

DEVELOPMENT PLAN REVIEW – VTTM 38811-3,
PARCELS 1-4
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 commercial retail development of approximately 24.5 acres and 168,000 square feet commercial building with 8 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 Daniela Way, Barrett Avenue to the west, Aldi shopping center to the south and Perris Boulevard 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 Perris Boulevard with no offsite flows. All the developed storm flows continue to travel easterly through the property, to an existing trapezoidal channel (b=6', d=2') that lies to the west of Perris Boulevard. This trapezoidal channel flows are intercepted by a grated inlet and conveyed into a lateral that connects to 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').

Storm Duration	SP Q _{peak}	SP	MDP	MDP Q _{PEAK}	MDP V _{TOTAL}
1	72.79	2.2085	57.73	1.7826	1.7826
3	43.01	3.5139	34.14	2.5147	2.5147
6	35.3	4.2937	26.59	2.883	2.883
24	14.35	8.3545	9.74	5.1496	5.1496
Average		24.44			24.45

*Since this volume is greater than 5.69 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the MDP land use levels. See the table below for the unit hydrograph results:

MDP Condition Watershed A Volume: 3.38 ac-ft; Q_{100-24hr}: 9.74 cfs
 Proposed Condition Watershed A Volume: 5.54 ac-ft; Q_{100-24hr}: 14.35 cfs
 Underground Chamber Watershed A Volume: *5.79 ac-ft

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 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 analyzed, 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.

Description	Q ₁₀₀ Peak Flow Rates
Proposed	54.8
Existing	27.7
Onsite MDP	31.9

The preliminary offsite design is shown on Exhibit G "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 via onsite storm drain system and conveyed to a CDS unit for pretreatment and directed to an offsite water quality retention system for water quality mitigation. However, the higher flow rates will be directed to an on-site underground pipe chamber which will mitigate the 100-year frequency storm event and release flows to be at or below the proposed land use condition flow rates. See the table below for the rational method results:

DEVELOPED CONDITIONS

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.

CONCLUSIONS & RECOMMENDATIONS

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"-48" 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.

HYDRAULICS

1. The map from the Riverside County Hydrology Manual indicates that the study area consists Group "A" and "C" soils. 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.

Hydrologic calculations were performed using the Riverside County Rational Method from RCFC D & 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:

HYDROLOGY

METHODOLOGY

SECTION 2 - HYDROLOGY ANALYSIS

- 100-YEAR EXISTING ON-SITE HYDROLOGY (RATIONAL METHOD)
- 100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)
- 100-YEAR PROPOSED ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)
- 100-YEAR PROPOSED ON-SITE HYDROLOGY (RATIONAL METHOD)
- 100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)
- 100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:qa100x.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
100-YEAR STORM 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 = 754.000(Ft.)

Top (of initial area) elevation = 1449.600(Ft.)

Bottom (of initial area) elevation = 1442.000(Ft.)

Difference in elevation = 7.600(Ft.)

Slope = 0.01008 s(percent)= 1.01

$TC = k(0.530)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 18.816 min.
 Rainfall intensity = 1.977(In/Hr) for a 100.0 year storm
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.678
 Decimal fraction soil group A = 0.980
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.020
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 67.38
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Initial subarea runoff = 6.465(CFS)
 Total initial stream area = 4.820(Ac.)
 Pervious area fraction = 1.000

++++++
 Process from Point/Station 11.000 to Point/Station 12.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 12.535(CFS)
 Depth of flow = 0.354(Ft.), Average velocity = 1.003(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	100.00	0.00
3	200.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 12.535(CFS)
 ' ' flow top width = 70.702(Ft.)
 ' ' velocity = 1.003(Ft/s)
 ' ' area = 12.497(Sq.Ft)
 ' ' Froude number = 0.420

Upstream point elevation = 1442.000(Ft.)
 Downstream point elevation = 1438.800(Ft.)
 Flow length = 774.000(Ft.)
 Travel time = 12.86 min.
 Time of concentration = 31.68 min.
 Depth of flow = 0.354(Ft.)
 Average velocity = 1.003(Ft/s)
 Total irregular channel flow = 12.535(CFS)
 Irregular channel normal depth above invert elev. = 0.354(Ft.)
 Average velocity of channel(s) = 1.003(Ft/s)
 Adding area flow to channel
 USER INPUT of soil data for subarea
 Runoff Coefficient = 0.655
 Decimal fraction soil group A = 0.580
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.420
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 70.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.532(In/Hr) for a 100.0 year storm

Subarea runoff = 12.067(CFS) for 12.020(Ac.)
Total runoff = 18.532(CFS) Total area = 16.840(Ac.)
Depth of flow = 0.409(Ft.), Average velocity = 1.106(Ft/s)

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 16.840(Ac.)
Runoff from this stream = 18.532(CFS)
Time of concentration = 31.68 min.
Rainfall intensity = 1.532(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 = 711.000(Ft.)
Top (of initial area) elevation = 1445.000(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00703 s(percent)= 0.70
TC = $k(0.530)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 19.752 min.
Rainfall intensity = 1.930(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.160
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 82.96
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 4.519(CFS)
Total initial stream area = 2.970(Ac.)
Pervious area fraction = 1.000

++++
Process from Point/Station 10.200 to Point/Station 12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.887(CFS)
Depth of flow = 0.313(Ft.), Average velocity = 0.702(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.00
2 100.00 0.00
3 200.00 1.00
Manning's 'N' friction factor = 0.030

```

-----
Sub-Channel flow = 6.887(CFS)
' ' flow top width = 62.637(Ft.)
' ' velocity= 0.702(Ft/s)
' ' area = 9.808(Sq.Ft)
' ' Froude number = 0.313

Upstream point elevation = 1440.000(Ft.)
Downstream point elevation = 1438.800(Ft.)
Flow length = 504.000(Ft.)
Travel time = 11.96 min.
Time of concentration = 31.71 min.
Depth of flow = 0.313(Ft.)
Average velocity = 0.702(Ft/s)
Total irregular channel flow = 6.887(CFS)
Irregular channel normal depth above invert elev. = 0.313(Ft.)
Average velocity of channel(s) = 0.702(Ft/s)
Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.655
Decimal fraction soil group A = 0.460
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 70.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.531(In/Hr) for a 100.0 year storm
Subarea runoff = 4.655(CFS) for 4.640(Ac.)
Total runoff = 9.174(CFS) Total area = 7.610(Ac.)
Depth of flow = 0.349(Ft.), Average velocity = 0.754(Ft/s)

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+++++
Process from Point/Station 10.200 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

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The following data inside Main Stream is listed:

```

In Main Stream number: 2
Stream flow area = 7.610(Ac.)
Runoff from this stream = 9.174(CFS)
Time of concentration = 31.71 min.
Rainfall intensity = 1.531(In/Hr)
Summary of stream data:

```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.532	31.68	1.532
2	9.174	31.71	1.531

