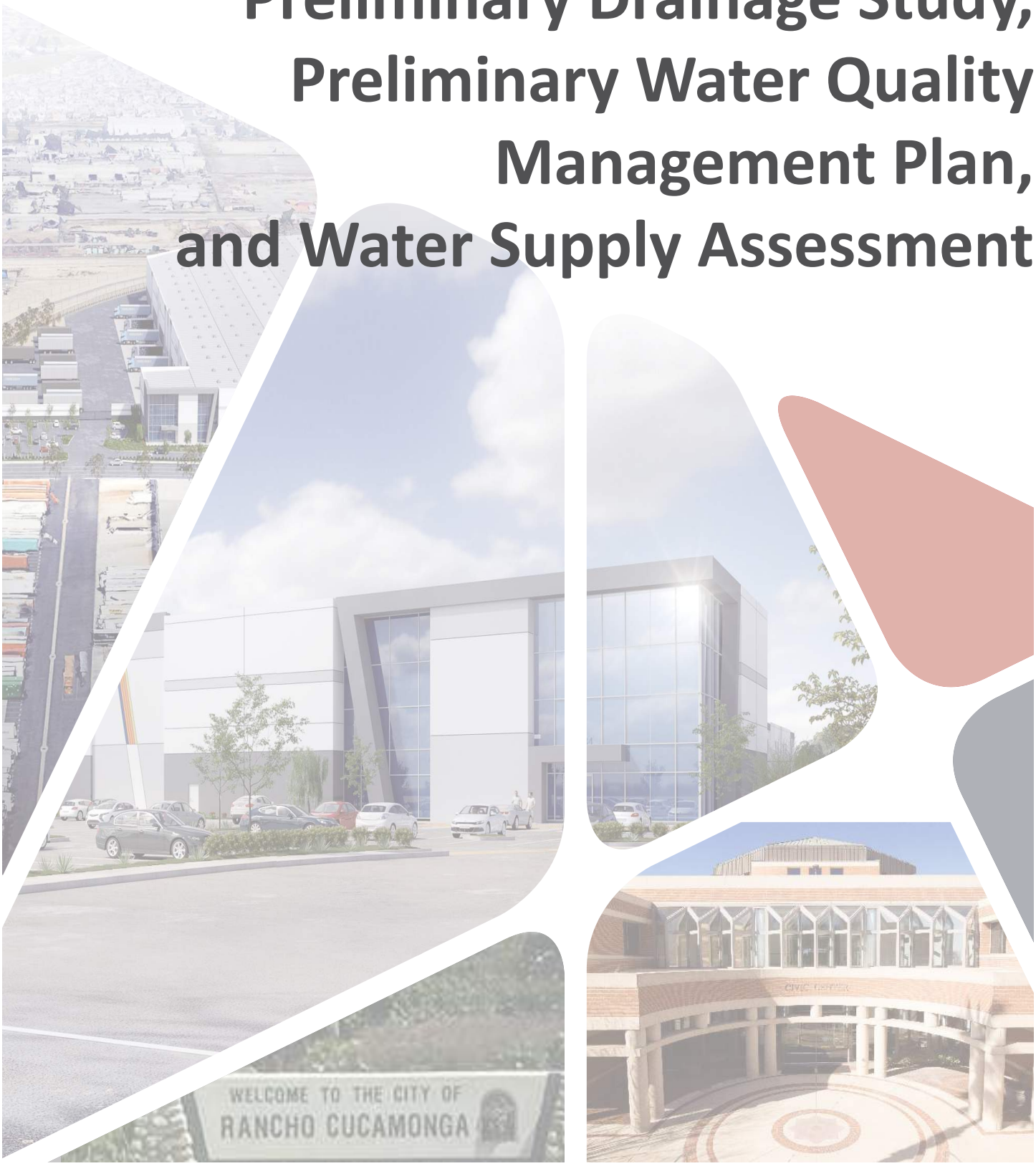
Appendix F

Preliminary Drainage Study, Preliminary Water Quality Management Plan, and Water Supply Assessment



Hillwood-Rancho Cucamonga Industrial Property

TPM No. XXXXX

City of Rancho Cucamonga, County of San Bernardino, California

Preliminary Drainage Study

Prepared for:

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Original Prepared Date: April 2020
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TABLE OF CONTENTS

SECTION 1 - SUMMARY 1-1

PURPOSE 1-1
DESCRIPTION OF WATERSHED 1-1
PROPOSED CONDITIONS 1-1
METHODOLOGY 1-2

FIG. 1 VICINITY MAP
FIG. 2 USGS TOPOGRAPHY MAP
FIG. 3 AERIAL PHOTOGRAPH

SECTION 2 - HYDROLOGY ANALYSIS 2-1

HYDROLOGY PARAMETERS 2-1
RATIONAL METHOD HYDROLOGY 2-1

SECTION 3 - HYDRAULIC ANALYSIS 3-1

ON-SITE STORM DRAIN FACILITIES 3-1

SECTION 4 - CONCLUSION 4-2

APPENDIX A – HYDROLOGY ..... A

POINT PRECIPITATION VALUES (NOAA ATLAS 14)
LAND COVER/RUNOFF INDEX NUMBER ASSUMPTIONS
NRCS WEB SOILS REPORT AND PLATE C-11
PROPOSED RATIONAL METHOD HYDROLOGY
10-YEAR STORM EVENT
100-YEAR STORM EVENT
HYDROLOGY MAPS

APPENDIX B – HYDRAULICS ..... B

LINE-A WSPG MODEL
LINE-B WSPG MODEL
LINE C-WSPG MODEL
LINE-D WSPG MODEL
LINE-E WSPG MODEL
INLET CAPACITIES
CMP DETENTION BASIN
CMP DETENTION BASIN SIZING
CMP DETENTION BASIN DRAWDOWN CALCULATION

APPENDIX C – REFERENCES C

SECTION 1 - SUMMARY

PURPOSE

The purpose of this report is to document the hydrologic and hydraulic analyses performed in support of the Hillwood-Rancho Cucamonga Industrial Property project located in the City of Rancho Cucamonga, California. The project site is located to the north of Napa Street, between Etiwanda Avenue and W Perimeter Road. The site is bound by East Etiwanda Creek along the west, railroad tracks along the north, and by San Sevaine Channel to the East. The project is proposing the development of two industrial warehouse buildings on approximately 36 acres of vacant land. This report will summarize the hydrology and hydraulic analyses that were completed to determine the necessary drainage improvements required for the project to safely convey runoff through the site.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the developed condition using the rational method as outlined in the San Bernardino County Hydrology Manual.
- Determine the required storm drain facilities, alignment, and sizes required to flood protect the project site.
- Determine the necessary underground detention area and volume required for water quality treatment.

DESCRIPTION OF WATERSHED

The project site is divided into two areas due to railroad tracks running through the middle of the site. Building A is the area to the East of the railroad tracks (Area A), while Building B is located to the west of the tracks (Area B). The existing elevations across Area A vary from 1128 at the northeast corner to 1107 along the southerly property line near an existing culvert (NAVD88 datum). Existing elevations across Area B vary from 1114 at the northeast corner to 1105 at the southwest corner (NAVD88 datum). The existing drainage pattern for this site and the general area is characterized by sheet flow that follows the drainage pattern from Northeast to Southwest. Area A currently drains to an existing catch basin/culvert along Napa Street, and discharges into San Sevaine Channel. Area B drains towards Napa Street, and runoff flows towards an existing catch basin near the westerly property line that discharges into the East Etiwanda Creek. The existing drainage pattern of each project area will be preserved. Area A will outlet into the existing 36" storm drain that connects to San Sevaine Channel, and Area B will discharge into the existing RCB culvert of East Etiwanda Creek. San Sevaine Channel and East Etiwanda Creek both discharge into reach 3 of the Santa Ana River, which eventually discharges into the Prado Bain.

PROPOSED CONDITIONS

As previously described, the project is proposing two warehouse facilities totaling approximately 649,200 SF on approximately 36 acres of vacant land. The project is not impacted by off-site flows.

On-site flows generated by the proposed project will surface flow through the site utilizing ribbon gutters, curb & gutters, and grate inlets. The project utilizes subsurface storm drain systems that convey flows into the proposed underground CMP detention systems. For Area A, higher flows will bypass the underground system and drain into the existing 36" storm drain line in Napa Street that discharges into San Sevaine Channel. For Area B, the underground system will have to fill up completely before flows begin to spill over and begin to discharge into a proposed 24" that will connect the existing East Etiwanda Creek RCB culvert in Napa Street.

METHODOLOGY

HYDROLOGY

The San Bernardino County Hydrology Manual has an addendum on rainfall values, stating the use the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for obtaining point precipitation values. The rainfall values were derived from NOAA Atlas 14 website. Soil types were derived from the United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) web site.

Hydrology calculations were performed using a computer program developed by CivilDesign Corporation and Joseph E. Bonadiman and Associates Inc. The computer program is commonly referred to as CivilD, which performs hydrologic calculations as outlined in the hydrology manual.

The Rational Method was used to determine the peak flow rates used to size and design the subsurface storm drain systems to convey on-site flows to the proposed basin. The flow rates were computed by generating a hydrologic "link-node" model in which the overall area is divided into separate drainage sub-areas, each tributary to a concentration point (node) determined by the proposed layout and grading.

Hydrologic calculations were performed in accordance with the San Bernardino County Hydrology Manual, dated August 1986. The rational method and synthetic unit hydrograph methods were utilized in hydrologic analyses.

HYDRAULICS

Normal depth calculations and inlet calculations were performed using the Hydraulic Toolbox 4.1 Software developed by Federal Highway Administration (FHWA) in cooperation with Aquaveo. For results, see Appendix B.

Water quality volume calculations were performed using forms found in the Preliminary WQMP (P-WQMP) Report. Additional details can be found in the P-WQMP Report.

