TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

San Clemente Senior Housing & Health Center

Prepared For:

Saddleback Memorial Care

July, 2022 – REVISED September, 2022

Prepared by:

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

REGISTERED PROFESSIONAL ENGINEER
LUIS A PARRA-ROSALES
RCE ~ 66377
EXP 6/30/24
CIVIL
STATE OF CALIFORNIA

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

TECHNICAL MEMORANDUM

TO: Saddleback Memorial Health Care

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

DATE: July 6, 2022, Revised September 1, 2022

RE: Summary of SWMM Modeling for Hydromodification Compliance for San Clemente Senior Housing & Health Center, San Clemente, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed residential/medical development site in the City of San Clemente using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for pre and post-developed conditions at the site in order to determine if the proposed underground detention facilities have sufficient volume to meet Order R9-2015-0001. This order states that South Orange County should be under the California Regional Water Quality Control Board San Diego Region (SDRWQCB) Permit requirements (Order R9-2013-001), as explained in the South Orange County Hydromodification Management Plan (HMP), dated April, 2015, prepared for the southern portion of Orange County.

SWMM MODEL DEVELOPMENT

The San Clemente Senior Housing & Health Center project proposes a senior care residential development on the current hospital site. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to two (2) Points of Compliance (POC); POC-1 which is an existing storm drain located to the southwest of the project site and POC-2 which is also an existing storm drain system located to the eastern boundary of the project site. Both storm drain systems convey flow in a westerly direction beneath the adjacent 405 Freeway, discharging to a natural stream at two (2) separate locations.

The SWMM model was used since we have found it to be more comparable to the Orange County area watersheds than the alternative South Orange County Hydrology Model (SOHM) and also because it is a non-proprietary model approved by the HMP document. 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 Laguna Beach gauge from the SOCHM model was extracted and used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 4 Evapotranspiration Area. Thus, evapotranspiration values for the site were modeled using Zone 4 average monthly values from Table

G.1-1 from the County of San Diego 2020 BMP Design Manual as this include the location of the site. The site was modeled with Type D hydrologic soil as this is the existing soils determined from the NRCS Soil Survey. Soils have been assumed to be compact in the existing condition to represent the current mass graded condition of the site. The post developed conditions were modeled also as fully compacted. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

EXISTING CONDITIONS

The runoff from the existing hospital site and associated hardscape parking areas discharge to two (2) Points of Compliance located to the northwest and southwest of the project site to two (2) separate storm drain systems. Table 1 below provides a summary of the existing conditions DMAs.

TABLE 1 – SUMMARY OF EXISTING CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip(1)	POC
DMA-1	2.092	0%	1
DMA-2	4.538	0%	2
TOTAL	**6.63**	--	n/a

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis if they are part of property boundary. Therefore, both DMAs were modeled as 0% impervious.

DEVELOPED CONDITIONS

Runoff from the developed project site drains to two (2) separate underground detention facilities located at the existing discharge locations from the project site. Flows are intercepted by a series of curb inlets which then convey runoff flows via a proposed storm drain to the aforementioned detention vaults. Peak flows beyond the HMP threshold (i.e. flows greater than the 10-year event) bypass the proposed vault systems and discharge directly to the receiving storm drain outlet location. Table 2 on the following page provides a summary of the developed conditions DMAs.

Runoff tributary to the aforementioned underground vaults are primarily drained via a proposed dry well system or a riser outlet structure. The first riser structure outlet is located at an elevation such that the water quality treatment volume (Design Capture Volume – DCV) is fully contained within the vault and can only exit the vault via dry well infiltration. Flows in excess of the DCV can outlet via the riser structure within the vault systems. A riser spillway structure with orifices and slots (see dimensions in Table 4) will be located at the downstream end of the vaults to control the flows. The riser structures will act as a spillway such that peak flows can be safely discharged to the receiving storm drain system.

It is assumed all storm water quality requirements for the project will be met by the onsite water quality BMPs. 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, please refer to the site specific Water Quality Management Plan (WQMP).

TABLE 2 – SUMMARY OF DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip	POC
DMA 1	1.674	85.4%	POC 1
DMA 4-1	0.353	0%	
DMA 2	4.462	82.0%	POC 2
DMA 3	0.019	15.8%	
DMA 4-2	0.095	0%	
TOTAL	**6.67**	--	--

The underground detention vault systems were modeled using the storage unit feature within SWMM. The riser structure with its given outlets was modeled using the outlet feature in SWMM. The storage unit feature can model the vaults volume while the outlet feature models the discharge of the flows via the riser structure. It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

DMA's 3 and 4 are self-treating and/or deminimus areas that drain directly to the receiving POC, confluencing with flows from the overall developed site. It should be noted that offsite improvements (DMA's 5-1, 5-2 and 5-3) are part of the EPA green street initiative design for the adjacent Camino De Los Mares and are not required to be analyzed for HMP given the EPA green streets design designation.

BMP MODELING FOR HMP PURPOSES

Two (2) underground detention vault systems will be used for hydromodification conformance for the project site. Tables 3 & 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE DETENTION VAULTS

Vault	Tributary Area (Ac)	DIMENSIONS					
		Vault Dimensions (ft)	Vault Area, (ft^2)	Depth to spillway (ft)(1)	Weir Length(2) (ft)	Total Vault Depth(3) (ft)	Drywell Infiltration (cfs)
UG 1	1.32	1 x 10' x 50' x 8'	500	9.50	5.0	10.0	0.0698
UG 1	4.587	2 x 20' x 44' x 10'	1,760	7.70	10.0	8.0	0.1111

Notes: (1): Depth of ponding beneath outlet structure's main weir.
(2): Overflow length.
(3): Total surface depth of BMP from top crest elevation to basin invert.

TABLE 4 – SUMMARY OF RISER DETAILS

Vault	Lower Slot		Main Weir	
	B x h	Elev.(1)	Length(2)	Elev.(1)
UG-1	2.0' x 1"	7.7 ft	5.0'	9.5 ft
UG-2	2.5' x 2"	5.7 ft	10.0'	8.5 ft

(1) Underground vault elevation assumed to be 0.00 ft elevation.

DETERMINATION OF MANNINGS N=0.05

The n = 0.05 has already been approved in many studies prepared by multiple San Diego consulting firms, among them REC, TRWE, Excel and others. Per the regional board approved study undertaken in the TRWE N-Perv paper (an excerpt of which is provided in Attachment 7 of this report) establishes an n value as low as 0.017 to 0.038 for smooth, moderate, rough and gravel soil depending on the intensity of rain, 0.04 to 0.055 for pasture, and average grasses, with values as high as 0.08 to 0.12 for dense shrub and bushes. Values of n for heavy rain are not considered (I > 1.2 in/hr) because those intensities are very rare and if they occur generate peaks larger than Q10.

In this regard, there are 16 potential values of n that can be used in the most common scenarios, depending on the combination of intensity and surface condition (LR = light rain; MR = moderate rain): smooth soil (0.017 LR, 0.021 MR); moderate bare soil (0.025 LR, 0.030 MR); rough soil (0.032 LR, 0.038 MR); gravel soil (0.025 LR; 0.032 MR); average grass (0.04 LR; 0.05 MR); pasture (0.04 LR; 0.055 MR); dense grass (0.06 LR, 0.09 MR); and shrubs an bushes (0.08 LR; 0.12 MR).

An average of those values corresponds to n = 0.047 as an arithmetic mean, with a geometric mean to 0.045. A weighted average of those values (giving soil values a 30% weight and vegetation values a 70% weight) would be 0.051 as arithmetic mean and 0.048 as geometric mean. Therefore, it is the opinion of REC that a conservative weighted average of n = 0.05 properly represents the conditions of the project based on TRWE – Board Approved paper.

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 POCs is illustrated in Figures 1a/2a and 1b/2b in both normal and logarithmic scale.

As can be seen in Figures 1a and 1b, the FDC for the proposed condition with the HMP BMP 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 POC-1 and POC-2. 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.

SUMMARY

This study has demonstrated that the proposed HMP underground BMPs provided for the San Clemente Senior Housing site are sufficient to meet the current HMP criteria for the Points of Compliance, if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifices and outlet structures are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soils are representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. Flow Duration Curve Analysis
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Area Vs Elevation & Discharge Vs Elevation
5. Pre & Post Development Maps, Project Plan and Section Sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. EPA SWMM Figures and Explanations
8. Soil Maps
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] – *"South Orange County Hydromodification Management Plan (HMP)"* Prepared for South Orange County", April 1, 2015, Prepared by RBF.

[3] - Order R9-2013-001, 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*", September 2020.