```

Largest stream flow has longer or shorter time of concentration
Qp = 18.532 + sum of
      Qa      Tb/Ta
      9.174 * 0.999 = 9.163
Qp = 27.695

```

Total of 2 main streams to confluence:

Flow rates before confluence point:
18.532 9.174
Area of streams before confluence:
16.840 7.610

Results of confluence:

Total flow rate = 27.695(CFS)
Time of concentration = 31.677 min.
Effective stream area after confluence = 24.450(Ac.)
End of computations, total study area = 24.45 (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 = 71.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/15/23 File:qa100x.out

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

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

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LANDUSE CONDITION
100-YEAR STORM 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 = 754.000(Ft.)

Top (of initial area) elevation = 1449.600(Ft.)

Bottom (of initial area) elevation = 1442.000(Ft.)

Difference in elevation = 7.600(Ft.)

Slope = 0.01008 s(percent)= 1.01
 TC = k(0.390)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration = 13.846 min.
 Rainfall intensity = 2.298(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.655
 Decimal fraction soil group A = 0.980
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.020
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 32.74
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 7.257(CFS)
 Total initial stream area = 4.820(Ac.)
 Pervious area fraction = 0.500

++++++
 Process from Point/Station 11.000 to Point/Station 12.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 14.250(CFS)
 Depth of flow = 0.371(Ft.), Average velocity = 1.036(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	100.00	0.00
3	200.00	1.00

 Manning's 'N' friction factor = 0.030

Sub-Channel flow = 14.250(CFS)
 ' ' flow top width = 74.184(Ft.)
 ' ' velocity= 1.036(Ft/s)
 ' ' area = 13.758(Sq.Ft)
 ' ' Froude number = 0.424

Upstream point elevation = 1442.000(Ft.)
 Downstream point elevation = 1438.800(Ft.)
 Flow length = 774.000(Ft.)
 Travel time = 12.45 min.
 Time of concentration = 26.30 min.
 Depth of flow = 0.371(Ft.)
 Average velocity = 1.036(Ft/s)
 Total irregular channel flow = 14.250(CFS)
 Irregular channel normal depth above invert elev. = 0.371(Ft.)
 Average velocity of channel(s) = 1.036(Ft/s)

Adding area flow to channel
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.690
 Decimal fraction soil group A = 0.580
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.420
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 47.54
 Pervious area fraction = 0.500; Impervious fraction = 0.500

Rainfall intensity = 1.678(In/Hr) for a 100.0 year storm
Subarea runoff = 13.910(CFS) for 12.020(Ac.)
Total runoff = 21.166(CFS) Total area = 16.840(Ac.)
Depth of flow = 0.430(Ft.), Average velocity = 1.143(Ft/s)

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 16.840(Ac.)
Runoff from this stream = 21.166(CFS)
Time of concentration = 26.30 min.
Rainfall intensity = 1.678(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 = 711.000(Ft.)
Top (of initial area) elevation = 1445.000(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00703 s(percent)= 0.70
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.534 min.
Rainfall intensity = 2.244(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.784
Decimal fraction soil group A = 0.160
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 63.08
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 5.223(CFS)
Total initial stream area = 2.970(Ac.)
Pervious area fraction = 0.500

++++
Process from Point/Station 10.200 to Point/Station 12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.045(CFS)
Depth of flow = 0.332(Ft.), Average velocity = 0.730(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	100.00	0.00
3	200.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 8.045(CFS)
' ' flow top width = 66.394(Ft.)
' ' velocity= 0.730(Ft/s)
' ' area = 11.021(Sq.Ft)
' ' Froude number = 0.316

Upstream point elevation = 1440.000(Ft.)
Downstream point elevation = 1438.800(Ft.)
Flow length = 504.000(Ft.)
Travel time = 11.51 min.
Time of concentration = 26.04 min.
Depth of flow = 0.332(Ft.)
Average velocity = 0.730(Ft/s)
Total irregular channel flow = 8.045(CFS)
Irregular channel normal depth above invert elev. = 0.332(Ft.)
Average velocity of channel(s) = 0.730(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.710
Decimal fraction soil group A = 0.460
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 51.98
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 1.686(In/Hr) for a 100.0 year storm
Subarea runoff = 5.554(CFS) for 4.640(Ac.)
Total runoff = 10.777(CFS) Total area = 7.610(Ac.)
Depth of flow = 0.370(Ft.), Average velocity = 0.785(Ft/s)

+++++
Process from Point/Station 10.200 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 7.610(Ac.)
Runoff from this stream = 10.777(CFS)
Time of concentration = 26.04 min.
Rainfall intensity = 1.686(In/Hr)
Summary of stream data:

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

1	21.166	26.30	1.678
2	10.777	26.04	1.686

Largest stream flow has longer time of concentration

Qp = 21.166 + sum of
Qb Ia/Ib
10.777 * 0.995 = 10.725
Qp = 31.892

Total of 2 main streams to confluence:

Flow rates before confluence point:

21.166 10.777

Area of streams before confluence:

16.840 7.610

Results of confluence:

Total flow rate = 31.892(CFS)

Time of concentration = 26.301 min.

Effective stream area after confluence = 24.450(Ac.)

End of computations, total study area = 24.45 (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 = 47.4

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:ql00psams.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 - WITH OFFSITE FLOWS
100-YEAR STORM 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 = 745.000(Ft.)

Top (of initial area) elevation = 1449.000(Ft.)

Bottom (of initial area) elevation = 1440.700(Ft.)

Difference in elevation = 8.300(Ft.)

Slope = 0.01114 s(percent)= 1.11
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.390 min.
Rainfall intensity = 2.645(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 39.40
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 16.776(CFS)
Total initial stream area = 7.370(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.000(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.776(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 16.776(CFS)
Normal flow depth in pipe = 14.98(In.)
Flow top width inside pipe = 19.00(In.)
Critical Depth = 18.05(In.)
Pipe flow velocity = 9.14(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.47 min.

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 7.370(Ac.)
Runoff from this stream = 16.776(CFS)
Time of concentration = 10.47 min.
Rainfall intensity = 2.635(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 11.100 to Point/Station 11.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 859.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.01048 s(percent)= 1.05

TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.134 min.
Rainfall intensity = 2.556(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 50.50
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.981(CFS)
Total initial stream area = 3.590(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.510(Ft.)
Downstream point/station elevation = 1433.680(Ft.)
Pipe length = 165.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.981(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 7.981(CFS)
Normal flow depth in pipe = 13.08(In.)
Flow top width inside pipe = 20.36(In.)
Critical Depth = 12.58(In.)
Pipe flow velocity = 5.07(Ft/s)
Travel time through pipe = 0.54 min.
Time of concentration (TC) = 11.68 min.

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.590(Ac.)
Runoff from this stream = 7.981(CFS)
Time of concentration = 11.68 min.
Rainfall intensity = 2.498(In/Hr)

++++
Process from Point/Station 11.300 to Point/Station 11.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 757.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.200(Ft.)
Difference in elevation = 8.800(Ft.)
Slope = 0.01162 s(percent)= 1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.368 min.
Rainfall intensity = 2.647(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.500
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.500
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 50.50
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 2.880(CFS)
 Total initial stream area = 1.250(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1436.050(Ft.)
 Downstream point/station elevation = 1433.680(Ft.)
 Pipe length = 28.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.880(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.880(CFS)
 Normal flow depth in pipe = 5.02(In.)
 Flow top width inside pipe = 8.94(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.38(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 10.41 min.

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.250(Ac.)
 Runoff from this stream = 2.880(CFS)
 Time of concentration = 10.41 min.
 Rainfall intensity = 2.642(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.981	11.68	2.498
2	2.880	10.41	2.642

Largest stream flow has longer time of concentration
 $Q_p = 7.981 + \text{sum of } Q_b \text{ Ia/Ib}$
 $2.880 * 0.945 = 2.722$
 $Q_p = 10.703$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 7.981 2.880

Area of streams before confluence:

3.590 1.250

Results of confluence:

Total flow rate = 10.703(CFS)

Time of concentration = 11.677 min.

Effective stream area after confluence = 4.840(Ac.)

Process from Point/Station 11.500 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.680(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.703(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 10.703(CFS)
Normal flow depth in pipe = 16.43(In.)
Flow top width inside pipe = 17.33(In.)
Critical Depth = 14.62(In.)
Pipe flow velocity = 5.30(Ft/s)
Travel time through pipe = 0.22 min.
Time of concentration (TC) = 11.90 min.

Process from Point/Station 11.500 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 4.840(Ac.)
Runoff from this stream = 10.703(CFS)
Time of concentration = 11.90 min.
Rainfall intensity = 2.475(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.776	10.47	2.635
2	10.703	11.90	2.475

Largest stream flow has longer or shorter time of concentration

Qp = 16.776 + sum of
Qa Tb/Ta
10.703 * 0.880 = 9.419
Qp = 26.195

Total of 2 main streams to confluence:

Flow rates before confluence point:

16.776 10.703

Area of streams before confluence:

7.370 4.840

Results of confluence:

Total flow rate = 26.195(CFS)
Time of concentration = 10.470 min.
Effective stream area after confluence = 12.210(Ac.)

Process from Point/Station 12.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.330(Ft.)
Downstream point/station elevation = 1432.180(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.195(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 26.195(CFS)
Normal flow depth in pipe = 18.52(In.)
Flow top width inside pipe = 20.15(In.)
Critical Depth = 21.49(In.)
Pipe flow velocity = 10.07(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 10.60 min.

Process from Point/Station 12.000 to Point/Station 13.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 12.210(Ac.)
Runoff from this stream = 26.195(CFS)
Time of concentration = 10.60 min.
Rainfall intensity = 2.619(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 12.100 to Point/Station 12.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 538.000(Ft.)
Top (of initial area) elevation = 1447.600(Ft.)
Bottom (of initial area) elevation = 1439.150(Ft.)
Difference in elevation = 8.450(Ft.)
Slope = 0.01571 s(percent)= 1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.516 min.
Rainfall intensity = 2.915(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 68.63
Pervious area fraction = 0.100; Impervious fraction = 0.900

Initial subarea runoff = 4.693(CFS)
Total initial stream area = 1.820(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 12.200 to Point/Station 12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.590(Ft.)
Downstream point/station elevation = 1433.860(Ft.)
Pipe length = 146.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.693(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.693(CFS)
Normal flow depth in pipe = 10.38(In.)
Flow top width inside pipe = 17.79(In.)
Critical Depth = 9.98(In.)
Pipe flow velocity = 4.45(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 9.06 min.

Process from Point/Station 12.200 to Point/Station 12.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.820(Ac.)
Runoff from this stream = 4.693(CFS)
Time of concentration = 9.06 min.
Rainfall intensity = 2.828(In/Hr)

Process from Point/Station 12.300 to Point/Station 12.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 211.000(Ft.)
Top (of initial area) elevation = 1443.600(Ft.)
Bottom (of initial area) elevation = 1440.400(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01517 s(percent)= 1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.897 min.
Rainfall intensity = 3.491(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 = 2.414(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 12.400 to Point/Station 12.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.470(Ft.)
 Downstream point/station elevation = 1433.860(Ft.)
 Pipe length = 121.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.414(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.414(CFS)
 Normal flow depth in pipe = 9.38(In.)
 Flow top width inside pipe = 9.92(In.)
 Critical Depth = 7.98(In.)
 Pipe flow velocity = 3.67(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 6.45 min.

Process from Point/Station 12.400 to Point/Station 12.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.780(Ac.)
 Runoff from this stream = 2.414(CFS)
 Time of concentration = 6.45 min.
 Rainfall intensity = 3.341(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.693	9.06	2.828
2	2.414	6.45	3.341

Largest stream flow has longer time of concentration
 $Q_p = 4.693 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $Q_p = 2.414 * 0.846 = 2.043$
 $Q_p = 6.736$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.693 2.414
 Area of streams before confluence:
 1.820 0.780
 Results of confluence:
 Total flow rate = 6.736(CFS)
 Time of concentration = 9.063 min.
 Effective stream area after confluence = 2.600(Ac.)

Process from Point/Station 12.500 to Point/Station 13.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.860(Ft.)
 Downstream point/station elevation = 1432.180(Ft.)
 Pipe length = 335.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.736(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 6.736(CFS)
 Normal flow depth in pipe = 13.43(In.)
 Flow top width inside pipe = 15.67(In.)
 Critical Depth = 12.05(In.)
 Pipe flow velocity = 4.77(Ft/s)
 Travel time through pipe = 1.17 min.
 Time of concentration (TC) = 10.23 min.

++++++
 Process from Point/Station 12.500 to Point/Station 13.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.600(Ac.)
 Runoff from this stream = 6.736(CFS)
 Time of concentration = 10.23 min.
 Rainfall intensity = 2.664(In/Hr)
 Summary of stream data:

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

1	26.195	10.60	2.619
2	6.736	10.23	2.664

Largest stream flow has longer time of concentration

$Q_p = 26.195 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $6.736 * 0.983 = 6.623$
 $Q_p = 32.818$

Total of 2 main streams to confluence:

Flow rates before confluence point:

26.195 6.736

Area of streams before confluence:

12.210 2.600

Results of confluence:

Total flow rate = 32.818(CFS)

Time of concentration = 10.596 min.

Effective stream area after confluence = 14.810(Ac.)

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.180(Ft.)

Downstream point/station elevation = 1428.170(Ft.)
Pipe length = 286.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.818(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 32.818(CFS)
Normal flow depth in pipe = 19.92(In.)
Flow top width inside pipe = 23.75(In.)
Critical Depth = 23.58(In.)
Pipe flow velocity = 10.43(Ft/s)
Travel time through pipe = 0.46 min.
Time of concentration (TC) = 11.05 min.

++++
Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 14.810(Ac.)
Runoff from this stream = 32.818(CFS)
Time of concentration = 11.05 min.
Rainfall intensity = 2.566(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 13.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 173.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 1.200(Ft.)
Slope = 0.00694 s(percent)= 0.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.370 min.
Rainfall intensity = 3.361(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.619(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1443.810(Ft.)
Downstream point/station elevation = 1440.720(Ft.)

Pipe length = 260.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.619(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.619(CFS)
Normal flow depth in pipe = 8.86(In.)
Flow top width inside pipe = 14.75(In.)
Critical Depth = 10.45(In.)
Pipe flow velocity = 6.12(Ft/s)
Travel time through pipe = 0.71 min.
Time of concentration (TC) = 7.08 min.

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.600(Ac.)
Runoff from this stream = 4.619(CFS)
Time of concentration = 7.08 min.
Rainfall intensity = 3.192(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 174.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 2.200(Ft.)
Slope = 0.01264 s(percent)= 1.26
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.662 min.
Rainfall intensity = 3.561(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.135(CFS)
Total initial stream area = 1.350(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.400 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1442.930(Ft.)
Downstream point/station elevation = 1440.720(Ft.)
Pipe length = 21.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.135(CFS)
Nearest computed pipe diameter = 9.00(In.)

Calculated individual pipe flow = 4.135(CFS)
 Normal flow depth in pipe = 5.93(In.)
 Flow top width inside pipe = 8.53(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.40(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 5.69 min.

++++++
 Process from Point/Station 13.400 to Point/Station 13.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.350(Ac.)
 Runoff from this stream = 4.135(CFS)
 Time of concentration = 5.69 min.
 Rainfall intensity = 3.553(In/Hr)
 Summary of stream data:

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

1	4.619	7.08	3.192
2	4.135	5.69	3.553

Largest stream flow has longer time of concentration

$Q_p = 4.619 + \text{sum of } Q_b \cdot I_a/I_b$
 $4.135 * 0.898 = 3.715$
 $Q_p = 8.334$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.619 4.135
 Area of streams before confluence:
 1.600 1.350

Results of confluence:
 Total flow rate = 8.334(CFS)
 Time of concentration = 7.078 min.
 Effective stream area after confluence = 2.950(Ac.)

++++++
 Process from Point/Station 13.500 to Point/Station 13.800
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.720(Ft.)
 Downstream point/station elevation = 1434.830(Ft.)
 Pipe length = 496.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.334(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 8.334(CFS)
 Normal flow depth in pipe = 11.39(In.)
 Flow top width inside pipe = 17.35(In.)
 Critical Depth = 13.42(In.)
 Pipe flow velocity = 7.07(Ft/s)

Travel time through pipe = 1.17 min.
Time of concentration (TC) = 8.25 min.

++++
Process from Point/Station 13.500 to Point/Station 13.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.950(Ac.)
Runoff from this stream = 8.334(CFS)
Time of concentration = 8.25 min.
Rainfall intensity = 2.962(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.700
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 452.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1446.300(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00819 s(percent)= 0.82
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 9.048 min.
Rainfall intensity = 2.830(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.307(CFS)
Total initial stream area = 1.780(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.700 to Point/Station 13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1435.110(Ft.)
Downstream point/station elevation = 1434.830(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.307(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.307(CFS)
Normal flow depth in pipe = 8.78(In.)
Flow top width inside pipe = 10.64(In.)
Critical Depth = 10.47(In.)
Pipe flow velocity = 7.00(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 9.08 min.

++++
Process from Point/Station 13.700 to Point/Station 13.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.780(Ac.)
Runoff from this stream = 4.307(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	8.334	8.25	2.962
2	4.307	9.08	2.825

Largest stream flow has longer or shorter time of concentration

Qp = 8.334 + sum of
Qa Tb/Ta
4.307 * 0.908 = 3.910
Qp = 12.244

Total of 2 streams to confluence:
Flow rates before confluence point:
8.334 4.307
Area of streams before confluence:
2.950 1.780

Results of confluence:
Total flow rate = 12.244(CFS)
Time of concentration = 8.248 min.
Effective stream area after confluence = 4.730(Ac.)

++++
Process from Point/Station 13.800 to Point/Station 14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.830(Ft.)
Downstream point/station elevation = 1428.170(Ft.)
Pipe length = 562.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.244(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 12.244(CFS)
Normal flow depth in pipe = 13.07(In.)
Flow top width inside pipe = 20.36(In.)
Critical Depth = 15.65(In.)
Pipe flow velocity = 7.78(Ft/s)
Travel time through pipe = 1.20 min.
Time of concentration (TC) = 9.45 min.

++++
Process from Point/Station 13.800 to Point/Station 14.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 4.730(Ac.)
Runoff from this stream = 12.244(CFS)
Time of concentration = 9.45 min.
Rainfall intensity = 2.770(In/Hr)
Summary of stream data:

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

1	32.818	11.05	2.566
2	12.244	9.45	2.770

Largest stream flow has longer time of concentration

Qp = 32.818 + sum of
Qb Ia/Ib
12.244 * 0.926 = 11.340
Qp = 44.158

Total of 2 main streams to confluence:

Flow rates before confluence point:

32.818 12.244

Area of streams before confluence:

14.810 4.730

Results of confluence:

Total flow rate = 44.158(CFS)
Time of concentration = 11.053 min.
Effective stream area after confluence = 19.540(Ac.)

++++
Process from Point/Station 14.000 to Point/Station 15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.170(Ft.)
Downstream point/station elevation = 1428.080(Ft.)
Pipe length = 17.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 44.158(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 44.158(CFS)
Normal flow depth in pipe = 26.95(In.)
Flow top width inside pipe = 31.23(In.)
Critical Depth = 25.96(In.)
Pipe flow velocity = 7.78(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 11.09 min.

++++
Process from Point/Station 14.000 to Point/Station 15.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 19.540(Ac.)
Runoff from this stream = 44.158(CFS)
Time of concentration = 11.09 min.
Rainfall intensity = 2.562(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 14.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 444.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1444.400(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.01036 s(percent)= 1.04
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.570 min.
Rainfall intensity = 2.906(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.026(CFS)
Total initial stream area = 1.570(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.000(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 266.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.026(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.026(CFS)
Normal flow depth in pipe = 8.03(In.)
Flow top width inside pipe = 11.29(In.)
Critical Depth = 10.19(In.)
Pipe flow velocity = 7.21(Ft/s)
Travel time through pipe = 0.61 min.
Time of concentration (TC) = 9.18 min.

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.570(Ac.)

Runoff from this stream = 4.026(CFS)
Time of concentration = 9.18 min.
Rainfall intensity = 2.809(In/Hr)

Process from Point/Station 14.200 to Point/Station 14.300
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 370.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1443.800(Ft.)
Difference in elevation = 5.200(Ft.)
Slope = 0.01405 s(percent)= 1.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.496 min.