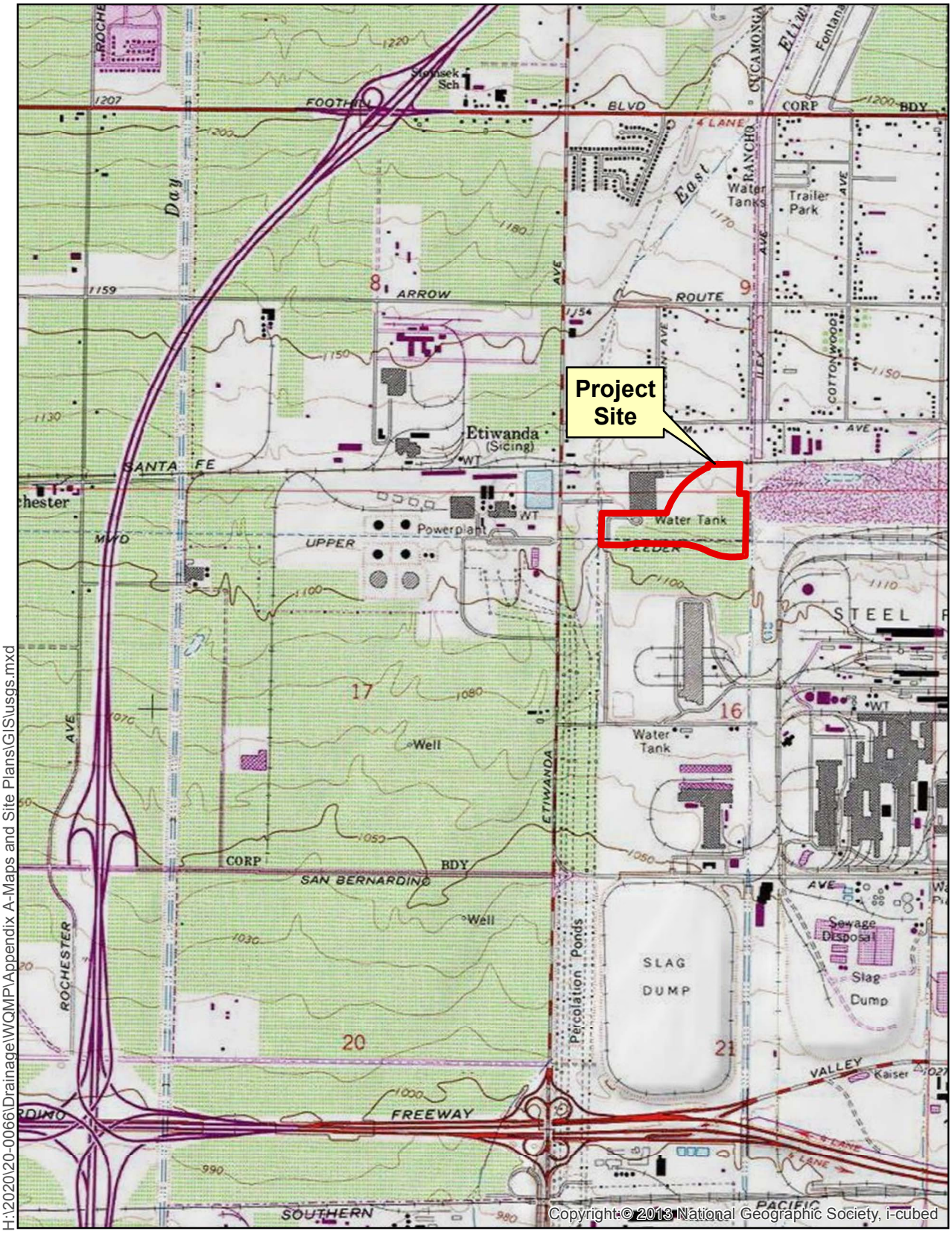
FIG. 1 VICINITY MAP

FIG. 2 USGS TOPOGRAPHY MAP

FIG. 3 AERIAL PHOTOGRAPH



Figure 1. Vicinity Map



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Sources: ESRI / USGS 7.5min Quad

Figure 2. USGS Topography Map

0 1,000 2,000 Feet



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Sources: County of Riverside GIS, 2013; Eagle Aerial, April 2012.

Figure 3. Aerial Photograph

0 400 800 Feet

SECTION 2 - HYDROLOGY ANALYSIS

HYDROLOGY PARAMETERS

The San Bernardino County Hydrology Manual (SBCHM) addendum was followed and rainfall depths were derived from NOAA Atlas 14. The rainfall values were obtained from the NOAA website and are included in Appendix A.

Table 1 – Precipitation Values

	Duration		
Storm Event	1-Hour (inches)	6-Hour (inches)	24-Hour (inches)
10-Year	0.841	2.17	3.37
100-Year	1.21	4.13	6.17

Based on soil information obtained from the USDA NRCS website, the soils within the project boundary are classified as hydrologic soil group A.

The cover type was determined based on the proposed use of the site and utilizing Figures C-3 & C-4 from the San Bernardino County Hydrology Manual.

The proposed condition used the commercial landscaping cover type to represent the developed condition. The table below summarizes the runoff index values and recommended values for percentage each category of impervious cover:

Table 2 – Cover Type

Cover Type	Soil Group A	Soil Group B	Soil Group C	Soil Group D	Percentage of Impervious Cover
Commercial Landscaping	32	56	69	75	90

RATIONAL METHOD HYDROLOGY

The rational method was used to determine peak flow rates in order to adequately size on-site storm drain facilities.

The project site is broken down into two drainage areas, Area A and Area B. Area A is further broken down into nine subareas: Area-A1 through Area A9. All these subareas drain into BMP-A, underground CMP detention system A, via storm drain Line A and Line B. Once the CMP detention system reaches capacity, the water quality volume, the flows will be conveyed into Line C. Line C connects into an existing 36" Storm drain in Napa Street.

Area B is broken down into two subareas: Area-B1 and Area-B2. These subareas drain in BMP-B, underground CMP detention system B. Like system A, once underground system B reaches capacity, flow will begin to spill out into a proposed 24" storm drain, Line E. Line E, will connect into the existing Etiwanda Creek RCB culvert in Napa Street.

The following table summarizes the rational method results at key points:

Table 3 – Rational Method Results

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Node 102: Runoff generated from Area-A1	9.5	15.9
Node 103: Runoff generated from Area-A2	5.9	10.1
Node 104: Runoff generated from Area-A3	2.9	5.0
Node 105: Runoff generated from Area-A4	3.1	5.0
Node 106: Runoff generated from Area-A5	5.0	8.6
Total runoff generated by Area-A1 through A5	**24.5**	**44.8**
Node 202: Runoff generated from Area-A6	3.9	6.5
Node 203: Runoff generated from Area-A7	6.4	10.9
Node 204: Runoff generated from Area-A8	3.6	6.3
Node 205: Runoff generated from Area-A9	3.4	5.9
Total runoff generated by Area-A6 through A9	**17.4**	**29.6**
Node 107: Total runoff generated by Drainage Area 1	**43.5**	**74.0**
Node 301: Runoff generated from Area-B1	7.8	13.1
Node 303: Runoff generated from Area-B2	7.5	12.6
Node 303: Total runoff generated by Drainage Area 2	**15.1**	**25.2**

The rational method output files and hydrology maps have been included in Appendix A.

SECTION 3 - HYDRAULIC ANALYSIS

ON-SITE STORM DRAIN FACILITIES

The project proposes to install two subsurface storm drain systems, one for each drainage area. The on-site flows sheet flow into the designed low points. The flows are then conveyed into the onsite storm drain lines. For Building A, the low flows are conveyed into underground CMP detention system where they will be treated for water quality. The higher storms will bypass the underground detention system and flow into Line C. For Building B, the underground system will have to fill up completely before flows begin to spill over and begin to discharge into the proposed 24" storm drain, Line E." All storm drain lines were designed based on the 100-year peak flowrates obtained from the rational method results. All results are in Appendix B.

Line A

Line A is a proposed HDPE storm drain line that will be used to convey on-site flows generated by the western half of Building A and the western truck court and parking area. Preliminary sizes for Line A were obtained from rational method, which vary from 24" upstream to 36" downstream. A hydraulic model for this storm drain system will be created during final engineering.

Line B

Line B is a proposed HDPE storm drain line that will be used to convey on-site flows generated by the eastern half of Building A, as well as the truck court areas to the north and east of the building. Preliminary sizes for Line B were obtained from rational method, which vary from 18" upstream to 36" downstream. A hydraulic model for this storm drain system will be created during final engineering.

Line C

Line C is a proposed 36" RCP storm drain that will convey excess runoff that bypasses the underground detention system for Building A. A hydraulic model for this storm drain system will be created during final engineering. Hydraulic Toolbox was used to preliminarily size Line C.

Line D

Line C is a proposed 18" HDPE storm drain that will convey on-site flows generated by the northern half of Building B and the truck court area. Line C was preliminarily sized from rational method. A hydraulic model for this storm drain system will be created during final engineering.

Line E

Line E is a proposed 24" RCP storm drain that will convey run-off from the underground detention system for Building A. Line C was preliminarily sized from rational method. A hydraulic model for this storm drain system will be created during final engineering.

CMP Detention Systems

The project proposes to install two underground CMP Detention Systems, one for each Building Area. The CMP Detention Systems were sized to hold the water quality volume. Refer to Appendix B for more details. See PWQMP Report for more information on the water quality volume.

SECTION 4 - CONCLUSION

Based on the analyses and results of this report, the following conclusions were derived from the hydrology and hydraulic results:

- The proposed project can adequately convey flows to the basin and provide flood protection for the 100-year storm event.
- The proposed CMP detention system will adequately treat on-site flows.
- The proposed project will not impact flooding conditions to upstream or downstream properties.

APPENDIX A – HYDROLOGY

POINT PRECIPITATION VALUES (NOAA ATLAS 14)

NOAA Atlas 14, Volume 6, Version 2
Location name: Rancho Cucamonga, California, USA*
Latitude: 34.0912°, Longitude: -117.5169°
Elevation: 1116.91 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	0.107 (0.089-0.129)	0.141 (0.117-0.171)	0.187 (0.155-0.227)	0.226 (0.186-0.277)	0.282 (0.224-0.358)	0.327 (0.254-0.424)	0.374 (0.284-0.498)	0.425 (0.313-0.583)	0.497 (0.351-0.712)	0.556 (0.379-0.825)
10-min	0.153 (0.128-0.186)	0.201 (0.168-0.244)	0.268 (0.222-0.326)	0.324 (0.267-0.398)	0.404 (0.321-0.513)	0.468 (0.364-0.608)	0.536 (0.407-0.714)	0.609 (0.449-0.835)	0.713 (0.503-1.02)	0.797 (0.543-1.18)
15-min	0.185 (0.154-0.224)	0.244 (0.203-0.296)	0.324 (0.269-0.394)	0.392 (0.322-0.481)	0.489 (0.388-0.621)	0.567 (0.441-0.736)	0.649 (0.492-0.864)	0.737 (0.543-1.01)	0.862 (0.608-1.23)	0.964 (0.657-1.43)
30-min	0.272 (0.226-0.329)	0.357 (0.297-0.434)	0.475 (0.394-0.578)	0.575 (0.473-0.706)	0.717 (0.570-0.911)	0.831 (0.646-1.08)	0.952 (0.722-1.27)	1.08 (0.796-1.48)	1.26 (0.893-1.81)	1.42 (0.964-2.10)
60-min	0.397 (0.331-0.482)	0.523 (0.435-0.634)	0.695 (0.577-0.846)	0.841 (0.692-1.03)	1.05 (0.833-1.33)	1.22 (0.946-1.58)	1.39 (1.06-1.85)	1.58 (1.17-2.17)	1.85 (1.31-2.65)	2.07 (1.41-3.07)
2-hr	0.611 (0.509-0.741)	0.782 (0.651-0.949)	1.02 (0.844-1.24)	1.22 (1.00-1.49)	1.50 (1.19-1.90)	1.73 (1.34-2.24)	1.97 (1.49-2.62)	2.23 (1.64-3.05)	2.59 (1.83-3.71)	2.89 (1.97-4.29)
3-hr	0.784 (0.654-0.951)	0.995 (0.828-1.21)	1.28 (1.06-1.56)	1.53 (1.25-1.87)	1.87 (1.49-2.38)	2.14 (1.67-2.78)	2.43 (1.85-3.24)	2.74 (2.02-3.76)	3.18 (2.24-4.55)	3.53 (2.41-5.24)
6-hr	1.13 (0.943-1.37)	1.43 (1.19-1.74)	1.84 (1.52-2.24)	2.17 (1.79-2.66)	2.63 (2.09-3.35)	3.00 (2.33-3.89)	3.37 (2.56-4.49)	3.77 (2.78-5.17)	4.32 (3.05-6.18)	4.75 (3.24-7.05)
12-hr	1.51 (1.25-1.83)	1.94 (1.61-2.35)	2.50 (2.07-3.04)	2.95 (2.42-3.62)	3.54 (2.82-4.50)	4.00 (3.11-5.19)	4.45 (3.37-5.93)	4.91 (3.62-6.73)	5.53 (3.90-7.91)	6.00 (4.08-8.90)
24-hr	2.02 (1.79-2.33)	2.67 (2.37-3.09)	3.49 (3.08-4.04)	4.13 (3.62-4.82)	4.96 (4.20-5.98)	5.58 (4.63-6.86)	6.17 (5.00-7.78)	6.77 (5.33-8.77)	7.54 (5.71-10.2)	8.12 (5.94-11.3)
2-day	2.49 (2.21-2.87)	3.38 (2.99-3.90)	4.52 (3.99-5.23)	5.43 (4.75-6.34)	6.64 (5.63-8.00)	7.55 (6.27-9.29)	8.46 (6.85-10.7)	9.38 (7.39-12.1)	10.6 (8.02-14.3)	11.5 (8.44-16.1)
3-day	2.73 (2.42-3.15)	3.76 (3.32-4.34)	5.10 (4.50-5.91)	6.21 (5.43-7.24)	7.71 (6.53-9.29)	8.86 (7.35-10.9)	10.0 (8.13-12.7)	11.3 (8.88-14.6)	12.9 (9.78-17.4)	14.2 (10.4-19.8)
4-day	2.99 (2.64-3.44)	4.14 (3.66-4.78)	5.68 (5.01-6.57)	6.94 (6.08-8.10)	8.69 (7.36-10.5)	10.1 (8.34-12.4)	11.5 (9.28-14.4)	12.9 (10.2-16.7)	14.9 (11.3-20.2)	16.5 (12.1-23.1)
7-day	3.50 (3.10-4.03)	4.88 (4.31-5.63)	6.72 (5.92-7.77)	8.25 (7.21-9.62)	10.4 (8.78-12.5)	12.0 (9.99-14.8)	13.8 (11.2-17.4)	15.6 (12.3-20.2)	18.1 (13.7-24.4)	20.1 (14.7-28.1)
10-day	3.81 (3.37-4.39)	5.32 (4.71-6.14)	7.35 (6.49-8.51)	9.05 (7.92-10.6)	11.4 (9.66-13.8)	13.3 (11.0-16.3)	15.2 (12.3-19.2)	17.3 (13.6-22.4)	20.1 (15.2-27.1)	22.4 (16.4-31.3)
20-day	4.41 (3.90-5.08)	6.26 (5.54-7.22)	8.77 (7.74-10.2)	10.9 (9.53-12.7)	13.9 (11.7-16.7)	16.3 (13.5-20.0)	18.7 (15.2-23.6)	21.4 (16.9-27.7)	25.1 (19.0-33.9)	28.2 (20.6-39.3)
30-day	5.19 (4.60-5.98)	7.44 (6.58-8.58)	10.5 (9.26-12.1)	13.1 (11.5-15.3)	16.8 (14.2-20.2)	19.7 (16.4-24.3)	22.8 (18.5-28.8)	26.2 (20.6-33.9)	30.9 (23.4-41.7)	34.8 (25.4-48.5)
45-day	6.12 (5.41-7.05)	8.79 (7.77-10.1)	12.5 (11.0-14.4)	15.6 (13.6-18.2)	20.1 (17.0-24.2)	23.7 (19.6-29.1)	27.5 (22.3-34.6)	31.6 (24.9-41.0)	37.5 (28.4-50.6)	42.4 (31.0-59.1)
60-day	7.09 (6.28-8.17)	10.2 (8.98-11.7)	14.4 (12.7-16.7)	18.0 (15.8-21.0)	23.2 (19.7-28.0)	27.4 (22.7-33.7)	31.9 (25.8-40.2)	36.8 (29.0-47.6)	43.8 (33.1-59.0)	49.5 (36.2-69.1)

