

DEVELOPMENT PLAN REVIEW – VTPM 38811-2  
PARCEL 3 – SITE 7  
CITY OF PERRIS  
RIVERSIDE COUNTY, CALIFORNIA

## Drainage Study Report

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## SECTION 1 - GENERAL OVERVIEW

### INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 16.4 acres and 309,000 square feet warehouse building with 30 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue, the vacated Indian Avenue to the west, vacant land to the south and Barrett Avenue to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin
2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.
3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.
4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.
5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.
6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

### BACKGROUND

#### EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Barrett Avenue with no offsite flows. All the developed storm flows continue to travel easterly through the property, to Barrett Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8'). In the existing condition a portion of the site labeled watershed B is tributary to an existing inlet just west of the knuckle on Walmart Supercenter Drive and conveyed to the existing MDP Line "J". MDP Line "J" is an existing 12' x 5' box.

**DEVELOPED CONDITIONS**

The preliminary offsite design is shown on Exhibit F “Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System”. The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices to accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	Q100 Peak Flow Rates	
	A	B
<b>Watershed Area</b>		
<b>Proposed</b>	24.3	25.7
<b>Existing</b>	14.1	15.3
<b>Onsite MDP</b>	16.3	17.7

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events were analyzed in this, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Watershed A Volume: 1.39 ac-ft; Q<sub>100-24hr</sub>: 4.45 cfs  
 Proposed Condition Watershed A Volume: 1.90 ac-ft; Q<sub>100-24hr</sub>: 5.21 cfs  
 Underground Chamber Watershed A Volume: \*2.04 ac-ft

MDP Watershed B Volume: 1.13 ac-ft; Q<sub>100-24hr</sub>: 3.85 cfs  
 Proposed Condition Watershed B Volume: 1.86 ac-ft; Q<sub>100-24hr</sub>: 5.18 cfs  
 Underground Chamber Watershed B Volume: \*1.91 ac-ft

\*For watershed “A” since this volume is greater than 1.92 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the proposed land use levels. Similarly for watershed “B” since the volume provided by the underground chambers exceeds 1.91 ac-ft, there is enough storage to mitigate peak storm flows to the proposed land use levels. See the table on the following page for the unit hydrograph results:

Watershed A

Storm Duration	SP Q <sub>peak</sub>	SP V <sub>TOTAL</sub>	MDP Q <sub>PEAK</sub>	MDP V <sub>TOTAL</sub>
1	25.45	0.7488	21.92	0.6975
3	15.04	0.9868	13.36	0.8356
6	13.04	1.5032	11.01	1.2173
24	5.21	2.875	4.45	2.1619
<b>Acreage</b>	9.05		9.71	

Watershed B

Storm Duration	SP Q <sub>peak</sub>	SP V <sub>TOTAL</sub>	MDP Q <sub>PEAK</sub>	MDP V <sub>TOTAL</sub>
1	26.92	0.7387	17.34	0.5778
3	14.97	1.1666	10.85	0.8394
6	13.10	1.4806	9.27	1.01
24	5.18	2.8309	3.85	1.7993
<b>Acreage</b>	8.80		7.54	

## METHODOLOGY

### HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic “link-node” model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic “node” point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group “B” and “C” soils, with a small area as “A”. A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

### HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12”-30” in diameter. A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

## CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

## **SECTION 2 - HYDROLOGY ANALYSIS**

**100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)**

**100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)**

**100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED O – E FRONTAGE RD  
(RATIONAL METHOD)**

**100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED X – BARRETT AVE  
(RATIONAL METHOD)**

**100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A  
(RATIONAL METHOD)**

**100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B  
(RATIONAL METHOD)**

**100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)**

**100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)**

**100-YEAR PROPOSED OFF-SITE HYDROLOGY WATERSHED O – BARRETT AVE  
(RATIONAL METHOD)**

**100-YEAR PROPOSED OFF-SITE HYDROLOGY WATERSHED X – E FRONTAGE  
RD(RATIONAL METHOD)**

**100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY  
WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY  
WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A  
(UNIT HYDROGRAPH METHOD)**

**100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B  
(UNIT HYDROGRAPH METHOD)**

**100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

**100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)**

**100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00a7.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
EXISTING CONDITION - WATERSHED A  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 10.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 1000.000(Ft.)  
Top (of initial area) elevation = 1464.800(Ft.)  
Bottom (of initial area) elevation = 1450.200(Ft.)  
Difference in elevation = 14.600(Ft.)  
Slope = 0.01460 s(percent)= 1.46  
TC = k(0.530)\*[(length^3)/(elevation change)]^0.2

Initial area time of concentration = 19.562 min.  
Rainfall intensity = 1.940(In/Hr) for a 100.0 year storm  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.783  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.480  
Decimal fraction soil group C = 0.520  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 82.16  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Initial subarea runoff = 8.916(CFS)  
Total initial stream area = 5.870(Ac.)  
Pervious area fraction = 1.000

++++  
Process from Point/Station 10.000 to Point/Station 11.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 5.870(Ac.)  
Runoff from this stream = 8.916(CFS)  
Time of concentration = 19.56 min.  
Rainfall intensity = 1.940(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 10.100 to Point/Station 10.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 962.000(Ft.)  
Top (of initial area) elevation = 1466.400(Ft.)  
Bottom (of initial area) elevation = 1452.000(Ft.)  
Difference in elevation = 14.400(Ft.)  
Slope = 0.01497 s(percent)= 1.50  
TC = k(0.530)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 19.165 min.  
Rainfall intensity = 1.959(In/Hr) for a 100.0 year storm  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.755  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 78.00  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Initial subarea runoff = 4.719(CFS)  
Total initial stream area = 3.190(Ac.)  
Pervious area fraction = 1.000

++++  
Process from Point/Station 10.200 to Point/Station 11.000  
\*\*\*\* IRREGULAR CHANNEL FLOW TRAVEL TIME \*\*\*\*

---

Estimated mean flow rate at midpoint of channel = 5.200(CFS)  
Depth of flow = 0.219(Ft.), Average velocity = 1.534(Ft/s)  
!!Warning: Water is above left or right bank elevations  
\*\*\*\*\* Irregular Channel Data \*\*\*\*\*

-----  
Information entered for subchannel number 1 :  
Point number 'X' coordinate 'Y' coordinate  
1 0.00 0.10  
2 10.00 0.00  
3 20.00 0.10  
Manning's 'N' friction factor = 0.030  
-----

Sub-Channel flow = 5.200(CFS)  
' ' flow top width = 20.000(Ft.)  
' ' velocity= 1.534(Ft/s)  
' ' area = 3.390(Sq.Ft)  
' ' Froude number = 0.657

Upstream point elevation = 1452.000(Ft.)  
Downstream point elevation = 1450.200(Ft.)  
Flow length = 176.000(Ft.)  
Travel time = 1.91 min.  
Time of concentration = 21.08 min.  
Depth of flow = 0.219(Ft.)  
Average velocity = 1.534(Ft/s)  
Total irregular channel flow = 5.200(CFS)  
Irregular channel normal depth above invert elev. = 0.219(Ft.)  
Average velocity of channel(s) = 1.534(Ft/s)  
!!Warning: Water is above left or right bank elevations

Adding area flow to channel  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.750  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.990  
Decimal fraction soil group C = 0.010  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 78.08  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Rainfall intensity = 1.870(In/Hr) for a 100.0 year storm  
Subarea runoff = 0.912(CFS) for 0.650(Ac.)  
Total runoff = 5.631(CFS) Total area = 3.840(Ac.)  
Depth of flow = 0.228(Ft.), Average velocity = 1.584(Ft/s)  
!!Warning: Water is above left or right bank elevations

-----  
Process from Point/Station 10.200 to Point/Station 11.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*  
-----

The following data inside Main Stream is listed:  
In Main Stream number: 2  
Stream flow area = 3.840(Ac.)  
Runoff from this stream = 5.631(CFS)  
Time of concentration = 21.08 min.  
Rainfall intensity = 1.870(In/Hr)  
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	8.916	19.56	1.940
2	5.631	21.08	1.870

Largest stream flow has longer or shorter time of concentration

$Q_p = 8.916 + \text{sum of}$   
 $Q_a \quad T_b/T_a$   
 $5.631 * 0.928 = 5.226$   
 $Q_p = 14.142$

Total of 2 main streams to confluence:

Flow rates before confluence point:

8.916            5.631

Area of streams before confluence:

5.870            3.840

Results of confluence:

Total flow rate = 14.142(CFS)

Time of concentration = 19.562 min.

Effective stream area after confluence = 9.710(Ac.)

End of computations, total study area = 9.71 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 1.000

Area averaged RI index number = 80.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00b6x.out

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English (in-lb) Units used in input data file

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EXISTING CONDITION - WATERSHED B  
100-YEAR ANALYSIS

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Rational Method Hydrology Program based on  
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Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 20.000 to Point/Station 21.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 864.000(Ft.)

Top (of initial area) elevation = 1462.500(Ft.)

Bottom (of initial area) elevation = 1448.600(Ft.)

Difference in elevation = 13.900(Ft.)

Slope = 0.01609 s(percent)= 1.61

TC = k(0.530)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 18.096 min.  
Rainfall intensity = 2.015(In/Hr) for a 100.0 year storm  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.815  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.870  
Decimal fraction soil group D = 0.130  
RI index for soil(AMC 2) = 86.39  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Initial subarea runoff = 12.384(CFS)  
Total initial stream area = 7.540(Ac.)  
Pervious area fraction = 1.000

++++  
Process from Point/Station 21.000 to Point/Station 22.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.840(Ft.)  
Downstream point/station elevation = 1444.790(Ft.)  
Pipe length = 26.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 12.384(CFS)  
Nearest computed pipe diameter = 27.00(In.)  
Calculated individual pipe flow = 12.384(CFS)  
Normal flow depth in pipe = 20.25(In.)  
Flow top width inside pipe = 23.38(In.)  
Critical Depth = 14.64(In.)  
Pipe flow velocity = 3.87(Ft/s)  
Travel time through pipe = 0.11 min.  
Time of concentration (TC) = 18.21 min.

++++  
Process from Point/Station 21.000 to Point/Station 22.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area = 7.540(Ac.)  
Runoff from this stream = 12.384(CFS)  
Time of concentration = 18.21 min.  
Rainfall intensity = 2.009(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 21.100 to Point/Station 22.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 597.000(Ft.)  
Top (of initial area) elevation = 1460.000(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 11.000(Ft.)  
Slope = 0.01843 s(percent)= 1.84

TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 8.599 min.  
Rainfall intensity = 2.902(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.232(CFS)  
Total initial stream area = 0.480(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 21.100 to Point/Station 22.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.480(Ac.)  
Runoff from this stream = 1.232(CFS)  
Time of concentration = 8.60 min.  
Rainfall intensity = 2.902(In/Hr)  
Program is now starting with Main Stream No. 3

++++  
Process from Point/Station 21.200 to Point/Station 22.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 400.000(Ft.)  
Top (of initial area) elevation = 1450.300(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 1.300(Ft.)  
Slope = 0.00325 s(percent)= 0.32  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 10.365 min.  
Rainfall intensity = 2.648(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.883  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.748(CFS)  
Total initial stream area = 0.320(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 21.200 to Point/Station 22.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 3  
Stream flow area = 0.320(Ac.)  
Runoff from this stream = 0.748(CFS)  
Time of concentration = 10.36 min.  
Rainfall intensity = 2.648(In/Hr)  
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.384	18.21	2.009
2	1.232	8.60	2.902
3	0.748	10.36	2.648

Largest stream flow has longer time of concentration

Qp = 12.384 + sum of  
Qb Ia/Ib  
1.232 \* 0.692 = 0.853  
Qb Ia/Ib  
0.748 \* 0.759 = 0.568  
Qp = 13.805

Total of 3 main streams to confluence:

Flow rates before confluence point:  
12.384 1.232 0.748

Area of streams before confluence:  
7.540 0.480 0.320

Results of confluence:

Total flow rate = 13.805(CFS)  
Time of concentration = 18.208 min.  
Effective stream area after confluence = 8.340(Ac.)

---

\*\*\*\*\*  
Process from Point/Station 22.000 to Point/Station 23.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.790(Ft.)  
Downstream point/station elevation = 1444.710(Ft.)  
Pipe length = 35.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 13.805(CFS)  
Nearest computed pipe diameter = 27.00(In.)  
Calculated individual pipe flow = 13.805(CFS)  
Normal flow depth in pipe = 20.65(In.)  
Flow top width inside pipe = 22.90(In.)  
Critical Depth = 15.50(In.)  
Pipe flow velocity = 4.23(Ft/s)  
Travel time through pipe = 0.14 min.  
Time of concentration (TC) = 18.35 min.

---

\*\*\*\*\*  
Process from Point/Station 22.000 to Point/Station 23.000

\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 8.340(Ac.)  
Runoff from this stream = 13.805(CFS)  
Time of concentration = 18.35 min.  
Rainfall intensity = 2.002(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 22.100 to Point/Station 22.300  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 662.000(Ft.)  
Top (of initial area) elevation = 1460.800(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 11.800(Ft.)  
Slope = 0.01782 s(percent)= 1.78  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.021 min.  
Rainfall intensity = 2.834(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.328(CFS)  
Total initial stream area = 0.530(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 22.100 to Point/Station 22.300  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 1  
Stream flow area = 0.530(Ac.)  
Runoff from this stream = 1.328(CFS)  
Time of concentration = 9.02 min.  
Rainfall intensity = 2.834(In/Hr)

++++  
Process from Point/Station 22.200 to Point/Station 22.300  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 392.000(Ft.)  
Top (of initial area) elevation = 1450.700(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 1.700(Ft.)  
Slope = 0.00434 s(percent)= 0.43  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 9.705 min.  
 Rainfall intensity = 2.735(In/Hr) for a 100.0 year storm  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.884  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Initial subarea runoff = 0.725(CFS)  
 Total initial stream area = 0.300(Ac.)  
 Pervious area fraction = 0.100

++++  
 Process from Point/Station 22.200 to Point/Station 22.300  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 2  
 Stream flow area = 0.300(Ac.)  
 Runoff from this stream = 0.725(CFS)  
 Time of concentration = 9.71 min.  
 Rainfall intensity = 2.735(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.328	9.02	2.834
2	0.725	9.71	2.735

Largest stream flow has longer or shorter time of concentration  
 $Q_p = 1.328 + \text{sum of } \frac{Q_a T_b}{T_a}$   
 $Q_p = 0.725 * 0.930 = 0.674$   
 $Q_p = 2.002$

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 1.328      0.725  
 Area of streams before confluence:  
 0.530      0.300  
 Results of confluence:  
 Total flow rate = 2.002(CFS)  
 Time of concentration = 9.021 min.  
 Effective stream area after confluence = 0.830(Ac.)

++++  
 Process from Point/Station 22.300 to Point/Station 23.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.840(Ft.)  
 Downstream point/station elevation = 1444.710(Ft.)  
 Pipe length = 16.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 2.002(CFS)

Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 2.002(CFS)  
 Normal flow depth in pipe = 6.86(In.)  
 Flow top width inside pipe = 11.88(In.)  
 Critical Depth = 7.25(In.)  
 Pipe flow velocity = 4.31(Ft/s)  
 Travel time through pipe = 0.06 min.  
 Time of concentration (TC) = 9.08 min.

++++++  
 Process from Point/Station 22.300 to Point/Station 23.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.830(Ac.)  
 Runoff from this stream = 2.002(CFS)  
 Time of concentration = 9.08 min.  
 Rainfall intensity = 2.825(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	13.805	18.35	2.002
2	2.002	9.08	2.825

Largest stream flow has longer time of concentration

$Q_p = 13.805 + \text{sum of}$   
 $Q_b \quad I_a/I_b$   
 $2.002 * 0.709 = 1.419$   
 $Q_p = 15.223$

Total of 2 main streams to confluence:

Flow rates before confluence point:

13.805	2.002
--------	-------

Area of streams before confluence:

8.340	0.830
-------	-------

Results of confluence:

Total flow rate = 15.223(CFS)  
 Time of concentration = 18.346 min.  
 Effective stream area after confluence = 9.170(Ac.)  
 End of computations, total study area = 9.17 (Ac.)

The following figures may  
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.840  
 Area averaged RI index number = 83.3

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:100xo7.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
EXISTING CONDITION - WATERSHED O - E FRONTAGE RD  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 30.000 to Point/Station 31.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 715.000(Ft.)

Top (of initial area) elevation = 1468.000(Ft.)

Bottom (of initial area) elevation = 1461.200(Ft.)

Difference in elevation = 6.800(Ft.)

Slope = 0.00951 s(percent)= 0.95

$TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 10.549 min.  
 Rainfall intensity = 2.625(In/Hr) for a 100.0 year storm  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.874  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 1.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 56.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Initial subarea runoff = 2.249(CFS)  
 Total initial stream area = 0.980(Ac.)  
 Pervious area fraction = 0.100

++++++  
 Process from Point/Station 31.000 to Point/Station 32.000  
 \*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1461.200(Ft.)  
 End of street segment elevation = 1460.500(Ft.)  
 Length of street segment = 447.000(Ft.)  
 Height of curb above gutter flowline = 8.0(In.)  
 Width of half street (curb to crown) = 43.000(Ft.)  
 Distance from crown to crossfall grade break = 41.000(Ft.)  
 Slope from gutter to grade break (v/hz) = 0.083  
 Slope from grade break to crown (v/hz) = 0.020  
 Street flow is on [2] side(s) of the street  
 Distance from curb to property line = 12.000(Ft.)  
 Slope from curb to property line (v/hz) = 0.015  
 Gutter width = 2.000(Ft.)  
 Gutter hike from flowline = 2.000(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0150  
 Manning's N from grade break to crown = 0.0150  
 Estimated mean flow rate at midpoint of street = 2.957(CFS)  
 Depth of flow = 0.362(Ft.), Average velocity = 0.978(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 11.772(Ft.)  
 Flow velocity = 0.98(Ft/s)  
 Travel time = 7.62 min. TC = 18.17 min.  
 Adding area flow to street  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.869  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 1.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 56.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Rainfall intensity = 2.011(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.224(CFS) for 0.700(Ac.)  
 Total runoff = 3.473(CFS) Total area = 1.680(Ac.)  
 Street flow at end of street = 3.473(CFS)  
 Half street flow at end of street = 1.736(CFS)  
 Depth of flow = 0.378(Ft.), Average velocity = 1.015(Ft/s)

Flow width (from curb towards crown)= 12.583(Ft.)  
End of computations, total study area = 1.68 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.100  
Area averaged RI index number = 56.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/03/24 File:ql00px7.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
EXISTING CONDITION - BARRETT AVE WATERSHED - X  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 21.200 to Point/Station 12.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 103.000(Ft.)

Top (of initial area) elevation = 1450.300(Ft.)

Bottom (of initial area) elevation = 1450.200(Ft.)

Difference in elevation = 0.100(Ft.)

Slope = 0.00097 s(percent)= 0.10  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 7.670 min.  
Rainfall intensity = 3.069(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 2.038(CFS)  
Total initial stream area = 0.750(Ac.)  
Pervious area fraction = 0.100  
End of computations, total study area = 0.75 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100  
Area averaged RI index number = 69.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00a7.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED A  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 10.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 1000.000(Ft.)

Top (of initial area) elevation = 1464.800(Ft.)

Bottom (of initial area) elevation = 1450.200(Ft.)

Difference in elevation = 14.600(Ft.)

Slope = 0.01460 s(percent)= 1.46

TC = k(0.390)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 14.394 min.  
Rainfall intensity = 2.254(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.783  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.480  
Decimal fraction soil group C = 0.520  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 62.76  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Initial subarea runoff = 10.362(CFS)  
Total initial stream area = 5.870(Ac.)  
Pervious area fraction = 0.500

++++  
Process from Point/Station 10.000 to Point/Station 11.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area = 5.870(Ac.)  
Runoff from this stream = 10.362(CFS)  
Time of concentration = 14.39 min.  
Rainfall intensity = 2.254(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 10.100 to Point/Station 10.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 962.000(Ft.)  
Top (of initial area) elevation = 1466.400(Ft.)  
Bottom (of initial area) elevation = 1452.000(Ft.)  
Difference in elevation = 14.400(Ft.)  
Slope = 0.01497 s(percent)= 1.50  
TC = k(0.390)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 14.103 min.  
Rainfall intensity = 2.277(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.758  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Initial subarea runoff = 5.507(CFS)  
Total initial stream area = 3.190(Ac.)  
Pervious area fraction = 0.500

++++  
Process from Point/Station 10.200 to Point/Station 11.000  
\*\*\*\* IRREGULAR CHANNEL FLOW TRAVEL TIME \*\*\*\*

---

Estimated mean flow rate at midpoint of channel = 6.068(CFS)  
Depth of flow = 0.236(Ft.), Average velocity = 1.632(Ft/s)  
!!Warning: Water is above left or right bank elevations  
\*\*\*\*\* Irregular Channel Data \*\*\*\*\*

-----  
Information entered for subchannel number 1 :  
Point number 'X' coordinate 'Y' coordinate  
1 0.00 0.10  
2 10.00 0.00  
3 20.00 0.10  
Manning's 'N' friction factor = 0.030  
-----

Sub-Channel flow = 6.068(CFS)  
' ' flow top width = 20.000(Ft.)  
' ' velocity= 1.632(Ft/s)  
' ' area = 3.719(Sq.Ft)  
' ' Froude number = 0.667

Upstream point elevation = 1452.000(Ft.)  
Downstream point elevation = 1450.200(Ft.)  
Flow length = 176.000(Ft.)  
Travel time = 1.80 min.  
Time of concentration = 15.90 min.  
Depth of flow = 0.236(Ft.)  
Average velocity = 1.632(Ft/s)  
Total irregular channel flow = 6.068(CFS)  
Irregular channel normal depth above invert elev. = 0.236(Ft.)  
Average velocity of channel(s) = 1.632(Ft/s)  
!!Warning: Water is above left or right bank elevations

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.753  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.990  
Decimal fraction soil group C = 0.010  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.13  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Rainfall intensity = 2.147(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.051(CFS) for 0.650(Ac.)  
Total runoff = 6.558(CFS) Total area = 3.840(Ac.)  
Depth of flow = 0.245(Ft.), Average velocity = 1.683(Ft/s)  
!!Warning: Water is above left or right bank elevations

++++  
Process from Point/Station 10.200 to Point/Station 11.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 2  
Stream flow area = 3.840(Ac.)  
Runoff from this stream = 6.558(CFS)  
Time of concentration = 15.90 min.  
Rainfall intensity = 2.147(In/Hr)  
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	10.362	14.39	2.254
2	6.558	15.90	2.147

Largest stream flow has longer or shorter time of concentration

$Q_p = 10.362 + \text{sum of}$   
 $Q_a \quad T_b/T_a$   
 $6.558 * 0.905 = 5.937$   
 $Q_p = 16.299$

Total of 2 main streams to confluence:

Flow rates before confluence point:

10.362          6.558

Area of streams before confluence:

5.870          3.840

Results of confluence:

Total flow rate = 16.299(CFS)

Time of concentration = 14.394 min.

Effective stream area after confluence = 9.710(Ac.)

End of computations, total study area = 9.71 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.500

Area averaged RI index number = 60.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00b6x.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED B  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 20.000 to Point/Station 21.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 864.000(Ft.)

Top (of initial area) elevation = 1462.500(Ft.)

Bottom (of initial area) elevation = 1448.600(Ft.)

Difference in elevation = 13.900(Ft.)

Slope = 0.01609 s(percent)= 1.61

$TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 13.316 min.  
 Rainfall intensity = 2.342(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.811  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.870  
 Decimal fraction soil group D = 0.130  
 RI index for soil(AMC 2) = 69.78  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 14.321(CFS)  
 Total initial stream area = 7.540(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 21.000 to Point/Station 22.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.840(Ft.)  
 Downstream point/station elevation = 1444.790(Ft.)  
 Pipe length = 26.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 14.321(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 14.321(CFS)  
 Normal flow depth in pipe = 23.77(In.)  
 Flow top width inside pipe = 17.53(In.)  
 Critical Depth = 15.80(In.)  
 Pipe flow velocity = 3.86(Ft/s)  
 Travel time through pipe = 0.11 min.  
 Time of concentration (TC) = 13.43 min.

++++++  
 Process from Point/Station 21.000 to Point/Station 22.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
 In Main Stream number: 1  
 Stream flow area = 7.540(Ac.)  
 Runoff from this stream = 14.321(CFS)  
 Time of concentration = 13.43 min.  
 Rainfall intensity = 2.332(In/Hr)  
 Program is now starting with Main Stream No. 2

++++++  
 Process from Point/Station 21.100 to Point/Station 22.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 597.000(Ft.)  
 Top (of initial area) elevation = 1460.000(Ft.)  
 Bottom (of initial area) elevation = 1449.000(Ft.)  
 Difference in elevation = 11.000(Ft.)  
 Slope = 0.01843 s(percent)= 1.84  
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 8.599 min.  
Rainfall intensity = 2.902(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.232(CFS)  
Total initial stream area = 0.480(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 21.100 to Point/Station 22.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.480(Ac.)  
Runoff from this stream = 1.232(CFS)  
Time of concentration = 8.60 min.  
Rainfall intensity = 2.902(In/Hr)  
Program is now starting with Main Stream No. 3

++++  
Process from Point/Station 21.200 to Point/Station 22.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 400.000(Ft.)  
Top (of initial area) elevation = 1450.300(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 1.300(Ft.)  
Slope = 0.00325 s(percent)= 0.32  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 10.365 min.  
Rainfall intensity = 2.648(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.883  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.748(CFS)  
Total initial stream area = 0.320(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 21.200 to Point/Station 22.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 3  
Stream flow area = 0.320(Ac.)  
Runoff from this stream = 0.748(CFS)  
Time of concentration = 10.36 min.  
Rainfall intensity = 2.648(In/Hr)  
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	14.321	13.43	2.332
2	1.232	8.60	2.902
3	0.748	10.36	2.648

Largest stream flow has longer time of concentration

Qp = 14.321 + sum of  
Qb Ia/Ib  
1.232 \* 0.804 = 0.990  
Qb Ia/Ib  
0.748 \* 0.881 = 0.659  
Qp = 15.970

Total of 3 main streams to confluence:

Flow rates before confluence point:

14.321 1.232 0.748

Area of streams before confluence:

7.540 0.480 0.320

Results of confluence:

Total flow rate = 15.970(CFS)  
Time of concentration = 13.428 min.  
Effective stream area after confluence = 8.340(Ac.)

\*\*\*\*\*  
Process from Point/Station 22.000 to Point/Station 23.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.790(Ft.)  
Downstream point/station elevation = 1444.710(Ft.)  
Pipe length = 35.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 15.970(CFS)  
Nearest computed pipe diameter = 30.00(In.)  
Calculated individual pipe flow = 15.970(CFS)  
Normal flow depth in pipe = 20.58(In.)  
Flow top width inside pipe = 27.85(In.)  
Critical Depth = 16.20(In.)  
Pipe flow velocity = 4.45(Ft/s)  
Travel time through pipe = 0.13 min.  
Time of concentration (TC) = 13.56 min.

\*\*\*\*\*  
Process from Point/Station 22.000 to Point/Station 23.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 8.340(Ac.)  
Runoff from this stream = 15.970(CFS)  
Time of concentration = 13.56 min.  
Rainfall intensity = 2.321(In/Hr)  
Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 22.100 to Point/Station 22.300  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 662.000(Ft.)  
Top (of initial area) elevation = 1460.800(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 11.800(Ft.)  
Slope = 0.01782 s(percent)= 1.78  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.021 min.  
Rainfall intensity = 2.834(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.328(CFS)  
Total initial stream area = 0.530(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 22.100 to Point/Station 22.300  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 1  
Stream flow area = 0.530(Ac.)  
Runoff from this stream = 1.328(CFS)  
Time of concentration = 9.02 min.  
Rainfall intensity = 2.834(In/Hr)

\*\*\*\*\*  
Process from Point/Station 22.200 to Point/Station 22.300  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 392.000(Ft.)  
Top (of initial area) elevation = 1450.700(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 1.700(Ft.)  
Slope = 0.00434 s(percent)= 0.43  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.705 min.

Rainfall intensity = 2.735(In/Hr) for a 100.0 year storm  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.884  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Initial subarea runoff = 0.725(CFS)  
 Total initial stream area = 0.300(Ac.)  
 Pervious area fraction = 0.100

++++++  
 Process from Point/Station 22.200 to Point/Station 22.300  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 2 in normal stream number 2  
 Stream flow area = 0.300(Ac.)  
 Runoff from this stream = 0.725(CFS)  
 Time of concentration = 9.71 min.  
 Rainfall intensity = 2.735(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.328	9.02	2.834
2	0.725	9.71	2.735

Largest stream flow has longer or shorter time of concentration  
 $Q_p = 1.328 + \text{sum of } \frac{Q_a T_b}{T_a}$   
 $0.725 * \frac{9.02}{9.71} = 0.674$   
 $Q_p = 2.002$

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 1.328      0.725  
 Area of streams before confluence:  
 0.530      0.300  
 Results of confluence:  
 Total flow rate = 2.002(CFS)  
 Time of concentration = 9.021 min.  
 Effective stream area after confluence = 0.830(Ac.)

++++++  
 Process from Point/Station 22.300 to Point/Station 23.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 1444.840(Ft.)  
 Downstream point/station elevation = 1444.710(Ft.)  
 Pipe length = 16.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 2.002(CFS)  
 Nearest computed pipe diameter = 12.00(In.)

Calculated individual pipe flow = 2.002(CFS)  
 Normal flow depth in pipe = 6.86(In.)  
 Flow top width inside pipe = 11.88(In.)  
 Critical Depth = 7.25(In.)  
 Pipe flow velocity = 4.31(Ft/s)  
 Travel time through pipe = 0.06 min.  
 Time of concentration (TC) = 9.08 min.

++++++  
 Process from Point/Station 22.300 to Point/Station 23.000  
 \*\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.830(Ac.)  
 Runoff from this stream = 2.002(CFS)  
 Time of concentration = 9.08 min.  
 Rainfall intensity = 2.825(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.970	13.56	2.321
2	2.002	9.08	2.825

Largest stream flow has longer time of concentration

$Q_p = 15.970 + \text{sum of } Q_b \text{ Ia/Ib}$   
 $2.002 * 0.822 = 1.645$   
 $Q_p = 17.616$

Total of 2 main streams to confluence:

Flow rates before confluence point:  
 15.970      2.002  
 Area of streams before confluence:  
 8.340      0.830

Results of confluence:

Total flow rate = 17.616(CFS)  
 Time of concentration = 13.559 min.  
 Effective stream area after confluence = 9.170(Ac.)  
 End of computations, total study area = 9.17 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.429  
 Area averaged RI index number = 69.6

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00p7a.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED A  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 10.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 637.000(Ft.)

Top (of initial area) elevation = 1468.100(Ft.)

Bottom (of initial area) elevation = 1455.300(Ft.)

Difference in elevation = 12.800(Ft.)

Slope = 0.02009 s(percent)= 2.01

TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 8.673 min.  
Rainfall intensity = 2.889(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.879  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.710  
Decimal fraction soil group C = 0.290  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 59.77  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 13.253(CFS)  
Total initial stream area = 5.220(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 11.000 to Point/Station 11.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

UNDEVELOPED (good cover) subarea  
Runoff Coefficient = 0.696  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.990  
Decimal fraction soil group C = 0.010  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 61.13  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Time of concentration = 8.67 min.  
Rainfall intensity = 2.889(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.990(CFS) for 0.990(Ac.)  
Total runoff = 15.243(CFS) Total area = 6.210(Ac.)

++++  
Process from Point/Station 11.000 to Point/Station 16.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1448.200(Ft.)  
Downstream point/station elevation = 1445.230(Ft.)  
Pipe length = 28.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 15.243(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 15.243(CFS)  
Normal flow depth in pipe = 9.47(In.)  
Flow top width inside pipe = 14.47(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 18.69(Ft/s)  
Travel time through pipe = 0.02 min.  
Time of concentration (TC) = 8.70 min.

++++  
Process from Point/Station 11.000 to Point/Station 16.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 6.210(Ac.)  
Runoff from this stream = 15.243(CFS)  
Time of concentration = 8.70 min.  
Rainfall intensity = 2.885(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 13.000 to Point/Station 14.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 369.000(Ft.)  
Top (of initial area) elevation = 1457.600(Ft.)  
Bottom (of initial area) elevation = 1454.600(Ft.)  
Difference in elevation = 3.000(Ft.)  
Slope = 0.00813 s(percent)= 0.81  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 8.354 min.  
Rainfall intensity = 2.943(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.881  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.490  
Decimal fraction soil group C = 0.510  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 62.63  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 6.066(CFS)  
Total initial stream area = 2.340(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 14.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/2 Acre Lot)  
Runoff Coefficient = 0.792  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.360  
Decimal fraction soil group C = 0.640  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 64.32  
Pervious area fraction = 0.600; Impervious fraction = 0.400  
Time of concentration = 8.35 min.  
Rainfall intensity = 2.943(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.165(CFS) for 0.500(Ac.)  
Total runoff = 7.231(CFS) Total area = 2.840(Ac.)

++++  
Process from Point/Station 14.000 to Point/Station 16.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1449.300(Ft.)  
Downstream point/station elevation = 1445.230(Ft.)

Pipe length = 182.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 7.231(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 7.231(CFS)  
 Normal flow depth in pipe = 9.68(In.)  
 Flow top width inside pipe = 14.35(In.)  
 Critical Depth = 12.88(In.)  
 Pipe flow velocity = 8.64(Ft/s)  
 Travel time through pipe = 0.35 min.  
 Time of concentration (TC) = 8.71 min.

++++++  
 Process from Point/Station 14.000 to Point/Station 16.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 2.840(Ac.)  
 Runoff from this stream = 7.231(CFS)  
 Time of concentration = 8.71 min.  
 Rainfall intensity = 2.884(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.243	8.70	2.885
2	7.231	8.71	2.884

Largest stream flow has longer or shorter time of concentration

$Q_p = 15.243 + \text{sum of } Q_a$   
 $7.231 * \frac{T_b}{T_a} = 7.224$   
 $Q_p = 22.467$

Total of 2 main streams to confluence:

Flow rates before confluence point:

15.243      7.231

Area of streams before confluence:

6.210      2.840

Results of confluence:

Total flow rate = 22.467(CFS)  
 Time of concentration = 8.698 min.  
 Effective stream area after confluence = 9.050(Ac.)

++++++  
 Process from Point/Station 16.000 to Point/Station 17.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 1445.230(Ft.)  
 Downstream point/station elevation = 1442.090(Ft.)  
 Pipe length = 441.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 22.467(CFS)

Nearest computed pipe diameter = 27.00(In.)  
Calculated individual pipe flow = 22.467(CFS)  
Normal flow depth in pipe = 19.29(In.)  
Flow top width inside pipe = 24.39(In.)  
Critical Depth = 19.91(In.)  
Pipe flow velocity = 7.39(Ft/s)  
Travel time through pipe = 0.99 min.  
Time of concentration (TC) = 9.69 min.

\*\*\*\*\*  
Process from Point/Station 16.000 to Point/Station 17.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 9.050(Ac.)  
Runoff from this stream = 22.467(CFS)  
Time of concentration = 9.69 min.  
Rainfall intensity = 2.736(In/Hr)  
Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 16.100 to Point/Station 16.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 416.000(Ft.)  
Top (of initial area) elevation = 1451.300(Ft.)  
Bottom (of initial area) elevation = 1449.100(Ft.)  
Difference in elevation = 2.200(Ft.)  
Slope = 0.00529 s(percent)= 0.53  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.552 min.  
Rainfall intensity = 2.756(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.926(CFS)  
Total initial stream area = 0.380(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 16.200 to Point/Station 17.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1445.000(Ft.)  
Downstream point/station elevation = 1442.090(Ft.)  
Pipe length = 23.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.926(CFS)  
Nearest computed pipe diameter = 6.00(In.)

Calculated individual pipe flow = 0.926(CFS)  
 Normal flow depth in pipe = 2.87(In.)  
 Flow top width inside pipe = 5.99(In.)  
 Critical Depth = 5.57(In.)  
 Pipe flow velocity = 9.97(Ft/s)  
 Travel time through pipe = 0.04 min.  
 Time of concentration (TC) = 9.59 min.

++++++  
 Process from Point/Station 16.200 to Point/Station 17.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.380(Ac.)  
 Runoff from this stream = 0.926(CFS)  
 Time of concentration = 9.59 min.  
 Rainfall intensity = 2.751(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	22.467	9.69	2.736
2	0.926	9.59	2.751

Largest stream flow has longer time of concentration

$Q_p = 22.467 + \text{sum of } Q_b \text{ Ia/Ib}$   
 $Q_p = 22.467 + 0.926 * 0.995 = 23.388$

Total of 2 main streams to confluence:

Flow rates before confluence point:  
 22.467      0.926  
 Area of streams before confluence:  
 9.050      0.380

Results of confluence:

Total flow rate = 23.388(CFS)  
 Time of concentration = 9.692 min.  
 Effective stream area after confluence = 9.430(Ac.)

++++++  
 Process from Point/Station 17.000 to Point/Station 18.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 1442.090(Ft.)  
 Downstream point/station elevation = 1441.980(Ft.)  
 Pipe length = 21.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 23.388(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 23.388(CFS)  
 Normal flow depth in pipe = 23.34(In.)

Flow top width inside pipe = 18.48(In.)  
Critical Depth = 20.31(In.)  
Pipe flow velocity = 6.40(Ft/s)  
Travel time through pipe = 0.05 min.  
Time of concentration (TC) = 9.75 min.

++++  
Process from Point/Station 17.000 to Point/Station 18.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 9.430(Ac.)  
Runoff from this stream = 23.388(CFS)  
Time of concentration = 9.75 min.  
Rainfall intensity = 2.729(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 17.100 to Point/Station 17.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 395.000(Ft.)  
Top (of initial area) elevation = 1451.600(Ft.)  
Bottom (of initial area) elevation = 1450.000(Ft.)  
Difference in elevation = 1.600(Ft.)  
Slope = 0.00405 s(percent)= 0.41  
TC =  $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.869 min.  
Rainfall intensity = 2.712(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.863(CFS)  
Total initial stream area = 0.360(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 17.200 to Point/Station 18.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1445.000(Ft.)  
Downstream point/station elevation = 1441.980(Ft.)  
Pipe length = 33.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.863(CFS)  
Nearest computed pipe diameter = 6.00(In.)  
Calculated individual pipe flow = 0.863(CFS)  
Normal flow depth in pipe = 3.03(In.)  
Flow top width inside pipe = 6.00(In.)

Critical Depth = 5.46(In.)  
 Pipe flow velocity = 8.68(Ft/s)  
 Travel time through pipe = 0.06 min.  
 Time of concentration (TC) = 9.93 min.

Process from Point/Station 17.200 to Point/Station 18.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.360(Ac.)  
 Runoff from this stream = 0.863(CFS)  
 Time of concentration = 9.93 min.  
 Rainfall intensity = 2.704(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.388	9.75	2.729
2	0.863	9.93	2.704

Largest stream flow has longer or shorter time of concentration

Qp = 23.388 + sum of  
 $Q_a \cdot \frac{T_b}{T_a}$   
 0.863 \* 0.981 = 0.847  
 Qp = 24.235

Total of 2 main streams to confluence:

Flow rates before confluence point:  
 23.388 0.863  
 Area of streams before confluence:  
 9.430 0.360

Results of confluence:

Total flow rate = 24.235(CFS)  
 Time of concentration = 9.747 min.  
 Effective stream area after confluence = 9.790(Ac.)  
 End of computations, total study area = 9.79 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.217  
 Area averaged RI index number = 61.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00bp7.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED B  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 20.000 to Point/Station 21.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 495.000(Ft.)

Top (of initial area) elevation = 1461.900(Ft.)

Bottom (of initial area) elevation = 1455.100(Ft.)

Difference in elevation = 6.800(Ft.)

Slope = 0.01374 s(percent)= 1.37

TC = k(0.323)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 9.109 min.  
Rainfall intensity = 2.821(In/Hr) for a 100.0 year storm  
APARTMENT subarea type  
Runoff Coefficient = 0.861  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.430  
Decimal fraction soil group C = 0.570  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 63.41  
Pervious area fraction = 0.200; Impervious fraction = 0.800  
Initial subarea runoff = 12.271(CFS)  
Total initial stream area = 5.050(Ac.)  
Pervious area fraction = 0.200

++++  
Process from Point/Station 20.000 to Point/Station 21.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

CONDOMINIUM subarea type  
Runoff Coefficient = 0.845  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.010  
Decimal fraction soil group C = 0.990  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 68.87  
Pervious area fraction = 0.350; Impervious fraction = 0.650  
Time of concentration = 9.11 min.  
Rainfall intensity = 2.821(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.167(CFS) for 0.490(Ac.)  
Total runoff = 13.438(CFS) Total area = 5.540(Ac.)

++++  
Process from Point/Station 21.000 to Point/Station 25.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1451.350(Ft.)  
Downstream point/station elevation = 1448.020(Ft.)  
Pipe length = 120.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 13.438(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 13.438(CFS)  
Normal flow depth in pipe = 11.82(In.)  
Flow top width inside pipe = 17.09(In.)  
Critical Depth = 16.38(In.)  
Pipe flow velocity = 10.92(Ft/s)  
Travel time through pipe = 0.18 min.  
Time of concentration (TC) = 9.29 min.

++++  
Process from Point/Station 21.000 to Point/Station 25.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 5.540(Ac.)  
Runoff from this stream = 13.438(CFS)  
Time of concentration = 9.29 min.  
Rainfall intensity = 2.793(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 22.000 to Point/Station 23.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 236.000(Ft.)  
Top (of initial area) elevation = 1458.800(Ft.)  
Bottom (of initial area) elevation = 1455.100(Ft.)  
Difference in elevation = 3.700(Ft.)  
Slope = 0.01568 s(percent)= 1.57  
TC =  $k(0.323)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.596 min.  
Rainfall intensity = 3.304(In/Hr) for a 100.0 year storm  
APARTMENT subarea type  
Runoff Coefficient = 0.872  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.200; Impervious fraction = 0.800  
Initial subarea runoff = 7.206(CFS)  
Total initial stream area = 2.500(Ac.)  
Pervious area fraction = 0.200

++++  
Process from Point/Station 23.000 to Point/Station 24.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1451.600(Ft.)  
Downstream point/station elevation = 1451.070(Ft.)  
Pipe length = 110.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 7.206(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 7.206(CFS)  
Normal flow depth in pipe = 14.58(In.)  
Flow top width inside pipe = 14.13(In.)  
Critical Depth = 12.47(In.)  
Pipe flow velocity = 4.70(Ft/s)  
Travel time through pipe = 0.39 min.  
Time of concentration (TC) = 6.99 min.

++++  
Process from Point/Station 23.000 to Point/Station 24.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 1  
Stream flow area = 2.500(Ac.)

Runoff from this stream = 7.206(CFS)  
Time of concentration = 6.99 min.  
Rainfall intensity = 3.212(In/Hr)

\*\*\*\*\*  
Process from Point/Station 23.100 to Point/Station 23.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 291.000(Ft.)  
Top (of initial area) elevation = 1459.200(Ft.)  
Bottom (of initial area) elevation = 1455.100(Ft.)  
Difference in elevation = 4.100(Ft.)  
Slope = 0.01409 s(percent)= 1.41  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 6.806 min.  
Rainfall intensity = 3.254(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.886  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 2.191(CFS)  
Total initial stream area = 0.760(Ac.)  
Pervious area fraction = 0.100

\*\*\*\*\*  
Process from Point/Station 23.200 to Point/Station 24.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1451.580(Ft.)  
Downstream point/station elevation = 1451.070(Ft.)  
Pipe length = 101.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 2.191(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 2.191(CFS)  
Normal flow depth in pipe = 8.63(In.)  
Flow top width inside pipe = 10.79(In.)  
Critical Depth = 7.59(In.)  
Pipe flow velocity = 3.63(Ft/s)  
Travel time through pipe = 0.46 min.  
Time of concentration (TC) = 7.27 min.

\*\*\*\*\*  
Process from Point/Station 23.200 to Point/Station 24.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 2  
Stream flow area = 0.760(Ac.)  
Runoff from this stream = 2.191(CFS)  
Time of concentration = 7.27 min.  
Rainfall intensity = 3.150(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	7.206	6.99	3.212
2	2.191	7.27	3.150

Largest stream flow has longer or shorter time of concentration

Qp = 7.206 + sum of  
 Qa Tb/Ta  
 2.191 \* 0.961 = 2.105  
 Qp = 9.311

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 7.206 2.191

Area of streams before confluence:  
 2.500 0.760

Results of confluence:  
 Total flow rate = 9.311(CFS)  
 Time of concentration = 6.986 min.  
 Effective stream area after confluence = 3.260(Ac.)

\*\*\*\*\*  
 Process from Point/Station 24.000 to Point/Station 25.000  
 \*\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*\*

---

Upstream point/station elevation = 1451.070(Ft.)  
 Downstream point/station elevation = 1448.020(Ft.)  
 Pipe length = 9.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 9.311(CFS)  
 Nearest computed pipe diameter = 9.00(In.)  
 Calculated individual pipe flow = 9.311(CFS)  
 Normal flow depth in pipe = 7.13(In.)  
 Flow top width inside pipe = 7.31(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 24.83(Ft/s)  
 Travel time through pipe = 0.01 min.  
 Time of concentration (TC) = 6.99 min.

\*\*\*\*\*  
 Process from Point/Station 24.000 to Point/Station 25.000  
 \*\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 3.260(Ac.)  
 Runoff from this stream = 9.311(CFS)  
 Time of concentration = 6.99 min.  
 Rainfall intensity = 3.211(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	13.438	9.29	2.793
2	9.311	6.99	3.211

Largest stream flow has longer time of concentration

Qp = 13.438 + sum of  
Qb Ia/Ib  
9.311 \* 0.870 = 8.100

Qp = 21.539

Total of 2 main streams to confluence:  
Flow rates before confluence point:  
13.438 9.311  
Area of streams before confluence:  
5.540 3.260

Results of confluence:  
Total flow rate = 21.539(CFS)  
Time of concentration = 9.292 min.  
Effective stream area after confluence = 8.800(Ac.)

\*\*\*\*\*  
Process from Point/Station 25.000 to Point/Station 26.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1448.020(Ft.)  
Downstream point/station elevation = 1444.910(Ft.)  
Pipe length = 290.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 21.539(CFS)  
Nearest computed pipe diameter = 24.00(In.)  
Calculated individual pipe flow = 21.539(CFS)  
Normal flow depth in pipe = 18.14(In.)  
Flow top width inside pipe = 20.62(In.)  
Critical Depth = 19.93(In.)  
Pipe flow velocity = 8.46(Ft/s)  
Travel time through pipe = 0.57 min.  
Time of concentration (TC) = 9.86 min.

\*\*\*\*\*  
Process from Point/Station 25.000 to Point/Station 26.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area = 8.800(Ac.)  
Runoff from this stream = 21.539(CFS)  
Time of concentration = 9.86 min.  
Rainfall intensity = 2.713(In/Hr)  
Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 25.100 to Point/Station 26.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 592.000(Ft.)  
Top (of initial area) elevation = 1460.200(Ft.)  
Bottom (of initial area) elevation = 1449.300(Ft.)  
Difference in elevation = 10.900(Ft.)  
Slope = 0.01841 s(percent)= 1.84  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 8.571 min.  
Rainfall intensity = 2.906(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.388(CFS)  
Total initial stream area = 0.540(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 25.100 to Point/Station 26.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.540(Ac.)  
Runoff from this stream = 1.388(CFS)  
Time of concentration = 8.57 min.  
Rainfall intensity = 2.906(In/Hr)  
Program is now starting with Main Stream No. 3

++++  
Process from Point/Station 25.200 to Point/Station 26.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 391.000(Ft.)  
Top (of initial area) elevation = 1451.600(Ft.)  
Bottom (of initial area) elevation = 1449.300(Ft.)  
Difference in elevation = 2.300(Ft.)  
Slope = 0.00588 s(percent)= 0.59  
TC = k(0.300)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 9.122 min.  
Rainfall intensity = 2.819(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.847(CFS)  
Total initial stream area = 0.340(Ac.)

Pervious area fraction = 0.100

++++  
Process from Point/Station 25.200 to Point/Station 26.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 3  
Stream flow area = 0.340(Ac.)  
Runoff from this stream = 0.847(CFS)  
Time of concentration = 9.12 min.  
Rainfall intensity = 2.819(In/Hr)  
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.539	9.86	2.713
2	1.388	8.57	2.906
3	0.847	9.12	2.819

Largest stream flow has longer time of concentration

Qp = 21.539 + sum of  
Qb Ia/Ib  
1.388 \* 0.933 = 1.296  
Qb Ia/Ib  
0.847 \* 0.962 = 0.816  
Qp = 23.650

Total of 3 main streams to confluence:

Flow rates before confluence point:  
21.539 1.388 0.847  
Area of streams before confluence:  
8.800 0.540 0.340

Results of confluence:

Total flow rate = 23.650(CFS)  
Time of concentration = 9.863 min.  
Effective stream area after confluence = 9.680(Ac.)

++++  
Process from Point/Station 26.000 to Point/Station 27.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

Upstream point/station elevation = 1444.910(Ft.)  
Downstream point/station elevation = 1444.590(Ft.)  
Pipe length = 65.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 23.650(CFS)  
Nearest computed pipe diameter = 30.00(In.)  
Calculated individual pipe flow = 23.650(CFS)  
Normal flow depth in pipe = 20.72(In.)  
Flow top width inside pipe = 27.73(In.)  
Critical Depth = 19.85(In.)  
Pipe flow velocity = 6.55(Ft/s)

Travel time through pipe = 0.17 min.  
Time of concentration (TC) = 10.03 min.

