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PRELIMINARY HYDROLOGY REPORT

FOR

Pixior Distribution Center

City of Hesperia, CA

Prepared for:

55555 Amargosa LLC
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Commerce, CA 90040
Tel: 323-423-3105

Prepared by:

Bret Thorpe, P.E.

November 10, 2020

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1. PROJECT DESCRIPTION

1.Project Introduction

The Pixior Distribution Center project is a 444,000-sqft Distribution Warehouse Building located in the City of Hesperia that will create 746,000-sqft of impervious surface. The development site is irregular in shape, approximately 20.17 acres in size. The site is on northwest side of Amargosa Road parallels to the Interstate Freeway 15 on its easterly boundary, between live Oak Lane and California Aqueduct, in the City of Hesperia, California. The project will construct a Warehouse with office building on the center of the project site. The subject site is part of the Mojave River Watershed.

The purpose of this Preliminary Hydrology Report of to demonstrate that the proposed site can be designed to provide adequate flood protection without adversely impacting existing off-site drainage system and any other adjacent properties.

The report will provide engineering calculations in support of the Pixior Distribution Center development, which will:

1) Analyze the existing and proposed condition Hydrology

2) Provide Basin routing analysis, determine preliminary Basin sizing calculations for the purpose of flow mitigation

3) Provide calculations in support of the project Water Quality Management Plan

5) Provide recommended of the Underground Basin structure information of BMP's

2.Existing Hydrologic Characteristics

The subject site is currently vacant, with the site runoff being directed a sheet flow in a northeast direction toward the South California Edison Power line Easement. An existing open channel is located at the southwest corner of the site. It carries the off-site run-on from the California Aqueduct overshoot crossing the project site to the north direction. Per the Hydrology Report "10200 Amargosa" by David Evans and Associates, this approximate 100 year storm flows crossing the aqueduct overshoot is 211 cfs.

The existing site is flat, with a gentle slope of 2% with little vegetative cover. Hydrologic characteristics of the site, such as the hydrologic soil group, was identified as type A, which is generally described as sandy, loamy sand with a low runoff potential and high infiltration rate potential. The groundwater depth is 41 feet below the existing ground. The soil type is based on the NRCS Soil Survey, which is referenced in Appendix H.

In researching public record, the project site is within the "City of Victorville Master Plan of Drainage" (March 1992), see Appendix H. The drainage pattern for the project area flow in the northeasterly direction.

3.Developed Hydrologic Characteristics

As previously described, the Pixior Distribution Center project is a 450,000-sqft Distribution Warehouse Building and will create 17 acres of impervious surface. The majority of the project footprint will be composed of docks truck loading area, parking lots, fire lane, landscaped areas and driveways.

The project will generally follow the existing condition drainage pattern and will carry runoff to the northeast side of the project. The on-site runoff will be collected into the catch basins with filter inserts, through storm drainpipes routed to a proposed underground Contech perforate CMP Retention/Infiltration Basin System. The underground basin is for the mitigation of increased runoff and the stormwater treatment LID purposes. Since the existing site has no storm drain system to connect to, the on-site runoff well be storage in the underground perforate CMP system that with infiltration and an emergency overflow pipe (riser) on the top to release the flow. The overflow pipe will be connected to a proposed bubbler basin combined with a Drywell, located at the southeast corner of the site; from there the excess will leave the site onto the Amargosa Road through a parkway drain.

In order to meet the NPDES and the city of Hesperia WQMP retirements, the required stromwater treatment LID volume DVC=57,760 cu-ft must be treated. The site BMP's proposed site will use landscaped area for self-treatment & planter boxes for roof drains. However, the LID volume will be treated in the underground perforated CMP system. Additional information of the stomwater treatment calculation & design show in the project Water Quality Management Plan (WQMP) report.

Off-site runoff from Aqueduct on south site of the project will be maintained. Improvements will be made to the channel to capture sediment that travels across the aqueduct. This is done within the channelization of the water with a settling basin. The channel will end prior to the SCE Easement on the norths side of the property conveying the flows onto the property to the north in the current State. No other grading or improvements are proposed in this area. The Max 100 year flows leaving the site onto the neighboring property will be reduced from 256.4 cfs (per Hydrology Report "10200 Amargosa" by David Evans and Associates) to approximately 213.8 cfs.

For the proposed development drainage pattern and drainage system location referring to Appendix B Hydrology Map.

4.Methodology

As previously mentioned, the project design criteria was to determine the required capacity for the onsite storm drain system to safely convey storm water to the public for the 100 year storm, while mitigating the 100 year storm to a discharge level equal to or less than the 100 year existing condition. To do this, hydrologic calculations for the project were performed using CIVILCADD/ CIVILDESIGN Engineering Software, Version 7.0. 'Peak Flow' and 'Time of Concentration' values for each storm event were obtained using the 'San Bernardino County Rational Hydrology Program' option within the software.

The 'Unit Hydrograph Analysis' was performed using the same CIVILCADD/CIVILDESIGN Engineering Software previously mentioned. The unit hydrograph was used to obtain the time distribution of flow, which was performed for the 100-year 24-hour duration and the 10-year 24-hour duration. Once the desired hydrograph was obtained, basin routing was performed by using the same CIVILCADD/CIVILDESIGN Routing Engineering Software.

5.Summary of Hydrologic Results and Recommendations

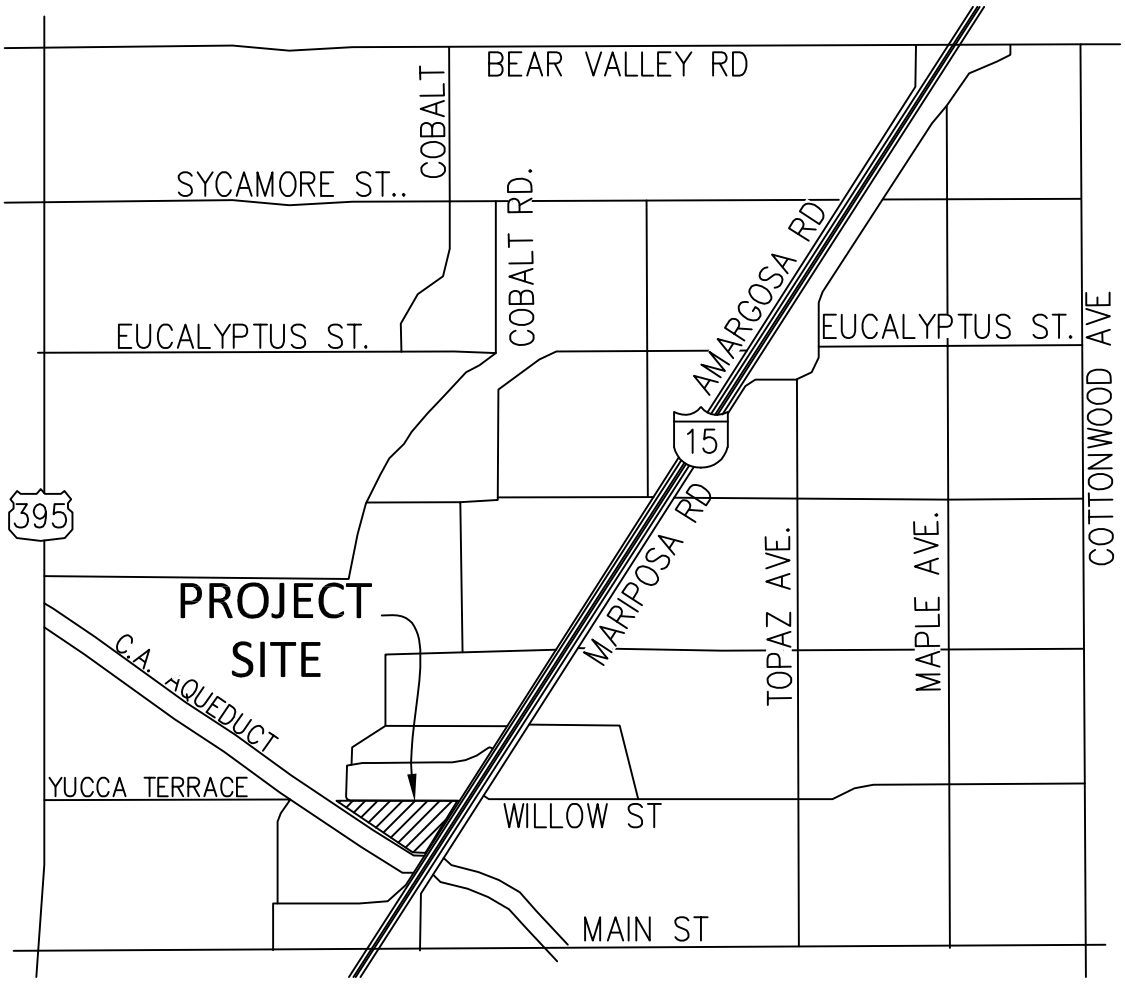
Hydrology Summary (UH Method)				
Condition	**Drainage Area**	**Area (acres)**	**100 Yr 24Hr Q_{UH} (cfs)**	**10Yr 24Hr Q_{UH} (cfs)**
Existing	**Area 1A**	19.13	28.70	11.25
Proposed	**Area 1A-4A**	19.37	38.85	15.91
Mitigated	**Area 1A-4A**	19.37	25.55	10.35

The Proposed condition would generate 38.85 cfs, however, the project will utilize an underground storage system that will mitigate the storm flows and reduce them to 25.55 cfs. This mean that there is a net reduction between the pre-development and the post-development of 3.15 cfs (approximate 11% reduction in the storm water runoff)

Based on the design criteria stated earlier, the report hereon demonstrates that the project is adequately designed to convey storm water to the public street, as well as satisfy the design requirements for peak flow mitigation of the 100-year 24-hr storm event.

The Hydrology Study shows that proposed development will result in runoff increase, it is necessary for retention/detention for the proposed condition. The proposed underground Contech CMP Infiltration/Retention Basin System will be employed to accommodate the increase in runoff, as well as satisfying the WQMP requirements. This report demonstrates the post development runoff at strategic confluence, has no increase at the outlet location. Due to this preliminary study is in the planning stage, the infiltration testing information is not available yet, it will be provided in the final engineering stage. All on-site storm drain design of the project will be complied with the 100-year flood protection requirements of the City of Hesperia and County of San Bernardino in the final engineering phase.

Appendix A: Vicinity Map

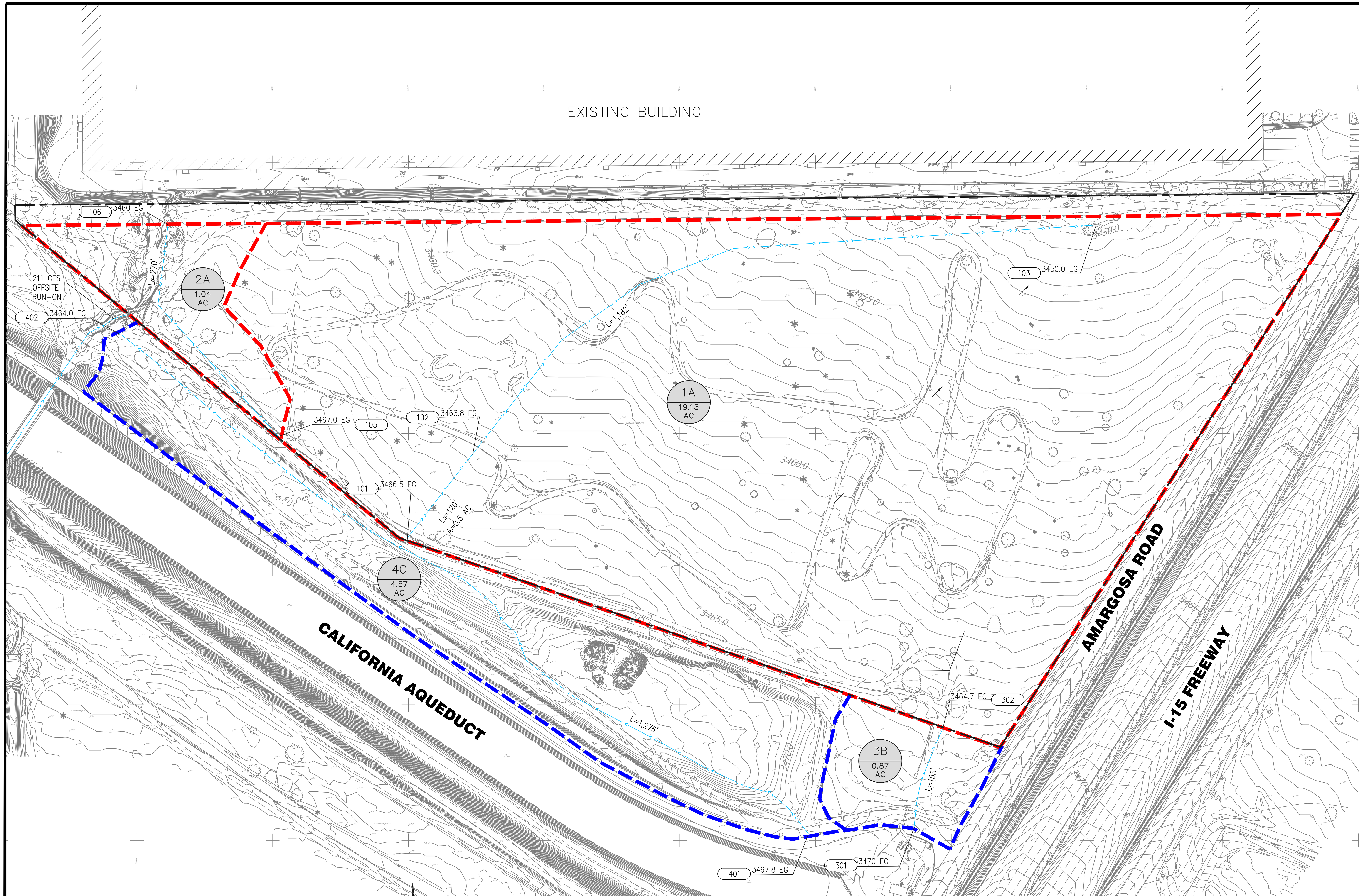


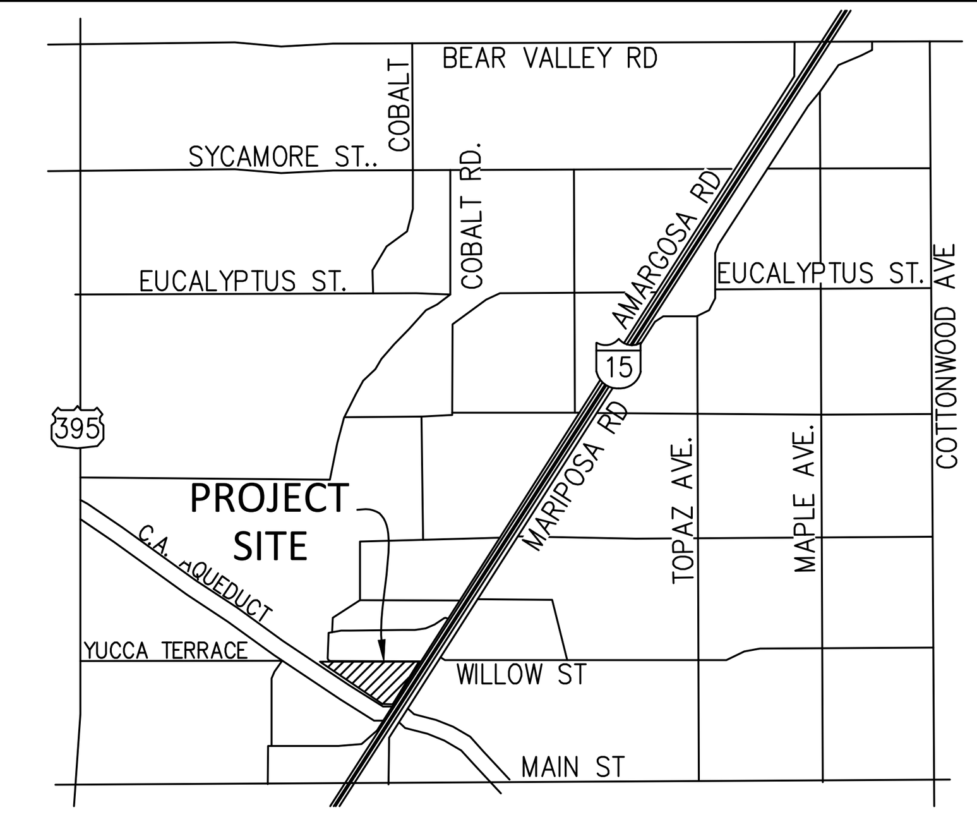
VICINITY MAP

NOT TO SCALE

Appendix B: Hydrology Maps

- Existing Hydrology Map
- Proposed Hydrology Map





VICINITY MAP
NOT TO SCALE

LEGEND

- DRAINAGE AREA BOUNDARY
- OFF-SITE DRAINAGE AREA BOUNDARY
- PROPERTY BOUNDARY
- FLOW PATH
- DIRECTION OF FLOW
- 100.00 249.97 FS NODE DESIGNATION
- A / 5.0 AC — DA ID / ACREAGE

HYDROLOGY INFORMATION

SITE AREA:	20.17 AC	
SOIL GROUP:	A	(PER NRCS Soil Survey)
IMPERVIOUS:	0	(EXISTING CONDITION)
RAINFALL RATE:	1.25 IN/HR.	(100-YEAR)
AMC NUMBER:	2	(SOIL GROUP A)
	1	(For 2-YEAR STORM)
	3	(For 100-YEAR STORM)
FREQUENCY:	100 YEAR	(For STORM DRAIN DESIGN)
	2 YEAR	(For STORMWATER TREATMENT)
METHOD:	SAN BERNARDINO COUNTY HYDROLOGY MANUAL RATIONAL METHOD	

Pre-Development Hydrology Table (Rational Method):

DA No.	TRIBUTARY AREA (AC)	IMPERVIOUS RATIO	Tc (min.)	Q100 (cfs)
1A	19.13	0.00	14.3	53.68
2A	1.04	0.00	10.5	3.69
3B	0.87	0.00	7.7	3.90
4C	4.57	0.00	29	7.28

N

70 0 70 140
scale 1"= 70' feet

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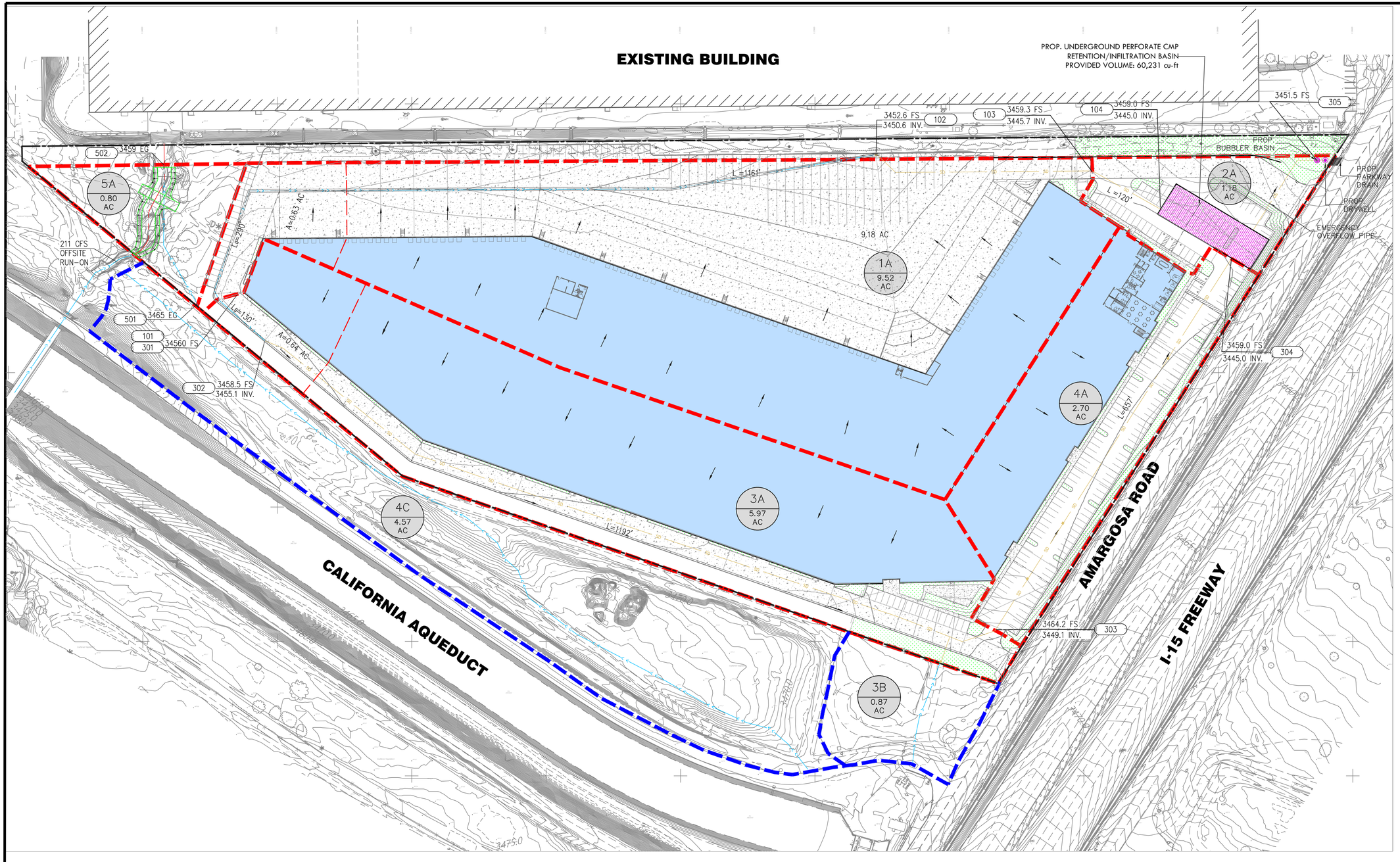
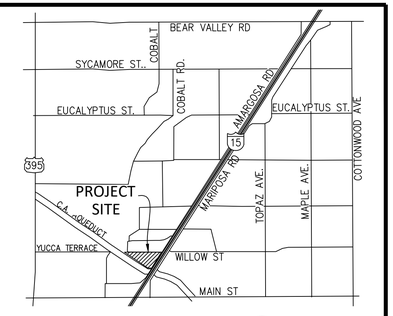
EXISTING CONDITION

HYDROLOGY EXHIBIT

Drawing Name: P:\P\PIXI00000001\0600INFO\0670Reports\Hydrology\Preliminary Hydrology\Exhibits\B_1_Hyd - Existing Condition.dwg
Last Opened: Nov 10, 2020 - 9:46pm by Bjth





VICINITY MAP
NOT TO SCALE

LEGEND

- PROPOSED UNDERGROUND CMP BASIN
- PROPOSED BUILDING
- PROPOSED LANDSCAPED AREA
- DRAINAGE AREA BOUNDARY
- OO-SITE DRAINAGE AREA BOUNDARY
- PROPERTY BOUNDARY
- FLOW PATH
- STORM DRAIN
- DIRECTION OF FLOW
- 100.0 FS / INV — NODE DESIGNATION
- 100.00 249.97 FS — NODE DESIGNATION
- A / 5.0 AC — DA ID / ACREAGE

HYDROLOGY INFORMATION

SITE AREA:	20.17 AC	
SOIL GROUP:	A	(PER NRCS Soil Survey)
IMPERVIOUS:	85	(POST CONDITION)
RAINFALL RATE:	1.25 IN/HR.	(100-YEAR)
AMC NUMBER:	2	(SOIL GROUP A)
	1	(For 2-YEAR STORM)
	3	(For 100-YEAR STORM)
FREQUENCY:	100 YEAR	(For STORM DRAIN DESIGN)
	2 YEAR	(For STORMWATER TREATMENT)
METHOD:	SAN BERNARDINO COUNTY HYDROLOGY MANUAL RATIONAL METHOD	

Post-Development Hydrology Table (Rational Method):

DA No.	TRIBUTARY AREA (AC)	IMPERVIOUS RATIO	Tc (min)	Q_{100} (cfs)
1A	9.52	0.85	9.4	46.43
2A	1.18	0.85	4.7	7.74
3A	5.97	0.85	8.6	32.38
4A	2.70	0.85	9.9	4.59
5A	0.80	0.00	10.6	2.83

TOTAL AREA: 20.17 AC

N

70 0 70 140
scale 1" = 70' feet

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POST- CONDITION

HYDROLOGY MAP

Appendix C: Rational Method Existing Condition

- 100 Year, 1-Hour Storm Rational Method Analysis
- 10 Year, 24-Hour Storm Rational Method Analysis

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 03/30/20

Pixior Distribution Center
Existing Condition
100-year, 1-hour Storm

Program License Serial Number 4009

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.250 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2) = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)
Initial subarea data:
Initial area flow distance = 120.000(Ft.)
Top (of initial area) elevation = 3465.500(Ft.)
Bottom (of initial area) elevation = 3463.800(Ft.)
Difference in elevation = 1.700(Ft.)
Slope = 0.01417 s(%)= 1.42
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.348 min.
Rainfall intensity = 4.972(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.848
Subarea runoff = 2.107(CFS)
Total initial stream area = 0.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.290(In/Hr)

++
Process from Point/Station 102.000 to Point/Station 103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 0.827(Ft.), Average velocity = 4.440(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.00

```
        2             10.00             1.00
        3             20.00             0.00
        4             30.00             1.00
        5             45.00             2.00
Manning's 'N' friction factor =   0.020
-----------------------------------------------------------------
Sub-Channel flow  =     30.350(CFS)
  '     '        flow top width =     16.535(Ft.)
  '     '    velocity=    4.440(Ft/s)
  '     '        area =      6.835(Sq.Ft)
  '     '        Froude number =     1.217

Upstream point elevation =  3463.800(Ft.)
Downstream point elevation =  3450.000(Ft.)
Flow length =  1182.000(Ft.)
Travel time  =    4.44 min.
Time of concentration =   12.78 min.
Depth of flow =   0.827(Ft.)
Average velocity =   4.440(Ft/s)
Total irregular channel flow =    30.350(CFS)
Irregular channel normal depth above invert elev. =   0.827(Ft.)
Average velocity of channel(s) =   4.440(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
Rainfall intensity =      3.689(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     56.418(CFS) for   18.630(Ac.)
Total runoff =     58.524(CFS)
Effective area this stream =       19.13(Ac.)
Total Study Area (Main Stream No. 1) =       19.13(Ac.)
Area averaged Fm value =    0.290(In/Hr)
Depth of flow =   1.061(Ft.), Average velocity =   5.197(Ft/s)


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Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
Initial subarea data:
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =  3467.000(Ft.)
Bottom (of initial area) elevation =  3460.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02593  s(%)=       2.59
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.232 min.
Rainfall intensity =      4.312(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      3.764(CFS)
Total initial stream area =        1.040(Ac.)
Pervious area fraction = 1.000
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Initial area Fm value = 0.290(In/Hr)

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Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****
_____
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2) = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)
Initial subarea data:
Initial area flow distance = 153.000(Ft.)
Top (of initial area) elevation = 3470.000(Ft.)
Bottom (of initial area) elevation = 3464.700(Ft.)
Difference in elevation = 5.300(Ft.)
Slope = 0.03464 s(%)= 3.46
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.693 min.
Rainfall intensity = 5.264(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff = 3.895(CFS)
Total initial stream area = 0.870(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.290(In/Hr)

++
Process from Point/Station 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****
_____
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2) = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)
Initial subarea data:
Initial area flow distance = 1276.000(Ft.)
Top (of initial area) elevation = 3467.800(Ft.)
Bottom (of initial area) elevation = 3464.000(Ft.)
Difference in elevation = 3.800(Ft.)
Slope = 0.00298 s(%)= 0.30
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 29.357 min.
Rainfall intensity = 2.062(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.773
Subarea runoff = 7.287(CFS)
Total initial stream area = 4.570(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.290(In/Hr)
End of computations, Total Study Area = 25.61 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 67.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 03/30/20

Pixior Distribution Center
Existing Condition
10-year, 24-hour Storm

Program License Serial Number 4009

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 3.330 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2) = 67.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.578(In/Hr)
Initial subarea data:
Initial area flow distance = 120.000(Ft.)
Top (of initial area) elevation = 3465.500(Ft.)
Bottom (of initial area) elevation = 3463.800(Ft.)
Difference in elevation = 1.700(Ft.)
Slope = 0.01417 s(%)= 1.42
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.348 min.
Rainfall intensity = 13.245(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.861
Subarea runoff = 5.700(CFS)
Total initial stream area = 0.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.578(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 1.236(Ft.), Average velocity = 5.663(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	10.00	1.00
3	20.00	0.00
4	30.00	1.00
5	45.00	2.00

Manning's 'N' friction factor = 0.020

```
------------------------------------------------------------------
Sub-Channel flow  =     87.252(CFS)
  '     '        flow top width =     25.893(Ft.)
  '     '    velocity=    5.663(Ft/s)
  '     '        area =     15.409(Sq.Ft)
  '     '        Froude number =     1.294

Upstream point elevation =  3463.800(Ft.)
Downstream point elevation =  3450.000(Ft.)
Flow length =  1182.000(Ft.)
Travel time  =    3.48 min.
Time of concentration =   11.83 min.
Depth of flow =   1.236(Ft.)
Average velocity =   5.663(Ft/s)
Total irregular channel flow =    87.252(CFS)
Irregular channel normal depth above invert elev. =   1.236(Ft.)
Average velocity of channel(s) =   5.663(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Rainfall intensity =     10.379(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =    163.032(CFS) for   18.630(Ac.)
Total runoff =    168.732(CFS)
Effective area this stream =       19.13(Ac.)
Total Study Area (Main Stream No. 1) =       19.13(Ac.)
Area averaged Fm value =    0.578(In/Hr)
Depth of flow =   1.575(Ft.), Average velocity =   6.583(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Initial subarea data:
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =  3467.000(Ft.)
Bottom (of initial area) elevation =  3460.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.02593  s(%)=       2.59
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.232 min.
Rainfall intensity =     11.486(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =     10.210(CFS)
Total initial stream area =        1.040(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.578(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Initial subarea data:
Initial area flow distance =   153.000(Ft.)
Top (of initial area) elevation =  3470.000(Ft.)
Bottom (of initial area) elevation =  3464.700(Ft.)
Difference in elevation =     5.300(Ft.)
Slope =    0.03464  s(%)=       3.46
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.693 min.
Rainfall intensity =     14.024(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =     10.528(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.578(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Initial subarea data:
Initial area flow distance =  1276.000(Ft.)
Top (of initial area) elevation =  3467.800(Ft.)
Bottom (of initial area) elevation =  3464.000(Ft.)
Difference in elevation =     3.800(Ft.)
Slope =    0.00298  s(%)=       0.30
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   29.357 min.
Rainfall intensity =      5.492(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.805
Subarea runoff =     20.211(CFS)
Total initial stream area =        4.570(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.578(In/Hr)
End of computations, Total Study Area =           25.61 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  67.0
```

Appendix D: Proposed Condition Rational Method

- Area A1-A5 - 100 Year, 1-Hour Storm Rational Method Analysis
- Area A1- A5 10 Year, 24-Hour Storm Rational Method Analysis

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 05/13/20

Pixior Distribition Center
Post-Development Condition
100-year, 1-hour Storm

Program License Serial Number 4009

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.250 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++

Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 290.000(Ft.)
Top (of initial area) elevation = 3460.000(Ft.)
Bottom (of initial area) elevation = 3456.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01103 s(%)= 1.10
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.232 min.
Rainfall intensity = 5.497(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887
Subarea runoff = 3.072(CFS)
Total initial stream area = 0.630(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Time of concentration = 7.23 min.
Rainfall intensity = 5.497(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified

```
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     43.353(CFS) for    8.890(Ac.)
Total runoff =     46.425(CFS)
Effective area this stream =        9.52(Ac.)
Total Study Area (Main Stream No. 1) =        9.52(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3453.800(Ft.)
Downstream point/station elevation =  3445.700(Ft.)
Pipe length  =  1161.00(Ft.)   Manning's N = 0.011
No. of pipes = 1  Required pipe flow  =    46.425(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    46.425(CFS)
Normal flow depth in pipe =   24.23(In.)
Flow top width inside pipe =   29.15(In.)
Critical Depth =   27.04(In.)
Pipe flow velocity =      9.93(Ft/s)
Travel time through pipe =    1.95 min.
Time of concentration (TC) =     9.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3445.700(Ft.)
Downstream point/station elevation =  3445.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.011
No. of pipes = 1  Required pipe flow  =    46.425(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    46.425(CFS)
Normal flow depth in pipe =   26.25(In.)
Flow top width inside pipe =   26.62(In.)
Critical Depth =   27.04(In.)
Pipe flow velocity =      9.16(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   150.000(Ft.)
Top (of initial area) elevation =  3460.000(Ft.)
Bottom (of initial area) elevation =  3459.000(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00667  s(%)=       0.67
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.145 min.
Rainfall intensity =      6.161(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff =      3.503(CFS)
Total initial stream area =        0.640(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =     6.15 min.
Rainfall intensity =      6.161(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.889
Subarea runoff =     29.177(CFS) for    5.330(Ac.)
Total runoff =     32.681(CFS)
Effective area this stream =        5.97(Ac.)
Total Study Area (Main Stream No. 1) =       15.49(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  3455.100(Ft.)
Downstream point/station elevation =  3449.100(Ft.)
Pipe length  =  1192.00(Ft.)   Manning's N = 0.011
No. of pipes = 1  Required pipe flow  =    32.681(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.681(CFS)
Normal flow depth in pipe =   23.34(In.)
Flow top width inside pipe =   24.93(In.)
Critical Depth =   23.37(In.)
Pipe flow velocity =      7.97(Ft/s)
Travel time through pipe =    2.49 min.
Time of concentration (TC) =     8.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =     8.64 min.
Rainfall intensity =      4.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.885
Subarea runoff =      4.588(CFS) for    2.700(Ac.)
Total runoff =     37.269(CFS)
Effective area this stream =        8.67(Ac.)
Total Study Area (Main Stream No. 1) =       18.19(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  3449.100(Ft.)
Downstream point/station elevation =  3445.000(Ft.)
```

```
Pipe length  =   657.00(Ft.)   Manning's N = 0.011
No. of pipes = 1  Required pipe flow  =    37.269(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    37.269(CFS)
Normal flow depth in pipe =   23.91(In.)
Flow top width inside pipe =   24.14(In.)
Critical Depth =   24.80(In.)
Pipe flow velocity =      8.89(Ft/s)
Travel time through pipe =    1.23 min.
Time of concentration (TC) =     9.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   192.000(Ft.)
Top (of initial area) elevation =  3459.000(Ft.)
Bottom (of initial area) elevation =  3451.500(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.03906  s(%)=       3.91
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.763 min.
Rainfall intensity =      7.364(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.890
Subarea runoff =      7.737(CFS)
Total initial stream area =        1.180(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
Initial subarea data:
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =  3465.000(Ft.)
Bottom (of initial area) elevation =  3459.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.02222  s(%)=       2.22
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.552 min.
Rainfall intensity =      4.220(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.838
Subarea runoff =      2.829(CFS)
Total initial stream area =        0.800(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.290(In/Hr)
End of computations, Total Study Area =           20.17 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.
```

```
Area averaged pervious area fraction(Ap) = 0.136
Area averaged SCS curve number =  33.4
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 05/13/20

Pixior Distribition Center
Post-Development Condition
10-year, 24-hour Storm

Program License Serial Number 4009

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 24 hour rainfall = 3.330 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 290.000(Ft.)
Top (of initial area) elevation = 3460.000(Ft.)
Bottom (of initial area) elevation = 3456.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01103 s(%)= 1.10
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.232 min.
Rainfall intensity = 14.644(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.894
Subarea runoff = 8.248(CFS)
Total initial stream area = 0.630(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Time of concentration = 7.23 min.
Rainfall intensity = 14.644(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.894
Subarea runoff = 116.382(CFS) for 8.890(Ac.)

Total runoff = 124.630(CFS)
Effective area this stream = 9.52(Ac.)
Total Study Area (Main Stream No. 1) = 9.52(Ac.)
Area averaged Fm value = 0.098(In/Hr)

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3453.800(Ft.)
Downstream point/station elevation = 3445.700(Ft.)
Pipe length = 1161.00(Ft.) Manning's N = 0.011
No. of pipes = 1 Required pipe flow = 124.630(CFS)
Nearest computed pipe diameter = 48.00(In.)
Calculated individual pipe flow = 124.630(CFS)
Normal flow depth in pipe = 34.92(In.)
Flow top width inside pipe = 42.74(In.)
Critical Depth = 40.24(In.)
Pipe flow velocity = 12.73(Ft/s)
Travel time through pipe = 1.52 min.
Time of concentration (TC) = 8.75 min.

++
Process from Point/Station 103.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3445.700(Ft.)
Downstream point/station elevation = 3445.000(Ft.)
Pipe length = 120.00(Ft.) Manning's N = 0.011
No. of pipes = 1 Required pipe flow = 124.630(CFS)
Nearest computed pipe diameter = 48.00(In.)
Calculated individual pipe flow = 124.630(CFS)
Normal flow depth in pipe = 37.78(In.)
Flow top width inside pipe = 39.30(In.)
Critical Depth = 40.24(In.)
Pipe flow velocity = 11.75(Ft/s)
Travel time through pipe = 0.17 min.
Time of concentration (TC) = 8.92 min.

++
Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 150.000(Ft.)
Top (of initial area) elevation = 3460.000(Ft.)
Bottom (of initial area) elevation = 3459.000(Ft.)
Difference in elevation = 1.000(Ft.)
Slope = 0.00667 s(%)= 0.67
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.145 min.
Rainfall intensity = 16.413(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.895
Subarea runoff = 9.397(CFS)
Total initial stream area = 0.640(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 302.000 to Point/Station 303.000

**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Time of concentration = 6.15 min.
Rainfall intensity = 16.413(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.895
Subarea runoff = 78.263(CFS) for 5.330(Ac.)
Total runoff = 87.660(CFS)
Effective area this stream = 5.97(Ac.)
Total Study Area (Main Stream No. 1) = 15.49(Ac.)
Area averaged Fm value = 0.098(In/Hr)

++
Process from Point/Station 302.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3455.100(Ft.)
Downstream point/station elevation = 3449.100(Ft.)
Pipe length = 1192.00(Ft.) Manning's N = 0.011
No. of pipes = 1 Required pipe flow = 87.660(CFS)
Nearest computed pipe diameter = 45.00(In.)
Calculated individual pipe flow = 87.660(CFS)
Normal flow depth in pipe = 32.30(In.)
Flow top width inside pipe = 40.51(In.)
Critical Depth = 34.56(In.)
Pipe flow velocity = 10.33(Ft/s)
Travel time through pipe = 1.92 min.
Time of concentration (TC) = 8.07 min.