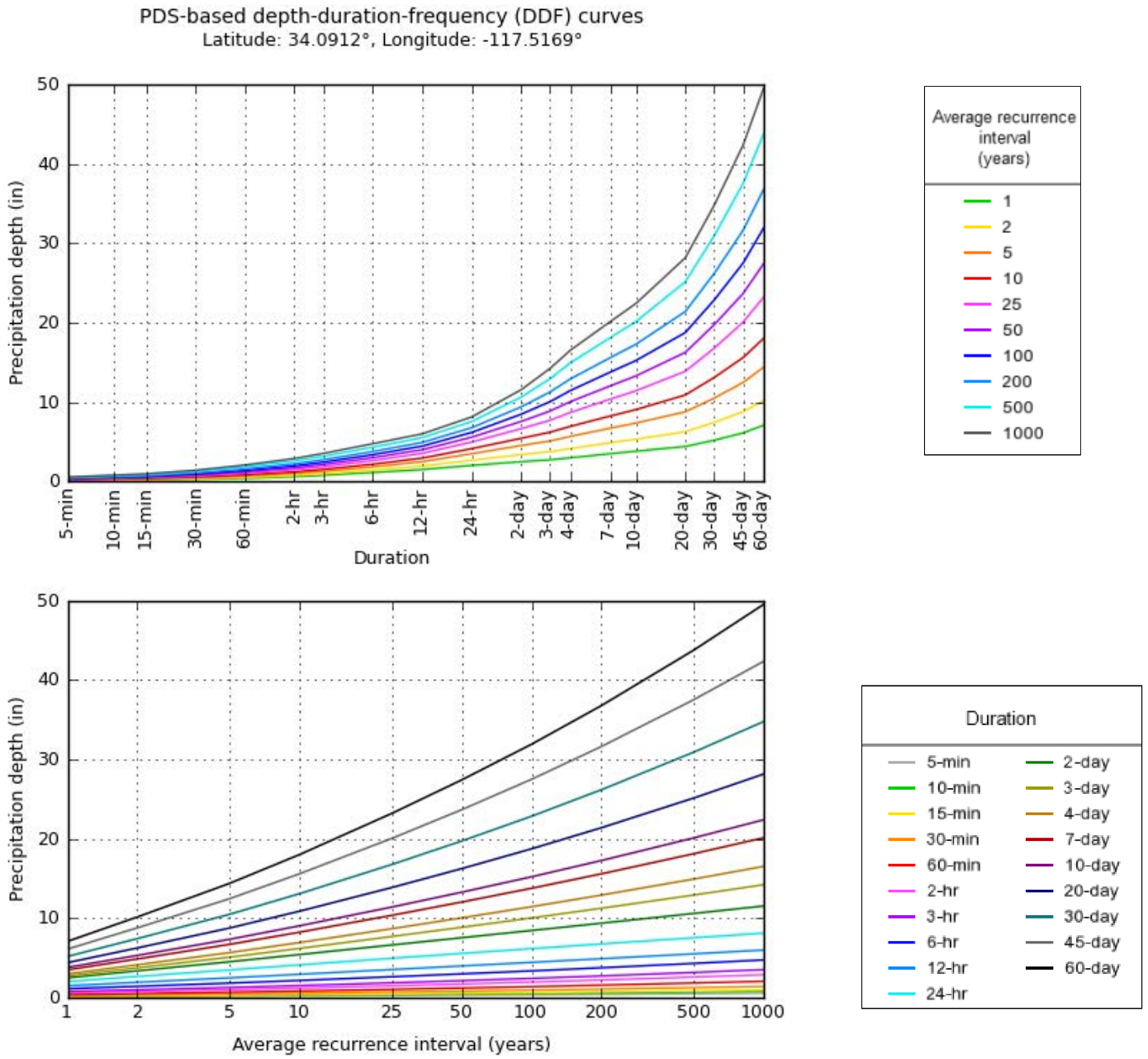
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



NOAA Atlas 14, Volume 6, Version 2

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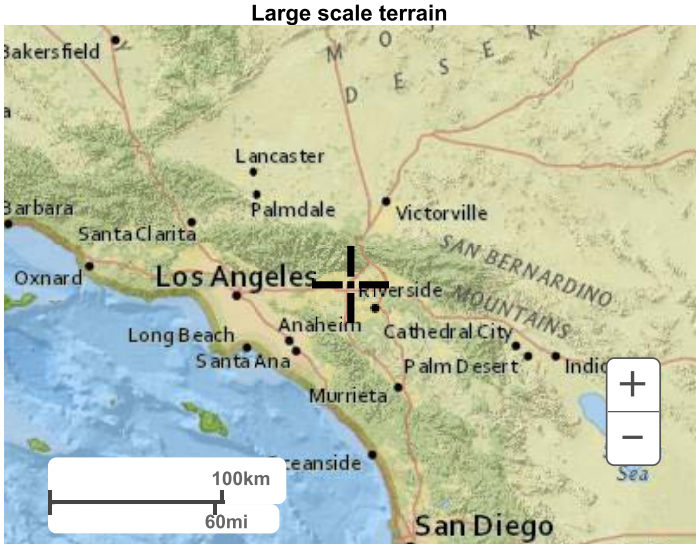
Back to Top

Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



Back to Top

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

Disclaimer

LAND COVER/RUNOFF INDEX NUMBER ASSUMPTIONS

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

   Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (2 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER
FOR
DEVELOPED AREAS

Figure C-4

NRCS WEB SOILS REPORT AND PLATE C-11

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

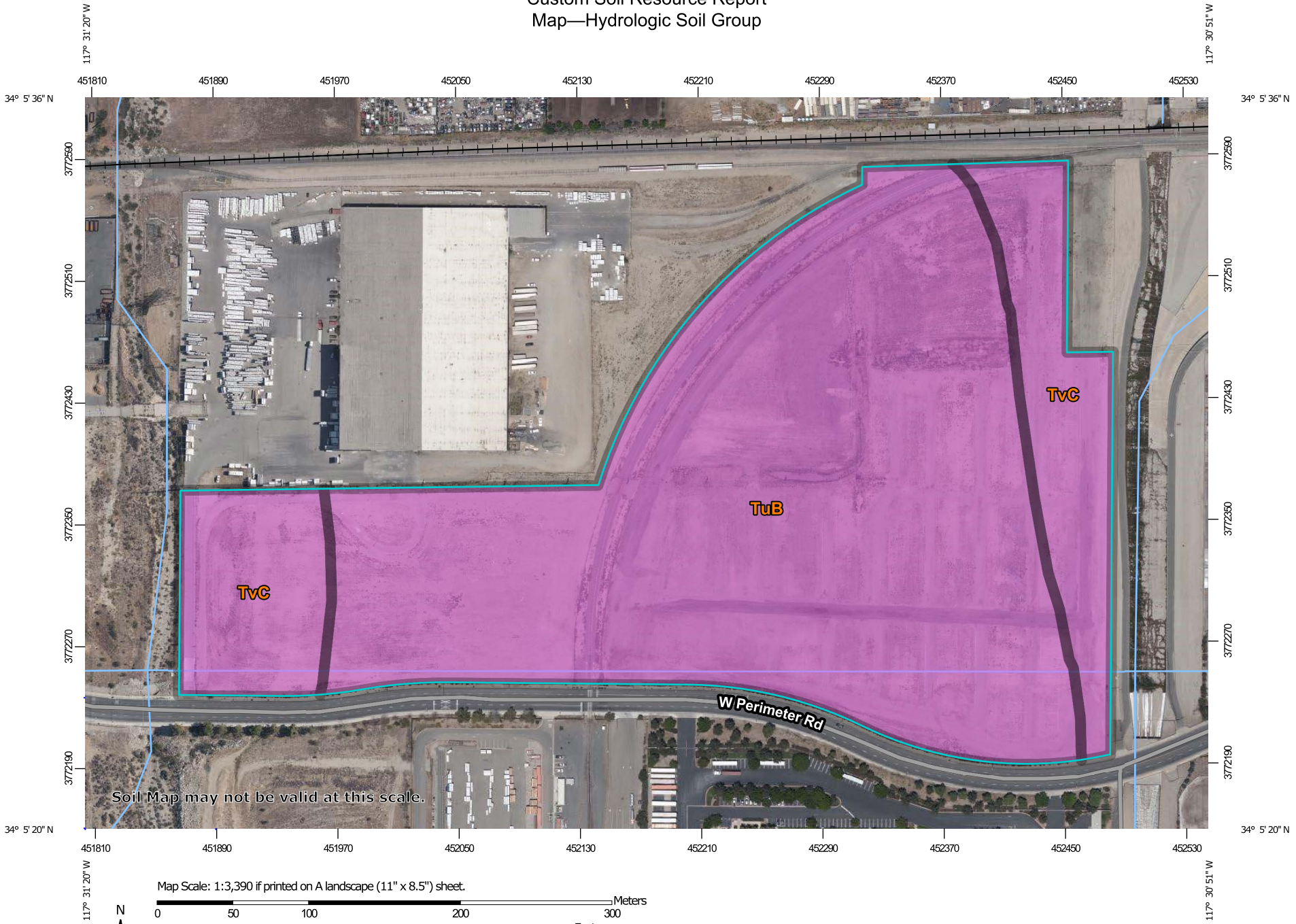
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Bernardino County Southwestern Part, California