Rainfall intensity = 3.103(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.098(CFS)
Total initial stream area = 1.130(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 14.300 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.690(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.098(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.098(CFS)
Normal flow depth in pipe = 9.06(In.)
Flow top width inside pipe = 14.67(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 4.00(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 7.64 min.

Process from Point/Station 14.300 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.130(Ac.)
Runoff from this stream = 3.098(CFS)
Time of concentration = 7.64 min.
Rainfall intensity = 3.075(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.026	9.18	2.809
2	3.098	7.64	3.075

Largest stream flow has longer time of concentration
Qp = 4.026 + sum of
Qb Ia/Ib
3.098 * 0.914 = 2.830
Qp = 6.856

Total of 2 streams to confluence:

Flow rates before confluence point:
4.026 3.098

Area of streams before confluence:
1.570 1.130

Results of confluence:

Total flow rate = 6.856(CFS)
Time of concentration = 9.185 min.
Effective stream area after confluence = 2.700(Ac.)

Process from Point/Station 14.400 to Point/Station 14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.520(Ft.)
Downstream point/station elevation = 1429.750(Ft.)
Pipe length = 231.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.856(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 6.856(CFS)
Normal flow depth in pipe = 9.59(In.)
Flow top width inside pipe = 14.41(In.)
Critical Depth = 12.61(In.)
Pipe flow velocity = 8.27(Ft/s)
Travel time through pipe = 0.47 min.
Time of concentration (TC) = 9.65 min.

Process from Point/Station 14.400 to Point/Station 14.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.700(Ac.)
Runoff from this stream = 6.856(CFS)
Time of concentration = 9.65 min.
Rainfall intensity = 2.742(In/Hr)

Process from Point/Station 14.500 to Point/Station 14.600
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 536.000(Ft.)
 Top (of initial area) elevation = 1449.000(Ft.)
 Bottom (of initial area) elevation = 1440.900(Ft.)
 Difference in elevation = 8.100(Ft.)
 Slope = 0.01511 s(percent)= 1.51
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 8.569 min.
 Rainfall intensity = 2.907(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.884
 Decimal fraction soil group A = 0.010
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.990
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 68.63
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 5.398(CFS)
 Total initial stream area = 2.100(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.790(Ft.)
 Downstream point/station elevation = 1429.750(Ft.)
 Pipe length = 208.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.398(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 5.398(CFS)
 Normal flow depth in pipe = 11.38(In.)
 Flow top width inside pipe = 17.36(In.)
 Critical Depth = 10.74(In.)
 Pipe flow velocity = 4.58(Ft/s)
 Travel time through pipe = 0.76 min.
 Time of concentration (TC) = 9.33 min.

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 2.100(Ac.)
 Runoff from this stream = 5.398(CFS)
 Time of concentration = 9.33 min.
 Rainfall intensity = 2.789(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.856	9.65	2.742
2	5.398	9.33	2.789

Largest stream flow has longer time of concentration

$Q_p = 6.856 + \text{sum of}$
 $\quad Q_b \quad I_a/I_b$
 $\quad 5.398 * \quad 0.983 = \quad 5.308$
 $Q_p = \quad 12.164$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 $\quad 6.856 \quad 5.398$
 Area of streams before confluence:
 $\quad 2.700 \quad 2.100$

Results of confluence:
 Total flow rate = $12.164(\text{CFS})$
 Time of concentration = 9.650 min.
 Effective stream area after confluence = $4.800(\text{Ac.})$

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = $1429.750(\text{Ft.})$
 Downstream point/station elevation = $1428.080(\text{Ft.})$
 Pipe length = $81.00(\text{Ft.})$ Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = $12.164(\text{CFS})$
 Nearest computed pipe diameter = $18.00(\text{In.})$
 Calculated individual pipe flow = $12.164(\text{CFS})$
 Normal flow depth in pipe = $12.26(\text{In.})$
 Flow top width inside pipe = $16.78(\text{In.})$
 Critical Depth = $15.85(\text{In.})$
 Pipe flow velocity = $9.50(\text{Ft/s})$
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 9.79 min.

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = $4.800(\text{Ac.})$
 Runoff from this stream = $12.164(\text{CFS})$
 Time of concentration = 9.79 min.
 Rainfall intensity = $2.723(\text{In/Hr})$
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	44.158	11.09	2.562
2	12.164	9.79	2.723

Largest stream flow has longer time of concentration

$Q_p = 44.158 + \text{sum of}$
 $\quad Q_b \quad I_a/I_b$
 $\quad 12.164 * \quad 0.941 = \quad 11.445$

Qp = 55.603

Total of 2 main streams to confluence:

Flow rates before confluence point:

44.158 12.164

Area of streams before confluence:

19.540 4.800

Results of confluence:

Total flow rate = 55.603(CFS)

Time of concentration = 11.089 min.

Effective stream area after confluence = 24.340(Ac.)

++++
Process from Point/Station 15.000 to Point/Station 24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.060(Ft.)
Downstream point/station elevation = 1430.720(Ft.)
Pipe length = 269.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 55.603(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 55.603(CFS)
Normal flow depth in pipe = 26.53(In.)
Flow top width inside pipe = 31.70(In.)
Critical Depth = 29.02(In.)
Pipe flow velocity = 9.95(Ft/s)
Travel time through pipe = 0.45 min.
Time of concentration (TC) = 11.54 min.

++++
Process from Point/Station 15.000 to Point/Station 24.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 24.340(Ac.)
Runoff from this stream = 55.603(CFS)
Time of concentration = 11.54 min.
Rainfall intensity = 2.512(In/Hr)
Program is now starting with Main Stream No. 2

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

Initial area flow distance = 266.000(Ft.)
Top (of initial area) elevation = 1451.300(Ft.)
Bottom (of initial area) elevation = 1449.700(Ft.)
Difference in elevation = 1.600(Ft.)
Slope = 0.00602 s(percent)= 0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.784 min.

Rainfall intensity = 3.047(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.857
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 32.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.496(CFS)
 Total initial stream area = 0.190(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 21.000 to Point/Station 22.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1449.700(Ft.)
 End of street segment elevation = 1446.500(Ft.)
 Length of street segment = 792.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 28.000(Ft.)
 Distance from crown to crossfall grade break = 26.000(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 = 11.000(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 = 1.119(CFS)
 Depth of flow = 0.247(Ft.), Average velocity = 1.148(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.006(Ft.)
 Flow velocity = 1.15(Ft/s)
 Travel time = 11.50 min. TC = 19.28 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.879
 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
 Rainfall intensity = 1.953(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.099(CFS) for 0.640(Ac.)
 Total runoff = 1.595(CFS) Total area = 0.830(Ac.)
 Street flow at end of street = 1.595(CFS)
 Half street flow at end of street = 0.797(CFS)
 Depth of flow = 0.271(Ft.), Average velocity = 1.231(Ft/s)
 Flow width (from curb towards crown)= 7.219(Ft.)

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

Upstream point/station elevation = 1439.500(Ft.)
 Downstream point/station elevation = 1435.530(Ft.)
 Pipe length = 26.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.595(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 1.595(CFS)
 Normal flow depth in pipe = 3.80(In.)
 Flow top width inside pipe = 5.78(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 12.18(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 19.32 min.

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

Upstream point/station elevation = 1435.530(Ft.)
 Downstream point/station elevation = 1430.720(Ft.)
 Pipe length = 1027.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.595(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 1.595(CFS)
 Normal flow depth in pipe = 7.08(In.)
 Flow top width inside pipe = 11.80(In.)
 Critical Depth = 6.43(In.)
 Pipe flow velocity = 3.31(Ft/s)
 Travel time through pipe = 5.17 min.
 Time of concentration (TC) = 24.49 min.

Process from Point/Station 23.000 to Point/Station 24.000
 **** 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 = 1.595(CFS)
 Time of concentration = 24.49 min.
 Rainfall intensity = 1.737(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	55.603	11.54	2.512
2	1.595	24.49	1.737

Largest stream flow has longer or shorter time of concentration
 Qp = 55.603 + sum of

	Qa	Tb/Ta	
	1.595 *	0.471 =	0.751
Qp =	56.355		

Total of 2 main streams to confluence:
Flow rates before confluence point:
55.603 1.595
Area of streams before confluence:
24.340 0.830

Results of confluence:
Total flow rate = 56.355(CFS)
Time of concentration = 11.540 min.
Effective stream area after confluence = 25.170(Ac.)

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

Upstream point/station elevation = 1430.720(Ft.)
Downstream point/station elevation = 1429.350(Ft.)
Pipe length = 459.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 56.355(CFS)
Nearest computed pipe diameter = 42.00(In.)
Calculated individual pipe flow = 56.355(CFS)
Normal flow depth in pipe = 35.44(In.)
Flow top width inside pipe = 30.50(In.)
Critical Depth = 28.19(In.)
Pipe flow velocity = 6.50(Ft/s)
Travel time through pipe = 1.18 min.
Time of concentration (TC) = 12.72 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: 1
Stream flow area = 25.170(Ac.)
Runoff from this stream = 56.355(CFS)
Time of concentration = 12.72 min.
Rainfall intensity = 2.395(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 24.100 to Point/Station 24.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 690.000(Ft.)
Top (of initial area) elevation = 1447.300(Ft.)
Bottom (of initial area) elevation = 1442.000(Ft.)
Difference in elevation = 5.300(Ft.)
Slope = 0.00768 s(percent)= 0.77

TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.854 min.
Rainfall intensity = 2.589(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 = 1.532(CFS)
Total initial stream area = 0.670(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 24.200 to Point/Station 24.400
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1442.000(Ft.)
End of street segment elevation = 1438.600(Ft.)
Length of street segment = 634.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 31.000(Ft.)
Distance from crown to crossfall grade break = 29.000(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 = 11.000(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 = 2.294(CFS)
Depth of flow = 0.287(Ft.), Average velocity = 1.486(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 8.033(Ft.)
Flow velocity = 1.49(Ft/s)
Travel time = 7.11 min. TC = 17.97 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
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
Rainfall intensity = 2.022(In/Hr) for a 100.0 year storm
Subarea runoff = 1.334(CFS) for 0.750(Ac.)
Total runoff = 2.865(CFS) Total area = 1.420(Ac.)
Street flow at end of street = 2.865(CFS)
Half street flow at end of street = 1.433(CFS)
Depth of flow = 0.305(Ft.), Average velocity = 1.560(Ft/s)

Flow width (from curb towards crown)= 8.898(Ft.)

++++
Process from Point/Station 24.200 to Point/Station 24.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.420(Ac.)
Runoff from this stream = 2.865(CFS)
Time of concentration = 17.97 min.
Rainfall intensity = 2.022(In/Hr)

++++
Process from Point/Station 24.300 to Point/Station 24.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 850.000(Ft.)
Top (of initial area) elevation = 1439.600(Ft.)
Bottom (of initial area) elevation = 1438.600(Ft.)
Difference in elevation = 1.000(Ft.)
Slope = 0.00118 s(percent)= 0.12
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 17.170 min.
Rainfall intensity = 2.068(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
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 = 2.201(CFS)
Total initial stream area = 1.210(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 24.300 to Point/Station 24.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.210(Ac.)
Runoff from this stream = 2.201(CFS)
Time of concentration = 17.17 min.
Rainfall intensity = 2.068(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.865	17.97	2.022
2	2.201	17.17	2.068

Largest stream flow has longer time of concentration

$Q_p = 2.865 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $2.201 * 0.978 = 2.153$
 $Q_p = 5.018$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 2.865 2.201
 Area of streams before confluence:
 1.420 1.210

Results of confluence:
 Total flow rate = 5.018(CFS)
 Time of concentration = 17.965 min.
 Effective stream area after confluence = 2.630(Ac.)

++++++
 Process from Point/Station 24.400 to Point/Station 25.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.100(Ft.)
 Downstream point/station elevation = 1429.350(Ft.)
 Pipe length = 47.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.018(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 5.018(CFS)
 Normal flow depth in pipe = 7.03(In.)
 Flow top width inside pipe = 7.44(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.55(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 18.02 min.

++++++
 Process from Point/Station 24.400 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 = 2.630(Ac.)
 Runoff from this stream = 5.018(CFS)
 Time of concentration = 18.02 min.
 Rainfall intensity = 2.019(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	56.355	12.72	2.395
2	5.018	18.02	2.019

Largest stream flow has longer or shorter time of concentration

$Q_p = 56.355 + \text{sum of}$
 $Q_a \quad T_b/T_a$
 $5.018 * 0.706 = 3.541$
 $Q_p = 59.895$

Total of 2 main streams to confluence:

Flow rates before confluence point:

56.355 5.018

Area of streams before confluence:

25.170 2.630

Results of confluence:

Total flow rate = 59.895(CFS)

Time of concentration = 12.716 min.

Effective stream area after confluence = 27.800(Ac.)

End of computations, total study area = 27.80 (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 = 51.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:Q100PSAMS.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 - WITH OFFSITE FLOWS
100-YEAR STORM 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 = 745.000(Ft.)

Top (of initial area) elevation = 1449.000(Ft.)

Bottom (of initial area) elevation = 1440.700(Ft.)

Difference in elevation = 8.300(Ft.)

Slope = 0.01114 s(percent)= 1.11
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.390 min.
Rainfall intensity = 2.645(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 39.40
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 16.776(CFS)
Total initial stream area = 7.370(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.000(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.776(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 16.776(CFS)
Normal flow depth in pipe = 14.98(In.)
Flow top width inside pipe = 19.00(In.)
Critical Depth = 18.05(In.)
Pipe flow velocity = 9.14(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.47 min.

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 7.370(Ac.)
Runoff from this stream = 16.776(CFS)
Time of concentration = 10.47 min.
Rainfall intensity = 2.635(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 11.100 to Point/Station 11.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 859.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.01048 s(percent)= 1.05

TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.134 min.
Rainfall intensity = 2.556(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 50.50
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.981(CFS)
Total initial stream area = 3.590(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.540(Ft.)
Downstream point/station elevation = 1433.710(Ft.)
Pipe length = 165.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.981(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 7.981(CFS)
Normal flow depth in pipe = 13.08(In.)
Flow top width inside pipe = 20.36(In.)
Critical Depth = 12.58(In.)
Pipe flow velocity = 5.07(Ft/s)
Travel time through pipe = 0.54 min.
Time of concentration (TC) = 11.68 min.

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.590(Ac.)
Runoff from this stream = 7.981(CFS)
Time of concentration = 11.68 min.
Rainfall intensity = 2.498(In/Hr)

++++
Process from Point/Station 11.300 to Point/Station 11.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 757.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.200(Ft.)
Difference in elevation = 8.800(Ft.)
Slope = 0.01162 s(percent)= 1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.368 min.
Rainfall intensity = 2.647(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.500
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.500
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 50.50
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 2.880(CFS)
 Total initial stream area = 1.250(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1436.050(Ft.)
 Downstream point/station elevation = 1433.680(Ft.)
 Pipe length = 28.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.880(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.880(CFS)
 Normal flow depth in pipe = 5.02(In.)
 Flow top width inside pipe = 8.94(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.38(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 10.41 min.

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.250(Ac.)
 Runoff from this stream = 2.880(CFS)
 Time of concentration = 10.41 min.
 Rainfall intensity = 2.642(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.981	11.68	2.498
2	2.880	10.41	2.642

Largest stream flow has longer time of concentration
 $Q_p = 7.981 + \text{sum of } Q_b \text{ Ia/Ib}$
 $2.880 * 0.945 = 2.722$
 $Q_p = 10.703$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 7.981 2.880

Area of streams before confluence:

3.590 1.250

Results of confluence:

Total flow rate = 10.703(CFS)

Time of concentration = 11.677 min.

Effective stream area after confluence = 4.840(Ac.)

Process from Point/Station 11.500 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.710(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.703(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 10.703(CFS)
Normal flow depth in pipe = 16.43(In.)
Flow top width inside pipe = 17.33(In.)
Critical Depth = 14.62(In.)
Pipe flow velocity = 5.30(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 11.92 min.

Process from Point/Station 11.500 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 4.840(Ac.)
Runoff from this stream = 10.703(CFS)
Time of concentration = 11.92 min.
Rainfall intensity = 2.473(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.776	10.47	2.635
2	10.703	11.92	2.473

Largest stream flow has longer or shorter time of concentration

Qp = 16.776 + sum of
Qa Tb/Ta
10.703 * 0.879 = 9.404
Qp = 26.180

Total of 2 main streams to confluence:

Flow rates before confluence point:

16.776 10.703

Area of streams before confluence:

7.370 4.840

Results of confluence:

Total flow rate = 26.180(CFS)
Time of concentration = 10.470 min.
Effective stream area after confluence = 12.210(Ac.)

Process from Point/Station 12.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.330(Ft.)
Downstream point/station elevation = 1432.180(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.180(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 26.180(CFS)
Normal flow depth in pipe = 18.52(In.)
Flow top width inside pipe = 20.15(In.)
Critical Depth = 21.47(In.)
Pipe flow velocity = 10.07(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 10.60 min.

Process from Point/Station 12.000 to Point/Station 13.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 12.210(Ac.)
Runoff from this stream = 26.180(CFS)
Time of concentration = 10.60 min.
Rainfall intensity = 2.619(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 12.100 to Point/Station 12.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 538.000(Ft.)
Top (of initial area) elevation = 1447.600(Ft.)
Bottom (of initial area) elevation = 1439.150(Ft.)
Difference in elevation = 8.450(Ft.)
Slope = 0.01571 s(percent)= 1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.516 min.
Rainfall intensity = 2.915(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 68.63
Pervious area fraction = 0.100; Impervious fraction = 0.900

Initial subarea runoff = 4.693(CFS)
Total initial stream area = 1.820(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 12.200 to Point/Station 12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.590(Ft.)
Downstream point/station elevation = 1433.860(Ft.)
Pipe length = 146.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.693(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.693(CFS)
Normal flow depth in pipe = 10.38(In.)
Flow top width inside pipe = 17.79(In.)
Critical Depth = 9.98(In.)
Pipe flow velocity = 4.45(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 9.06 min.

Process from Point/Station 12.200 to Point/Station 12.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.820(Ac.)
Runoff from this stream = 4.693(CFS)
Time of concentration = 9.06 min.
Rainfall intensity = 2.828(In/Hr)

Process from Point/Station 12.300 to Point/Station 12.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 211.000(Ft.)
Top (of initial area) elevation = 1443.600(Ft.)
Bottom (of initial area) elevation = 1440.400(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01517 s(percent)= 1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.897 min.
Rainfall intensity = 3.491(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 = 2.414(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 12.400 to Point/Station 12.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.470(Ft.)
 Downstream point/station elevation = 1433.860(Ft.)
 Pipe length = 121.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.414(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.414(CFS)
 Normal flow depth in pipe = 9.38(In.)
 Flow top width inside pipe = 9.92(In.)
 Critical Depth = 7.98(In.)
 Pipe flow velocity = 3.67(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 6.45 min.

Process from Point/Station 12.400 to Point/Station 12.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.780(Ac.)
 Runoff from this stream = 2.414(CFS)
 Time of concentration = 6.45 min.
 Rainfall intensity = 3.341(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.693	9.06	2.828
2	2.414	6.45	3.341

Largest stream flow has longer time of concentration
 $Q_p = 4.693 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $Q_p = 2.414 * 0.846 = 2.043$
 $Q_p = 6.736$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.693 2.414
 Area of streams before confluence:
 1.820 0.780
 Results of confluence:
 Total flow rate = 6.736(CFS)
 Time of concentration = 9.063 min.
 Effective stream area after confluence = 2.600(Ac.)

Process from Point/Station 12.500 to Point/Station 13.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.860(Ft.)
 Downstream point/station elevation = 1432.180(Ft.)
 Pipe length = 329.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.736(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 6.736(CFS)
 Normal flow depth in pipe = 13.31(In.)
 Flow top width inside pipe = 15.80(In.)
 Critical Depth = 12.05(In.)
 Pipe flow velocity = 4.81(Ft/s)
 Travel time through pipe = 1.14 min.
 Time of concentration (TC) = 10.20 min.

++++++
 Process from Point/Station 12.500 to Point/Station 13.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.600(Ac.)
 Runoff from this stream = 6.736(CFS)
 Time of concentration = 10.20 min.
 Rainfall intensity = 2.668(In/Hr)
 Summary of stream data:

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

1	26.180	10.60	2.619
2	6.736	10.20	2.668

Largest stream flow has longer time of concentration

$Q_p = 26.180 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $6.736 * 0.982 = 6.613$
 $Q_p = 32.794$

Total of 2 main streams to confluence:

Flow rates before confluence point:

26.180 6.736

Area of streams before confluence:

12.210 2.600

Results of confluence:

Total flow rate = 32.794(CFS)

Time of concentration = 10.596 min.

Effective stream area after confluence = 14.810(Ac.)