++
Process from Point/Station 303.000 to Point/Station 304.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Time of concentration = 8.07 min.
Rainfall intensity = 13.565(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.894
Subarea runoff = 17.424(CFS) for 2.700(Ac.)
Total runoff = 105.084(CFS)
Effective area this stream = 8.67(Ac.)
Total Study Area (Main Stream No. 1) = 18.19(Ac.)
Area averaged Fm value = 0.098(In/Hr)

++
Process from Point/Station 303.000 to Point/Station 304.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3449.100(Ft.)
Downstream point/station elevation = 3445.000(Ft.)
Pipe length = 657.00(Ft.) Manning's N = 0.011
No. of pipes = 1 Required pipe flow = 105.084(CFS)
Nearest computed pipe diameter = 45.00(In.)
Calculated individual pipe flow = 105.084(CFS)
Normal flow depth in pipe = 34.36(In.)

```
Flow top width inside pipe =   38.24(In.)
Critical Depth =   37.58(In.)
Pipe flow velocity =     11.61(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =     9.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
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
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   192.000(Ft.)
Top (of initial area) elevation =  3459.000(Ft.)
Bottom (of initial area) elevation =  3451.500(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.03906  s(%)=       3.91
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.763 min.
Rainfall intensity =     19.618(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.896
Subarea runoff =     20.731(CFS)
Total initial stream area =        1.180(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
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
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Initial subarea data:
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =  3465.000(Ft.)
Bottom (of initial area) elevation =  3459.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.02222  s(%)=       2.22
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.552 min.
Rainfall intensity =     11.241(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =      7.677(CFS)
Total initial stream area =        0.800(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.578(In/Hr)
End of computations, Total Study Area =           20.17 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.136
Area averaged SCS curve number =  33.4
```

Appendix E: Unit Hydrograph Analysis

- Existing Condition Area 1A - 100 Year, 24_Hour Storm Frequency
- Existing Condition Area 1A - 10 Year, 24_Hour Storm Frequency
- Post Condition Area 1A – 4A 100 Year, 24_Hour Storm Frequency
- Post Condition Area 1A – 4A 10 Year, 24_Hour Storm Frequency

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

Study date 02/24/20

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 4009

Pixior Distribution Center
Existing Condition
UH-Method
100-year, 24-hours Storm

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
19.13	1	1.25
Rainfall data for year 100		
19.13	6	2.81
Rainfall data for year 100		
19.13	24	5.90

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
67.0	84.6	19.13	1.000	0.290	1.000	0.290

Area-averaged adjusted loss rate Fm (In/Hr) = 0.290

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
19.13	1.000	67.0	84.6	1.82	0.706

Area-averaged catchment yield fraction, Y = 0.706
Area-averaged low loss fraction, Yb = 0.294
User entry of time of concentration = 0.240 (hours)
++
Watershed area = 19.13(Ac.)
Catchment Lag time = 0.192 hours
Unit interval = 15.000 minutes
Unit interval percentage of lag time = 130.2083
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.290(In/Hr)
Average low loss rate fraction (Yb) = 0.294 (decimal)
VALLEY UNDEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.593(In)
Computed peak 30-minute rainfall = 1.015(In)
Specified peak 1-hour rainfall = 1.250(In)
Computed peak 3-hour rainfall = 2.054(In)
Specified peak 6-hour rainfall = 2.810(In)
Specified peak 24-hour rainfall = 5.900(In)

Rainfall depth area reduction factors:
Using a total area of 19.13(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.593(In)
30-minute factor = 0.999 Adjusted rainfall = 1.014(In)
1-hour factor = 0.999 Adjusted rainfall = 1.249(In)
3-hour factor = 1.000 Adjusted rainfall = 2.054(In)
6-hour factor = 1.000 Adjusted rainfall = 2.810(In)
24-hour factor = 1.000 Adjusted rainfall = 5.900(In)

U n i t H y d r o g r a p h
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 77.12 (CFS))	
1	28.078	21.653
2	76.359	37.233
3	88.845	9.629
4	94.427	4.305
5	97.494	2.365
6	99.161	1.286
7	100.000	0.647

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8240	0.0944
2	1.0144	0.0540
3	1.1456	0.0398
4	1.2489	0.0322

5	1.3817	0.0425
6	1.5006	0.0383
7	1.6090	0.0352
8	1.7093	0.0326
9	1.8030	0.0305
10	1.8911	0.0288
11	1.9745	0.0273
12	2.0538	0.0260
13	2.1295	0.0249
14	2.2021	0.0239
15	2.2719	0.0230
16	2.3391	0.0222
17	2.4042	0.0214
18	2.4671	0.0208
19	2.5282	0.0202
20	2.5875	0.0196
21	2.6452	0.0191
22	2.7014	0.0186
23	2.7563	0.0181
24	2.8098	0.0177
25	2.8719	0.0206
26	2.9328	0.0202
27	2.9926	0.0198
28	3.0514	0.0195
29	3.1093	0.0192
30	3.1662	0.0189
31	3.2222	0.0186
32	3.2774	0.0183
33	3.3319	0.0181
34	3.3855	0.0178
35	3.4384	0.0176
36	3.4907	0.0173
37	3.5422	0.0171
38	3.5931	0.0169
39	3.6434	0.0167
40	3.6931	0.0165
41	3.7422	0.0163
42	3.7908	0.0161
43	3.8388	0.0160
44	3.8863	0.0158
45	3.9334	0.0156
46	3.9799	0.0155
47	4.0260	0.0153
48	4.0716	0.0152
49	4.1167	0.0150
50	4.1615	0.0149
51	4.2058	0.0147
52	4.2497	0.0146
53	4.2933	0.0145
54	4.3364	0.0143
55	4.3792	0.0142
56	4.4216	0.0141
57	4.4637	0.0140
58	4.5055	0.0139
59	4.5469	0.0138
60	4.5879	0.0137
61	4.6287	0.0136
62	4.6691	0.0134
63	4.7093	0.0133

64	4.7491	0.0133
65	4.7887	0.0132
66	4.8280	0.0131
67	4.8670	0.0130
68	4.9057	0.0129
69	4.9442	0.0128
70	4.9824	0.0127
71	5.0204	0.0126
72	5.0581	0.0125
73	5.0956	0.0125
74	5.1328	0.0124
75	5.1698	0.0123
76	5.2066	0.0122
77	5.2431	0.0122
78	5.2794	0.0121
79	5.3156	0.0120
80	5.3515	0.0119
81	5.3871	0.0119
82	5.4226	0.0118
83	5.4579	0.0117
84	5.4930	0.0117
85	5.5279	0.0116
86	5.5626	0.0115
87	5.5971	0.0115
88	5.6315	0.0114
89	5.6656	0.0114
90	5.6996	0.0113
91	5.7334	0.0112
92	5.7670	0.0112
93	5.8005	0.0111
94	5.8338	0.0111
95	5.8669	0.0110
96	5.8999	0.0110

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0330	0.0097	0.0233
2	0.0332	0.0098	0.0235
3	0.0335	0.0098	0.0236
4	0.0337	0.0099	0.0238
5	0.0340	0.0100	0.0240
6	0.0343	0.0101	0.0242
7	0.0345	0.0102	0.0244
8	0.0348	0.0102	0.0246
9	0.0351	0.0103	0.0248
10	0.0354	0.0104	0.0250
11	0.0357	0.0105	0.0252
12	0.0360	0.0106	0.0254
13	0.0364	0.0107	0.0257
14	0.0367	0.0108	0.0259
15	0.0370	0.0109	0.0261
16	0.0374	0.0110	0.0264
17	0.0377	0.0111	0.0266
18	0.0381	0.0112	0.0269
19	0.0385	0.0113	0.0272
20	0.0389	0.0114	0.0275
21	0.0393	0.0116	0.0278

22	0.0397	0.0117	0.0280
23	0.0402	0.0118	0.0284
24	0.0406	0.0119	0.0287
25	0.0411	0.0121	0.0290
26	0.0416	0.0122	0.0294
27	0.0421	0.0124	0.0297
28	0.0426	0.0125	0.0301
29	0.0432	0.0127	0.0305
30	0.0438	0.0129	0.0309
31	0.0444	0.0130	0.0313
32	0.0450	0.0132	0.0318
33	0.0457	0.0134	0.0322
34	0.0463	0.0136	0.0327
35	0.0471	0.0138	0.0332
36	0.0478	0.0140	0.0338
37	0.0486	0.0143	0.0343
38	0.0494	0.0145	0.0349
39	0.0504	0.0148	0.0356
40	0.0513	0.0151	0.0362
41	0.0523	0.0154	0.0369
42	0.0533	0.0157	0.0377
43	0.0545	0.0160	0.0385
44	0.0557	0.0164	0.0393
45	0.0570	0.0168	0.0403
46	0.0584	0.0172	0.0412
47	0.0599	0.0176	0.0423
48	0.0615	0.0181	0.0435
49	0.0537	0.0158	0.0379
50	0.0556	0.0163	0.0393
51	0.0579	0.0170	0.0409
52	0.0603	0.0177	0.0426
53	0.0632	0.0186	0.0446
54	0.0663	0.0195	0.0468
55	0.0701	0.0206	0.0495
56	0.0743	0.0218	0.0524
57	0.0798	0.0235	0.0563
58	0.0860	0.0253	0.0607
59	0.0944	0.0277	0.0666
60	0.1047	0.0308	0.0739
61	0.1204	0.0354	0.0850
62	0.1107	0.0325	0.0781
63	0.1372	0.0403	0.0969
64	0.2935	0.0725	0.2210
65	0.7149	0.0725	0.6424
66	0.1239	0.0364	0.0875
67	0.1033	0.0304	0.0730
68	0.0851	0.0250	0.0601
69	0.0737	0.0217	0.0520
70	0.0658	0.0193	0.0465
71	0.0599	0.0176	0.0423
72	0.0553	0.0163	0.0391
73	0.0613	0.0180	0.0433
74	0.0582	0.0171	0.0411
75	0.0555	0.0163	0.0392
76	0.0532	0.0156	0.0375
77	0.0511	0.0150	0.0361
78	0.0493	0.0145	0.0348
79	0.0477	0.0140	0.0337
80	0.0462	0.0136	0.0326

81	0.0449	0.0132	0.0317
82	0.0437	0.0128	0.0308
83	0.0425	0.0125	0.0300
84	0.0415	0.0122	0.0293
85	0.0406	0.0119	0.0286
86	0.0397	0.0117	0.0280
87	0.0388	0.0114	0.0274
88	0.0380	0.0112	0.0269
89	0.0373	0.0110	0.0263
90	0.0366	0.0108	0.0259
91	0.0360	0.0106	0.0254
92	0.0354	0.0104	0.0250
93	0.0348	0.0102	0.0246
94	0.0342	0.0101	0.0242
95	0.0337	0.0099	0.0238
96	0.0332	0.0098	0.0234

Total soil rain loss = 1.58(In)
Total effective rainfall = 4.32(In)
Peak flow rate in flood hydrograph = 28.70(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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+15	0.0104	0.50	Q				
0+30	0.0388	1.38	VQ				
0+45	0.0721	1.61	V Q				
1+ 0	0.1077	1.72	V Q				
1+15	0.1446	1.79	V Q				
1+30	0.1825	1.83	VQ				
1+45	0.2210	1.86	VQ				
2+ 0	0.2598	1.88	VQ				
2+15	0.2990	1.89	VQ				
2+30	0.3384	1.91	VQ				
2+45	0.3782	1.93	Q				
3+ 0	0.4183	1.94	Q				
3+15	0.4588	1.96	Q				
3+30	0.4996	1.98	Q				
3+45	0.5409	1.99	QV				
4+ 0	0.5825	2.01	QV				
4+15	0.6244	2.03	QV				
4+30	0.6668	2.05	QV				
4+45	0.7097	2.07	Q V				
5+ 0	0.7529	2.09	Q V				
5+15	0.7966	2.11	Q V				
5+30	0.8408	2.14	Q V				
5+45	0.8854	2.16	Q V				
6+ 0	0.9305	2.18	Q V				
6+15	0.9762	2.21	Q V				
6+30	1.0224	2.23	Q V				
6+45	1.0691	2.26	Q V				
7+ 0	1.1164	2.29	Q V				

```
 7+15       1.1643      2.32  |  Q  V   |         |         |         |
 7+30       1.2128      2.35  |  Q   V  |         |         |         |
 7+45       1.2619      2.38  |  Q   V  |         |         |         |
 8+ 0       1.3118      2.41  |  Q   V  |         |         |         |
 8+15       1.3623      2.45  |  Q   V  |         |         |         |
 8+30       1.4135      2.48  |  Q    V |         |         |         |
 8+45       1.4656      2.52  |  Q    V |         |         |         |
 9+ 0       1.5184      2.56  |  Q    V |         |         |         |
 9+15       1.5721      2.60  |  Q     V|         |         |         |
 9+30       1.6267      2.64  |  Q     V|         |         |         |
 9+45       1.6822      2.69  |  Q     V|         |         |         |
10+ 0       1.7387      2.74  |  Q      V         |         |         |
10+15       1.7963      2.79  |  Q      V         |         |         |
10+30       1.8550      2.84  |  Q      V         |         |         |
10+45       1.9149      2.90  |  Q       V        |         |         |
11+ 0       1.9760      2.96  |  Q      |V        |         |         |
11+15       2.0385      3.02  |   Q     |V        |         |         |
11+30       2.1025      3.10  |   Q     | V       |         |         |
11+45       2.1680      3.17  |   Q     | V       |         |         |
12+ 0       2.2352      3.25  |   Q     | V       |         |         |
12+15       2.3012      3.19  |   Q     |  V      |         |         |
12+30       2.3640      3.04  |   Q     |  V      |         |         |
12+45       2.4276      3.08  |   Q     |   V     |         |         |
13+ 0       2.4931      3.17  |   Q     |   V     |         |         |
13+15       2.5610      3.29  |   Q     |   V     |         |         |
13+30       2.6318      3.43  |   Q     |    V    |         |         |
13+45       2.7062      3.60  |   Q     |    V    |         |         |
14+ 0       2.7847      3.80  |    Q    |     V   |         |         |
14+15       2.8681      4.04  |    Q    |     V   |         |         |
14+30       2.9574      4.33  |    Q    |      V  |         |         |
14+45       3.0541      4.68  |     Q   |      V  |         |         |
15+ 0       3.1600      5.13  |     Q   |       V |         |         |
15+15       3.2784      5.73  |      Q  |        V|         |         |
15+30       3.4046      6.11  |       Q |        V|         |         |
15+45       3.5371      6.42  |       Q |         V         |         |
16+ 0       3.7398      9.81  |         |  Q       V        |         |
16+15       4.2305     23.75  |         |          |   V     |Q        |
16+30       4.8235     28.70  |         |          |       V |        Q|
16+45       5.0788     12.36  |         |     Q    |        V|         |
17+ 0       5.2508      8.32  |         |Q         |         V         |
17+15       5.3811      6.31  |       Q |          |          V        |
17+30       5.4847      5.01  |     Q   |          |          |V       |
17+45       5.5695      4.11  |    Q    |          |          | V      |
18+ 0       5.6394      3.39  |   Q     |          |          | V      |
18+15       5.7065      3.25  |   Q     |          |          |  V     |
18+30       5.7742      3.28  |   Q     |          |          |  V     |
18+45       5.8394      3.16  |   Q     |          |          |  V     |
19+ 0       5.9020      3.03  |   Q     |          |          |   V    |
19+15       5.9622      2.91  |  Q      |          |          |   V    |
19+30       6.0202      2.81  |  Q      |          |          |    V   |
19+45       6.0762      2.71  |  Q      |          |          |    V   |
20+ 0       6.1302      2.62  |  Q      |          |          |    V   |
20+15       6.1826      2.53  |  Q      |          |          |    V   |
20+30       6.2334      2.46  |  Q      |          |          |     V  |
20+45       6.2829      2.39  |  Q      |          |          |     V  |
21+ 0       6.3310      2.33  |  Q      |          |          |     V  |
21+15       6.3779      2.27  |  Q      |          |          |      V |
21+30       6.4238      2.22  | Q       |          |          |      V |
21+45       6.4686      2.17  | Q       |          |          |      V |
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   22+ 0       6.5125      2.12  | Q       |         |         |      V  |
   22+15       6.5555      2.08  | Q       |         |         |       V |
   22+30       6.5976      2.04  | Q       |         |         |       V |
   22+45       6.6390      2.00  | Q       |         |         |       V |
   23+ 0       6.6796      1.97  | Q       |         |         |       V |
   23+15       6.7195      1.93  | Q       |         |         |        V|
   23+30       6.7587      1.90  | Q       |         |         |        V|
   23+45       6.7973      1.87  | Q       |         |         |        V|
   24+ 0       6.8353      1.84  | Q       |         |         |        V|
   24+15       6.8625      1.31  |Q        |         |         |        V|
   24+30       6.8714      0.43  Q         |         |         |        V|
   24+45       6.8756      0.20  Q         |         |         |        V|
   25+ 0       6.8777      0.10  Q         |         |         |        V|
   25+15       6.8787      0.05  Q         |         |         |        V|
   25+30       6.8790      0.02  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

Study date 02/24/20

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 4009

Pixior Distribution Center
Existing Condition
UH_Method
10-year, 24-hours Storm

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
19.13	1	0.75
Rainfall data for year 10		
19.13	6	1.66
Rainfall data for year 10		
19.13	24	3.33

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
67.0	67.0	0.00	0.000	0.578	1.000	0.578
67.0	67.0	19.13	1.000	0.578	1.000	0.578

Area-averaged adjusted loss rate Fm (In/Hr) = 0.578

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
0.00	0.000	67.0	67.0	4.93	0.227
19.13	1.000	67.0	67.0	4.93	0.227

Area-averaged catchment yield fraction, Y = 0.227
Area-averaged low loss fraction, Yb = 0.773
User entry of time of concentration = 0.220 (hours)
++
Watershed area = 19.13(Ac.)
Catchment Lag time = 0.176 hours
Unit interval = 15.000 minutes
Unit interval percentage of lag time = 142.0455
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.578(In/Hr)
Average low loss rate fraction (Yb) = 0.773 (decimal)
VALLEY UNDEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.354(In)
Computed peak 30-minute rainfall = 0.607(In)
Specified peak 1-hour rainfall = 0.747(In)
Computed peak 3-hour rainfall = 1.219(In)
Specified peak 6-hour rainfall = 1.660(In)
Specified peak 24-hour rainfall = 3.330(In)

Rainfall depth area reduction factors:
Using a total area of 19.13(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.354(In)
30-minute factor = 0.999 Adjusted rainfall = 0.606(In)
1-hour factor = 0.999 Adjusted rainfall = 0.746(In)
3-hour factor = 1.000 Adjusted rainfall = 1.219(In)
6-hour factor = 1.000 Adjusted rainfall = 1.660(In)
24-hour factor = 1.000 Adjusted rainfall = 3.330(In)

U n i t H y d r o g r a p h
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 77.12 (CFS))	
1	31.201	24.061
2	78.771	36.685
3	90.441	8.999
4	95.575	3.960
5	98.284	2.089
6	100.000	1.324

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4924	0.0564
2	0.6062	0.0323
3	0.6846	0.0238
4	0.7463	0.0192
5	0.8245	0.0250
6	0.8944	0.0225
7	0.9581	0.0206
8	1.0170	0.0191

9	1.0719	0.0179
10	1.1235	0.0169
11	1.1723	0.0160
12	1.2187	0.0152
13	1.2630	0.0145
14	1.3054	0.0139
15	1.3462	0.0134
16	1.3855	0.0129
17	1.4234	0.0125
18	1.4601	0.0121
19	1.4958	0.0118
20	1.5303	0.0114
21	1.5640	0.0111
22	1.5968	0.0108
23	1.6287	0.0106
24	1.6599	0.0103
25	1.6943	0.0114
26	1.7280	0.0112
27	1.7610	0.0110
28	1.7935	0.0108
29	1.8254	0.0106
30	1.8567	0.0104
31	1.8876	0.0102
32	1.9179	0.0101
33	1.9478	0.0099
34	1.9772	0.0098
35	2.0062	0.0096
36	2.0348	0.0095
37	2.0630	0.0094
38	2.0908	0.0092
39	2.1182	0.0091
40	2.1453	0.0090
41	2.1721	0.0089
42	2.1985	0.0088
43	2.2247	0.0087
44	2.2505	0.0086
45	2.2761	0.0085
46	2.3013	0.0084
47	2.3263	0.0083
48	2.3510	0.0082
49	2.3755	0.0081
50	2.3997	0.0080
51	2.4237	0.0080
52	2.4475	0.0079
53	2.4710	0.0078
54	2.4943	0.0077
55	2.5174	0.0077
56	2.5403	0.0076
57	2.5629	0.0075
58	2.5854	0.0075
59	2.6077	0.0074
60	2.6298	0.0073
61	2.6517	0.0073
62	2.6735	0.0072
63	2.6951	0.0072
64	2.7164	0.0071
65	2.7377	0.0071
66	2.7588	0.0070
67	2.7797	0.0070
68	2.8004	0.0069
69	2.8210	0.0069
70	2.8415	0.0068

71	2.8618	0.0068
72	2.8820	0.0067
73	2.9020	0.0067
74	2.9219	0.0066
75	2.9417	0.0066
76	2.9613	0.0065
77	2.9808	0.0065
78	3.0002	0.0064
79	3.0194	0.0064
80	3.0386	0.0064
81	3.0576	0.0063
82	3.0765	0.0063
83	3.0953	0.0062
84	3.1139	0.0062
85	3.1325	0.0062
86	3.1510	0.0061
87	3.1693	0.0061
88	3.1875	0.0061
89	3.2057	0.0060
90	3.2237	0.0060
91	3.2417	0.0060
92	3.2595	0.0059
93	3.2772	0.0059
94	3.2949	0.0059
95	3.3125	0.0058
96	3.3299	0.0058

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0175	0.0135	0.0040
2	0.0176	0.0136	0.0040
3	0.0178	0.0137	0.0040
4	0.0179	0.0138	0.0041
5	0.0180	0.0140	0.0041
6	0.0182	0.0141	0.0041
7	0.0184	0.0142	0.0042
8	0.0185	0.0143	0.0042
9	0.0187	0.0144	0.0042
10	0.0188	0.0146	0.0043
11	0.0190	0.0147	0.0043
12	0.0192	0.0148	0.0044
13	0.0194	0.0150	0.0044
14	0.0196	0.0151	0.0044
15	0.0198	0.0153	0.0045
16	0.0200	0.0154	0.0045
17	0.0202	0.0156	0.0046
18	0.0204	0.0158	0.0046
19	0.0206	0.0159	0.0047
20	0.0208	0.0161	0.0047
21	0.0211	0.0163	0.0048
22	0.0213	0.0165	0.0048
23	0.0216	0.0167	0.0049
24	0.0218	0.0169	0.0050
25	0.0221	0.0171	0.0050
26	0.0224	0.0173	0.0051
27	0.0227	0.0175	0.0052
28	0.0230	0.0178	0.0052
29	0.0233	0.0180	0.0053
30	0.0236	0.0183	0.0054
31	0.0240	0.0186	0.0055

32	0.0244	0.0188	0.0055
33	0.0248	0.0191	0.0056
34	0.0251	0.0194	0.0057
35	0.0256	0.0198	0.0058
36	0.0260	0.0201	0.0059
37	0.0265	0.0205	0.0060
38	0.0270	0.0208	0.0061
39	0.0275	0.0212	0.0062
40	0.0280	0.0217	0.0064
41	0.0286	0.0221	0.0065
42	0.0292	0.0226	0.0066
43	0.0299	0.0231	0.0068
44	0.0306	0.0237	0.0070
45	0.0314	0.0243	0.0071
46	0.0322	0.0249	0.0073
47	0.0331	0.0256	0.0075
48	0.0341	0.0263	0.0077
49	0.0313	0.0242	0.0071
50	0.0324	0.0250	0.0074
51	0.0338	0.0261	0.0077
52	0.0352	0.0272	0.0080
53	0.0369	0.0285	0.0084
54	0.0387	0.0299	0.0088
55	0.0410	0.0316	0.0093
56	0.0434	0.0336	0.0099
57	0.0467	0.0361	0.0106
58	0.0503	0.0389	0.0114
59	0.0553	0.0428	0.0126
60	0.0615	0.0475	0.0140
61	0.0708	0.0547	0.0161
62	0.0657	0.0508	0.0149
63	0.0820	0.0634	0.0186
64	0.1754	0.1356	0.0398
65	0.4272	0.1446	0.2826
66	0.0732	0.0566	0.0166
67	0.0607	0.0469	0.0138
68	0.0498	0.0385	0.0113
69	0.0431	0.0333	0.0098
70	0.0384	0.0297	0.0087
71	0.0349	0.0270	0.0079
72	0.0322	0.0249	0.0073
73	0.0339	0.0262	0.0077
74	0.0321	0.0248	0.0073
75	0.0305	0.0236	0.0069
76	0.0291	0.0225	0.0066
77	0.0279	0.0216	0.0063
78	0.0269	0.0208	0.0061
79	0.0259	0.0200	0.0059
80	0.0251	0.0194	0.0057
81	0.0243	0.0188	0.0055
82	0.0236	0.0182	0.0054
83	0.0230	0.0177	0.0052
84	0.0224	0.0173	0.0051
85	0.0218	0.0169	0.0050
86	0.0213	0.0165	0.0048
87	0.0208	0.0161	0.0047
88	0.0204	0.0157	0.0046
89	0.0199	0.0154	0.0045
90	0.0195	0.0151	0.0044
91	0.0192	0.0148	0.0044
92	0.0188	0.0145	0.0043
93	0.0185	0.0143	0.0042

94	0.0182	0.0140	0.0041
95	0.0179	0.0138	0.0041
96	0.0176	0.0136	0.0040

Total soil rain loss = 2.39(In)
Total effective rainfall = 0.94(In)
Peak flow rate in flood hydrograph = 11.25(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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 5.0 10.0 15.0 20.0
0+15	0.0020	0.10	Q
0+30	0.0070	0.24	Q
0+45	0.0127	0.28	Q
1+ 0	0.0189	0.30	Q
1+15	0.0253	0.31	Q
1+30	0.0318	0.32	Q
1+45	0.0384	0.32	QV
2+ 0	0.0450	0.32	QV
2+15	0.0517	0.32	QV
2+30	0.0585	0.33	QV
2+45	0.0653	0.33	QV
3+ 0	0.0722	0.33	QV
3+15	0.0791	0.34	Q V
3+30	0.0861	0.34	Q V
3+45	0.0932	0.34	Q V
4+ 0	0.1004	0.35	Q V
4+15	0.1076	0.35	Q V
4+30	0.1149	0.35	Q V
4+45	0.1223	0.36	Q V
5+ 0	0.1297	0.36	Q V
5+15	0.1373	0.36	Q V
5+30	0.1449	0.37	Q V
5+45	0.1526	0.37	Q V
6+ 0	0.1604	0.38	Q V
6+15	0.1683	0.38	Q V
6+30	0.1763	0.39	Q V
6+45	0.1844	0.39	Q V
7+ 0	0.1926	0.40	Q V
7+15	0.2010	0.40	Q V
7+30	0.2094	0.41	Q V
7+45	0.2179	0.41	Q V
8+ 0	0.2266	0.42	Q V
8+15	0.2354	0.43	Q V
8+30	0.2444	0.43	Q V
8+45	0.2535	0.44	Q V
9+ 0	0.2627	0.45	Q V
9+15	0.2721	0.46	Q V
9+30	0.2817	0.46	Q V
9+45	0.2915	0.47	Q V
10+ 0	0.3014	0.48	Q V
10+15	0.3116	0.49	Q V
10+30	0.3219	0.50	|Q V
10+45	0.3325	0.51	|Q V
11+ 0	0.3433	0.52	|Q V|

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  11+15       0.3544      0.54  |Q       V|          |          |          |
  11+30       0.3657      0.55  |Q       V|          |          |          |
  11+45       0.3774      0.56  |Q        V          |          |          |
  12+ 0       0.3894      0.58  |Q        V          |          |          |
  12+15       0.4013      0.58  |Q        V          |          |          |
  12+30       0.4129      0.56  |Q         V         |          |          |
  12+45       0.4247      0.57  |Q        |V         |          |          |
  13+ 0       0.4370      0.59  |Q        |V         |          |          |
  13+15       0.4498      0.62  |Q        |V         |          |          |
  13+30       0.4631      0.65  |Q        | V        |          |          |
  13+45       0.4771      0.68  |Q        | V        |          |          |
  14+ 0       0.4920      0.72  |Q        |  V       |          |          |
  14+15       0.5077      0.76  |Q        |  V       |          |          |
  14+30       0.5247      0.82  |Q        |  V       |          |          |
  14+45       0.5430      0.89  |Q        |   V      |          |          |
  15+ 0       0.5631      0.97  |Q        |    V     |          |          |
  15+15       0.5857      1.09  | Q       |    V     |          |          |
  15+30       0.6097      1.16  | Q       |     V    |          |          |
  15+45       0.6353      1.24  | Q       |     V    |          |          |
  16+ 0       0.6742      1.89  |  Q      |      V   |          |          |
  16+15       0.8507      8.54  |         |      Q   | V        |          |
  16+30       1.0832     11.25  |         |          | Q     V  |          |
  16+45       1.1597      3.70  |      Q  |          |        V           |
  17+ 0       1.2042      2.15  |   Q     |          |          | V        |
  17+15       1.2349      1.48  | Q       |          |          | V        |
  17+30       1.2583      1.13  | Q       |          |          |  V       |
  17+45       1.2727      0.69  |Q        |          |          |  V       |
  18+ 0       1.2856      0.63  |Q        |          |          |   V      |
  18+15       1.2979      0.60  |Q        |          |          |   V      |
  18+30       1.3100      0.59  |Q        |          |          |   V      |
  18+45       1.3216      0.56  |Q        |          |          |    V     |
  19+ 0       1.3327      0.54  |Q        |          |          |    V     |
  19+15       1.3432      0.51  |Q        |          |          |    V     |
  19+30       1.3534      0.49  Q         |          |          |     V    |
  19+45       1.3632      0.47  Q         |          |          |     V    |
  20+ 0       1.3726      0.46  Q         |          |          |     V    |
  20+15       1.3817      0.44  Q         |          |          |     V    |
  20+30       1.3906      0.43  Q         |          |          |      V   |
  20+45       1.3991      0.41  Q         |          |          |      V   |
  21+ 0       1.4075      0.40  Q         |          |          |      V   |
  21+15       1.4156      0.39  Q         |          |          |      V   |
  21+30       1.4235      0.38  Q         |          |          |      V   |
  21+45       1.4312      0.37  Q         |          |          |       V  |
  22+ 0       1.4387      0.37  Q         |          |          |       V  |
  22+15       1.4461      0.36  Q         |          |          |       V  |
  22+30       1.4534      0.35  Q         |          |          |       V  |
  22+45       1.4604      0.34  Q         |          |          |       V  |
  23+ 0       1.4674      0.34  Q         |          |          |        V |
  23+15       1.4742      0.33  Q         |          |          |        V |
  23+30       1.4809      0.32  Q         |          |          |        V |
  23+45       1.4875      0.32  Q         |          |          |        V |
  24+ 0       1.4940      0.31  Q         |          |          |        V |
  24+15       1.4984      0.21  Q         |          |          |        V |
  24+30       1.4998      0.07  Q         |          |          |        V |
  24+45       1.5004      0.03  Q         |          |          |        V |
  25+ 0       1.5007      0.01  Q         |          |          |        V |
  25+15       1.5008      0.01  Q         |          |          |        V |
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U n i t H y d r o g r a p h A n a l y s i s

Study date 05/13/20

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 4009

Pixior Distribution Center
Post-Development Condition
UH_Method
100-year, 24-hours Storm

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
19.37	1	1.25
Rainfall data for year 100		
19.37	6	2.81
Rainfall data for year 100		
19.37	24	5.90

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	52.0	19.37	1.000	0.785	0.150	0.118

Area-averaged adjusted loss rate Fm (In/Hr) = 0.118

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
2.91	0.150	32.0	52.0	9.23	0.210
16.46	0.850	98.0	98.0	0.20	0.960

Area-averaged catchment yield fraction, Y = 0.847
Area-averaged low loss fraction, Yb = 0.153
User entry of time of concentration = 0.260 (hours)

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Watershed area = 19.37(Ac.)
Catchment Lag time = 0.208 hours
Unit interval = 15.000 minutes
Unit interval percentage of lag time = 120.1923
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.118(In/Hr)
Average low loss rate fraction (Yb) = 0.153 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.593(In)
Computed peak 30-minute rainfall = 1.015(In)
Specified peak 1-hour rainfall = 1.250(In)
Computed peak 3-hour rainfall = 2.054(In)
Specified peak 6-hour rainfall = 2.810(In)
Specified peak 24-hour rainfall = 5.900(In)

Rainfall depth area reduction factors:
Using a total area of 19.37(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.593(In)
30-minute factor = 0.999 Adjusted rainfall = 1.014(In)
1-hour factor = 0.999 Adjusted rainfall = 1.249(In)
3-hour factor = 1.000 Adjusted rainfall = 2.054(In)
6-hour factor = 1.000 Adjusted rainfall = 2.810(In)
24-hour factor = 1.000 Adjusted rainfall = 5.900(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 78.09 (CFS))	
1	24.149	18.857
2	88.685	50.393
3	100.000	8.836

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8239	0.0944
2	1.0144	0.0540
3	1.1456	0.0398
4	1.2489	0.0322
5	1.3816	0.0425
6	1.5006	0.0383
7	1.6090	0.0352
8	1.7093	0.0326
9	1.8030	0.0305
10	1.8911	0.0288
11	1.9745	0.0273
12	2.0538	0.0260
13	2.1295	0.0249
14	2.2021	0.0239
15	2.2719	0.0230
16	2.3391	0.0222
17	2.4042	0.0214
18	2.4671	0.0208
19	2.5282	0.0202
20	2.5875	0.0196
21	2.6452	0.0191
22	2.7014	0.0186
23	2.7563	0.0181
24	2.8098	0.0177
25	2.8719	0.0206
26	2.9328	0.0202
27	2.9926	0.0198
28	3.0514	0.0195
29	3.1093	0.0192
30	3.1662	0.0189
31	3.2222	0.0186

32	3.2774	0.0183
33	3.3319	0.0181
34	3.3855	0.0178
35	3.4384	0.0176
36	3.4906	0.0173
37	3.5422	0.0171
38	3.5931	0.0169
39	3.6434	0.0167
40	3.6931	0.0165
41	3.7422	0.0163
42	3.7908	0.0161
43	3.8388	0.0160
44	3.8863	0.0158
45	3.9334	0.0156
46	3.9799	0.0155
47	4.0259	0.0153
48	4.0716	0.0152
49	4.1167	0.0150
50	4.1615	0.0149
51	4.2058	0.0147
52	4.2497	0.0146
53	4.2933	0.0145
54	4.3364	0.0143
55	4.3792	0.0142
56	4.4216	0.0141
57	4.4637	0.0140
58	4.5055	0.0139
59	4.5469	0.0138
60	4.5879	0.0137
61	4.6287	0.0136
62	4.6691	0.0134
63	4.7093	0.0133
64	4.7491	0.0133
65	4.7887	0.0132
66	4.8280	0.0131
67	4.8670	0.0130
68	4.9057	0.0129
69	4.9442	0.0128
70	4.9824	0.0127
71	5.0204	0.0126
72	5.0581	0.0125
73	5.0956	0.0125
74	5.1328	0.0124
75	5.1698	0.0123
76	5.2066	0.0122
77	5.2431	0.0122
78	5.2794	0.0121
79	5.3156	0.0120
80	5.3515	0.0119
81	5.3871	0.0119
82	5.4226	0.0118
83	5.4579	0.0117
84	5.4930	0.0117
85	5.5279	0.0116
86	5.5626	0.0115
87	5.5971	0.0115
88	5.6315	0.0114
89	5.6656	0.0114
90	5.6996	0.0113
91	5.7334	0.0112
92	5.7670	0.0112
93	5.8005	0.0111
94	5.8338	0.0111
95	5.8669	0.0110
96	5.8999	0.0110

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0330	0.0050	0.0279

2	0.0332	0.0051	0.0281
3	0.0335	0.0051	0.0284
4	0.0337	0.0052	0.0286
5	0.0340	0.0052	0.0288
6	0.0343	0.0052	0.0290
7	0.0345	0.0053	0.0293
8	0.0348	0.0053	0.0295
9	0.0351	0.0054	0.0297
10	0.0354	0.0054	0.0300
11	0.0357	0.0055	0.0303
12	0.0360	0.0055	0.0305
13	0.0364	0.0056	0.0308
14	0.0367	0.0056	0.0311
15	0.0370	0.0057	0.0314
16	0.0374	0.0057	0.0317
17	0.0377	0.0058	0.0320
18	0.0381	0.0058	0.0323
19	0.0385	0.0059	0.0326
20	0.0389	0.0059	0.0329
21	0.0393	0.0060	0.0333
22	0.0397	0.0061	0.0337
23	0.0402	0.0061	0.0340
24	0.0406	0.0062	0.0344
25	0.0411	0.0063	0.0348
26	0.0416	0.0064	0.0352
27	0.0421	0.0064	0.0357
28	0.0426	0.0065	0.0361
29	0.0432	0.0066	0.0366
30	0.0438	0.0067	0.0371
31	0.0444	0.0068	0.0376
32	0.0450	0.0069	0.0381
33	0.0457	0.0070	0.0387
34	0.0463	0.0071	0.0392
35	0.0471	0.0072	0.0399
36	0.0478	0.0073	0.0405
37	0.0486	0.0074	0.0412
38	0.0494	0.0076	0.0419
39	0.0504	0.0077	0.0427
40	0.0513	0.0078	0.0434
41	0.0523	0.0080	0.0443
42	0.0533	0.0082	0.0452
43	0.0545	0.0083	0.0462
44	0.0557	0.0085	0.0472
45	0.0570	0.0087	0.0483
46	0.0584	0.0089	0.0495
47	0.0599	0.0092	0.0508
48	0.0615	0.0094	0.0521
49	0.0537	0.0082	0.0455
50	0.0556	0.0085	0.0471
51	0.0579	0.0088	0.0490
52	0.0603	0.0092	0.0511
53	0.0632	0.0097	0.0535
54	0.0663	0.0101	0.0561
55	0.0701	0.0107	0.0594
56	0.0743	0.0114	0.0629
57	0.0798	0.0122	0.0676
58	0.0860	0.0131	0.0728
59	0.0944	0.0144	0.0800
60	0.1047	0.0160	0.0887
61	0.1204	0.0184	0.1020
62	0.1107	0.0169	0.0938
63	0.1372	0.0210	0.1162
64	0.2935	0.0294	0.2641
65	0.7149	0.0294	0.6854
66	0.1239	0.0189	0.1049
67	0.1033	0.0158	0.0875
68	0.0851	0.0130	0.0721
69	0.0737	0.0113	0.0624
70	0.0658	0.0101	0.0557
71	0.0599	0.0092	0.0508
72	0.0553	0.0085	0.0469

73	0.0613	0.0094	0.0519
74	0.0582	0.0089	0.0493
75	0.0555	0.0085	0.0470
76	0.0532	0.0081	0.0450
77	0.0511	0.0078	0.0433
78	0.0493	0.0075	0.0418
79	0.0477	0.0073	0.0404
80	0.0462	0.0071	0.0392
81	0.0449	0.0069	0.0380
82	0.0437	0.0067	0.0370
83	0.0425	0.0065	0.0360
84	0.0415	0.0063	0.0352
85	0.0406	0.0062	0.0344
86	0.0397	0.0061	0.0336
87	0.0388	0.0059	0.0329
88	0.0380	0.0058	0.0322
89	0.0373	0.0057	0.0316
90	0.0366	0.0056	0.0310
91	0.0360	0.0055	0.0305
92	0.0354	0.0054	0.0300
93	0.0348	0.0053	0.0295
94	0.0342	0.0052	0.0290
95	0.0337	0.0051	0.0285
96	0.0332	0.0051	0.0281

Total soil rain loss = 0.81(In)
Total effective rainfall = 5.09(In)
Peak flow rate in flood hydrograph = 38.85(CFS)

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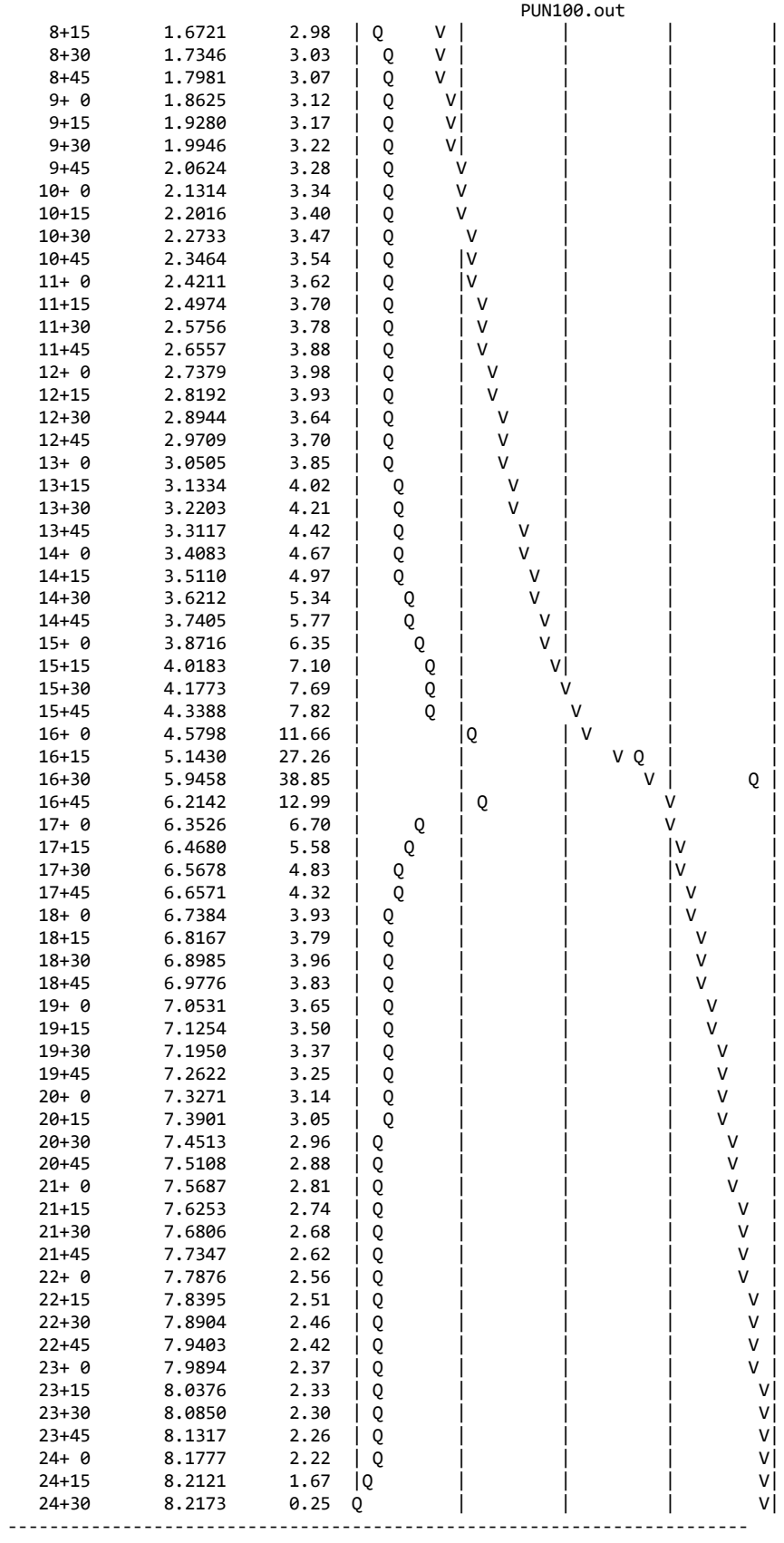
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 10.0 20.0 30.0 40.0
0+15	0.0109	0.53	Q
0+30	0.0509	1.94	VQ
0+45	0.0964	2.20	V Q
1+ 0	0.1422	2.22	V Q
1+15	0.1883	2.23	V Q
1+30	0.2348	2.25	VQ
1+45	0.2817	2.27	|VQ
2+ 0	0.3290	2.29	|VQ
2+15	0.3766	2.31	|VQ
2+30	0.4246	2.32	| Q
2+45	0.4731	2.34	| Q
3+ 0	0.5219	2.36	| Q
3+15	0.5712	2.39	| Q
3+30	0.6210	2.41	| QV
3+45	0.6711	2.43	| QV
4+ 0	0.7218	2.45	| QV
4+15	0.7729	2.48	| QV
4+30	0.8246	2.50	| Q V
4+45	0.8767	2.52	| Q V
5+ 0	0.9294	2.55	| Q V
5+15	0.9827	2.58	| Q V
5+30	1.0365	2.60	| Q V
5+45	1.0908	2.63	| Q V
6+ 0	1.1458	2.66	| Q V
6+15	1.2014	2.69	| Q V
6+30	1.2577	2.72	| Q V
6+45	1.3147	2.76	| Q V
7+ 0	1.3723	2.79	| Q V
7+15	1.4307	2.83	| Q V
7+30	1.4898	2.86	| Q V
7+45	1.5497	2.90	| Q V
8+ 0	1.6105	2.94	| Q V



8+15	1.6721	2.98	Q V				
8+30	1.7346	3.03	Q V				
8+45	1.7981	3.07	Q V				
9+ 0	1.8625	3.12	Q V				
9+15	1.9280	3.17	Q V				
9+30	1.9946	3.22	Q V				
9+45	2.0624	3.28	Q V				
10+ 0	2.1314	3.34	Q V				
10+15	2.2016	3.40	Q V				
10+30	2.2733	3.47	Q V				
10+45	2.3464	3.54	Q V				
11+ 0	2.4211	3.62	Q V				
11+15	2.4974	3.70	Q V				
11+30	2.5756	3.78	Q V				
11+45	2.6557	3.88	Q V				
12+ 0	2.7379	3.98	Q V				
12+15	2.8192	3.93	Q V				
12+30	2.8944	3.64	Q V				
12+45	2.9709	3.70	Q V				
13+ 0	3.0505	3.85	Q V				
13+15	3.1334	4.02	Q V				
13+30	3.2203	4.21	Q V				
13+45	3.3117	4.42	Q V				
14+ 0	3.4083	4.67	Q V				
14+15	3.5110	4.97	Q V				
14+30	3.6212	5.34	Q V				
14+45	3.7405	5.77	Q V				
15+ 0	3.8716	6.35	Q V				
15+15	4.0183	7.10	Q V				
15+30	4.1773	7.69	Q V				
15+45	4.3388	7.82	Q V				
16+ 0	4.5798	11.66	Q V				
16+15	5.1430	27.26	V Q				
16+30	5.9458	38.85	V Q				
16+45	6.2142	12.99	Q V				
17+ 0	6.3526	6.70	Q V				
17+15	6.4680	5.58	Q V				
17+30	6.5678	4.83	Q V				
17+45	6.6571	4.32	Q V				
18+ 0	6.7384	3.93	Q V				
18+15	6.8167	3.79	Q V				
18+30	6.8985	3.96	Q V				
18+45	6.9776	3.83	Q V				
19+ 0	7.0531	3.65	Q V				
19+15	7.1254	3.50	Q V				
19+30	7.1950	3.37	Q V				
19+45	7.2622	3.25	Q V				
20+ 0	7.3271	3.14	Q V				
20+15	7.3901	3.05	Q V				
20+30	7.4513	2.96	Q V				
20+45	7.5108	2.88	Q V				
21+ 0	7.5687	2.81	Q V				
21+15	7.6253	2.74	Q V				
21+30	7.6806	2.68	Q V				
21+45	7.7347	2.62	Q V				
22+ 0	7.7876	2.56	Q V				
22+15	7.8395	2.51	Q V				
22+30	7.8904	2.46	Q V				
22+45	7.9403	2.42	Q V				
23+ 0	7.9894	2.37	Q V				
23+15	8.0376	2.33	Q V				
23+30	8.0850	2.30	Q V				
23+45	8.1317	2.26	Q V				
24+ 0	8.1777	2.22	Q V				
24+15	8.2121	1.67	Q V				
24+30	8.2173	0.25	Q V				

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

Study date 05/13/20

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 4009

Pixior Distribition Center
Post-Development
UN_Method
10-year, 24-hours Storm

Storm Event Year = 10

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
19.37	1	0.75
Rainfall data for year 10		
19.37	6	1.66
Rainfall data for year 10		
19.37	24	3.33

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	19.37	1.000	0.978	0.150	0.147

Area-averaged adjusted loss rate Fm (In/Hr) = 0.147

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
2.91	0.150	32.0	32.0	16.65	0.000
16.46	0.850	98.0	98.0	0.20	0.930

Area-averaged catchment yield fraction, Y = 0.791
Area-averaged low loss fraction, Yb = 0.209
User entry of time of concentration = 0.170 (hours)

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Watershed area = 19.37(Ac.)
Catchment Lag time = 0.136 hours
Unit interval = 15.000 minutes
Unit interval percentage of lag time = 183.8235
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.147(In/Hr)
Average low loss rate fraction (Yb) = 0.209 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.354(In)
Computed peak 30-minute rainfall = 0.607(In)
Specified peak 1-hour rainfall = 0.747(In)
Computed peak 3-hour rainfall = 1.219(In)
Specified peak 6-hour rainfall = 1.660(In)
Specified peak 24-hour rainfall = 3.330(In)

Rainfall depth area reduction factors:
Using a total area of 19.37(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.354(In)
30-minute factor = 0.999 Adjusted rainfall = 0.606(In)
1-hour factor = 0.999 Adjusted rainfall = 0.746(In)
3-hour factor = 1.000 Adjusted rainfall = 1.219(In)
6-hour factor = 1.000 Adjusted rainfall = 1.660(In)
24-hour factor = 1.000 Adjusted rainfall = 3.330(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 78.09 (CFS))	
1	44.297	34.590
2	100.000	17.295

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4924	0.0564
2	0.6062	0.0323
3	0.6846	0.0238
4	0.7463	0.0192
5	0.8245	0.0250
6	0.8944	0.0225
7	0.9581	0.0206
8	1.0169	0.0191
9	1.0718	0.0179
10	1.1235	0.0169
11	1.1723	0.0160
12	1.2187	0.0152
13	1.2630	0.0145
14	1.3054	0.0139
15	1.3462	0.0134
16	1.3855	0.0129
17	1.4234	0.0125
18	1.4601	0.0121
19	1.4957	0.0118
20	1.5303	0.0114
21	1.5640	0.0111
22	1.5968	0.0108
23	1.6287	0.0106
24	1.6599	0.0103
25	1.6943	0.0114
26	1.7280	0.0112
27	1.7610	0.0110
28	1.7935	0.0108
29	1.8254	0.0106
30	1.8567	0.0104
31	1.8876	0.0102
32	1.9179	0.0101

33	1.9478	0.0099
34	1.9772	0.0098
35	2.0062	0.0096
36	2.0348	0.0095
37	2.0630	0.0094
38	2.0908	0.0092
39	2.1182	0.0091
40	2.1453	0.0090
41	2.1721	0.0089
42	2.1985	0.0088
43	2.2247	0.0087
44	2.2505	0.0086
45	2.2761	0.0085
46	2.3013	0.0084
47	2.3263	0.0083
48	2.3510	0.0082
49	2.3755	0.0081
50	2.3997	0.0080
51	2.4237	0.0080
52	2.4475	0.0079
53	2.4710	0.0078
54	2.4943	0.0077
55	2.5174	0.0077
56	2.5403	0.0076
57	2.5629	0.0075
58	2.5854	0.0075
59	2.6077	0.0074
60	2.6298	0.0073
61	2.6517	0.0073
62	2.6735	0.0072
63	2.6950	0.0072
64	2.7164	0.0071
65	2.7377	0.0071
66	2.7588	0.0070
67	2.7797	0.0070
68	2.8004	0.0069
69	2.8210	0.0069
70	2.8415	0.0068
71	2.8618	0.0068
72	2.8820	0.0067
73	2.9020	0.0067
74	2.9219	0.0066
75	2.9417	0.0066
76	2.9613	0.0065
77	2.9808	0.0065
78	3.0002	0.0064
79	3.0194	0.0064
80	3.0386	0.0064
81	3.0576	0.0063
82	3.0765	0.0063
83	3.0953	0.0062
84	3.1139	0.0062
85	3.1325	0.0062
86	3.1510	0.0061
87	3.1693	0.0061
88	3.1875	0.0061
89	3.2057	0.0060
90	3.2237	0.0060
91	3.2417	0.0060
92	3.2595	0.0059
93	3.2772	0.0059
94	3.2949	0.0059
95	3.3125	0.0058
96	3.3299	0.0058

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0175	0.0037	0.0138
2	0.0176	0.0037	0.0139

3	0.0178	0.0037	0.0140
4	0.0179	0.0037	0.0141
5	0.0180	0.0038	0.0143
6	0.0182	0.0038	0.0144
7	0.0184	0.0038	0.0145
8	0.0185	0.0039	0.0146
9	0.0187	0.0039	0.0148
10	0.0188	0.0039	0.0149
11	0.0190	0.0040	0.0150
12	0.0192	0.0040	0.0152
13	0.0194	0.0041	0.0153
14	0.0196	0.0041	0.0155
15	0.0198	0.0041	0.0156
16	0.0200	0.0042	0.0158
17	0.0202	0.0042	0.0160
18	0.0204	0.0043	0.0161
19	0.0206	0.0043	0.0163
20	0.0208	0.0044	0.0165
21	0.0211	0.0044	0.0167
22	0.0213	0.0045	0.0169
23	0.0216	0.0045	0.0171
24	0.0218	0.0046	0.0173
25	0.0221	0.0046	0.0175
26	0.0224	0.0047	0.0177
27	0.0227	0.0048	0.0179
28	0.0230	0.0048	0.0182
29	0.0233	0.0049	0.0184
30	0.0236	0.0050	0.0187
31	0.0240	0.0050	0.0190
32	0.0244	0.0051	0.0193
33	0.0248	0.0052	0.0196
34	0.0251	0.0053	0.0199
35	0.0256	0.0054	0.0202
36	0.0260	0.0054	0.0206
37	0.0265	0.0055	0.0209
38	0.0270	0.0056	0.0213
39	0.0275	0.0058	0.0217
40	0.0280	0.0059	0.0222
41	0.0286	0.0060	0.0226
42	0.0292	0.0061	0.0231
43	0.0299	0.0063	0.0237
44	0.0306	0.0064	0.0242
45	0.0314	0.0066	0.0248
46	0.0322	0.0067	0.0255
47	0.0331	0.0069	0.0262
48	0.0341	0.0071	0.0269
49	0.0313	0.0066	0.0247
50	0.0324	0.0068	0.0256
51	0.0338	0.0071	0.0267
52	0.0352	0.0074	0.0278
53	0.0369	0.0077	0.0291
54	0.0387	0.0081	0.0306
55	0.0410	0.0086	0.0324
56	0.0434	0.0091	0.0343
57	0.0467	0.0098	0.0369
58	0.0503	0.0105	0.0398
59	0.0553	0.0116	0.0437
60	0.0615	0.0129	0.0486
61	0.0708	0.0148	0.0560
62	0.0657	0.0138	0.0520
63	0.0820	0.0172	0.0648
64	0.1754	0.0367	0.1387
65	0.4272	0.0367	0.3905
66	0.0732	0.0153	0.0579
67	0.0607	0.0127	0.0479
68	0.0498	0.0104	0.0394
69	0.0431	0.0090	0.0340
70	0.0384	0.0080	0.0304
71	0.0349	0.0073	0.0276
72	0.0322	0.0068	0.0255
73	0.0339	0.0071	0.0268

74	0.0321	0.0067	0.0254
75	0.0305	0.0064	0.0241
76	0.0291	0.0061	0.0230
77	0.0279	0.0059	0.0221
78	0.0269	0.0056	0.0213
79	0.0259	0.0054	0.0205
80	0.0251	0.0053	0.0198
81	0.0243	0.0051	0.0192
82	0.0236	0.0049	0.0187
83	0.0230	0.0048	0.0181
84	0.0224	0.0047	0.0177
85	0.0218	0.0046	0.0172
86	0.0213	0.0045	0.0168
87	0.0208	0.0044	0.0165
88	0.0204	0.0043	0.0161
89	0.0199	0.0042	0.0158
90	0.0195	0.0041	0.0155
91	0.0192	0.0040	0.0152
92	0.0188	0.0039	0.0149
93	0.0185	0.0039	0.0146
94	0.0182	0.0038	0.0144
95	0.0179	0.0037	0.0141
96	0.0176	0.0037	0.0139

Total soil rain loss = 0.64(In)
Total effective rainfall = 2.69(In)
Peak flow rate in flood hydrograph = 15.91(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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 5.0 10.0 15.0 20.0
0+15	0.0099	0.48	Q | | | |
0+30	0.0248	0.72	VQ | | | |
0+45	0.0398	0.73	VQ | | | |
1+ 0	0.0549	0.73	VQ | | | |
1+15	0.0701	0.74	VQ | | | |
1+30	0.0855	0.74	|Q | | | |
1+45	0.1010	0.75	|Q | | | |
2+ 0	0.1167	0.76	|Q | | | |
2+15	0.1325	0.76	|Q | | | |
2+30	0.1484	0.77	|QV | | | |
2+45	0.1645	0.78	|QV | | | |
3+ 0	0.1807	0.79	|QV | | | |
3+15	0.1971	0.79	|QV | | | |
3+30	0.2136	0.80	|QV | | | |
3+45	0.2303	0.81	|Q V | | | |
4+ 0	0.2472	0.82	|Q V | | | |
4+15	0.2642	0.83	|Q V | | | |
4+30	0.2814	0.83	|Q V | | | |
4+45	0.2989	0.84	|Q V | | | |
5+ 0	0.3165	0.85	|Q V | | | |
5+15	0.3343	0.86	|Q V | | | |
5+30	0.3523	0.87	|Q V | | | |
5+45	0.3705	0.88	|Q V | | | |
6+ 0	0.3889	0.89	|Q V | | | |
6+15	0.4076	0.90	|Q V | | | |
6+30	0.4265	0.91	|Q V | | | |
6+45	0.4457	0.93	|Q V | | | |
7+ 0	0.4651	0.94	|Q V | | | |
7+15	0.4847	0.95	|Q V | | | |
7+30	0.5047	0.97	|Q V | | | |
7+45	0.5249	0.98	|Q V | | | |
8+ 0	0.5455	0.99	|Q V | | | |
8+15	0.5663	1.01	| Q V | | | |