April 15, 2020

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:3,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

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 Southwestern Part, California
Survey Area Data: Version 11, Sep 16, 2019

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

Date(s) aerial images were photographed: May 10, 2018—Jun 5, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
TuB	Tujunga loamy sand, 0 to 5 percent slopes	A	27.9	78.7%
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	A	7.5	21.3%
Totals for Area of Interest			**35.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

PROPOSED RATIONAL METHOD HYDROLOGY

10-YEAR STORM EVENT

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 04/23/20

20-0066 HILLWOOD-RANCHO CUCAMONGA INDUSTRIAL PROPERTY
RATIONAL METHOD HYDROLOGY - PROPOSED CONDITION BLDG A
10 YEAR STORM EVENT
FN: PROP10.OUT CV

Program License Serial Number 4010

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.841 (In.)
Slope used for rainfall intensity curve b = 0.6000
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 = 673.000(Ft.)
Top (of initial area) elevation = 1119.700(Ft.)
Bottom (of initial area) elevation = 1113.000(Ft.)
Difference in elevation = 6.700(Ft.)
Slope = 0.00996 s(%)= 1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.339 min.
Rainfall intensity = 2.415(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff = 9.465(CFS)
Total initial stream area = 4.500(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
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1109.500(Ft.)
Downstream point/station elevation = 1107.800(Ft.)
Pipe length = 238.50(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 9.465(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 9.465(CFS)
Normal flow depth in pipe = 14.53(In.)
Flow top width inside pipe = 14.20(In.)
Critical Depth = 14.26(In.)
Pipe flow velocity = 6.20(Ft/s)
Travel time through pipe = 0.64 min.
Time of concentration (TC) = 10.98 min.

++
Process from Point/Station 103.000 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 = 10.98 min.
Rainfall intensity = 2.330(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870

```
Subarea runoff =      5.934(CFS) for    3.100(Ac.)
Total runoff =     15.399(CFS)
Effective area this stream =        7.60(Ac.)
Total Study Area (Main Stream No. 1) =        7.60(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1107.800(Ft.)
Downstream point/station elevation =  1106.800(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    15.399(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.399(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   23.00(In.)
Critical Depth =   16.97(In.)
Pipe flow velocity =      7.22(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    11.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** 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 =    11.30 min.
Rainfall intensity =      2.290(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =      2.909(CFS) for    1.600(Ac.)
Total runoff =     18.308(CFS)
Effective area this stream =        9.20(Ac.)
Total Study Area (Main Stream No. 1) =        9.20(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1106.800(Ft.)
Downstream point/station elevation =  1106.000(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    18.308(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.308(CFS)
Normal flow depth in pipe =   17.02(In.)
Flow top width inside pipe =   21.80(In.)
Critical Depth =   18.49(In.)
Pipe flow velocity =      7.68(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    11.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** 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 =    11.53 min.
Rainfall intensity =      2.263(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =      3.118(CFS) for    1.700(Ac.)
Total runoff =     21.426(CFS)
Effective area this stream =       10.90(Ac.)
Total Study Area (Main Stream No. 1) =       10.90(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1106.000(Ft.)
Downstream point/station elevation =  1104.100(Ft.)
Pipe length  =   283.50(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    21.426(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    21.426(CFS)
Normal flow depth in pipe =   17.93(In.)
Flow top width inside pipe =   25.51(In.)
Critical Depth =   19.45(In.)
Pipe flow velocity =      7.64(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =    12.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** 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 =    12.15 min.
Rainfall intensity =      2.193(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =      5.023(CFS) for    3.000(Ac.)
Total runoff =     26.450(CFS)
Effective area this stream =       13.90(Ac.)
Total Study Area (Main Stream No. 1) =       13.90(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1104.100(Ft.)
Downstream point/station elevation =  1101.200(Ft.)
Pipe length  =   440.50(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    26.450(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    26.450(CFS)
Normal flow depth in pipe =   21.47(In.)
Flow top width inside pipe =   21.79(In.)
Critical Depth =   21.54(In.)
Pipe flow velocity =      7.80(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    13.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     13.900(Ac.)
Runoff from this stream =     26.450(CFS)
Time of concentration =   13.09 min.
Rainfall intensity =     2.097(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** 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 =   451.000(Ft.)
Top (of initial area) elevation =  1116.500(Ft.)
Bottom (of initial area) elevation =  1114.000(Ft.)
Difference in elevation =     2.500(Ft.)
```

```
Slope =    0.00554  s(%)=       0.55
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.904 min.
Rainfall intensity =      2.479(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff =      3.888(CFS)
Total initial stream area =        1.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1111.000(Ft.)
Downstream point/station elevation =  1109.800(Ft.)
Pipe length  =   414.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     3.888(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     3.888(CFS)
Normal flow depth in pipe =   10.41(In.)
Flow top width inside pipe =   17.78(In.)
Critical Depth =    9.04(In.)
Pipe flow velocity =      3.67(Ft/s)
Travel time through pipe =    1.88 min.
Time of concentration (TC) =    11.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** 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 =    11.78 min.
Rainfall intensity =      2.233(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =      6.390(CFS) for    3.500(Ac.)
Total runoff =     10.278(CFS)
Effective area this stream =        5.30(Ac.)
Total Study Area (Main Stream No. 2) =       19.20(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1109.800(Ft.)
Downstream point/station elevation =  1109.100(Ft.)
Pipe length  =   234.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    10.278(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.278(CFS)
Normal flow depth in pipe =   15.75(In.)
Flow top width inside pipe =   22.80(In.)
Critical Depth =   13.78(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    12.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** 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 =    12.61 min.
Rainfall intensity =      2.144(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      3.663(CFS) for    2.200(Ac.)
Total runoff =     13.941(CFS)
Effective area this stream =        7.50(Ac.)
Total Study Area (Main Stream No. 2) =       21.40(Ac.)
```

```
Area averaged Fm value =    0.079(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1109.100(Ft.)
Downstream point/station elevation =  1108.600(Ft.)
Pipe length  =   173.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    13.941(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    13.941(CFS)
Normal flow depth in pipe =   17.81(In.)
Flow top width inside pipe =   25.59(In.)
Critical Depth =   15.59(In.)
Pipe flow velocity =      5.01(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    13.19 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** 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 =    13.19 min.
Rainfall intensity =      2.087(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =      3.414(CFS) for    2.100(Ac.)
Total runoff =     17.355(CFS)
Effective area this stream =        9.60(Ac.)
Total Study Area (Main Stream No. 2) =       23.50(Ac.)
Area averaged Fm value =    0.079(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1108.600(Ft.)
Downstream point/station elevation =  1101.200(Ft.)
Pipe length  =   369.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    17.355(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    17.355(CFS)
Normal flow depth in pipe =   13.13(In.)
Flow top width inside pipe =   20.33(In.)
Critical Depth =   18.29(In.)
Pipe flow velocity =     10.98(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    13.75 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      9.600(Ac.)
Runoff from this stream =     17.355(CFS)
Time of concentration =   13.75 min.
Rainfall intensity =     2.036(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1     26.45    13.900     13.09    0.079      2.097
2     17.36     9.600     13.75    0.079      2.036
Qmax(1) =
           1.000 *    1.000 *    26.450) +
           1.031 *    0.952 *    17.355) + =      43.486
Qmax(2) =
           0.970 *    1.000 *    26.450) +
           1.000 *    1.000 *    17.355) + =      43.005

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      27.450      18.355
Maximum flow rates at confluence using above data:
       43.486       43.005
Area of streams before confluence:
       13.900        9.600
Effective area values after confluence:
       23.039       23.500


Results of confluence:
Total flow rate =     43.486(CFS)
Time of concentration =    13.088 min.
Effective stream area after confluence  =     23.039(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      23.50(Ac.)
End of computations, Total Study Area =           23.50 (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) = 0.100
Area averaged SCS curve number =  32.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 04/23/20

20-0066 HILLWOOD-RANCHO CUCAMONGA INDUSTRIAL PROPERTY
RATIONAL METHOD HYDROLOGY - PROPOSED CONDITION BLDG B
10 YEAR STORM EVENT
FN: PROP10.OUT CV

Program License Serial Number 4010

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.841 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++

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 = 832.000(Ft.)
Top (of initial area) elevation = 1111.900(Ft.)
Bottom (of initial area) elevation = 1107.100(Ft.)
Difference in elevation = 4.800(Ft.)
Slope = 0.00577 s(%)= 0.58
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.552 min.
Rainfall intensity = 2.150(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff = 7.831(CFS)
Total initial stream area = 4.200(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
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1103.600(Ft.)
Downstream point/station elevation = 1098.700(Ft.)
Pipe length = 73.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 7.831(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 7.831(CFS)
Normal flow depth in pipe = 7.99(In.)
Flow top width inside pipe = 11.32(In.)
Critical depth could not be calculated.
Pipe flow velocity = 14.09(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 12.64 min.

++

Process from Point/Station 303.000 to Point/Station 303.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 4.200(Ac.)
Runoff from this stream = 7.831(CFS)
Time of concentration = 12.64 min.
Rainfall intensity = 2.141(In/Hr)
Area averaged loss rate (Fm) = 0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2

++

```
Process from Point/Station      301.000 to Point/Station      303.000
**** 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 =   995.000(Ft.)
Top (of initial area) elevation =  1111.900(Ft.)
Bottom (of initial area) elevation =  1098.700(Ft.)
Difference in elevation =    13.200(Ft.)
Slope =    0.01327  s(%)=       1.33
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.414 min.
Rainfall intensity =      2.276(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =      7.516(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station      303.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.800(Ac.)
Runoff from this stream =      7.516(CFS)
Time of concentration =   11.41 min.
Rainfall intensity =     2.276(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      7.83     4.200     12.64    0.079      2.141
2      7.52     3.800     11.41    0.079      2.276
Qmax(1) =
           1.000 *    1.000 *     7.831) +
           0.939 *    1.000 *     7.516) + =      14.886
Qmax(2) =
           1.065 *    0.903 *     7.831) +
           1.000 *    1.000 *     7.516) + =      15.051

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.831       8.516
Maximum flow rates at confluence using above data:
      14.886      15.051
Area of streams before confluence:
       4.200       3.800
Effective area values after confluence:
       8.000       7.593


Results of confluence:
Total flow rate =     15.051(CFS)
Time of concentration =    11.414 min.
Effective stream area after confluence  =      7.593(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =       8.00(Ac.)
End of computations, Total Study Area =            8.00 (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) = 0.100
Area averaged SCS curve number =  32.0
```

100-YEAR STORM EVENT

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 04/23/20

20-0066 HILLWOOD-RANCHO CUCAMONGA INDUSTRIAL PROPERTY
RATIONAL METHOD HYDROLOGY - PROPOSED CONDITION BLDG A
100 YEAR STORM EVENT
FN: PROP100.OUT CV

Program License Serial Number 4010

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.390 (In.)
Slope used for rainfall intensity curve b = 0.6000
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 = 673.000(Ft.)
Top (of initial area) elevation = 1119.700(Ft.)
Bottom (of initial area) elevation = 1113.000(Ft.)
Difference in elevation = 6.700(Ft.)
Slope = 0.00996 s(%)= 1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.339 min.
Rainfall intensity = 3.992(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.882
Subarea runoff = 15.851(CFS)
Total initial stream area = 4.500(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
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1109.500(Ft.)
Downstream point/station elevation = 1107.800(Ft.)
Pipe length = 238.50(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 15.851(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 15.851(CFS)
Normal flow depth in pipe = 15.75(In.)
Flow top width inside pipe = 22.80(In.)
Critical Depth = 17.23(In.)
Pipe flow velocity = 7.26(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 10.89 min.

++
Process from Point/Station 103.000 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 = 10.89 min.
Rainfall intensity = 3.871(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882

