CEQA-Level Preliminary Drainage Study
for
Rite Aid Valley Center
Valley Center, California

Prepared for:

Halferty Development Company, LLC
199 S. Los Robles Ave, Suite 840
Pasadena, CA 91101

March 31, 2017
Revised July 3, 2017

Tory R. Walker, R.C.E. 45005
President

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Appendices

1. Introduction

This drainage report has been prepared in support of the proposed planning-level processing for the Rite Aid Valley Center project, and in conjunction with the project stormwater quality management plan (SWQMP) designs and requirements. County of San Diego development requirements call for hydrology calculations at this project stage, with an analysis of existing and developed conditions. An increase in runoff is anticipated for the project as the impervious area will be greater in developed conditions. Therefore, a detention routing analysis is included in this study to demonstrate that the developed condition 100-year peak flow is below the existing condition level.

2. Project Description

The Rite Aid Valley Center project is a retail project located at the southeast corner of the intersection of Valley Center Road and Cole Grade Road in Valley Center, County of San Diego, California (see Figure 1 below for project location). The project proposes redevelopment of the property from the existing restaurant and parking lot to a Rite Aid store, parking, and a delivery access driveway. The current land use designation of commercial will remain unchanged.

Figure 1: Location Map

3. Drainage Patterns and Hydrologic Methodology

The existing site is partially built upon with a restaurant and parking lot occupying the western half of the site. The remaining eastern area is an open graded lot, and there is no runon from the adjacent properties or streets. Runoff from the 1.2 acre project's onsite drainage sheet flows in a southwesterly direction and discharges to the curb and gutter along Cole Grade Road. There is no other drainage infrastructure onsite.

In developed conditions, site drainage patterns will remain generally unchanged, flowing in a southwesterly direction towards Cole Grade Road. Runoff from the onsite parking lot and landscaping will drain to a biofiltration basin along Cole Grade Road, while runoff from the building roof will drain into a biofiltration basin at the southwest corner of the building. Both biofiltration basins drain to an underground detention vault. Since there is no reliable infiltration and no storm drain infrastructure near the downstream end of the site, pumps are proposed to drain runoff from the invert of the storage vault to the curb and gutter on Cole Grade Road. The pumps are preliminarily sized to meet both HMP and flood control requirements, and flowrates are provided in the stage-discharge table within Appendix C.

Rational Method hydrologic calculations are provided for the existing and developed conditions using San Diego County methodology. 100-year flows were calculated using a spreadsheet that calculates runoff using the Rational Method based on estimated runoff coefficients and times-of-concentration (see Appendix B). The Rational Method calculations are reflected on the hydrology maps in Appendix D, with corresponding drainage boundaries, initial subareas, and discharge points illustrated.

In order to mitigate the increase in 100-year peak flow for developed conditions, a Rational Method hydrograph and detention routing analysis was performed for the project. The 100-year, 6-hour Rational Method hydrograph was routed through the underground detention vault using SWMM. The detention routing analysis is provided in Appendix C.

For this tentative map-level study, separate hydraulic calculations for storm drain sizing are not provided. It is anticipated that further refinement of the storm drain design will occur at the final construction drawing stage of the project, along with a more detailed analysis of the attenuation provided in the underground detention vault. In addition, discharge of onsite runoff into the curb and gutter will be designed per public road standards and calculations will be provided in final engineering.

4. Summary and Conclusions

The proposed Rite Aid Valley Center development project, as designed, will not substantially alter the existing drainage pattern. Though flowrates increase from pre- to post- project condition, the proposed underground detention will detain peak flow rates to below existing levels, and therefore runoff from the proposed project will not exceed the capacity of the downstream storm drain system. A summary of existing and proposed conditions runoff is provided in Table 1 and Table 2.

Table 1: Existing Conditions Runoff Table

Location	Area (ac)	Runoff Coeff. C	Tc (min)	Intenisty I (in/hr)	Q_{100} (cfs)
Project Discharge Point	1.2	0.51	9	6.52	4.03

Table 2: Developed Conditions Runoff Table

Location	Area (ac)	Runoff Coeff. C	Tc (min)	Intenisty I (in/hr)	Q_{100}, without detention (cfs)	Q_{100}, with detention (cfs)
Project Discharge Point	1.2	0.85	5	9.75	10.03	3.99

Additional impacts to a stream or river are not anticipated for this project. This is because there are no streams or rivers running through or immediately around the project site, and onsite runoff is detained to meet hydromodification and flood control criteria. Therefore, the project will not result in any on- or off-site erosion, siltation, or flooding.

Based on FEMA and County of San Diego floodplain maps, the project site is approximately 750-feet from the nearest 100-year flood hazard area boundary. Thus, it is clear that no housing is proposed within the 100-year flood hazard area, and no structures are proposed within the 100-year flood hazard area which would impede or redirect flood flows. Furthermore, the project will not expose people or structures to a significant risk of loss, injury, or death involving flooding as a result of the failure of a levee or dam, as there are no levees or dams impacted by the project site.

5. DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Tory R Walker

July 3, 2017

TORY R. WALKER, R.C.E. 45005 DATE

Appendix A

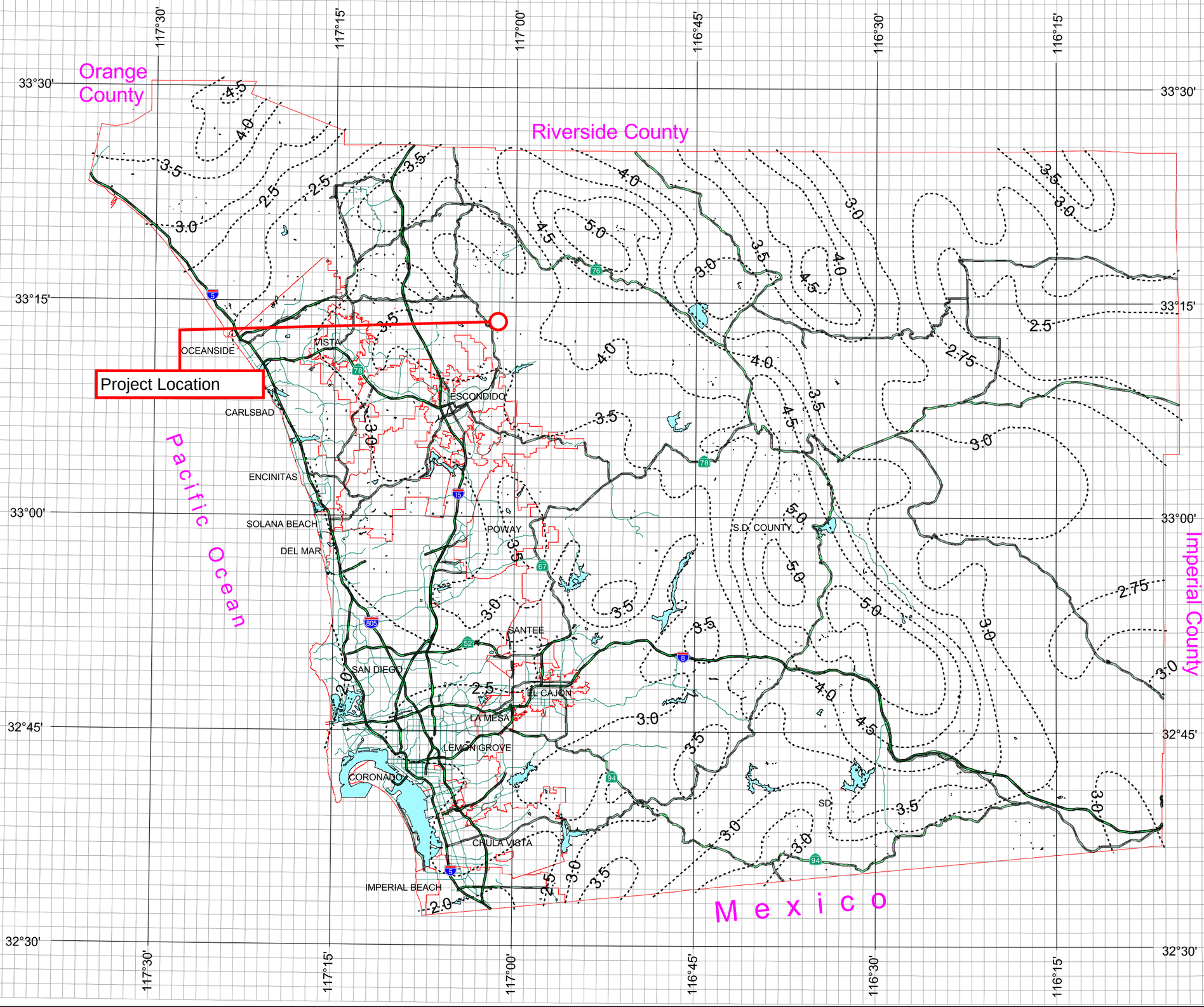
San Diego County Figures and Nomographs

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Project Location

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
POWAY
S.D. COUNTY
DEL MAR
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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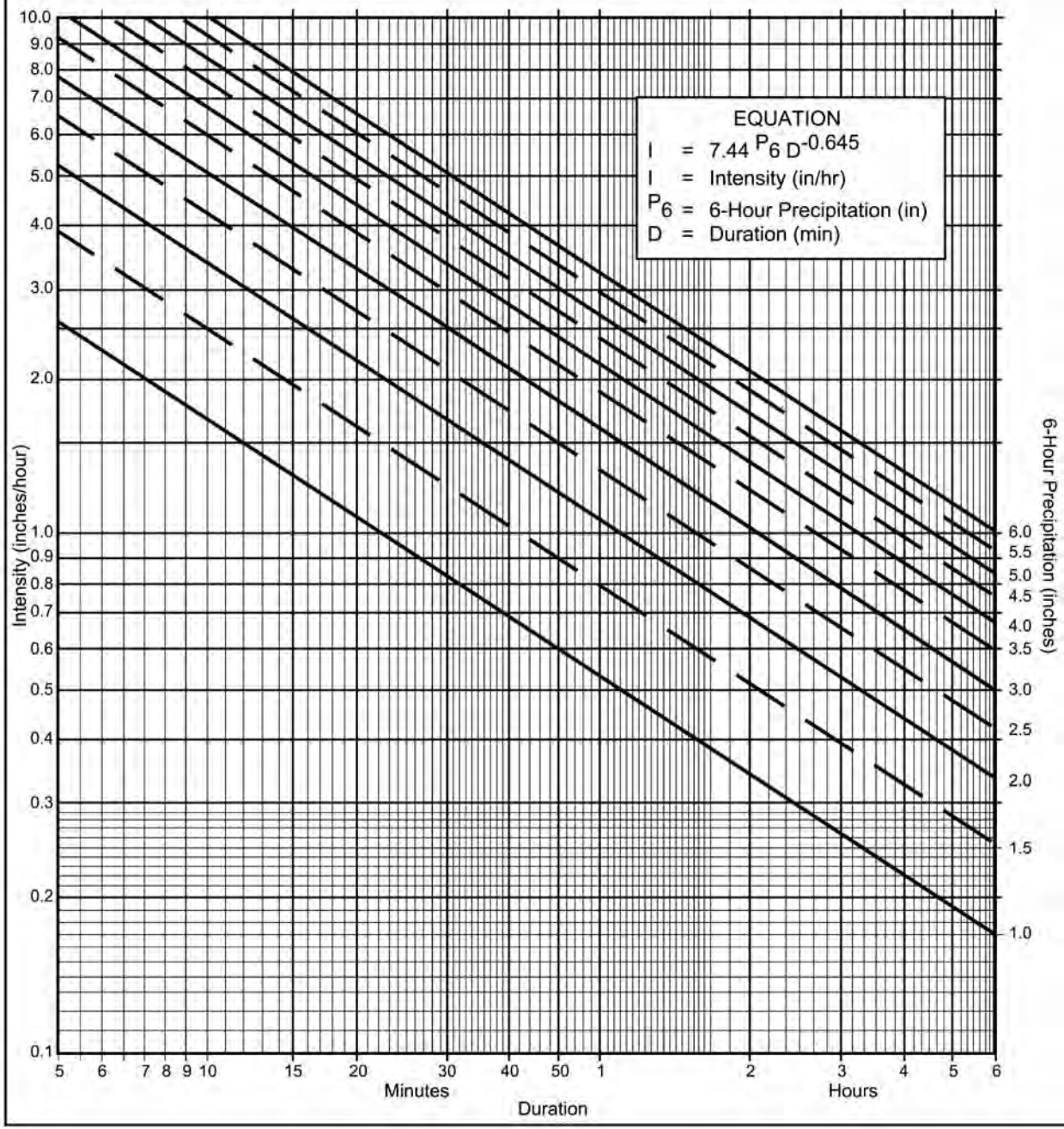
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100- year

(b) P_6 = 3.7 in., P_{24} = 8.2 in , $\frac{P_6}{P_{24}}$ = 45 %(2)

(c) Adjusted P_6(2) = N/A in.

(d) t_x = _____ min.

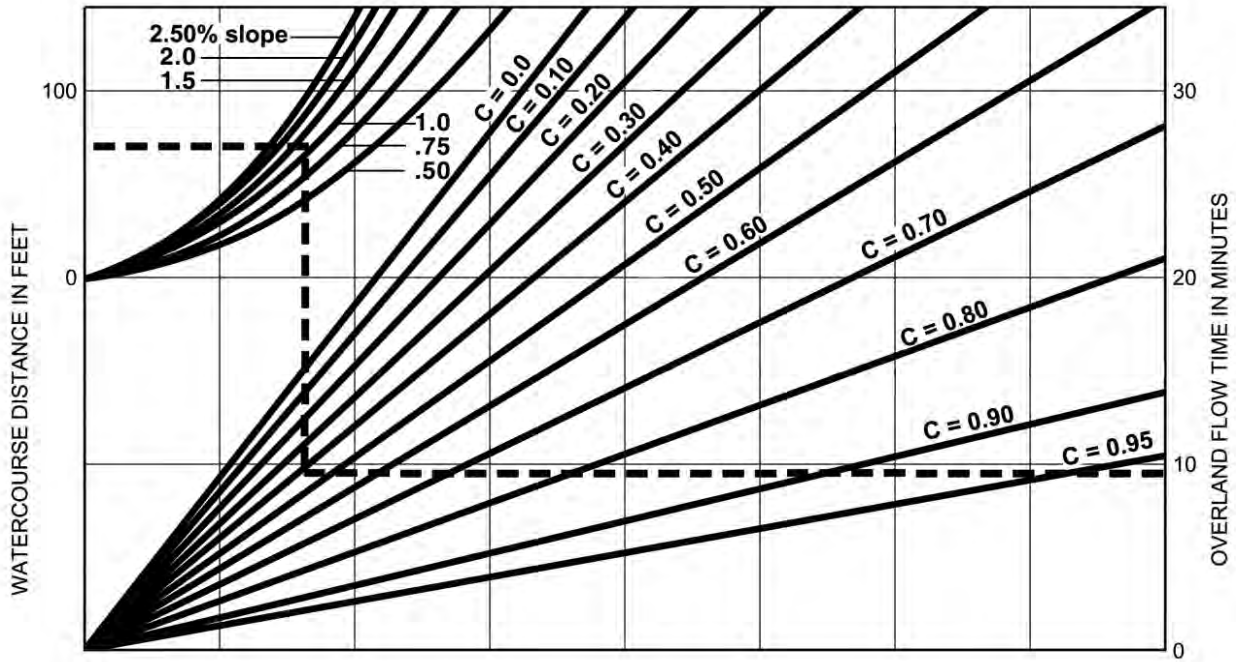
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



EXAMPLE:
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph


117° 1' 28" W
117° 1' 22" W
33° 13' 52" N
33° 13' 49" N
497720
497730
497740
497750
497760
497770
497780
497790
497800
497810
497820
497830
497840
497850
497860
497870
497710
3676920
3676910
3676900
3676890
3676880
3676870
3676860
3676850
3676840
3676830
3676820
Valley Center Rd
S6
Cole Grade Rd
PeC
FaC2
Map Scale: 1:759 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0
10
20
40
60
Feet
0
35
70
140
210
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: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

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

Date(s) aerial images were photographed: Data not available.

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

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
FaC2	Fallbrook sandy loam, 5 to 9 percent slopes, eroded	C	0.0	0.1%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	2.1	99.9%
Totals for Area of Interest			**2.1**	**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

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Value selected for Cp

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Appendix B

Rational Method Calculations (Q100)

Runoff Coefficient Calculations					
Existing Conditions					
DMA-1					
Area (ac)	Impervious Area (ac)	%Impervious	Soil Type	C_p	Area Weighted Runoff C*
1.20	0.43	35%	C	0.3	0.51
Proposed Conditions					
DMA-1					
Area (ac)	Impervious Area (ac)	%Impervious	Soil Type	C_p	Area Weighted Runoff C*
1.20	1.09	91%	C	0.3	0.85
	*Note: C = 0.90 x (%Impervious) + C_p x (1 - %Impervious)				
	where C_p is the Pervious Coefficient Runoff Value for the soil type shown in				
	Table 3-1 (2003 San Diego County Hydrology Manual).				

PRE - DEVELOPMENT (POC-1)

DMA-1

Time of concentration

Initial Sub Area

L :	95	ft
A:	0.16	acres
C:	0.300	
Δz :	4.0	ft
s:	5.5	%
ti :	7.97	min
P6 :	3.7	in
I:	7.21	in/hr
Qi :	0.356	cfs

Mannings in triangular channel

Initial velocity

z:	4	
n :	0.03	
so :	0.055	
y :	0.193	ft
Aflow:	0.149	sq-ft
Pflow:	1.6	ft
Q:	0.356	cfs
v :	2.393	ft/s

Final velocity

z:	4	
n :	0.03	(average n)
so :	0.043	
y :	0.501	ft
Aflow:	1.002	sq-ft
Pflow:	4.1	ft
Q:	4.03	cfs
v :	4.020	ft/s

Final Q

Ltravel:	259	ft
vaverage:	3.21	ft/s
tt :	1.35	min
tc:	9.32	min
I :	6.52	in/hr
A :	1.20	acres
C:	0.510	
Q :	4.03	cfs

Time of concentration DMA-1:

9.32 min

9 min (rounded)

Total Peak Flow

A :	1.200	acres
C :	0.510	
I :	6.52	in/hr
Q :	4.03	cfs

POST - DEVELOPMENT (POC-1)

DMA-1

Time of concentration

Initial Sub Area

L :	22	ft
A:	0.017	acres
C:	0.900	
Δz :	0.66	ft
s:	3	%
ti :	1.17	min
P6 :	3.7	in
I:	9.75	in/hr
Qi :	0.145	cfs

Mannings in triangular channel

Initial velocity

z:	10	
n :	0.016	
so :	0.04	
y :	0.081	ft
Aflow:	0.066	sq-ft
Pflow:	1.6	ft
Q:	0.145	cfs
v :	2.192	ft/s

Final velocity

z:	10	
n :	0.016	(average n)
so :	0.01	
y :	0.517	ft
Aflow:	2.671	sq-ft
Pflow:	10.4	ft
Q:	10.03	cfs
v :	3.755	ft/s

Final Q

Ltravel:	401	ft
vaverage:	2.97	ft/s
tt :	2.25	min
tc:	3.42	min
I :	9.75	in/hr
A :	1.20	acres
C:	0.850	
Q :	10.03	cfs

Time of concentration DMA-1:

3.42 min

5 min (rounded)

Total Peak Flow

A :	1.200	acres
C :	0.850	
I :	9.75	in/hr
Q :	10.03	cfs

Appendix C

Detention Routing Study

TECHNICAL MEMORANDUM:

Determination of 100-year Peak Flow In Pre- and Post-Developed Conditions for Rite Aid

Valley Center, CA

Prepared for:

Halferty Development Company, LLC

July 3, 2017

Tory R. Walker, PE, CFM, LEED GA
R.C.E. 45005

REGISTERED PROFESSIONAL ENGINEER
TORY R WALKER
No. 45005
Exp. 3-31-2018
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TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

TECHNICAL MEMORANDUM

TO: Halferty Development Company, LLC
Attn: Chris Peto
199 S. Los Robles Ave, Suite 840
Pasadena, CA 91101

FROM: Tory Walker, PE, CFM, LEED GA

DATE: July 3, 2017

RE: Determination of the 100-year Peak Flow in Pre- and Post-Developed Conditions for Rite Aid, Valley Center, CA.