Process from Point/Station 26.000 to Point/Station 27.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 9.680(Ac.)  
Runoff from this stream = 23.650(CFS)  
Time of concentration = 10.03 min.  
Rainfall intensity = 2.691(In/Hr)  
Program is now starting with Main Stream No. 2

Process from Point/Station 26.100 to Point/Station 27.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 667.000(Ft.)  
Top (of initial area) elevation = 1460.200(Ft.)  
Bottom (of initial area) elevation = 1449.000(Ft.)  
Difference in elevation = 11.200(Ft.)  
Slope = 0.01679 s(percent)= 1.68  
TC =  $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 9.157 min.  
Rainfall intensity = 2.814(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.884  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 1.368(CFS)  
Total initial stream area = 0.550(Ac.)  
Pervious area fraction = 0.100

Process from Point/Station 26.100 to Point/Station 27.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 0.550(Ac.)  
Runoff from this stream = 1.368(CFS)  
Time of concentration = 9.16 min.  
Rainfall intensity = 2.814(In/Hr)  
Program is now starting with Main Stream No. 3

Process from Point/Station 26.200 to Point/Station 27.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 390.000(Ft.)  
 Top (of initial area) elevation = 1451.800(Ft.)  
 Bottom (of initial area) elevation = 1449.000(Ft.)  
 Difference in elevation = 2.800(Ft.)  
 Slope = 0.00718 s(percent)= 0.72  
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 8.756 min.  
 Rainfall intensity = 2.876(In/Hr) for a 100.0 year storm  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.884  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Initial subarea runoff = 0.763(CFS)  
 Total initial stream area = 0.300(Ac.)  
 Pervious area fraction = 0.100

\*\*\*\*\*  
 Process from Point/Station 26.200 to Point/Station 27.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 3  
 Stream flow area = 0.300(Ac.)  
 Runoff from this stream = 0.763(CFS)  
 Time of concentration = 8.76 min.  
 Rainfall intensity = 2.876(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	23.650	10.03	2.691
2	1.368	9.16	2.814
3	0.763	8.76	2.876

Largest stream flow has longer time of concentration

Qp = 23.650 + sum of  
 $Qb \cdot Ia/Ib$   
 1.368 \* 0.956 = 1.309  
 $Qb \cdot Ia/Ib$   
 0.763 \* 0.936 = 0.714  
 Qp = 25.673

Total of 3 main streams to confluence:

Flow rates before confluence point:

23.650      1.368      0.763

Area of streams before confluence:

9.680      0.550      0.300

Results of confluence:

Total flow rate = 25.673(CFS)

Time of concentration = 10.029 min.

Effective stream area after confluence = 10.530(Ac.)

End of computations, total study area = 10.53 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.183

Area averaged RI index number = 66.3

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/02/24 File:ql00o7p.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED O - BARRETT AVE  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 25.200 to Point/Station 30.100  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 245.000(Ft.)

Top (of initial area) elevation = 1451.600(Ft.)

Bottom (of initial area) elevation = 1450.600(Ft.)

Difference in elevation = 1.000(Ft.)

Slope = 0.00408 s(percent)= 0.41

TC =  $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 8.140 min.  
Rainfall intensity = 2.981(In/Hr) for a 100.0 year storm  
COMMERCIAL subarea type  
Runoff Coefficient = 0.885  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Initial subarea runoff = 0.923(CFS)  
Total initial stream area = 0.350(Ac.)  
Pervious area fraction = 0.100

++++  
Process from Point/Station 30.100 to Point/Station 31.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.920(Ft.)  
Downstream point/station elevation = 1444.720(Ft.)  
Pipe length = 28.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 0.923(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 0.923(CFS)  
Normal flow depth in pipe = 5.34(In.)  
Flow top width inside pipe = 8.84(In.)  
Critical Depth = 5.28(In.)  
Pipe flow velocity = 3.38(Ft/s)  
Travel time through pipe = 0.14 min.  
Time of concentration (TC) = 8.28 min.

++++  
Process from Point/Station 30.100 to Point/Station 31.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area = 0.350(Ac.)  
Runoff from this stream = 0.923(CFS)  
Time of concentration = 8.28 min.  
Rainfall intensity = 2.956(In/Hr)  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station 26.200 to Point/Station 30.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 243.000(Ft.)  
Top (of initial area) elevation = 1451.800(Ft.)  
Bottom (of initial area) elevation = 1449.600(Ft.)  
Difference in elevation = 2.200(Ft.)  
Slope = 0.00905 s(percent)= 0.91  
TC =  $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 6.918 min.  
 Rainfall intensity = 3.228(In/Hr) for a 100.0 year storm  
 COMMERCIAL subarea type  
 Runoff Coefficient = 0.886  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.100; Impervious fraction = 0.900  
 Initial subarea runoff = 1.087(CFS)  
 Total initial stream area = 0.380(Ac.)  
 Pervious area fraction = 0.100

++++++  
 Process from Point/Station 30.000 to Point/Station 31.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1444.860(Ft.)  
 Downstream point/station elevation = 1444.720(Ft.)  
 Pipe length = 28.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 1.087(CFS)  
 Nearest computed pipe diameter = 9.00(In.)  
 Calculated individual pipe flow = 1.087(CFS)  
 Normal flow depth in pipe = 6.86(In.)  
 Flow top width inside pipe = 7.67(In.)  
 Critical Depth = 5.74(In.)  
 Pipe flow velocity = 3.01(Ft/s)  
 Travel time through pipe = 0.16 min.  
 Time of concentration (TC) = 7.07 min.

++++++  
 Process from Point/Station 30.000 to Point/Station 31.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.380(Ac.)  
 Runoff from this stream = 1.087(CFS)  
 Time of concentration = 7.07 min.  
 Rainfall intensity = 3.193(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	0.923	8.28	2.956
2	1.087	7.07	3.193

Largest stream flow has longer or shorter time of concentration

Qp = 1.087 + sum of  
 Qa Tb/Ta  
 0.923 \* 0.854 = 0.789  
 Qp = 1.876

Total of 2 main streams to confluence:

Flow rates before confluence point:

0.923            1.087

Area of streams before confluence:

0.350            0.380

Results of confluence:

Total flow rate =            1.876(CFS)

Time of concentration =        7.074 min.

Effective stream area after confluence =            0.730(Ac.)

End of computations, total study area =            0.73 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.100

Area averaged RI index number = 69.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0  
Rational Hydrology Study Date: 10/11/24 File:frontage7p.out

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED O - E FRONTAGE ROAD  
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on  
Riverside County Flood Control & Water Conservation District  
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [ Perris Valley ] area used.

10 year storm 10 minute intensity = 1.880(In/Hr)

10 year storm 60 minute intensity = 0.780(In/Hr)

100 year storm 10 minute intensity = 2.690(In/Hr)

100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.120(In/Hr)

Slope of intensity duration curve = 0.4900

\*\*\*\*\*  
Process from Point/Station 40.000 to Point/Station 40.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

Rainfall intensity = 1.769(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.865

Decimal fraction soil group A = 0.090

Decimal fraction soil group B = 0.910  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 53.84  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
User specified values are as follows:  
TC = 23.61 min. Rain intensity = 1.77(In/Hr)  
Total area = 2.60(Ac.) Total runoff = 4.90(CFS)

\*\*\*\*\*  
Process from Point/Station 40.000 to Point/Station 41.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1467.200(Ft.)  
End of street segment elevation = 1461.700(Ft.)  
Length of street segment = 621.000(Ft.)  
Height of curb above gutter flowline = 8.0(In.)  
Width of half street (curb to crown) = 43.000(Ft.)  
Distance from crown to crossfall grade break = 41.000(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 12.000(Ft.)  
Slope from curb to property line (v/hz) = 0.015  
Gutter width = 2.000(Ft.)  
Gutter hike from flowline = 2.000(In.)  
Manning's N in gutter = 0.0130  
Manning's N from gutter to grade break = 0.0130  
Manning's N from grade break to crown = 0.0130  
Estimated mean flow rate at midpoint of street = 5.501(CFS)  
Depth of flow = 0.394(Ft.), Average velocity = 2.883(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 13.347(Ft.)  
Flow velocity = 2.88(Ft/s)  
Travel time = 3.59 min. TC = 27.20 min.  
Adding area flow to street  
COMMERCIAL subarea type  
Runoff Coefficient = 0.865  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Rainfall intensity = 1.650(In/Hr) for a 100.0 year storm  
  
Subarea runoff = 1.114(CFS) for 0.780(Ac.)  
Total runoff = 6.014(CFS) Total area = 3.380(Ac.)  
Street flow at end of street = 6.014(CFS)  
Half street flow at end of street = 6.014(CFS)  
Depth of flow = 0.403(Ft.), Average velocity = 2.945(Ft/s)  
Flow width (from curb towards crown)= 13.839(Ft.)

\*\*\*\*\*  
Process from Point/Station 41.000 to Point/Station 42.000

\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1461.700(Ft.)  
End of street segment elevation = 1459.800(Ft.)  
Length of street segment = 498.000(Ft.)  
Height of curb above gutter flowline = 8.0(In.)  
Width of half street (curb to crown) = 43.000(Ft.)  
Distance from crown to crossfall grade break = 41.000(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 12.000(Ft.)  
Slope from curb to property line (v/hz) = 0.015  
Gutter width = 2.000(Ft.)  
Gutter hike from flowline = 2.000(In.)  
Manning's N in gutter = 0.0130  
Manning's N from gutter to grade break = 0.0130  
Manning's N from grade break to crown = 0.0130  
Estimated mean flow rate at midpoint of street = 6.564(CFS)  
Depth of flow = 0.466(Ft.), Average velocity = 2.186(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 16.960(Ft.)  
Flow velocity = 2.19(Ft/s)  
Travel time = 3.80 min. TC = 31.00 min.  
Adding area flow to street  
COMMERCIAL subarea type  
Runoff Coefficient = 0.864  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.00  
Pervious area fraction = 0.100; Impervious fraction = 0.900  
Rainfall intensity = 1.548(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.016(CFS) for 0.760(Ac.)  
Total runoff = 7.030(CFS) Total area = 4.140(Ac.)  
Street flow at end of street = 7.030(CFS)  
Half street flow at end of street = 7.030(CFS)  
Depth of flow = 0.475(Ft.), Average velocity = 2.222(Ft/s)  
Flow width (from curb towards crown)= 17.425(Ft.)  
End of computations, total study area = 4.14 (Ac.)  
The following figures may  
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100  
Area averaged RI index number = 54.6

Unit Hydrograph Analysis

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Study date 10/02/24 File: q100uh7ax24100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED A  
100 YEAR, 24 HOUR STORM EVENT ANALYSIS  
-----

English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 1138.00(Ft.)  
Length along longest watercourse measured to centroid = 638.00(Ft.)  
Length along longest watercourse = 0.216 Mi.  
Length along longest watercourse measured to centroid = 0.121 Mi.  
Difference in elevation = 14.60(Ft.)  
Slope along watercourse = 67.7399 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.081 Hr.  
Lag time = 4.85 Min.  
25% of lag time = 1.21 Min.  
40% of lag time = 1.94 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.80	17.48

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	5.00	48.55

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.800(In)  
 Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500
Total Area Entered = 9.71(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
						Sum (F) = 0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258  
 Minimum soil loss rate ((In/Hr)) = 0.129  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

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 U n i t H y d r o g r a p h  
 VALLEY S-Curve  
 -----

Unit Hydrograph Data  
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Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	1.973
2	0.167	206.259	4.756
3	0.250	309.388	1.486
4	0.333	412.518	0.675
5	0.417	515.647	0.377
6	0.500	618.777	0.243
7	0.583	721.906	0.147
8	0.667	825.035	0.129
		Sum = 100.000	Sum= 9.786

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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
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	(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.07	0.040	( 0.457)	0.020	0.020
2	0.17	0.07	0.040	( 0.455)	0.020	0.020
3	0.25	0.07	0.040	( 0.454)	0.020	0.020
4	0.33	0.10	0.060	( 0.452)	0.030	0.030
5	0.42	0.10	0.060	( 0.450)	0.030	0.030
6	0.50	0.10	0.060	( 0.448)	0.030	0.030
7	0.58	0.10	0.060	( 0.447)	0.030	0.030
8	0.67	0.10	0.060	( 0.445)	0.030	0.030
9	0.75	0.10	0.060	( 0.443)	0.030	0.030
10	0.83	0.13	0.080	( 0.441)	0.040	0.040
11	0.92	0.13	0.080	( 0.440)	0.040	0.040
12	1.00	0.13	0.080	( 0.438)	0.040	0.040
13	1.08	0.10	0.060	( 0.436)	0.030	0.030
14	1.17	0.10	0.060	( 0.434)	0.030	0.030
15	1.25	0.10	0.060	( 0.433)	0.030	0.030
16	1.33	0.10	0.060	( 0.431)	0.030	0.030
17	1.42	0.10	0.060	( 0.429)	0.030	0.030
18	1.50	0.10	0.060	( 0.428)	0.030	0.030
19	1.58	0.10	0.060	( 0.426)	0.030	0.030
20	1.67	0.10	0.060	( 0.424)	0.030	0.030
21	1.75	0.10	0.060	( 0.422)	0.030	0.030
22	1.83	0.13	0.080	( 0.421)	0.040	0.040
23	1.92	0.13	0.080	( 0.419)	0.040	0.040
24	2.00	0.13	0.080	( 0.417)	0.040	0.040
25	2.08	0.13	0.080	( 0.416)	0.040	0.040
26	2.17	0.13	0.080	( 0.414)	0.040	0.040
27	2.25	0.13	0.080	( 0.412)	0.040	0.040
28	2.33	0.13	0.080	( 0.411)	0.040	0.040
29	2.42	0.13	0.080	( 0.409)	0.040	0.040
30	2.50	0.13	0.080	( 0.407)	0.040	0.040
31	2.58	0.17	0.100	( 0.406)	0.050	0.050
32	2.67	0.17	0.100	( 0.404)	0.050	0.050
33	2.75	0.17	0.100	( 0.402)	0.050	0.050
34	2.83	0.17	0.100	( 0.401)	0.050	0.050
35	2.92	0.17	0.100	( 0.399)	0.050	0.050
36	3.00	0.17	0.100	( 0.397)	0.050	0.050
37	3.08	0.17	0.100	( 0.396)	0.050	0.050
38	3.17	0.17	0.100	( 0.394)	0.050	0.050
39	3.25	0.17	0.100	( 0.392)	0.050	0.050
40	3.33	0.17	0.100	( 0.391)	0.050	0.050
41	3.42	0.17	0.100	( 0.389)	0.050	0.050
42	3.50	0.17	0.100	( 0.388)	0.050	0.050
43	3.58	0.17	0.100	( 0.386)	0.050	0.050
44	3.67	0.17	0.100	( 0.384)	0.050	0.050
45	3.75	0.17	0.100	( 0.383)	0.050	0.050
46	3.83	0.20	0.120	( 0.381)	0.060	0.060
47	3.92	0.20	0.120	( 0.379)	0.060	0.060
48	4.00	0.20	0.120	( 0.378)	0.060	0.060
49	4.08	0.20	0.120	( 0.376)	0.060	0.060
50	4.17	0.20	0.120	( 0.375)	0.060	0.060
51	4.25	0.20	0.120	( 0.373)	0.060	0.060
52	4.33	0.23	0.140	( 0.371)	0.070	0.070
53	4.42	0.23	0.140	( 0.370)	0.070	0.070
54	4.50	0.23	0.140	( 0.368)	0.070	0.070
55	4.58	0.23	0.140	( 0.367)	0.070	0.070
56	4.67	0.23	0.140	( 0.365)	0.070	0.070

57	4.75	0.23	0.140	( 0.364)	0.070	0.070
58	4.83	0.27	0.160	( 0.362)	0.080	0.080
59	4.92	0.27	0.160	( 0.360)	0.080	0.080
60	5.00	0.27	0.160	( 0.359)	0.080	0.080
61	5.08	0.20	0.120	( 0.357)	0.060	0.060
62	5.17	0.20	0.120	( 0.356)	0.060	0.060
63	5.25	0.20	0.120	( 0.354)	0.060	0.060
64	5.33	0.23	0.140	( 0.353)	0.070	0.070
65	5.42	0.23	0.140	( 0.351)	0.070	0.070
66	5.50	0.23	0.140	( 0.350)	0.070	0.070
67	5.58	0.27	0.160	( 0.348)	0.080	0.080
68	5.67	0.27	0.160	( 0.347)	0.080	0.080
69	5.75	0.27	0.160	( 0.345)	0.080	0.080
70	5.83	0.27	0.160	( 0.343)	0.080	0.080
71	5.92	0.27	0.160	( 0.342)	0.080	0.080
72	6.00	0.27	0.160	( 0.340)	0.080	0.080
73	6.08	0.30	0.180	( 0.339)	0.090	0.090
74	6.17	0.30	0.180	( 0.337)	0.090	0.090
75	6.25	0.30	0.180	( 0.336)	0.090	0.090
76	6.33	0.30	0.180	( 0.334)	0.090	0.090
77	6.42	0.30	0.180	( 0.333)	0.090	0.090
78	6.50	0.30	0.180	( 0.331)	0.090	0.090
79	6.58	0.33	0.200	( 0.330)	0.100	0.100
80	6.67	0.33	0.200	( 0.328)	0.100	0.100
81	6.75	0.33	0.200	( 0.327)	0.100	0.100
82	6.83	0.33	0.200	( 0.325)	0.100	0.100
83	6.92	0.33	0.200	( 0.324)	0.100	0.100
84	7.00	0.33	0.200	( 0.323)	0.100	0.100
85	7.08	0.33	0.200	( 0.321)	0.100	0.100
86	7.17	0.33	0.200	( 0.320)	0.100	0.100
87	7.25	0.33	0.200	( 0.318)	0.100	0.100
88	7.33	0.37	0.220	( 0.317)	0.110	0.110
89	7.42	0.37	0.220	( 0.315)	0.110	0.110
90	7.50	0.37	0.220	( 0.314)	0.110	0.110
91	7.58	0.40	0.240	( 0.312)	0.120	0.120
92	7.67	0.40	0.240	( 0.311)	0.120	0.120
93	7.75	0.40	0.240	( 0.309)	0.120	0.120
94	7.83	0.43	0.260	( 0.308)	0.130	0.130
95	7.92	0.43	0.260	( 0.307)	0.130	0.130
96	8.00	0.43	0.260	( 0.305)	0.130	0.130
97	8.08	0.50	0.300	( 0.304)	0.150	0.150
98	8.17	0.50	0.300	( 0.302)	0.150	0.150
99	8.25	0.50	0.300	( 0.301)	0.150	0.150
100	8.33	0.50	0.300	( 0.300)	0.150	0.150
101	8.42	0.50	0.300	( 0.298)	0.150	0.150
102	8.50	0.50	0.300	( 0.297)	0.150	0.150
103	8.58	0.53	0.320	( 0.295)	0.160	0.160
104	8.67	0.53	0.320	( 0.294)	0.160	0.160
105	8.75	0.53	0.320	( 0.293)	0.160	0.160
106	8.83	0.57	0.340	( 0.291)	0.170	0.170
107	8.92	0.57	0.340	( 0.290)	0.170	0.170
108	9.00	0.57	0.340	( 0.288)	0.170	0.170
109	9.08	0.63	0.380	( 0.287)	0.190	0.190
110	9.17	0.63	0.380	( 0.286)	0.190	0.190
111	9.25	0.63	0.380	( 0.284)	0.190	0.190
112	9.33	0.67	0.400	( 0.283)	0.200	0.200
113	9.42	0.67	0.400	( 0.282)	0.200	0.200

114	9.50	0.67	0.400	( 0.280)	0.200	0.200
115	9.58	0.70	0.420	( 0.279)	0.210	0.210
116	9.67	0.70	0.420	( 0.278)	0.210	0.210
117	9.75	0.70	0.420	( 0.276)	0.210	0.210
118	9.83	0.73	0.440	( 0.275)	0.220	0.220
119	9.92	0.73	0.440	( 0.274)	0.220	0.220
120	10.00	0.73	0.440	( 0.272)	0.220	0.220
121	10.08	0.50	0.300	( 0.271)	0.150	0.150
122	10.17	0.50	0.300	( 0.270)	0.150	0.150
123	10.25	0.50	0.300	( 0.268)	0.150	0.150
124	10.33	0.50	0.300	( 0.267)	0.150	0.150
125	10.42	0.50	0.300	( 0.266)	0.150	0.150
126	10.50	0.50	0.300	( 0.265)	0.150	0.150
127	10.58	0.67	0.400	( 0.263)	0.200	0.200
128	10.67	0.67	0.400	( 0.262)	0.200	0.200
129	10.75	0.67	0.400	( 0.261)	0.200	0.200
130	10.83	0.67	0.400	( 0.259)	0.200	0.200
131	10.92	0.67	0.400	( 0.258)	0.200	0.200
132	11.00	0.67	0.400	( 0.257)	0.200	0.200
133	11.08	0.63	0.380	( 0.256)	0.190	0.190
134	11.17	0.63	0.380	( 0.254)	0.190	0.190
135	11.25	0.63	0.380	( 0.253)	0.190	0.190
136	11.33	0.63	0.380	( 0.252)	0.190	0.190
137	11.42	0.63	0.380	( 0.251)	0.190	0.190
138	11.50	0.63	0.380	( 0.249)	0.190	0.190
139	11.58	0.57	0.340	( 0.248)	0.170	0.170
140	11.67	0.57	0.340	( 0.247)	0.170	0.170
141	11.75	0.57	0.340	( 0.246)	0.170	0.170
142	11.83	0.60	0.360	( 0.244)	0.180	0.180
143	11.92	0.60	0.360	( 0.243)	0.180	0.180
144	12.00	0.60	0.360	( 0.242)	0.180	0.180
145	12.08	0.83	0.500	0.241 ( 0.250)	0.259	0.259
146	12.17	0.83	0.500	0.240 ( 0.250)	0.260	0.260
147	12.25	0.83	0.500	0.238 ( 0.250)	0.262	0.262
148	12.33	0.87	0.520	0.237 ( 0.260)	0.283	0.283
149	12.42	0.87	0.520	0.236 ( 0.260)	0.284	0.284
150	12.50	0.87	0.520	0.235 ( 0.260)	0.285	0.285
151	12.58	0.93	0.560	0.234 ( 0.280)	0.326	0.326
152	12.67	0.93	0.560	0.232 ( 0.280)	0.328	0.328
153	12.75	0.93	0.560	0.231 ( 0.280)	0.329	0.329
154	12.83	0.97	0.580	0.230 ( 0.290)	0.350	0.350
155	12.92	0.97	0.580	0.229 ( 0.290)	0.351	0.351
156	13.00	0.97	0.580	0.228 ( 0.290)	0.352	0.352
157	13.08	1.13	0.680	0.227 ( 0.340)	0.453	0.453
158	13.17	1.13	0.680	0.225 ( 0.340)	0.455	0.455
159	13.25	1.13	0.680	0.224 ( 0.340)	0.456	0.456
160	13.33	1.13	0.680	0.223 ( 0.340)	0.457	0.457
161	13.42	1.13	0.680	0.222 ( 0.340)	0.458	0.458
162	13.50	1.13	0.680	0.221 ( 0.340)	0.459	0.459
163	13.58	0.77	0.460	0.220 ( 0.230)	0.240	0.240
164	13.67	0.77	0.460	0.219 ( 0.230)	0.241	0.241
165	13.75	0.77	0.460	0.218 ( 0.230)	0.242	0.242
166	13.83	0.77	0.460	0.216 ( 0.230)	0.244	0.244
167	13.92	0.77	0.460	0.215 ( 0.230)	0.245	0.245
168	14.00	0.77	0.460	0.214 ( 0.230)	0.246	0.246
169	14.08	0.90	0.540	0.213 ( 0.270)	0.327	0.327
170	14.17	0.90	0.540	0.212 ( 0.270)	0.328	0.328

171	14.25	0.90	0.540	0.211	( 0.270)	0.329
172	14.33	0.87	0.520	0.210	( 0.260)	0.310
173	14.42	0.87	0.520	0.209	( 0.260)	0.311
174	14.50	0.87	0.520	0.208	( 0.260)	0.312
175	14.58	0.87	0.520	0.207	( 0.260)	0.313
176	14.67	0.87	0.520	0.206	( 0.260)	0.314
177	14.75	0.87	0.520	0.205	( 0.260)	0.315
178	14.83	0.83	0.500	0.204	( 0.250)	0.296
179	14.92	0.83	0.500	0.202	( 0.250)	0.298
180	15.00	0.83	0.500	0.201	( 0.250)	0.299
181	15.08	0.80	0.480	0.200	( 0.240)	0.280
182	15.17	0.80	0.480	0.199	( 0.240)	0.281
183	15.25	0.80	0.480	0.198	( 0.240)	0.282
184	15.33	0.77	0.460	0.197	( 0.230)	0.263
185	15.42	0.77	0.460	0.196	( 0.230)	0.264
186	15.50	0.77	0.460	0.195	( 0.230)	0.265
187	15.58	0.63	0.380	( 0.194)	0.190	0.190
188	15.67	0.63	0.380	( 0.193)	0.190	0.190
189	15.75	0.63	0.380	( 0.192)	0.190	0.190
190	15.83	0.63	0.380	( 0.191)	0.190	0.190
191	15.92	0.63	0.380	( 0.190)	0.190	0.190
192	16.00	0.63	0.380	0.189	( 0.190)	0.191
193	16.08	0.13	0.080	( 0.188)	0.040	0.040
194	16.17	0.13	0.080	( 0.187)	0.040	0.040
195	16.25	0.13	0.080	( 0.187)	0.040	0.040
196	16.33	0.13	0.080	( 0.186)	0.040	0.040
197	16.42	0.13	0.080	( 0.185)	0.040	0.040
198	16.50	0.13	0.080	( 0.184)	0.040	0.040
199	16.58	0.10	0.060	( 0.183)	0.030	0.030
200	16.67	0.10	0.060	( 0.182)	0.030	0.030
201	16.75	0.10	0.060	( 0.181)	0.030	0.030
202	16.83	0.10	0.060	( 0.180)	0.030	0.030
203	16.92	0.10	0.060	( 0.179)	0.030	0.030
204	17.00	0.10	0.060	( 0.178)	0.030	0.030
205	17.08	0.17	0.100	( 0.177)	0.050	0.050
206	17.17	0.17	0.100	( 0.176)	0.050	0.050
207	17.25	0.17	0.100	( 0.175)	0.050	0.050
208	17.33	0.17	0.100	( 0.175)	0.050	0.050
209	17.42	0.17	0.100	( 0.174)	0.050	0.050
210	17.50	0.17	0.100	( 0.173)	0.050	0.050
211	17.58	0.17	0.100	( 0.172)	0.050	0.050
212	17.67	0.17	0.100	( 0.171)	0.050	0.050
213	17.75	0.17	0.100	( 0.170)	0.050	0.050
214	17.83	0.13	0.080	( 0.169)	0.040	0.040
215	17.92	0.13	0.080	( 0.169)	0.040	0.040
216	18.00	0.13	0.080	( 0.168)	0.040	0.040
217	18.08	0.13	0.080	( 0.167)	0.040	0.040
218	18.17	0.13	0.080	( 0.166)	0.040	0.040
219	18.25	0.13	0.080	( 0.165)	0.040	0.040
220	18.33	0.13	0.080	( 0.164)	0.040	0.040
221	18.42	0.13	0.080	( 0.164)	0.040	0.040
222	18.50	0.13	0.080	( 0.163)	0.040	0.040
223	18.58	0.10	0.060	( 0.162)	0.030	0.030
224	18.67	0.10	0.060	( 0.161)	0.030	0.030
225	18.75	0.10	0.060	( 0.161)	0.030	0.030
226	18.83	0.07	0.040	( 0.160)	0.020	0.020
227	18.92	0.07	0.040	( 0.159)	0.020	0.020

228	19.00	0.07	0.040	( 0.158)	0.020	0.020
229	19.08	0.10	0.060	( 0.158)	0.030	0.030
230	19.17	0.10	0.060	( 0.157)	0.030	0.030
231	19.25	0.10	0.060	( 0.156)	0.030	0.030
232	19.33	0.13	0.080	( 0.155)	0.040	0.040
233	19.42	0.13	0.080	( 0.155)	0.040	0.040
234	19.50	0.13	0.080	( 0.154)	0.040	0.040
235	19.58	0.10	0.060	( 0.153)	0.030	0.030
236	19.67	0.10	0.060	( 0.152)	0.030	0.030
237	19.75	0.10	0.060	( 0.152)	0.030	0.030
238	19.83	0.07	0.040	( 0.151)	0.020	0.020
239	19.92	0.07	0.040	( 0.150)	0.020	0.020
240	20.00	0.07	0.040	( 0.150)	0.020	0.020
241	20.08	0.10	0.060	( 0.149)	0.030	0.030
242	20.17	0.10	0.060	( 0.148)	0.030	0.030
243	20.25	0.10	0.060	( 0.148)	0.030	0.030
244	20.33	0.10	0.060	( 0.147)	0.030	0.030
245	20.42	0.10	0.060	( 0.147)	0.030	0.030
246	20.50	0.10	0.060	( 0.146)	0.030	0.030
247	20.58	0.10	0.060	( 0.145)	0.030	0.030
248	20.67	0.10	0.060	( 0.145)	0.030	0.030
249	20.75	0.10	0.060	( 0.144)	0.030	0.030
250	20.83	0.07	0.040	( 0.143)	0.020	0.020
251	20.92	0.07	0.040	( 0.143)	0.020	0.020
252	21.00	0.07	0.040	( 0.142)	0.020	0.020
253	21.08	0.10	0.060	( 0.142)	0.030	0.030
254	21.17	0.10	0.060	( 0.141)	0.030	0.030
255	21.25	0.10	0.060	( 0.141)	0.030	0.030
256	21.33	0.07	0.040	( 0.140)	0.020	0.020
257	21.42	0.07	0.040	( 0.140)	0.020	0.020
258	21.50	0.07	0.040	( 0.139)	0.020	0.020
259	21.58	0.10	0.060	( 0.139)	0.030	0.030
260	21.67	0.10	0.060	( 0.138)	0.030	0.030
261	21.75	0.10	0.060	( 0.138)	0.030	0.030
262	21.83	0.07	0.040	( 0.137)	0.020	0.020
263	21.92	0.07	0.040	( 0.137)	0.020	0.020
264	22.00	0.07	0.040	( 0.136)	0.020	0.020
265	22.08	0.10	0.060	( 0.136)	0.030	0.030
266	22.17	0.10	0.060	( 0.135)	0.030	0.030
267	22.25	0.10	0.060	( 0.135)	0.030	0.030
268	22.33	0.07	0.040	( 0.134)	0.020	0.020
269	22.42	0.07	0.040	( 0.134)	0.020	0.020
270	22.50	0.07	0.040	( 0.134)	0.020	0.020
271	22.58	0.07	0.040	( 0.133)	0.020	0.020
272	22.67	0.07	0.040	( 0.133)	0.020	0.020
273	22.75	0.07	0.040	( 0.133)	0.020	0.020
274	22.83	0.07	0.040	( 0.132)	0.020	0.020
275	22.92	0.07	0.040	( 0.132)	0.020	0.020
276	23.00	0.07	0.040	( 0.131)	0.020	0.020
277	23.08	0.07	0.040	( 0.131)	0.020	0.020
278	23.17	0.07	0.040	( 0.131)	0.020	0.020
279	23.25	0.07	0.040	( 0.131)	0.020	0.020
280	23.33	0.07	0.040	( 0.130)	0.020	0.020
281	23.42	0.07	0.040	( 0.130)	0.020	0.020
282	23.50	0.07	0.040	( 0.130)	0.020	0.020
283	23.58	0.07	0.040	( 0.130)	0.020	0.020



2+40	0.0688	0.46	Q
2+45	0.0721	0.47	Q
2+50	0.0754	0.48	Q
2+55	0.0787	0.48	Q
3+ 0	0.0821	0.49	Q
3+ 5	0.0854	0.49	Q
3+10	0.0888	0.49	Q
3+15	0.0922	0.49	Q
3+20	0.0956	0.49	Q
3+25	0.0989	0.49	Q
3+30	0.1023	0.49	Q
3+35	0.1057	0.49	Q
3+40	0.1090	0.49	QV
3+45	0.1124	0.49	QV
3+50	0.1159	0.51	Q
3+55	0.1198	0.56	Q
4+ 0	0.1237	0.57	Q
4+ 5	0.1277	0.58	Q
4+10	0.1317	0.58	Q
4+15	0.1357	0.58	Q
4+20	0.1399	0.61	Q
4+25	0.1444	0.65	Q
4+30	0.1490	0.67	Q
4+35	0.1537	0.68	Q
4+40	0.1584	0.68	Q
4+45	0.1631	0.68	QV
4+50	0.1679	0.70	QV
4+55	0.1731	0.75	Q
5+ 0	0.1784	0.77	Q
5+ 5	0.1834	0.73	QV
5+10	0.1879	0.64	QV
5+15	0.1921	0.62	QV
5+20	0.1964	0.62	QV
5+25	0.2010	0.67	QV
5+30	0.2056	0.68	QV
5+35	0.2104	0.70	QV
5+40	0.2156	0.75	QV
5+45	0.2209	0.76	QV
5+50	0.2262	0.77	QV
5+55	0.2315	0.78	QV
6+ 0	0.2369	0.78	QV
6+ 5	0.2424	0.80	QV
6+10	0.2483	0.85	QV
6+15	0.2543	0.87	QV
6+20	0.2603	0.87	QV
6+25	0.2663	0.88	QV
6+30	0.2723	0.88	Q V
6+35	0.2785	0.90	Q V
6+40	0.2851	0.95	Q V
6+45	0.2917	0.96	Q V
6+50	0.2984	0.97	Q V
6+55	0.3051	0.97	Q V
7+ 0	0.3118	0.98	Q V
7+ 5	0.3186	0.98	Q V
7+10	0.3253	0.98	Q V
7+15	0.3320	0.98	Q V
7+20	0.3389	1.00	Q V

7+25	0.3461	1.05	Q	V			
7+30	0.3534	1.06	Q	V			
7+35	0.3609	1.09	Q	V			
7+40	0.3688	1.14	Q	V			
7+45	0.3767	1.16	Q	V			
7+50	0.3849	1.18	Q	V			
7+55	0.3934	1.24	Q	V			
8+ 0	0.4021	1.25	Q	V			
8+ 5	0.4110	1.30	Q	V			
8+10	0.4207	1.40	Q	V			
8+15	0.4306	1.43	Q	V			
8+20	0.4405	1.45	Q	V			
8+25	0.4506	1.46	Q	V			
8+30	0.4607	1.46	Q	V			
8+35	0.4709	1.49	Q	V			
8+40	0.4815	1.54	Q	V			
8+45	0.4921	1.55	Q	V			
8+50	0.5030	1.58	Q	V			
8+55	0.5142	1.63	Q	V			
9+ 0	0.5256	1.65	Q	V			
9+ 5	0.5372	1.69	Q	V			
9+10	0.5496	1.79	Q	V			
9+15	0.5622	1.83	Q	V			
9+20	0.5750	1.86	Q	V			
9+25	0.5882	1.92	Q	V			
9+30	0.6015	1.94	Q	V			
9+35	0.6151	1.97	Q	V			
9+40	0.6290	2.02	Q	V			
9+45	0.6430	2.04	Q	V			
9+50	0.6572	2.07	Q	V			
9+55	0.6718	2.12	Q	V			
10+ 0	0.6865	2.14	Q	V			
10+ 5	0.7003	2.01	Q	V			
10+10	0.7119	1.68	Q	V			
10+15	0.7227	1.58	Q	V			
10+20	0.7333	1.53	Q	V			
10+25	0.7436	1.50	Q	V			
10+30	0.7539	1.49	Q	V			
10+35	0.7647	1.58	Q	V			
10+40	0.7772	1.81	Q	V			
10+45	0.7901	1.88	Q	V			
10+50	0.8033	1.91	Q	V			
10+55	0.8166	1.93	Q	V			
11+ 0	0.8300	1.94	Q	V			
11+ 5	0.8433	1.93	Q	V			
11+10	0.8563	1.89	Q	V			
11+15	0.8692	1.88	Q	V			
11+20	0.8821	1.87	Q	V			
11+25	0.8950	1.87	Q	V			
11+30	0.9078	1.86	Q	V			
11+35	0.9203	1.82	Q	V			
11+40	0.9322	1.73	Q	V			
11+45	0.9439	1.70	Q	V			
11+50	0.9556	1.70	Q	V			
11+55	0.9676	1.74	Q	V			
12+ 0	0.9797	1.75	Q	V			
12+ 5	0.9929	1.91	Q	V			

12+10	1.0087	2.29		Q		V		
12+15	1.0253	2.42		Q		V		
12+20	1.0427	2.53		Q		V		
12+25	1.0611	2.66		Q		V		
12+30	1.0798	2.72		Q		V		
12+35	1.0994	2.84		Q		V		
12+40	1.1204	3.06		Q		V		
12+45	1.1420	3.13		Q		V		
12+50	1.1641	3.21		Q		V		
12+55	1.1871	3.34		Q		V		
13+ 0	1.2105	3.39		Q		V		
13+ 5	1.2354	3.62		Q		V		
13+10	1.2638	4.12		Q		V		
13+15	1.2933	4.28		Q		V		
13+20	1.3233	4.36		Q		V		
13+25	1.3537	4.42		Q		V		
13+30	1.3844	4.45		Q		V		
13+35	1.4122	4.04		Q		V		
13+40	1.4330	3.02		Q		V		
13+45	1.4516	2.70		Q		V		
13+50	1.4693	2.57		Q		V		
13+55	1.4865	2.49		Q		V		
14+ 0	1.5034	2.45		Q		V		
14+ 5	1.5212	2.59		Q		V		
14+10	1.5415	2.95		Q		V		
14+15	1.5627	3.08		Q		V		
14+20	1.5841	3.11		Q		V		
14+25	1.6051	3.05		Q		V		
14+30	1.6261	3.05		Q		V		
14+35	1.6472	3.06		Q		V		
14+40	1.6684	3.07		Q		V		
14+45	1.6896	3.08		Q		V		
14+50	1.7106	3.05		Q		V		
14+55	1.7309	2.96		Q		V		
15+ 0	1.7512	2.94		Q		V		
15+ 5	1.7711	2.90		Q		V		
15+10	1.7905	2.80		Q		V		
15+15	1.8096	2.78		Q		V		
15+20	1.8284	2.73		Q		V		
15+25	1.8466	2.64		Q		V		
15+30	1.8646	2.61		Q		V		
15+35	1.8815	2.46		Q		V		
15+40	1.8960	2.10		Q		V		
15+45	1.9096	1.98		Q		V		
15+50	1.9229	1.93		Q		V		
15+55	1.9360	1.90		Q		V		
16+ 0	1.9489	1.88		Q		V		
16+ 5	1.9598	1.58		Q		V		
16+10	1.9656	0.85		Q		V		
16+15	1.9700	0.63	Q	Q		V		
16+20	1.9736	0.53	Q	Q		V		
16+25	1.9768	0.47	Q	Q		V		
16+30	1.9798	0.43	Q	Q		V		
16+35	1.9825	0.39	Q	Q		V		
16+40	1.9847	0.32	Q	Q		V		
16+45	1.9869	0.31	Q	Q		V		
16+50	1.9890	0.30	Q	Q		V		

16+55	1.9910	0.30	Q	V
17+ 0	1.9931	0.30	Q	V
17+ 5	1.9954	0.33	Q	V
17+10	1.9983	0.43	Q	V
17+15	2.0015	0.46	Q	V
17+20	2.0047	0.47	Q	V
17+25	2.0080	0.48	Q	V
17+30	2.0113	0.48	Q	V
17+35	2.0147	0.49	Q	V
17+40	2.0181	0.49	Q	V
17+45	2.0214	0.49	Q	V
17+50	2.0247	0.47	Q	V
17+55	2.0276	0.42	Q	V
18+ 0	2.0304	0.41	Q	V
18+ 5	2.0332	0.40	Q	V
18+10	2.0359	0.40	Q	V
18+15	2.0386	0.39	Q	V
18+20	2.0413	0.39	Q	V
18+25	2.0440	0.39	Q	V
18+30	2.0467	0.39	Q	V
18+35	2.0493	0.37	Q	V
18+40	2.0515	0.32	Q	V
18+45	2.0536	0.31	Q	V
18+50	2.0556	0.28	Q	V
18+55	2.0572	0.23	Q	V
19+ 0	2.0586	0.21	Q	V
19+ 5	2.0602	0.23	Q	V
19+10	2.0620	0.27	Q	V
19+15	2.0640	0.28	Q	V
19+20	2.0661	0.31	Q	V
19+25	2.0685	0.36	Q	V
19+30	2.0711	0.37	Q	V
19+35	2.0736	0.36	Q	V
19+40	2.0758	0.32	Q	V
19+45	2.0779	0.31	Q	V
19+50	2.0798	0.28	Q	V
19+55	2.0814	0.23	Q	V
20+ 0	2.0829	0.21	Q	V
20+ 5	2.0845	0.23	Q	V
20+10	2.0863	0.27	Q	V
20+15	2.0883	0.28	Q	V
20+20	2.0902	0.29	Q	V
20+25	2.0922	0.29	Q	V
20+30	2.0942	0.29	Q	V
20+35	2.0962	0.29	Q	V
20+40	2.0983	0.29	Q	V
20+45	2.1003	0.29	Q	V
20+50	2.1022	0.27	Q	V
20+55	2.1037	0.23	Q	V
21+ 0	2.1052	0.21	Q	V
21+ 5	2.1067	0.22	Q	V
21+10	2.1086	0.27	Q	V
21+15	2.1105	0.28	Q	V
21+20	2.1123	0.27	Q	V
21+25	2.1139	0.22	Q	V
21+30	2.1153	0.21	Q	V
21+35	2.1168	0.22	Q	V

21+40	2.1187	0.27	Q				V
21+45	2.1206	0.28	Q				V
21+50	2.1225	0.27	Q				V
21+55	2.1240	0.22	Q				V
22+ 0	2.1254	0.21	Q				V
22+ 5	2.1270	0.22	Q				V
22+10	2.1288	0.27	Q				V
22+15	2.1307	0.28	Q				V
22+20	2.1326	0.27	Q				V
22+25	2.1341	0.22	Q				V
22+30	2.1355	0.21	Q				V
22+35	2.1369	0.20	Q				V
22+40	2.1383	0.20	Q				V
22+45	2.1397	0.20	Q				V
22+50	2.1410	0.20	Q				V
22+55	2.1424	0.20	Q				V
23+ 0	2.1437	0.20	Q				V
23+ 5	2.1451	0.20	Q				V
23+10	2.1464	0.20	Q				V
23+15	2.1478	0.20	Q				V
23+20	2.1491	0.20	Q				V
23+25	2.1505	0.20	Q				V
23+30	2.1518	0.20	Q				V
23+35	2.1532	0.20	Q				V
23+40	2.1545	0.20	Q				V
23+45	2.1559	0.20	Q				V
23+50	2.1572	0.20	Q				V
23+55	2.1586	0.20	Q				V
24+ 0	2.1599	0.20	Q				V
24+ 5	2.1610	0.16	Q				V
24+10	2.1614	0.06	Q				V
24+15	2.1616	0.03	Q				V
24+20	2.1618	0.02	Q				V
24+25	2.1618	0.01	Q				V
24+30	2.1619	0.01	Q				V
24+35	2.1619	0.00	Q				V

Unit Hydrograph Analysis

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Study date 10/02/24 File: q100uhbx724100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED B  
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) =  
0.012 Sq. Mi.  
Length along longest watercourse = 864.00(Ft.)  
Length along longest watercourse measured to centroid = 584.00(Ft.)  
Length along longest watercourse = 0.164 Mi.  
Length along longest watercourse measured to centroid = 0.111 Mi.  
Difference in elevation = 13.90(Ft.)  
Slope along watercourse = 84.9444 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.067 Hr.  
Lag time = 4.04 Min.  
25% of lag time = 1.01 Min.  
40% of lag time = 1.62 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.80	13.57

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   7.54                    5.00                    37.70

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.800(In)  
 Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   7.540            69.78            0.500  
 Total Area Entered = 7.54(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
						Sum (F) = 0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200  
 Minimum soil loss rate ((In/Hr)) = 0.100  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

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 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	1.994
2	0.167	247.253	3.692
3	0.250	370.880	0.988
4	0.333	494.506	0.445
5	0.417	618.133	0.248
6	0.500	741.759	0.139
7	0.583	865.386	0.092
		Sum = 100.000	Sum= 7.599

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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.040	( 0.355)    0.020	0.020
2	0.17	0.040	( 0.354)    0.020	0.020

3	0.25	0.07	0.040	( 0.353)	0.020	0.020
4	0.33	0.10	0.060	( 0.351)	0.030	0.030
5	0.42	0.10	0.060	( 0.350)	0.030	0.030
6	0.50	0.10	0.060	( 0.348)	0.030	0.030
7	0.58	0.10	0.060	( 0.347)	0.030	0.030
8	0.67	0.10	0.060	( 0.346)	0.030	0.030
9	0.75	0.10	0.060	( 0.344)	0.030	0.030
10	0.83	0.13	0.080	( 0.343)	0.040	0.040
11	0.92	0.13	0.080	( 0.342)	0.040	0.040
12	1.00	0.13	0.080	( 0.340)	0.040	0.040
13	1.08	0.10	0.060	( 0.339)	0.030	0.030
14	1.17	0.10	0.060	( 0.338)	0.030	0.030
15	1.25	0.10	0.060	( 0.336)	0.030	0.030
16	1.33	0.10	0.060	( 0.335)	0.030	0.030
17	1.42	0.10	0.060	( 0.334)	0.030	0.030
18	1.50	0.10	0.060	( 0.332)	0.030	0.030
19	1.58	0.10	0.060	( 0.331)	0.030	0.030
20	1.67	0.10	0.060	( 0.330)	0.030	0.030
21	1.75	0.10	0.060	( 0.328)	0.030	0.030
22	1.83	0.13	0.080	( 0.327)	0.040	0.040
23	1.92	0.13	0.080	( 0.326)	0.040	0.040
24	2.00	0.13	0.080	( 0.324)	0.040	0.040
25	2.08	0.13	0.080	( 0.323)	0.040	0.040
26	2.17	0.13	0.080	( 0.322)	0.040	0.040
27	2.25	0.13	0.080	( 0.320)	0.040	0.040
28	2.33	0.13	0.080	( 0.319)	0.040	0.040
29	2.42	0.13	0.080	( 0.318)	0.040	0.040
30	2.50	0.13	0.080	( 0.317)	0.040	0.040
31	2.58	0.17	0.100	( 0.315)	0.050	0.050
32	2.67	0.17	0.100	( 0.314)	0.050	0.050
33	2.75	0.17	0.100	( 0.313)	0.050	0.050
34	2.83	0.17	0.100	( 0.311)	0.050	0.050
35	2.92	0.17	0.100	( 0.310)	0.050	0.050
36	3.00	0.17	0.100	( 0.309)	0.050	0.050
37	3.08	0.17	0.100	( 0.307)	0.050	0.050
38	3.17	0.17	0.100	( 0.306)	0.050	0.050
39	3.25	0.17	0.100	( 0.305)	0.050	0.050
40	3.33	0.17	0.100	( 0.304)	0.050	0.050
41	3.42	0.17	0.100	( 0.302)	0.050	0.050
42	3.50	0.17	0.100	( 0.301)	0.050	0.050
43	3.58	0.17	0.100	( 0.300)	0.050	0.050
44	3.67	0.17	0.100	( 0.299)	0.050	0.050
45	3.75	0.17	0.100	( 0.297)	0.050	0.050
46	3.83	0.20	0.120	( 0.296)	0.060	0.060
47	3.92	0.20	0.120	( 0.295)	0.060	0.060
48	4.00	0.20	0.120	( 0.294)	0.060	0.060
49	4.08	0.20	0.120	( 0.292)	0.060	0.060
50	4.17	0.20	0.120	( 0.291)	0.060	0.060
51	4.25	0.20	0.120	( 0.290)	0.060	0.060
52	4.33	0.23	0.140	( 0.289)	0.070	0.070
53	4.42	0.23	0.140	( 0.287)	0.070	0.070
54	4.50	0.23	0.140	( 0.286)	0.070	0.070
55	4.58	0.23	0.140	( 0.285)	0.070	0.070
56	4.67	0.23	0.140	( 0.284)	0.070	0.070
57	4.75	0.23	0.140	( 0.283)	0.070	0.070
58	4.83	0.27	0.160	( 0.281)	0.080	0.080
59	4.92	0.27	0.160	( 0.280)	0.080	0.080