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.180(Ft.)

Downstream point/station elevation = 1428.170(Ft.)
Pipe length = 572.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.794(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 32.794(CFS)
Normal flow depth in pipe = 23.44(In.)
Flow top width inside pipe = 24.80(In.)
Critical Depth = 23.39(In.)
Pipe flow velocity = 7.96(Ft/s)
Travel time through pipe = 1.20 min.
Time of concentration (TC) = 11.79 min.

++++
Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 14.810(Ac.)
Runoff from this stream = 32.794(CFS)
Time of concentration = 11.79 min.
Rainfall intensity = 2.486(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 13.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 173.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 1.200(Ft.)
Slope = 0.00694 s(percent)= 0.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.370 min.
Rainfall intensity = 3.361(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.619(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1443.810(Ft.)
Downstream point/station elevation = 1440.720(Ft.)

Pipe length = 260.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.619(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.619(CFS)
Normal flow depth in pipe = 8.86(In.)
Flow top width inside pipe = 14.75(In.)
Critical Depth = 10.45(In.)
Pipe flow velocity = 6.12(Ft/s)
Travel time through pipe = 0.71 min.
Time of concentration (TC) = 7.08 min.

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.600(Ac.)
Runoff from this stream = 4.619(CFS)
Time of concentration = 7.08 min.
Rainfall intensity = 3.192(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 174.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 2.200(Ft.)
Slope = 0.01264 s(percent)= 1.26
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.662 min.
Rainfall intensity = 3.561(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.135(CFS)
Total initial stream area = 1.350(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.400 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1442.930(Ft.)
Downstream point/station elevation = 1440.720(Ft.)
Pipe length = 21.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.135(CFS)
Nearest computed pipe diameter = 9.00(In.)

Calculated individual pipe flow = 4.135(CFS)
 Normal flow depth in pipe = 5.93(In.)
 Flow top width inside pipe = 8.53(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.40(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 5.69 min.

++++++
 Process from Point/Station 13.400 to Point/Station 13.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.350(Ac.)
 Runoff from this stream = 4.135(CFS)
 Time of concentration = 5.69 min.
 Rainfall intensity = 3.553(In/Hr)
 Summary of stream data:

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

1	4.619	7.08	3.192
2	4.135	5.69	3.553

Largest stream flow has longer time of concentration

$Q_p = 4.619 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $4.135 * 0.898 = 3.715$
 $Q_p = 8.334$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.619 4.135
 Area of streams before confluence:
 1.600 1.350

Results of confluence:
 Total flow rate = 8.334(CFS)
 Time of concentration = 7.078 min.
 Effective stream area after confluence = 2.950(Ac.)

++++++
 Process from Point/Station 13.500 to Point/Station 13.800
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.720(Ft.)
 Downstream point/station elevation = 1434.830(Ft.)
 Pipe length = 496.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.334(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 8.334(CFS)
 Normal flow depth in pipe = 11.39(In.)
 Flow top width inside pipe = 17.35(In.)
 Critical Depth = 13.42(In.)
 Pipe flow velocity = 7.07(Ft/s)

Travel time through pipe = 1.17 min.
Time of concentration (TC) = 8.25 min.

++++
Process from Point/Station 13.500 to Point/Station 13.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.950(Ac.)
Runoff from this stream = 8.334(CFS)
Time of concentration = 8.25 min.
Rainfall intensity = 2.962(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.700
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 452.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1446.300(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00819 s(percent)= 0.82
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 9.048 min.
Rainfall intensity = 2.830(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.307(CFS)
Total initial stream area = 1.780(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.700 to Point/Station 13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1435.110(Ft.)
Downstream point/station elevation = 1434.830(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.307(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.307(CFS)
Normal flow depth in pipe = 8.78(In.)
Flow top width inside pipe = 10.64(In.)
Critical Depth = 10.47(In.)
Pipe flow velocity = 7.00(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 9.08 min.

++++
Process from Point/Station 13.700 to Point/Station 13.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.780(Ac.)
Runoff from this stream = 4.307(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	8.334	8.25	2.962
2	4.307	9.08	2.825

Largest stream flow has longer or shorter time of concentration

Qp = 8.334 + sum of
Qa Tb/Ta
4.307 * 0.908 = 3.910
Qp = 12.244

Total of 2 streams to confluence:
Flow rates before confluence point:
8.334 4.307

Area of streams before confluence:
2.950 1.780

Results of confluence:

Total flow rate = 12.244(CFS)
Time of concentration = 8.248 min.
Effective stream area after confluence = 4.730(Ac.)

++++
Process from Point/Station 13.800 to Point/Station 14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.830(Ft.)
Downstream point/station elevation = 1428.170(Ft.)
Pipe length = 356.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.244(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 12.244(CFS)
Normal flow depth in pipe = 12.77(In.)
Flow top width inside pipe = 16.34(In.)
Critical Depth = 15.88(In.)
Pipe flow velocity = 9.13(Ft/s)
Travel time through pipe = 0.65 min.
Time of concentration (TC) = 8.90 min.

++++
Process from Point/Station 13.800 to Point/Station 14.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 4.730(Ac.)
Runoff from this stream = 12.244(CFS)
Time of concentration = 8.90 min.
Rainfall intensity = 2.853(In/Hr)
Summary of stream data:

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

1	32.794	11.79	2.486
2	12.244	8.90	2.853

Largest stream flow has longer time of concentration

Qp = 32.794 + sum of
Qb Ia/Ib
12.244 * 0.871 = 10.665
Qp = 43.459

Total of 2 main streams to confluence:

Flow rates before confluence point:

32.794 12.244

Area of streams before confluence:

14.810 4.730

Results of confluence:

Total flow rate = 43.459(CFS)
Time of concentration = 11.793 min.
Effective stream area after confluence = 19.540(Ac.)

++++
Process from Point/Station 14.000 to Point/Station 15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.170(Ft.)
Downstream point/station elevation = 1427.940(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 43.459(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 43.459(CFS)
Normal flow depth in pipe = 27.23(In.)
Flow top width inside pipe = 30.90(In.)
Critical Depth = 25.79(In.)
Pipe flow velocity = 7.57(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.89 min.

++++
Process from Point/Station 14.000 to Point/Station 15.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 19.540(Ac.)
Runoff from this stream = 43.459(CFS)
Time of concentration = 11.89 min.
Rainfall intensity = 2.475(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 14.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 444.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1444.400(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.01036 s(percent)= 1.04
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.570 min.
Rainfall intensity = 2.906(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.026(CFS)
Total initial stream area = 1.570(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.000(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 266.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.026(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.026(CFS)
Normal flow depth in pipe = 8.03(In.)
Flow top width inside pipe = 11.29(In.)
Critical Depth = 10.19(In.)
Pipe flow velocity = 7.21(Ft/s)
Travel time through pipe = 0.61 min.
Time of concentration (TC) = 9.18 min.

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.570(Ac.)
Runoff from this stream = 4.026(CFS)

Time of concentration = 9.18 min.
Rainfall intensity = 2.809(In/Hr)

Process from Point/Station 14.200 to Point/Station 14.300
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 370.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1443.800(Ft.)
Difference in elevation = 5.200(Ft.)
Slope = 0.01405 s(percent)= 1.41
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 7.496 min.
Rainfall intensity = 3.103(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.098(CFS)
Total initial stream area = 1.130(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 14.300 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.690(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.098(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.098(CFS)
Normal flow depth in pipe = 9.06(In.)
Flow top width inside pipe = 14.67(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 4.00(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 7.64 min.

Process from Point/Station 14.300 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.130(Ac.)
Runoff from this stream = 3.098(CFS)
Time of concentration = 7.64 min.
Rainfall intensity = 3.075(In/Hr)
Summary of stream data:

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

1	4.026	9.18	2.809
2	3.098	7.64	3.075

Largest stream flow has longer time of concentration

$Q_p = 4.026 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $3.098 * 0.914 = 2.830$
 $Q_p = 6.856$

Total of 2 streams to confluence:
Flow rates before confluence point:
4.026 3.098

Area of streams before confluence:
1.570 1.130

Results of confluence:
Total flow rate = 6.856(CFS)
Time of concentration = 9.185 min.
Effective stream area after confluence = 2.700(Ac.)

++++
Process from Point/Station 14.400 to Point/Station 14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.520(Ft.)
Downstream point/station elevation = 1429.750(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.856(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 6.856(CFS)
Normal flow depth in pipe = 8.67(In.)
Flow top width inside pipe = 14.82(In.)
Critical Depth = 12.61(In.)
Pipe flow velocity = 9.34(Ft/s)
Travel time through pipe = 0.30 min.
Time of concentration (TC) = 9.49 min.

++++
Process from Point/Station 14.400 to Point/Station 14.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.700(Ac.)
Runoff from this stream = 6.856(CFS)
Time of concentration = 9.49 min.
Rainfall intensity = 2.765(In/Hr)

++++
Process from Point/Station 14.500 to Point/Station 14.600
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 536.000(Ft.)
 Top (of initial area) elevation = 1449.000(Ft.)
 Bottom (of initial area) elevation = 1440.900(Ft.)
 Difference in elevation = 8.100(Ft.)
 Slope = 0.01511 s(percent)= 1.51
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 8.569 min.
 Rainfall intensity = 2.907(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.884
 Decimal fraction soil group A = 0.010
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.990
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 68.63
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 5.398(CFS)
 Total initial stream area = 2.100(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.850(Ft.)
 Downstream point/station elevation = 1429.750(Ft.)
 Pipe length = 219.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.398(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 5.398(CFS)
 Normal flow depth in pipe = 11.37(In.)
 Flow top width inside pipe = 17.37(In.)
 Critical Depth = 10.74(In.)
 Pipe flow velocity = 4.59(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 9.36 min.

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 2.100(Ac.)
 Runoff from this stream = 5.398(CFS)
 Time of concentration = 9.36 min.
 Rainfall intensity = 2.783(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.856	9.49	2.765
2	5.398	9.36	2.783

Largest stream flow has longer time of concentration

$Q_p = 6.856 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $5.398 * 0.994 = 5.363$
 $Q_p = 12.219$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 6.856 5.398
 Area of streams before confluence:
 2.700 2.100

Results of confluence:
 Total flow rate = 12.219(CFS)
 Time of concentration = 9.489 min.
 Effective stream area after confluence = 4.800(Ac.)

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1429.750(Ft.)
 Downstream point/station elevation = 1427.940(Ft.)
 Pipe length = 239.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.219(CFS)
 Nearest computed pipe diameter = 21.00(In.)
 Calculated individual pipe flow = 12.219(CFS)
 Normal flow depth in pipe = 15.38(In.)
 Flow top width inside pipe = 18.60(In.)
 Critical Depth = 15.64(In.)
 Pipe flow velocity = 6.47(Ft/s)
 Travel time through pipe = 0.62 min.
 Time of concentration (TC) = 10.10 min.

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 4.800(Ac.)
 Runoff from this stream = 12.219(CFS)
 Time of concentration = 10.10 min.
 Rainfall intensity = 2.681(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	43.459	11.89	2.475
2	12.219	10.10	2.681

Largest stream flow has longer time of concentration

$Q_p = 43.459 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $12.219 * 0.923 = 11.281$
 $Q_p = 54.739$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 43.459 12.219
 Area of streams before confluence:
 19.540 4.800

Results of confluence:
 Total flow rate = 54.739(CFS)
 Time of concentration = 11.894 min.
 Effective stream area after confluence = 24.340(Ac.)

 Process from Point/Station 15.000 to Point/Station 24.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.060(Ft.)
 Downstream point/station elevation = 1430.720(Ft.)
 Pipe length = 389.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 54.739(CFS)
 Nearest computed pipe diameter = 36.00(In.)
 Calculated individual pipe flow = 54.739(CFS)
 Normal flow depth in pipe = 31.88(In.)
 Flow top width inside pipe = 22.93(In.)
 Critical Depth = 28.83(In.)
 Pipe flow velocity = 8.27(Ft/s)
 Travel time through pipe = 0.78 min.
 Time of concentration (TC) = 12.68 min.

 Process from Point/Station 15.000 to Point/Station 24.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 24.340(Ac.)
 Runoff from this stream = 54.739(CFS)
 Time of concentration = 12.68 min.
 Rainfall intensity = 2.399(In/Hr)
 Program is now starting with Main Stream No. 2

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

Initial area flow distance = 266.000(Ft.)
 Top (of initial area) elevation = 1451.300(Ft.)
 Bottom (of initial area) elevation = 1449.700(Ft.)
 Difference in elevation = 1.600(Ft.)
 Slope = 0.00602 s(percent)= 0.60
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 7.784 min.
 Rainfall intensity = 3.047(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type
Runoff Coefficient = 0.857
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.496(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 21.000 to Point/Station 22.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1449.700(Ft.)
End of street segment elevation = 1446.500(Ft.)
Length of street segment = 792.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 28.000(Ft.)
Distance from crown to crossfall grade break = 26.000(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 = 11.000(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 = 1.119(CFS)
Depth of flow = 0.247(Ft.), Average velocity = 1.148(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 6.006(Ft.)
Flow velocity = 1.15(Ft/s)
Travel time = 11.50 min. TC = 19.28 min.

Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
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
Rainfall intensity = 1.953(In/Hr) for a 100.0 year storm
Subarea runoff = 1.099(CFS) for 0.640(Ac.)
Total runoff = 1.595(CFS) Total area = 0.830(Ac.)
Street flow at end of street = 1.595(CFS)
Half street flow at end of street = 0.797(CFS)
Depth of flow = 0.271(Ft.), Average velocity = 1.231(Ft/s)
Flow width (from curb towards crown)= 7.219(Ft.)

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

Upstream point/station elevation = 1439.500(Ft.)
 Downstream point/station elevation = 1435.530(Ft.)
 Pipe length = 26.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.595(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 1.595(CFS)
 Normal flow depth in pipe = 3.80(In.)
 Flow top width inside pipe = 5.78(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 12.18(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 19.32 min.

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

Upstream point/station elevation = 1435.530(Ft.)
 Downstream point/station elevation = 1430.720(Ft.)
 Pipe length = 1027.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.595(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 1.595(CFS)
 Normal flow depth in pipe = 7.08(In.)
 Flow top width inside pipe = 11.80(In.)
 Critical Depth = 6.43(In.)
 Pipe flow velocity = 3.31(Ft/s)
 Travel time through pipe = 5.17 min.
 Time of concentration (TC) = 24.49 min.

 Process from Point/Station 23.000 to Point/Station 24.000
 ***** 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 = 1.595(CFS)
 Time of concentration = 24.49 min.
 Rainfall intensity = 1.737(In/Hr)
 Summary of stream data:

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

1	54.739	12.68	2.399
2	1.595	24.49	1.737

Largest stream flow has longer or shorter time of concentration

Qp = 54.739 + sum of
 Qa Tb/Ta

Qp = 1.595 * 0.518 = 0.826
55.565

Total of 2 main streams to confluence:
Flow rates before confluence point:
54.739 1.595
Area of streams before confluence:
24.340 0.830

Results of confluence:
Total flow rate = 55.565(CFS)
Time of concentration = 12.678 min.
Effective stream area after confluence = 25.170(Ac.)

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

Upstream point/station elevation = 1430.720(Ft.)
Downstream point/station elevation = 1429.350(Ft.)
Pipe length = 459.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 55.565(CFS)
Nearest computed pipe diameter = 42.00(In.)
Calculated individual pipe flow = 55.565(CFS)
Normal flow depth in pipe = 34.88(In.)
Flow top width inside pipe = 31.53(In.)
Critical Depth = 27.99(In.)
Pipe flow velocity = 6.51(Ft/s)
Travel time through pipe = 1.18 min.
Time of concentration (TC) = 13.85 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: 1
Stream flow area = 25.170(Ac.)
Runoff from this stream = 55.565(CFS)
Time of concentration = 13.85 min.
Rainfall intensity = 2.297(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 24.100 to Point/Station 24.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 690.000(Ft.)
Top (of initial area) elevation = 1447.300(Ft.)
Bottom (of initial area) elevation = 1442.000(Ft.)
Difference in elevation = 5.300(Ft.)
Slope = 0.00768 s(percent)= 0.77
TC = k(0.300)*[(length^3)/(elevation change)]^0.2

Initial area time of concentration = 10.854 min.
 Rainfall intensity = 2.589(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 = 1.532(CFS)
 Total initial stream area = 0.670(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 24.200 to Point/Station 24.400
 ***** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION *****

Top of street segment elevation = 1442.000(Ft.)
 End of street segment elevation = 1438.600(Ft.)
 Length of street segment = 634.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 31.000(Ft.)
 Distance from crown to crossfall grade break = 29.000(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 = 11.000(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 = 2.294(CFS)
 Depth of flow = 0.287(Ft.), Average velocity = 1.486(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.033(Ft.)
 Flow velocity = 1.49(Ft/s)
 Travel time = 7.11 min. TC = 17.97 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.879
 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
 Rainfall intensity = 2.022(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.334(CFS) for 0.750(Ac.)
 Total runoff = 2.865(CFS) Total area = 1.420(Ac.)
 Street flow at end of street = 2.865(CFS)
 Half street flow at end of street = 1.433(CFS)
 Depth of flow = 0.305(Ft.), Average velocity = 1.560(Ft/s)
 Flow width (from curb towards crown)= 8.898(Ft.)

Process from Point/Station 24.200 to Point/Station 24.400
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 1.420(Ac.)
 Runoff from this stream = 2.865(CFS)
 Time of concentration = 17.97 min.
 Rainfall intensity = 2.022(In/Hr)

Process from Point/Station 24.300 to Point/Station 24.400
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 850.000(Ft.)
 Top (of initial area) elevation = 1439.600(Ft.)
 Bottom (of initial area) elevation = 1438.600(Ft.)
 Difference in elevation = 1.000(Ft.)
 Slope = 0.00118 s(percent)= 0.12
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 17.170 min.
 Rainfall intensity = 2.068(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.880
 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 = 2.201(CFS)
 Total initial stream area = 1.210(Ac.)
 Pervious area fraction = 0.100

Process from Point/Station 24.300 to Point/Station 24.400
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.210(Ac.)
 Runoff from this stream = 2.201(CFS)
 Time of concentration = 17.17 min.
 Rainfall intensity = 2.068(In/Hr)
 Summary of stream data:

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

1	2.865	17.97	2.022
2	2.201	17.17	2.068

Largest stream flow has longer time of concentration
 $Q_p = 2.865 + \text{sum of}$

$$Q_p = \frac{Q_b}{I_a/I_b} = \frac{2.201}{0.978} = 2.153$$

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

2.865 2.201

Area of streams before confluence:

1.420 1.210

Results of confluence:

Total flow rate = 5.018(CFS)
 Time of concentration = 17.965 min.
 Effective stream area after confluence = 2.630(Ac.)

++++++
 Process from Point/Station 24.400 to Point/Station 25.000
 ***** PIPEFLOW TRAVEL TIME (Program estimated size) *****

Upstream point/station elevation = 1434.100(Ft.)
 Downstream point/station elevation = 1429.350(Ft.)
 Pipe length = 47.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.018(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 5.018(CFS)
 Normal flow depth in pipe = 7.03(In.)
 Flow top width inside pipe = 7.44(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.55(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 18.02 min.

++++++
 Process from Point/Station 24.400 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 = 2.630(Ac.)
 Runoff from this stream = 5.018(CFS)
 Time of concentration = 18.02 min.
 Rainfall intensity = 2.019(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	55.565	13.85	2.297
2	5.018	18.02	2.019

Largest stream flow has longer or shorter time of concentration

$$Q_p = \frac{Q_a}{T_b/T_a} = \frac{55.565}{13.85/18.02} = 3.857$$

$$Q_p = 59.422$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

55.565 5.018

Area of streams before confluence:

25.170 2.630

Results of confluence:

Total flow rate = 59.422(CFS)

Time of concentration = 13.853 min.

Effective stream area after confluence = 27.800(Ac.)

End of computations, total study area = 27.80 (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 = 51.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:Q100PSAMS.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 - ONSITE
100-YEAR STORM 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 = 745.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.700(Ft.)
Difference in elevation = 8.300(Ft.)
Slope = 0.01114 s(percent)= 1.11

TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.390 min.
Rainfall intensity = 2.645(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 39.40
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 16.776(CFS)
Total initial stream area = 7.370(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.000(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.776(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 16.776(CFS)
Normal flow depth in pipe = 14.98(In.)
Flow top width inside pipe = 19.00(In.)
Critical Depth = 18.05(In.)
Pipe flow velocity = 9.14(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.47 min.

++++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 7.370(Ac.)
Runoff from this stream = 16.776(CFS)
Time of concentration = 10.47 min.