INTRODUCTION

This report is based on the hydraulic model used in the technical memorandum *"SWMM Modeling for Hydromodification Compliance of Rite Aid, Valley Center, CA, July 3, 2017"*[1] by Tory R. Walker Engineering (TRWE). Pre- and post-developed 100-year, 6-hour hydrographs were generated to prove that the post-developed peak flow is smaller than the pre-developed peak flow for the project's point of compliance (POC).

For this drainage analysis, time of concentration values and peak flows were obtained from the project's CEQA Drainage Study. Hydrographs were generated using the "*San Diego County Hydrology Manual (SDCHM), June 2003*"[2] Rational Method Hydrograph procedure. This is the prescribed method for drainage areas less than one square mile. Hydraulic routing was performed in SWMM, as the complex routing structures discharging to the POC have already been built in SWMM for hydromodification analysis: models include LID calculations and Modified Puls routing.

PRE- AND POST-DEVELOPED CONDITIONS

The Rite Aid project proposes to develop an existing site, which is partially developed as a restaurant and parking lot, located at the southeastern corner of the intersection of Valley Center Road and Cole Grade Road in Valley Center, CA. One (1) Point of Compliance (POC-1) has been identified at the southwest corner of the project site along Cole Grade Road, which is the point at which the majority of the proposed site runoff will be discharged to the Valley Center MS4 system (see Appendix 1 for hydrology exhibits).

GENERAL HYDROLOGIC CONSIDERATIONS

SWMM was selected for the hydraulic routing because the model was already built for hydromodification analysis, and all parameters have already been defined to work under the SWMM framework. In order to change SWMM for hydromodification to SWMM for Q_{100}, changes in the rainfall data, infiltration method, and time interval were required. A general explanation of the changes and

reasoning for the selection of SWMM as a hydraulic modeling tool for routing Q_{100} follows, as well as considerations for typical differences between SWMM and other models.

Rainfall

Rainfall was developed using the SDCHM, where the duration "t" is made equal to the time of concentration to maximize the peak flow. However, longer durations up to 360 minutes are used to build the complete hyetograph (precipitation distribution for the 100-year, 6-hour storm event). The 6-hour storm is distributed according to the methodology explained in the SDCHM, where the peak precipitation starts four hours after the beginning of the storm (see intensity tables in Appendix 2).

Pre- and Post-Developed Hydrograph Determination

For pre-developed conditions, the runoff hydrograph was calculated with a spreadsheet following the SDCHM Rational Method Hydrograph procedure (see results in Appendix 2). Each peak at each time interval is equal to $Q = C \cdot I \cdot A$ (with I corresponding to the intensity at any given time during the 6-hour storm).

For post-developed conditions, runoff hydrographs are determined using the same approach as described above for pre-developed conditions (SDCHM Rational Method Hydrograph spreadsheets were used, see results in Appendix 3). These hydrographs are then entered into the developed condition SWMM model.

LID Routing Considerations

The biofiltration basin BMP-1 and underground storage vault are responsible for handling hydromodification and Q100 requirements for POC-1. The vault will be hydraulically connected to the gravel layer of BMP-1, allowing the system to function hydraulically as one effective storage unit. Flows will be discharged from the biofiltration basin and underground vault by a system of three pumps that will outlet to the existing curb and gutter along Cole Grade Road. Pump flowrates are preliminary, and will be supplanted with specific pump rating curves in final engineering. As the biofiltration basin is hydraulically connected to the underground vault, the system was modeled as one effective storage unit within SWMM. Thus the LID module within SWMM was not used to model the biofiltration basin. The volume of ponding above the lowest pump discharge elevation was considered as a pond, which requires an elevation vs. area table, and an elevation vs. discharge table for use with the Modified Puls Method. The required stage-storage-discharge information and a detailed description of the basin outlet structures are provided in the HMP Study. The elevation vs. area tables, and the elevation vs. discharge tables are included in Appendix 3 of this report. Detailed explanations for obtaining those values are included in the HMP Study.

MODEL RESULTS

The results show that the proposed biofiltration basin and underground storage system reduce the post-developed peak flow below pre-developed conditions. Results are displayed in Table 1. A pre- vs. post-developed hydrograph comparison is illustrated in Figure 1. It is clear that the proposed BMPs not only satisfy hydromodification criteria, but also reduce the post-developed peak flow below the pre-developed level for the 100-year, 6-hour synthetic storm.

TABLE 1. SUMMARY OF PEAK FLOW RESULTS

POC	Pre-Dev. Peak flow (cfs)	Post-Dev. Undetained Peak flow (cfs)	Post-Dev. Detained Peak flow (cfs)	Post-Dev. – Pre-Dev. Peak Flow (cfs)
1	4.03	10.03	3.99	0.04

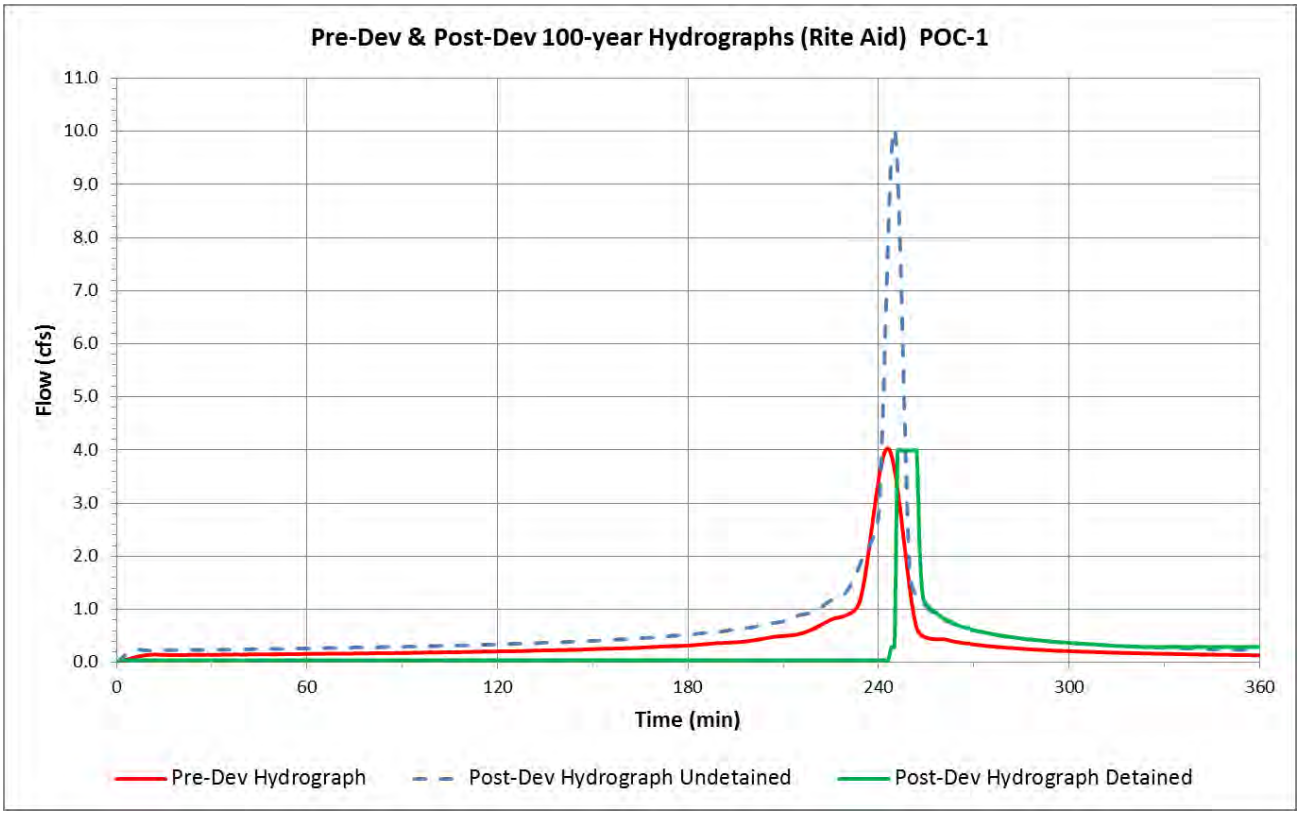


Figure 1. Hydrograph comparison for POC-1.

CONCLUSION

The design of the biofiltration basin and underground storage system with multiple functions (water quality, hydromodification, and flood mitigation) allows the reduction of the 100-year post-developed peak flow below the pre-developed level for the project's point of compliance.

REFERENCES

[1] "*Hydromodification Management Plan for Onsite Improvements at Rite Aid, Valley Center, CA, April 15, 2016, Revised March 31, 2017, Revised July 3, 2017*", prepared by Tory R. Walker Engineering.