60	5.00	0.27	0.160	( 0.279)	0.080	0.080
61	5.08	0.20	0.120	( 0.278)	0.060	0.060
62	5.17	0.20	0.120	( 0.276)	0.060	0.060
63	5.25	0.20	0.120	( 0.275)	0.060	0.060
64	5.33	0.23	0.140	( 0.274)	0.070	0.070
65	5.42	0.23	0.140	( 0.273)	0.070	0.070
66	5.50	0.23	0.140	( 0.272)	0.070	0.070
67	5.58	0.27	0.160	( 0.270)	0.080	0.080
68	5.67	0.27	0.160	( 0.269)	0.080	0.080
69	5.75	0.27	0.160	( 0.268)	0.080	0.080
70	5.83	0.27	0.160	( 0.267)	0.080	0.080
71	5.92	0.27	0.160	( 0.266)	0.080	0.080
72	6.00	0.27	0.160	( 0.265)	0.080	0.080
73	6.08	0.30	0.180	( 0.263)	0.090	0.090
74	6.17	0.30	0.180	( 0.262)	0.090	0.090
75	6.25	0.30	0.180	( 0.261)	0.090	0.090
76	6.33	0.30	0.180	( 0.260)	0.090	0.090
77	6.42	0.30	0.180	( 0.259)	0.090	0.090
78	6.50	0.30	0.180	( 0.258)	0.090	0.090
79	6.58	0.33	0.200	( 0.256)	0.100	0.100
80	6.67	0.33	0.200	( 0.255)	0.100	0.100
81	6.75	0.33	0.200	( 0.254)	0.100	0.100
82	6.83	0.33	0.200	( 0.253)	0.100	0.100
83	6.92	0.33	0.200	( 0.252)	0.100	0.100
84	7.00	0.33	0.200	( 0.251)	0.100	0.100
85	7.08	0.33	0.200	( 0.249)	0.100	0.100
86	7.17	0.33	0.200	( 0.248)	0.100	0.100
87	7.25	0.33	0.200	( 0.247)	0.100	0.100
88	7.33	0.37	0.220	( 0.246)	0.110	0.110
89	7.42	0.37	0.220	( 0.245)	0.110	0.110
90	7.50	0.37	0.220	( 0.244)	0.110	0.110
91	7.58	0.40	0.240	( 0.243)	0.120	0.120
92	7.67	0.40	0.240	( 0.242)	0.120	0.120
93	7.75	0.40	0.240	( 0.240)	0.120	0.120
94	7.83	0.43	0.260	( 0.239)	0.130	0.130
95	7.92	0.43	0.260	( 0.238)	0.130	0.130
96	8.00	0.43	0.260	( 0.237)	0.130	0.130
97	8.08	0.50	0.300	( 0.236)	0.150	0.150
98	8.17	0.50	0.300	( 0.235)	0.150	0.150
99	8.25	0.50	0.300	( 0.234)	0.150	0.150
100	8.33	0.50	0.300	( 0.233)	0.150	0.150
101	8.42	0.50	0.300	( 0.232)	0.150	0.150
102	8.50	0.50	0.300	( 0.231)	0.150	0.150
103	8.58	0.53	0.320	( 0.230)	0.160	0.160
104	8.67	0.53	0.320	( 0.228)	0.160	0.160
105	8.75	0.53	0.320	( 0.227)	0.160	0.160
106	8.83	0.57	0.340	( 0.226)	0.170	0.170
107	8.92	0.57	0.340	( 0.225)	0.170	0.170
108	9.00	0.57	0.340	( 0.224)	0.170	0.170
109	9.08	0.63	0.380	( 0.223)	0.190	0.190
110	9.17	0.63	0.380	( 0.222)	0.190	0.190
111	9.25	0.63	0.380	( 0.221)	0.190	0.190
112	9.33	0.67	0.400	( 0.220)	0.200	0.200
113	9.42	0.67	0.400	( 0.219)	0.200	0.200
114	9.50	0.67	0.400	( 0.218)	0.200	0.200
115	9.58	0.70	0.420	( 0.217)	0.210	0.210
116	9.67	0.70	0.420	( 0.216)	0.210	0.210

117	9.75	0.70	0.420	( 0.215)	0.210	0.210
118	9.83	0.73	0.440	0.214	( 0.220)	0.226
119	9.92	0.73	0.440	0.213	( 0.220)	0.227
120	10.00	0.73	0.440	0.212	( 0.220)	0.228
121	10.08	0.50	0.300	( 0.211)	0.150	0.150
122	10.17	0.50	0.300	( 0.210)	0.150	0.150
123	10.25	0.50	0.300	( 0.209)	0.150	0.150
124	10.33	0.50	0.300	( 0.208)	0.150	0.150
125	10.42	0.50	0.300	( 0.207)	0.150	0.150
126	10.50	0.50	0.300	( 0.206)	0.150	0.150
127	10.58	0.67	0.400	( 0.205)	0.200	0.200
128	10.67	0.67	0.400	( 0.204)	0.200	0.200
129	10.75	0.67	0.400	( 0.203)	0.200	0.200
130	10.83	0.67	0.400	( 0.202)	0.200	0.200
131	10.92	0.67	0.400	( 0.201)	0.200	0.200
132	11.00	0.67	0.400	0.200	( 0.200)	0.200
133	11.08	0.63	0.380	( 0.199)	0.190	0.190
134	11.17	0.63	0.380	( 0.198)	0.190	0.190
135	11.25	0.63	0.380	( 0.197)	0.190	0.190
136	11.33	0.63	0.380	( 0.196)	0.190	0.190
137	11.42	0.63	0.380	( 0.195)	0.190	0.190
138	11.50	0.63	0.380	( 0.194)	0.190	0.190
139	11.58	0.57	0.340	( 0.193)	0.170	0.170
140	11.67	0.57	0.340	( 0.192)	0.170	0.170
141	11.75	0.57	0.340	( 0.191)	0.170	0.170
142	11.83	0.60	0.360	( 0.190)	0.180	0.180
143	11.92	0.60	0.360	( 0.189)	0.180	0.180
144	12.00	0.60	0.360	( 0.188)	0.180	0.180
145	12.08	0.83	0.500	0.187	( 0.250)	0.313
146	12.17	0.83	0.500	0.186	( 0.250)	0.314
147	12.25	0.83	0.500	0.185	( 0.250)	0.315
148	12.33	0.87	0.520	0.184	( 0.260)	0.336
149	12.42	0.87	0.520	0.183	( 0.260)	0.337
150	12.50	0.87	0.520	0.182	( 0.260)	0.338
151	12.58	0.93	0.560	0.182	( 0.280)	0.378
152	12.67	0.93	0.560	0.181	( 0.280)	0.379
153	12.75	0.93	0.560	0.180	( 0.280)	0.380
154	12.83	0.97	0.580	0.179	( 0.290)	0.401
155	12.92	0.97	0.580	0.178	( 0.290)	0.402
156	13.00	0.97	0.580	0.177	( 0.290)	0.403
157	13.08	1.13	0.680	0.176	( 0.340)	0.504
158	13.17	1.13	0.680	0.175	( 0.340)	0.505
159	13.25	1.13	0.680	0.174	( 0.340)	0.506
160	13.33	1.13	0.680	0.173	( 0.340)	0.507
161	13.42	1.13	0.680	0.173	( 0.340)	0.507
162	13.50	1.13	0.680	0.172	( 0.340)	0.508
163	13.58	0.77	0.460	0.171	( 0.230)	0.289
164	13.67	0.77	0.460	0.170	( 0.230)	0.290
165	13.75	0.77	0.460	0.169	( 0.230)	0.291
166	13.83	0.77	0.460	0.168	( 0.230)	0.292
167	13.92	0.77	0.460	0.167	( 0.230)	0.293
168	14.00	0.77	0.460	0.166	( 0.230)	0.294
169	14.08	0.90	0.540	0.166	( 0.270)	0.374
170	14.17	0.90	0.540	0.165	( 0.270)	0.375
171	14.25	0.90	0.540	0.164	( 0.270)	0.376
172	14.33	0.87	0.520	0.163	( 0.260)	0.357
173	14.42	0.87	0.520	0.162	( 0.260)	0.358

174	14.50	0.87	0.520	0.161	( 0.260)	0.359
175	14.58	0.87	0.520	0.161	( 0.260)	0.359
176	14.67	0.87	0.520	0.160	( 0.260)	0.360
177	14.75	0.87	0.520	0.159	( 0.260)	0.361
178	14.83	0.83	0.500	0.158	( 0.250)	0.342
179	14.92	0.83	0.500	0.157	( 0.250)	0.343
180	15.00	0.83	0.500	0.157	( 0.250)	0.343
181	15.08	0.80	0.480	0.156	( 0.240)	0.324
182	15.17	0.80	0.480	0.155	( 0.240)	0.325
183	15.25	0.80	0.480	0.154	( 0.240)	0.326
184	15.33	0.77	0.460	0.153	( 0.230)	0.307
185	15.42	0.77	0.460	0.153	( 0.230)	0.307
186	15.50	0.77	0.460	0.152	( 0.230)	0.308
187	15.58	0.63	0.380	0.151	( 0.190)	0.229
188	15.67	0.63	0.380	0.150	( 0.190)	0.230
189	15.75	0.63	0.380	0.149	( 0.190)	0.231
190	15.83	0.63	0.380	0.149	( 0.190)	0.231
191	15.92	0.63	0.380	0.148	( 0.190)	0.232
192	16.00	0.63	0.380	0.147	( 0.190)	0.233
193	16.08	0.13	0.080	( 0.146)	0.040	0.040
194	16.17	0.13	0.080	( 0.146)	0.040	0.040
195	16.25	0.13	0.080	( 0.145)	0.040	0.040
196	16.33	0.13	0.080	( 0.144)	0.040	0.040
197	16.42	0.13	0.080	( 0.143)	0.040	0.040
198	16.50	0.13	0.080	( 0.143)	0.040	0.040
199	16.58	0.10	0.060	( 0.142)	0.030	0.030
200	16.67	0.10	0.060	( 0.141)	0.030	0.030
201	16.75	0.10	0.060	( 0.141)	0.030	0.030
202	16.83	0.10	0.060	( 0.140)	0.030	0.030
203	16.92	0.10	0.060	( 0.139)	0.030	0.030
204	17.00	0.10	0.060	( 0.138)	0.030	0.030
205	17.08	0.17	0.100	( 0.138)	0.050	0.050
206	17.17	0.17	0.100	( 0.137)	0.050	0.050
207	17.25	0.17	0.100	( 0.136)	0.050	0.050
208	17.33	0.17	0.100	( 0.136)	0.050	0.050
209	17.42	0.17	0.100	( 0.135)	0.050	0.050
210	17.50	0.17	0.100	( 0.134)	0.050	0.050
211	17.58	0.17	0.100	( 0.134)	0.050	0.050
212	17.67	0.17	0.100	( 0.133)	0.050	0.050
213	17.75	0.17	0.100	( 0.132)	0.050	0.050
214	17.83	0.13	0.080	( 0.132)	0.040	0.040
215	17.92	0.13	0.080	( 0.131)	0.040	0.040
216	18.00	0.13	0.080	( 0.130)	0.040	0.040
217	18.08	0.13	0.080	( 0.130)	0.040	0.040
218	18.17	0.13	0.080	( 0.129)	0.040	0.040
219	18.25	0.13	0.080	( 0.128)	0.040	0.040
220	18.33	0.13	0.080	( 0.128)	0.040	0.040
221	18.42	0.13	0.080	( 0.127)	0.040	0.040
222	18.50	0.13	0.080	( 0.127)	0.040	0.040
223	18.58	0.10	0.060	( 0.126)	0.030	0.030
224	18.67	0.10	0.060	( 0.125)	0.030	0.030
225	18.75	0.10	0.060	( 0.125)	0.030	0.030
226	18.83	0.07	0.040	( 0.124)	0.020	0.020
227	18.92	0.07	0.040	( 0.124)	0.020	0.020
228	19.00	0.07	0.040	( 0.123)	0.020	0.020
229	19.08	0.10	0.060	( 0.122)	0.030	0.030
230	19.17	0.10	0.060	( 0.122)	0.030	0.030

231	19.25	0.10	0.060	( 0.121)	0.030	0.030
232	19.33	0.13	0.080	( 0.121)	0.040	0.040
233	19.42	0.13	0.080	( 0.120)	0.040	0.040
234	19.50	0.13	0.080	( 0.120)	0.040	0.040
235	19.58	0.10	0.060	( 0.119)	0.030	0.030
236	19.67	0.10	0.060	( 0.118)	0.030	0.030
237	19.75	0.10	0.060	( 0.118)	0.030	0.030
238	19.83	0.07	0.040	( 0.117)	0.020	0.020
239	19.92	0.07	0.040	( 0.117)	0.020	0.020
240	20.00	0.07	0.040	( 0.116)	0.020	0.020
241	20.08	0.10	0.060	( 0.116)	0.030	0.030
242	20.17	0.10	0.060	( 0.115)	0.030	0.030
243	20.25	0.10	0.060	( 0.115)	0.030	0.030
244	20.33	0.10	0.060	( 0.114)	0.030	0.030
245	20.42	0.10	0.060	( 0.114)	0.030	0.030
246	20.50	0.10	0.060	( 0.113)	0.030	0.030
247	20.58	0.10	0.060	( 0.113)	0.030	0.030
248	20.67	0.10	0.060	( 0.112)	0.030	0.030
249	20.75	0.10	0.060	( 0.112)	0.030	0.030
250	20.83	0.07	0.040	( 0.112)	0.020	0.020
251	20.92	0.07	0.040	( 0.111)	0.020	0.020
252	21.00	0.07	0.040	( 0.111)	0.020	0.020
253	21.08	0.10	0.060	( 0.110)	0.030	0.030
254	21.17	0.10	0.060	( 0.110)	0.030	0.030
255	21.25	0.10	0.060	( 0.109)	0.030	0.030
256	21.33	0.07	0.040	( 0.109)	0.020	0.020
257	21.42	0.07	0.040	( 0.108)	0.020	0.020
258	21.50	0.07	0.040	( 0.108)	0.020	0.020
259	21.58	0.10	0.060	( 0.108)	0.030	0.030
260	21.67	0.10	0.060	( 0.107)	0.030	0.030
261	21.75	0.10	0.060	( 0.107)	0.030	0.030
262	21.83	0.07	0.040	( 0.107)	0.020	0.020
263	21.92	0.07	0.040	( 0.106)	0.020	0.020
264	22.00	0.07	0.040	( 0.106)	0.020	0.020
265	22.08	0.10	0.060	( 0.105)	0.030	0.030
266	22.17	0.10	0.060	( 0.105)	0.030	0.030
267	22.25	0.10	0.060	( 0.105)	0.030	0.030
268	22.33	0.07	0.040	( 0.104)	0.020	0.020
269	22.42	0.07	0.040	( 0.104)	0.020	0.020
270	22.50	0.07	0.040	( 0.104)	0.020	0.020
271	22.58	0.07	0.040	( 0.104)	0.020	0.020
272	22.67	0.07	0.040	( 0.103)	0.020	0.020
273	22.75	0.07	0.040	( 0.103)	0.020	0.020
274	22.83	0.07	0.040	( 0.103)	0.020	0.020
275	22.92	0.07	0.040	( 0.102)	0.020	0.020
276	23.00	0.07	0.040	( 0.102)	0.020	0.020
277	23.08	0.07	0.040	( 0.102)	0.020	0.020
278	23.17	0.07	0.040	( 0.102)	0.020	0.020
279	23.25	0.07	0.040	( 0.101)	0.020	0.020
280	23.33	0.07	0.040	( 0.101)	0.020	0.020
281	23.42	0.07	0.040	( 0.101)	0.020	0.020
282	23.50	0.07	0.040	( 0.101)	0.020	0.020
283	23.58	0.07	0.040	( 0.101)	0.020	0.020
284	23.67	0.07	0.040	( 0.101)	0.020	0.020
285	23.75	0.07	0.040	( 0.100)	0.020	0.020
286	23.83	0.07	0.040	( 0.100)	0.020	0.020
287	23.92	0.07	0.040	( 0.100)	0.020	0.020

288 24.00 0.07 0.040 ( 0.100) 0.020 0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 34.4

Flood volume = Effective rainfall 2.86(In)  
 times area 7.5(Ac.)/[ (In)/(Ft.) ] = 1.8(Ac.Ft)  
 Total soil loss = 2.14(In)  
 Total soil loss = 1.342(Ac.Ft)  
 Total rainfall = 5.00(In)  
 Flood volume = 78378.6 Cubic Feet  
 Total soil loss = 58470.4 Cubic Feet

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 Peak flow rate of this hydrograph = 3.847(CFS)  
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24 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h

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 Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0003	0.04	Q				
0+10	0.0011	0.11	Q				
0+15	0.0020	0.13	Q				
0+20	0.0031	0.16	Q				
0+25	0.0045	0.20	Q				
0+30	0.0060	0.22	Q				
0+35	0.0075	0.22	Q				
0+40	0.0091	0.23	Q				
0+45	0.0107	0.23	Q				
0+50	0.0124	0.25	Q				
0+55	0.0143	0.28	VQ				
1+ 0	0.0164	0.29	VQ				
1+ 5	0.0183	0.28	VQ				
1+10	0.0200	0.24	Q				
1+15	0.0216	0.24	Q				
1+20	0.0232	0.23	Q				
1+25	0.0248	0.23	Q				
1+30	0.0264	0.23	Q				
1+35	0.0279	0.23	Q				
1+40	0.0295	0.23	Q				
1+45	0.0311	0.23	Q				
1+50	0.0328	0.25	Q				
1+55	0.0347	0.28	VQ				
2+ 0	0.0368	0.29	VQ				
2+ 5	0.0388	0.30	VQ				
2+10	0.0409	0.30	VQ				
2+15	0.0430	0.30	VQ				
2+20	0.0451	0.30	Q				
2+25	0.0472	0.30	Q				
2+30	0.0493	0.30	Q				
2+35	0.0515	0.32	Q				
2+40	0.0540	0.36	Q				
2+45	0.0566	0.37	Q				
2+50	0.0591	0.38	Q				
2+55	0.0617	0.38	Q				

3+ 0	0.0644	0.38	Q
3+ 5	0.0670	0.38	Q
3+10	0.0696	0.38	Q
3+15	0.0722	0.38	Q
3+20	0.0748	0.38	Q
3+25	0.0774	0.38	Q
3+30	0.0801	0.38	Q
3+35	0.0827	0.38	Q
3+40	0.0853	0.38	Q
3+45	0.0879	0.38	Q
3+50	0.0907	0.40	QV
3+55	0.0937	0.44	QV
4+ 0	0.0968	0.45	QV
4+ 5	0.0999	0.45	QV
4+10	0.1030	0.45	QV
4+15	0.1061	0.46	QV
4+20	0.1094	0.48	QV
4+25	0.1129	0.51	Q
4+30	0.1165	0.52	Q
4+35	0.1202	0.53	Q
4+40	0.1238	0.53	Q
4+45	0.1275	0.53	Q
4+50	0.1313	0.55	Q
4+55	0.1353	0.59	QV
5+ 0	0.1395	0.60	QV
5+ 5	0.1434	0.56	QV
5+10	0.1467	0.49	Q V
5+15	0.1500	0.47	Q V
5+20	0.1534	0.49	Q V
5+25	0.1569	0.52	QV
5+30	0.1605	0.52	QV
5+35	0.1643	0.55	QV
5+40	0.1683	0.59	QV
5+45	0.1725	0.60	QV
5+50	0.1766	0.60	QV
5+55	0.1808	0.61	Q V
6+ 0	0.1850	0.61	Q V
6+ 5	0.1893	0.63	Q V
6+10	0.1939	0.67	Q V
6+15	0.1985	0.67	Q V
6+20	0.2032	0.68	Q V
6+25	0.2079	0.68	Q V
6+30	0.2126	0.68	Q V
6+35	0.2175	0.70	Q V
6+40	0.2226	0.74	Q V
6+45	0.2277	0.75	Q V
6+50	0.2329	0.76	Q V
6+55	0.2382	0.76	Q V
7+ 0	0.2434	0.76	Q V
7+ 5	0.2486	0.76	Q V
7+10	0.2539	0.76	Q V
7+15	0.2591	0.76	Q V
7+20	0.2645	0.78	Q V
7+25	0.2701	0.82	Q V
7+30	0.2758	0.83	Q V
7+35	0.2817	0.85	Q V
7+40	0.2878	0.89	Q V

7+45	0.2940	0.90	Q	V				
7+50	0.3004	0.93	Q	V				
7+55	0.3071	0.97	Q	V				
8+ 0	0.3138	0.98	Q	V				
8+ 5	0.3208	1.02	Q	V				
8+10	0.3284	1.10	Q	V				
8+15	0.3361	1.12	Q	V				
8+20	0.3439	1.13	Q	V				
8+25	0.3517	1.14	Q	V				
8+30	0.3596	1.14	Q	V				
8+35	0.3676	1.16	Q	V				
8+40	0.3758	1.20	Q	V				
8+45	0.3841	1.21	Q	V				
8+50	0.3926	1.23	Q	V				
8+55	0.4014	1.27	Q	V				
9+ 0	0.4102	1.28	Q	V				
9+ 5	0.4193	1.33	Q	V				
9+10	0.4290	1.40	Q	V				
9+15	0.4388	1.43	Q	V				
9+20	0.4488	1.45	Q	V				
9+25	0.4592	1.50	Q	V				
9+30	0.4696	1.51	Q	V				
9+35	0.4801	1.54	Q	V				
9+40	0.4910	1.58	Q	V				
9+45	0.5019	1.59	Q	V				
9+50	0.5131	1.62	Q	V				
9+55	0.5247	1.69	Q	V				
10+ 0	0.5365	1.71	Q	V				
10+ 5	0.5473	1.57	Q	V				
10+10	0.5562	1.29	Q	V				
10+15	0.5645	1.21	Q	V				
10+20	0.5726	1.18	Q	V				
10+25	0.5806	1.16	Q	V				
10+30	0.5885	1.15	Q	V				
10+35	0.5970	1.24	Q	V				
10+40	0.6069	1.42	Q	V				
10+45	0.6170	1.47	Q	V				
10+50	0.6273	1.50	Q	V				
10+55	0.6377	1.51	Q	V				
11+ 0	0.6482	1.52	Q	V				
11+ 5	0.6585	1.50	Q	V				
11+10	0.6686	1.46	Q	V				
11+15	0.6786	1.45	Q	V				
11+20	0.6886	1.45	Q	V				
11+25	0.6985	1.45	Q	V				
11+30	0.7085	1.45	Q	V				
11+35	0.7182	1.40	Q	V				
11+40	0.7273	1.33	Q	V				
11+45	0.7364	1.31	Q	V				
11+50	0.7455	1.32	Q	V				
11+55	0.7548	1.35	Q	V				
12+ 0	0.7642	1.36	Q	V				
12+ 5	0.7754	1.63	Q	V				
12+10	0.7900	2.12	Q	V				
12+15	0.8056	2.26	Q	V				
12+20	0.8219	2.37	Q	V				
12+25	0.8390	2.48	Q	V				

12+30	0.8564	2.53		Q	V		
12+35	0.8746	2.64		Q	V		
12+40	0.8938	2.79		Q	V		
12+45	0.9134	2.84		Q	V		
12+50	0.9334	2.91		Q	V		
12+55	0.9541	3.00		Q	V		
13+ 0	0.9750	3.03		Q	V		
13+ 5	0.9974	3.25		Q	V		
13+10	1.0224	3.63		Q	V		
13+15	1.0482	3.74		Q	V		
13+20	1.0743	3.80		Q	V		
13+25	1.1007	3.83		Q	V		
13+30	1.1272	3.85		Q	V		
13+35	1.1508	3.42		Q	V		
13+40	1.1688	2.62		Q	V		
13+45	1.1854	2.41		Q	V		
13+50	1.2013	2.32		Q	V		
13+55	1.2170	2.27		Q	V		
14+ 0	1.2324	2.24		Q	V		
14+ 5	1.2489	2.39		Q	V		
14+10	1.2674	2.69		Q	V		
14+15	1.2865	2.78		Q	V		
14+20	1.3057	2.78		Q	V		
14+25	1.3245	2.73		Q	V		
14+30	1.3433	2.73		Q	V		
14+35	1.3621	2.73		Q	V		
14+40	1.3810	2.74		Q	V		
14+45	1.3998	2.74		Q	V		
14+50	1.4185	2.70		Q	V		
14+55	1.4366	2.64		Q	V		
15+ 0	1.4547	2.62		Q	V		
15+ 5	1.4724	2.58		Q	V		
15+10	1.4897	2.51		Q	V		
15+15	1.5069	2.49		Q	V		
15+20	1.5237	2.45		Q	V		
15+25	1.5400	2.37		Q	V		
15+30	1.5563	2.36		Q	V		
15+35	1.5714	2.19		Q	V		
15+40	1.5844	1.90		Q	V		
15+45	1.5970	1.82		Q	V		
15+50	1.6093	1.79		Q	V		
15+55	1.6215	1.78		Q	V		
16+ 0	1.6337	1.77		Q	V		
16+ 5	1.6433	1.38		Q	V		
16+10	1.6479	0.67	Q				
16+15	1.6512	0.48	Q				
16+20	1.6539	0.40	Q				
16+25	1.6563	0.35	Q				
16+30	1.6585	0.32	Q				
16+35	1.6605	0.28	Q				
16+40	1.6622	0.25	Q				
16+45	1.6638	0.24	Q				
16+50	1.6654	0.23	Q				
16+55	1.6670	0.23	Q				
17+ 0	1.6686	0.23	Q				
17+ 5	1.6705	0.27	Q				
17+10	1.6728	0.34	Q				

17+15	1.6753	0.36	Q	V
17+20	1.6778	0.37	Q	V
17+25	1.6804	0.38	Q	V
17+30	1.6830	0.38	Q	V
17+35	1.6857	0.38	Q	V
17+40	1.6883	0.38	Q	V
17+45	1.6909	0.38	Q	V
17+50	1.6934	0.36	Q	V
17+55	1.6956	0.32	Q	V
18+ 0	1.6978	0.31	Q	V
18+ 5	1.6999	0.31	Q	V
18+10	1.7020	0.31	Q	V
18+15	1.7041	0.31	Q	V
18+20	1.7062	0.30	Q	V
18+25	1.7083	0.30	Q	V
18+30	1.7104	0.30	Q	V
18+35	1.7123	0.28	Q	V
18+40	1.7140	0.25	Q	V
18+45	1.7157	0.24	Q	V
18+50	1.7171	0.21	Q	V
18+55	1.7183	0.17	Q	V
19+ 0	1.7195	0.16	Q	V
19+ 5	1.7207	0.18	Q	V
19+10	1.7221	0.21	Q	V
19+15	1.7236	0.22	Q	V
19+20	1.7253	0.24	Q	V
19+25	1.7273	0.28	Q	V
19+30	1.7293	0.29	Q	V
19+35	1.7312	0.28	Q	V
19+40	1.7329	0.24	Q	V
19+45	1.7345	0.24	Q	V
19+50	1.7360	0.21	Q	V
19+55	1.7372	0.17	Q	V
20+ 0	1.7383	0.16	Q	V
20+ 5	1.7395	0.18	Q	V
20+10	1.7410	0.21	Q	V
20+15	1.7425	0.22	Q	V
20+20	1.7440	0.22	Q	V
20+25	1.7456	0.23	Q	V
20+30	1.7471	0.23	Q	V
20+35	1.7487	0.23	Q	V
20+40	1.7503	0.23	Q	V
20+45	1.7519	0.23	Q	V
20+50	1.7533	0.21	Q	V
20+55	1.7545	0.17	Q	V
21+ 0	1.7556	0.16	Q	V
21+ 5	1.7568	0.18	Q	V
21+10	1.7583	0.21	Q	V
21+15	1.7598	0.22	Q	V
21+20	1.7612	0.20	Q	V
21+25	1.7623	0.17	Q	V
21+30	1.7634	0.16	Q	V
21+35	1.7647	0.18	Q	V
21+40	1.7661	0.21	Q	V
21+45	1.7676	0.22	Q	V
21+50	1.7690	0.20	Q	V
21+55	1.7702	0.17	Q	V

22+ 0	1.7713	0.16	Q				V
22+ 5	1.7725	0.18	Q				V
22+10	1.7740	0.21	Q				V
22+15	1.7755	0.22	Q				V
22+20	1.7769	0.20	Q				V
22+25	1.7780	0.17	Q				V
22+30	1.7791	0.16	Q				V
22+35	1.7802	0.16	Q				V
22+40	1.7813	0.15	Q				V
22+45	1.7823	0.15	Q				V
22+50	1.7834	0.15	Q				V
22+55	1.7844	0.15	Q				V
23+ 0	1.7855	0.15	Q				V
23+ 5	1.7865	0.15	Q				V
23+10	1.7876	0.15	Q				V
23+15	1.7886	0.15	Q				V
23+20	1.7897	0.15	Q				V
23+25	1.7907	0.15	Q				V
23+30	1.7918	0.15	Q				V
23+35	1.7928	0.15	Q				V
23+40	1.7939	0.15	Q				V
23+45	1.7949	0.15	Q				V
23+50	1.7960	0.15	Q				V
23+55	1.7970	0.15	Q				V
24+ 0	1.7981	0.15	Q				V
24+ 5	1.7988	0.11	Q				V
24+10	1.7991	0.04	Q				V
24+15	1.7992	0.02	Q				V
24+20	1.7993	0.01	Q				V
24+25	1.7993	0.00	Q				V
24+30	1.7993	0.00	Q				V

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Unit Hydrograph Analysis

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Study date 10/02/24 File: qp7100uh24100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED A  
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 665.00(Ft.)  
Length along longest watercourse measured to centroid = 635.00(Ft.)  
Length along longest watercourse = 0.126 Mi.  
Length along longest watercourse measured to centroid = 0.120 Mi.  
Difference in elevation = 22.87(Ft.)  
Slope along watercourse = 181.5844 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.027 Hr.  
Lag time = 1.64 Min.  
25% of lag time = 0.41 Min.  
40% of lag time = 0.65 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.80	16.29

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   9.05                    5.00                    45.25

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.800(In)  
 Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   9.050            61.50            0.800  
 Total Area Entered = 9.05(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
						Sum (F) = 0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127  
 Minimum soil loss rate ((In/Hr)) = 0.064  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

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 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	305.645	57.252
2	0.167	611.289	36.820
3	0.250	916.934	5.928
		Sum = 100.000	Sum= 9.121

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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.040	( 0.225)	0.010	0.030
2	0.17	0.040	( 0.224)	0.010	0.030
3	0.25	0.040	( 0.224)	0.010	0.030
4	0.33	0.060	( 0.223)	0.016	0.044
5	0.42	0.060	( 0.222)	0.016	0.044
6	0.50	0.060	( 0.221)	0.016	0.044

7	0.58	0.10	0.060	( 0.220)	0.016	0.044
8	0.67	0.10	0.060	( 0.219)	0.016	0.044
9	0.75	0.10	0.060	( 0.218)	0.016	0.044
10	0.83	0.13	0.080	( 0.217)	0.021	0.059
11	0.92	0.13	0.080	( 0.217)	0.021	0.059
12	1.00	0.13	0.080	( 0.216)	0.021	0.059
13	1.08	0.10	0.060	( 0.215)	0.016	0.044
14	1.17	0.10	0.060	( 0.214)	0.016	0.044
15	1.25	0.10	0.060	( 0.213)	0.016	0.044
16	1.33	0.10	0.060	( 0.212)	0.016	0.044
17	1.42	0.10	0.060	( 0.212)	0.016	0.044
18	1.50	0.10	0.060	( 0.211)	0.016	0.044
19	1.58	0.10	0.060	( 0.210)	0.016	0.044
20	1.67	0.10	0.060	( 0.209)	0.016	0.044
21	1.75	0.10	0.060	( 0.208)	0.016	0.044
22	1.83	0.13	0.080	( 0.207)	0.021	0.059
23	1.92	0.13	0.080	( 0.206)	0.021	0.059
24	2.00	0.13	0.080	( 0.206)	0.021	0.059
25	2.08	0.13	0.080	( 0.205)	0.021	0.059
26	2.17	0.13	0.080	( 0.204)	0.021	0.059
27	2.25	0.13	0.080	( 0.203)	0.021	0.059
28	2.33	0.13	0.080	( 0.202)	0.021	0.059
29	2.42	0.13	0.080	( 0.202)	0.021	0.059
30	2.50	0.13	0.080	( 0.201)	0.021	0.059
31	2.58	0.17	0.100	( 0.200)	0.026	0.074
32	2.67	0.17	0.100	( 0.199)	0.026	0.074
33	2.75	0.17	0.100	( 0.198)	0.026	0.074
34	2.83	0.17	0.100	( 0.197)	0.026	0.074
35	2.92	0.17	0.100	( 0.197)	0.026	0.074
36	3.00	0.17	0.100	( 0.196)	0.026	0.074
37	3.08	0.17	0.100	( 0.195)	0.026	0.074
38	3.17	0.17	0.100	( 0.194)	0.026	0.074
39	3.25	0.17	0.100	( 0.193)	0.026	0.074
40	3.33	0.17	0.100	( 0.193)	0.026	0.074
41	3.42	0.17	0.100	( 0.192)	0.026	0.074
42	3.50	0.17	0.100	( 0.191)	0.026	0.074
43	3.58	0.17	0.100	( 0.190)	0.026	0.074
44	3.67	0.17	0.100	( 0.189)	0.026	0.074
45	3.75	0.17	0.100	( 0.189)	0.026	0.074
46	3.83	0.20	0.120	( 0.188)	0.031	0.089
47	3.92	0.20	0.120	( 0.187)	0.031	0.089
48	4.00	0.20	0.120	( 0.186)	0.031	0.089
49	4.08	0.20	0.120	( 0.185)	0.031	0.089
50	4.17	0.20	0.120	( 0.185)	0.031	0.089
51	4.25	0.20	0.120	( 0.184)	0.031	0.089
52	4.33	0.23	0.140	( 0.183)	0.036	0.104
53	4.42	0.23	0.140	( 0.182)	0.036	0.104
54	4.50	0.23	0.140	( 0.181)	0.036	0.104
55	4.58	0.23	0.140	( 0.181)	0.036	0.104
56	4.67	0.23	0.140	( 0.180)	0.036	0.104
57	4.75	0.23	0.140	( 0.179)	0.036	0.104
58	4.83	0.27	0.160	( 0.178)	0.042	0.118
59	4.92	0.27	0.160	( 0.178)	0.042	0.118
60	5.00	0.27	0.160	( 0.177)	0.042	0.118
61	5.08	0.20	0.120	( 0.176)	0.031	0.089
62	5.17	0.20	0.120	( 0.175)	0.031	0.089
63	5.25	0.20	0.120	( 0.175)	0.031	0.089

64	5.33	0.23	0.140	( 0.174)	0.036	0.104
65	5.42	0.23	0.140	( 0.173)	0.036	0.104
66	5.50	0.23	0.140	( 0.172)	0.036	0.104
67	5.58	0.27	0.160	( 0.171)	0.042	0.118
68	5.67	0.27	0.160	( 0.171)	0.042	0.118
69	5.75	0.27	0.160	( 0.170)	0.042	0.118
70	5.83	0.27	0.160	( 0.169)	0.042	0.118
71	5.92	0.27	0.160	( 0.168)	0.042	0.118
72	6.00	0.27	0.160	( 0.168)	0.042	0.118
73	6.08	0.30	0.180	( 0.167)	0.047	0.133
74	6.17	0.30	0.180	( 0.166)	0.047	0.133
75	6.25	0.30	0.180	( 0.165)	0.047	0.133
76	6.33	0.30	0.180	( 0.165)	0.047	0.133
77	6.42	0.30	0.180	( 0.164)	0.047	0.133
78	6.50	0.30	0.180	( 0.163)	0.047	0.133
79	6.58	0.33	0.200	( 0.163)	0.052	0.148
80	6.67	0.33	0.200	( 0.162)	0.052	0.148
81	6.75	0.33	0.200	( 0.161)	0.052	0.148
82	6.83	0.33	0.200	( 0.160)	0.052	0.148
83	6.92	0.33	0.200	( 0.160)	0.052	0.148
84	7.00	0.33	0.200	( 0.159)	0.052	0.148
85	7.08	0.33	0.200	( 0.158)	0.052	0.148
86	7.17	0.33	0.200	( 0.157)	0.052	0.148
87	7.25	0.33	0.200	( 0.157)	0.052	0.148
88	7.33	0.37	0.220	( 0.156)	0.057	0.163
89	7.42	0.37	0.220	( 0.155)	0.057	0.163
90	7.50	0.37	0.220	( 0.155)	0.057	0.163
91	7.58	0.40	0.240	( 0.154)	0.062	0.178
92	7.67	0.40	0.240	( 0.153)	0.062	0.178
93	7.75	0.40	0.240	( 0.152)	0.062	0.178
94	7.83	0.43	0.260	( 0.152)	0.068	0.192
95	7.92	0.43	0.260	( 0.151)	0.068	0.192
96	8.00	0.43	0.260	( 0.150)	0.068	0.192
97	8.08	0.50	0.300	( 0.150)	0.078	0.222
98	8.17	0.50	0.300	( 0.149)	0.078	0.222
99	8.25	0.50	0.300	( 0.148)	0.078	0.222
100	8.33	0.50	0.300	( 0.148)	0.078	0.222
101	8.42	0.50	0.300	( 0.147)	0.078	0.222
102	8.50	0.50	0.300	( 0.146)	0.078	0.222
103	8.58	0.53	0.320	( 0.146)	0.083	0.237
104	8.67	0.53	0.320	( 0.145)	0.083	0.237
105	8.75	0.53	0.320	( 0.144)	0.083	0.237
106	8.83	0.57	0.340	( 0.143)	0.088	0.252
107	8.92	0.57	0.340	( 0.143)	0.088	0.252
108	9.00	0.57	0.340	( 0.142)	0.088	0.252
109	9.08	0.63	0.380	( 0.141)	0.099	0.281
110	9.17	0.63	0.380	( 0.141)	0.099	0.281
111	9.25	0.63	0.380	( 0.140)	0.099	0.281
112	9.33	0.67	0.400	( 0.139)	0.104	0.296
113	9.42	0.67	0.400	( 0.139)	0.104	0.296
114	9.50	0.67	0.400	( 0.138)	0.104	0.296
115	9.58	0.70	0.420	( 0.137)	0.109	0.311
116	9.67	0.70	0.420	( 0.137)	0.109	0.311
117	9.75	0.70	0.420	( 0.136)	0.109	0.311
118	9.83	0.73	0.440	( 0.135)	0.114	0.326
119	9.92	0.73	0.440	( 0.135)	0.114	0.326
120	10.00	0.73	0.440	( 0.134)	0.114	0.326

121	10.08	0.50	0.300	( 0.134)	0.078	0.222
122	10.17	0.50	0.300	( 0.133)	0.078	0.222
123	10.25	0.50	0.300	( 0.132)	0.078	0.222
124	10.33	0.50	0.300	( 0.132)	0.078	0.222
125	10.42	0.50	0.300	( 0.131)	0.078	0.222
126	10.50	0.50	0.300	( 0.130)	0.078	0.222
127	10.58	0.67	0.400	( 0.130)	0.104	0.296
128	10.67	0.67	0.400	( 0.129)	0.104	0.296
129	10.75	0.67	0.400	( 0.128)	0.104	0.296
130	10.83	0.67	0.400	( 0.128)	0.104	0.296
131	10.92	0.67	0.400	( 0.127)	0.104	0.296
132	11.00	0.67	0.400	( 0.127)	0.104	0.296
133	11.08	0.63	0.380	( 0.126)	0.099	0.281
134	11.17	0.63	0.380	( 0.125)	0.099	0.281
135	11.25	0.63	0.380	( 0.125)	0.099	0.281
136	11.33	0.63	0.380	( 0.124)	0.099	0.281
137	11.42	0.63	0.380	( 0.123)	0.099	0.281
138	11.50	0.63	0.380	( 0.123)	0.099	0.281
139	11.58	0.57	0.340	( 0.122)	0.088	0.252
140	11.67	0.57	0.340	( 0.122)	0.088	0.252
141	11.75	0.57	0.340	( 0.121)	0.088	0.252
142	11.83	0.60	0.360	( 0.120)	0.094	0.266
143	11.92	0.60	0.360	( 0.120)	0.094	0.266
144	12.00	0.60	0.360	( 0.119)	0.094	0.266
145	12.08	0.83	0.500	0.119 ( 0.130)		0.381
146	12.17	0.83	0.500	0.118 ( 0.130)		0.382
147	12.25	0.83	0.500	0.117 ( 0.130)		0.383
148	12.33	0.87	0.520	0.117 ( 0.135)		0.403
149	12.42	0.87	0.520	0.116 ( 0.135)		0.404
150	12.50	0.87	0.520	0.116 ( 0.135)		0.404
151	12.58	0.93	0.560	0.115 ( 0.146)		0.445
152	12.67	0.93	0.560	0.115 ( 0.146)		0.445
153	12.75	0.93	0.560	0.114 ( 0.146)		0.446
154	12.83	0.97	0.580	0.113 ( 0.151)		0.467
155	12.92	0.97	0.580	0.113 ( 0.151)		0.467
156	13.00	0.97	0.580	0.112 ( 0.151)		0.468
157	13.08	1.13	0.680	0.112 ( 0.177)		0.568
158	13.17	1.13	0.680	0.111 ( 0.177)		0.569
159	13.25	1.13	0.680	0.111 ( 0.177)		0.569
160	13.33	1.13	0.680	0.110 ( 0.177)		0.570
161	13.42	1.13	0.680	0.109 ( 0.177)		0.571
162	13.50	1.13	0.680	0.109 ( 0.177)		0.571
163	13.58	0.77	0.460	0.108 ( 0.120)		0.352
164	13.67	0.77	0.460	0.108 ( 0.120)		0.352
165	13.75	0.77	0.460	0.107 ( 0.120)		0.353
166	13.83	0.77	0.460	0.107 ( 0.120)		0.353
167	13.92	0.77	0.460	0.106 ( 0.120)		0.354
168	14.00	0.77	0.460	0.106 ( 0.120)		0.354
169	14.08	0.90	0.540	0.105 ( 0.140)		0.435
170	14.17	0.90	0.540	0.104 ( 0.140)		0.436
171	14.25	0.90	0.540	0.104 ( 0.140)		0.436
172	14.33	0.87	0.520	0.103 ( 0.135)		0.417
173	14.42	0.87	0.520	0.103 ( 0.135)		0.417
174	14.50	0.87	0.520	0.102 ( 0.135)		0.418
175	14.58	0.87	0.520	0.102 ( 0.135)		0.418
176	14.67	0.87	0.520	0.101 ( 0.135)		0.419
177	14.75	0.87	0.520	0.101 ( 0.135)		0.419

178	14.83	0.83	0.500	0.100	( 0.130)	0.400
179	14.92	0.83	0.500	0.100	( 0.130)	0.400
180	15.00	0.83	0.500	0.099	( 0.130)	0.401
181	15.08	0.80	0.480	0.099	( 0.125)	0.381
182	15.17	0.80	0.480	0.098	( 0.125)	0.382
183	15.25	0.80	0.480	0.098	( 0.125)	0.382
184	15.33	0.77	0.460	0.097	( 0.120)	0.363
185	15.42	0.77	0.460	0.097	( 0.120)	0.363
186	15.50	0.77	0.460	0.096	( 0.120)	0.364
187	15.58	0.63	0.380	0.096	( 0.099)	0.284
188	15.67	0.63	0.380	0.095	( 0.099)	0.285
189	15.75	0.63	0.380	0.095	( 0.099)	0.285
190	15.83	0.63	0.380	0.094	( 0.099)	0.286
191	15.92	0.63	0.380	0.094	( 0.099)	0.286
192	16.00	0.63	0.380	0.093	( 0.099)	0.287
193	16.08	0.13	0.080	( 0.093)	0.021	0.059
194	16.17	0.13	0.080	( 0.092)	0.021	0.059
195	16.25	0.13	0.080	( 0.092)	0.021	0.059
196	16.33	0.13	0.080	( 0.091)	0.021	0.059
197	16.42	0.13	0.080	( 0.091)	0.021	0.059
198	16.50	0.13	0.080	( 0.090)	0.021	0.059
199	16.58	0.10	0.060	( 0.090)	0.016	0.044
200	16.67	0.10	0.060	( 0.090)	0.016	0.044
201	16.75	0.10	0.060	( 0.089)	0.016	0.044
202	16.83	0.10	0.060	( 0.089)	0.016	0.044
203	16.92	0.10	0.060	( 0.088)	0.016	0.044
204	17.00	0.10	0.060	( 0.088)	0.016	0.044
205	17.08	0.17	0.100	( 0.087)	0.026	0.074
206	17.17	0.17	0.100	( 0.087)	0.026	0.074
207	17.25	0.17	0.100	( 0.086)	0.026	0.074
208	17.33	0.17	0.100	( 0.086)	0.026	0.074
209	17.42	0.17	0.100	( 0.086)	0.026	0.074
210	17.50	0.17	0.100	( 0.085)	0.026	0.074
211	17.58	0.17	0.100	( 0.085)	0.026	0.074
212	17.67	0.17	0.100	( 0.084)	0.026	0.074
213	17.75	0.17	0.100	( 0.084)	0.026	0.074
214	17.83	0.13	0.080	( 0.083)	0.021	0.059
215	17.92	0.13	0.080	( 0.083)	0.021	0.059
216	18.00	0.13	0.080	( 0.083)	0.021	0.059
217	18.08	0.13	0.080	( 0.082)	0.021	0.059
218	18.17	0.13	0.080	( 0.082)	0.021	0.059
219	18.25	0.13	0.080	( 0.081)	0.021	0.059
220	18.33	0.13	0.080	( 0.081)	0.021	0.059
221	18.42	0.13	0.080	( 0.081)	0.021	0.059
222	18.50	0.13	0.080	( 0.080)	0.021	0.059
223	18.58	0.10	0.060	( 0.080)	0.016	0.044
224	18.67	0.10	0.060	( 0.079)	0.016	0.044
225	18.75	0.10	0.060	( 0.079)	0.016	0.044
226	18.83	0.07	0.040	( 0.079)	0.010	0.030
227	18.92	0.07	0.040	( 0.078)	0.010	0.030
228	19.00	0.07	0.040	( 0.078)	0.010	0.030
229	19.08	0.10	0.060	( 0.078)	0.016	0.044
230	19.17	0.10	0.060	( 0.077)	0.016	0.044
231	19.25	0.10	0.060	( 0.077)	0.016	0.044
232	19.33	0.13	0.080	( 0.077)	0.021	0.059
233	19.42	0.13	0.080	( 0.076)	0.021	0.059
234	19.50	0.13	0.080	( 0.076)	0.021	0.059

235	19.58	0.10	0.060	( 0.075)	0.016	0.044
236	19.67	0.10	0.060	( 0.075)	0.016	0.044
237	19.75	0.10	0.060	( 0.075)	0.016	0.044
238	19.83	0.07	0.040	( 0.074)	0.010	0.030
239	19.92	0.07	0.040	( 0.074)	0.010	0.030
240	20.00	0.07	0.040	( 0.074)	0.010	0.030
241	20.08	0.10	0.060	( 0.073)	0.016	0.044
242	20.17	0.10	0.060	( 0.073)	0.016	0.044
243	20.25	0.10	0.060	( 0.073)	0.016	0.044
244	20.33	0.10	0.060	( 0.073)	0.016	0.044
245	20.42	0.10	0.060	( 0.072)	0.016	0.044
246	20.50	0.10	0.060	( 0.072)	0.016	0.044
247	20.58	0.10	0.060	( 0.072)	0.016	0.044
248	20.67	0.10	0.060	( 0.071)	0.016	0.044
249	20.75	0.10	0.060	( 0.071)	0.016	0.044
250	20.83	0.07	0.040	( 0.071)	0.010	0.030
251	20.92	0.07	0.040	( 0.070)	0.010	0.030
252	21.00	0.07	0.040	( 0.070)	0.010	0.030
253	21.08	0.10	0.060	( 0.070)	0.016	0.044
254	21.17	0.10	0.060	( 0.070)	0.016	0.044
255	21.25	0.10	0.060	( 0.069)	0.016	0.044
256	21.33	0.07	0.040	( 0.069)	0.010	0.030
257	21.42	0.07	0.040	( 0.069)	0.010	0.030
258	21.50	0.07	0.040	( 0.069)	0.010	0.030
259	21.58	0.10	0.060	( 0.068)	0.016	0.044
260	21.67	0.10	0.060	( 0.068)	0.016	0.044
261	21.75	0.10	0.060	( 0.068)	0.016	0.044
262	21.83	0.07	0.040	( 0.068)	0.010	0.030
263	21.92	0.07	0.040	( 0.067)	0.010	0.030
264	22.00	0.07	0.040	( 0.067)	0.010	0.030
265	22.08	0.10	0.060	( 0.067)	0.016	0.044
266	22.17	0.10	0.060	( 0.067)	0.016	0.044
267	22.25	0.10	0.060	( 0.066)	0.016	0.044
268	22.33	0.07	0.040	( 0.066)	0.010	0.030
269	22.42	0.07	0.040	( 0.066)	0.010	0.030
270	22.50	0.07	0.040	( 0.066)	0.010	0.030
271	22.58	0.07	0.040	( 0.066)	0.010	0.030
272	22.67	0.07	0.040	( 0.065)	0.010	0.030
273	22.75	0.07	0.040	( 0.065)	0.010	0.030
274	22.83	0.07	0.040	( 0.065)	0.010	0.030
275	22.92	0.07	0.040	( 0.065)	0.010	0.030
276	23.00	0.07	0.040	( 0.065)	0.010	0.030
277	23.08	0.07	0.040	( 0.065)	0.010	0.030
278	23.17	0.07	0.040	( 0.064)	0.010	0.030
279	23.25	0.07	0.040	( 0.064)	0.010	0.030
280	23.33	0.07	0.040	( 0.064)	0.010	0.030
281	23.42	0.07	0.040	( 0.064)	0.010	0.030
282	23.50	0.07	0.040	( 0.064)	0.010	0.030
283	23.58	0.07	0.040	( 0.064)	0.010	0.030
284	23.67	0.07	0.040	( 0.064)	0.010	0.030
285	23.75	0.07	0.040	( 0.064)	0.010	0.030
286	23.83	0.07	0.040	( 0.064)	0.010	0.030
287	23.92	0.07	0.040	( 0.064)	0.010	0.030
288	24.00	0.07	0.040	( 0.064)	0.010	0.030

(Loss Rate Not Used)

Sum = 100.0

Sum = 45.7

Flood volume = Effective rainfall 3.81(In)

times area            9.1(Ac.)/[ (In)/(Ft.) ] =            2.9(Ac.Ft)  
 Total soil loss =        1.19(In)  
 Total soil loss =        0.896(Ac.Ft)  
 Total rainfall =         5.00(In)  
 Flood volume =         125235.5 Cubic Feet  
 Total soil loss =        39019.1 Cubic Feet

-----  
 Peak flow rate of this hydrograph =            5.210(CFS)  
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24 - H O U R        S T O R M  
 R u n o f f        H y d r o g r a p h