Rainfall intensity = 2.635(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 11.100 to Point/Station 11.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 859.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.01048 s(percent)= 1.05
TC = k(0.300)*[(length^3)/(elevation change)]^0.2

Initial area time of concentration = 11.134 min.
Rainfall intensity = 2.556(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 50.50
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.981(CFS)
Total initial stream area = 3.590(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.540(Ft.)
Downstream point/station elevation = 1433.710(Ft.)
Pipe length = 165.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.981(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 7.981(CFS)
Normal flow depth in pipe = 13.08(In.)
Flow top width inside pipe = 20.36(In.)
Critical Depth = 12.58(In.)
Pipe flow velocity = 5.07(Ft/s)
Travel time through pipe = 0.54 min.
Time of concentration (TC) = 11.68 min.

++++
Process from Point/Station 11.200 to Point/Station 11.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.590(Ac.)
Runoff from this stream = 7.981(CFS)
Time of concentration = 11.68 min.
Rainfall intensity = 2.498(In/Hr)

++++
Process from Point/Station 11.300 to Point/Station 11.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 757.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.200(Ft.)
Difference in elevation = 8.800(Ft.)
Slope = 0.01162 s(percent)= 1.16
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 10.368 min.
Rainfall intensity = 2.647(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type

Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.500
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.500
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 50.50
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 2.880(CFS)
 Total initial stream area = 1.250(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1436.050(Ft.)
 Downstream point/station elevation = 1433.680(Ft.)
 Pipe length = 28.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.880(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.880(CFS)
 Normal flow depth in pipe = 5.02(In.)
 Flow top width inside pipe = 8.94(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.38(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 10.41 min.

++++++
 Process from Point/Station 11.400 to Point/Station 11.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.250(Ac.)
 Runoff from this stream = 2.880(CFS)
 Time of concentration = 10.41 min.
 Rainfall intensity = 2.642(In/Hr)
 Summary of stream data:

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

1	7.981	11.68	2.498
2	2.880	10.41	2.642

Largest stream flow has longer time of concentration

$Q_p = 7.981 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $Q_p = 2.880 * 0.945 = 2.722$
 $Q_p = 10.703$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 7.981 2.880
 Area of streams before confluence:

3.590 1.250

Results of confluence:

Total flow rate = 10.703(CFS)
Time of concentration = 11.677 min.
Effective stream area after confluence = 4.840(Ac.)

Process from Point/Station 11.500 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.710(Ft.)
Downstream point/station elevation = 1433.330(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.703(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 10.703(CFS)
Normal flow depth in pipe = 16.43(In.)
Flow top width inside pipe = 17.33(In.)
Critical Depth = 14.62(In.)
Pipe flow velocity = 5.30(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 11.92 min.

Process from Point/Station 11.500 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 4.840(Ac.)
Runoff from this stream = 10.703(CFS)
Time of concentration = 11.92 min.
Rainfall intensity = 2.473(In/Hr)
Summary of stream data:

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

1 16.776 10.47 2.635
2 10.703 11.92 2.473

Largest stream flow has longer or shorter time of concentration

Qp = 16.776 + sum of
Qa Tb/Ta
10.703 * 0.879 = 9.404
Qp = 26.180

Total of 2 main streams to confluence:

Flow rates before confluence point:
16.776 10.703
Area of streams before confluence:
7.370 4.840

Results of confluence:

Total flow rate = 26.180(CFS)
Time of concentration = 10.470 min.
Effective stream area after confluence = 12.210(Ac.)

Process from Point/Station 12.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.330(Ft.)
Downstream point/station elevation = 1432.180(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.180(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 26.180(CFS)
Normal flow depth in pipe = 18.52(In.)
Flow top width inside pipe = 20.15(In.)
Critical Depth = 21.47(In.)
Pipe flow velocity = 10.07(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 10.60 min.

Process from Point/Station 12.000 to Point/Station 13.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 12.210(Ac.)
Runoff from this stream = 26.180(CFS)
Time of concentration = 10.60 min.
Rainfall intensity = 2.619(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 12.100 to Point/Station 12.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 538.000(Ft.)
Top (of initial area) elevation = 1447.600(Ft.)
Bottom (of initial area) elevation = 1439.150(Ft.)
Difference in elevation = 8.450(Ft.)
Slope = 0.01571 s(percent)= 1.57
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.516 min.
Rainfall intensity = 2.915(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 68.63
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.693(CFS)

Total initial stream area = 1.820(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 12.200 to Point/Station 12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.590(Ft.)
Downstream point/station elevation = 1433.860(Ft.)
Pipe length = 146.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.693(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.693(CFS)
Normal flow depth in pipe = 10.38(In.)
Flow top width inside pipe = 17.79(In.)
Critical Depth = 9.98(In.)
Pipe flow velocity = 4.45(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 9.06 min.

+++++
Process from Point/Station 12.200 to Point/Station 12.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.820(Ac.)
Runoff from this stream = 4.693(CFS)
Time of concentration = 9.06 min.
Rainfall intensity = 2.828(In/Hr)

+++++
Process from Point/Station 12.300 to Point/Station 12.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 211.000(Ft.)
Top (of initial area) elevation = 1443.600(Ft.)
Bottom (of initial area) elevation = 1440.400(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01517 s(percent)= 1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.897 min.
Rainfall intensity = 3.491(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 = 2.414(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.100

+-----+
 Process from Point/Station 12.400 to Point/Station 12.500
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.470(Ft.)
 Downstream point/station elevation = 1433.860(Ft.)
 Pipe length = 121.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.414(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.414(CFS)
 Normal flow depth in pipe = 9.38(In.)
 Flow top width inside pipe = 9.92(In.)
 Critical Depth = 7.98(In.)
 Pipe flow velocity = 3.67(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 6.45 min.

+-----+
 Process from Point/Station 12.400 to Point/Station 12.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.780(Ac.)
 Runoff from this stream = 2.414(CFS)
 Time of concentration = 6.45 min.
 Rainfall intensity = 3.341(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.693	9.06	2.828
2	2.414	6.45	3.341

Largest stream flow has longer time of concentration
 $Q_p = 4.693 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $Q_p = 2.414 * 0.846 = 2.043$
 $Q_p = 6.736$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.693 2.414
 Area of streams before confluence:
 1.820 0.780

Results of confluence:
 Total flow rate = 6.736(CFS)
 Time of concentration = 9.063 min.
 Effective stream area after confluence = 2.600(Ac.)

+-----+
 Process from Point/Station 12.500 to Point/Station 13.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.860(Ft.)
 Downstream point/station elevation = 1432.180(Ft.)
 Pipe length = 329.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.736(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 6.736(CFS)
 Normal flow depth in pipe = 13.31(In.)
 Flow top width inside pipe = 15.80(In.)
 Critical Depth = 12.05(In.)
 Pipe flow velocity = 4.81(Ft/s)
 Travel time through pipe = 1.14 min.
 Time of concentration (TC) = 10.20 min.

++++++
 Process from Point/Station 12.500 to Point/Station 13.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.600(Ac.)
 Runoff from this stream = 6.736(CFS)
 Time of concentration = 10.20 min.
 Rainfall intensity = 2.668(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.180	10.60	2.619
2	6.736	10.20	2.668

Largest stream flow has longer time of concentration
 $Q_p = 26.180 + \text{sum of } Q_b \cdot I_a/I_b$
 $6.736 * 0.982 = 6.613$
 $Q_p = 32.794$

Total of 2 main streams to confluence:

Flow rates before confluence point:

26.180 6.736

Area of streams before confluence:

12.210 2.600

Results of confluence:

Total flow rate = 32.794(CFS)

Time of concentration = 10.596 min.

Effective stream area after confluence = 14.810(Ac.)

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.180(Ft.)
 Downstream point/station elevation = 1428.170(Ft.)

Pipe length = 572.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.794(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 32.794(CFS)
Normal flow depth in pipe = 23.44(In.)
Flow top width inside pipe = 24.80(In.)
Critical Depth = 23.39(In.)
Pipe flow velocity = 7.96(Ft/s)
Travel time through pipe = 1.20 min.
Time of concentration (TC) = 11.79 min.

++++
Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 14.810(Ac.)
Runoff from this stream = 32.794(CFS)
Time of concentration = 11.79 min.
Rainfall intensity = 2.486(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 13.200
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 173.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 1.200(Ft.)
Slope = 0.00694 s(percent)= 0.69
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 6.370 min.
Rainfall intensity = 3.361(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.619(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1443.810(Ft.)
Downstream point/station elevation = 1440.720(Ft.)
Pipe length = 260.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 4.619(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.619(CFS)
Normal flow depth in pipe = 8.86(In.)
Flow top width inside pipe = 14.75(In.)
Critical Depth = 10.45(In.)
Pipe flow velocity = 6.12(Ft/s)
Travel time through pipe = 0.71 min.
Time of concentration (TC) = 7.08 min.

++++
Process from Point/Station 13.200 to Point/Station 13.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.600(Ac.)
Runoff from this stream = 4.619(CFS)
Time of concentration = 7.08 min.
Rainfall intensity = 3.192(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.400
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 174.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1447.800(Ft.)
Difference in elevation = 2.200(Ft.)
Slope = 0.01264 s(percent)= 1.26
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 5.662 min.
Rainfall intensity = 3.561(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.135(CFS)
Total initial stream area = 1.350(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.400 to Point/Station 13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1442.930(Ft.)
Downstream point/station elevation = 1440.720(Ft.)
Pipe length = 21.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.135(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 4.135(CFS)

Normal flow depth in pipe = 5.93(In.)
 Flow top width inside pipe = 8.53(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.40(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 5.69 min.

++++
 Process from Point/Station 13.400 to Point/Station 13.500
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.350(Ac.)
 Runoff from this stream = 4.135(CFS)
 Time of concentration = 5.69 min.
 Rainfall intensity = 3.553(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.619	7.08	3.192
2	4.135	5.69	3.553

Largest stream flow has longer time of concentration
 $Q_p = 4.619 + \text{sum of } Q_b \cdot I_a/I_b$
 $4.135 * 0.898 = 3.715$
 $Q_p = 8.334$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.619 4.135
 Area of streams before confluence:
 1.600 1.350
 Results of confluence:
 Total flow rate = 8.334(CFS)
 Time of concentration = 7.078 min.
 Effective stream area after confluence = 2.950(Ac.)

++++
 Process from Point/Station 13.500 to Point/Station 13.800
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.720(Ft.)
 Downstream point/station elevation = 1434.830(Ft.)
 Pipe length = 496.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.334(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 8.334(CFS)
 Normal flow depth in pipe = 11.39(In.)
 Flow top width inside pipe = 17.35(In.)
 Critical Depth = 13.42(In.)
 Pipe flow velocity = 7.07(Ft/s)
 Travel time through pipe = 1.17 min.

Time of concentration (TC) = 8.25 min.

++++
Process from Point/Station 13.500 to Point/Station 13.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.950(Ac.)
Runoff from this stream = 8.334(CFS)
Time of concentration = 8.25 min.
Rainfall intensity = 2.962(In/Hr)

++++
Process from Point/Station 13.300 to Point/Station 13.700
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 452.000(Ft.)
Top (of initial area) elevation = 1450.000(Ft.)
Bottom (of initial area) elevation = 1446.300(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00819 s(percent)= 0.82
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 9.048 min.
Rainfall intensity = 2.830(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.307(CFS)
Total initial stream area = 1.780(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 13.700 to Point/Station 13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1435.110(Ft.)
Downstream point/station elevation = 1434.830(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.307(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.307(CFS)
Normal flow depth in pipe = 8.78(In.)
Flow top width inside pipe = 10.64(In.)
Critical Depth = 10.47(In.)
Pipe flow velocity = 7.00(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 9.08 min.

 Process from Point/Station 13.700 to Point/Station 13.800
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.780(Ac.)
 Runoff from this stream = 4.307(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	8.334	8.25	2.962
2	4.307	9.08	2.825

Largest stream flow has longer or shorter time of concentration

Qp = 8.334 + sum of

$$Qa \quad Tb/Ta$$

$$4.307 * 0.908 = 3.910$$
 Qp = 12.244

Total of 2 streams to confluence:
 Flow rates before confluence point:
 8.334 4.307

Area of streams before confluence:
 2.950 1.780

Results of confluence:
 Total flow rate = 12.244(CFS)
 Time of concentration = 8.248 min.
 Effective stream area after confluence = 4.730(Ac.)

 Process from Point/Station 13.800 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.830(Ft.)
 Downstream point/station elevation = 1428.170(Ft.)
 Pipe length = 356.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.244(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 12.244(CFS)
 Normal flow depth in pipe = 12.77(In.)
 Flow top width inside pipe = 16.34(In.)
 Critical Depth = 15.88(In.)
 Pipe flow velocity = 9.13(Ft/s)
 Travel time through pipe = 0.65 min.
 Time of concentration (TC) = 8.90 min.

 Process from Point/Station 13.800 to Point/Station 14.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 4.730(Ac.)
 Runoff from this stream = 12.244(CFS)
 Time of concentration = 8.90 min.
 Rainfall intensity = 2.853(In/Hr)
 Summary of stream data:

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

1	32.794	11.79	2.486
2	12.244	8.90	2.853

Largest stream flow has longer time of concentration

Qp = 32.794 + sum of
 Qb Ia/Ib
 12.244 * 0.871 = 10.665
 Qp = 43.459

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 32.794 12.244
 Area of streams before confluence:
 14.810 4.730

Results of confluence:
 Total flow rate = 43.459(CFS)
 Time of concentration = 11.793 min.
 Effective stream area after confluence = 19.540(Ac.)

 Process from Point/Station 14.000 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.170(Ft.)
 Downstream point/station elevation = 1427.940(Ft.)
 Pipe length = 46.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 43.459(CFS)
 Nearest computed pipe diameter = 36.00(In.)
 Calculated individual pipe flow = 43.459(CFS)
 Normal flow depth in pipe = 27.23(In.)
 Flow top width inside pipe = 30.90(In.)
 Critical Depth = 25.79(In.)
 Pipe flow velocity = 7.57(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 11.89 min.

 Process from Point/Station 14.000 to Point/Station 15.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 19.540(Ac.)

Runoff from this stream = 43.459(CFS)
Time of concentration = 11.89 min.
Rainfall intensity = 2.475(In/Hr)
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 13.100 to Point/Station 14.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 444.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1444.400(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.01036 s(percent)= 1.04
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.570 min.
Rainfall intensity = 2.906(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.026(CFS)
Total initial stream area = 1.570(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1440.000(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 266.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.026(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.026(CFS)
Normal flow depth in pipe = 8.03(In.)
Flow top width inside pipe = 11.29(In.)
Critical Depth = 10.19(In.)
Pipe flow velocity = 7.21(Ft/s)
Travel time through pipe = 0.61 min.
Time of concentration (TC) = 9.18 min.

++++
Process from Point/Station 14.100 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.570(Ac.)
Runoff from this stream = 4.026(CFS)
Time of concentration = 9.18 min.

Rainfall intensity = 2.809(In/Hr)

++++
Process from Point/Station 14.200 to Point/Station 14.300
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 370.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1443.800(Ft.)
Difference in elevation = 5.200(Ft.)
Slope = 0.01405 s(percent)= 1.41
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 7.496 min.
Rainfall intensity = 3.103(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 65.30
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.098(CFS)
Total initial stream area = 1.130(Ac.)
Pervious area fraction = 0.100

++++
Process from Point/Station 14.300 to Point/Station 14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.690(Ft.)
Downstream point/station elevation = 1434.520(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.098(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.098(CFS)
Normal flow depth in pipe = 9.06(In.)
Flow top width inside pipe = 14.67(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 4.00(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 7.64 min.

++++
Process from Point/Station 14.300 to Point/Station 14.400
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.130(Ac.)
Runoff from this stream = 3.098(CFS)
Time of concentration = 7.64 min.
Rainfall intensity = 3.075(In/Hr)
Summary of stream data:

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

1	4.026	9.18	2.809
2	3.098	7.64	3.075

Largest stream flow has longer time of concentration

$Q_p = 4.026 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $3.098 * 0.914 = 2.830$
 $Q_p = 6.856$

Total of 2 streams to confluence:
Flow rates before confluence point:
4.026 3.098

Area of streams before confluence:
1.570 1.130

Results of confluence:
Total flow rate = 6.856(CFS)
Time of concentration = 9.185 min.
Effective stream area after confluence = 2.700(Ac.)

++++
Process from Point/Station 14.400 to Point/Station 14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.520(Ft.)
Downstream point/station elevation = 1429.750(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.856(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 6.856(CFS)
Normal flow depth in pipe = 8.67(In.)
Flow top width inside pipe = 14.82(In.)
Critical Depth = 12.61(In.)
Pipe flow velocity = 9.34(Ft/s)
Travel time through pipe = 0.30 min.
Time of concentration (TC) = 9.49 min.

++++
Process from Point/Station 14.400 to Point/Station 14.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 2.700(Ac.)
Runoff from this stream = 6.856(CFS)
Time of concentration = 9.49 min.
Rainfall intensity = 2.765(In/Hr)

++++
Process from Point/Station 14.500 to Point/Station 14.600
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 536.000(Ft.)

Top (of initial area) elevation = 1449.000(Ft.)
 Bottom (of initial area) elevation = 1440.900(Ft.)
 Difference in elevation = 8.100(Ft.)
 Slope = 0.01511 s(percent)= 1.51
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 8.569 min.
 Rainfall intensity = 2.907(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.884
 Decimal fraction soil group A = 0.010
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.990
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 68.63
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 5.398(CFS)
 Total initial stream area = 2.100(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.850(Ft.)
 Downstream point/station elevation = 1429.750(Ft.)
 Pipe length = 219.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.398(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 5.398(CFS)
 Normal flow depth in pipe = 11.37(In.)
 Flow top width inside pipe = 17.37(In.)
 Critical Depth = 10.74(In.)
 Pipe flow velocity = 4.59(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 9.36 min.

++++++
 Process from Point/Station 14.600 to Point/Station 14.700
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 2.100(Ac.)
 Runoff from this stream = 5.398(CFS)
 Time of concentration = 9.36 min.
 Rainfall intensity = 2.783(In/Hr)
 Summary of stream data:

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

1	6.856	9.49	2.765
2	5.398	9.36	2.783

Largest stream flow has longer time of concentration
 $Q_p = 6.856 + \text{sum of}$

$$Q_p = \frac{Q_b \cdot I_a/I_b}{I_a/I_b + 1}$$

$$Q_p = \frac{5.398 \cdot 0.994}{0.994 + 1} = 2.700$$

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

6.856 5.398

Area of streams before confluence:

2.700 2.100

Results of confluence:

Total flow rate = 12.219(CFS)
 Time of concentration = 9.489 min.
 Effective stream area after confluence = 4.800(Ac.)

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 ***** PIPEFLOW TRAVEL TIME (Program estimated size) *****

Upstream point/station elevation = 1429.750(Ft.)
 Downstream point/station elevation = 1427.940(Ft.)
 Pipe length = 239.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 12.219(CFS)
 Nearest computed pipe diameter = 21.00(In.)
 Calculated individual pipe flow = 12.219(CFS)
 Normal flow depth in pipe = 15.38(In.)
 Flow top width inside pipe = 18.60(In.)
 Critical Depth = 15.64(In.)
 Pipe flow velocity = 6.47(Ft/s)
 Travel time through pipe = 0.62 min.
 Time of concentration (TC) = 10.10 min.

++++++
 Process from Point/Station 14.700 to Point/Station 15.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 4.800(Ac.)
 Runoff from this stream = 12.219(CFS)
 Time of concentration = 10.10 min.
 Rainfall intensity = 2.681(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	43.459	11.89	2.475
2	12.219	10.10	2.681

Largest stream flow has longer time of concentration

$$Q_p = \frac{Q_b \cdot I_a/I_b}{I_a/I_b + 1}$$

$$Q_p = \frac{43.459 \cdot 0.923}{0.923 + 1} = 24.739$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

43.459 12.219

Area of streams before confluence:

19.540 4.800

Results of confluence:

Total flow rate = 54.739(CFS)

Time of concentration = 11.894 min.

Effective stream area after confluence = 24.340(Ac.)

End of computations, total study area = 24.34 (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 = 48.7

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/11/23 File: 100QAXUH24100.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 LAND USE CONDITION
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

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 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]
24.45	2.00	48.90

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	5.00	122.25

STORM EVENT (YEAR) = 100.00

Area Averaged 2-Year Rainfall = 2.000(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 %
24.450	47.40	0.500
Total Area Entered = 24.45(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
Sum (F) =						0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329