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

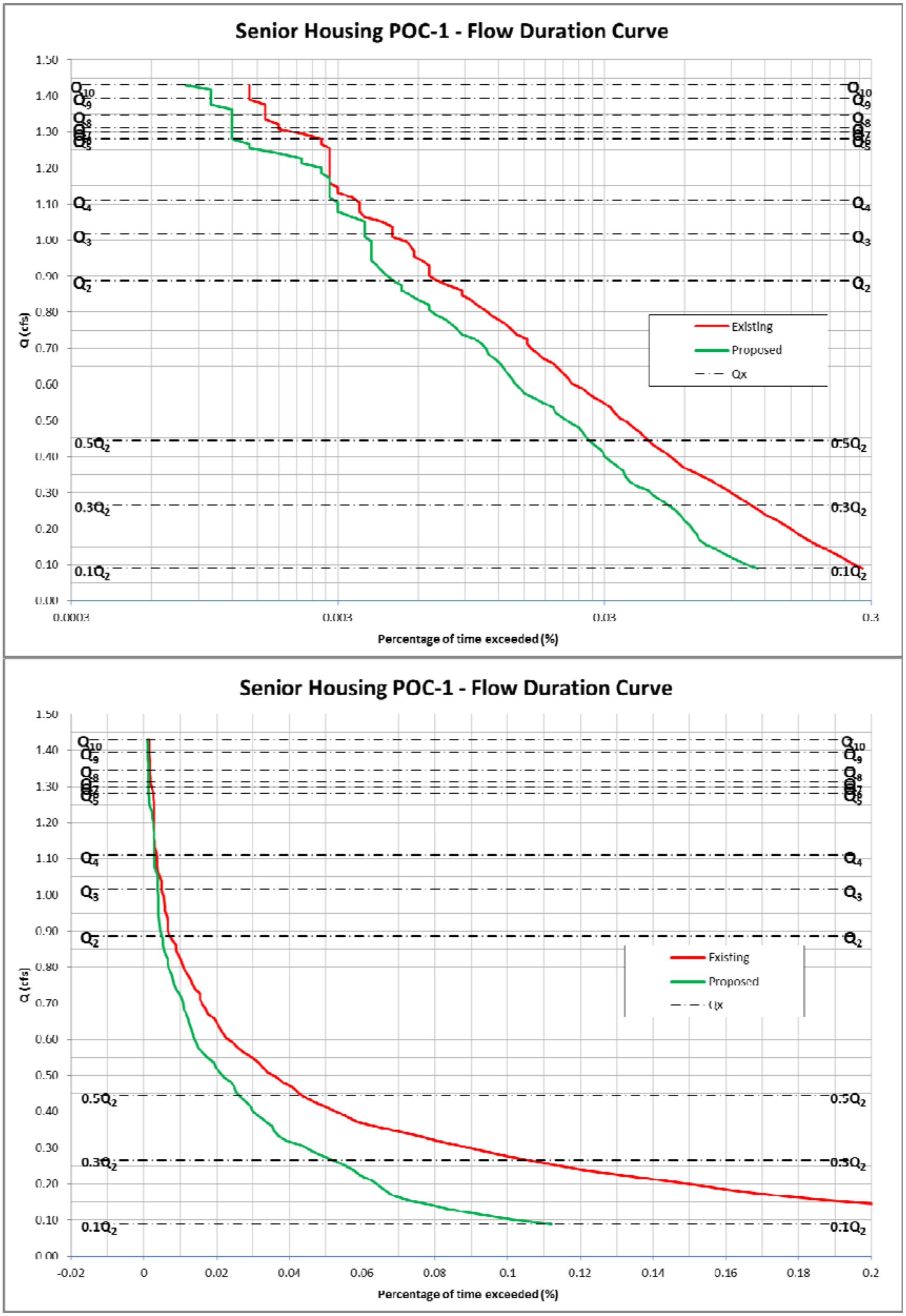


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

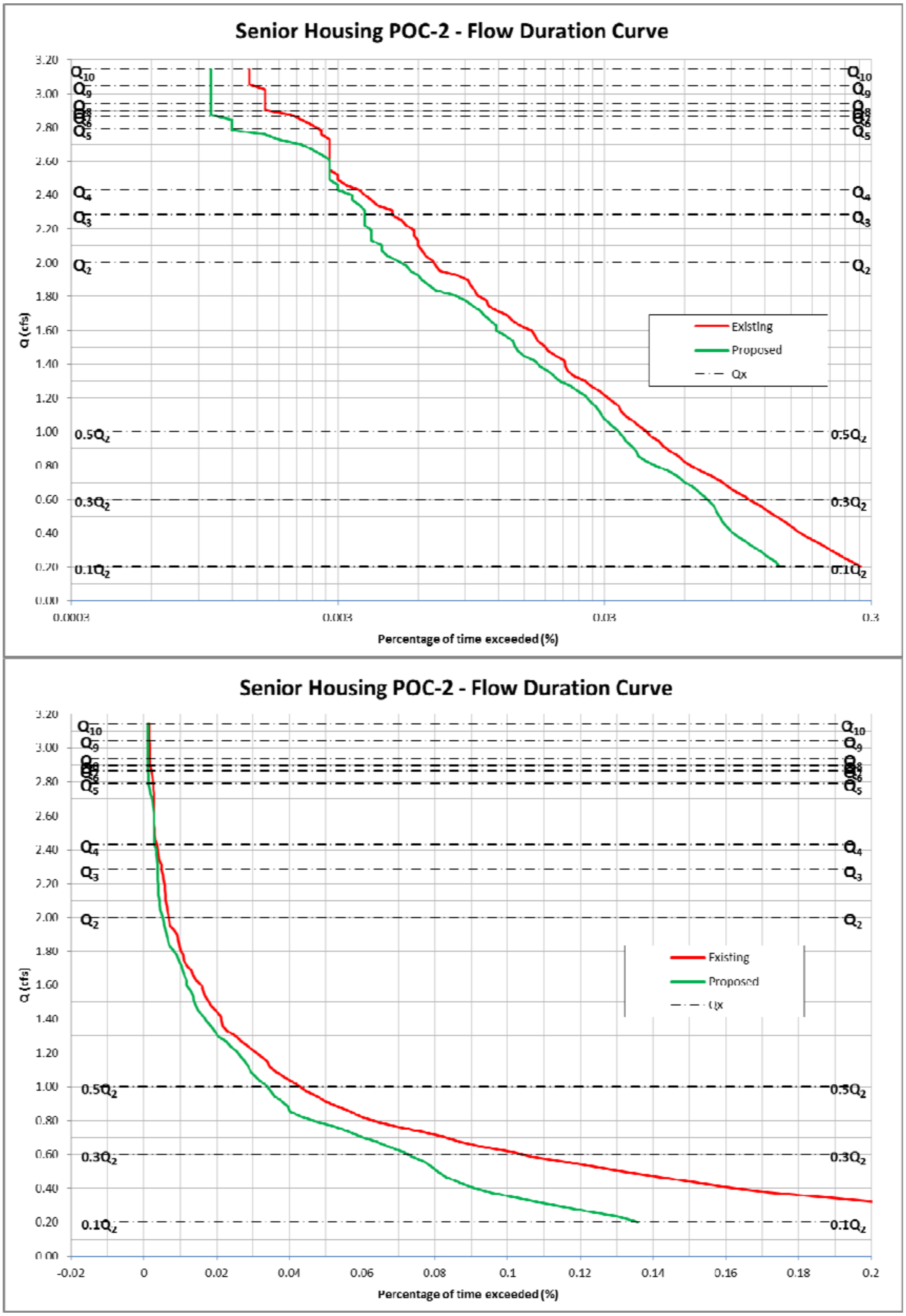


Figure 2a and 2b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

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	0.888	0.792	0.096
3-year	1.016	0.886	0.131
4-year	1.110	1.058	0.053
5-year	1.281	1.196	0.084
6-year	1.298	1.228	0.071
7-year	1.313	1.239	0.074
8-year	1.346	1.250	0.096
9-year	1.395	1.256	0.139
10-year	1.430	1.267	0.164

Q_2 to Q_{10} Comparison Table – POC 2

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	2.001	1.820	0.180
3-year	2.284	2.075	0.208
4-year	2.432	2.353	0.079
5-year	2.794	2.626	0.169
6-year	2.868	2.671	0.197
7-year	2.896	2.709	0.187
8-year	2.941	2.747	0.194
9-year	3.046	2.768	0.278
10-year	3.144	2.780	0.364

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.

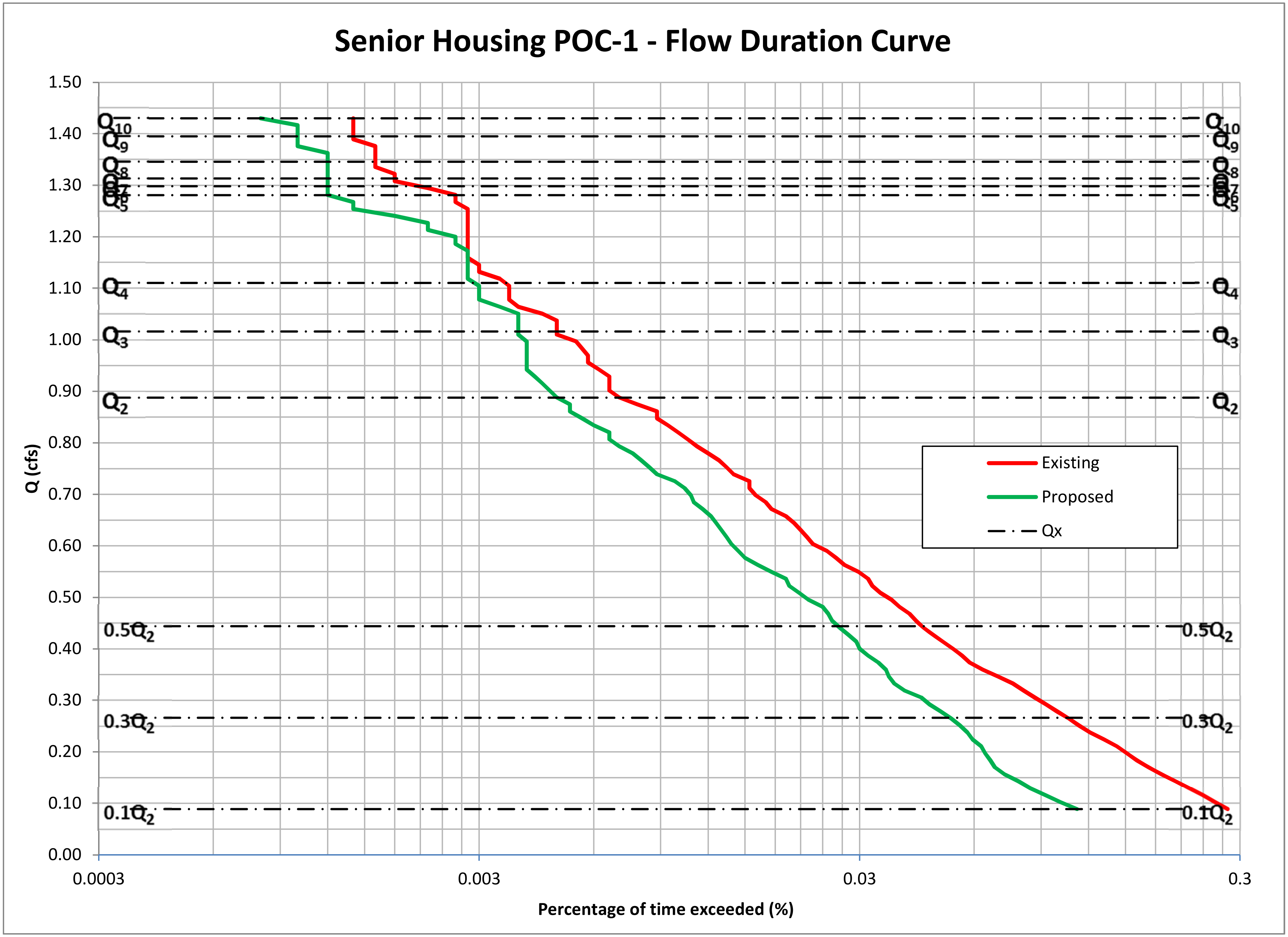
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, 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%).

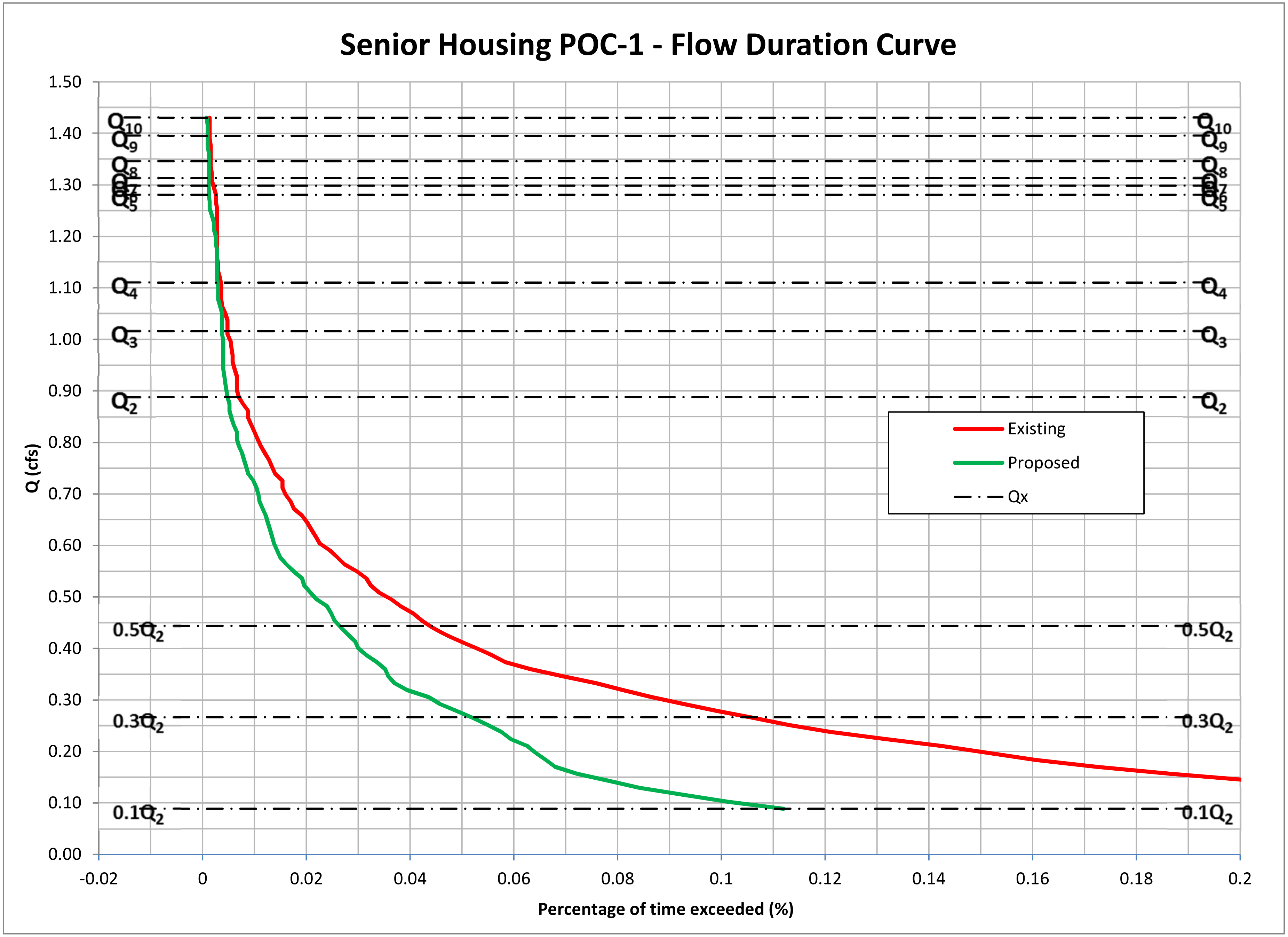
Consequently, the design passes the hydromodification test.

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 City of San Clemente 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.


Senior Housing POC-1 - Flow Duration Curve
Q (cfs)
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0003
0.003
0.03
0.3
Percentage of time exceeded (%)
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx


Senior Housing POC-1 - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
Existing
Proposed
Qx
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.02
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2

Flow Duration Curve Data for Senior Housing POC-1, City of San Clemente CA

Q2 =	0.89	cfs	Fraction	10 %
Q10 =	1.43	cfs		
Step =	0.0136	cfs		
Count =	499995	hours		
	57.04	years		

