

Appendix G

Hydrology Letter



1672 Donlon Street
Ventura, CA 93003
Local 805 654-6977
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www.jdscivil.com

PER07.5990
Monday, February 17, 2020

City of Ventura
Mark Wilde
501 Poli Street
Ventura, CA 93002

Subject: 5250 Ralston St. - Ventura VA Clinic Preliminary Hydrology Letter

Dear Mr. Wilde,

The proposed project is at 5250 Ralston Street on an 8.0 acre site. The property has an existing building and parking lot on the east side and is undeveloped on the west. The project is to construct a VA Clinic and parking lot. The intent of this letter is to show how this project meets the City of Ventura's MS4 permit requirements and identify detention opportunities.

The existing 8 acre lot has a large industrial building, a parking lot, and 2.5 acres of undeveloped area on site. The site surface drains from the northeast corner to the southwest corner of the site. Runoff from the site drains towards the Highway 101 East Drain and eventually is tributary to the Santa Clara River and finally the Pacific Ocean.

The proposed project will maintain the same overall drainage patterns and peak runoff flows. The site will be divided into three drainage subareas, each tributary to a separate infiltration BMP handling the water quality design volume (SQDV). See attached Hydrology Exhibit for reference. The proposed infiltration BMPs have been designed in accordance with the Ventura County Technical Guidance Manual. An infiltration test was completed by AGS and resulted in a corrected infiltration rate between 0.53-0.90 in/hr. BMP sizing was completed using the infiltration tests performed in the area of each infiltration BMP at a depth of five feet.

Table 1 shows the tributary area, SQDV, minimum infiltration BMP surface area, and provided BMP surface area for each of the three subareas. All three infiltration BMPs exceed the minimum infiltration surface area. Any excess area is to allow for adjustment in final design.

Subarea	Area (AC)	SQDV (CF)	Min. Infiltration Surface Area (SF)	Provided Infiltration Area (SF)
1	4.13	6569	6018	9481
2	1.6	2545	2736	2892
3	2.26	3595	2550	2966

Table 1: SQDV

The project has been designed to mitigate the 25-, 50-, and 100-year storm events back to pre-developed conditions. Peak runoffs were determined using the County's TC Calc and VCRat programs. Tc Calc was used to determine the time of concentration for each of the subareas and for each storm event. Those time of concentrations were used within the VCRat program to determine the peak runoffs and obtain the hydrographs. The required storage volumes were calculated using Hydraflow Program and the hydrographs produced from VCRat. See attached calculations for reference.

Existing condition peak runoff was calculated for the entire site and then a peak runoff per acre (q) was determined. The existing runoff for each of the subareas was calculated using the runoff per acre (q). Peak runoff per acre for the 25-, 50-, and 100-year storm events are shown in Table 2 below.

Existing Site Runoff per Acre		
q_{25} (cfs/ac)	q_{50} (cfs/ac)	q_{100} (cfs/ac)
2.19	2.95	3.28

Table 2: Runoff/Acre

In the developed condition the overall percent of impervious area of the site will increase from 46% to 61.5%, but the time of concentration will also increase. The small increase in impervious area and the increase in time of concentration will result in minimal increases to the peak runoff of Subareas 1 & 2, and will decrease the peak runoff in Subarea 3. Table 3 below shows the peak runoff of each of the subareas pre- and post-development prior to detention.

Subarea 1				
	Area (ac)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Post-Development	4.13	9.6	13.6	15.1
Pre-Development		9.0	12.2	13.5
Δ		0.6	1.4	1.6
Subarea 2				
	Area (ac)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Post-Development	1.60	4.3	5.3	5.9
Pre-Development		3.5	4.7	5.2
Δ		0.8	0.6	0.7
Subarea 3				
	Area (ac)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Post-Development	2.26	4.1	6.3	7
Pre-Development		4.9	6.7	7.4
Δ		-0.8	-0.4	-0.4

Table 3: Peak Runoff

To reduce the peak runoff back to existing conditions in Subareas 1 & 2, each of the onsite basins have been sized to allow for detention on top of the infiltration volume. Table 4 on the next page shows the 25-, 50-, and 100-year peak runoff pre- and post-development for the entire site.

Post-Development Peak Runoffs			
	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Subarea 1	9.0	10.6	13.5
Subarea 2	3.5	4.7	5.2
Subarea 3	4.1	6.3	7.0
Total Post-Development	16.7	21.6	25.8
Existing Condition	17.5	23.6	26.2
Δ	-0.8	-2.0	-0.4

Table 4: Runoff Mitigation

This site is required to comply with the trash provisions contained within the Water Quality Control Plan Ocean Waters of California 2015. Approved Flexstorm products will be installed to meet the state requirements. Flexstorm CPS devices will be provided at the inlet of the diversion units within Subareas 1 and 2. The trash capture devices will function to capture the incoming trash prior to any flows outletting from the diversion unit. Within subarea 3 all inlets draining to the infiltration trench will contain Flexstorm Catch-It inlet filters.

The proposed site contains a truck loading dock with a trench drain located at the bottom of the dock. The City of Ventura has requested that this trench drain be offline from the storm drain system. The intent is for this project to meet the City's requirements in place at the time the project is approved.

As described, the proposed project will utilize four infiltration BMPs to meet the City of Ventura's MS4 requirements. Detention will be provided to mitigate the peak runoff back to existing conditions in the 25-, 50-, and 100-year storm events. All sizing has been done in accordance with the Technical Guidance Manual and all detention and/or BMPs exceed the minimum sizing requirements.

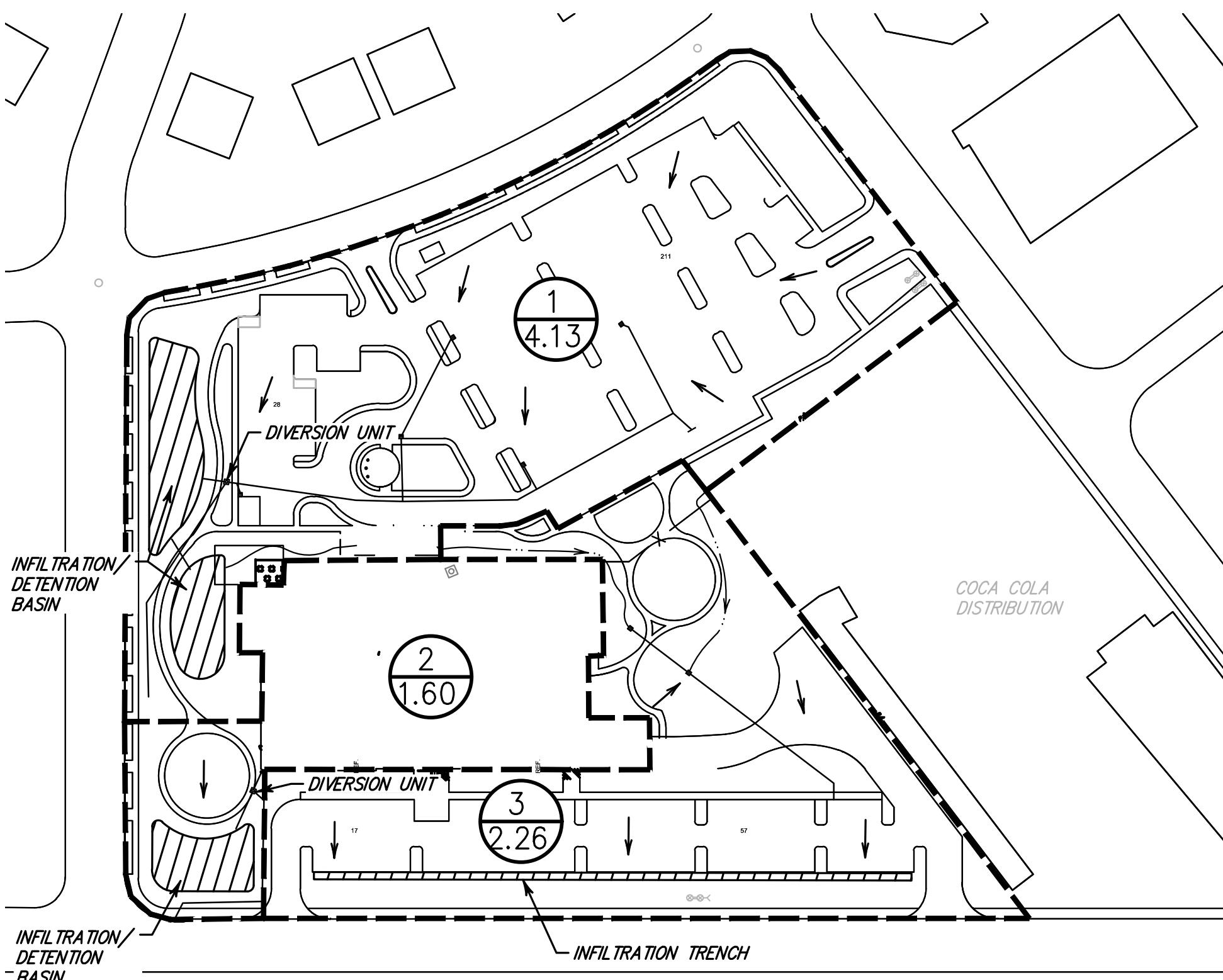
Sincerely,
Jensen Design & Survey, Inc.



Robert Harvey, P.E.
 Civil Engineer



Attachments:
 Hydrology Exhibit
 SQDV Calculations
 TC Calculations
 VCRat Calculations
 Hydraflow Calculations
 AGS Infiltration Test Results
 City of Ventura MS4 Spreadsheet



LEGEND

- ← FLOW DIRECTION
- X X.XX ← DRAINAGE SUBAREA
AREA (AC)
- - - WATERSHED SUB-AREA
BOUNDARY
- ▨ BMP

50' 0' 100'
SCALE: 1"=100'



1672 DONLON STREET
VENTURA, CALIF. 93003
PHONE 805/654-6977
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HYDROLOGY EXHIBIT

VENTURA VA CLINIC

SHEET

1 OF 1

Dec 26, 2019

SQDV Calculations

Designer:	Jensen Design & Survey, Inc		
Subarea:	1		
Date:	2/13/2020		
Project:	VA Clinic - VC Star Bldg		
Location:	Ventura		
Type of Vegetation: (Check type used or describe "Other")	<input type="checkbox"/>	Native Grass	
	<input type="checkbox"/>	Irrigated Turf Grass	
	<input checked="" type="checkbox"/> X	Other	

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	Aproject=	4.13	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%) (refer to permit), ranges from 5-30% allowable	%allowable=	0	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project}) * (%allowable)$	EIAallowable=	0.00	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.58	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project} * IMP$	TIA =	2.40	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain} = TIA - EIA_{allowable}$	Aretain =	2.40	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	$C_p =$	0.050	
1-8	Calculate runoff coefficient $C = 0.95 * IMP + C_p(1-IMP)$	C =	0.9500	
1-9	Enter design rainfall depth of the storm (in), P_i	$P_i =$	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i / 12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560 * C * P * A_{retain}$	SQDV =	6195.40	cf

Table 6.4 - Infiltration Facility Safety Factor Determination Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \cdot v$
A	Suitability Assessment	Soil Assessment Method	0.25	1	0.25
		Predominant Soil texture	0.25	2	0.5
		Soil Variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor $S_A =$			1.5
B	Design	Tributary Area Size	0.25	2	0.5
		Level of pre-treatment / expected sediment loads	0.25	3	0.75
		Redundancy	0.25	2	0.5
		Compaction during construction	0.25	1	0.25
		Design Safety Factor $S_B =$			2

Combined Safety Factor = $S_A \cdot S_B =$

3

INF-1 - Infiltration Basin

Designer:	Jensen Design & Survey, Inc		
Subarea:	1		
Date:	2/13/2020		
Project:	VA Clinic - VC Star Bldg		
Location:	Ventura		
Type of Vegetation: (Check type used or describe "Other")	<input checked="" type="checkbox"/>	Native Grass	
	<input type="checkbox"/>	Irrigated Turf Grass	
	<input type="checkbox"/>	Other	

Step 2: Determine the design percolation rate

2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured} =$	0.53	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	$S_A =$	1.5	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	$S_B =$	2.00	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	$S =$	3	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	$P_{design} =$	0.177	in/hr