```
Subarea runoff =     10.087(CFS) for    3.100(Ac.)
Total runoff =     25.938(CFS)
Effective area this stream =        7.60(Ac.)
Total Study Area (Main Stream No. 1) =        7.60(Ac.)
Area averaged Fm value =    0.079(In/Hr)


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Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1107.800(Ft.)
Downstream point/station elevation =  1106.800(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    25.938(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    25.938(CFS)
Normal flow depth in pipe =   20.30(In.)
Flow top width inside pipe =   23.33(In.)
Critical Depth =   21.33(In.)
Pipe flow velocity =      8.09(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    11.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** 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 =    11.17 min.
Rainfall intensity =      3.810(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =      4.961(CFS) for    1.600(Ac.)
Total runoff =     30.899(CFS)
Effective area this stream =        9.20(Ac.)
Total Study Area (Main Stream No. 1) =        9.20(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1106.800(Ft.)
Downstream point/station elevation =  1106.000(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    30.899(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    30.899(CFS)
Normal flow depth in pipe =   20.16(In.)
Flow top width inside pipe =   28.17(In.)
Critical Depth =   22.73(In.)
Pipe flow velocity =      8.81(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** 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 =    11.37 min.
Rainfall intensity =      3.771(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =      5.320(CFS) for    1.700(Ac.)
Total runoff =     36.219(CFS)
Effective area this stream =       10.90(Ac.)
Total Study Area (Main Stream No. 1) =       10.90(Ac.)
Area averaged Fm value =    0.079(In/Hr)


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Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1106.000(Ft.)
Downstream point/station elevation =  1104.100(Ft.)
Pipe length  =   283.50(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    36.219(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    36.219(CFS)
Normal flow depth in pipe =   24.47(In.)
Flow top width inside pipe =   23.27(In.)
Critical Depth =   24.49(In.)
Pipe flow velocity =      8.45(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    11.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** 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 =    11.93 min.
Rainfall intensity =      3.664(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =      8.629(CFS) for    3.000(Ac.)
Total runoff =     44.848(CFS)
Effective area this stream =       13.90(Ac.)
Total Study Area (Main Stream No. 1) =       13.90(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1104.100(Ft.)
Downstream point/station elevation =  1101.200(Ft.)
Pipe length  =   440.50(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    44.848(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    44.848(CFS)
Normal flow depth in pipe =   26.06(In.)
Flow top width inside pipe =   26.89(In.)
Critical Depth =   26.63(In.)
Pipe flow velocity =      8.92(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =    12.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     13.900(Ac.)
Runoff from this stream =     44.848(CFS)
Time of concentration =   12.75 min.
Rainfall intensity =     3.520(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** 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 =   451.000(Ft.)
Top (of initial area) elevation =  1116.500(Ft.)
Bottom (of initial area) elevation =  1114.000(Ft.)
Difference in elevation =     2.500(Ft.)
```

```
Slope =    0.00554  s(%)=       0.55
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.904 min.
Rainfall intensity =      4.097(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =      6.509(CFS)
Total initial stream area =        1.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1111.000(Ft.)
Downstream point/station elevation =  1109.800(Ft.)
Pipe length  =   414.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     6.509(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     6.509(CFS)
Normal flow depth in pipe =   13.01(In.)
Flow top width inside pipe =   20.39(In.)
Critical Depth =   11.30(In.)
Pipe flow velocity =      4.16(Ft/s)
Travel time through pipe =    1.66 min.
Time of concentration (TC) =    11.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** 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 =    11.56 min.
Rainfall intensity =      3.733(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =     10.925(CFS) for    3.500(Ac.)
Total runoff =     17.434(CFS)
Effective area this stream =        5.30(Ac.)
Total Study Area (Main Stream No. 2) =       19.20(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1109.800(Ft.)
Downstream point/station elevation =  1109.100(Ft.)
Pipe length  =   234.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    17.434(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    17.434(CFS)
Normal flow depth in pipe =   21.00(In.)
Flow top width inside pipe =   22.45(In.)
Critical Depth =   17.49(In.)
Pipe flow velocity =      5.25(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    12.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** 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 =    12.30 min.
Rainfall intensity =      3.597(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      6.313(CFS) for    2.200(Ac.)
Total runoff =     23.747(CFS)
Effective area this stream =        7.50(Ac.)
Total Study Area (Main Stream No. 2) =       21.40(Ac.)
```

```
Area averaged Fm value =    0.079(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1109.100(Ft.)
Downstream point/station elevation =  1108.600(Ft.)
Pipe length  =   173.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    23.747(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    23.747(CFS)
Normal flow depth in pipe =   24.42(In.)
Flow top width inside pipe =   23.34(In.)
Critical Depth =   19.90(In.)
Pipe flow velocity =      5.55(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    12.82 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** 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 =    12.82 min.
Rainfall intensity =      3.508(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      5.887(CFS) for    2.100(Ac.)
Total runoff =     29.634(CFS)
Effective area this stream =        9.60(Ac.)
Total Study Area (Main Stream No. 2) =       23.50(Ac.)
Area averaged Fm value =    0.079(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1108.600(Ft.)
Downstream point/station elevation =  1101.200(Ft.)
Pipe length  =   369.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    29.634(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    29.634(CFS)
Normal flow depth in pipe =   17.06(In.)
Flow top width inside pipe =   21.76(In.)
Critical Depth =   22.28(In.)
Pipe flow velocity =     12.41(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    13.32 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      107.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      9.600(Ac.)
Runoff from this stream =     29.634(CFS)
Time of concentration =   13.32 min.
Rainfall intensity =     3.429(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1     44.85    13.900     12.75    0.079      3.520
2     29.63     9.600     13.32    0.079      3.429
Qmax(1) =
           1.000 *    1.000 *    44.848) +
           1.027 *    0.958 *    29.634) + =      73.991
Qmax(2) =
           0.974 *    1.000 *    44.848) +
           1.000 *    1.000 *    29.634) + =      73.307

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      45.848      30.634
Maximum flow rates at confluence using above data:
       73.991       73.307
Area of streams before confluence:
       13.900        9.600
Effective area values after confluence:
       23.093       23.500


Results of confluence:
Total flow rate =     73.991(CFS)
Time of concentration =    12.754 min.
Effective stream area after confluence  =     23.093(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      23.50(Ac.)
End of computations, Total Study Area =           23.50 (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) = 0.100
Area averaged SCS curve number =  32.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 04/23/20

20-0066 HILLWOOD-RANCHO CUCAMONGA INDUSTRIAL PROPERTY
RATIONAL METHOD HYDROLOGY - PROPOSED CONDITION BLDG B
100 YEAR STORM EVENT
FN: PROP100.OUT CV

Program License Serial Number 4010

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.390 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
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 = 832.000(Ft.)
Top (of initial area) elevation = 1111.900(Ft.)
Bottom (of initial area) elevation = 1107.100(Ft.)
Difference in elevation = 4.800(Ft.)
Slope = 0.00577 s(%)= 0.58
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.552 min.
Rainfall intensity = 3.554(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff = 13.136(CFS)
Total initial stream area = 4.200(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
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1103.600(Ft.)
Downstream point/station elevation = 1098.700(Ft.)
Pipe length = 73.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 13.136(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 13.136(CFS)
Normal flow depth in pipe = 9.47(In.)
Flow top width inside pipe = 14.47(In.)
Critical depth could not be calculated.
Pipe flow velocity = 16.10(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 12.63 min.

++
Process from Point/Station 303.000 to Point/Station 303.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 4.200(Ac.)
Runoff from this stream = 13.136(CFS)
Time of concentration = 12.63 min.
Rainfall intensity = 3.541(In/Hr)
Area averaged loss rate (Fm) = 0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2

++

```
Process from Point/Station      301.000 to Point/Station      303.000
**** 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 =   995.000(Ft.)
Top (of initial area) elevation =  1111.900(Ft.)
Bottom (of initial area) elevation =  1098.700(Ft.)
Difference in elevation =    13.200(Ft.)
Slope =    0.01327  s(%)=       1.33
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.414 min.
Rainfall intensity =      3.762(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.881
Subarea runoff =     12.598(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.800(Ac.)
Runoff from this stream =     12.598(CFS)
Time of concentration =   11.41 min.
Rainfall intensity =     3.762(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1     13.14     4.200     12.63    0.079      3.541
2     12.60     3.800     11.41    0.079      3.762
Qmax(1) =
           1.000 *    1.000 *    13.136) +
           0.940 *    1.000 *    12.598) + =      24.978
Qmax(2) =
           1.064 *    0.904 *    13.136) +
           1.000 *    1.000 *    12.598) + =      25.231

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.136      13.598
Maximum flow rates at confluence using above data:
       24.978       25.231
Area of streams before confluence:
       4.200        3.800
Effective area values after confluence:
        8.000        7.597


Results of confluence:
Total flow rate =     25.231(CFS)
Time of concentration =    11.414 min.
Effective stream area after confluence  =      7.597(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =       8.00(Ac.)
End of computations, Total Study Area =            8.00 (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) = 0.100
Area averaged SCS curve number =  32.0
```

HYDROLOGY MAPS

LEGEND

- DRAINAGE AREA BOUNDARY
- SUB-AREA BOUNDARY
- FLOW DIRECTION
- SD — PROPOSED STORM DRAIN
- XXX / XXXX — NODE DESIGNATION / NODE ELEVATION
- *IXXX — *INVERT ELEVATION
- X.XX / XXX — WATERSHED AREA (ACRES) / LONGEST WATER PATH (FT)

RAILROAD

RAILROAD EASEMENT

EAST ETIWANDA CREEK

SAN SEVAINE CHANNEL

NAPA STREET

PROPOSED BUILDING A

PROPOSED BUILDING B

AREA-A6 — 1.8 / 451'

AREA-A1 — 4.5 / 673'

AREA-A7 — 3.5

AREA-A2 — 3.1

AREA-A8 — 2.2

AREA-A3 — 1.6

AREA-A9 — 2.1

AREA-A4 — 1.7

AREA-A5 — 3.0

AREA-B1 — 4.2 / 832'

AREA-B2 — 3.8 / 995'