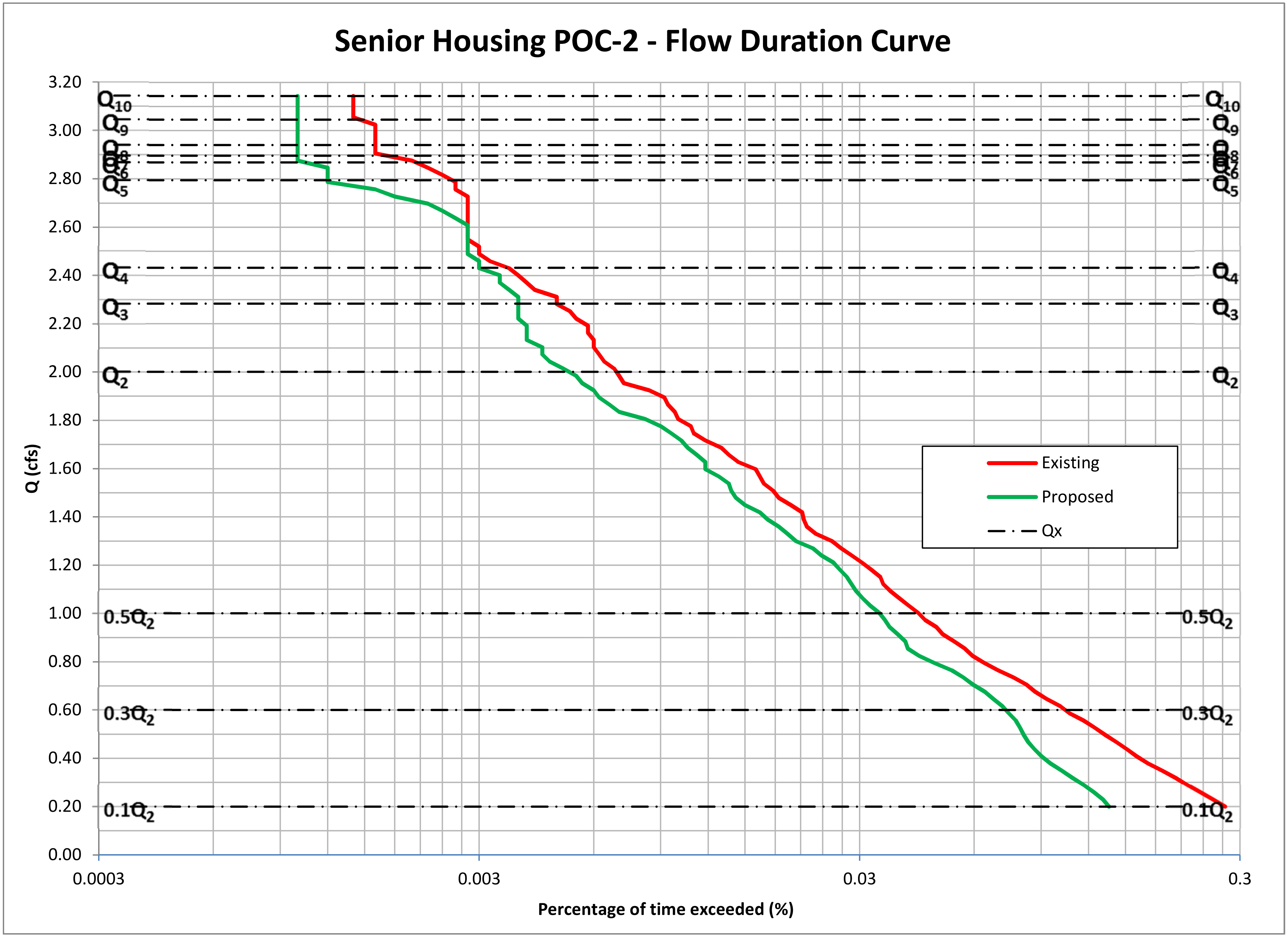
	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.089	1391	2.78E-01	560	1.12E-01	40%	Pass
2	0.102	1287	2.57E-01	507	1.01E-01	39%	Pass
3	0.116	1197	2.39E-01	463	9.26E-02	39%	Pass
4	0.129	1099	2.20E-01	421	8.42E-02	38%	Pass
5	0.143	1016	2.03E-01	392	7.84E-02	39%	Pass
6	0.157	933	1.87E-01	361	7.22E-02	39%	Pass
7	0.170	862	1.72E-01	340	6.80E-02	39%	Pass
8	0.184	803	1.61E-01	331	6.62E-02	41%	Pass
9	0.197	757	1.51E-01	321	6.42E-02	42%	Pass
10	0.211	712	1.42E-01	313	6.26E-02	44%	Pass
11	0.224	658	1.32E-01	297	5.94E-02	45%	Pass
12	0.238	605	1.21E-01	288	5.76E-02	48%	Pass
13	0.251	565	1.13E-01	275	5.50E-02	49%	Pass
14	0.265	532	1.06E-01	261	5.22E-02	49%	Pass
15	0.279	496	9.92E-02	245	4.90E-02	49%	Pass
16	0.292	464	9.28E-02	229	4.58E-02	49%	Pass
17	0.306	433	8.66E-02	218	4.36E-02	50%	Pass
18	0.319	405	8.10E-02	197	3.94E-02	49%	Pass
19	0.333	379	7.58E-02	185	3.70E-02	49%	Pass
20	0.346	347	6.94E-02	179	3.58E-02	52%	Pass
21	0.360	316	6.32E-02	176	3.52E-02	56%	Pass
22	0.373	292	5.84E-02	168	3.36E-02	58%	Pass
23	0.387	279	5.58E-02	158	3.16E-02	57%	Pass
24	0.400	264	5.28E-02	150	3.00E-02	57%	Pass
25	0.414	248	4.96E-02	147	2.94E-02	59%	Pass
26	0.428	234	4.68E-02	140	2.80E-02	60%	Pass
27	0.441	221	4.42E-02	133	2.66E-02	60%	Pass
28	0.455	211	4.22E-02	127	2.54E-02	60%	Pass
29	0.468	203	4.06E-02	124	2.48E-02	61%	Pass
30	0.482	191	3.82E-02	120	2.40E-02	63%	Pass
31	0.495	182	3.64E-02	110	2.20E-02	60%	Pass
32	0.509	170	3.40E-02	104	2.08E-02	61%	Pass
33	0.522	162	3.24E-02	98	1.96E-02	60%	Pass
34	0.536	158	3.16E-02	96	1.92E-02	61%	Pass
35	0.550	149	2.98E-02	88	1.76E-02	59%	Pass
36	0.563	137	2.74E-02	81	1.62E-02	59%	Pass
37	0.577	130	2.60E-02	75	1.50E-02	58%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
38	0.590	123	2.46E-02	72	1.44E-02	59%	Pass
39	0.604	113	2.26E-02	69	1.38E-02	61%	Pass
40	0.617	109	2.18E-02	67	1.34E-02	61%	Pass
41	0.631	105	2.10E-02	65	1.30E-02	62%	Pass
42	0.644	101	2.02E-02	63	1.26E-02	62%	Pass
43	0.658	96	1.92E-02	61	1.22E-02	64%	Pass
44	0.671	88	1.76E-02	58	1.16E-02	66%	Pass
45	0.685	85	1.70E-02	55	1.10E-02	65%	Pass
46	0.699	80	1.60E-02	54	1.08E-02	68%	Pass
47	0.712	77	1.54E-02	52	1.04E-02	68%	Pass
48	0.726	77	1.54E-02	49	9.80E-03	64%	Pass
49	0.739	70	1.40E-02	44	8.80E-03	63%	Pass
50	0.753	67	1.34E-02	42	8.40E-03	63%	Pass
51	0.766	64	1.28E-02	40	8.00E-03	63%	Pass
52	0.780	60	1.20E-02	38	7.60E-03	63%	Pass
53	0.793	56	1.12E-02	35	7.00E-03	63%	Pass
54	0.807	53	1.06E-02	33	6.60E-03	62%	Pass
55	0.821	50	1.00E-02	33	6.60E-03	66%	Pass
56	0.834	47	9.40E-03	30	6.00E-03	64%	Pass
57	0.848	44	8.80E-03	28	5.60E-03	64%	Pass
58	0.861	44	8.80E-03	26	5.20E-03	59%	Pass
59	0.875	39	7.80E-03	26	5.20E-03	67%	Pass
60	0.888	35	7.00E-03	24	4.80E-03	69%	Pass
61	0.902	33	6.60E-03	23	4.60E-03	70%	Pass
62	0.915	33	6.60E-03	22	4.40E-03	67%	Pass
63	0.929	33	6.60E-03	21	4.20E-03	64%	Pass
64	0.942	31	6.20E-03	20	4.00E-03	65%	Pass
65	0.956	29	5.80E-03	20	4.00E-03	69%	Pass
66	0.970	29	5.80E-03	20	4.00E-03	69%	Pass
67	0.983	28	5.60E-03	20	4.00E-03	71%	Pass
68	0.997	27	5.40E-03	20	4.00E-03	74%	Pass
69	1.010	24	4.80E-03	19	3.80E-03	79%	Pass
70	1.024	24	4.80E-03	19	3.80E-03	79%	Pass
71	1.037	24	4.80E-03	19	3.80E-03	79%	Pass
72	1.051	22	4.40E-03	19	3.80E-03	86%	Pass
73	1.064	19	3.80E-03	17	3.40E-03	89%	Pass
74	1.078	18	3.60E-03	15	3.00E-03	83%	Pass
75	1.092	18	3.60E-03	15	3.00E-03	83%	Pass
76	1.105	18	3.60E-03	15	3.00E-03	83%	Pass
77	1.119	17	3.40E-03	14	2.80E-03	82%	Pass
78	1.132	15	3.00E-03	14	2.80E-03	93%	Pass
79	1.146	15	3.00E-03	14	2.80E-03	93%	Pass
80	1.159	14	2.80E-03	14	2.80E-03	100%	Pass
81	1.173	14	2.80E-03	14	2.80E-03	100%	Pass
82	1.186	14	2.80E-03	13	2.60E-03	93%	Pass

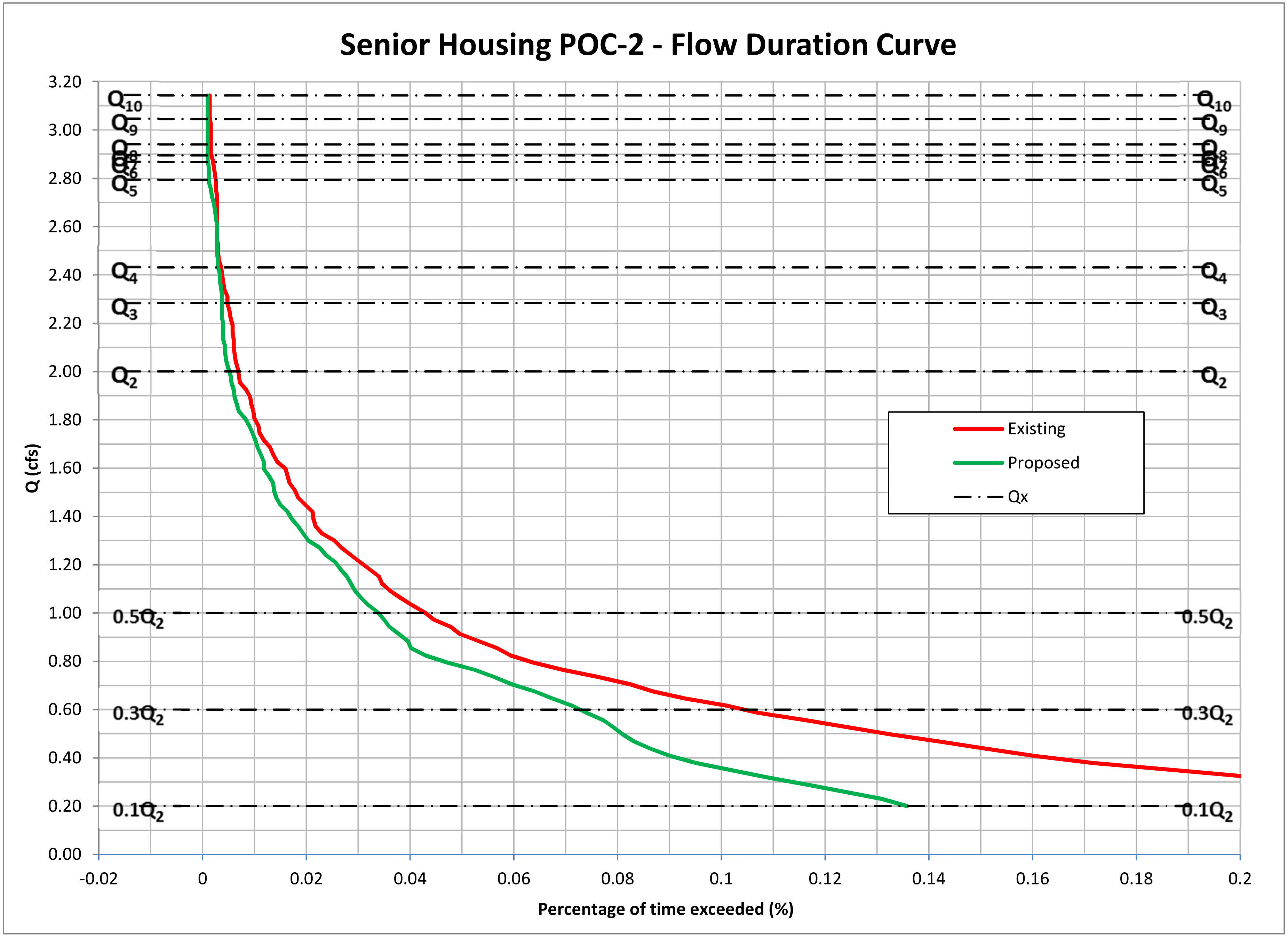
Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
83	1.200	14	2.80E-03	13	2.60E-03	93%	Pass
84	1.213	14	2.80E-03	11	2.20E-03	79%	Pass
85	1.227	14	2.80E-03	11	2.20E-03	79%	Pass
86	1.241	14	2.80E-03	9	1.80E-03	64%	Pass
87	1.254	14	2.80E-03	7	1.40E-03	50%	Pass
88	1.268	13	2.60E-03	7	1.40E-03	54%	Pass
89	1.281	13	2.60E-03	6	1.20E-03	46%	Pass
90	1.295	11	2.20E-03	6	1.20E-03	55%	Pass
91	1.308	9	1.80E-03	6	1.20E-03	67%	Pass
92	1.322	9	1.80E-03	6	1.20E-03	67%	Pass
93	1.335	8	1.60E-03	6	1.20E-03	75%	Pass
94	1.349	8	1.60E-03	6	1.20E-03	75%	Pass
95	1.363	8	1.60E-03	6	1.20E-03	75%	Pass
96	1.376	8	1.60E-03	5	1.00E-03	63%	Pass
97	1.390	7	1.40E-03	5	1.00E-03	71%	Pass
98	1.403	7	1.40E-03	5	1.00E-03	71%	Pass
99	1.417	7	1.40E-03	5	1.00E-03	71%	Pass
100	1.430	7	1.40E-03	4	8.00E-04	57%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	1.430	1.267	0.164
9	1.395	1.256	0.139
8	1.346	1.250	0.096
7	1.313	1.239	0.074
6	1.298	1.228	0.071
5	1.281	1.196	0.084
4	1.110	1.058	0.053
3	1.016	0.886	0.131
2	0.888	0.792	0.096



Senior Housing POC-2 - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.0003
0.003
0.03
0.3
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx


Senior Housing POC-2 - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.02
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx

Flow Duration Curve Data for Senior Housing POC-2, City of San Clemente CA

Q2 =	2.00	cfs	Fraction	10 %
Q10 =	3.14	cfs		
Step =	0.0297	cfs		
Count =	499995	hours		
	57.04	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.200	1369	2.74E-01	679	1.36E-01	50%	Pass
2	0.230	1272	2.54E-01	655	1.31E-01	51%	Pass
3	0.260	1176	2.35E-01	619	1.24E-01	53%	Pass
4	0.289	1090	2.18E-01	583	1.17E-01	53%	Pass
5	0.319	1015	2.03E-01	544	1.09E-01	54%	Pass
6	0.349	938	1.88E-01	510	1.02E-01	54%	Pass
7	0.378	859	1.72E-01	476	9.52E-02	55%	Pass
8	0.408	802	1.60E-01	451	9.02E-02	56%	Pass
9	0.438	756	1.51E-01	432	8.64E-02	57%	Pass
10	0.468	710	1.42E-01	416	8.32E-02	59%	Pass
11	0.497	663	1.33E-01	405	8.10E-02	61%	Pass
12	0.527	622	1.24E-01	396	7.92E-02	64%	Pass
13	0.557	581	1.16E-01	386	7.72E-02	66%	Pass
14	0.587	535	1.07E-01	370	7.40E-02	69%	Pass
15	0.616	505	1.01E-01	356	7.12E-02	70%	Pass
16	0.646	465	9.30E-02	337	6.74E-02	72%	Pass
17	0.676	434	8.68E-02	320	6.40E-02	74%	Pass
18	0.706	412	8.24E-02	298	5.96E-02	72%	Pass
19	0.735	381	7.62E-02	281	5.62E-02	74%	Pass
20	0.765	347	6.94E-02	262	5.24E-02	76%	Pass
21	0.795	319	6.38E-02	236	4.72E-02	74%	Pass
22	0.824	297	5.94E-02	215	4.30E-02	72%	Pass
23	0.854	284	5.68E-02	201	4.02E-02	71%	Pass
24	0.884	266	5.32E-02	198	3.96E-02	74%	Pass
25	0.914	248	4.96E-02	189	3.78E-02	76%	Pass
26	0.943	239	4.78E-02	180	3.60E-02	75%	Pass
27	0.973	223	4.46E-02	175	3.50E-02	78%	Pass
28	1.003	214	4.28E-02	169	3.38E-02	79%	Pass
29	1.033	202	4.04E-02	160	3.20E-02	79%	Pass
30	1.062	191	3.82E-02	153	3.06E-02	80%	Pass
31	1.092	181	3.62E-02	147	2.94E-02	81%	Pass
32	1.122	173	3.46E-02	143	2.86E-02	83%	Pass
33	1.152	170	3.40E-02	139	2.78E-02	82%	Pass
34	1.181	161	3.22E-02	133	2.66E-02	83%	Pass
35	1.211	152	3.04E-02	128	2.56E-02	84%	Pass
36	1.241	143	2.86E-02	119	2.38E-02	83%	Pass
37	1.270	134	2.68E-02	113	2.26E-02	84%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
38	1.300	127	2.54E-02	102	2.04E-02	80%	Pass
39	1.330	115	2.30E-02	97	1.94E-02	84%	Pass
40	1.360	109	2.18E-02	92	1.84E-02	84%	Pass
41	1.389	107	2.14E-02	86	1.72E-02	80%	Pass
42	1.419	106	2.12E-02	82	1.64E-02	77%	Pass
43	1.449	99	1.98E-02	75	1.50E-02	76%	Pass
44	1.479	92	1.84E-02	71	1.42E-02	77%	Pass
45	1.508	89	1.78E-02	69	1.38E-02	78%	Pass
46	1.538	84	1.68E-02	68	1.36E-02	81%	Pass
47	1.568	82	1.64E-02	64	1.28E-02	78%	Pass
48	1.597	80	1.60E-02	59	1.18E-02	74%	Pass
49	1.627	72	1.44E-02	59	1.18E-02	82%	Pass
50	1.657	68	1.36E-02	56	1.12E-02	82%	Pass
51	1.687	65	1.30E-02	53	1.06E-02	82%	Pass
52	1.716	59	1.18E-02	51	1.02E-02	86%	Pass
53	1.746	55	1.10E-02	48	9.60E-03	87%	Pass
54	1.776	54	1.08E-02	45	9.00E-03	83%	Pass
55	1.806	50	1.00E-02	41	8.20E-03	82%	Pass
56	1.835	49	9.80E-03	35	7.00E-03	71%	Pass
57	1.865	47	9.40E-03	33	6.60E-03	70%	Pass
58	1.895	46	9.20E-03	31	6.20E-03	67%	Pass
59	1.925	42	8.40E-03	30	6.00E-03	71%	Pass
60	1.954	36	7.20E-03	28	5.60E-03	78%	Pass
61	1.984	35	7.00E-03	27	5.40E-03	77%	Pass
62	2.014	34	6.80E-03	25	5.00E-03	74%	Pass
63	2.043	32	6.40E-03	23	4.60E-03	72%	Pass
64	2.073	31	6.20E-03	22	4.40E-03	71%	Pass
65	2.103	30	6.00E-03	22	4.40E-03	73%	Pass
66	2.133	30	6.00E-03	20	4.00E-03	67%	Pass
67	2.162	29	5.80E-03	20	4.00E-03	69%	Pass
68	2.192	29	5.80E-03	20	4.00E-03	69%	Pass
69	2.222	27	5.40E-03	19	3.80E-03	70%	Pass
70	2.252	26	5.20E-03	19	3.80E-03	73%	Pass
71	2.281	24	4.80E-03	19	3.80E-03	79%	Pass
72	2.311	24	4.80E-03	19	3.80E-03	79%	Pass
73	2.341	21	4.20E-03	18	3.60E-03	86%	Pass
74	2.371	20	4.00E-03	17	3.40E-03	85%	Pass
75	2.400	19	3.80E-03	17	3.40E-03	89%	Pass
76	2.430	18	3.60E-03	15	3.00E-03	83%	Pass
77	2.460	16	3.20E-03	15	3.00E-03	94%	Pass
78	2.489	15	3.00E-03	14	2.80E-03	93%	Pass
79	2.519	15	3.00E-03	14	2.80E-03	93%	Pass
80	2.549	14	2.80E-03	14	2.80E-03	100%	Pass
81	2.579	14	2.80E-03	14	2.80E-03	100%	Pass
82	2.608	14	2.80E-03	14	2.80E-03	100%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
83	2.638	14	2.80E-03	13	2.60E-03	93%	Pass
84	2.668	14	2.80E-03	12	2.40E-03	86%	Pass
85	2.698	14	2.80E-03	11	2.20E-03	79%	Pass
86	2.727	14	2.80E-03	9	1.80E-03	64%	Pass
87	2.757	13	2.60E-03	8	1.60E-03	62%	Pass
88	2.787	13	2.60E-03	6	1.20E-03	46%	Pass
89	2.817	12	2.40E-03	6	1.20E-03	50%	Pass
90	2.846	11	2.20E-03	6	1.20E-03	55%	Pass
91	2.876	10	2.00E-03	5	1.00E-03	50%	Pass
92	2.906	8	1.60E-03	5	1.00E-03	63%	Pass
93	2.935	8	1.60E-03	5	1.00E-03	63%	Pass
94	2.965	8	1.60E-03	5	1.00E-03	63%	Pass
95	2.995	8	1.60E-03	5	1.00E-03	63%	Pass
96	3.025	8	1.60E-03	5	1.00E-03	63%	Pass
97	3.054	7	1.40E-03	5	1.00E-03	71%	Pass
98	3.084	7	1.40E-03	5	1.00E-03	71%	Pass
99	3.114	7	1.40E-03	5	1.00E-03	71%	Pass
100	3.144	7	1.40E-03	5	1.00E-03	71%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	3.144	2.780	0.364
9	3.046	2.768	0.278
8	2.941	2.747	0.194
7	2.896	2.709	0.187
6	2.868	2.671	0.197
5	2.794	2.626	0.169
4	2.432	2.353	0.079
3	2.284	2.075	0.208
2	2.001	1.820	0.180

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)
Senior Housing - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.43**	**1.46**
9	**1.40**	**1.41**
8	**1.35**	**1.36**
7	**1.31**	**1.32**
6	**1.30**	**1.30**
5	**1.28**	**1.29**
4	**1.11**	**1.11**
3	**1.02**	**1.02**
2	**0.89**	**0.89**

Peaks (cfs)	Date	Posit	Period of Return (Years) Weibull	Period of Return (Years) Cunnane
0.707	2/12/1980	58	1.02	1.01
0.712	2/3/1958	57	1.04	1.03
0.728	2/9/1963	56	1.05	1.05
0.728	1/16/1993	55	1.07	1.07
0.729	1/20/1962	54	1.09	1.09
0.732	2/21/2005	53	1.11	1.11
0.739	3/8/1975	52	1.13	1.13
0.74	1/11/2001	51	1.16	1.15
0.742	2/27/1991	50	1.18	1.17
0.743	1/12/1960	49	1.20	1.20
0.754	12/31/2004	48	1.23	1.22
0.755	10/20/2004	47	1.26	1.25
0.766	1/9/2005	46	1.28	1.28
0.768	2/19/1958	45	1.31	1.30
0.778	3/8/1974	44	1.34	1.33
0.782	2/1/1960	43	1.37	1.37
0.812	9/5/1978	42	1.40	1.40
0.82	2/26/1983	41	1.44	1.43
0.824	3/16/1958	40	1.48	1.47
0.832	10/27/2004	39	1.51	1.51
0.834	10/30/1975	38	1.55	1.55
0.836	2/14/1980	37	1.59	1.59
0.844	4/28/2005	36	1.64	1.63
0.863	2/21/1980	35	1.69	1.68
0.871	3/1/1981	34	1.74	1.73
0.876	1/10/1995	33	1.79	1.79
0.879	1/18/1973	32	1.84	1.84
0.883	1/16/1952	31	1.90	1.90
0.886	1/3/2006	30	1.97	1.97
0.89	1/16/1973	29	2.03	2.03
0.898	3/22/1958	28	2.11	2.11
0.942	1/16/1978	27	2.19	2.19
0.946	1/2/2006	26	2.27	2.27
0.948	11/20/1963	25	2.36	2.37
0.954	2/15/1992	24	2.46	2.47
0.984	10/11/1957	23	2.57	2.58
0.999	11/6/1960	22	2.68	2.69
1.002	2/27/1983	21	2.81	2.83
1.01	4/27/1960	20	2.95	2.97
1.042	10/26/2004	19	3.11	3.13
1.055	3/25/1998	18	3.28	3.31
1.057	11/11/1978	17	3.47	3.51
1.07	3/15/2003	16	3.69	3.73
1.11	2/14/1998	15	3.93	3.99
1.12	2/6/1969	14	4.21	4.28
1.124	12/10/1965	13	4.54	4.62
1.288	1/25/1997	12	4.92	5.02
1.294	12/4/1974	11	5.36	5.49
1.299	2/12/1992	10	5.90	6.06
1.308	1/6/1959	9	6.56	6.77
1.328	2/7/1998	8	7.38	7.66
1.389	3/1/1983	7	8.43	8.82
1.444	11/14/1972	6	9.83	10.39
1.582	12/16/2002	5	11.80	12.65
1.595	3/3/1981	4	14.75	16.17
2.08	3/20/1992	3	19.67	22.38
2.103	4/21/1988	2	29.50	36.38
2.558	12/6/1997	1	59.00	97.00

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

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Senior Housing - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.27**	**1.28**
9	**1.26**	**1.26**
8	**1.25**	**1.25**
7	**1.24**	**1.24**
6	**1.23**	**1.23**
5	**1.20**	**1.20**
4	**1.06**	**1.06**
3	**0.89**	**0.89**
2	**0.79**	**0.79**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.552	2/19/2005	58	1.02	1.01
0.555	10/26/2004	57	1.04	1.03
0.557	12/24/1994	56	1.05	1.05
0.557	2/23/1998	55	1.07	1.07
0.565	2/10/1978	54	1.09	1.09
0.568	1/11/2005	53	1.11	1.11
0.582	11/22/1965	52	1.13	1.13
0.584	2/3/1998	51	1.16	1.15
0.587	4/28/2005	50	1.18	1.17
0.6	2/7/1993	49	1.20	1.20
0.611	1/9/2005	48	1.23	1.22
0.618	12/3/1966	47	1.26	1.25
0.63	1/26/1956	46	1.28	1.28
0.631	11/6/1960	45	1.31	1.30
0.632	3/5/1995	44	1.34	1.33
0.646	2/13/1954	43	1.37	1.37
0.651	2/21/2005	42	1.40	1.40
0.661	11/7/1966	41	1.44	1.43
0.672	1/12/1997	40	1.48	1.47
0.677	12/7/1992	39	1.51	1.51
0.686	4/14/2003	38	1.55	1.55
0.703	1/11/2001	37	1.59	1.59
0.741	2/9/1963	36	1.64	1.63
0.753	1/16/1993	35	1.69	1.68
0.771	3/16/1958	34	1.74	1.73
0.772	2/1/1960	33	1.79	1.79
0.782	2/26/1983	32	1.84	1.84
0.787	1/9/1980	31	1.90	1.90
0.788	2/12/1980	30	1.97	1.97
0.797	2/27/1991	29	2.03	2.03
0.798	2/19/1958	28	2.11	2.11
0.827	1/20/1962	27	2.19	2.19
0.83	1/10/1995	26	2.27	2.27
0.831	3/8/1974	25	2.36	2.37
0.844	2/14/1980	24	2.46	2.47
0.85	1/16/1973	23	2.57	2.58
0.863	1/2/2006	22	2.68	2.69
0.877	9/5/1978	21	2.81	2.83
0.879	1/16/1978	20	2.95	2.97
0.913	4/27/1960	19	3.11	3.13
0.933	11/20/1963	18	3.28	3.31
1.009	3/25/1998	17	3.47	3.51
1.051	2/6/1969	16	3.69	3.73
1.057	12/10/1965	15	3.93	3.99
1.072	3/15/2003	14	4.21	4.28
1.073	2/14/1998	13	4.54	4.62
1.202	1/25/1997	12	4.92	5.02
1.209	2/12/1992	11	5.36	5.49
1.23	2/7/1998	10	5.90	6.06
1.236	3/3/1981	9	6.56	6.77
1.248	3/1/1983	8	7.38	7.66
1.254	11/14/1972	7	8.43	8.82
1.271	12/4/1974	6	9.83	10.39
1.376	1/6/1959	5	11.80	12.65
1.422	4/21/1988	4	14.75	16.17
1.747	12/16/2002	3	19.67	22.38
2.177	3/20/1992	2	29.50	36.38
2.559	12/6/1997	1	59.00	97.00

