.500	0.867	1.480	14.798	1.480	23.006	20.259	20.259	0.000	0.000	0.000	0.000	21.738
3.250	9.750	0.900	1.500	15.002	1.500	24.029	21.586	21.586	0.000	0.000	0.000	0.000	23.086
3.500	10.500	1.000	1.560	15.599	1.560	26.866	25.668	25.668	0.000	0.000	0.000	0.000	27.228
3.750	11.250	1.100	1.617	16.173	1.617	29.430	29.845	29.430	0.000	0.000	0.000	0.000	31.047
4.000	12.000	1.200	1.673	16.728	1.673	31.788	34.051	31.788	0.000	0.000	0.000	0.000	33.461
4.250	12.750	1.300	1.726	17.265	1.726	33.983	38.221	33.983	0.000	0.000	0.000	0.000	35.709
4.500	13.500	1.400	1.779	17.785	1.779	36.044	42.293	36.044	0.000	0.000	0.000	0.000	37.823
4.750	14.250	1.500	1.829	18.291	1.829	37.994	46.208	37.994	0.000	0.000	0.000	0.000	39.823
5.000	15.000	1.600	1.878	18.783	1.878	39.848	49.913	39.848	0.000	0.000	0.000	0.000	41.727

PARCEL 2: Volume vs Elevation

Vconc (cfs)	h (ft)	Q
0	0.00	0.00
2304	0.75	0.00
3092	0.88	0.04
3879	1.00	0.10
4667	1.13	0.14
5454	1.25	0.16
7029	1.50	0.21
8604	1.75	0.24
10179	2.00	0.28
11754	2.25	0.30
13329	2.50	0.33
14904	2.75	0.35
16479	3.00	0.38
18054	3.25	0.40
19629	3.50	0.42
21204	3.75	0.436
22254	3.917	1.253
22779	4.00	1.550
24354	4.25	2.461
25929	4.50	3.44
27504	4.75	4.50
29079	5.00	5.65
30654	5.25	7.17
32229	5.50	8.16
33804	5.75	9.01
35379	6.00	9.77
36954	6.25	10.47
38529	6.50	11.12
40104	6.75	11.74
41679	7.00	12.32
43254	7.250	12.87
44829	7.500	13.40
46121	7.705	13.99
47192	7.875	16.22
47979	8.00	18.58
49554	8.25	24.55
51129	8.50	31.85
52704	8.75	40.25

Vconc: Concrete system
h: Elev. From bottom of gravel.

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention

Section Sketches

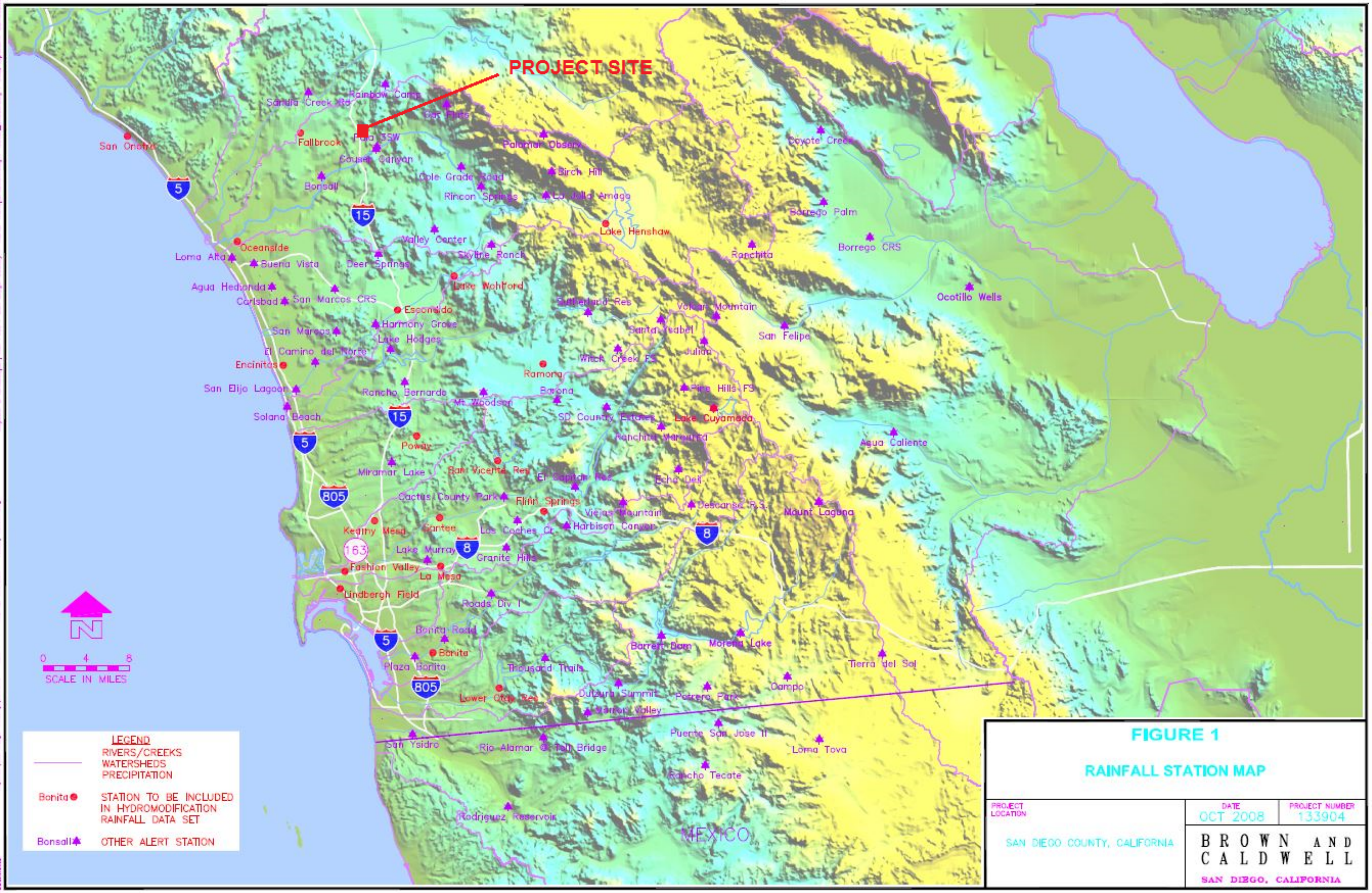
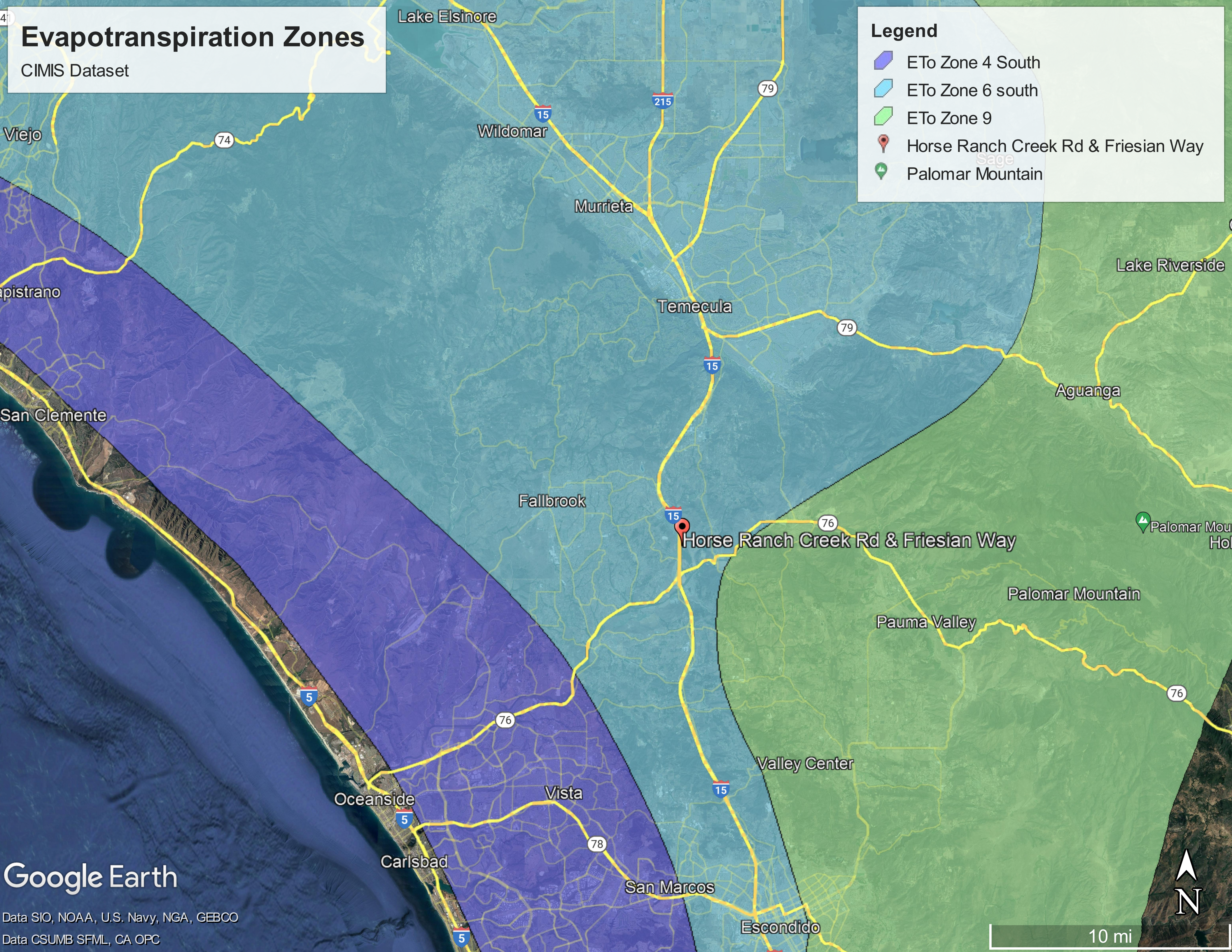