101 / 1119.7

201 / 1116.5

102 / 1113.0 *1109.5

103 / 1107.8

104 / 1106.8

105 / 1106.0

106 / 1104.1

107 / 1101.2

202 / 1114.4 *1111.0

203 / 1109.8

204 / 1109.1

205 / 1108.6

301 / 1111.9

302 / 1107.1 *1103.6

303 / 1098.7

AREA-A6 RUNOFF
Q_{100}=6.5 CFS
Q_{10}=3.9 CFS

AREA-A7 RUNOFF
Q_{100}=10.9 CFS
Q_{10}=6.4 CFS

TOTAL RUNOFF
Q_{100}=17.4 CFS
Q_{10}=10.3 CFS

AREA-A8 RUNOFF
Q_{100}=6.3 CFS
Q_{10}=3.6 CFS

TOTAL RUNOFF
Q_{100}=23.7 CFS
Q_{10}=13.9 CFS

AREA-A8 RUNOFF
Q_{100}=5.9 CFS
Q_{10}=3.4 CFS

TOTAL RUNOFF
Q_{100}=29.6 CFS
Q_{10}=17.4 CFS

AREA-A1 RUNOFF
Q_{100}=15.9 CFS
Q_{10}=9.5 CFS

AREA-A2 RUNOFF
Q_{100}=10.1 CFS
Q_{10}=5.9 CFS

TOTAL RUNOFF
Q_{100}=25.9 CFS
Q_{10}=15.4 CFS

AREA-A3 RUNOFF
Q_{100}=5.0 CFS
Q_{10}=2.9 CFS

TOTAL RUNOFF
Q_{100}=30.9 CFS
Q_{10}=18.3 CFS

AREA-A4 RUNOFF
Q_{100}=5.3 CFS
Q_{10}=3.1 CFS

TOTAL RUNOFF
Q_{100}=36.2 CFS
Q_{10}=21.4 CFS

AREA-A5 RUNOFF
Q_{100}=8.6 CFS
Q_{10}=5.0 CFS

TOTAL RUNOFF
Q_{100}=44.8 CFS
Q_{10}=24.5 CFS

TOTAL RUNOFF
Q_{100}=74.0 CFS
Q_{10}=43.5 CFS

AREA-B1 RUNOFF
Q_{100}=13.1 CFS
Q_{10}=7.8 CFS

AREA_B2 RUNOFF
Q_{100}=12.6 CFS
Q_{10}=7.5 CFS

TOTAL RUNOFF
Q_{100}=25.2 CFS
Q_{10}=15.1 CFS

LINE A — LINE B — LINE C — LINE D — LINE E

EXISTING CULVERT (5) 60"S X 38"H ELLIPTICAL RCP

EXISTING 36" RCP

N / W / E / S — WEBB

1" = 80'

40 0 80 160 240

CITY OF RANCHO CUCAMONGA

RATIONAL METHOD HYDROLOGY MAP
PROPOSED CONDITION HYDROLOGY MAP
HILLWOOD-RANCHO CUCAMONGA INDUSTRIAL PROPERTY

SCALE:	1"=80'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0066
DATE:	4/23/20	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET 1
DESIGNED:			OF 1 SHEETS
CHECKED:			DWG. NO.
PLN CK REF:			
F.B.			

H:\2020\20-0066\DRAINAGE\HYDROLOGY\DWG FOLDER\20-0066-PHYD-RATIONAL PROP.DWG 4/23/2020 5:32:58 PM

PLOTTED:

APPENDIX B – HYDRAULICS

LINE-A WSPG MODEL

*To be included during final engineering

LINE-B WSPG MODEL

*To be included during final engineering

LINE C-WSPG MODEL

*To be included during final engineering

LINE-D WSPG MODEL

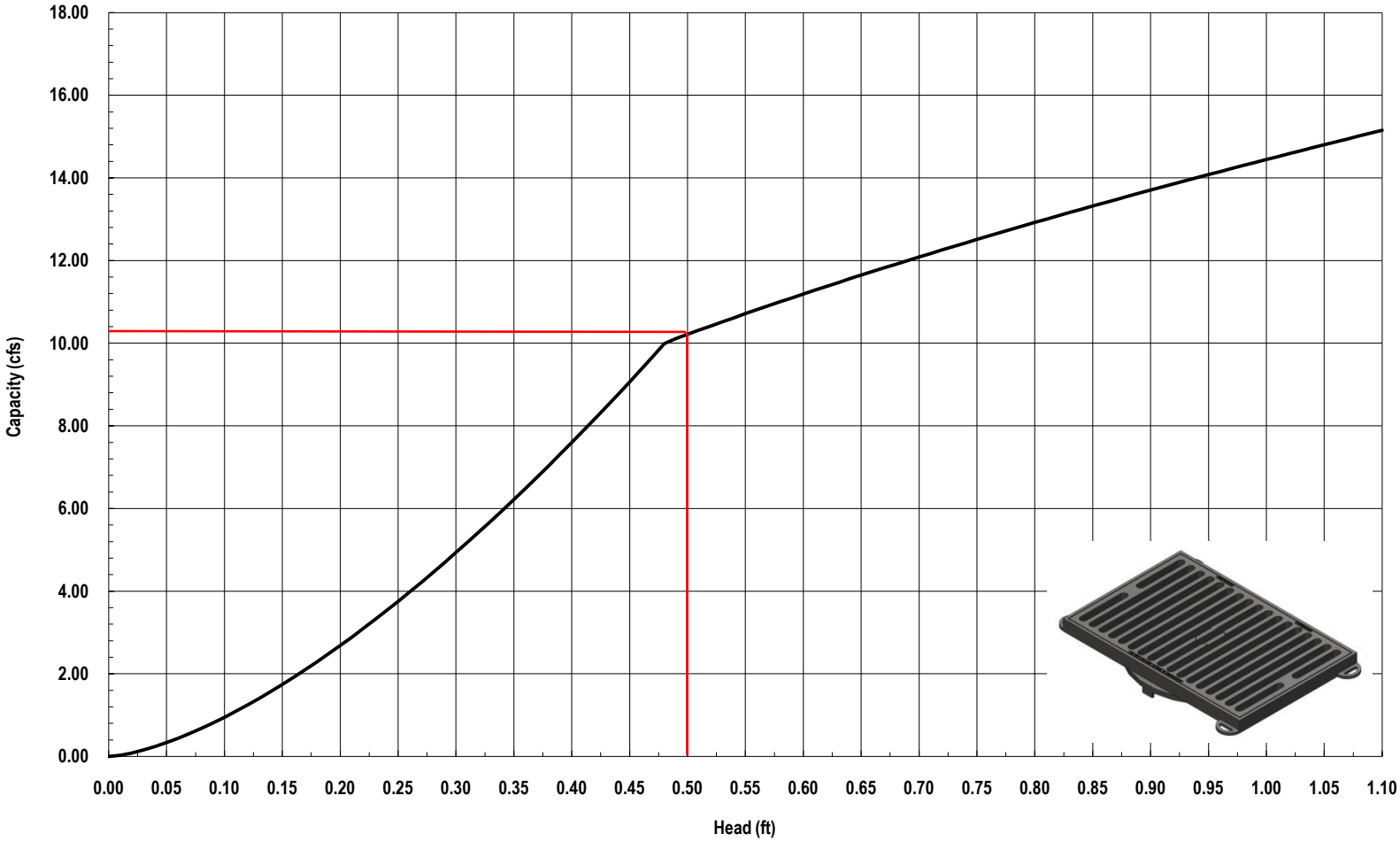
*To be included during final engineering

LINE-E WSPG MODEL

*To be included during final engineering

INLET CAPACITIES

Nyloplast 2' x 3' Road & Highway Grate Inlet Capacity Chart



Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
© Nyloplast Inlet Capacity Charts June 2012

CMP DETENTION BASIN

CMP DETENTION BASIN SIZING

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH CONSTRUCTION PRODUCTS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

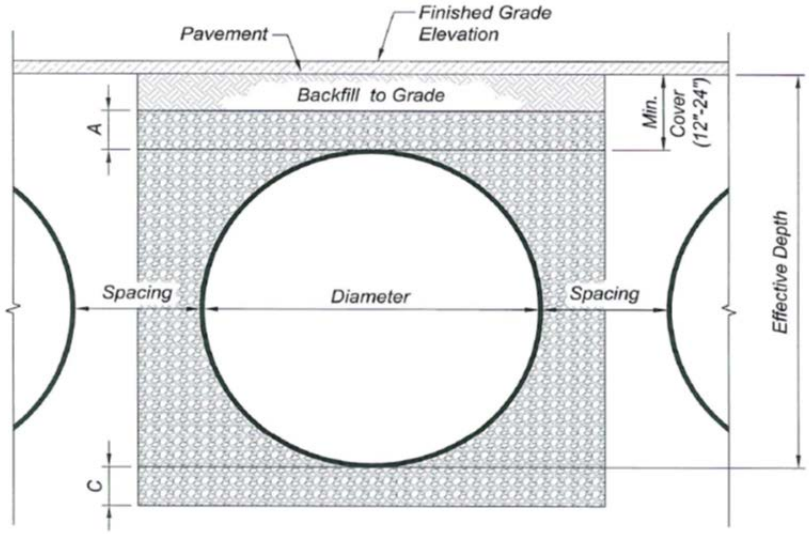
Date:	4/17/2020
Project Name:	Hillwood - Napa BLDG A
City / County:	Rancho Cucamonga
State:	CA
Designed By:	CV
Company:	Albert A. Webb Associates
Telephone:	(951) 686-1070

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	98,530
Limiting Width (ft):	53.50
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	78
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1.5
Depth A: Porous Stone Above Pipe (in):	9
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

33.18 ft^2 Pipe Area



System Sizing

Pipe Storage:	64,176	cf	
Porous Stone Storage:	34,678	cf	
Total Storage Provided:	98,854	cf	100.3% Of Required Storage
Number of Barrels:	5	barrels	
Length per Barrel:	369.0	ft	
Length Per Header:	44.5	ft	
Rectangular Footprint (W x L):	47.5 ft x 385. ft		

CONTECH Materials

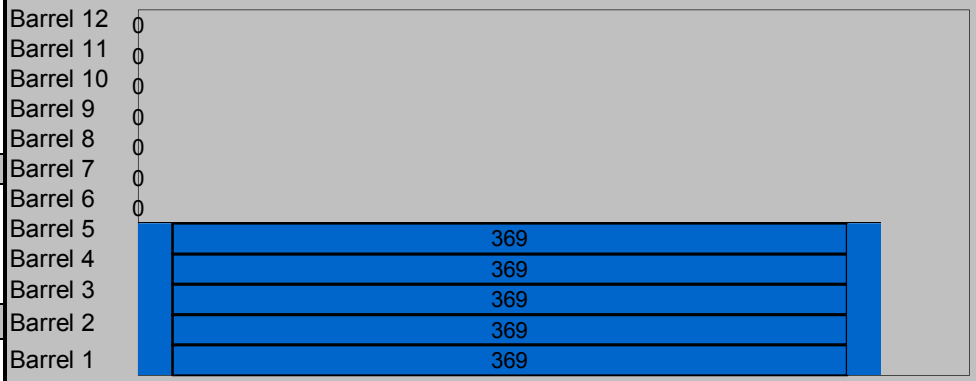
Total CMP Footage:	1,934	ft
Approximate Total Pieces:	84	pcs
Approximate Coupling Bands:	87	bands
Approximate Truckloads:	42	trucks

Construction Quantities**

Total Excavation:	6096	cy
Porous Stone Backfill For Storage:	3211	cy stone
Backfill to Grade Excluding Stone:	508	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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CONTECH CONSTRUCTION PRODUCTS INC.