```
  8+30       0.5875      1.03  | Q     V |          |          |          |
  8+45       0.6091      1.04  | Q     V |          |          |          |
  9+ 0       0.6310      1.06  | Q     V |          |          |          |
  9+15       0.6533      1.08  | Q      V|          |          |          |
  9+30       0.6760      1.10  | Q      V|          |          |          |
  9+45       0.6992      1.12  | Q      V|          |          |          |
 10+ 0       0.7228      1.14  | Q       V          |          |          |
 10+15       0.7469      1.17  | Q       V          |          |          |
 10+30       0.7715      1.19  | Q       V          |          |          |
 10+45       0.7966      1.22  | Q        V         |          |          |
 11+ 0       0.8224      1.25  | Q       |V         |          |          |
 11+15       0.8488      1.28  | Q       |V         |          |          |
 11+30       0.8758      1.31  | Q       | V        |          |          |
 11+45       0.9036      1.35  | Q       | V        |          |          |
 12+ 0       0.9322      1.38  | Q       | V        |          |          |
 12+15       0.9595      1.32  | Q       |  V       |          |          |
 12+30       0.9867      1.31  | Q       |  V       |          |          |
 12+45       1.0149      1.37  | Q       |   V      |          |          |
 13+ 0       1.0443      1.42  | Q       |   V      |          |          |
 13+15       1.0751      1.49  | Q       |   V      |          |          |
 13+30       1.1073      1.56  |  Q      |    V     |          |          |
 13+45       1.1414      1.65  |  Q      |    V     |          |          |
 14+ 0       1.1775      1.75  |  Q      |     V    |          |          |
 14+15       1.2161      1.87  |  Q      |     V    |          |          |
 14+30       1.2578      2.01  |   Q     |      V   |          |          |
 14+45       1.3032      2.20  |   Q     |       V  |          |          |
 15+ 0       1.3536      2.44  |   Q     |       V  |          |          |
 15+15       1.4110      2.78  |    Q    |        V|          |          |
 15+30       1.4681      2.77  |    Q    |         V          |          |
 15+45       1.5330      3.14  |     Q   |          V         |          |
 16+ 0       1.6553      5.92  |         |Q         |  V       |          |
 16+15       1.9840     15.91  |         |          |      V   |Q         |
 16+30       2.1649      8.76  |         |      Q   |          V          |
 16+45       2.2199      2.66  |    Q    |          |          V          |
 17+ 0       2.2652      2.19  |   Q     |          |          |V         |
 17+15       2.3036      1.86  |  Q      |          |          | V        |
 17+30       2.3375      1.64  |  Q      |          |          | V        |
 17+45       2.3681      1.48  | Q       |          |          | V        |
 18+ 0       2.3961      1.36  | Q       |          |          |  V       |
 18+15       2.4244      1.37  | Q       |          |          |  V       |
 18+30       2.4521      1.34  | Q       |          |          |   V      |
 18+45       2.4784      1.27  | Q       |          |          |   V      |
 19+ 0       2.5035      1.21  | Q       |          |          |   V      |
 19+15       2.5275      1.16  | Q       |          |          |    V     |
 19+30       2.5506      1.12  | Q       |          |          |    V     |
 19+45       2.5729      1.08  | Q       |          |          |    V     |
 20+ 0       2.5944      1.04  | Q       |          |          |     V    |
 20+15       2.6152      1.01  | Q       |          |          |     V    |
 20+30       2.6354      0.98  |Q        |          |          |     V    |
 20+45       2.6550      0.95  |Q        |          |          |     V    |
 21+ 0       2.6741      0.93  |Q        |          |          |      V   |
 21+15       2.6928      0.90  |Q        |          |          |      V   |
 21+30       2.7109      0.88  |Q        |          |          |      V   |
 21+45       2.7287      0.86  |Q        |          |          |      V   |
 22+ 0       2.7461      0.84  |Q        |          |          |       V  |
 22+15       2.7631      0.82  |Q        |          |          |       V  |
 22+30       2.7798      0.81  |Q        |          |          |       V  |
 22+45       2.7961      0.79  |Q        |          |          |       V  |
 23+ 0       2.8122      0.78  |Q        |          |          |        V|
 23+15       2.8280      0.76  |Q        |          |          |        V|
 23+30       2.8434      0.75  |Q        |          |          |        V|
 23+45       2.8587      0.74  |Q        |          |          |        V|
 24+ 0       2.8737      0.73  |Q        |          |          |        V|
 24+15       2.8786      0.24  Q         |          |          |         V
-------------------------------------------------------------------------
```

Appendix F: Basin Routing Analysis

- Basin Routing Analysis for 100 - Year Storm
- Basin Routing Analysis for 10 - Year Storm
- Underground Basin Volume Information
- Outlet Pipe Size Calculation

FLOOD HYDROGRAPH ROUTING PROGRAM

Study date: 05/13/20

Pixior Distribution Center
Basin Routing
100-year, 24-hour Storm

Program License Serial Number 4009

********** HYDROGRAPH INFORMATION **********

From study/file name: PUN100.rte
**********HYDROGRAPH DATA**********
Number of intervals = 98
Time interval = 15.0 (Min.)
Maximum/Peak flow rate = 38.853 (CFS)
Total volume = 8.217 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

++
Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 98
Hydrograph time unit = 15.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
3.000	0.410	0.010	0.410	0.410
6.000	0.930	0.015	0.930	0.930
9.000	1.330	15.200	1.173	1.487

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	9.7	19.43	29.14	38.85	Depth (Ft.)
0.250	0.53	0.00	0.005	O	|	|	|	|	0.04
0.500	1.94	0.00	0.031	OI	|	|	|	|	0.23
0.750	2.20	0.00	0.074	OI	|	|	|	|	0.54

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 1.000    2.22    0.00      0.119  OI      |       |       |       |     0.87
 1.250    2.23    0.00      0.165  OI      |       |       |       |     1.21
 1.500    2.25    0.01      0.211  OI      |       |       |       |     1.55
 1.750    2.27    0.01      0.258  OI      |       |       |       |     1.89
 2.000    2.29    0.01      0.305  OI      |       |       |       |     2.23
 2.250    2.31    0.01      0.352  OI      |       |       |       |     2.58
 2.500    2.32    0.01      0.400  OI      |       |       |       |     2.92
 2.750    2.34    0.01      0.448  OI      |       |       |       |     3.22
 3.000    2.36    0.01      0.496  OI      |       |       |       |     3.50
 3.250    2.39    0.01      0.545  OI      |       |       |       |     3.78
 3.500    2.41    0.01      0.594  OI      |       |       |       |     4.06
 3.750    2.43    0.01      0.644  O I     |       |       |       |     4.35
 4.000    2.45    0.01      0.694  O I     |       |       |       |     4.64
 4.250    2.48    0.01      0.745  O I     |       |       |       |     4.93
 4.500    2.50    0.01      0.796  O I     |       |       |       |     5.23
 4.750    2.52    0.01      0.848  O I     |       |       |       |     5.52
 5.000    2.55    0.01      0.900  O I     |       |       |       |     5.83
 5.250    2.58    0.62      0.946  O I     |       |       |       |     6.12
 5.500    2.60    1.73      0.975  |OI     |       |       |       |     6.34
 5.750    2.63    2.23      0.988  |OI     |       |       |       |     6.44
 6.000    2.66    2.47      0.995  | O     |       |       |       |     6.48
 6.250    2.69    2.58      0.998  | O     |       |       |       |     6.51
 6.500    2.72    2.65      1.000  | O     |       |       |       |     6.52
 6.750    2.76    2.70      1.001  | O     |       |       |       |     6.53
 7.000    2.79    2.74      1.002  | O     |       |       |       |     6.54
 7.250    2.83    2.78      1.003  | O     |       |       |       |     6.55
 7.500    2.86    2.82      1.004  | O     |       |       |       |     6.55
 7.750    2.90    2.85      1.005  | O     |       |       |       |     6.56
 8.000    2.94    2.89      1.006  | O     |       |       |       |     6.57
 8.250    2.98    2.93      1.007  | O     |       |       |       |     6.58
 8.500    3.03    2.97      1.008  | O     |       |       |       |     6.58
 8.750    3.07    3.02      1.009  | O     |       |       |       |     6.59
 9.000    3.12    3.06      1.010  | O     |       |       |       |     6.60
 9.250    3.17    3.11      1.011  | O     |       |       |       |     6.61
 9.500    3.22    3.16      1.013  | O     |       |       |       |     6.62
 9.750    3.28    3.21      1.014  | O     |       |       |       |     6.63
10.000    3.34    3.27      1.016  | O     |       |       |       |     6.64
10.250    3.40    3.32      1.017  | O     |       |       |       |     6.65
10.500    3.47    3.39      1.019  | O     |       |       |       |     6.67
10.750    3.54    3.45      1.021  | O     |       |       |       |     6.68
11.000    3.62    3.52      1.022  | O     |       |       |       |     6.69
11.250    3.70    3.60      1.024  | OI    |       |       |       |     6.71
11.500    3.78    3.68      1.026  |  O    |       |       |       |     6.72
11.750    3.88    3.76      1.029  |  O    |       |       |       |     6.74
12.000    3.98    3.86      1.031  |  O    |       |       |       |     6.76
12.250    3.93    3.91      1.033  |  O    |       |       |       |     6.77
12.500    3.64    3.84      1.031  | IO    |       |       |       |     6.76
12.750    3.70    3.75      1.028  |  O    |       |       |       |     6.74
13.000    3.85    3.76      1.029  |  O    |       |       |       |     6.74
13.250    4.02    3.86      1.031  |  O    |       |       |       |     6.76
13.500    4.21    4.00      1.035  |  O    |       |       |       |     6.79
13.750    4.42    4.18      1.040  |  O    |       |       |       |     6.82
14.000    4.67    4.39      1.045  |  O    |       |       |       |     6.86
14.250    4.97    4.63      1.052  |  OI   |       |       |       |     6.91
14.500    5.34    4.93      1.059  |   O   |       |       |       |     6.97
14.750    5.77    5.28      1.069  |   O   |       |       |       |     7.04
15.000    6.35    5.72      1.080  |   OI  |       |       |       |     7.13
15.250    7.10    6.28      1.095  |    O  |       |       |       |     7.24
15.500    7.69    6.91      1.112  |    OI |       |       |       |     7.36
15.750    7.82    7.39      1.124  |     O |       |       |       |     7.46
16.000   11.66    8.71      1.159  |      O|I      |       |       |     7.72
16.250   27.26   14.77      1.319  |       |   O   |     I |       |     8.91
       Warning: Basin depth limit exceeded, the data here is an estimation
16.500   38.85   25.07      1.590  |       |       |   O   |       I    10.95
       Warning: Basin depth limit exceeded, the data here is an estimation
16.750   12.99   25.55      1.603  |       | I     |    O  |       |    11.05
       Warning: Basin depth limit exceeded, the data here is an estimation
17.000    6.70   16.70      1.370  |    I  |    O  |       |       |     9.30
17.250    5.58   10.75      1.213  |   I   O       |       |       |     8.12
17.500    4.83    7.63      1.131  |  I  O |       |       |       |     7.50
17.750    4.32    5.91      1.085  |  IO   |       |       |       |     7.16
```

18.000	3.93	4.90	1.059	IO				6.97
18.250	3.79	4.32	1.043	O				6.85
18.500	3.96	4.07	1.037	O				6.80
18.750	3.83	3.97	1.034	O				6.78
19.000	3.65	3.84	1.031	O				6.76
19.250	3.50	3.69	1.027	IO				6.73
19.500	3.37	3.55	1.023	O				6.70
19.750	3.25	3.41	1.020	O				6.67
20.000	3.14	3.29	1.016	O				6.65
20.250	3.05	3.18	1.013	O				6.63
20.500	2.96	3.08	1.011	O				6.61
20.750	2.88	2.99	1.008	O				6.59
21.000	2.81	2.91	1.006	O				6.57
21.250	2.74	2.83	1.004	O				6.56
21.500	2.68	2.76	1.002	O				6.54
21.750	2.62	2.70	1.001	O				6.53
22.000	2.56	2.64	0.999	O				6.52
22.250	2.51	2.58	0.998	O				6.51
22.500	2.46	2.53	0.996	O				6.50
22.750	2.42	2.48	0.995	IO				6.49
23.000	2.37	2.43	0.994	IO				6.48
23.250	2.33	2.39	0.993	O				6.47
23.500	2.30	2.35	0.991	O				6.46
23.750	2.26	2.31	0.990	O				6.45
24.000	2.22	2.27	0.989	O				6.45
24.250	1.67	2.09	0.985	O				6.41
24.500	0.25	1.45	0.968	IO				6.28
24.750	0.00	0.70	0.948	O				6.14
25.000	0.00	0.31	0.938	O				6.06
25.250	0.00	0.13	0.933	O				6.02
25.500	0.00	0.06	0.931	O				6.01

Remaining water in basin = 0.93 (Ac.Ft)

**********HYDROGRAPH DATA**********

Number of intervals = 102
Time interval = 15.0 (Min.)
Maximum/Peak flow rate = 25.552 (CFS)
Total volume = 7.287 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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FLOOD HYDROGRAPH ROUTING PROGRAM

Study date: 05/13/20

Pixior Distribution Center
Basin Routing
10-year, 24-hour Storm

Program License Serial Number 4009

********** HYDROGRAPH INFORMATION **********

From study/file name: PUN10.rte
**********HYDROGRAPH DATA**********
Number of intervals = 97
Time interval = 15.0 (Min.)
Maximum/Peak flow rate = 15.908 (CFS)
Total volume = 2.879 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 97
Hydrograph time unit = 15.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
3.000	0.410	0.010	0.410	0.410
6.000	0.930	0.015	0.930	0.930
9.000	1.330	15.200	1.173	1.487

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	4.0	7.95	11.93	15.91	Depth (Ft.)
0.250	0.48	0.00	0.005	O	|	|	|	|	0.04
0.500	0.72	0.00	0.017	OI	|	|	|	|	0.13
0.750	0.73	0.00	0.032	OI	|	|	|	|	0.24

1.000	0.73	0.00	0.047	OI	|	|	|	0.35
1.250	0.74	0.00	0.062	OI	|	|	|	0.46
1.500	0.74	0.00	0.078	OI	|	|	|	0.57
1.750	0.75	0.00	0.093	OI	|	|	|	0.68
2.000	0.76	0.00	0.109	OI	|	|	|	0.80
2.250	0.76	0.00	0.124	OI	|	|	|	0.91
2.500	0.77	0.00	0.140	OI	|	|	|	1.03
2.750	0.78	0.00	0.156	OI	|	|	|	1.14
3.000	0.79	0.00	0.172	OI	|	|	|	1.26
3.250	0.79	0.00	0.188	OI	|	|	|	1.38
3.500	0.80	0.00	0.205	OI	|	|	|	1.50
3.750	0.81	0.01	0.221	OI	|	|	|	1.62
4.000	0.82	0.01	0.238	OI	|	|	|	1.74
4.250	0.83	0.01	0.255	OI	|	|	|	1.86
4.500	0.83	0.01	0.272	OI	|	|	|	1.99
4.750	0.84	0.01	0.289	OI	|	|	|	2.11
5.000	0.85	0.01	0.306	OI	|	|	|	2.24
5.250	0.86	0.01	0.324	OI	|	|	|	2.37
5.500	0.87	0.01	0.342	OI	|	|	|	2.50
5.750	0.88	0.01	0.359	OI	|	|	|	2.63
6.000	0.89	0.01	0.378	OI	|	|	|	2.76
6.250	0.90	0.01	0.396	OI	|	|	|	2.90
6.500	0.91	0.01	0.415	OI	|	|	|	3.03
6.750	0.93	0.01	0.433	OI	|	|	|	3.13
7.000	0.94	0.01	0.452	OI	|	|	|	3.24
7.250	0.95	0.01	0.472	OI	|	|	|	3.36
7.500	0.97	0.01	0.491	OI	|	|	|	3.47
7.750	0.98	0.01	0.511	OI	|	|	|	3.58
8.000	0.99	0.01	0.531	O I	|	|	|	3.70
8.250	1.01	0.01	0.552	O I	|	|	|	3.82
8.500	1.03	0.01	0.573	O I	|	|	|	3.94
8.750	1.04	0.01	0.594	O I	|	|	|	4.06
9.000	1.06	0.01	0.615	O I	|	|	|	4.18
9.250	1.08	0.01	0.637	O I	|	|	|	4.31
9.500	1.10	0.01	0.659	O I	|	|	|	4.44
9.750	1.12	0.01	0.682	O I	|	|	|	4.57
10.000	1.14	0.01	0.705	O I	|	|	|	4.70
10.250	1.17	0.01	0.729	O I	|	|	|	4.84
10.500	1.19	0.01	0.753	O I	|	|	|	4.98
10.750	1.22	0.01	0.777	O I	|	|	|	5.12
11.000	1.25	0.01	0.803	O I	|	|	|	5.26
11.250	1.28	0.01	0.828	O I	|	|	|	5.41
11.500	1.31	0.01	0.855	O I	|	|	|	5.57
11.750	1.35	0.01	0.882	O I	|	|	|	5.72
12.000	1.38	0.01	0.910	O I	|	|	|	5.88
12.250	1.32	0.22	0.935	O I	|	|	|	6.04
12.500	1.31	0.84	0.952	|OI	|	|	|	6.16
12.750	1.37	1.12	0.959	| O	|	|	|	6.22
13.000	1.42	1.27	0.963	| O	|	|	|	6.25
13.250	1.49	1.38	0.966	| O	|	|	|	6.27
13.500	1.56	1.46	0.968	| OI	|	|	|	6.29
13.750	1.65	1.54	0.970	| O	|	|	|	6.30
14.000	1.75	1.63	0.973	| O	|	|	|	6.32
14.250	1.87	1.73	0.975	| O	|	|	|	6.34
14.500	2.01	1.85	0.978	| OI	|	|	|	6.36
14.750	2.20	2.00	0.982	| O	|	|	|	6.39
15.000	2.44	2.18	0.987	| O	|	|	|	6.43
15.250	2.78	2.42	0.993	| OI	|	|	|	6.48
15.500	2.77	2.62	0.999	| O	|	|	|	6.51
15.750	3.14	2.81	1.004	| OI	|	|	|	6.55
16.000	5.92	3.78	1.029	| O| I	|	|	|	6.74
16.250	15.91	7.80	1.135	| | O|	|	| I	7.54
16.500	8.76	10.35	1.202	| | |I O	|	|	8.04
16.750	2.66	7.74	1.133	| I | O|	|	|	7.53
17.000	2.19	4.74	1.055	| I |O	|	|	|	6.93
17.250	1.86	3.21	1.014	| I O |	|	|	|	6.63
17.500	1.64	2.39	0.993	| IO	|	|	|	6.47
17.750	1.48	1.92	0.980	| IO	|	|	|	6.38
18.000	1.36	1.64	0.973	| IO	|	|	|	6.32
18.250	1.37	1.48	0.969	| O	|	|	|	6.29
18.500	1.34	1.41	0.967	| O	|	|	|	6.28

18.750	1.27	1.35	0.965	| O	|	|	|	6.26
19.000	1.21	1.29	0.964	| O	|	|	|	6.25
19.250	1.16	1.23	0.962	| O	|	|	|	6.24
19.500	1.12	1.18	0.961	| O	|	|	|	6.23
19.750	1.08	1.13	0.959	| O	|	|	|	6.22
20.000	1.04	1.09	0.958	| O	|	|	|	6.21
20.250	1.01	1.05	0.957	| O	|	|	|	6.21
20.500	0.98	1.02	0.956	|IO	|	|	|	6.20
20.750	0.95	0.99	0.956	|O	|	|	|	6.19
21.000	0.93	0.96	0.955	|O	|	|	|	6.19
21.250	0.90	0.93	0.954	|O	|	|	|	6.18
21.500	0.88	0.91	0.954	|O	|	|	|	6.18
21.750	0.86	0.89	0.953	|O	|	|	|	6.17
22.000	0.84	0.87	0.952	|O	|	|	|	6.17
22.250	0.82	0.85	0.952	|O	|	|	|	6.16
22.500	0.81	0.83	0.951	|O	|	|	|	6.16
22.750	0.79	0.81	0.951	|O	|	|	|	6.16
23.000	0.78	0.80	0.951	|O	|	|	|	6.15
23.250	0.76	0.78	0.950	|O	|	|	|	6.15
23.500	0.75	0.77	0.950	|O	|	|	|	6.15
23.750	0.74	0.75	0.949	|O	|	|	|	6.15
24.000	0.73	0.74	0.949	|O	|	|	|	6.14
24.250	0.24	0.60	0.945	IO	|	|	|	6.11
24.500	0.00	0.33	0.938	O	|	|	|	6.06
24.750	0.00	0.14	0.933	O	|	|	|	6.03
25.000	0.00	0.06	0.931	O	|	|	|	6.01

Remaining water in basin = 0.93 (Ac.Ft)

**********HYDROGRAPH DATA**********

Number of intervals = 100
Time interval = 15.0 (Min.)
Maximum/Peak flow rate = 10.353 (CFS)
Total volume = 1.948 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

CONTECH ENGINEERED SOLUTIONS

CMP: Underground Detention System
Storage Volume Estimation

Date: 5/13/20
Project Name: Pixior Distribution Center

City / County: Hesperia
State: CA

Designed By: Hong Zhang
Company: David Evans And Associates, Inc
Telephone: 909-912-7351

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. **This tool is only applicable for rectangular shaped systems.**

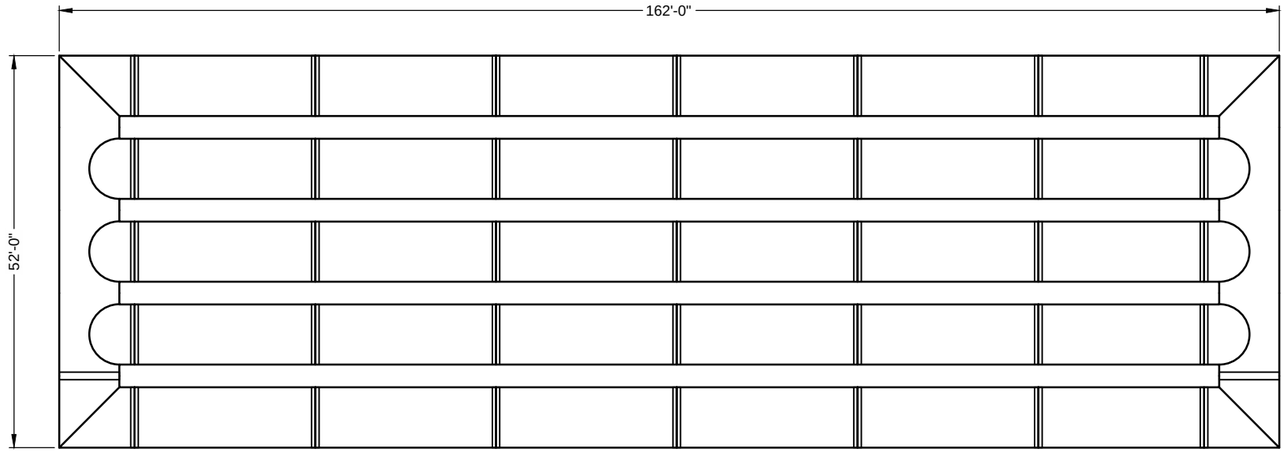
Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	162.0	Backfill Porosity (%):	40%	System Diameter (in):	96
Out-to-out width (ft):	52.0	Depth Above Pipe (in):	6.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	2.0	Depth Below Pipe (in):	6.0	Incremental Analysis (in):	2
Number of Barrels (ea):	5.0	Width At Ends (ft):	3.0	System Invert (Elevation):	0
		Width At Sides (ft):	3.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	3,897.6
0.17	0.16	0.0	0.0	649.6	649.6	649.6	649.6	0.0%	3,897.6
0.33	0.33	0.0	0.0	649.6	1,299.2	649.6	1,299.2	0.0%	3,897.6
0.50	0.50	0.0	0.0	649.6	1,948.8	649.6	1,948.8	0.0%	3,897.6
0.67	0.66	212.7	212.7	564.5	2,513.3	777.2	2,726.0	7.8%	5,041.1
0.83	0.83	385.0	597.7	495.6	3,008.9	880.6	3,606.6	16.6%	5,497.5
1.00	1.00	493.2	1,090.9	452.3	3,461.2	945.5	4,552.1	24.0%	5,835.6
1.17	1.16	577.7	1,668.6	418.5	3,879.8	996.2	5,548.3	30.1%	6,110.5
1.33	1.33	647.8	2,316.4	390.5	4,270.2	1,038.3	6,586.7	35.2%	6,343.4
1.50	1.50	708.1	3,024.5	366.4	4,636.6	1,074.4	7,661.1	39.5%	6,545.5
1.67	1.66	760.7	3,785.2	345.3	4,981.9	1,106.0	8,767.1	43.2%	6,723.4
1.83	1.83	807.3	4,592.5	326.7	5,308.6	1,134.0	9,901.1	46.4%	6,881.4
2.00	2.00	848.8	5,441.3	310.1	5,618.7	1,158.9	11,060.0	49.2%	7,022.6
2.17	2.16	885.9	6,327.3	295.2	5,913.9	1,181.2	12,241.2	51.7%	7,149.1
2.33	2.33	919.3	7,246.5	281.9	6,195.8	1,201.2	13,442.3	53.9%	7,262.7
2.50	2.50	949.1	8,195.7	269.9	6,465.7	1,219.1	14,661.4	55.9%	7,364.5
2.67	2.66	975.9	9,171.6	259.2	6,725.0	1,235.1	15,896.6	57.7%	7,455.6
2.83	2.83	999.8	10,171.4	249.7	6,974.6	1,249.5	17,146.0	59.3%	7,536.7
3.00	3.00	1,021.1	11,192.5	241.2	7,215.8	1,262.2	18,408.3	60.8%	7,608.7
3.17	3.16	1,039.8	12,232.3	233.7	7,449.5	1,273.5	19,681.8	62.2%	7,671.9
3.33	3.33	1,056.2	13,288.5	227.1	7,676.6	1,283.3	20,965.1	63.4%	7,726.7
3.50	3.50	1,070.4	14,358.9	221.5	7,898.1	1,291.8	22,256.9	64.5%	7,773.7
3.67	3.66	1,082.3	15,441.2	216.7	8,114.7	1,299.0	23,555.9	65.6%	7,813.0
3.83	3.83	1,092.2	16,533.4	212.7	8,327.4	1,304.9	24,860.8	66.5%	7,844.8
4.00	4.00	1,100.0	17,633.4	209.6	8,537.0	1,309.6	26,170.4	67.4%	7,869.4
4.17	4.16	1,105.9	18,739.3	207.3	8,744.3	1,313.1	27,483.6	68.2%	7,886.9
4.33	4.33	1,109.7	19,849.0	205.7	8,950.0	1,315.4	28,799.0	68.9%	7,897.3
4.50	4.50	1,111.7	20,960.7	204.9	9,154.9	1,316.6	30,115.6	69.6%	7,900.8
4.67	4.66	1,111.7	22,072.4	204.9	9,359.8	1,316.6	31,432.2	70.2%	7,897.3
4.83	4.83	1,109.7	23,182.1	205.7	9,565.5	1,315.4	32,747.7	70.8%	7,886.9
5.00	5.00	1,105.9	24,288.0	207.3	9,772.8	1,313.1	34,060.8	71.3%	7,869.4
5.17	5.16	1,100.0	25,388.0	209.6	9,982.4	1,309.6	35,370.4	71.8%	7,844.8
5.33	5.33	1,092.2	26,480.2	212.7	10,195.1	1,304.9	36,675.3	72.2%	7,813.0
5.50	5.50	1,082.3	27,562.5	216.7	10,411.8	1,299.0	37,974.3	72.6%	7,773.7
5.67	5.66	1,070.4	28,632.9	221.5	10,633.2	1,291.8	39,266.1	72.9%	7,726.7
5.83	5.83	1,056.2	29,689.1	227.1	10,860.4	1,283.3	40,549.5	73.2%	7,671.9
6.00	6.00	1,039.8	30,728.9	233.7	11,094.0	1,273.5	41,823.0	73.5%	7,608.7

6.17	6.16	1,021.1	31,750.0	241.2	11,335.2	1,262.2	43,085.2	73.7%	7,536.7
6.33	6.33	999.8	32,749.8	249.7	11,584.9	1,249.5	44,334.7	73.9%	7,455.6
6.50	6.50	975.9	33,725.7	259.2	11,844.1	1,235.1	45,569.8	74.0%	7,364.5
6.67	6.66	949.1	34,674.9	269.9	12,114.1	1,219.1	46,788.9	74.1%	7,262.7
6.83	6.83	919.3	35,594.1	281.9	12,396.0	1,201.2	47,990.1	74.2%	7,149.1
7.00	7.00	885.9	36,480.1	295.2	12,691.2	1,181.2	49,171.2	74.2%	7,022.6
7.17	7.16	848.8	37,328.9	310.1	13,001.2	1,158.9	50,330.1	74.2%	6,881.4
7.33	7.33	807.3	38,136.2	326.7	13,327.9	1,134.0	51,464.1	74.1%	6,723.4
7.50	7.50	760.7	38,896.9	345.3	13,673.2	1,106.0	52,570.1	74.0%	6,545.5
7.67	7.66	708.1	39,605.0	366.4	14,039.6	1,074.4	53,644.6	73.8%	6,343.4
7.83	7.83	647.8	40,252.8	390.5	14,430.1	1,038.3	54,682.9	73.6%	6,110.5
8.00	8.00	577.7	40,830.5	418.5	14,848.6	996.2	55,679.1	73.3%	5,835.6
8.17	8.16	493.2	41,323.7	452.3	15,300.9	945.5	56,624.6	73.0%	5,497.5
8.33	8.33	385.0	41,708.8	495.6	15,796.5	880.6	57,505.3	72.5%	5,041.1
8.50	8.50	212.7	41,921.4	564.5	16,361.0	777.2	58,282.4	71.9%	3,897.6
8.67	8.66	0.0	41,921.4	649.6	17,010.6	649.6	58,932.0	71.1%	3,897.6
8.83	8.83	0.0	41,921.4	649.6	17,660.2	649.6	59,581.6	70.4%	3,897.6
9.00	9.00	0.0	41,921.4	649.6	18,309.8	649.6	60,231.2	69.6%	3,897.6



ASSEMBLY
SCALE: 1" = 20'

PROJECT SUMMARY

CALCULATION DETAILS
- LENGTH PER BARREL = 146 FT
- LENGTH PER HEADER = 52 FT
- LOADING = H20 & H25
- APPROX. CMP FOOTAGE = 834 FT

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED 60,000 CF
- PIPE STORAGE = 41,921 CF
- STRUCTURAL BACKFILL STORAGE = 18,309 CF
- TOTAL STORAGE PROVIDED = 60,231 CF

PIPE DETAILS
- DIAMETER = 96 IN
- CORRUGATION = 5" X 1" OR 3" X 1"
- GAGE = 16
- COATING = ALUMINIZED STEEL TYPE 2 (ALT2)
- WALL TYPE = PERFORATED
- BARREL SPACING = 36 IN

BACKFILL DETAILS
- WIDTH AT ENDS = 36 IN
- ABOVE PIPE = 6 IN
- WIDTH AT SIDES = 36 IN
- BELOW PIPE = 6 IN

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

NOTES
- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2 ⅔" x ½" 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.