Step 3: Calculate the surface area

3-1	Enter required drain time (hours, 72 hours max, t)	$t =$	72	hr
3-2	Calculate max. depth of runoff that can be infiltrated within the t (ft), $P_{design} * t / 12$	$d_{max} =$	1.060	ft
3-3	For Basins, Select ponding depth d_p such that $d_p \leq d_{max}$	$d_p =$	1	ft
3-6	Enter the time to fill infiltration basin with water (sue 2 hours for most designs), T	$T =$	2	hrs
3-7	Calculate Infiltrating surface area for infiltration basin $A_b = SQDV / (TP_{design} / 12 + d_p)$	$A_b =$	6018.2	sf

Designer: Jensen Design & Survey, Inc	
Subarea: 2	
Date: 2/13/2020	
Project: VA Clinic - VC Star Bldg	
Location: Ventura	
Type of Vegetation: (Check type used or describe "Other")	<input type="checkbox"/> Native Grass <input type="checkbox"/> Irrigated Turf Grass <input checked="" type="checkbox"/> X Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	Aproject=	1.6	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%) (refer to permit), ranges from 5-30% allowable	%allowable=	0	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project}) * (%allowable)$	EIAallowable=	0.00	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.68	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project} * IMP$	TIA =	1.09	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain} = TIA - EIA_{allowable}$	Aretain =	1.09	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	$C_p =$	0.050	
1-8	Calculate runoff coefficient $C = 0.95 * IMP + C_p(1-IMP)$	C =	0.9500	
1-9	Enter design rainfall depth of the storm (in), P_i	$P_i =$	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i / 12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560 * C * P * A_{retain}$	SQDV =	2813.98	cf

Table 6.4 - Infiltration Facility Safety Factor Determination Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \cdot v$
A	Suitability Assessment	Soil Assessment Method	0.25	2	0.5
		Predominant Soil texture	0.25	2	0.5
		Soil Variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor $S_A =$			1.75
B	Design	Tributary Area Size	0.25	2	0.5
		Level of pre-treatment / expected sediment loads	0.25	3	0.75
		Redundancy	0.25	2	0.5
		Compaction during construction	0.25	1	0.25
		Design Safety Factor $S_B =$			2

$$\text{Combined Safety Factor} = S_A * S_B = 3.5$$

INF-1 - Infiltration Basin

Designer:	Jensen Design & Survey, Inc		
Subarea:	2		
Date:	2/13/2020		
Project:	VA Clinic - VC Star Bldg		
Location:	Ventura		
Type of Vegetation: (Check type used or describe "Other")	<input checked="" type="checkbox"/>	Native Grass	
	<input type="checkbox"/>	Irrigated Turf Grass	
	<input type="checkbox"/>	Other	

Step 2: Determine the design percolation rate

2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured} =$	0.6	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	$S_A =$	1.75	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	$S_B =$	2	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	$S =$	3.5	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	$P_{design} =$	0.171	in/hr

Step 3: Calculate the surface area

3-1	Enter required drain time (hours, 72 hours max, t)	$t =$	72	hr
3-2	Calculate max. depth of runoff that can be infiltrated within the t (ft), $P_{design} * t / 12$	$d_{max} =$	1.029	ft
3-3	For Basins, Select ponding depth d_p such that $d_p \leq d_{max}$	$d_p =$	1	ft
3-6	Enter the time to fill infiltration basin with water (sue 2 hours for most designs), T	$T =$	2	hrs
3-7	Calculate Infiltrating surface area for infiltration basin $A_b = SQDV / (TP_{design} / 12 + d_p)$	$A_b =$	2735.8	sf

Designer: Jensen Design & Survey, Inc	
Subarea: 3	
Date: 2/13/2020	
Project: VA Clinic - VC Star Bldg	
Location: Ventura	
Type of Vegetation: (Check type used or describe "Other")	<input type="checkbox"/> Native Grass <input type="checkbox"/> Irrigated Turf Grass <input checked="" type="checkbox"/> X Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	Aproject=	2.26	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%) (refer to permit), ranges from 5-30% allowable	%allowable=	0	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project}) * (%allowable)$	EIAallowable=	0.00	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.56	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project} * IMP$	TIA =	1.27	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain} = TIA - EIA_{allowable}$	Aretain =	1.27	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	$C_p =$	0.050	
1-8	Calculate runoff coefficient $C = 0.95 * IMP + C_p(1-IMP)$	C =	0.9500	
1-9	Enter design rainfall depth of the storm (in), P_i	$P_i =$	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i / 12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560 * C * P * A_{retain}$	SQDV =	3273.32	cf

Table 6.4 - Infiltration Facility Safety Factor Determination Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \cdot v$
A	Suitability Assessment	Soil Assessment Method	0.25	1	0.25
		Predominant Soil texture	0.25	2	0.5
		Soil Variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor $S_A =$			1.5
B	Design	Tributary Area Size	0.25	2	0.5
		Level of pre-treatment / expected sediment loads	0.25	3	0.75
		Redundancy	0.25	2	0.5
		Compaction during construction	0.25	1	0.25
		Design Safety Factor $S_B =$			2

Combined Safety Factor = $S_A \cdot S_B =$

3

INF-2 - Infiltration Trench / INF-4 - Dry Well

Designer:	Jensen Design & Survey, Inc		
Subarea:	3		
Date:	2/13/2020		
Project:	VA Clinic - VC Star Bldg		
Location:	Ventura		
Type of Vegetation: (Check type used or describe "Other")	<input type="checkbox"/>	Native Grass	
	<input type="checkbox"/>	Irrigated Turf Grass	
	<input checked="" type="checkbox"/>	Other	

Step 2: Determine the design percolation rate

2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. P _{measured}	P _{measured} =	0.6	in/hr
2-2	Determine percolation rate correction factor, S _A based on suitability assessment (see Section 6 INF-1, Table 6-2)	S _A =	1.5	
2-3	Determine percolation rate correction factor, S _B based on design (see Section 6 INF-1)	S _B =	2	
2-4	Calculate Combine safety factor, S = S _A * S _B	S =	3	
2-5	Calculate the design percolation rate (in/hr) P _{design} = P _{measured} /S	P _{design} =	0.200	in/hr

Step 3: Calculate the surface area

3-1	Enter required drain time (hours, 72 hours max, t)	t =	72	hr
3-2	within the t (ft), d _{max} = P _{design} *t/(12*n)	d _{max} =	3.000	ft
3-3	For trenches, enter trench fill aggregate porosity, n _t	n _t =	0.4	ft
3-4	For trenches, enter depth of trench fill (ft), d _t	d _t =	2.5	ft
3-5	For trenches, select ponding depth d _p such that d _p <= d _{max} - n _t *d _t	d _p =	0.250	ft
3-6	Enter the time to fill infiltration trench with water (use 2 hours for most designs), T	T =	2	hrs
3-7	Calculate Infiltrating surface area for infiltration trenches $At = SQDV/(TPdesign/12+ntdt+dp)$	At =	2550.6	sf

TC Calculations

VENTURA COUNTY WATERSHED PROTECTION DISTRICT

TIME OF CONCENTRATION

TC Program Version: 2.64.0.37

Project: Ventura VA Clinic

Date: 12:00:00 AM

Engineer: Robert Harvey

Consultant: Jensen Design & Survey

SUMMARY OF COMPUTATIONS

Watershed Name: Entire Site

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Existing Entire Site	K	10	5.00	8.0 / 8	7.240 / 7
Existing Entire Site	K	25	5.00	8.0 / 8	6.843 / 7
Existing Entire Site	K	50	5.00	8.0 / 8	TC ERROR
Existing Entire Site	K	100	5.00	8.0 / 8	TC ERROR

Watershed Name: Existing Entire Site

Sub-Area Name: Existing Entire Site

Computing Tc for all rainfall frequencies for sub-area Existing Entire Site...

Tc for frequency = 25.00: 6.843 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 6.843 min. = 7 min.

SUB AREA INPUT DATA

Sub Area Name: Existing Entire Site

Total Area (ac): 7.99

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 25

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 46

SUB AREA OUTPUT

Intensity (in/hr): 3.454

C Total: 0.811

Sum Q Segments (cfs): 22.38

Q Total (cfs): 22.38
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 410.60
Time of Concentration (min): 6.843

DATA FOR FLOW PATH 1

Flow Path Name: Overland
FLOW PATH TRAVEL TIME (min): 6.2882
Flow Type: Overland
Length (ft): 200
Top Elevation (ft): 159
Bottom Elevation (ft): 155
Contributing Area (acres): 4
Percent of Sub-Area (%): 50.1
Overland Type: Valley
Development Type: Industrial
Map Slope: 0.0200
Effective Slope: 0.0200
Q for Flow Path (cfs): 11.20
Avg Velocity (ft/s): 0.53
Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Channelized Flow
FLOW PATH TRAVEL TIME (min): 0.5551
Flow Type: Natural Channel
Length (ft): 200
Top Elevation (ft): 155
Bottom Elevation (ft): 151
Contributing Area (acres): 3.99
Percent of Sub-Area (%): 49.9
Overland Type: Valley
Map Slope: 0.0200
Effective Slope: 0.0200
Q for Flow Path (cfs): 11.17
Q Top (cfs): 11.20
Q Bottom (cfs): 22.38
Velocity Top (ft/s): 3.64
Velocity Bottom (ft/s): 4.37
Avg Velocity (ft/s): 4.00
Wave Velocity (ft/s): 6.01

USE 5 MIN.

Tc for frequency = 50.00: 3.828 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 3.828 min. = 4 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Existing Entire Site

Total Area (ac): 7.99

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 50

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 46

SUB AREA OUTPUT

Intensity (in/hr): 5.160

C Total: 0.833

Sum Q Segments (cfs): 34.36

Q Total (cfs): 34.36

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 229.67

Time of Concentration (min): 3.828

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 159

Bottom Elevation (ft): 155

Contributing Area (acres): 4

Percent of Sub-Area (%): 50.1

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 17.20

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Channelized Flow

FLOW PATH TRAVEL TIME (min): 0.4945

Flow Type: Natural Channel

Length (ft): 200

Top Elevation (ft): 155

Bottom Elevation (ft): 151

Contributing Area (acres): 3.99

Percent of Sub-Area (%): 49.9

Overland Type: Valley

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 17.16

Q Top (cfs): 17.20

Q Bottom (cfs): 34.36

Velocity Top (ft/s): 4.07

Velocity Bottom (ft/s): 4.92

Avg Velocity (ft/s): 4.49

Wave Velocity (ft/s): 6.74

Tc for frequency = 100.00: 3.829 Minutes

DATA FOR SUB AREA 1

USE 5 MIN.

SUB AREA TIME OF CONCENTRATION: 3.829 min. = 4 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Existing Entire Site

Total Area (ac): 7.99

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 100

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 46

SUB AREA OUTPUT

Intensity (in/hr): 5.100

C Total: 0.833

Sum Q Segments (cfs): 33.94

Q Total (cfs): 33.94

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 229.77

Time of Concentration (min): 3.829

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 159

Bottom Elevation (ft): 155

Contributing Area (acres): 4

Percent of Sub-Area (%): 50.1

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 16.99

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Channelized Flow

FLOW PATH TRAVEL TIME (min): 0.4961

Flow Type: Natural Channel

Length (ft): 200

Top Elevation (ft): 155

Bottom Elevation (ft): 151

Contributing Area (acres): 3.99

Percent of Sub-Area (%): 49.9

Overland Type: Valley

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 16.95

Q Top (cfs): 16.99

Q Bottom (cfs): 33.94

Velocity Top (ft/s): 4.06

Velocity Bottom (ft/s): 4.90

Avg Velocity (ft/s): 4.48

Wave Velocity (ft/s): 6.72

VENTURA COUNTY WATERSHED PROTECTION DISTRICT

TIME OF CONCENTRATION

TC Program Version: 2.64.0.37

Project: Ventura VA Clinic

Date: 12:00:00 AM

Engineer: Robert Harvey

Consultant: Jensen Design & Survey

SUMMARY OF COMPUTATIONS

Watershed Name: Subarea 1

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Subarea 1	K	10	5.00	4.1 / 4	8.015 / 8
Subarea 1	K	25	5.00	4.1 / 4	7.564 / 8
Subarea 1	K	50	5.00	4.1 / 4	TC ERROR
Subarea 1	K	100	5.00	4.1 / 4	TC ERROR

Watershed Name: Subarea 1

Sub-Area Name: Subarea 1

Tc: 7.564 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 7.564 min. = 8 min.