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and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

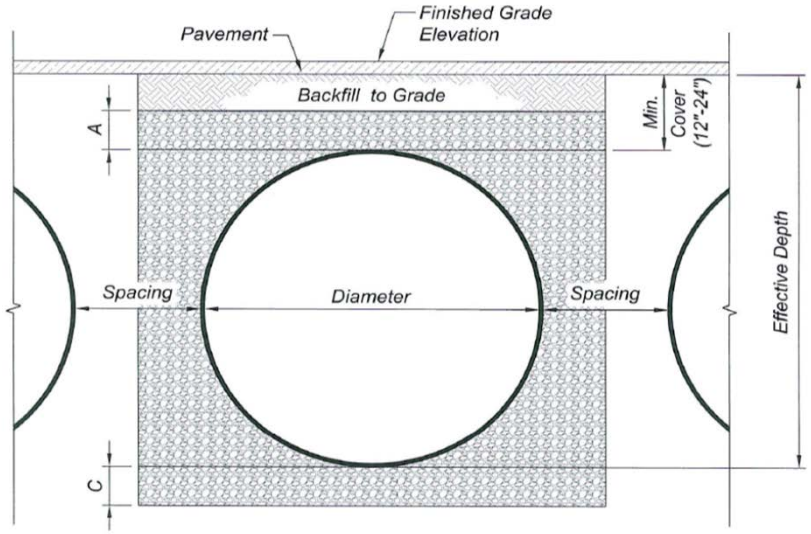
Date:	4/17/2020
Project Name:	Hillwood-Napa BLDG B
City / County:	Rancho Cucamonga
State:	CA
Designed By:	CV`
Company:	Albert A. Webb Associates
Telephone:	(951) 686-1070

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	32,915
Limiting Width (ft):	23.00
Invert Depth Below Asphalt (ft):	7.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	60
Number Of Headers:	1
Spacing between Barrels (ft):	2.50
Stone Width Around Perimeter of System (ft):	1.5
Depth A: Porous Stone Above Pipe (in):	9
Depth C: Porous Stone Below Pipe (in):	24
Stone Porosity (0 to 40%):	40

19.63 ft^2 Pipe Area



System Sizing

Pipe Storage:	18,241	cf	
Porous Stone Storage:	14,878	cf	
Total Storage Provided:	33,119	cf	100.6% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	303.0	ft	
Length Per Header:	20.0	ft	
Rectangular Footprint (W x L):	23. ft x 311. ft		

CONTECH Materials

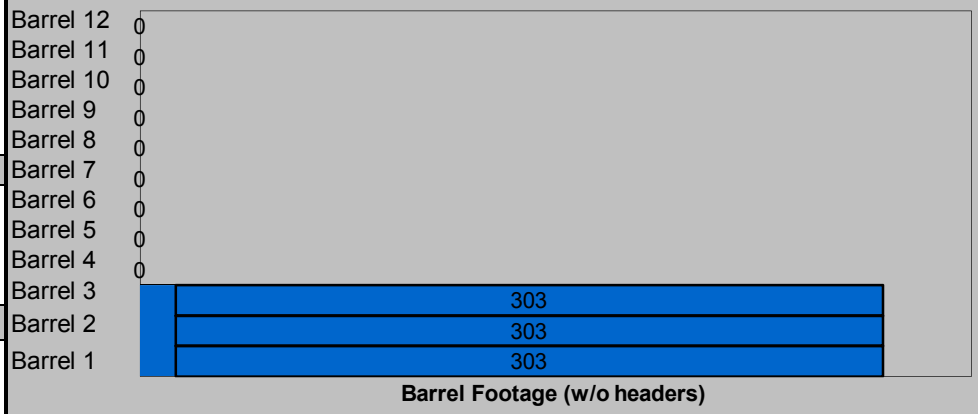
Total CMP Footage:	929	ft
Approximate Total Pieces:	40	pcs
Approximate Coupling Bands:	39	bands
Approximate Truckloads:	10	trucks

Construction Quantities**

Total Excavation:	1855	cy
Porous Stone Backfill For Storage:	1378	cy stone
Backfill to Grade Excluding Stone:	-198	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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CMP DETENTION BASIN DRAWDOWN CALCULATION

Underground Storage System A
Drawdown Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

Designer: CV
Date: 4/21/2020
Project: Hillwood- Napa BLDG A
Location: City of Rancho Cucamonga
Area: DA-1

(1)	VBMP =	98,530	ft^3
(2)	Basin Bottom Area=	18288	ft^2
(3)	Infiltration Rate =	1.61	in/hr*

$$Drawdown = \frac{V_{BMP}\ (ft^3)}{Infiltration\ Rate\left(\frac{in}{hr}\right) \times \left(\frac{1ft}{12in}\right) \times Bottom\ Area\ (ft^2)}$$

Water Quality Drawdown Time= 40.2 hr

* Infiltration rate 4.5 in/hr and has a Factor of Safety of 2.8 (per Worksheet H in Appendix C)

Underground Storage System B
Drawdown Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

Designer: CV
Date: 4/21/2020
Project: Hillwood- Napa BLDG B
Location: City of Rancho Cucamonga
Area: DA-1

(1)	VBMP =	32,915	ft^3
(2)	Basin Bottom Area=	7153	ft^2
(3)	Infiltration Rate =	2.25	in/hr*

$$Drawdown = \frac{V_{BMP}\ (ft^3)}{Infiltration\ Rate\left(\frac{in}{hr}\right) \times \left(\frac{1ft}{12in}\right) \times Bottom\ Area\ (ft^2)}$$

Water Quality Drawdown Time= 24.5 hr

* Infiltration rate 6.3 in/hr and has a Factor of Safety of 2.8 (per Worksheet H in Appendix C)

APPENDIX C – REFERENCES

1110 LEFT

1110 C.L.

1110 RIGHT

L=78.54' CURB RETURN

100.00' V.C. PVI=1105.22

79.00' V.C. PVI=1106.26

37.11' V.C. PVI=06.19'

200.00' V.C. PVI=1102.06

200.00' V.C. PVI=1102.03

EXISTING GROUND @ R/W

EXISTING GROUND @ C/L

T.C. 26' LEFT

C/L PROFILE GRADE

T.C. 26' RIGHT

SEE DETAIL "A" FOR LOCAL DEPRESSION

-0.57%

-0.50%

-1.05%

0.50%

TAN. = -1.53%

TAN. = 0.14%

TAN. = -1.98%

TAN. = 1.16%

TAN. = 0.64%

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00

PROFILE SCALE

VERT: 1" = 4'

HORZ: 1" = 40'

**NOTE: FIELD GRADE TO DRAIN 1% MINIMUM OVER MWD EASEMENT

*NOTE: TOP OF MWD PIPE ESTIMATED FROM RECORD DATA. PROTECT PIPE IN PLACE.

SCALE: 1" = 40'

CONSTRUCTION NOTES:

1. CONST. 8" CURB AND GUTTER PER SAN BERNARDINO COUNTY STD. NO. 115
3. CONST. A.C. PAVING OVER A.B.
4. CONSTRUCT 6' CONCRETE SIDEWALK PER S.B.CO. STD. 109, TYPE C
7. CONSTRUCT 16' D/W APPROACH PER MODIFIED S.B.CO. STD. 129
9. CONSTRUCT ST. LIGHT BASE & P.B. PER A.P.W.A. STD. 443-0 & 460-0
17. INSTALL 18" RCP CLASS IV
23. CONSTRUCT TYPE "A" CATCH BASIN PER S.B.CO. STD. 206
24. CONSTRUCT LOCAL DEPRESSION PER S.B.CO. STD. 203-B
27. (5) 60"S x 38"H HORIZ. ELLIPTICAL RCP (1000 D-LOAD, MIN.) WITH CALTRANS STRAIGHT HEADWALL, D89 (L=69.5', H=8.33')
33. CONSTRUCT STRAIGHT HEADWALL PER CALTRANS STD. D89
35. INSTALL FACING RIP-RAP - 1.8' THICK MIN.
36. INSTALL LIGHT RIP-RAP - 2.5' THICK MIN.
44. INSTALL PIPE GATE PER S.B.C.F.C.D. STD. 209

ETIWANDA AVENUE

SEE SHEET 3

SEE SHEET 2

ETIWANDA AVENUE

FUTURE R/W

EXISTING R/W

M.W.D. EASEMENT

APN 229-291-22

APN 229-291-23

APN 229-291-24

APN 229-291-25

GRADED ROAD

RANCHO CUCAMONGA CITY LIMITS

S.C.E. ETIWANDA GENERATING STATION

-0+02.10 C/L NAPA ST. = 46+06.69 C/L ETIWANDA AVE.

NAPA STREET

SOUTHERN CALIFORNIA EDISON CO. P/L

S.C.E. P/L

PROPOSED R/W

EXISTING SCE GRADED ACCESS ROAD

40' M.W.D. EASEMENT

SCE TOWER (TYP.)

PP #1888781E

PP #1888782E(PROTECT IN PLACE)

4' CUTOFF WALL PER CALTRANS STD. D84 TYP. EACH HEADWALL

SEE DETAIL "A" ON SHEET 14

SEE DETAIL "H" ON SHEET 14

SEE SECT. "E-E" ON SHT. 14

SEE SECT. "F-F" ON SHT. 5

REMOVE EXIST. ASPHALT WITHIN CONSTRUCTION AREA & PROPERLY DISPOSE OF

FILL WITH DIRT

PROTECT 12" GAS LINE IN PLACE

FUTURE SLOPE EASEMENT

DRAINAGE EASEMENT

JOIN EXIST. LEVEE FIELD CONSTRUCT.

6+60 END LIGHT RIP-RAP BEGIN FACING RIP-RAP

MATCH LINE SEE SHEET 5

CURB RETURN CURVE DATA
Δ =90°00'18"
R=50.00'
L=78.54'
T=50.00'

CURB RETURN CURVE DATA
Δ=89°59'42"
R=50.00'
L=78.54'
T=50.00

N89°42'00"W 199.50'

N89°42'00"W 305.02'

N 00°18'19" E

R=846.00' L=179.30 Δ=12°08'35" R=820.00' L=173.79' T=87.22'

R=794.00' L=168.28' Δ=12°08'35" R=820.00' L=173.79' T=87.22'

R=974.00' L=177.75 Δ=10°27'22" R=1000.00' L=182.49' T=91.50'

R=1026.00' L=187.24'

LEVEL 3:1

VARIES

GRADE TO DRAIN

GRADE TO DRAIN 1%

GROUT RIP-RAP PAD

STA. 5+70 5-60"S x 38" H. RCP

STA. 6+55.00 C/L-EER 1%=10' V=5.0'

1097.90 F.L.

1097.0 F.L.

1098.40 F.L.

1098.4 INV.

1098.10 F.L.

1106.0 F.S.

1106.6 F.S.

1106.0 F.S.

1106.0 F.S.

1106.0 FS

10+32.49 P.R.C.

SEE SHEET 5

APN 229-291-25

SCE OVERHEAD LINE SEE DETAIL "C" ON SHT. 14

SCE OVERHEAD LINE SEE DETAIL "A" ON SHT. 14

STA. 3+16± SCE OVERHEAD LINE SEE DETAIL "A" ON SHT. 14

STA. 5+09± SCE OVERHEAD LINE SEE DETAIL "C" ON SHT. 14

STA. 5+44.98 EC

STA. 6+15.00 SCE OVERHEAD LINE SEE DETAIL "A" ON SHT. 14

STA. 6+35.00 C/L 16' D/W

STA. 8+50.00 46.5 LT. C/L

STA. 8+00.00 98.50 FL

STA. 9+85.00

STA. 0+87.91 ECR BEGIN CONSTRUCTION

STA. 1+97.40 BC

STA. 2+65.00

STA. 2+95.00 C.L. 16' D/W

STA. 3+71.19 PRC

STA. 4+20 BEGIN FACING RIP-RAP

STA. 4+20 BEGIN LIGHT RIP-RAP

STA. 4+55.00

STA. 3+05.00 C.L. 16' D/W

STA. 8+15.00

STA. 9+00 C.B.

STA. 8+35.00 C.B.

STA. 6+50.00

STA. 6+25.00

STA. 5+75.00

STA. 5+25.00

STA. 4+75.00

STA. 4+25.00

STA. 3+75.00

STA. 3+25.00

STA. 2+75.00

STA. 2+25.00

STA. 1+75.00

STA. 1+25.00

STA. 0+75.00

STA. 0+25.00

STA. 0+42.40 L/P

STA. 0+46.08

STA. 0+65.75

STA. 0+85.50 MVC

STA. 1+05.25

STA. 1+25.00 EVC

STA. 1+06.45 MVC

STA. 1+25.00 EVC

STA. 1+15.72

STA. 1+26.13 V.C.

STA. 0+97.17

STA. 10+32.49 PRC

STA. 9+85.00

STA. 8+50.00 B.C.