Minimum soil loss rate ((In/Hr)) = 0.164

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.500

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)	
1	0.083	115.899	23.999	5.914
2	0.167	231.798	48.816	12.029
3	0.250	347.696	13.683	3.372
4	0.333	463.595	6.239	1.537
5	0.417	579.494	3.476	0.857
6	0.500	695.393	2.068	0.510

7	0.583	811.291	1.719	0.423
			Sum = 100.000	Sum= 24.641

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)		Effective (In/Hr)
				Max	Low	
1	0.08	0.07	0.040	(0.583)	0.020	0.020
2	0.17	0.07	0.040	(0.580)	0.020	0.020
3	0.25	0.07	0.040	(0.578)	0.020	0.020
4	0.33	0.10	0.060	(0.576)	0.030	0.030
5	0.42	0.10	0.060	(0.574)	0.030	0.030
6	0.50	0.10	0.060	(0.571)	0.030	0.030
7	0.58	0.10	0.060	(0.569)	0.030	0.030
8	0.67	0.10	0.060	(0.567)	0.030	0.030
9	0.75	0.10	0.060	(0.565)	0.030	0.030
10	0.83	0.13	0.080	(0.562)	0.040	0.040
11	0.92	0.13	0.080	(0.560)	0.040	0.040
12	1.00	0.13	0.080	(0.558)	0.040	0.040
13	1.08	0.10	0.060	(0.556)	0.030	0.030
14	1.17	0.10	0.060	(0.554)	0.030	0.030
15	1.25	0.10	0.060	(0.551)	0.030	0.030
16	1.33	0.10	0.060	(0.549)	0.030	0.030
17	1.42	0.10	0.060	(0.547)	0.030	0.030
18	1.50	0.10	0.060	(0.545)	0.030	0.030
19	1.58	0.10	0.060	(0.543)	0.030	0.030
20	1.67	0.10	0.060	(0.540)	0.030	0.030
21	1.75	0.10	0.060	(0.538)	0.030	0.030
22	1.83	0.13	0.080	(0.536)	0.040	0.040
23	1.92	0.13	0.080	(0.534)	0.040	0.040
24	2.00	0.13	0.080	(0.532)	0.040	0.040
25	2.08	0.13	0.080	(0.530)	0.040	0.040
26	2.17	0.13	0.080	(0.528)	0.040	0.040
27	2.25	0.13	0.080	(0.525)	0.040	0.040
28	2.33	0.13	0.080	(0.523)	0.040	0.040
29	2.42	0.13	0.080	(0.521)	0.040	0.040
30	2.50	0.13	0.080	(0.519)	0.040	0.040
31	2.58	0.17	0.100	(0.517)	0.050	0.050
32	2.67	0.17	0.100	(0.515)	0.050	0.050
33	2.75	0.17	0.100	(0.513)	0.050	0.050
34	2.83	0.17	0.100	(0.511)	0.050	0.050
35	2.92	0.17	0.100	(0.508)	0.050	0.050
36	3.00	0.17	0.100	(0.506)	0.050	0.050
37	3.08	0.17	0.100	(0.504)	0.050	0.050
38	3.17	0.17	0.100	(0.502)	0.050	0.050
39	3.25	0.17	0.100	(0.500)	0.050	0.050
40	3.33	0.17	0.100	(0.498)	0.050	0.050

41	3.42	0.17	0.100	(0.496)	0.050	0.050
42	3.50	0.17	0.100	(0.494)	0.050	0.050
43	3.58	0.17	0.100	(0.492)	0.050	0.050
44	3.67	0.17	0.100	(0.490)	0.050	0.050
45	3.75	0.17	0.100	(0.488)	0.050	0.050
46	3.83	0.20	0.120	(0.486)	0.060	0.060
47	3.92	0.20	0.120	(0.483)	0.060	0.060
48	4.00	0.20	0.120	(0.481)	0.060	0.060
49	4.08	0.20	0.120	(0.479)	0.060	0.060
50	4.17	0.20	0.120	(0.477)	0.060	0.060
51	4.25	0.20	0.120	(0.475)	0.060	0.060
52	4.33	0.23	0.140	(0.473)	0.070	0.070
53	4.42	0.23	0.140	(0.471)	0.070	0.070
54	4.50	0.23	0.140	(0.469)	0.070	0.070
55	4.58	0.23	0.140	(0.467)	0.070	0.070
56	4.67	0.23	0.140	(0.465)	0.070	0.070
57	4.75	0.23	0.140	(0.463)	0.070	0.070
58	4.83	0.27	0.160	(0.461)	0.080	0.080
59	4.92	0.27	0.160	(0.459)	0.080	0.080
60	5.00	0.27	0.160	(0.457)	0.080	0.080
61	5.08	0.20	0.120	(0.455)	0.060	0.060
62	5.17	0.20	0.120	(0.453)	0.060	0.060
63	5.25	0.20	0.120	(0.451)	0.060	0.060
64	5.33	0.23	0.140	(0.449)	0.070	0.070
65	5.42	0.23	0.140	(0.447)	0.070	0.070
66	5.50	0.23	0.140	(0.445)	0.070	0.070
67	5.58	0.27	0.160	(0.443)	0.080	0.080
68	5.67	0.27	0.160	(0.442)	0.080	0.080
69	5.75	0.27	0.160	(0.440)	0.080	0.080
70	5.83	0.27	0.160	(0.438)	0.080	0.080
71	5.92	0.27	0.160	(0.436)	0.080	0.080
72	6.00	0.27	0.160	(0.434)	0.080	0.080
73	6.08	0.30	0.180	(0.432)	0.090	0.090
74	6.17	0.30	0.180	(0.430)	0.090	0.090
75	6.25	0.30	0.180	(0.428)	0.090	0.090
76	6.33	0.30	0.180	(0.426)	0.090	0.090
77	6.42	0.30	0.180	(0.424)	0.090	0.090
78	6.50	0.30	0.180	(0.422)	0.090	0.090
79	6.58	0.33	0.200	(0.420)	0.100	0.100
80	6.67	0.33	0.200	(0.418)	0.100	0.100
81	6.75	0.33	0.200	(0.417)	0.100	0.100
82	6.83	0.33	0.200	(0.415)	0.100	0.100
83	6.92	0.33	0.200	(0.413)	0.100	0.100
84	7.00	0.33	0.200	(0.411)	0.100	0.100
85	7.08	0.33	0.200	(0.409)	0.100	0.100
86	7.17	0.33	0.200	(0.407)	0.100	0.100
87	7.25	0.33	0.200	(0.405)	0.100	0.100
88	7.33	0.37	0.220	(0.404)	0.110	0.110
89	7.42	0.37	0.220	(0.402)	0.110	0.110
90	7.50	0.37	0.220	(0.400)	0.110	0.110

91	7.58	0.40	0.240	(0.398)	0.120	0.120
92	7.67	0.40	0.240	(0.396)	0.120	0.120
93	7.75	0.40	0.240	(0.394)	0.120	0.120
94	7.83	0.43	0.260	(0.393)	0.130	0.130
95	7.92	0.43	0.260	(0.391)	0.130	0.130
96	8.00	0.43	0.260	(0.389)	0.130	0.130
97	8.08	0.50	0.300	(0.387)	0.150	0.150
98	8.17	0.50	0.300	(0.385)	0.150	0.150
99	8.25	0.50	0.300	(0.383)	0.150	0.150
100	8.33	0.50	0.300	(0.382)	0.150	0.150
101	8.42	0.50	0.300	(0.380)	0.150	0.150
102	8.50	0.50	0.300	(0.378)	0.150	0.150
103	8.58	0.53	0.320	(0.376)	0.160	0.160
104	8.67	0.53	0.320	(0.375)	0.160	0.160
105	8.75	0.53	0.320	(0.373)	0.160	0.160
106	8.83	0.57	0.340	(0.371)	0.170	0.170
107	8.92	0.57	0.340	(0.369)	0.170	0.170
108	9.00	0.57	0.340	(0.368)	0.170	0.170
109	9.08	0.63	0.380	(0.366)	0.190	0.190
110	9.17	0.63	0.380	(0.364)	0.190	0.190
111	9.25	0.63	0.380	(0.362)	0.190	0.190
112	9.33	0.67	0.400	(0.361)	0.200	0.200
113	9.42	0.67	0.400	(0.359)	0.200	0.200
114	9.50	0.67	0.400	(0.357)	0.200	0.200
115	9.58	0.70	0.420	(0.355)	0.210	0.210
116	9.67	0.70	0.420	(0.354)	0.210	0.210
117	9.75	0.70	0.420	(0.352)	0.210	0.210
118	9.83	0.73	0.440	(0.350)	0.220	0.220
119	9.92	0.73	0.440	(0.349)	0.220	0.220
120	10.00	0.73	0.440	(0.347)	0.220	0.220
121	10.08	0.50	0.300	(0.345)	0.150	0.150
122	10.17	0.50	0.300	(0.344)	0.150	0.150
123	10.25	0.50	0.300	(0.342)	0.150	0.150
124	10.33	0.50	0.300	(0.340)	0.150	0.150
125	10.42	0.50	0.300	(0.339)	0.150	0.150
126	10.50	0.50	0.300	(0.337)	0.150	0.150
127	10.58	0.67	0.400	(0.335)	0.200	0.200
128	10.67	0.67	0.400	(0.334)	0.200	0.200
129	10.75	0.67	0.400	(0.332)	0.200	0.200
130	10.83	0.67	0.400	(0.330)	0.200	0.200
131	10.92	0.67	0.400	(0.329)	0.200	0.200
132	11.00	0.67	0.400	(0.327)	0.200	0.200
133	11.08	0.63	0.380	(0.326)	0.190	0.190
134	11.17	0.63	0.380	(0.324)	0.190	0.190
135	11.25	0.63	0.380	(0.322)	0.190	0.190
136	11.33	0.63	0.380	(0.321)	0.190	0.190
137	11.42	0.63	0.380	(0.319)	0.190	0.190
138	11.50	0.63	0.380	(0.318)	0.190	0.190
139	11.58	0.57	0.340	(0.316)	0.170	0.170
140	11.67	0.57	0.340	(0.315)	0.170	0.170

141	11.75	0.57	0.340	(0.313)	0.170	0.170
142	11.83	0.60	0.360	(0.311)	0.180	0.180
143	11.92	0.60	0.360	(0.310)	0.180	0.180
144	12.00	0.60	0.360	(0.308)	0.180	0.180
145	12.08	0.83	0.500	(0.307)	0.250	0.250
146	12.17	0.83	0.500	(0.305)	0.250	0.250
147	12.25	0.83	0.500	(0.304)	0.250	0.250
148	12.33	0.87	0.520	(0.302)	0.260	0.260
149	12.42	0.87	0.520	(0.301)	0.260	0.260
150	12.50	0.87	0.520	(0.299)	0.260	0.260
151	12.58	0.93	0.560	(0.298)	0.280	0.280
152	12.67	0.93	0.560	(0.296)	0.280	0.280
153	12.75	0.93	0.560	(0.295)	0.280	0.280
154	12.83	0.97	0.580	(0.293)	0.290	0.290
155	12.92	0.97	0.580	(0.292)	0.290	0.290
156	13.00	0.97	0.580	(0.290)	0.290	0.290
157	13.08	1.13	0.680	0.289 (0.340)		0.391
158	13.17	1.13	0.680	0.287 (0.340)		0.393
159	13.25	1.13	0.680	0.286 (0.340)		0.394
160	13.33	1.13	0.680	0.284 (0.340)		0.396
161	13.42	1.13	0.680	0.283 (0.340)		0.397
162	13.50	1.13	0.680	0.281 (0.340)		0.399
163	13.58	0.77	0.460	(0.280)	0.230	0.230
164	13.67	0.77	0.460	(0.279)	0.230	0.230
165	13.75	0.77	0.460	(0.277)	0.230	0.230
166	13.83	0.77	0.460	(0.276)	0.230	0.230
167	13.92	0.77	0.460	(0.274)	0.230	0.230
168	14.00	0.77	0.460	(0.273)	0.230	0.230
169	14.08	0.90	0.540	(0.272)	0.270	0.270
170	14.17	0.90	0.540	(0.270)	0.270	0.270
171	14.25	0.90	0.540	0.269 (0.270)		0.271
172	14.33	0.87	0.520	(0.267)	0.260	0.260
173	14.42	0.87	0.520	(0.266)	0.260	0.260
174	14.50	0.87	0.520	(0.265)	0.260	0.260
175	14.58	0.87	0.520	(0.263)	0.260	0.260
176	14.67	0.87	0.520	(0.262)	0.260	0.260
177	14.75	0.87	0.520	(0.261)	0.260	0.260
178	14.83	0.83	0.500	(0.259)	0.250	0.250
179	14.92	0.83	0.500	(0.258)	0.250	0.250
180	15.00	0.83	0.500	(0.257)	0.250	0.250
181	15.08	0.80	0.480	(0.255)	0.240	0.240
182	15.17	0.80	0.480	(0.254)	0.240	0.240
183	15.25	0.80	0.480	(0.253)	0.240	0.240
184	15.33	0.77	0.460	(0.251)	0.230	0.230
185	15.42	0.77	0.460	(0.250)	0.230	0.230
186	15.50	0.77	0.460	(0.249)	0.230	0.230
187	15.58	0.63	0.380	(0.248)	0.190	0.190
188	15.67	0.63	0.380	(0.246)	0.190	0.190
189	15.75	0.63	0.380	(0.245)	0.190	0.190
190	15.83	0.63	0.380	(0.244)	0.190	0.190

191	15.92	0.63	0.380	(0.243)	0.190	0.190
192	16.00	0.63	0.380	(0.241)	0.190	0.190
193	16.08	0.13	0.080	(0.240)	0.040	0.040
194	16.17	0.13	0.080	(0.239)	0.040	0.040
195	16.25	0.13	0.080	(0.238)	0.040	0.040
196	16.33	0.13	0.080	(0.236)	0.040	0.040
197	16.42	0.13	0.080	(0.235)	0.040	0.040
198	16.50	0.13	0.080	(0.234)	0.040	0.040
199	16.58	0.10	0.060	(0.233)	0.030	0.030
200	16.67	0.10	0.060	(0.232)	0.030	0.030
201	16.75	0.10	0.060	(0.230)	0.030	0.030
202	16.83	0.10	0.060	(0.229)	0.030	0.030
203	16.92	0.10	0.060	(0.228)	0.030	0.030
204	17.00	0.10	0.060	(0.227)	0.030	0.030
205	17.08	0.17	0.100	(0.226)	0.050	0.050
206	17.17	0.17	0.100	(0.225)	0.050	0.050
207	17.25	0.17	0.100	(0.224)	0.050	0.050
208	17.33	0.17	0.100	(0.222)	0.050	0.050
209	17.42	0.17	0.100	(0.221)	0.050	0.050
210	17.50	0.17	0.100	(0.220)	0.050	0.050
211	17.58	0.17	0.100	(0.219)	0.050	0.050
212	17.67	0.17	0.100	(0.218)	0.050	0.050
213	17.75	0.17	0.100	(0.217)	0.050	0.050
214	17.83	0.13	0.080	(0.216)	0.040	0.040
215	17.92	0.13	0.080	(0.215)	0.040	0.040
216	18.00	0.13	0.080	(0.214)	0.040	0.040
217	18.08	0.13	0.080	(0.213)	0.040	0.040
218	18.17	0.13	0.080	(0.212)	0.040	0.040
219	18.25	0.13	0.080	(0.211)	0.040	0.040
220	18.33	0.13	0.080	(0.210)	0.040	0.040
221	18.42	0.13	0.080	(0.209)	0.040	0.040
222	18.50	0.13	0.080	(0.208)	0.040	0.040
223	18.58	0.10	0.060	(0.207)	0.030	0.030
224	18.67	0.10	0.060	(0.206)	0.030	0.030
225	18.75	0.10	0.060	(0.205)	0.030	0.030
226	18.83	0.07	0.040	(0.204)	0.020	0.020
227	18.92	0.07	0.040	(0.203)	0.020	0.020
228	19.00	0.07	0.040	(0.202)	0.020	0.020
229	19.08	0.10	0.060	(0.201)	0.030	0.030
230	19.17	0.10	0.060	(0.200)	0.030	0.030
231	19.25	0.10	0.060	(0.199)	0.030	0.030
232	19.33	0.13	0.080	(0.198)	0.040	0.040
233	19.42	0.13	0.080	(0.197)	0.040	0.040
234	19.50	0.13	0.080	(0.196)	0.040	0.040
235	19.58	0.10	0.060	(0.195)	0.030	0.030
236	19.67	0.10	0.060	(0.194)	0.030	0.030
237	19.75	0.10	0.060	(0.193)	0.030	0.030
238	19.83	0.07	0.040	(0.193)	0.020	0.020
239	19.92	0.07	0.040	(0.192)	0.020	0.020
240	20.00	0.07	0.040	(0.191)	0.020	0.020

241	20.08	0.10	0.060	(0.190)	0.030	0.030
242	20.17	0.10	0.060	(0.189)	0.030	0.030
243	20.25	0.10	0.060	(0.188)	0.030	0.030
244	20.33	0.10	0.060	(0.188)	0.030	0.030
245	20.42	0.10	0.060	(0.187)	0.030	0.030
246	20.50	0.10	0.060	(0.186)	0.030	0.030
247	20.58	0.10	0.060	(0.185)	0.030	0.030
248	20.67	0.10	0.060	(0.184)	0.030	0.030
249	20.75	0.10	0.060	(0.184)	0.030	0.030
250	20.83	0.07	0.040	(0.183)	0.020	0.020
251	20.92	0.07	0.040	(0.182)	0.020	0.020
252	21.00	0.07	0.040	(0.181)	0.020	0.020
253	21.08	0.10	0.060	(0.181)	0.030	0.030
254	21.17	0.10	0.060	(0.180)	0.030	0.030
255	21.25	0.10	0.060	(0.179)	0.030	0.030
256	21.33	0.07	0.040	(0.179)	0.020	0.020
257	21.42	0.07	0.040	(0.178)	0.020	0.020
258	21.50	0.07	0.040	(0.177)	0.020	0.020
259	21.58	0.10	0.060	(0.177)	0.030	0.030
260	21.67	0.10	0.060	(0.176)	0.030	0.030
261	21.75	0.10	0.060	(0.175)	0.030	0.030
262	21.83	0.07	0.040	(0.175)	0.020	0.020
263	21.92	0.07	0.040	(0.174)	0.020	0.020
264	22.00	0.07	0.040	(0.174)	0.020	0.020
265	22.08	0.10	0.060	(0.173)	0.030	0.030
266	22.17	0.10	0.060	(0.172)	0.030	0.030
267	22.25	0.10	0.060	(0.172)	0.030	0.030
268	22.33	0.07	0.040	(0.171)	0.020	0.020
269	22.42	0.07	0.040	(0.171)	0.020	0.020
270	22.50	0.07	0.040	(0.170)	0.020	0.020
271	22.58	0.07	0.040	(0.170)	0.020	0.020
272	22.67	0.07	0.040	(0.169)	0.020	0.020
273	22.75	0.07	0.040	(0.169)	0.020	0.020
274	22.83	0.07	0.040	(0.168)	0.020	0.020
275	22.92	0.07	0.040	(0.168)	0.020	0.020
276	23.00	0.07	0.040	(0.168)	0.020	0.020
277	23.08	0.07	0.040	(0.167)	0.020	0.020
278	23.17	0.07	0.040	(0.167)	0.020	0.020
279	23.25	0.07	0.040	(0.166)	0.020	0.020
280	23.33	0.07	0.040	(0.166)	0.020	0.020
281	23.42	0.07	0.040	(0.166)	0.020	0.020
282	23.50	0.07	0.040	(0.165)	0.020	0.020
283	23.58	0.07	0.040	(0.165)	0.020	0.020
284	23.67	0.07	0.040	(0.165)	0.020	0.020
285	23.75	0.07	0.040	(0.165)	0.020	0.020
286	23.83	0.07	0.040	(0.165)	0.020	0.020
287	23.92	0.07	0.040	(0.164)	0.020	0.020
288	24.00	0.07	0.040	(0.164)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0

Sum = 30.3

Flood volume = Effective rainfall 2.53(In)
 times area 24.4(Ac.)/[(In)/(Ft.)] = 5.1(Ac.Ft)
 Total soil loss = 2.47(In)
 Total soil loss = 5.037(Ac.Ft)
 Total rainfall = 5.00(In)
 Flood volume = 224318.3 Cubic Feet
 Total soil loss = 219428.0 Cubic Feet

 Peak flow rate of this hydrograph = 9.736(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	0.0008	0.12	Q				
0+10	0.0033	0.36	VQ				
0+15	0.0062	0.43	VQ				
0+20	0.0098	0.52	V Q				
0+25	0.0143	0.65	V Q				
0+30	0.0191	0.70	V Q				
0+35	0.0241	0.72	V Q				
0+40	0.0291	0.73	V Q				
0+45	0.0342	0.74	V Q				
0+50	0.0397	0.80	V Q				
0+55	0.0460	0.92	V Q				
1+ 0	0.0525	0.95	V Q				
1+ 5	0.0588	0.91	V Q				
1+10	0.0643	0.80	V Q				
1+15	0.0696	0.77	V Q				
1+20	0.0748	0.76	V Q				
1+25	0.0800	0.75	V Q				
1+30	0.0851	0.74	V Q				
1+35	0.0902	0.74	V Q				
1+40	0.0953	0.74	V Q				
1+45	0.1004	0.74	V Q				
1+50	0.1059	0.80	V Q				
1+55	0.1122	0.92	V Q				
2+ 0	0.1188	0.95	V Q				
2+ 5	0.1254	0.97	V Q				
2+10	0.1322	0.98	V Q				
2+15	0.1389	0.98	V Q				
2+20	0.1457	0.99	V Q				
2+25	0.1525	0.99	V Q				
2+30	0.1593	0.99	V Q				
2+35	0.1665	1.05	V Q				

2+40	0.1745	1.17	V Q				
2+45	0.1828	1.20	V Q				
2+50	0.1911	1.21	V Q				
2+55	0.1996	1.22	V Q				
3+ 0	0.2080	1.23	V Q				
3+ 5	0.2165	1.23	V Q				
3+10	0.2250	1.23	V Q				
3+15	0.2335	1.23	V Q				
3+20	0.2420	1.23	V Q				
3+25	0.2505	1.23	V Q				
3+30	0.2590	1.23	V Q				
3+35	0.2675	1.23	V Q				
3+40	0.2759	1.23	V Q				
3+45	0.2844	1.23	V Q				
3+50	0.2933	1.29	V Q				
3+55	0.3031	1.41	V Q				
4+ 0	0.3130	1.45	V Q				
4+ 5	0.3231	1.46	V Q				
4+10	0.3332	1.47	V Q				
4+15	0.3434	1.47	V Q				
4+20	0.3540	1.54	V Q				
4+25	0.3654	1.66	V Q				
4+30	0.3770	1.69	V Q				
4+35	0.3888	1.71	V Q				
4+40	0.4006	1.72	V Q				
4+45	0.4125	1.72	V Q				
4+50	0.4248	1.78	V Q				
4+55	0.4379	1.91	V Q				
5+ 0	0.4512	1.94	V Q				
5+ 5	0.4639	1.84	V Q				
5+10	0.4749	1.60	V Q				
5+15	0.4855	1.54	V Q				
5+20	0.4964	1.57	V Q				
5+25	0.5079	1.68	V Q				
5+30	0.5196	1.70	V Q				
5+35	0.5318	1.77	V Q				
5+40	0.5449	1.90	V Q				
5+45	0.5582	1.93	V Q				
5+50	0.5717	1.95	V Q				
5+55	0.5852	1.96	V Q				
6+ 0	0.5987	1.97	V Q				
6+ 5	0.6127	2.03	V Q				
6+10	0.6275	2.15	V Q				
6+15	0.6426	2.19	V Q				
6+20	0.6577	2.20	V Q				
6+25	0.6730	2.21	V Q				
6+30	0.6882	2.21	V Q				
6+35	0.7039	2.28	V Q				
6+40	0.7204	2.40	V Q				
6+45	0.7372	2.43	V Q				

6+50	0.7540	2.45	V	Q				
6+55	0.7709	2.46	V	Q				
7+ 0	0.7879	2.46	V	Q				
7+ 5	0.8049	2.47	V	Q				
7+10	0.8218	2.47	V	Q				
7+15	0.8388	2.47	V	Q				
7+20	0.8562	2.52	V	Q				
7+25	0.8744	2.64	V	Q				
7+30	0.8929	2.68	V	Q				
7+35	0.9118	2.75	V	Q				
7+40	0.9317	2.88	V	Q				
7+45	0.9518	2.92	V	Q				
7+50	0.9725	3.00	V	Q				
7+55	0.9940	3.13	V	Q				
8+ 0	1.0158	3.17	V	Q				
8+ 5	1.0386	3.31	V	Q				
8+10	1.0631	3.55	V	Q				
8+15	1.0880	3.63	V	Q				
8+20	1.1133	3.66	V	Q				
8+25	1.1386	3.68	V	Q				
8+30	1.1640	3.69	V	Q				
8+35	1.1899	3.76	V	Q				
8+40	1.2166	3.88	V	Q				
8+45	1.2435	3.91	V	Q				
8+50	1.2710	3.99	V	Q				
8+55	1.2993	4.11	V	Q				
9+ 0	1.3279	4.15	V	Q				
9+ 5	1.3575	4.29	V	Q				
9+10	1.3887	4.54	V	Q				
9+15	1.4205	4.61	V	Q				
9+20	1.4529	4.71	V	Q				
9+25	1.4863	4.84	V	Q				
9+30	1.5200	4.89	V	Q				
9+35	1.5542	4.97	V	Q				
9+40	1.5893	5.10	V	Q				
9+45	1.6247	5.14	V	Q				
9+50	1.6607	5.22	V	Q				
9+55	1.6975	5.35	V	Q				
10+ 0	1.7346	5.39	V	Q				
10+ 5	1.7690	4.99	V	Q				
10+10	1.7976	4.16	V	Q				
10+15	1.8246	3.93	V	Q				
10+20	1.8510	3.82	V	Q				
10+25	1.8769	3.76	V	Q				
10+30	1.9026	3.73	V	Q				
10+35	1.9301	3.99	V	Q				
10+40	1.9617	4.60	V	Q				
10+45	1.9945	4.76	V	Q				
10+50	2.0279	4.84	V	Q				
10+55	2.0615	4.88	V	Q				

15+10	4.2560	5.99				Q	V
15+15	4.2970	5.95				Q	V
15+20	4.3375	5.88				Q	V
15+25	4.3770	5.75				Q	V
15+30	4.4163	5.71				Q	V
15+35	4.4539	5.45				Q	V
15+40	4.4881	4.96				Q	V
15+45	4.5213	4.82				Q	V
15+50	4.5540	4.76				Q	V
15+55	4.5865	4.72				Q	V
16+ 0	4.6189	4.70				Q	V
16+ 5	4.6450	3.80			Q		V
16+10	4.6588	1.99		Q			V
16+15	4.6690	1.49		Q			V
16+20	4.6776	1.25		Q			V
16+25	4.6854	1.13		Q			V
16+30	4.6926	1.05		Q			V
16+35	4.6990	0.93		Q			V
16+40	4.7046	0.81		Q			V
16+45	4.7099	0.77		Q			V
16+50	4.7151	0.76		Q			V
16+55	4.7203	0.75		Q			V
17+ 0	4.7254	0.74		Q			V
17+ 5	4.7313	0.86		Q			V
17+10	4.7389	1.10		Q			V
17+15	4.7469	1.17		Q			V
17+20	4.7551	1.20		Q			V
17+25	4.7635	1.21		Q			V
17+30	4.7719	1.22		Q			V
17+35	4.7804	1.23		Q			V
17+40	4.7889	1.23		Q			V
17+45	4.7974	1.23		Q			V
17+50	4.8055	1.17		Q			V
17+55	4.8127	1.05		Q			V
18+ 0	4.8197	1.02		Q			V
18+ 5	4.8267	1.00		Q			V
18+10	4.8335	1.00		Q			V
18+15	4.8403	0.99		Q			V
18+20	4.8471	0.99		Q			V
18+25	4.8539	0.99		Q			V
18+30	4.8607	0.99		Q			V
18+35	4.8671	0.93		Q			V
18+40	4.8726	0.81		Q			V
18+45	4.8780	0.77		Q			V
18+50	4.8828	0.70		Q			V
18+55	4.8867	0.57		Q			V
19+ 0	4.8904	0.53		Q			V
19+ 5	4.8943	0.57		Q			V
19+10	4.8990	0.68		Q			V
19+15	4.9039	0.71		Q			V

19+20	4.9092	0.78	Q				V
19+25	4.9155	0.91	Q				V
19+30	4.9220	0.95	Q				V
19+35	4.9283	0.91	Q				V
19+40	4.9338	0.80	Q				V
19+45	4.9391	0.77	Q				V
19+50	4.9439	0.70	Q				V
19+55	4.9478	0.57	Q				V
20+ 0	4.9515	0.53	Q				V
20+ 5	4.9554	0.57	Q				V
20+10	4.9601	0.68	Q				V
20+15	4.9650	0.71	Q				V
20+20	4.9700	0.72	Q				V
20+25	4.9750	0.73	Q				V
20+30	4.9801	0.74	Q				V
20+35	4.9851	0.74	Q				V
20+40	4.9902	0.74	Q				V
20+45	4.9953	0.74	Q				V
20+50	5.0000	0.68	Q				V
20+55	5.0039	0.56	Q				V
21+ 0	5.0075	0.53	Q				V
21+ 5	5.0114	0.57	Q				V
21+10	5.0161	0.68	Q				V
21+15	5.0210	0.71	Q				V
21+20	5.0256	0.66	Q				V
21+25	5.0294	0.55	Q				V
21+30	5.0330	0.52	Q				V
21+35	5.0369	0.57	Q				V
21+40	5.0416	0.68	Q				V
21+45	5.0465	0.71	Q				V
21+50	5.0510	0.66	Q				V
21+55	5.0548	0.55	Q				V
22+ 0	5.0584	0.52	Q				V
22+ 5	5.0624	0.57	Q				V
22+10	5.0671	0.68	Q				V
22+15	5.0720	0.71	Q				V
22+20	5.0765	0.66	Q				V
22+25	5.0803	0.55	Q				V
22+30	5.0839	0.52	Q				V
22+35	5.0874	0.51	Q				V
22+40	5.0909	0.50	Q				V
22+45	5.0943	0.50	Q				V
22+50	5.0977	0.49	Q				V
22+55	5.1011	0.49	Q				V
23+ 0	5.1045	0.49	Q				V
23+ 5	5.1079	0.49	Q				V
23+10	5.1113	0.49	Q				V
23+15	5.1147	0.49	Q				V
23+20	5.1181	0.49	Q				V
23+25	5.1215	0.49	Q				V

23+30	5.1249	0.49	Q				V
23+35	5.1283	0.49	Q				V
23+40	5.1317	0.49	Q				V
23+45	5.1351	0.49	Q				V
23+50	5.1385	0.49	Q				V
23+55	5.1418	0.49	Q				V
24+ 0	5.1452	0.49	Q				V
24+ 5	5.1478	0.37	Q				V
24+10	5.1487	0.13	Q				V
24+15	5.1492	0.07	Q				V
24+20	5.1495	0.04	Q				V
24+25	5.1496	0.02	Q				V
24+30	5.1496	0.01	Q				V

Unit Hydrograph Analysis

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Study date 10/03/24 File: QP100SAMSUH24100.out

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

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

Program License Serial Number 6405

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

English Units used in output format

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 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]
24.34	2.00	48.68

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
 24.34 5.00 121.70

STORM EVENT (YEAR) = 100.00
 Area Averaged 2-Year Rainfall = 2.000(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 %
 24.340 48.70 0.900
 Total Area Entered = 24.34(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
						Sum (F) = 0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
 Minimum soil loss rate ((In/Hr)) = 0.056
 (for 24 hour storm duration)
 Soil low loss rate (decimal) = 0.180

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	288.727	55.492
2	0.167	577.453	37.758
3	0.250	866.180	6.750
		Sum = 100.000	Sum= 24.530

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	(0.197)	0.007
2	0.17	0.040	(0.196)	0.007
3	0.25	0.040	(0.195)	0.007
4	0.33	0.060	(0.195)	0.011
5	0.42	0.060	(0.194)	0.011
6	0.50	0.060	(0.193)	0.011

7	0.58	0.10	0.060	(0.192)	0.011	0.049
8	0.67	0.10	0.060	(0.192)	0.011	0.049
9	0.75	0.10	0.060	(0.191)	0.011	0.049
10	0.83	0.13	0.080	(0.190)	0.014	0.066
11	0.92	0.13	0.080	(0.189)	0.014	0.066
12	1.00	0.13	0.080	(0.189)	0.014	0.066
13	1.08	0.10	0.060	(0.188)	0.011	0.049
14	1.17	0.10	0.060	(0.187)	0.011	0.049
15	1.25	0.10	0.060	(0.186)	0.011	0.049
16	1.33	0.10	0.060	(0.186)	0.011	0.049
17	1.42	0.10	0.060	(0.185)	0.011	0.049
18	1.50	0.10	0.060	(0.184)	0.011	0.049
19	1.58	0.10	0.060	(0.183)	0.011	0.049
20	1.67	0.10	0.060	(0.183)	0.011	0.049
21	1.75	0.10	0.060	(0.182)	0.011	0.049
22	1.83	0.13	0.080	(0.181)	0.014	0.066
23	1.92	0.13	0.080	(0.181)	0.014	0.066
24	2.00	0.13	0.080	(0.180)	0.014	0.066
25	2.08	0.13	0.080	(0.179)	0.014	0.066
26	2.17	0.13	0.080	(0.178)	0.014	0.066
27	2.25	0.13	0.080	(0.178)	0.014	0.066
28	2.33	0.13	0.080	(0.177)	0.014	0.066
29	2.42	0.13	0.080	(0.176)	0.014	0.066
30	2.50	0.13	0.080	(0.175)	0.014	0.066
31	2.58	0.17	0.100	(0.175)	0.018	0.082
32	2.67	0.17	0.100	(0.174)	0.018	0.082
33	2.75	0.17	0.100	(0.173)	0.018	0.082
34	2.83	0.17	0.100	(0.173)	0.018	0.082
35	2.92	0.17	0.100	(0.172)	0.018	0.082
36	3.00	0.17	0.100	(0.171)	0.018	0.082
37	3.08	0.17	0.100	(0.170)	0.018	0.082
38	3.17	0.17	0.100	(0.170)	0.018	0.082
39	3.25	0.17	0.100	(0.169)	0.018	0.082
40	3.33	0.17	0.100	(0.168)	0.018	0.082
41	3.42	0.17	0.100	(0.168)	0.018	0.082
42	3.50	0.17	0.100	(0.167)	0.018	0.082
43	3.58	0.17	0.100	(0.166)	0.018	0.082
44	3.67	0.17	0.100	(0.166)	0.018	0.082
45	3.75	0.17	0.100	(0.165)	0.018	0.082
46	3.83	0.20	0.120	(0.164)	0.022	0.098
47	3.92	0.20	0.120	(0.163)	0.022	0.098
48	4.00	0.20	0.120	(0.163)	0.022	0.098
49	4.08	0.20	0.120	(0.162)	0.022	0.098
50	4.17	0.20	0.120	(0.161)	0.022	0.098
51	4.25	0.20	0.120	(0.161)	0.022	0.098
52	4.33	0.23	0.140	(0.160)	0.025	0.115
53	4.42	0.23	0.140	(0.159)	0.025	0.115
54	4.50	0.23	0.140	(0.159)	0.025	0.115
55	4.58	0.23	0.140	(0.158)	0.025	0.115
56	4.67	0.23	0.140	(0.157)	0.025	0.115
57	4.75	0.23	0.140	(0.157)	0.025	0.115
58	4.83	0.27	0.160	(0.156)	0.029	0.131
59	4.92	0.27	0.160	(0.155)	0.029	0.131
60	5.00	0.27	0.160	(0.155)	0.029	0.131
61	5.08	0.20	0.120	(0.154)	0.022	0.098
62	5.17	0.20	0.120	(0.153)	0.022	0.098
63	5.25	0.20	0.120	(0.153)	0.022	0.098

64	5.33	0.23	0.140	(0.152)	0.025	0.115
65	5.42	0.23	0.140	(0.151)	0.025	0.115
66	5.50	0.23	0.140	(0.151)	0.025	0.115
67	5.58	0.27	0.160	(0.150)	0.029	0.131
68	5.67	0.27	0.160	(0.149)	0.029	0.131
69	5.75	0.27	0.160	(0.149)	0.029	0.131
70	5.83	0.27	0.160	(0.148)	0.029	0.131
71	5.92	0.27	0.160	(0.147)	0.029	0.131
72	6.00	0.27	0.160	(0.147)	0.029	0.131
73	6.08	0.30	0.180	(0.146)	0.032	0.148
74	6.17	0.30	0.180	(0.145)	0.032	0.148
75	6.25	0.30	0.180	(0.145)	0.032	0.148
76	6.33	0.30	0.180	(0.144)	0.032	0.148
77	6.42	0.30	0.180	(0.143)	0.032	0.148
78	6.50	0.30	0.180	(0.143)	0.032	0.148
79	6.58	0.33	0.200	(0.142)	0.036	0.164
80	6.67	0.33	0.200	(0.141)	0.036	0.164
81	6.75	0.33	0.200	(0.141)	0.036	0.164
82	6.83	0.33	0.200	(0.140)	0.036	0.164
83	6.92	0.33	0.200	(0.140)	0.036	0.164
84	7.00	0.33	0.200	(0.139)	0.036	0.164
85	7.08	0.33	0.200	(0.138)	0.036	0.164
86	7.17	0.33	0.200	(0.138)	0.036	0.164
87	7.25	0.33	0.200	(0.137)	0.036	0.164
88	7.33	0.37	0.220	(0.136)	0.040	0.180
89	7.42	0.37	0.220	(0.136)	0.040	0.180
90	7.50	0.37	0.220	(0.135)	0.040	0.180
91	7.58	0.40	0.240	(0.135)	0.043	0.197
92	7.67	0.40	0.240	(0.134)	0.043	0.197
93	7.75	0.40	0.240	(0.133)	0.043	0.197
94	7.83	0.43	0.260	(0.133)	0.047	0.213
95	7.92	0.43	0.260	(0.132)	0.047	0.213
96	8.00	0.43	0.260	(0.131)	0.047	0.213
97	8.08	0.50	0.300	(0.131)	0.054	0.246
98	8.17	0.50	0.300	(0.130)	0.054	0.246
99	8.25	0.50	0.300	(0.130)	0.054	0.246
100	8.33	0.50	0.300	(0.129)	0.054	0.246
101	8.42	0.50	0.300	(0.128)	0.054	0.246
102	8.50	0.50	0.300	(0.128)	0.054	0.246
103	8.58	0.53	0.320	(0.127)	0.058	0.262
104	8.67	0.53	0.320	(0.127)	0.058	0.262
105	8.75	0.53	0.320	(0.126)	0.058	0.262
106	8.83	0.57	0.340	(0.125)	0.061	0.279
107	8.92	0.57	0.340	(0.125)	0.061	0.279
108	9.00	0.57	0.340	(0.124)	0.061	0.279
109	9.08	0.63	0.380	(0.124)	0.068	0.312
110	9.17	0.63	0.380	(0.123)	0.068	0.312
111	9.25	0.63	0.380	(0.123)	0.068	0.312
112	9.33	0.67	0.400	(0.122)	0.072	0.328
113	9.42	0.67	0.400	(0.121)	0.072	0.328
114	9.50	0.67	0.400	(0.121)	0.072	0.328
115	9.58	0.70	0.420	(0.120)	0.076	0.344
116	9.67	0.70	0.420	(0.120)	0.076	0.344
117	9.75	0.70	0.420	(0.119)	0.076	0.344
118	9.83	0.73	0.440	(0.118)	0.079	0.361
119	9.92	0.73	0.440	(0.118)	0.079	0.361
120	10.00	0.73	0.440	(0.117)	0.079	0.361

121	10.08	0.50	0.300	(0.117)	0.054	0.246
122	10.17	0.50	0.300	(0.116)	0.054	0.246
123	10.25	0.50	0.300	(0.116)	0.054	0.246
124	10.33	0.50	0.300	(0.115)	0.054	0.246
125	10.42	0.50	0.300	(0.115)	0.054	0.246
126	10.50	0.50	0.300	(0.114)	0.054	0.246
127	10.58	0.67	0.400	(0.113)	0.072	0.328
128	10.67	0.67	0.400	(0.113)	0.072	0.328
129	10.75	0.67	0.400	(0.112)	0.072	0.328
130	10.83	0.67	0.400	(0.112)	0.072	0.328
131	10.92	0.67	0.400	(0.111)	0.072	0.328
132	11.00	0.67	0.400	(0.111)	0.072	0.328
133	11.08	0.63	0.380	(0.110)	0.068	0.312
134	11.17	0.63	0.380	(0.110)	0.068	0.312