FIGURE 1

RAINFALL STATION MAP



Evapotranspiration Zones
CIMIS Dataset
Legend
ETo Zone 4 South
ETo Zone 6 south
ETo Zone 9
Horse Ranch Creek Rd & Friesian Way
Palomar Mountain
Lake Elsinore
Wildomar
Murrieta
Temecula
Viejo
apistrano
San Clemente
Fallbrook
Aguanga
Lake Riverside
Sage
Horse Ranch Creek Rd & Friesian Way
Palomar Mountain
Pauma Valley
Valley Center
Oceanside
Vista
Carlsbad
San Marcos
Escondido
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data CSUMB SFML, CA OPC
10 mi
N

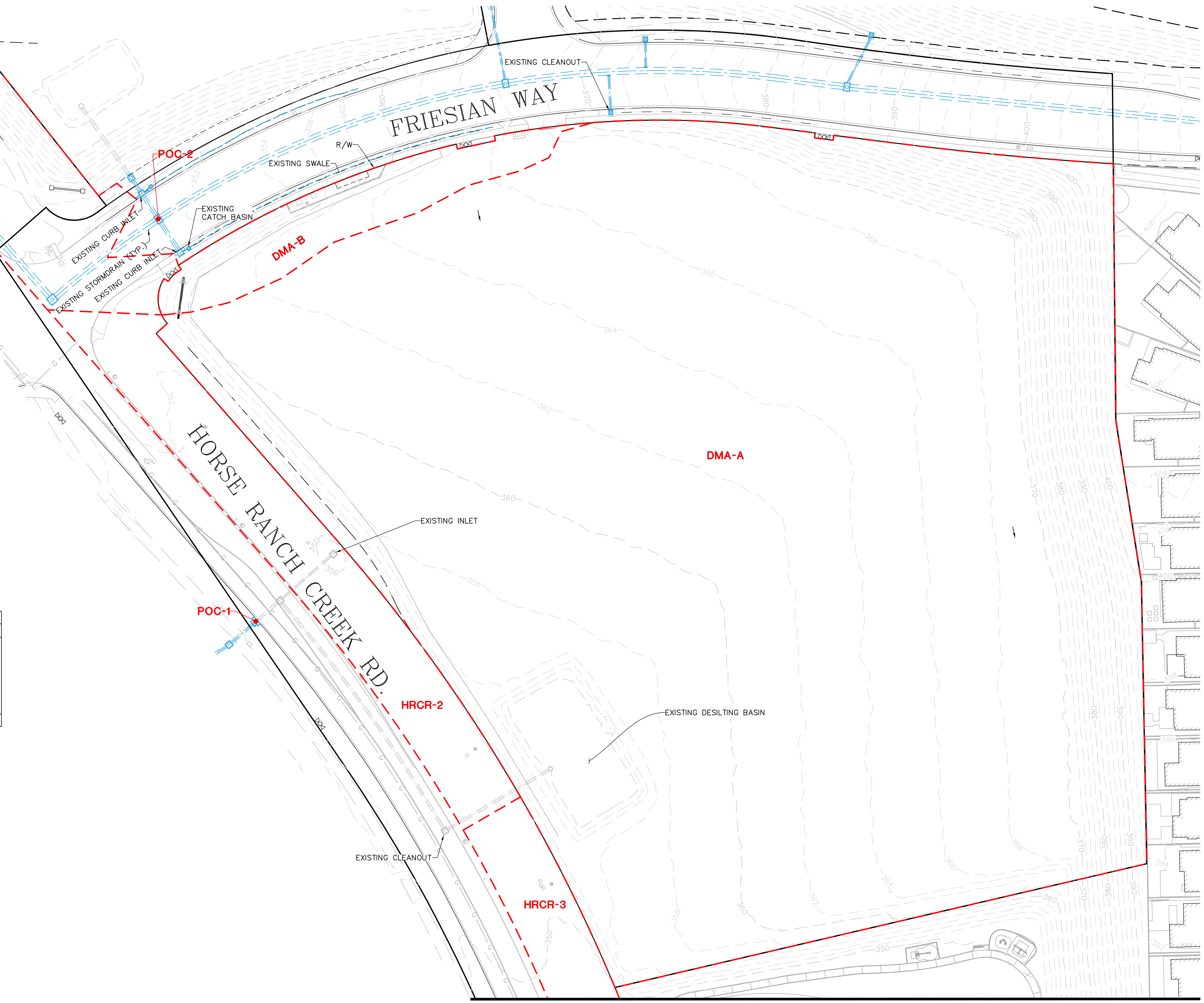
LEGEND

- EX. STORM DRAIN
- PROP. STORM DRAIN
- EX. INLET/CATCHBASIN/CLEANOUT
- DRAINAGE MANAGEMENT AREA BOUNDARY

40 20 0 40 80 120

SCALE: 1" = 40'

PRE-DEVELOPED AREAS				
AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	TOTAL AREA (AC)	POC
DM-A	0.000	8.618	8.618	POC-1
DM-B	0.000	0.320	0.320	
HRCR-1	0.104	0.402	0.506	
HRCR-2	0.027	0.602	0.629	
HRCR-3	0.000	1.410	1.410	
TOTAL	0.1310	11.3520	11.483	



POC-3 LOCATED DOWNSTREAM SEE SHEET 2

MATCHLINE – SEE SHEET 2

NO.	DESCRIPTION	DATE	APP'D
	REVISIONS		

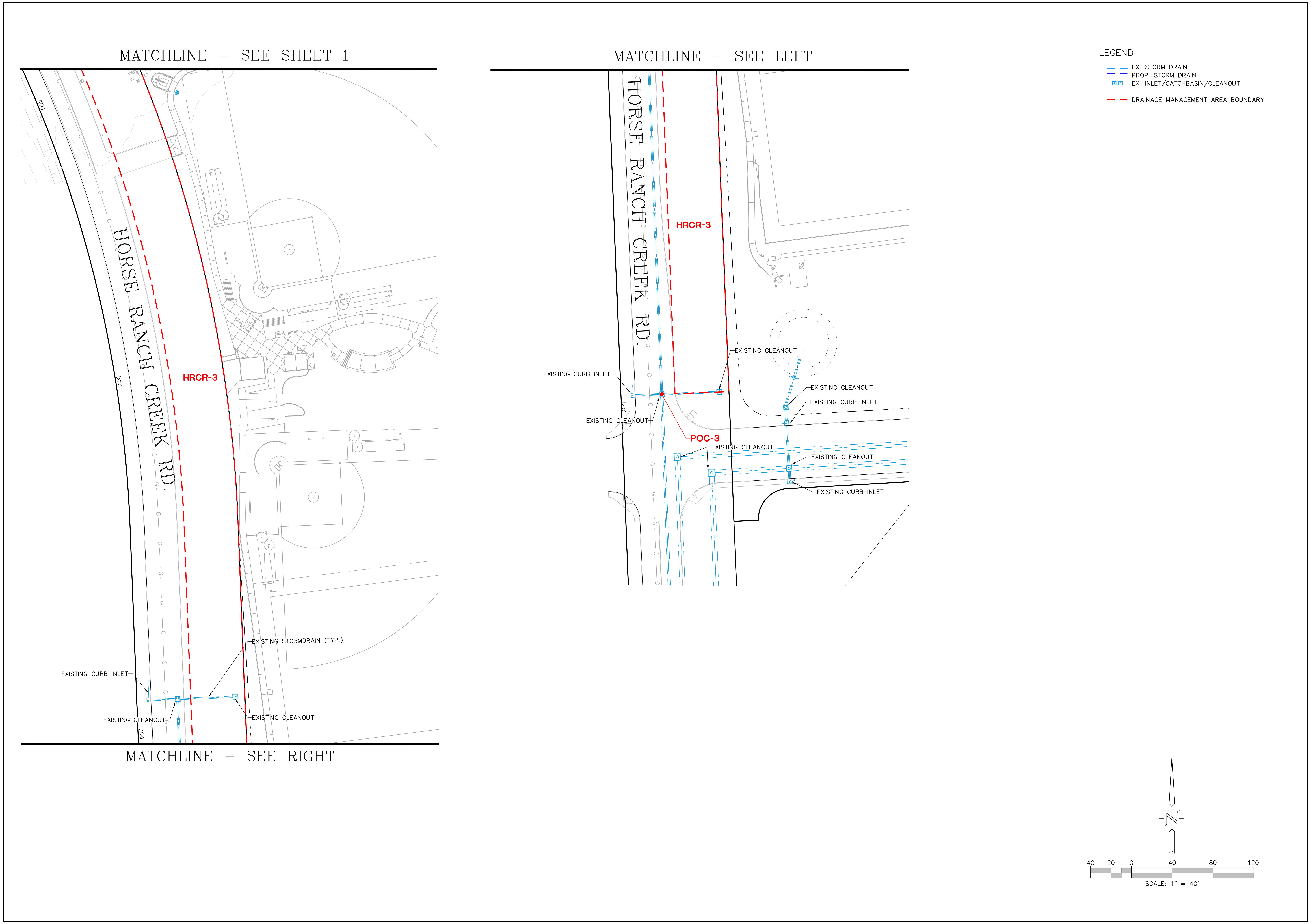
R·E·C Consultants, Inc.
Civil Engineering·Environmental Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