SUB AREA INPUT DATA

Sub Area Name: Subarea 1

Total Area (ac): 4.13

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 25

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 3.191

C Total: 0.845

Sum Q Segments (cfs): 11.14

Q Total (cfs): 11.14

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 453.85

Time of Concentration (min): 7.564

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 6.2882

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 163

Bottom Elevation (ft): 159

Contributing Area (acres): 1.32

Percent of Sub-Area (%): 32.0

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 3.56

Avg Velocity (ft/s): 0.53

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe

FLOW PATH TRAVEL TIME (min): 1.2760

Flow Type: Pipe

Length (ft): 500

Top Elevation (ft): 157.8

Bottom Elevation (ft): 155.8

Contributing Area (acres): 2.81

Percent of Sub-Area (%): 68.0

Initial Pipe Diameter (in): 21

Calculated Pipe Diameter (in): 24

Used Pipe Diameter (in): 24

Manning's N: 0.012

Map Slope: 0.0040

Q for Flow Path (cfs): 7.58

Q Top (cfs): 3.56

Q Bottom (cfs): 11.14

Avg Velocity (ft/s): 4.85

Wave Velocity (ft/s): 6.53

Tc for frequency = 50.00: 4.505 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 4.505 min. = 5 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Subarea 1

Total Area (ac): 4.13

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 50

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 4.548

C Total: 0.862

Sum Q Segments (cfs): 16.19

Q Total (cfs): 16.19

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 270.28

Time of Concentration (min): 4.505

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 163

Bottom Elevation (ft): 159

Contributing Area (acres): 1.32

Percent of Sub-Area (%): 32.0

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 5.17

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

USE 5 MIN.



Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 1.1713
Flow Type: Pipe
Length (ft): 500
Top Elevation (ft): 157.8
Bottom Elevation (ft): 155.8
Contributing Area (acres): 2.81
Percent of Sub-Area (%): 68.0
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 27
Used Pipe Diameter (in): 27
Manning's N: 0.012
Map Slope: 0.0040
Q for Flow Path (cfs): 11.02
Q Top (cfs): 5.17
Q Bottom (cfs): 16.19
Avg Velocity (ft/s): 5.35
Wave Velocity (ft/s): 7.11

USE 5 MIN.

Tc for frequency = 100.00: 4.482 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 4.482 min. = 4 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Subarea 1

Total Area (ac): 4.13

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 100

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 5.100

C Total: 0.865

Sum Q Segments (cfs): 18.23

Q Total (cfs): 18.23

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 268.91

Time of Concentration (min): 4.482

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 163

Bottom Elevation (ft): 159

Contributing Area (acres): 1.32

Percent of Sub-Area (%): 32.0

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 5.83

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 1.1486
Flow Type: Pipe
Length (ft): 500
Top Elevation (ft): 157.8
Bottom Elevation (ft): 155.8
Contributing Area (acres): 2.81
Percent of Sub-Area (%): 68.0
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 27
Used Pipe Diameter (in): 27
Manning's N: 0.012
Map Slope: 0.0040
Q for Flow Path (cfs): 12.40
Q Top (cfs): 5.83
Q Bottom (cfs): 18.23
Avg Velocity (ft/s): 5.49
Wave Velocity (ft/s): 7.26

VENTURA COUNTY WATERSHED PROTECTION DISTRICT

TIME OF CONCENTRATION

TC Program Version: 2.64.0.37

Project: Ventura VA Clinic

Date: 12:00:00 AM

Engineer: Robert Harvey

Consultant: Jensen Design & Survey

SUMMARY OF COMPUTATIONS

Watershed Name: Subarea 2

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Subarea 2	K	10	5.00	1.6 / 2	6.739 / 7
Subarea 2	K	25	5.00	1.6 / 2	6.360 / 6
Subarea 2	K	50	5.00	1.6 / 2	TC ERROR
Subarea 2	K	100	5.00	1.6 / 2	TC ERROR

Watershed Name: Subarea 2

Sub-Area Name: Subarea 2

Tc: 6.360 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 6.360 min. = 6 min.

SUB AREA INPUT DATA

Sub Area Name: Subarea 2

Total Area (ac): 1.6

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 25

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 3.800

C Total: 0.854

Sum Q Segments (cfs): 5.20

Q Total (cfs): 5.20

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 381.58

Time of Concentration (min): 6.360

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 6.2882

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 190

Bottom Elevation (ft): 186

Contributing Area (acres): 1.1

Percent of Sub-Area (%): 68.8

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 3.57

Avg Velocity (ft/s): 0.53

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe

FLOW PATH TRAVEL TIME (min): 0.0715

Flow Type: Pipe

Length (ft): 50

Top Elevation (ft): 153

Bottom Elevation (ft): 151.5

Contributing Area (acres): 0.5

Percent of Sub-Area (%): 31.3

Initial Pipe Diameter (in): 12

Calculated Pipe Diameter (in): 12

Used Pipe Diameter (in): 12

Manning's N: 0.012

Map Slope: 0.0300

Q for Flow Path (cfs): 1.62

Q Top (cfs): 3.57

Q Bottom (cfs): 5.20

Avg Velocity (ft/s): 9.07

Wave Velocity (ft/s): 11.66

Tc for frequency = 50.00: 3.395 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 3.395 min. **= 3 min. ** TC ERROR ****

USE 5 MIN.



SUB AREA INPUT DATA

Sub Area Name: Subarea 2

Total Area (ac): 1.6

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 50

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 5.900

C Total: 0.869

Sum Q Segments (cfs): 8.21

Q Total (cfs): 8.21

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 203.72

Time of Concentration (min): 3.395

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 190

Bottom Elevation (ft): 186

Contributing Area (acres): 1.1

Percent of Sub-Area (%): 68.8

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 5.64

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 0.0621
Flow Type: Pipe
Length (ft): 50
Top Elevation (ft): 153
Bottom Elevation (ft): 151.5
Contributing Area (acres): 0.5
Percent of Sub-Area (%): 31.3
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 15
Used Pipe Diameter (in): 15
Manning's N: 0.012
Map Slope: 0.0300
Q for Flow Path (cfs): 2.56
Q Top (cfs): 5.64
Q Bottom (cfs): 8.21
Avg Velocity (ft/s): 10.18
Wave Velocity (ft/s): 13.43

Tc for frequency = 100.00: 3.396 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 3.396 min. = 3 min. ** TC ERROR **

USE 5 MIN.



SUB AREA INPUT DATA

Sub Area Name: Subarea 2

Total Area (ac): 1.6

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 100

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 5.440

C Total: 0.867

Sum Q Segments (cfs): 7.55

Q Total (cfs): 7.55

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 203.76

Time of Concentration (min): 3.396

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 3.3333

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 190

Bottom Elevation (ft): 186

Contributing Area (acres): 1.1

Percent of Sub-Area (%): 68.8

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0200

Effective Slope: 0.0200

Q for Flow Path (cfs): 5.19

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 0.0627
Flow Type: Pipe
Length (ft): 50
Top Elevation (ft): 153
Bottom Elevation (ft): 151.5
Contributing Area (acres): 0.5
Percent of Sub-Area (%): 31.3
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 15
Used Pipe Diameter (in): 15
Manning's N: 0.012
Map Slope: 0.0300
Q for Flow Path (cfs): 2.36
Q Top (cfs): 5.19
Q Bottom (cfs): 7.55
Avg Velocity (ft/s): 9.97
Wave Velocity (ft/s): 13.29

VENTURA COUNTY WATERSHED PROTECTION DISTRICT

TIME OF CONCENTRATION

TC Program Version: 2.64.0.37

Project: Ventura VA Clinic

Date: 12:00:00 AM

Engineer: Robert Harvey

Consultant: Jensen Design & Survey

SUMMARY OF COMPUTATIONS

Watershed Name: Subarea 3

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Subarea 3	K	10	5.00	2.3 / 2	12.966 / 13
Subarea 3	K	25	5.00	2.3 / 2	12.666 / 13
Subarea 3	K	50	5.00	2.3 / 2	6.832 / 7
Subarea 3	K	100	5.00	2.3 / 2	6.832 / 7

Watershed Name: Subarea 3

Sub-Area Name: Subarea 3

Tc: 12.666 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 12.666 min. = 13 min.

SUB AREA INPUT DATA

Sub Area Name: Subarea 3

Total Area (ac): 2.26

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 25

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 2.430

C Total: 0.823

Sum Q Segments (cfs): 4.52

Q Total (cfs): 4.52

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 759.96

Time of Concentration (min): 12.666

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 5.1907

Flow Type: Overland

Length (ft): 160

Top Elevation (ft): 159

Bottom Elevation (ft): 157.8

Contributing Area (acres): 0.8

Percent of Sub-Area (%): 35.4

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0075

Effective Slope: 0.0075

Q for Flow Path (cfs): 1.60

Avg Velocity (ft/s): 0.51

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe

FLOW PATH TRAVEL TIME (min): 0.9658

Flow Type: Pipe

Length (ft): 230

Top Elevation (ft): 156.3

Bottom Elevation (ft): 155.5

Contributing Area (acres): 0

Percent of Sub-Area (%): 0.0

Initial Pipe Diameter (in): 12

Calculated Pipe Diameter (in): 12

Used Pipe Diameter (in): 12

Manning's N: 0.012

Map Slope: 0.0035

Q for Flow Path (cfs): 0.00

Q Top (cfs): 1.60

Q Bottom (cfs): 1.60

Avg Velocity (ft/s): 3.13

Wave Velocity (ft/s): 3.97

DATA FOR FLOW PATH 3

Flow Path Name: FlowPath

FLOW PATH TRAVEL TIME (min): 6.6667

Flow Type: Overland

Length (ft): 200

Top Elevation (ft): 155.5

Bottom Elevation (ft): 154.4

Contributing Area (acres): 1.46

Percent of Sub-Area (%): 64.6

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0055

Effective Slope: 0.0055

Q for Flow Path (cfs): 2.62

Avg Velocity (ft/s): 0.50

Passed Scour Check: N/A

Tc for frequency = 50.00: 6.832 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 6.832 min. = 7 min.

SUB AREA INPUT DATA

Sub Area Name: Subarea 3

Total Area (ac): 2.26

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 50

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 3.771

C Total: 0.854

Sum Q Segments (cfs): 7.28

Q Total (cfs): 7.28

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 409.94

Time of Concentration (min): 6.832

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 2.6667

Flow Type: Overland

Length (ft): 160

Top Elevation (ft): 159

Bottom Elevation (ft): 157.8

Contributing Area (acres): 0.8

Percent of Sub-Area (%): 35.4

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0075

Effective Slope: 0.0075

Q for Flow Path (cfs): 2.58

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 0.8323
Flow Type: Pipe
Length (ft): 230
Top Elevation (ft): 156.3
Bottom Elevation (ft): 155.5
Contributing Area (acres): 0
Percent of Sub-Area (%): 0.0
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 15
Used Pipe Diameter (in): 15
Manning's N: 0.012
Map Slope: 0.0035
Q for Flow Path (cfs): 0.00
Q Top (cfs): 2.58
Q Bottom (cfs): 2.58
Avg Velocity (ft/s): 3.55
Wave Velocity (ft/s): 4.61
DATA FOR FLOW PATH 3

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 3.3333
Flow Type: Overland
Length (ft): 200
Top Elevation (ft): 155.5
Bottom Elevation (ft): 154.4
Contributing Area (acres): 1.46
Percent of Sub-Area (%): 64.6
Overland Type: Valley
Development Type: Industrial
Map Slope: 0.0055
Effective Slope: 0.0055
Q for Flow Path (cfs): 4.70
Avg Velocity (ft/s): 1.00
Passed Scour Check: N/A

Tc for frequency = 100.00: 6.832 Minutes

DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 6.832 min. = 7 min.