-----  
 Hydrograph in    5    Minute intervals ((CFS))  
 -----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0011	0.15	Q				
0+10	0.0028	0.25	VQ				
0+15	0.0047	0.27	VQ				
0+20	0.0071	0.35	VQ				
0+25	0.0098	0.40	VQ				
0+30	0.0126	0.41	VQ				
0+35	0.0154	0.41	VQ				
0+40	0.0182	0.41	VQ				
0+45	0.0210	0.41	VQ				
0+50	0.0243	0.48	VQ				
0+55	0.0280	0.53	V Q				
1+ 0	0.0317	0.54	V Q				
1+ 5	0.0349	0.46	VQ				
1+10	0.0377	0.41	VQ				
1+15	0.0405	0.41	VQ				
1+20	0.0433	0.41	VQ				
1+25	0.0461	0.41	VQ				
1+30	0.0489	0.41	VQ				
1+35	0.0517	0.41	VQ				
1+40	0.0544	0.41	VQ				
1+45	0.0572	0.41	VQ				
1+50	0.0606	0.48	VQ				
1+55	0.0642	0.53	V Q				
2+ 0	0.0679	0.54	V Q				
2+ 5	0.0717	0.54	V Q				
2+10	0.0754	0.54	VQ				
2+15	0.0791	0.54	VQ				
2+20	0.0828	0.54	VQ				
2+25	0.0866	0.54	VQ				
2+30	0.0903	0.54	VQ				
2+35	0.0945	0.62	VQ				
2+40	0.0991	0.67	VQ				
2+45	0.1038	0.68	VQ				
2+50	0.1084	0.68	VQ				
2+55	0.1131	0.68	VQ				
3+ 0	0.1177	0.68	VQ				
3+ 5	0.1224	0.68	VQ				
3+10	0.1270	0.68	VQ				
3+15	0.1317	0.68	VQ				

3+20	0.1363	0.68	VQ
3+25	0.1410	0.68	VQ
3+30	0.1456	0.68	Q
3+35	0.1503	0.68	Q
3+40	0.1549	0.68	Q
3+45	0.1596	0.68	Q
3+50	0.1648	0.75	VQ
3+55	0.1703	0.80	VQ
4+ 0	0.1759	0.81	VQ
4+ 5	0.1814	0.81	VQ
4+10	0.1870	0.81	VQ
4+15	0.1926	0.81	VQ
4+20	0.1987	0.89	VQ
4+25	0.2052	0.94	VQ
4+30	0.2117	0.95	VQ
4+35	0.2182	0.95	Q
4+40	0.2247	0.95	Q
4+45	0.2312	0.95	Q
4+50	0.2383	1.02	VQ
4+55	0.2457	1.07	VQ
5+ 0	0.2531	1.08	VQ
5+ 5	0.2595	0.93	Q
5+10	0.2652	0.83	Q
5+15	0.2707	0.81	Q
5+20	0.2769	0.89	Q
5+25	0.2833	0.94	Q
5+30	0.2898	0.95	QV
5+35	0.2969	1.02	Q
5+40	0.3042	1.07	Q
5+45	0.3117	1.08	Q
5+50	0.3191	1.08	Q
5+55	0.3266	1.08	Q
6+ 0	0.3340	1.08	Q
6+ 5	0.3420	1.16	Q
6+10	0.3503	1.21	Q
6+15	0.3587	1.22	Q
6+20	0.3670	1.22	QV
6+25	0.3754	1.22	QV
6+30	0.3838	1.22	QV
6+35	0.3927	1.29	Q
6+40	0.4019	1.34	Q
6+45	0.4112	1.35	Q
6+50	0.4205	1.35	Q
6+55	0.4298	1.35	Q
7+ 0	0.4391	1.35	QV
7+ 5	0.4484	1.35	QV
7+10	0.4577	1.35	QV
7+15	0.4670	1.35	QV
7+20	0.4769	1.43	QV
7+25	0.4871	1.48	QV
7+30	0.4973	1.49	QV
7+35	0.5080	1.56	QV
7+40	0.5192	1.61	QV
7+45	0.5303	1.62	QV
7+50	0.5420	1.70	QV
7+55	0.5540	1.75	QV
8+ 0	0.5661	1.76	Q

8+ 5	0.5793	1.91	QV			
8+10	0.5931	2.01	Q			
8+15	0.6071	2.03	Q			
8+20	0.6210	2.03	Q			
8+25	0.6350	2.03	Q			
8+30	0.6489	2.03	QV			
8+35	0.6634	2.10	QV			
8+40	0.6783	2.15	QV			
8+45	0.6931	2.16	QV			
8+50	0.7086	2.24	QV			
8+55	0.7243	2.29	QV			
9+ 0	0.7401	2.30	QV			
9+ 5	0.7570	2.45	QV			
9+10	0.7746	2.55	Q			
9+15	0.7922	2.57	QV			
9+20	0.8104	2.64	QV			
9+25	0.8290	2.69	QV			
9+30	0.8476	2.70	QV			
9+35	0.8667	2.78	QV			
9+40	0.8862	2.83	QV			
9+45	0.9057	2.84	QV			
9+50	0.9258	2.91	QV			
9+55	0.9462	2.96	Q V			
10+ 0	0.9667	2.97	Q V			
10+ 5	0.9834	2.43	Q	V		
10+10	0.9977	2.08	Q	V		
10+15	1.0117	2.03	Q	V		
10+20	1.0256	2.03	Q	V		
10+25	1.0396	2.03	Q	V		
10+30	1.0535	2.03	Q	V		
10+35	1.0702	2.41	Q	V		
10+40	1.0885	2.66	Q	V		
10+45	1.1071	2.70	Q	V		
10+50	1.1257	2.70	Q	V		
10+55	1.1443	2.70	Q	V		
11+ 0	1.1629	2.70	Q	V		
11+ 5	1.1810	2.62	Q	V		
11+10	1.1987	2.57	Q	V		
11+15	1.2164	2.57	Q	V		
11+20	1.2340	2.57	Q	V		
11+25	1.2517	2.57	Q	V		
11+30	1.2694	2.57	Q	V		
11+35	1.2860	2.41	Q	V		
11+40	1.3019	2.31	Q	V		
11+45	1.3177	2.30	Q	V		
11+50	1.3341	2.37	Q	V		
11+55	1.3508	2.42	Q	V		
12+ 0	1.3675	2.43	Q	V		
12+ 5	1.3884	3.03	Q	V		
12+10	1.4119	3.42	Q	V		
12+15	1.4360	3.49	Q	V		
12+20	1.4607	3.60	Q	V		
12+25	1.4860	3.67	Q	V		
12+30	1.5114	3.69	Q	V		
12+35	1.5383	3.90	Q	V		
12+40	1.5661	4.04	Q	V		
12+45	1.5941	4.07	Q	V		

12+50	1.6229	4.18			Q	V	
12+55	1.6522	4.25			Q	V	
13+ 0	1.6816	4.27			Q	V	
13+ 5	1.7146	4.79				V	
13+10	1.7499	5.13			Q	V	
13+15	1.7857	5.19			Q	V	
13+20	1.8215	5.20			Q	V	
13+25	1.8574	5.20			Q	V	
13+30	1.8932	5.21			Q	V	
13+35	1.9212	4.07				V	
13+40	1.9442	3.33		Q		V	
13+45	1.9663	3.22		Q		V	
13+50	1.9885	3.22		Q		V	
13+55	2.0108	3.23		Q		V	
14+ 0	2.0330	3.23		Q		V	
14+ 5	2.0582	3.65			Q	V	
14+10	2.0852	3.93			Q	V	
14+15	2.1126	3.98			Q	V	
14+20	2.1393	3.88			Q	V	
14+25	2.1656	3.81			Q	V	
14+30	2.1918	3.81			Q	V	
14+35	2.2181	3.81			Q	V	
14+40	2.2444	3.82			Q	V	
14+45	2.2707	3.82			Q	V	
14+50	2.2964	3.72				V	
14+55	2.3216	3.66		Q		V	
15+ 0	2.3468	3.65		Q		V	
15+ 5	2.3712	3.55		Q		V	
15+10	2.3953	3.49			Q	V	
15+15	2.4193	3.49			Q	V	
15+20	2.4426	3.39			Q	V	
15+25	2.4655	3.32			Q	V	
15+30	2.4884	3.32			Q	V	
15+35	2.5084	2.90				V	
15+40	2.5265	2.64		Q		V	
15+45	2.5445	2.60		Q		V	
15+50	2.5624	2.61		Q		V	
15+55	2.5804	2.61		Q		V	
16+ 0	2.5984	2.61		Q		V	
16+ 5	2.6082	1.43		Q		V	
16+10	2.6128	0.66	Q			V	
16+15	2.6165	0.54	Q			V	
16+20	2.6202	0.54	Q			V	
16+25	2.6239	0.54	Q			V	
16+30	2.6276	0.54	Q			V	
16+35	2.6308	0.46	Q			V	
16+40	2.6337	0.41	Q			V	
16+45	2.6365	0.41	Q			V	
16+50	2.6393	0.41	Q			V	
16+55	2.6421	0.41	Q			V	
17+ 0	2.6448	0.41	Q			V	
17+ 5	2.6487	0.56	Q			V	
17+10	2.6532	0.66	Q			V	
17+15	2.6579	0.68	Q			V	
17+20	2.6625	0.68	Q			V	
17+25	2.6672	0.68	Q			V	
17+30	2.6718	0.68	Q			V	

17+35	2.6765	0.68	Q	V
17+40	2.6811	0.68	Q	V
17+45	2.6858	0.68	Q	V
17+50	2.6899	0.60	Q	V
17+55	2.6937	0.55	Q	V
18+ 0	2.6974	0.54	Q	V
18+ 5	2.7011	0.54	Q	V
18+10	2.7048	0.54	Q	V
18+15	2.7086	0.54	Q	V
18+20	2.7123	0.54	Q	V
18+25	2.7160	0.54	Q	V
18+30	2.7197	0.54	Q	V
18+35	2.7229	0.46	Q	V
18+40	2.7258	0.41	Q	V
18+45	2.7286	0.41	Q	V
18+50	2.7308	0.33	Q	V
18+55	2.7327	0.28	Q	V
19+ 0	2.7346	0.27	Q	V
19+ 5	2.7370	0.35	Q	V
19+10	2.7397	0.40	Q	V
19+15	2.7425	0.41	Q	V
19+20	2.7458	0.48	Q	V
19+25	2.7495	0.53	Q	V
19+30	2.7532	0.54	Q	V
19+35	2.7564	0.46	Q	V
19+40	2.7592	0.41	Q	V
19+45	2.7620	0.41	Q	V
19+50	2.7643	0.33	Q	V
19+55	2.7662	0.28	Q	V
20+ 0	2.7681	0.27	Q	V
20+ 5	2.7705	0.35	Q	V
20+10	2.7732	0.40	Q	V
20+15	2.7760	0.41	Q	V
20+20	2.7788	0.41	Q	V
20+25	2.7816	0.41	Q	V
20+30	2.7844	0.41	Q	V
20+35	2.7872	0.41	Q	V
20+40	2.7899	0.41	Q	V
20+45	2.7927	0.41	Q	V
20+50	2.7950	0.33	Q	V
20+55	2.7969	0.28	Q	V
21+ 0	2.7988	0.27	Q	V
21+ 5	2.8012	0.35	Q	V
21+10	2.8039	0.40	Q	V
21+15	2.8067	0.41	Q	V
21+20	2.8089	0.33	Q	V
21+25	2.8109	0.28	Q	V
21+30	2.8127	0.27	Q	V
21+35	2.8151	0.35	Q	V
21+40	2.8178	0.40	Q	V
21+45	2.8206	0.41	Q	V
21+50	2.8229	0.33	Q	V
21+55	2.8248	0.28	Q	V
22+ 0	2.8267	0.27	Q	V
22+ 5	2.8291	0.35	Q	V
22+10	2.8318	0.40	Q	V
22+15	2.8346	0.41	Q	V

22+20	2.8368	0.33	Q			V
22+25	2.8388	0.28	Q			V
22+30	2.8406	0.27	Q			V
22+35	2.8425	0.27	Q			V
22+40	2.8443	0.27	Q			V
22+45	2.8462	0.27	Q			V
22+50	2.8481	0.27	Q			V
22+55	2.8499	0.27	Q			V
23+ 0	2.8518	0.27	Q			V
23+ 5	2.8536	0.27	Q			V
23+10	2.8555	0.27	Q			V
23+15	2.8574	0.27	Q			V
23+20	2.8592	0.27	Q			V
23+25	2.8611	0.27	Q			V
23+30	2.8629	0.27	Q			V
23+35	2.8648	0.27	Q			V
23+40	2.8667	0.27	Q			V
23+45	2.8685	0.27	Q			V
23+50	2.8704	0.27	Q			V
23+55	2.8722	0.27	Q			V
24+ 0	2.8741	0.27	Q			V
24+ 5	2.8749	0.12	Q			V
24+10	2.8750	0.02	Q			V

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Unit Hydrograph Analysis

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Study date 10/02/24 File: qo100b724100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED B  
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 615.00(Ft.)  
Length along longest watercourse measured to centroid = 247.00(Ft.)  
Length along longest watercourse = 0.116 Mi.  
Length along longest watercourse measured to centroid = 0.047 Mi.  
Difference in elevation = 13.88(Ft.)  
Slope along watercourse = 119.1649 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.020 Hr.  
Lag time = 1.20 Min.  
25% of lag time = 0.30 Min.  
40% of lag time = 0.48 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.80	15.84

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   8.80                    5.00                    44.00

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.800(In)  
 Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   8.800            66.30            0.800  
 Total Area Entered = 8.80(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
						Sum (F) = 0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113  
 Minimum soil loss rate ((In/Hr)) = 0.056  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

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 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	416.091	5.868
2	0.167	832.183	3.001
		Sum = 100.000	Sum= 8.869

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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.040	( 0.200)	0.010	0.030
2	0.17	0.040	( 0.199)	0.010	0.030
3	0.25	0.040	( 0.198)	0.010	0.030
4	0.33	0.060	( 0.197)	0.016	0.044
5	0.42	0.060	( 0.196)	0.016	0.044
6	0.50	0.060	( 0.196)	0.016	0.044
7	0.58	0.060	( 0.195)	0.016	0.044

8	0.67	0.10	0.060	( 0.194)	0.016	0.044
9	0.75	0.10	0.060	( 0.193)	0.016	0.044
10	0.83	0.13	0.080	( 0.193)	0.021	0.059
11	0.92	0.13	0.080	( 0.192)	0.021	0.059
12	1.00	0.13	0.080	( 0.191)	0.021	0.059
13	1.08	0.10	0.060	( 0.190)	0.016	0.044
14	1.17	0.10	0.060	( 0.190)	0.016	0.044
15	1.25	0.10	0.060	( 0.189)	0.016	0.044
16	1.33	0.10	0.060	( 0.188)	0.016	0.044
17	1.42	0.10	0.060	( 0.187)	0.016	0.044
18	1.50	0.10	0.060	( 0.187)	0.016	0.044
19	1.58	0.10	0.060	( 0.186)	0.016	0.044
20	1.67	0.10	0.060	( 0.185)	0.016	0.044
21	1.75	0.10	0.060	( 0.184)	0.016	0.044
22	1.83	0.13	0.080	( 0.184)	0.021	0.059
23	1.92	0.13	0.080	( 0.183)	0.021	0.059
24	2.00	0.13	0.080	( 0.182)	0.021	0.059
25	2.08	0.13	0.080	( 0.181)	0.021	0.059
26	2.17	0.13	0.080	( 0.181)	0.021	0.059
27	2.25	0.13	0.080	( 0.180)	0.021	0.059
28	2.33	0.13	0.080	( 0.179)	0.021	0.059
29	2.42	0.13	0.080	( 0.178)	0.021	0.059
30	2.50	0.13	0.080	( 0.178)	0.021	0.059
31	2.58	0.17	0.100	( 0.177)	0.026	0.074
32	2.67	0.17	0.100	( 0.176)	0.026	0.074
33	2.75	0.17	0.100	( 0.176)	0.026	0.074
34	2.83	0.17	0.100	( 0.175)	0.026	0.074
35	2.92	0.17	0.100	( 0.174)	0.026	0.074
36	3.00	0.17	0.100	( 0.173)	0.026	0.074
37	3.08	0.17	0.100	( 0.173)	0.026	0.074
38	3.17	0.17	0.100	( 0.172)	0.026	0.074
39	3.25	0.17	0.100	( 0.171)	0.026	0.074
40	3.33	0.17	0.100	( 0.171)	0.026	0.074
41	3.42	0.17	0.100	( 0.170)	0.026	0.074
42	3.50	0.17	0.100	( 0.169)	0.026	0.074
43	3.58	0.17	0.100	( 0.168)	0.026	0.074
44	3.67	0.17	0.100	( 0.168)	0.026	0.074
45	3.75	0.17	0.100	( 0.167)	0.026	0.074
46	3.83	0.20	0.120	( 0.166)	0.031	0.089
47	3.92	0.20	0.120	( 0.166)	0.031	0.089
48	4.00	0.20	0.120	( 0.165)	0.031	0.089
49	4.08	0.20	0.120	( 0.164)	0.031	0.089
50	4.17	0.20	0.120	( 0.163)	0.031	0.089
51	4.25	0.20	0.120	( 0.163)	0.031	0.089
52	4.33	0.23	0.140	( 0.162)	0.036	0.104
53	4.42	0.23	0.140	( 0.161)	0.036	0.104
54	4.50	0.23	0.140	( 0.161)	0.036	0.104
55	4.58	0.23	0.140	( 0.160)	0.036	0.104
56	4.67	0.23	0.140	( 0.159)	0.036	0.104
57	4.75	0.23	0.140	( 0.159)	0.036	0.104
58	4.83	0.27	0.160	( 0.158)	0.042	0.118
59	4.92	0.27	0.160	( 0.157)	0.042	0.118
60	5.00	0.27	0.160	( 0.157)	0.042	0.118
61	5.08	0.20	0.120	( 0.156)	0.031	0.089
62	5.17	0.20	0.120	( 0.155)	0.031	0.089
63	5.25	0.20	0.120	( 0.155)	0.031	0.089

64	5.33	0.23	0.140	( 0.154)	0.036	0.104
65	5.42	0.23	0.140	( 0.153)	0.036	0.104
66	5.50	0.23	0.140	( 0.153)	0.036	0.104
67	5.58	0.27	0.160	( 0.152)	0.042	0.118
68	5.67	0.27	0.160	( 0.151)	0.042	0.118
69	5.75	0.27	0.160	( 0.151)	0.042	0.118
70	5.83	0.27	0.160	( 0.150)	0.042	0.118
71	5.92	0.27	0.160	( 0.149)	0.042	0.118
72	6.00	0.27	0.160	( 0.149)	0.042	0.118
73	6.08	0.30	0.180	( 0.148)	0.047	0.133
74	6.17	0.30	0.180	( 0.147)	0.047	0.133
75	6.25	0.30	0.180	( 0.147)	0.047	0.133
76	6.33	0.30	0.180	( 0.146)	0.047	0.133
77	6.42	0.30	0.180	( 0.145)	0.047	0.133
78	6.50	0.30	0.180	( 0.145)	0.047	0.133
79	6.58	0.33	0.200	( 0.144)	0.052	0.148
80	6.67	0.33	0.200	( 0.143)	0.052	0.148
81	6.75	0.33	0.200	( 0.143)	0.052	0.148
82	6.83	0.33	0.200	( 0.142)	0.052	0.148
83	6.92	0.33	0.200	( 0.141)	0.052	0.148
84	7.00	0.33	0.200	( 0.141)	0.052	0.148
85	7.08	0.33	0.200	( 0.140)	0.052	0.148
86	7.17	0.33	0.200	( 0.139)	0.052	0.148
87	7.25	0.33	0.200	( 0.139)	0.052	0.148
88	7.33	0.37	0.220	( 0.138)	0.057	0.163
89	7.42	0.37	0.220	( 0.138)	0.057	0.163
90	7.50	0.37	0.220	( 0.137)	0.057	0.163
91	7.58	0.40	0.240	( 0.136)	0.062	0.178
92	7.67	0.40	0.240	( 0.136)	0.062	0.178
93	7.75	0.40	0.240	( 0.135)	0.062	0.178
94	7.83	0.43	0.260	( 0.134)	0.068	0.192
95	7.92	0.43	0.260	( 0.134)	0.068	0.192
96	8.00	0.43	0.260	( 0.133)	0.068	0.192
97	8.08	0.50	0.300	( 0.133)	0.078	0.222
98	8.17	0.50	0.300	( 0.132)	0.078	0.222
99	8.25	0.50	0.300	( 0.131)	0.078	0.222
100	8.33	0.50	0.300	( 0.131)	0.078	0.222
101	8.42	0.50	0.300	( 0.130)	0.078	0.222
102	8.50	0.50	0.300	( 0.130)	0.078	0.222
103	8.58	0.53	0.320	( 0.129)	0.083	0.237
104	8.67	0.53	0.320	( 0.128)	0.083	0.237
105	8.75	0.53	0.320	( 0.128)	0.083	0.237
106	8.83	0.57	0.340	( 0.127)	0.088	0.252
107	8.92	0.57	0.340	( 0.126)	0.088	0.252
108	9.00	0.57	0.340	( 0.126)	0.088	0.252
109	9.08	0.63	0.380	( 0.125)	0.099	0.281
110	9.17	0.63	0.380	( 0.125)	0.099	0.281
111	9.25	0.63	0.380	( 0.124)	0.099	0.281
112	9.33	0.67	0.400	( 0.124)	0.104	0.296
113	9.42	0.67	0.400	( 0.123)	0.104	0.296
114	9.50	0.67	0.400	( 0.122)	0.104	0.296
115	9.58	0.70	0.420	( 0.122)	0.109	0.311
116	9.67	0.70	0.420	( 0.121)	0.109	0.311
117	9.75	0.70	0.420	( 0.121)	0.109	0.311
118	9.83	0.73	0.440	( 0.120)	0.114	0.326
119	9.92	0.73	0.440	( 0.119)	0.114	0.326
120	10.00	0.73	0.440	( 0.119)	0.114	0.326

121	10.08	0.50	0.300	( 0.118)	0.078	0.222
122	10.17	0.50	0.300	( 0.118)	0.078	0.222
123	10.25	0.50	0.300	( 0.117)	0.078	0.222
124	10.33	0.50	0.300	( 0.117)	0.078	0.222
125	10.42	0.50	0.300	( 0.116)	0.078	0.222
126	10.50	0.50	0.300	( 0.115)	0.078	0.222
127	10.58	0.67	0.400	( 0.115)	0.104	0.296
128	10.67	0.67	0.400	( 0.114)	0.104	0.296
129	10.75	0.67	0.400	( 0.114)	0.104	0.296
130	10.83	0.67	0.400	( 0.113)	0.104	0.296
131	10.92	0.67	0.400	( 0.113)	0.104	0.296
132	11.00	0.67	0.400	( 0.112)	0.104	0.296
133	11.08	0.63	0.380	( 0.112)	0.099	0.281
134	11.17	0.63	0.380	( 0.111)	0.099	0.281
135	11.25	0.63	0.380	( 0.110)	0.099	0.281
136	11.33	0.63	0.380	( 0.110)	0.099	0.281
137	11.42	0.63	0.380	( 0.109)	0.099	0.281
138	11.50	0.63	0.380	( 0.109)	0.099	0.281
139	11.58	0.57	0.340	( 0.108)	0.088	0.252
140	11.67	0.57	0.340	( 0.108)	0.088	0.252
141	11.75	0.57	0.340	( 0.107)	0.088	0.252
142	11.83	0.60	0.360	( 0.107)	0.094	0.266
143	11.92	0.60	0.360	( 0.106)	0.094	0.266
144	12.00	0.60	0.360	( 0.106)	0.094	0.266
145	12.08	0.83	0.500	0.105 ( 0.130)		0.395
146	12.17	0.83	0.500	0.105 ( 0.130)		0.395
147	12.25	0.83	0.500	0.104 ( 0.130)		0.396
148	12.33	0.87	0.520	0.103 ( 0.135)		0.417
149	12.42	0.87	0.520	0.103 ( 0.135)		0.417
150	12.50	0.87	0.520	0.102 ( 0.135)		0.418
151	12.58	0.93	0.560	0.102 ( 0.146)		0.458
152	12.67	0.93	0.560	0.101 ( 0.146)		0.459
153	12.75	0.93	0.560	0.101 ( 0.146)		0.459
154	12.83	0.97	0.580	0.100 ( 0.151)		0.480
155	12.92	0.97	0.580	0.100 ( 0.151)		0.480
156	13.00	0.97	0.580	0.099 ( 0.151)		0.481
157	13.08	1.13	0.680	0.099 ( 0.177)		0.581
158	13.17	1.13	0.680	0.098 ( 0.177)		0.582
159	13.25	1.13	0.680	0.098 ( 0.177)		0.582
160	13.33	1.13	0.680	0.097 ( 0.177)		0.583
161	13.42	1.13	0.680	0.097 ( 0.177)		0.583
162	13.50	1.13	0.680	0.096 ( 0.177)		0.584
163	13.58	0.77	0.460	0.096 ( 0.120)		0.364
164	13.67	0.77	0.460	0.095 ( 0.120)		0.365
165	13.75	0.77	0.460	0.095 ( 0.120)		0.365
166	13.83	0.77	0.460	0.094 ( 0.120)		0.366
167	13.92	0.77	0.460	0.094 ( 0.120)		0.366
168	14.00	0.77	0.460	0.093 ( 0.120)		0.367
169	14.08	0.90	0.540	0.093 ( 0.140)		0.447
170	14.17	0.90	0.540	0.093 ( 0.140)		0.447
171	14.25	0.90	0.540	0.092 ( 0.140)		0.448
172	14.33	0.87	0.520	0.092 ( 0.135)		0.428
173	14.42	0.87	0.520	0.091 ( 0.135)		0.429
174	14.50	0.87	0.520	0.091 ( 0.135)		0.429
175	14.58	0.87	0.520	0.090 ( 0.135)		0.430
176	14.67	0.87	0.520	0.090 ( 0.135)		0.430
177	14.75	0.87	0.520	0.089 ( 0.135)		0.431

178	14.83	0.83	0.500	0.089	( 0.130)	0.411
179	14.92	0.83	0.500	0.088	( 0.130)	0.412
180	15.00	0.83	0.500	0.088	( 0.130)	0.412
181	15.08	0.80	0.480	0.087	( 0.125)	0.393
182	15.17	0.80	0.480	0.087	( 0.125)	0.393
183	15.25	0.80	0.480	0.087	( 0.125)	0.393
184	15.33	0.77	0.460	0.086	( 0.120)	0.374
185	15.42	0.77	0.460	0.086	( 0.120)	0.374
186	15.50	0.77	0.460	0.085	( 0.120)	0.375
187	15.58	0.63	0.380	0.085	( 0.099)	0.295
188	15.67	0.63	0.380	0.084	( 0.099)	0.296
189	15.75	0.63	0.380	0.084	( 0.099)	0.296
190	15.83	0.63	0.380	0.084	( 0.099)	0.296
191	15.92	0.63	0.380	0.083	( 0.099)	0.297
192	16.00	0.63	0.380	0.083	( 0.099)	0.297
193	16.08	0.13	0.080	( 0.082)	0.021	0.059
194	16.17	0.13	0.080	( 0.082)	0.021	0.059
195	16.25	0.13	0.080	( 0.081)	0.021	0.059
196	16.33	0.13	0.080	( 0.081)	0.021	0.059
197	16.42	0.13	0.080	( 0.081)	0.021	0.059
198	16.50	0.13	0.080	( 0.080)	0.021	0.059
199	16.58	0.10	0.060	( 0.080)	0.016	0.044
200	16.67	0.10	0.060	( 0.079)	0.016	0.044
201	16.75	0.10	0.060	( 0.079)	0.016	0.044
202	16.83	0.10	0.060	( 0.079)	0.016	0.044
203	16.92	0.10	0.060	( 0.078)	0.016	0.044
204	17.00	0.10	0.060	( 0.078)	0.016	0.044
205	17.08	0.17	0.100	( 0.077)	0.026	0.074
206	17.17	0.17	0.100	( 0.077)	0.026	0.074
207	17.25	0.17	0.100	( 0.077)	0.026	0.074
208	17.33	0.17	0.100	( 0.076)	0.026	0.074
209	17.42	0.17	0.100	( 0.076)	0.026	0.074
210	17.50	0.17	0.100	( 0.075)	0.026	0.074
211	17.58	0.17	0.100	( 0.075)	0.026	0.074
212	17.67	0.17	0.100	( 0.075)	0.026	0.074
213	17.75	0.17	0.100	( 0.074)	0.026	0.074
214	17.83	0.13	0.080	( 0.074)	0.021	0.059
215	17.92	0.13	0.080	( 0.074)	0.021	0.059
216	18.00	0.13	0.080	( 0.073)	0.021	0.059
217	18.08	0.13	0.080	( 0.073)	0.021	0.059
218	18.17	0.13	0.080	( 0.072)	0.021	0.059
219	18.25	0.13	0.080	( 0.072)	0.021	0.059
220	18.33	0.13	0.080	( 0.072)	0.021	0.059
221	18.42	0.13	0.080	( 0.071)	0.021	0.059
222	18.50	0.13	0.080	( 0.071)	0.021	0.059
223	18.58	0.10	0.060	( 0.071)	0.016	0.044
224	18.67	0.10	0.060	( 0.070)	0.016	0.044
225	18.75	0.10	0.060	( 0.070)	0.016	0.044
226	18.83	0.07	0.040	( 0.070)	0.010	0.030
227	18.92	0.07	0.040	( 0.069)	0.010	0.030
228	19.00	0.07	0.040	( 0.069)	0.010	0.030
229	19.08	0.10	0.060	( 0.069)	0.016	0.044
230	19.17	0.10	0.060	( 0.068)	0.016	0.044
231	19.25	0.10	0.060	( 0.068)	0.016	0.044
232	19.33	0.13	0.080	( 0.068)	0.021	0.059
233	19.42	0.13	0.080	( 0.067)	0.021	0.059
234	19.50	0.13	0.080	( 0.067)	0.021	0.059

235	19.58	0.10	0.060	( 0.067)	0.016	0.044
236	19.67	0.10	0.060	( 0.067)	0.016	0.044
237	19.75	0.10	0.060	( 0.066)	0.016	0.044
238	19.83	0.07	0.040	( 0.066)	0.010	0.030
239	19.92	0.07	0.040	( 0.066)	0.010	0.030
240	20.00	0.07	0.040	( 0.065)	0.010	0.030
241	20.08	0.10	0.060	( 0.065)	0.016	0.044
242	20.17	0.10	0.060	( 0.065)	0.016	0.044
243	20.25	0.10	0.060	( 0.064)	0.016	0.044
244	20.33	0.10	0.060	( 0.064)	0.016	0.044
245	20.42	0.10	0.060	( 0.064)	0.016	0.044
246	20.50	0.10	0.060	( 0.064)	0.016	0.044
247	20.58	0.10	0.060	( 0.063)	0.016	0.044
248	20.67	0.10	0.060	( 0.063)	0.016	0.044
249	20.75	0.10	0.060	( 0.063)	0.016	0.044
250	20.83	0.07	0.040	( 0.063)	0.010	0.030
251	20.92	0.07	0.040	( 0.062)	0.010	0.030
252	21.00	0.07	0.040	( 0.062)	0.010	0.030
253	21.08	0.10	0.060	( 0.062)	0.016	0.044
254	21.17	0.10	0.060	( 0.062)	0.016	0.044
255	21.25	0.10	0.060	( 0.061)	0.016	0.044
256	21.33	0.07	0.040	( 0.061)	0.010	0.030
257	21.42	0.07	0.040	( 0.061)	0.010	0.030
258	21.50	0.07	0.040	( 0.061)	0.010	0.030
259	21.58	0.10	0.060	( 0.060)	0.016	0.044
260	21.67	0.10	0.060	( 0.060)	0.016	0.044
261	21.75	0.10	0.060	( 0.060)	0.016	0.044
262	21.83	0.07	0.040	( 0.060)	0.010	0.030
263	21.92	0.07	0.040	( 0.060)	0.010	0.030
264	22.00	0.07	0.040	( 0.059)	0.010	0.030
265	22.08	0.10	0.060	( 0.059)	0.016	0.044
266	22.17	0.10	0.060	( 0.059)	0.016	0.044
267	22.25	0.10	0.060	( 0.059)	0.016	0.044
268	22.33	0.07	0.040	( 0.059)	0.010	0.030
269	22.42	0.07	0.040	( 0.058)	0.010	0.030
270	22.50	0.07	0.040	( 0.058)	0.010	0.030
271	22.58	0.07	0.040	( 0.058)	0.010	0.030
272	22.67	0.07	0.040	( 0.058)	0.010	0.030
273	22.75	0.07	0.040	( 0.058)	0.010	0.030
274	22.83	0.07	0.040	( 0.058)	0.010	0.030
275	22.92	0.07	0.040	( 0.058)	0.010	0.030
276	23.00	0.07	0.040	( 0.057)	0.010	0.030
277	23.08	0.07	0.040	( 0.057)	0.010	0.030
278	23.17	0.07	0.040	( 0.057)	0.010	0.030
279	23.25	0.07	0.040	( 0.057)	0.010	0.030
280	23.33	0.07	0.040	( 0.057)	0.010	0.030
281	23.42	0.07	0.040	( 0.057)	0.010	0.030
282	23.50	0.07	0.040	( 0.057)	0.010	0.030
283	23.58	0.07	0.040	( 0.057)	0.010	0.030
284	23.67	0.07	0.040	( 0.057)	0.010	0.030
285	23.75	0.07	0.040	( 0.056)	0.010	0.030
286	23.83	0.07	0.040	( 0.056)	0.010	0.030
287	23.92	0.07	0.040	( 0.056)	0.010	0.030
288	24.00	0.07	0.040	( 0.056)	0.010	0.030

(Loss Rate Not Used)

Sum = 100.0

Sum = 46.3

Flood volume = Effective rainfall 3.86(In)



3+20	0.1332	0.66	VQ
3+25	0.1378	0.66	VQ
3+30	0.1423	0.66	Q
3+35	0.1468	0.66	Q
3+40	0.1513	0.66	Q
3+45	0.1558	0.66	Q
3+50	0.1610	0.74	Q
3+55	0.1664	0.79	VQ
4+ 0	0.1718	0.79	VQ
4+ 5	0.1772	0.79	VQ
4+10	0.1827	0.79	VQ
4+15	0.1881	0.79	VQ
4+20	0.1941	0.87	VQ
4+25	0.2004	0.92	VQ
4+30	0.2068	0.92	VQ
4+35	0.2131	0.92	Q
4+40	0.2194	0.92	Q
4+45	0.2258	0.92	Q
4+50	0.2327	1.01	VQ
4+55	0.2399	1.05	VQ
5+ 0	0.2472	1.05	VQ
5+ 5	0.2532	0.88	Q
5+10	0.2586	0.79	Q
5+15	0.2641	0.79	Q
5+20	0.2701	0.87	Q
5+25	0.2764	0.92	Q
5+30	0.2828	0.92	Q
5+35	0.2897	1.01	Q
5+40	0.2969	1.05	Q
5+45	0.3042	1.05	Q
5+50	0.3114	1.05	Q
5+55	0.3186	1.05	Q
6+ 0	0.3259	1.05	Q
6+ 5	0.3337	1.14	Q
6+10	0.3418	1.18	Q
6+15	0.3500	1.18	Q
6+20	0.3581	1.18	QV
6+25	0.3663	1.18	QV
6+30	0.3744	1.18	QV
6+35	0.3831	1.27	Q
6+40	0.3922	1.31	Q
6+45	0.4012	1.31	Q
6+50	0.4103	1.31	Q
6+55	0.4193	1.31	Q
7+ 0	0.4284	1.31	QV
7+ 5	0.4374	1.31	QV
7+10	0.4464	1.31	QV
7+15	0.4555	1.31	QV
7+20	0.4651	1.40	QV
7+25	0.4751	1.44	QV
7+30	0.4850	1.44	QV
7+35	0.4956	1.53	QV
7+40	0.5064	1.58	QV
7+45	0.5173	1.58	QV
7+50	0.5287	1.66	QV
7+55	0.5405	1.71	QV
8+ 0	0.5522	1.71	QV

8+ 5	0.5652	1.88	Q			
8+10	0.5788	1.97	QV			
8+15	0.5923	1.97	QV			
8+20	0.6059	1.97	QV			
8+25	0.6195	1.97	QV			
8+30	0.6330	1.97	QV			
8+35	0.6472	2.06	QV			
8+40	0.6617	2.10	QV			
8+45	0.6761	2.10	QV			
8+50	0.6912	2.19	QV			
8+55	0.7066	2.23	QV			
9+ 0	0.7220	2.23	Q V			
9+ 5	0.7385	2.41	QV			
9+10	0.7557	2.50	QV			
9+15	0.7729	2.50	QV			
9+20	0.7907	2.58	QV			
9+25	0.8088	2.63	QV			
9+30	0.8269	2.63	QV			
9+35	0.8455	2.71	QV			
9+40	0.8645	2.76	QV			
9+45	0.8835	2.76	QV			
9+50	0.9031	2.84	QV			
9+55	0.9230	2.89	Q V			
10+ 0	0.9429	2.89	Q V			
10+ 5	0.9586	2.28	Q V			
10+10	0.9722	1.97	Q V			
10+15	0.9858	1.97	Q V			
10+20	0.9993	1.97	Q V			
10+25	1.0129	1.97	Q V			
10+30	1.0265	1.97	Q V			
10+35	1.0430	2.40	Q V			
10+40	1.0611	2.63	Q V			
10+45	1.0792	2.63	Q V			
10+50	1.0973	2.63	Q V			
10+55	1.1154	2.63	Q V			
11+ 0	1.1335	2.63	Q V			
11+ 5	1.1509	2.54	Q V			
11+10	1.1681	2.50	Q V			
11+15	1.1853	2.50	Q V			
11+20	1.2025	2.50	Q V			
11+25	1.2197	2.50	Q V			
11+30	1.2369	2.50	Q V			
11+35	1.2529	2.32	Q V			
11+40	1.2682	2.23	Q V			
11+45	1.2836	2.23	Q V			
11+50	1.2996	2.32	Q V			
11+55	1.3159	2.36	Q V			
12+ 0	1.3321	2.36	Q V			
12+ 5	1.3536	3.12	Q V			
12+10	1.3778	3.51	Q V			
12+15	1.4020	3.51	Q V			
12+20	1.4270	3.63	Q V			
12+25	1.4525	3.70	Q V			
12+30	1.4780	3.70	Q V			
12+35	1.5051	3.94	Q V			
12+40	1.5331	4.07	Q V			
12+45	1.5612	4.07	Q V			

12+50	1.5901	4.19			Q	V	
12+55	1.6194	4.26			Q	V	
13+ 0	1.6488	4.26			Q	V	
13+ 5	1.6822	4.85			Q	V	
13+10	1.7177	5.16			Q	V	
13+15	1.7533	5.16			Q	V	
13+20	1.7889	5.17			Q	V	
13+25	1.8245	5.17			Q	V	
13+30	1.8602	5.18			Q	V	
13+35	1.8869	3.89			Q	V	
13+40	1.9092	3.23			Q	V	
13+45	1.9315	3.24		Q		V	
13+50	1.9538	3.24		Q		V	
13+55	1.9762	3.25		Q		V	
14+ 0	1.9986	3.25		Q		V	
14+ 5	2.0242	3.72		Q		V	
14+10	2.0516	3.97		Q		V	
14+15	2.0789	3.97		Q		V	
14+20	2.1055	3.86		Q		V	
14+25	2.1317	3.80		Q		V	
14+30	2.1579	3.81		Q		V	
14+35	2.1842	3.81		Q		V	
14+40	2.2105	3.82		Q		V	
14+45	2.2368	3.82		Q		V	
14+50	2.2623	3.71		Q		V	
14+55	2.2875	3.65		Q		V	
15+ 0	2.3126	3.66		Q		V	
15+ 5	2.3370	3.54		Q		V	
15+10	2.3610	3.49		Q		V	
15+15	2.3851	3.49		Q		V	
15+20	2.4083	3.38		Q		V	
15+25	2.4312	3.32		Q		V	
15+30	2.4541	3.32		Q		V	
15+35	2.4738	2.86		Q		V	
15+40	2.4918	2.62		Q		V	
15+45	2.5099	2.63		Q		V	
15+50	2.5280	2.63		Q		V	
15+55	2.5462	2.63		Q		V	
16+ 0	2.5643	2.64		Q		V	
16+ 5	2.5729	1.24	Q			V	
16+10	2.5765	0.53	Q			V	
16+15	2.5801	0.53	Q			V	
16+20	2.5837	0.53	Q			V	
16+25	2.5873	0.53	Q			V	
16+30	2.5910	0.53	Q			V	
16+35	2.5940	0.44	Q			V	
16+40	2.5967	0.39	Q			V	
16+45	2.5994	0.39	Q			V	
16+50	2.6021	0.39	Q			V	
16+55	2.6048	0.39	Q			V	
17+ 0	2.6075	0.39	Q			V	
17+ 5	2.6115	0.57	Q			V	
17+10	2.6160	0.66	Q			V	
17+15	2.6205	0.66	Q			V	
17+20	2.6250	0.66	Q			V	
17+25	2.6295	0.66	Q			V	
17+30	2.6341	0.66	Q			V	

17+35	2.6386	0.66	Q	V
17+40	2.6431	0.66	Q	V
17+45	2.6476	0.66	Q	V
17+50	2.6516	0.57	Q	V
17+55	2.6552	0.53	Q	V
18+ 0	2.6588	0.53	Q	V
18+ 5	2.6624	0.53	Q	V
18+10	2.6660	0.53	Q	V
18+15	2.6696	0.53	Q	V
18+20	2.6733	0.53	Q	V
18+25	2.6769	0.53	Q	V
18+30	2.6805	0.53	Q	V
18+35	2.6835	0.44	Q	V
18+40	2.6862	0.39	Q	V
18+45	2.6889	0.39	Q	V
18+50	2.6911	0.31	Q	V
18+55	2.6929	0.26	Q	V
19+ 0	2.6947	0.26	Q	V
19+ 5	2.6971	0.35	Q	V
19+10	2.6998	0.39	Q	V
19+15	2.7025	0.39	Q	V
19+20	2.7058	0.48	Q	V
19+25	2.7094	0.53	Q	V
19+30	2.7131	0.53	Q	V
19+35	2.7161	0.44	Q	V
19+40	2.7188	0.39	Q	V
19+45	2.7215	0.39	Q	V
19+50	2.7236	0.31	Q	V
19+55	2.7254	0.26	Q	V
20+ 0	2.7272	0.26	Q	V
20+ 5	2.7296	0.35	Q	V
20+10	2.7324	0.39	Q	V
20+15	2.7351	0.39	Q	V
20+20	2.7378	0.39	Q	V
20+25	2.7405	0.39	Q	V
20+30	2.7432	0.39	Q	V
20+35	2.7459	0.39	Q	V
20+40	2.7486	0.39	Q	V
20+45	2.7513	0.39	Q	V
20+50	2.7535	0.31	Q	V
20+55	2.7553	0.26	Q	V
21+ 0	2.7571	0.26	Q	V
21+ 5	2.7595	0.35	Q	V
21+10	2.7622	0.39	Q	V
21+15	2.7649	0.39	Q	V
21+20	2.7670	0.31	Q	V
21+25	2.7688	0.26	Q	V
21+30	2.7706	0.26	Q	V
21+35	2.7731	0.35	Q	V
21+40	2.7758	0.39	Q	V
21+45	2.7785	0.39	Q	V
21+50	2.7806	0.31	Q	V
21+55	2.7824	0.26	Q	V
22+ 0	2.7842	0.26	Q	V
22+ 5	2.7866	0.35	Q	V
22+10	2.7893	0.39	Q	V
22+15	2.7920	0.39	Q	V

22+20	2.7942	0.31	Q				V
22+25	2.7960	0.26	Q				V
22+30	2.7978	0.26	Q				V
22+35	2.7996	0.26	Q				V
22+40	2.8014	0.26	Q				V
22+45	2.8032	0.26	Q				V
22+50	2.8050	0.26	Q				V
22+55	2.8068	0.26	Q				V
23+ 0	2.8086	0.26	Q				V
23+ 5	2.8104	0.26	Q				V
23+10	2.8122	0.26	Q				V
23+15	2.8141	0.26	Q				V
23+20	2.8159	0.26	Q				V
23+25	2.8177	0.26	Q				V
23+30	2.8195	0.26	Q				V
23+35	2.8213	0.26	Q				V
23+40	2.8231	0.26	Q				V
23+45	2.8249	0.26	Q				V
23+50	2.8267	0.26	Q				V
23+55	2.8285	0.26	Q				V
24+ 0	2.8303	0.26	Q				V
24+ 5	2.8309	0.09	Q				V

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Unit Hydrograph Analysis

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Study date 10/02/24 File: q100uh7ax6100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED A  
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 1138.00(Ft.)  
Length along longest watercourse measured to centroid = 638.00(Ft.)  
Length along longest watercourse = 0.216 Mi.  
Length along longest watercourse measured to centroid = 0.121 Mi.  
Difference in elevation = 14.60(Ft.)  
Slope along watercourse = 67.7399 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.081 Hr.  
Lag time = 4.85 Min.  
25% of lag time = 1.21 Min.  
40% of lag time = 1.94 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.20	11.65

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	2.50	24.28

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.200(In)  
 Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500
Total Area Entered = 9.71(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
						Sum (F) = 0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258  
 Minimum soil loss rate ((In/Hr)) = 0.129  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

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 U n i t H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	1.973
2	0.167	206.259	4.756
3	0.250	309.388	1.486
4	0.333	412.518	0.675
5	0.417	515.647	0.377
6	0.500	618.777	0.243
7	0.583	721.906	0.147
8	0.667	825.035	0.129
		Sum = 100.000	Sum= 9.786

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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.150	( 0.258)	0.075

2	0.17	0.60	0.180	( 0.258)	0.090	0.090
3	0.25	0.60	0.180	( 0.258)	0.090	0.090
4	0.33	0.60	0.180	( 0.258)	0.090	0.090
5	0.42	0.60	0.180	( 0.258)	0.090	0.090
6	0.50	0.70	0.210	( 0.258)	0.105	0.105
7	0.58	0.70	0.210	( 0.258)	0.105	0.105
8	0.67	0.70	0.210	( 0.258)	0.105	0.105
9	0.75	0.70	0.210	( 0.258)	0.105	0.105
10	0.83	0.70	0.210	( 0.258)	0.105	0.105
11	0.92	0.70	0.210	( 0.258)	0.105	0.105
12	1.00	0.80	0.240	( 0.258)	0.120	0.120
13	1.08	0.80	0.240	( 0.258)	0.120	0.120
14	1.17	0.80	0.240	( 0.258)	0.120	0.120
15	1.25	0.80	0.240	( 0.258)	0.120	0.120
16	1.33	0.80	0.240	( 0.258)	0.120	0.120
17	1.42	0.80	0.240	( 0.258)	0.120	0.120
18	1.50	0.80	0.240	( 0.258)	0.120	0.120
19	1.58	0.80	0.240	( 0.258)	0.120	0.120
20	1.67	0.80	0.240	( 0.258)	0.120	0.120
21	1.75	0.80	0.240	( 0.258)	0.120	0.120
22	1.83	0.80	0.240	( 0.258)	0.120	0.120
23	1.92	0.80	0.240	( 0.258)	0.120	0.120
24	2.00	0.90	0.270	( 0.258)	0.135	0.135
25	2.08	0.80	0.240	( 0.258)	0.120	0.120
26	2.17	0.90	0.270	( 0.258)	0.135	0.135
27	2.25	0.90	0.270	( 0.258)	0.135	0.135
28	2.33	0.90	0.270	( 0.258)	0.135	0.135
29	2.42	0.90	0.270	( 0.258)	0.135	0.135
30	2.50	0.90	0.270	( 0.258)	0.135	0.135
31	2.58	0.90	0.270	( 0.258)	0.135	0.135
32	2.67	0.90	0.270	( 0.258)	0.135	0.135
33	2.75	1.00	0.300	( 0.258)	0.150	0.150
34	2.83	1.00	0.300	( 0.258)	0.150	0.150
35	2.92	1.00	0.300	( 0.258)	0.150	0.150
36	3.00	1.00	0.300	( 0.258)	0.150	0.150
37	3.08	1.00	0.300	( 0.258)	0.150	0.150
38	3.17	1.10	0.330	( 0.258)	0.165	0.165
39	3.25	1.10	0.330	( 0.258)	0.165	0.165
40	3.33	1.10	0.330	( 0.258)	0.165	0.165
41	3.42	1.20	0.360	( 0.258)	0.180	0.180
42	3.50	1.30	0.390	( 0.258)	0.195	0.195
43	3.58	1.40	0.420	( 0.258)	0.210	0.210
44	3.67	1.40	0.420	( 0.258)	0.210	0.210
45	3.75	1.50	0.450	( 0.258)	0.225	0.225
46	3.83	1.50	0.450	( 0.258)	0.225	0.225
47	3.92	1.60	0.480	( 0.258)	0.240	0.240
48	4.00	1.60	0.480	( 0.258)	0.240	0.240
49	4.08	1.70	0.510	( 0.258)	0.255	0.255
50	4.17	1.80	0.540	0.258	( 0.270)	0.282
51	4.25	1.90	0.570	0.258	( 0.285)	0.312
52	4.33	2.00	0.600	0.258	( 0.300)	0.342
53	4.42	2.10	0.630	0.258	( 0.315)	0.372
54	4.50	2.10	0.630	0.258	( 0.315)	0.372
55	4.58	2.20	0.660	0.258	( 0.330)	0.402
56	4.67	2.30	0.690	0.258	( 0.345)	0.432
57	4.75	2.40	0.720	0.258	( 0.360)	0.462
58	4.83	2.40	0.720	0.258	( 0.360)	0.462

59	4.92	2.50	0.750	0.258	( 0.375)	0.492
60	5.00	2.60	0.780	0.258	( 0.390)	0.522
61	5.08	3.10	0.930	0.258	( 0.465)	0.672
62	5.17	3.60	1.080	0.258	( 0.540)	0.822
63	5.25	3.90	1.170	0.258	( 0.585)	0.912
64	5.33	4.20	1.260	0.258	( 0.630)	1.002
65	5.42	4.70	1.410	0.258	( 0.705)	1.152
66	5.50	5.60	1.680	0.258	( 0.840)	1.422
67	5.58	1.90	0.570	0.258	( 0.285)	0.312
68	5.67	0.90	0.270	( 0.258)	0.135	0.135
69	5.75	0.60	0.180	( 0.258)	0.090	0.090
70	5.83	0.50	0.150	( 0.258)	0.075	0.075
71	5.92	0.30	0.090	( 0.258)	0.045	0.045
72	6.00	0.20	0.060	( 0.258)	0.030	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.1