135	11.25	0.63	0.380	(0.109)	0.068	0.312
136	11.33	0.63	0.380	(0.108)	0.068	0.312
137	11.42	0.63	0.380	(0.108)	0.068	0.312
138	11.50	0.63	0.380	(0.107)	0.068	0.312
139	11.58	0.57	0.340	(0.107)	0.061	0.279
140	11.67	0.57	0.340	(0.106)	0.061	0.279
141	11.75	0.57	0.340	(0.106)	0.061	0.279
142	11.83	0.60	0.360	(0.105)	0.065	0.295
143	11.92	0.60	0.360	(0.105)	0.065	0.295
144	12.00	0.60	0.360	(0.104)	0.065	0.295
145	12.08	0.83	0.500	(0.104)	0.090	0.410
146	12.17	0.83	0.500	(0.103)	0.090	0.410
147	12.25	0.83	0.500	(0.103)	0.090	0.410
148	12.33	0.87	0.520	(0.102)	0.094	0.426
149	12.42	0.87	0.520	(0.102)	0.094	0.426
150	12.50	0.87	0.520	(0.101)	0.094	0.426
151	12.58	0.93	0.560	0.101	(0.101)	0.459
152	12.67	0.93	0.560	0.100	(0.101)	0.460
153	12.75	0.93	0.560	0.100	(0.101)	0.460
154	12.83	0.97	0.580	0.099	(0.104)	0.481
155	12.92	0.97	0.580	0.099	(0.104)	0.481
156	13.00	0.97	0.580	0.098	(0.104)	0.482
157	13.08	1.13	0.680	0.098	(0.122)	0.582
158	13.17	1.13	0.680	0.097	(0.122)	0.583
159	13.25	1.13	0.680	0.097	(0.122)	0.583
160	13.33	1.13	0.680	0.096	(0.122)	0.584
161	13.42	1.13	0.680	0.096	(0.122)	0.584
162	13.50	1.13	0.680	0.095	(0.122)	0.585
163	13.58	0.77	0.460	(0.095)	0.083	0.377
164	13.67	0.77	0.460	(0.094)	0.083	0.377
165	13.75	0.77	0.460	(0.094)	0.083	0.377
166	13.83	0.77	0.460	(0.093)	0.083	0.377
167	13.92	0.77	0.460	(0.093)	0.083	0.377
168	14.00	0.77	0.460	(0.092)	0.083	0.377
169	14.08	0.90	0.540	0.092	(0.097)	0.448
170	14.17	0.90	0.540	0.091	(0.097)	0.449
171	14.25	0.90	0.540	0.091	(0.097)	0.449
172	14.33	0.87	0.520	0.090	(0.094)	0.430
173	14.42	0.87	0.520	0.090	(0.094)	0.430
174	14.50	0.87	0.520	0.089	(0.094)	0.430
175	14.58	0.87	0.520	0.089	(0.094)	0.431
176	14.67	0.87	0.520	0.089	(0.094)	0.431
177	14.75	0.87	0.520	0.088	(0.094)	0.432

178	14.83	0.83	0.500	0.088	(0.090)	0.412
179	14.92	0.83	0.500	0.087	(0.090)	0.413
180	15.00	0.83	0.500	0.087	(0.090)	0.413
181	15.08	0.80	0.480	0.086	(0.086)	0.394
182	15.17	0.80	0.480	0.086	(0.086)	0.394
183	15.25	0.80	0.480	0.085	(0.086)	0.395
184	15.33	0.77	0.460	(0.085)	0.083	0.377
185	15.42	0.77	0.460	(0.085)	0.083	0.377
186	15.50	0.77	0.460	(0.084)	0.083	0.377
187	15.58	0.63	0.380	(0.084)	0.068	0.312
188	15.67	0.63	0.380	(0.083)	0.068	0.312
189	15.75	0.63	0.380	(0.083)	0.068	0.312
190	15.83	0.63	0.380	(0.082)	0.068	0.312
191	15.92	0.63	0.380	(0.082)	0.068	0.312
192	16.00	0.63	0.380	(0.082)	0.068	0.312
193	16.08	0.13	0.080	(0.081)	0.014	0.066
194	16.17	0.13	0.080	(0.081)	0.014	0.066
195	16.25	0.13	0.080	(0.080)	0.014	0.066
196	16.33	0.13	0.080	(0.080)	0.014	0.066
197	16.42	0.13	0.080	(0.080)	0.014	0.066
198	16.50	0.13	0.080	(0.079)	0.014	0.066
199	16.58	0.10	0.060	(0.079)	0.011	0.049
200	16.67	0.10	0.060	(0.078)	0.011	0.049
201	16.75	0.10	0.060	(0.078)	0.011	0.049
202	16.83	0.10	0.060	(0.078)	0.011	0.049
203	16.92	0.10	0.060	(0.077)	0.011	0.049
204	17.00	0.10	0.060	(0.077)	0.011	0.049
205	17.08	0.17	0.100	(0.076)	0.018	0.082
206	17.17	0.17	0.100	(0.076)	0.018	0.082
207	17.25	0.17	0.100	(0.076)	0.018	0.082
208	17.33	0.17	0.100	(0.075)	0.018	0.082
209	17.42	0.17	0.100	(0.075)	0.018	0.082
210	17.50	0.17	0.100	(0.074)	0.018	0.082
211	17.58	0.17	0.100	(0.074)	0.018	0.082
212	17.67	0.17	0.100	(0.074)	0.018	0.082
213	17.75	0.17	0.100	(0.073)	0.018	0.082
214	17.83	0.13	0.080	(0.073)	0.014	0.066
215	17.92	0.13	0.080	(0.073)	0.014	0.066
216	18.00	0.13	0.080	(0.072)	0.014	0.066
217	18.08	0.13	0.080	(0.072)	0.014	0.066
218	18.17	0.13	0.080	(0.072)	0.014	0.066
219	18.25	0.13	0.080	(0.071)	0.014	0.066
220	18.33	0.13	0.080	(0.071)	0.014	0.066
221	18.42	0.13	0.080	(0.071)	0.014	0.066
222	18.50	0.13	0.080	(0.070)	0.014	0.066
223	18.58	0.10	0.060	(0.070)	0.011	0.049
224	18.67	0.10	0.060	(0.069)	0.011	0.049
225	18.75	0.10	0.060	(0.069)	0.011	0.049
226	18.83	0.07	0.040	(0.069)	0.007	0.033
227	18.92	0.07	0.040	(0.069)	0.007	0.033
228	19.00	0.07	0.040	(0.068)	0.007	0.033
229	19.08	0.10	0.060	(0.068)	0.011	0.049
230	19.17	0.10	0.060	(0.068)	0.011	0.049
231	19.25	0.10	0.060	(0.067)	0.011	0.049
232	19.33	0.13	0.080	(0.067)	0.014	0.066
233	19.42	0.13	0.080	(0.067)	0.014	0.066
234	19.50	0.13	0.080	(0.066)	0.014	0.066

235	19.58	0.10	0.060	(0.066)	0.011	0.049
236	19.67	0.10	0.060	(0.066)	0.011	0.049
237	19.75	0.10	0.060	(0.065)	0.011	0.049
238	19.83	0.07	0.040	(0.065)	0.007	0.033
239	19.92	0.07	0.040	(0.065)	0.007	0.033
240	20.00	0.07	0.040	(0.065)	0.007	0.033
241	20.08	0.10	0.060	(0.064)	0.011	0.049
242	20.17	0.10	0.060	(0.064)	0.011	0.049
243	20.25	0.10	0.060	(0.064)	0.011	0.049
244	20.33	0.10	0.060	(0.063)	0.011	0.049
245	20.42	0.10	0.060	(0.063)	0.011	0.049
246	20.50	0.10	0.060	(0.063)	0.011	0.049
247	20.58	0.10	0.060	(0.063)	0.011	0.049
248	20.67	0.10	0.060	(0.062)	0.011	0.049
249	20.75	0.10	0.060	(0.062)	0.011	0.049
250	20.83	0.07	0.040	(0.062)	0.007	0.033
251	20.92	0.07	0.040	(0.062)	0.007	0.033
252	21.00	0.07	0.040	(0.061)	0.007	0.033
253	21.08	0.10	0.060	(0.061)	0.011	0.049
254	21.17	0.10	0.060	(0.061)	0.011	0.049
255	21.25	0.10	0.060	(0.061)	0.011	0.049
256	21.33	0.07	0.040	(0.060)	0.007	0.033
257	21.42	0.07	0.040	(0.060)	0.007	0.033
258	21.50	0.07	0.040	(0.060)	0.007	0.033
259	21.58	0.10	0.060	(0.060)	0.011	0.049
260	21.67	0.10	0.060	(0.059)	0.011	0.049
261	21.75	0.10	0.060	(0.059)	0.011	0.049
262	21.83	0.07	0.040	(0.059)	0.007	0.033
263	21.92	0.07	0.040	(0.059)	0.007	0.033
264	22.00	0.07	0.040	(0.059)	0.007	0.033
265	22.08	0.10	0.060	(0.058)	0.011	0.049
266	22.17	0.10	0.060	(0.058)	0.011	0.049
267	22.25	0.10	0.060	(0.058)	0.011	0.049
268	22.33	0.07	0.040	(0.058)	0.007	0.033
269	22.42	0.07	0.040	(0.058)	0.007	0.033
270	22.50	0.07	0.040	(0.058)	0.007	0.033
271	22.58	0.07	0.040	(0.057)	0.007	0.033
272	22.67	0.07	0.040	(0.057)	0.007	0.033
273	22.75	0.07	0.040	(0.057)	0.007	0.033
274	22.83	0.07	0.040	(0.057)	0.007	0.033
275	22.92	0.07	0.040	(0.057)	0.007	0.033
276	23.00	0.07	0.040	(0.057)	0.007	0.033
277	23.08	0.07	0.040	(0.057)	0.007	0.033
278	23.17	0.07	0.040	(0.056)	0.007	0.033
279	23.25	0.07	0.040	(0.056)	0.007	0.033
280	23.33	0.07	0.040	(0.056)	0.007	0.033
281	23.42	0.07	0.040	(0.056)	0.007	0.033
282	23.50	0.07	0.040	(0.056)	0.007	0.033
283	23.58	0.07	0.040	(0.056)	0.007	0.033
284	23.67	0.07	0.040	(0.056)	0.007	0.033
285	23.75	0.07	0.040	(0.056)	0.007	0.033
286	23.83	0.07	0.040	(0.056)	0.007	0.033
287	23.92	0.07	0.040	(0.056)	0.007	0.033
288	24.00	0.07	0.040	(0.056)	0.007	0.033

(Loss Rate Not Used)

Sum = 100.0

Sum = 49.4

Flood volume = Effective rainfall 4.12(In)

3+20	0.4059	2.01	V Q
3+25	0.4198	2.01	V Q
3+30	0.4336	2.01	V Q
3+35	0.4475	2.01	V Q
3+40	0.4614	2.01	V Q
3+45	0.4752	2.01	V Q
3+50	0.4906	2.24	V Q
3+55	0.5071	2.39	V Q
4+ 0	0.5237	2.41	V Q
4+ 5	0.5403	2.41	V Q
4+10	0.5569	2.41	V Q
4+15	0.5736	2.41	V Q
4+20	0.5917	2.64	V Q
4+25	0.6110	2.79	V Q
4+30	0.6304	2.82	V Q
4+35	0.6498	2.82	V Q
4+40	0.6692	2.82	V Q
4+45	0.6886	2.82	V Q
4+50	0.7095	3.04	V Q
4+55	0.7315	3.19	V Q
5+ 0	0.7537	3.22	V Q
5+ 5	0.7728	2.77	V Q
5+10	0.7898	2.47	VQ
5+15	0.8064	2.41	VQ
5+20	0.8246	2.64	V Q
5+25	0.8438	2.79	VQ
5+30	0.8632	2.82	VQ
5+35	0.8842	3.04	V Q
5+40	0.9061	3.19	V Q
5+45	0.9283	3.22	V Q
5+50	0.9505	3.22	V Q
5+55	0.9727	3.22	V Q
6+ 0	0.9948	3.22	V Q
6+ 5	1.0186	3.44	V Q
6+10	1.0433	3.60	V Q
6+15	1.0683	3.62	V Q
6+20	1.0932	3.62	V Q
6+25	1.1182	3.62	V Q
6+30	1.1431	3.62	V Q
6+35	1.1696	3.85	V Q
6+40	1.1971	4.00	V Q
6+45	1.2248	4.02	V Q
6+50	1.2526	4.02	V Q
6+55	1.2803	4.02	V Q
7+ 0	1.3080	4.02	V Q
7+ 5	1.3357	4.02	V Q
7+10	1.3634	4.02	V Q
7+15	1.3912	4.02	V Q
7+20	1.4204	4.25	V Q
7+25	1.4507	4.40	V Q
7+30	1.4812	4.43	VQ
7+35	1.5132	4.65	V Q
7+40	1.5463	4.80	V Q
7+45	1.5796	4.83	V Q
7+50	1.6144	5.05	V Q
7+55	1.6502	5.21	V Q
8+ 0	1.6863	5.23	V Q

8+ 5	1.7254	5.68	V	Q
8+10	1.7666	5.98	V	Q
8+15	1.8082	6.04	V	Q
8+20	1.8497	6.04	V	Q
8+25	1.8913	6.04	V	Q
8+30	1.9329	6.04	V	Q
8+35	1.9760	6.26	V	Q
8+40	2.0202	6.41	V	Q
8+45	2.0645	6.44	V	Q
8+50	2.1104	6.66	V	Q
8+55	2.1574	6.82	V	Q
9+ 0	2.2045	6.84	V	Q
9+ 5	2.2547	7.29	V	Q
9+10	2.3070	7.59	V	Q
9+15	2.3596	7.65	V	Q
9+20	2.4138	7.87	V	Q
9+25	2.4691	8.02	V	Q
9+30	2.5245	8.05	V	Q
9+35	2.5815	8.27	V	Q
9+40	2.6395	8.42	V	Q
9+45	2.6977	8.45	V	Q
9+50	2.7575	8.68	V	Q
9+55	2.8183	8.83	V	Q
10+ 0	2.8793	8.85	V	Q
10+ 5	2.9295	7.29	Q	
10+10	2.9724	6.23	Q	V
10+15	3.0139	6.04	Q	V
10+20	3.0555	6.04	Q	V
10+25	3.0971	6.04	Q	V
10+30	3.1387	6.04	Q	V
10+35	3.1880	7.15	Q	V
10+40	3.2425	7.91	Q	
10+45	3.2979	8.05	V	Q
10+50	3.3533	8.05	Q	
10+55	3.4088	8.05	Q	
11+ 0	3.4642	8.05	Q	
11+ 5	3.5181	7.83	Q	V
11+10	3.5710	7.67	Q	V
11+15	3.6236	7.65	Q	V
11+20	3.6763	7.65	Q	V
11+25	3.7290	7.65	Q	V
11+30	3.7816	7.65	Q	V
11+35	3.8312	7.20	Q	V
11+40	3.8787	6.90	Q	V
11+45	3.9258	6.84	Q	V
11+50	3.9745	7.07	Q	V
11+55	4.0242	7.22	Q	V
12+ 0	4.0741	7.24	Q	V
12+ 5	4.1348	8.81	Q	V
12+10	4.2028	9.87	Q	V
12+15	4.2720	10.06	Q	V
12+20	4.3429	10.29	Q	V
12+25	4.4148	10.44	Q	V
12+30	4.4868	10.46	Q	V
12+35	4.5620	10.91	Q	V
12+40	4.6393	11.23	Q	V
12+45	4.7171	11.29	Q	V

12+50	4.7968	11.58				VQ	
12+55	4.8779	11.77				Q	
13+ 0	4.9593	11.82				Q	
13+ 5	5.0502	13.19				V Q	
13+10	5.1475	14.13				V	Q
13+15	5.2461	14.31				V	Q
13+20	5.3447	14.32				V	Q
13+25	5.4434	14.33				V	Q
13+30	5.5422	14.35				V	Q
13+35	5.6216	11.52				V	
13+40	5.6877	9.60			Q	V	
13+45	5.7515	9.26			Q	V	
13+50	5.8152	9.26			Q	V	
13+55	5.8790	9.26			Q	V	
14+ 0	5.9428	9.26			Q	V	
14+ 5	6.0132	10.22			Q	V	
14+10	6.0882	10.89			Q	V	
14+15	6.1640	11.02			Q	V	
14+20	6.2381	10.76			Q	V	
14+25	6.3110	10.58			Q	V	
14+30	6.3837	10.56			Q	V	
14+35	6.4565	10.57			Q	V	
14+40	6.5294	10.58			Q	V	
14+45	6.6023	10.59			Q	V	
14+50	6.6735	10.33			Q	V	
14+55	6.7434	10.16			Q	V	
15+ 0	6.8132	10.14			Q	V	
15+ 5	6.8812	9.87			Q	V	
15+10	6.9481	9.70			Q	V	
15+15	7.0147	9.68			Q	V	
15+20	7.0798	9.45			Q	V	
15+25	7.1437	9.29			Q	V	
15+30	7.2075	9.26			Q	V	
15+35	7.2651	8.36			Q	V	
15+40	7.3185	7.76			Q	V	
15+45	7.3711	7.65			Q	V	
15+50	7.4238	7.65			Q	V	
15+55	7.4765	7.65			Q	V	
16+ 0	7.5291	7.65			Q	V	
16+ 5	7.5587	4.30		Q		V	
16+10	7.5726	2.02		Q		V	
16+15	7.5837	1.61	Q			V	
16+20	7.5948	1.61	Q			V	
16+25	7.6059	1.61	Q			V	
16+30	7.6170	1.61	Q			V	
16+35	7.6265	1.39	Q			V	
16+40	7.6350	1.23	Q			V	
16+45	7.6433	1.21	Q			V	
16+50	7.6517	1.21	Q			V	
16+55	7.6600	1.21	Q			V	
17+ 0	7.6683	1.21	Q			V	
17+ 5	7.6797	1.65	Q			V	
17+10	7.6932	1.96	Q			V	
17+15	7.7070	2.01	Q			V	
17+20	7.7209	2.01	Q			V	
17+25	7.7348	2.01	Q			V	
17+30	7.7486	2.01	Q			V	

17+35	7.7625	2.01	Q	V
17+40	7.7763	2.01	Q	V
17+45	7.7902	2.01	Q	V
17+50	7.8025	1.79	Q	V
17+55	7.8138	1.64	Q	V
18+ 0	7.8249	1.61	Q	V
18+ 5	7.8360	1.61	Q	V
18+10	7.8471	1.61	Q	V
18+15	7.8581	1.61	Q	V
18+20	7.8692	1.61	Q	V
18+25	7.8803	1.61	Q	V
18+30	7.8914	1.61	Q	V
18+35	7.9010	1.39	Q	V
18+40	7.9095	1.23	Q	V
18+45	7.9178	1.21	Q	V
18+50	7.9245	0.98	Q	V
18+55	7.9303	0.83	Q	V
19+ 0	7.9358	0.80	Q	V
19+ 5	7.9429	1.03	Q	V
19+10	7.9510	1.18	Q	V
19+15	7.9593	1.21	Q	V
19+20	7.9692	1.43	Q	V
19+25	7.9801	1.58	Q	V
19+30	7.9912	1.61	Q	V
19+35	8.0007	1.39	Q	V
19+40	8.0092	1.23	Q	V
19+45	8.0176	1.21	Q	V
19+50	8.0243	0.98	Q	V
19+55	8.0301	0.83	Q	V
20+ 0	8.0356	0.80	Q	V
20+ 5	8.0427	1.03	Q	V
20+10	8.0508	1.18	Q	V
20+15	8.0591	1.21	Q	V
20+20	8.0675	1.21	Q	V
20+25	8.0758	1.21	Q	V
20+30	8.0841	1.21	Q	V
20+35	8.0924	1.21	Q	V
20+40	8.1007	1.21	Q	V
20+45	8.1090	1.21	Q	V
20+50	8.1158	0.98	Q	V
20+55	8.1215	0.83	Q	V
21+ 0	8.1271	0.80	Q	V
21+ 5	8.1342	1.03	Q	V
21+10	8.1423	1.18	Q	V
21+15	8.1506	1.21	Q	V
21+20	8.1574	0.98	Q	V
21+25	8.1631	0.83	Q	V
21+30	8.1687	0.80	Q	V
21+35	8.1757	1.03	Q	V
21+40	8.1839	1.18	Q	V
21+45	8.1922	1.21	Q	V
21+50	8.1990	0.98	Q	V
21+55	8.2047	0.83	Q	V
22+ 0	8.2102	0.80	Q	V
22+ 5	8.2173	1.03	Q	V
22+10	8.2255	1.18	Q	V

22+15	8.2338	1.21	Q				V
22+20	8.2405	0.98	Q				V
22+25	8.2463	0.83	Q				V
22+30	8.2518	0.80	Q				V
22+35	8.2574	0.80	Q				V
22+40	8.2629	0.80	Q				V
22+45	8.2685	0.80	Q				V
22+50	8.2740	0.80	Q				V
22+55	8.2795	0.80	Q				V
23+ 0	8.2851	0.80	Q				V
23+ 5	8.2906	0.80	Q				V
23+10	8.2962	0.80	Q				V
23+15	8.3017	0.80	Q				V
23+20	8.3073	0.80	Q				V
23+25	8.3128	0.80	Q				V
23+30	8.3183	0.80	Q				V
23+35	8.3239	0.80	Q				V
23+40	8.3294	0.80	Q				V
23+45	8.3350	0.80	Q				V
23+50	8.3405	0.80	Q				V
23+55	8.3461	0.80	Q				V
24+ 0	8.3516	0.80	Q				V
24+ 5	8.3541	0.36	Q				V
24+10	8.3545	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

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
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

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 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]
24.45	1.20	29.34

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	2.50	61.13

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 = 99.99 %

Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500
Total Area Entered = 24.45(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
Sum (F) =						0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329

Minimum soil loss rate ((In/Hr)) = 0.164

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.500

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	5.914
2	0.167	231.798	12.029
3	0.250	347.696	3.372
4	0.333	463.595	1.537
5	0.417	579.494	0.857
6	0.500	695.393	0.510

7	0.583	811.291	1.719	0.423
			Sum = 100.000	Sum= 24.641

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)		Effective (In/Hr)
				Max	Low	
1	0.08	0.50	0.150	(0.329)	0.075	0.075
2	0.17	0.60	0.180	(0.329)	0.090	0.090
3	0.25	0.60	0.180	(0.329)	0.090	0.090
4	0.33	0.60	0.180	(0.329)	0.090	0.090
5	0.42	0.60	0.180	(0.329)	0.090	0.090
6	0.50	0.70	0.210	(0.329)	0.105	0.105
7	0.58	0.70	0.210	(0.329)	0.105	0.105
8	0.67	0.70	0.210	(0.329)	0.105	0.105
9	0.75	0.70	0.210	(0.329)	0.105	0.105
10	0.83	0.70	0.210	(0.329)	0.105	0.105
11	0.92	0.70	0.210	(0.329)	0.105	0.105
12	1.00	0.80	0.240	(0.329)	0.120	0.120
13	1.08	0.80	0.240	(0.329)	0.120	0.120
14	1.17	0.80	0.240	(0.329)	0.120	0.120
15	1.25	0.80	0.240	(0.329)	0.120	0.120
16	1.33	0.80	0.240	(0.329)	0.120	0.120
17	1.42	0.80	0.240	(0.329)	0.120	0.120
18	1.50	0.80	0.240	(0.329)	0.120	0.120
19	1.58	0.80	0.240	(0.329)	0.120	0.120
20	1.67	0.80	0.240	(0.329)	0.120	0.120
21	1.75	0.80	0.240	(0.329)	0.120	0.120
22	1.83	0.80	0.240	(0.329)	0.120	0.120
23	1.92	0.80	0.240	(0.329)	0.120	0.120
24	2.00	0.90	0.270	(0.329)	0.135	0.135
25	2.08	0.80	0.240	(0.329)	0.120	0.120
26	2.17	0.90	0.270	(0.329)	0.135	0.135
27	2.25	0.90	0.270	(0.329)	0.135	0.135
28	2.33	0.90	0.270	(0.329)	0.135	0.135
29	2.42	0.90	0.270	(0.329)	0.135	0.135
30	2.50	0.90	0.270	(0.329)	0.135	0.135
31	2.58	0.90	0.270	(0.329)	0.135	0.135
32	2.67	0.90	0.270	(0.329)	0.135	0.135
33	2.75	1.00	0.300	(0.329)	0.150	0.150
34	2.83	1.00	0.300	(0.329)	0.150	0.150
35	2.92	1.00	0.300	(0.329)	0.150	0.150
36	3.00	1.00	0.300	(0.329)	0.150	0.150
37	3.08	1.00	0.300	(0.329)	0.150	0.150
38	3.17	1.10	0.330	(0.329)	0.165	0.165
39	3.25	1.10	0.330	(0.329)	0.165	0.165
40	3.33	1.10	0.330	(0.329)	0.165	0.165

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0031	0.44	Q					
0+10	0.0129	1.44	VQ					
0+15	0.0258	1.87	V Q					
0+20	0.0398	2.03	V Q					
0+25	0.0544	2.12	V Q					
0+30	0.0700	2.26	V Q					
0+35	0.0871	2.48	V Q					
0+40	0.1046	2.54	V Q					
0+45	0.1222	2.56	V Q					
0+50	0.1400	2.57	V Q					
0+55	0.1577	2.58	VQ					
1+ 0	0.1762	2.68	VQ					
1+ 5	0.1959	2.86	VQ					
1+10	0.2159	2.91	VQ					
1+15	0.2361	2.93	Q					
1+20	0.2563	2.94	Q					
1+25	0.2767	2.95	Q					
1+30	0.2971	2.96	QV					
1+35	0.3174	2.96	QV					
1+40	0.3378	2.96	QV					
1+45	0.3582	2.96	QV					
1+50	0.3785	2.96	Q V					
1+55	0.3989	2.96	Q V					
2+ 0	0.4199	3.05	QV					
2+ 5	0.4415	3.14	Q V					
2+10	0.4629	3.10	Q V					
2+15	0.4852	3.25	Q V					
2+20	0.5079	3.29	Q V					
2+25	0.5307	3.31	Q V					
2+30	0.5536	3.32	Q V					
2+35	0.5764	3.32	Q V					
2+40	0.5994	3.33	Q V					
2+45	0.6229	3.42	Q V					
2+50	0.6477	3.60	Q V					
2+55	0.6728	3.65	Q V					
3+ 0	0.6981	3.67	Q V					
3+ 5	0.7234	3.68	Q V					
3+10	0.7495	3.78	Q V					
3+15	0.7768	3.97	Q V					
3+20	0.8045	4.02	Q V					
3+25	0.8329	4.13	Q V					
3+30	0.8633	4.41	Q V					
3+35	0.8959	4.74	Q V					
3+40	0.9304	5.00	Q V					
3+45	0.9660	5.17	Q V					
3+50	1.0032	5.40	Q V					
3+55	1.0415	5.57	Q V					

4+ 0	1.0813	5.78		Q		V			
4+ 5	1.1222	5.94		Q		V			
4+10	1.1652	6.24		Q		V			
4+15	1.2105	6.58		Q		V			
4+20	1.2583	6.93		Q		V			
4+25	1.3085	7.29		Q		V			
4+30	1.3606	7.57		Q		V			
4+35	1.4141	7.76		Q		V			
4+40	1.4705	8.19		Q		V			
4+45	1.5312	8.81		Q	Q	V			
4+50	1.5953	9.31		Q	Q	V			
4+55	1.6618	9.66		Q	Q	V			
5+ 0	1.7326	10.27		Q	Q	V			
5+ 5	1.8130	11.67		Q	Q	V			
5+10	1.9131	14.54		Q	Q	V			
5+15	2.0334	17.47		Q	Q	V			
5+20	2.1702	19.86		Q	Q	V			
5+25	2.3253	22.52		Q	Q	V			
5+30	2.5084	26.59		Q	Q	V			
5+35	2.6764	24.39		Q	Q	V			
5+40	2.7590	12.00		Q	Q	V			
5+45	2.8069	6.95		Q	Q	V			
5+50	2.8380	4.52		Q	Q	V			
5+55	2.8592	3.07		Q	Q	V			
6+ 0	2.8726	1.94	Q	Q	Q	V			
6+ 5	2.8787	0.89	Q	Q	Q	V			
6+10	2.8811	0.34	Q	Q	Q	V			
6+15	2.8822	0.16	Q	Q	Q	V			
6+20	2.8827	0.08	Q	Q	Q	V			
6+25	2.8830	0.03	Q	Q	Q	V			
6+30	2.8830	0.01	Q	Q	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
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

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 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]
24.34	1.20	29.21

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	2.50	60.85

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 = 99.99 %
 Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.340	48.70	0.900
Total Area Entered = 24.34(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
						Sum (F) = 0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
 Minimum soil loss rate ((In/Hr)) = 0.056
 (for 24 hour storm duration)
 Soil low loss rate (decimal) = 0.180

 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	288.727	13.612
2	0.167	577.453	9.262
3	0.250	866.180	1.656
		Sum = 100.000	Sum= 24.530

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	(0.111) 0.027	0.123
2	0.17	0.180	(0.111) 0.032	0.148
3	0.25	0.180	(0.111) 0.032	0.148
4	0.33	0.180	(0.111) 0.032	0.148

5	0.42	0.60	0.180	(0.111)	0.032	0.148
6	0.50	0.70	0.210	(0.111)	0.038	0.172
7	0.58	0.70	0.210	(0.111)	0.038	0.172
8	0.67	0.70	0.210	(0.111)	0.038	0.172
9	0.75	0.70	0.210	(0.111)	0.038	0.172
10	0.83	0.70	0.210	(0.111)	0.038	0.172
11	0.92	0.70	0.210	(0.111)	0.038	0.172
12	1.00	0.80	0.240	(0.111)	0.043	0.197
13	1.08	0.80	0.240	(0.111)	0.043	0.197
14	1.17	0.80	0.240	(0.111)	0.043	0.197
15	1.25	0.80	0.240	(0.111)	0.043	0.197
16	1.33	0.80	0.240	(0.111)	0.043	0.197
17	1.42	0.80	0.240	(0.111)	0.043	0.197
18	1.50	0.80	0.240	(0.111)	0.043	0.197
19	1.58	0.80	0.240	(0.111)	0.043	0.197
20	1.67	0.80	0.240	(0.111)	0.043	0.197
21	1.75	0.80	0.240	(0.111)	0.043	0.197
22	1.83	0.80	0.240	(0.111)	0.043	0.197
23	1.92	0.80	0.240	(0.111)	0.043	0.197
24	2.00	0.90	0.270	(0.111)	0.049	0.221
25	2.08	0.80	0.240	(0.111)	0.043	0.197
26	2.17	0.90	0.270	(0.111)	0.049	0.221
27	2.25	0.90	0.270	(0.111)	0.049	0.221
28	2.33	0.90	0.270	(0.111)	0.049	0.221
29	2.42	0.90	0.270	(0.111)	0.049	0.221
30	2.50	0.90	0.270	(0.111)	0.049	0.221
31	2.58	0.90	0.270	(0.111)	0.049	0.221
32	2.67	0.90	0.270	(0.111)	0.049	0.221
33	2.75	1.00	0.300	(0.111)	0.054	0.246
34	2.83	1.00	0.300	(0.111)	0.054	0.246
35	2.92	1.00	0.300	(0.111)	0.054	0.246
36	3.00	1.00	0.300	(0.111)	0.054	0.246
37	3.08	1.00	0.300	(0.111)	0.054	0.246
38	3.17	1.10	0.330	(0.111)	0.059	0.271
39	3.25	1.10	0.330	(0.111)	0.059	0.271
40	3.33	1.10	0.330	(0.111)	0.059	0.271
41	3.42	1.20	0.360	(0.111)	0.065	0.295
42	3.50	1.30	0.390	(0.111)	0.070	0.320
43	3.58	1.40	0.420	(0.111)	0.076	0.344
44	3.67	1.40	0.420	(0.111)	0.076	0.344
45	3.75	1.50	0.450	(0.111)	0.081	0.369
46	3.83	1.50	0.450	(0.111)	0.081	0.369
47	3.92	1.60	0.480	(0.111)	0.086	0.394
48	4.00	1.60	0.480	(0.111)	0.086	0.394
49	4.08	1.70	0.510	(0.111)	0.092	0.418
50	4.17	1.80	0.540	(0.111)	0.097	0.443
51	4.25	1.90	0.570	(0.111)	0.103	0.467
52	4.33	2.00	0.600	(0.111)	0.108	0.492
53	4.42	2.10	0.630	0.111 (0.113)		0.519
54	4.50	2.10	0.630	0.111 (0.113)		0.519
55	4.58	2.20	0.660	0.111 (0.119)		0.549
56	4.67	2.30	0.690	0.111 (0.124)		0.579
57	4.75	2.40	0.720	0.111 (0.130)		0.609
58	4.83	2.40	0.720	0.111 (0.130)		0.609
59	4.92	2.50	0.750	0.111 (0.135)		0.639
60	5.00	2.60	0.780	0.111 (0.140)		0.669
61	5.08	3.10	0.930	0.111 (0.167)		0.819

62	5.17	3.60	1.080	0.111	(0.194)	0.969
63	5.25	3.90	1.170	0.111	(0.211)	1.059
64	5.33	4.20	1.260	0.111	(0.227)	1.149
65	5.42	4.70	1.410	0.111	(0.254)	1.299
66	5.50	5.60	1.680	0.111	(0.302)	1.569
67	5.58	1.90	0.570	(0.111)	0.103	0.467
68	5.67	0.90	0.270	(0.111)	0.049	0.221
69	5.75	0.60	0.180	(0.111)	0.032	0.148
70	5.83	0.50	0.150	(0.111)	0.027	0.123
71	5.92	0.30	0.090	(0.111)	0.016	0.074
72	6.00	0.20	0.060	(0.111)	0.011	0.049

(Loss Rate Not Used)

Sum = 100.0 Sum = 25.4

Flood volume = Effective rainfall 2.12(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 4.3(Ac.Ft)
Total soil loss = 0.38(In)
Total soil loss = 0.777(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 187032.1 Cubic Feet
Total soil loss = 33834.9 Cubic Feet

Peak flow rate of this hydrograph = 35.304(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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0115	1.68	VQ				
0+10	0.0332	3.15	V Q				
0+15	0.0579	3.58	V Q				
0+20	0.0828	3.62	V Q				
0+25	0.1078	3.62	V Q				
0+30	0.1350	3.96	V Q				
0+35	0.1639	4.19	V Q				
0+40	0.1930	4.23	V Q				
0+45	0.2221	4.23	V Q				
0+50	0.2512	4.23	V Q				
0+55	0.2803	4.23	V Q				
1+ 0	0.3117	4.56	V Q				
1+ 5	0.3447	4.79	VQ				
1+10	0.3779	4.83	VQ				
1+15	0.4112	4.83	VQ				
1+20	0.4445	4.83	Q				
1+25	0.4777	4.83	Q				
1+30	0.5110	4.83	Q				
1+35	0.5442	4.83	QV				
1+40	0.5775	4.83	QV				
1+45	0.6108	4.83	QV				
1+50	0.6440	4.83	QV				
1+55	0.6773	4.83	Q V				
2+ 0	0.7129	5.16	QV				
2+ 5	0.7477	5.06	QV				

2+10	0.7835	5.21	Q	V					
2+15	0.8207	5.39	Q	V					
2+20	0.8581	5.43	Q	V					
2+25	0.8955	5.43	Q	V					
2+30	0.9329	5.43	Q	V					
2+35	0.9704	5.43	Q	V					
2+40	1.0078	5.43	Q	V					
2+45	1.0475	5.77	Q	V					
2+50	1.0888	6.00	Q	V					
2+55	1.1304	6.04	Q	V					
3+ 0	1.1720	6.04	Q	V					
3+ 5	1.2135	6.04	Q	V					
3+10	1.2574	6.37	Q	V					
3+15	1.3029	6.60	Q	V					
3+20	1.3486	6.64	Q	V					
3+25	1.3967	6.98	Q	V					
3+30	1.4486	7.54	Q	V					
3+35	1.5046	8.14	Q	V					
3+40	1.5626	8.41	Q	V					
3+45	1.6231	8.79	Q	V					
3+50	1.6852	9.01	Q	V					
3+55	1.7499	9.39	Q	V					
4+ 0	1.8161	9.62	Q	V					
4+ 5	1.8849	9.99	Q	V					
4+10	1.9576	10.56	Q	V					
4+15	2.0345	11.16	Q	V					
4+20	2.1155	11.76	Q	V					
4+25	2.2009	12.40	Q	V					
4+30	2.2883	12.69	Q	V					
4+35	2.3788	13.14	Q	V					
4+40	2.4741	13.83	Q	V					
4+45	2.5744	14.57	Q	V					
4+50	2.6769	14.89	Q	V					
4+55	2.7827	15.35	Q	V					
5+ 0	2.8931	16.04	Q	V					
5+ 5	3.0199	18.41	Q	V					
5+10	3.1707	21.89	Q	V					
5+15	3.3411	24.75	Q	V					
5+20	3.5275	27.06	Q	V					
5+25	3.7347	30.09	Q	V					
5+30	3.9779	35.30	Q	V					
5+35	4.1367	23.05	Q	V					
5+40	4.2052	9.94	Q	V					
5+45	4.2385	4.84	Q	V					
5+50	4.2619	3.41	Q	V					
5+55	4.2784	2.39	Q	V					
6+ 0	4.2891	1.56	Q	V					
6+ 5	4.2931	0.58	Q	V					
6+10	4.2937	0.08	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 LAND USE CONDITION
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 = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 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]
24.45	0.80	19.56

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	2.00	48.90

STORM EVENT (YEAR) = 100.00

Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)

Areal adjustment factor = 99.99 %

Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500
Total Area Entered = 24.45(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
Sum (F) =						0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329

Minimum soil loss rate ((In/Hr)) = 0.164

(for 24 hour storm duration)

Soil low loss rate (decimal) = 0.500

Unit Hydrograph
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	5.914
2	0.167	231.798	12.029
3	0.250	347.696	3.372
4	0.333	463.595	1.537
5	0.417	579.494	0.857
6	0.500	695.393	0.510

7	0.583	811.291	1.719	0.423
			Sum = 100.000	Sum= 24.641

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)		Effective (In/Hr)
				Max	Low	
1	0.08	1.30	0.312	(0.329)	0.156	0.156
2	0.17	1.30	0.312	(0.329)	0.156	0.156
3	0.25	1.10	0.264	(0.329)	0.132	0.132
4	0.33	1.50	0.360	(0.329)	0.180	0.180
5	0.42	1.50	0.360	(0.329)	0.180	0.180
6	0.50	1.80	0.432	(0.329)	0.216	0.216
7	0.58	1.50	0.360	(0.329)	0.180	0.180
8	0.67	1.80	0.432	(0.329)	0.216	0.216
9	0.75	1.80	0.432	(0.329)	0.216	0.216
10	0.83	1.50	0.360	(0.329)	0.180	0.180
11	0.92	1.60	0.384	(0.329)	0.192	0.192
12	1.00	1.80	0.432	(0.329)	0.216	0.216
13	1.08	2.20	0.528	(0.329)	0.264	0.264
14	1.17	2.20	0.528	(0.329)	0.264	0.264
15	1.25	2.20	0.528	(0.329)	0.264	0.264
16	1.33	2.00	0.480	(0.329)	0.240	0.240
17	1.42	2.60	0.624	(0.329)	0.312	0.312
18	1.50	2.70	0.648	(0.329)	0.324	0.324
19	1.58	2.40	0.576	(0.329)	0.288	0.288
20	1.67	2.70	0.648	(0.329)	0.324	0.324
21	1.75	3.30	0.792	0.329	(0.396)	0.463
22	1.83	3.10	0.744	0.329	(0.372)	0.415
23	1.92	2.90	0.696	0.329	(0.348)	0.367
24	2.00	3.00	0.720	0.329	(0.360)	0.391
25	2.08	3.10	0.744	0.329	(0.372)	0.415
26	2.17	4.20	1.008	0.329	(0.504)	0.679
27	2.25	5.00	1.200	0.329	(0.600)	0.871