SUB AREA INPUT DATA

Sub Area Name: Subarea 3

Total Area (ac): 2.26

Flood Zone: 2

Rainfall Zone: K

Storm Frequency (years): 100

Development Type: Industrial

Soil Type: 5.00

Percent Impervious: 61

SUB AREA OUTPUT

Intensity (in/hr): 4.226

C Total: 0.859

Sum Q Segments (cfs): 8.21

Q Total (cfs): 8.21

Sum Percent Area (%): 100.0

Sum of Flow Path Travel Times (sec): 409.94

Time of Concentration (min): 6.832

DATA FOR FLOW PATH 1

Flow Path Name: Overland

FLOW PATH TRAVEL TIME (min): 2.6667

Flow Type: Overland

Length (ft): 160

Top Elevation (ft): 159

Bottom Elevation (ft): 157.8

Contributing Area (acres): 0.8

Percent of Sub-Area (%): 35.4

Overland Type: Valley

Development Type: Industrial

Map Slope: 0.0075

Effective Slope: 0.0075

Q for Flow Path (cfs): 2.91

Avg Velocity (ft/s): 1.00

Passed Scour Check: N/A

DATA FOR FLOW PATH 2

Flow Path Name: Pipe
FLOW PATH TRAVEL TIME (min): 0.8323
Flow Type: Pipe
Length (ft): 230
Top Elevation (ft): 156.3
Bottom Elevation (ft): 155.5
Contributing Area (acres): 0
Percent of Sub-Area (%): 0.0
Initial Pipe Diameter (in): 12
Calculated Pipe Diameter (in): 15
Used Pipe Diameter (in): 15
Manning's N: 0.012
Map Slope: 0.0035
Q for Flow Path (cfs): 0.00
Q Top (cfs): 2.91
Q Bottom (cfs): 2.91
Avg Velocity (ft/s): 3.63
Wave Velocity (ft/s): 4.61
DATA FOR FLOW PATH 3

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 3.3333
Flow Type: Overland
Length (ft): 200
Top Elevation (ft): 155.5
Bottom Elevation (ft): 154.4
Contributing Area (acres): 1.46
Percent of Sub-Area (%): 64.6
Overland Type: Valley
Development Type: Industrial
Map Slope: 0.0055
Effective Slope: 0.0055
Q for Flow Path (cfs): 5.30
Avg Velocity (ft/s): 1.00
Passed Scour Check: N/A

Existing Site Q25

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Existing 25-year Conditions

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA					ROUTING AFTER ACCUMULATION								
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(Z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A25	7	46	80	175	80	175	1153	-	-	-	-	-	-	-	-	
2A	--	--	--	--	--	--	80	175	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
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NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 80

HYDROGRAPH PEAK: 175

TIME OF PEAK: 1153

HYDROGRAPH VOLUME: 17.89 acre-ft

multiplied by 10 to be within
County recommended 40-80 ac

divide by 10
Q25= 17.5 cfs

TIME (min)	FLOW (cfs)								
0	0.00	100	4.03	200	4.03	300	4.01	400	4.03
500	4.03	600	4.68	700	6.72	800	6.72	900	8.89
1000	12.71	1050	16.93	1100	22.18	1110	33.21	1120	43.29
1130	44.39	1131	44.70	1132	45.54	1133	45.85	1134	46.17
1135	47.01	1136	47.32	1137	47.63	1138	48.16	1139	47.63
1140	47.63	1141	48.68	1142	49.21	1143	50.25	1144	51.30
1145	56.46	1146	62.05	1147	67.65	1148	72.04	1149	94.58
1150	116.59	1151	139.02	1152	157.08	1153	175.23	1154	175.23
1155	170.93	1156	147.83	1157	124.00	1158	101.26	1159	77.82
1160	52.87	1161	47.11	1162	45.54	1163	44.49	1164	43.97
1165	40.13	1166	36.62	1167	33.10	1168	28.40	1169	26.41
1170	24.61	1171	22.81	1172	22.81	1173	22.81	1174	22.51
1175	22.81	1176	22.81	1177	22.21	1178	21.31	1179	20.41
1180	19.81	1181	19.21	1182	18.61	1183	17.71	1184	17.71
1185	17.71	1186	18.01	1187	17.71	1188	17.71	1189	16.81
1190	16.21	1191	15.61	1192	15.01	1193	14.11	1194	13.51
1195	12.91	1196	12.91	1197	12.91	1198	12.61	1199	12.60
1200	12.60	1201	12.60	1202	12.60	1203	12.60	1204	12.60
1205	12.60	1206	12.61	1207	12.61	1208	12.61	1209	12.61
1210	12.61	1211	12.91	1212	12.91	1213	12.91	1214	12.91
1215	12.91	1216	12.91	1217	12.91	1218	12.60	1219	12.61
1220	12.61	1221	12.61	1222	12.61	1223	12.61	1224	12.60
1225	11.70	1226	11.10	1227	10.20	1228	9.30	1229	8.40
1230	7.50	1231	6.90	1232	6.90	1233	6.60	1234	6.60
1235	6.60	1236	6.90	1237	6.90	1238	6.60	1239	6.60
1240	6.60	1241	6.90	1242	6.90	1243	6.60	1244	6.60
1245	6.60	1246	6.90	1247	6.90	1248	6.60	1249	6.60
1250	6.60	1251	6.90	1252	6.90	1253	6.60	1254	6.60
1255	6.60	1256	6.90	1257	6.90	1258	6.60	1259	6.60
1260	6.60	1261	6.90	1262	6.90	1263	6.60	1264	6.60
1265	6.90	1266	6.90	1267	6.90	1268	6.60	1269	6.60
1270	6.90	1271	6.90	1272	6.60	1273	6.60	1274	6.60
1275	6.90	1276	6.90	1277	6.60	1278	6.60	1279	6.60
1280	6.90	1281	6.90	1282	6.60	1283	6.60	1284	6.60
1285	6.90	1286	6.90	1287	6.60	1288	6.60	1289	6.60
1290	6.90	1291	6.90	1292	6.60	1293	6.60	1294	6.60
1295	6.90	1296	6.90	1297	6.30	1298	6.00	1299	5.70
1300	5.10	1310	4.20	1320	3.99	1330	3.99	1340	3.99
1350	3.99	1360	4.20	1370	3.99	1380	3.99	1390	3.99
1400	3.99	1420	4.10	1440	3.99	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Model Lines

```
005      1  001A Header place holder
005      1  002A Header place holder
999
999
006      1  001A 050046008007A97          G1
006      1  002A 010        099A97          1  2
999
```

Existing Site Q50

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Existing 50-year Conditions

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(Z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A50	5	46	80	236	80	236	1153	-	-	-	-	-	-	-	-	-
2A	-	-	-	-	-	-	80	236	1153	-	-	-	-	-	-	-	-	-

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
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NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 80

HYDROGRAPH PEAK: 236

TIME OF PEAK: 1153

HYDROGRAPH VOLUME: 20.04 acre-ft

multiplied by 10 to be within
County recommended 40-80 ac

divide by 10
Q50= 23.6 cfs

TIME (min)	FLOW (cfs)								
0	0.00	100	4.52	200	4.54	300	4.52	400	4.54
500	4.52	600	5.23	700	7.48	800	7.48	900	9.86
1000	14.11	1050	18.70	1100	24.54	1110	39.78	1120	50.62
1130	50.99	1131	52.31	1132	52.89	1133	53.48	1134	54.77
1135	55.34	1136	54.63	1137	55.34	1138	55.34	1139	54.63
1140	55.34	1141	56.77	1142	58.19	1143	59.61	1144	61.04
1145	69.54	1146	76.28	1147	82.35	1148	89.04	1149	123.17
1150	151.74	1151	179.91	1152	207.92	1153	235.80	1154	207.92
1155	173.22	1156	136.67	1157	101.07	1158	65.31	1159	56.05
1160	53.19	1161	52.45	1162	51.72	1163	50.25	1164	50.25
1165	45.12	1166	39.78	1167	34.03	1168	28.28	1169	25.21
1170	25.21	1171	25.21	1172	25.21	1173	25.21	1174	25.21
1175	25.21	1176	25.21	1177	23.95	1178	23.11	1179	21.85
1180	20.59	1181	19.75	1182	19.75	1183	19.33	1184	19.75
1185	19.75	1186	19.33	1187	19.33	1188	19.75	1189	18.49
1190	17.23	1191	16.39	1192	15.55	1193	13.87	1194	13.87
1195	14.29	1196	14.29	1197	13.87	1198	14.29	1199	14.29
1200	13.87	1201	13.87	1202	14.29	1203	14.29	1204	13.87
1205	14.29	1206	14.29	1207	13.87	1208	13.87	1209	14.29
1210	14.29	1211	13.87	1212	14.29	1213	14.29	1214	13.87
1215	13.87	1216	14.29	1217	14.29	1218	13.87	1219	14.29
1220	14.29	1221	13.87	1222	13.87	1223	14.29	1224	14.29
1225	12.60	1226	11.76	1227	10.08	1228	8.82	1229	7.14
1230	7.56	1231	7.56	1232	7.56	1233	7.56	1234	7.56
1235	7.56	1236	7.14	1237	7.56	1238	7.14	1239	7.56
1240	7.56	1241	7.56	1242	7.56	1243	7.56	1244	7.56
1245	7.14	1246	7.56	1247	7.14	1248	7.56	1249	7.56
1250	7.56	1251	7.56	1252	7.56	1253	7.56	1254	7.14
1255	7.56	1256	7.14	1257	7.56	1258	7.56	1259	7.56
1260	7.56	1261	7.56	1262	7.56	1263	7.14	1264	7.56
1265	7.14	1266	7.56	1267	7.56	1268	7.56	1269	7.56
1270	7.56	1271	7.56	1272	7.14	1273	7.56	1274	7.56
1275	7.56	1276	7.56	1277	7.56	1278	7.56	1279	7.14
1280	7.56	1281	7.14	1282	7.56	1283	7.56	1284	7.56
1285	7.56	1286	7.56	1287	7.56	1288	7.14	1289	7.56
1290	7.14	1291	7.56	1292	7.56	1293	7.56	1294	7.56
1295	7.56	1296	7.56	1297	6.72	1298	6.30	1299	5.46
1300	5.04	1310	4.62	1320	4.62	1330	4.41	1340	4.62
1350	4.41	1360	4.62	1370	4.41	1380	4.62	1390	4.41
1400	4.62	1420	4.52	1440	4.52	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Model Lines

```
005      1  001A Header place holder
005      1  002A Header place holder
999
999
006      1  001A 050046008005A97          G1
006      1  002A 010        099A97          1  2
999
```

Existing Site Q100

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Existing 100-year Conditions

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA					ROUTING AFTER ACCUMULATION								
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N VALUES	VEL	DEPTH	
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(Z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A100	5	46	80	262	80	262	1153	-	-	-	-	-	-	-	-	
2A	--	--	--	--	--	--	80	262	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
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NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

80

acres

multiplied by 10 to be within
County recommended 40-80 ac

HYDROGRAPH PEAK:

262

cfs

TIME OF PEAK:

1153 minutes

HYDROGRAPH VOLUME:

22.45 acre-ft

divide by 10
Q100= 26.2 cfs

TIME (min)	FLOW (cfs)								
0	0.00	100	5.08	200	5.11	300	5.08	400	5.08
500	5.11	600	5.86	700	8.32	800	8.32	900	10.97
1000	15.63	1050	20.71	1100	27.14	1110	46.59	1120	57.83
1130	59.26	1131	59.61	1132	60.68	1133	61.04	1134	62.10
1135	63.17	1136	63.17	1137	63.17	1138	63.17	1139	63.17
1140	62.46	1141	64.60	1142	65.31	1143	67.44	1144	68.86
1145	77.63	1146	85.02	1147	92.38	1148	99.73	1149	137.36
1150	169.21	1151	200.60	1152	231.84	1153	262.21	1154	231.84
1155	193.27	1156	153.11	1157	112.79	1158	73.58	1159	63.17
1160	61.04	1161	59.61	1162	58.90	1163	58.19	1164	58.19
1165	52.45	1166	46.59	1167	41.43	1168	34.03	1169	27.73
1170	27.73	1171	28.28	1172	27.73	1173	27.73	1174	27.73
1175	28.28	1176	27.73	1177	26.47	1178	25.63	1179	24.37
1180	22.69	1181	21.85	1182	21.85	1183	21.43	1184	21.85
1185	21.85	1186	21.43	1187	21.43	1188	21.85	1189	20.17
1190	19.33	1191	18.07	1192	17.23	1193	15.55	1194	15.55
1195	15.55	1196	15.55	1197	15.55	1198	15.55	1199	15.97
1200	15.55	1201	15.97	1202	15.55	1203	15.55	1204	15.55
1205	15.55	1206	15.55	1207	15.55	1208	15.97	1209	15.55
1210	15.97	1211	15.55	1212	15.55	1213	15.55	1214	15.55
1215	15.55	1216	15.55	1217	15.97	1218	15.55	1219	15.97
1220	15.55	1221	15.55	1222	15.55	1223	15.55	1224	15.55
1225	14.29	1226	13.03	1227	11.34	1228	10.08	1229	8.40
1230	8.40	1231	8.40	1232	7.98	1233	7.98	1234	7.98
1235	7.98	1236	7.98	1237	8.40	1238	8.40	1239	8.40
1240	8.40	1241	8.40	1242	8.40	1243	8.40	1244	8.40
1245	8.40	1246	8.40	1247	8.40	1248	8.40	1249	8.40
1250	8.40	1251	8.40	1252	8.40	1253	8.40	1254	8.40
1255	8.40	1256	8.40	1257	8.40	1258	7.98	1259	7.98
1260	7.98	1261	7.98	1262	7.98	1263	8.40	1264	8.40
1265	8.40	1266	8.40	1267	8.40	1268	8.40	1269	8.40
1270	8.40	1271	8.40	1272	8.40	1273	8.40	1274	8.40
1275	8.40	1276	8.40	1277	8.40	1278	8.40	1279	8.40
1280	8.40	1281	8.40	1282	8.40	1283	8.40	1284	7.98
1285	7.98	1286	7.98	1287	7.98	1288	7.98	1289	8.40
1290	8.40	1291	8.40	1292	8.40	1293	8.40	1294	8.40
1295	8.40	1296	8.40	1297	7.56	1298	7.14	1299	6.30
1300	5.88	1310	5.04	1320	5.04	1330	5.04	1340	5.25
1350	5.04	1360	5.04	1370	5.04	1380	5.25	1390	5.04
1400	5.04	1420	5.15	1440	5.04	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Clinic Ex. Conditions

Page: 3

VCRat Model Input

Model Lines

```
005      1 001A Header place holder
005      1 002A Header place holder
999
999
006      1 001A 050046008005A97          G1
006      1 002A 010        099A97          1  2
999
```

Subarea 1 Q25

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 1

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 1 Q25

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A25	8	62	41	96	41	96	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	--	--	41	96	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages
multiplied by 10 to be within
County recommended 40-80 ac

TYPE ERR NO PROCEDURE LOCATION MESSAGE

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 41
HYDROGRAPH PEAK: 96
TIME OF PEAK: 1153

acres
cfs
minutes

divide by 10
Q25 = 9.6 cfs

HYDROGRAPH VOLUME:

11.97 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	2.78	200	2.78	300	2.77	400	2.78
500	2.78	600	3.23	700	4.64	800	4.64	900	6.13
1000	8.77	1050	11.69	1100	15.31	1110	22.09	1120	27.45
1130	28.06	1131	28.21	1132	28.61	1133	28.76	1134	28.91
1135	29.32	1136	29.47	1137	29.62	1138	30.02	1139	30.02
1140	29.77	1141	30.27	1142	30.78	1143	31.03	1144	31.53
1145	34.28	1146	36.75	1147	39.47	1148	42.16	1149	53.35
1150	64.43	1151	75.40	1152	86.49	1153	95.57	1154	95.57
1155	93.43	1156	91.06	1157	79.26	1158	67.69	1159	55.96
1160	44.31	1161	32.29	1162	29.27	1163	28.51	1164	28.01
1165	26.22	1166	24.32	1167	22.69	1168	20.78	1169	19.03
1170	17.95	1171	16.86	1172	15.77	1173	15.77	1174	15.59
1175	15.59	1176	15.77	1177	15.41	1178	14.86	1179	14.32
1180	13.96	1181	13.41	1182	13.23	1183	12.69	1184	12.33
1185	12.14	1186	12.33	1187	12.33	1188	12.14	1189	11.78
1190	11.24	1191	11.06	1192	10.51	1193	10.15	1194	9.61
1195	9.24	1196	8.88	1197	8.88	1198	8.88	1199	8.70
1200	8.70	1201	8.70	1202	8.70	1203	8.70	1204	8.70
1205	8.70	1206	8.70	1207	8.70	1208	8.70	1209	8.70
1210	8.70	1211	8.88	1212	8.88	1213	8.88	1214	8.88
1215	8.88	1216	8.88	1217	8.88	1218	8.88	1219	8.70
1220	8.70	1221	8.70	1222	8.70	1223	8.70	1224	8.70
1225	8.16	1226	7.79	1227	7.25	1228	6.71	1229	6.16
1230	5.62	1231	5.26	1232	4.71	1233	4.71	1234	4.53
1235	4.53	1236	4.71	1237	4.71	1238	4.71	1239	4.53
1240	4.53	1241	4.71	1242	4.71	1243	4.71	1244	4.53
1245	4.53	1246	4.71	1247	4.71	1248	4.71	1249	4.53
1250	4.53	1251	4.71	1252	4.71	1253	4.71	1254	4.53
1255	4.53	1256	4.71	1257	4.71	1258	4.71	1259	4.53
1260	4.53	1261	4.71	1262	4.71	1263	4.71	1264	4.53
1265	4.71	1266	4.71	1267	4.71	1268	4.71	1269	4.53
1270	4.71	1271	4.71	1272	4.71	1273	4.53	1274	4.53
1275	4.71	1276	4.71	1277	4.71	1278	4.53	1279	4.53
1280	4.71	1281	4.71	1282	4.71	1283	4.53	1284	4.53
1285	4.71	1286	4.71	1287	4.71	1288	4.53	1289	4.53
1290	4.71	1291	4.71	1292	4.71	1293	4.53	1294	4.53
1295	4.71	1296	4.71	1297	4.53	1298	4.17	1299	3.99
1300	3.63	1310	2.90	1320	2.76	1330	2.76	1340	2.76
1350	2.76	1360	2.90	1370	2.76	1380	2.76	1390	2.76
1400	2.76	1420	2.83	1440	2.75	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 1

VCRat Model Input

Model Lines

```
-----  
005      1  001A Header place holder  
005      1  002A Header place holder  
999  
999  
006      1  001A 050062004108A97          G1  
006      1  002A 010        099A97          1  2  
999
```

Subarea 1 Q50

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 1 Q50

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 1 Q50

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(Z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A50	5	62	41	136	41	136	1153	-	-	-	-	-	-	-	-	-
2A	-	-	-	-	-	-	41	136	1153	-	-	-	-	-	-	-	-	-

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
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NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 41

HYDROGRAPH PEAK: 136

TIME OF PEAK: 1153

HYDROGRAPH VOLUME: 13.34 acre-ft

multiplied by 10 to be within
County recommended 40-80 ac

divide by 10
Q50 = 13.6 cfs

TIME (min)	FLOW (cfs)								
0	0.00	100	3.12	200	3.13	300	3.12	400	3.13
500	3.12	600	3.61	700	5.16	800	5.16	900	6.80
1000	9.74	1050	12.91	1100	16.94	1110	25.56	1120	31.48
1130	31.68	1131	32.41	1132	32.73	1133	33.05	1134	33.77
1135	34.09	1136	33.69	1137	34.08	1138	34.08	1139	33.69
1140	34.08	1141	34.88	1142	35.67	1143	36.46	1144	37.25
1145	41.97	1146	45.79	1147	49.23	1148	53.02	1149	72.53
1150	88.65	1151	104.63	1152	120.55	1153	136.42	1154	120.55
1155	100.83	1156	80.17	1157	59.86	1158	39.62	1159	34.48
1160	32.89	1161	32.49	1162	32.09	1163	31.28	1164	31.28
1165	28.46	1166	25.57	1167	22.52	1168	19.48	1169	17.40
1170	17.40	1171	17.40	1172	17.40	1173	17.40	1174	17.40
1175	17.40	1176	17.40	1177	16.53	1178	15.95	1179	15.08
1180	14.21	1181	13.63	1182	13.63	1183	13.34	1184	13.63
1185	13.63	1186	13.34	1187	13.34	1188	13.63	1189	12.76
1190	11.89	1191	11.31	1192	10.73	1193	9.57	1194	9.57
1195	9.86	1196	9.86	1197	9.57	1198	9.86	1199	9.86
1200	9.57	1201	9.57	1202	9.86	1203	9.86	1204	9.57
1205	9.86	1206	9.86	1207	9.57	1208	9.57	1209	9.86
1210	9.86	1211	9.57	1212	9.86	1213	9.86	1214	9.57
1215	9.57	1216	9.86	1217	9.86	1218	9.57	1219	9.86
1220	9.86	1221	9.57	1222	9.57	1223	9.86	1224	9.86
1225	8.70	1226	8.12	1227	6.96	1228	6.09	1229	4.93
1230	5.22	1231	5.22	1232	5.22	1233	5.22	1234	5.22
1235	5.22	1236	4.93	1237	5.22	1238	4.93	1239	5.22
1240	5.22	1241	5.22	1242	5.22	1243	5.22	1244	5.22
1245	4.93	1246	5.22	1247	4.93	1248	5.22	1249	5.22
1250	5.22	1251	5.22	1252	5.22	1253	5.22	1254	4.93
1255	5.22	1256	4.93	1257	5.22	1258	5.22	1259	5.22
1260	5.22	1261	5.22	1262	5.22	1263	4.93	1264	5.22
1265	4.93	1266	5.22	1267	5.22	1268	5.22	1269	5.22
1270	5.22	1271	5.22	1272	4.93	1273	5.22	1274	5.22
1275	5.22	1276	5.22	1277	5.22	1278	5.22	1279	4.93
1280	5.22	1281	4.93	1282	5.22	1283	5.22	1284	5.22
1285	5.22	1286	5.22	1287	5.22	1288	4.93	1289	5.22
1290	4.93	1291	5.22	1292	5.22	1293	5.22	1294	5.22
1295	5.22	1296	5.22	1297	4.64	1298	4.35	1299	3.77
1300	3.48	1310	3.19	1320	3.19	1330	3.05	1340	3.19
1350	3.05	1360	3.19	1370	3.05	1380	3.19	1390	3.05
1400	3.19	1420	3.12	1440	3.12	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 1 Q50

Page: 3

VCRat Model Input

Model Lines

```
005      1 001A Header place holder
005      1 002A Header place holder
999
999
006      1 001A 050062004105A97          G1
006      1 002A 010        099A97          1  2
999
```

Subarea 1 Q100

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 1 Q100

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 1 Q100

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A100	5	62	41	151	41	151	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	--	--	41	151	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
				multiplied by 10 to be within County recommended 40-80 ac

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

41

acres

151

cfs

HYDROGRAPH PEAK:

TIME OF PEAK:

1153

minutes

divide by 10
Q100 = 15.1 cfs

5990_VCRat (subarea 1 Q100).out

HYDROGRAPH VOLUME:

14.90 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	3.51	200	3.52	300	3.51	400	3.51
500	3.52	600	4.05	700	5.74	800	5.74	900	7.57
1000	10.79	1050	14.30	1100	18.74	1110	29.27	1120	35.47
1130	36.26	1131	36.46	1132	37.05	1133	37.25	1134	37.84
1135	38.43	1136	38.43	1137	38.43	1138	38.43	1139	38.43
1140	38.04	1141	39.22	1142	39.62	1143	40.80	1144	41.59
1145	46.55	1146	50.74	1147	54.92	1148	59.10	1149	80.56
1150	98.56	1151	116.38	1152	134.16	1153	151.48	1154	134.16
1155	112.22	1156	89.43	1157	66.57	1158	44.26	1159	38.43
1160	37.25	1161	36.46	1162	36.06	1163	35.67	1164	35.67
1165	32.49	1166	29.27	1167	26.43	1168	22.52	1169	19.14
1170	19.14	1171	19.48	1172	19.14	1173	19.14	1174	19.14
1175	19.48	1176	19.14	1177	18.27	1178	17.69	1179	16.82
1180	15.66	1181	15.08	1182	15.08	1183	14.79	1184	15.08
1185	15.08	1186	14.79	1187	14.79	1188	15.08	1189	13.92
1190	13.34	1191	12.47	1192	11.89	1193	10.73	1194	10.73
1195	10.73	1196	10.73	1197	10.73	1198	10.73	1199	11.02
1200	10.73	1201	11.02	1202	10.73	1203	10.73	1204	10.73
1205	10.73	1206	10.73	1207	10.73	1208	11.02	1209	10.73
1210	11.02	1211	10.73	1212	10.73	1213	10.73	1214	10.73
1215	10.73	1216	10.73	1217	11.02	1218	10.73	1219	11.02
1220	10.73	1221	10.73	1222	10.73	1223	10.73	1224	10.73
1225	9.86	1226	8.99	1227	7.83	1228	6.96	1229	5.80
1230	5.80	1231	5.80	1232	5.51	1233	5.51	1234	5.51
1235	5.51	1236	5.51	1237	5.80	1238	5.80	1239	5.80
1240	5.80	1241	5.80	1242	5.80	1243	5.80	1244	5.80
1245	5.80	1246	5.80	1247	5.80	1248	5.80	1249	5.80
1250	5.80	1251	5.80	1252	5.80	1253	5.80	1254	5.80
1255	5.80	1256	5.80	1257	5.80	1258	5.51	1259	5.51
1260	5.51	1261	5.51	1262	5.51	1263	5.80	1264	5.80
1265	5.80	1266	5.80	1267	5.80	1268	5.80	1269	5.80
1270	5.80	1271	5.80	1272	5.80	1273	5.80	1274	5.80
1275	5.80	1276	5.80	1277	5.80	1278	5.80	1279	5.80
1280	5.80	1281	5.80	1282	5.80	1283	5.80	1284	5.51
1285	5.51	1286	5.51	1287	5.51	1288	5.51	1289	5.80
1290	5.80	1291	5.80	1292	5.80	1293	5.80	1294	5.80
1295	5.80	1296	5.80	1297	5.22	1298	4.93	1299	4.35
1300	4.06	1310	3.48	1320	3.48	1330	3.48	1340	3.63
1350	3.48	1360	3.48	1370	3.48	1380	3.63	1390	3.48
1400	3.48	1420	3.55	1440	3.48	1460	0.00	1500	0.00

Page: 3

Job: 1 Project: Ventura VA Subarea 1 Q100
5990_VCRat (subarea 1 Q100).out

VCRat Model Input

Model Lines

```
005 1 001A Header place holder
005 1 002A Header place holder
999
999
006 1 001A 050062004105A97      G1
006 1 002A 010      099A97      1 2
999
```

Subarea 2 Q25

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 2 Q25

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 2 Q25

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A25	6	62	16	43	16	43	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	--	--	16	43	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
NO ISSUES OR WARNINGS DETECTED				

multiplied by 10

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

16

acres

HYDROGRAPH PEAK:

43

cfs

TIME OF PEAK:

1153

minutes

divide by 10
Q25 = 4.3 cfs

5990_VCRat (subarea 2 Q25).out

HYDROGRAPH VOLUME:

4.66 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	1.09	200	1.09	300	1.08	400	1.09
500	1.09	600	1.26	700	1.81	800	1.81	900	2.39
1000	3.42	1050	4.56	1100	5.98	1110	8.62	1120	10.71
1130	10.95	1131	11.03	1132	11.24	1133	11.32	1134	11.39
1135	11.60	1136	11.68	1137	11.68	1138	11.68	1139	11.68
1140	11.68	1141	11.81	1142	12.08	1143	12.34	1144	12.47
1145	13.89	1146	15.31	1147	16.45	1148	17.57	1149	23.38
1150	29.08	1151	33.84	1152	38.44	1153	43.13	1154	43.13
1155	37.32	1156	31.34	1157	25.33	1158	19.43	1159	13.12
1160	11.55	1161	11.29	1162	11.03	1163	10.90	1164	10.77
1165	9.95	1166	9.10	1167	8.11	1168	7.26	1169	6.70
1170	6.13	1171	6.13	1172	6.13	1173	6.13	1174	6.13
1175	6.13	1176	6.13	1177	5.94	1178	5.66	1179	5.38
1180	5.28	1181	5.00	1182	4.81	1183	4.72	1184	4.81
1185	4.81	1186	4.81	1187	4.81	1188	4.72	1189	4.53
1190	4.24	1191	4.15	1192	3.87	1193	3.68	1194	3.49
1195	3.49	1196	3.49	1197	3.40	1198	3.40	1199	3.40
1200	3.40	1201	3.40	1202	3.40	1203	3.40	1204	3.40
1205	3.40	1206	3.40	1207	3.40	1208	3.40	1209	3.40
1210	3.40	1211	3.49	1212	3.49	1213	3.49	1214	3.49
1215	3.49	1216	3.49	1217	3.40	1218	3.40	1219	3.40
1220	3.40	1221	3.40	1222	3.40	1223	3.40	1224	3.40
1225	3.11	1226	2.92	1227	2.64	1228	2.36	1229	2.07
1230	1.79	1231	1.89	1232	1.79	1233	1.79	1234	1.79
1235	1.79	1236	1.89	1237	1.79	1238	1.79	1239	1.79
1240	1.79	1241	1.89	1242	1.79	1243	1.79	1244	1.79
1245	1.79	1246	1.89	1247	1.79	1248	1.79	1249	1.79
1250	1.79	1251	1.89	1252	1.79	1253	1.79	1254	1.79
1255	1.79	1256	1.89	1257	1.79	1258	1.79	1259	1.79
1260	1.79	1261	1.89	1262	1.79	1263	1.79	1264	1.79
1265	1.89	1266	1.89	1267	1.79	1268	1.79	1269	1.79
1270	1.89	1271	1.79	1272	1.79	1273	1.79	1274	1.79
1275	1.89	1276	1.79	1277	1.79	1278	1.79	1279	1.79
1280	1.89	1281	1.79	1282	1.79	1283	1.79	1284	1.79
1285	1.89	1286	1.79	1287	1.79	1288	1.79	1289	1.79
1290	1.89	1291	1.79	1292	1.79	1293	1.79	1294	1.79
1295	1.89	1296	1.79	1297	1.70	1298	1.60	1299	1.51
1300	1.32	1310	1.13	1320	1.08	1330	1.08	1340	1.08
1350	1.08	1360	1.13	1370	1.08	1380	1.08	1390	1.08
1400	1.08	1420	1.10	1440	1.07	1460	0.00	1500	0.00

5990_VCRat (subarea 2 Q25).out
Job: 1 Project: Ventura VA Subarea 2 Q25
Page: 3
VCRat Model Input

Model Lines

```
005 1 001A Header place holder
005 1 002A Header place holder
999
999
006 1 001A 050062001606A97      G1
006 1 002A 010      099A97      1 2
999
```

Subarea 2 Q50

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 2 Q50

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 2 Q50

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A50	5	62	16	53	16	53	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	--	--	16	53	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
------	--------	-----------	----------	---------

multiplied by 10

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

16

acres

HYDROGRAPH PEAK:

53

cfs

TIME OF PEAK:

1153

minutes

divide by 10
Q50 = 5.3 cfs

5990_VCRat (subarea 2 Q50).out

HYDROGRAPH VOLUME:

5.21 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	1.22	200	1.22	300	1.22	400	1.22
500	1.22	600	1.41	700	2.02	800	2.02	900	2.65
1000	3.80	1050	5.04	1100	6.61	1110	9.98	1120	12.29
1130	12.36	1131	12.65	1132	12.77	1133	12.90	1134	13.18
1135	13.30	1136	13.15	1137	13.30	1138	13.30	1139	13.15
1140	13.30	1141	13.61	1142	13.92	1143	14.23	1144	14.54
1145	16.38	1146	17.87	1147	19.21	1148	20.69	1149	28.31
1150	34.60	1151	40.83	1152	47.04	1153	53.24	1154	47.04
1155	39.35	1156	31.29	1157	23.36	1158	15.46	1159	13.46
1160	12.84	1161	12.68	1162	12.52	1163	12.21	1164	12.21
1165	11.11	1166	9.98	1167	8.79	1168	7.60	1169	6.79
1170	6.79	1171	6.79	1172	6.79	1173	6.79	1174	6.79
1175	6.79	1176	6.79	1177	6.45	1178	6.22	1179	5.89
1180	5.55	1181	5.32	1182	5.32	1183	5.21	1184	5.32
1185	5.32	1186	5.21	1187	5.21	1188	5.32	1189	4.98
1190	4.64	1191	4.41	1192	4.19	1193	3.73	1194	3.73
1195	3.85	1196	3.85	1197	3.73	1198	3.85	1199	3.85
1200	3.73	1201	3.73	1202	3.85	1203	3.85	1204	3.73
1205	3.85	1206	3.85	1207	3.73	1208	3.73	1209	3.85
1210	3.85	1211	3.73	1212	3.85	1213	3.85	1214	3.73
1215	3.73	1216	3.85	1217	3.85	1218	3.73	1219	3.85
1220	3.85	1221	3.73	1222	3.73	1223	3.85	1224	3.85
1225	3.40	1226	3.17	1227	2.72	1228	2.38	1229	1.92
1230	2.04	1231	2.04	1232	2.04	1233	2.04	1234	2.04
1235	2.04	1236	1.92	1237	2.04	1238	1.92	1239	2.04
1240	2.04	1241	2.04	1242	2.04	1243	2.04	1244	2.04
1245	1.92	1246	2.04	1247	1.92	1248	2.04	1249	2.04
1250	2.04	1251	2.04	1252	2.04	1253	2.04	1254	1.92
1255	2.04	1256	1.92	1257	2.04	1258	2.04	1259	2.04
1260	2.04	1261	2.04	1262	2.04	1263	1.92	1264	2.04
1265	1.92	1266	2.04	1267	2.04	1268	2.04	1269	2.04
1270	2.04	1271	2.04	1272	1.92	1273	2.04	1274	2.04
1275	2.04	1276	2.04	1277	2.04	1278	2.04	1279	1.92
1280	2.04	1281	1.92	1282	2.04	1283	2.04	1284	2.04
1285	2.04	1286	2.04	1287	2.04	1288	1.92	1289	2.04
1290	1.92	1291	2.04	1292	2.04	1293	2.04	1294	2.04
1295	2.04	1296	2.04	1297	1.81	1298	1.70	1299	1.47
1300	1.36	1310	1.24	1320	1.24	1330	1.19	1340	1.24
1350	1.19	1360	1.24	1370	1.19	1380	1.24	1390	1.19
1400	1.24	1420	1.22	1440	1.22	1460	0.00	1500	0.00

Page: 3

Job: 1 Project: Ventura VA Subarea 2 Q50

VCRat Model Input

Model Lines

```
-----  
005 1 001A Header place holder  
005 1 002A Header place holder  
999  
999  
006 1 001A 050062001605A97 G1  
006 1 002A 010      099A97    1 2  
999
```

Subarea 2 Q100

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 2 Q100

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 2 Q100

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A100	5	62	16	59	16	59	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	--	--	16	59	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
------	--------	-----------	----------	---------

NO ISSUES OR WARNINGS DETECTED

multiplied by 10

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

16

acres

HYDROGRAPH PEAK:

59

cfs

TIME OF PEAK:

1153

minutes

divide by 10
Q100 = 5.9 cfs

5990_VCRat (subarea 2 Q100).out

HYDROGRAPH VOLUME:

5.82 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	1.37	200	1.38	300	1.37	400	1.37
500	1.38	600	1.58	700	2.24	800	2.24	900	2.95
1000	4.21	1050	5.58	1100	7.31	1110	11.42	1120	13.84
1130	14.15	1131	14.23	1132	14.46	1133	14.54	1134	14.77
1135	15.00	1136	15.00	1137	15.00	1138	15.00	1139	15.00
1140	14.84	1141	15.31	1142	15.46	1143	15.92	1144	16.23
1145	18.17	1146	19.80	1147	21.43	1148	23.06	1149	31.44
1150	38.46	1151	45.42	1152	52.36	1153	59.12	1154	52.36
1155	43.79	1156	34.90	1157	25.98	1158	17.27	1159	15.00
1160	14.54	1161	14.23	1162	14.07	1163	13.92	1164	13.92
1165	12.68	1166	11.42	1167	10.32	1168	8.79	1169	7.47
1170	7.47	1171	7.60	1172	7.47	1173	7.47	1174	7.47
1175	7.60	1176	7.47	1177	7.13	1178	6.90	1179	6.56
1180	6.11	1181	5.89	1182	5.89	1183	5.77	1184	5.89
1185	5.89	1186	5.77	1187	5.77	1188	5.89	1189	5.43
1190	5.21	1191	4.87	1192	4.64	1193	4.19	1194	4.19
1195	4.19	1196	4.19	1197	4.19	1198	4.19	1199	4.30
1200	4.19	1201	4.30	1202	4.19	1203	4.19	1204	4.19
1205	4.19	1206	4.19	1207	4.19	1208	4.30	1209	4.19
1210	4.30	1211	4.19	1212	4.19	1213	4.19	1214	4.19
1215	4.19	1216	4.19	1217	4.30	1218	4.19	1219	4.30
1220	4.19	1221	4.19	1222	4.19	1223	4.19	1224	4.19
1225	3.85	1226	3.51	1227	3.06	1228	2.72	1229	2.26
1230	2.26	1231	2.26	1232	2.15	1233	2.15	1234	2.15
1235	2.15	1236	2.15	1237	2.26	1238	2.26	1239	2.26
1240	2.26	1241	2.26	1242	2.26	1243	2.26	1244	2.26
1245	2.26	1246	2.26	1247	2.26	1248	2.26	1249	2.26
1250	2.26	1251	2.26	1252	2.26	1253	2.26	1254	2.26
1255	2.26	1256	2.26	1257	2.26	1258	2.15	1259	2.15
1260	2.15	1261	2.15	1262	2.15	1263	2.26	1264	2.26
1265	2.26	1266	2.26	1267	2.26	1268	2.26	1269	2.26
1270	2.26	1271	2.26	1272	2.26	1273	2.26	1274	2.26
1275	2.26	1276	2.26	1277	2.26	1278	2.26	1279	2.26
1280	2.26	1281	2.26	1282	2.26	1283	2.26	1284	2.15
1285	2.15	1286	2.15	1287	2.15	1288	2.15	1289	2.26
1290	2.26	1291	2.26	1292	2.26	1293	2.26	1294	2.26
1295	2.26	1296	2.26	1297	2.04	1298	1.92	1299	1.70
1300	1.58	1310	1.36	1320	1.36	1330	1.36	1340	1.41
1350	1.36	1360	1.36	1370	1.36	1380	1.41	1390	1.36
1400	1.36	1420	1.39	1440	1.36	1460	0.00	1500	0.00

Page: 3

Job: 1 Project: Ventura VA Subarea 2 Q100
5990_VCRat (subarea 2 Q100).out

VCRat Model Input

Model Lines

```
005 1 001A Header place holder
005 1 002A Header place holder
999
999
006 1 001A 050062001605A97          G1
006 1 002A 010      099A97          1  2
999
```

Subarea 3 Q25

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 3 Q25

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 3 Q25

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A25	13	62	226	409	226	409	1154	-	-	-	-	-	-	-	-	
2A	---	---	--	--	---	---	226	409	1154	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
NO ISSUES OR WARNINGS DETECTED				

multiplied by 100

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

226

acres

HYDROGRAPH PEAK:

409

cfs

TIME OF PEAK:

1154

minutes

divide by 100
Q25 = 4.1 cfs

5990_VCRat (subarea 3 Q25).out

HYDROGRAPH VOLUME:

66.22 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	15.35	200	15.35	300	15.27	400	15.35
500	15.35	600	17.82	700	25.58	800	25.58	900	33.81
1000	48.35	1050	64.43	1100	84.41	1110	110.58	1120	144.79
1130	153.89	1131	154.65	1132	156.28	1133	157.05	1134	157.56
1135	158.93	1136	159.44	1137	159.95	1138	161.32	1139	161.83
1140	162.34	1141	164.56	1142	166.79	1143	169.00	1144	170.71
1145	179.25	1146	188.55	1147	197.77	1148	206.15	1149	246.58
1150	286.15	1151	324.79	1152	362.86	1153	401.55	1154	408.66
1155	408.66	1156	407.87	1157	406.29	1158	397.60	1159	388.13
1160	378.65	1161	369.96	1162	330.42	1163	290.18	1164	249.82
1165	204.47	1166	157.05	1167	141.29	1168	132.07	1169	124.70
1170	118.25	1171	111.80	1172	106.37	1173	102.68	1174	97.76
1175	94.07	1176	90.39	1177	85.47	1178	83.62	1179	81.78
1180	80.55	1181	79.32	1182	78.09	1183	76.24	1184	75.01
1185	73.17	1186	71.94	1187	70.71	1188	68.87	1189	65.79
1190	63.95	1191	63.33	1192	62.10	1193	60.26	1194	59.03
1195	57.18	1196	55.95	1197	54.11	1198	52.88	1199	51.03
1200	49.80	1201	48.57	1202	48.57	1203	48.57	1204	47.96
1205	47.96	1206	47.96	1207	47.96	1208	47.96	1209	47.96
1210	47.96	1211	48.57	1212	48.57	1213	48.57	1214	48.57
1215	48.57	1216	48.57	1217	48.57	1218	48.57	1219	48.57
1220	48.57	1221	48.57	1222	48.57	1223	48.57	1224	47.96
1225	46.12	1226	44.89	1227	43.04	1228	41.20	1229	39.35
1230	37.51	1231	36.28	1232	34.43	1233	32.59	1234	30.74
1235	28.90	1236	27.67	1237	25.82	1238	25.82	1239	25.21
1240	25.21	1241	25.82	1242	25.82	1243	25.82	1244	25.21
1245	25.21	1246	25.82	1247	25.82	1248	25.82	1249	25.21
1250	25.21	1251	25.82	1252	25.82	1253	25.82	1254	25.21
1255	25.21	1256	25.82	1257	25.82	1258	25.82	1259	25.21
1260	25.21	1261	25.82	1262	25.82	1263	25.82	1264	25.21
1265	25.82	1266	25.82	1267	25.82	1268	25.82	1269	25.21
1270	25.82	1271	25.82	1272	25.82	1273	25.82	1274	25.21
1275	25.82	1276	25.82	1277	25.82	1278	25.21	1279	25.21
1280	25.82	1281	25.82	1282	25.82	1283	25.21	1284	25.21
1285	25.82	1286	25.82	1287	25.82	1288	25.21	1289	25.21
1290	25.82	1291	25.82	1292	25.82	1293	25.21	1294	25.21
1295	25.82	1296	25.82	1297	25.21	1298	23.98	1299	23.36
1300	22.14	1310	15.37	1320	15.37	1330	15.19	1340	15.19
1350	15.19	1360	15.80	1370	15.37	1380	15.19	1390	15.19
1400	15.19	1420	15.59	1440	15.19	1460	0.00	1500	0.00

5990_VCRat (subarea 3 Q25).out
Job: 1 Project: Ventura VA Subarea 3 Q25
Page: 3
VCRat Model Input

Model Lines

```
005 1 001A Header place holder
005 1 002A Header place holder
999
999
006 1 001A 050062022613A97      G1
006 1 002A 010      099A97      1 2
999
```

Subarea 3 Q50

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 3 Q50

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 3 Q50

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A50	7	62	226	626	226	626	1153	-	-	-	-	-	-	-	-	
2A	---	---	--	--	---	---	226	626	1153	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
------	--------	-----------	----------	---------

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 226

HYDROGRAPH PEAK: 626

TIME OF PEAK: 1153

multiplied by 100

divide by 100

Q50 = 6.3 cfs

acres

cfs

minutes

HYDROGRAPH VOLUME:

73.74 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	17.19	200	17.26	300	17.19	400	17.26
500	17.18	600	19.90	700	28.46	800	28.46	900	37.50
1000	53.71	1050	71.14	1100	93.36	1110	140.92	1120	173.53
1130	174.64	1131	177.50	1132	178.77	1133	180.04	1134	182.89
1135	184.15	1136	185.40	1137	188.19	1138	186.64	1139	186.64
1140	188.19	1141	189.75	1142	194.42	1143	197.53	1144	199.09
1145	219.32	1146	237.68	1147	254.21	1148	269.24	1149	345.26
1150	423.41	1151	502.30	1152	563.59	1153	626.33	1154	626.33
1155	612.92	1156	532.20	1157	449.22	1158	370.19	1159	288.68
1160	205.31	1161	185.08	1162	178.77	1163	177.18	1164	175.59
1165	161.32	1166	150.21	1167	138.52	1168	126.54	1169	114.56
1170	103.91	1171	95.92	1172	95.92	1173	95.92	1174	95.92
1175	95.92	1176	95.92	1177	92.49	1178	90.21	1179	86.78
1180	83.36	1181	81.07	1182	77.65	1183	74.22	1184	75.37
1185	74.22	1186	74.22	1187	74.22	1188	74.22	1189	71.94
1190	68.51	1191	65.09	1192	62.80	1193	59.38	1194	57.10
1195	53.67	1196	53.67	1197	53.67	1198	53.67	1199	53.67
1200	53.67	1201	53.67	1202	53.67	1203	53.67	1204	53.67
1205	53.67	1206	53.67	1207	53.67	1208	53.67	1209	53.67
1210	53.67	1211	53.67	1212	53.67	1213	53.67	1214	53.67
1215	53.67	1216	53.67	1217	53.67	1218	53.67	1219	53.67
1220	53.67	1221	53.67	1222	53.67	1223	53.67	1224	53.67
1225	50.24	1226	46.82	1227	42.25	1228	39.97	1229	35.40
1230	31.97	1231	28.55	1232	28.55	1233	28.55	1234	28.55
1235	28.55	1236	28.55	1237	28.55	1238	27.41	1239	28.55
1240	28.55	1241	28.55	1242	28.55	1243	28.55	1244	28.55
1245	28.55	1246	28.55	1247	27.41	1248	28.55	1249	28.55
1250	28.55	1251	28.55	1252	28.55	1253	28.55	1254	28.55
1255	28.55	1256	27.41	1257	28.55	1258	28.55	1259	28.55
1260	28.55	1261	28.55	1262	28.55	1263	28.55	1264	28.55
1265	27.41	1266	28.55	1267	28.55	1268	28.55	1269	28.55
1270	28.55	1271	28.55	1272	28.55	1273	28.55	1274	28.55
1275	28.55	1276	28.55	1277	28.55	1278	28.55	1279	28.55
1280	28.55	1281	27.41	1282	28.55	1283	28.55	1284	28.55
1285	28.55	1286	28.55	1287	28.55	1288	28.55	1289	28.55
1290	27.41	1291	28.55	1292	28.55	1293	28.55	1294	28.55
1295	28.55	1296	28.55	1297	27.41	1298	25.12	1299	22.84
1300	21.70	1310	17.58	1320	17.58	1330	16.79	1340	17.58
1350	16.79	1360	17.59	1370	16.79	1380	17.58	1390	16.79
1400	17.59	1420	17.18	1440	17.18	1460	0.00	1500	0.00

Ventura County Watershed Protection District
 Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 3 Q50

VCRat Model Input

Model Lines

```
-----  
005      1  001A Header place holder  
005      1  002A Header place holder  
999  
999  
006      1  001A 050062022607A97          G1  
006      1  002A 010        099A97          1  2  
999
```

Subarea 3 Q100

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: Ventura VA Subarea 3 Q100

Project Description

VCRat version: 2.64.0.37
VCRain version: 201801
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: PRIN1: Prince - Arundell
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: Ventura VA Subarea 3 Q100

Page: 2

Model Results

SUBAREA DATA AND RESULTS					ACCUMULATED DATA				ROUTING AFTER ACCUMULATION									
NODE	SOIL	RAIN	TC	%	AREA	FLOW	AREA	FLOW	TIME	CHANNEL	LENGTH	SLOPE	SIZE	H:V	N	VALUES	VEL	DEPTH
ID	TYPE	ZONE	(MIN)	IMP	(AC)	(CFS)	(AC)	(CFS)	(MIN)	TYPE	(FT)	(FT/FT)	(FT)	(z)	CHNL	SIDES	(FT/S)	(FT)
1A	050	A100	7	62	226	698	226	698	1154	-	-	-	-	-	-	-	-	
2A	---	---	--	--	---	---	226	698	1154	-	-	-	-	-	-	-	-	