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
Senior Housing - POC-2

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**3.14**	**3.21**
9	**3.05**	**3.09**
8	**2.94**	**2.98**
7	**2.90**	**2.90**
6	**2.87**	**2.88**
5	**2.79**	**2.81**
4	**2.43**	**2.44**
3	**2.28**	**2.29**
2	**2.00**	**2.00**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
1.614	12/1/1952	58	1.02	1.01
1.614	1/11/2001	57	1.04	1.03
1.614	2/21/2005	56	1.05	1.05
1.623	1/16/1993	55	1.07	1.07
1.625	12/24/1994	54	1.09	1.09
1.628	1/20/1962	53	1.11	1.11
1.629	2/27/1991	52	1.13	1.13
1.653	2/3/1958	51	1.16	1.15
1.671	1/12/1960	50	1.18	1.17
1.675	3/8/1975	49	1.20	1.20
1.706	2/19/1958	48	1.23	1.22
1.714	12/31/2004	47	1.26	1.25
1.715	10/20/2004	46	1.28	1.28
1.719	2/1/1960	45	1.31	1.30
1.734	1/9/2005	44	1.34	1.33
1.743	3/8/1974	43	1.37	1.37
1.782	9/5/1978	42	1.40	1.40
1.788	2/26/1983	41	1.44	1.43
1.792	3/16/1958	40	1.48	1.47
1.859	2/14/1980	39	1.51	1.51
1.873	10/27/2004	38	1.55	1.55
1.9	4/28/2005	37	1.59	1.59
1.923	2/21/1980	36	1.64	1.63
1.931	10/30/1975	35	1.69	1.68
1.939	3/1/1981	34	1.74	1.73
1.948	1/18/1973	33	1.79	1.79
1.948	1/10/1995	32	1.84	1.84
1.963	1/16/1973	31	1.90	1.90
1.985	3/22/1958	30	1.97	1.97
2.017	1/16/1952	29	2.03	2.03
2.039	1/3/2006	28	2.11	2.11
2.066	1/16/1978	27	2.19	2.19
2.085	11/20/1963	26	2.27	2.27
2.146	1/2/2006	25	2.36	2.37
2.155	2/15/1992	24	2.46	2.47
2.202	11/6/1960	23	2.57	2.58
2.234	4/27/1960	22	2.68	2.69
2.258	10/11/1957	21	2.81	2.83
2.274	2/27/1983	20	2.95	2.97
2.324	10/26/2004	19	3.11	3.13
2.331	3/25/1998	18	3.28	3.31
2.351	3/15/2003	17	3.47	3.51
2.419	11/11/1978	16	3.69	3.73
2.431	2/14/1998	15	3.93	3.99
2.449	2/6/1969	14	4.21	4.28
2.469	12/10/1965	13	4.54	4.62
2.809	1/25/1997	12	4.92	5.02
2.836	2/12/1992	11	5.36	5.49
2.872	12/4/1974	10	5.90	6.06
2.893	2/7/1998	9	6.56	6.77
2.904	1/6/1959	8	7.38	7.66
3.028	3/1/1983	7	8.43	8.82
3.182	11/14/1972	6	9.83	10.39
3.501	12/16/2002	5	11.80	12.65
3.591	3/3/1981	4	14.75	16.17
4.584	3/20/1992	3	19.67	22.38
4.692	4/21/1988	2	29.50	36.38
5.594	12/6/1997	1	59.00	97.00

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Senior Housing - POC-2

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**2.78**	**2.79**
9	**2.77**	**2.77**
8	**2.75**	**2.76**
7	**2.71**	**2.72**
6	**2.67**	**2.68**
5	**2.63**	**2.64**
4	**2.35**	**2.36**
3	**2.08**	**2.08**
2	**1.82**	**1.82**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
1.391	2/10/1978	58	1.02	1.01
1.418	2/10/1963	57	1.04	1.03
1.42	1/9/2005	56	1.05	1.05
1.422	2/7/1993	55	1.07	1.07
1.422	4/28/2005	54	1.09	1.09
1.433	11/6/1960	53	1.11	1.11
1.448	12/3/1966	52	1.13	1.13
1.471	2/13/2003	51	1.16	1.15
1.478	1/26/1956	50	1.18	1.17
1.481	3/5/1995	49	1.20	1.20
1.498	2/17/1980	48	1.23	1.22
1.56	11/7/1966	47	1.26	1.25
1.566	2/13/1954	46	1.28	1.28
1.576	12/24/1994	45	1.31	1.30
1.582	12/7/1992	44	1.34	1.33
1.586	1/12/1997	43	1.37	1.37
1.63	2/21/2005	42	1.40	1.40
1.638	3/3/1980	41	1.44	1.43
1.642	1/11/2001	40	1.48	1.47
1.659	2/21/1980	39	1.51	1.51
1.662	4/14/2003	38	1.55	1.55
1.697	1/16/1993	37	1.59	1.59
1.729	2/9/1963	36	1.64	1.63
1.774	10/27/2004	35	1.69	1.68
1.78	2/1/1960	34	1.74	1.73
1.785	2/12/1980	33	1.79	1.79
1.786	1/9/1980	32	1.84	1.84
1.813	2/26/1983	31	1.90	1.90
1.817	2/19/1958	30	1.97	1.97
1.824	3/16/1958	29	2.03	2.03
1.855	2/27/1991	28	2.11	2.11
1.877	3/8/1974	27	2.19	2.19
1.894	1/20/1962	26	2.27	2.27
1.929	2/14/1980	25	2.36	2.37
1.94	1/10/1995	24	2.46	2.47
1.969	1/16/1973	23	2.57	2.58
1.994	1/16/1978	22	2.68	2.69
2.031	9/5/1978	21	2.81	2.83
2.068	4/27/1960	20	2.95	2.97
2.107	11/20/1963	19	3.11	3.13
2.143	1/2/2006	18	3.28	3.31
2.205	3/25/1998	17	3.47	3.51
2.335	12/10/1965	16	3.69	3.73
2.35	2/6/1969	15	3.93	3.99
2.406	2/14/1998	14	4.21	4.28
2.417	3/15/2003	13	4.54	4.62
2.635	11/14/1972	12	4.92	5.02
2.649	1/25/1997	11	5.36	5.49
2.674	4/21/1988	10	5.90	6.06
2.698	2/12/1992	9	6.56	6.77
2.739	2/7/1998	8	7.38	7.66
2.766	3/1/1983	7	8.43	8.82
2.784	12/4/1974	6	9.83	10.39
2.864	1/6/1959	5	11.80	12.65
3.816	12/16/2002	4	14.75	16.17
3.95	3/3/1981	3	19.67	22.38
5.076	3/20/1992	2	29.50	36.38
5.935	12/6/1997	1	59.00	97.00

ATTACHMENT 4

AREA VS ELEVATION

Volume provided on the underground vaults is accounted for in the storage module within SWMM. As the concrete vaults are a constant area, the stage storage relationship remains constant with depth. Please refer to SWMM model inputs in Attachment 7.

DISCHARGE VS ELEVATION

The orifice has been selected to maximize its size while still restricting flows to conform to the required 10% of the Q_2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While REC acknowledges that the orifice/s is/are small, to increase the size of the outlet 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 spillway 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.

A stage-discharge relationship is provided on the following pages for the surface outlet structure.

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 of 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 1

Note: 0' elevation = 7.7 feet

Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir		Drw Well	0.0698 cfs
Number of orif:	0	Number of slots:	1	Number of weirs:	1		
Cg-low:	0.61	Invert:	0.00 ft	Invert:	1.80		
		B	2.000 ft	B:	5.00		
Middle orifice	1.000 "	h_{slot}	0.083 ft				
Number of orif:	0						
Cg-middle:	0.61	Upper slot		Emergency weir			
invert elev:	0.000 ft	Number of slots:	0	Invert:	0.000 ft		
		Invert:	0.000 ft	W:	0.00 ft		
		B:	0.00 ft				
		h_{slot}	0.000 ft				

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qweir (cfs)	Qemerg (cfs)	Qtot (cfs)	Qtotal(inf) (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	0.0698
0.100	1.200	1.200	0.000	0.000	0.000	0.000	0.000	0.000	0.196	0.000	0.000	0.000	0.196	0.2659
0.200	2.400	2.400	0.000	0.000	0.000	0.000	0.000	0.000	0.324	0.000	0.000	0.000	0.324	0.3933
0.300	3.600	3.600	0.000	0.000	0.000	0.000	0.000	0.000	0.413	0.000	0.000	0.000	0.413	0.4830
0.400	4.800	4.800	0.000	0.000	0.000	0.000	0.000	0.000	0.487	0.000	0.000	0.000	0.487	0.5563
0.500	6.000	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.550	0.000	0.000	0.000	0.550	0.6200
0.600	7.200	7.200	0.000	0.000	0.000	0.000	0.000	0.000	0.607	0.000	0.000	0.000	0.607	0.6771
0.700	8.400	8.400	0.000	0.000	0.000	0.000	0.000	0.000	0.659	0.000	0.000	0.000	0.659	0.7292
0.800	9.600	9.600	0.000	0.000	0.000	0.000	0.000	0.000	0.708	0.000	0.000	0.000	0.708	0.7775
0.900	10.800	10.800	0.000	0.000	0.000	0.000	0.000	0.000	0.753	0.000	0.000	0.000	0.753	0.8227
1.000	12.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	0.796	0.000	0.000	0.000	0.796	0.8654
1.100	13.200	13.200	0.000	0.000	0.000	0.000	0.000	0.000	0.836	0.000	0.000	0.000	0.836	0.9058
1.200	14.400	14.400	0.000	0.000	0.000	0.000	0.000	0.000	0.875	0.000	0.000	0.000	0.875	0.9444
1.300	15.600	15.600	0.000	0.000	0.000	0.000	0.000	0.000	0.912	0.000	0.000	0.000	0.912	0.9814
1.400	16.800	16.800	0.000	0.000	0.000	0.000	0.000	0.000	0.947	0.000	0.000	0.000	0.947	1.0169
1.500	18.000	18.000	0.000	0.000	0.000	0.000	0.000	0.000	0.981	0.000	0.000	0.000	0.981	1.0512
1.600	19.200	19.200	0.000	0.000	0.000	0.000	0.000	0.000	1.014	0.000	0.000	0.000	1.014	1.0843
1.700	20.400	20.400	0.000	0.000	0.000	0.000	0.000	0.000	1.046	0.000	0.000	0.000	1.046	1.1163
1.800	21.600	21.600	0.000	0.000	0.000	0.000	0.000	0.000	1.078	0.000	0.000	0.000	1.078	1.1474
1.900	22.800	22.800	0.000	0.000	0.000	0.000	0.000	0.000	1.108	0.000	0.483	0.000	1.591	1.6604
2.000	24.000	24.000	0.000	0.000	0.000	0.000	0.000	0.000	1.137	0.000	1.376	0.000	2.513	2.5830
2.100	25.200	25.200	0.000	0.000	0.000	0.000	0.000	0.000	1.166	0.000	2.534	0.000	3.700	3.7699
2.200	26.400	26.400	0.000	0.000	0.000	0.000	0.000	0.000	1.194	0.000	3.907	0.000	5.100	5.1702
2.300	27.600	27.600	0.000	0.000	0.000	0.000	0.000	0.000	1.221	0.000	5.464	0.000	6.685	6.7547

Outlet structure for Discharge of Underground System 2

Note: 0' elevation = 5.7 feet

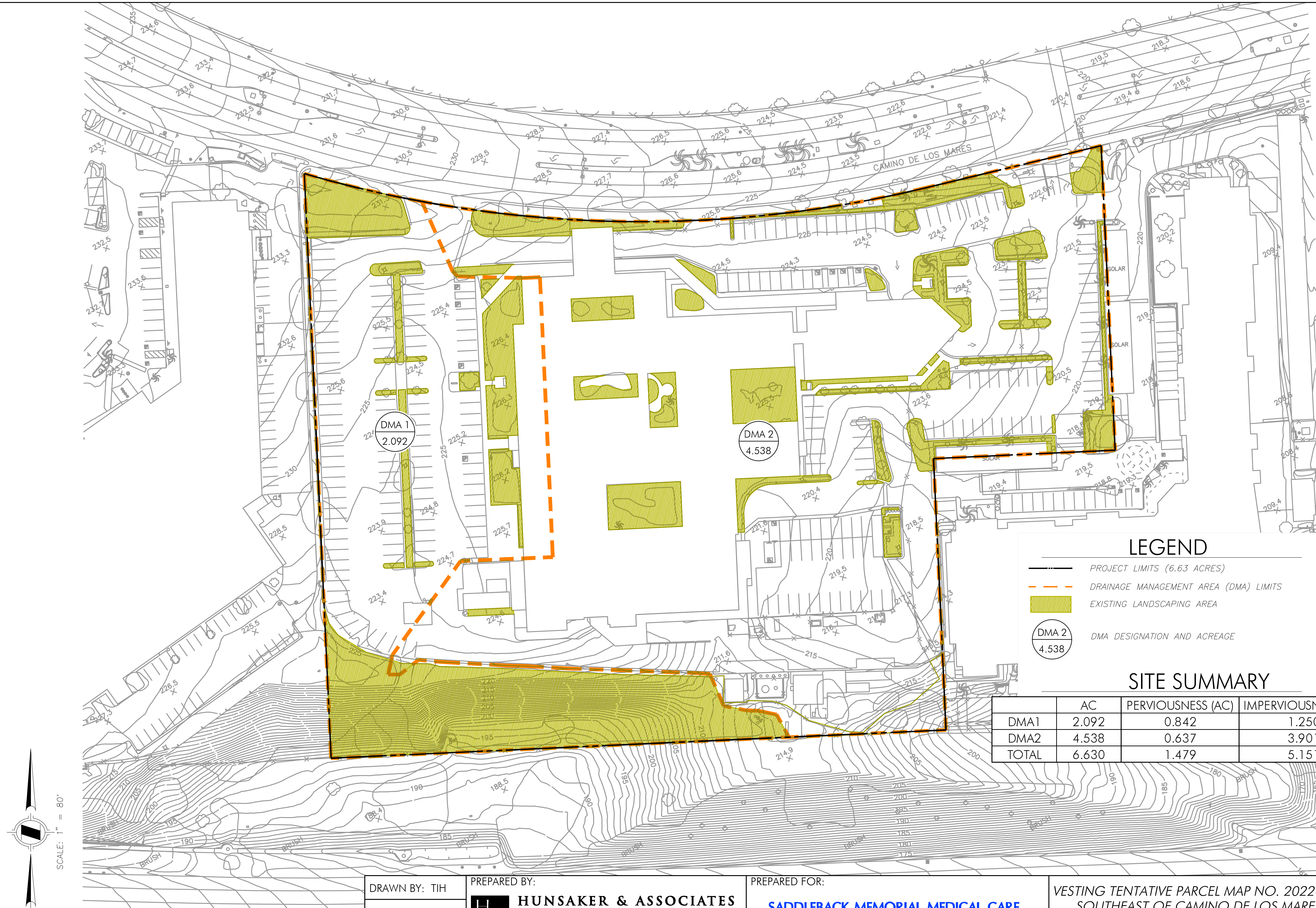
Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir		Drw Well	0.1111 cfs
Number of orif:	0	Number of slots:	1	Number of weirs:	1		
Cg-low:	0.61	Invert:	0.00 ft	Invert:	2.00		
		B	2.500 ft	B:	10.00		
Middle orifice	1.000 "	h_{slot}	0.167 ft				
Number of orif:	0						
Cg-middle:	0.61	Upper slot		Emergency weir			
invert elev:	6.417 ft	Number of slots:	1	Invert:	0.000 ft		
		Invert:	0.000 ft	W:	0.00 ft		
		B:	0.00 ft				
		h_{slot}	0.000 ft				