Flood volume = Effective rainfall 1.50(In)  
times area 9.7(Ac.)/[ (In)/(Ft.) ] = 1.2(Ac.Ft)  
Total soil loss = 1.00(In)  
Total soil loss = 0.806(Ac.Ft)  
Total rainfall = 2.50(In)  
Flood volume = 53023.5 Cubic Feet  
Total soil loss = 35091.8 Cubic Feet

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Peak flow rate of this hydrograph = 11.009(CFS)  
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6 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0010		0.15	Q				
0+10	0.0047		0.53	VQ				
0+15	0.0096		0.72	VQ				
0+20	0.0151		0.79	VQ				
0+25	0.0208		0.83	VQ				
0+30	0.0269		0.88	VQ				
0+35	0.0335		0.97	Q				
0+40	0.0404		1.00	VQ				
0+45	0.0474		1.01	VQ				
0+50	0.0545		1.02	VQ				
0+55	0.0615		1.02	Q				
1+ 0	0.0688		1.06	Q				
1+ 5	0.0766		1.13	Q				
1+10	0.0845		1.15	Q				
1+15	0.0925		1.16	QV				
1+20	0.1005		1.17	QV				
1+25	0.1086		1.17	QV				
1+30	0.1167		1.17	QV				
1+35	0.1248		1.17	Q V				
1+40	0.1328		1.17	Q V				
1+45	0.1409		1.17	Q V				
1+50	0.1490		1.17	Q V				

1+55	0.1571	1.17	Q	V						
2+ 0	0.1654	1.20	Q	V						
2+ 5	0.1740	1.25	Q	V						
2+10	0.1824	1.23	Q	V						
2+15	0.1913	1.29	Q	V						
2+20	0.2003	1.30	Q	V						
2+25	0.2093	1.31	Q	V						
2+30	0.2184	1.32	Q	V						
2+35	0.2275	1.32	Q	V						
2+40	0.2366	1.32	Q	V						
2+45	0.2459	1.35	Q	V						
2+50	0.2557	1.42	Q	V						
2+55	0.2656	1.45	Q	V						
3+ 0	0.2756	1.46	Q	V						
3+ 5	0.2857	1.46	Q	V						
3+10	0.2960	1.49	Q	V						
3+15	0.3068	1.57	Q	V						
3+20	0.3177	1.59	Q	V						
3+25	0.3290	1.63	Q	V						
3+30	0.3410	1.74	Q	V						
3+35	0.3538	1.87	Q	V						
3+40	0.3674	1.97	Q	V						
3+45	0.3814	2.04	Q	V						
3+50	0.3961	2.13	Q	V						
3+55	0.4112	2.20	Q	V						
4+ 0	0.4270	2.28	Q	V						
4+ 5	0.4431	2.35	Q	V						
4+10	0.4602	2.49	Q	V						
4+15	0.4789	2.70	Q	V						
4+20	0.4993	2.96	Q	V						
4+25	0.5216	3.24	Q	V						
4+30	0.5454	3.46	Q	V						
4+35	0.5702	3.60	Q	V						
4+40	0.5967	3.85	Q	V						
4+45	0.6251	4.12	Q	V						
4+50	0.6550	4.35	Q	V						
4+55	0.6860	4.49	Q	V						
5+ 0	0.7186	4.73	Q	V						
5+ 5	0.7547	5.24	Q	V						
5+10	0.7983	6.33	Q	V						
5+15	0.8498	7.49	Q	V						
5+20	0.9079	8.44	Q	V						
5+25	0.9731	9.47	Q	V						
5+30	1.0489	11.01	Q	V						
5+35	1.1211	10.48	Q	V						
5+40	1.1587	5.45	Q	V						
5+45	1.1805	3.16	Q	V						
5+50	1.1947	2.07	Q	V						
5+55	1.2046	1.43	Q	V						
6+ 0	1.2110	0.93	Q	V						
6+ 5	1.2148	0.56	Q	V						
6+10	1.2161	0.19	Q	V						
6+15	1.2167	0.09	Q	V						
6+20	1.2170	0.04	Q	V						
6+25	1.2172	0.02	Q	V						
6+30	1.2172	0.01	Q	V						
6+35	1.2173	0.00	Q	V						



Unit Hydrograph Analysis

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Study date 10/02/24 File: q100uhbx76100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED B  
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) =  
0.012 Sq. Mi.  
Length along longest watercourse = 864.00(Ft.)  
Length along longest watercourse measured to centroid = 584.00(Ft.)  
Length along longest watercourse = 0.164 Mi.  
Length along longest watercourse measured to centroid = 0.111 Mi.  
Difference in elevation = 13.90(Ft.)  
Slope along watercourse = 84.9444 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.067 Hr.  
Lag time = 4.04 Min.  
25% of lag time = 1.01 Min.  
40% of lag time = 1.62 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.20	9.05

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   7.54                    2.50                    18.85

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.200(In)  
 Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   7.540            69.78            0.500  
 Total Area Entered = 7.54(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
						Sum (F) = 0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200  
 Minimum soil loss rate ((In/Hr)) = 0.100  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	1.994
2	0.167	247.253	3.692
3	0.250	370.880	0.988
4	0.333	494.506	0.445
5	0.417	618.133	0.248
6	0.500	741.759	0.139
7	0.583	865.386	0.092
		Sum = 100.000	Sum= 7.599

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.150	( 0.200)	0.075
2	0.17	0.180	( 0.200)	0.090

3	0.25	0.60	0.180	( 0.200)	0.090	0.090
4	0.33	0.60	0.180	( 0.200)	0.090	0.090
5	0.42	0.60	0.180	( 0.200)	0.090	0.090
6	0.50	0.70	0.210	( 0.200)	0.105	0.105
7	0.58	0.70	0.210	( 0.200)	0.105	0.105
8	0.67	0.70	0.210	( 0.200)	0.105	0.105
9	0.75	0.70	0.210	( 0.200)	0.105	0.105
10	0.83	0.70	0.210	( 0.200)	0.105	0.105
11	0.92	0.70	0.210	( 0.200)	0.105	0.105
12	1.00	0.80	0.240	( 0.200)	0.120	0.120
13	1.08	0.80	0.240	( 0.200)	0.120	0.120
14	1.17	0.80	0.240	( 0.200)	0.120	0.120
15	1.25	0.80	0.240	( 0.200)	0.120	0.120
16	1.33	0.80	0.240	( 0.200)	0.120	0.120
17	1.42	0.80	0.240	( 0.200)	0.120	0.120
18	1.50	0.80	0.240	( 0.200)	0.120	0.120
19	1.58	0.80	0.240	( 0.200)	0.120	0.120
20	1.67	0.80	0.240	( 0.200)	0.120	0.120
21	1.75	0.80	0.240	( 0.200)	0.120	0.120
22	1.83	0.80	0.240	( 0.200)	0.120	0.120
23	1.92	0.80	0.240	( 0.200)	0.120	0.120
24	2.00	0.90	0.270	( 0.200)	0.135	0.135
25	2.08	0.80	0.240	( 0.200)	0.120	0.120
26	2.17	0.90	0.270	( 0.200)	0.135	0.135
27	2.25	0.90	0.270	( 0.200)	0.135	0.135
28	2.33	0.90	0.270	( 0.200)	0.135	0.135
29	2.42	0.90	0.270	( 0.200)	0.135	0.135
30	2.50	0.90	0.270	( 0.200)	0.135	0.135
31	2.58	0.90	0.270	( 0.200)	0.135	0.135
32	2.67	0.90	0.270	( 0.200)	0.135	0.135
33	2.75	1.00	0.300	( 0.200)	0.150	0.150
34	2.83	1.00	0.300	( 0.200)	0.150	0.150
35	2.92	1.00	0.300	( 0.200)	0.150	0.150
36	3.00	1.00	0.300	( 0.200)	0.150	0.150
37	3.08	1.00	0.300	( 0.200)	0.150	0.150
38	3.17	1.10	0.330	( 0.200)	0.165	0.165
39	3.25	1.10	0.330	( 0.200)	0.165	0.165
40	3.33	1.10	0.330	( 0.200)	0.165	0.165
41	3.42	1.20	0.360	( 0.200)	0.180	0.180
42	3.50	1.30	0.390	( 0.200)	0.195	0.195
43	3.58	1.40	0.420	0.200 ( 0.210)	0.220	0.220
44	3.67	1.40	0.420	0.200 ( 0.210)	0.220	0.220
45	3.75	1.50	0.450	0.200 ( 0.225)	0.250	0.250
46	3.83	1.50	0.450	0.200 ( 0.225)	0.250	0.250
47	3.92	1.60	0.480	0.200 ( 0.240)	0.280	0.280
48	4.00	1.60	0.480	0.200 ( 0.240)	0.280	0.280
49	4.08	1.70	0.510	0.200 ( 0.255)	0.310	0.310
50	4.17	1.80	0.540	0.200 ( 0.270)	0.340	0.340
51	4.25	1.90	0.570	0.200 ( 0.285)	0.370	0.370
52	4.33	2.00	0.600	0.200 ( 0.300)	0.400	0.400
53	4.42	2.10	0.630	0.200 ( 0.315)	0.430	0.430
54	4.50	2.10	0.630	0.200 ( 0.315)	0.430	0.430
55	4.58	2.20	0.660	0.200 ( 0.330)	0.460	0.460
56	4.67	2.30	0.690	0.200 ( 0.345)	0.490	0.490
57	4.75	2.40	0.720	0.200 ( 0.360)	0.520	0.520
58	4.83	2.40	0.720	0.200 ( 0.360)	0.520	0.520
59	4.92	2.50	0.750	0.200 ( 0.375)	0.550	0.550

60	5.00	2.60	0.780	0.200	( 0.390)	0.580
61	5.08	3.10	0.930	0.200	( 0.465)	0.730
62	5.17	3.60	1.080	0.200	( 0.540)	0.880
63	5.25	3.90	1.170	0.200	( 0.585)	0.970
64	5.33	4.20	1.260	0.200	( 0.630)	1.060
65	5.42	4.70	1.410	0.200	( 0.705)	1.210
66	5.50	5.60	1.680	0.200	( 0.840)	1.480
67	5.58	1.90	0.570	0.200	( 0.285)	0.370
68	5.67	0.90	0.270	( 0.200)	0.135	0.135
69	5.75	0.60	0.180	( 0.200)	0.090	0.090
70	5.83	0.50	0.150	( 0.200)	0.075	0.075
71	5.92	0.30	0.090	( 0.200)	0.045	0.045
72	6.00	0.20	0.060	( 0.200)	0.030	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.3

Flood volume = Effective rainfall 1.61(In)  
times area 7.5(Ac.)/[ (In)/(Ft.) ] = 1.0(Ac.Ft)  
Total soil loss = 0.89(In)  
Total soil loss = 0.561(Ac.Ft)  
Total rainfall = 2.50(In)  
Flood volume = 43995.8 Cubic Feet  
Total soil loss = 24428.0 Cubic Feet

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Peak flow rate of this hydrograph = 9.273(CFS)  
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6 - H O U R S T O R M  
R u n o f f H y d r o g r a p h  
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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0010	0.15	Q				
0+10	0.0042	0.46	VQ				
0+15	0.0082	0.59	V Q				
0+20	0.0126	0.63	V Q				
0+25	0.0171	0.66	V Q				
0+30	0.0220	0.70	V Q				
0+35	0.0273	0.77	V Q				
0+40	0.0327	0.78	V Q				
0+45	0.0381	0.79	V Q				
0+50	0.0436	0.79	V Q				
0+55	0.0491	0.80	V Q				
1+ 0	0.0548	0.83	VQ				
1+ 5	0.0609	0.88	VQ				
1+10	0.0671	0.90	VQ				
1+15	0.0733	0.91	VQ				
1+20	0.0795	0.91	Q				
1+25	0.0858	0.91	Q				
1+30	0.0921	0.91	Q				
1+35	0.0984	0.91	Q				
1+40	0.1047	0.91	QV				
1+45	0.1110	0.91	QV				
1+50	0.1172	0.91	QV				
1+55	0.1235	0.91	QV				

2+ 0	0.1300	0.94	Q V				
2+ 5	0.1367	0.97	Q V				
2+10	0.1433	0.96	Q V				
2+15	0.1502	1.00	QV				
2+20	0.1572	1.02	Q V				
2+25	0.1642	1.02	Q V				
2+30	0.1713	1.02	Q V				
2+35	0.1783	1.02	Q V				
2+40	0.1854	1.03	Q V				
2+45	0.1927	1.06	Q V				
2+50	0.2003	1.11	Q V				
2+55	0.2081	1.13	Q V				
3+ 0	0.2159	1.13	Q V				
3+ 5	0.2237	1.14	Q V				
3+10	0.2318	1.17	Q V				
3+15	0.2402	1.23	Q V				
3+20	0.2488	1.24	Q V				
3+25	0.2575	1.28	Q V				
3+30	0.2670	1.37	Q V				
3+35	0.2772	1.49	Q V				
3+40	0.2882	1.60	Q V				
3+45	0.2999	1.70	Q V				
3+50	0.3125	1.82	Q V				
3+55	0.3257	1.92	Q V				
4+ 0	0.3398	2.05	Q V				
4+ 5	0.3547	2.15	Q V				
4+10	0.3708	2.34	Q V				
4+15	0.3883	2.55	Q V				
4+20	0.4074	2.77	Q V				
4+25	0.4280	2.99	Q V				
4+30	0.4497	3.16	Q V				
4+35	0.4723	3.27	Q V				
4+40	0.4962	3.47	Q V				
4+45	0.5216	3.69	Q V				
4+50	0.5481	3.85	Q V				
4+55	0.5754	3.96	Q V				
5+ 0	0.6040	4.16	Q V				
5+ 5	0.6357	4.61	Q V				
5+10	0.6737	5.51	Q V				
5+15	0.7179	6.42	Q V				
5+20	0.7672	7.16	Q V				
5+25	0.8223	7.99	QV				
5+30	0.8861	9.27	Q V				
5+35	0.9433	8.30	Q V				
5+40	0.9716	4.11	Q				
5+45	0.9870	2.24	Q				
5+50	0.9968	1.41	Q				
5+55	1.0032	0.93	Q				
6+ 0	1.0070	0.56	Q				
6+ 5	1.0088	0.26	Q				
6+10	1.0095	0.09	Q				
6+15	1.0098	0.04	Q				
6+20	1.0099	0.02	Q				
6+25	1.0100	0.01	Q				
6+30	1.0100	0.00	Q				



Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED A  
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 665.00(Ft.)  
Length along longest watercourse measured to centroid = 635.00(Ft.)  
Length along longest watercourse = 0.126 Mi.  
Length along longest watercourse measured to centroid = 0.120 Mi.  
Difference in elevation = 22.87(Ft.)  
Slope along watercourse = 181.5844 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.027 Hr.  
Lag time = 1.64 Min.  
25% of lag time = 0.41 Min.  
40% of lag time = 0.65 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.20	10.86

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   9.05                    2.50                    22.63

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.200(In)  
 Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   9.050            61.50            0.800  
 Total Area Entered = 9.05(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
						Sum (F) = 0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127  
 Minimum soil loss rate ((In/Hr)) = 0.064  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

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 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data  
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Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	305.645	5.222
2	0.167	611.289	3.358
3	0.250	916.934	0.541
		Sum = 100.000	Sum= 9.121

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.150	( 0.127)	0.039	0.111
2	0.17	0.180	( 0.127)	0.047	0.133
3	0.25	0.180	( 0.127)	0.047	0.133
4	0.33	0.180	( 0.127)	0.047	0.133
5	0.42	0.180	( 0.127)	0.047	0.133
6	0.50	0.210	( 0.127)	0.055	0.155

7	0.58	0.70	0.210	( 0.127)	0.055	0.155
8	0.67	0.70	0.210	( 0.127)	0.055	0.155
9	0.75	0.70	0.210	( 0.127)	0.055	0.155
10	0.83	0.70	0.210	( 0.127)	0.055	0.155
11	0.92	0.70	0.210	( 0.127)	0.055	0.155
12	1.00	0.80	0.240	( 0.127)	0.062	0.178
13	1.08	0.80	0.240	( 0.127)	0.062	0.178
14	1.17	0.80	0.240	( 0.127)	0.062	0.178
15	1.25	0.80	0.240	( 0.127)	0.062	0.178
16	1.33	0.80	0.240	( 0.127)	0.062	0.178
17	1.42	0.80	0.240	( 0.127)	0.062	0.178
18	1.50	0.80	0.240	( 0.127)	0.062	0.178
19	1.58	0.80	0.240	( 0.127)	0.062	0.178
20	1.67	0.80	0.240	( 0.127)	0.062	0.178
21	1.75	0.80	0.240	( 0.127)	0.062	0.178
22	1.83	0.80	0.240	( 0.127)	0.062	0.178
23	1.92	0.80	0.240	( 0.127)	0.062	0.178
24	2.00	0.90	0.270	( 0.127)	0.070	0.200
25	2.08	0.80	0.240	( 0.127)	0.062	0.178
26	2.17	0.90	0.270	( 0.127)	0.070	0.200
27	2.25	0.90	0.270	( 0.127)	0.070	0.200
28	2.33	0.90	0.270	( 0.127)	0.070	0.200
29	2.42	0.90	0.270	( 0.127)	0.070	0.200
30	2.50	0.90	0.270	( 0.127)	0.070	0.200
31	2.58	0.90	0.270	( 0.127)	0.070	0.200
32	2.67	0.90	0.270	( 0.127)	0.070	0.200
33	2.75	1.00	0.300	( 0.127)	0.078	0.222
34	2.83	1.00	0.300	( 0.127)	0.078	0.222
35	2.92	1.00	0.300	( 0.127)	0.078	0.222
36	3.00	1.00	0.300	( 0.127)	0.078	0.222
37	3.08	1.00	0.300	( 0.127)	0.078	0.222
38	3.17	1.10	0.330	( 0.127)	0.086	0.244
39	3.25	1.10	0.330	( 0.127)	0.086	0.244
40	3.33	1.10	0.330	( 0.127)	0.086	0.244
41	3.42	1.20	0.360	( 0.127)	0.094	0.266
42	3.50	1.30	0.390	( 0.127)	0.101	0.289
43	3.58	1.40	0.420	( 0.127)	0.109	0.311
44	3.67	1.40	0.420	( 0.127)	0.109	0.311
45	3.75	1.50	0.450	( 0.127)	0.117	0.333
46	3.83	1.50	0.450	( 0.127)	0.117	0.333
47	3.92	1.60	0.480	( 0.127)	0.125	0.355
48	4.00	1.60	0.480	( 0.127)	0.125	0.355
49	4.08	1.70	0.510	0.127 ( 0.133)		0.383
50	4.17	1.80	0.540	0.127 ( 0.140)		0.413
51	4.25	1.90	0.570	0.127 ( 0.148)		0.443
52	4.33	2.00	0.600	0.127 ( 0.156)		0.473
53	4.42	2.10	0.630	0.127 ( 0.164)		0.503
54	4.50	2.10	0.630	0.127 ( 0.164)		0.503
55	4.58	2.20	0.660	0.127 ( 0.172)		0.533
56	4.67	2.30	0.690	0.127 ( 0.179)		0.563
57	4.75	2.40	0.720	0.127 ( 0.187)		0.593
58	4.83	2.40	0.720	0.127 ( 0.187)		0.593
59	4.92	2.50	0.750	0.127 ( 0.195)		0.623
60	5.00	2.60	0.780	0.127 ( 0.203)		0.653
61	5.08	3.10	0.930	0.127 ( 0.242)		0.803
62	5.17	3.60	1.080	0.127 ( 0.281)		0.953
63	5.25	3.90	1.170	0.127 ( 0.304)		1.043

64	5.33	4.20	1.260	0.127	( 0.328)	1.133
65	5.42	4.70	1.410	0.127	( 0.367)	1.283
66	5.50	5.60	1.680	0.127	( 0.437)	1.553
67	5.58	1.90	0.570	0.127	( 0.148)	0.443
68	5.67	0.90	0.270	( 0.127)	0.070	0.200
69	5.75	0.60	0.180	( 0.127)	0.047	0.133
70	5.83	0.50	0.150	( 0.127)	0.039	0.111
71	5.92	0.30	0.090	( 0.127)	0.023	0.067
72	6.00	0.20	0.060	( 0.127)	0.016	0.044

(Loss Rate Not Used)

Sum = 100.0 Sum = 23.9

Flood volume = Effective rainfall 1.99(In)  
times area 9.1(Ac.)/[ (In)/(Ft.) ] = 1.5(Ac.Ft)  
Total soil loss = 0.51(In)  
Total soil loss = 0.382(Ac.Ft)  
Total rainfall = 2.50(In)  
Flood volume = 65481.2 Cubic Feet  
Total soil loss = 16645.0 Cubic Feet

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Peak flow rate of this hydrograph = 13.036(CFS)  
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6 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0040	0.58	VQ				
0+10	0.0114	1.07	V Q				
0+15	0.0196	1.20	V Q				
0+20	0.0280	1.22	V Q				
0+25	0.0364	1.22	V Q				
0+30	0.0456	1.33	VQ				
0+35	0.0552	1.41	VQ				
0+40	0.0650	1.42	VQ				
0+45	0.0748	1.42	VQ				
0+50	0.0845	1.42	Q				
0+55	0.0943	1.42	Q				
1+ 0	0.1049	1.53	VQ				
1+ 5	0.1159	1.61	Q				
1+10	0.1271	1.62	Q				
1+15	0.1383	1.62	Q				
1+20	0.1494	1.62	Q				
1+25	0.1606	1.62	QV				
1+30	0.1718	1.62	QV				
1+35	0.1829	1.62	QV				
1+40	0.1941	1.62	Q V				
1+45	0.2052	1.62	Q V				
1+50	0.2164	1.62	Q V				
1+55	0.2276	1.62	Q V				
2+ 0	0.2395	1.74	Q V				
2+ 5	0.2512	1.70	Q V				
2+10	0.2632	1.75	Q V				
2+15	0.2757	1.81	Q V				

2+20	0.2883	1.82	Q	V					
2+25	0.3008	1.82	Q	V					
2+30	0.3134	1.82	Q	V					
2+35	0.3259	1.82	Q	V					
2+40	0.3385	1.82	Q	V					
2+45	0.3518	1.94	Q	V					
2+50	0.3657	2.01	Q	V					
2+55	0.3797	2.03	Q	V					
3+ 0	0.3936	2.03	Q	V					
3+ 5	0.4076	2.03	Q	V					
3+10	0.4223	2.14	Q	V					
3+15	0.4376	2.22	Q	V					
3+20	0.4529	2.23	Q	V					
3+25	0.4691	2.34	Q	V					
3+30	0.4865	2.53	Q	V					
3+35	0.5054	2.74	Q	V					
3+40	0.5248	2.82	Q	V					
3+45	0.5452	2.95	Q	V					
3+50	0.5660	3.03	Q	V					
3+55	0.5877	3.15	Q	V					
4+ 0	0.6100	3.23	Q	V					
4+ 5	0.6333	3.39	Q	V					
4+10	0.6583	3.64	Q	V					
4+15	0.6853	3.91	Q	V					
4+20	0.7141	4.18	Q	V					
4+25	0.7448	4.46	Q	V					
4+30	0.7763	4.57	Q	V					
4+35	0.8089	4.75	Q	V					
4+40	0.8434	5.00	Q	V					
4+45	0.8797	5.28	Q	V					
4+50	0.9169	5.39	Q	V					
4+55	0.9552	5.57	Q	V					
5+ 0	0.9954	5.82	Q	V					
5+ 5	1.0417	6.73	Q	V					
5+10	1.0970	8.03	Q	V					
5+15	1.1595	9.08	Q	V					
5+20	1.2280	9.94	Q	V					
5+25	1.3042	11.07	Q	V					
5+30	1.3940	13.04	Q	V					
5+35	1.4507	8.23	Q	V					
5+40	1.4739	3.37	Q	V					
5+45	1.4850	1.61	Q	V					
5+50	1.4928	1.14	Q	V					
5+55	1.4982	0.79	Q	V					
6+ 0	1.5018	0.52	Q	V					
6+ 5	1.5031	0.19	Q	V					
6+10	1.5032	0.02	Q	V					

Unit Hydrograph Analysis

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Study date 10/02/24 File: qo100b76100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED B  
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 615.00(Ft.)  
Length along longest watercourse measured to centroid = 247.00(Ft.)  
Length along longest watercourse = 0.116 Mi.  
Length along longest watercourse measured to centroid = 0.047 Mi.  
Difference in elevation = 13.88(Ft.)  
Slope along watercourse = 119.1649 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.020 Hr.  
Lag time = 1.20 Min.  
25% of lag time = 0.30 Min.  
40% of lag time = 0.48 Min.  
Unit time = 5.00 Min.  
Duration of storm = 6 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.20	10.56

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   8.80                    2.50                    22.00

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.200(In)  
 Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   8.800            66.30            0.800  
 Total Area Entered = 8.80(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
						Sum (F) = 0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113  
 Minimum soil loss rate ((In/Hr)) = 0.056  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

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 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	416.091	5.868
2	0.167	832.183	3.001
		Sum = 100.000	Sum= 8.869

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.150	( 0.113)	0.039
2	0.17	0.180	( 0.113)	0.047
3	0.25	0.180	( 0.113)	0.047
4	0.33	0.180	( 0.113)	0.047
5	0.42	0.180	( 0.113)	0.047
6	0.50	0.210	( 0.113)	0.055
7	0.58	0.210	( 0.113)	0.055

8	0.67	0.70	0.210	( 0.113)	0.055	0.155
9	0.75	0.70	0.210	( 0.113)	0.055	0.155
10	0.83	0.70	0.210	( 0.113)	0.055	0.155
11	0.92	0.70	0.210	( 0.113)	0.055	0.155
12	1.00	0.80	0.240	( 0.113)	0.062	0.178
13	1.08	0.80	0.240	( 0.113)	0.062	0.178
14	1.17	0.80	0.240	( 0.113)	0.062	0.178
15	1.25	0.80	0.240	( 0.113)	0.062	0.178
16	1.33	0.80	0.240	( 0.113)	0.062	0.178
17	1.42	0.80	0.240	( 0.113)	0.062	0.178
18	1.50	0.80	0.240	( 0.113)	0.062	0.178
19	1.58	0.80	0.240	( 0.113)	0.062	0.178
20	1.67	0.80	0.240	( 0.113)	0.062	0.178
21	1.75	0.80	0.240	( 0.113)	0.062	0.178
22	1.83	0.80	0.240	( 0.113)	0.062	0.178
23	1.92	0.80	0.240	( 0.113)	0.062	0.178
24	2.00	0.90	0.270	( 0.113)	0.070	0.200
25	2.08	0.80	0.240	( 0.113)	0.062	0.178
26	2.17	0.90	0.270	( 0.113)	0.070	0.200
27	2.25	0.90	0.270	( 0.113)	0.070	0.200
28	2.33	0.90	0.270	( 0.113)	0.070	0.200
29	2.42	0.90	0.270	( 0.113)	0.070	0.200
30	2.50	0.90	0.270	( 0.113)	0.070	0.200
31	2.58	0.90	0.270	( 0.113)	0.070	0.200
32	2.67	0.90	0.270	( 0.113)	0.070	0.200
33	2.75	1.00	0.300	( 0.113)	0.078	0.222
34	2.83	1.00	0.300	( 0.113)	0.078	0.222
35	2.92	1.00	0.300	( 0.113)	0.078	0.222
36	3.00	1.00	0.300	( 0.113)	0.078	0.222
37	3.08	1.00	0.300	( 0.113)	0.078	0.222
38	3.17	1.10	0.330	( 0.113)	0.086	0.244
39	3.25	1.10	0.330	( 0.113)	0.086	0.244
40	3.33	1.10	0.330	( 0.113)	0.086	0.244
41	3.42	1.20	0.360	( 0.113)	0.094	0.266
42	3.50	1.30	0.390	( 0.113)	0.101	0.289
43	3.58	1.40	0.420	( 0.113)	0.109	0.311
44	3.67	1.40	0.420	( 0.113)	0.109	0.311
45	3.75	1.50	0.450	0.113 ( 0.117)		0.337
46	3.83	1.50	0.450	0.113 ( 0.117)		0.337
47	3.92	1.60	0.480	0.113 ( 0.125)		0.367
48	4.00	1.60	0.480	0.113 ( 0.125)		0.367
49	4.08	1.70	0.510	0.113 ( 0.133)		0.397
50	4.17	1.80	0.540	0.113 ( 0.140)		0.427
51	4.25	1.90	0.570	0.113 ( 0.148)		0.457
52	4.33	2.00	0.600	0.113 ( 0.156)		0.487
53	4.42	2.10	0.630	0.113 ( 0.164)		0.517
54	4.50	2.10	0.630	0.113 ( 0.164)		0.517
55	4.58	2.20	0.660	0.113 ( 0.172)		0.547
56	4.67	2.30	0.690	0.113 ( 0.179)		0.577
57	4.75	2.40	0.720	0.113 ( 0.187)		0.607
58	4.83	2.40	0.720	0.113 ( 0.187)		0.607
59	4.92	2.50	0.750	0.113 ( 0.195)		0.637
60	5.00	2.60	0.780	0.113 ( 0.203)		0.667
61	5.08	3.10	0.930	0.113 ( 0.242)		0.817
62	5.17	3.60	1.080	0.113 ( 0.281)		0.967
63	5.25	3.90	1.170	0.113 ( 0.304)		1.057
64	5.33	4.20	1.260	0.113 ( 0.328)		1.147

65	5.42	4.70	1.410	0.113	( 0.367)	1.297
66	5.50	5.60	1.680	0.113	( 0.437)	1.567
67	5.58	1.90	0.570	0.113	( 0.148)	0.457
68	5.67	0.90	0.270	( 0.113)	0.070	0.200
69	5.75	0.60	0.180	( 0.113)	0.047	0.133
70	5.83	0.50	0.150	( 0.113)	0.039	0.111
71	5.92	0.30	0.090	( 0.113)	0.023	0.067
72	6.00	0.20	0.060	( 0.113)	0.016	0.044

(Loss Rate Not Used)

Sum = 100.0 Sum = 24.2

Flood volume = Effective rainfall 2.02(In)  
times area 8.8(Ac.)/[ (In)/(Ft.) ] = 1.5(Ac.Ft)

Total soil loss = 0.48(In)  
Total soil loss = 0.353(Ac.Ft)  
Total rainfall = 2.50(In)  
Flood volume = 64495.4 Cubic Feet  
Total soil loss = 15362.2 Cubic Feet

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Peak flow rate of this hydrograph = 13.097(CFS)  
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6 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0045	0.65	VQ				
0+10	0.0122	1.12	V Q				
0+15	0.0203	1.18	V Q				
0+20	0.0284	1.18	V Q				
0+25	0.0366	1.18	V Q				
0+30	0.0456	1.31	VQ				
0+35	0.0551	1.38	VQ				
0+40	0.0646	1.38	VQ				
0+45	0.0741	1.38	Q				
0+50	0.0836	1.38	Q				
0+55	0.0931	1.38	Q				
1+ 0	0.1035	1.51	VQ				
1+ 5	0.1144	1.58	Q				
1+10	0.1252	1.58	Q				
1+15	0.1361	1.58	Q				
1+20	0.1469	1.58	Q				
1+25	0.1578	1.58	QV				
1+30	0.1686	1.58	QV				
1+35	0.1795	1.58	QV				
1+40	0.1903	1.58	Q V				
1+45	0.2012	1.58	Q V				
1+50	0.2120	1.58	Q V				
1+55	0.2229	1.58	Q V				
2+ 0	0.2346	1.71	Q V				
2+ 5	0.2459	1.64	Q V				
2+10	0.2577	1.71	Q V				
2+15	0.2699	1.77	Q V				
2+20	0.2821	1.77	Q V				



Unit Hydrograph Analysis

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Study date 10/02/24 File: q100uh7ax3100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED A  
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 1138.00(Ft.)  
Length along longest watercourse measured to centroid = 638.00(Ft.)  
Length along longest watercourse = 0.216 Mi.  
Length along longest watercourse measured to centroid = 0.121 Mi.  
Difference in elevation = 14.60(Ft.)  
Slope along watercourse = 67.7399 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.081 Hr.  
Lag time = 4.85 Min.  
25% of lag time = 1.21 Min.  
40% of lag time = 1.94 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	0.80	7.77

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   9.71                    1.90                    18.45

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.800(In)  
 Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   9.710            60.10            0.500  
 Total Area Entered = 9.71(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
						Sum (F) = 0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258  
 Minimum soil loss rate ((In/Hr)) = 0.129  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	1.973
2	0.167	206.259	4.756
3	0.250	309.388	1.486
4	0.333	412.518	0.675
5	0.417	515.647	0.377
6	0.500	618.777	0.243
7	0.583	721.906	0.147
8	0.667	825.035	0.129
		Sum = 100.000	Sum= 9.786

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	1.30	( 0.258)	0.148

2	0.17	1.30	0.296	( 0.258)	0.148	0.148
3	0.25	1.10	0.251	( 0.258)	0.125	0.125
4	0.33	1.50	0.342	( 0.258)	0.171	0.171
5	0.42	1.50	0.342	( 0.258)	0.171	0.171
6	0.50	1.80	0.410	( 0.258)	0.205	0.205
7	0.58	1.50	0.342	( 0.258)	0.171	0.171
8	0.67	1.80	0.410	( 0.258)	0.205	0.205
9	0.75	1.80	0.410	( 0.258)	0.205	0.205
10	0.83	1.50	0.342	( 0.258)	0.171	0.171
11	0.92	1.60	0.365	( 0.258)	0.182	0.182
12	1.00	1.80	0.410	( 0.258)	0.205	0.205
13	1.08	2.20	0.502	( 0.258)	0.251	0.251
14	1.17	2.20	0.502	( 0.258)	0.251	0.251
15	1.25	2.20	0.502	( 0.258)	0.251	0.251
16	1.33	2.00	0.456	( 0.258)	0.228	0.228
17	1.42	2.60	0.593	0.258 ( 0.296)		0.335
18	1.50	2.70	0.616	0.258 ( 0.308)		0.358
19	1.58	2.40	0.547	0.258 ( 0.274)		0.289
20	1.67	2.70	0.616	0.258 ( 0.308)		0.358
21	1.75	3.30	0.752	0.258 ( 0.376)		0.494
22	1.83	3.10	0.707	0.258 ( 0.353)		0.449
23	1.92	2.90	0.661	0.258 ( 0.331)		0.403
24	2.00	3.00	0.684	0.258 ( 0.342)		0.426
25	2.08	3.10	0.707	0.258 ( 0.353)		0.449
26	2.17	4.20	0.958	0.258 ( 0.479)		0.700
27	2.25	5.00	1.140	0.258 ( 0.570)		0.882
28	2.33	3.50	0.798	0.258 ( 0.399)		0.540
29	2.42	6.80	1.550	0.258 ( 0.775)		1.292
30	2.50	7.30	1.664	0.258 ( 0.832)		1.406
31	2.58	8.20	1.870	0.258 ( 0.935)		1.612
32	2.67	5.90	1.345	0.258 ( 0.673)		1.087
33	2.75	2.00	0.456	( 0.258)	0.228	0.228
34	2.83	1.80	0.410	( 0.258)	0.205	0.205
35	2.92	1.80	0.410	( 0.258)	0.205	0.205
36	3.00	0.60	0.137	( 0.258)	0.068	0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 14.9

Flood volume = Effective rainfall 1.24(In)  
times area 9.7(Ac.)/[ (In)/(Ft.) ] = 1.0(Ac.Ft)  
Total soil loss = 0.66(In)  
Total soil loss = 0.534(Ac.Ft)  
Total rainfall = 1.90(In)  
Flood volume = 43696.4 Cubic Feet  
Total soil loss = 23270.7 Cubic Feet

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Peak flow rate of this hydrograph = 13.358(CFS)  
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3 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
-----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0020	0.29	Q				



Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED B  
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) =  
0.012 Sq. Mi.  
Length along longest watercourse = 864.00(Ft.)  
Length along longest watercourse measured to centroid = 584.00(Ft.)  
Length along longest watercourse = 0.164 Mi.  
Length along longest watercourse measured to centroid = 0.111 Mi.  
Difference in elevation = 13.90(Ft.)  
Slope along watercourse = 84.9444 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.067 Hr.  
Lag time = 4.04 Min.  
25% of lag time = 1.01 Min.  
40% of lag time = 1.62 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	0.80	6.03

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   7.54                    1.90                    14.33

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.800(In)  
 Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   7.540            69.78            0.500  
 Total Area Entered = 7.54(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
						Sum (F) = 0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200  
 Minimum soil loss rate ((In/Hr)) = 0.100  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	1.994
2	0.167	247.253	3.692
3	0.250	370.880	0.988
4	0.333	494.506	0.445
5	0.417	618.133	0.248
6	0.500	741.759	0.139
7	0.583	865.386	0.092
		Sum = 100.000	Sum= 7.599

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	1.30	( 0.200)    0.148	0.148
2	0.17	1.30	( 0.200)    0.148	0.148

3	0.25	1.10	0.251	( 0.200)	0.125	0.125
4	0.33	1.50	0.342	( 0.200)	0.171	0.171
5	0.42	1.50	0.342	( 0.200)	0.171	0.171
6	0.50	1.80	0.410	0.200 ( 0.205)		0.210
7	0.58	1.50	0.342	( 0.200)	0.171	0.171
8	0.67	1.80	0.410	0.200 ( 0.205)		0.210
9	0.75	1.80	0.410	0.200 ( 0.205)		0.210
10	0.83	1.50	0.342	( 0.200)	0.171	0.171
11	0.92	1.60	0.365	( 0.200)	0.182	0.182
12	1.00	1.80	0.410	0.200 ( 0.205)		0.210
13	1.08	2.20	0.502	0.200 ( 0.251)		0.301
14	1.17	2.20	0.502	0.200 ( 0.251)		0.301
15	1.25	2.20	0.502	0.200 ( 0.251)		0.301
16	1.33	2.00	0.456	0.200 ( 0.228)		0.256
17	1.42	2.60	0.593	0.200 ( 0.296)		0.392
18	1.50	2.70	0.616	0.200 ( 0.308)		0.415
19	1.58	2.40	0.547	0.200 ( 0.274)		0.347
20	1.67	2.70	0.616	0.200 ( 0.308)		0.415
21	1.75	3.30	0.752	0.200 ( 0.376)		0.552
22	1.83	3.10	0.707	0.200 ( 0.353)		0.506
23	1.92	2.90	0.661	0.200 ( 0.331)		0.461
24	2.00	3.00	0.684	0.200 ( 0.342)		0.484
25	2.08	3.10	0.707	0.200 ( 0.353)		0.506
26	2.17	4.20	0.958	0.200 ( 0.479)		0.757
27	2.25	5.00	1.140	0.200 ( 0.570)		0.940
28	2.33	3.50	0.798	0.200 ( 0.399)		0.598
29	2.42	6.80	1.550	0.200 ( 0.775)		1.350
30	2.50	7.30	1.664	0.200 ( 0.832)		1.464
31	2.58	8.20	1.870	0.200 ( 0.935)		1.669
32	2.67	5.90	1.345	0.200 ( 0.673)		1.145
33	2.75	2.00	0.456	0.200 ( 0.228)		0.256
34	2.83	1.80	0.410	0.200 ( 0.205)		0.210
35	2.92	1.80	0.410	0.200 ( 0.205)		0.210
36	3.00	0.60	0.137	( 0.200)	0.068	0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 16.0

Flood volume = Effective rainfall 1.34(In)  
times area 7.5(Ac.)/[ (In)/(Ft.) ] = 0.8(Ac.Ft)  
Total soil loss = 0.56(In)  
Total soil loss = 0.354(Ac.Ft)  
Total rainfall = 1.90(In)  
Flood volume = 36565.9 Cubic Feet  
Total soil loss = 15435.7 Cubic Feet

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Peak flow rate of this hydrograph = 10.847(CFS)  
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3 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
-----

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0020		0.30	Q				
0+10	0.0078		0.84	VQ				

0+15	0.0143	0.94	VQ						
0+20	0.0213	1.02	VQ						
0+25	0.0296	1.20	VQ						
0+30	0.0388	1.33	VQ						
0+35	0.0486	1.43	Q						
0+40	0.0583	1.41	Q						
0+45	0.0689	1.53	Q						
0+50	0.0792	1.49	QV						
0+55	0.0887	1.38	Q V						
1+ 0	0.0987	1.45	Q V						
1+ 5	0.1106	1.73	Q V						
1+10	0.1250	2.09	QV						
1+15	0.1401	2.19	Q V						
1+20	0.1549	2.15	Q V						
1+25	0.1706	2.28	Q V						
1+30	0.1899	2.80	Q V						
1+35	0.2097	2.87	Q V						
1+40	0.2292	2.83	Q V						
1+45	0.2520	3.32	Q V						
1+50	0.2782	3.80	Q V						
1+55	0.3037	3.70	Q V						
2+ 0	0.3285	3.60	Q V						
2+ 5	0.3540	3.70	Q V						
2+10	0.3836	4.31	Q V						
2+15	0.4224	5.62	Q V						
2+20	0.4628	5.87	Q V						
2+25	0.5069	6.40	Q V						
2+30	0.5704	9.22	Q V						
2+35	0.6442	10.72	Q V						
2+40	0.7189	10.85	Q V						
2+45	0.7709	7.55	Q V						
2+50	0.7974	3.84	Q V						
2+55	0.8160	2.70	Q V						
3+ 0	0.8290	1.89	Q V						
3+ 5	0.8354	0.93	Q V						
3+10	0.8378	0.35	Q V						
3+15	0.8387	0.14	Q V						
3+20	0.8392	0.07	Q V						
3+25	0.8394	0.03	Q V						
3+30	0.8394	0.01	Q V						

Unit Hydrograph Analysis

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Study date 10/02/24 File: qp7100uh3100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED A  
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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-----  
Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 665.00(Ft.)  
Length along longest watercourse measured to centroid = 635.00(Ft.)  
Length along longest watercourse = 0.126 Mi.  
Length along longest watercourse measured to centroid = 0.120 Mi.  
Difference in elevation = 22.87(Ft.)  
Slope along watercourse = 181.5844 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.027 Hr.  
Lag time = 1.64 Min.  
25% of lag time = 0.41 Min.  
40% of lag time = 0.65 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	0.80	7.24

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   9.05                    1.90                    17.20

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.800(In)  
 Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   9.050            61.50            0.800  
 Total Area Entered = 9.05(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
						Sum (F) = 0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127  
 Minimum soil loss rate ((In/Hr)) = 0.064  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	305.645	5.222
2	0.167	611.289	3.358
3	0.250	916.934	0.541
		Sum = 100.000	Sum= 9.121

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective	
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)	
1	0.08	1.30	0.296	( 0.127)	0.077	0.219
2	0.17	1.30	0.296	( 0.127)	0.077	0.219
3	0.25	1.10	0.251	( 0.127)	0.065	0.186
4	0.33	1.50	0.342	( 0.127)	0.089	0.253
5	0.42	1.50	0.342	( 0.127)	0.089	0.253
6	0.50	1.80	0.410	( 0.127)	0.107	0.304

7	0.58	1.50	0.342	( 0.127)	0.089	0.253
8	0.67	1.80	0.410	( 0.127)	0.107	0.304
9	0.75	1.80	0.410	( 0.127)	0.107	0.304
10	0.83	1.50	0.342	( 0.127)	0.089	0.253
11	0.92	1.60	0.365	( 0.127)	0.095	0.270
12	1.00	1.80	0.410	( 0.127)	0.107	0.304
13	1.08	2.20	0.502	0.127 ( 0.130)		0.375
14	1.17	2.20	0.502	0.127 ( 0.130)		0.375
15	1.25	2.20	0.502	0.127 ( 0.130)		0.375
16	1.33	2.00	0.456	( 0.127)	0.119	0.337
17	1.42	2.60	0.593	0.127 ( 0.154)		0.466
18	1.50	2.70	0.616	0.127 ( 0.160)		0.489
19	1.58	2.40	0.547	0.127 ( 0.142)		0.420
20	1.67	2.70	0.616	0.127 ( 0.160)		0.489
21	1.75	3.30	0.752	0.127 ( 0.196)		0.625
22	1.83	3.10	0.707	0.127 ( 0.184)		0.580
23	1.92	2.90	0.661	0.127 ( 0.172)		0.534
24	2.00	3.00	0.684	0.127 ( 0.178)		0.557
25	2.08	3.10	0.707	0.127 ( 0.184)		0.580
26	2.17	4.20	0.958	0.127 ( 0.249)		0.830
27	2.25	5.00	1.140	0.127 ( 0.296)		1.013
28	2.33	3.50	0.798	0.127 ( 0.207)		0.671
29	2.42	6.80	1.550	0.127 ( 0.403)		1.423
30	2.50	7.30	1.664	0.127 ( 0.433)		1.537
31	2.58	8.20	1.870	0.127 ( 0.486)		1.742
32	2.67	5.90	1.345	0.127 ( 0.350)		1.218
33	2.75	2.00	0.456	( 0.127)	0.119	0.337
34	2.83	1.80	0.410	( 0.127)	0.107	0.304
35	2.92	1.80	0.410	( 0.127)	0.107	0.304
36	3.00	0.60	0.137	( 0.127)	0.036	0.101

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.8

Flood volume = Effective rainfall 1.57(In)  
times area 9.1(Ac.)/[ (In)/(Ft.) ] = 1.2(Ac.Ft)  
Total soil loss = 0.33(In)  
Total soil loss = 0.251(Ac.Ft)  
Total rainfall = 1.90(In)  
Flood volume = 51473.3 Cubic Feet  
Total soil loss = 10942.1 Cubic Feet

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Peak flow rate of this hydrograph = 15.039(CFS)  
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3 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

-----  
Hydrograph in 5 Minute intervals ((CFS))  
-----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0079	1.15	V Q				
0+10	0.0209	1.88	V Q				
0+15	0.0334	1.83	V Q				
0+20	0.0476	2.06	V Q				
0+25	0.0633	2.27	V Q				
0+30	0.0810	2.57	V Q				

0+35	0.0981	2.48	VQ						
0+40	0.1160	2.60	V Q						
0+45	0.1349	2.74	VQ						
0+50	0.1522	2.51	Q						
0+55	0.1689	2.42	QV						
1+ 0	0.1870	2.63	QV						
1+ 5	0.2085	3.12	QV						
1+10	0.2318	3.38	QV						
1+15	0.2553	3.42	Q V						
1+20	0.2775	3.22	Q V						
1+25	0.3035	3.77	Q V						
1+30	0.3331	4.30	Q V						
1+35	0.3612	4.09	Q V						
1+40	0.3904	4.23	Q V						
1+45	0.4257	5.14	Q V						
1+50	0.4629	5.39	Q V						
1+55	0.4978	5.08	Q V						
2+ 0	0.5324	5.02	Q V						
2+ 5	0.5681	5.19	Q V						
2+10	0.6135	6.59	Q V						
2+15	0.6713	8.40	Q V						
2+20	0.7220	7.36	Q V						
2+25	0.7925	10.24	Q V						
2+30	0.8833	13.18	Q V						
2+35	0.9868	15.04	Q V						
2+40	1.0767	13.05	Q V						
2+45	1.1235	6.80	Q V						
2+50	1.1468	3.38	Q V						
2+55	1.1660	2.79	Q V						
3+ 0	1.1778	1.71	Q V						
3+ 5	1.1813	0.50	Q V						
3+10	1.1817	0.05	Q V						

Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED B  
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 615.00(Ft.)  
Length along longest watercourse measured to centroid = 247.00(Ft.)  
Length along longest watercourse = 0.116 Mi.  
Length along longest watercourse measured to centroid = 0.047 Mi.  
Difference in elevation = 13.88(Ft.)  
Slope along watercourse = 119.1649 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.020 Hr.  
Lag time = 1.20 Min.  
25% of lag time = 0.30 Min.  
40% of lag time = 0.48 Min.  
Unit time = 5.00 Min.  
Duration of storm = 3 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	0.80	7.04

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   8.80                    1.90                    16.72

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.800(In)  
 Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   8.800            66.30            0.800  
 Total Area Entered = 8.80(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
						Sum (F) = 0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113  
 Minimum soil loss rate ((In/Hr)) = 0.056  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

-----  
 U n i t   H y d r o g r a p h  
 VALLEY S-Curve  
 -----

Unit Hydrograph Data  
 -----

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	416.091	5.868
2	0.167	832.183	3.001
		Sum = 100.000	Sum= 8.869

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective	
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)	
1	0.08	1.30	0.296	( 0.113)	0.077	0.219
2	0.17	1.30	0.296	( 0.113)	0.077	0.219
3	0.25	1.10	0.251	( 0.113)	0.065	0.186
4	0.33	1.50	0.342	( 0.113)	0.089	0.253
5	0.42	1.50	0.342	( 0.113)	0.089	0.253
6	0.50	1.80	0.410	( 0.113)	0.107	0.304
7	0.58	1.50	0.342	( 0.113)	0.089	0.253



0+40	0.1154	2.54	V Q				
0+45	0.1339	2.69	VQ				
0+50	0.1505	2.40	QV				
0+55	0.1666	2.34	QV				
1+ 0	0.1845	2.59	QV				
1+ 5	0.2065	3.20	QV				
1+10	0.2302	3.45	QV				
1+15	0.2540	3.45	Q V				
1+20	0.2759	3.18	Q V				
1+25	0.3025	3.85	Q V				
1+30	0.3327	4.40	Q V				
1+35	0.3607	4.06	Q V				
1+40	0.3900	4.26	Q V				
1+45	0.4263	5.27	Q V				
1+50	0.4636	5.41	Q V				
1+55	0.4980	5.01	Q V				
2+ 0	0.5325	5.00	Q V				
2+ 5	0.5683	5.20	Q V				
2+10	0.6148	6.75	Q	Q	V		
2+15	0.6738	8.57		Q	Q	V	
2+20	0.7228	7.11		Q		V	
2+25	0.7951	10.50			Q	V	
2+30	0.8875	13.43				Q	V
2+35	0.9907	14.97				Q	V
2+40	1.0768	12.51				Q	V
2+45	1.1162	5.72		Q			V
2+50	1.1356	2.81		Q			V
2+55	1.1541	2.69		Q			V
3+ 0	1.1645	1.51	Q				V
3+ 5	1.1666	0.30	Q				V

Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED A  
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 1138.00(Ft.)  
Length along longest watercourse measured to centroid = 638.00(Ft.)  
Length along longest watercourse = 0.216 Mi.  
Length along longest watercourse measured to centroid = 0.121 Mi.  
Difference in elevation = 14.60(Ft.)  
Slope along watercourse = 67.7399 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.081 Hr.  
Lag time = 4.85 Min.  
25% of lag time = 1.21 Min.  
40% of lag time = 1.94 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	0.50	4.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.12	10.88

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.500(In)  
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500
Total Area Entered = 9.71(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
						Sum (F) = 0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258  
Minimum soil loss rate ((In/Hr)) = 0.129  
(for 24 hour storm duration)  
Soil low loss rate (decimal) = 0.500

-----  
Slope of intensity-duration curve for a 1 hour storm =0.5000  
-----

U n i t H y d r o g r a p h  
VALLEY S-Curve

-----  
Unit Hydrograph Data  
-----

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)	
1	0.083	103.129	20.160	1.973
2	0.167	206.259	48.606	4.756
3	0.250	309.388	15.181	1.486
4	0.333	412.518	6.899	0.675
5	0.417	515.647	3.854	0.377
6	0.500	618.777	2.481	0.243
7	0.583	721.906	1.504	0.147
8	0.667	825.035	1.315	0.129
Sum = 100.000			Sum=	9.786

-----  
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective
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Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
MDP LANDUSE CONDITION - WATERSHED B  
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) =  
0.012 Sq. Mi.  
Length along longest watercourse = 864.00(Ft.)  
Length along longest watercourse measured to centroid = 584.00(Ft.)  
Length along longest watercourse = 0.164 Mi.  
Length along longest watercourse measured to centroid = 0.111 Mi.  
Difference in elevation = 13.90(Ft.)  
Slope along watercourse = 84.9444 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.067 Hr.  
Lag time = 4.04 Min.  
25% of lag time = 1.01 Min.  
40% of lag time = 1.62 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	0.50	3.77

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   7.54                    1.12                    8.44

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.500(In)  
 Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   7.540            69.78            0.500  
 Total Area Entered = 7.54(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
						Sum (F) = 0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200  
 Minimum soil loss rate ((In/Hr)) = 0.100  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.500

-----  
 Slope of intensity-duration curve for a 1 hour storm =0.5000  
 -----

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

-----  
 Unit Hydrograph Data  
 -----

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	1.994
2	0.167	247.253	3.692
3	0.250	370.880	0.988
4	0.333	494.506	0.445
5	0.417	618.133	0.248
6	0.500	741.759	0.139
7	0.583	865.386	0.092
		Sum = 100.000	Sum= 7.599

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
--------------------	--------------------	-----------------------	--------------------------------	----------------------

1	0.08	4.20	0.564	0.200	( 0.282)	0.364
2	0.17	4.30	0.578	0.200	( 0.289)	0.377
3	0.25	5.00	0.672	0.200	( 0.336)	0.472
4	0.33	5.00	0.672	0.200	( 0.336)	0.472
5	0.42	5.80	0.779	0.200	( 0.390)	0.579
6	0.50	6.50	0.874	0.200	( 0.437)	0.673
7	0.58	7.40	0.994	0.200	( 0.497)	0.794
8	0.67	8.60	1.156	0.200	( 0.578)	0.955
9	0.75	12.30	1.653	0.200	( 0.827)	1.453
10	0.83	29.10	3.911	0.200	( 1.955)	3.710
11	0.92	6.80	0.914	0.200	( 0.457)	0.713
12	1.00	5.00	0.672	0.200	( 0.336)	0.472

(Loss Rate Not Used)

Sum = 100.0 Sum = 11.0

Flood volume = Effective rainfall 0.92(In)  
times area 7.5(Ac.)/[ (In)/(Ft.) ] = 0.6(Ac.Ft)  
Total soil loss = 0.20(In)  
Total soil loss = 0.126(Ac.Ft)  
Total rainfall = 1.12(In)  
Flood volume = 25167.4 Cubic Feet  
Total soil loss = 5485.2 Cubic Feet

-----  
Peak flow rate of this hydrograph = 17.336(CFS)  
-----

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1 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

-----  
Hydrograph in 5 Minute intervals ((CFS))  
-----

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0050		0.73	VQ				
0+10	0.0194		2.10	V Q				
0+15	0.0380		2.70	V Q				
0+20	0.0602		3.22	V Q				
0+25	0.0851		3.62	V Q				
0+30	0.1147		4.30	VQ				
0+35	0.1496		5.06		Q			
0+40	0.1908		5.98		Q V			
0+45	0.2442		7.76			QV		
0+50	0.3431		14.36			V	Q	
0+55	0.4625		17.34				V Q	
1+ 0	0.5197		8.30			Q		V
1+ 5	0.5518		4.67		Q			V
1+10	0.5656		2.00	Q				V
1+15	0.5727		1.04	Q				V
1+20	0.5766		0.56	Q				V
1+25	0.5775		0.13	Q				V
1+30	0.5778		0.04	Q				V

Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED A  
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 665.00(Ft.)  
Length along longest watercourse measured to centroid = 635.00(Ft.)  
Length along longest watercourse = 0.126 Mi.  
Length along longest watercourse measured to centroid = 0.120 Mi.  
Difference in elevation = 22.87(Ft.)  
Slope along watercourse = 181.5844 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.027 Hr.  
Lag time = 1.64 Min.  
25% of lag time = 0.41 Min.  
40% of lag time = 0.65 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	0.50	4.53

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.12	10.14

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.500(In)  
 Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.050	61.50	0.800
Total Area Entered = 9.05(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
						Sum (F) = 0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127  
 Minimum soil loss rate ((In/Hr)) = 0.064  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

-----  
 Slope of intensity-duration curve for a 1 hour storm =0.5000  
 -----

U n i t H y d r o g r a p h  
 VALLEY S-Curve

-----  
 Unit Hydrograph Data  
 -----

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	305.645	57.252
2	0.167	611.289	36.820
3	0.250	916.934	5.928
		Sum = 100.000	Sum= 9.121

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	4.20	0.564 ( 0.147)	0.437
2	0.17	4.30	0.578 ( 0.150)	0.451
3	0.25	5.00	0.672 ( 0.175)	0.545
4	0.33	5.00	0.672 ( 0.175)	0.545

5	0.42	5.80	0.779	0.127	( 0.203)	0.652
6	0.50	6.50	0.874	0.127	( 0.227)	0.746
7	0.58	7.40	0.994	0.127	( 0.259)	0.867
8	0.67	8.60	1.156	0.127	( 0.300)	1.029
9	0.75	12.30	1.653	0.127	( 0.430)	1.526
10	0.83	29.10	3.911	0.127	( 1.017)	3.784
11	0.92	6.80	0.914	0.127	( 0.238)	0.787
12	1.00	5.00	0.672	0.127	( 0.175)	0.545

(Loss Rate Not Used)

Sum = 100.0 Sum = 11.9

Flood volume = Effective rainfall 0.99(In)  
times area 9.1(Ac.)/[ (In)/(Ft.) ] = 0.7(Ac.Ft)

Total soil loss = 0.13(In)  
Total soil loss = 0.096(Ac.Ft)  
Total rainfall = 1.12(In)  
Flood volume = 32616.4 Cubic Feet  
Total soil loss = 4174.2 Cubic Feet

-----  
Peak flow rate of this hydrograph = 25.451(CFS)  
-----

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1 - H O U R S T O R M  
R u n o f f H y d r o g r a p h  
-----

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0157	2.29	V Q				
0+10	0.0421	3.82	V Q				
0+15	0.0737	4.60	V Q				
0+20	0.1076	4.92	VQ				
0+25	0.1458	5.53	Q				
0+30	0.1897	6.39	Q V				
0+35	0.2407	7.39	Q V				
0+40	0.3005	8.69	Q V				
0+45	0.3825	11.90	Q V				
0+50	0.5577	25.45	Q V				
0+55	0.6793	17.65	Q V				
1+ 0	0.7312	7.54	Q V				
1+ 5	0.7467	2.26	Q V				
1+10	0.7488	0.29	Q V				

Unit Hydrograph Analysis

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

-----  
20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK  
PROPOSED CONDITION - WATERSHED B  
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
-----  
Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) =  
0.014 Sq. Mi.  
Length along longest watercourse = 615.00(Ft.)  
Length along longest watercourse measured to centroid = 247.00(Ft.)  
Length along longest watercourse = 0.116 Mi.  
Length along longest watercourse measured to centroid = 0.047 Mi.  
Difference in elevation = 13.88(Ft.)  
Slope along watercourse = 119.1649 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.020 Hr.  
Lag time = 1.20 Min.  
25% of lag time = 0.30 Min.  
40% of lag time = 0.48 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	0.50	4.40

100 YEAR Area rainfall data:

Area(Ac.)[1]            Rainfall(In)[2]            Weighting[1\*2]  
                   8.80                    1.12                    9.86

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 0.500(In)  
 Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)  
 Areal adjustment factor = 99.99 %  
 Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)            Runoff Index    Impervious %  
                   8.800            66.30            0.800  
 Total Area Entered = 8.80(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
						Sum (F) = 0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113  
 Minimum soil loss rate ((In/Hr)) = 0.056  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.260

-----  
 Slope of intensity-duration curve for a 1 hour storm =0.5000  
 -----

U n i t   H y d r o g r a p h  
 VALLEY S-Curve

-----  
 Unit Hydrograph Data  
 -----

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	416.091	5.868
2	0.167	832.183	3.001
		Sum = 100.000	Sum= 8.869

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)		Effective
(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	4.20	0.113	( 0.147)	0.452
2	0.17	4.30	0.113	( 0.150)	0.465
3	0.25	5.00	0.113	( 0.175)	0.559
4	0.33	5.00	0.113	( 0.175)	0.559
5	0.42	5.80	0.113	( 0.203)	0.667

6	0.50	6.50	0.874	0.113	( 0.227)	0.761
7	0.58	7.40	0.994	0.113	( 0.259)	0.882
8	0.67	8.60	1.156	0.113	( 0.300)	1.043
9	0.75	12.30	1.653	0.113	( 0.430)	1.540
10	0.83	29.10	3.911	0.113	( 1.017)	3.798
11	0.92	6.80	0.914	0.113	( 0.238)	0.801
12	1.00	5.00	0.672	0.113	( 0.175)	0.559

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.1

Flood volume = Effective rainfall 1.01(In)  
times area 8.8(Ac.)/[ (In)/(Ft.) ] = 0.7(Ac.Ft)  
Total soil loss = 0.11(In)  
Total soil loss = 0.083(Ac.Ft)  
Total rainfall = 1.12(In)  
Flood volume = 32179.2 Cubic Feet  
Total soil loss = 3595.3 Cubic Feet

-----  
Peak flow rate of this hydrograph = 26.924(CFS)  
-----

+++++

1 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

-----  
Hydrograph in 5 Minute intervals ((CFS))  
-----

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0183	2.65	V Q				
0+10	0.0464	4.09	V Q				
0+15	0.0787	4.68	V Q				
0+20	0.1129	4.96	Q				
0+25	0.1514	5.59	QV				
0+30	0.1959	6.47	Q V				
0+35	0.2473	7.46	Q V				
0+40	0.3078	8.77	Q V				
0+45	0.3916	12.18	Q V				
0+50	0.5770	26.92			V	Q	
0+55	0.6880	16.11			Q	V	
1+ 0	0.7272	5.69	Q				V
1+ 5	0.7387	1.68	Q				V

-----

**SECTION 3 - REFERENCE DATA**

**USGS SOILS REPORT**

**PLATE D-4.1**

**INFILTRATION REPORT (EXCERPT)**

**CONTECH UNDERGROUND CHAMBER SYSTEM**

**DCV CALCULATIONS (WQMP)**

**PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE  
IMPROVEMENTS (HYDROLOGY MAPS)**



United States  
Department of  
Agriculture

NRCS

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for Western Riverside Area, California



# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

## Custom Soil Resource Report

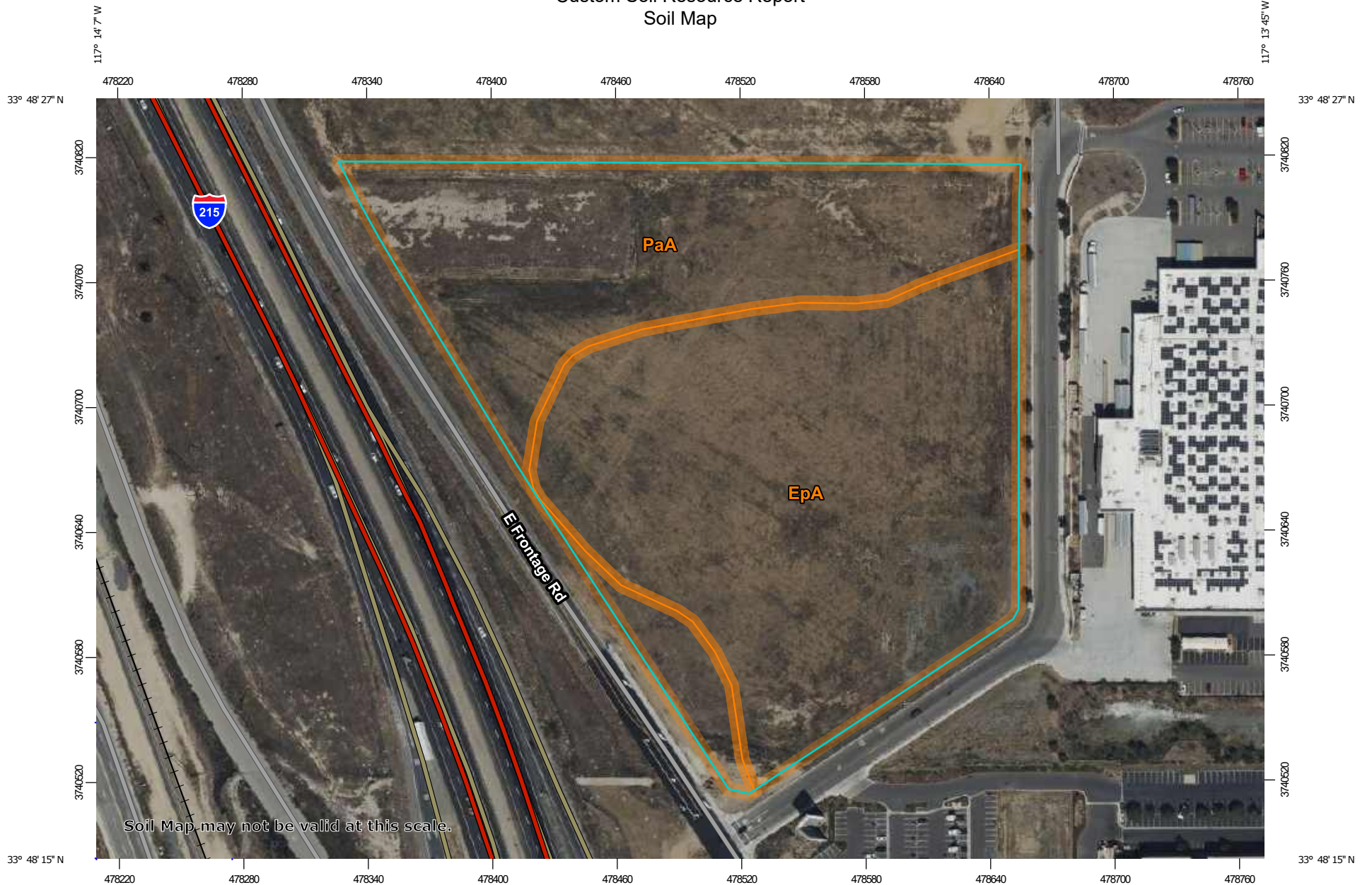
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

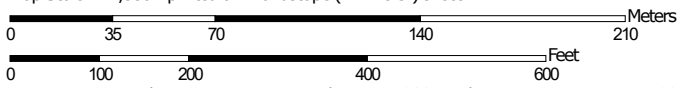
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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map




Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.




### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


**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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California  
 Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	9.6	58.8%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	6.7	41.2%
<b>Totals for Area of Interest</b>		<b>16.4</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

## Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Western Riverside Area, California

### EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

#### Map Unit Setting

*National map unit symbol:* hctk  
*Elevation:* 300 to 700 feet  
*Mean annual precipitation:* 7 to 15 inches  
*Mean annual air temperature:* 64 degrees F  
*Frost-free period:* 250 to 300 days  
*Farmland classification:* Prime farmland if irrigated

#### Map Unit Composition

*Exeter and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Exeter

##### Setting

*Landform:* Alluvial fans  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from granite

##### Typical profile

*H1 - 0 to 16 inches:* sandy loam  
*H2 - 16 to 37 inches:* sandy clay loam  
*H3 - 37 to 50 inches:* indurated  
*H4 - 50 to 60 inches:* stratified sandy loam to silt loam

##### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* 35 to 60 inches to duripan  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 to 0.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 1 percent  
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Low (about 5.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 2s  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* C  
*Ecological site:* R019XD029CA - LOAMY  
*Hydric soil rating:* No

**Minor Components**

**Greenfield**

*Percent of map unit: 5 percent*  
*Hydric soil rating: No*

**Ramona**

*Percent of map unit: 5 percent*  
*Hydric soil rating: No*

**Monserate**

*Percent of map unit: 5 percent*  
*Hydric soil rating: No*

**PaA—Pachappa fine sandy loam, 0 to 2 percent slopes**

**Map Unit Setting**

*National map unit symbol: hcxn*  
*Elevation: 1,000 feet*  
*Mean annual precipitation: 14 inches*  
*Mean annual air temperature: 63 degrees F*  
*Frost-free period: 270 days*  
*Farmland classification: Prime farmland if irrigated*

**Map Unit Composition**

*Pachappa and similar soils: 85 percent*  
*Minor components: 15 percent*  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Pachappa**

**Setting**

*Landform: Alluvial fans*  
*Landform position (three-dimensional): Tread*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Parent material: Alluvium derived from granite*

**Typical profile**

*H1 - 0 to 20 inches: fine sandy loam*  
*H2 - 20 to 63 inches: loam*

**Properties and qualities**

*Slope: 0 to 2 percent*  
*Depth to restrictive feature: More than 80 inches*  
*Drainage class: Well drained*  
*Runoff class: Low*  
*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high*  
*(0.57 to 1.98 in/hr)*  
*Depth to water table: More than 80 inches*  
*Frequency of flooding: Rare*

## Custom Soil Resource Report

*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 5 percent  
*Maximum salinity:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Moderate (about 9.0 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* 1  
*Land capability classification (nonirrigated):* 3c  
*Hydrologic Soil Group:* B  
*Ecological site:* R019XD029CA - LOAMY  
*Hydric soil rating:* No

### **Minor Components**

#### **Hanford**

*Percent of map unit:* 5 percent  
*Hydric soil rating:* No

#### **Greenfield**

*Percent of map unit:* 5 percent  
*Hydric soil rating:* No

#### **San emigdio**

*Percent of map unit:* 5 percent  
*Hydric soil rating:* No

# Soil Information for All Uses

---

## Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

## Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

## Hydrologic Soil Group

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.

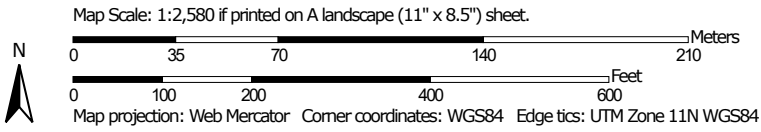
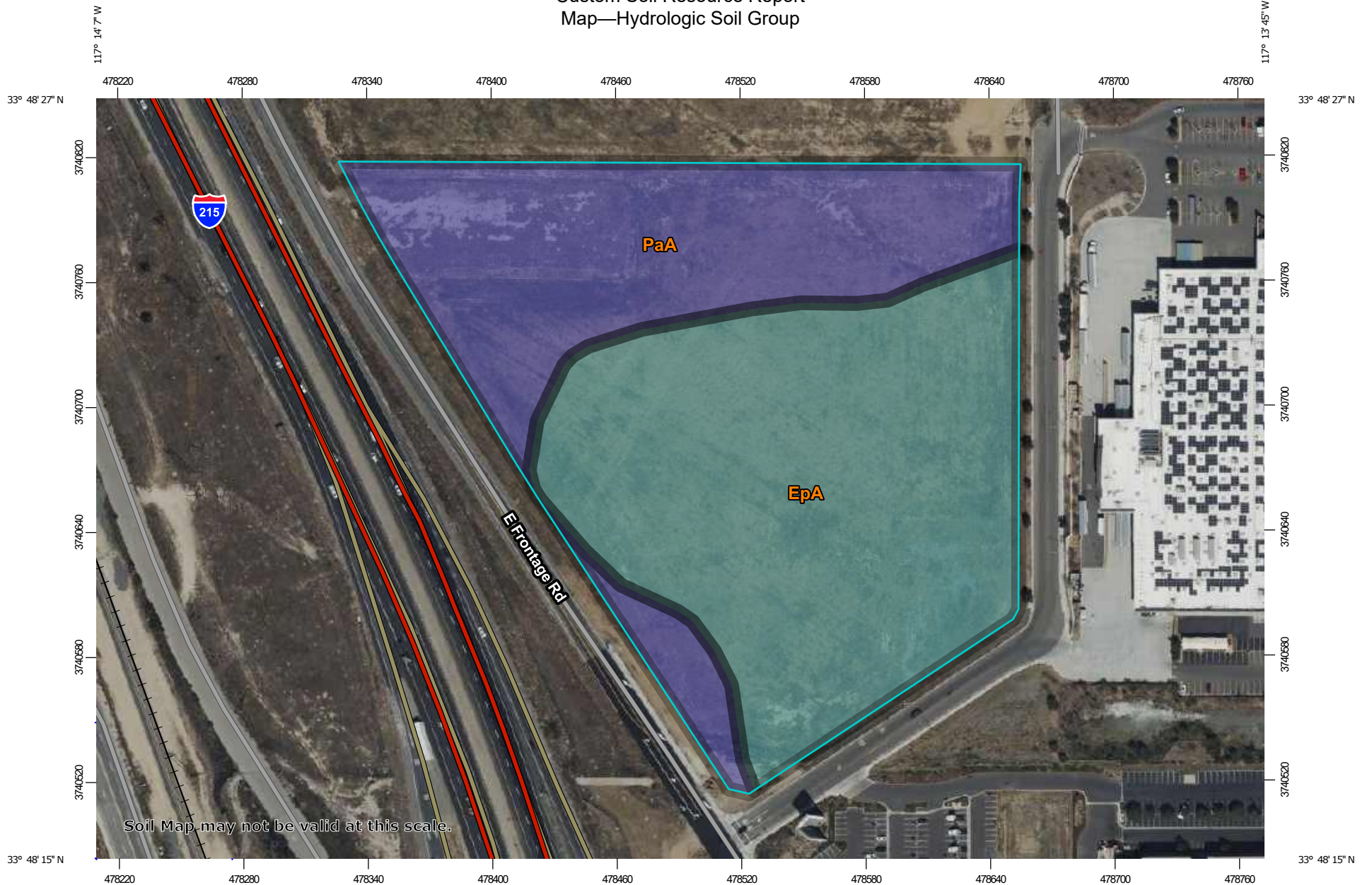
## Custom Soil Resource Report

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.

# Custom Soil Resource Report Map—Hydrologic Soil Group



### 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 1:15,800.

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

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

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

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

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Soil Survey Area: Western Riverside Area, California  
 Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

**Table—Hydrologic Soil Group**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	9.6	58.8%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	6.7	41.2%
<b>Totals for Area of Interest</b>			<b>16.4</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group**

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

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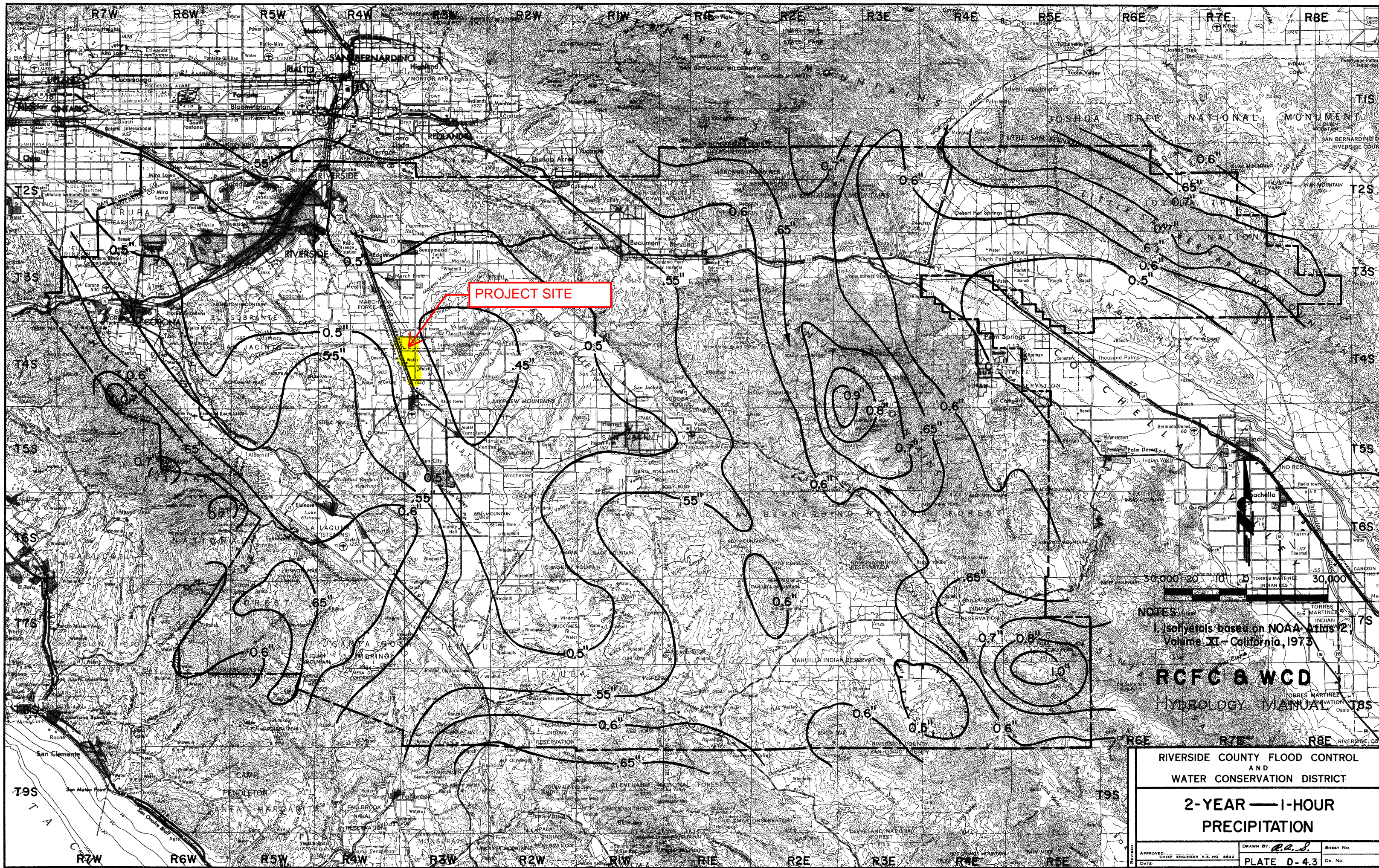
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# RAINFALL INTENSITY—INCHES PER HOUR

**RCFC & WCD**  
 HYDROLOGY MANUAL

STANDARD  
 INTENSITY - DURATION  
 CURVES DATA

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		



**PROJECT SITE**

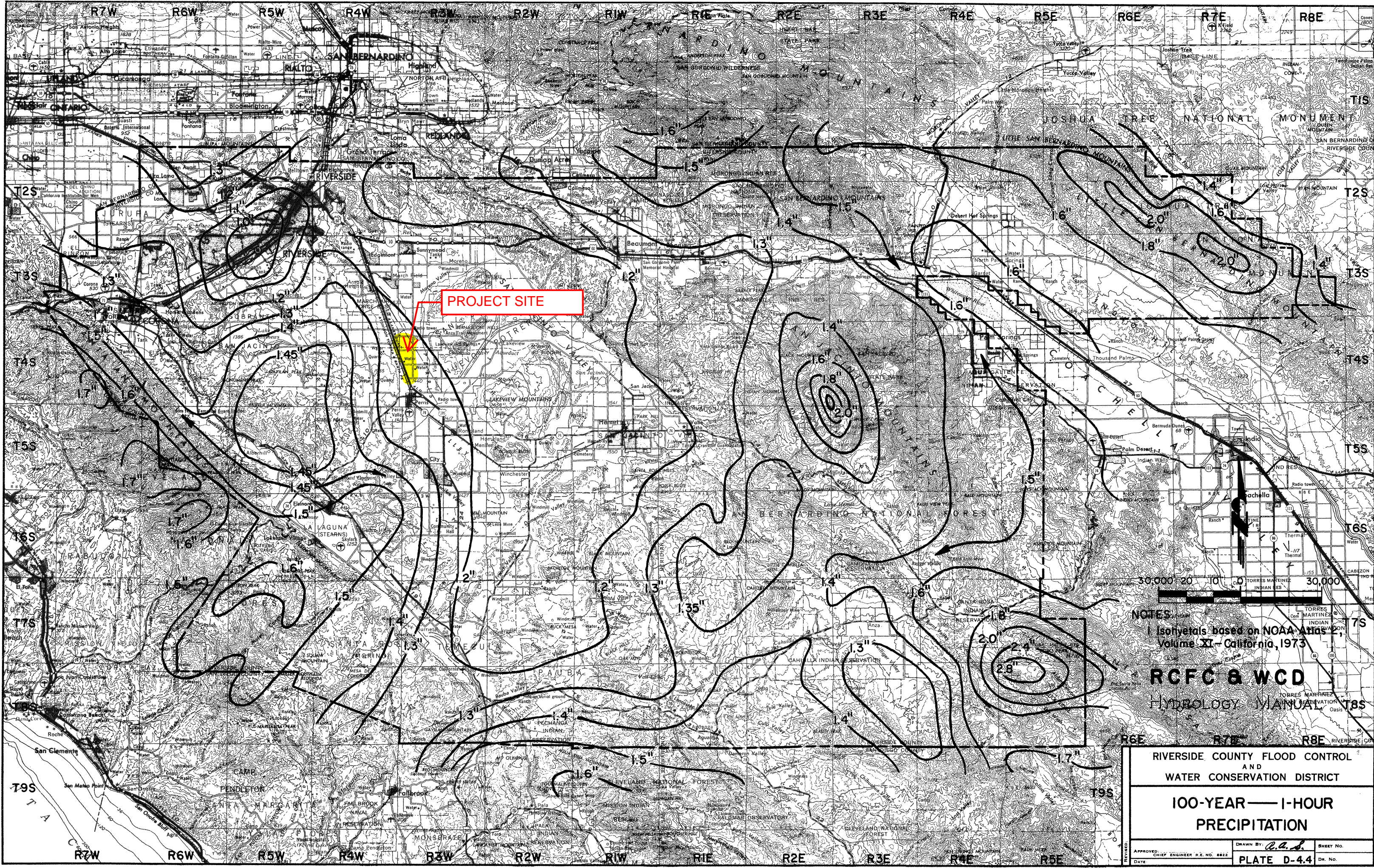
NOTES:  
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 Volume XI - California, 1973



**RCFC & WCD**  
 HYDROLOGY MANUAL

**RIVERSIDE COUNTY FLOOD CONTROL  
 AND  
 WATER CONSERVATION DISTRICT**  
**2-YEAR — 1-HOUR  
 PRECIPITATION**

APPROVED: _____ CHIEF ENGINEER R.E. NO. 8822	DRAWN BY: <i>P.L.S.</i>	SHEET NO. _____
DATE: _____	PLATE D-4.3	DR. NO. _____



**PROJECT SITE**



NOTES:  
 1 Isohyets based on NOAA Atlas  
 Volume XI - California, 1973

**RCFC & WCD**  
 HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT		
<b>100-YEAR — 1-HOUR PRECIPITATION</b>		
APPROVED: DATE	CHIEF ENGINEER P.E. NO. 8822	DRAWN BY: <i>C.A.S.</i> SHEET NO.
		PLATE D-4.4 DR. NO.



**SOUTHERN  
CALIFORNIA  
GEOTECHNICAL**  
*A California Corporation*

September 20, 2023

Howard Industrial Partners  
1944 North Tustin Street, Suite 122  
Orange, California 92865

Attention: Mr. Mike Tunney  
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**  
Harvest Landing Industrial Development  
Indian Avenue and Orange Avenue  
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

### **Scope of Services**

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

## **Site and Project Description**

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft<sup>2</sup> in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

## **Proposed Development**

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

<b>Building Type</b>	<b>Building Name</b>	<b>Location</b>	<b>Size (ft<sup>2</sup>)</b>
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

**Building Nos. 1 through 4 - Industrial Buildings**

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

**Building No. 5 - Distribution Building**

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

**Commercial – Big Box Retail**

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

### Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft<sup>2</sup> to 54,000± ft<sup>2</sup> in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

### Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

### Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

### General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

### Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

### **Previous Studies**

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

### **Concurrent Study**

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

### Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, <http://www.water.ca.gov/waterdatalibrary/>. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

### **Subsurface Exploration**

#### Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

#### Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

**Infiltration Testing**

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole’s radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole’s radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where “non-sandy soils” were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, “sandy-soils” were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

<b><u>Infiltration Test No.</u></b>	<b><u>Depth (feet)</u></b>	<b><u>Soil Description</u></b>	<b><u>Measured Infiltration Rate (inches/hour)</u></b>
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

## **Laboratory Testing**

### Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

### Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

## **Design Recommendations**

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

<b><u>Infiltration System(s)</u></b>	<b><u>Infiltration Test Nos.</u></b>	<b><u>Infiltration Test Depth (ft)</u></b>	<b><u>Infiltration System Type</u></b>	<b><u>Infiltration System Location</u></b>	<b><u>Design Infiltration Rate (inches/hour)</u></b>
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

\*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to be feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

### **Infiltration Rate Considerations**

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grain size distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

### **Location of Infiltration Systems**

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

**The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils.** Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

### **General Comments**

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

**Closure**

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.



Ryan Bremer  
Staff Geologist

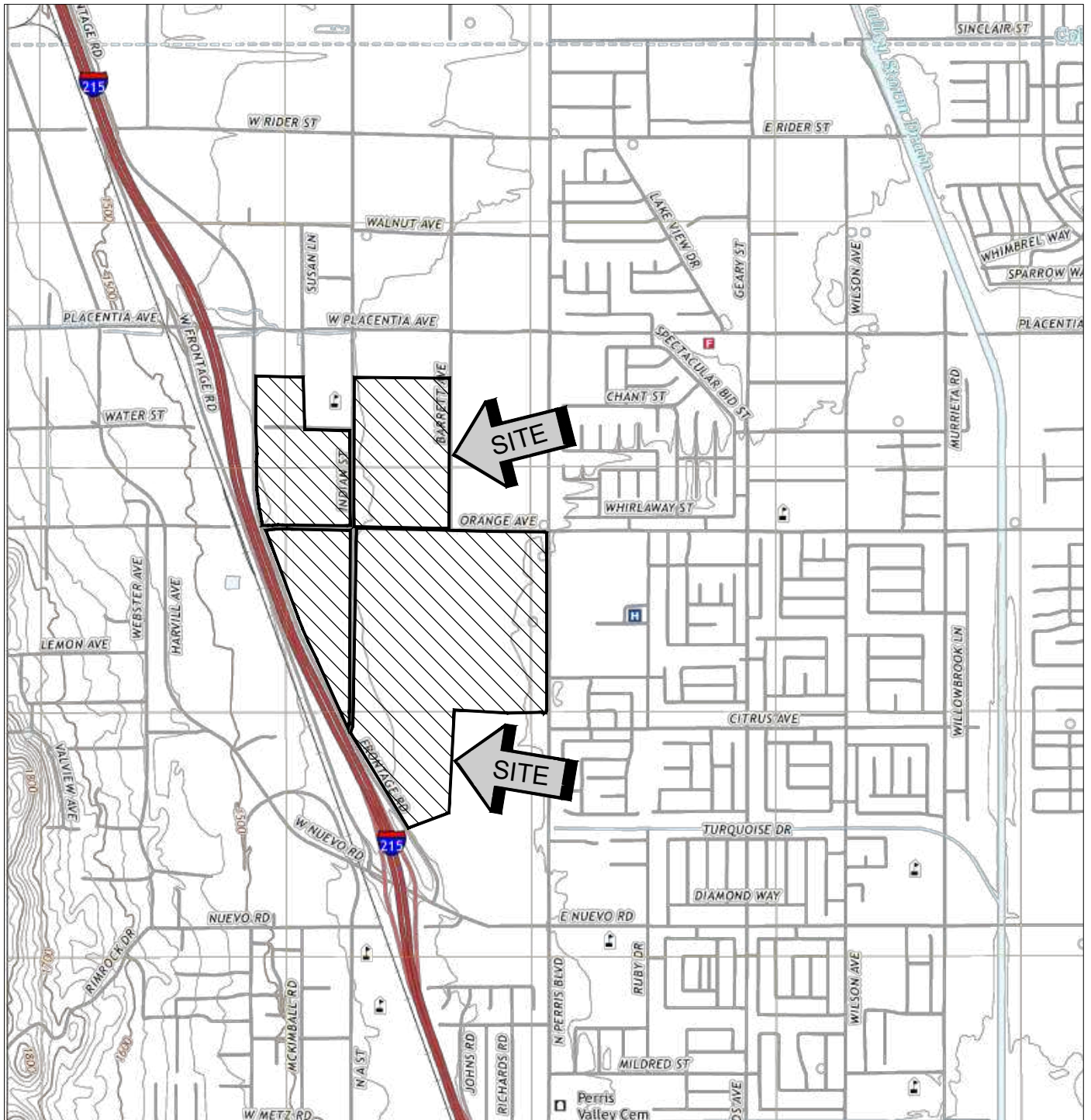


Daniel W. Nielsen, GE 3166  
Senior Engineer



Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map  
Plate 2 - Infiltration Test Location Plan  
Boring Log Legend and Logs (39 pages)  
Infiltration Test Results Spreadsheets (37 pages)  
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE  
 PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA,  
 2021



**SITE LOCATION MAP**

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'

DRAWN: RB

CHKD: RGT

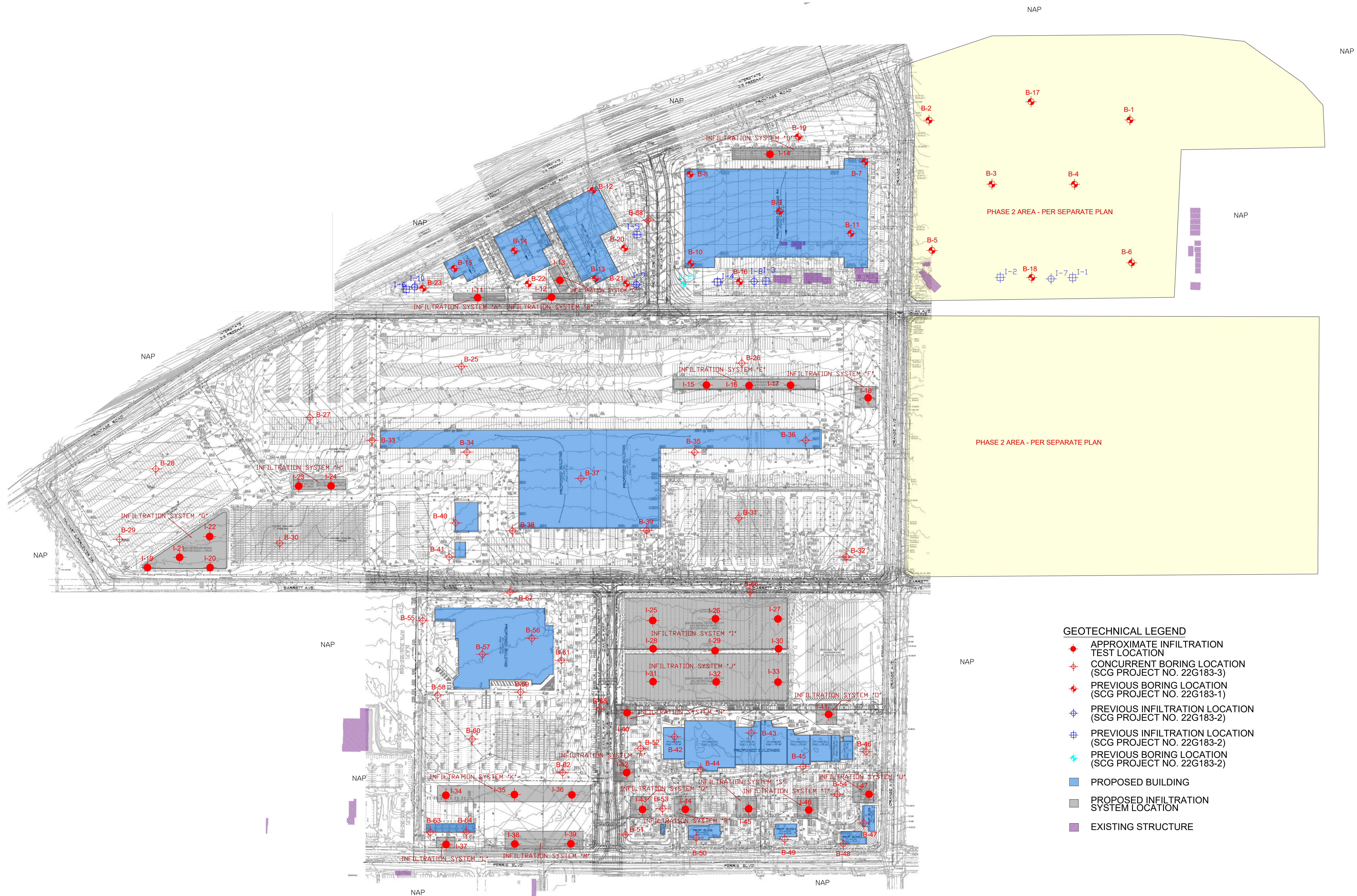
SCG PROJECT

22G183-4

PLATE 1



**SOUTHERN  
 CALIFORNIA  
 GEOTECHNICAL**



- GEOTECHNICAL LEGEND**
- ◆ APPROXIMATE INFILTRATION TEST LOCATION
  - ◆ CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
  - ◆ PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
  - ◆ PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
  - ◆ PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
  - ◆ PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
  - PROPOSED BUILDING
  - PROPOSED INFILTRATION SYSTEM LOCATION
  - EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

**INFLTRATION TEST LOCATION PLAN**

HARVEST LANDING INDUSTRIAL DEVELOPMENT  
PERRIS, CALIFORNIA

**PLATE 2**

22885 Savi Ranch Parkway  
Suite E  
Yorba Linda, CA 92887  
Phone: (714) 685-1115  
Fax: (714) 685-1118  
www.socalgeo.com

**SOUTHERN CALIFORNIA GEOTECHNICAL**  
A California Corporation

SCALE: 1" = 200'

DRAWN: RB  
CHKD: RGT  
SCG PROJECT  
22G183-4

**NORTH**

# PROJECT SUMMARY

## CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,770 LF

## STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 88,970 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 88,970 CF

## PIPE DETAILS

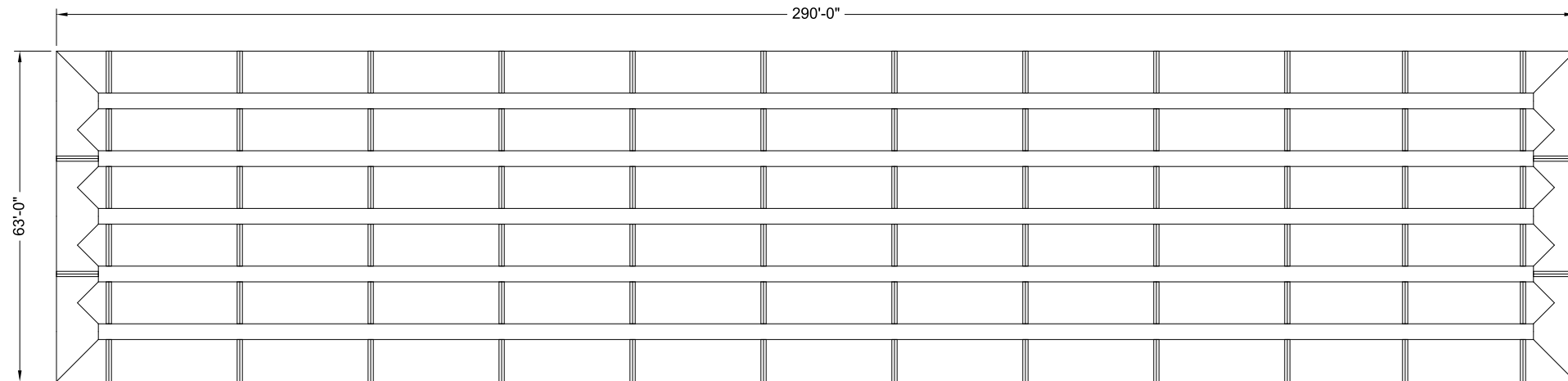
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

## BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

## NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2<sup>2</sup>/<sub>3</sub>" x 1<sup>1</sup>/<sub>2</sub>" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



**ASSEMBLY**  
SCALE: 1" = 30'

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DATE	REVISION DESCRIPTION	BY


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**CONTECH**  
CMP DETENTION SYSTEMS

CONTECH  
**DYODS**  
DRAWING

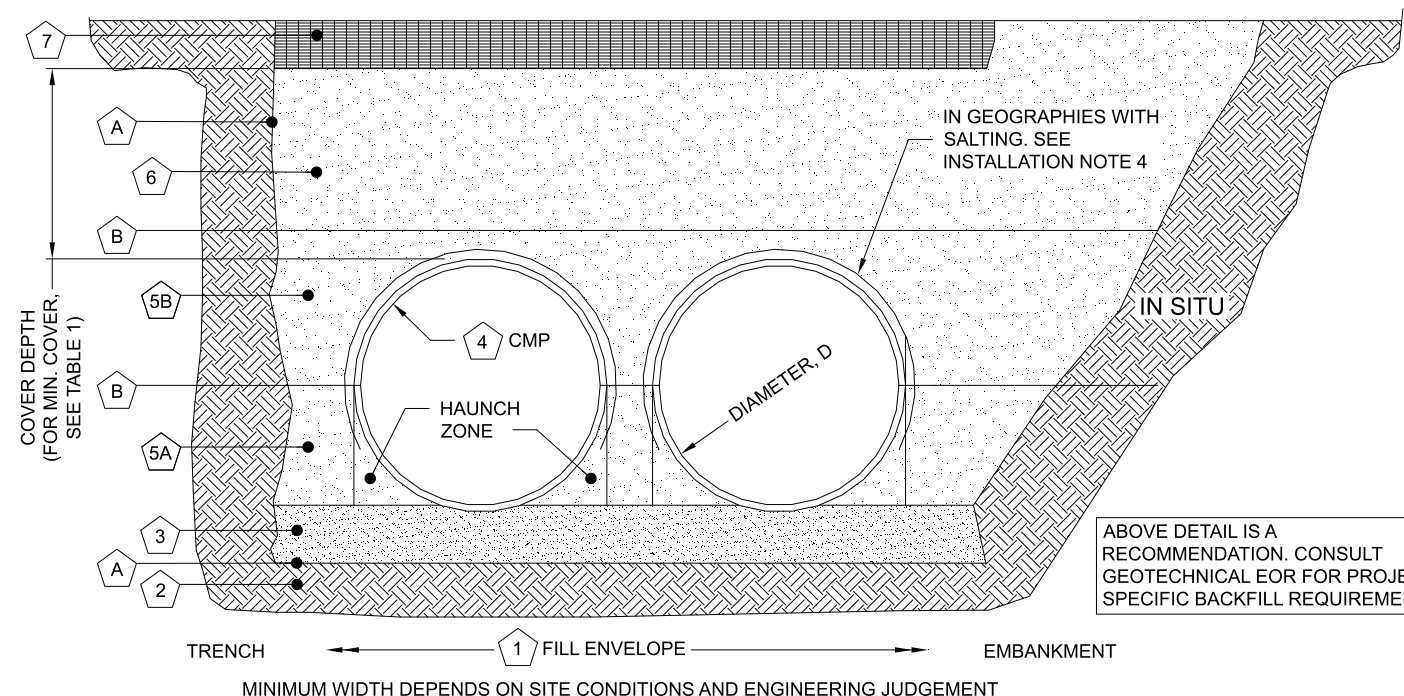
DYO60569 20-001 Harvest Landing Retail Center and Business Park  
Northerly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42851	SEQ. No.: 60569	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		<b>1</b>

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"  MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4	CORRUGATED METAL PIPE		
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING.  WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- \* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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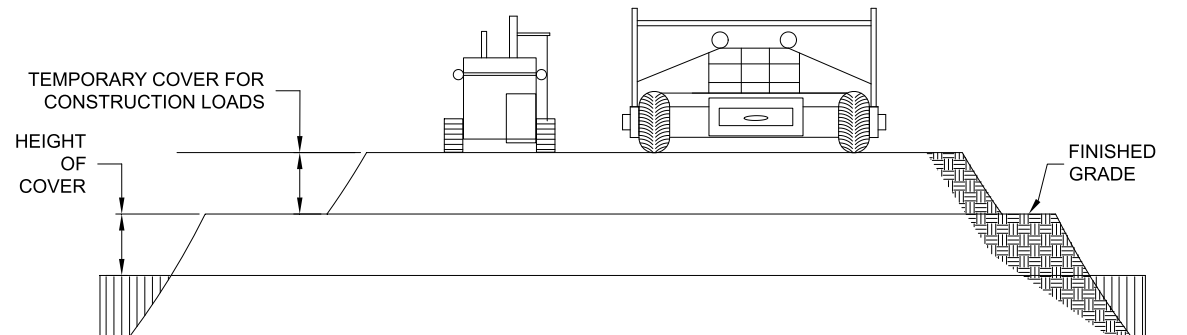
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**CONTECH**  
CMP DETENTION SYSTEMS  
CONTECH  
DYODS  
DRAWING

DYO60569 20-001 Harvest Landing Retail Center and Business Park  
Notherly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42851	SEQ. No.: 60569	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



**CONSTRUCTION LOADS**

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

\*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

**CONSTRUCTION LOADING DIAGRAM**

SCALE: N.T.S.