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYODS - 14192-2-0
PROJECT NAME: Pixior Distribution Center
Hesperia, CA
DESCRIPTION: UNDERGROUND RETENTION / INFILTRATION BASIN

PROJECT No.:	SEQ. No.:	DATE:
14192-2	0	5/13/2020
DESIGNED:		DRAWN:
DYODS		DYODS
CHECKED:		APPROVED:
SHEET NO.:		D1

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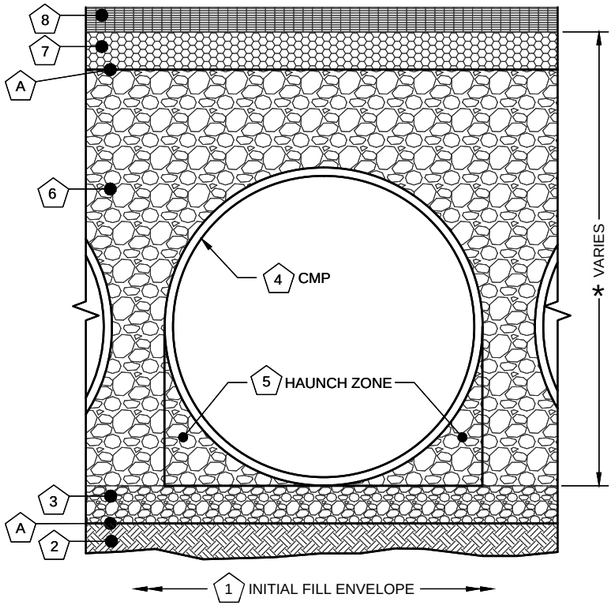

Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe			
Material Location	Description	Material Designation	Designation
8 Rigid or Flexible Pavement (if applicable)			
7 Road Base (if applicable			
A Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6 Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 145-A-1 or AASHTO M 43 - 3, 4	Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the Project Engineer or his representative is satisfied with the level of compaction"
3 Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation.
A Geotextile Layer	None	None	Contech does not recommend geotextiles be placed under the invert of Infiltration systems due to the propensity for geotextiles to clog over time.
* Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2 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 BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

BACKFILL
MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT. MAINTAIN BALANCED LOADING ON ALL PIPES IN THE SYSTEM DURING ALL SUCH OPERATIONS.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

BACKFILL DETAIL
SCALE: N.T.S.

NOTE:
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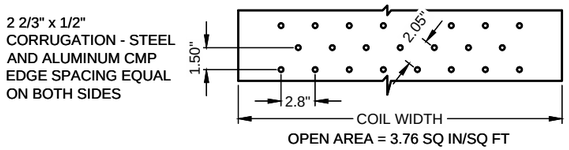
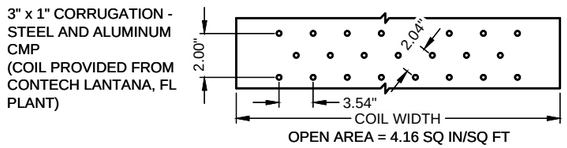
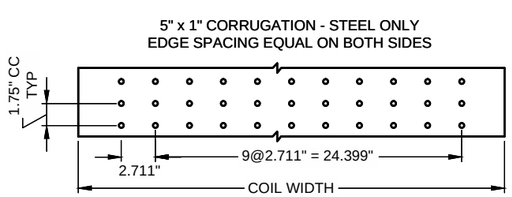


OPEN AREA = 3.76 SQ IN/SQ FT



OPEN AREA = 4.16 SQ IN/SQ FT

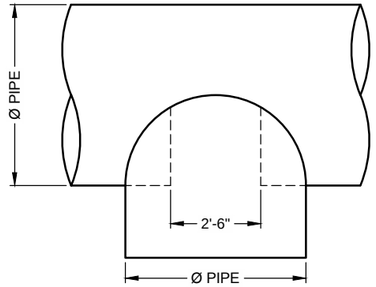


OPEN AREA = 3.33 SQ IN/SQ FT

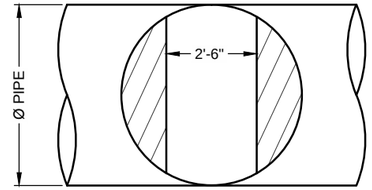
NOTES:

1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES Ø3/8".

TYPICAL PERFORATION DETAIL
SCALE: N.T.S.



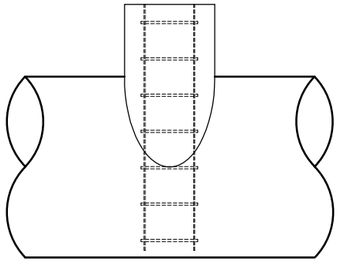
PLAN



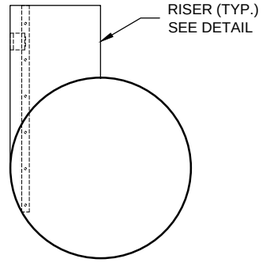
FRONT

TYPICAL MANWAY DETAIL
SCALE: N.T.S.

NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.



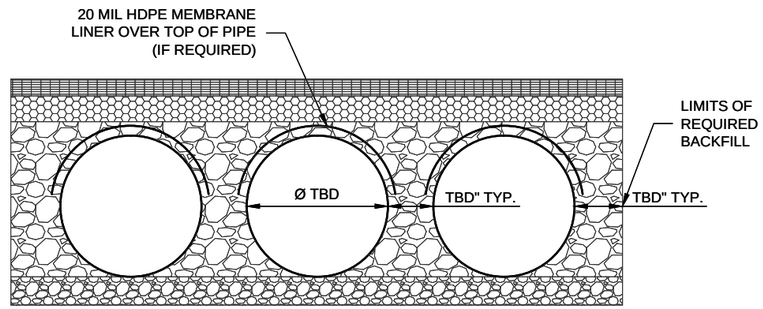
ELEVATION



END

TYPICAL RISER DETAIL
SCALE: N.T.S.

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.



TYPICAL SECTION VIEW
LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE 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.

MARK	DATE	REVISION DESCRIPTION	BY

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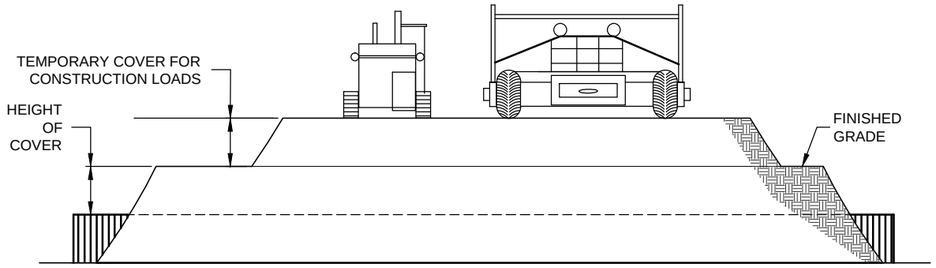
CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYODS - 14192-2-0
PROJECT NAME: Pixior Distribution Center
Hesperia, CA
DESCRIPTION: UNDERGROUND RETENTION / INFILTRATION BASIN

PROJECT No.:	SEQ. No.:	DATE:
14192-2	0	5/13/2020
DESIGNED: DYODS	DRAWN: DYODS	
CHECKED:	APPROVED:	
SHEET NO.: D2		



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 APPLICABLE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

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

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

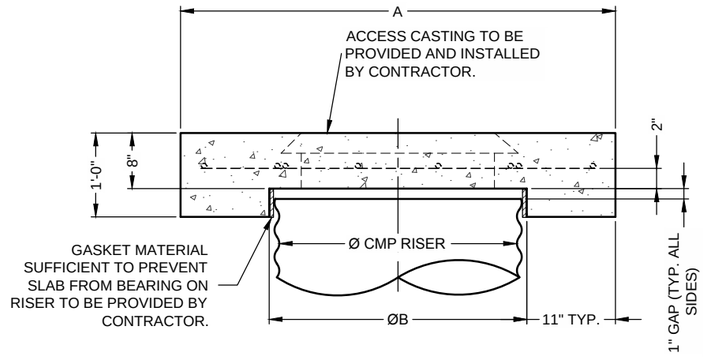
POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE 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.

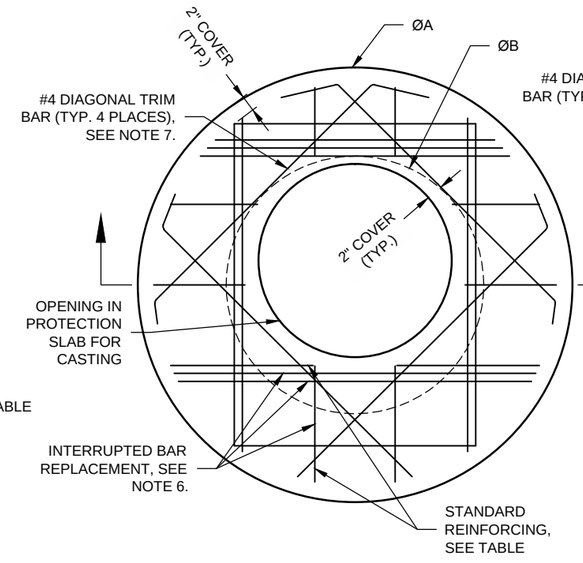
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



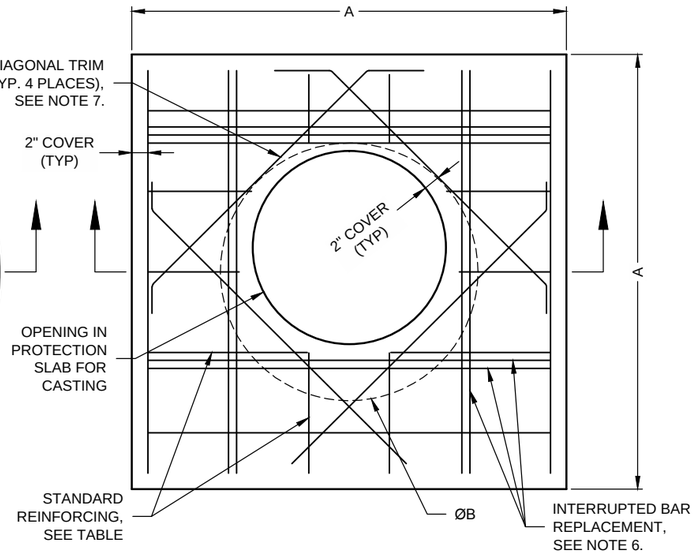
SECTION VIEW

REINFORCING TABLE				
Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYODS - 14192-2-0
PROJECT NAME: Pixior Distribution Center
Hesperia, CA
DESCRIPTION: UNDERGROUND RETENTION / INFILTRATION BASIN

PROJECT No.:	SEQ. No.:	DATE:
14192-2	0	5/13/2020
DESIGNED: DYODS	DRAWN: DYODS	
CHECKED:	APPROVED:	
SHEET NO.: D3		

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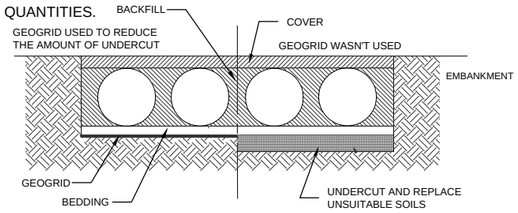
CMP DETENTION INSTALLATION GUIDE

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.

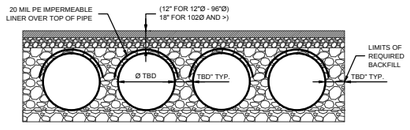


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

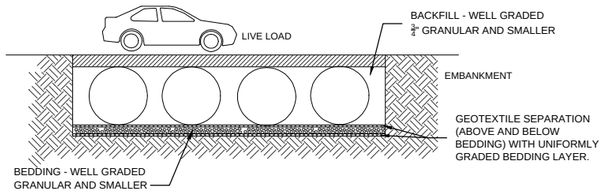
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

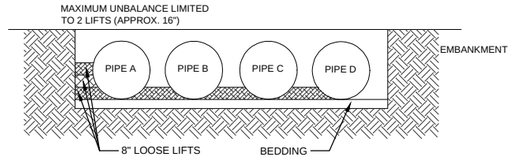
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION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



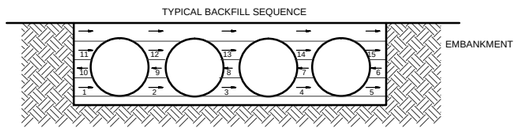
BACKFILL PLACEMENT

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

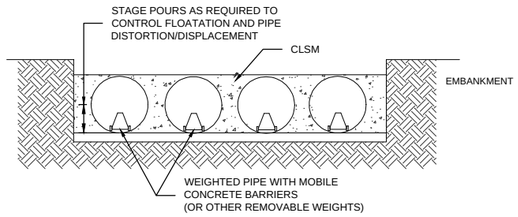


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE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

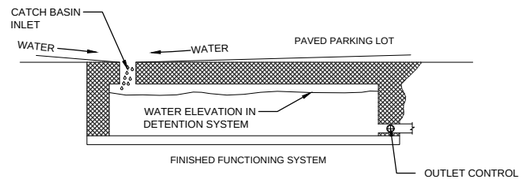


CONSTRUCTION LOADING

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, QUARTERLY 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.

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
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800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYODS - 14192-2-0
PROJECT NAME: Pixior Distribution Center
Hesperia, CA
DESCRIPTION: UNDERGROUND RETENTION / INFILTRATION BASIN

PROJECT No.:	SEQ. No.:	DATE:
14192-2	0	5/13/2020
DESIGNED: DYODS	DRAWN: DYODS	
CHECKED:	APPROVED:	
SHEET NO.: D4		

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Appendix G: Soils Report

SOILS ENGINEERING INVESTIGATION

Proposed Warehouse/Distribution Center
APN: 0405-062-51
Amargosa Road & Live Oak Lane
Hesperia, California

February 24, 2020
Project No. 30-5468-00

Prepared for:

55555 Amargosa Rd., LLC
Attn: Mr. Jason Green
5901 S. Eastern Ave.
Commerce, CA 90040

A.G.I. GEOTECHNICAL, INC.

A. G. I. GEOTECHNICAL, INC.
16555 Sherman Way, Suite A - Van Nuys, CA 91406 - Office: (818) 785-5244 - Facsimile: (818) 785-6251

February 24, 2020

Project No. 30-5468-00

55555 Amargosa Rd., LLC
5901 S. Eastern Ave.
Commerce, CA 90040

Attention: Mr. Jason Green

Subject: **SOILS ENGINEERING INVESTIGATION**
Proposed Warehouse/Distribution Center
APN: 0405-062-51
Amargosa Road & Live Oak Lane
Hesperia, California

Dear Mr. Green:

This report presents the results of the investigation and our opinions regarding the soils engineering factors affecting the development of the subject site. This investigation was performed in January and February, 2020, and consisted of field depthexploration, laboratory testing, engineering analyses of the field and laboratory data and the preparation of this report. *Determination of the presence or not of hazardous or toxic materials in the on-site soils is beyond the scope of this investigation.*

If you have any questions regarding this report, please contact this office.

Respectfully submitted,
A.G.I. GEOTECHNICAL, INC.

Juan A. Vidal, R.G.E. 861
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
JUAN A. VIDAL
No. 861
Exp. 12-31-21
GEOTECHNICAL
STATE OF CALIFORNIA

JAV:wb

Distribution: (4) 55555 Amargosa Rd., LLC

Enclosures: Location Map (Figure 1)
Site Plan (Figure 2)
Boring Logs
Laboratory Test Results
U.S. Seismic Design Maps
Slot Cut Stability Analysis

TABLE OF CONTENTS

INTRODUCTION

DESCRIPTION OF SITE

The subject site is located on the northwest side of Amargosa Road, between Live Oak Lane and the California Aqueduct, in the City of Hesperia, California. The subject property is practically level and presently vacant. The site is bound on the north by a developed property. The location of the site is shown on the enclosed Location Map, Figure 1.

PROPOSED SITE DEVELOPMENT

The proposed development consists of a warehouse/distribution center that will include an approximately 450,000ft^2 building with driveways and adjacent asphalt parking areas, a trash enclosure, guard shacks and advertising signs. It is understood that the proposed building will be tilt-up walls with a concrete slab-on-grade construction. Structural loads are anticipated to be relatively light, less than ten kips per linear foot for continuous footings and less than 100 kips for column loads.

FIELD EXPLORATION

Subsurface conditions were explored by drilling nine exploratory borings at the locations shown on the Site Plan, Figure 2. The borings were drilled to a maximum depth of 41.5 feet below existing ground surface using a truck mounted 8-inch diameter hollow stem flight auger.

The drilling of borings was supervised by our field engineer who logged the materials brought up from borings. Undisturbed and bulk samples were collected at depths appropriate to the investigation. The undisturbed samples were sealed immediately in watertight containers for shipment to our laboratory. The soil sampler used in our investigation included a 2.50-inch I.D. drive barrel lined with 1-inch brass rings. The sampler used in the exploratory boring was driven to a depth of 12 inches with a 140-pound hammer falling from a height of 30 inches. The blow counts noted on the Boring Logs represent the accumulated number of blows that were required to drive the sampler.

SUBSURFACE CONDITIONS

Soil Profile

The existing soil profile, as depicted in the borings to the depth explored, consists of light brown and brown silty sands, well-graded sands with silt and gravel, and poorly-graded sandswith silt and gravel in a damp to slightly moist and medium dense to very dense condition. For a more detailed description of the soils encountered in the exploratory borings, please refer to the Boring Logs enclosed in this report.

Groundwater

No groundwater was encountered in the exploratory borings to the maximum depth explored, 41.5 feet below existing ground surface. The groundwater level may fluctuate because of seasonal changes, injection or extraction of water, variations in temperature and other causes.

LIQUEFACTION POTENTIAL (CYCLIC MOBILITY)

Since the site is **not** located within a State of California Liquefaction Seismic Hazard Zone, a liquefaction analysis was not performed.

ON-SITE INFILTRATION FACILITIES

The soil profile, as depicted in the borings to the depth explored, consists of silty sands, well-graded sands with silt and gravel, and poorly-graded sands with silt and gravel in a damp to slightly moist and very dense condition. These soils generally have poor permeability and they carry the potential for creating perched water conditions. Based on the soils present at the site to the depths explored, it is our opinion that the percolation characteristics of these soils would **not** be suitable for use of a properly functioning infiltration-type of SUSMP system on the subject property.

SEISMICITY AND SEISMIC DESIGN CRITERIA

The southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process which has contributed to the characteristic landscape of the region. Research on earthquakes during the past forty years has greatly enhanced our knowledge on the nature of faulting in California; however, seismology is a relatively new science and standard procedures for prediction of geoseismic parameters have not yet been widely accepted. The time, location, and magnitude of an earthquake cannot be

accurately predicted at this time; therefore, data on faults and the nature of earthquakes in California is presently incomplete. However, numerous investigations performed by the United States Geological Survey, California Division of Mines and Geology, and other research institutions have presented techniques to quantify the nature of earthquakes and the estimated impact to development in a seismically active environment.

It is our opinion that future structures should be designed in accordance with the applicable seismic building code as determined by the structural engineer. The subject site is located within **Site Class D** per 2019 California Building Code. The following values of short and long period accelerations are recommended for the Risk-Targeted Maximum Considered Earthquake (MCE_R). The design spectral response acceleration parameters presented on the following table for **Site Class D**, generated by the U.S. Seismic Design Maps Website (https://seismicmaps.org), may be utilized for seismic design:

2019 CBC Seismic Design Parameters

Latitude	34.4328 N
Longitude	117.3783 W
Site Class Definition (ASCE 7-16 Table 20.3-1)	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s (Figure 1613A.2.1)	1.487
Mapped Spectral Response Acceleration at 1s Period, S_1 (Figure 1613A.2.1)	0.577
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613A.2.3(1))	1.000
Long Period Site Coefficient at 1s Period, F_v (Table 1613A.2.3(2))	1.723
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16A-36)	1.487
Adjusted Spectral Response Acceleration at 1s Period, S_{M1} (Eq. 16A-37)	0.994
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16A-38)	0.992
Design Spectral Response Acceleration at 1s Period, S_{D1} (Eq. 16A-39)	0.663

LABORATORY TESTING

CLASSIFICATION

Soils were classified visually according to the Unified Soil Classification System. Unit weight and moisture determinations were performed for each undisturbed sample. Results of density and moisture determinations, together with classifications, are shown on the enclosed Boring Logs.

DIRECT SHEAR TESTS (ASTM:D-3080)

In order to determine the shear strength of the soils, direct shear tests were performed on undisturbed and remolded samples of the on-site soils. The remolded sample was tested at 90% of the maximum dry density. To simulate possible adverse field conditions, the samples were saturated prior to shearing. Graphic summaries of the test results, including moisture content at the time of shearing, are included in this report.

GRAIN SIZE DISTRIBUTION (ASTM:D-422-63 (2002))

To aid in classification, sieve analyses and hydrometer tests were performed on typical samples of the upper soils. The results of the tests are shown on the enclosed Grain Size Distribution Charts.

MAXIMUM DENSITY/OPTIMUM MOISTURE (ASTM:D-1557)

The maximum density/optimum moisture content relationship was determined for typical samples of the upper soils. The tests were conducted in accordance with the ASTM:D-1557 standard. Graphic summaries of the results are included with this report.

EXPANSION TESTS (ASTM:D-4829)

Expansion tests were performed on representative samples of the on-site soils in accordance with ASTM:D-4829 to evaluate their volume change with increasing moisture conditions. The results are as follows:

Location	Depth (ft.)	Expansion Index	Potential Expansion
B-1	0-5	1	Very Low
B-3	0-5	1	Very Low
B-5	0-5	1	Very Low
B-9	0-5	2	Very Low

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

The property is suitable for the proposed construction from a geotechnical engineering standpoint. The construction plans should take into account the appropriate soils engineering features of the site. The on-site soils are medium dense to very dense. No groundwater was encountered to the maximum depth explored, 41.5 feet below existing surface. The on-site soils have a very low potential expansion.

SITE PREPARATION

Debris from demolition, vegetation and underground utility lines to be abandoned should be removed from the site. After site clearance, the upper three feet of the on-site soils should be removed and placed back as compacted fill. The removal and compaction should extend three feet beyond the building lines in each direction. After removal, the exposed surface should be scarified to a depth of eight inches, brought to about optimum moisture content and compacted to at least 90% of the maximum dry density as determined by ASTM:D-1557. An estimated shrinkage percentage of 5% was determined by our calculations for the on-site soils.

All excavations resulting from removal of existing obstructions should be backfilled with soil compacted to at least 90% of the maximum dry density as determined by ASTM:D-1557. If any cesspools or seepage pits are encountered during grading, they should be backfilled with vibrated gravel or slurry mix to five feet below finish grade. The upper five feet should be backfilled with soil compacted by mechanical means.

FILL PLACEMENT

Fill soils should be cleared of deleterious debris, placed in six to eight inch lifts, brought to about optimum moisture content, and compacted to at least 90% of the maximum dry density as determined by ASTM:D-1557. **The placement of the fill should be performed under our observation and testing.**

FOUNDATION DESIGN

Type of Foundation

The proposed strucure may be supported on conventional shallow spread (isolated) and continuous footings. Exterior and interior footings should be founded on compacted fill with a minimum embedment of 18 inches below lowest adjacent grade. Minimum

reinforcement in continuous footings should consist of four No. 4 bars: two placed about four inches from the top and two placed about four inches from the bottom.

Soil Bearing Pressures

Footings founded on compacted fill may be designed for a maximum soil bearing pressure of 2,000lb/ft^2. The recommended soil bearing pressure may be increased by 400lb/ft^2 per each additional foot of embedment over 18 inches and by 200lb/ft^2 per each additional foot in width over 18 inches up to 3,500lb/ft^2. In addition, the recommended soil bearing pressures may be increased by one-third when designing for wind and seismic forces.

Expected Settlements

If footings are supported on compacted fill and are sized for the recommended bearing pressures, differential settlements are not expected to exceed ¼ inch in a 30-foot span. Total settlements are anticipated to be less than ¾ inch.

FLOOR SLABS-ON-GRADE

Concrete floor slabs-on-grade thickness and reinforcement should reflect the anticipated use of the slabs and should be designed by the structural engineer. Concrete floor slabs-on-grade should be a minimum of four inches (full) thick with minimum reinforcement consisting of No.4 deformed bars spaced a maximum of 16 inches each way. In areas where floor coverings or equipment that are sensitive to moisture are contemplated, a 10-mil visqueen moisture barrier should be placed beneath the slab with one inch of clean sand between the concrete slabs and the visqueen to aid in curing and to prevent puncture of the visqueen. Cracking of reinforced concrete is a relatively common occurrence. Some cracking of reinforced concrete, including slabs, can be anticipated. Irregularities in new slabs are also common. If cracking of slabs cannot be tolerated, heavily reinforced structural slabs are an option.

The recommendations presented above are intended to reduce the potential for random cracking to which concrete flatwork is often prone. Judicious spacing of crack control joints has proven effective in further reducing random cracking. A structural engineer may recommend the desirable spacing. Usually the crack control joints are placed 12 to 15 feet apart in each direction. Factors influencing cracking of concrete flatwork, (other than expansion, settlement and creep of soils), and which should be avoided, include: poor-quality concrete, excessive time passing between the mixing and placement of the concrete (the concrete should be rejected if this time interval exceeds two hours), temperature and wind conditions at the time of placement of the concrete, curing of the concrete and workmanship. The concrete should be maintained in a moist condition (curing) for at least the first seven days after concrete placement. During hot weather, proper attention should be given to the ingredients, production methods, handling,

placement, protection and curing to prevent excessive concrete temperature or water evaporation. In hot weather and windy conditions, water evaporates more rapidly from the surface of the concrete flatwork. This requires more frequent moistening of the concrete during the curing period or the use of a protective chemical film to prevent evaporation.

LATERAL RESISTANCE

An allowable lateral bearing of 300lb/ft^2 per foot of depth may be assumed up to a maximum of 3,000lb/ft^2. A coefficient of friction between soil and concrete of 0.4 may be used.

LATERAL LOADS

No retaining walls are proposed. Backfill for retaining walls, if any, should consist of granular, free-draining material. Cantilevered retaining walls should be designed to resist an active pressure of 30lb/ft^3 equivalent fluid pressure. Restrained walls should be designed for an at-rest earth pressure of 45lb/ft^3 equivalent fluid pressure. If the on-site upper soils are used for backfill, the at-rest earth pressure should be increased to 100lb/ft^3.

Walls subject to surcharge loads should be designed to include the additional lateral pressure. Walls should have adequate drainage to prevent build-up of hydrostatic pressure.

BACKFILL

All backfill of walls, footings or trenches should be compacted to 90% of the maximum dry density as determined by ASTM:D-1557 **and should be tested by the soils engineer**.

DRAINAGE

Adequate drainage at the site is absolutely essential and it should be provided. Rain gutters should be connected to an appropriate drainage system and carried away from the building and to the street. Yard drainage should be kept adequate to prevent ponding of water and saturation of the soils. Water should be directed to the street in an approved manner. Future performance of the building and other structures will be significantly influenced by the site drainage conditions.

PLANTERS

Planters and lawns adjacent to the building should be avoided. If planters are planned adjacent to the building, they should have the bottom and walls waterproofed and a drain installed to carry irrigation water away from the footing areas.

CONSTRUCTION CUTS

Construction cuts up to five feet in height may be excavated vertically for their entire length and height provided they do not undermine adjacent buildings or property line walls; otherwise, the construction cuts will need to be excavated using the 'A, B, C' slot-cutting method. If the slot-cutting method is used, the cut should be opened at a gradient of 1:1 first, then each slot opened and the removed soils replaced as engineered compacted fill before the subsequent slot is opened. The slots should not exceed eight feet in width or five feet in height. If the construction cuts are to remain open for more than two weeks or if rain is expected while they are open, they should be covered by a plastic membrane kept in place by holding blocks or driven re-bars at the top and bottom of the membrane. No equipment or personnel should stand closer than ten feet from the top of the temporary cut. **We should examine the construction cuts periodically to verify performance.** All construction cuts should comply with the State of California Construction Safety Orders (CAL/OSHA).

PAVED AREAS

The upper on-site soils are fair subgrade. Based on an estimated "R" value of 60 and assuming traffic indices of 5.2 for light duty and 6.3 for heavy duty, the following pavement sections may be used for a twenty-year life. "R" value tests should be performed on the soils exposed at subgrade elevation upon completion of grading to verify the recommended pavement sections.

Light Duty (T.I.5.2)

Two and one-half (2 ½) inches of asphaltic concrete placed on four inches of untreated aggregate base. The aggregate base should be compacted to at least 95% of the maximum density as determined by California Test Method 216-G, the California Impact.

Heavy Duty (T.I.6.3)

Three inches of asphaltic concrete placed on four inches of untreated aggregate base. The aggregate base should be compacted to at least 95% of the maximum density as determined by California Test Method 216-G, the California Impact.

Concrete Floor Slabs (Loading and Unloading Areas)

We recommend that concrete slabs be used for loading, unloading and truck turning areas. The concrete slabs should be a minimum of six inches thick, reinforced with 6x6-6/6 welded wire mesh or #3 bars placed at 18 inches on-center and placed at slab about mid-height. The upper six inches of earth material beneath the slabs should consist of untreated aggregate base. The aggregate base should be compacted to at least 95% of

the maximum density as determined by California Test Method 216-G, the California Impact.

RECOMMENDED INSPECTIONS

It is strongly recommended (and is a condition of use of this report), that the developer ensures that each phase of construction be properly inspected and approved by the local Building Department official.

WORKMAN SAFETY-EXCAVATIONS

It is essential for the contractor to provide adequate shoring and safety equipment as required by the State or Federal OSHA regulations. All regulations of the State or Federal OSHA should be followed before allowing workmen in a trench or other excavation. If excavations are to be made during the rainy season, particular care should be given to ensure that berms or other devices will prevent surface water from flowing over the top of the excavation or ponding at the top of the excavations.

OBSERVATION

Removal bottoms should be examined and approved by us and the City inspector before any fill is placed. Footing excavations should be examined by us prior to forming or placement of reinforcing steel to confirm that the soil conditions meet the requirements set by this report. Footing excavations should be kept moist and concrete should be placed as soon as possible after excavations are completed, examined and approved by us and the City inspector.

REVIEW

The geotechnical consultants shall review and sign the plans and specifications.

REGULATORY AGENCY REVIEW AND ADDITIONAL CONSULTING

All geotechnical and/or engineering geologic aspects of the proposed development are subject to review and approval by the government reviewing agency. It should be understood that the government reviewing agency may approve or deny any portion of the proposed development which may require additional geotechnical services by this office. Additional geotechnical services may include review responses, supplemental letters, plan reviews, construction/site observations, meetings, etc. The fees for generating additional reports, letters, exploration, analyses, etc. will be billed on a time and material basis.

COMMENTS

The conclusions and recommendations presented in this report are based on research, site observations and limited subsurface information. The conclusions and recommendations presented are based on the supposition that subsurface conditions do not vary significantly from those indicated. Although no significant variations in subsurface conditions are anticipated, the possibility of significant variations cannot be ruled out. If such conditions are encountered, this consultant should be contacted immediately to consider the need for modification of this project.

This report was prepared for the exclusive use of 55555 Amargosa Rd., LLC and their design consultants for the specific project outlined herein. This report may not be suitable for use by other parties or other uses. This report is subject to review by regulatory agencies and these agencies may require their approval before the project can proceed. No guarantee that the regulatory public agency or agencies will approve the project is intended, expressed or implied.

One of the purposes of this report is to provide the client with advice regarding geotechnical conditions on the site. It is important to recognize that other consultants could arrive at different conclusions and recommendations. No warranties of future site performance are intended, expressed or implied.