DATE: 3/1/21
SCALE: 1" = 30'
DRAWN: WOG
CHECKED: WOG

SHEET TITLE: PRE-DEV DMA & HMP EXHIBIT

PROJECT: CAMPUS PARK CONDOS
Horse Ranch Creek Rd
Fallbrook, CA 92028

SHEET 1 OF 2 SHEETS



NO.	REVISIONS DESCRIPTION	DATE	APP'D

Civil Engineering•Environmental
Land Surveying

REC Consultants, Inc.

2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

DATE: 3/1/21
SCALE: 1" = 30'
DRAWN: WOG
CHECKED: WOG

SHEET TITLE
PRE-DEV DMA & HMP EXHIBIT

PROJECT
CAMPUS PARK CONDOS
Horse Ranch Creek Rd
Fallbrook, CA 92028

SHEET 2
OF 2 SHEETS

SAVE DATE: 7/20/2023 -- PLOT DATE: 7/20/2023 -- FILE NAME: P:\Acad\1581 Campus Park Condo\Parcel 2\CAD\DMA MAP.DWG

LEGEND

- EX. STORM DRAIN
- PROP. STORM DRAIN
- EX. INLET/CATCHBASIN/CLEANOUT
- DRAINAGE MANAGEMENT AREA BOUNDARY

SITE DESIGN BMPS

- SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- SC-2 STORM DRAIN STENCILING OR SIGNAGE
- SC-5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
- SC-6A ON-SITE STORM DRAIN INLETS
- SC-6D NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- SC-6E LANDSCAPE/OUTDOOR PESTICIDE USE
- SC-6H REFUSE AREAS
- SC-6O FIRE SPRINKLER TEST WATER
- SC-6P MISCELLANEOUS DRAIN OR WASH WATER
- SC-6Q PLAZAS, SIDEWALKS, AND PARKING LOTS

SOURCE CONTROL BMPS

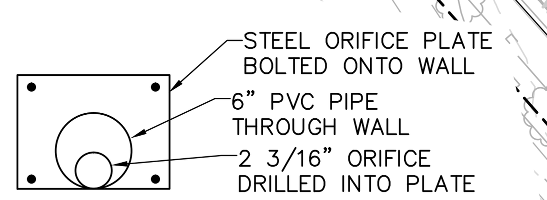
- SD-1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
- SD-3 MINIMIZE IMPERVIOUS AREA
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-6 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