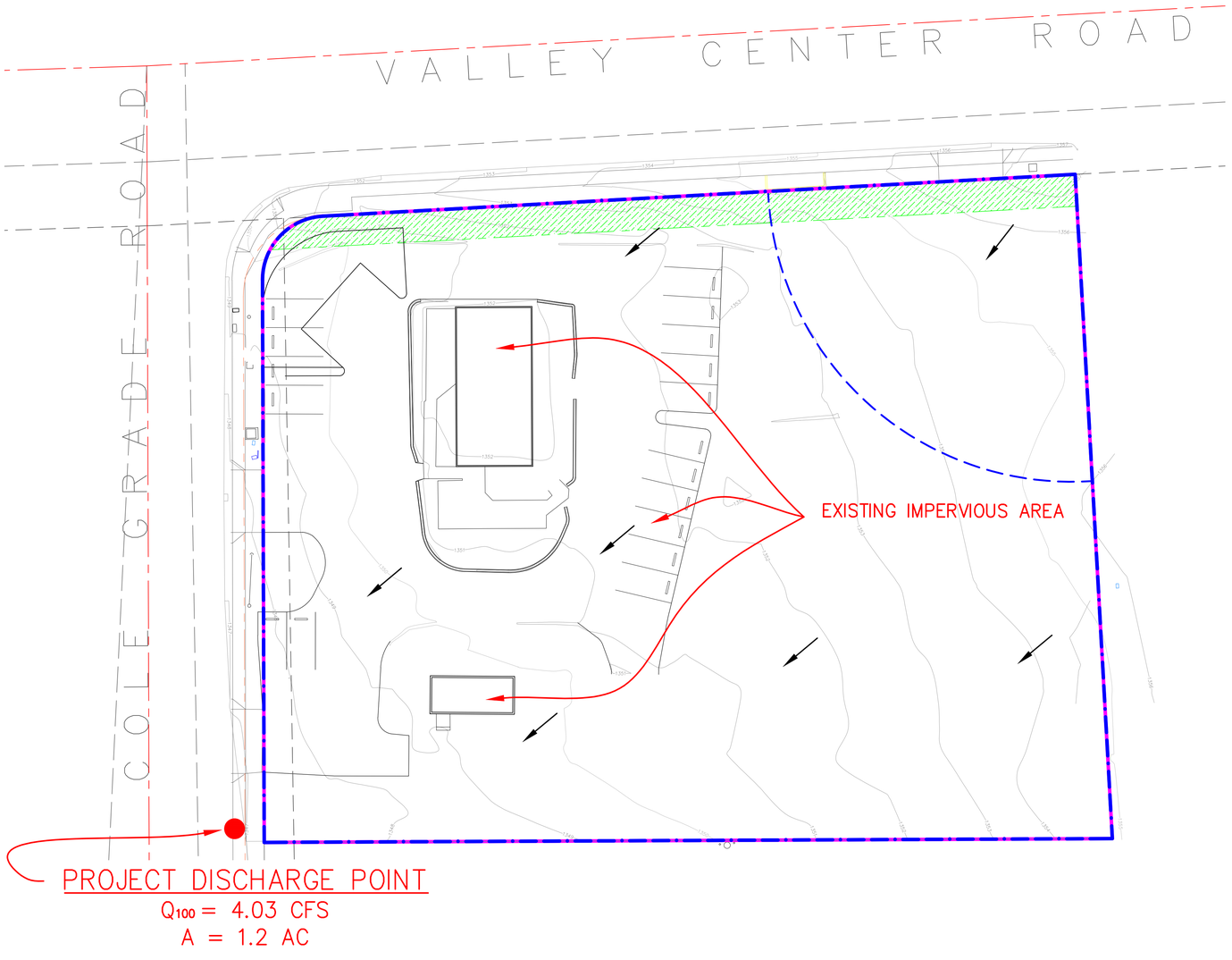
[2] "*San Diego County Hydrology Manual, June 2003".* Available at: http://www.sdcounty.ca.gov/dpw/floodcontrol/hydrologymanual.html

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

APPENDIX LIST

Appendix 1: Pre- and Post-Developed Maps
Appendix 2: Precipitation and Rational Method Hydrograph Data
Appendix 3: Elevation vs. Area and Elevation vs. Discharge Curves
Appendix 4: SWMM Model Input
Appendix 5: SWMM Model Results

Appendix 1:
Pre- and Post-Developed Maps



LEGEND

- CENTERLINE OF ROAD
- R/W LINE
- PROPERTY LINE
- DRAINAGE BOUNDARY LINE
- INITIAL SUBAREA BOUNDARY
- FLOW DIRECTION
- S.D.COUNTY FUTURE DEDICATION FOR ROAD AREA

N

0 10 20 FEET

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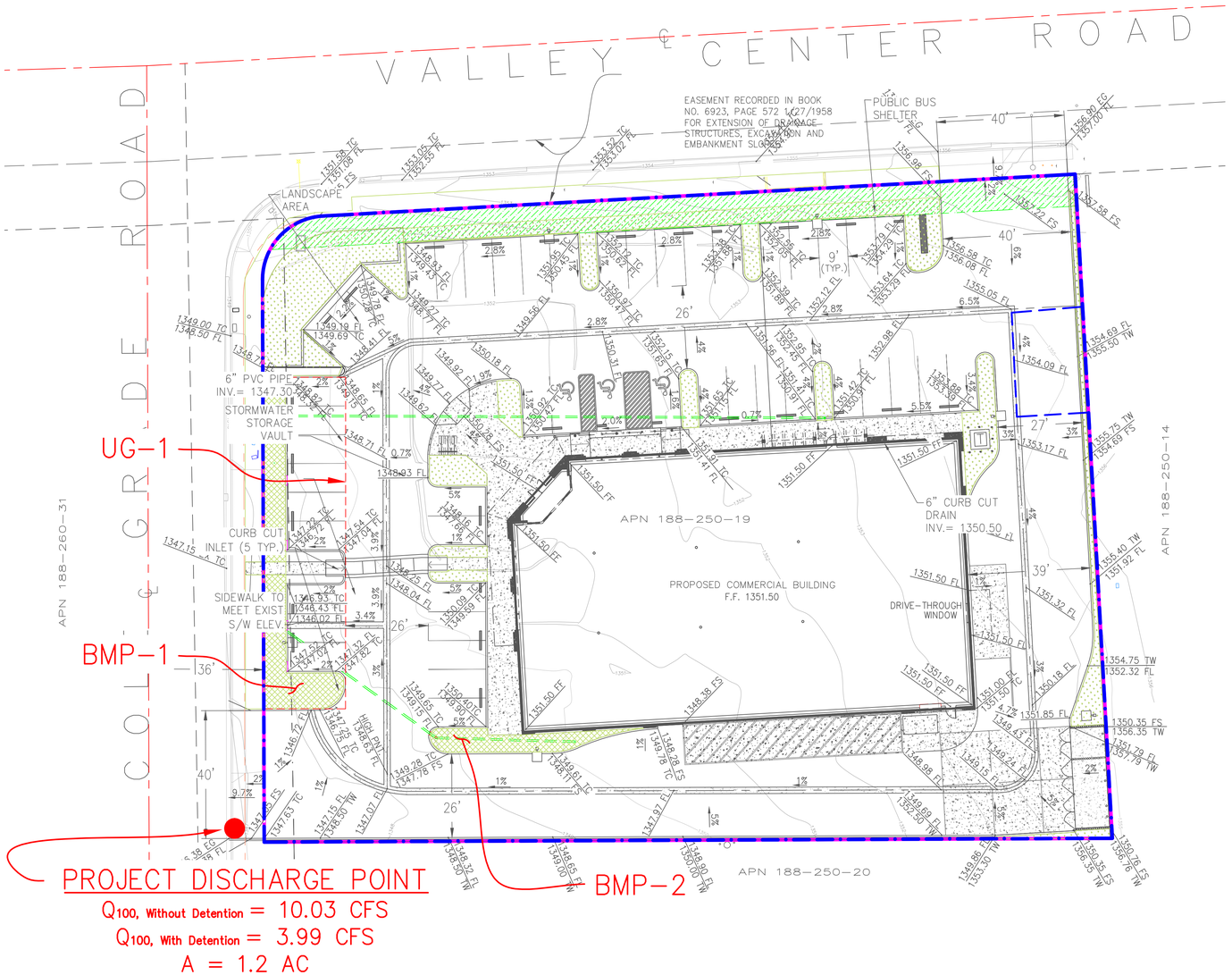
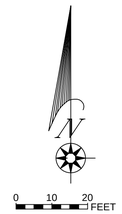
RITE AID VALLEY CENTER
HYDROLOGY MAP – EXISTING CONDITION



LEGEND

- CENTERLINE OF ROAD
- R/W LINE
- PROPERTY LINE
- DRAINAGE BOUNDARY LINE
- INITIAL SUBAREA BOUNDARY
- FLOW DIRECTION 0.7%
- LANDSCAPE AREA
- BMP FILTRATION AREA
- STORM VAULT
- CONCRETE
- S.D.COUNTY FUTURE DEDICATION FOR ROAD AREA



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RITE AID VALLEY CENTER
HYDROLOGY MAP – PROPOSED CONDITION

Appendix 2:

Precipitation and Rational Method Hydrograph Data

Rational Method Hydrograph Calculations
for Pre Developed Conditions

		Q_{100}=	4.03	cfs				
		Tc=	9	min	C=	0.51		
#=	40	$P_{100,6}$=	3.7	in	A=	1.20	acres	
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
#	**D (MIN)**	**I (IN/HR)**	**VOL (IN)**	**ΔVOL (IN)**	**I (INCR) (IN/HR)**	**Q (CFS)**	**VOL (CF)**	**ORDINATE SUM=**
0	0	0.00	0.00	1.00	6.67	4.03	2176	
1	9	6.67	1.00	0.28	1.86	1.14	615	0.14
2	18	4.27	1.28	0.20	1.32	0.81	437	0.14
3	27	3.29	1.48	0.16	1.06	0.65	350	0.15
4	36	2.73	1.64	0.13	0.90	0.55	297	0.15
5	45	2.36	1.77	0.12	0.79	0.48	261	0.15
6	54	2.10	1.89	0.11	0.71	0.43	234	0.16
7	63	1.90	2.00	0.10	0.65	0.40	214	0.16
8	72	1.74	2.09	0.09	0.60	0.36	197	0.17
9	81	1.62	2.18	0.08	0.55	0.34	183	0.18
10	90	1.51	2.27	0.08	0.52	0.32	172	0.18
11	99	1.42	2.34	0.07	0.49	0.30	162	0.19
12	108	1.34	2.42	0.07	0.46	0.28	154	0.19
13	117	1.28	2.49	0.07	0.44	0.27	146	0.21
14	126	1.22	2.55	0.06	0.42	0.26	140	0.21
15	135	1.16	2.62	0.06	0.40	0.25	134	0.23
16	144	1.12	2.68	0.06	0.39	0.24	128	0.24
17	153	1.07	2.74	0.06	0.37	0.23	124	0.26
18	162	1.03	2.79	0.05	0.36	0.22	119	0.27
19	171	1.00	2.85	0.05	0.35	0.21	115	0.30
20	180	0.97	2.90	0.05	0.34	0.21	112	0.32
21	189	0.94	2.95	0.05	0.33	0.20	108	0.36
22	198	0.91	3.00	0.05	0.32	0.19	105	0.40
23	207	0.88	3.05	0.05	0.31	0.19	102	0.48
24	216	0.86	3.09	0.05	0.30	0.18	99	0.55
25	225	0.84	3.14	0.04	0.29	0.18	97	0.81
26	234	0.82	3.18	0.04	0.29	0.18	95	1.14
27	243	0.80	3.22	0.04	0.28	0.17	92	4.03
28	252	0.78	3.27	0.04	0.27	0.17	90	0.65
29	261	0.76	3.31	0.04	0.27	0.16	88	0.43
30	270	0.74	3.35	0.04	0.26	0.16	86	0.34
31	279	0.73	3.39	0.04	0.26	0.16	85	0.28
32	288	0.71	3.43	0.04	0.25	0.15	83	0.25
33	297	0.70	3.46	0.04	0.25	0.15	81	0.22
34	306	0.69	3.50	0.04	0.24	0.15	80	0.20
35	315	0.67	3.54	0.04	0.24	0.15	78	0.18
36	324	0.66	3.57	0.03	0.23	0.14	77	0.17
37	333	0.65	3.61	0.03	0.23	0.14	76	0.16
38	342	0.64	3.64	0.03	0.22	0.14	74	0.15
39	351	0.63	3.67	0.03	0.22	0.14	73	0.14
40	360	0.62	3.71	0.00	0.00	0.00	0	0.14
						SUM=	**8140**	**cubic feet**
							0.19	**acre-feet**