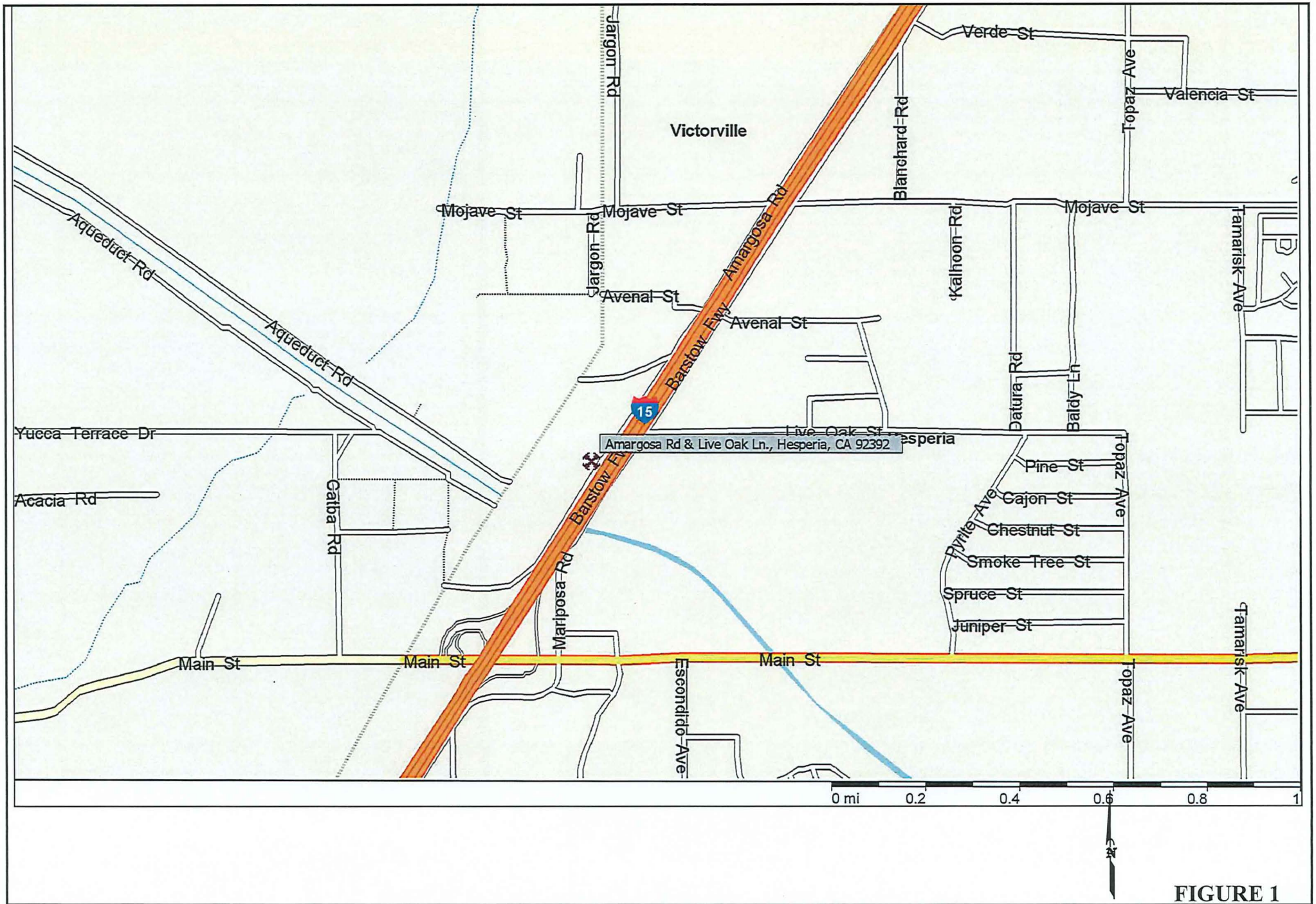


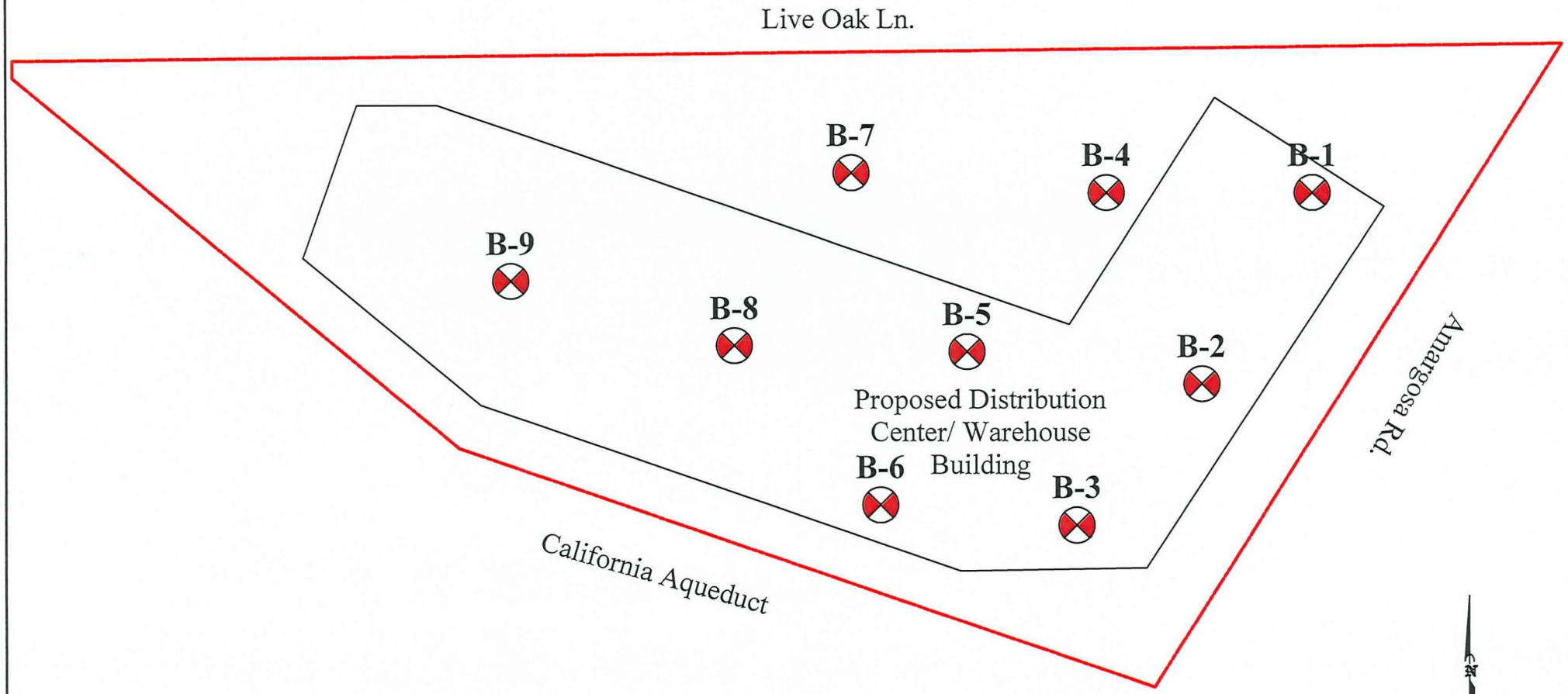
FIGURE 1

LOCATION MAP

Amargosa Rd. & Live Oak Ln., Hesperia

A.G.I. GEOTECHNICAL, INC.
Engineering Geology • Geotechnical Engineering
16555 Sherman Way, Ste. A • Van Nuys, CA 91406
(818) 785-5244 • Fax (818) 785-6251

PROJECT NO.	30-5468-00
DATE	1-2020
PREPARED BY	AM
APPROVED BY	JAV



EXPLANATION

B-1 ⊗ Approximate Location of Exploratory Boring

Scale 1/16" = 1'-0"

FIGURE 2

A.G.I. GEOTECHNICAL, INC.
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(818) 785-5244 • Fax (818) 785-6251

SITE PLAN

Amargosa Rd. & Live Oak Ln., Hesperia

PROJECT NO.	30-5468-00
DATE	02-2020
PREPARED BY	WFB
APPROVED BY	JAV

BORING LOGS

LEGEND

 Ring Sample, or Bulk Sample

 Standard Penetration Test (SPT)

 Ground Water Level

SOIL SIZE	
COMPONENT	SIZE RANGE
Boulders	Above 12"
Cobbles	3"-12"
Gravel	#4 - 3"
coarse	¾" - 3"
fine	#4 - ¾"
Sand	#200-#4
coarse	#10-#4
medium	#40-#10
fine	#200-#40
Fines (Silt or Clays)	Below #200

PLASTICITY OF FINE GRAINED SOILS	
PLASTICITY INDEX	VOLUME CHANGE POTENTIAL
0-15	Probably Low
15-30	Probably Moderate
30 or more	Probably High

WATER CONTENT
Dry: No feel of moisture
Damp: Much less than normal moisture
Moist: Normal moisture
Wet: Much greater than normal moisture
Saturated: At or near saturation

	GROUP SYMBOLS	DESCRIPTIONS	DIVISIONS
COARSE-GRAINED SOILS (Less than 50% Fines)	GW	Well-graded gravels or gravel-sand mixtures, less than 5% fines	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
	GP	Poorly-graded gravels or gravel-sand mixtures, less than 5% fines	
	GM	Silty gravels, gravel-sand silt mixtures, more than 12% fines	
	GC	Clayey gravels, gravel-sand-clay mixtures, more than 12% fines	
	SW	Well-graded sands or gravelly sands, less than 5% fines	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
	SP	Poorly-graded sands or gravelly sands, less than 5% fines	
	SM	Silty sands, sand-silt mixtures, more than 12% fines	
	SC	Clayey sands, sand-clay mixtures, more than 12% fines	
FINE-GRAINED SOILS (More than 50% Fines	ML	Inorganic silt, very fine sands, rock flour, silty or clayey fine sands	SILTS AND CLAYS Liquid limit less than 50
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	OL	Organic silts or organic silt-clays of low plasticity	
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	SILTS AND CLAYS Liquid limit less than 50
	CH	Inorganic clays of high plasticity, fat clays	
	OH	Organic clays of medium to high plasticity	
	PT	Peat, mulch, and other highly organic soils	HIGHLY ORGANIC SOILS

RELATIVE DENSITY	
SANDS & GRAVELS	BLOWS PER FOOT
Very loose	0-4
Loose	4-10
Medium dense	10-30
Dense	30-50
Very dense	Over 50

CONSISTENCY	
CLAYS & SILTS	BLOWS PER FOOT
Very soft	0-2
Soft	2-4
Firm	4-8
Stiff	8-15
Very stiff	15-30
Hard	Over 30

BORING NUMBER B-1

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	48/$\frac{50}{4"}$	X	8.3	125	136				Alluvium Brown Silty SAND (Slightly moist, very dense)			SM
5	X	19/28/41		1.6	124	126				Light brown Silty SAND (Damp, dense)			SM
10	X	26/28/45		2.2	114	116							
15	X	26/28/32		1.3	112	114							
20	X	19/28/37		1.7	121	123				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	21/46/49		1.4	121	122							
30	X	32/40/$\frac{50}{2"}$		3.6	117	122				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-2

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	☒	11/22/$\frac{50}{5"}$		11.2	129	144				Alluvium Brown Silty SAND (Slightly moist, very dense)			SM
5	☒	$\frac{50}{5"}$		3.7	124	129				Light brown Silty SAND (Damp, very dense to dense)			SM
10	☒	18/21/26		4.1	119	124							
15	☒	23/31/50		2.1	113	116							
20	☒	29/$\frac{50}{6"}$		1.8	111	113				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	☒	28/43/$\frac{50}{5"}$		2.0	127	129							
30	☒	11/26/50		4.1	117	121				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-3

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	X	10/21/5"	X	5.9	130	138				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	22/33/41		4.9	128	135				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	25/32/38		3.1	119	123							
15	X	33/34/3"		2.2	118	120							
20	X	37/48/3"		1.8	115	117				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	28/42/2"		1.9	119	121							
30	X	22/48/2"		4.3	119	124				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-4

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	X	7/32/$\frac{50}{4"}$		3.0	121	125				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	38/$\frac{50}{4"}$		3.9	116	120				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	19/20/31		3.7	121	125							
15	X	11/30/$\frac{50}{2"}$		2.1	115	118							
20	X	17/$\frac{50}{6"}$		1.9	119	121				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense to dense)			SW - SM
25	X	16/21/36		2.8	126	130							
30	X	20/21/46		2.1	116	119				Brown Well-graded SAND with Silt (Damp, dense)			SW - SM

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EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A
DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop
LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
35	X	18/36/$\frac{50}{5"}$		1.8	119	122				Light brown Poorly-graded SAND with Silt & Gravel (Damp, dense)			SP - SM
40	X	38/$\frac{50}{6"}$		1.8	116	118							
45										Total Depth: 41.5' No Water			
50													
55													
60													
65													

BORING NUMBER B-5

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	8/10/20	X	4.7	121	127				Alluvium Brown Silty SAND (Damp, medium dense)			SM
5	X	19/31/40		4.6	127	133				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	15/25/46		2.5	123	126							
15	X	16/29/$\frac{50}{5"}$		2.0	120	123							
20	X	9/21/36		1.8	120	122				Light brown Well-graded SAND with Silt & Gravel (Damp, dense)			SW - SM
25	X	20/27/50		4.0	115	120							
30	X	20/49/$\frac{50}{4"}$		2.3	124	126				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-6

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	15/$\frac{50}{6"}$		6.7	132	141				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	30/$\frac{50}{5"}$		4.5	126	132				Light brown Silty SAND (Damp, very dense)			SM
10	X	28/38/36		2.4	124	127							
15	X	19/26/$\frac{50}{5"}$		1.7	118	120							
20	X	34/36/$\frac{50}{4"}$		2.4	110	113				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	18/35/$\frac{50}{5"}$		2.6	117	120							
30	X	$\frac{50}{6"}$		2.5	105	108				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-7

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	18/5"		7.2	136	146				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	18/30/5"		3.9	128	133				Light brown Silty SAND (Damp, very dense)			SM
10	X	22/38/50		2.2	124	127							
15	X	31/36/50		2.0	121	124							
20	X	22/34/45		1.5	124	126				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	20/40/4"		4.4	126	132							
30	X	26/6"		2.2	118	121				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-8

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D50	Classification
0										Alluvium Brown Silty SAND (Damp, very dense)			SM
	X	44/49/$\frac{50}{4"}$		3.7	127	132							
5	X	45/32/46		2.8	125	128				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	25/28/40		7.1	114	122							
15	X	20/30/$\frac{50}{6"}$		2.0	121	123							
20	X	34/38/50		2.0	116	119				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	21/40/50		1.2	125	127							
30	X	24/$\frac{50}{5"}$		2.3	121	123				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-9

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

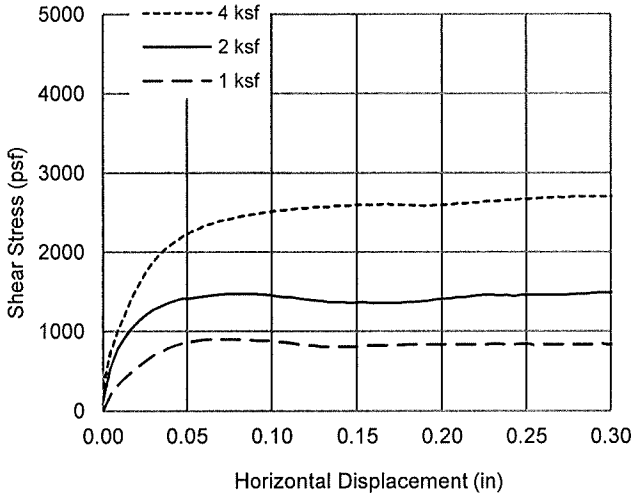
DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

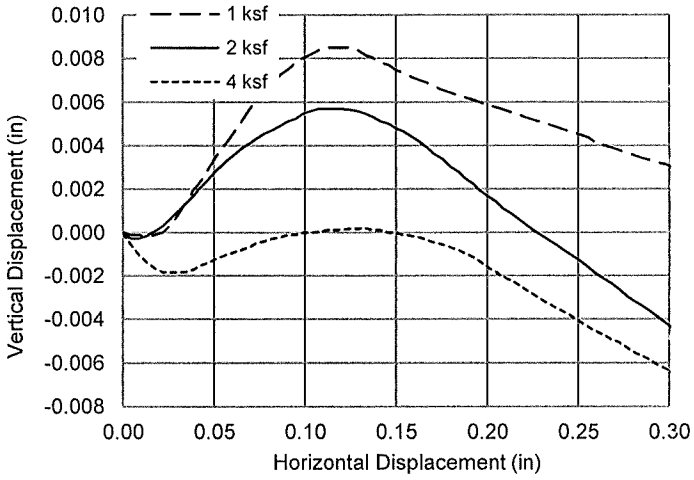
LOGGED BY: CWL CHECKED BY: JAV

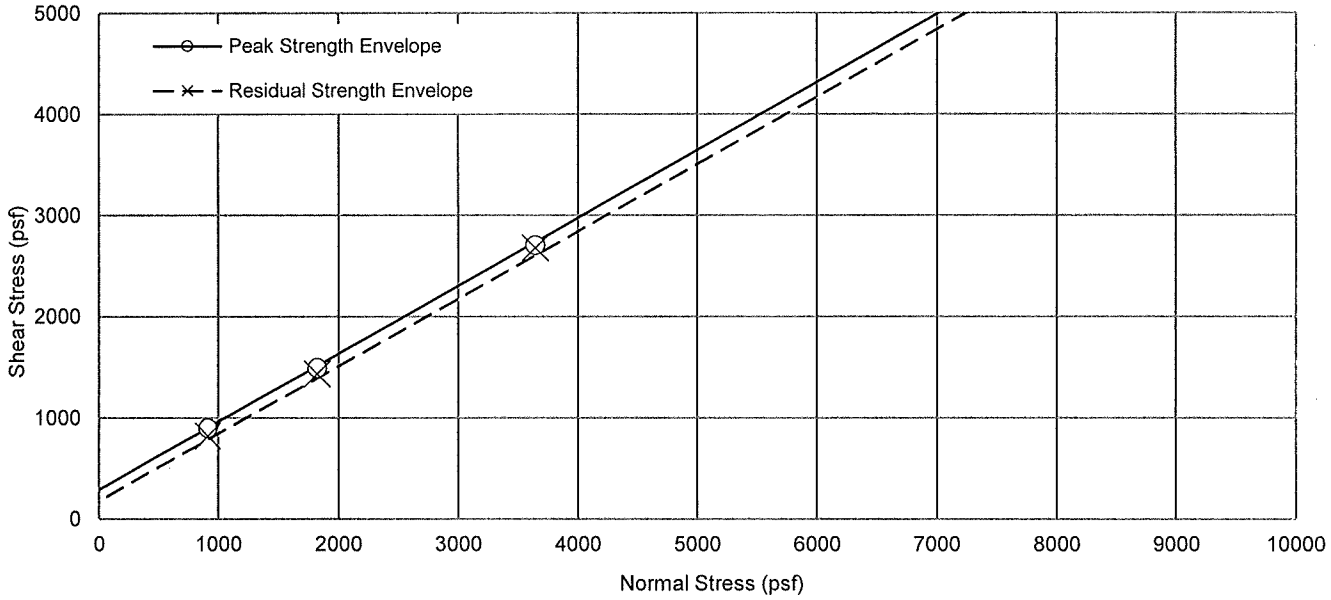
DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	☒	24/$\frac{50}{4"}$	☒	5.6	121	127				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	☒	30/$\frac{50}{4"}$		4.3	122	128				Light brown Silty SAND (Damp, very dense to dense)			SM
10	☒	17/22/30		3.4	128	133							
15	☒	12/24/28		4.4	116	121							
20	☒	16/32/40		1.3	118	119				Light brown Well-graded SAND with Silt & Gravel (Damp, dense to very dense)			SW - SM
25	☒	24/$\frac{50}{5"}$		3.4	118	122							
30	☒	49/$\frac{50}{5"}$		3.5	116	120				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

LABORATORY TEST RESULTS

Sample ID :		1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	7.5	7.5	7.5			
	Dry Density (%)	136.0	135.6	135.0			
	Saturation (%)	84.8	83.5	81.7			
Final	Water Content (%)	9.6	9.9	9.8			
	Dry Density (pcf)	135.4	134.7	133.8			
	Saturation (%)	106.1	106.6	102.1			
Normal Stress (psf)		910	1821	3642			
Peak Shear Stress (psf)		898	1490	2703			
Residual Shear Stress (psf)		817	1432	2673			







Peak Cohesion, c' (psf):	291	Residual Cohesion, c (psf):	180
Peak Friction, ϕ' (deg):	33.9	Residual Friction, ϕ' (deg):	33.6

DIRECT SHEAR TEST (ASTM:D-3080)

SAMPLE TYPE: Remolded
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

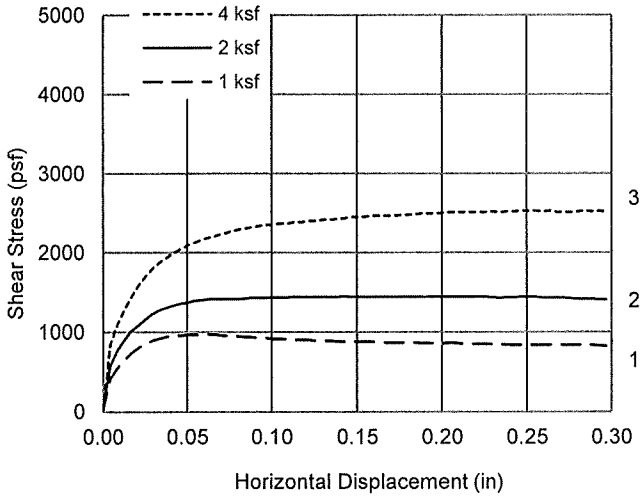
USCS:
GEOLOGY:
SYMBOL:
REMARKS:

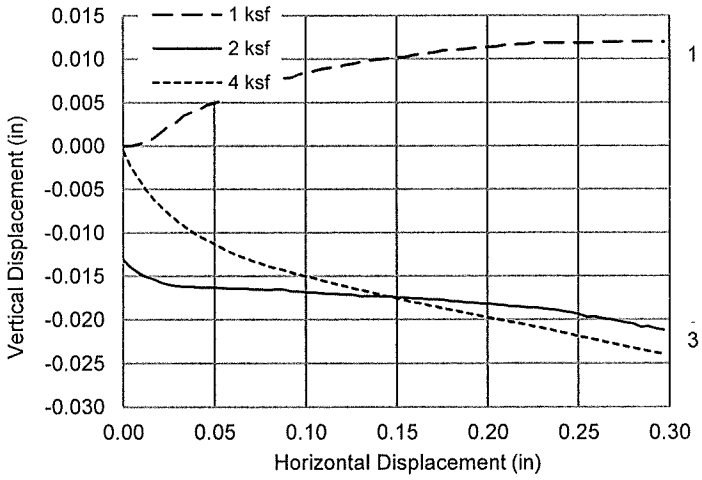
CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln.
Hesperia
SAMPLE LOCATION: B-1 @ 0-5'

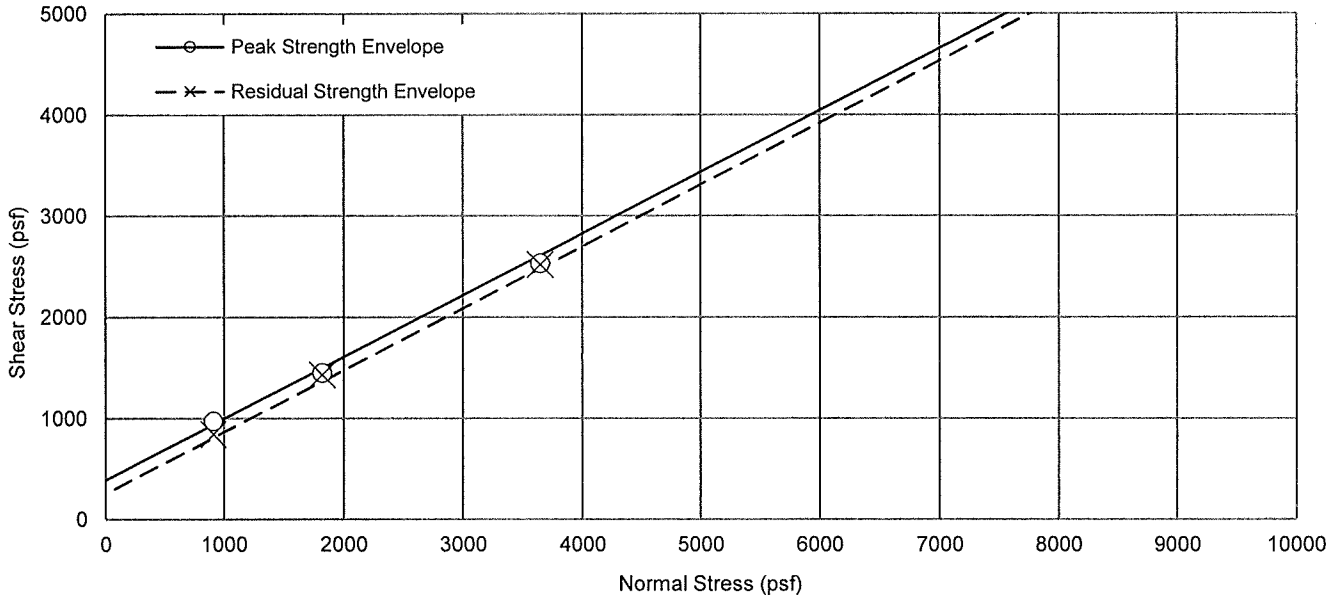
PROJECT NO.: 30-5468-00 TESTED: 02/19/20

A.G.I. GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	8.3	8.3	8.3			
	Dry Density (%)	124.6	124.1	123.7			
	Saturation (%)	63.6	62.7	61.9			
Final	Water Content (%)	13.7	13.8	14.1			
	Dry Density (pcf)	123.5	123.1	122.5			
	Saturation (%)	101.6	101.1	101.4			
Normal Stress (psf)		910	1821	3642			
Peak Shear Stress (psf)		971	1447	2528			
Residual Shear Stress (psf)		840	1428	2517			







Peak Cohesion, c' (psf):	388	Residual Cohesion, c (psf):	254
Peak Friction, ϕ' (deg):	31.4	Residual Friction, ϕ' (deg):	31.5

DIRECT SHEAR TEST (ASTM:D-3080)

SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

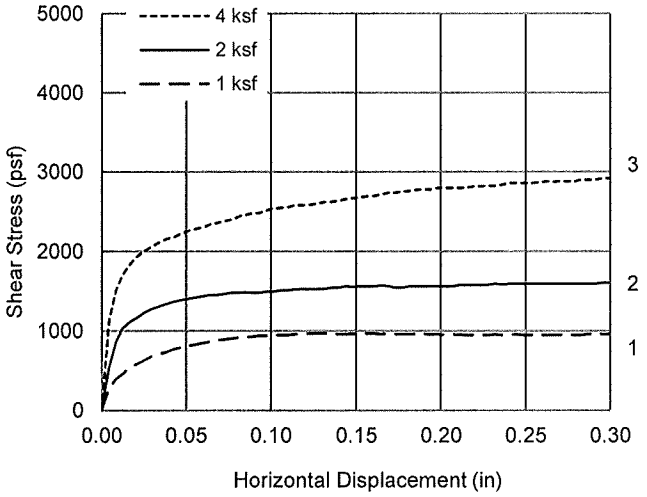
USCS:
GEOLOGY:
SYMBOL:
REMARKS:

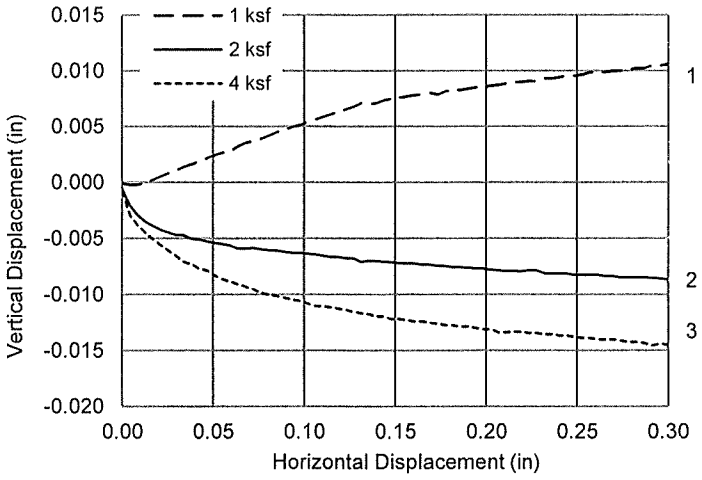
CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln.
Los Angeles
SAMPLE LOCATION: B-1 @ 2.5'

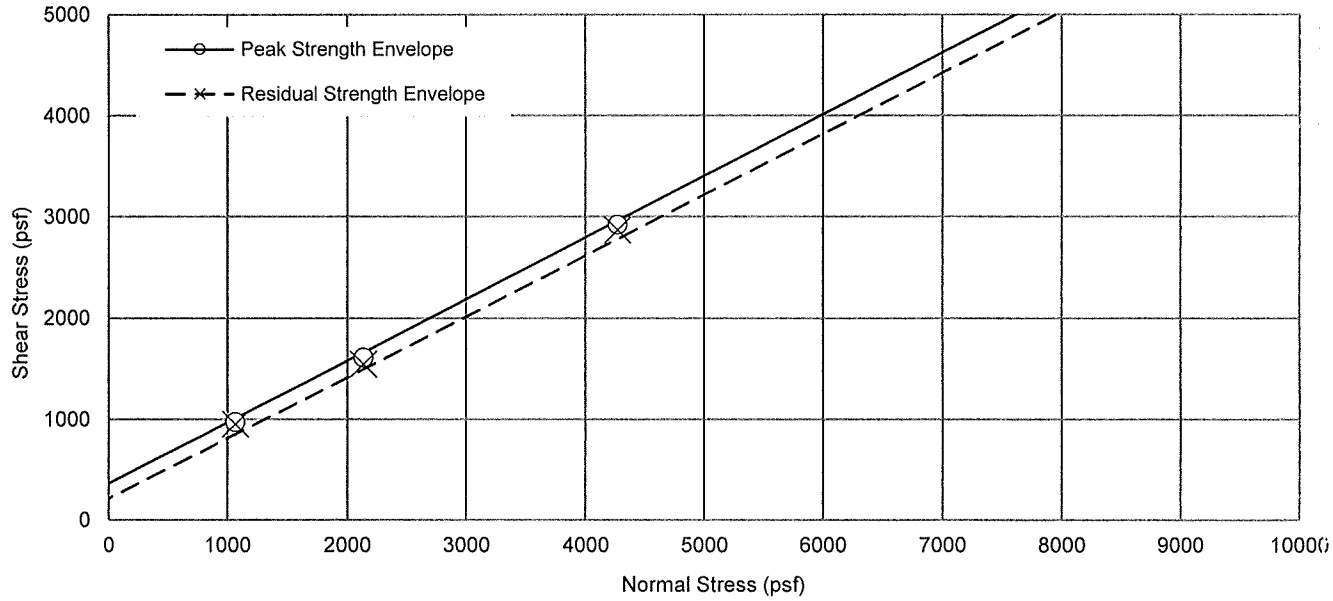
PROJECT NO.: 30-5468-00 TESTED: 02/19/20

A.G.I. GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	7.5	7.5	7.5			
	Dry Density (%)	134.9	134.3	133.7			
	Saturation (%)	81.3	79.6	77.8			
Final	Water Content (%)	10.0	10.2	10.3			
	Dry Density (pcf)	134.1	133.3	132.4			
	Saturation (%)	105.3	104.4	102.1			
Normal Stress (psf)		1067	2134	4269			
Peak Shear Stress (psf)		972	1607	2918			
Residual Shear Stress (psf)		949	1543	2866			







Peak Cohesion, c' (psf):	360	Residual Cohesion, c (psf):	211	**DIRECT SHEAR TEST (ASTM:D-3080)**
Peak Friction, ϕ' (deg):	31.3	Residual Friction, Φ' (deg):	31.0	

SAMPLE TYPE: Remolded
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

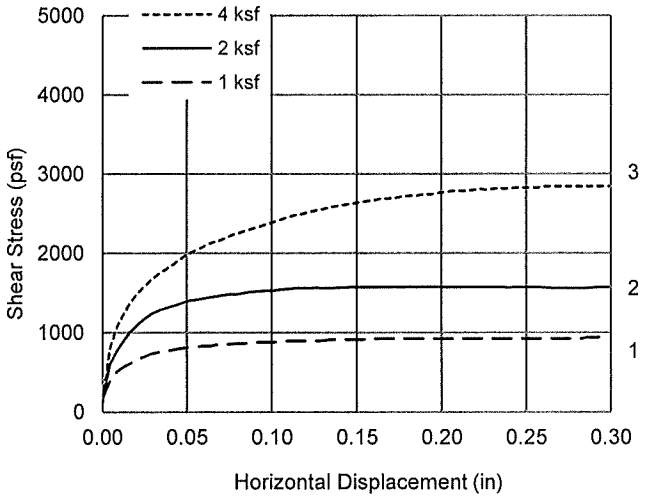
USCS:
GEOLOGY:
SYMBOL:
REMARKS:

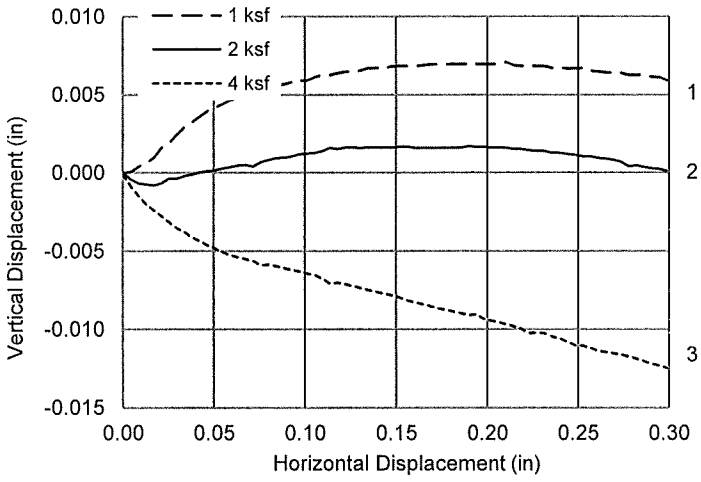
CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln.
Hesperia
SAMPLE LOCATION: B-3 @ 0-5'

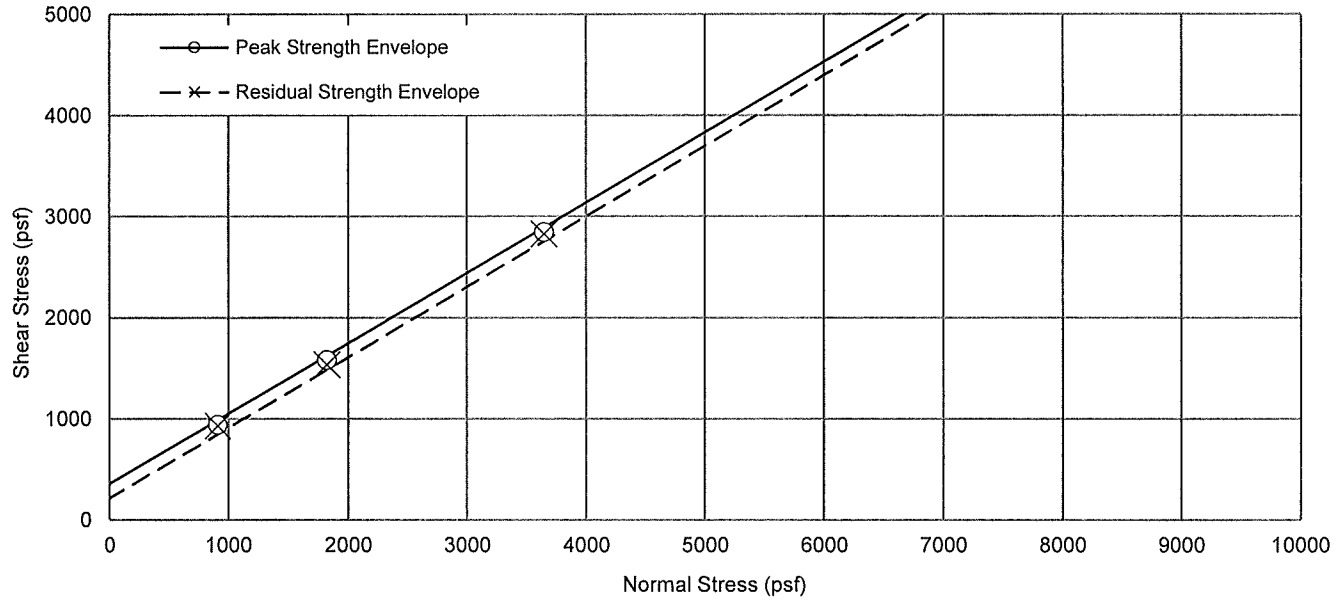
PROJECT NO.: 30-5468-00 TESTED: 02/22/20

A.G.I. GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	7.5	7.5	7.5			
	Dry Density (%)	136.4	135.9	135.4			
	Saturation (%)	86.1	84.5	82.9			
Final	Water Content (%)	9.2	9.5	9.7			
	Dry Density (pcf)	135.7	135.0	134.2			
	Saturation (%)	102.8	103.4	102.5			
Normal Stress (psf)		910	1821	3642			
Peak Shear Stress (psf)		940	1579	2842			
Residual Shear Stress (psf)		925	1532	2825			







Peak Cohesion, c' (psf):	355	Residual Cohesion, c (psf):	214
Peak Friction, ϕ' (deg):	34.8	Residual Friction, ϕ' (deg):	34.9

DIRECT SHEAR TEST (ASTM:D-3080)

SAMPLE TYPE: Remolded
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

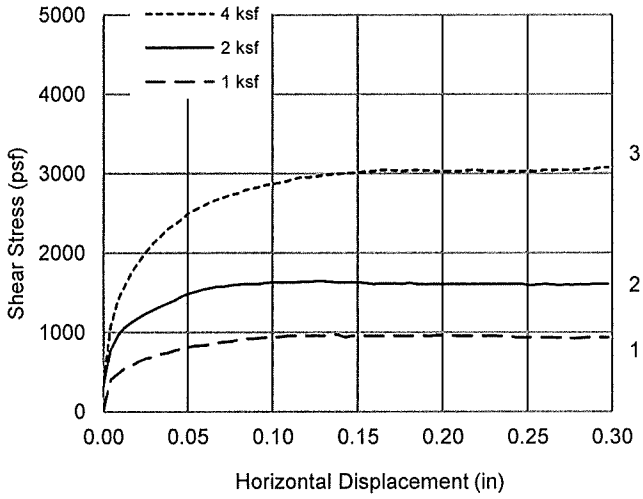
USCS:
GEOLOGY:
SYMBOL:
REMARKS:

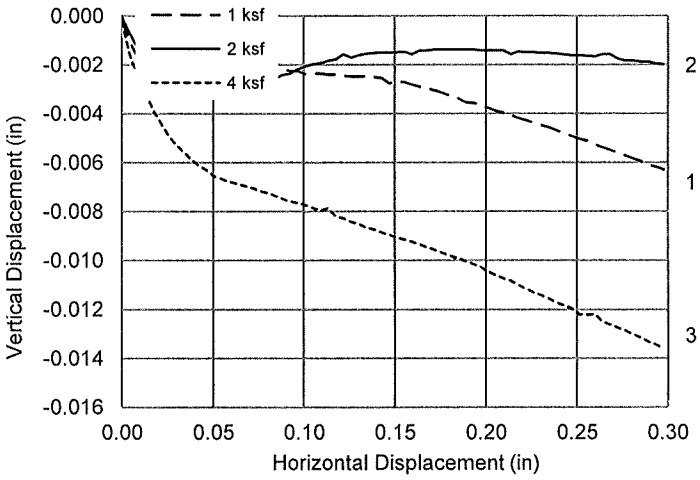
CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln.
Hesperia
SAMPLE LOCATION: B-5 @ 0-5'

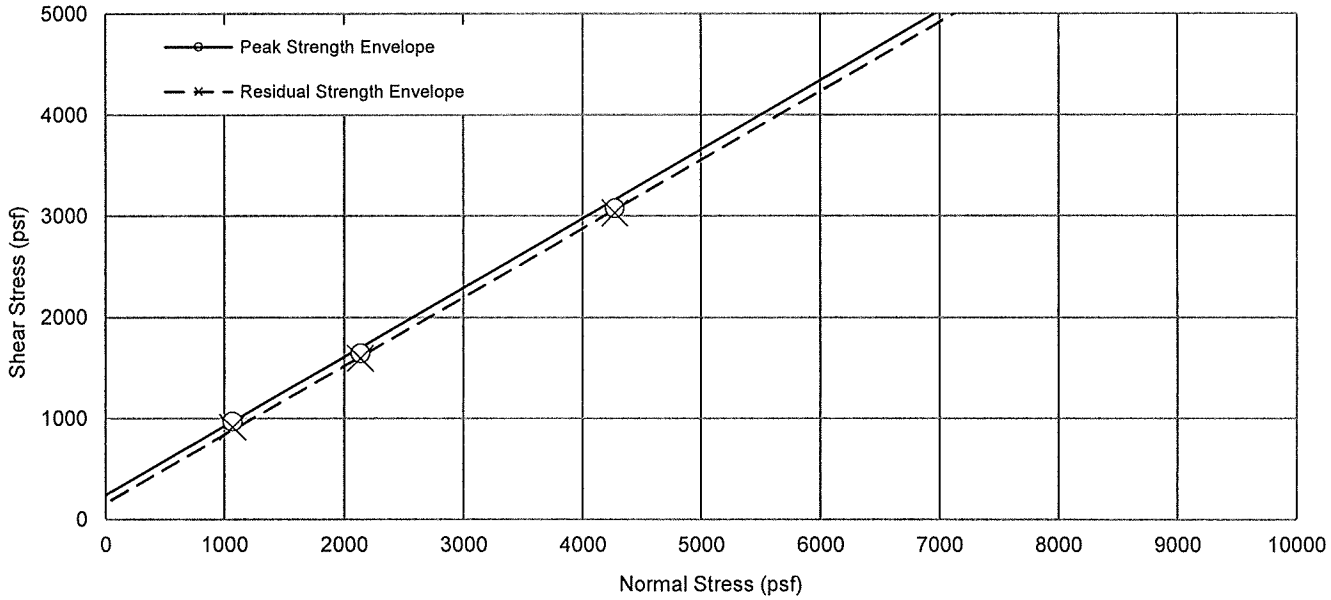
PROJECT NO.: 30-5468-00 TESTED: 02/22/20

A.G.I. GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	3.7	3.7	3.7			
	Dry Density (%)	126.9	126.3	125.8			
	Saturation (%)	30.5	29.9	29.4			
Final	Water Content (%)	12.9	13.2	13.3			
	Dry Density (pcf)	126.3	125.6	124.8			
	Saturation (%)	104.3	104.4	102.6			
Normal Stress (psf)		1067	2134	4269			
Peak Shear Stress (psf)		969	1644	3074			
Residual Shear Stress (psf)		911	1591	3028			







Peak Cohesion, c' (psf):	240	Residual Cohesion, c (psf):	159
Peak Friction, ϕ' (deg):	34.4	Residual Friction, ϕ' (deg):	34.2

DIRECT SHEAR TEST (ASTM:D-3080)

SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

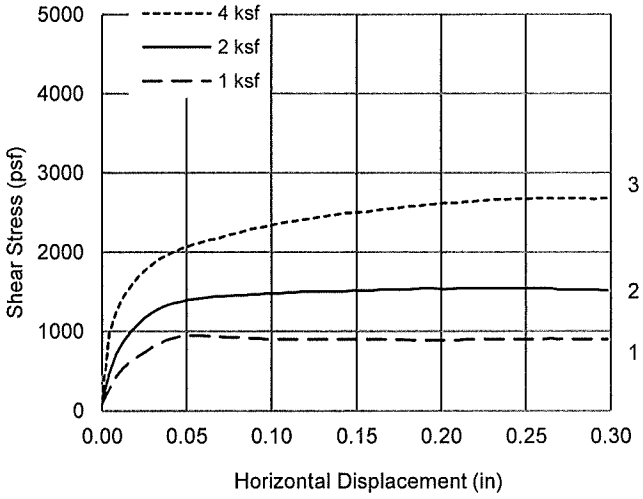
USCS:
GEOLOGY:
SYMBOL:
REMARKS:

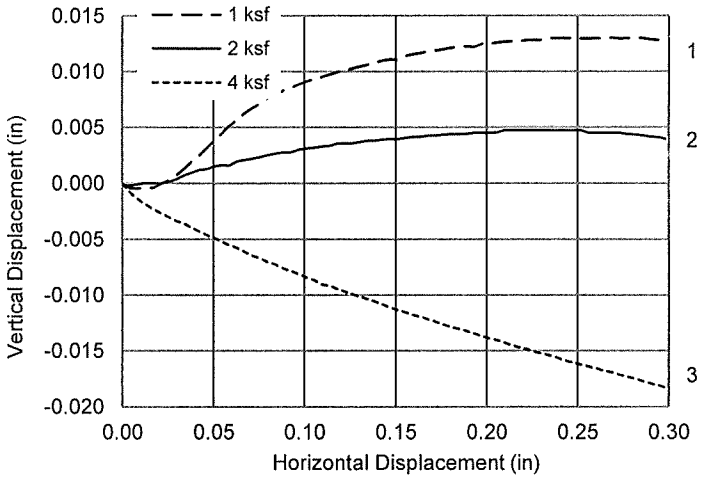
CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln.
Hesperia
SAMPLE LOCATION: B-8 @ 2.5'