POLLUTANT CONTROL BMPS

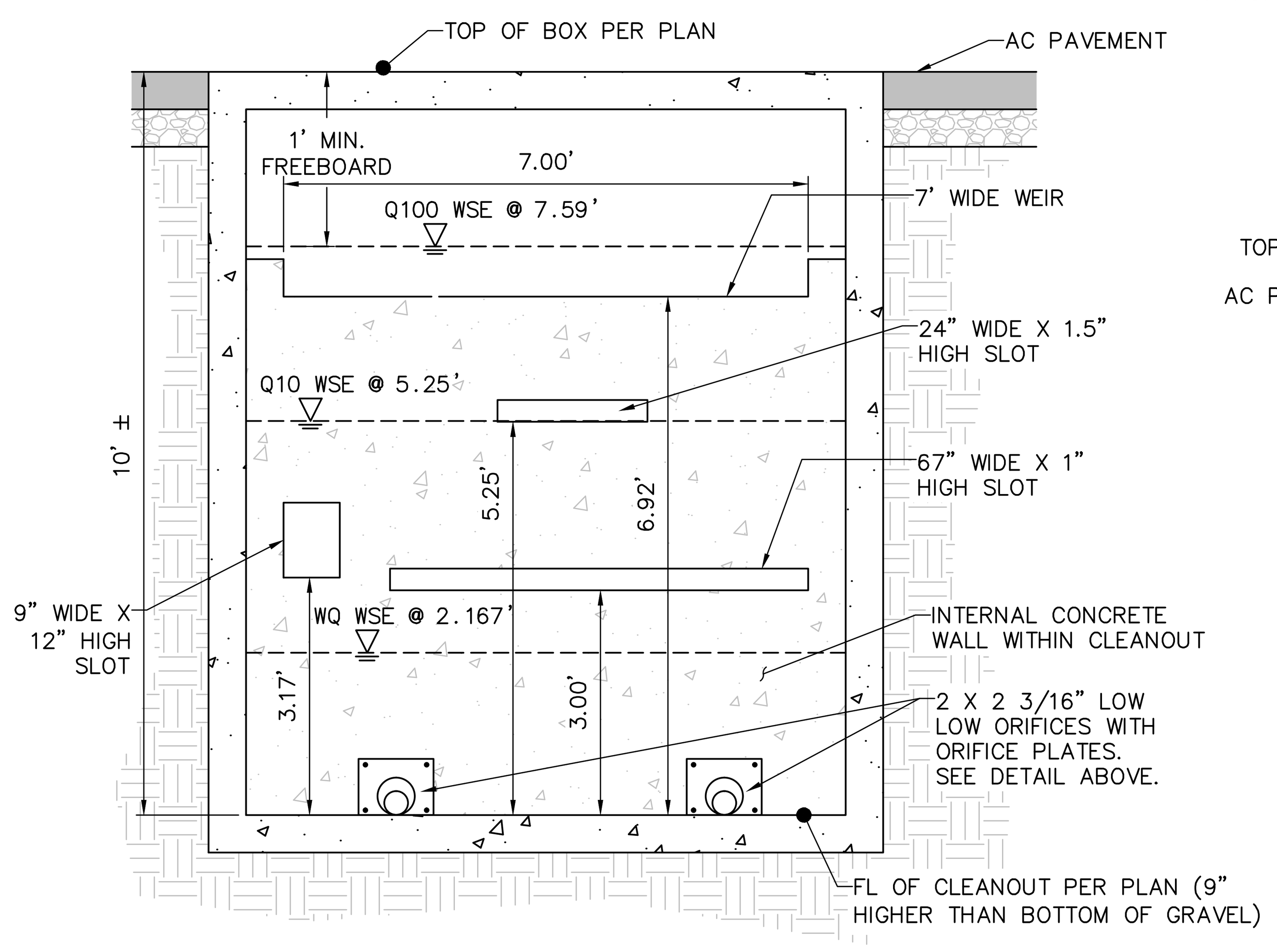
- MODULAR WETLAND SYSTEM (BF-3)
- STORMDRAIN PIPE
- UNDERGROUND DETENTION TANK

NOTES

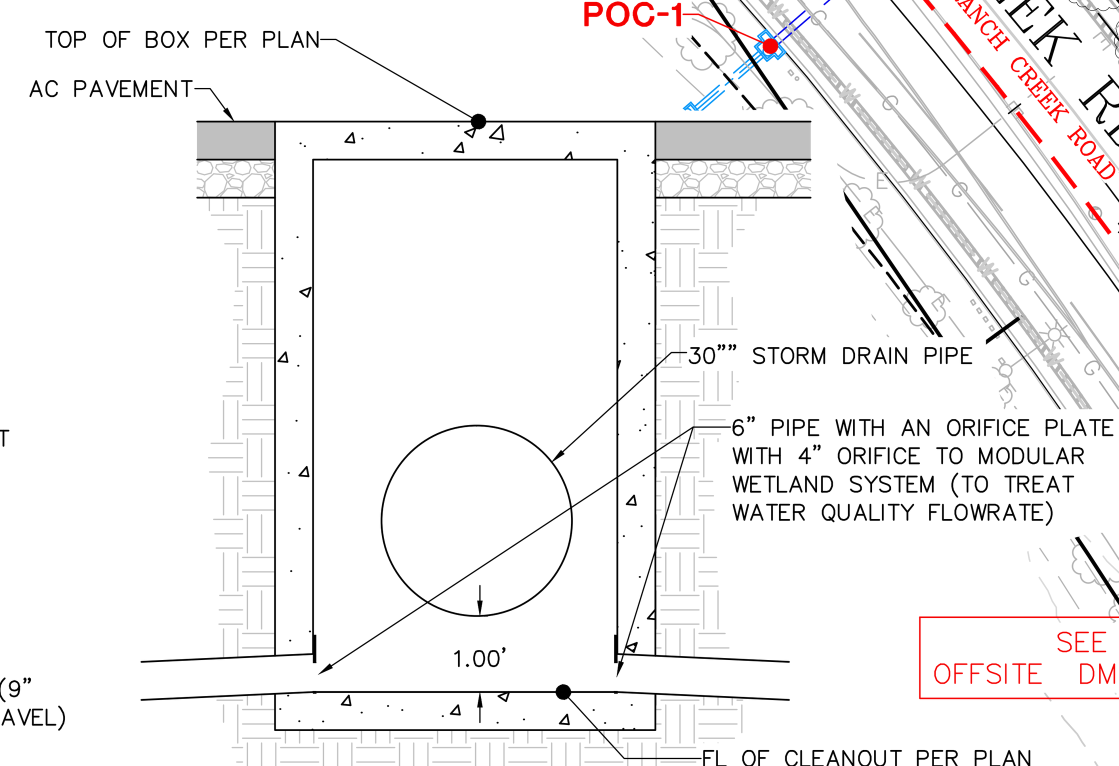
1. CCSYA: NONE. SEE EXHIBIT IN ATTACHMENT 9
2. HYDROLOGIC SOIL GROUP: TYPE C PER COUNTY SOIL MAP
3. THE UNDERGROUND DETENTION SYSTEM (BMP-A) IS COMPRISED OR A SERIES OF OLDCASTLE STORMCAPTURE TANKS (A = 3,072 SF, VOL = 52,704 CFT)
4. APPROXIMATE DEPTH TO GROUNDWATER: >10' (PREGRADED LOT)
5. EXISTING HYDRAULIC FEATURES: NONE
6. EACH UNIT ASSUMED TO HAVE A 32'X10' MINIMUM IMPERVIOUS PATIO (NOT SHOWN)
7. UNDERGROUND STORAGE MAINTENANCE ACCESS VIA CLEANOUT.



1 ORIFICE PLATE DETAIL
N.T.S.



A OUTLET STRUCTURE
SCALE: 1"=2'



B WQ DIVERSION STRUCTURE
SCALE: 1"=2'

DMA & BMP SUMMARY TABLE

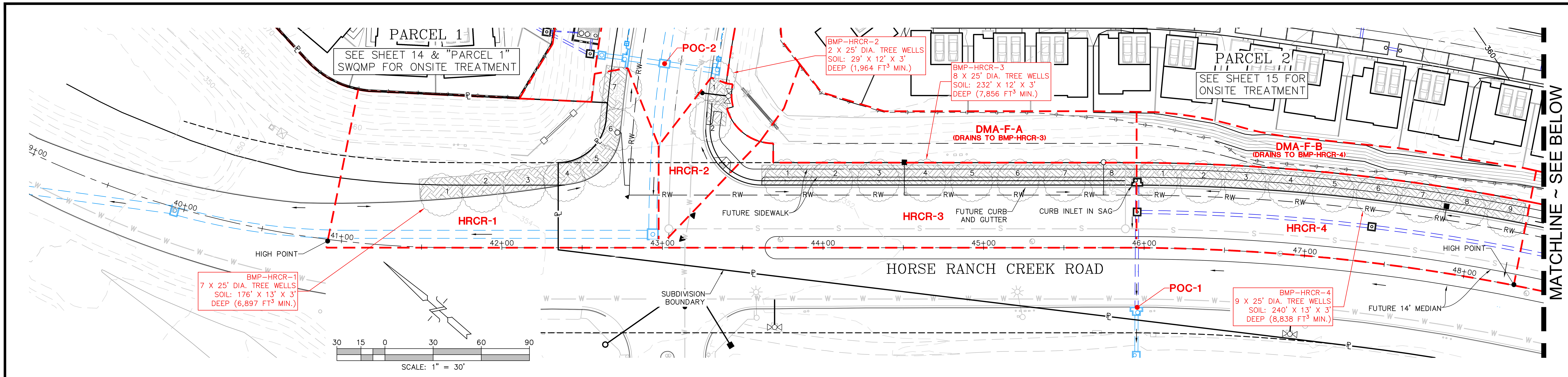
AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	TOTAL AREA (AC)	DMA TYPE	BMP	POC
DM-A	5.947	1.758	7.705	DRAINS TO BMP	BMP-A: UNDERGROUND STORAGE TANK & BMP-B: MODULAR WETLAND SYSTEM (BF-2)	1
DM-B	0.061	0.030	0.091	DRAINS TO BMP	BMP-B: MODULAR WETLAND SYSTEM (BF-2)	1
DMA-C	0.003	0.615	0.618	DRAINS TO BMP	BMP-A: UNDERGROUND STORAGE TANK & BMP-B: MODULAR WETLAND SYSTEM (BF-2)	1
DMA-D	0.000	0.165	0.165	SELF-MITIGATING	N/A	2
DMA-E	0.000	0.050	0.050	SELF-MITIGATING	N/A	3
TOTAL	6.011	2.618	8.629	—	—	—

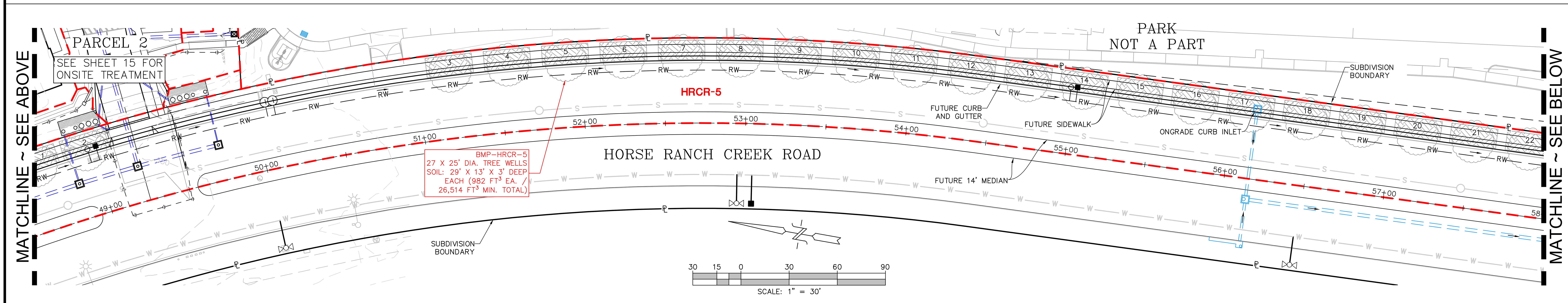
R·E·C Consultants, Inc.
Civil Engineering · Environmental
2970 FIFTHE AVENUE, SUITE 340
SAN DIEGO, CA 92103
(619)232-9200 (619)232-9210 Fax