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE
------	--------	-----------	----------	---------

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH:

226

acres

HYDROGRAPH PEAK:

698

cfs

TIME OF PEAK:

1154

minutes

MULTIPLIED BY 100

Page 1

DIVIDE BY 100
Q100 = 7.0 CFS

5990_VCRat (subarea 3 Q100).out

HYDROGRAPH VOLUME: 82.40 acre-ft

TIME (min)	FLOW (cfs)								
0	0.00	100	19.34	200	19.42	300	19.34	400	19.34
500	19.43	600	22.30	700	31.65	800	31.66	900	41.73
1000	59.46	1050	78.81	1100	103.28	1110	161.32	1120	195.51
1130	199.86	1131	200.64	1132	202.98	1133	203.75	1134	206.09
1135	208.42	1136	209.20	1137	211.54	1138	211.54	1139	211.54
1140	211.54	1141	214.65	1142	216.20	1143	220.87	1144	223.99
1145	243.69	1146	263.23	1147	282.70	1148	299.15	1149	384.86
1150	470.47	1151	557.61	1152	627.82	1153	696.38	1154	697.87
1155	679.98	1156	592.00	1157	502.30	1158	411.27	1159	321.57
1160	230.17	1161	206.87	1162	202.20	1163	200.64	1164	199.09
1165	183.53	1166	170.83	1167	159.73	1168	147.04	1169	133.39
1170	117.99	1171	106.20	1172	106.20	1173	106.20	1174	105.05
1175	106.20	1176	106.20	1177	102.77	1178	99.34	1179	95.92
1180	92.49	1181	90.21	1182	85.64	1183	82.22	1184	83.36
1185	82.22	1186	82.22	1187	82.22	1188	82.22	1189	78.79
1190	76.51	1191	71.94	1192	69.66	1193	66.23	1194	62.80
1195	59.38	1196	59.38	1197	59.38	1198	59.38	1199	59.38
1200	59.38	1201	60.52	1202	59.38	1203	59.38	1204	59.38
1205	59.38	1206	59.38	1207	59.38	1208	59.38	1209	59.38
1210	60.52	1211	59.38	1212	59.38	1213	59.38	1214	59.38
1215	59.38	1216	59.38	1217	59.38	1218	59.38	1219	60.52
1220	59.38	1221	59.38	1222	59.38	1223	59.38	1224	59.38
1225	55.95	1226	51.39	1227	47.96	1228	44.53	1229	39.97
1230	36.54	1231	31.97	1232	30.83	1233	30.83	1234	30.83
1235	30.83	1236	30.83	1237	30.83	1238	30.83	1239	31.97
1240	31.97	1241	31.97	1242	31.97	1243	31.97	1244	31.97
1245	31.97	1246	31.97	1247	31.97	1248	31.97	1249	31.97
1250	31.97	1251	31.97	1252	31.97	1253	31.97	1254	31.97
1255	31.97	1256	31.97	1257	31.97	1258	30.83	1259	30.83
1260	30.83	1261	30.83	1262	30.83	1263	30.83	1264	30.83
1265	31.97	1266	31.97	1267	31.97	1268	31.97	1269	31.97
1270	31.97	1271	31.97	1272	31.97	1273	31.97	1274	31.97
1275	31.97	1276	31.97	1277	31.97	1278	31.97	1279	31.97
1280	31.97	1281	31.97	1282	31.97	1283	31.97	1284	30.83
1285	30.83	1286	30.83	1287	30.83	1288	30.83	1289	30.83
1290	30.83	1291	31.97	1292	31.97	1293	31.97	1294	31.97
1295	31.97	1296	31.97	1297	29.69	1298	28.55	1299	26.26
1300	25.12	1310	19.18	1320	19.18	1330	19.18	1340	19.98
1350	19.18	1360	19.18	1370	19.18	1380	19.98	1390	19.18
1400	19.18	1420	19.58	1440	19.18	1460	0.00	1500	0.00

5990_VCRat (subarea 3 Q100).out
Job: 1 Project: Ventura VA Subarea 3 Q100

Page: 3

VCRat Model Input

Model Lines

005 1 001A Header place holder
005 1 002A Header place holder
999
999
006 1 001A 050062022607A97 G1
006 1 002A 010 099A97 1 2
999

Q25 Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	9.600	1	1152	41,069	----	----	----	Hydrograph for Subarea 1 from VCRat
2	Diversion1	0.240	1	534	6,569	1	----	----	SQDV First Flush
3	Diversion2	9.600	1	1152	34,493	1	----	----	Remaining Flow
4	Diversion1	9.000	1	1152	34,457	3	----	----	Flow Out to the City SD
5	Diversion2	0.600	1	1152	36	3	----	----	Subarea 1 Onsite Detention
7	Manual	4.300	1	1152	18,396	----	----	----	Hydrograph for Subarea 2 from VCRat
8	Diversion1	0.190	1	0	2,545	7	----	----	SQDV First Flush
9	Diversion2	4.300	1	1152	15,847	7	----	----	Remaining Flow
10	Diversion1	3.500	1	1151	15,761	9	----	----	Flow Out to the City SD
11	Diversion2	0.800	1	1152	85	9	----	----	Subarea 2 Onsite Detention
13	Manual	4.100	1	1152	17,662	----	----	----	Hydrograph for Subarea 3 from VCRat
14	Diversion1	0.190	1	0	3,595	13	----	----	SQDV First Flush
15	Diversion2	4.100	1	1152	14,066	13	----	----	Remaining Flow
16	Diversion1	4.100	1	1152	14,066	15	----	----	Flow Out to the City SD
17	Diversion2	0.000	1	n/a	0	15	----	----	Subarea 3 Onsite Detention

DICTATES MIN.
STORAGE FOR
SUBAREA 2

BECAUSE OF HIGHER TC, Q IS
REDUCED IN PROPOSED
CONDITION AND NO
DETENTION IS REQUIRED

Q50 Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	10.60	1	1152	45,539	----	----	----	Hydrograph for Subarea 1 from VCRat
2	Diversion1	0.250	1	99	6,575	1	----	----	SQDV First Flush
3	Diversion2	10.60	1	1152	38,965	1	----	----	Remaining Flow
4	Diversion1	10.60	1	1152	38,965	3	----	----	Flow Out to the City SD
5	Diversion2	0.000	1	n/a	0	3	----	----	Subarea 1 Onsite Detention
7	Manual	5.300	1	1152	22,629	----	----	----	Hydrograph for Subarea 2 from VCRat
8	Diversion1	0.190	1	0	2,550	7	----	----	SQDV First Flush
9	Diversion2	5.300	1	1152	20,079	7	----	----	Remaining Flow
10	Diversion1	4.700	1	1152	20,043	9	----	----	Flow Out to the City SD
11	Diversion2	0.600	1	1152	36	9	----	----	Subarea 2 Onsite Detention
13	Manual	6.300	1	1152	27,110	----	----	----	Hydrograph for Subarea 3 from VCRat
14	Diversion1	0.190	1	0	3,604	13	----	----	SQDV First Flush
15	Diversion2	6.300	1	1152	23,507	13	----	----	Remaining Flow
16	Diversion1	6.300	1	1152	23,507	15	----	----	Flow Out to the City SD
17	Diversion2	0.000	1	n/a	0	15	----	----	Subarea 3 Onsite Detention
5990_Basin Sizing.gpw				Return Period: 50 Year			Thursday, Dec 26, 2019		

Q100 Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	15.10	1	1152	64,704	----	----	----	Hydrograph for Subarea 1 from VCRat
2	Diversion1	0.350	1	98	6,572	1	----	----	SQDV First Flush
3	Diversion2	15.10	1	1152	58,132	1	----	----	Remaining Flow
4	Diversion1	13.50	1	1152	58,036	3	----	----	Flow Out to the City SD
5	Diversion2	1.600	1	1152	96	3	----	----	Subarea 1 Onsite Detention
7	Manual	5.900	1	1152	25,384	----	----	----	Hydrograph for Subarea 2 from VCRat
8	Diversion1	0.190	1	0	2,551	7	----	----	SQDV First Flush
9	Diversion2	5.900	1	1152	22,833	7	----	----	Remaining Flow
10	Diversion1	5.200	1	1151	22,787	9	----	----	Flow Out to the City SD
11	Diversion2	0.700	1	1152	46	9	----	----	Subarea 2 Onsite Detention
13	Manual	7.000	1	1152	29,972	----	----	----	Hydrograph for Subarea 3 from VCRat
14	Diversion1	0.190	1	0	3,603	13	----	----	SQDV First Flush
15	Diversion2	7.000	1	1152	26,369	13	----	----	Remaining Flow
16	Diversion1	7.000	1	1152	26,369	15	----	----	Flow Out to the City SD
17	Diversion2	0.000	1	n/a	0	15	----	----	Subarea 3 Onsite Detention

DICTATES MIN.
STORAGE FOR
SUBAREA 1

the lowest corrected infiltration rate of 0.53 inches per hour obtained in Boring P-2 be utilized in the design for the entire site.

Percolation Test Data Summary

Boring #	Depth (ft)	Stabilized Field Absorption Rate (min/in)	Stabilized Field Absorption Rate (in/hr)	Correction Factor	Corrected Infiltration Rate (min/in)	Corrected Infiltration Rate (in/hr)
P-1	16.0	20.00	3.00	3.63	72.50	0.83
P-2	5.0	30.00	2.00	3.78	113.44	0.53
P-3	16.0	18.46	3.25	3.59	66.34	0.90
P-4	5.0	26.67	2.25	3.72	99.18	0.60

Upon completion of the field testing program, the PVC piping was pulled from each test hole, and the test holes were backfilled.

3.5.1 Infiltration Discussion

The intentional introduction of enormous amounts of water into the ground via the infiltration of onsite stormwater is a relatively new concept, and is inherently risky, regardless of any precautions which may be taken. Infiltration features should be located entirely within landscape areas, and should be as far as possible from the proposed structure, pavements, site walls, sidewalks and other improvements. Some potential settlement and cracking of any improvements located in the vicinity of infiltration features should be anticipated, due to shrinking and swelling of the expansive soils, and possible hydroconsolidation. There should also be careful coordination of the site utility locations with any proposed stormwater infiltration features. The proposed stormwater infiltration features should *not* be allowed to come into contact with, or to even be in close proximity to utility trench backfill, and utilities are not allowed to cross above, below or through any proposed infiltration features.

One of the restrictions related to onsite infiltration is that there must be a minimum of 5 feet of vertical separation between the depth of infiltration and either the current or historically highest groundwater level, whichever is higher. Therefore, since the historically highest groundwater level was approximately 11 feet below grade, the bottom of any proposed infiltration features should not exceed a depth of 6 feet below the natural site grade. Note that although the ‘bottom’ elevations of the infiltration areas shown on the attached Plate 1 indicate an elevation within approximately 1 foot of surrounding grade, these infiltration areas are typically filled with an infiltration medium ranging from a few to several feet thick, which includes some type of granular material (typically sand and/or small gravel) at the bottom, and some type of mulch, growing medium and/or vegetative layer at the top. The ‘depth of infiltration’ is considered to be at the bottom of this infiltration medium (i.e. at the top of the underlying native soil). Infiltration is not allowed into artificial fill.

4. SEISMICITY

4.1 Seismic Design Criteria

The California Building Code (CBC) is utilized in the seismic design of structures, and is based on the *Maximum Considered Earthquake Ground Motion*. The maximum considered earthquake spectral response accelerations are then adjusted for the general type of earth materials within approximately the upper 100 feet underlying the site, termed a *Site Class*, which would be D for the subject site. The *Site Class* is based on parameters such as shear wave velocity, standard penetration test resistance, undrained shear strength, and earth material type.

The site-specific seismic design criteria required by the CBC were determined utilizing the SEAOC/OSHPD (2019) Seismic Design Maps web app, utilizing both the ASCE 7-10 and ASCE 7-16 Standards, since it is unknown which of these design criteria may be required at the time the proposed development goes through the plan check process. The output from the Seismic Design Maps web app is included as an attachment in Appendix C of this report, for both the ASCE 7-10 and 7-16 Standards, and the primary design criteria are summarized in the table below.