28	2.33	3.50	0.840	0.329	(0.420)	0.511
29	2.42	6.80	1.632	0.329	(0.816)	1.303
30	2.50	7.30	1.752	0.329	(0.876)	1.423
31	2.58	8.20	1.968	0.329	(0.984)	1.639
32	2.67	5.90	1.416	0.329	(0.708)	1.087
33	2.75	2.00	0.480	(0.329)	0.240	0.240
34	2.83	1.80	0.432	(0.329)	0.216	0.216
35	2.92	1.80	0.432	(0.329)	0.216	0.216
36	3.00	0.60	0.144	(0.329)	0.072	0.072

(Loss Rate Not Used)

Sum =	100.0			Sum =	14.8
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Flood volume =	Effective rainfall	1.23(In)	
times area	24.4(Ac.)/[(In)/(Ft.)] =		2.5(Ac.Ft)

Total soil loss = 0.77(In)
 Total soil loss = 1.560(Ac.Ft)
 Total rainfall = 2.00(In)
 Flood volume = 109541.2 Cubic Feet
 Total soil loss = 67946.8 Cubic Feet

 Peak flow rate of this hydrograph = 34.136(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	10.0	20.0	30.0	40.0
0+ 5	0.0064		0.92	Q				
0+10	0.0256		2.80	V Q				
0+15	0.0476		3.18	V Q				
0+20	0.0711		3.42	V Q				
0+25	0.0990		4.05	V Q				
0+30	0.1298		4.47	V Q				
0+35	0.1629		4.81	V Q				
0+40	0.1955		4.74	VQ				
0+45	0.2308		5.12	V Q				
0+50	0.2654		5.02	VQ				
0+55	0.2977		4.70	Q				
1+ 0	0.3315		4.90	QV				
1+ 5	0.3690		5.46	Q				
1+10	0.4112		6.12	Q				
1+15	0.4546		6.31	QV				
1+20	0.4977		6.25	QV				
1+25	0.5421		6.45	Q V				
1+30	0.5927		7.34	Q V				
1+35	0.6443		7.50	Q V				
1+40	0.6953		7.41	Q V				
1+45	0.7546		8.61	Q V				
1+50	0.8242	10.11	10.11	Q V				
1+55	0.8915	9.78	9.78	Q V				
2+ 0	0.9564	9.41	9.41	Q V				
2+ 5	1.0234	9.73	9.73	Q V				
2+10	1.1035	11.63	11.63	Q V				
2+15	1.2140	16.06	16.06	Q V				
2+20	1.3321	17.14	17.14	Q V				
2+25	1.4599	18.56	18.56	Q V				
2+30	1.6536	28.13	28.13	Q V				
2+35	1.8828	33.28	33.28	Q V				
2+40	2.1179	34.14	34.14	Q V				
2+45	2.2830	23.97	23.97	Q V				

2+50	2.3688	12.46				Q						V	
2+55	2.4311	9.04				Q						V	
3+ 0	2.4758	6.49			Q							V	
3+ 5	2.4991	3.38		Q								V	
3+10	2.5083	1.34		Q								V	
3+15	2.5118	0.51	Q									V	
3+20	2.5136	0.26	Q									V	
3+25	2.5145	0.13	Q									V	
3+30	2.5147	0.03	Q									V	

Unit Hydrograph Analysis

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Study date 10/03/24 File: QP100SAMSUH3100.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
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 = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 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]

24.34 0.80 19.47

100 YEAR Area rainfall data:

Area(Ac.)[1] Rainfall(In)[2] Weighting[1*2]
 24.34 2.00 48.68

STORM EVENT (YEAR) = 100.00
 Area Averaged 2-Year Rainfall = 0.800(In)
 Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
 Areal adjustment factor = 99.99 %
 Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.) Runoff Index Impervious %
 24.340 48.70 0.900
 Total Area Entered = 24.34(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
						Sum (F) = 0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
 Minimum soil loss rate ((In/Hr)) = 0.056
 (for 24 hour storm duration)
 Soil low loss rate (decimal) = 0.180

 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	288.727	13.612
2	0.167	577.453	9.262
3	0.250	866.180	1.656
		Sum = 100.000	Sum= 24.530

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	(0.111)	0.056	0.256
2	0.17	1.30	(0.111)	0.056	0.256
3	0.25	1.10	(0.111)	0.048	0.216
4	0.33	1.50	(0.111)	0.065	0.295
5	0.42	1.50	(0.111)	0.065	0.295

6	0.50	1.80	0.432	(0.111)	0.078	0.354
7	0.58	1.50	0.360	(0.111)	0.065	0.295
8	0.67	1.80	0.432	(0.111)	0.078	0.354
9	0.75	1.80	0.432	(0.111)	0.078	0.354
10	0.83	1.50	0.360	(0.111)	0.065	0.295
11	0.92	1.60	0.384	(0.111)	0.069	0.315
12	1.00	1.80	0.432	(0.111)	0.078	0.354
13	1.08	2.20	0.528	(0.111)	0.095	0.433
14	1.17	2.20	0.528	(0.111)	0.095	0.433
15	1.25	2.20	0.528	(0.111)	0.095	0.433
16	1.33	2.00	0.480	(0.111)	0.086	0.394
17	1.42	2.60	0.624	0.111	(0.112)	0.513
18	1.50	2.70	0.648	0.111	(0.117)	0.537
19	1.58	2.40	0.576	(0.111)	0.104	0.472
20	1.67	2.70	0.648	0.111	(0.117)	0.537
21	1.75	3.30	0.792	0.111	(0.143)	0.681
22	1.83	3.10	0.744	0.111	(0.134)	0.633
23	1.92	2.90	0.696	0.111	(0.125)	0.585
24	2.00	3.00	0.720	0.111	(0.130)	0.609
25	2.08	3.10	0.744	0.111	(0.134)	0.633
26	2.17	4.20	1.008	0.111	(0.181)	0.897
27	2.25	5.00	1.200	0.111	(0.216)	1.089
28	2.33	3.50	0.840	0.111	(0.151)	0.729
29	2.42	6.80	1.632	0.111	(0.294)	1.521
30	2.50	7.30	1.752	0.111	(0.315)	1.641
31	2.58	8.20	1.968	0.111	(0.354)	1.857
32	2.67	5.90	1.416	0.111	(0.255)	1.305
33	2.75	2.00	0.480	(0.111)	0.086	0.394
34	2.83	1.80	0.432	(0.111)	0.078	0.354
35	2.92	1.80	0.432	(0.111)	0.078	0.354
36	3.00	0.60	0.144	(0.111)	0.026	0.118

(Loss Rate Not Used)

Sum = 100.0 Sum = 20.8

Flood volume = Effective rainfall 1.73(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 3.5(Ac.Ft)
Total soil loss = 0.27(In)
Total soil loss = 0.542(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 153065.3 Cubic Feet
Total soil loss = 23624.3 Cubic Feet

Peak flow rate of this hydrograph = 43.010(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	12.5	25.0	37.5	50.0
0+ 5	0.0240	3.48	V Q				
0+10	0.0643	5.85	V Q				
0+15	0.1039	5.74	V Q				
0+20	0.1483	6.45	V Q				
0+25	0.1973	7.11	V Q				

0+30	0.2527	8.05	V	Q						
0+35	0.3064	7.79	V	Q						
0+40	0.3625	8.15	V	Q						
0+45	0.4217	8.60	V	Q						
0+50	0.4760	7.89	VQ							
0+55	0.5284	7.61	Q							
1+ 0	0.5851	8.23	Q							
1+ 5	0.6519	9.70	Q							
1+10	0.7242	10.49	Q							
1+15	0.7973	10.62	QV							
1+20	0.8668	10.09	QV							
1+25	0.9450	11.35	QV							
1+30	1.0326	12.72	QV							
1+35	1.1170	12.26	Q	V						
1+40	1.2036	12.58	Q	V						
1+45	1.3071	15.03	Q	V						
1+50	1.4160	15.82	Q	V						
1+55	1.5190	14.96	Q	V						
2+ 0	1.6207	14.76	Q	V						
2+ 5	1.7256	15.23	Q	V						
2+10	1.8570	19.09	Q	V						
2+15	2.0236	24.19	Q	V						
2+20	2.1717	21.50	Q	V						
2+25	2.3733	29.27	Q	V						
2+30	2.6325	37.65	Q	V						
2+35	2.9287	43.01	Q	V						
2+40	3.1883	37.69	Q	V						
2+45	3.3297	20.53	Q	V						
2+50	3.4029	10.63	Q	V						
2+55	3.4633	8.76	Q	V						
3+ 0	3.5010	5.48	Q	V						
3+ 5	3.5125	1.68	Q	V						
3+10	3.5139	0.20	Q	V						

Unit Hydrograph Analysis

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Study date 10/11/23 File: 100QAXUH1100.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 LAND USE CONDITION
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 = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 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]
24.45	0.50	12.23

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	1.20	29.34

STORM EVENT (YEAR) = 100.00

Area Averaged 2-Year Rainfall = 0.500(In)

Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)

Areal adjustment factor = 99.98 %

Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500
Total Area Entered = 24.45(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
Sum (F) =						0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329

Minimum soil loss rate ((In/Hr)) = 0.164

(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	115.899	5.914
2	0.167	231.798	12.029
3	0.250	347.696	3.372
4	0.333	463.595	1.537

0+30	0.3074	12.03		v	Q					
0+35	0.4080	14.60			Q					
0+40	0.5301	17.74				Q				
0+45	0.6934	23.70					Q			
0+50	1.0057	45.35						v		
0+55	1.4033	57.73							Q	v
1+ 0	1.5878	26.80					Q			v
1+ 5	1.6901	14.85				Q				v
1+10	1.7366	6.75			Q					v
1+15	1.7623	3.74		Q						v
1+20	1.7782	2.30		Q						v
1+25	1.7815	0.48		Q						v
1+30	1.7826	0.17		Q						v

Unit Hydrograph Analysis

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Study date 10/03/24 File: QP100SAMSUH1100.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
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 = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) =
0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 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]

4	0.33	5.00	0.720	0.111	(0.130)	0.609
5	0.42	5.80	0.835	0.111	(0.150)	0.724
6	0.50	6.50	0.936	0.111	(0.168)	0.825
7	0.58	7.40	1.065	0.111	(0.192)	0.954
8	0.67	8.60	1.238	0.111	(0.223)	1.127
9	0.75	12.30	1.771	0.111	(0.319)	1.660
10	0.83	29.10	4.189	0.111	(0.754)	4.078
11	0.92	6.80	0.979	0.111	(0.176)	0.868
12	1.00	5.00	0.720	0.111	(0.130)	0.609

(Loss Rate Not Used)

Sum = 100.0 Sum = 13.1

Flood volume = Effective rainfall 1.09(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 2.2(Ac.Ft)
Total soil loss = 0.11(In)
Total soil loss = 0.225(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 96202.1 Cubic Feet
Total soil loss = 9799.6 Cubic Feet

Peak flow rate of this hydrograph = 72.792(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	20.0	40.0	60.0	80.0
0+ 5	0.0465	6.75	V Q				
0+10	0.1258	11.51	V Q				
0+15	0.2210	13.82	V Q				
0+20	0.3227	14.77	V Q				
0+25	0.4364	16.51	V Q				
0+30	0.5669	18.95	Q V				
0+35	0.7173	21.84	Q V				
0+40	0.8933	25.56	Q V				
0+45	1.1318	34.63	Q V				
0+50	1.6332	72.79	Q V				
0+55	1.9938	52.36	Q V				
1+ 0	2.1528	23.09	Q V				
1+ 5	2.2016	7.08	Q V				
1+10	2.2085	1.01	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

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).

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

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.

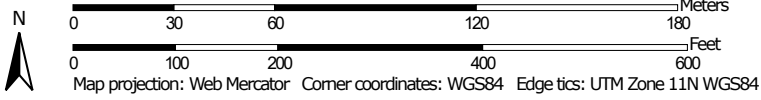
Soil Map

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: 1:2,250 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 15, Sep 6, 2022

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	10.2	41.6%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	14.3	58.4%
Totals for Area of Interest		24.4	100.0%

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

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

GyA—Greenfield sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcvv
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Terraces, 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 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 10 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 2 percent
Hydric soil rating: No

Arlington

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 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 (Sams)

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.

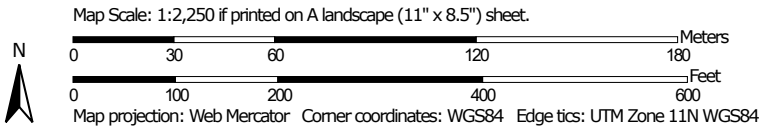
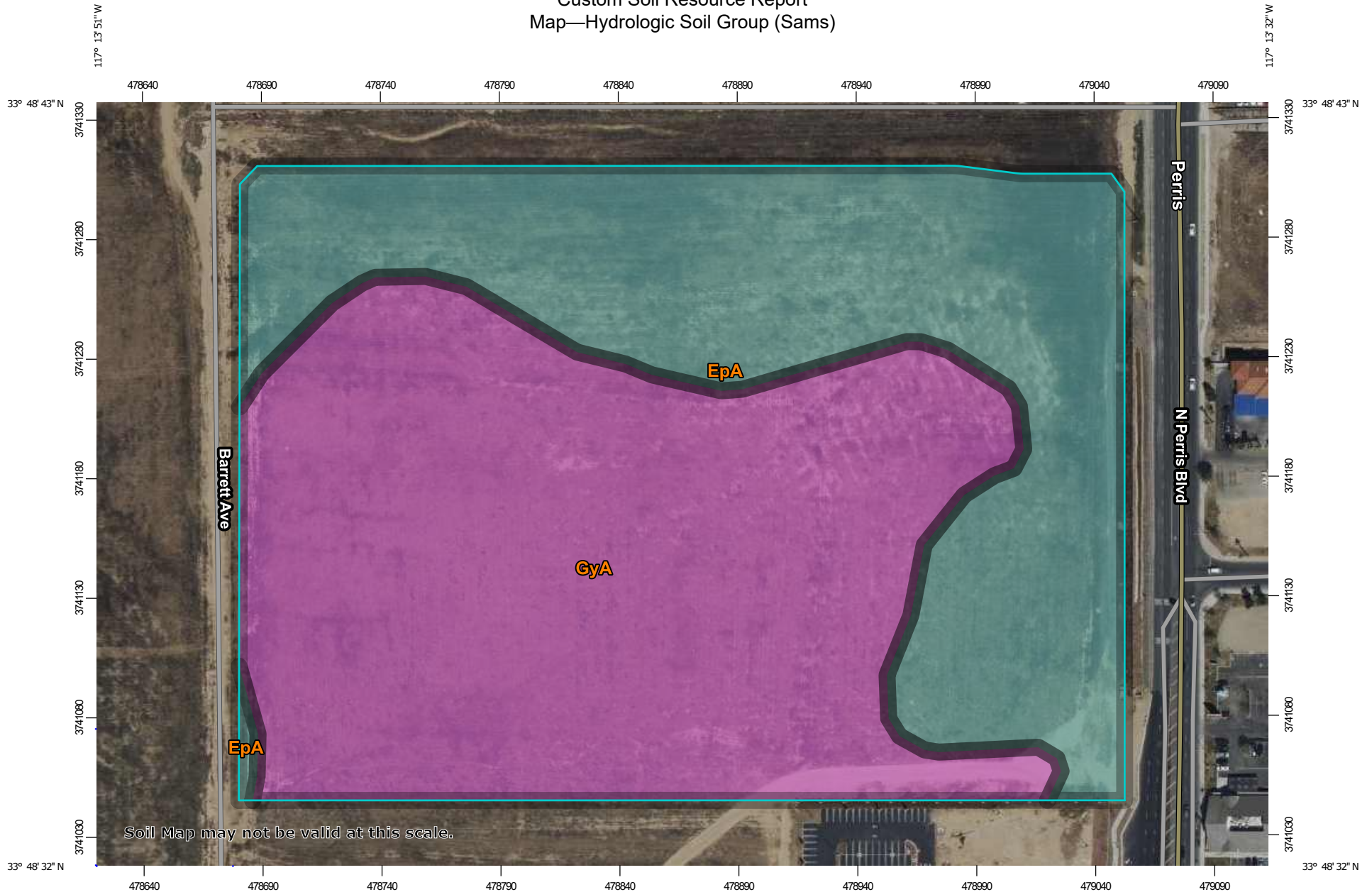
Custom Soil Resource Report

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 (Sams)



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)

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 15, Sep 6, 2022

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 (Sams)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	10.2	41.6%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	A	14.3	58.4%
Totals for Area of Interest			24.4	100.0%

Rating Options—Hydrologic Soil Group (Sams)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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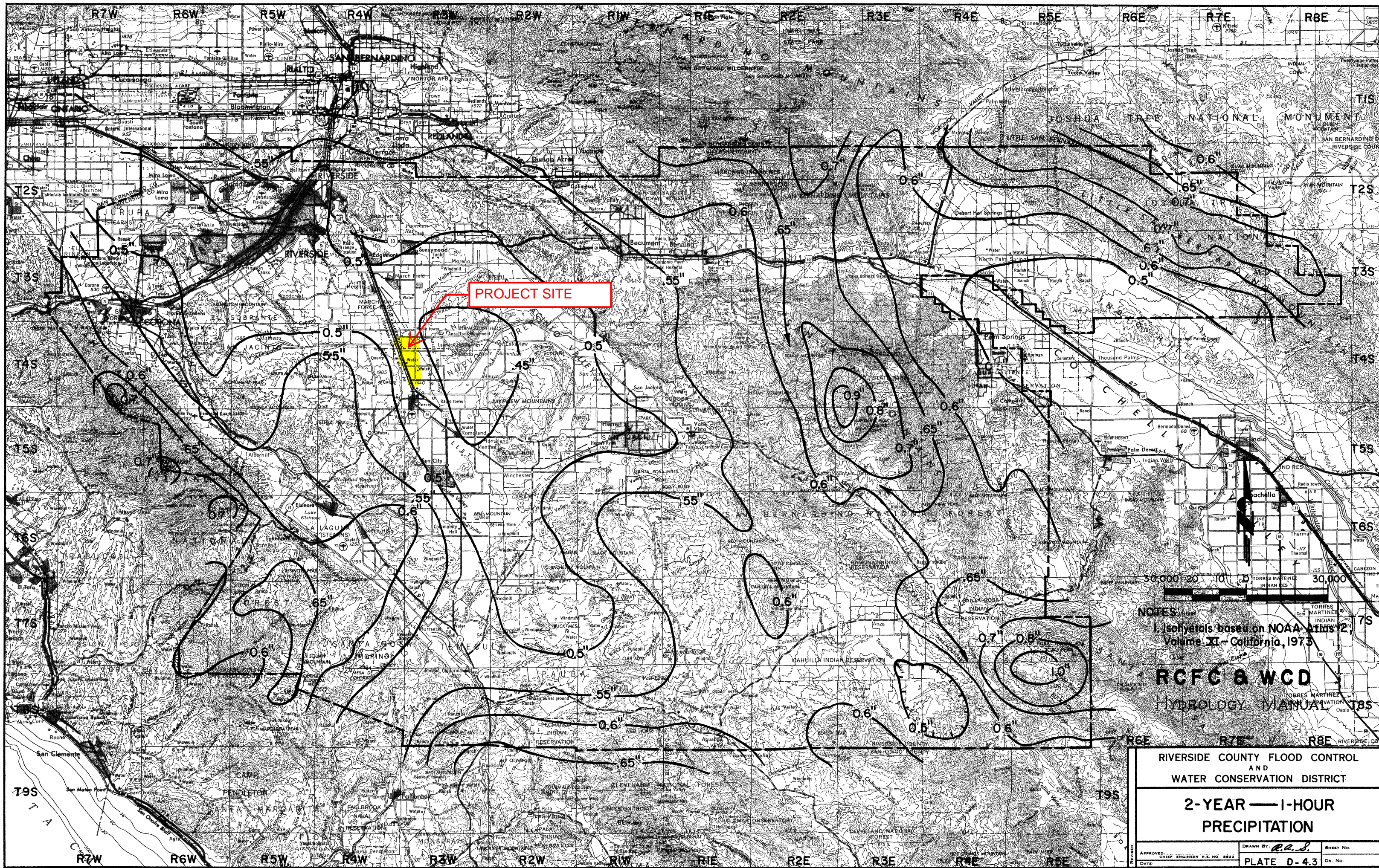
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RAINFALL INTENSITY—INCHES PER HOUR

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		



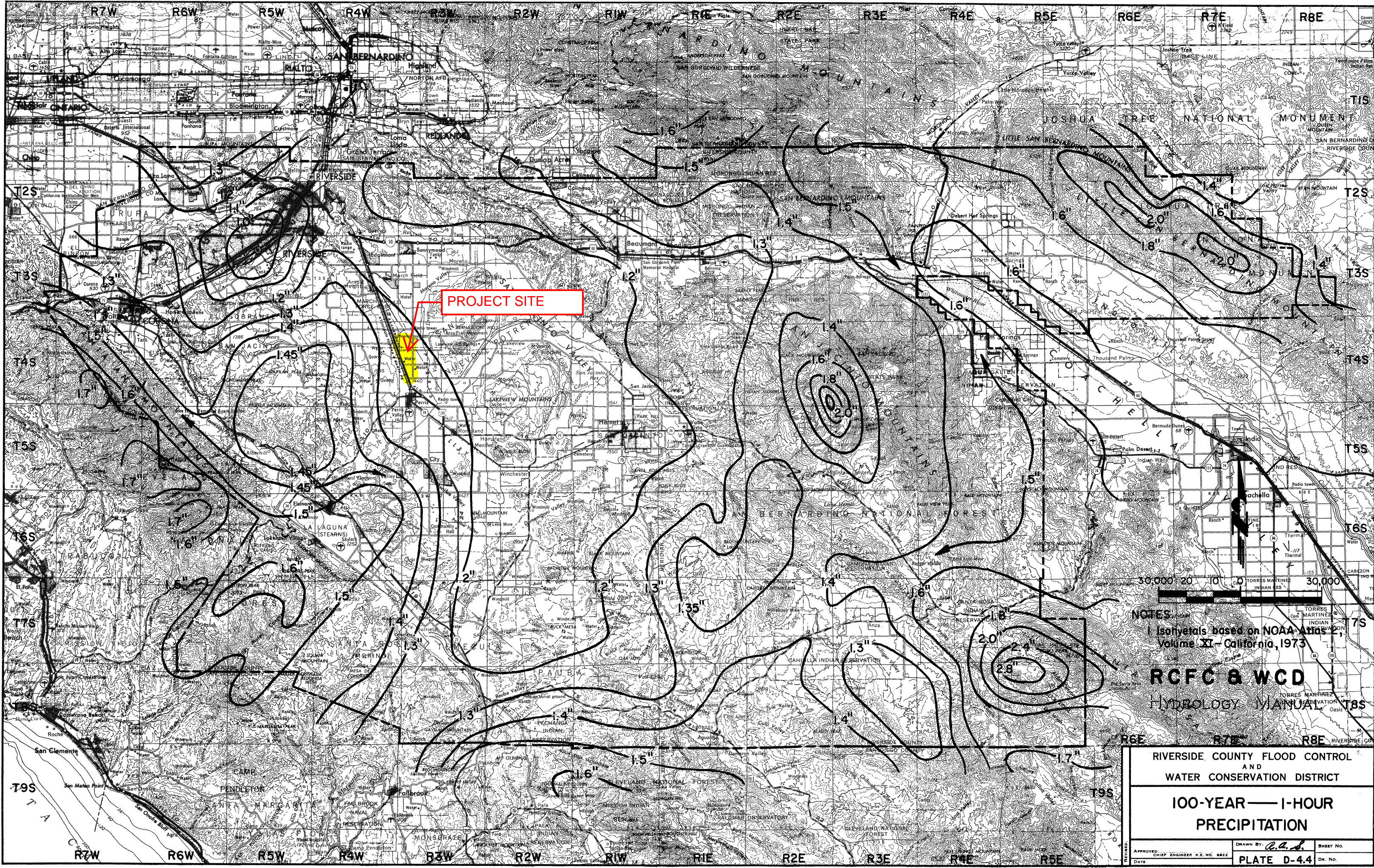
PROJECT SITE

NOTES:
 Isohyets based on NOAA Atlas 2,
 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		
100-YEAR — 1-HOUR PRECIPITATION		
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 ft² 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.

Building Type	Building Name	Location	Size (ft²)
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± ft² to 54,000± ft² 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:

<u>Infiltration Test No.</u>	<u>Depth (feet)</u>	<u>Soil Description</u>	<u>Measured Infiltration Rate (inches/hour)</u>
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:**

<u>Infiltration System(s)</u>	<u>Infiltration Test Nos.</u>	<u>Infiltration Test Depth (ft)</u>	<u>Infiltration System Type</u>	<u>Infiltration System Location</u>	<u>Design Infiltration Rate (inches/hour)</u>
"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

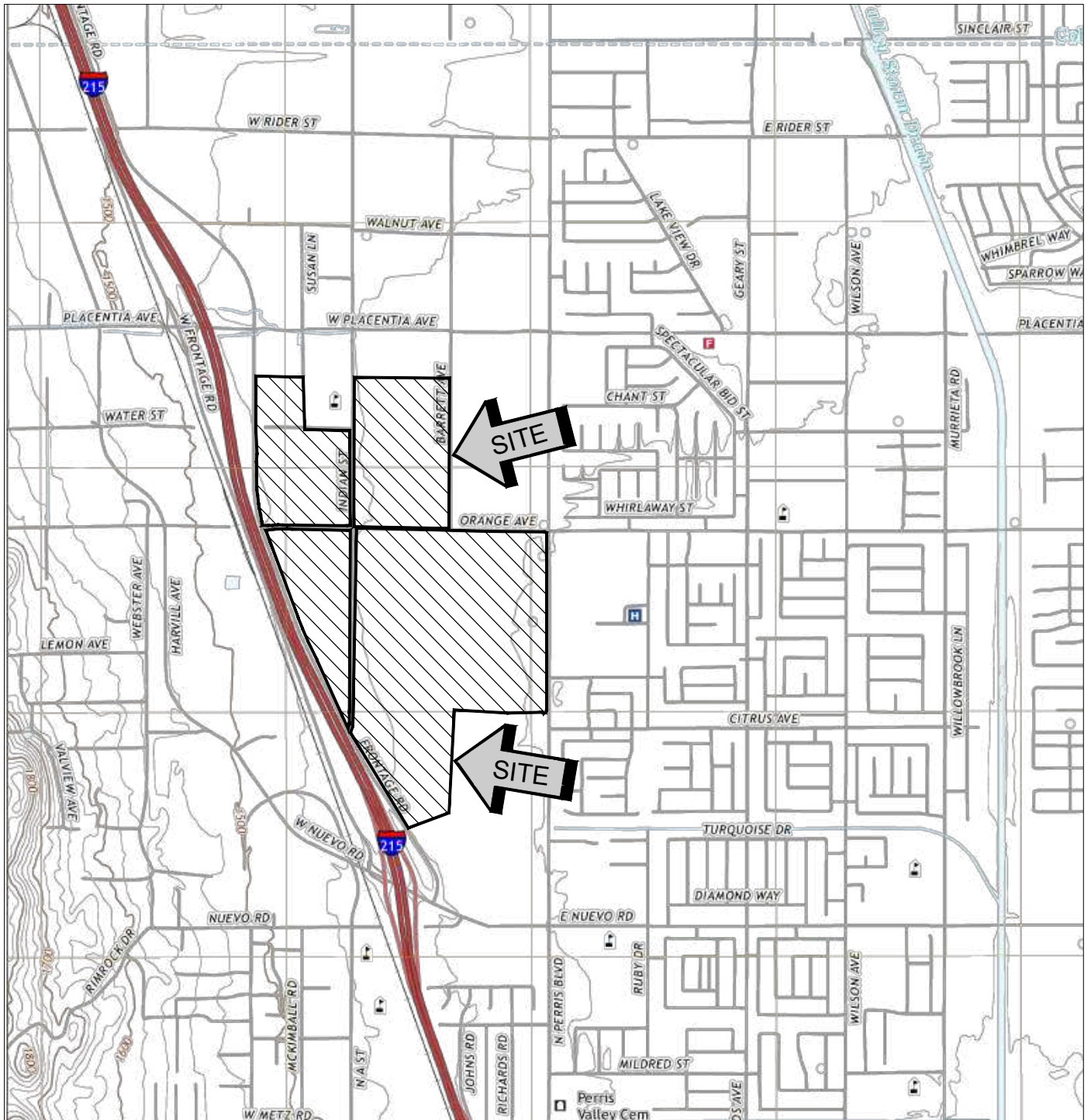


Daniel W. Nielsen, GE 3166
Senior Engineer



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

SoCalGeo

NORTH

PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 5,020 LF

STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 252,333 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 252,333 CF

PIPE DETAILS

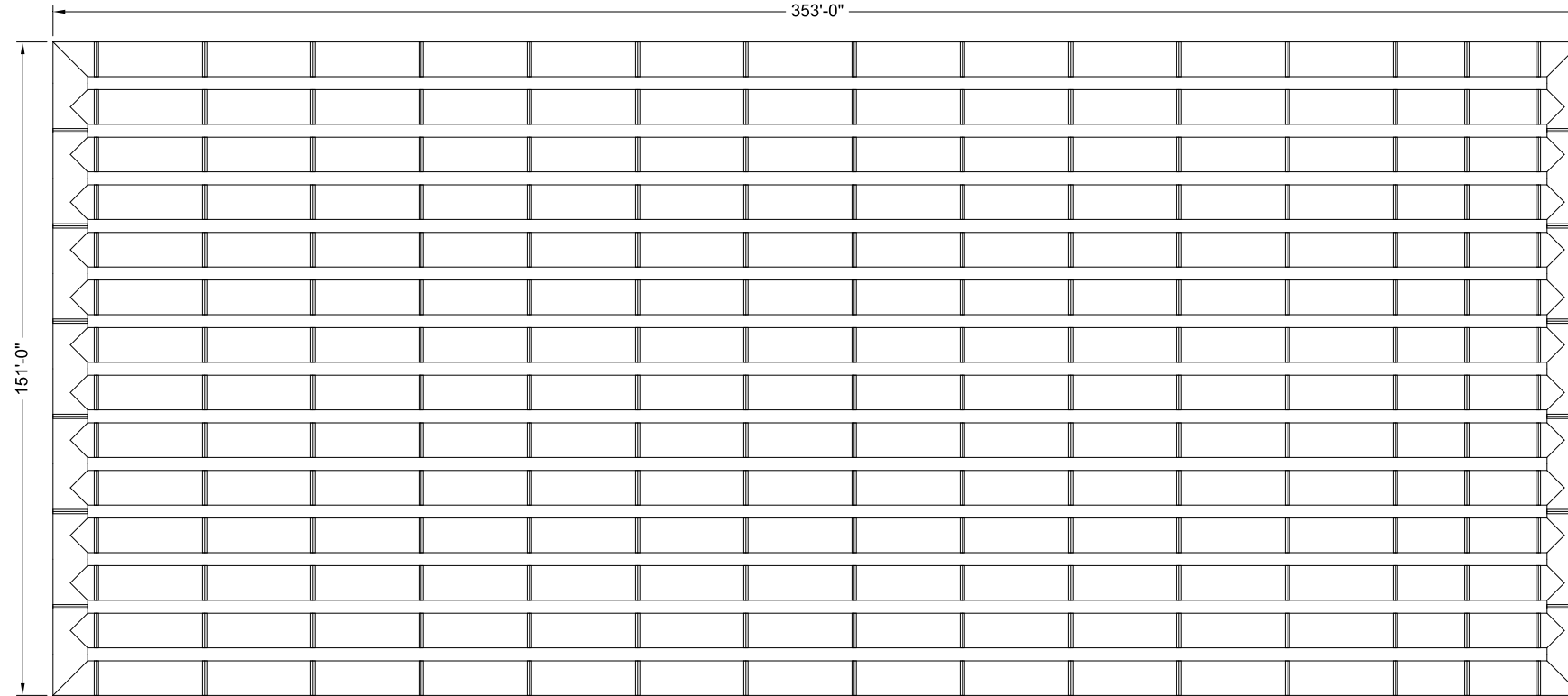
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

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 2²/₃" x 1¹/₂" 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" = 40'

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The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.		
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DATE	REVISION DESCRIPTION	BY

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ENGINEERED SOLUTIONS LLC
www.ContechES.com
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800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH
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DYODS
DRAWING

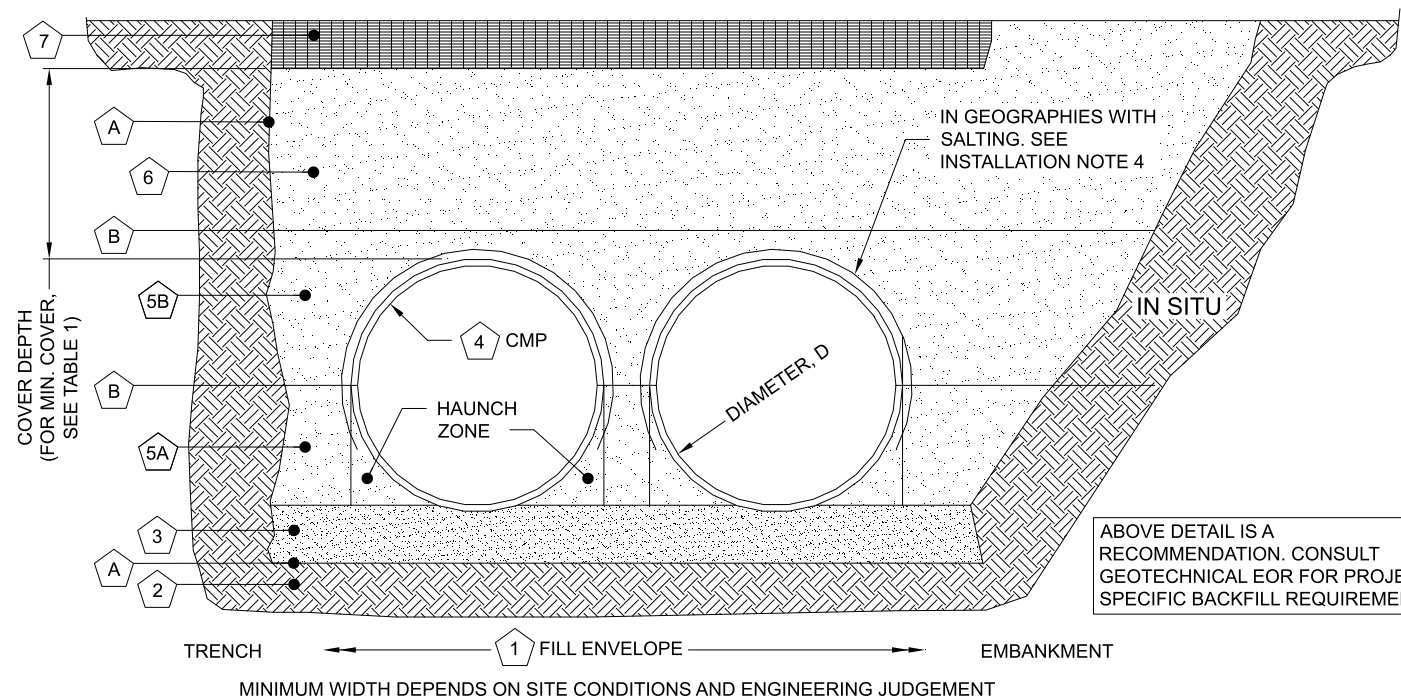
DY036518 20-001 Harvest Landing Retail Center and Business Park
VTTM 38811-3, PARCELS 1-4
Perris, CA
DETENTION SYSTEM

PROJECT No.: 24787	SEQ. No.: 36518	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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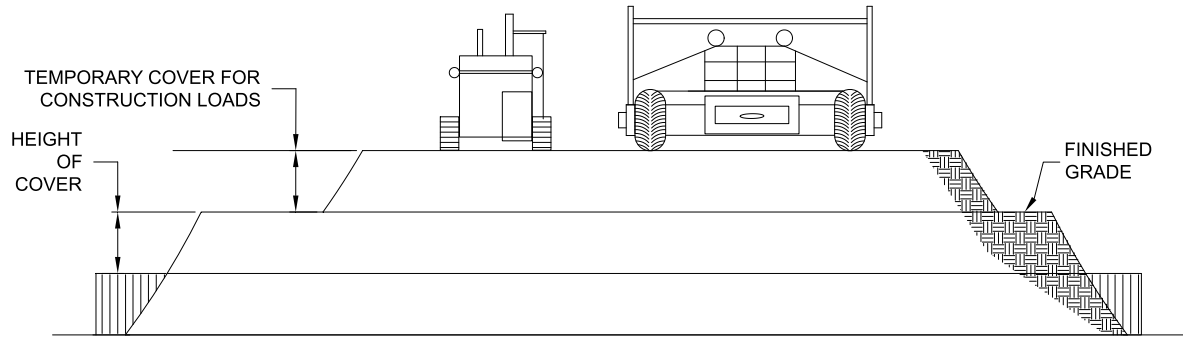
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DY036518 20-001 Harvest Landing Retail Center and Business Park
VTTM 38811-3, PARCELS 1-4
Perris, CA
DETENTION SYSTEM

PROJECT No.: 24787	SEQ. No.: 36518	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 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

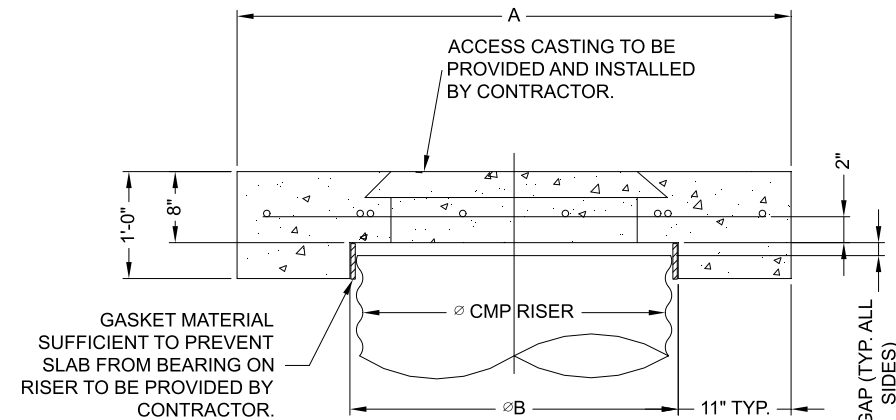
HANDLING AND ASSEMBLY

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.

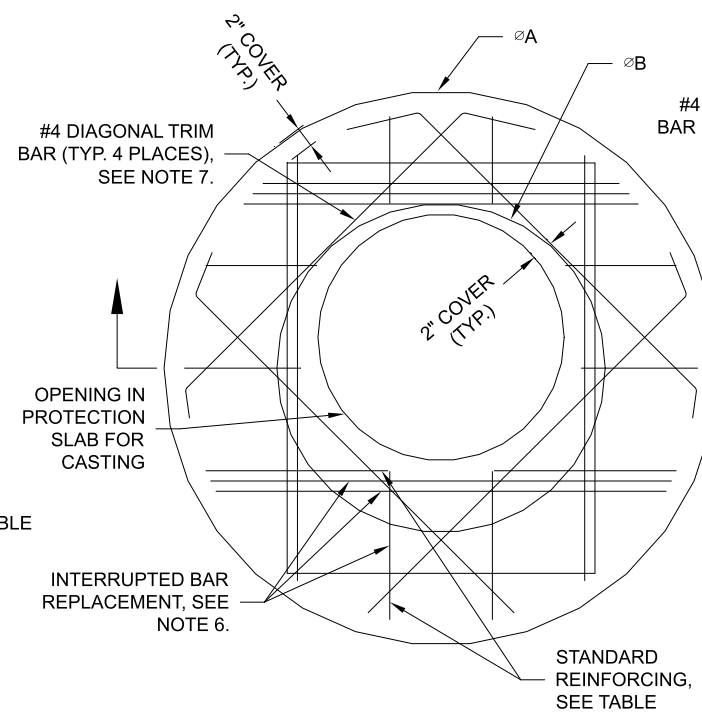
INSTALLATION

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.

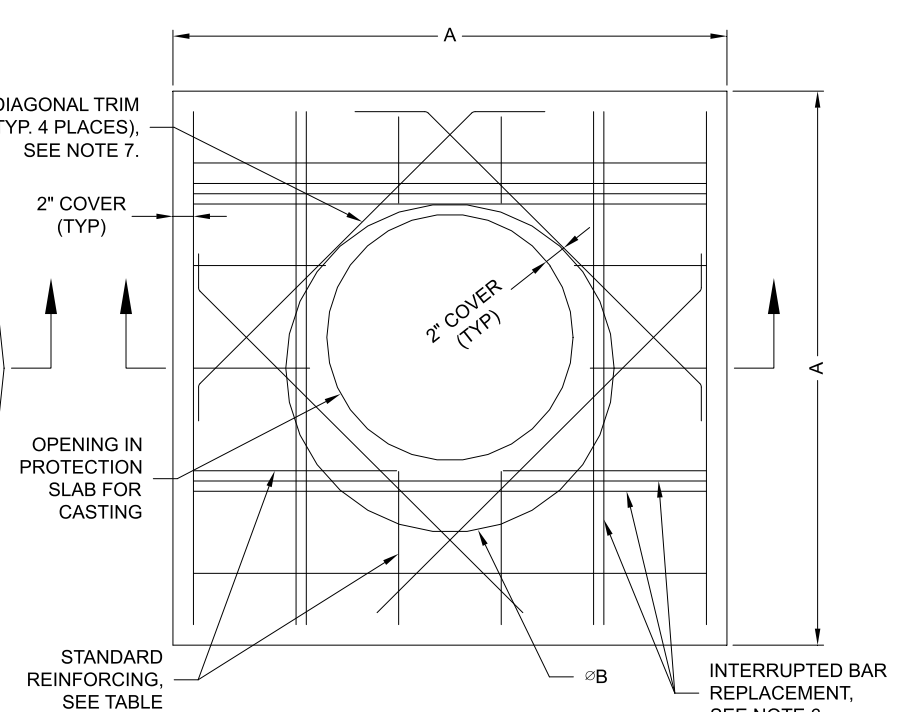
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



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' 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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NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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DY036518 20-001 Harvest Landing Retail Center and Business Park
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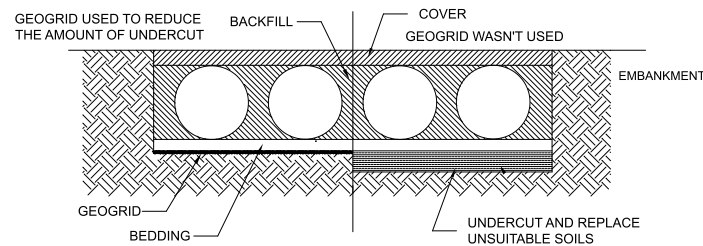
CMP DETENTION INSTALLATION GUIDE

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.

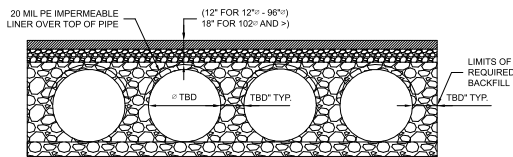
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM 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

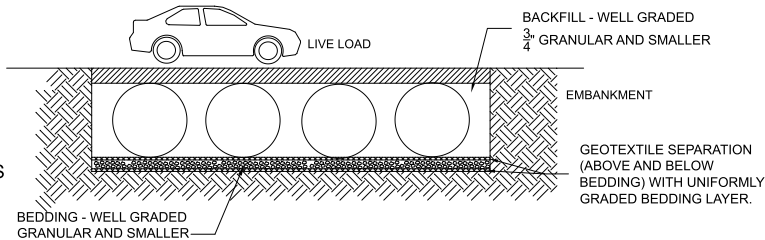
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. 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

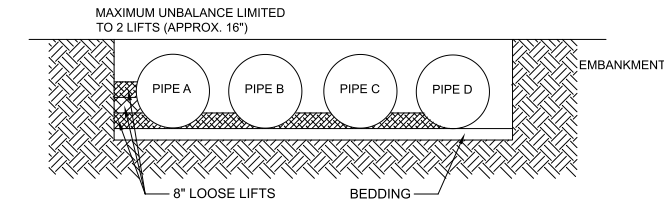
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION 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.



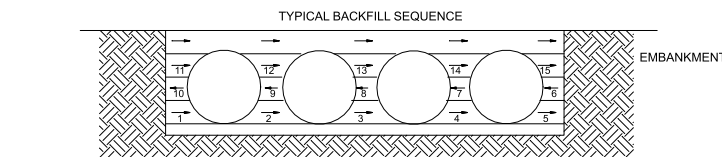
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

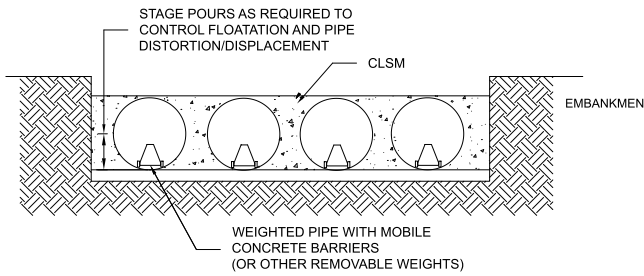


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE 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.

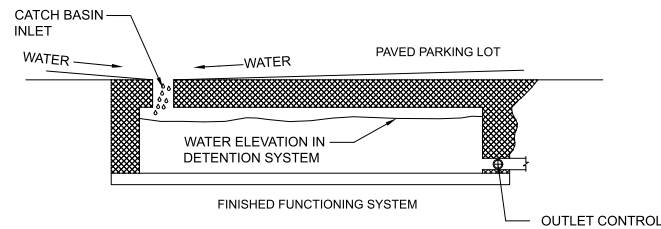


CONSTRUCTION LOADING

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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DY036518 20-001 Harvest Landing Retail Center and Business Park
VTTM 38811-3, PARCELS 1-4
Perris, CA
DETENTION SYSTEM

PROJECT No.: 24787	SEQ. No.: 36518	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

Santa Ana Watershed - BMP Design Volume, V_{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 9**

BMP Identification

BMP NAME / ID **Offsite Bioretention Basin**

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85} = **0.60** inches

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	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
9-1A	166666.11	Roofs	1	0.89	148666.2			
9-1C	629913.07	Concrete or Asphalt	1	0.89	561882.5			
796579.18		Total			710548.7	0.60	35527.4	

Proposed Volume must be greater than the Design Capture Volume

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 9**

BMP Identification

BMP NAME / ID **S9-2 Modular Wetlands**

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity

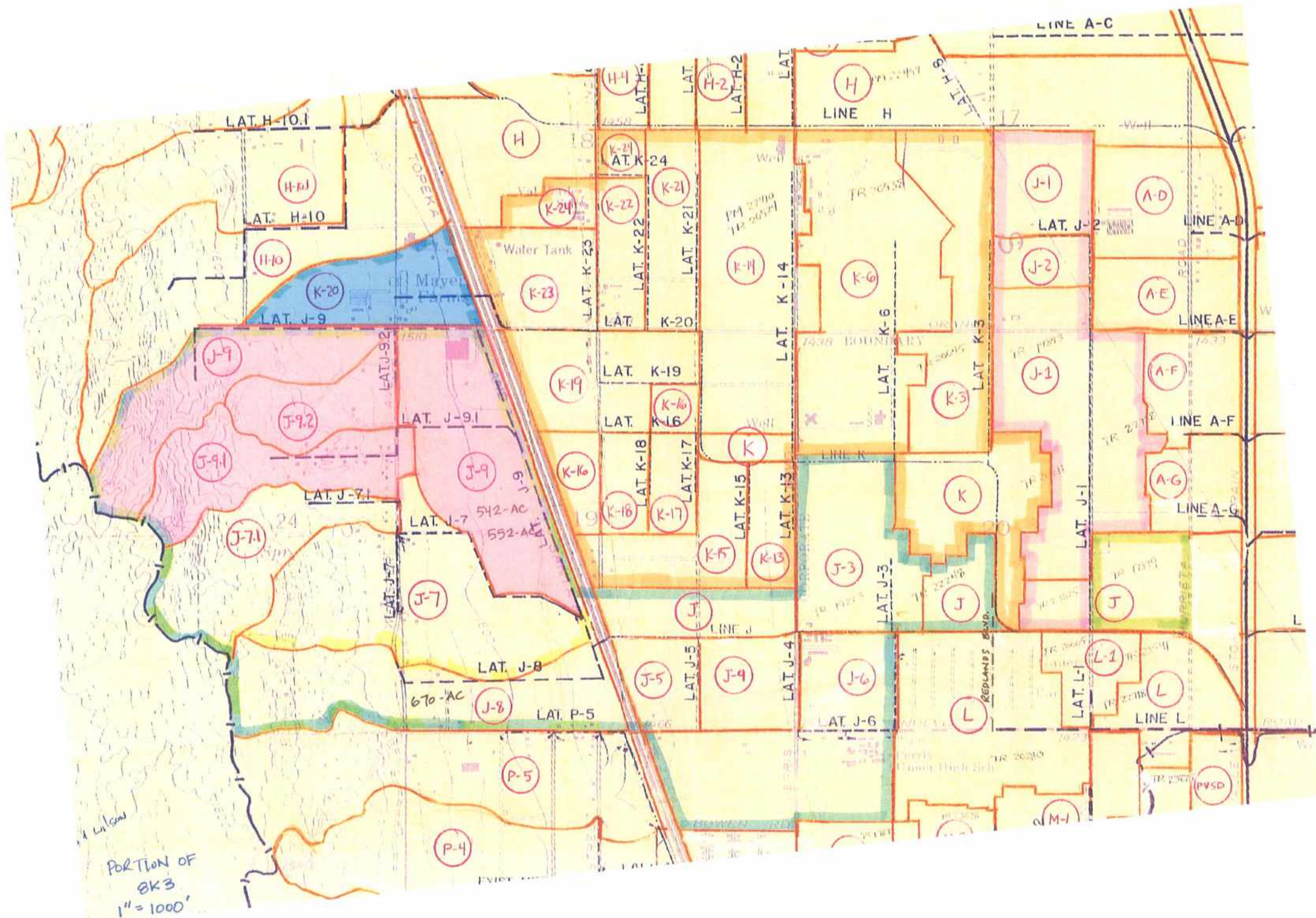
I = **0.20** in/hr

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 _f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S9-2A	0	Roofs	1	0.89	0			
S9-2C	87575.2	Concrete or Asphalt	1	0.892	78117.1			
Total					78117.1	0.20	0.36	0.462

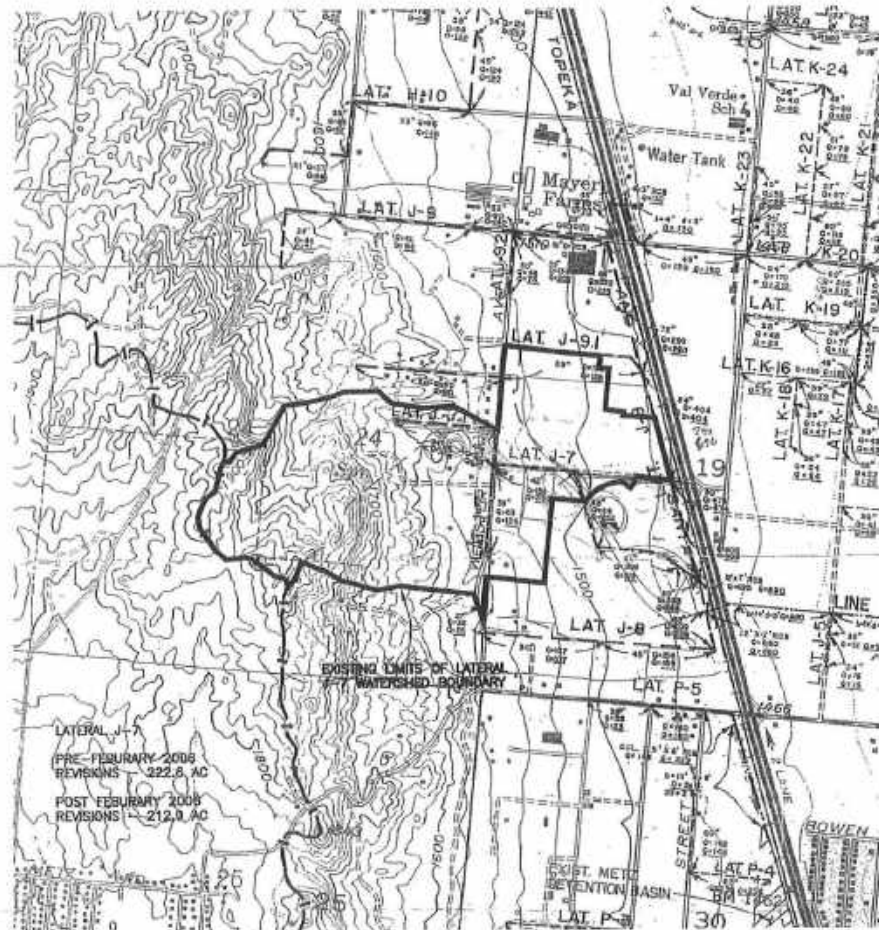
Notes:



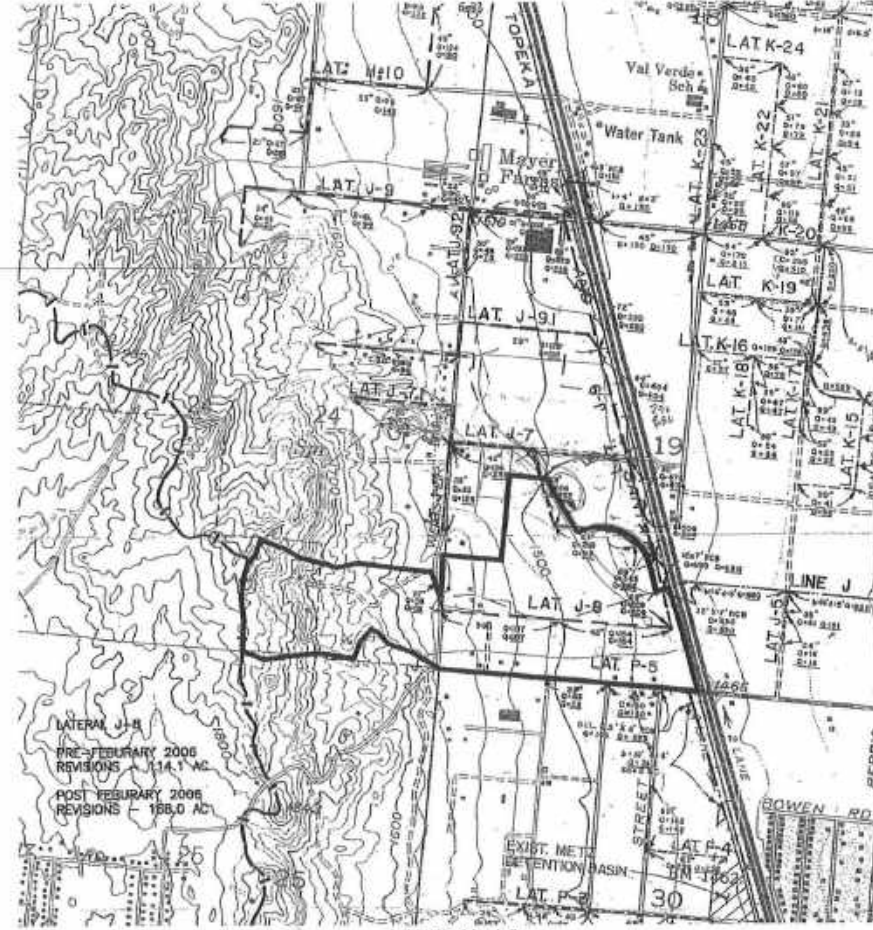
PORTION OF
BK 3
1" = 1000'

REVISED HYDROLOGY MAP PERRIS MASTER DRAINAGE PLAN

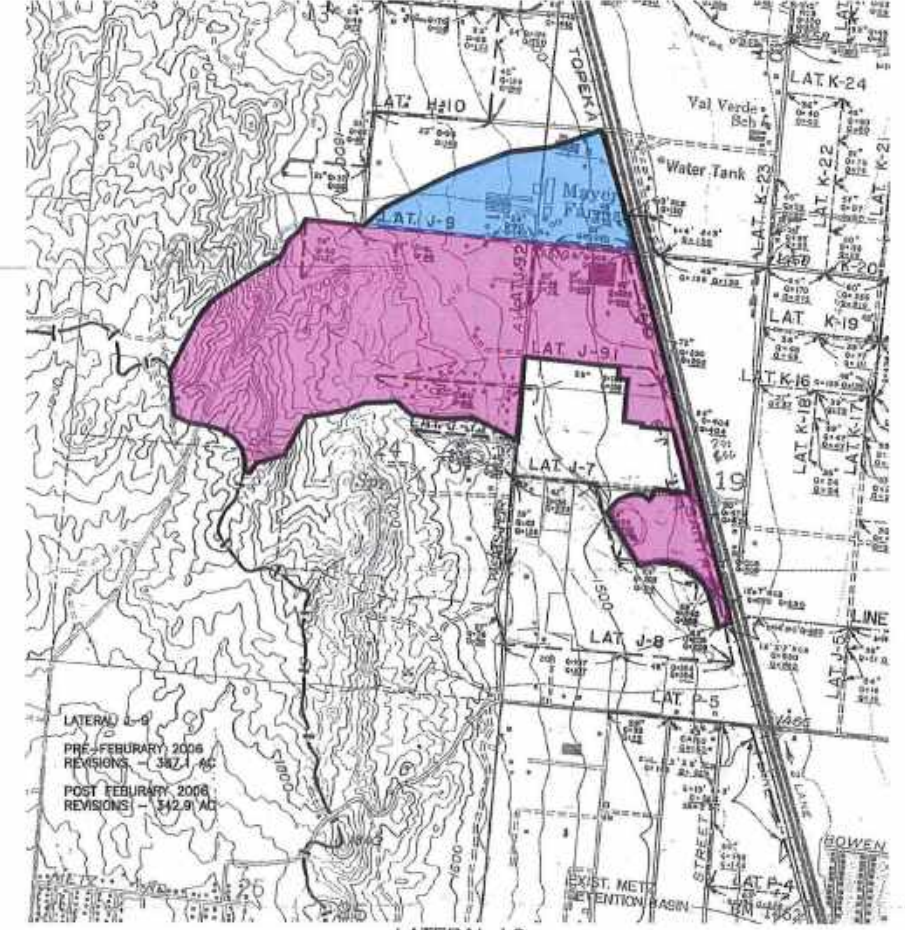
LATERALS J-7, J-8, & J-9



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

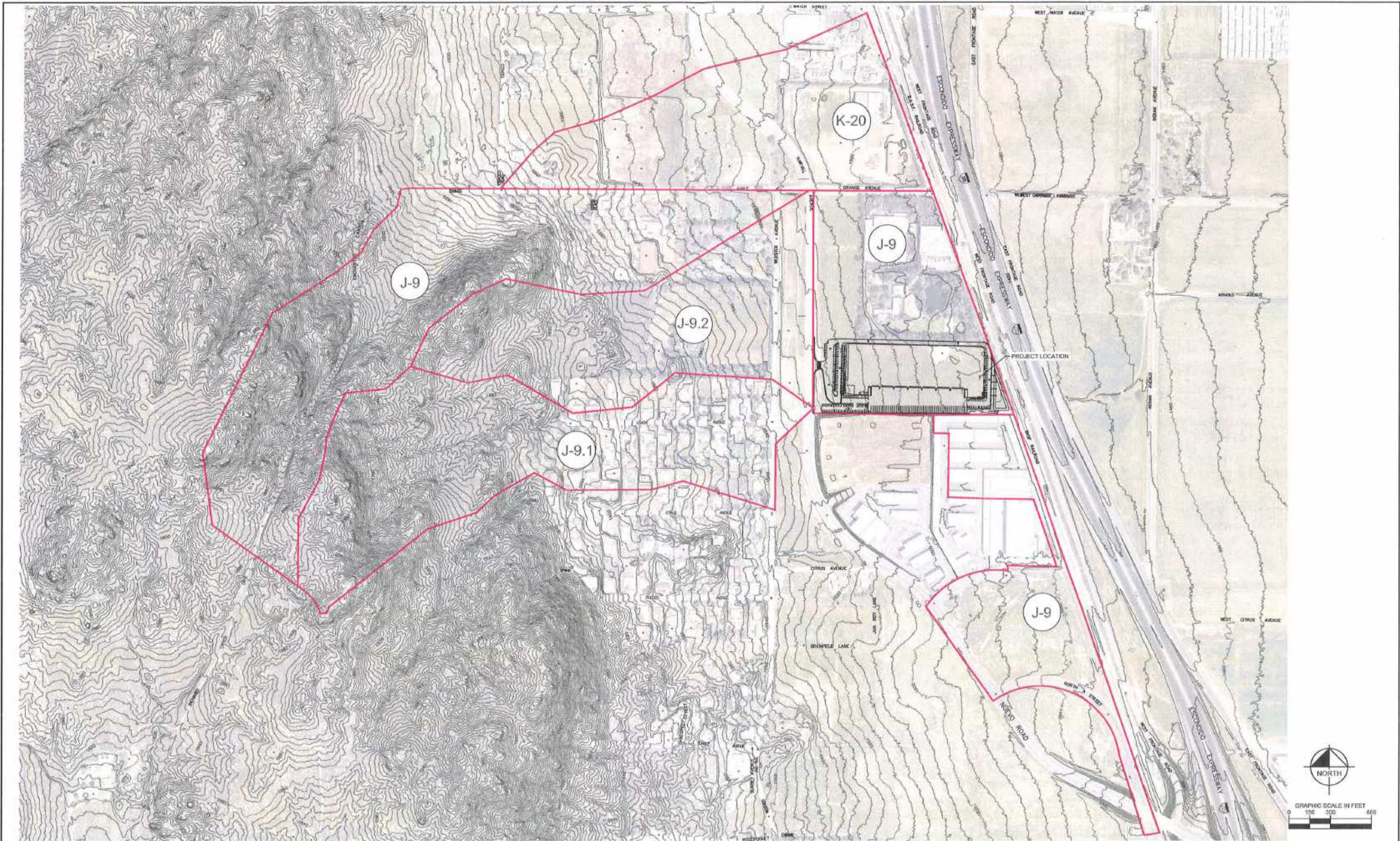
— PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION



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 PLANNING ENGINEER DATE:	APPROVED BY: CHIEF ENGINEER DATE:	ENGINEERING SOLUTIONS ENGINEERING LAND PLANNING SERVICES GROUP 2155 CHICAGO AVENUE, STE. 201 RIVERSIDE, CA 92507 PHONE - (951) 784-0288 FAX - (951) 784-0287 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. 1 OF 1 SHEETS
	DATE BY MARK APPR DATE ENGINEER REVISIONS COUNTY	RECOMMENDED DATE	DATE EXP. 06-30-07	FOR: W.O. COUNTY FILE NO.:				



EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

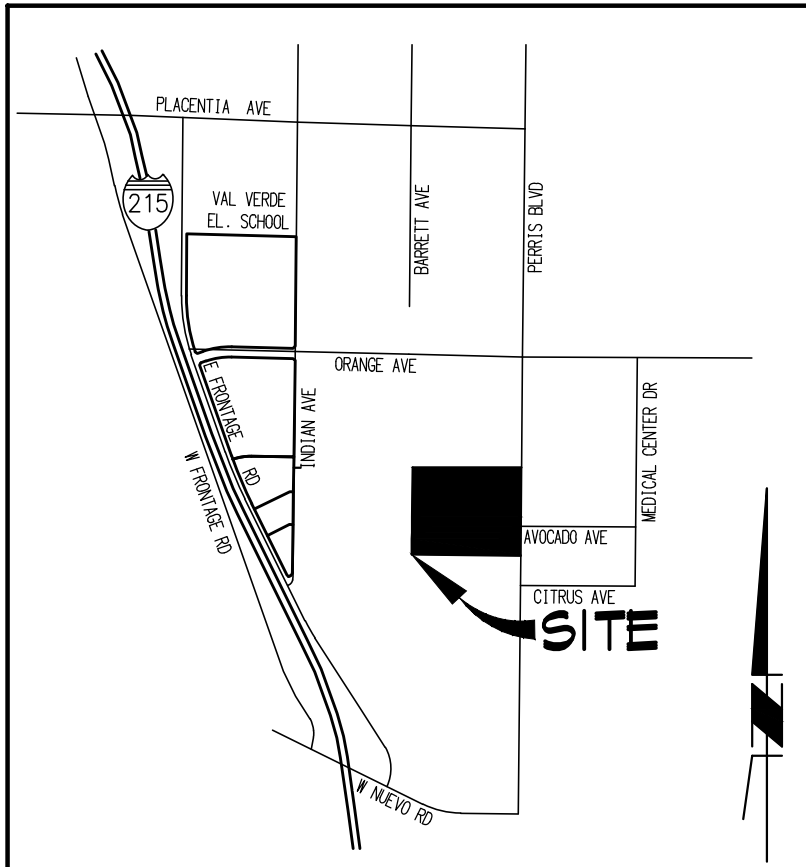
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCDD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

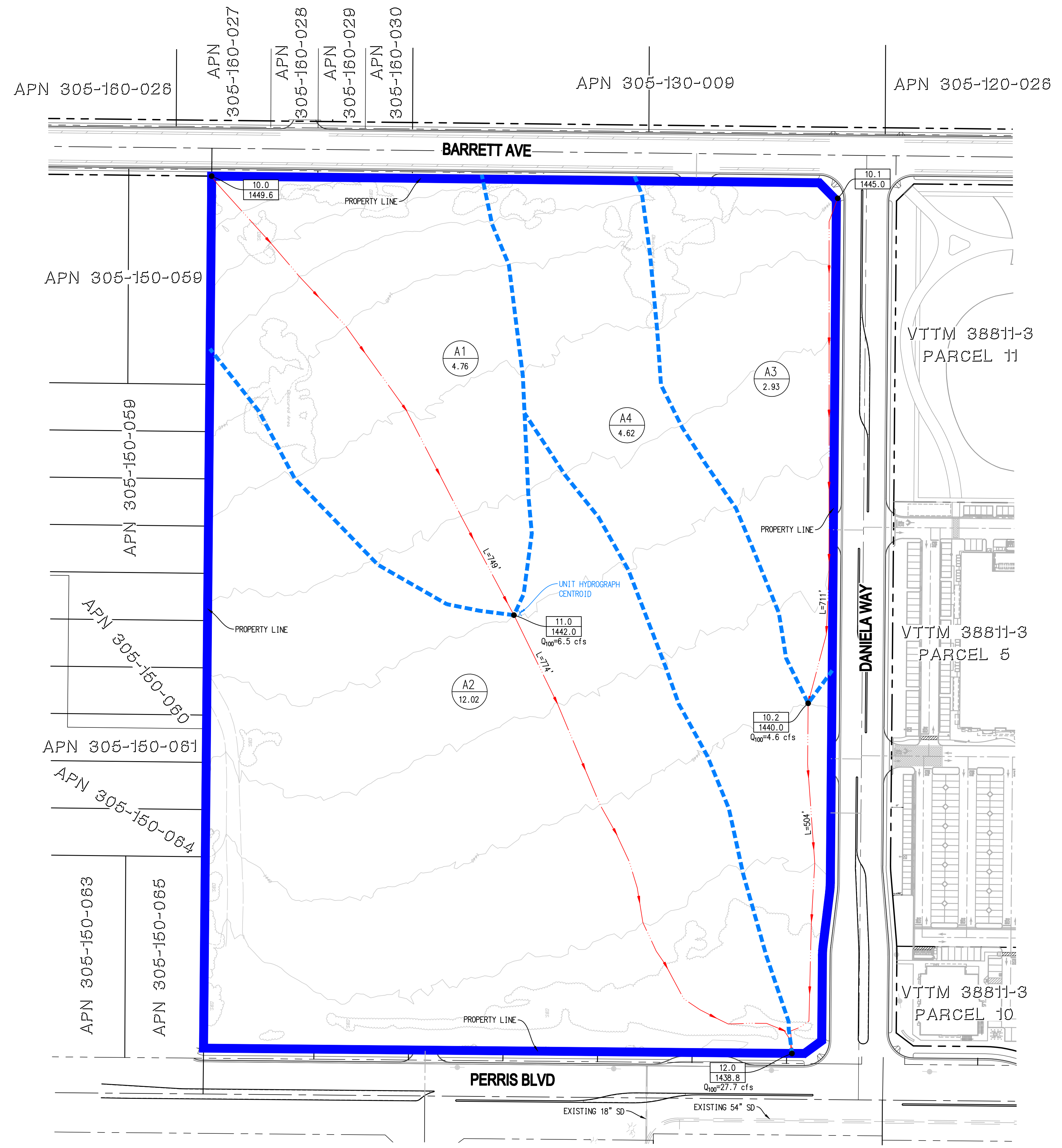
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL
ENGINEERS INC.

29995 TECHNOLOGY DRIVE, SUITE
306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

**HARVEST LANDING
VTTM 38811-3, PARCELS 1-4**

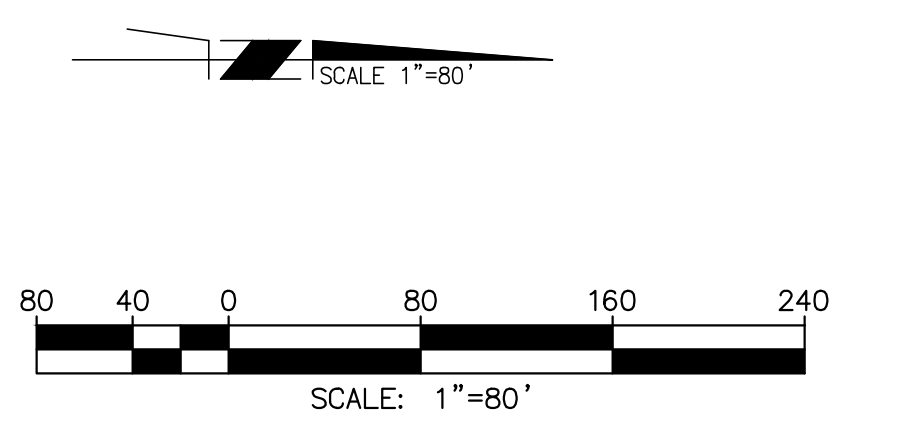
**FIGURE 1
VICINITY MAP**

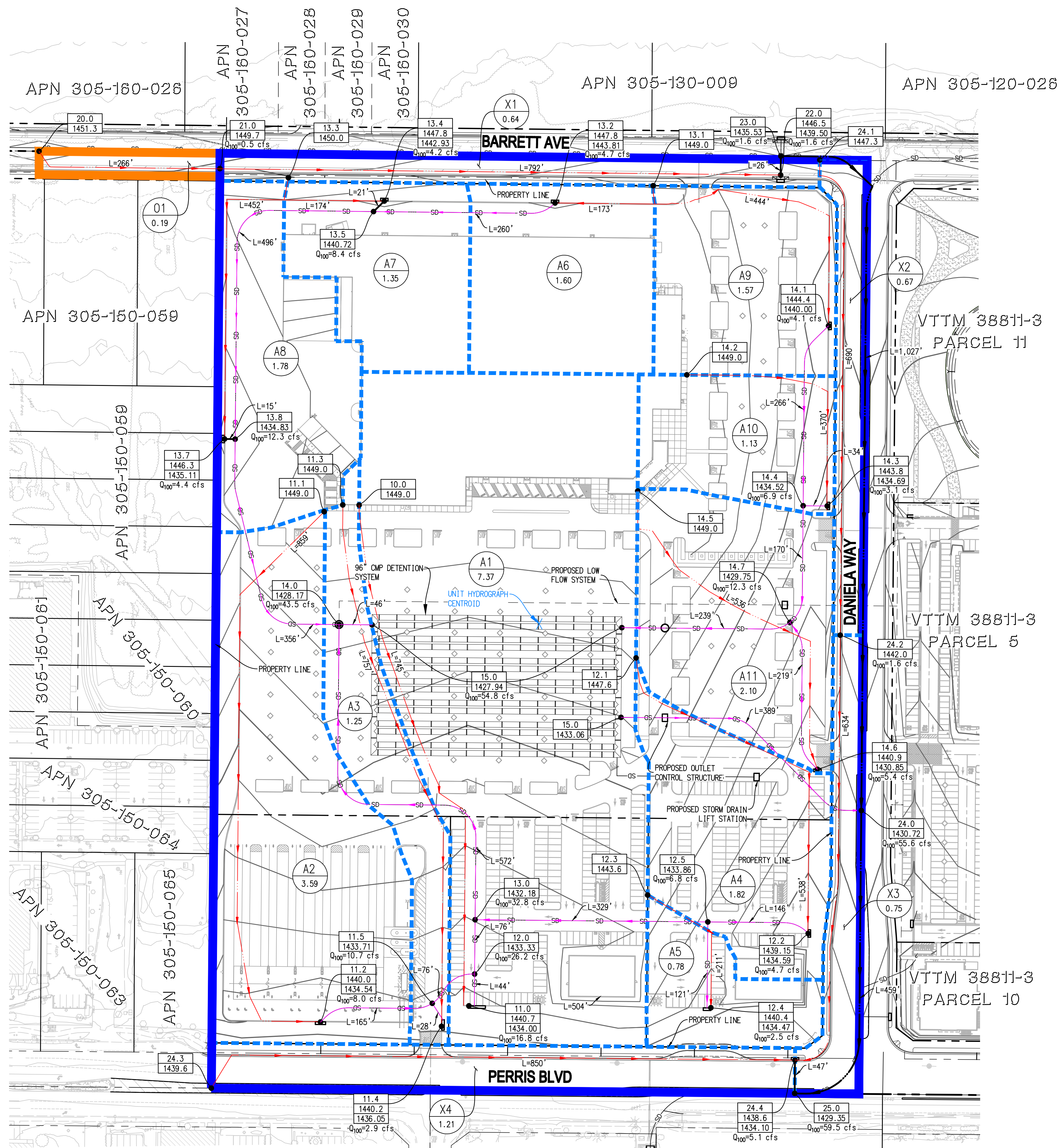


UNIT HYDROGRAPH PARAMETERS

L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,528	754	10.80	0.02

- LEGEND**
- DRAINAGE BASIN NAME
 - DRAINAGE BASIN AREA (AC.)
 - NODE I.D.
 - ELEVATION
 - WATERSHED BOUNDARY
 - SUB-WATERSHED BOUNDARY
 - FLOW DIRECTION

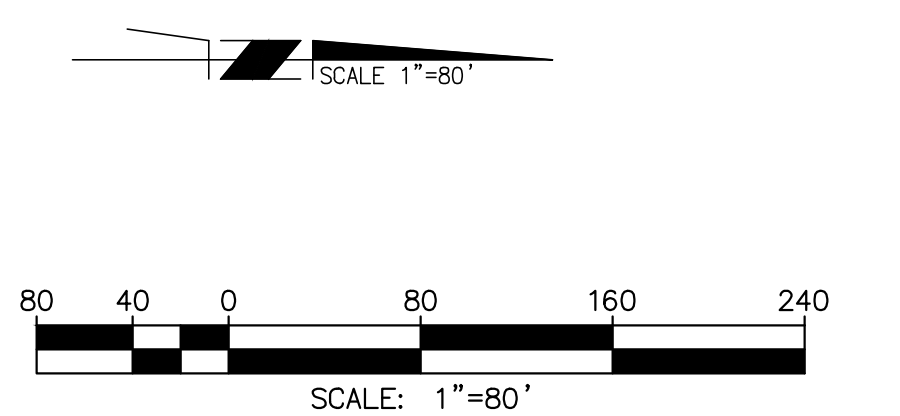




UNIT HYDROGRAPH PARAMETERS




L_{wc} (FT)	L_c (FT)	Δ ELEV (FT)	N (-)
1,495	210	21.06	0.015

- 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





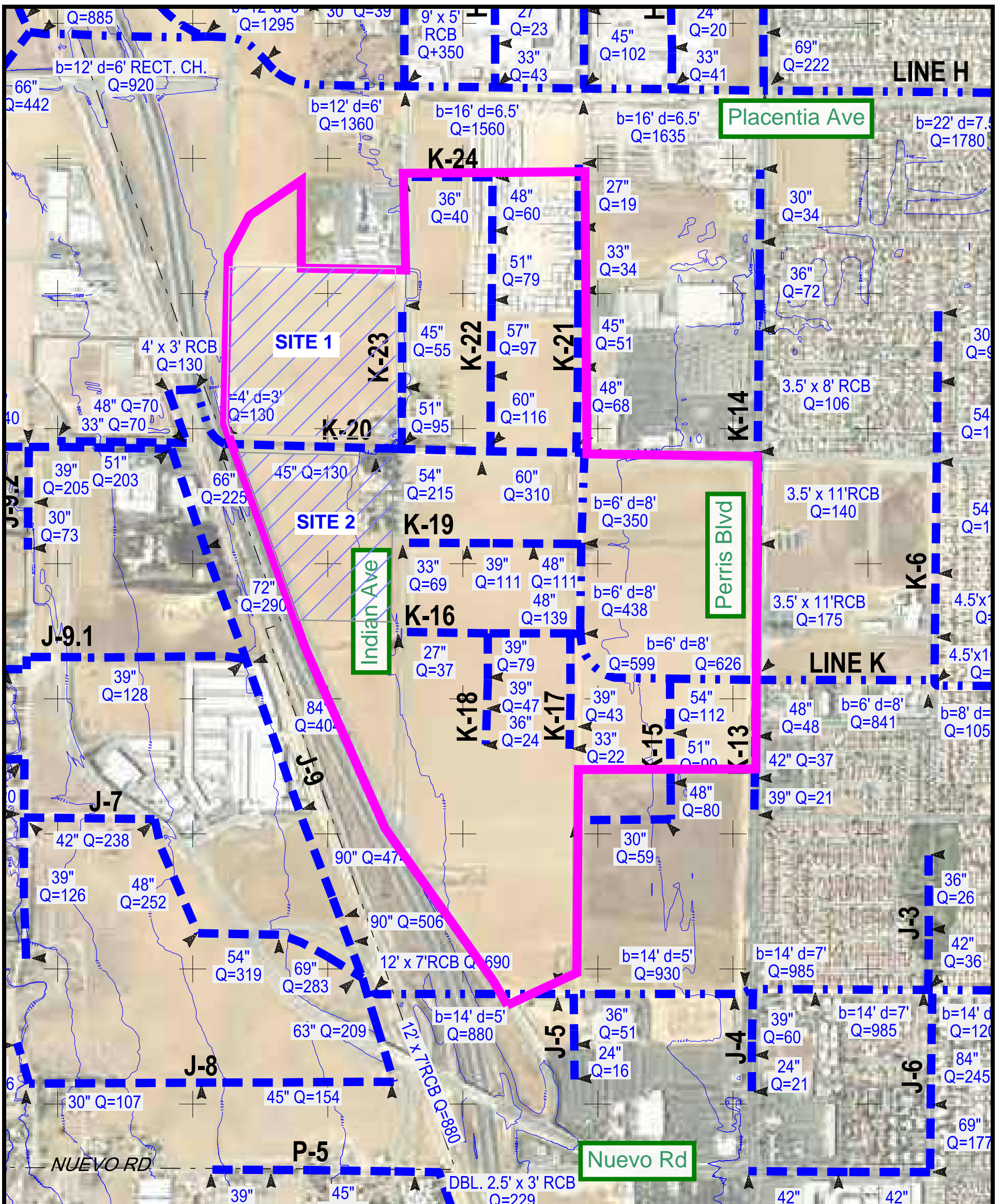
LEGEND

-  BOUNDARY
-  HYDROLOGIC SOIL A
-  HYDROLOGIC SOIL C



0 250 500 ft



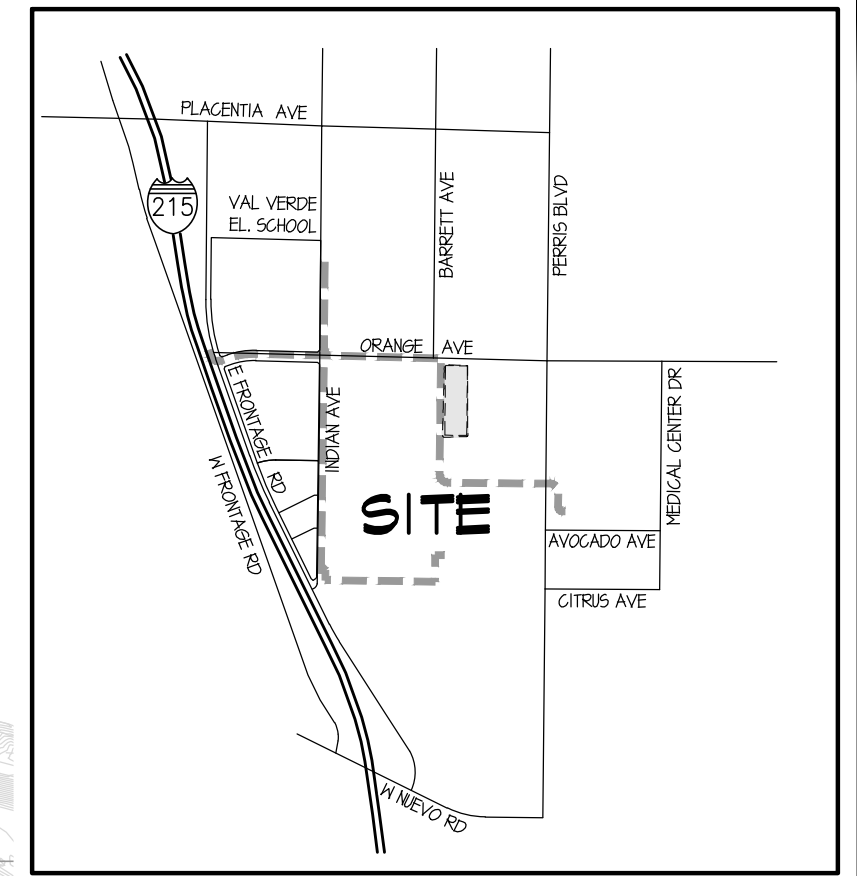


N.T.S.

- Limits of master planned development - Howard Industrial
- RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.
- Site 1 and Site 2



IN THE CITY OF PERRIS,
 COUNTY OF RIVERSIDE, STATE OF CALIFORNIA
HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

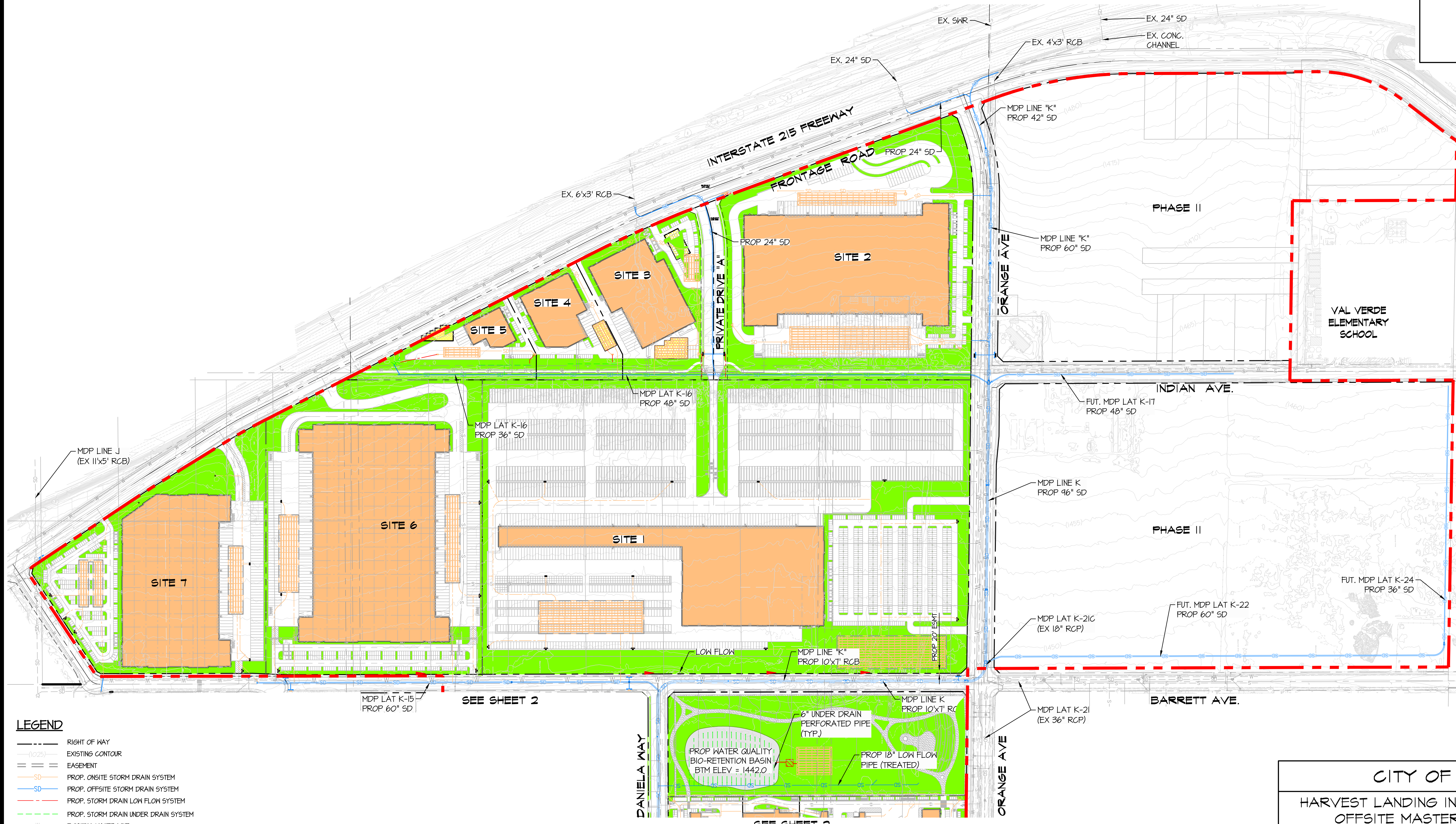


VICINITY MAP
 T4S, R3W, SEC 19
 NOT TO SCALE

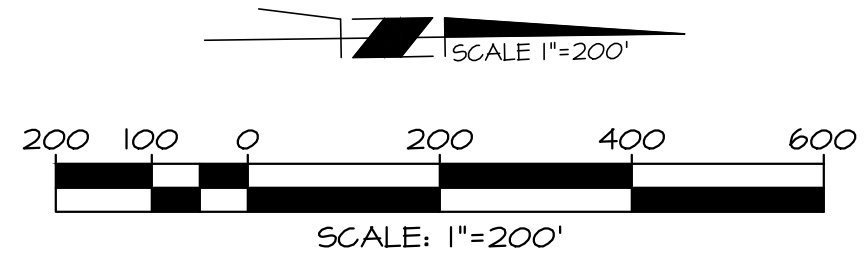
APPLICANT/OWNER
 HOWARD INDUSTRIAL PARTNERS
 1444 NORTH TUSTIN STREET, SUITE 122
 ORANGE, CA 92665
 CONTACT: TIM HOWARD
 (TEL) 714-769-4155

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
 - LFW PROP. STORM DRAIN LOW FLOW SYSTEM
 - UDS PROP. STORM DRAIN UNDER DRAIN SYSTEM
 - W EXISTING WATER LINE
 - W PROP. WATER LINE
 - SWR 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	FMCIVIL ENGINEERS INC.	41810 KALMA STREET, SUITE 120 MURRIETA, CA 92562 951.913.0202 - FMCIVIL.COM	SHEET
DATE: OCT. 2024			1
DESIGNED: AJ			
CHECKED: FM			
PLN CK REF:			
			OF 2 SHEETS

P:\DATA\20-001-HARVEST LANDING\DWG\PLANS\EXHIBIT\EXHIBIT\1-215-2024-4-55.DWG DANNY 10/17/2024 4:55 PM

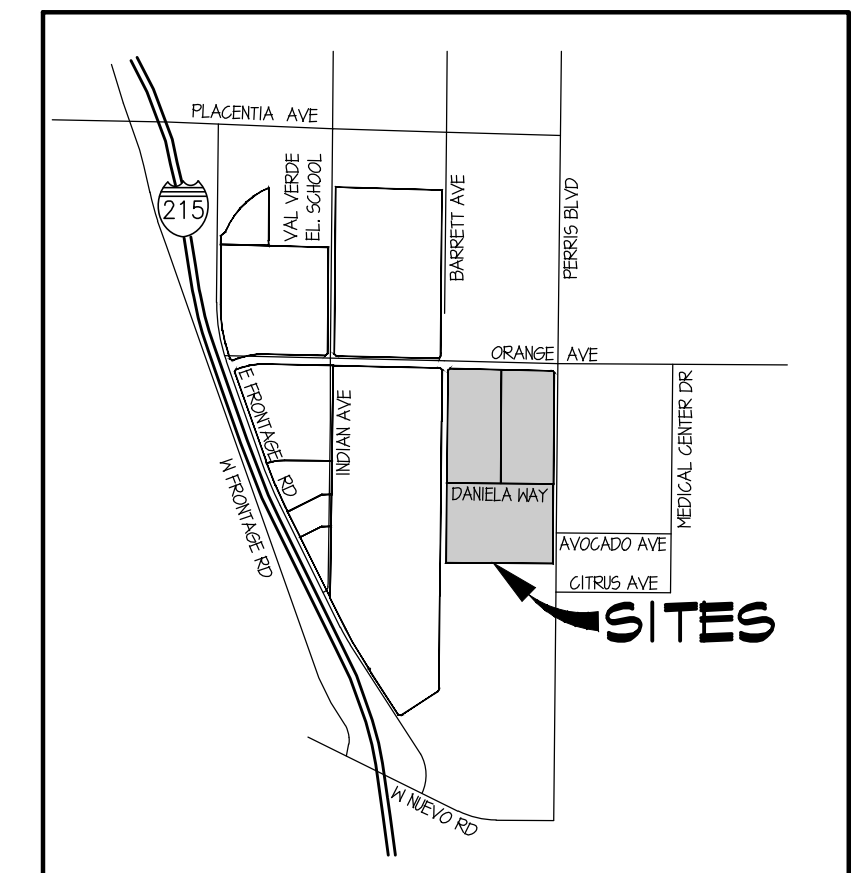
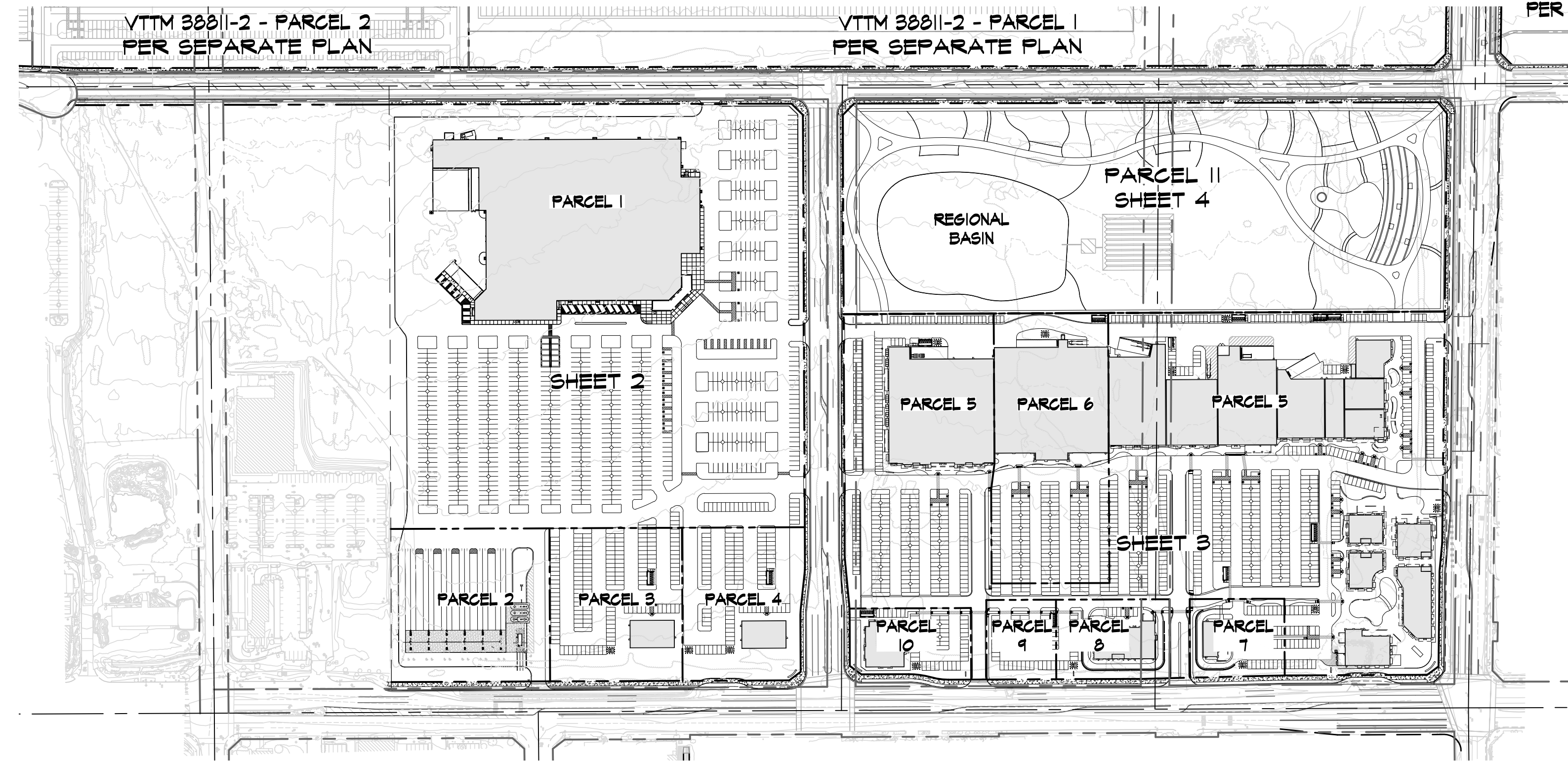
LEGEND

- (1025)— EXISTING CONTOUR
- 1025— PROPOSED CONTOUR
- A— RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- W— PROPOSED WATER LINE
- SS— EXISTING SHW LINE
- SS— PROPOSED SEWER LINE
- SD— EXISTING STORM DRAIN PIPE
- SD— PROPOSED STORM DRAIN PIPE
- E— EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-II

TTM 38810
PHASE 2
PER SEPARATE
PLAN



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)951-413-0202

ARCHITECT
MMA ARCHITECTURE
120 WEST LIME AVE.
MONROVIA, CA 91016
CONTACT: DANIEL KIM
(TEL)626-583-8348

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:

305-110-015, 016, 022 thru 027, 032 thru 035, #
305-140-012, 024 thru 027, 031, 032, 034, 040, 041, 044 thru 050, 052 thru 061

LEGAL DESCRIPTION

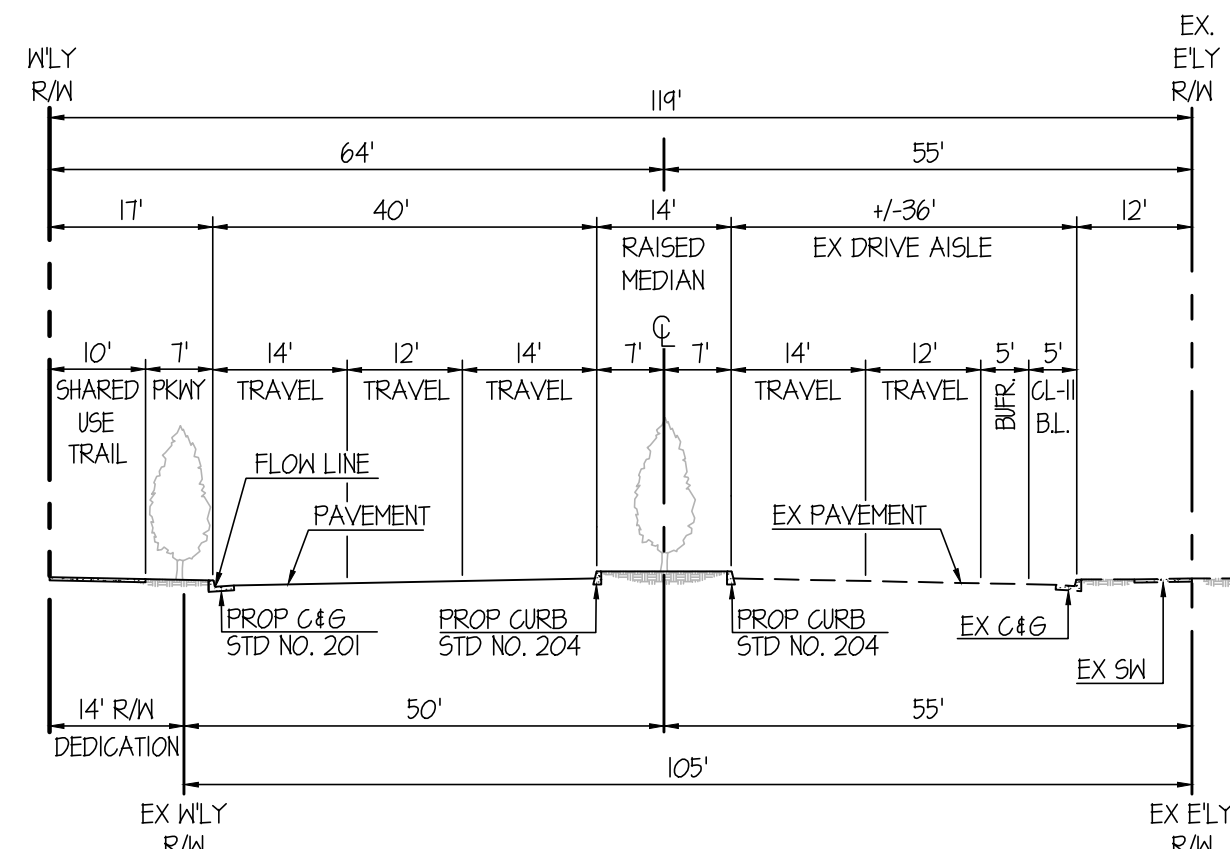
BLOCKS 1-3, 8-14, AND 19-20 OF FIGADOTA FARMS NO. 6 AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 77.



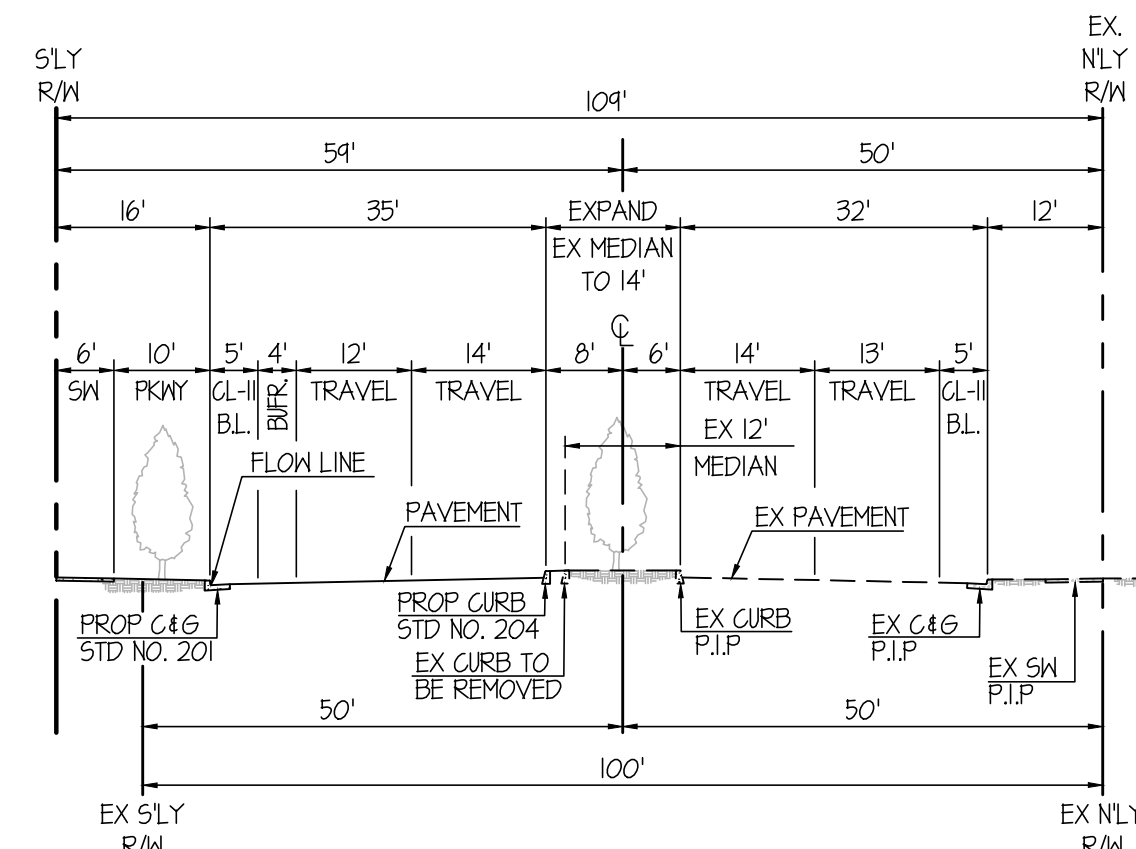
EARTHWORK ESTIMATE:

RAW CUT: 6,665 CY
RAW FILL: 261,405 CY
NET: 254,740 CY IMPORT

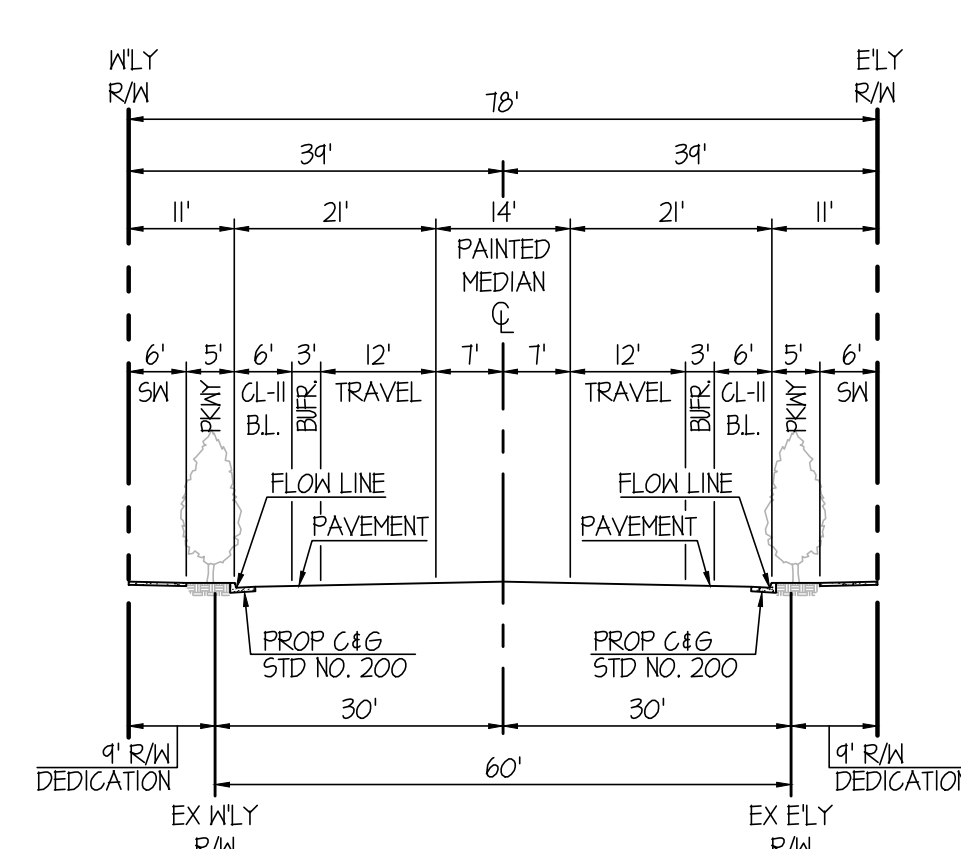
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 19,595



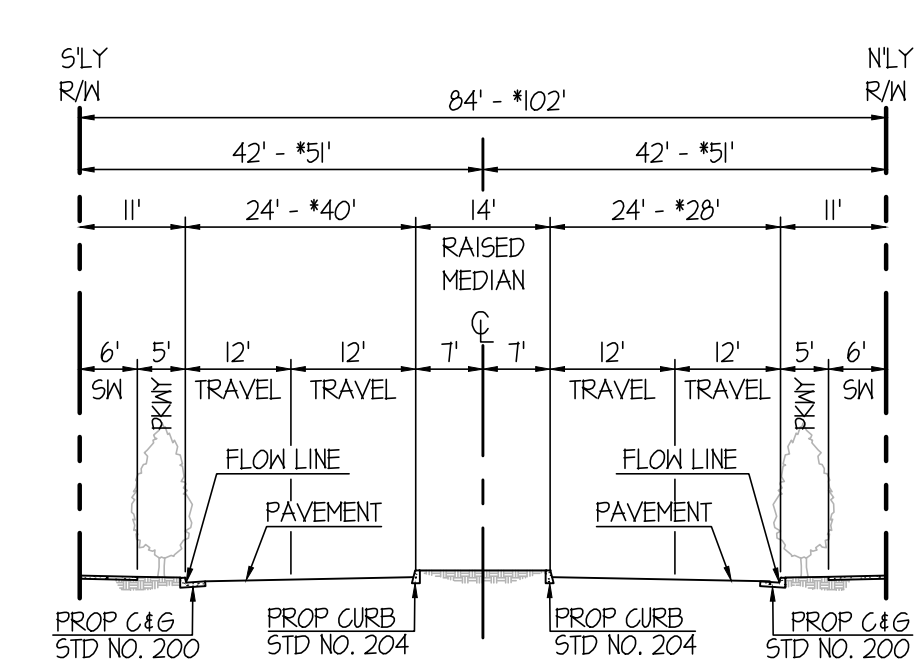
**PERRIS BOULEVARD
PRIMARY ARTERIAL**
(114/90')



**ORANGE AVENUE
(WEST OF PERRIS BLVD)
SECONDARY ARTERIAL**
(109/80')



**BARRETT AVE
(N'LY WALMART DWY - ORANGE AVE)
MAJOR COLLECTOR**
(181/56')



**DANIELA WAY
MODIFIED COLLECTOR**
(84/62')

CITY OF PERRIS

**HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-12**

SCALE: AS SHOWN	SHEET
DATE: OCT. 2024	FMCIVIL ENGINEERS INC.
DESIGNED: AJ	
CHECKED: FM	
PLN CK REF:	
4870 KALMIA STREET, SUITE 120 MURRIETA, CA 92562 951.413.0202 - FMCIVIL.COM	
OF 4 SHEETS	

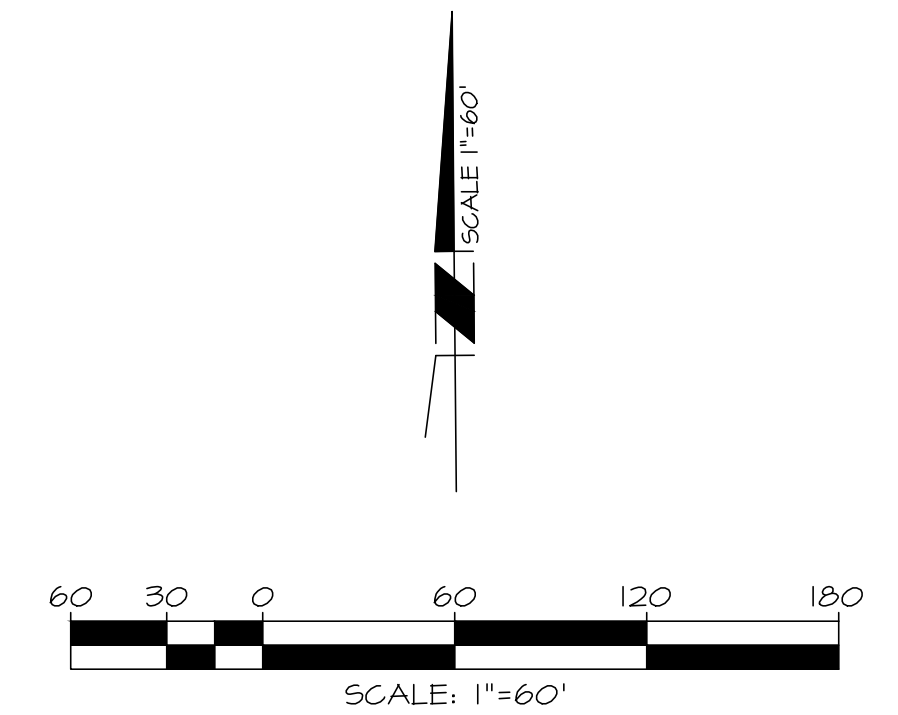
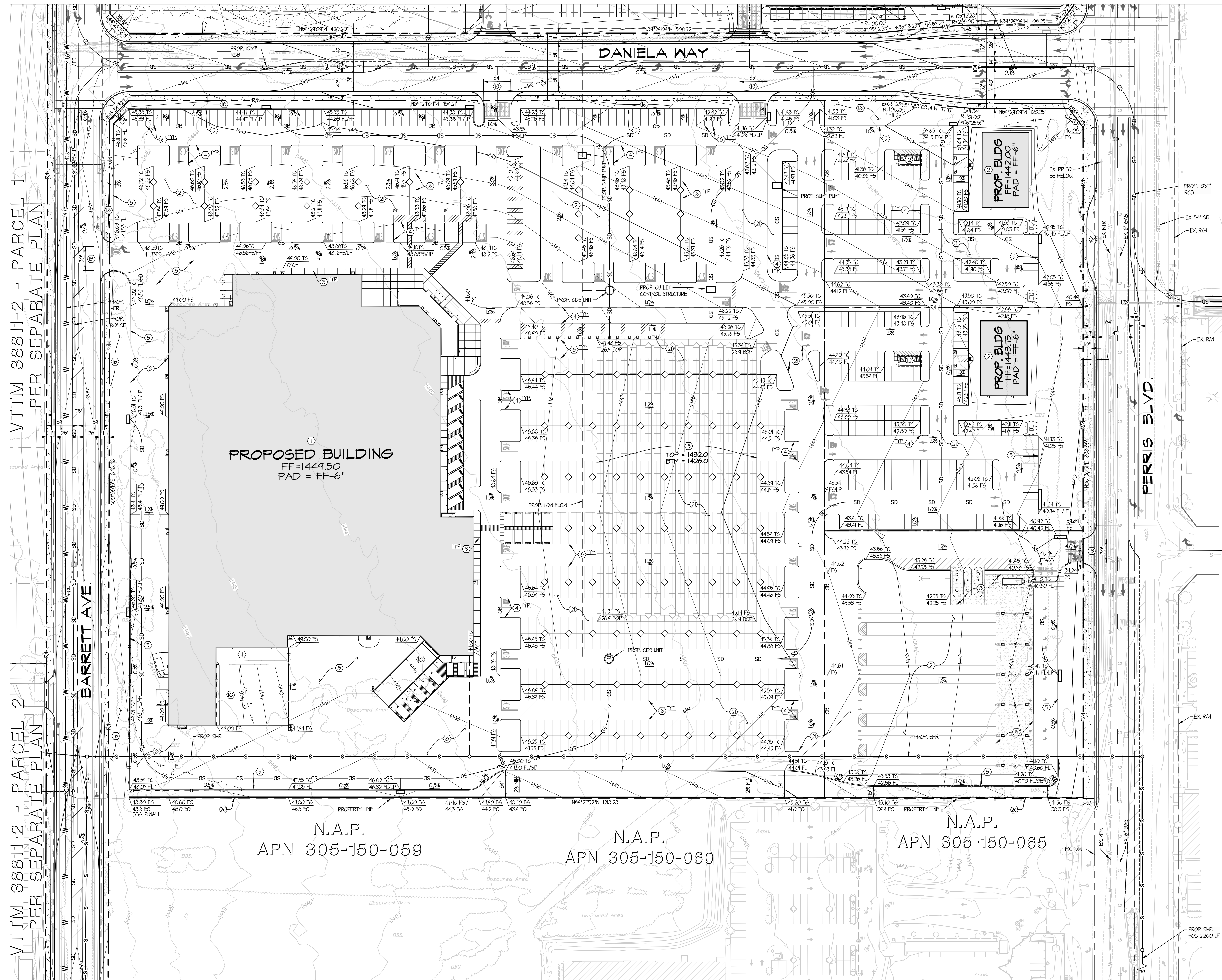
I:\PROJECTS\20-001-HARVEST LANDING\WORKS\PERMITS\ENTIREMENT\CUP\VAL-3\RETAIL\20-001-CUP-RET-CG-01.DWG - ALLAN 10/9/2024 9:59 AM

SEE SHEET 4

SEE SHEET 3

SITE PLAN KEYNOTES

- ① PAINTED CONCRETE TILT-UP RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
- ② PAINTED STUCCO FRAMING RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
- ③ ON SITE ACCESSIBLE SIDEWALK AND CURB RAMP.
- ④ CONCRETE CURB
- ⑤ CONCRETE CURB & GUTTER
- ⑥ STANDARD PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑦ HANDICAP PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑧ PORTLAND CONC. CEMENT (PCC) PAVED TRUCK ACCESS PER ARCHITECT'S PLANS
- ⑨ PORTLAND CONC. CEMENT (PCC) PAVED PARKING PER ARCHITECT'S PLANS
- ⑩ DEPRESSED LOADING DOCK PER ARCHITECT'S PLANS
- ⑪ TRASH COMPACTOR PER ARCHITECT'S PLANS
- ⑫ TRASH ENCLOSURES WITH ROOF PER ARCHITECT'S PLANS
- ⑬ COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD. 201A
- ⑭ DETENTION BASIN
- ⑮ UNDERGROUND DETENTION CHAMBER SYSTEM - 96" CMP - TOP AND BOTTOM OF PIPE (BOP) ELEVATION PER PLAN
- ⑯ LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
- ⑰ CHAIN LINK FENCE PER ARCHITECT'S PLANS
- ⑱ APPROXIMATE LOCATION OF MONUMENT PROJECT SIGNS PER ARCHITECT'S PLANS
- ⑲ APPROXIMATE LOCATION OF ELECTRIC TRANSFORMERS
- ⑳ RETAINING WALL PER ARCHITECT'S PLANS
- ㉑ ASPHALT CONCRETE (AC) PAVED PARKING ARCHITECT'S PLANS
- ㉒ PROPOSED CONCRETE RIBBON GUTTER
- ㉓ COMPACT PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ㉔ BUS TURNOUT PER RIVERSIDE COUNTY STD. 814



CITY OF PERRIS

**HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-4**

SCALE: AS SHOWN	SHEET
DATE: OCT. 2024	2
DESIGNED: AJ	
CHECKED: FM	
PLN CK REF:	

4810 KALMA STREET, SUITE 120
MURRIETA, CA 92562
951.913.0202 - FMCIVIL.COM

F:\PROJECTS\38811-3 HARVEST LANDING\DWGS\PERMITS\ENTIREMENT\GUP\VAL-3\RETAIL\38811-3-001-CUP_RETAIL-CC-01.DWG - ALLAN - 10/9/2024 4:01 PM

VTM 38811-2 - PARCEL 1
PER SEPARATE PLAN

VTM 38811-2 - PARCEL 2
PER SEPARATE PLAN

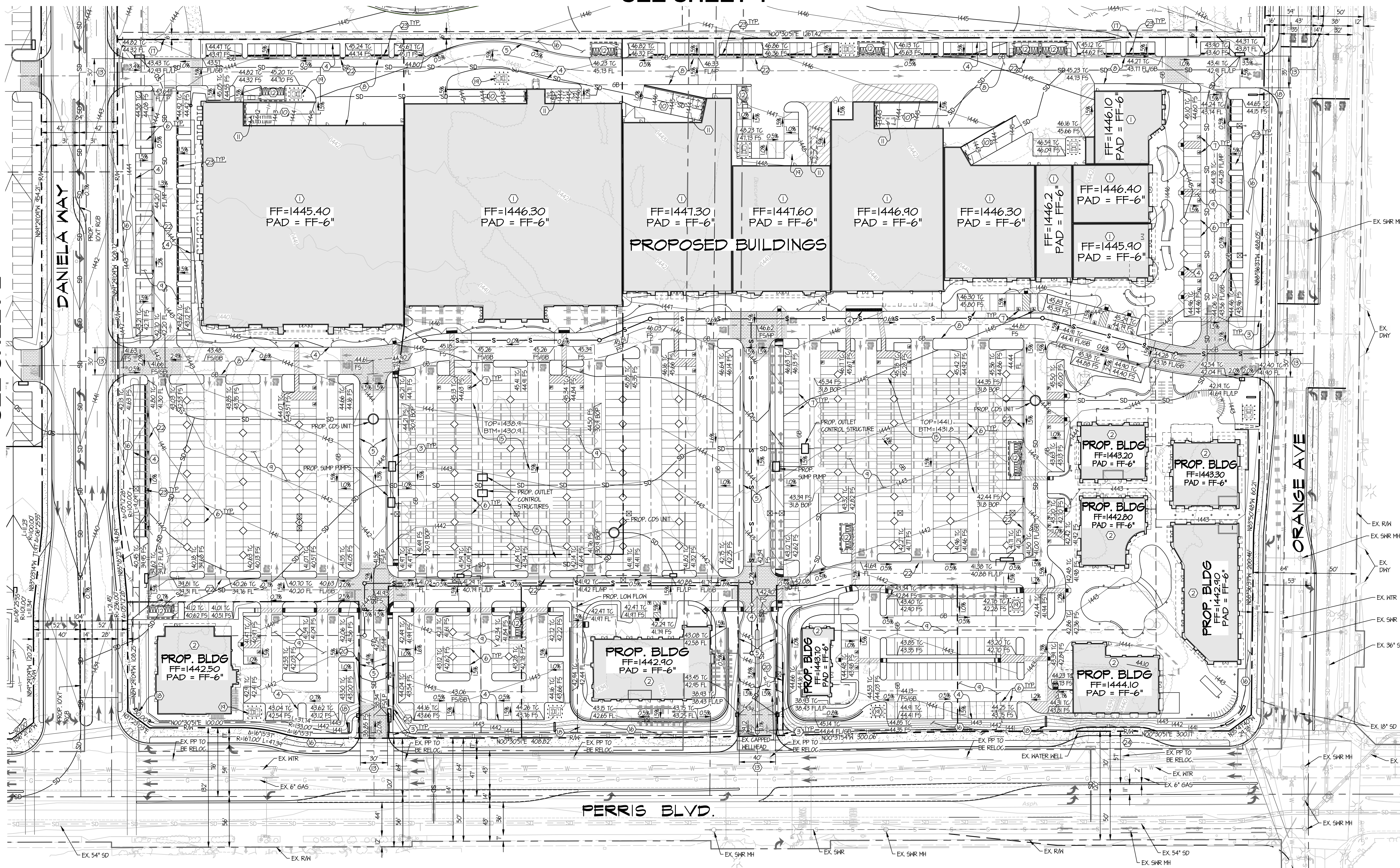
N.A.P.
APN 305-150-059

N.A.P.
APN 305-150-060

N.A.P.
APN 305-150-065

SEE SHEET 4

SEE SHEET 2



SITE PLAN KEYNOTES

- ① PAINTED CONCRETE TILT-UP RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
- ② PAINTED STUCCO FRAMING RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
- ③ ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
- ④ CONCRETE CURB
- ⑤ CONCRETE CURB & GUTTER
- ⑥ STANDARD PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ⑦ HANDICAP PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
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- ⑩ DEPRESSED LOADING DOCK PER ARCHITECT'S PLANS
- ⑪ TRASH COMPACTOR PER ARCHITECT'S PLANS
- ⑫ TRASH ENCLOSURES WITH ROOF PER ARCHITECT'S PLANS
- ⑬ COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD. 207A
- ⑭ DETENTION BASIN
- ⑮ UNDERGROUND DETENTION CHAMBER SYSTEM - 96" CMP - TOP AND BOTTOM OF PIPE (BOP) ELEVATION PER PLAN
- ⑯ LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
- ⑰ CHAIN LINK FENCE PER ARCHITECT'S PLANS
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- ㉓ COMPACT PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
- ㉔ BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

CITY OF PERRIS

**HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 5-10**

SCALE: AS SHOWN	SHEET
DATE: OCT. 2024	3
DESIGNED: AJ	
CHECKED: FM	
PLN CK REF:	

4810 KALMA STREET, SUITE 120
MARRIETA, GA 30062
951.913.0202 - FMCIVIL.COM

OF 4 SHEETS