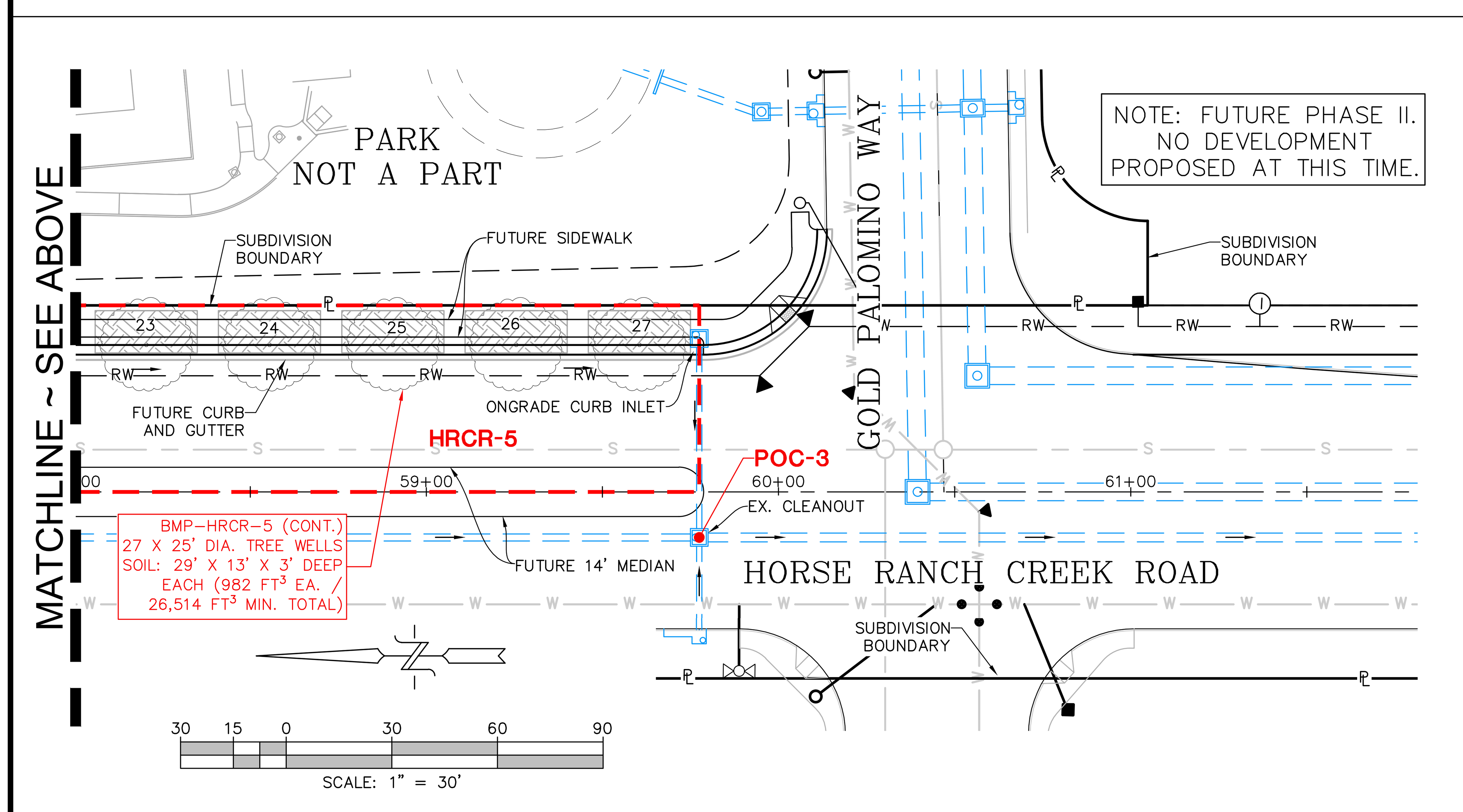
REVISIONS | BY | DATE | DESCRIPTION

JOB NO. 1581

POST DEVELOPED DMA & HMP EXHIBIT
PASSERELLE (PARCEL 2)
COUNTY OF SAN DIEGO TRACT NO. ____
County of San Diego, California







DMA & BMP SUMMARY TABLE

DMA	POC	DMA TYPE	BMP	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)
HRCR-1	1	DRAINS TO BMP	BMP-HRCR-1: Tree Well (SD-A)	18,827	0.432	8,300	0.191	10,527	0.242
HRCR-2	1	DRAINS TO BMP	BMP-HRCR-2: Tree Well (SD-A)	3,254	0.075	2,577	0.059	677	0.016
HRCR-3	2	DRAINS TO BMP	BMP-HRCR-3: Tree Well (SD-A)	14,616	0.336	10,681	0.245	3,935	0.090
DMA-F-A	2	DRAINS TO BMP	BMP-HRCR-3: Tree Well (SD-A)	7,931	0.182	0	0.000	7,931	0.182
HRCR-4	2	DRAINS TO BMP	BMP-HRCR-4: Tree Well (SD-A)	12,802	0.294	8,935	0.205	3,867	0.089
DMA-F-B	2	DRAINS TO BMP	BMP-HRCR-4: Tree Well (SD-A)	5,565	0.128	0	0.000	5,565	0.128
HRCR-5	3	DRAINS TO BMP	BMP-HRCR-5: Tree Well (SD-A)	61,406	1.410	43,575	1.000	17,831	0.409
			TOTAL	124,401	2.856	74,068	1.700	50,333	1.155

LEGEND

- EX. STORM DRAIN
- PROP. STORM DRAIN
- EX. INLET/CATCHBASIN/CLEANOUT
- DRAINAGE MANAGEMENT AREA BOUNDARY
- DIRECTION OF FLOW
- TREE WELL (SD-A)

NOTES

1. ALL TREE WELLS ARE PER SAN DIEGO COUNTY DEPARTMENT OF PUBLIC WORKS GREEN STREET STANDARD DRAWING GS-1.02. SEE DETAIL ON SHEET 18
2. TREE WELLS TO HAVE STRUCTURAL SOIL.
3. THE REMAINDER PARCEL IS PHASE II OF THE PROJECT. NO DEVELOPMENT IS PROPOSED AT THIS TIME. THE BMPS FOR PHASE II ONSITE AND FRONTAGE IMPROVEMENTS WILL BE DESIGNED PER A SUBSEQUENT PERMIT APPLICATION.

Civil Engineering • Environmental
2970 FIFTHE AVENUE, SUITE 340
SAN DIEGO, CA 92103
(619)232-9200 (619)232-9210 Fax

R·E·C Consultants, Inc.

REVISIONS BY	DATE	DESCRIPTION

JOB NO. 1581

POST DEVELOPED DMA & HMP EXHIBIT
PASSERELLE

COUNTY OF SAN DIEGO TRACT NO. ____
County of San Diego, California

ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           07/24/1951
START_TIME           00:00:00
REPORT_START_DATE    07/24/1951
REPORT_START_TIME    00:00:00
END_DATE             05/24/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.20   0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
FALLBROOK        INTENSITY 1:00   1.0    TIMESERIES FALLBROOK

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet          Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
A-Flat-C         FALLBROOK        POC-1           7.0323   0        1370     3        0
A-Slope-C        FALLBROOK        POC-1           1.5437   0        600      45       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
A-Flat-C         0.012      0.05       0.05       0.10       25         OUTLET
A-Slope-C        0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
A-Flat-C         6          0.10       0.31
A-Slope-C        6          0.10       0.31

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
FALLBROOK        FILE "Fallbrook.txt"
```

```
[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2362.500 4900.000 2637.500 7100.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2500.000           5000.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
A-Flat-C         2500.000           6000.000
A-Slope-C        2950.000           6000.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
FALLBROOK        2500.000           6500.000
```

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           07/24/1951
START_TIME           00:00:00
REPORT_START_DATE    07/24/1951
REPORT_START_TIME    00:00:00
END_DATE             05/24/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.20   0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
FALLBROOK        INTENSITY 1:00   1.0    TIMESERIES FALLBROOK

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
A-Flat-C         FALLBROOK        POC-1            7.0323   0        1370     3        0
A-Slope-C        FALLBROOK        POC-1            1.5437   0        600      45       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
A-Flat-C         0.012      0.05       0.05       0.10       25         OUTLET
A-Slope-C        0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
A-Flat-C         6          0.10       0.31
A-Slope-C        6          0.10       0.31

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
FALLBROOK        FILE "Fallbrook.txt"
```

```
[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2362.500 4900.000 2637.500 7100.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2500.000           5000.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
A-Flat-C         2500.000           6000.000
A-Slope-C        2950.000           6000.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
FALLBROOK        2500.000           6500.000
```

POST_DEV_1

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           07/24/1951
START_TIME           00:00:00
REPORT_START_DATE    07/24/1951
REPORT_START_TIME    00:00:00
END_DATE             05/24/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.20   0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
FALLBROOK        INTENSITY 1:00   1.0    TIMESERIES FALLBROOK

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
A-1-C            FALLBROOK        UND-Campus       7.7048   77.18    2618     3.0      0
B-1-C            FALLBROOK        UND-Campus       0.092    66.3     40       5.0      0
F-BYPASS-C       FALLBROOK        POC-1            0.215    0        490      25       0
C-1-C            FALLBROOK        UND-Campus       0.6178   0.5      930      45       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
A-1-C            0.012      0.05       0.05       0.10       25         OUTLET
B-1-C            0.012      0.05       0.05       0.10       25         OUTLET
F-BYPASS-C       0.012      0.05       0.05       0.10       25         OUTLET
C-1-C            0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
A-1-C            6          0.075      0.31
B-1-C            6.0        0.075      0.31
F-BYPASS-C       6          0.10       0.31
C-1-C            6.0        0.075      0.31

[LID_CONTROLS]
;;               Type/Layer Parameters
;;-------------- ---------- ----------
LID-1            BC
LID-1            SURFACE    10.2       0.05       0          0          5
LID-1            SOIL       18         0.4        0.2        0.1        5          5          1.5
LID-1            STORAGE    21         0.67       0          0
LID-1            DRAIN      0.3642     0.5        3          6

[LID_USAGE]
```

POST_DEV_1

```
;;Subcatchment   LID Process      Number  Area       Width      InitSatur  FromImprv  ToPerv     Report File
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- -----------

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[DIVIDERS]
;;               Invert     Diverted         Divider
;;Name           Elev.      Link             Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
Und-DIV          0          Low-flow         TABULAR    2-pipes          0          0          0          0