Check: $V = C*A*P_6$

V= 0.19 acre-feet

OK

Rational Method Hydrograph Calculations
for Post Developed Conditions

		Q_{100}=	10.03	cfs				
		Tc=	5	min	C=	0.85		
#=	72	$P_{100,6}$=	3.7	in	A=	1.20	acres	

		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
#	**D (MIN)**	**I (IN/HR)**	**VOL (IN)**	**ΔVOL (IN)**	**I (INCR) (IN/HR)**	**Q (CFS)**	**VOL (CF)**	**ORDINATE SUM=**
0	0	0.00	0.00	0.81	9.75	10.03	3009	
1	5	9.75	0.81	0.23	2.72	2.77	832	0.22
2	10	6.23	1.04	0.16	1.93	1.97	591	0.23
3	15	4.80	1.20	0.13	1.55	1.58	474	0.23
4	20	3.99	1.33	0.11	1.31	1.34	402	0.23
5	25	3.45	1.44	0.10	1.15	1.18	353	0.24
6	30	3.07	1.53	0.09	1.04	1.06	317	0.24
7	35	2.78	1.62	0.08	0.94	0.96	289	0.25
8	40	2.55	1.70	0.07	0.87	0.89	266	0.25
9	45	2.36	1.77	0.07	0.81	0.83	248	0.25
10	50	2.21	1.84	0.06	0.76	0.77	232	0.26
11	55	2.08	1.90	0.06	0.72	0.73	219	0.26
12	60	1.96	1.96	0.06	0.68	0.69	208	0.26
13	65	1.86	2.02	0.05	0.65	0.66	198	0.27
14	70	1.78	2.07	0.05	0.62	0.63	189	0.27
15	75	1.70	2.12	0.05	0.59	0.60	181	0.28
16	80	1.63	2.17	0.05	0.57	0.58	174	0.28
17	85	1.57	2.22	0.05	0.55	0.56	167	0.29
18	90	1.51	2.27	0.04	0.53	0.54	161	0.30
19	95	1.46	2.31	0.04	0.51	0.52	156	0.31
20	100	1.41	2.35	0.04	0.49	0.50	151	0.31
21	105	1.37	2.39	0.04	0.48	0.49	146	0.32
22	110	1.33	2.43	0.04	0.46	0.47	142	0.32
23	115	1.29	2.47	0.04	0.45	0.46	138	0.34
24	120	1.26	2.51	0.04	0.44	0.45	135	0.34
25	125	1.22	2.55	0.04	0.43	0.44	131	0.35
26	130	1.19	2.58	0.03	0.42	0.43	128	0.36
27	135	1.16	2.62	0.03	0.41	0.42	125	0.37
28	140	1.14	2.65	0.03	0.40	0.41	122	0.38
29	145	1.11	2.68	0.03	0.39	0.40	119	0.40
30	150	1.09	2.72	0.03	0.38	0.39	117	0.41
31	155	1.06	2.75	0.03	0.37	0.38	114	0.43
32	160	1.04	2.78	0.03	0.37	0.37	112	0.44
33	165	1.02	2.81	0.03	0.36	0.37	110	0.46
34	170	1.00	2.84	0.03	0.35	0.36	108	0.47
35	175	0.98	2.87	0.03	0.35	0.35	106	0.50
36	180	0.97	2.90	0.03	0.34	0.35	104	0.52
37	185	0.95	2.93	0.03	0.33	0.34	102	0.56
38	190	0.93	2.96	0.03	0.33	0.34	101	0.58
39	195	0.92	2.98	0.03	0.32	0.33	99	0.63
40	200	0.90	3.01	0.03	0.32	0.32	97	0.66
41	205	0.89	3.04	0.03	0.31	0.32	96	0.73

Rational Method Hydrograph Calculations
for Post Developed Conditions

42	210	0.87	3.06	0.03	0.31	0.31	94	0.77
43	215	0.86	3.09	0.03	0.30	0.31	93	0.89
44	220	0.85	3.11	0.02	0.30	0.31	92	0.96
45	225	0.84	3.14	0.02	0.29	0.30	90	1.18
46	230	0.83	3.16	0.02	0.29	0.30	89	1.34
47	235	0.81	3.19	0.02	0.29	0.29	88	1.97
48	240	0.80	3.21	0.02	0.28	0.29	87	2.77
49	245	0.79	3.23	0.02	0.28	0.28	85	10.03
50	250	0.78	3.26	0.02	0.28	0.28	84	1.58
51	255	0.77	3.28	0.02	0.27	0.28	83	1.06
52	260	0.76	3.30	0.02	0.27	0.27	82	0.83
53	265	0.75	3.33	0.02	0.27	0.27	81	0.69
54	270	0.74	3.35	0.02	0.26	0.27	80	0.60
55	275	0.74	3.37	0.02	0.26	0.26	79	0.54
56	280	0.73	3.39	0.02	0.26	0.26	78	0.49
57	285	0.72	3.41	0.02	0.25	0.26	78	0.45
58	290	0.71	3.43	0.02	0.25	0.26	77	0.42
59	295	0.70	3.45	0.02	0.25	0.25	76	0.39
60	300	0.70	3.48	0.02	0.25	0.25	75	0.37
61	305	0.69	3.50	0.02	0.24	0.25	74	0.35
62	310	0.68	3.52	0.02	0.24	0.25	74	0.33
63	315	0.67	3.54	0.02	0.24	0.24	73	0.31
64	320	0.67	3.56	0.02	0.24	0.24	72	0.30
65	325	0.66	3.58	0.02	0.23	0.24	71	0.29
66	330	0.65	3.59	0.02	0.23	0.24	71	0.28
67	335	0.65	3.61	0.02	0.23	0.23	70	0.27
68	340	0.64	3.63	0.02	0.23	0.23	69	0.26
69	345	0.64	3.65	0.02	0.22	0.23	69	0.25
70	350	0.63	3.67	0.02	0.22	0.23	68	0.24
71	355	0.62	3.69	0.02	0.22	0.22	67	0.24
72	360	0.62	3.71	0.00	0.00	0.00	0	0.23
						SUM=	**13641**	**cubic feet**
							0.31	**acre-feet**

Check: $V = C*A*P_6$

V= 0.31 acre-feet

OK

Appendix 3:

Elev. vs. Area

Elev. vs. Discharge Curves

Stage-Area for BMP 1 (Biofiltration Basin) and UG-1 (Underground Detention Vault)

Depth (ft)	BMP 1 Surface Area (ft^2)	Effective Subsurface Vault Storage Area (ft^2)	Effective Subsurface BMP 1 Area (ft^2)	Effective Subsurface BMP-2 Area (ft^2)	Total Area (ft^2)	Total Volume (ft^3)	
0.000000	0	1473	943	n/a	2416	0	**INV OF VAULT (1)**
0.083333	0	1473	943	n/a	2416	201	
0.166667	0	1473	943	n/a	2416	403	
0.250000	0	1473	943	n/a	2416	604	
0.333333	0	1473	943	n/a	2416	805	
0.416667	0	1473	943	n/a	2416	1007	
0.500000	0	1473	943	n/a	2416	1208	
0.583333	0	1473	943	n/a	2416	1409	
0.666667	0	1473	943	n/a	2416	1611	
0.750000	0	1473	943	n/a	2416	1812	
0.833333	0	1473	943	n/a	2416	2013	
0.916667	0	1473	943	n/a	2416	2215	
0.999999	0	1473	943	n/a	2416	2416	
1.000000	0	1473	943	n/a	2416	2416	
1.000001	0	1473	943	n/a	2416	2416	
1.083333	0	1473	943	n/a	2416	2617	
1.166667	0	1473	943	n/a	2416	2818	
1.250000	0	1473	943	n/a	2416	3020	
1.333333	0	1473	943	n/a	2416	3221	
1.416667	0	1473	943	n/a	2416	3422	
1.500000	0	1473	943	n/a	2416	3624	
1.583333	0	1473	943	n/a	2416	3825	
1.666667	0	1473	943	n/a	2416	4026	
1.750000	0	1473	943	n/a	2416	4228	
1.833333	0	1473	943	n/a	2416	4429	
1.916667	0	1473	943	n/a	2416	4630	
2.000000	0	1473	943	n/a	2416	4832	
2.083333	0	1473	943	n/a	2416	5033	
2.166667	0	1473	943	n/a	2416	5234	
2.250000	0	1473	943	n/a	2416	5436	
2.333333	0	1473	943	n/a	2416	5637	
2.416667	0	1473	943	n/a	2416	5838	
2.499999	0	1473	943	n/a	2416	6040	
2.500000	0	1473	943	n/a	2416	6040	
2.500001	0	1473	943	n/a	2416	6040	
2.583333	0	1473	943	n/a	2416	6241	
2.666667	0	1473	943	n/a	2416	6442	
2.750000	0	1473	943	n/a	2416	6644	
2.833333	0	1473	943	n/a	2416	6845	
2.916667	0	1473	943	n/a	2416	7046	
3.000000	0	1473	943	n/a	2416	7248	
3.083333	0	1473	943	n/a	2416	7449	
3.166667	0	1473	943	n/a	2416	7650	
3.250000	0	1473	943	n/a	2416	7852	
3.333333	0	1473	943	n/a	2416	8053	
3.416667	0	1473	943	n/a	2416	8254	
3.499999	0	1473	943	n/a	2416	8455	
3.500000	0	1473	943	n/a	2416	8455	**TOP OF VAULT (1)**
3.500001	0	0	397	n/a	397	8455	
3.583333	0	0	397	n/a	397	8489	
3.666667	0	0	397	n/a	397	8522	
3.750000	0	0	397	n/a	397	8555	
3.833333	0	0	397	n/a	397	8588	
3.916667	0	0	397	n/a	397	8621	
3.999999	0	0	397	n/a	397	8654	
4.000000	0	0	397	n/a	397	8654	**INV OF AMENDED SOIL (2)**
4.000001	0	0	199	n/a	199	8654	
4.083333	0	0	199	n/a	199	8671	
4.166667	0	0	199	n/a	199	8687	
4.250000	0	0	199	n/a	199	8704	
4.333333	0	0	199	n/a	199	8720	
4.416667	0	0	199	n/a	199	8737	
4.500000	0	0	199	n/a	199	8753	
4.583333	0	0	199	n/a	199	8770	
4.666667	0	0	199	n/a	199	8786	
4.750000	0	0	199	n/a	199	8803	