**SPECIFICATION FOR DESIGNED DETENTION SYSTEM:**

**SCOPE**

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

**MATERIAL**

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

**CONSTRUCTION LOADS**

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSIPA GUIDELINES.

**PIPE**

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

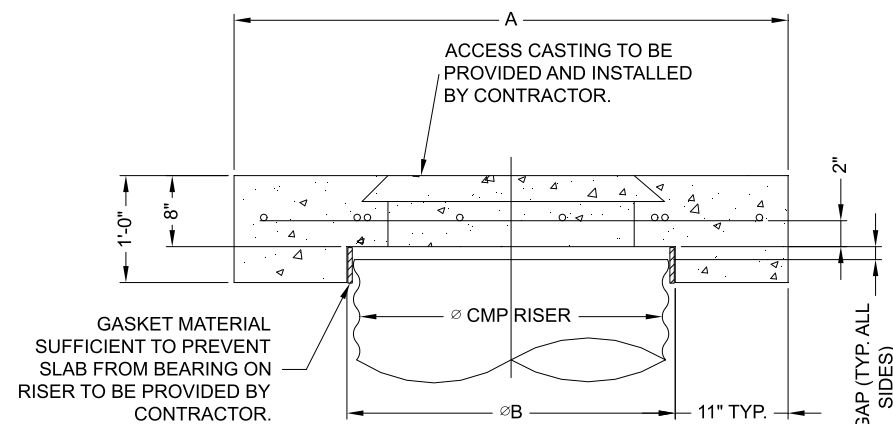
**APPLICABLE HANDLING AND ASSEMBLY**

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

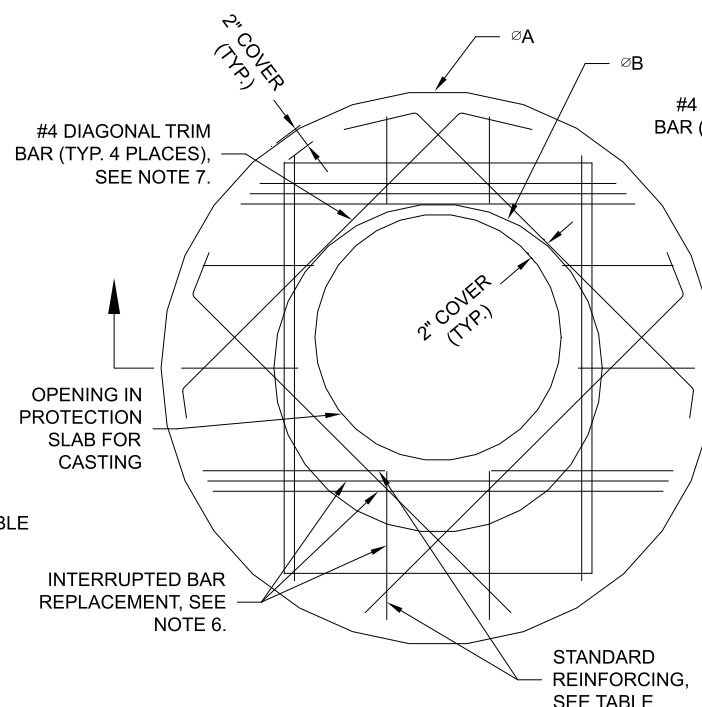
**INSTALLATION**

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

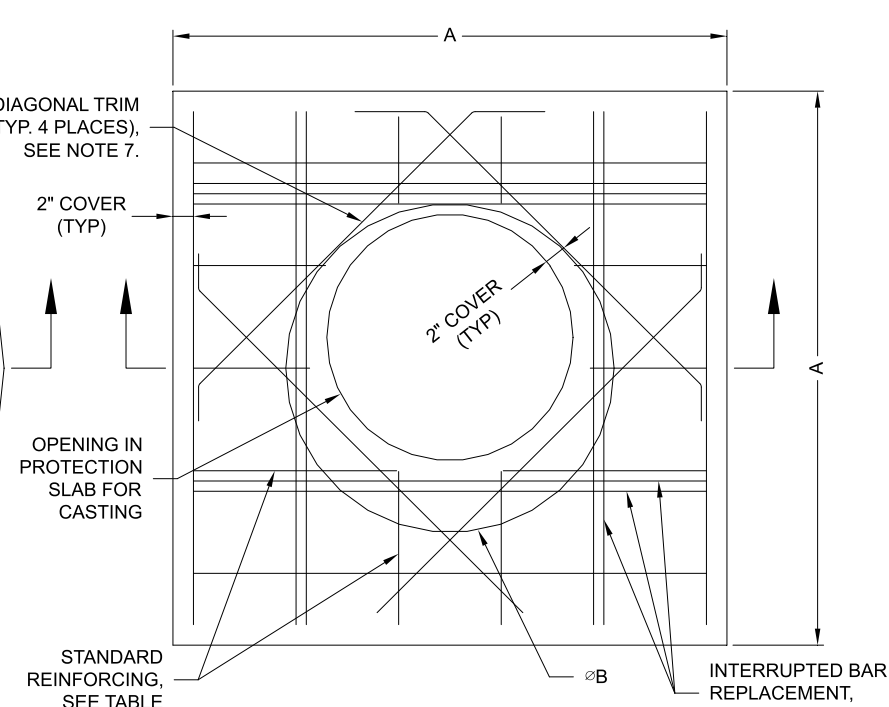
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



**SECTION VIEW**



**ROUND OPTION PLAN VIEW**



**SQUARE OPTION PLAN VIEW**

**NOTES:**

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

**MANHOLE CAP DETAIL**

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

\*\* ASSUMED SOIL BEARING CAPACITY

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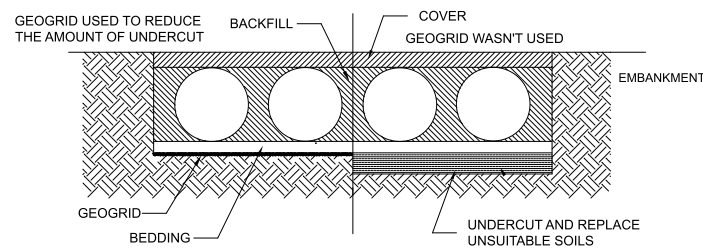
## CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

## FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

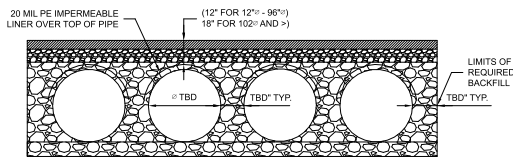
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

## GEOMEMBRANE BARRIER

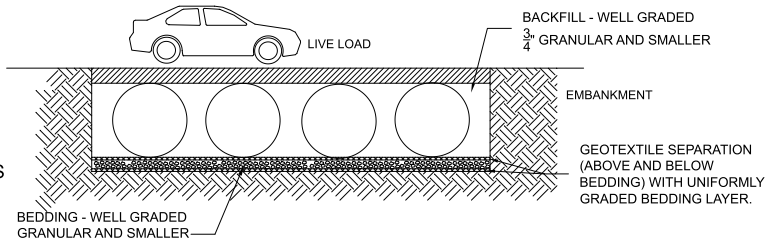
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



## IN-SITU TRENCH WALL

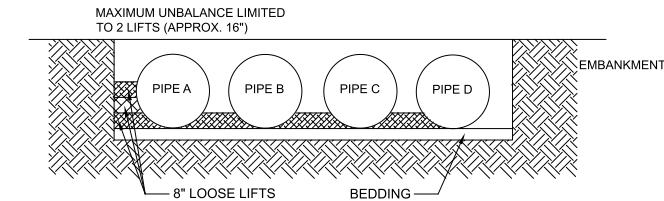
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



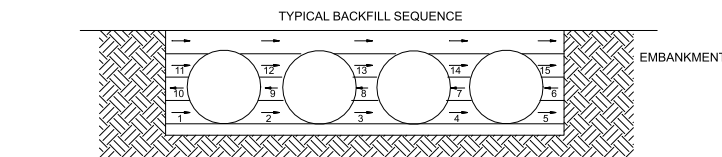
## BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

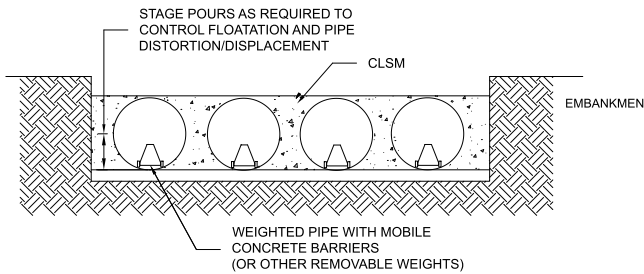


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

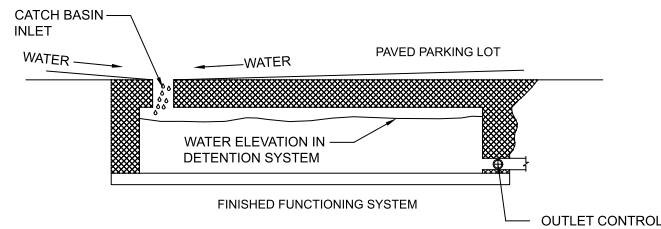


## CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

## ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



## CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

### INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

### MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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DY060569 20-001 Harvest Landing Retail Center and Business Park  
Northerly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42851	SEQ. No.: 60569	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

# PROJECT SUMMARY

## CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,656 LF

## STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 83,240 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 83,240 CF

## PIPE DETAILS

- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

## BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

## NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2<sup>2</sup>/<sub>3</sub>" x 1<sup>1</sup>/<sub>2</sub>" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
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**ASSEMBLY**  
SCALE: 1" = 20'

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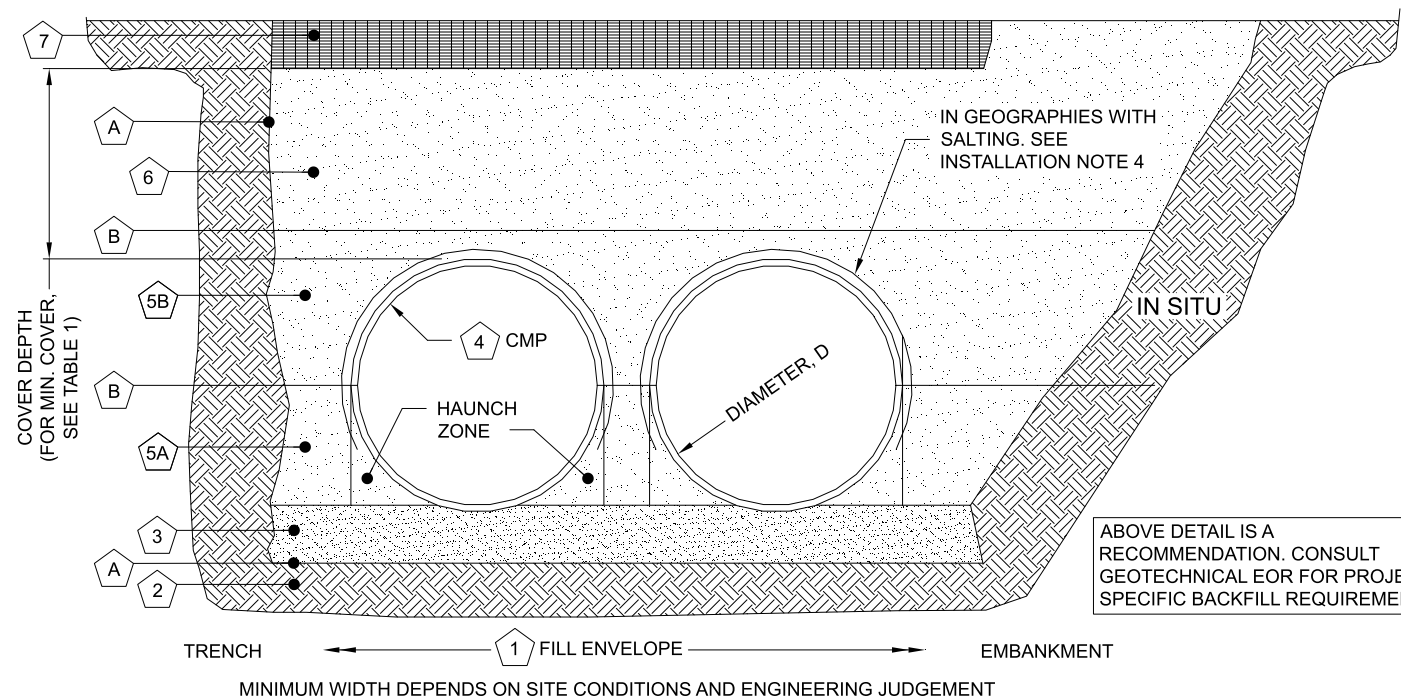
DY060570 20-001 Harvest Landing Retail Center and Business Park - Site 7  
Southerly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42852	SEQ. No.: 60570	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"  MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4			CORRUGATED METAL PIPE
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING.  WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- \* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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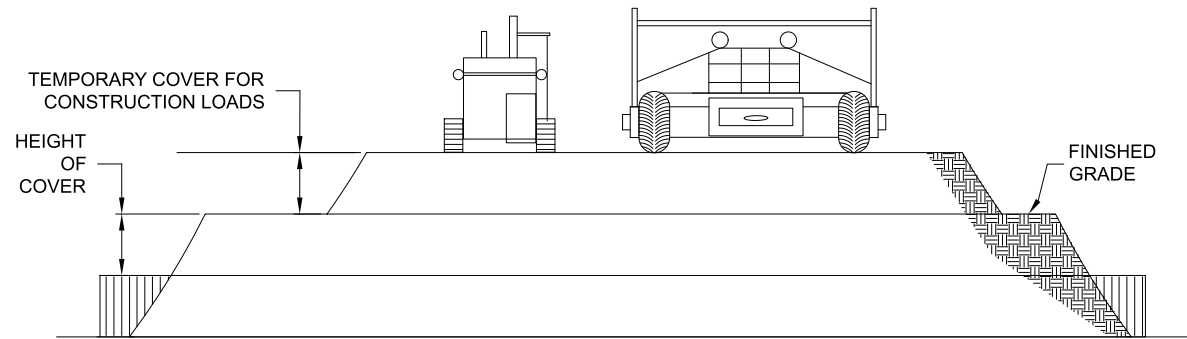
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CMP DETENTION SYSTEMS  
CONTECH  
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DRAWING

DY060570 20-001 Harvest Landing Retail Center and Business Park - Site 7  
Southernly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42852	60570	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



**CONSTRUCTION LOADS**

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

\*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

**CONSTRUCTION LOADING DIAGRAM**

SCALE: N.T.S.

**SPECIFICATION FOR DESIGNED DETENTION SYSTEM:**

**SCOPE**

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

**MATERIAL**

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

**CONSTRUCTION LOADS**

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSA GUIDELINES.

**PIPE**

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

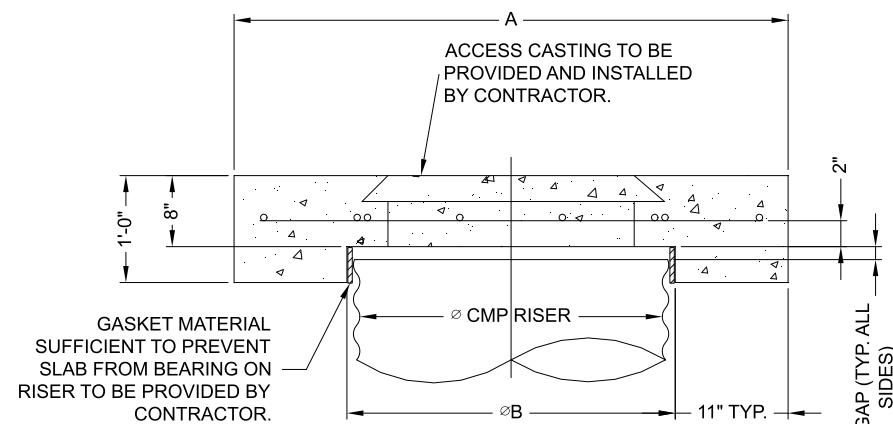
**HANDLING AND ASSEMBLY**

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

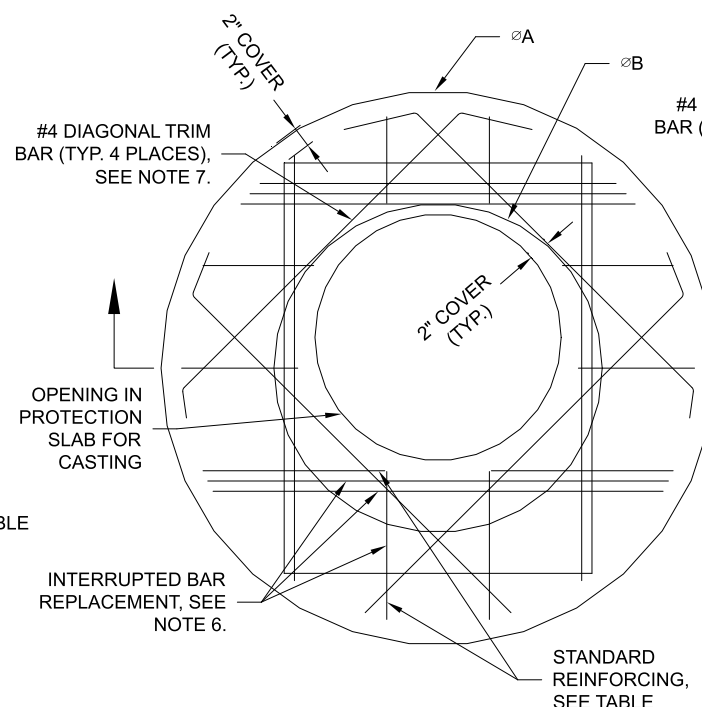
**INSTALLATION**

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

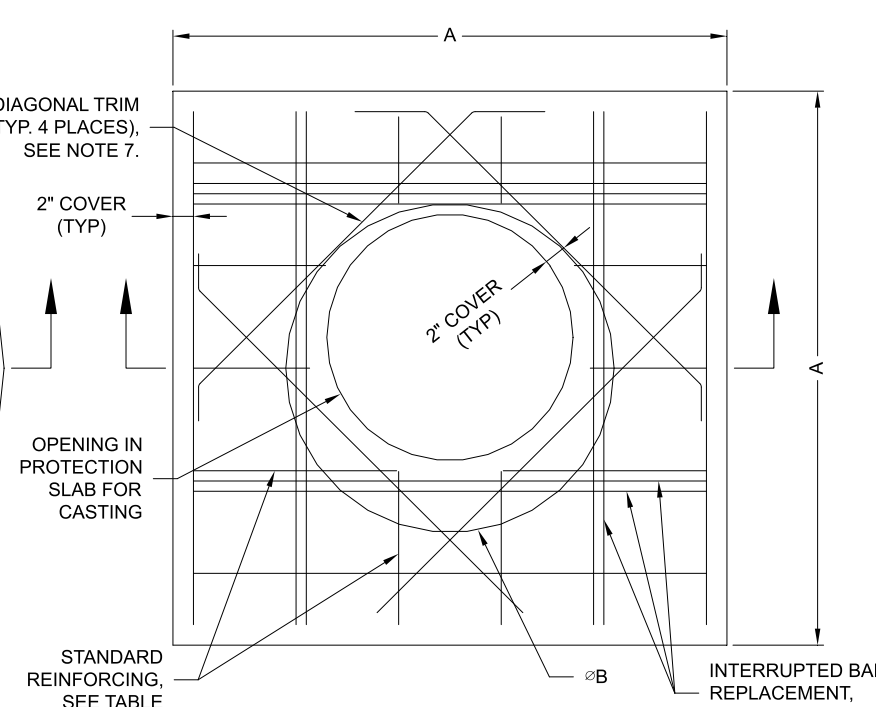
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



**SECTION VIEW**



**ROUND OPTION PLAN VIEW**



**SQUARE OPTION PLAN VIEW**

**NOTES:**

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

**MANHOLE CAP DETAIL**

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

\*\* ASSUMED SOIL BEARING CAPACITY

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**NOTE:**  
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YO60570 20-001 Harvest Landing Retail Center and Business Park - Site 7  
Southernly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42852	SEQ. No.: 60570	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
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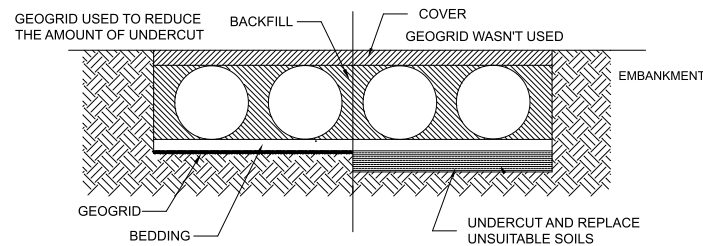
## CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

## FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

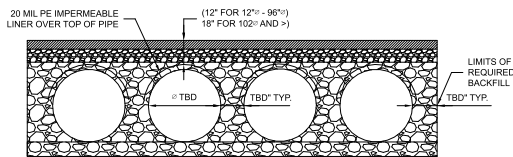
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

## GEOMEMBRANE BARRIER

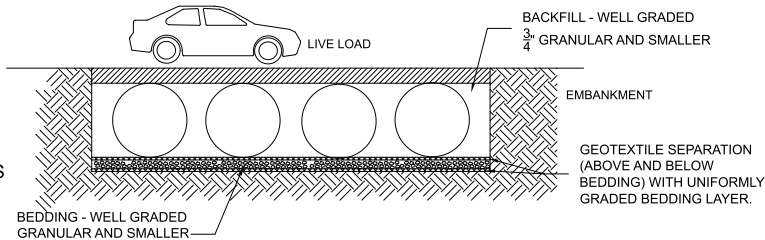
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



## IN-SITU TRENCH WALL

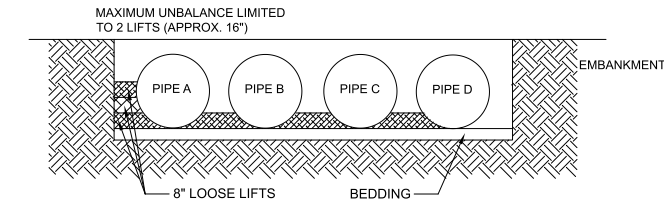
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



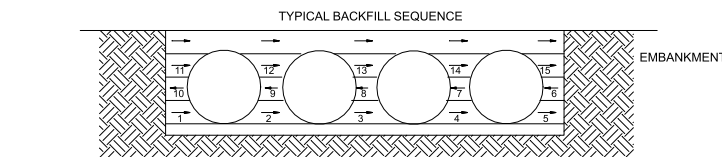
## BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

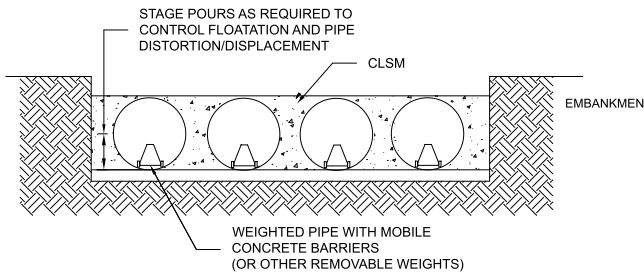


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

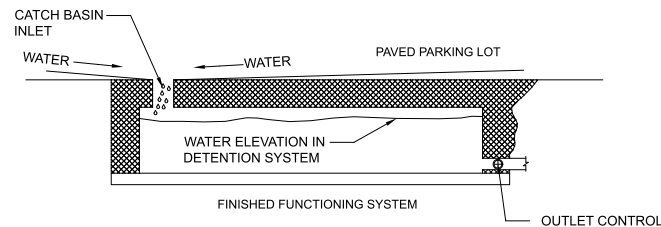


## CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

## ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



## CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

### INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

### MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CMP DETENTION SYSTEMS

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**DYODS**  
DRAWING

DYO60570 20-001 Harvest Landing Retail Center and Business Park - Site 7  
Southernly Chambers  
Perris, CA  
DETENTION SYSTEM

PROJECT No.: 42852	SEQ. No.: 60570	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

**Santa Ana Watershed - BMP Design Flow Rate,  $Q_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name

**20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-1 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, $I_p$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-1A	57309.9	Roofs	1	0.89	51120.4			
S7-1C	67852.19	Concrete or Asphalt	1	0.892	60524.2			
<b>Total</b>					<b>111644.6</b>	<b>0.20</b>	<b>0.51</b>	<b>0.577</b>

Notes:

**Santa Ana Watershed - BMP Design Flow Rate,  $Q_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name

**20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-2 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, $I_p$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-2A	17606	Roofs	1	0.89	15704.6			
S7-2C	11967.73	Concrete or Asphalt	1	0.892	10675.2			
<b>Total</b>					<b>26379.8</b>	<b>0.20</b>	<b>0.12</b>	<b>0.144</b>

Notes:

**Santa Ana Watershed - BMP Design Flow Rate,  $Q_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name **20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-3 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, $I_p$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-3A	54098.5	Roofs	1	0.89	48255.9			
S7-3C	32139.36	Concrete or Asphalt	1	0.892	28668.3			
<b>Total</b>					<b>76924.2</b>	<b>0.20</b>	<b>0.35</b>	<b>0.346</b>

Proposed Volume must be greater than the Design Capture Volume

Notes:

**Santa Ana Watershed - BMP Design Flow Rate, Q<sub>BMP</sub>**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name **20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-4 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I <sub>f</sub>	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-4A	98582.75	Roofs	1	0.89	87935.8			
S7-4C	93880.34	Concrete or Asphalt	1	0.892	83741.3			
<b>Total</b>					<b>171677.1</b>	<b>0.20</b>	<b>0.79</b>	<b>0.808</b>

Notes:

**Santa Ana Watershed - BMP Design Flow Rate, Q<sub>BMP</sub>**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name

**20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-5 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I <sub>f</sub>	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-5A	56184.36	Roofs	1	0.89	50116.4			
S7-5C	43500.29	Concrete or Asphalt	1	0.892	38802.3			
<b>Total</b>					<b>88918.7</b>	<b>0.20</b>	<b>0.41</b>	<b>0.462</b>

Notes:

**Santa Ana Watershed - BMP Design Flow Rate,  $Q_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name **20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-6 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, $I_p$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-6A	6528.45	Roofs	1	0.89	5823.4			
S7-6C	1757.82	Concrete or Asphalt	1	0.892	1568			
<b>Total</b>					<b>7391.4</b>	<b>0.20</b>	<b>0.03</b>	<b>0.052</b>

Notes:

**Santa Ana Watershed - BMP Design Flow Rate, Q<sub>BMP</sub>**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **FMCivil Engineers Inc**

Date **10/4/2024**

Designed by **Hector Paez**

Case No

Company Project Number/Name

**20-001 - Site 7**

**BMP Identification**

BMP NAME / ID **S7-7 Modular Wetlands**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

Design Rainfall Intensity

I = **0.20** in/hr

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I <sub>f</sub>	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-7A	13853.76	Roofs	1	0.89	12357.6			
S7-7C	126.23	Concrete or Asphalt	1	0.892	112.6			
<b>Total</b>					<b>12470.2</b>	<b>0.20</b>	<b>0.06</b>	<b>0.073</b>

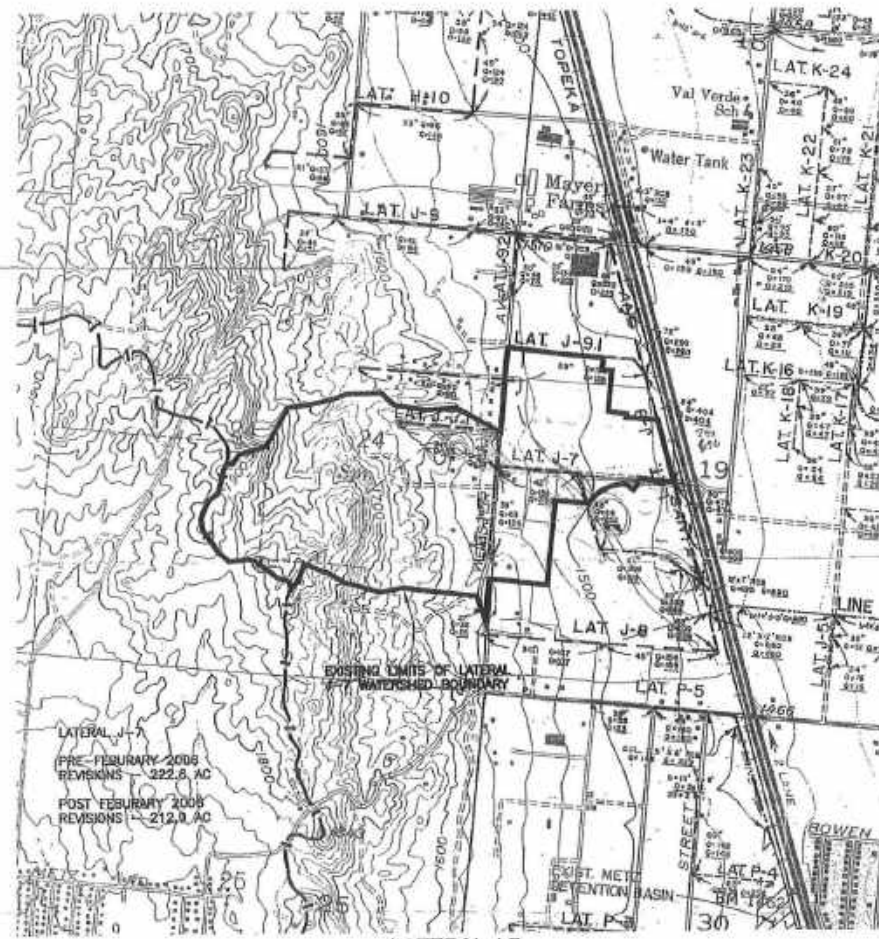
Notes:



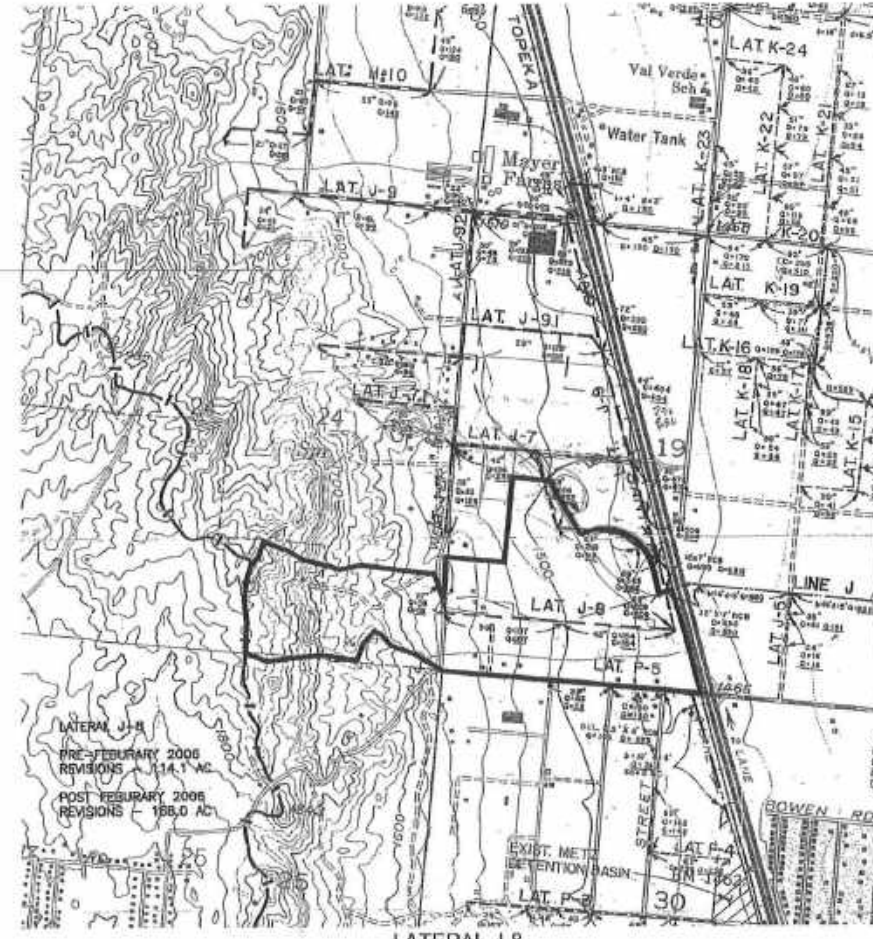


# REVISED HYDROLOGY MAP PERRIS MASTER DRAINAGE PLAN

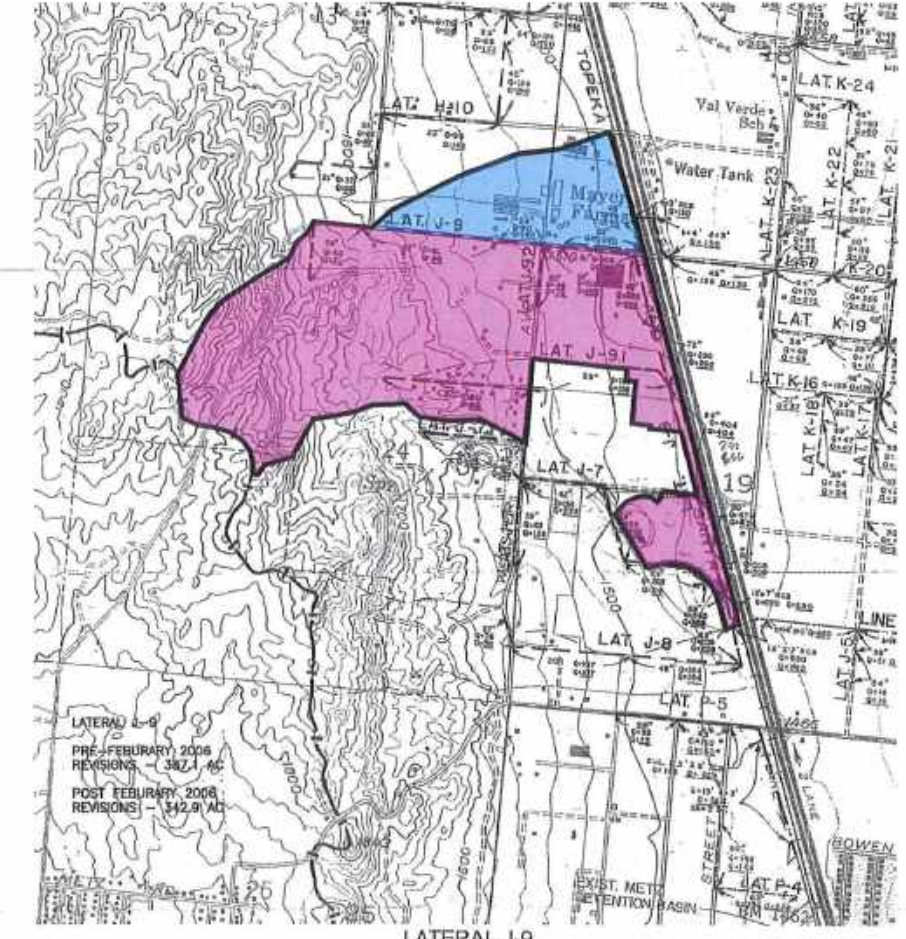
LATERALS J-7, J-8, & J-9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE-FEBRUARY 2006 REVISIONS	POST FEBRUARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J-8	114.1	168.0	+53.9
LAT J-9	609.8	555.9	-53.9

**LEGEND**

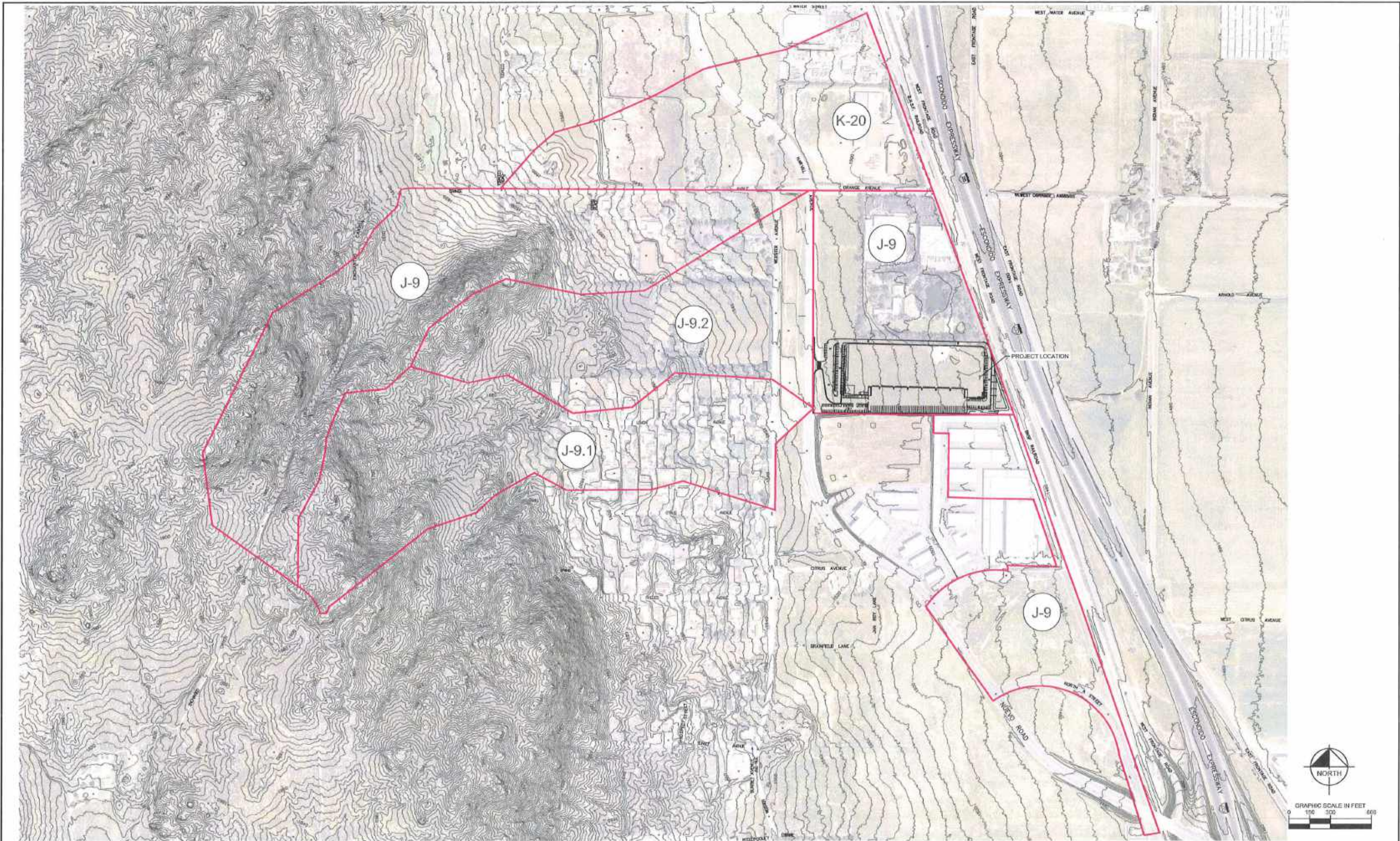
— PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION



SCALE: 1"=1000'

B:\CD\Newer Industrial Park - MUP\Echobay\UP - Perris MCP Hydrology map lat 7 and lat 8.dwg, 2/22/07 1:10:00 PM, Conrad Perris

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.  THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.	SEAL-COUNTY 	COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT APPROVED BY:  ALAN D. FRENCH, P.E. CIVIL ENGINEER, R.C.E. NO. 45702	SEAL-ENGINEER  RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT RECOMMENDED FOR APPROVAL: _____ APPROVED BY: _____ PLANNING ENGINEER: _____ CHIEF ENGINEER: _____ DATE: _____ DATE: _____	ENGINEERING SOLUTIONS ENGINEERING LAND PLANNING SERVICES GROUP 2155 CHICAGO AVENUE, STE. 201 RIVERSIDE, CA 92507 PHONE - (951) 784-0239 FAX - (951) 784-0237  PREPARED BY: _____ DATE: _____ EXP. 06-30-07	BENCHMARK:  SCALE: _____	I.P. No. XXXXX COUNTY OF RIVERSIDE REVISED HYDROLOGY MAP PERRIS MASTER DRAINAGE PLAN LATERALS J-7, J-8, & J-9	SHEET NO. <b>1</b> OF 1 SHEETS
	DATE BY MARK APPR DATE ENGINEER REVISIONS COUNTY	RECOMMENDED DATE	FOR: _____ W.O. _____ COUNTY FILE NO.: _____				



## **EXHIBITS**

**EXHIBIT A: VICINITY MAP**

**EXHIBIT B: EXISTING HYDROLOGY MAP**

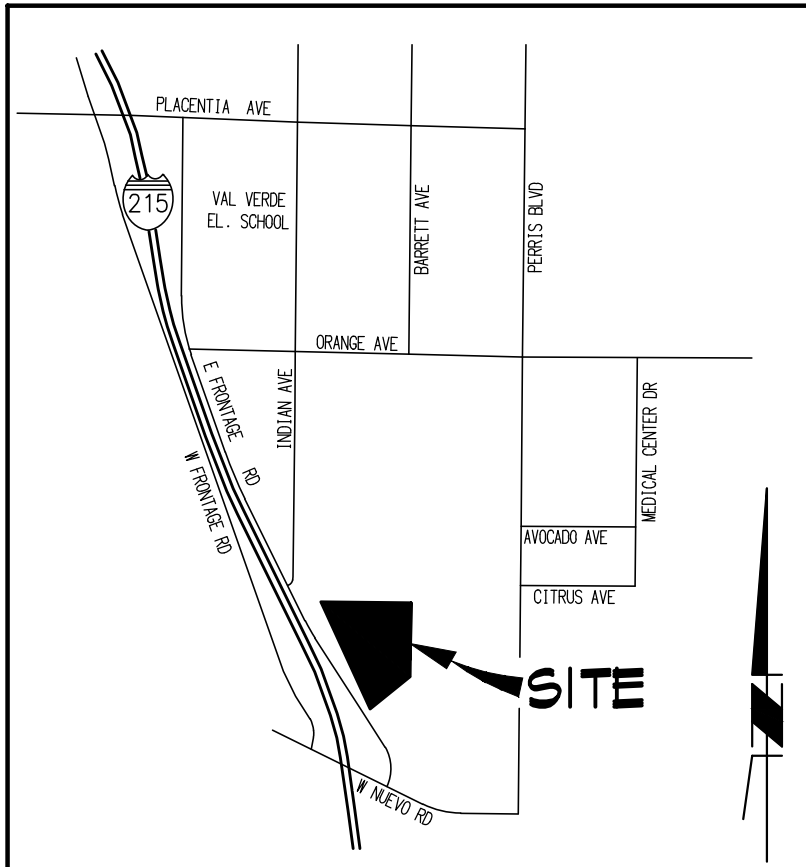
**EXHIBIT C: PROPOSED HYDROLOGY MAP**

**EXHIBIT D: HYDROLOGIC SOILS GROUP MAP**

**EXHIBIT E: RCFC D MDP FACILITIES OVERLAY**

**EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM**

**EXHIBIT G: CONCEPTUAL GRADING**



## VICINITY MAP

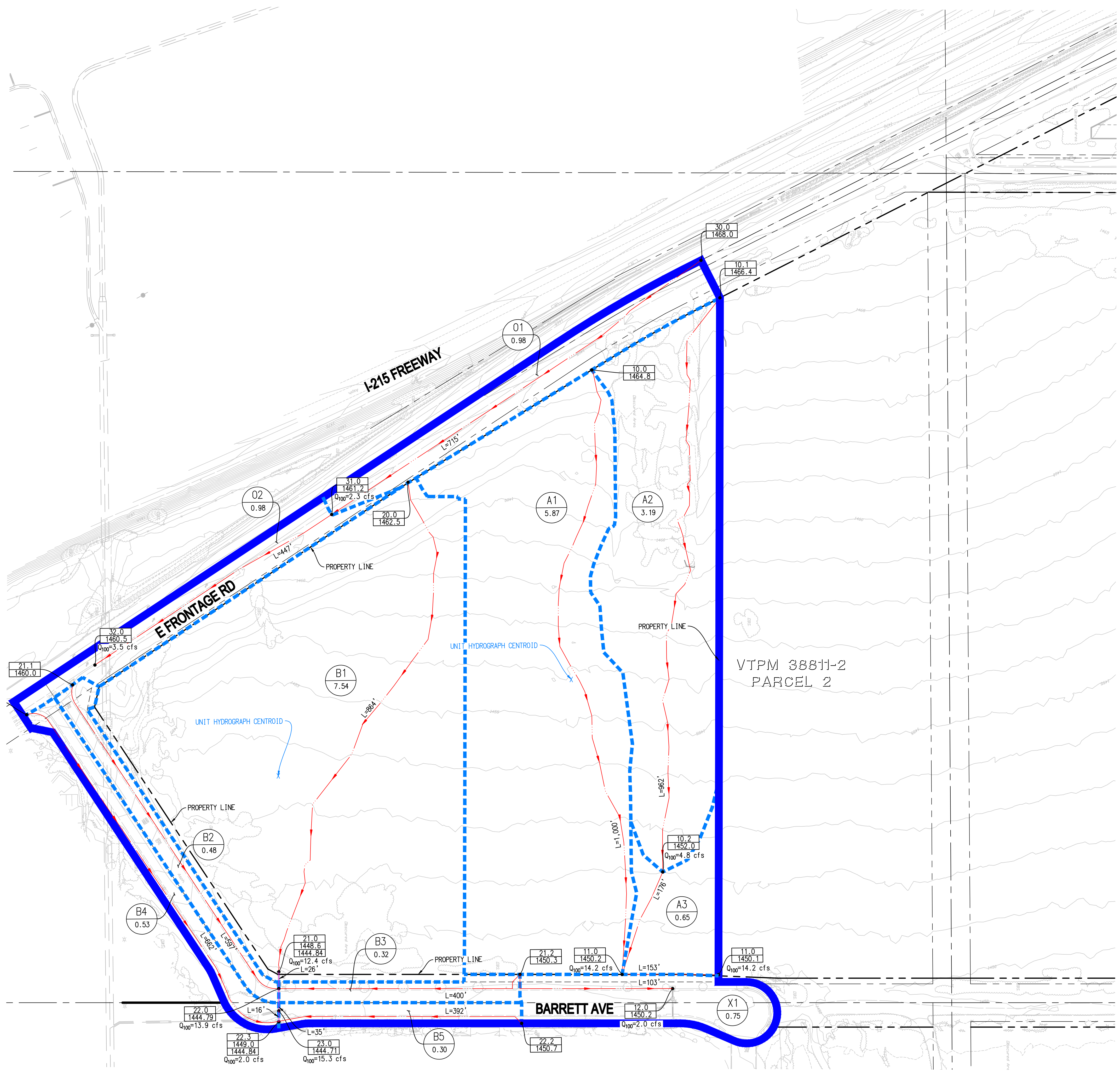
T4S, R3W, SEC 19  
NOT TO SCALE

**FMCIVIL**  
ENGINEERS INC.

29995 TECHNOLOGY DRIVE, SUITE  
306 | MURRIETA | CA 92563  
951.331.9873 - FMCIVIL.COM

**SITE 7 AT HARVEST LANDING**

**FIGURE 1  
VICINITY MAP**



**LEGEND**

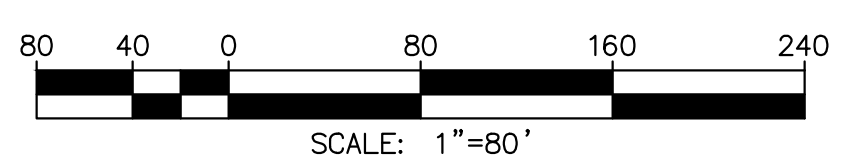
- D2 DRAINAGE BASIN NAME
- 2.16 DRAINAGE BASIN AREA(AC.)
- 11 NODE I. D.
- 1027.0 ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