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qweir (cfs)	Qemerg (cfs)	Qtot (cfs)	Qtotal(inf) (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	0.111
0.100	1.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.245	0.000	0.000	0.000	0.245	0.356
0.200	2.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.693	0.000	0.000	0.000	0.693	0.804
0.300	3.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.949	0.000	0.000	0.000	0.949	1.061
0.400	4.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.148	0.000	0.000	0.000	1.148	1.259
0.500	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.317	0.000	0.000	0.000	1.317	1.428
0.600	7.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.466	0.000	0.000	0.000	1.466	1.577
0.700	8.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.602	0.000	0.000	0.000	1.602	1.713
0.800	9.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.727	0.000	0.000	0.000	1.727	1.838
0.900	10.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.843	0.000	0.000	0.000	1.843	1.954
1.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.953	0.000	0.000	0.000	1.953	2.064
1.100	13.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.057	0.000	0.000	0.000	2.057	2.168
1.200	14.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.155	0.000	0.000	0.000	2.155	2.266
1.300	15.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.250	0.000	0.000	0.000	2.250	2.361
1.400	16.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.340	0.000	0.000	0.000	2.340	2.452
1.500	18.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.428	0.000	0.000	0.000	2.428	2.539
1.600	19.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.512	0.000	0.000	0.000	2.512	2.623
1.700	20.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.593	0.000	0.000	0.000	2.593	2.705
1.800	21.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.672	0.000	0.000	0.000	2.672	2.784
1.900	22.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.749	0.000	0.000	0.000	2.749	2.860
2.000	24.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.824	0.000	0.000	0.000	2.824	2.935
2.100	25.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.897	0.000	0.980	0.000	3.877	3.988
2.200	26.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.967	0.000	2.773	0.000	5.740	5.851
2.300	27.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.037	0.000	5.094	0.000	8.130	8.241

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention Section Sketches



LEGEND

PROJECT LIMITS (6.63 ACRES)

DRAINAGE MANAGEMENT AREA (DMA) LIMITS

EXISTING LANDSCAPING AREA

DMA 2 / 4.538 — DMA DESIGNATION AND ACREAGE

SITE SUMMARY

	AC	PERVIOUSNESS (AC)	IMPERVIOUSNESS (AC)
DMA1	2.092	0.842	1.250
DMA2	4.538	0.637	3.901
TOTAL	6.630	1.479	5.151

DRAWN BY: TIH

DATE: 08/31/2022

W.O.: 4479-1

PREPARED BY:

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ■ ENGINEERING ■ SURVEYING
Three Hughes, Irvine, CA 92618 ■ PH: (949) 583-1010 ■ FX: (949) 583-0759

PREPARED FOR:

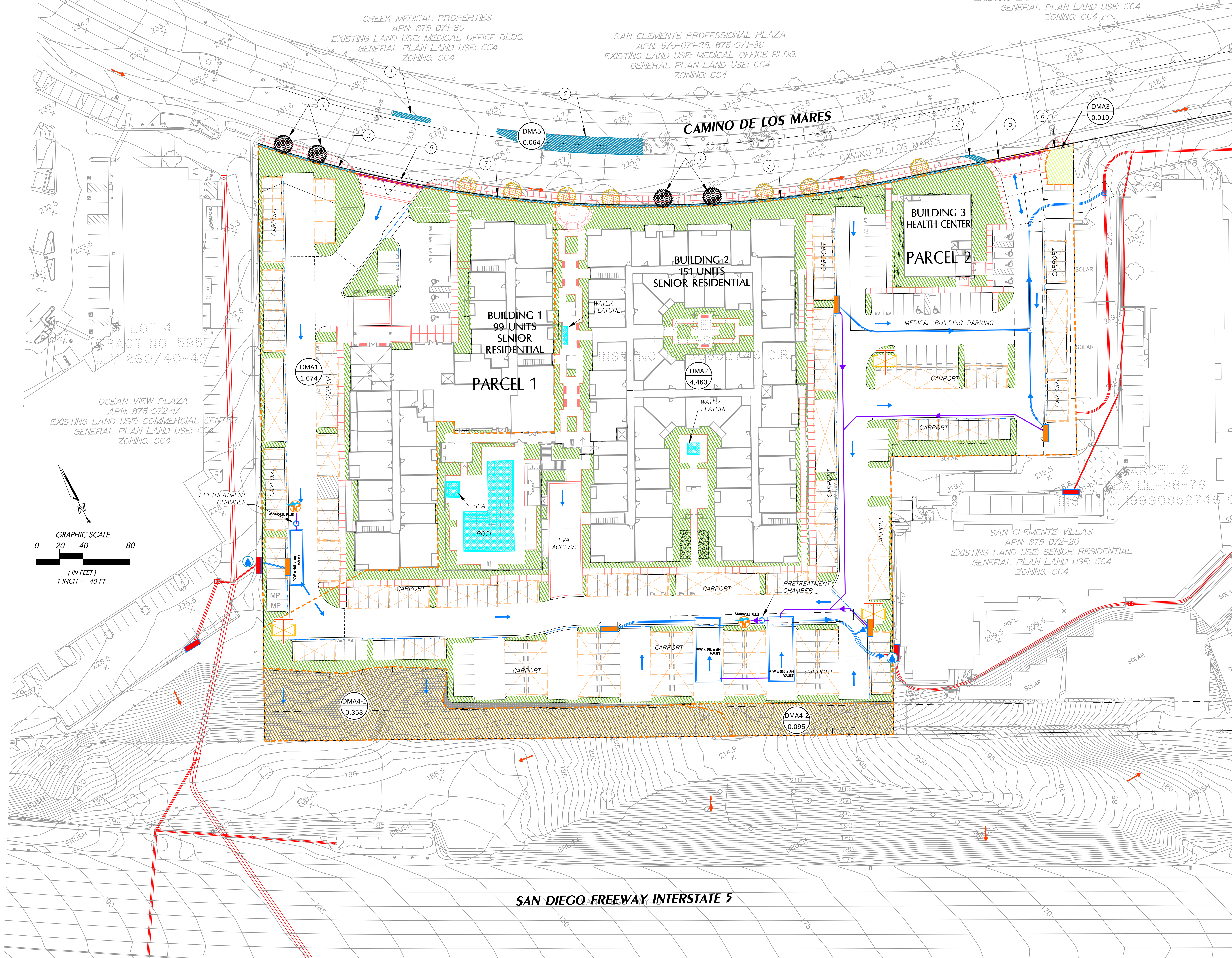
SADDLEBACK MEMORIAL MEDICAL CARE
24451 HEALTH CENTER DRIVE
LAGUNA HILLS, CA 92653
(949) 452-3627

VESTING TENTATIVE PARCEL MAP NO. 2022-116
SOUTHEAST OF CAMINO DE LOS MARES
AND CALLE AGUA
SAN CLEMENTE, CALIFORNIA

EXISTING CONDITION PERVIOUSNESS EXHIBIT

PARKWAY IMPROVEMENT (DMA 5) NOTES

1. DMA 5-1: EXTEND EXISTING PAVED MEDIAN
2. DMA 5-2: REMOVE TURNING LANE AND REPLACE WITH LANDSCAPED MEDIAN
3. DMA 5-3: CONSTRUCT 2' OF ADDITIONAL SIDEWALK AND EXTEND SIDEWALK TO RECONFIGURE ENTRANCE
4. NEW STREET TREES WITH PARKWAY INLET/OUTLET
5. TRENCH DRAIN. CONNECTION TO SD VIA AREA DRAIN SYSTEM (NOT SHOWN)
6. NO IMPROVEMENTS. REMAIN AS EXISTING



LEGEND

- TRACT BOUNDARY
- NAP — NOT A PART
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- DMA / ACRE — DMA DESIGNATION AND ACREAGE
- POOL, SPA & WATER FEATURE
- SURFACE FLOW (ONSITE)
- SURFACE FLOW (OFFSITE)
- EXISTING DRAINAGE SYSTEM
- PROPOSED STORM DRAIN SYSTEM
- PROPOSED DRAINAGE SYSTEM (WATER QUALITY AND < Q10)
- EXISTING CATCH BASIN
- PROJECT CATCH BASIN WITH BMPS S1 STORM DRAIN SYSTEM STENCIL/SIGNAGE
- DRIVEWAY TRENCH DRAIN
- PROJECT LANDSCAPING AREA WITH BMPS S4 EFFICIENT IRRIGATION SYSTEM AND LANDSCAPE PLANNING
- MEDIAN AND PARKWAY IMPROVEMENT AREAS (DMA 5) (SEE PARKWAY IMPROVEMENT NOTES)
- EXISTING LANDSCAPING TO REMAIN
- NATURAL AREA/AREA RETURNED TO NATURAL (DMA 4)
- EXISTING PARKWAY TREES (FERN PINE) TO REMAIN BMP HSC-3 STREET TREES
- PROPOSED PARKWAY TREES (FERN PINE) BMP HSC-3 STREET TREES
- PROJECT WALKWAYS
- COVERED PARKING (CARPORT)
- S7 DESIGNATED TRASH ENCLOSURE
- LID BMP – INF4 DRYWELL MAXWELL PLUS DRYWELL SYSTEM WITH PRE-TREATMENT CHAMBER
- SUBSURFACE DETENTION FACILITY
- DISCHARGE POINT/POINT OF COMPLIANCE (HYDROMOD)
- STORM OVERFLOW DISCHARGE POINT (EVENTS > Q10)

DMA SUMMARY

DMA	Acres	Pervious Acres	Imp. Ratio	C	D (in)	DCV (simple)	LID BMP
1	1.674	0.244	0.854	0.791	0.8	3843.7	INF-5 Infiltration Well
2	4.463	0.767	0.828	0.771	0.8	9994.0	INF-5 Infiltration Well
3	0.019	0.016	0.158	0.268	0.8	14.8	No improvement area
4-1	0.353	0.353	0.000	0.150	0.8	153.8	Natural/return to natural landscape
4-2	0.095	0.095	0.000	0.150	0.8	41.4	Natural/return to natural landscape
5-1	0.002	0	1.000	0.900	0.8	5.2	None. Direct replacement of impervious area
5-2	0.035	0.032	0.086	0.214	0.8	21.8	HSC-6 Self-retaining Area
5-3	0.027	0	1.000	0.900	0.8	70.6	HSC-3 Street Trees

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

APPLICANT:
SADDLEBACK MEMORIAL MEDICAL CARE
24451 HEALTH CENTER DRIVE
LAGUNA HILLS, CA 92653
(949) 452-3627

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

"VESTING TENTATIVE PARCEL MAP NO. 2022-116"
SOUTHEAST OF CAMINO DE LOS MARES &
CALLE AGUA
CITY OF SAN CLEMENTE, COUNTY OF ORANGE, CALIFORNIA

DRAFTED BY: TIH | DATE: 08/30/2022 | W.O. NO: 4479-1 | SHEET NO: 1 OF 1

DATE: Aug. 30, 2022 02:55:59 PM FILE: F:\1223\Planning\SY_WQ\PWQMP\Exhibits\WQMP_SP SC Senior.dwg

ATTACHMENT 6

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

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           12/01/1948
START_TIME           00:00:00
REPORT_START_DATE    12/01/1948
REPORT_START_TIME    00:00:00
END_DATE             12/01/2006
END_TIME             00:00:00
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
;;-------------- --------- ------ ------ ----------
LAGUNA           INTENSITY 1:00   1.0    TIMESERIES Laguna

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb
Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length
Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- -
-------
DMA-2            LAGUNA           POC-2            4.538    0        391      1        0
DMA-1            LAGUNA           POC-1            2.092    0        153      1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-2            0.012      0.05       0.05       0.10       25         OUTLET
DMA-1            0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-2            9.0        0.01875    0.33
DMA-1            9          0.01875    0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO
POC-2            0          FREE                        NO
```

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

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

[TAGS]

[MAP]
DIMENSIONS 2988.241 6077.246 3859.971 6869.504
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            3034.142           6331.570
POC-2            3810.987           6346.984

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-2            3820.347           6640.618
DMA-1            3027.865           6646.382

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LAGUNA           3495.115           6833.492
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           12/01/1948
START_TIME           00:00:00
REPORT_START_DATE    12/01/1948
REPORT_START_TIME    00:00:00
END_DATE             12/01/2006
END_TIME             00:00:00
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
;;-------------- --------- ------ ------ ----------
LAGUNA           INTENSITY 1:00   1.0    TIMESERIES Laguna

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb
Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length
Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- -
-------
DMA-2            LAGUNA           BASIN_2          4.462    82.8     365      1        0
DMA-1            LAGUNA           BASIN_1          1.674    85.4     133      1        0
DMA-4-1          LAGUNA           POC-1            0.353    0        77       1        0
DMA-3            LAGUNA           POC-2            0.019    15.8     17       1        0
DMA-5            LAGUNA           POC-2            0.064    50       56       1        0
DMA-4-2          LAGUNA           POC-2            0.095    0        83       1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-2            0.012      0.05       0.05       0.10       25         OUTLET
DMA-1            0.012      0.05       0.05       0.10       25         OUTLET
DMA-4-1          0.012      0.05       0.05       0.10       25         OUTLET
DMA-3            0.012      0.05       0.05       0.10       25         OUTLET
DMA-5            0.012      0.05       0.05       0.10       25         OUTLET
DMA-4-2          0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-2            9.0        0.01875    0.33
DMA-1            9          0.01875    0.33
```

```
DMA-4-1          9          0.01875    0.33
DMA-3            9.0        0.01875    0.33
DMA-5            9.0        0.01875    0.33
DMA-4-2          9.0        0.01875    0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
DRW-WELL-1       0          FREE                        NO
POC-2            0          FREE                        NO
DRY-WELL-2       0          FREE                        NO
POC-1            0          FREE                        NO

[DIVIDERS]
;;               Invert     Diverted         Divider
;;Name           Elev.      Link             Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-2            0          OUTLET           CUTOFF     0.1111     0          0          0
0
DIV-1            0          OUTLET1          CUTOFF     0.0698     0          0          0
0

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.
Infiltration Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- ------
-- -----------------------
BASIN_2          0        8        0        TABULAR    BASIN2                     1760     0
BASIN_1          0        10       0        TABULAR    BASIN_1                    500      0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet
Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset
Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- --
-------- ----------
DW               DIV-2            DRY-WELL-2       10         0.01       0          0          0
0
OUTLET           DIV-2            POC-2            10         0.01       0          0          0
0
DW1              DIV-1            DRW-WELL-1       10         0.01       0          0          0
0
OUTLET1          DIV-1            POC-1            10         0.01       0          0          0
0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/
Flap
;;Name           Node             Node             Height     Type            QTable
Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- --
-------- ----
OUT-2            BASIN_2          DIV-2            0          TABULAR/HEAD    OUT-2
NO
OUT-1            BASIN_1          DIV-1            0          TABULAR/HEAD    OUT1
NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
DW               DUMMY        0                0          0          0          1
OUTLET           DUMMY        0                0          0          0          1
DW1              DUMMY        0                0          0          0          1
OUTLET1          DUMMY        0                0          0          0          1

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

POST_DEV