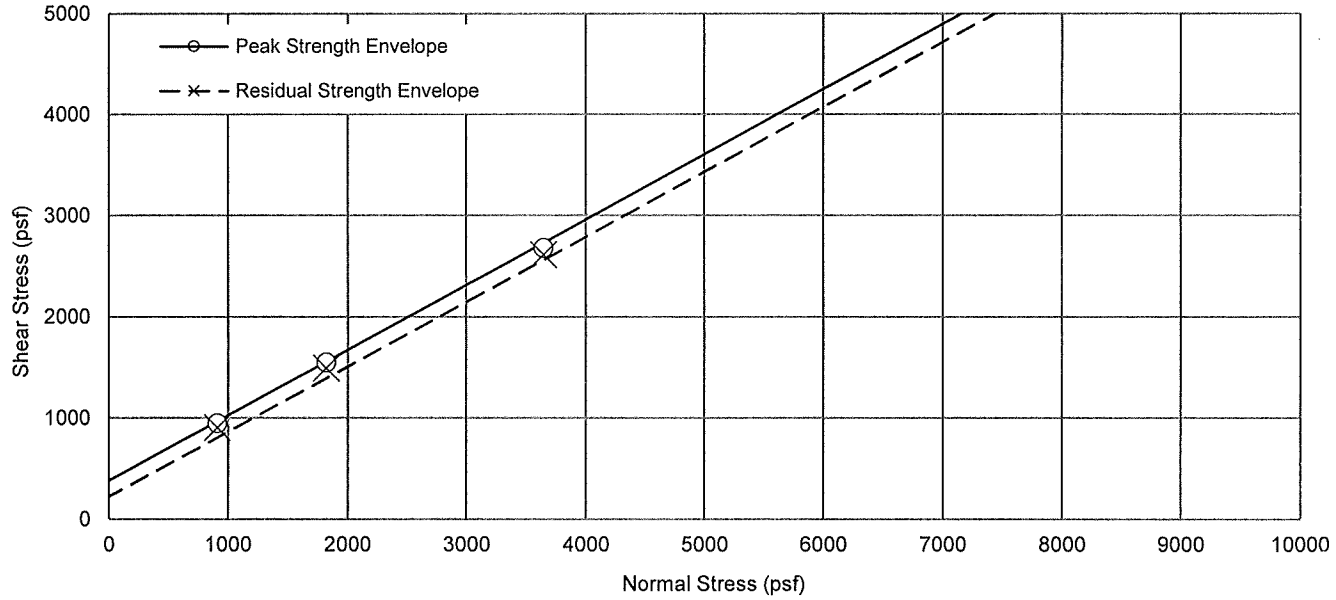
PROJECT NO.: 30-5468-00 TESTED: 02/21/20

A.G.I. GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	8.0	8.0	8.0			
	Dry Density (%)	134.7	134.1	133.6			
	Saturation (%)	86.1	84.3	82.7			
Final	Water Content (%)	9.8	10.1	10.4			
	Dry Density (pcf)	133.8	133.0	132.3			
	Saturation (%)	102.1	102.2	102.7			
Normal Stress (psf)		910	1821	3642			
Peak Shear Stress (psf)		946	1545	2677			
Residual Shear Stress (psf)		900	1488	2611			







Peak Cohesion, c' (psf):	379	Residual Cohesion, c (psf):	222
Peak Friction, ϕ' (deg):	32.8	Residual Friction, ϕ' (deg):	32.7

DIRECT SHEAR TEST (ASTM:D-3080)

SAMPLE TYPE: Remolded
DESCRIPTION: Silty SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

USCS:
GEOLOGY:
SYMBOL:
REMARKS:

CLIENT: 55555 Amargosa Rd., LLC
PROJECT NAME:
LOCATION: Amargosa Rd. & Live Oak Ln. Hesperia
SAMPLE LOCATION: B-9 @ 0-5'

PROJECT NO.: 30-5468-00 TESTED: 02/19/20

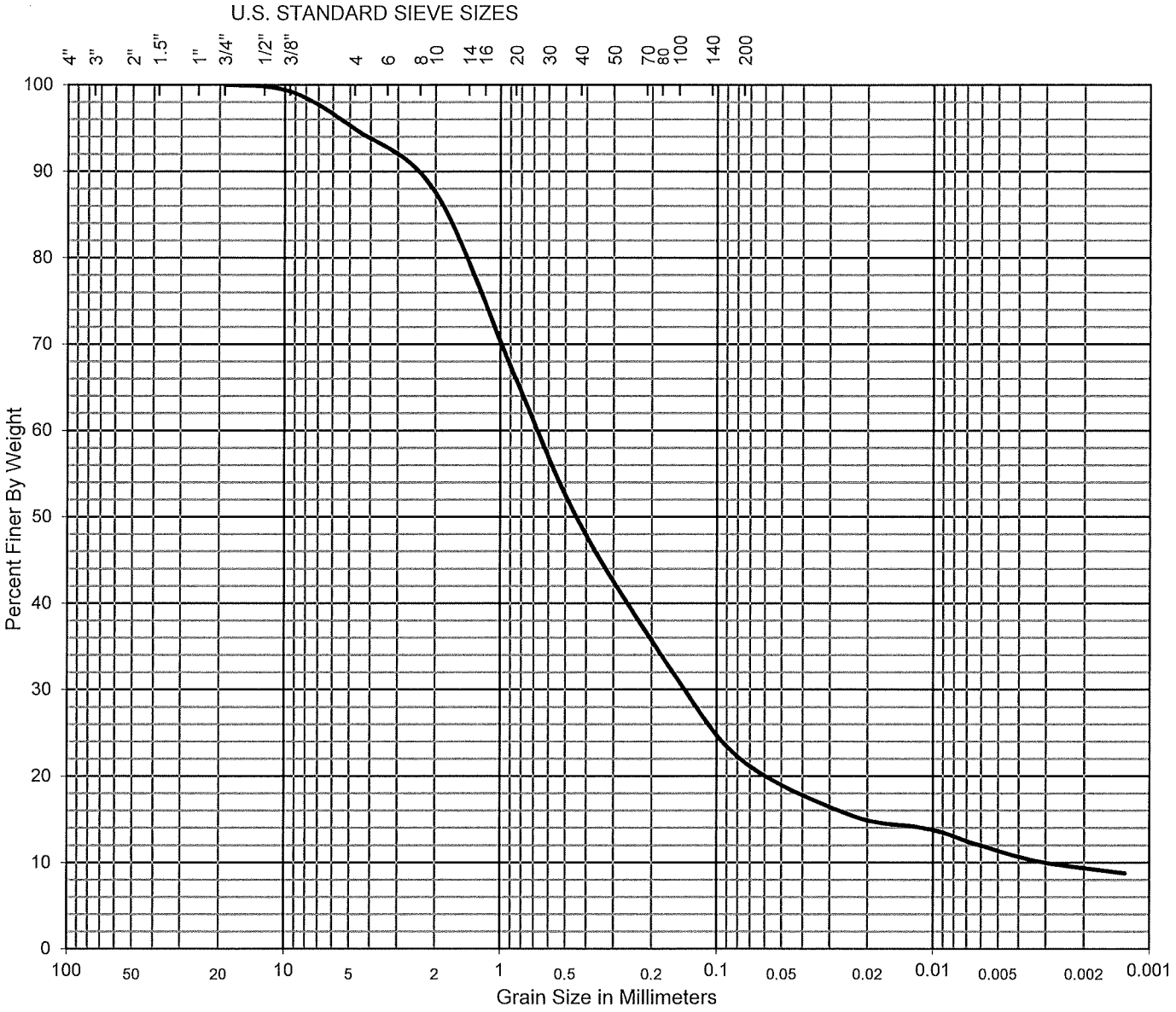
A.G.I. GEOTECHNICAL, INC.

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-1			**DEPTH (FT)**	0-5
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	5.1	**Sand (%)**	73.2			**Silt & Clay (%)**	21.7
D_{10} (mm)	-	**D_{30} (mm)**	-	**D_{60} (mm)**	-	**D_{50} (mm)**	-
C_u	-	**C_c**	-			**% Fines (< 75υm)**	21.7

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM)



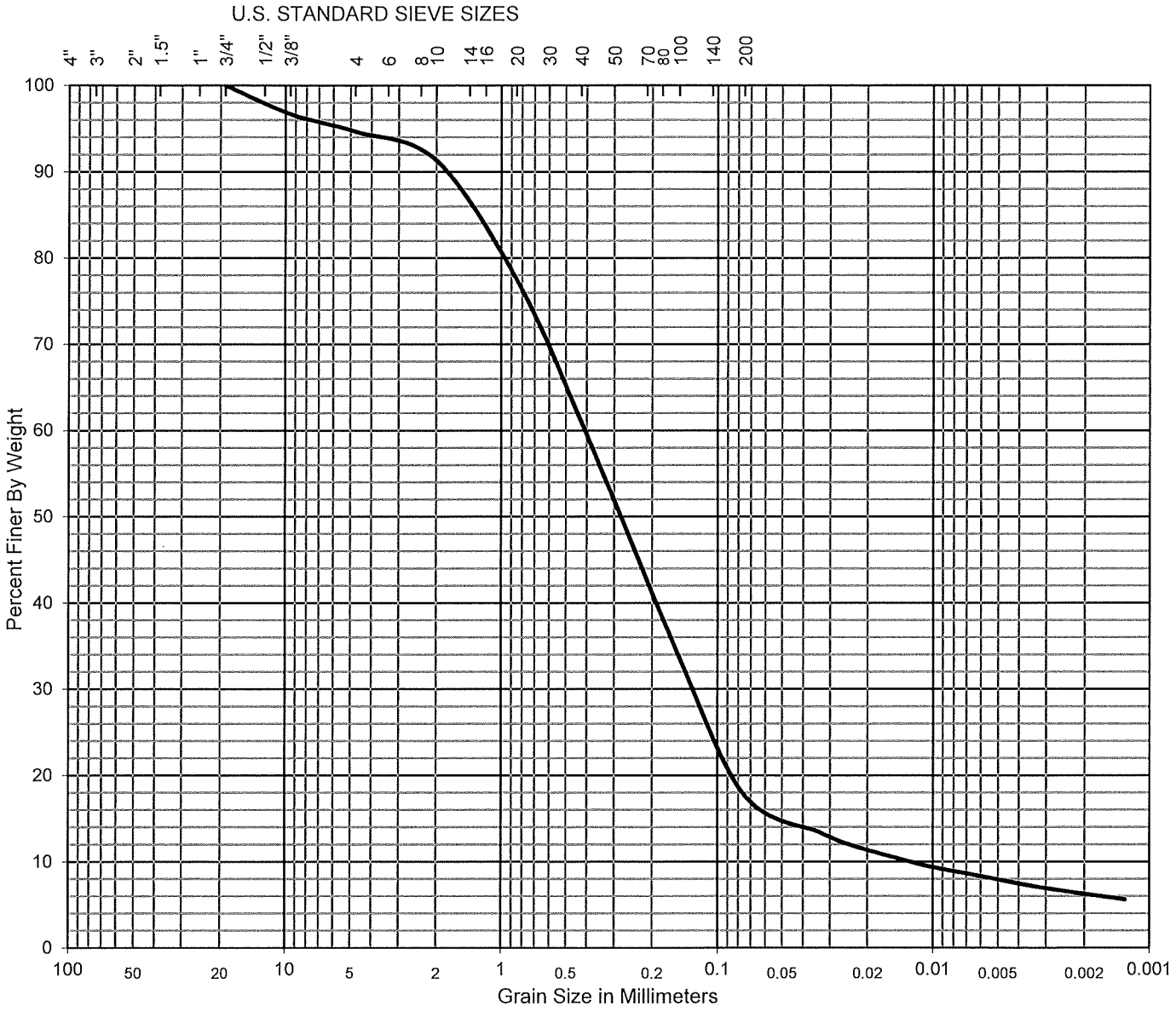
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-2			**DEPTH (FT)**	10
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	5.3	**Sand (%)**	77.0			**Silt & Clay (%)**	17.7
D_{10} (mm)	-	**D_{30} (mm)**	-	**D_{60} (mm)**	-	**D_{50} (mm)**	-
C_u	-	**C_c**	-			**% Fines (< 75υm)**	17.7

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM)



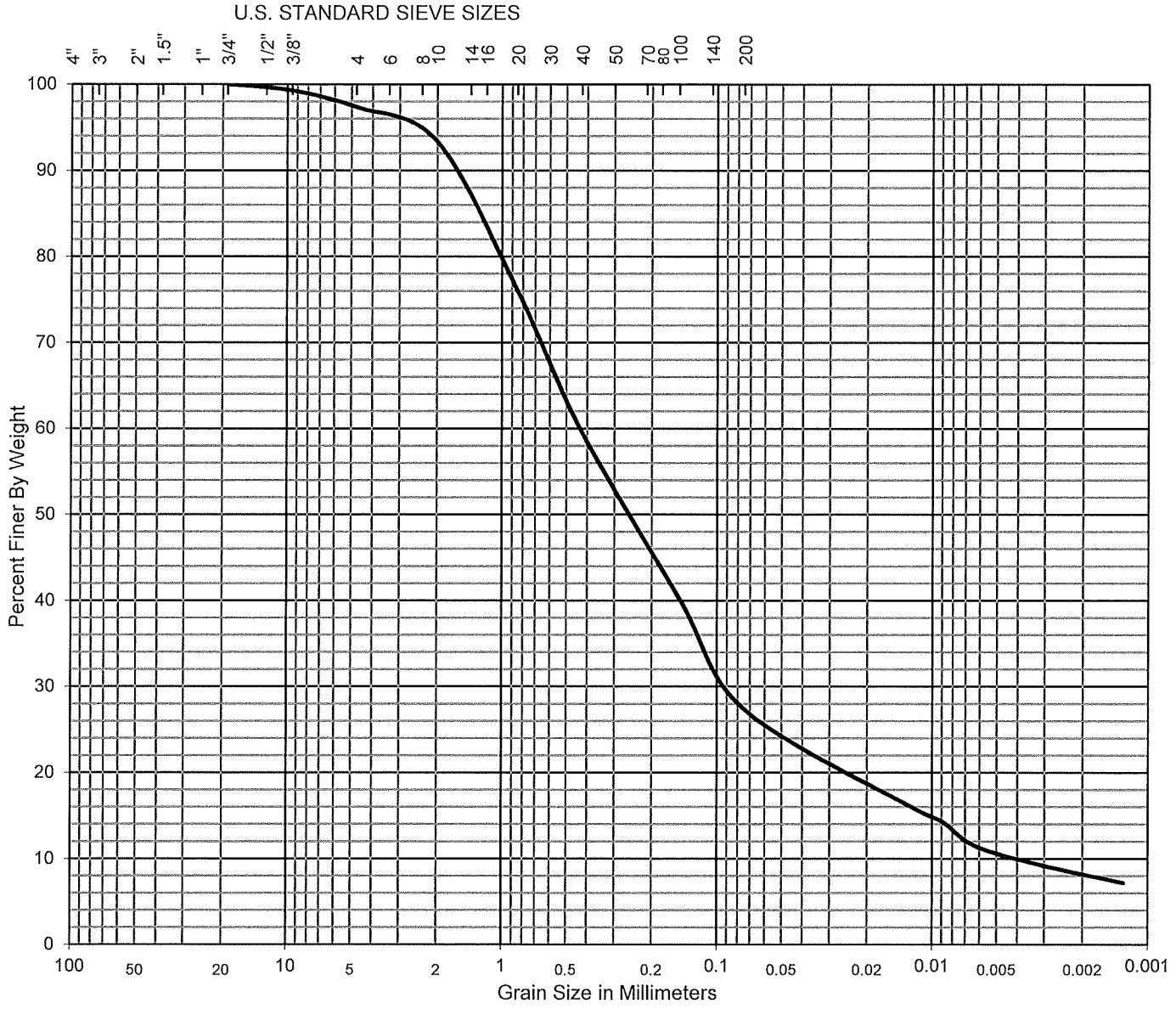
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-3			**DEPTH (FT)**	0-5
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	2.6	**Sand (%)**	70.0			**Silt & Clay (%)**	27.4
D_{10} (mm)	-	**D_{30} (mm)**	-	**D_{60} (mm)**	-	**D_{50} (mm)**	-
C_u	-	**C_c**	-			**% Fines (< 75υm)**	27.4

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM)



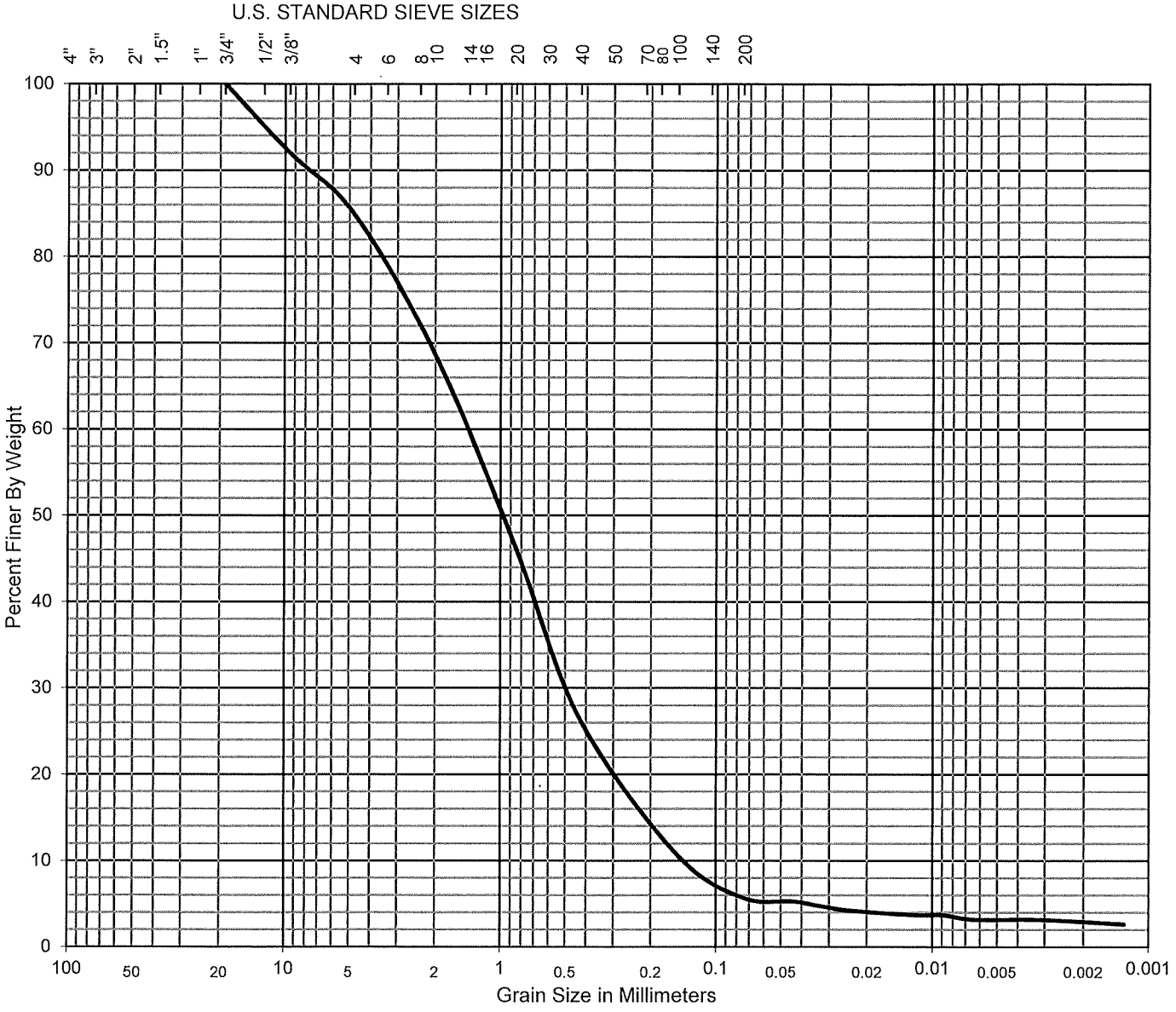
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-3			**DEPTH (FT)**	20
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	15.1	**Sand (%)**	79.2			**Silt & Clay (%)**	5.7
D_{10} (mm)	0.15	**D_{30} (mm)**	0.50	**D_{60} (mm)**	1.50	**D_{50} (mm)**	1.00
C_u	10.00	**C_c**	1.11			**% Fines (< 75υm)**	5.7

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Well-Graded SAND with Silt & Gravel (SW-SM)



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

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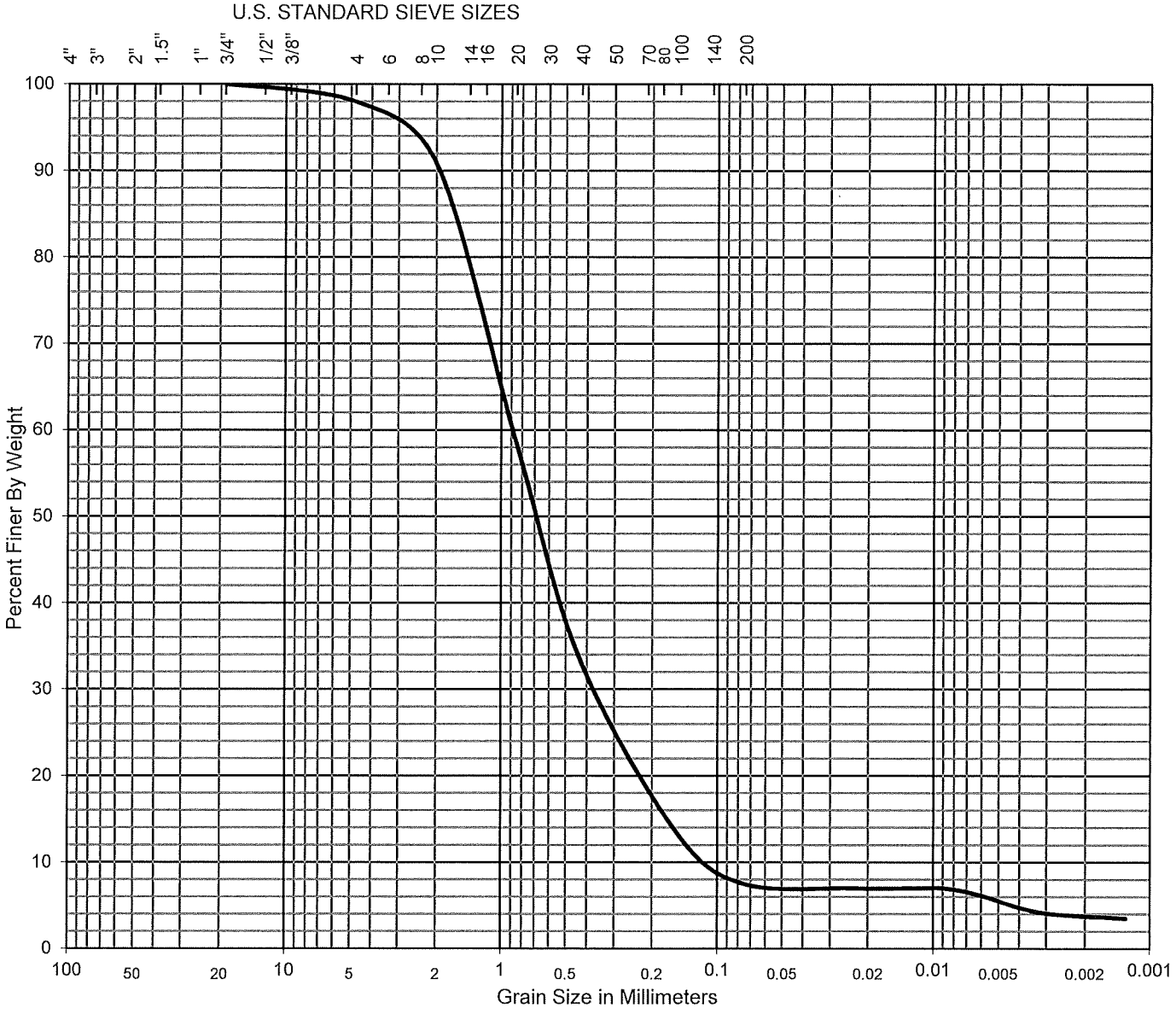
GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-4			**DEPTH (FT)**	30
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	2.0	**Sand (%)**	90.5			**Silt & Clay (%)**	7.5
D_{10} (mm)	0.13	**D_{30} (mm)**	0.38	**D_{60} (mm)**	0.90	**D_{50} (mm)**	0.70
C_u	6.92	**C_c**	1.23			**% Fines (< 75υm)**	7.5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Well-Graded SAND with Silt (SW-SM)



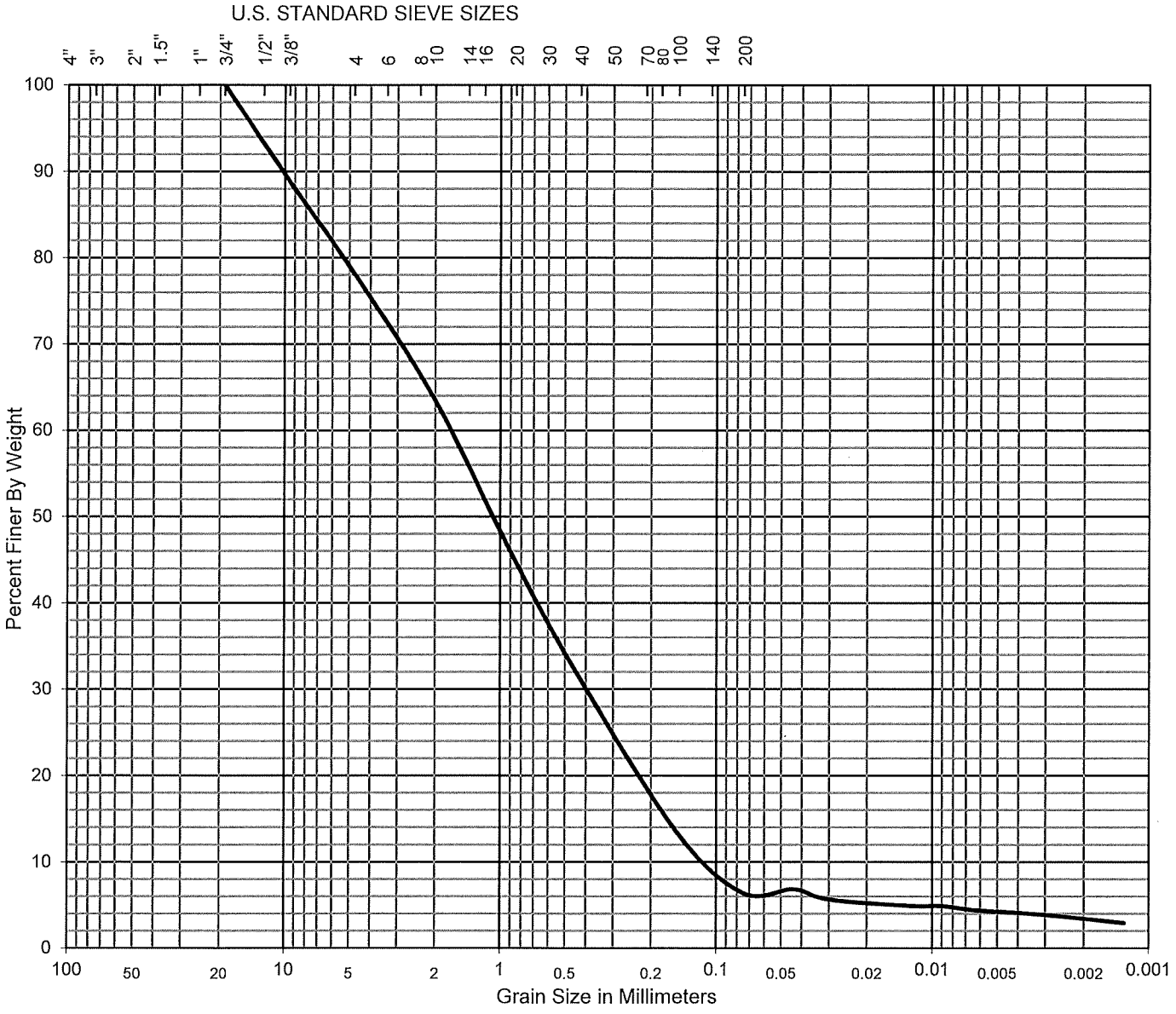
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-4			**DEPTH (FT)**	40
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	21.8	**Sand (%)**	71.8			**Silt & Clay (%)**	6.4
D_{10} (mm)	0.13	**D_{30} (mm)**	0.40	**D_{60} (mm)**	1.80	**D_{50} (mm)**	1.20
C_u	13.85	**C_c**	0.68			**% Fines (< 75υm)**	6.4

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Poorly-Graded SAND with Silt & Gravel (SP-SM)



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

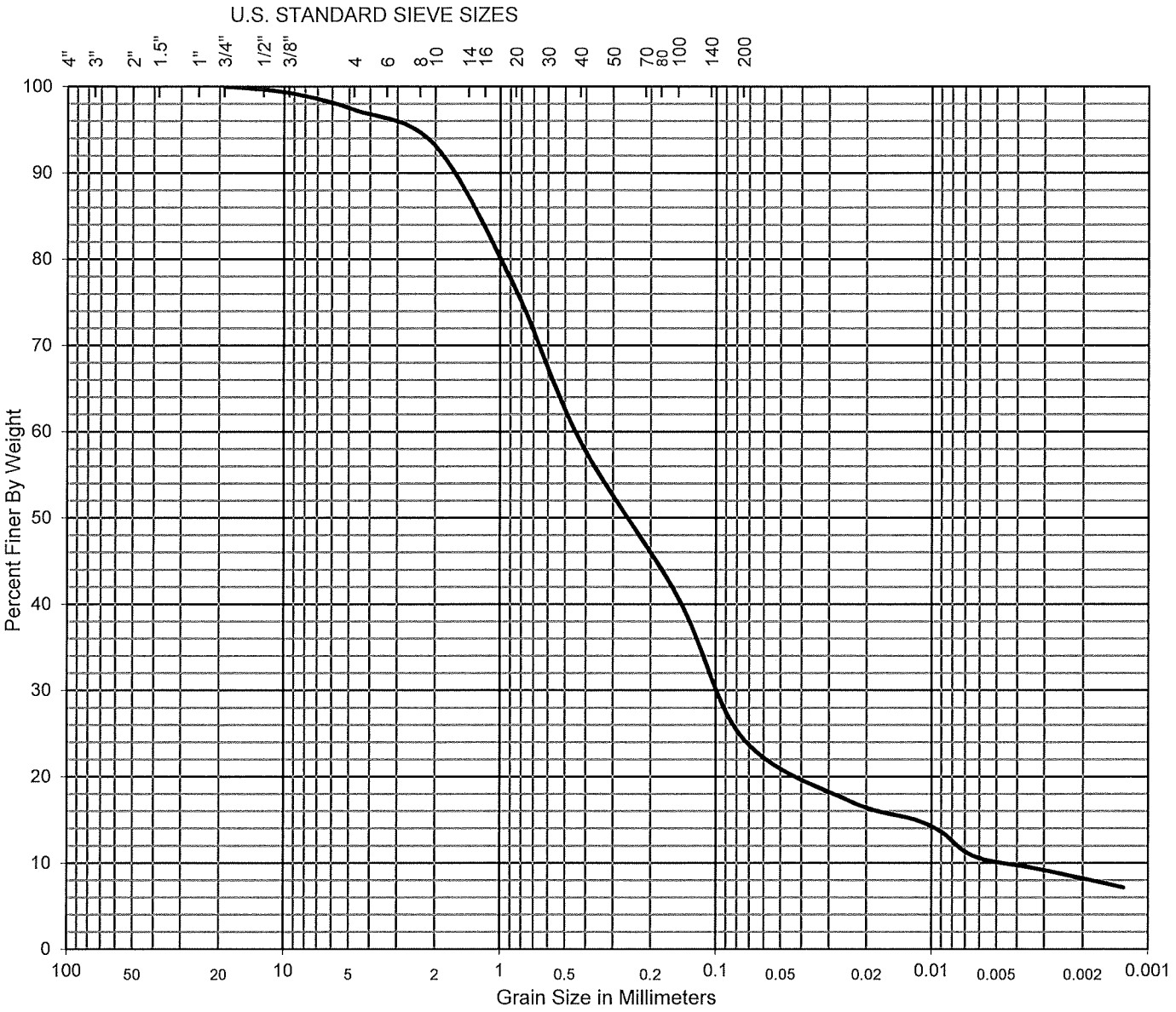
A.G.I. GEOTECHNICAL, INC.

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-5			**DEPTH (FT)**	0-5
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	2.7	**Sand (%)**	72.9			**Silt & Clay (%)**	24.5
D_{10} (mm)	-	**D_{30} (mm)**	-	**D_{60} (mm)**	-	**D_{50} (mm)**	-
C_u	-	**C_c**	-			**% Fines (< 75υm)**	24.5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM)



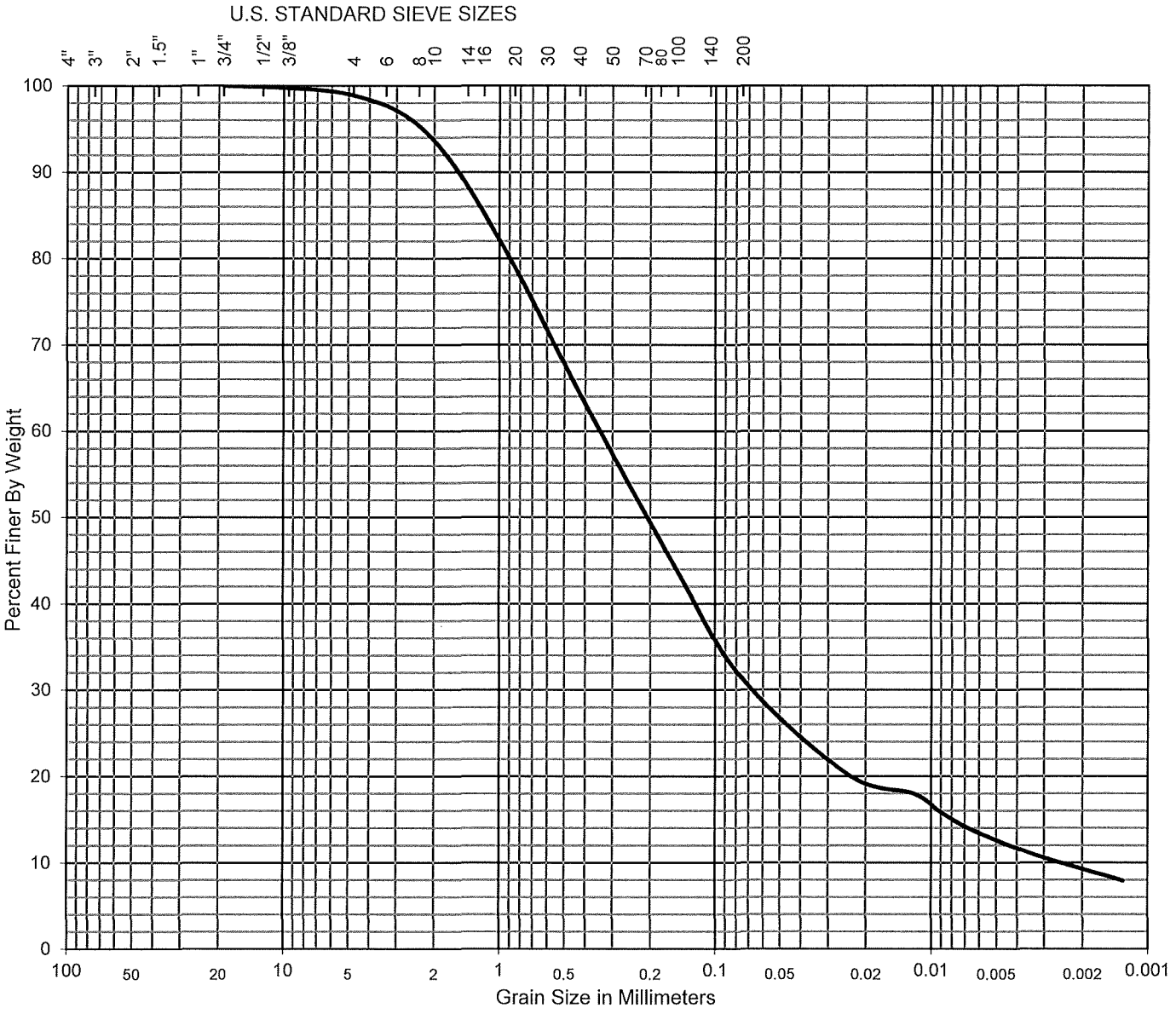
GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION

PROJECT NO.	30-5468-00	**BORING NO.**	B-9			**DEPTH (FT)**	0-5
Liquid Limit (%)	-	**Plastic Limit (%)**	-			**Plasticity Index**	-
Gravel (%)	1.1	**Sand (%)**	67.6			**Silt & Clay (%)**	31.3
D_{10} (mm)	-	**D_{30} (mm)**	-	**D_{60} (mm)**	-	**D_{50} (mm)**	-
C_u	-	**C_c**	-			**% Fines (< 75υm)**	31.3

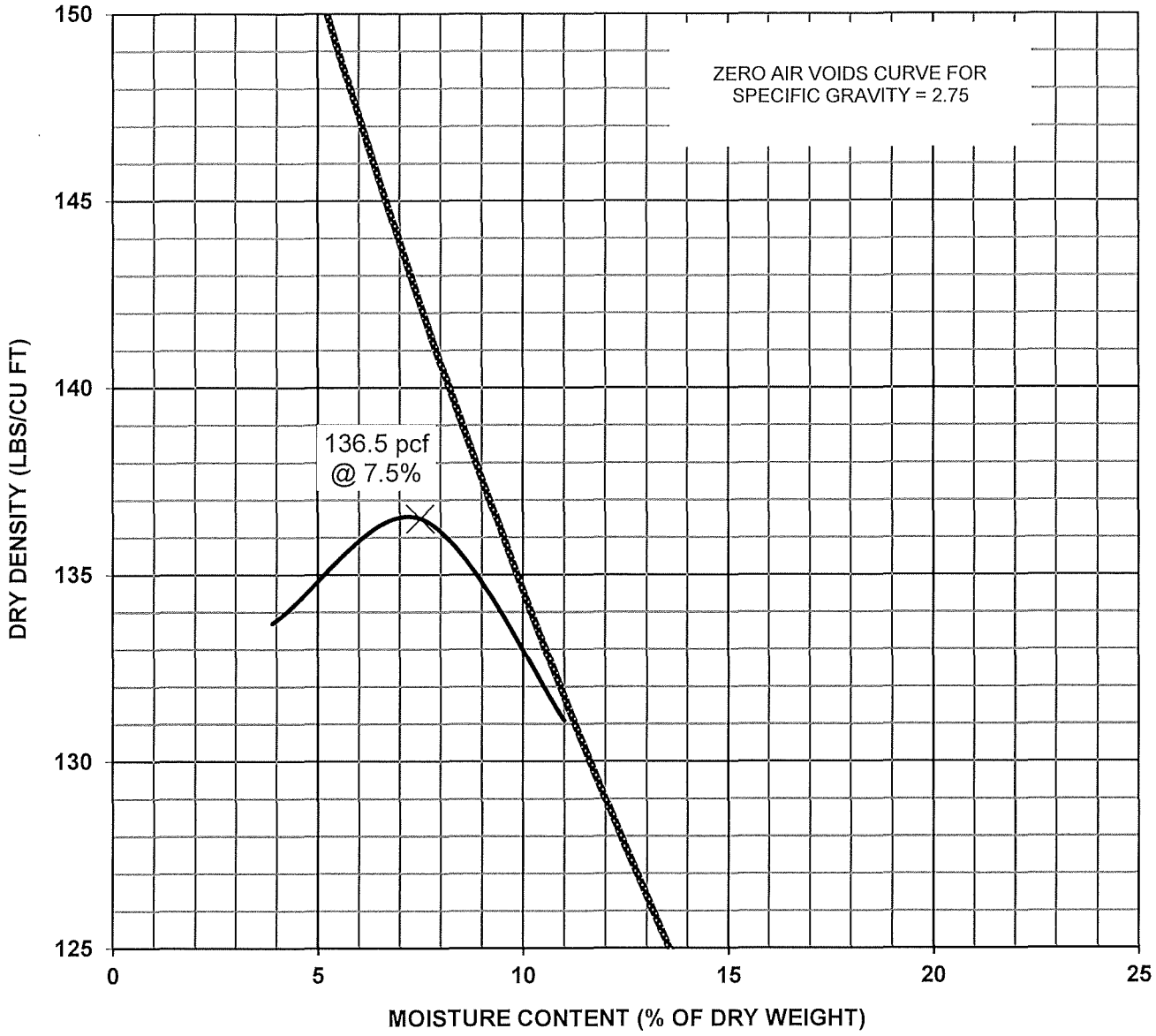
REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM)



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

MAXIMUM DENSITY CURVE



PROJECT NO. 30-5468-00 **BORING NO.** B-1 **DEPTH (FT)** 0-5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM), (E.I. = 1, Very Low)

MAXIMUM DRY DENSITY (LBS/CU FT) 136.5

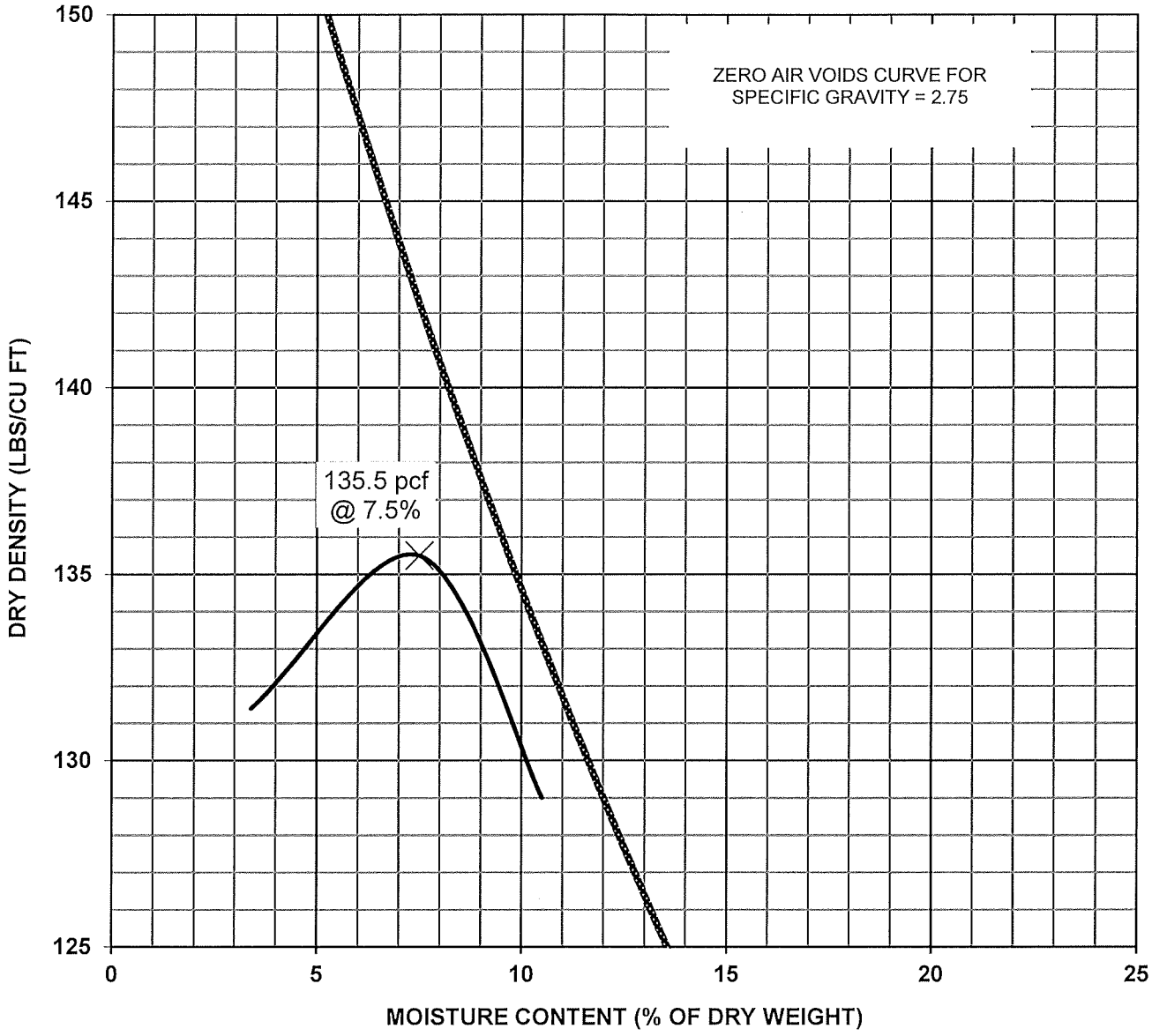
OPTIMUM MOISTURE CONTENT (% OF DRY WEIGHT) 7.5

METHOD OF COMPACTION
ASTM:D-1557

AGI

A.G.I. GEOTECHNICAL, INC.