4.833333	0	0	199	n/a	199	8819	
4.916667	0	0	199	n/a	199	8836	
4.999999	0	0	199	n/a	199	8853	
5.000000	0	0	199	n/a	199	8853	
5.000001	0	0	199	n/a	199	8853	
5.083333	0	0	199	n/a	199	8869	
5.166667	0	0	199	n/a	199	8886	
5.250000	0	0	199	n/a	199	8902	
5.333333	0	0	199	n/a	199	8919	
5.416667	0	0	199	n/a	199	8935	
5.499999	0	0	199	n/a	199	8952	**TOP OF AMENDED SOIL (2)**
5.500000	993	0	0	n/a	993	8952	**SURFACE (3)**
6.000000	993	0	0	n/a	993	9449	**SURFACE OUTLET (4)**
6.083333	993	0	0	n/a	993	9531	
6.166667	993	0	0	n/a	993	9614	

(1): Depth=0 is the invert of the undeground vault
(2): Effective amended soil area in BMP-1 (assume porosity = 0.2)
(3): Surface ponding area of BMP-1 (area of amended soil).
(4): Emergency overflow outlet elevation
(5): Note: subsurface storage area in BMP-2 ignored (conservative)

Facility	Total Area (sq ft)	Effective Storage Vault Area (assume porosity = 0.95)	Effective Subsurface Gravel Area (assume porosity = 0.4)	Effective Subsurface Amended Soil Area (assume porosity = 0.2)
Vault	1550	1473	n/a	n/a
BMP-1	993	943	397	199

Outlet structure for Discharge of Underground Storage Vault UG_1

Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir	
Number of orif:	0	Number of slots:	0	Number of weirs:	0
Cg-low:	0.62	Invert:	0.00 ft	Invert:	0.00
		B	0.00 ft	B:	0.00
Middle orifice	1.000 "	h_{slot}	0.000 ft		
Number of orif:	0				
Cg-middle:	0	Upper slot		Emergency weir	
invert elev:	0.000 ft	Number of slots:	0	Invert:	6.00 ft
		Invert:	0.00 ft	B:	50.00 ft
*Note: h = head above the invert of the lowest surface discharge opening.		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)	Q pump 1 (cfs)	Q pump 2 (cfs)	Q pump 3 (cfs)	Qtot (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	0.040	0.000	0.000	0.040
0.083	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.167	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.250	3.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.333	4.000	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.417	5.000	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.500	6.000	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.583	7.000	7.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.667	8.000	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.750	9.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.833	10.000	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
0.917	11.000	11.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.000	12.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.083	13.000	13.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.167	14.000	14.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.250	15.000	15.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.333	16.000	16.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.417	17.000	17.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.500	18.000	18.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.583	19.000	19.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.667	20.000	20.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.750	21.000	21.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.833	22.000	22.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
1.917	23.000	23.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.000	24.000	24.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.083	25.000	25.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.167	26.000	26.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.250	27.000	27.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.333	28.000	28.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.417	29.000	29.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040

Outlet structure for Discharge of Underground Storage Vault UG_1

Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir	
Number of orif:	0	Number of slots:	0	Number of weirs:	0
Cg-low:	0.62	Invert:	0.00 ft	Invert:	0.00
		B	0.00 ft	B:	0.00
Middle orifice	1.000 "	h_{slot}	0.000 ft		
Number of orif:	0				
Cg-middle:	0	Upper slot		Emergency weir	
invert elev:	0.000 ft	Number of slots:	0	Invert:	6.00 ft
		Invert:	0.00 ft	B:	50.00 ft
*Note: h = head above the invert of the lowest surface discharge opening.		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)	Q pump 1 (cfs)	Q pump 2 (cfs)	Q pump 3 (cfs)	Qtot (cfs)
2.500	30.000	30.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.583	31.000	31.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.667	32.000	32.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.750	33.000	33.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.833	34.000	34.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
2.917	35.000	35.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
3.000	36.000	36.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
3.083	37.000	37.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040
3.167	38.000	38.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.250	39.000	39.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.333	40.000	40.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.417	41.000	41.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.500	42.000	42.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.583	43.000	43.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.667	44.000	44.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.750	45.000	45.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.833	46.000	46.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
3.917	47.000	47.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	0.000	0.290
4.000	48.000	48.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	1.750	2.040
4.083	49.000	49.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	1.750	2.040
4.167	50.000	50.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	1.750	2.040
4.250	51.000	51.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.333	52.000	52.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.417	53.000	53.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.500	54.000	54.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.583	55.000	55.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.667	56.000	56.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.750	57.000	57.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.833	58.000	58.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
4.917	59.000	59.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990

Outlet structure for Discharge of Underground Storage Vault UG_1

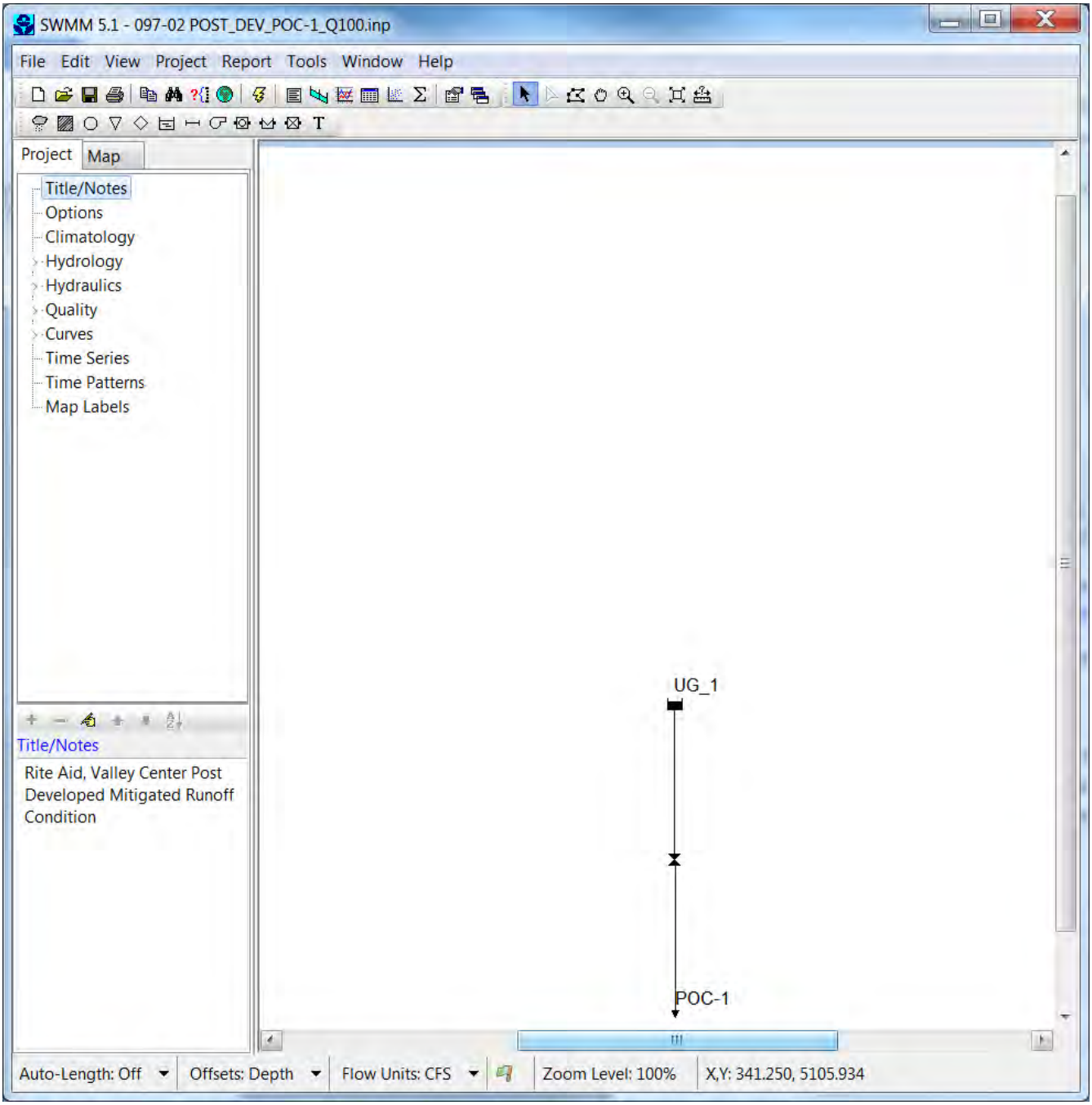
Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir	
Number of orif:	0	Number of slots:	0	Number of weirs:	0
Cg-low:	0.62	Invert:	0.00 ft	Invert:	0.00
		B	0.00 ft	B:	0.00
Middle orifice	1.000 "	h_{slot}	0.000 ft		
Number of orif:	0				
Cg-middle:	0	Upper slot		Emergency weir	
invert elev:	0.000 ft	Number of slots:	0	Invert:	6.00 ft
		Invert:	0.00 ft	B:	50.00 ft
*Note: h = head above the invert of the lowest surface discharge opening.		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)	Q pump 1 (cfs)	Q pump 2 (cfs)	Q pump 3 (cfs)	Qtot (cfs)
5.000	60.000	60.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.083	61.000	61.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.167	62.000	62.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.250	63.000	63.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.333	64.000	64.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.417	65.000	65.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.500	66.000	66.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.583	67.000	67.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.667	68.000	68.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.750	69.000	69.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.833	70.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
5.917	71.000	71.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
6.000	72.000	72.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.250	3.700	3.990
6.083	73.000	73.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.729	0.040	0.250	3.700	7.719
6.167	74.000	74.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.546	0.040	0.250	3.700	14.536