```
[CURVES]
;;Name           Type       X-Value    Y-Value   
;;-------------- ---------- ---------- ----------
OUT-2            Rating     0          0.111     
OUT-2                       1          0.111     
OUT-2                       2          0.111     
OUT-2                       3          0.111     
OUT-2                       4          0.111     
OUT-2                       5          0.111     
OUT-2                       5.700      0.111     
OUT-2                       5.800      0.356     
OUT-2                       5.900      0.804     
OUT-2                       6.000      1.061     
OUT-2                       6.100      1.259     
OUT-2                       6.200      1.428     
OUT-2                       6.300      1.577     
OUT-2                       6.400      1.713     
OUT-2                       6.500      1.838     
OUT-2                       6.600      1.954     
OUT-2                       6.700      2.064     
OUT-2                       6.800      2.168     
OUT-2                       6.900      2.266     
OUT-2                       7.000      2.361     
OUT-2                       7.100      2.452     
OUT-2                       7.200      2.539     
OUT-2                       7.300      2.623     
OUT-2                       7.400      2.705     
OUT-2                       7.500      2.784     
OUT-2                       7.600      2.860     
OUT-2                       7.700      2.935     
OUT-2                       7.800      3.988     
OUT-2                       7.900      5.851     
OUT-2                       8.000      8.241     

OUT1             Rating     1          0.0698    
OUT1                        2          0.0698    
OUT1                        3          0.0698    
OUT1                        4          0.0698    
OUT1                        5          0.0698    
OUT1                        6          0.0698    
OUT1                        7          0.0698    
OUT1                        7.700      0.0698    
OUT1                        7.800      0.2659    
OUT1                        7.900      0.3944    
OUT1                        8.000      0.4845    
OUT1                        8.100      0.5582    
OUT1                        8.200      0.6221    
OUT1                        8.300      0.6794    
OUT1                        8.400      0.7318    
OUT1                        8.500      0.7803    
OUT1                        8.600      0.8257    
OUT1                        8.700      0.8685    
OUT1                        8.800      0.9091    
OUT1                        8.900      0.9479    
OUT1                        9.000      0.9850    
OUT1                        9.100      1.0207    
OUT1                        9.200      1.0551    
OUT1                        9.300      1.0883    
OUT1                        9.400      1.1204    
OUT1                        9.500      1.1517    
OUT1                        9.600      1.6648    
OUT1                        9.700      2.5875    
OUT1                        9.800      3.7745    
OUT1                        9.900      5.1749    
OUT1                        10.000     6.7595    

BASIN2           Storage    0          1760      
BASIN2                      1          1760      
BASIN2                      2          1760      
BASIN2                      3          1760      
```

```
BASIN2                      4          1760
BASIN2                      5          1760
BASIN2                      6          1760
BASIN2                      7          1760
BASIN2                      8          1760

BASIN_1          Storage    0          500
BASIN_1                     1          500
BASIN_1                     2          500
BASIN_1                     3          500
BASIN_1                     4          500
BASIN_1                     5          500
BASIN_1                     6          500
BASIN_1                     7          500
BASIN_1                     8          500
BASIN_1                     9          500
BASIN_1                     10         500

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

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

[TAGS]

[MAP]
DIMENSIONS 2988.241 6077.246 3859.971 6869.504
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DRW-WELL-1       3066.511           6223.675
POC-2            3935.837           6225.216
DRY-WELL-2       3720.047           6317.698
POC-1            3417.941           6274.540
DIV-2            3820.235           6374.728
DIV-1            3277.677           6357.773
BASIN_2          3818.694           6502.661
BASIN_1          3280.760           6488.789

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-2            3820.347           6640.618
DMA-1            3282.301           6646.007
DMA-4-1          3416.399           6445.631
DMA-3            3938.291           6368.831
DMA-5            4039.279           6316.204
DMA-4-2          4066.304           6259.309

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LAGUNA           3495.115           6833.492
```

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.

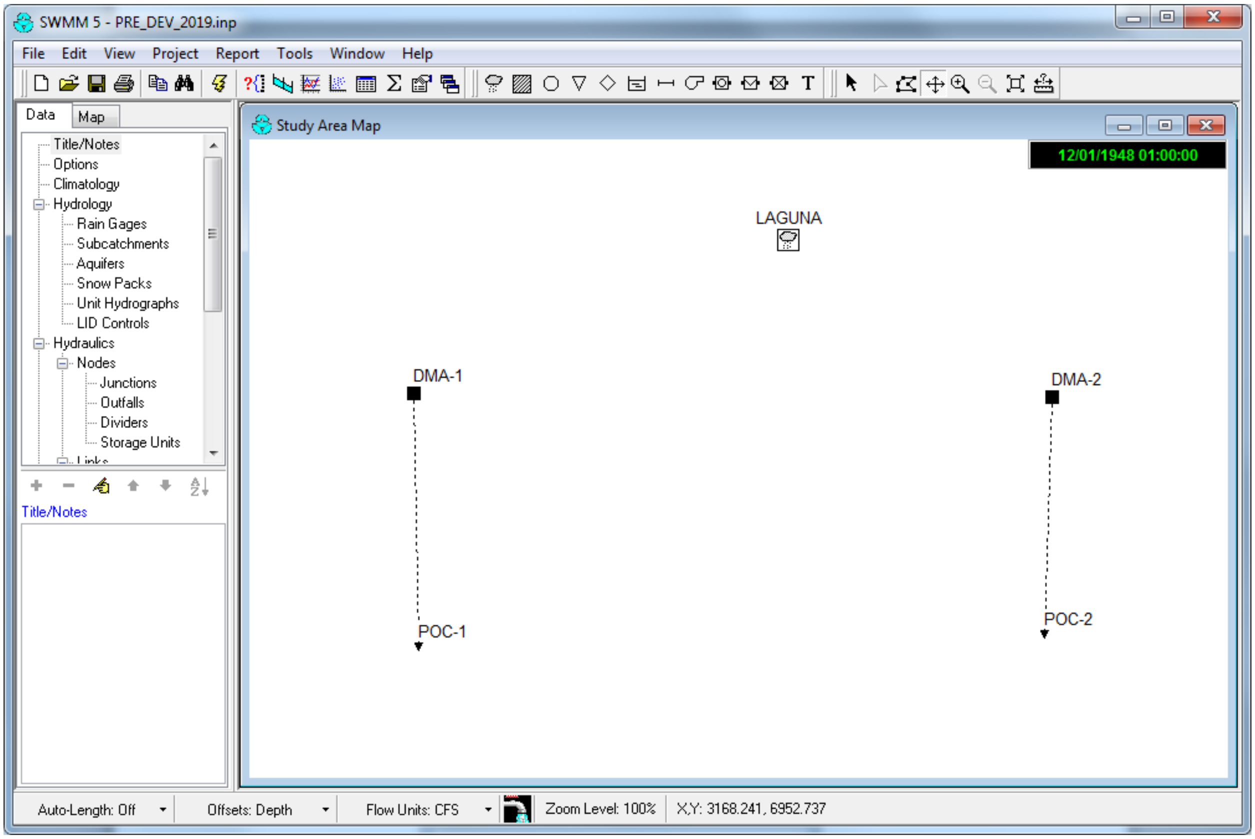
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from Appendix G of the 2020 County of San Diego BMP Design Manual.

Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey (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 CONDITION



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	3034.142
Y-Coordinate	6331.570
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	*

Outfall POC-2

Property	Value
Name	POC-2
X-Coordinate	3810.987
Y-Coordinate	6346.984
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	*

Rain Gage LAGUNA

Property	Value
Name	LAGUNA
X-Coordinate	3495.115
Y-Coordinate	6833.492
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Laguna
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Name of rainfall data file

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	3027.865
Y-Coordinate	6646.382
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-1
Area	2.092
Width	153
% Slope	1
% 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 DMA-2

Property	Value
Name	DMA-2
X-Coordinate	3820.347
Y-Coordinate	6640.618
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-2
Area	4.538
Width	391
% Slope	1
% 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

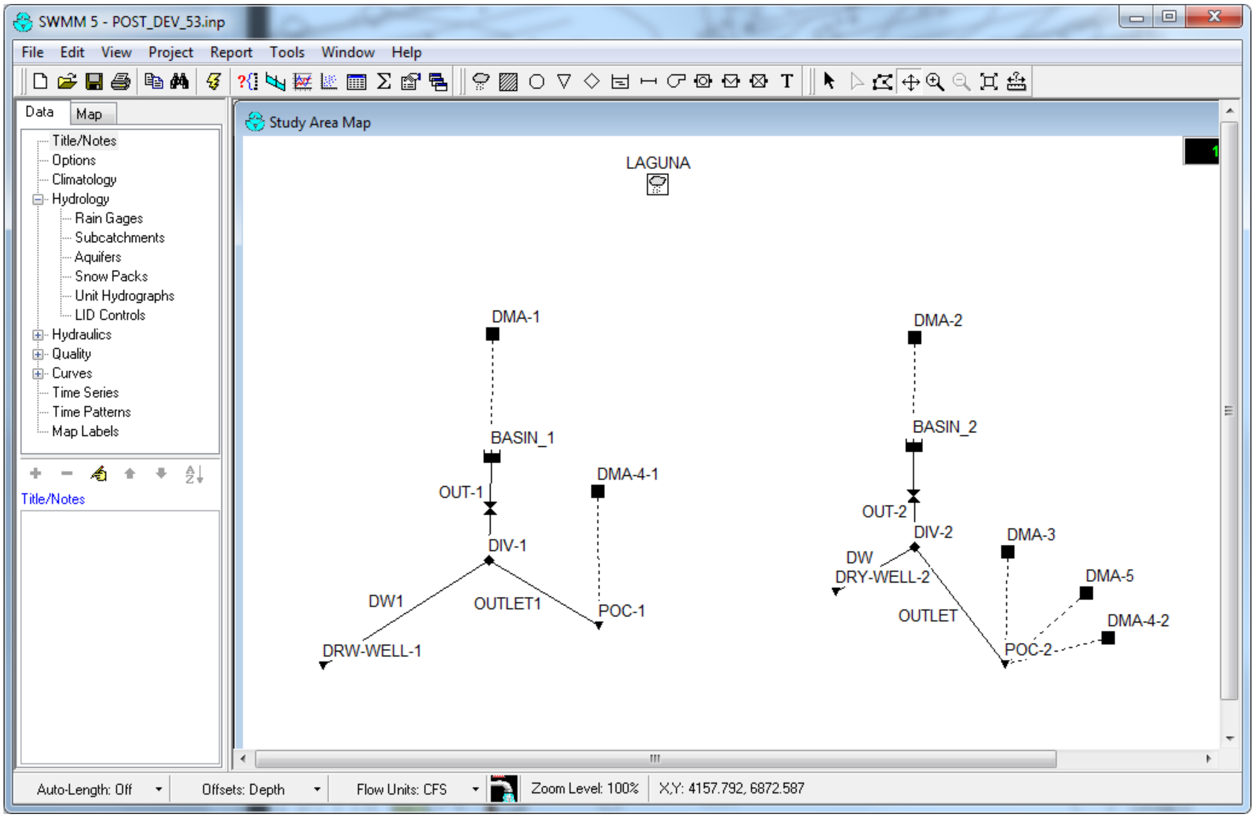
Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

POST-DEVELOPED CONDITION



Rain Gage LAGUNA

Property	Value
Name	LAGUNA
X-Coordinate	3495.115
Y-Coordinate	6833.492
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Laguna
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	3417.941
Y-Coordinate	6274.540
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	*

User-assigned name of outfall

Outfall POC-2

Property	Value
Name	POC-2
X-Coordinate	3935.837
Y-Coordinate	6225.216
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	*

User-assigned name of outfall

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	3282.301
Y-Coordinate	6646.007
Description	
Tag	
Rain Gage	LAGUNA
Outlet	BASIN_1
Area	1.674
Width	133
% Slope	1
% Imperv	85.4
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 DMA-4-1

Property	Value
Name	DMA-4-1
X-Coordinate	3416.399
Y-Coordinate	6445.631
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-1
Area	0.353
Width	77
% Slope	1
% 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 DMA-2

Property	Value
Name	DMA-2
X-Coordinate	3820.347
Y-Coordinate	6640.618
Description	
Tag	
Rain Gage	LAGUNA
Outlet	BASIN_2
Area	4.462
Width	365
% Slope	1
% Imperv	82.8
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	9.0
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment DMA-3

Property	Value
Name	DMA-3
X-Coordinate	3938.291
Y-Coordinate	6368.831
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-2
Area	0.019
Width	17
% Slope	1
% Imperv	15.8
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 DMA-5

Property	Value
Name	DMA-5
X-Coordinate	4039.279
Y-Coordinate	6316.204
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-2
Area	0.064
Width	56
% Slope	1
% Imperv	50
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 DMA-4-2

Property	Value
Name	DMA-4-2
X-Coordinate	4066.304
Y-Coordinate	6259.309
Description	
Tag	
Rain Gage	LAGUNA
Outlet	POC-2
Area	0.095
Width	83
% Slope	1
% 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	9.0
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9.0
Conductivity	0.01875
Initial Deficit	0.33

Divider DIV-1

Property	Value
Name	DIV-1
X-Coordinate	3277.677
Y-Coordinate	6357.773
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	OUTLET1
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.0698
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

User-assigned name of divider

Divider DIV-2

Property	Value
Name	DIV-2
X-Coordinate	3820.235
Y-Coordinate	6374.728
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	OUTLET
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.1111
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

User-assigned name of divider

EXPLANATION OF SELECTED VARIABLES

Sub-Catchment Areas:

Please refer to the attached diagrams that indicate the DMA 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 D as determined from the site specific geotechnical investigation (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.

Detention Basin Data

Storage Unit BASIN_1

Property	Value
Name	BASIN_1
X-Coordinate	3280.760
Y-Coordinate	6488.789
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	10
Initial Depth	0
Ponded Area	500
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN_1

User-assigned name of storage unit

Storage Curve Editor

Curve Name: BASIN_1

Description:

	Depth (ft)	Area (ft2)
1	0	500
2	1	500
3	2	500
4	3	500
5	4	500
6	5	500
7	6	500
8	7	500
9	8	500

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

Outlet OUT-1

Property	Value
Name	OUT-1
Inlet Node	BASIN_1
Outlet Node	DIV-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUT1

User-assigned name of outlet

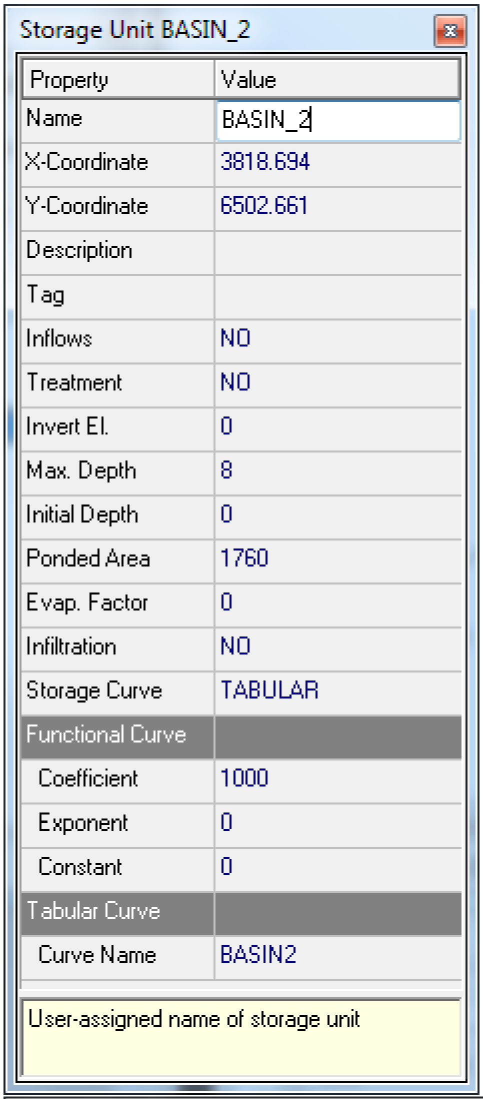
Rating Curve Editor

Curve Name: OUT1

Description:

	Head (ft)	Outflow (CFS)
1	1	0.0698
2	2	0.0698
3	3	0.0698
4	4	0.0698
5	5	0.0698
6	6	0.0698
7	7	0.0698
8	7.700	0.0698
9	7.800	0.2659

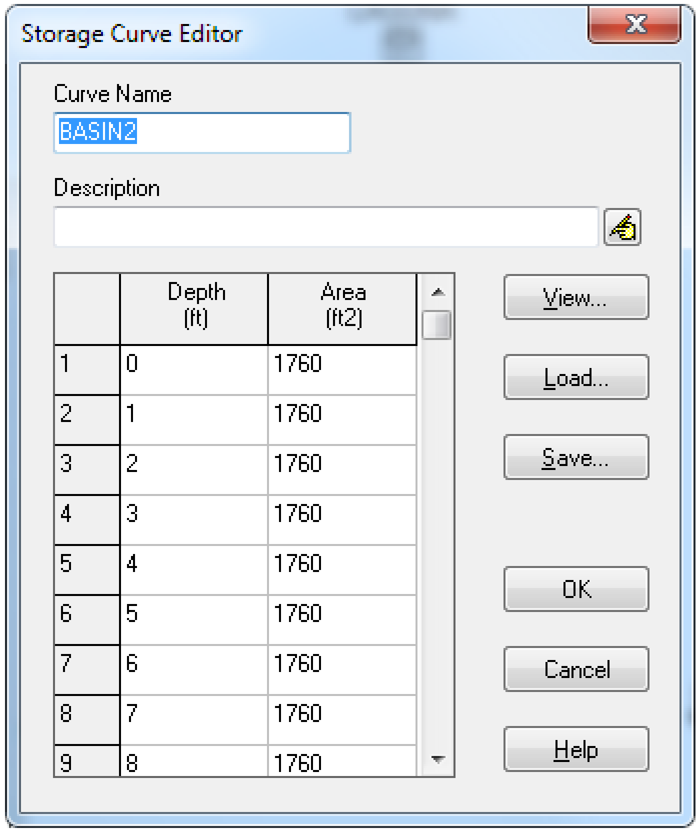
View... Load... Save... OK Cancel Help



Storage Unit BASIN_2

Property	Value
Name	BASIN_2
X-Coordinate	3818.694
Y-Coordinate	6502.661
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	8
Initial Depth	0
Ponded Area	1760
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN2

User-assigned name of storage unit



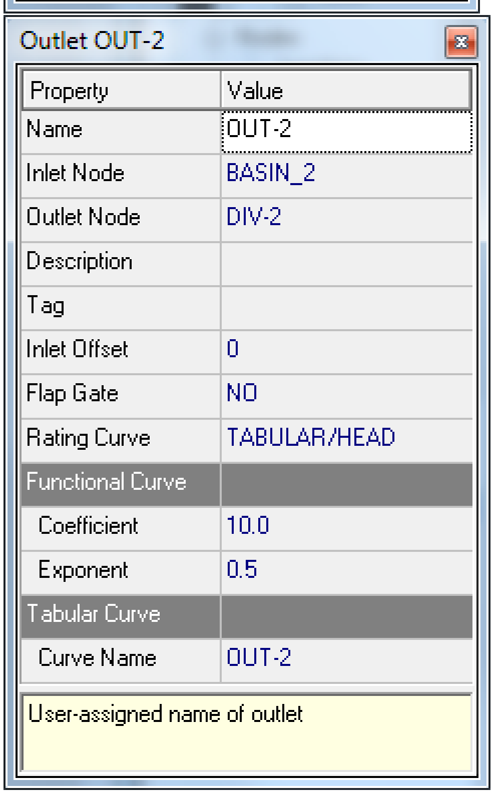
Storage Curve Editor

Curve Name: BASIN2

Description:

	Depth (ft)	Area (ft2)
1	0	1760
2	1	1760
3	2	1760
4	3	1760
5	4	1760
6	5	1760
7	6	1760
8	7	1760
9	8	1760

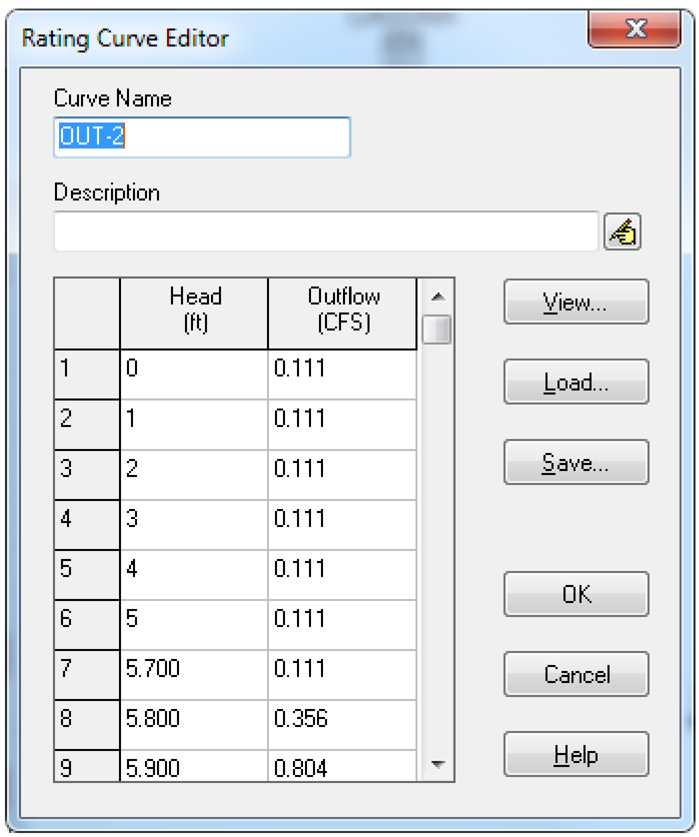
View... Load... Save... OK Cancel Help



Outlet OUT-2

Property	Value
Name	OUT-2
Inlet Node	BASIN_2
Outlet Node	DIV-2
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUT-2

User-assigned name of outlet



Rating Curve Editor

Curve Name: OUT-2

Description:

	Head (ft)	Outflow (CFS)
1	0	0.111
2	1	0.111
3	2	0.111
4	3	0.111
5	4	0.111
6	5	0.111
7	5.700	0.111
8	5.800	0.356
9	5.900	0.804

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

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

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

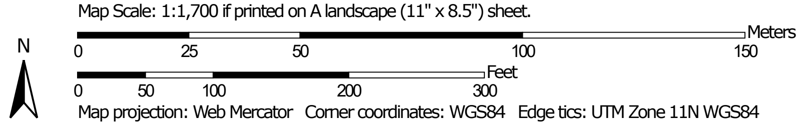
For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural 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

Soils Maps

Map Scale: 1:1,700 if printed on A landscape (11" x 8.5") sheet.



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: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

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

Date(s) aerial images were photographed: Dec 29, 2020—Jan 10, 2021

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
100	Alo clay, 9 to 15 percent slopes	D	3.9	58.2%
134	Calleguas clay loam, 50 to 75 percent slopes, eroded	D	2.8	41.8%
Totals for Area of Interest			**6.7**	**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 ............ DEC-01-1948 00:00:00
Ending Date .............. DEC-01-2006 00:00:00
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 ......       409.264       740.749
Evaporation Loss .........        17.501        31.675
Infiltration Loss ........       288.507       522.184
Surface Runoff ...........       110.646       200.265
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -1.806


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       110.646        36.056
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........       110.646        36.056
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
***************************
```