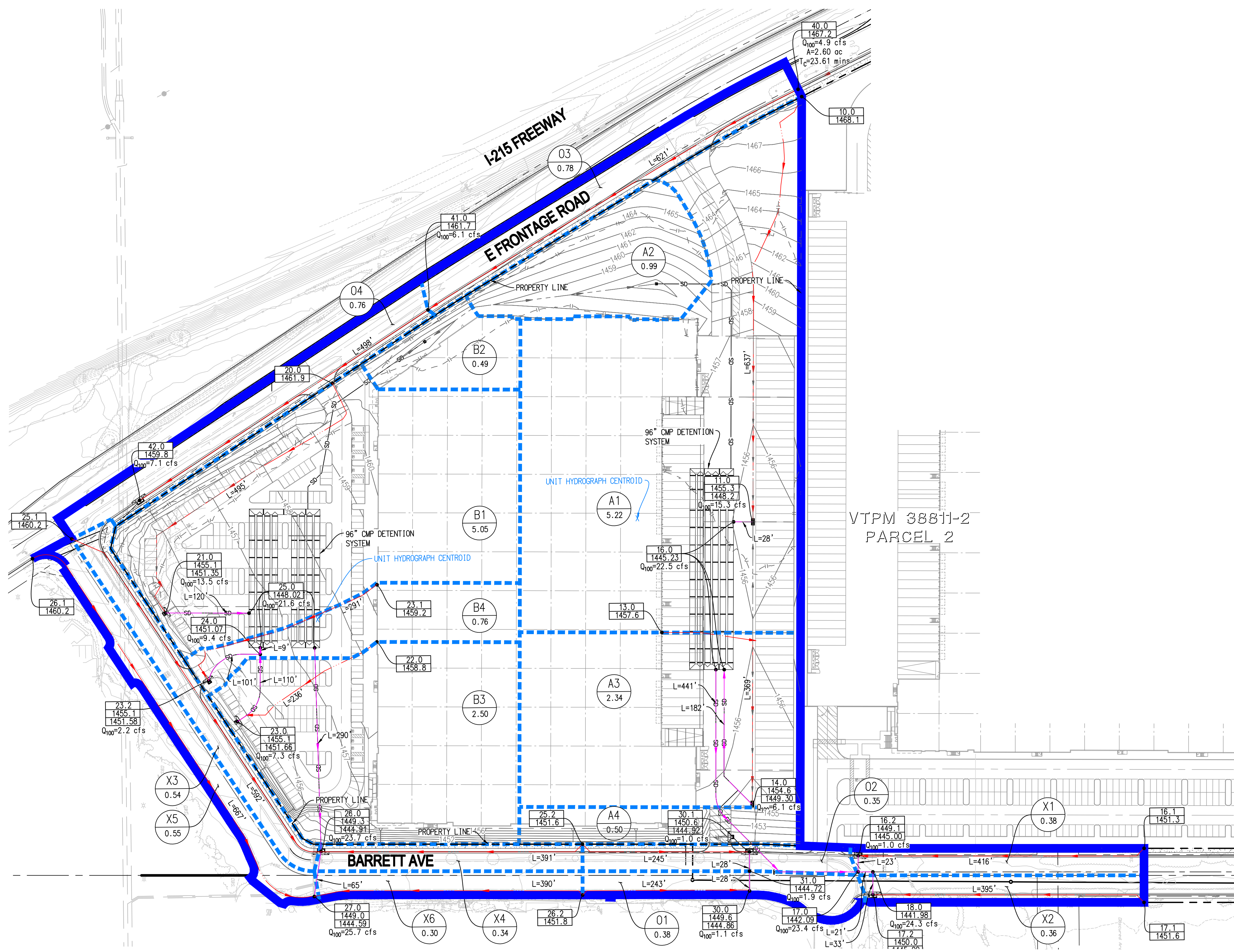
**UNIT HYDROGRAPH PARAMETERS - AREA A**

$L_{wc}$ (FT)	$L_c$ (FT)	$\Delta$ ELEV (FT)	N (-)
1,138	638	14.60	0.03

**UNIT HYDROGRAPH PARAMETERS - AREA B**

$L_{wc}$ (FT)	$L_c$ (FT)	$\Delta$ ELEV (FT)	N (-)
864	584	13.90	0.03





**LEGEND**

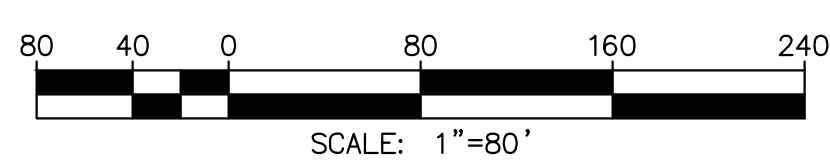
- D2 DRAINAGE BASIN NAME
- 2.16 DRAINAGE BASIN AREA (AC.)
- 11 NODE I. D.
- 1027.0 ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

**UNIT HYDROGRAPH PARAMETERS - AREA A**

$L_{wc}$ (FT)	$L_c$ (FT)	$\Delta$ ELEV (FT)	N (-)
665	635	22.87	0.015





**UNIT HYDROGRAPH PARAMETERS - AREA B**

$L_{wc}$ (FT)	$L_c$ (FT)	$\Delta$ ELEV (FT)	N (-)
615	247	13.88	0.015





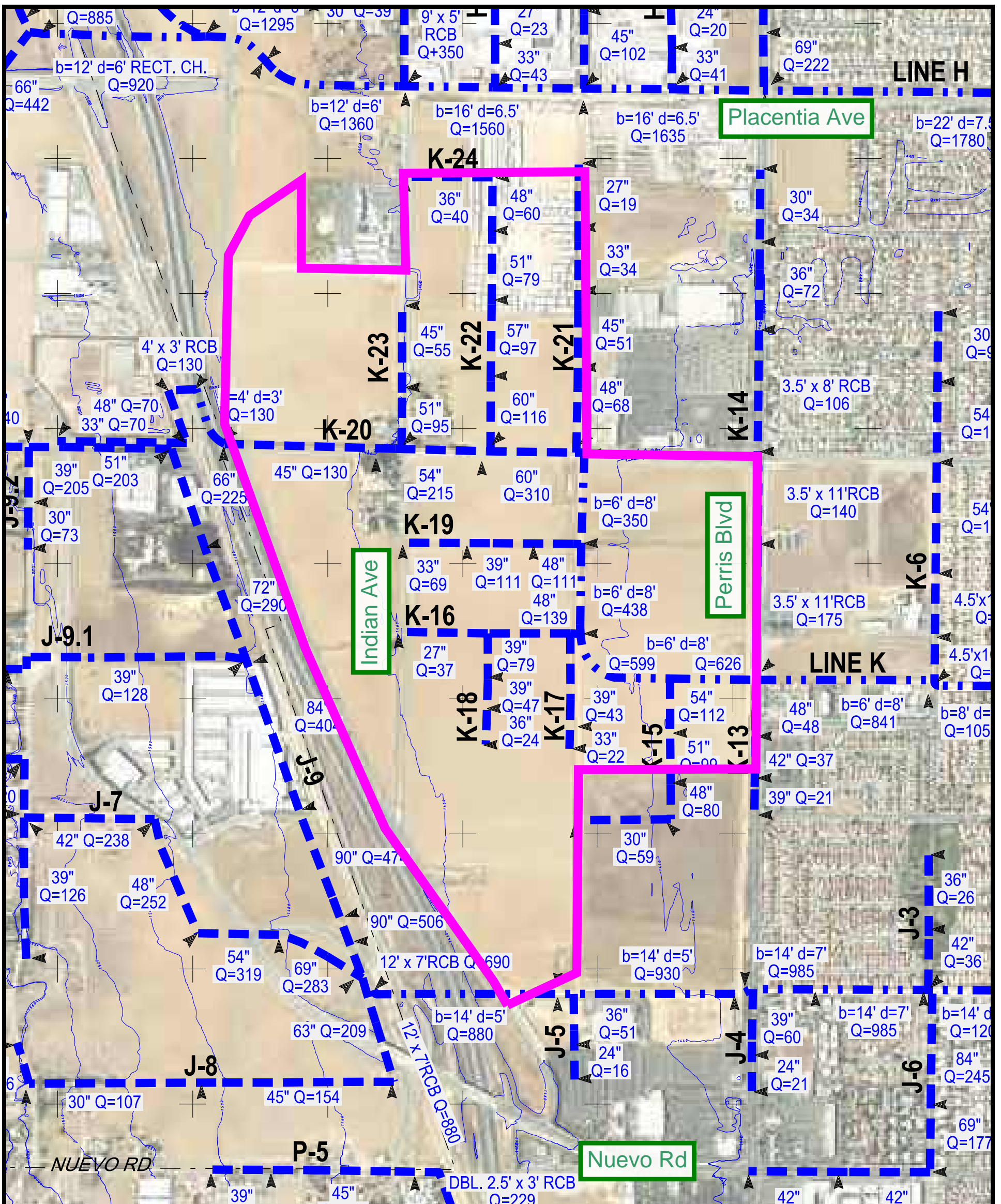
**LEGEND**

-  SITE 7 BOUNDARY
-  HYDROLOGIC SOIL A
-  HYDROLOGIC SOIL B
-  HYDROLOGIC SOIL C



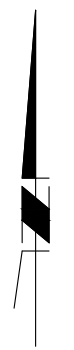
0 500 1,000 ft



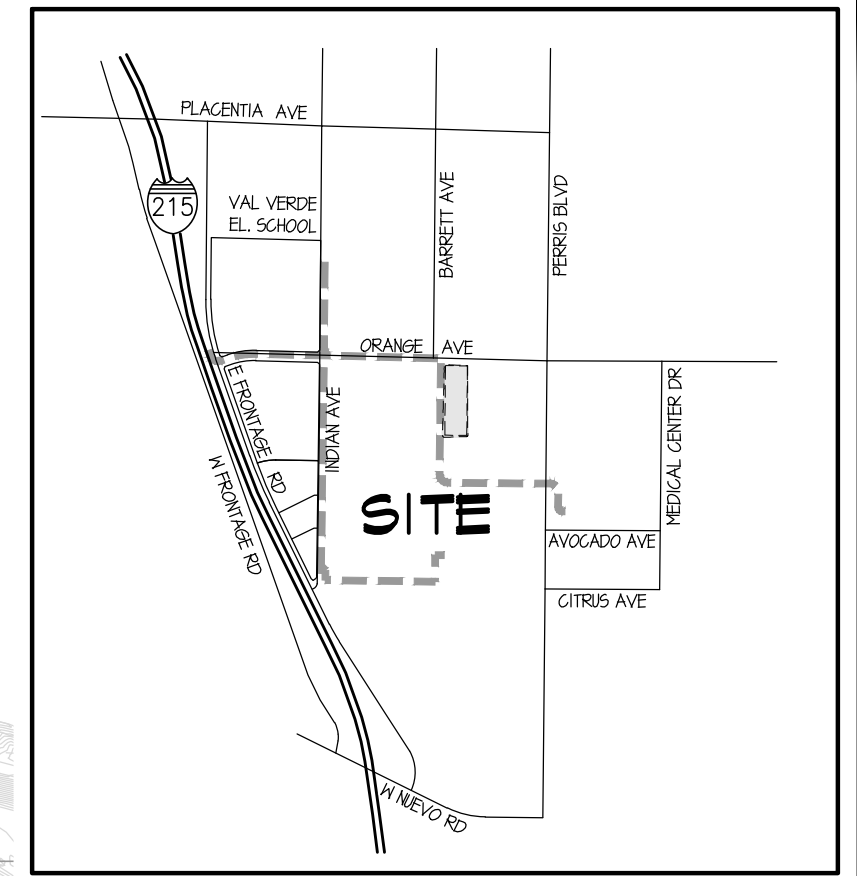


N.T.S.

- Site Boundary
- MDP Facilities



IN THE CITY OF PERRIS,  
 COUNTY OF RIVERSIDE, STATE OF CALIFORNIA  
**HARVEST LANDING INDUSTRIAL - PHASE I**  
**OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM**



**VICINITY MAP**  
 T4S, R3W, SEC 19  
 NOT TO SCALE

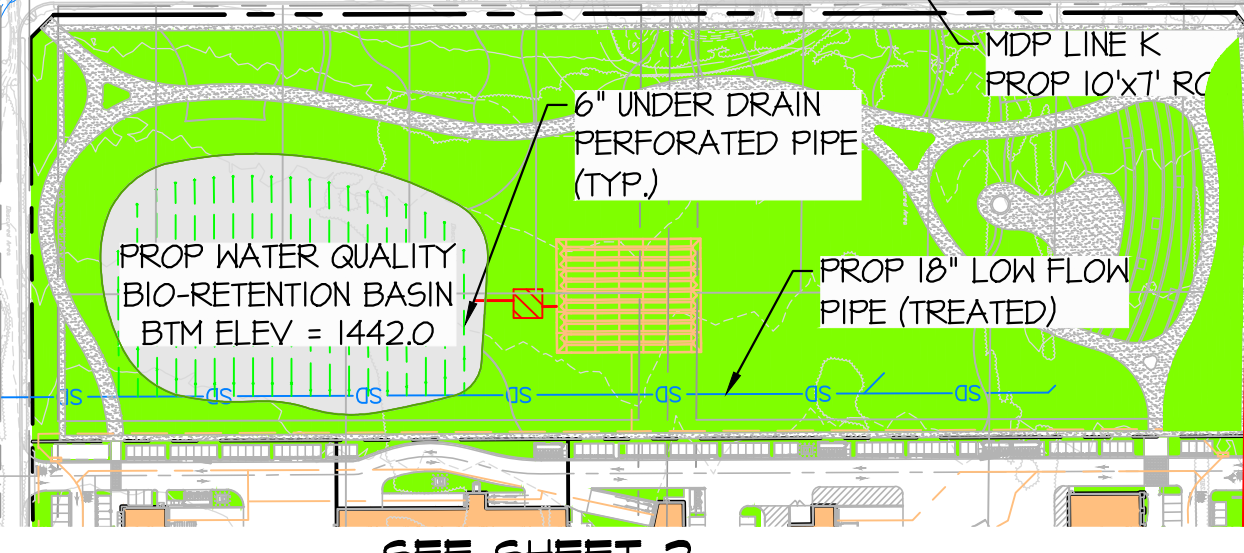
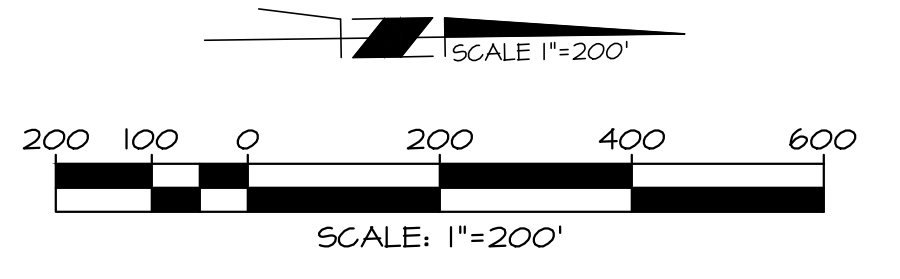
**APPLICANT/OWNER**  
 HOWARD INDUSTRIAL PARTNERS  
 1444 NORTH TUSTIN STREET, SUITE 122  
 ORANGE, CA 92665  
 CONTACT: TIM HOWARD  
 (TEL)714-769-4155

**ENGINEER**  
 FMCIVIL ENGINEERS INC.  
 24445 TECHNOLOGY DRIVE, SUITE 306  
 MURRIETA, CA 92563  
 CONTACT: FRANCISCO MARTINEZ  
 (TEL)951-331-4073

**ARCHITECT**  
 AO ARCHITECTURE  
 144 NORTH STREET  
 ORANGE, CA 92666  
 CONTACT: STEPHEN PRZYBYLOSKI  
 (TEL)714-634-4860



- LEGEND**
- RIGHT OF WAY
  - - - EXISTING CONTOUR
  - - - EASEMENT
  - SD- PROP. ONSITE STORM DRAIN SYSTEM
  - SD- PROP. OFFSITE STORM DRAIN SYSTEM
  - - - PROP. STORM DRAIN LOW FLOW SYSTEM
  - - - PROP. STORM DRAIN UNDER DRAIN SYSTEM
  - W- EXISTING WATER LINE
  - W- PROP. WATER LINE
  - SS- EXISTING SWR LINE
  - SS- PROP. SEWER LINE
  - SD- EXISTING STORM DRAIN PIPE
  - E- EXISTING OVERHEAD LINES



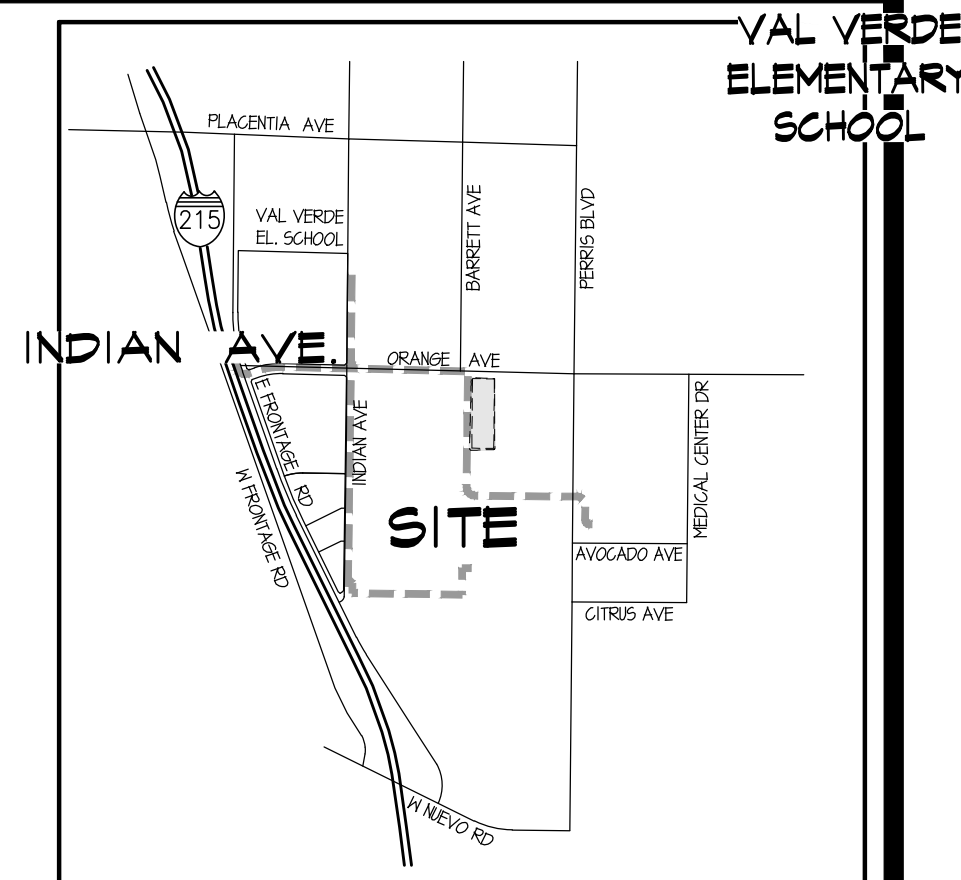
**CITY OF PERRIS**

**HARVEST LANDING INDUSTRIAL - PHASE I**  
**OFFSITE MASTER STORM DRAIN**  
**& LOW FLOW SYSTEM EXHIBIT**

SCALE: AS SHOWN	<b>FMCIVIL</b> ENGINEERS INC.	4870 KALMA STREET, SUITE 120 MURRIETA, CA 92562 951.913.0202 - FMCIVIL.COM	SHEET
DATE: OCT. 2024		1	OF 2 SHEETS
DESIGNED: AJ			
CHECKED: FM			
PLN CK REF:			

P:\DATA\20-001-HARVEST LANDING\DWG\PLANS\ENVIRONMENTAL\CIP\VAL-3\20-001-CIP\_MSD3-01.DWG - DANNY 10/17/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA  
**HARVEST LANDING INDUSTRIAL - PHASE I**  
**OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM**

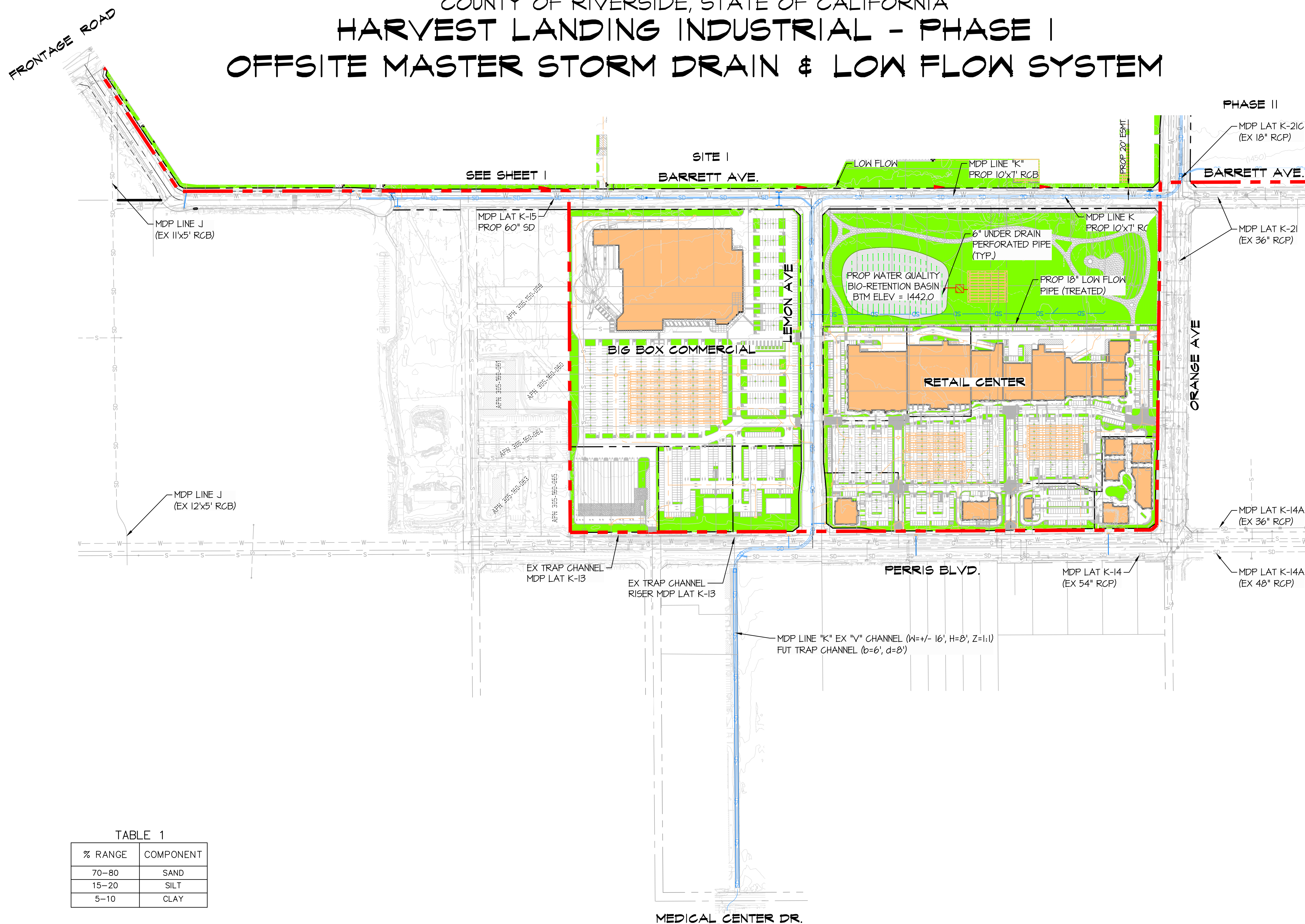


**VICINITY MAP**  
 T4S, R3W, SEC 19  
 NOT TO SCALE

**APPLICANT/OWNER**  
 HOWARD INDUSTRIAL PARTNERS  
 1444 NORTH TUSTIN STREET, SUITE 122  
 ORANGE, CA 92665  
 CONTACT: TIM HOWARD  
 (TEL) 714-769-4155

**ENGINEER**  
 FMCIVIL ENGINEERS INC.  
 24445 TECHNOLOGY DRIVE, SUITE 306  
 MURRIETA, CA 92563  
 CONTACT: FRANCISCO MARTINEZ  
 (TEL) 951-331-4873

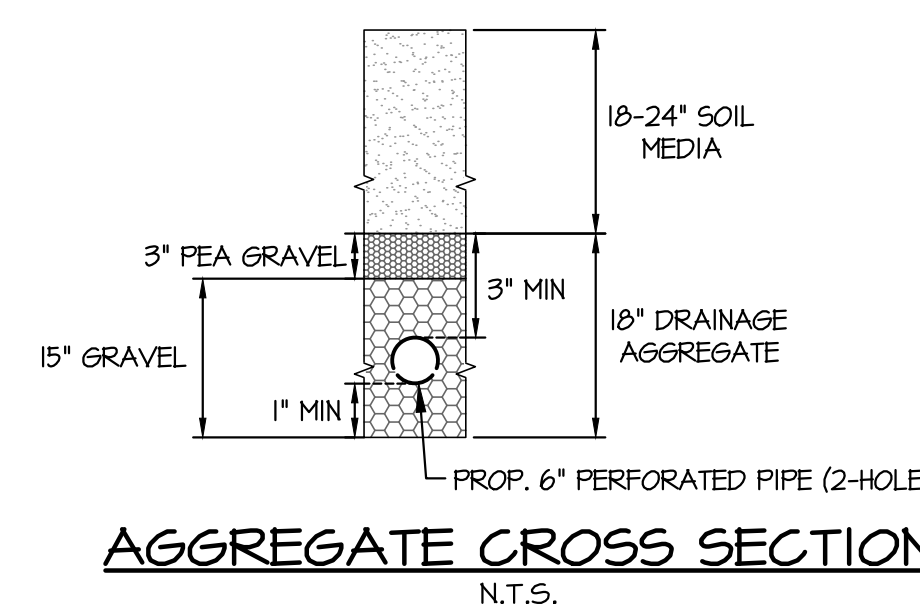
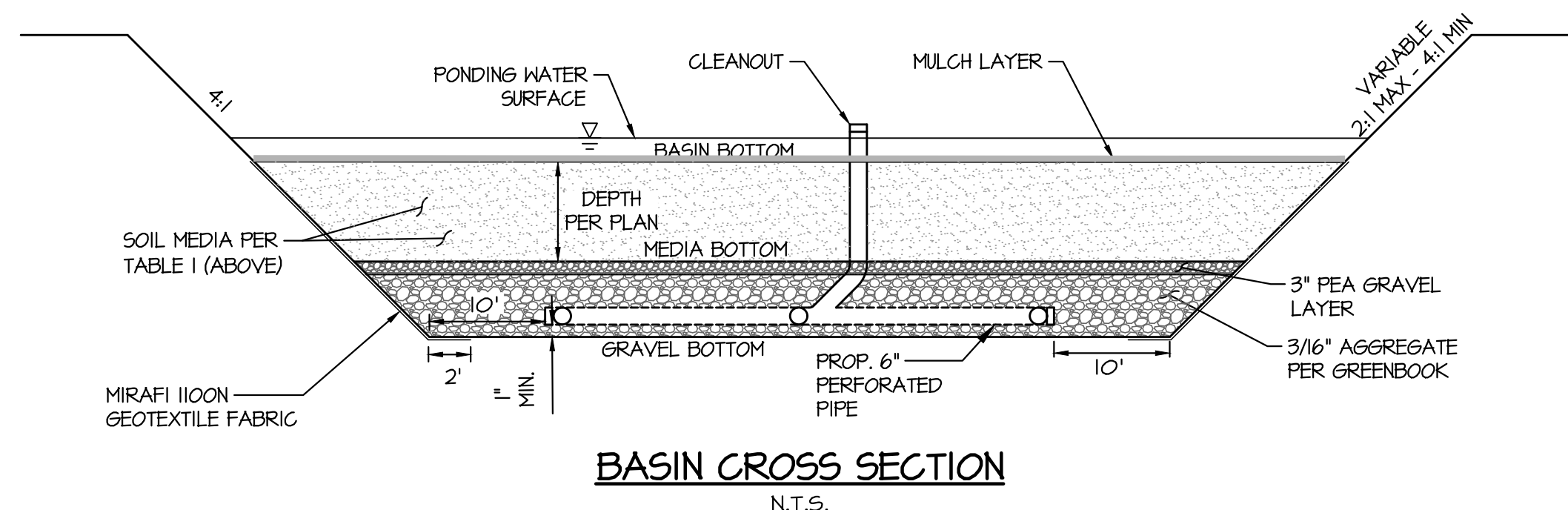
**ARCHITECT**  
 AO ARCHITECTURE  
 144 NORTH STREET  
 ORANGE, CA 92666  
 CONTACT: STEPHEN PRZYBYLOSKI  
 (TEL) 714-634-4860



**TABLE 1**

% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

- LEGEND**
- RIGHT OF WAY
  - EXISTING CONTOUR
  - EASEMENT
  - PROP. ONSITE STORM DRAIN SYSTEM
  - PROP. OFFSITE STORM DRAIN SYSTEM
  - PROP. STORM DRAIN LOW FLOW SYSTEM
  - PROP. STORM DRAIN UNDER DRAIN SYSTEM
  - EXISTING WATER LINE
  - PROP. WATER LINE
  - EXISTING SWR LINE
  - PROP. SEWER LINE
  - EXISTING STORM DRAIN PIPE
  - EXISTING OVERHEAD LINES



**CITY OF PERRIS**

**HARVEST LANDING INDUSTRIAL - PHASE I**  
**OFFSITE MASTER STORM DRAIN**  
**& LOW FLOW SYSTEM EXHIBIT**

SCALE: AS SHOWN	DATE: OCT. 2024		41870 KALMA STREET, SUITE 120 MURRIETA, CA 92562 951.913.0202 - FMCIVIL.COM	SHEET
DESIGNED: AJ	CHECKED: FM			<b>2</b> OF 2 SHEETS
PLN CK REF:				

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLANS\EXHIBIT\VAL-3\20-001-CIP\_MSD3-01.DWG -DANNY 10/18/2024 7:35 AM

**LEGEND**

- (1025)— EXISTING CONTOUR
- 1025— PROPOSED CONTOUR
- A— RETAINING WALL
- FENCE— FENCE
- E— EDGE OF PAVEMENT
- S— SIGN
- MH— MANHOLE
- R/W— RIGHT OF WAY
- E— EASEMENT
- P— PARCEL LINE
- PMB— PARCEL MAP BOUNDARY
- SCL— STREET CENTER LINE
- S— SCREEN WALL
- CS— COMBINATION SCREEN/RETAINING WALL
- E— EXISTING LOT LINE
- R— RIDGE LINE
- R— RIBBON GUTTER
- F— FLOW ARROW
- PE— PROPOSED EDGE OF PAVEMENT
- W— EXISTING WATER LINE
- PW— PROPOSED WATER LINE
- SS— EXISTING SHW LINE
- PSS— PROPOSED SEWER LINE
- SD— EXISTING STORM DRAIN PIPE
- PSD— PROPOSED STORM DRAIN PIPE
- E— EXISTING OVERHEAD LINES
- C— CUT/FILL LINE
- S— SLOPE SYMBOL

**ZONING ORDINANCE**

**EXISTING ZONING:**  
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

**PROPOSED ZONING:**  
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

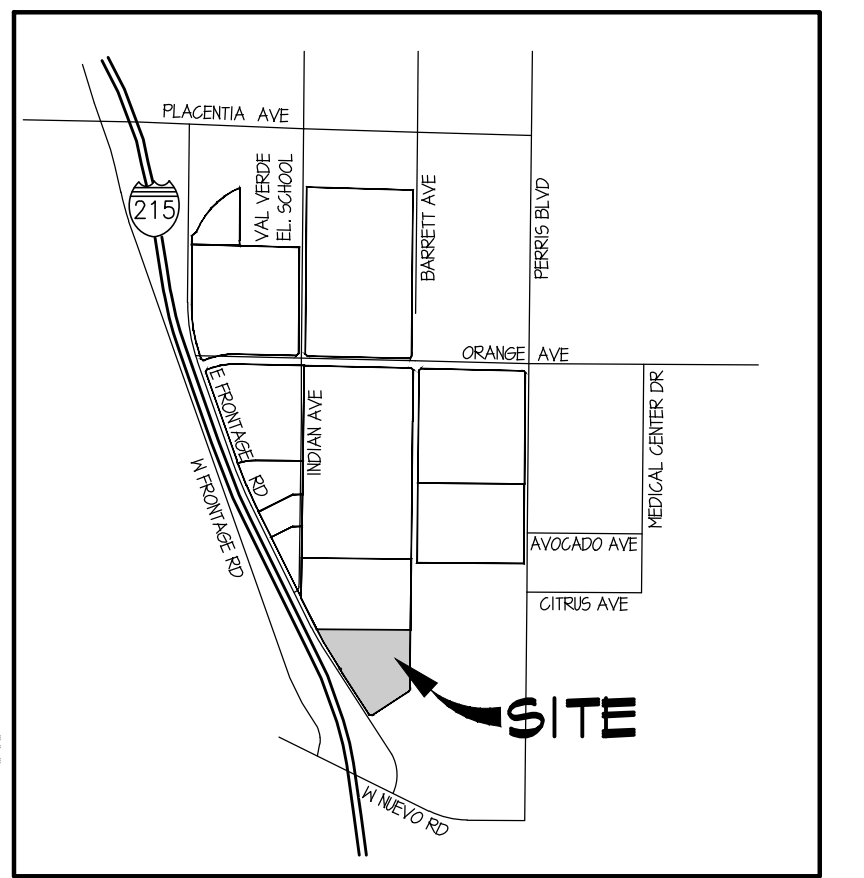
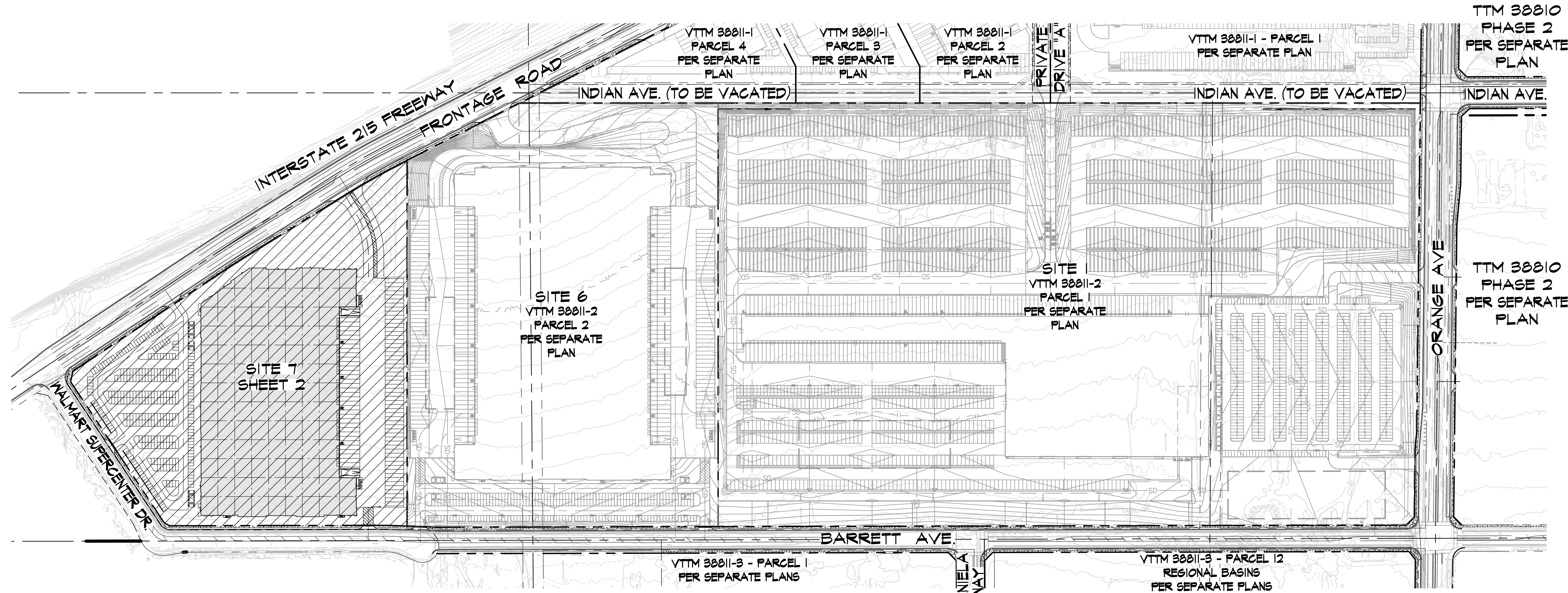
**ASSESSOR'S PARCEL NUMBERS:**

305-120-004 thru 008, 020 thru 026, &  
305-130-001 thru 006, 009, &  
305-160-001 thru 003, 025 thru 030, &  
305-190-014, 019, 020, 028 thru 031, &  
305-220-011, 059 thru 062

**LEGAL DESCRIPTION**

BLOCKS 1-4 OF FIGADOTA FARMS NO. 1A AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 68 TOGETHER WITH LOTS 1-8, AND 13-20 OF FIGADOTA FARMS AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 53 EXCEPTING THAT PORTION LYING WEST OF THE EASTERLY LINE OF THE FRONTAGE ROAD.

IN THE CITY OF PERRIS,  
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA  
**HARVEST LANDING RETAIL CENTER & BUSINESS PARK**  
**SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN**  
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3



**VICINITY MAP**  
T4S, R3W, SEC 19  
NOT TO SCALE

**APPLICANT/OWNER**  
HOWARD INDUSTRIAL PARTNERS  
2244 NORTH PACIFIC STREET  
ORANGE, CA 92665  
CONTACT: TIM HOWARD  
(TEL)714-637-3333

**ENGINEER**  
FMCIVIL ENGINEERS INC.  
41870 KALMIA ST., SUITE 120  
MURRIETA, CA 92562  
CONTACT: FRANCISCO MARTINEZ  
(TEL)951-913-0202

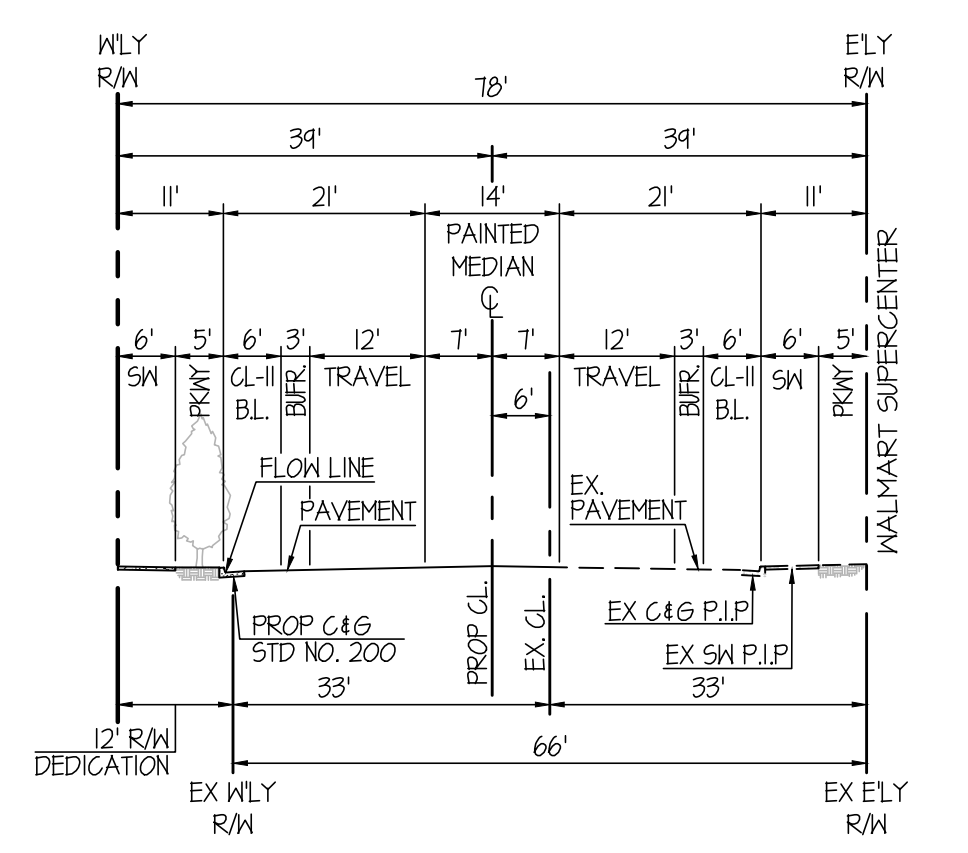
**ARCHITECT**  
AO ARCHITECTURE  
144 NORTH STREET  
ORANGE, CA 92666  
CONTACT: DAN MACDAVID  
(TEL)714-634-9860

**EARTHWORK ESTIMATE:**

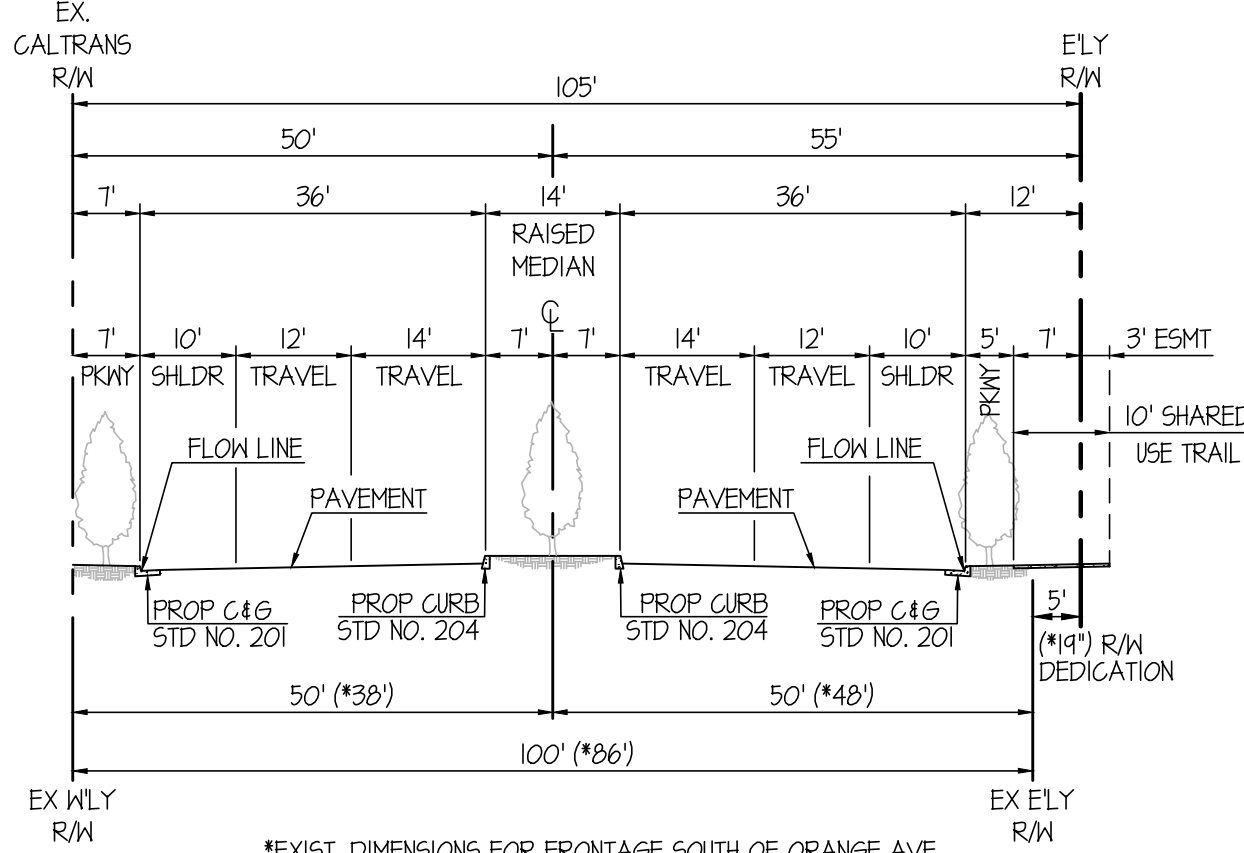
RAW CUT:	7,630 CY
RAW FILL:	94,590 CY
NET:	86,960 CY IMPORT

HAUL TRIPS:  
ASSUMED (13 CY PER TRIP) = 6,690

**INDEX MAP**



**BARRETT AVE**  
(FRONTAGE RD. - N'LY WALMART DWT)  
MAJOR COLLECTOR  
(18'/56')



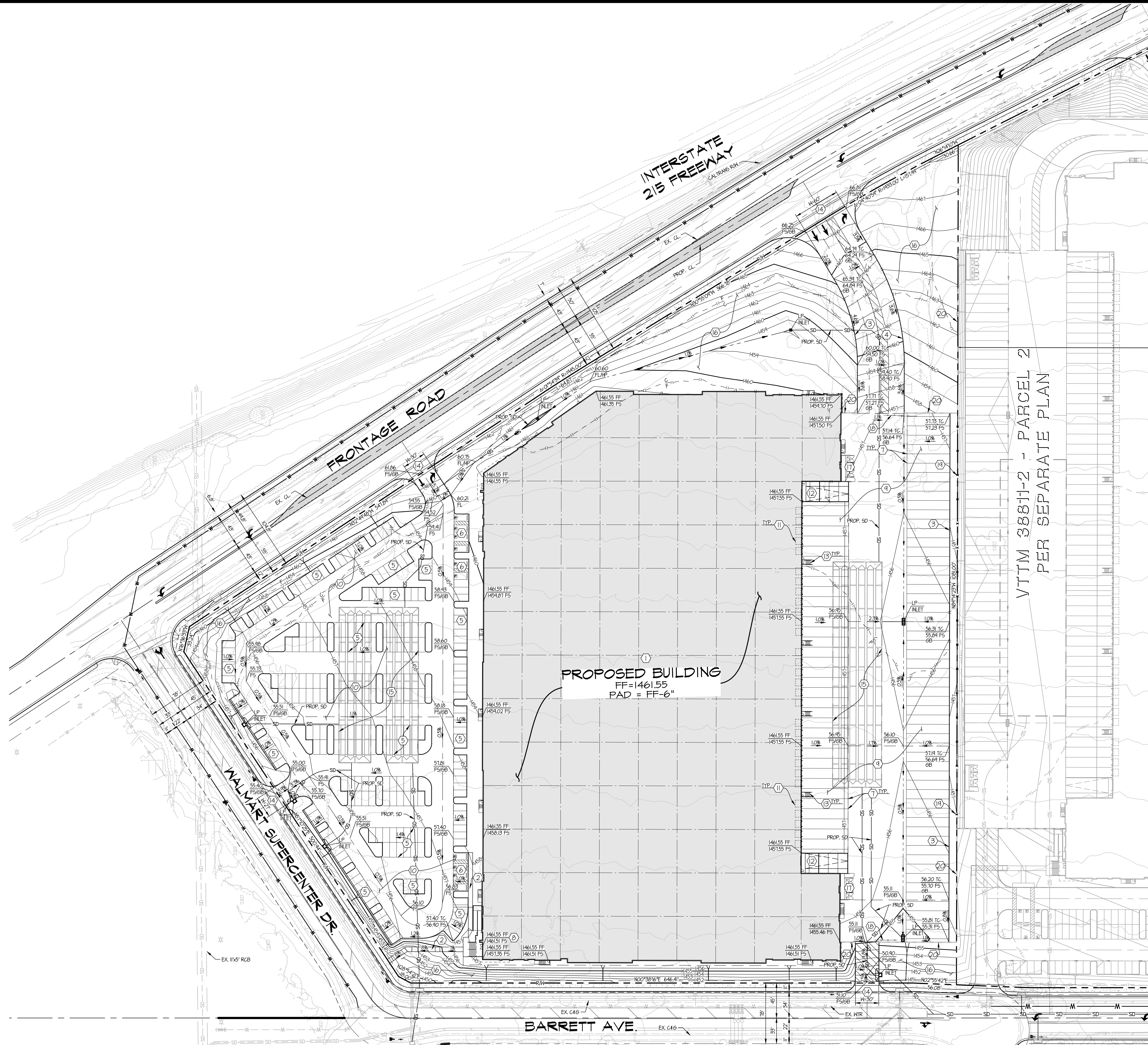
**FRONTAGE ROAD**  
SECONDARY ARTERIAL  
(105'/84')

**CITY OF PERRIS**

HARVEST LANDING RETAIL CENTER & BUSINESS PARK  
SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN  
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3

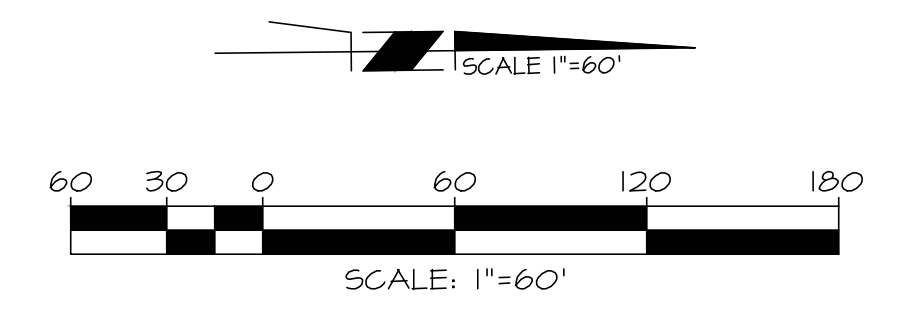
SCALE: AS SHOWN	<b>FMCIVIL</b> ENGINEERS INC.	41870 KALMIA STREET, SUITE 120 MURRIETA, CA 92562 951.913.0202 - FMCIVIL.COM	SHEET	
DATE: OCT. 2024			1	
DESIGNED: AJ			OF	2 SHEETS
CHECKED: FM				PLN CK REF:

P:\PROJECTS\20-001-HARVEST LANDING\WORKS\ENVIRONMENTAL\CAD\PLAN-3\BLDG-7\10-001-CURB\_BLDG2-CO-01.DWG - JASON STODUFFER - 10/22/2024 4:53 PM



**SITE PLAN KEYNOTES**

- ① PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
- ② ON SITE ACCESSIBLE SIDEWALK AND CURB RAMP.
- ③ CONCRETE CURB
- ④ CONCRETE CURB & GUTTER
- ⑤ STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑥ HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑦ TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑧ ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
- ⑨ PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
- ⑩ PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
- ⑪ DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
- ⑫ GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
- ⑬ EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
- ⑭ COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.201A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
- ⑮ UNDERGROUND STORM WATER CHAMBER SYSTEM
- ⑯ LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
- ⑰ APPROXIMATE LOCATION OF TRASH ENCLOSURE
- ⑱ ENTRY GATE PER ARCHITECT'S PLANS
- ⑲ CHAIN LINK FENCE PER ARCHITECT'S PLANS
- ⑳ SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)



**CITY OF PERRIS**

**HARVEST LANDING RETAIL CENTER & BUSINESS PARK  
SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN  
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3**

SCALE: AS SHOWN DATE: OCT. 2024 DESIGNED: AJ CHECKED: FM PLN CK REF:	 41810 KALMIA STREET, SUITE 120 MARRIETA, GA 30062 404.913.0202 - FMCIVIL.COM	SHEET <div style="font-size: 24px; font-weight: bold; text-align: center;">2</div> OF 2 SHEETS
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P:\PROJECTS\20-001-HARVEST-LANDING\DWGS\PLANS\ENTIREMENT\GUP\VAL-3\BLDG-7\20-001-CURB-BLDG2-CO-CO.DWG - JASON, STODIFFER - 10/17/2024 - 3:47 PM