MAXIMUM DENSITY CURVE



PROJECT NO. 30-5468-00 **BORING NO.** B-3 **DEPTH (FT)** 0-5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM), (E.I. = 1, Very Low)

MAXIMUM DRY DENSITY (LBS/CU FT) 135.5

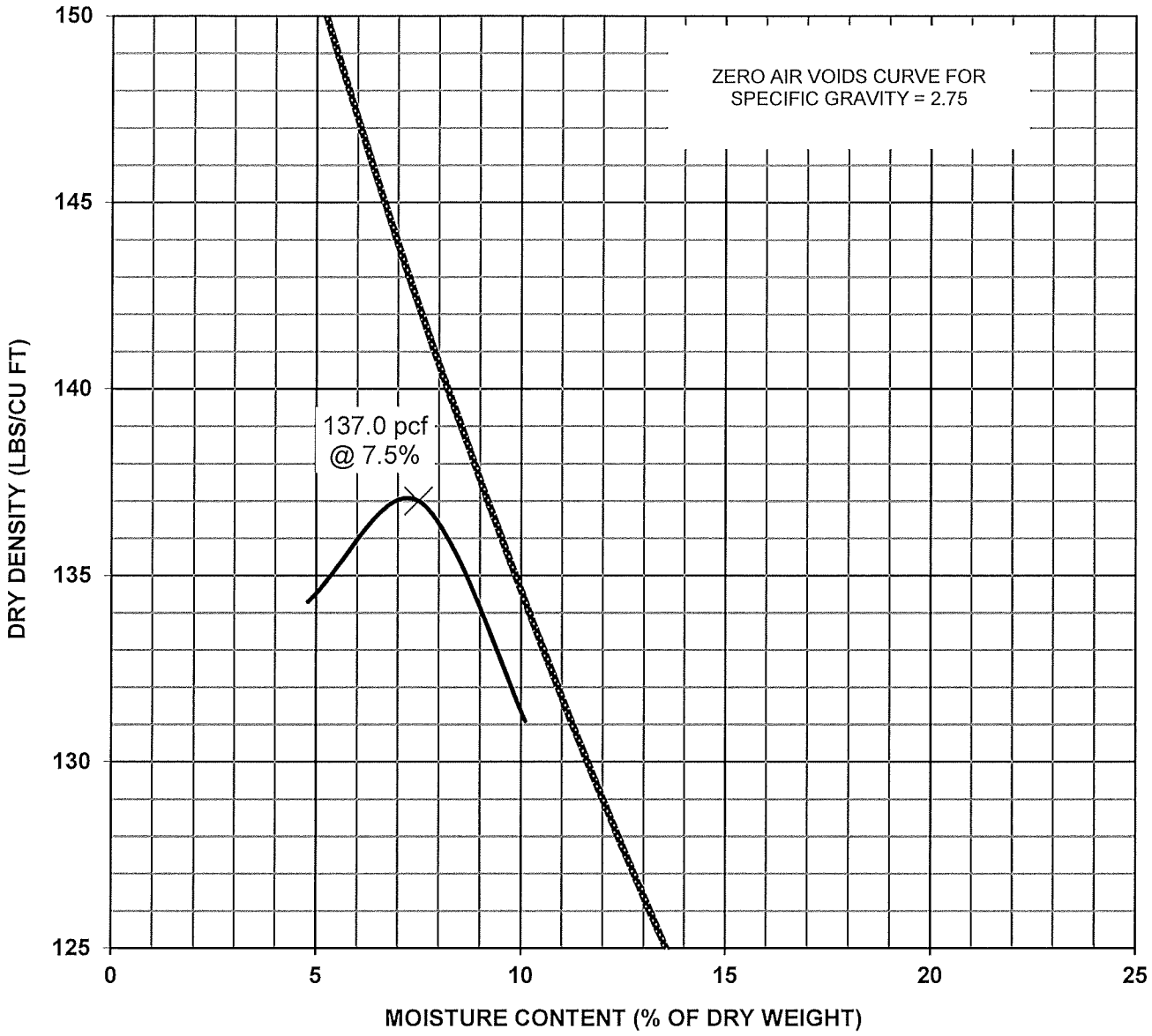
OPTIMUM MOISTURE CONTENT (% OF DRY WEIGHT) 7.5

METHOD OF COMPACTION
ASTM:D-1557

AGI

A.G.I. GEOTECHNICAL, INC.

MAXIMUM DENSITY CURVE



PROJECT NO. 30-5468-00 **BORING NO.** B-5 **DEPTH (FT)** 0-5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM), (E.I. = 1, Very Low)

MAXIMUM DRY DENSITY (LBS/CU FT) 137.0

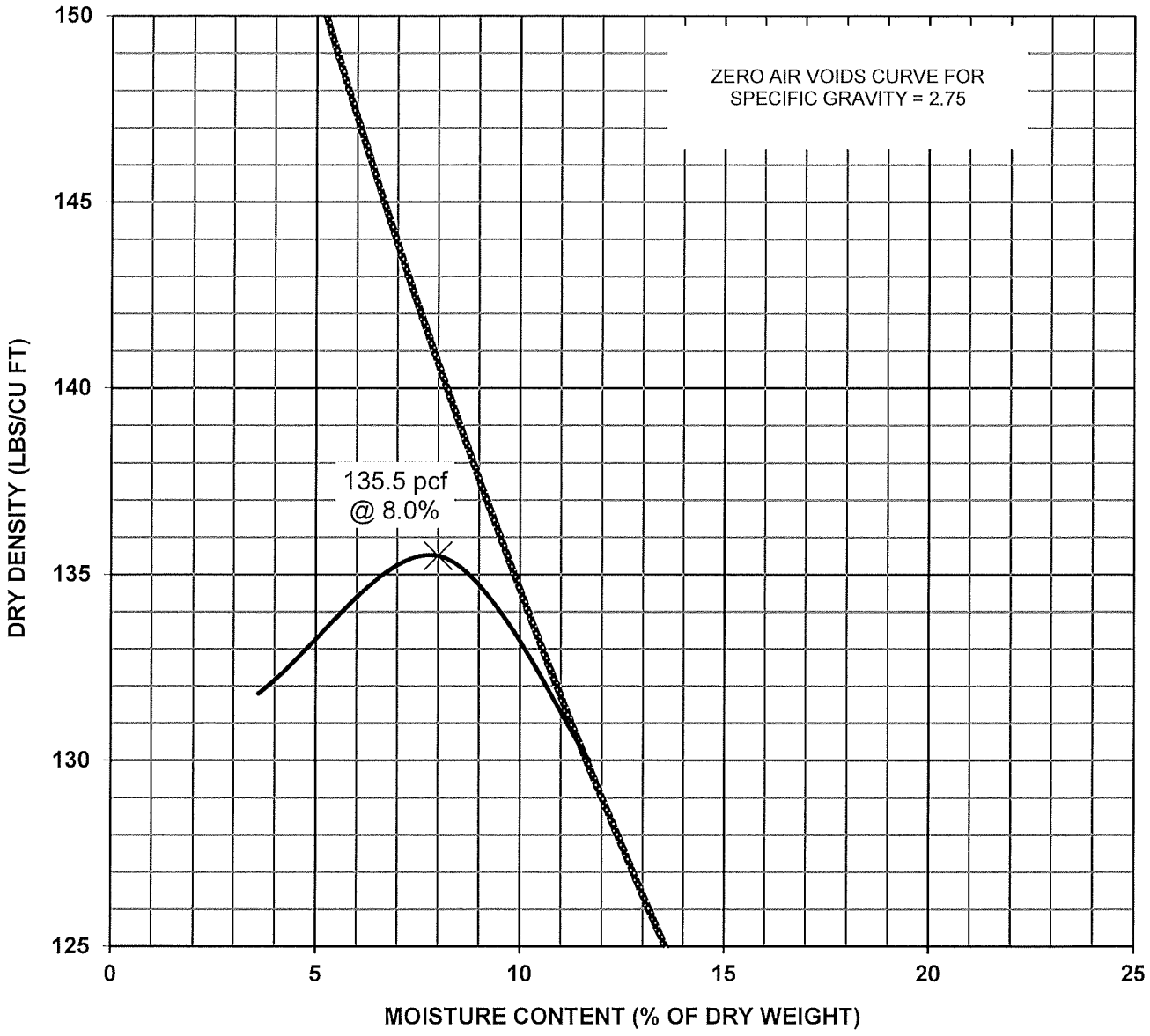
OPTIMUM MOISTURE CONTENT (% OF DRY WEIGHT) 7.5

METHOD OF COMPACTION
ASTM:D-1557

AGI

A.G.I. GEOTECHNICAL, INC.

MAXIMUM DENSITY CURVE



PROJECT NO. 30-5468-00 **BORING NO.** B-9 **DEPTH (FT)** 0-5

REPRESENTATIVE FOR Alluvium

SOIL TYPE AND DESCRIPTION Silty SAND (SM), (E.I. = 2, Very Low)

MAXIMUM DRY DENSITY (LBS/CU FT) 135.5

OPTIMUM MOISTURE CONTENT (% OF DRY WEIGHT) 8.0

METHOD OF COMPACTION
ASTM:D-1557

AGI

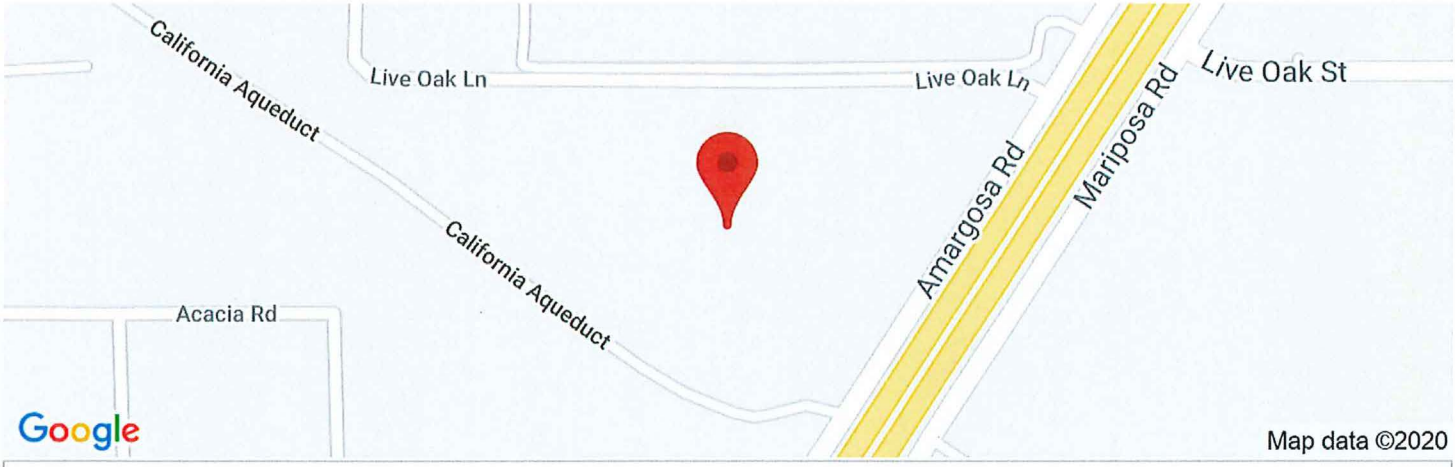
A.G.I. GEOTECHNICAL, INC.

U.S. SEISMIC DESIGN MAPS

A.G.I. GEOTECHNICAL, INC.

Amargosa Rd. & Live Oak Ln., Hesperia

Latitude, Longitude: 34.43279482, -117.37832187



Date	2/25/2020, 12:10:00 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.487	MCE_R ground motion. (for 0.2 second period)
S_1	0.577	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.487	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.992	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.55	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.487	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.604	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.577	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.637	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.927	Mapped value of the risk coefficient at short periods
C_{R1}	0.906	Mapped value of the risk coefficient at a period of 1 s

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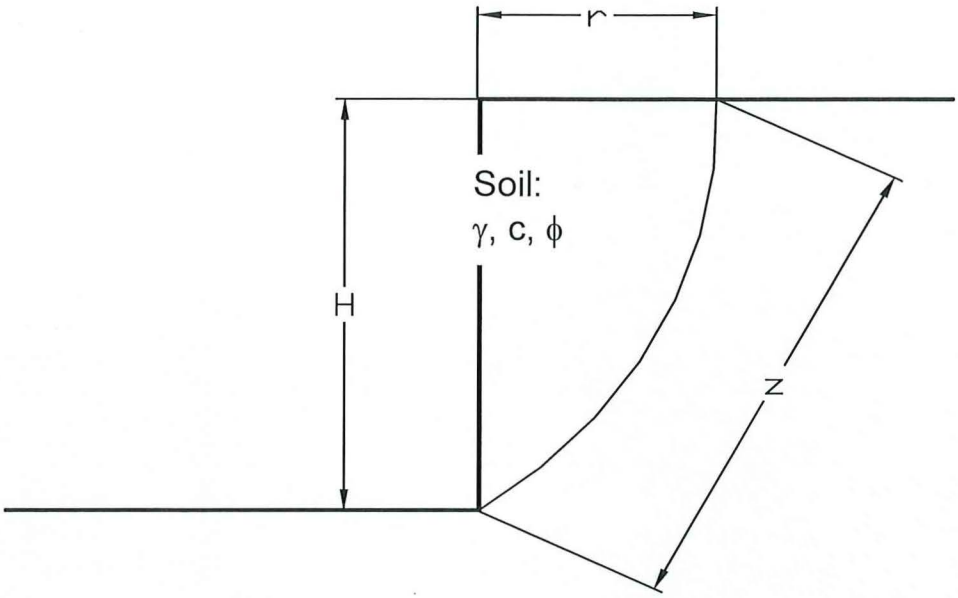
SLOT CUT STABILITY ANALYSIS

A.G.I. GEOTECHNICAL, INC.

SLOT CUT STABILITY ANALYSIS



Description	Value
Unit Weight, γ (pcf)	130.0
Friction, ϕ (deg)	31.0
Cohesion, c (psf)	159.0

Cut Height, H (ft)	5.0
Failure Radius, r (ft)	4.0
Failure Width, B = 2r (ft)	8.0

Volume, $V = \pi r^2 H / 4$ (ft^3)	63
Weight, $W = V\gamma$ (lb)	8,190
Surcharge, Q (lb)	1,000
Weight+Surcharge, W + Q, (lb)	9,190

Surface Area, $A = 0.5236r((r^2+4H^2)^{3/2} - r^3)$ (ft^2)	50
Driving Force, $F_D = WH / (r^2+H^2)^{1/2}$ (lb)	7,176
Normal Force, $F_N = Wr / (r^2+H^2)^{1/2}$ (lb)	5,741
Frictional Resistance, $R_F = F_N \tan\phi$ (lb)	3,450
Cohesive Resistance, $R_C = A\ c$ (lb)	7,950
Total Resistance, $R = R_F + R_C$ (lb)	11,400
Factor of Safety, $FS = R / F_D$	1.59

A.G.I. GEOTECHNICAL, INC.

Project No.: 30-5468-00	Date: 2/24/2020
Calc. By: WFB	
Proj Name: Amargosa Rd. & Live Oak Ln.	

PERCOLATION TESTING RESULTS

Proposed On-Site Stormwater Infiltration System for a
Proposed Warehouse/Distribution Center
APN 0405-062-51
Amargosa Road & Live Oak Lane
Hesperia, California

March 23, 2020
Project No. 30-5468-01

Prepared for:

55555 Amargosa Rd., LLC
Attn: Mr. Jason Green
5901 S. Eastern Ave.
Commerce, CA 90040

A.G.I. GEOTECHNICAL, INC.

A. G. I. GEOTECHNICAL, INC.
16555 Sherman Way, Suite A - Van Nuys, CA 91406 - Office: (818) 785-5244 - Facsimile: (818) 785-6251

March 23, 2020 Project No. 30-5468-01

55555 Amargosa Rd., LLC
5901 S. Eastern Ave.
Commerce, CA 90040

Attention: Mr. Jason Green

Subject: **PERCOLATION TESTING RESULTS**
Proposed On-Site Stormwater Infiltration System for a
Proposed Warehouse/Distribution Center
APN: 0405-062-51
Amargosa Road & Live Oak Lane
Hesperia, California

Reference: **SOILS ENGINEERING INVESTIGATION**
Proposed Warehouse/Distribution Center
APN: 0405-062-51
Amargosa Road & Live Oak Lane
Hesperia, California
Prepared by A.G.I. Geotechnical, Inc., Project No. 30-5468-00
dated February 24, 2020

Dear Mr. Green:

Pursuant to your request, A.G.I. Geotechnical, Inc. has completed percolation testing at the subject site for a proposed on-site stormwater infiltration system. This report has been prepared to present the findings of our investigation and to provide you with our preliminary geotechnical recommendations for the planned stormwater infiltration. If you have any questions regarding the information contained in this report, please feel free to call this office. *Determination of the presence or not of hazardous or toxic materials in the on-site soils or within the subject property is beyond the scope of this investigation.*

Sincerely,
A.G.I. GEOTECHNICAL, INC.

Juan A. Vidal, R.G.E. 861
Principal Engineer

JAV:wb

Distribution: (4) 55555 Amargosa Rd., LLC

Enclosures: Site Plan, Figure 1
Boring Logs (From Soils Engineering Investigation report dated February 24, 2020)
Percolation Test Data Sheets

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

The site was previously investigated for a proposed warehouse/distribution center (See Referenced Soils Engineering Investigation Report dated February 24, 2020). It is understood that a drywell infiltration system is currently proposed for an on-site stormwater infiltration system at the subject site.

SITE DESCRIPTION

The subject site is located on the northwest side of Amargosa Road, between Live Oak Lane and the California Aqueduct, in the City of Hesperia, California. The subject property is practically level, is presently vacant, and is bound on the north by a developed property. The location of the site is shown on the enclosed Location Map, Figure 1.

PROPOSED INFILTRATION DRY WELL

The purpose of this report is to provide a soil infiltration rate so that the client can evaluate the feasibility and design of a stormwater infiltration drywell system. Four additional borings were drilled to a maximum depth of 25 feet on March 13, 2020 to conduct percolation testing. Locations of the additional borings (as well as the borings drilled on January 30, 2020) are shown on the Site Plan, Figure 1. Percolation testing was performed in accordance with the Boring Percolation Test Procedure per the County of San Bernardino "Technical Guidance Documents for Water Quality Management Plans (WQMP)". Design infiltration rates of 0.06, 0.07, 0.1, and 0.1 minutes per inch were determined for borings P-1, P-2, P-3, and P-4 respectively.

Based on the preliminary information provided to us, we understand that multiple infiltration drywells are considered to discharge "first" stormwater runoff into the subsurface which apparently reduces surface runoff and/or contributes to the recharge of groundwater. The actual or final infiltration drywell system (Designed by your civil engineer) must comply with minimum setback requirements and shall contain an overflow drain that conducts overall drainage to the street, an approved location, and/or per the regulatory government agency. We recommend that the proposed infiltration dry well(s) be sealed or capped at a minimum depth of ten feet below floor slab.

Provided minimum setback is followed, the proposed stormwater infiltration system is not anticipated to saturate the foundation bearing soils adjacent to existing or neighboring structures and is not anticipated to contribute to the effects of hydro-consolidation or expansive soils. Resulting settlements from stormwater infiltration are anticipated to less than ¼ inch and are not expected to affect any existing or proposed structures. Based on our investigation, the potential for groundwater mounding or perched groundwater, liquefaction, lateral spreading, slope instability, effects of expansion soils, etc. as a result of the proposed stormwater infiltration are anticipated to be low.

The site is **not** located in a State-Defined Liquefaction Hazard Zone. No groundwater was encountered in our exploratory borings excavated on March 13, 2020 to a maximum depth of 25 feet below existing ground level or the nine previous borings excavated on January 31, 2020 to a maximum depth of 41.5 feet below existing ground level.

The proposed infiltration drywell location should be reviewed and approved by this office. Provided that the proposed infiltration pit complies with minimum setback requirements, use of an infiltration pit at the subject site is acceptable from a geotechnical standpoint. Sustained long-term use of the stormwater infiltration system is not expected to adversely affect the site or adjacent site stability.

SCOPE OF WORK & FIELD EXPLORATION

We completed the following tasks to reach the opinions, findings and/or recommendations presented in this report.

- We researched available geologic, topographic, and seismic hazard maps relevant to the subject site.
- We excavated, logged, and sampled four exploratory, truck-mounted 8-inch diameter hollow-stem augers boring to a maximum depth of 25 feet below grade in the general areas of the proposed stormwater infiltration systems. Percolation testing was performed in Boring P-1 thru P-4. The locations of our percolation test borings are shown on the Site Plan, Figure 1.
- Preparation of this report.

SUBSURFACE CONDITIONS

SOIL PROFILE

No artificial fill was encountered in the exploratory borings. The natural soil profile, as depicted in the borings to the depth explored, consists of light brown silty sand and well graded sand with silt. In general, the alluvium is dense to very dense and damp. For a more detailed description of the soils encountered in the exploratory borings, please refer to the Boring Logs enclosed in this report.

EXCAVATION CHARACTERISTICS

Alluvium was observed to be damp and dense to very dense. Localized caving should be expected while installing the proposed infiltration drywell(s). We recommend that an experienced driller be consulted and utilized to install the proposed infiltration pit due to caving in the highly granular alluvial soils.

GROUNDWATER

No groundwater or seepage was encountered in the exploratory borings to a maximum depth explored, 25 feet below the existing ground surface on March 13, 2020, nor in our previous exploratory borings excavated to a maximum depth of 41.5 feet on January 31, 2020. It should be noted that local fluctuations in groundwater levels may occur due to seasonal variations, rainfall, irrigation, sewage disposal, and water line leaks.

CONCLUSIONS AND RECOMMENDATIONS

Based on our investigation, it is our conclusion that current geotechnical conditions at the site are suitable for the proposed stormwater infiltration system in accordance with current County of San Bernardino requirements, provided our recommendations are incorporated into the development plans.

PERCOLATION TESTING

Upon completion of drilling for the percolation test borings, a 3-inch diameter perforated PVC pipe, covered with a filter fabric sock, was inserted into the holes. Following removal of the augers, the borings were pre-soaked to a depth of four feet below the existing ground surface (measured from a fixed reference point).

Percolation testing was performed on March 13, 2020. To perform the tests, each boring was filled with water to a depth of approximately 48 inches below the existing ground surface. After the initial measurement, water was allowed to drain for a period of 25 minutes before being measured. This procedure was then repeated. The hole was refilled between each test interval. Measurements showed that more than six inches of water drained within both 25-minute test intervals, thereby meeting the criteria for the sandy soil percolation testing procedure.

In accordance with the sandy soil criteria, the percolation test was conducted for an additional hour with measurements taken every ten minutes. The water level was refilled between each test increment. Measurements were taken with a precision of 0.25 inch from a fixed reference point at the top of the hole and recorded. Test data and calculated percolation rates are shown on the Percolation Test Data Sheets.

The percolation rate for the last 10-minute test interval reading was 0.06, 0.07, 0.1, and 0.1 for borings P-1, P-2, P-3, and P-4 respectively. No factor of safety was applied.

PLAN REVIEW

When infiltration system design, foundation and/or final development plans become available, they should be forwarded to our office for review.

REGULATORY AGENCY REVIEW AND ADDITIONAL CONSULTING

All geotechnical and/or engineering geologic aspects of the proposed development are subject to review and approval by the government reviewing agency. It should be understood that the government reviewing agency may approve or deny any portion of the proposed development which may require additional geotechnical services by this office. Additional geotechnical services may include review responses, supplemental letters, plan reviews, construction/site observations, meetings, etc. The fees for generating additional reports, letters, exploration, analyses, etc. will be billed on a time and material basis.

COMMENTS

The investigation findings and recommendations presented in this report are based on research, site observations, and limited subsurface information. The investigation findings and recommendations presented are based on the supposition that subsurface conditions do not vary significantly from those indicated. Although no significant variations in subsurface conditions are anticipated, the possibility of significant variations cannot be ruled out. If such conditions are encountered, this consultant should be contacted immediately to consider the need for modification of this project.

This report is subject to review by regulatory agencies and these agencies may require their approval before the project can proceed. No guarantee that the regulatory public agency or agencies will approve the project is intended, expressed or implied.

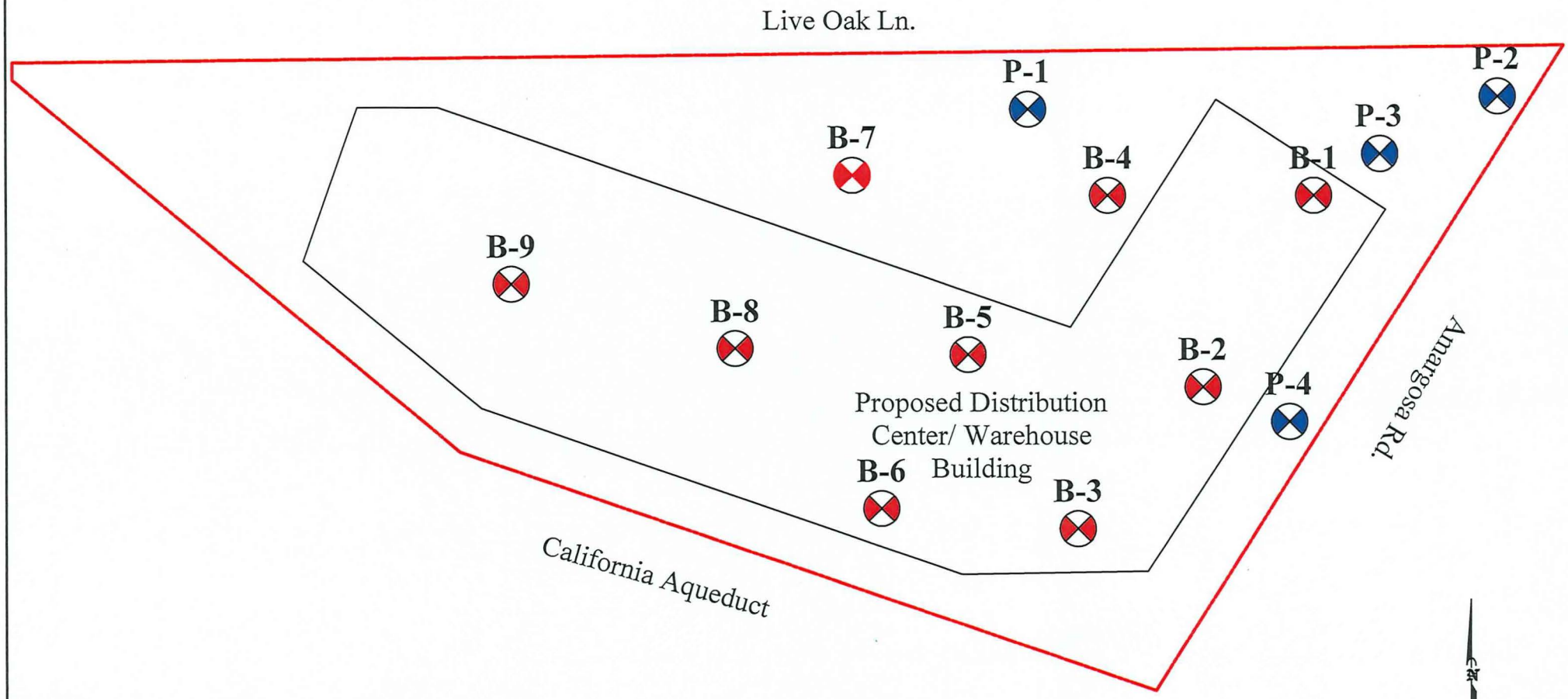
One of the purposes of this report is to provide the client with advice regarding geotechnical conditions on the site. It is important to recognize that other consultants could arrive at different conclusions and recommendations. No warranties of future site performance are intended, expressed or implied.

We trust that the foregoing information currently fulfills your requirements. If you have any questions regarding this report, or if we may be of any further service to you, please do not hesitate to contact us.

REFERENCES

California Geological Survey, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A, 108 p.

San Bernardino County Stormwater Program "Technical Guidance Document for Water Quality Management Plans (WQMP)"; dated July 28, 2011.



EXPLANATION

B-1 Approximate Location of Exploratory Boring

P-1 Approximate Location of Exploratory Boring

Scale 1/16" = 1'-0"

FIGURE 1

A.G.I. GEOTECHNICAL, INC.
Engineering Geology • Geotechnical Engineering
16555 Sherman Way, Ste. A • Van Nuys, CA 91406
(818) 785-5244 • Fax (818) 785-6251

SITE PLAN

Amargosa Rd. & Live Oak Ln., Hesperia

PROJECT NO.	30-5468-01
DATE	03-2020
PREPARED BY	WFB
APPROVED BY	JAV

BORING LOGS

LEGEND


Ring Sample, or Bulk Sample


Standard Penetration Test (SPT)


Ground Water Level

SOIL SIZE	
COMPONENT	SIZE RANGE
Boulders	Above 12"
Cobbles	3"-12"
Gravel	#4 - 3"
coarse	¾" - 3"
fine	#4 - ¾"
Sand	#200-#4
coarse	#10-#4
medium	#40-#10
fine	#200-#40
Fines (Silt or Clays)	Below #200

PLASTICITY OF FINE GRAINED SOILS	
PLASTICITY INDEX	VOLUME CHANGE POTENTIAL
0-15	Probably Low
15-30	Probably Moderate
30 or more	Probably High

WATER CONTENT
Dry: No feel of moisture
Damp: Much less than normal moisture
Moist: Normal moisture
Wet: Much greater than normal moisture
Saturated: At or near saturation

RELATIVE DENSITY	
SANDS & GRAVELS	BLOWS PER FOOT
Very loose	0-4
Loose	4-10
Medium dense	10-30
Dense	30-50
Very dense	Over 50

	GROUP SYMBOLS	DESCRIPTIONS	DIVISIONS
COARSE-GRAINED SOILS (Less than 50% Fines)	GW	Well-graded gravels or gravel-sand mixtures, less than 5% fines	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
	GP	Poorly-graded gravels or gravel-sand mixtures, less than 5% fines	
	GM	Silty gravels, gravel-sand silt mixtures, more than 12% fines	
	GC	Clayey gravels, gravel-sand-clay mixtures, more than 12% fines	
	SW	Well-graded sands or gravelly sands, less than 5% fines	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
	SP	Poorly-graded sands or gravelly sands, less than 5% fines	
	SM	Silty sands, sand-silt mixtures, more than 12% fines	
	SC	Clayey sands, sand-clay mixtures, more than 12% fines	
FINE-GRAINED SOILS (More than 50% Fines	ML	Inorganic silt, very fine sands, rock flour, silty or clayey fine sands	SILTS AND CLAYS Liquid limit less than 50
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	OL	Organic silts or organic silt-clays of low plasticity	
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	SILTS AND CLAYS Liquid limit less than 50
	CH	Inorganic clays of high plasticity, fat clays	
	OH	Organic clays of medium to high plasticity	
	PT	Peat, mulch, and other highly organic soils	HIGHLY ORGANIC SOILS

CONSISTENCY	
CLAYS & SILTS	BLOWS PER FOOT
Very soft	0-2
Soft	2-4
Firm	4-8
Stiff	8-15
Very stiff	15-30
Hard	Over 30

A.G.I. GEOTECHNICAL, INC.
Engineering Geology • Geotechnical Engineering

BORING NUMBER B-1

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	48/$\frac{50}{4"}$	X	8.3	125	136				Alluvium Brown Silty SAND (Slightly moist, very dense)			SM
5	X	19/28/41		1.6	124	126				Light brown Silty SAND (Damp, dense)			SM
10	X	26/28/45		2.2	114	116							
15	X	26/28/32		1.3	112	114							
20	X	19/28/37		1.7	121	123				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	21/46/49		1.4	121	122							
30	X	32/40/$\frac{50}{2"}$		3.6	117	122				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-2

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D50	Classification
0													
	X	11/22/$\frac{50}{5"}$		11.2	129	144				Alluvium Brown Silty SAND (Slightly moist, very dense)			SM
5	X	$\frac{50}{5"}$		3.7	124	129				Light brown Silty SAND (Damp, very dense to dense)			SM
10	X	18/21/26		4.1	119	124							
15	X	23/31/50		2.1	113	116							
20	X	29/$\frac{50}{6"}$		1.8	111	113				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	28/43/$\frac{50}{5"}$		2.0	127	129							
30	X	11/26/50		4.1	117	121				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-3

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	X	10/21/$\frac{50}{5"}$	X	5.9	130	138				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	22/33/41		4.9	128	135				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	25/32/38		3.1	119	123							
15	X	33/34/$\frac{50}{3"}$		2.2	118	120							
20	X	37/48/$\frac{50}{3"}$		1.8	115	117				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	28/42/$\frac{50}{2"}$		1.9	119	121							
30	X	22/48/$\frac{50}{2"}$		4.3	119	124				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-4

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	X	7/32/$\frac{50}{4"}$		3.0	121	125				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	38/$\frac{50}{4"}$		3.9	116	120				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	19/20/31		3.7	121	125							
15	X	11/30/$\frac{50}{2"}$		2.1	115	118							
20	X	17/$\frac{50}{6"}$		1.9	119	121				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense to dense)			SW - SM
25	X	16/21/36		2.8	126	130							
30	X	20/21/46		2.1	116	119				Brown Well-graded SAND with Silt (Damp, dense)			SW - SM

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center
PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia
DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"
EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A
DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop
LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
35	X	18/36/$\frac{50}{5"}$		1.8	119	122				Light brown Poorly-graded SAND with Silt & Gravel (Damp, dense)			SP - SM
40	X	38/$\frac{50}{6"}$		1.8	116	118							
45										Total Depth: 41.5' No Water			
50													
55													
60													
65													

BORING NUMBER B-5

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0													
	☒	8/10/20	☒	4.7	121	127				Alluvium Brown Silty SAND (Damp, medium dense)			SM
5	☒	19/31/40		4.6	127	133				Light brown Silty SAND (Damp, dense to very dense)			SM
10	☒	15/25/46		2.5	123	126							
15	☒	16/29/50/5"		2.0	120	123							
20	☒	9/21/36		1.8	120	122				Light brown Well-graded SAND with Silt & Gravel (Damp, dense)			SW - SM
25	☒	20/27/50		4.0	115	120							
30	☒	20/49/50/4"		2.3	124	126				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-6

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	X	15/$\frac{50}{6"}$		6.7	132	141				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	30/$\frac{50}{5"}$		4.5	126	132				Light brown Silty SAND (Damp, very dense)			SM
10	X	28/38/36		2.4	124	127							
15	X	19/26/$\frac{50}{5"}$		1.7	118	120							
20	X	34/36/$\frac{50}{4"}$		2.4	110	113				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	18/35/$\frac{50}{5"}$		2.6	117	120							
30	X	$\frac{50}{6"}$		2.5	105	108				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-7

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D50	Classification
0										Alluvium Brown Silty SAND (Damp, very dense)			SM
	X	18/5"		7.2	136	146							
5													
	X	18/30/5"		3.9	128	133				Light brown Silty SAND (Damp, very dense)			SM
10	X	22/38/50		2.2	124	127							
15	X	31/36/50		2.0	121	124							
20	X	22/34/45		1.5	124	126				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	20/40/4"		4.4	126	132							
30	X	26/6"		2.2	118	121				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-8

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0										Alluvium Brown Silty SAND (Damp, very dense)			SM
	X	44/49/$\frac{50}{4"}$		3.7	127	132							
5	X	45/32/46		2.8	125	128				Light brown Silty SAND (Damp, dense to very dense)			SM
10	X	25/28/40		7.1	114	122							
15	X	20/30/$\frac{50}{6"}$		2.0	121	123							
20	X	34/38/50		2.0	116	119				Light brown Well-graded SAND with Silt & Gravel (Damp, very dense)			SW - SM
25	X	21/40/50		1.2	125	127							
30	X	24/$\frac{50}{5"}$		2.3	121	123				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

BORING NUMBER B-9

A.G.I. GEOTECHNICAL, INC.

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CLIENT: 55555 Amargosa Rd., LLC PROJECT NAME: Proposed Warehouse/ Distribution Center

PROJECT NUMBER: 30-5468-00 PROJECT LOCATION: Amargosa Rd. & Live Oak Ln., Hesperia

DATE STARTED: 01/30/2020 COMPLETED: 01/31/2020 GROUND ELEVATION: N/A BORING DIAMETER: 8"

EXCAVATION METHOD: 8" Hollow Stem Auger GROUND WATER LEVELS: N/A

DRILLING CONTRACTOR: Choice Drilling SAMPLING METHOD: Autohammer, 140 lb., 30" Drop

LOGGED BY: CWL CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D_{50}	Classification
0													
	X	24/4"	X	5.6	121	127				Alluvium Brown Silty SAND (Damp, very dense)			SM
5	X	30/4"		4.3	122	128				Light brown Silty SAND (Damp, very dense to dense)			SM
10	X	17/22/30		3.4	128	133							
15	X	12/24/28		4.4	116	121							
20	X	16/32/40		1.3	118	119				Light brown Well-graded SAND with Silt & Gravel (Damp, dense to very dense)			SW - SM
25	X	24/5"		3.4	118	122							
30	X	49/5"		3.5	116	120				Brown Well-graded SAND with Silt (Damp, very dense)			SW - SM
										Total Depth: 31.5' No Water			

PERCOLATION TEST DATA SHEETS

PERCOLATION TEST DATA SHEET

Project	Amargosa Rd. & Live Oak Ln., Hesperia	Project No.:	30-5468-01	Date	3/13/2020
Test Hole No.:	P-1	Tested By:	A.G.I. Geotechnical		
Depth of Test Hole:	25'	USCS Soil Classification		SM-SW	
Test Hole Dimentions (inches)				Length	Width
Diameter {if round}	8"	Sides {if Rectangular}		N/A	N/A

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Greater Than or Equal to 6"? (Y/N)
1	10:55 a.m.	11:20 a.m.	25	48	291.0	243.0	Y
2	12:15 p.m.	12:40 p.m.	25	48	255.8	207.8	Y

***If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak {fill} overnight. Obtain at least twelve measurements per hole over at least six hours {approximately 30 minutes intervals} with a precision of at least 0.25".**

Percolation Rate: 952.3 in/hr.
Infiltration Rate: 10.95 in/hr.