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
DMA-2	740.75	0.00	31.64	521.53	201.04	24.77	5.59	0.271
DMA-1	740.75	0.00	31.75	523.61	198.59	11.28	2.56	0.268

```
Analysis begun on:  Tue Aug 30 13:57:35 2022
Analysis ended on:  Tue Aug 30 13:58:08 2022
Total elapsed time: 00:00:33
```

POST_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 ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ DEC-01-1948 00:00:00
Ending Date .............. DEC-01-2006 00:00:00
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 DW

WARNING 04: minimum elevation drop used for Conduit OUTLET

WARNING 04: minimum elevation drop used for Conduit DW1

WARNING 04: minimum elevation drop used for Conduit OUTLET1

**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       411.548       740.749
Evaporation Loss .........        51.725        93.101
Infiltration Loss ........        63.363       114.048
Surface Runoff ...........       299.778       539.574
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -0.806


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       299.778        97.687
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........       300.748        98.003
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 (%) .....        -0.324


********************************
Highest Flow Instability Indexes
********************************
```

Link OUT-1 (1)
Link DW1 (1)

****
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
DMA-2	740.75	0.00	97.76	86.59	562.25	68.12	5.82	0.759
DMA-1	740.75	0.00	100.35	73.39	572.67	26.03	2.19	0.773
DMA-4-1	740.75	0.00	26.46	508.94	212.31	2.03	0.44	0.287
DMA-3	740.75	0.00	37.01	420.82	292.97	0.15	0.02	0.396
DMA-5	740.75	0.00	63.60	249.13	439.27	0.76	0.08	0.593
DMA-4-2	740.75	0.00	25.18	500.53	224.12	0.58	0.12	0.303

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
DRW-WELL-1	OUTFALL	0.00	0.00	0.00	0 00:00
POC-2	OUTFALL	0.00	0.00	0.00	0 00:00
DRY-WELL-2	OUTFALL	0.00	0.00	0.00	0 00:00
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
DIV-2	DIVIDER	0.00	0.00	0.00	0 00:00
DIV-1	DIVIDER	0.00	0.00	0.00	0 00:00
BASIN_2	STORAGE	0.08	7.90	7.90	17902 03:33
BASIN_1	STORAGE	0.06	9.66	9.66	17902 04:00

****
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

DRW-WELL-1	OUTFALL	0.00	0.07	3688	03:45	0.000	22.644
POC-2	OUTFALL	0.23	5.94	17902	03:33	1.493	15.065
DRY-WELL-2	OUTFALL	0.00	0.11	15815	14:45	0.000	54.721
POC-1	OUTFALL	0.44	2.56	17902	04:00	2.035	5.565
DIV-2	DIVIDER	0.00	5.82	17902	03:33	0.000	68.294
DIV-1	DIVIDER	0.00	2.19	17902	04:00	0.000	26.175
BASIN_2	STORAGE	5.82	5.82	17902	04:00	68.122	68.122
BASIN_1	STORAGE	2.19	2.19	17902	04:00	26.031	26.031

****
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
DIV-2	DIVIDER	508416.02	0.000	0.000
DIV-1	DIVIDER	508416.02	0.000	0.000
BASIN_2	STORAGE	508416.02	7.899	0.101
BASIN_1	STORAGE	508416.02	9.657	0.343

****
Node Flooding Summary
****

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
BASIN_2	0.132	1	0	13.903	99	17902 03:32	5.82
BASIN_1	0.029	1	0	4.828	97	17902 04:00	2.19

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
DRW-WELL-1	3.08	0.05	0.07	22.644
POC-2	1.06	0.10	5.94	15.065
DRY-WELL-2	4.04	0.10	0.11	54.721
POC-1	0.47	0.09	2.56	5.565
System	2.16	0.34	8.67	97.996

****
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

POST_DEV

DW	DUMMY	0.11	15815	14:45
OUTLET	DUMMY	5.71	17902	03:33
DW1	DUMMY	0.07	3688	03:45
OUTLET1	DUMMY	2.12	17902	04:00
OUT-2	DUMMY	5.82	17902	03:33
OUT-1	DUMMY	2.19	17902	04:00

****
Conduit Surcharge Summary
****

	--------- Hours Full --------			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
DW	0.01	0.01	0.01	508416.02	0.01
OUTLET	0.01	0.01	0.01	508416.02	0.01
DW1	0.01	0.01	0.01	508416.02	0.01
OUTLET1	0.01	0.01	0.01	508416.02	0.01

Analysis begun on: Wed Aug 31 13:32:27 2022
Analysis ended on: Wed Aug 31 13:33:27 2022
Total elapsed time: 00:01:00