Appendix 4:
SWMM Model Input

POST-DEV (POC-1)



```
[TITLE]
;;Project Title/Notes
Rite Aid, Valley Center Post Developed Mitigated Runoff Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/01/2000
END_TIME             12:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         0:00:10

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;--------------- ----------------
MONTHLY          0.070  0.100  0.130  0.170  0.190  0.220  0.240  0.220  0.190  0.130  0.090  0.060
DRY_ONLY         NO

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          -------- --------
UG_1             0        6.17       0          TABULAR    S_1                          0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
Outlet1          UG_1             POC-1            0          TABULAR/DEPTH   OUT_1                       NO

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
UG_1             FLOW             DMA-1            FLOW     1.0      1.0

[CURVES]
;;Name           Type       X-Value    Y-Value
```

```
;;-------------- ---------- ---------- ----------
;UG
OUT_1            Rating     0.000      0.040
OUT_1                       0.083      0.040
OUT_1                       0.167      0.040
OUT_1                       0.250      0.040
OUT_1                       0.333      0.040
OUT_1                       0.417      0.040
OUT_1                       0.500      0.040
OUT_1                       0.583      0.040
OUT_1                       0.667      0.040
OUT_1                       0.750      0.040
OUT_1                       0.833      0.040
OUT_1                       0.917      0.040
OUT_1                       1.000      0.040
OUT_1                       1.083      0.040
OUT_1                       1.167      0.040
OUT_1                       1.250      0.040
OUT_1                       1.333      0.040
OUT_1                       1.417      0.040
OUT_1                       1.500      0.040
OUT_1                       1.583      0.040
OUT_1                       1.667      0.040
OUT_1                       1.750      0.040
OUT_1                       1.833      0.040
OUT_1                       1.917      0.040
OUT_1                       2.000      0.040
OUT_1                       2.083      0.040
OUT_1                       2.167      0.040
OUT_1                       2.250      0.040
OUT_1                       2.333      0.040
OUT_1                       2.417      0.040
OUT_1                       2.500      0.040
OUT_1                       2.583      0.040
OUT_1                       2.667      0.040
OUT_1                       2.750      0.040
OUT_1                       2.833      0.040
OUT_1                       2.917      0.040
OUT_1                       3.000      0.040
OUT_1                       3.083      0.040
OUT_1                       3.167      0.290
OUT_1                       3.250      0.290
OUT_1                       3.333      0.290
OUT_1                       3.417      0.290
OUT_1                       3.500      0.290
OUT_1                       3.583      0.290
OUT_1                       3.667      0.290
OUT_1                       3.750      0.290
OUT_1                       3.833      0.290
OUT_1                       3.917      0.290
OUT_1                       4.000      2.040
OUT_1                       4.083      2.040
OUT_1                       4.167      2.040
OUT_1                       4.250      3.990
OUT_1                       4.333      3.990
OUT_1                       4.417      3.990
OUT_1                       4.500      3.990
OUT_1                       4.583      3.990
OUT_1                       4.667      3.990
OUT_1                       4.750      3.990
OUT_1                       4.833      3.990
OUT_1                       4.917      3.990
OUT_1                       5.000      3.990
OUT_1                       5.083      3.990
OUT_1                       5.167      3.990
OUT_1                       5.250      3.990
OUT_1                       5.333      3.990
OUT_1                       5.417      3.990
OUT_1                       5.500      3.990
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OUT_1                       5.583      3.990
OUT_1                       5.667      3.990
OUT_1                       5.750      3.990
OUT_1                       5.833      3.990
OUT_1                       5.917      3.990
OUT_1                       6.000      3.990
OUT_1                       6.083      7.719
OUT_1                       6.167      14.536
;
S_1              Storage    0.000000   2416
S_1                         0.083333   2416
S_1                         0.166667   2416
S_1                         0.250000   2416
S_1                         0.333333   2416
S_1                         0.416667   2416
S_1                         0.500000   2416
S_1                         0.583333   2416
S_1                         0.666667   2416
S_1                         0.750000   2416
S_1                         0.833333   2416
S_1                         0.916667   2416
S_1                         0.999999   2416
S_1                         1.000000   2416
S_1                         1.000001   2416
S_1                         1.083333   2416
S_1                         1.166667   2416
S_1                         1.250000   2416
S_1                         1.333333   2416
S_1                         1.416667   2416
S_1                         1.500000   2416
S_1                         1.583333   2416
S_1                         1.666667   2416
S_1                         1.750000   2416
S_1                         1.833333   2416
S_1                         1.916667   2416
S_1                         2.000000   2416
S_1                         2.083333   2416
S_1                         2.166667   2416
S_1                         2.250000   2416
S_1                         2.333333   2416
S_1                         2.416667   2416
S_1                         2.499999   2416
S_1                         2.500000   2416
S_1                         2.500001   2416
S_1                         2.583333   2416
S_1                         2.666667   2416
S_1                         2.750000   2416
S_1                         2.833333   2416
S_1                         2.916667   2416
S_1                         3.000000   2416
S_1                         3.083333   2416
S_1                         3.166667   2416
S_1                         3.250000   2416
S_1                         3.333333   2416
S_1                         3.416667   2416
S_1                         3.499999   2416
S_1                         3.500000   2416
S_1                         3.500001   397
S_1                         3.583333   397
S_1                         3.666667   397
S_1                         3.750000   397
S_1                         3.833333   397
S_1                         3.916667   397
S_1                         3.999999   397
S_1                         4.000000   397
S_1                         4.000001   199
S_1                         4.083333   199
S_1                         4.166667   199
S_1                         4.250000   199
```

```
S_1                         4.333333   199
S_1                         4.416667   199
S_1                         4.500000   199
S_1                         4.583333   199
S_1                         4.666667   199
S_1                         4.750000   199
S_1                         4.833333   199