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	12:41 p.m.	12:57 p.m.	10	48	204.0	156.0	0.064
2	12:53 p.m.	1:03 p.m.	10	48	205.2	157.2	0.064
3	1:06 p.m.	1:16 p.m.	10	48	205.8	157.8	0.063
4	1:18 p.m.	1:28 p.m.	10	48	206.8	158.8	0.063
5	1:30 p.m.	1:40 p.m.	10	48	205.7	157.7	0.063
6	1:42 p.m.	1:52 p.m.	10	48	207.2	159.2	0.063
7							
8							
9							
10							
11							
12							
13							
14							
15							

Comments:

A.G.I. GEOTECHNICAL, INC.

Project No.:	30-5468-01	Date: 03/19/2020
Calc. By:	WFB	
Proj Name:	Amargosa Rd. & Live Oak Ln.	

PERCOLATION TEST DATA SHEET

Project	Amargosa Rd. & Live Oak Ln., Hesperia	Project No.:	30-5468-01	Date	3/13/2020
Test Hole No.:	P-2	Tested By:	A.G.I. Geotechnical		
Depth of Test Hole:	25'	USCS Soil Classification		SM-SW	
Test Hole Dimentions (inches)				Length	Width
Diameter {if round}	8"	Sides {if Rectangular}		N/A	N/A

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Greater Than or Equal to 6"? (Y/N)
1	11:00 a.m.	11:25 a.m.	25	48	252.0	204.0	Y
2	12:20 p.m.	12:45 p.m.	25	48	261.6	213.6	Y

***If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak {fill} overnight. Obtain at least twelve measurements per hole over at least six hours {approximately 30 minutes intervals} with a precision of at least 0.25".**

Infiltration Rate: 855.0 in/hr

Percolation Rate: 869.6 in/hr

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	2:00 p.m.	2:10 p.m.	10	48	192.1	144.1	0.069
2	2:12 p.m.	2:22 p.m.	10	48	192.6	144.6	0.069
3	2:24 p.m.	2:34 p.m.	10	48	192.2	144.2	0.069
4	2:36 p.m.	2:46 p.m.	10	48	193.3	145.3	0.069
5	2:48 p.m.	2:58 p.m.	10	48	194.8	146.8	0.068
6	3:00 p.m.	3:10 p.m.	10	48	193.0	145.0	0.069
7							
8							
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14							
15							

Comments:

A.G.I. GEOTECHNICAL, INC.

Project No.:	30-5468-01	Date: 03/19/2020
Calc. By:	WFB	
Proj Name:	Amargosa Rd. & Live Oak Ln.	

PERCOLATION TEST DATA SHEET

Project	Amargosa Rd. & Live Oak Ln., Hesperia	Project No.:	30-5468-01	Date	3/13/2020
Test Hole No.:	P-3	Tested By:	A.G.I. Geotechnical		
Depth of Test Hole:	20'	USCS Soil Classification		SM	
Test Hole Dimentions (inches)				Length	Width
Diameter {if round}	8"	Sides {if Rectangular}		N/A	N/A

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Greater Than or Equal to 6"? (Y/N)
1	11:05 a.m.	11:30 a.m.	25	48	232.8	184.8	Y
2	12:25 p.m.	12:50 p.m.	25	48	230.5	182.5	Y

***If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak {fill} overnight. Obtain at least twelve measurements per hole over at least six hours {approximately 30 minutes intervals} with a precision of at least 0.25".**

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	3:15 p.m.	3:25 p.m.	10	48	150.5	102.5	0.098
2	3:27 p.m.	3:37 p.m.	10	48	148.7	100.7	0.099
3	3:39 p.m.	3:49 p.m.	10	48	149.6	101.6	0.098
4	3:51 p.m.	4:01 p.m.	10	48	149.9	101.9	0.098
5	4:03 p.m.	4:13 p.m.	10	48	151.0	103.0	0.097
6	4:15 p.m.	4:25 p.m.	10	48	148.3	100.3	0.100
7							
8							
9							
10							
11							
12							
13							
14							
15							

Infiltration Rate: 6.37 in/hr

Percolation Rate: 612.2 in/hr

Comments:

A.G.I. GEOTECHNICAL, INC.

Project No.:	30-5468-01	Date: 03/19/2020
Calc. By:	WFB	
Proj Name:	Amargosa Rd. & Live Oak Ln.	

PERCOLATION TEST DATA SHEET

Project	Amargosa Rd. & Live Oak Ln., Hesperia	Project No.:	30-5468-01	Date	3/13/2020
Test Hole No.:	P-4	Tested By:	A.G.I. Geotechnical		
Depth of Test Hole:	20'	USCS Soil Classification		SM	
Test Hole Dimentions (inches)				Length	Width
Diameter {if round}	8"	Sides {if Rectangular}		N/A	N/A

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Greater Than or Equal to 6"? (Y/N)
1	11:45 a.m.	12:10 p.m.	25	48	227.2	179.2	Y
2	12:30 p.m.	12:55 p.m.	25	48	225.0	177.0	Y

***If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak {fill} overnight. Obtain at least twelve measurements per hole over at least six hours {approximately 30 minutes intervals} with a precision of at least 0.25".**

Infiltration Rate: 8.33 in/hr. Percolation Rate: 606.1 in/hr.

Trial No.	Start Time	Stop Time	Time Intrval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in)	Change in Water Level (in.)	Percolation Rate (min./in.)
1	4:30 p.m.	4:40 p.m.	10	48	154.4	106.4	0.094
2	4:42 p.m.	4:52 p.m.	10	48	149.4	101.4	0.099
3	4:54 p.m.	5:04 p.m.	10	48	148.7	100.7	0.099
4	5:06 p.m.	5:16 p.m.	10	48	148.9	100.9	0.099
5	5:18 p.m.	5:28 p.m.	10	48	147.2	99.2	0.101
6	5:30 p.m.	5:40 p.m.	10	48	148.0	100.0	0.100
7							
8							
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10							
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12							
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14							
15							

Comments:

A.G.I. GEOTECHNICAL, INC.

Project No.:	30-5468-01	Date: 03/19/2020
Calc. By:	WFB	
Proj Name:	Amargosa Rd. & Live Oak Ln.	

Appendix H: References

- NOAA Atlas 14, Precipitation
- NRCS Soil Survey
- Drywell Information
- Require LID Design Capture Volume Information
- Drainage Master Plan

NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4333°, Longitude: -117.3783°
Elevation: 3464.34 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.083 (0.068-0.101)	0.118 (0.098-0.145)	0.166 (0.136-0.203)	0.204 (0.167-0.252)	0.257 (0.203-0.329)	0.299 (0.231-0.390)	0.341 (0.257-0.456)	0.385 (0.283-0.529)	0.445 (0.314-0.638)	0.493 (0.335-0.731)
10-min	0.118 (0.098-0.145)	0.170 (0.140-0.207)	0.237 (0.196-0.291)	0.293 (0.239-0.362)	0.369 (0.292-0.471)	0.428 (0.331-0.558)	0.488 (0.369-0.653)	0.552 (0.405-0.759)	0.638 (0.449-0.915)	0.706 (0.481-1.05)
15-min	0.143 (0.119-0.175)	0.205 (0.170-0.251)	0.287 (0.236-0.352)	0.354 (0.289-0.437)	0.446 (0.353-0.570)	0.517 (0.400-0.675)	0.591 (0.446-0.790)	0.667 (0.490-0.917)	0.772 (0.544-1.11)	0.854 (0.581-1.27)
30-min	0.217 (0.180-0.265)	0.311 (0.257-0.380)	0.435 (0.359-0.533)	0.537 (0.439-0.664)	0.677 (0.535-0.865)	0.785 (0.608-1.02)	0.896 (0.677-1.20)	1.01 (0.743-1.39)	1.17 (0.824-1.68)	1.30 (0.881-1.92)
60-min	0.302 (0.250-0.369)	0.433 (0.358-0.530)	0.606 (0.499-0.743)	0.747 (0.611-0.924)	0.942 (0.744-1.20)	1.09 (0.846-1.43)	1.25 (0.942-1.67)	1.41 (1.03-1.94)	1.63 (1.15-2.34)	1.80 (1.23-2.68)
2-hr	0.434 (0.359-0.530)	0.590 (0.488-0.722)	0.802 (0.661-0.983)	0.979 (0.800-1.21)	1.23 (0.971-1.57)	1.43 (1.11-1.86)	1.64 (1.24-2.19)	1.86 (1.36-2.55)	2.17 (1.53-3.11)	2.42 (1.64-3.58)
3-hr	0.548 (0.453-0.669)	0.733 (0.605-0.895)	0.985 (0.812-1.21)	1.20 (0.981-1.48)	1.51 (1.19-1.92)	1.75 (1.36-2.29)	2.01 (1.52-2.69)	2.29 (1.68-3.15)	2.69 (1.89-3.85)	3.01 (2.05-4.47)
6-hr	0.766 (0.634-0.935)	1.01 (0.838-1.24)	1.36 (1.12-1.67)	1.66 (1.35-2.05)	2.09 (1.65-2.66)	2.44 (1.89-3.18)	2.81 (2.12-3.76)	3.22 (2.37-4.43)	3.81 (2.69-5.46)	4.30 (2.93-6.38)
12-hr	0.980 (0.811-1.20)	1.34 (1.11-1.64)	1.84 (1.51-2.25)	2.27 (1.85-2.80)	2.88 (2.28-3.69)	3.39 (2.63-4.43)	3.93 (2.97-5.26)	4.53 (3.32-6.23)	5.38 (3.79-7.72)	6.09 (4.15-9.04)
24-hr	1.34 (1.19-1.54)	1.89 (1.68-2.18)	2.66 (2.35-3.08)	3.33 (2.91-3.88)	4.28 (3.63-5.16)	5.06 (4.20-6.22)	5.90 (4.78-7.43)	6.80 (5.36-8.81)	8.11 (6.13-11.0)	9.20 (6.72-12.8)
2-day	1.50 (1.33-1.72)	2.11 (1.87-2.44)	2.98 (2.63-3.44)	3.72 (3.26-4.34)	4.81 (4.08-5.80)	5.71 (4.74-7.03)	6.69 (5.42-8.42)	7.75 (6.10-10.0)	9.30 (7.03-12.6)	10.6 (7.74-14.8)
3-day	1.60 (1.42-1.84)	2.25 (1.99-2.60)	3.17 (2.80-3.66)	3.96 (3.47-4.62)	5.13 (4.35-6.18)	6.10 (5.06-7.50)	7.15 (5.79-9.01)	8.31 (6.54-10.8)	10.00 (7.56-13.5)	11.4 (8.34-15.9)
4-day	1.73 (1.53-1.99)	2.42 (2.15-2.79)	3.40 (3.00-3.93)	4.26 (3.73-4.96)	5.51 (4.67-6.63)	6.55 (5.43-8.05)	7.67 (6.22-9.67)	8.91 (7.02-11.5)	10.7 (8.11-14.5)	12.3 (8.96-17.1)
7-day	1.92 (1.70-2.21)	2.66 (2.36-3.07)	3.71 (3.28-4.29)	4.62 (4.05-5.38)	5.95 (5.04-7.16)	7.05 (5.85-8.66)	8.24 (6.67-10.4)	9.54 (7.52-12.4)	11.4 (8.65-15.4)	13.0 (9.53-18.2)
10-day	2.05 (1.82-2.36)	2.84 (2.52-3.27)	3.94 (3.48-4.55)	4.89 (4.28-5.70)	6.27 (5.31-7.55)	7.41 (6.15-9.11)	8.64 (7.00-10.9)	9.99 (7.87-12.9)	12.0 (9.04-16.1)	13.6 (9.93-19.0)
20-day	2.49 (2.21-2.87)	3.42 (3.03-3.94)	4.71 (4.16-5.44)	5.82 (5.10-6.78)	7.43 (6.30-8.95)	8.76 (7.27-10.8)	10.2 (8.25-12.8)	11.7 (9.25-15.2)	14.0 (10.6-18.9)	15.9 (11.6-22.2)
30-day	2.94 (2.60-3.38)	4.00 (3.54-4.61)	5.48 (4.84-6.33)	6.75 (5.91-7.87)	8.59 (7.28-10.3)	10.1 (8.39-12.4)	11.7 (9.50-14.8)	13.5 (10.6-17.5)	16.1 (12.2-21.7)	18.3 (13.4-25.5)
45-day	3.48 (3.08-4.00)	4.68 (4.14-5.39)	6.34 (5.60-7.33)	7.78 (6.81-9.06)	9.85 (8.35-11.9)	11.5 (9.59-14.2)	13.4 (10.8-16.9)	15.4 (12.1-20.0)	18.3 (13.9-24.8)	20.8 (15.2-29.1)
60-day	3.95 (3.50-4.55)	5.24 (4.64-6.03)	7.01 (6.19-8.11)	8.55 (7.48-9.96)	10.8 (9.12-13.0)	12.6 (10.4-15.5)	14.6 (11.8-18.3)	16.7 (13.2-21.7)	19.9 (15.1-26.9)	22.6 (16.5-31.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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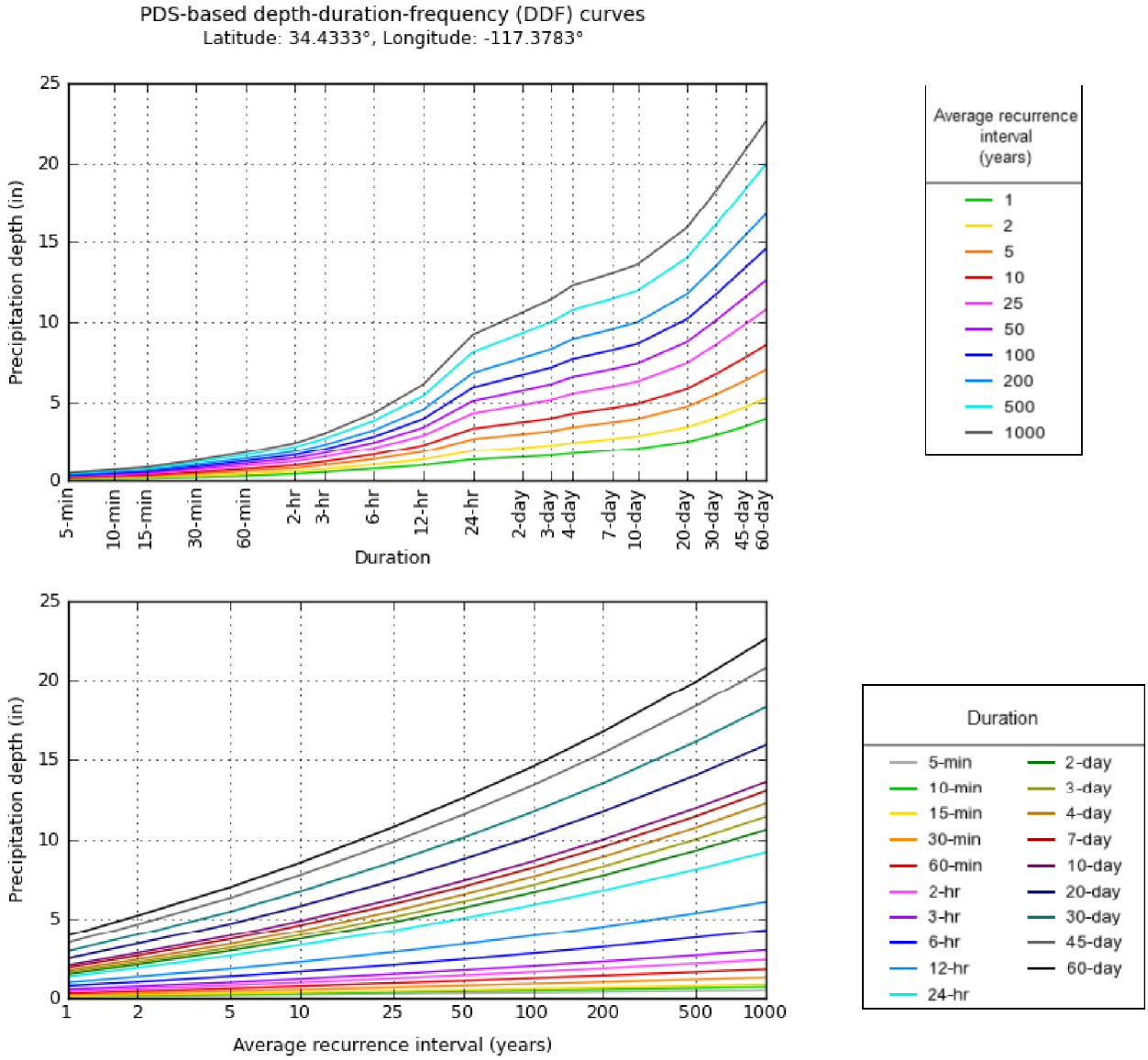
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Feb 20 22:00:25 2020

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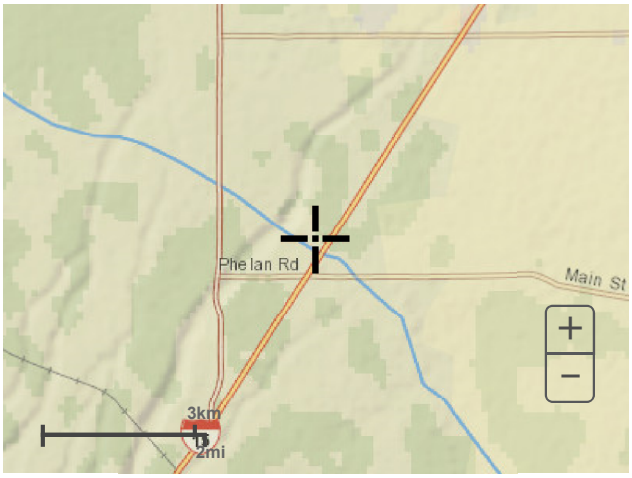
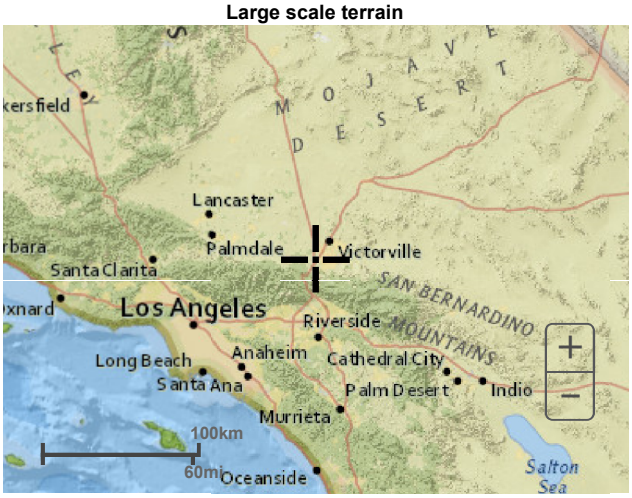
Maps & aerials

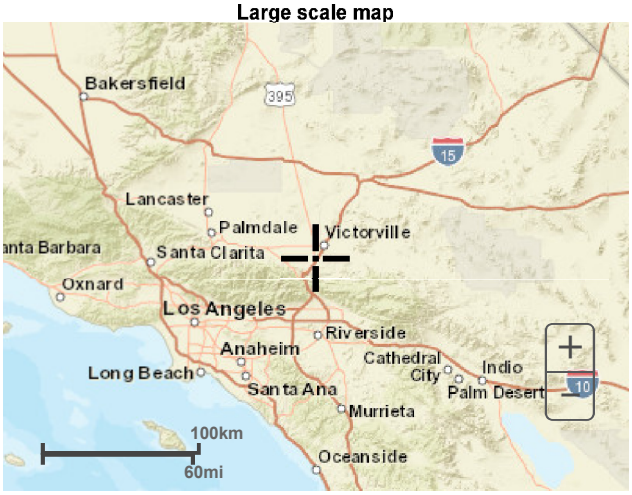
Small scale terrain



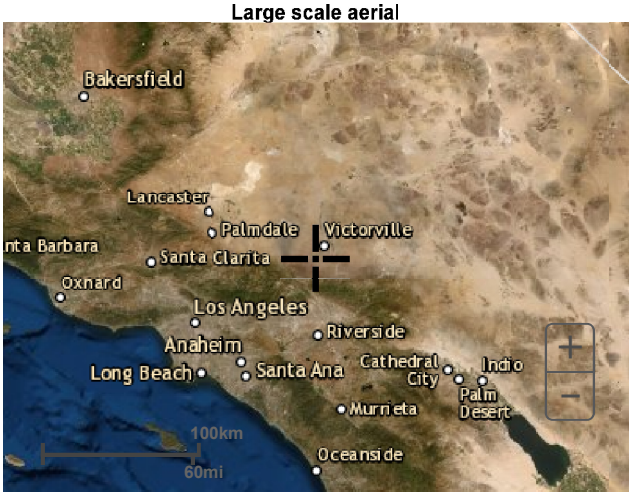
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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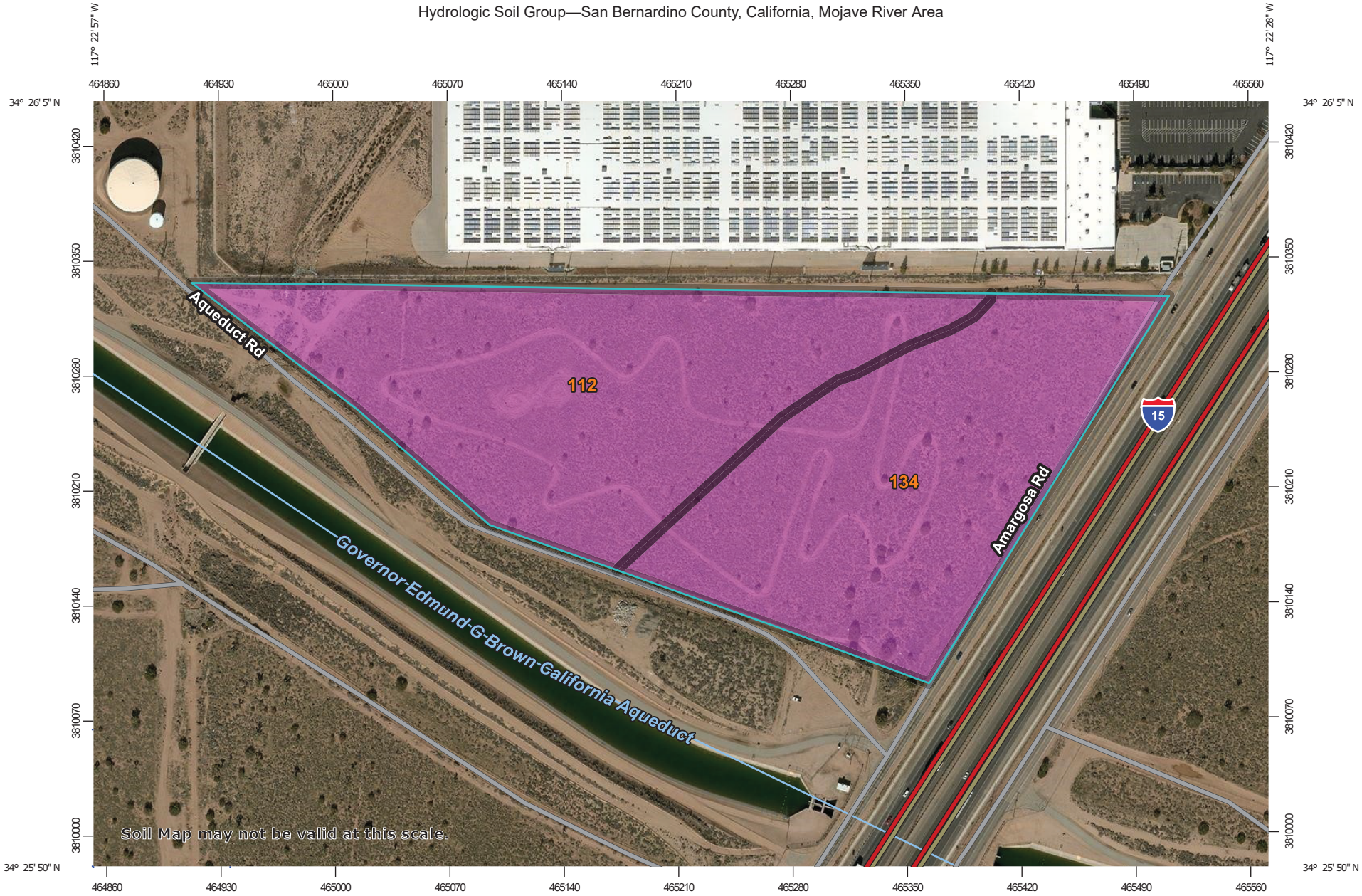

Map Scale: 1:3,290 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 11, Sep 17, 2019

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

Date(s) aerial images were photographed: Feb 1, 2015—Feb 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	A	10.6	52.5%
134	HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES	A	9.6	47.5%
Totals for Area of Interest			**20.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

The watermark for drainage solutions.®

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- Piping
- Drainage Appurtenances
- Pump Systems

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- Design Review
- Percolation Testing
- Geologic Database
- ADEQ Drywell Registration

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- Municipal/Private Recharge Wells
- Injection Wells & Galleries

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- Drainage Rehabilitation
- Drywell Abandonments
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- System Retrofit

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- Preventive Maintenance
- Service Contracts
- Drywell Cleaning

TORRENT RESOURCES INCORPORATED

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Phoenix Arizona 85040-1391

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AZ Lic. ROC070465 A,
ROC047067 B-4; ADWR 363

CA Lic. 528080 A, C-42, HAZ

NV Lic. 0035350 A

NM Lic. 90504 GF04

TORRENT RESOURCES (CA) INCORPORATED

phone 661-947-9836

CA Lic. 886759 A, C-42

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An evolution of McGuckin Drilling

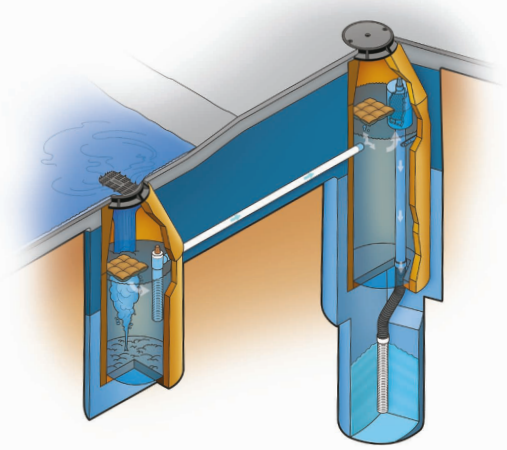
1/12

MaxWell® Plus DRAINAGE SYSTEM

Product Information and Design Features

TORRENT RESOURCES

The ***MaxWell® Plus,*** as manufactured and installed exclusively by Torrent Resources Incorporated, is the industry standard for draining large paved surfaces, nuisance water and other demanding applications. This patented system incorporates state-of-the-art pre-treatment technology.



THE ULTIMATE IN DESIGN

Since 1974, nearly 65,000 MaxWell® Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. They are accepted by state and municipal agencies and are a standard detail in numerous drainage manuals. Many municipalities have recognized the inherent benefits of the MaxWell Plus and now require it for drainage of all paved surfaces.

SUPERIOR PRE-TREATMENT

Industry research, together with Torrent Resources' own experience, have shown that initial storm drainage flows have the greatest impact on system performance. This "first flush" occurs during the first few minutes of runoff, and carries the majority of sediment and debris. Larger paved surfaces or connecting pipes from catch basins, underground storage, etc. can also generate high peak flows which may strain system function. In addition, nuisance water flows require controlled processing separate from normal storm runoff demands.

Manufactured and Installed Exclusively by Torrent Resources Incorporated
Please see reverse side for additional information
U.S. Patent No. 4,923,330

In the ***MaxWell® Plus,*** preliminary treatment is provided through collection and separation in deep large-volume settling chambers. The standard MaxWell Plus System has over 2,500 gallons of capacity to contain sediment and debris carried by incoming water. Floating trash, paper, pavement oil, etc. are effectively stopped by the **PureFlo®** Debris Shields in each chamber. These shielding devices are equipped with an effective screen to filter suspended material and are vented to prevent siphoning of floating surface debris as the system drains.

EFFECTIVE PROCESSING

Incoming water from the surface grated inlets or connecting pipes is received in the Primary Settling Chamber where silt and other heavy particles settle to the bottom. A PureFlo Debris Shield ensures containment by trapping floating debris and pavement oil. The pre-treated flow is then regulated to a design rate of up to 0.25cfs and directed to a Secondary Settling Chamber. The settling and containment process is repeated, thereby effectively achieving controlled, uniform treatment. The system is drained as water rises under the PureFlo Debris Shield and spills into the top of the overflow pipe. The drainage assembly returns the cleaned water into the surrounding soil through the **FloFast®** Drainage Screen.

ABSORBENT TECHNOLOGY

Both MaxWell Plus settling chambers are equipped with absorbent sponges to provide prompt removal of pavement oils. These floating pillow-like devices are 100% water repellent and literally wick petrochemical compounds from the water. Each sponge has a capacity of up to 128 ounces to accommodate effective, long-term treatment. The absorbent is completely inert and will safely remove runoff constituents down to rainbow sheens that are typically no more than one molecule thick.

SECURITY FEATURES

MaxWell Plus Systems include bolted, theft-deterrent, cast iron gratings and covers as standard security features. Special inset castings which are resistant to loosening from accidental impact are available for use in landscaped applications. Machined mating surfaces and "Storm Water Only" wording are standard.

THE MAXWELL FIVE-YEAR WARRANTY

Innovative engineering, quality materials and exacting construction are standard with every MaxWell System designed, manufactured and installed by Torrent Resources Incorporated. The MaxWell Drainage Systems Warranty is the best in the industry and guarantees against failures due to workmanship or materials for a period of five years from date of completion.

MAXWELL® PLUS DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

CALCULATING MAXWELL PLUS REQUIREMENTS:

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained stormwater, use one standard ***MaxWell® Plus*** per the instructions below for up to 5 acres of landscaped contributory area, and up to 2 acres of paved surface. To drain nuisance water flows in storm runoff systems, add a remote inlet to the system. For smaller drainage needs, refer to our ***MaxWell® IV.*** For industrial drainage, our ***Envibro® System*** may be recommended. For additional considerations, please refer to **"Design Suggestions For Retention And Drainage Systems"** or consult our Design Staff.

COMPLETING THE MAXWELL PLUS DRAWING

To apply the MaxWell Plus drawing to your specific project, simply fill in the blue boxes per the following instructions. For assistance, please consult our Design Staff.

PRIMARY SETTLING CHAMBER DEPTH

The overall depth of the Primary Settling Chamber is determined by the amount of surface area being drained. Use a standard depth of **15 feet** for the initial acre of contributory drainage area, **plus 2 feet** for each additional acre, up to the design limits of the property type noted in "Calculating MaxWell Plus Requirements" noted above. Other conditions that would require increased chamber depths are property usage, maintenance scheduling, and severe or unusual service conditions. Connecting pipe depth may dictate deeper chambers so as to maintain the effectiveness of the settling process. Maximum chamber depth is 25 feet. A pump and lift station is recommended for systems with deeper requirements.

ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate total system depth required to achieve 10 continuous feet of penetration into permeable soils, based upon known soil information. Torrent utilizes specialized **"crowd"** equipped rigs to get through the difficult cemented soil and to reach clean drainage soils at depths up to **180 feet.** An extensive drilling log database is available to use as a reference.

SETTLING CHAMBER DEPTH

On MaxWell Plus Systems of over 30 feet overall depth and up to 0.25cfs design rate, the standard Settling Chamber Depth is **18 feet.** Maximum chamber depth is 25 feet.

OVERFLOW HEIGHT

The Overflow Height and Secondary Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. An overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet.**

DRAINAGE PIPE

This dimension also applies to the **PureFlo®** Debris Shields, the **FloFast®** Drainage Screen, and fittings. The size is based upon system design rates, multiple primary settling chambers, soil conditions, and need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to our company's **"Design Suggestions for Retention and Drainage Systems"** for recommendations on which size best matches your application.

BOLTED RING & GRATE/COVER

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording "Storm Water Only" in raised letters. For other surface treatments, please refer to "Design Suggestions for Retention and Drainage Systems."

INLET PIPE INVERT

Pipes up to 12" in diameter from catch basins, underground storage, etc. may be connected into the primary settling chamber. Larger pipe diameters dictate the use of manhole material for the primary setting chamber with 48" grates on the cone.Inverts deeper than 5 feet will require additional depth in both system settling chambers to maintain respective effective settling capacities.

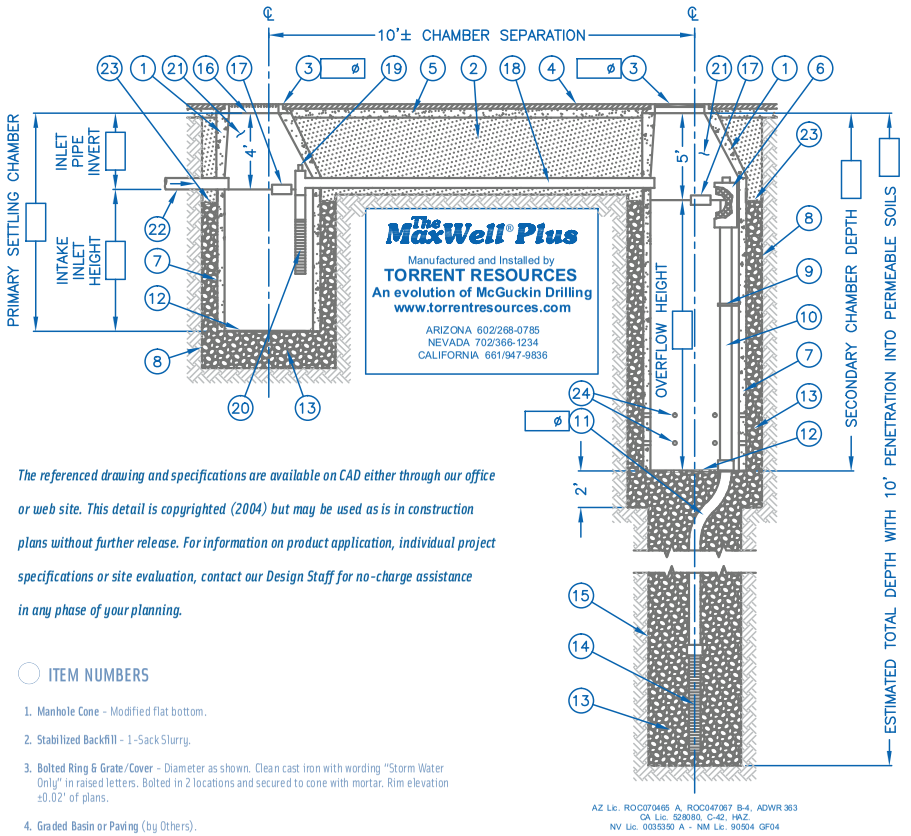
INTAKE INLET HEIGHT

The Intake Inlet Height determines the effectiveness of the settling process in the Primary Settling Chamber. A minimum inlet height of **11 feet** is used with the standard primary settling chamber depth of 15 feet. Greater inlet heights would be required with increased system demands as noted in Primary Settling Chamber Depth. Freeboard Depth Varies with inlet pipe elevation. Increase primary/secondary settling chamber depths as needed to maintain all inlet pipe elevations above connector pipe overflow.

CHAMBER SEPARATION

The standard separation between chambers is **10 feet** from center to center.
Soil conditions and deeper inverts may dictate required variations in chamber separation.

The MaxWell® Plus Drainage System Detail And Specifications



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 528080, C-42, HAZ
NV Lic. 0035350 A - NM Lic. 90504 GF04

The referenced drawing and specifications are available on CAD either through our office or web site. This detail is copyrighted (2004) but may be used as is in construction plans without further release. For information on product application, individual project specifications or site evaluation, contact our Design Staff for no-charge assistance in any phase of your planning.

ITEM NUMBERS

1. **Manhole Cone** - Modified flat bottom.
2. **Stabilized Backfill** - 1-Sack Slurry.
3. **Bolted Ring & Grate/Cover** - Diameter as shown. Clean cast iron with wording "Storm Water Only" in raised letters. Bolted in 2 locations and secured to cone with mortar. Rim elevation ±0.02' of plans.
4. **Graded Basin or Paving** (by Others).
5. **Compacted Base Material** (by Others).
6. **PureFlo® Debris Shield** - Rolled 16 Ga. steel X 24" length with vented anti-siphon and internal .265" Max. SWO flattened expanded steel screen X 12" length. **Fusion bonded epoxy coated.**
7. **Pre-cast Liner** - 4000 PSI concrete 48" ID. X 54" OD. **Center in hole** and align sections to **maximize bearing surface.**
8. **Min. 6' Ø Drilled Shaft.**
9. **Support Bracket** - Formed 12 Ga. steel. **Fusion bonded epoxy coated.**
10. **Overflow Pipe** - Sch. 40 PVC mated to drainage pipe at base seal.
11. **Drainage Pipe** - ADS highway grade with TRI-A coupler. **Suspend pipe** during backfill operations to prevent buckling or breakage. Diameter as noted.
12. **Base Seal** - Geotextile or concrete slurry.
13. **Rock** - Washed, sized between 3/8" and 1-1/2" to **best complement soil conditions.**
14. **FloFast® Drainage Screen** - Sch. 40 PVC 0.120" slotted well screen with 32 slots per row/ft. Diameter varies 120" overall length with TRI-B coupler.
15. **Min. 4' Ø Shaft** - Drilled to **maintain permeability** of drainage soils.
16. **Fabric Seal** - U.V. Resistant Geotextile - **To be removed by customer** at project completion.
17. **Absorbent** – Hydrophobic Petrochemical Sponge. Min 128 oz. capacity.
18. **Connector Pipe** – 4" Ø Sch. 40 PVC.
19. **Anti-Siphon Vent** with flow regulator.
20. **Intake Screen** – Sch. 40 PVC 0.120" modified slotted well screen with 32 slots per row/ft. 48" overall length with TRI-C end cap.
21. **Freeboard Depth Varies** with inlet pipe elevation. Increase primary/secondary settling chamber depths as needed to maintain all inlet pipe elevations above connector pipe overflow.
22. **Optional Inlet Pipe** (by Others).
23. **Moisture Membrane** – 6 mil. Plastic. Place securely against eccentric cone and hole sidewall. Used in lieu of slurry in landscaped areas.
24. **Eight – (8) perforations per foot,** 2 row minimum.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume
Drainage Area 1 (DMA B)

1 Drainage area (ft^2): **833,303**	2 Imperviousness after applying preventative site design practices (Imp%): **85.0%**	3 Runoff Coefficient (Rc): **0.661** $R_c=0.858(Imp)^3-0.78(Imp)^2+0.774(Imp)+0.04$

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): **0.433** *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*

5 Compute P_6, Mean 6-hr Precipitation (inches): **0.64**

P_6=Item 4 * C_1 where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley=1.4807; Mountain=1.909; Desert = 1.2371)

6 Drawdown Rate:

Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to the approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.

24-hrs	
48-hrs	X

7 Compute design capture volume, DCV (ft^3): **57,760**

DCV = 1/12 * [Item 1 * Item 3 * Item 5 * C2], Where C2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2


AIR BASE RD.
RANCHO RD.
HOPLAND ST.
MOJAVE DR.
PALMDALE RD.
LA MESA RD.
DUNCAN RD.
OSBORN RD.
SMOKE TREE RD.
PHELAN RD.
MESQUITE ST.
ARROWHEAD RD.
MOJAVE ST.
MAIN ST.
MUSCATEL ST.
ESCALPTUS RD.
MISSOURI RD.
SOUTHERN PACIFIC RAILROAD
CALIFORNIA AQUEDUCT
HIGHWAY 395
PROJECT SITE
CITY OF VICTORVILLE REGIONAL BASIN
CITY OF VICTORVILLE REGIONAL BASIN
0 2000' 4000
SCALE IN FEET
VICTORVILLE MASTER PLAN OF DRAINAGE
RECOMMENDED ALTERNATIVE
MAJOR ALIGNMENTS & DRAINAGE DIVIDES
LEGEND
A-01 PROPOSED REGIONAL FACILITY
A-01-01 PROPOSED SECONDARY FACILITY
PROPOSED LOCAL FACILITY
EXISTING FACILITY-ADEQUATE
EXISTING FACILITY-IMPROVEMENT REQUIRED
DETENTION BASIN SITE
PROJECT BOUNDARY
REGIONAL FACILITY DRAINAGE DIVIDE
FLOODWAY
FLOODPLAIN
Q100 DISCHARGE (C.F.S.)
ACCUMULATED WATERSHED (SQ.MI.)
WILLIAMSON & SCHMID