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                        Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                       Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------------
------
UND-Campus       0        8.75     0        TABULAR    UND-Campus                   6300     0        6        0.1875
0.31

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Overflow         Und-DIV          POC-1            100        0.01       0          0          0          0
Low-flow         Und-DIV          POC-1            400        0.01       0          0          0          0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                     Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
U-Campus         UND-Campus       Und-DIV          0          TABULAR/HEAD    U-Out-Campus                NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
Overflow         DUMMY        0                0          0          0          1
Low-flow         DUMMY        0                0          0          0          1

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
2-pipes          Diversion  0          0.000
2-pipes                     0.780      0.780
2-pipes                     1.228      0.889
2-pipes                     2.298      0.987
2-pipes                     3.951      1.075
2-pipes                     6.138      1.157
2-pipes                     8.808      1.233
2-pipes                     11.901     1.305
2-pipes                     15.356     1.373
2-pipes                     19.106     1.438
2-pipes                     21.738     1.480
2-pipes                     23.086     1.500
2-pipes                     27.228     1.560
2-pipes                     31.047     1.617
2-pipes                     33.461     1.673
2-pipes                     35.709     1.726
2-pipes                     37.823     1.779
2-pipes                     39.823     1.829
2-pipes                     41.727     1.878

U-Out-Campus     Rating     0.00       0.00
U-Out-Campus                0.75       0.00
U-Out-Campus                0.88       0.04
U-Out-Campus                1.00       0.10
U-Out-Campus                1.13       0.14
U-Out-Campus                1.25       0.16
U-Out-Campus                1.50       0.21
```

```
U-Out-Campus                1.75       0.24
U-Out-Campus                2.00       0.28
U-Out-Campus                2.25       0.30
U-Out-Campus                2.50       0.33
U-Out-Campus                2.75       0.35
U-Out-Campus                3.00       0.38
U-Out-Campus                3.25       0.40
U-Out-Campus                3.50       0.42
U-Out-Campus                3.75       0.436
U-Out-Campus                3.917      1.253
U-Out-Campus                4.00       1.550
U-Out-Campus                4.25       2.461
U-Out-Campus                4.50       3.44
U-Out-Campus                4.75       4.50
U-Out-Campus                5.00       5.65
U-Out-Campus                5.25       7.17
U-Out-Campus                5.50       8.16
U-Out-Campus                5.75       9.01
U-Out-Campus                6.00       9.77
U-Out-Campus                6.25       10.47
U-Out-Campus                6.50       11.12
U-Out-Campus                6.75       11.74
U-Out-Campus                7.00       12.32
U-Out-Campus                7.250      12.87
U-Out-Campus                7.500      13.40
U-Out-Campus                7.705      13.99
U-Out-Campus                7.875      16.22
U-Out-Campus                8.00       18.58
U-Out-Campus                8.25       24.55
U-Out-Campus                8.50       31.85
U-Out-Campus                8.75       40.25

UND-Campus       Storage    0          3072
UND-Campus                  0.75       3072
UND-Campus                  0.7501     6300
UND-Campus                  8.75       6300

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
FALLBROOK        FILE "Fallbrook.txt"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 950.000 4925.000 2050.000 6575.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            1500.000           4750.000
Und-DIV          1500.000           5100.000
UND-Campus       1500.000           5500.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Low-flow         1294.062           5067.284
Low-flow         1294.062           4842.625

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
A-1-C            1500.000           6000.000
B-1-C            1200.000           6000.000
F-BYPASS-C       2000.000           5000.000
C-1-C            1800.000           6000.000

[SYMBOLS]
```

POST_DEV_1

```
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
FALLBROOK        2000.000           5750.000
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

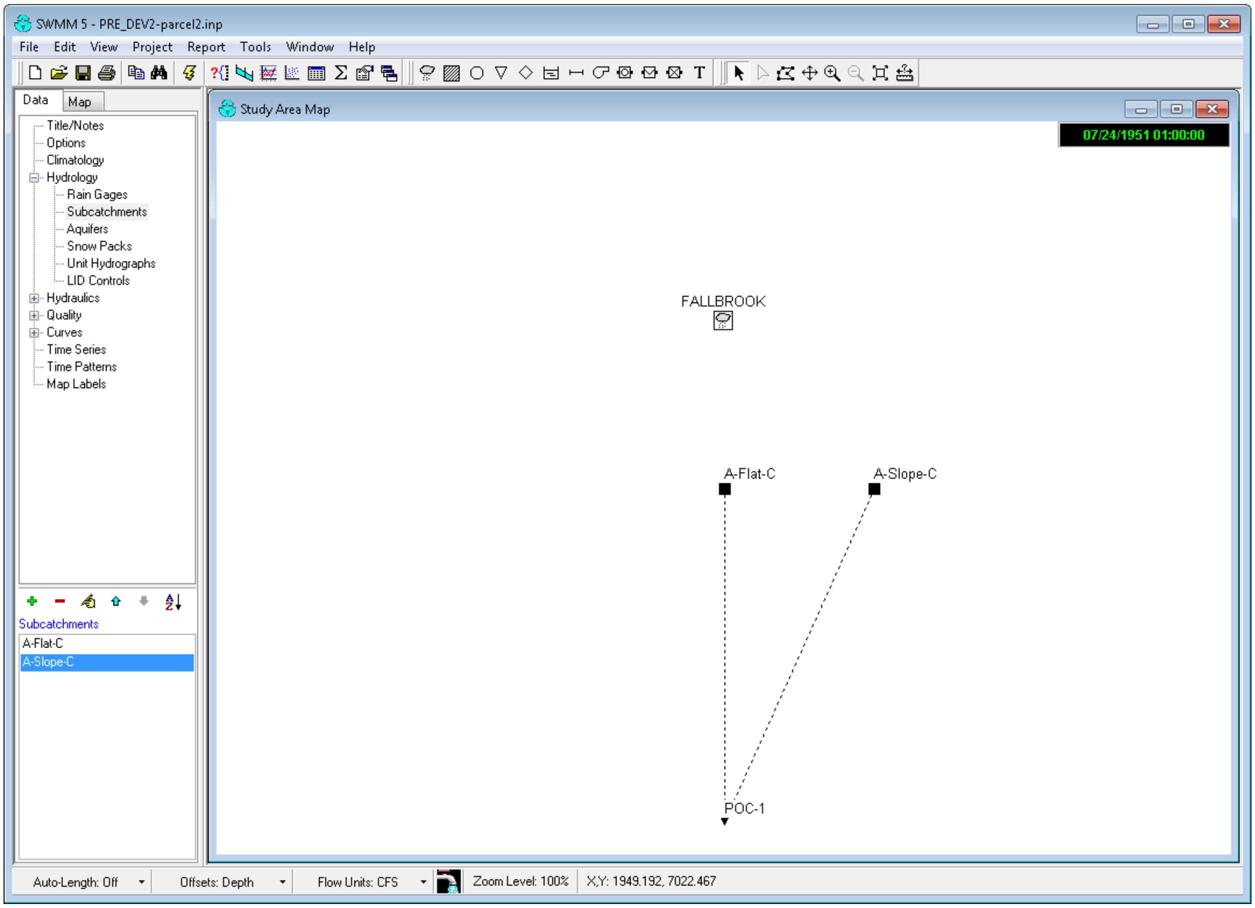
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from Appendix G of the 2020 County of San Diego BMP Design Manual.

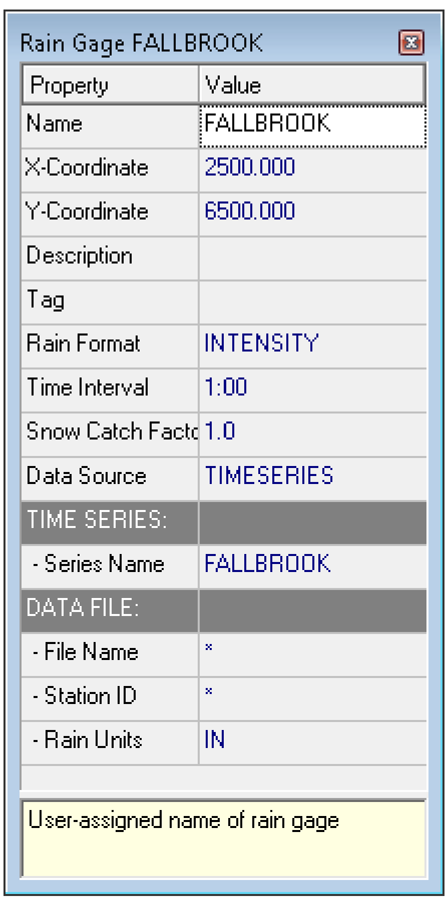
Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey and site specific geotechnical report (located in Attachment 8 of this report).