S_1                         4.916667   199
S_1                         4.999999   199
S_1                         5.000000   199
S_1                         5.000001   199
S_1                         5.083333   199
S_1                         5.166667   199
S_1                         5.250000   199
S_1                         5.333333   199
S_1                         5.416667   199
S_1                         5.499999   199
S_1                         5.500000   993
S_1                         6.000000   993
S_1                         6.083333   993
S_1                         6.166667   993

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
DMA-1                       0:00       0.00
DMA-1                       0:05       0.22
DMA-1                       0:10       0.23
DMA-1                       0:15       0.23
DMA-1                       0:20       0.23
DMA-1                       0:25       0.24
DMA-1                       0:30       0.24
DMA-1                       0:35       0.25
DMA-1                       0:40       0.25
DMA-1                       0:45       0.25
DMA-1                       0:50       0.26
DMA-1                       0:55       0.26
DMA-1                       1:00       0.26
DMA-1                       1:05       0.27
DMA-1                       1:10       0.27
DMA-1                       1:15       0.28
DMA-1                       1:20       0.28
DMA-1                       1:25       0.29
DMA-1                       1:30       0.30
DMA-1                       1:35       0.31
DMA-1                       1:40       0.31
DMA-1                       1:45       0.32
DMA-1                       1:50       0.32
DMA-1                       1:55       0.34
DMA-1                       2:00       0.34
DMA-1                       2:05       0.35
DMA-1                       2:10       0.36
DMA-1                       2:15       0.37
DMA-1                       2:20       0.38
DMA-1                       2:25       0.40
DMA-1                       2:30       0.41
DMA-1                       2:35       0.43
DMA-1                       2:40       0.44
DMA-1                       2:45       0.46
DMA-1                       2:50       0.47
DMA-1                       2:55       0.50
DMA-1                       3:00       0.52
DMA-1                       3:05       0.56
DMA-1                       3:10       0.58
DMA-1                       3:15       0.63
DMA-1                       3:20       0.66
DMA-1                       3:25       0.73
DMA-1                       3:30       0.77
DMA-1                       3:35       0.89
```

```
DMA-1                      3:40       0.96
DMA-1                      3:45       1.18
DMA-1                      3:50       1.34
DMA-1                      3:55       1.97
DMA-1                      4:00       2.77
DMA-1                      4:05       10.03
DMA-1                      4:10       1.58
DMA-1                      4:15       1.06
DMA-1                      4:20       0.83
DMA-1                      4:25       0.69
DMA-1                      4:30       0.60
DMA-1                      4:35       0.54
DMA-1                      4:40       0.49
DMA-1                      4:45       0.45
DMA-1                      4:50       0.42
DMA-1                      4:55       0.39
DMA-1                      5:00       0.37
DMA-1                      5:05       0.35
DMA-1                      5:10       0.33
DMA-1                      5:15       0.31
DMA-1                      5:20       0.30
DMA-1                      5:25       0.29
DMA-1                      5:30       0.28
DMA-1                      5:35       0.27
DMA-1                      5:40       0.26
DMA-1                      5:45       0.25
DMA-1                      5:50       0.24
DMA-1                      5:55       0.24
DMA-1                      6:00       0.23

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 191.920 4920.830 1021.827 5718.627
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            669.094            4992.275
UG_1             667.958            5251.240

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

Appendix 5:
SWMM Model Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

Rite Aid, Valley Center Post Developed Mitigated Runoff Condition

****
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 ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date JAN-01-2000 00:00:00
Ending Date JAN-01-2000 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Routing Time Step ..... 10.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.312	0.102
External Outflow	0.157	0.051
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.155	0.051
Continuity Error (%)	0.056	

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

****
Routing Time Step Summary
****
Minimum Time Step : 10.00 sec
Average Time Step : 10.00 sec
Maximum Time Step : 10.00 sec

Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
UG_1	STORAGE	2.44	5.64	5.64	0 04:08	5.64

****
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	Flow Balance Error Percent
POC-1	OUTFALL	0.00	3.99	0 04:06	0	0.0511	0.000
UG_1	STORAGE	10.03	10.03	0 04:05	0.102	0.102	0.056

****
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
UG_1	STORAGE	12.00	5.644	0.526

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS

UG_1	5.731	60	0	0	9.097	95	0	04:08	3.99

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	99.91	0.16	3.99	0.051
System	99.91	0.16	3.99	0.051

****
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
Outlet1	DUMMY	3.99	0 04:06			

****
Conduit Surcharge Summary
****

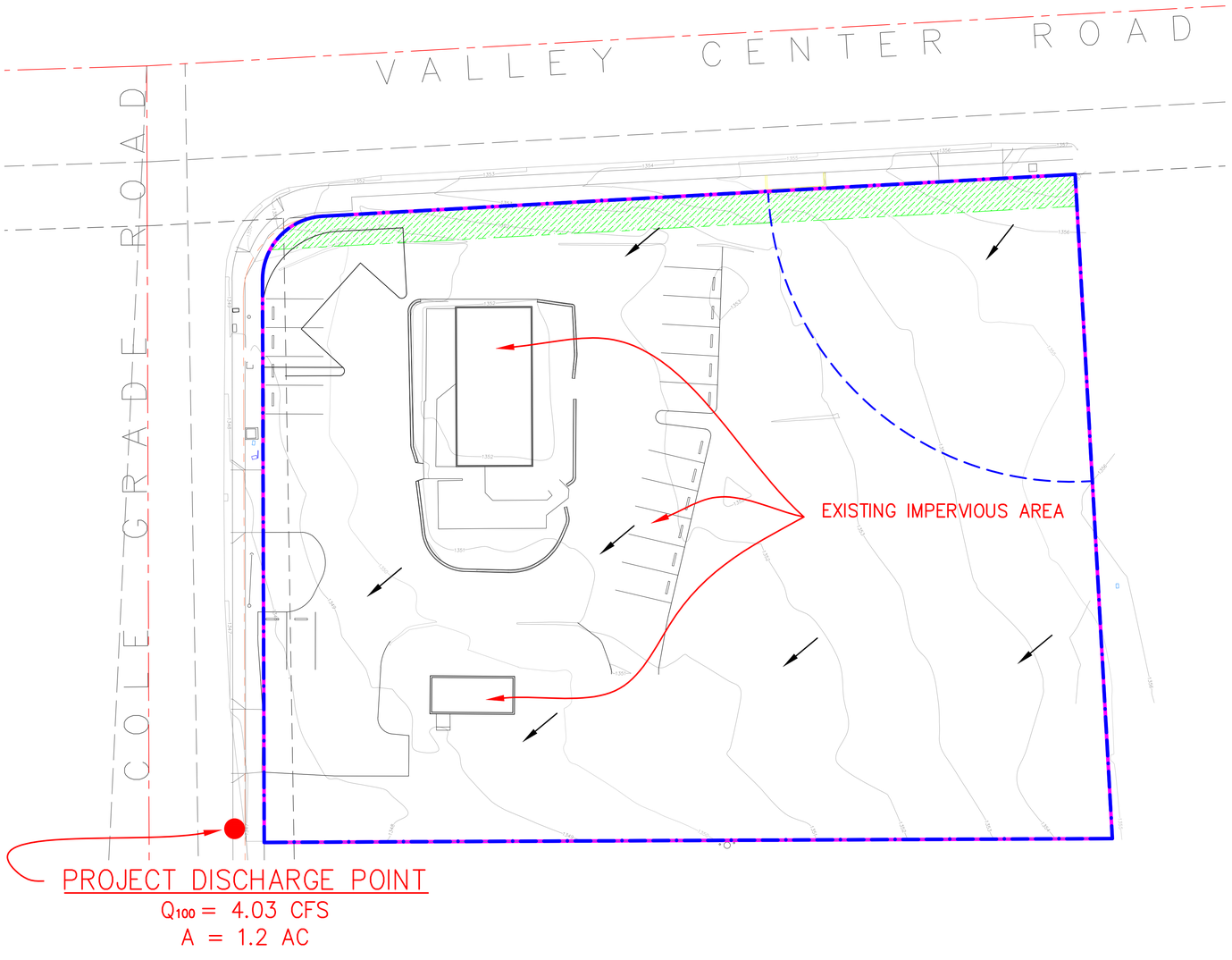
No conduits were surcharged.

Analysis begun on: Tue Mar 28 09:58:10 2017
Analysis ended on: Tue Mar 28 09:58:10 2017
Total elapsed time: < 1 sec

Appendix D

Project Maps

Existing Condition Hydrology Map
Developed Condition Hydrology Map
FEMA Floodplain Map



LEGEND

- CENTERLINE OF ROAD
- R/W LINE
- PROPERTY LINE
- DRAINAGE BOUNDARY LINE
- INITIAL SUBAREA BOUNDARY
- FLOW DIRECTION
- S.D.COUNTY FUTURE DEDICATION FOR ROAD AREA

N

0 10 20 FEET

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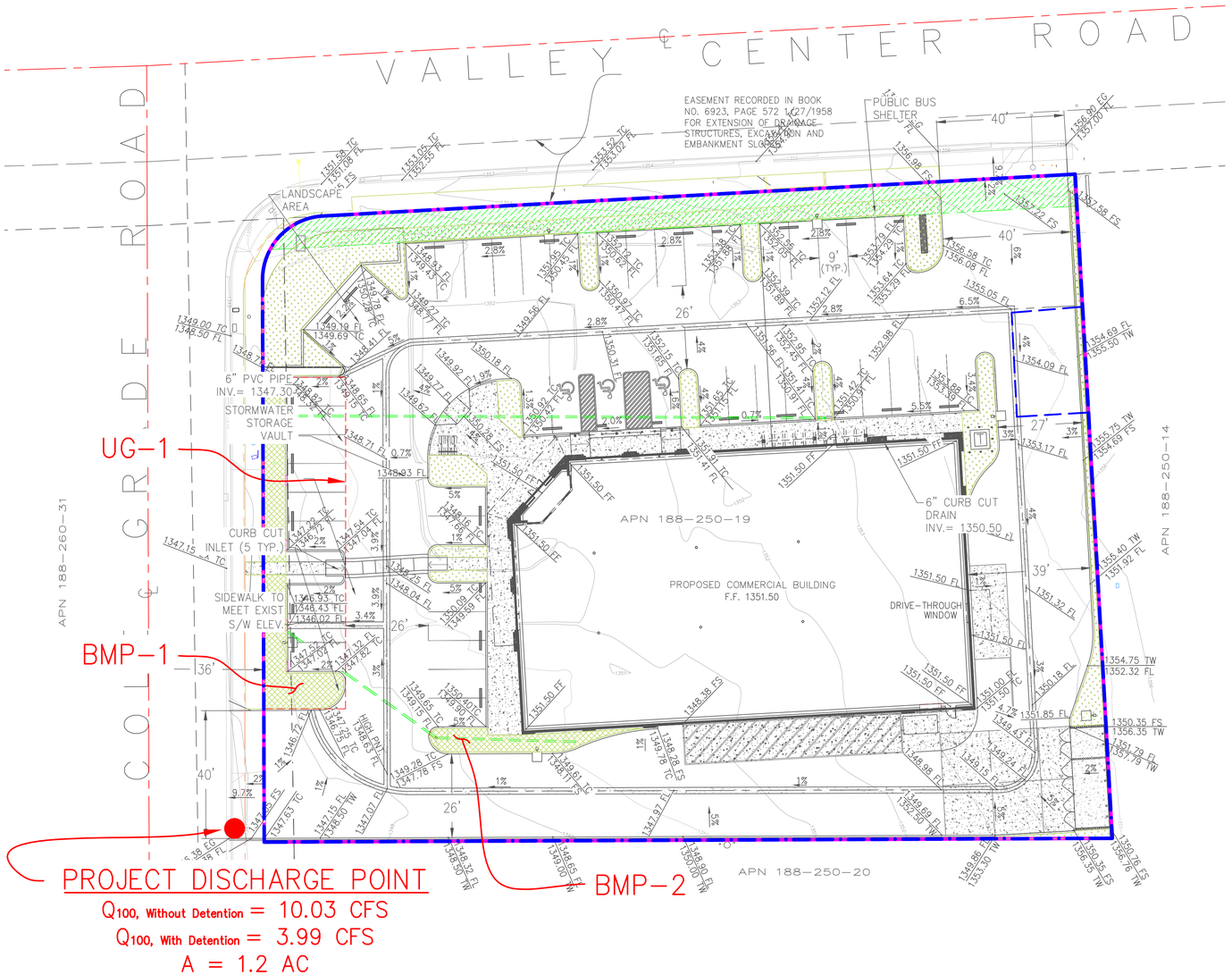
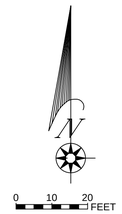
RELIABLE SOLUTIONS IN WATER RESOURCES

RITE AID VALLEY CENTER
HYDROLOGY MAP – EXISTING CONDITION



LEGEND

- CENTERLINE OF ROAD
- R/W LINE
- PROPERTY LINE
- DRAINAGE BOUNDARY LINE
- INITIAL SUBAREA BOUNDARY
- FLOW DIRECTION 0.7%
- LANDSCAPE AREA
- BMP FILTRATION AREA
- STORM VAULT
- CONCRETE
- S.D.COUNTY FUTURE DEDICATION FOR ROAD AREA



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RELIABLE SOLUTIONS IN WATER RESOURCES

RITE AID VALLEY CENTER
HYDROLOGY MAP – PROPOSED CONDITION


FEMA NFHL
PANEL
06073C0810G
eff. 5/16/2012
PROJECT SITE
405-01 (Rite Aid)
Valley Center Rd
S6
Miller Rd
School Bus Ln
Lizard Rocks Rd
Juba Rd
Indian Creek Rd
Cole Grade Rd
REFERENCE LAYERS
NFHL Data Available
FIRM Panel Boundary
LOMR Boundary
SPECIAL FLOOD HAZARD AREAS
1% Annual Chance Flood Hazard
Zone A, AE, A99, AO, AH, AR, V, VE
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard
Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee Zone X
NO SCREEN
Areas Outside the 0.2% Annual Chance Floodplain Zone X
Areas of Undetermined Flood Hazard Zone D
CROSS SECTIONS & BFES
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Base Flood Elevation
SUPPORTING INFORMATION
Limit of Study
Jurisdictional Boundary
Google Earth
© 2016 Google
N
1000 ft