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE-DEVELOPED CONDITIONS

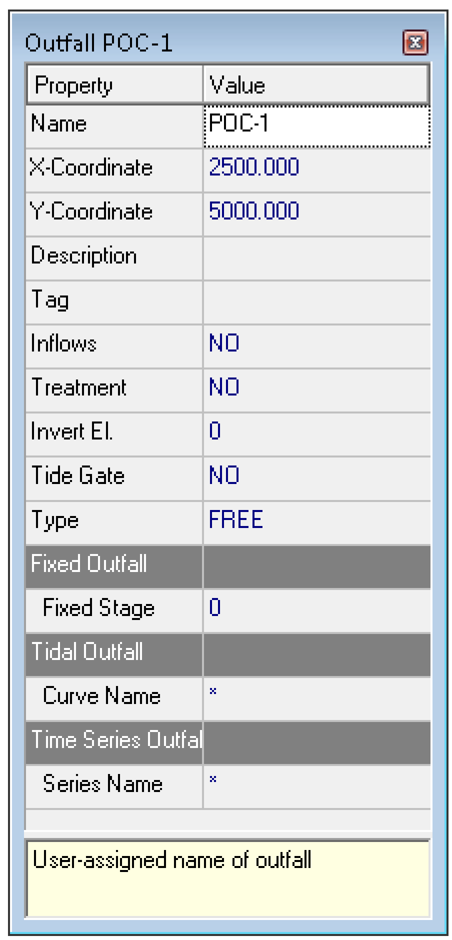




Rain Gage FALLBROOK

Property	Value
Name	FALLBROOK
X-Coordinate	2500.000
Y-Coordinate	6500.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factc	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	FALLBROOK
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2500.000
Y-Coordinate	5000.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfal	
Series Name	*

User-assigned name of outfall

Subcatchment A-Flat-C

Property	Value
Name	A-Flat-C
X-Coordinate	2500.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	POC-1
Area	7.0323
Width	1370
% Slope	3
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment A-Slope-C

Property	Value
Name	A-Slope-C
X-Coordinate	2950.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	POC-1
Area	1.5437
Width	600
% Slope	45
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

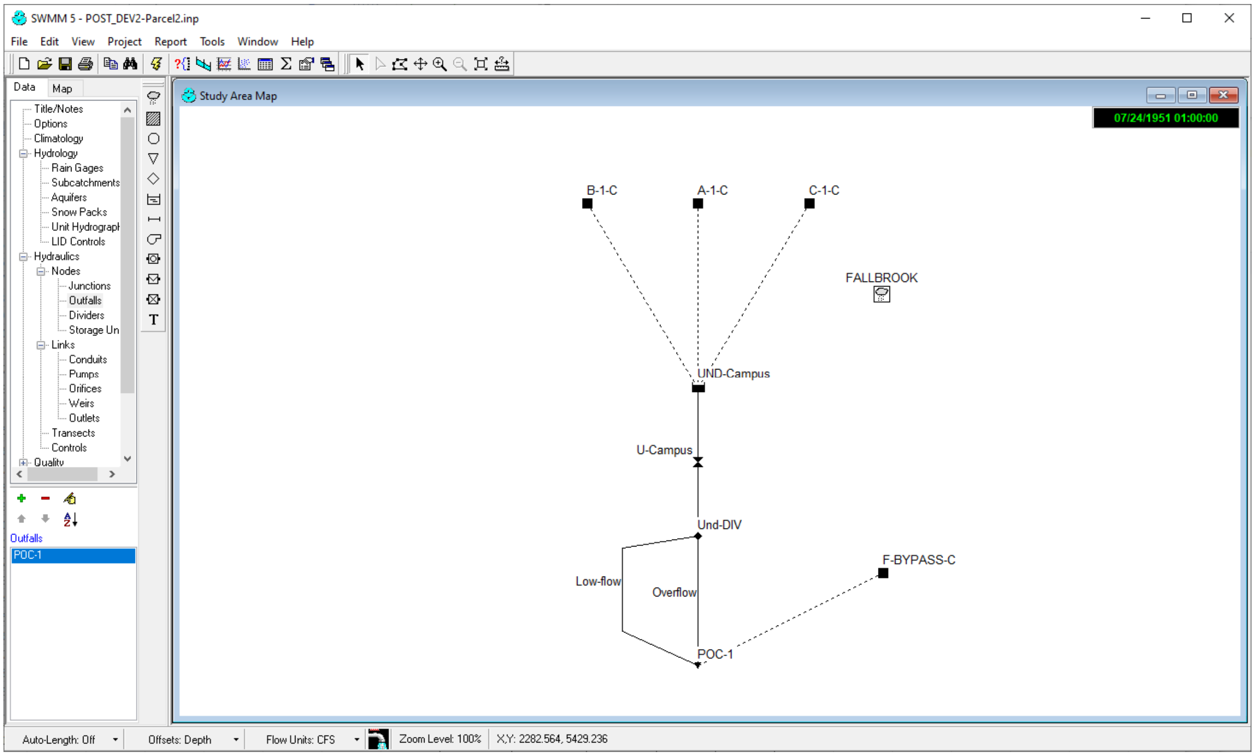
Property	Value
Suction Head	6
Conductivity	0.10
Initial Deficit	0.31

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.10
Initial Deficit	0.31

POST-DEVELOPED CONDITIONS – POC-1



Rain Gage FALLBROOK

Property	Value
Name	FALLBROOK
X-Coordinate	2000.000
Y-Coordinate	5750.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	FALLBROOK
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Station ID contained in data file

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	1500.000
Y-Coordinate	4750.000
Description	...
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

Optional comment or description

Subcatchment A-1-C

Property	Value
Name	A-1-C
X-Coordinate	1500.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	UND-Campus
Area	7.7048
Width	2618
% Slope	3.0
% Imperv	77.18
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment B-1-C

Property	Value
Name	B-1-C
X-Coordinate	1200.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	UND-Campus
Area	0.092
Width	40
% Slope	5.0
% Imperv	66.3
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.31

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.10
Initial Deficit	0.31

Subcatchment C-1-C

Property	Value
Name	C-1-C
X-Coordinate	1800.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	UND-Campus
Area	0.6178
Width	930
% Slope	45
% Imperv	0.5
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment F-BYPASS-C

Property	Value
Name	F-BYPASS-C
X-Coordinate	2000.000
Y-Coordinate	5000.000
Description	
Tag	
Rain Gage	FALLBROOK
Outlet	POC-1
Area	0.215
Width	490
% Slope	25
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.31

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.10
Initial Deficit	0.31

DETENTION BASIN

Storage Unit UND-Campus

Property	Value
Name	UND-Campus
X-Coordinate	1500.000
Y-Coordinate	5500.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	8.75
Initial Depth	0
Ponded Area	6300
Evap. Factor	0
Infiltration	YES
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	UND-Campus

User-assigned name of storage unit

Storage Curve Editor

Curve Name: UND-Campus

Description:

	Depth (ft)	Area (ft2)
1	0	3072
2	0.75	3072
3	0.7501	6300
4	8.75	6300
5		
6		
7		
8		
9		

View... Load... Save... OK Cancel Help

Outlet U-Campus

Property	Value
Name	U-Campus
Inlet Node	UND-Campus
Outlet Node	Und-DIV
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	U-Out-Campus

Rating Curve Editor

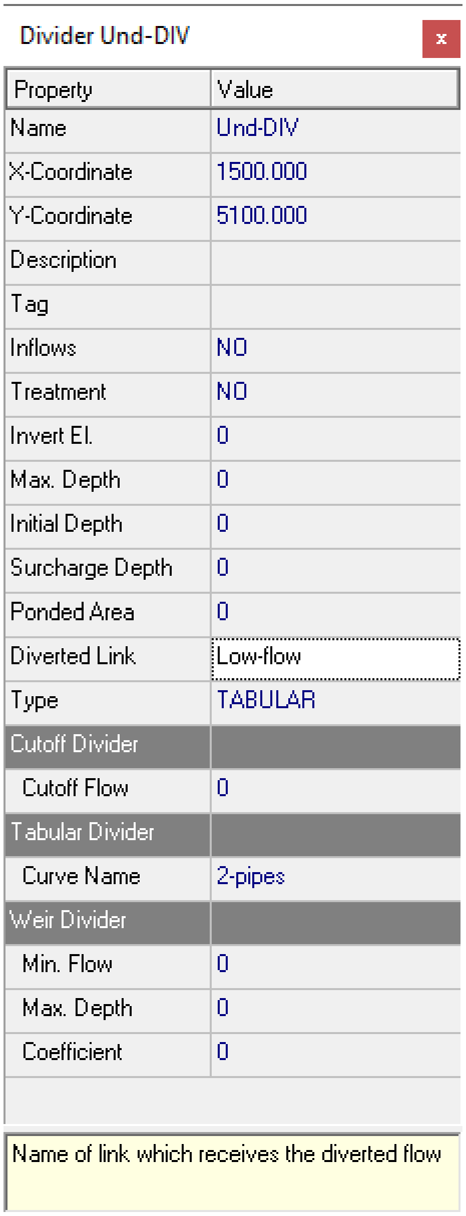
Curve Name: U-Out-Campus

Description:

	Head (ft)	Outflow (CFS)
1	0.00	0.00
2	0.75	0.00
3	0.88	0.04
4	1.00	0.10
5	1.13	0.14
6	1.25	0.16
7	1.50	0.21
8	1.75	0.24
9	2.00	0.28

View... Load... Save... OK Cancel Help

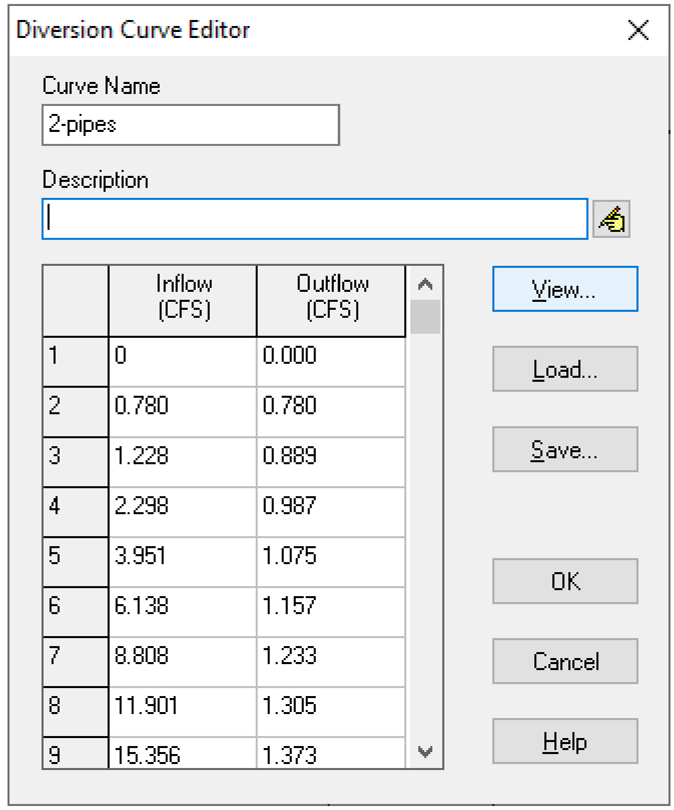
DIVERSION STRUCTURE



Divider Und-DIV

Property	Value
Name	Und-DIV
X-Coordinate	1500.000
Y-Coordinate	5100.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	Low-flow
Type	TABULAR
Cutoff Divider	
Cutoff Flow	0
Tabular Divider	
Curve Name	2-pipes
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

Name of link which receives the diverted flow



Diversion Curve Editor

Curve Name: 2-pipes

Description:

	Inflow (CFS)	Outflow (CFS)
1	0	0.000
2	0.780	0.780
3	1.228	0.889
4	2.298	0.987
5	3.951	1.075
6	6.138	1.157
7	8.808	1.233
8	11.901	1.305
9	15.356	1.373

Overland Flow Manning’s Coefficient per TRWE (Reference [6])

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and detention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

Parameters for the pre- and post-developed models include soil type C as determined from the NRCS websoil survey review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to Appendix G of the 2020 County of San Diego BMP Design Manual.

For surface runoff infiltration values, REC selected infiltration values per Appendix G of the 2020 County of San Diego BMP Design Manual corresponding to hydrologic soil type.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

appeal of a de facto value, we anticipate that jurisdictions will not be inclined to approve land surfaces other than short prairie grass. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology.

SWMM-Endorsed Values Will Improve Model Quality

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual and SWMM 5 Applications Manual by providing an in-depth description of the program's hydrologic components (EPA 2016). Table 3-5 of the SWMM Hydrology Reference Manual expounds upon SWMM 5 User's Manual Table A.6 by providing Manning's *n* values for additional overland flow surfaces[3]. The values are provided in Table 1:

Table 1: Manning's *n* Values for Overland Flow (EPA, 2016; Yen 2001; Yen and Chow, 1983).

Overland Surface	**Light Rain (< 0.8 in/hr)**	**Moderate Rain (0.8-1.2 in/hr)**	**Heavy Rain (> 1.2 in/hr)**
Smooth asphalt pavement	0.010	0.012	0.015
Smooth impervious surface	0.011	0.013	0.015
Tar and sand pavement	0.012	0.014	0.016
Concrete pavement	0.014	0.017	0.020
Rough impervious surface	0.015	0.019	0.023
Smooth bare packed soil	0.017	0.021	0.025
Moderate bare packed soil	0.025	0.030	0.035
Rough bare packed soil	0.032	0.038	0.045
Gravel soil	0.025	0.032	0.045
Mowed poor grass	0.030	0.038	0.045
Average grass, closely clipped sod	0.040	0.050	0.060
Pasture	0.040	0.055	0.070
Timberland	0.060	0.090	0.120
Dense grass	0.060	0.090	0.120
Shrubs and bushes	0.080	0.120	0.180
Land Use			
Business	0.014	0.022	0.035
Semibusiness	0.022	0.035	0.050
Industrial	0.020	0.035	0.050
Dense residential	0.025	0.040	0.060
Suburban residential	0.030	0.055	0.080
Parks and lawns	0.040	0.075	0.120

For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural land covers, comes with the disclaimer that the provided Manning's *n* values are valid for shallow-depth overland flow that match the conditions in the experimental plots (Engman,

[3] Further discussion is provided on page 6 under "Discussion of Differences Between Manning's *n* Values"

ATTACHMENT 8

Geotechnical Documentation

Map Scale: 1:1,750 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WmB	Wyman loam, 2 to 5 percent slopes	C	1.3	17.9%
WmC	Wyman loam, 5 to 9 percent slopes	C	6.0	82.1%
Totals for Area of Interest			**7.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ JUL-24-1951 00:00:00
Ending Date .............. MAY-24-2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       622.532       871.080
Evaporation Loss .........         6.855         9.592
Infiltration Loss ........       544.751       762.244
Surface Runoff ...........        76.175       106.588
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -0.843


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        76.175        24.823
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        76.175        24.823
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

--------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total        Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff       Runoff   Runoff   Coeff
Subcatchment                   in         in         in         in         in     10^6 gal      CFS
--------------------------------------------------------------------------------------------------------
A-Flat-C                   871.08       0.00       9.66     763.34     104.77        20.01     9.20   0.120
A-Slope-C                  871.08       0.00       9.30     757.25     114.85         4.81     2.02   0.132
Analysis begun on:  Wed Mar 10 19:55:48 2021
Analysis ended on:  Wed Mar 10 19:56:02 2021
Total elapsed time: 00:00:14
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ JUL-24-1951 00:00:00
Ending Date .............. MAY-24-2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


WARNING 04: minimum elevation drop used for Conduit Overflow

WARNING 04: minimum elevation drop used for Conduit Low-flow

**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       626.423       871.080
Evaporation Loss .........        55.152        76.692
Infiltration Loss ........       162.588       226.089
Surface Runoff ...........       417.650       580.768
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -1.432


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       417.650       136.097
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........       299.201        97.499
Internal Outflow .........         0.000         0.000
Storage Losses ...........       118.319        38.556
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.023         0.008
Continuity Error (%) .....         0.026


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
```

POST_DEV

Routing Time Step Summary
****
Minimum Time Step : 60.00 sec
Average Time Step : 60.00 sec
Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
A-1-C	871.08	0.00	84.08	169.90	629.85	131.77	10.68	0.723
B-1-C	871.08	0.00	72.51	250.84	560.42	1.40	0.13	0.643
F-BYPASS-C	871.08	0.00	6.93	755.01	117.87	0.69	0.28	0.135
C-1-C	871.08	0.00	9.48	739.12	132.74	2.23	0.81	0.152

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
Und-DIV	DIVIDER	0.00	0.00	0.00	0 00:00
UND-Campus	STORAGE	0.08	6.27	6.27	9673 21:02

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
POC-1	OUTFALL	0.28	10.77	9673 21:01	0.688	97.492
Und-DIV	DIVIDER	0.00	10.51	9673 21:02	0.000	96.804
UND-Campus	STORAGE	11.62	11.62	9673 20:45	135.399	135.399

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
Und-DIV	DIVIDER	498239.02	0.000	0.000
UND-Campus	STORAGE	498239.02	6.267	2.483

****
Node Flooding Summary
****

POST_DEV

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
UND-Campus	0.350	1	28	37.066	70	9673 21:01	10.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
POC-1	3.79	0.19	10.77	97.492
System	3.79	0.19	10.77	97.492

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Overflow	DUMMY	9.24	9673 21:02			
Low-flow	DUMMY	1.27	9673 21:02			
U-Campus	DUMMY	10.51	9673 21:02			

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
Overflow	0.01	0.01	0.01	498239.02	0.01
Low-flow	0.01	0.01	0.01	498239.02	0.01

Analysis begun on: Mon Aug 21 18:41:13 2023
Analysis ended on: Mon Aug 21 18:42:06 2023
Total elapsed time: 00:00:53