STA. 8+15.00

STA. 7+75.00

STA. 7+50.00

STA. 7+25.00

STA. 7+00.00 EVC

STA. 6+75.00

STA. 6+50.00

STA. 6+25.00

STA. 6+00.00 MVC

STA. 5+75.00

STA. 5+50.00

STA. 5+25.00

STA. 5+00.00 BVC

STA. 4+75.00

STA. 4+50.00

STA. 4+25.00

STA. 4+00.00 BVC

STA. 3+75.00

STA. 3+50.00 EVC

STA. 3+25.00

STA. 3+00.00 MVC

STA. 2+75.00

STA. 2+50.00 BVC

STA. 2+25.00

STA. 2+00.00 BVC

STA. 1+75.00

STA. 1+50.00 BVC

STA. 1+25.00

STA. 1+00.00 MVC

STA. 0+75.00

STA. 0+50.00 BVC

STA. 0+25.00

STA. 0+00.00 BCR

STA. 0+87.89 ECR

STA. 0+87.91 ECR

STA. 0+65.75

STA. 0+46.08

STA. 0+42.40 L/P

STA. 0+02.10

1107.08 BCR

1106.79 CR

1106.58 CR

1106.45 CR

1106.42 T.C.

1106.51 C.L.

1106.83 C.L.

1106.82 C.L.

1106.10 C.L.

1106.06 C.L.

1106.37 C.L.

1105.38 F.L.

1105.17 BCR

1108.42 CR

1105.67 CR

1105.90 CR

1106.07 T.C.

1106.14 T.C.

1108.10 T.C.

1106.11 V.C.

1126.13 V.C.

1104.19 C.L.

1104.22 T.C.

1103.55 F.L.

1104.22 T.C.

1103.55 F.L.

1103.11 T.C.

1102.87 T.C.

1102.68 T.C.

1102.54 T.C.

1102.45 V.C.

1102.40 T.C.

1102.41 T.C.

1102.46 T.C.

1102.56 T.C.

1103.08 C.L.

1102.84 C.L.

1102.65 C.L.

1102.97 C.L.

1102.43 C.L.

1102.53 C.L.

1103.17 T.C.

1102.87 T.C.

1102.68 T.C.

1102.54 T.C.

1102.45 V.C.

1102.40 T.C.

1102.41 T.C.

1102.46 T.C.

1102.56 T.C.

1103.41 T.C.

1102.87 T.C.

1102.68 T.C.

1102.54 T.C.

1102.45 V.C.

1102.40 T.C.

1102.41 T.C.

1102.46 T.C.

1102.56 T.C.

1104.94 T.C.

1104.69 T.C.

1103.14 T.C.

1103.15 T.C.

1103.33 T.C.

1103.47 T.C.

1104.94 T.C.

1104.69 T.C.

1104.90 C.L.

1104.66 C.L.

1103.12 C.L.

1103.30 C.L.

1103.44 C.L.

1104.90 C.L.

1104.66 C.L.

1103.14 C.L.

1103.33 C.L.

1103.47 C.L.

1104.94 T.C.

1104.69 T.C.

1103.15 T.C.

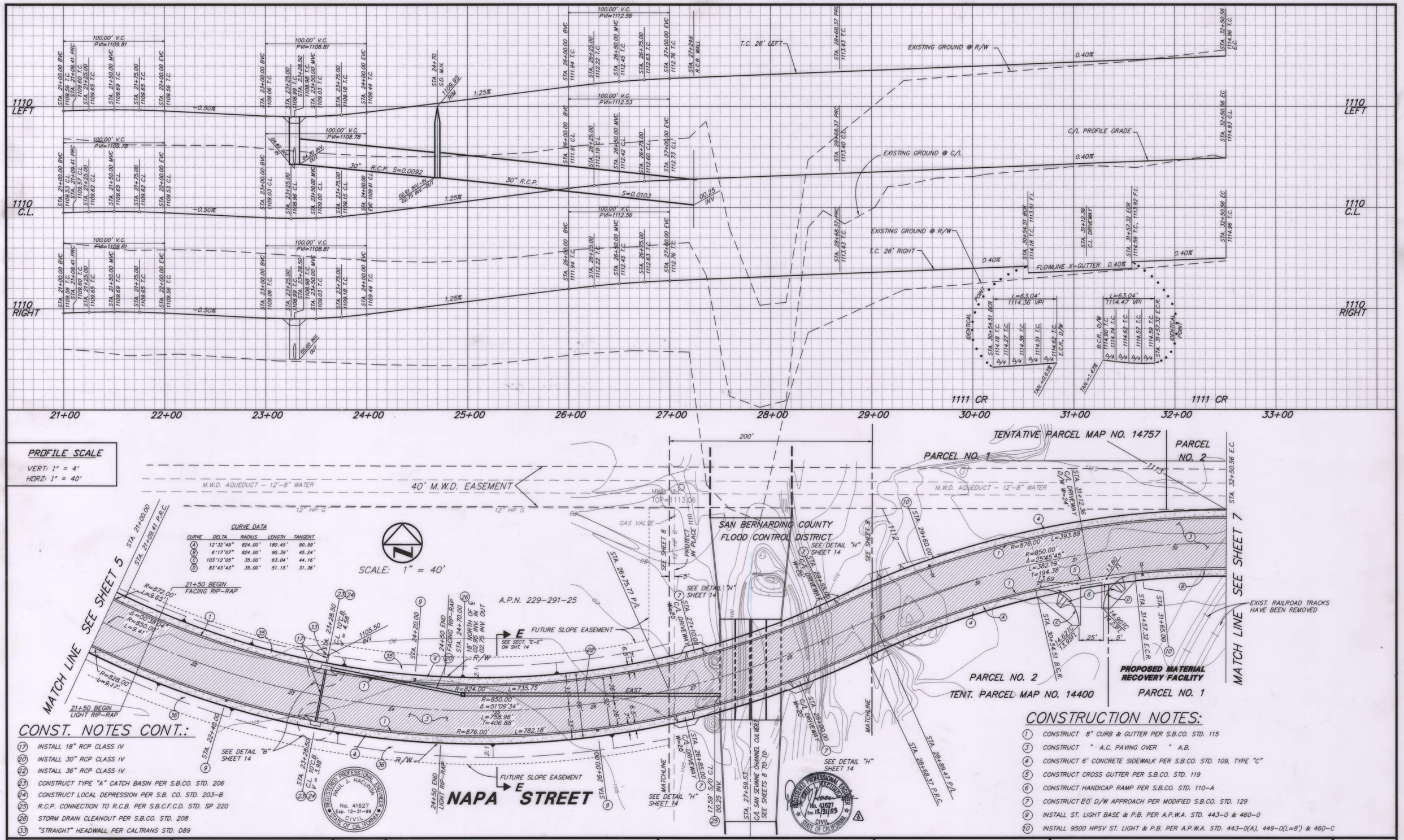
1103.33 T.C.

1103.47 T.C.

1104.94 T.C.

1104.69 T.C.

1103.14



CONST. NOTES CONT.:

(17) INSTALL 18" RCP CLASS IV
(20) INSTALL 30" RCP CLASS IV
(22) INSTALL 36" RCP CLASS IV
(23) CONSTRUCT TYPE "A" CATCH BASIN PER S.B.CO. STD. 206
(24) CONSTRUCT LOCAL DEPRESSION PER S.B. CO. STD. 203-B
(25) R.C.P. CONNECTION TO R.C.B. PER S.B.C.F.C.D. STD. SP 220
(26) STORM DRAIN CLEANOUT PER S.B.CO. STD. 208
(33) "STRAIGHT" HEADWALL PER CALTRANS STD. D89

CONSTRUCTION NOTES:

(1) CONSTRUCT 8" CURB & GUTTER PER S.B.CO. STD. 115
(3) CONSTRUCT " A.C. PAVING OVER " A.B.
(4) CONSTRUCT 6' CONCRETE SIDEWALK PER S.B.CO. STD. 109, TYPE "C"
(5) CONSTRUCT CROSS GUTTER PER S.B.CO. STD. 119
(6) CONSTRUCT HANDICAP RAMP PER S.B.CO. STD. 110-A
(7) CONSTRUCT 20' D/W APPROACH PER MODIFIED S.B.CO. STD. 129
(9) INSTALL ST. LIGHT BASE & P.B. PER A.P.W.A. STD. 443-0 & 460-0
(10) INSTALL 9500 HPSV ST. LIGHT & P.B. PER A.P.W.A. STD. 443-0(A), 449-0(L=8') & 460-C

REGISTERED PROFESSIONAL ENGINEER PAUL J. HACUNDA No. 41627 Exp. 12-31-99 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER PAUL J. HACUNDA No. 41627 Exp. 12/31/99 CIVIL STATE OF CALIFORNIA

BENCH MARK: S.B.CO. SURVEYOR DISK STAMPED 700-22 1968
LOCATION: 5.00 FEET BELOW RR TRACKS (MAIN LINE) 0.4 MI. EAST OF ETIWANDA AVE. AT AT&SF RR, 58.2 FT. SOUTH OF SOUTH RAIL (MAIN LINE, 96 FT. WEST & 10 FT. SOUTH OF SIDING SWITCH, 10.75 POLES WEST OF MILEPOLE 93, IN N/W CORNER CONC. SLAB FOR MWD VALVES INSIDE A 6 FT. HIGH CHAIN LINK FENCE CAGE.
ELEVATION: 1125.014

SUBMITTED BY: Paul J. Hacunda
PAUL J. HACUNDA R.C.E. 41627, EXP. 12/31/99
DATE: 3-2-96

DRAWN BY: L.B.
DESIGN BY: D.R.C.
CHECKED BY: M.A.
RECOMMENDED BY:

REVISIONS

MARK	DATE	INITIAL	DESCRIPTION	APP'VD.

COUNTY OF SAN BERNARDINO
TRANSPORTATION/FLOOD CONTROL DEPARTMENT

DESIGNED BY	DRAWN BY	CHECKED BY
WMA/NK	NK/EMH	PJH/SJ

SUBMITTED BY _____ C.D.E.
RECOMMENDED/APPROVED BY: _____ 3/14/96
LAND DEVELOPMENT ENGR. DATE
APPROVED BY
ASSIST. DIRECTOR OF TRANS. DATE
DIRECTOR OF TRANSPORTATION DATE

ENGINEERING ASSOCIATES
Mail P.O. Box 6087 · 92412
Phone (909)884-8804 FAX (909)889-6143
225 East Airport Drive, San Bernardino, California

STREET IMPROVEMENT PLAN

NAPA STREET

SHEET: 6 OF 14 SHTS.
FILE NO. 34060.540

DATE=03/18/96 TIME=12:37 PATH=[NICK]-C:\ACADR12\34060\NAPA-S6.DWG

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS
TRANSPORTATION

PLANS FOR CONSTRUCTION ON

NAPA STREET CULVERT REPAIR

AT ETIWANDA CREEK

WEST FONTANA

WORK ORDER NO. H13870 ROAD NO. 585975 SA

LENGTH = 235 FT

FILE NO. 585975 SA

INDEX OF SHEETS

1 TITLE SHEET
2A PLAN AND PROFILE SHEET
3A DETAILS / TYPICAL SECTIONS
4 CROSS SECTION SHEET

THE FOLLOWING SPECIAL DRAWINGS AND COUNTY STANDARDS ARE ATTACHED TO THE SPECIAL PROVISIONS:

115 206 206B SP-1
109 206 206B SP-2
206A

TO BE SUPPLEMENTED BY THE FOLLOWING AMERICAN PUBLIC WORKS ASSOCIATION (APWA), LATEST.

606-1

TO BE SUPPLEMENTED BY THE FOLLOWING CALTRANS STANDARD PLANS DATED JULY, 1992.

~~A62A~~
~~D90~~
~~D96~~

TO BE SUPPLEMENTED BY THE FOLLOWING MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) OR CALIFORNIA SUPPLEMENT, 2003

FIG 3A-102 (CA) FIG 3A-104(CA)
FIG 3C-101 (CA)
FIG 6H-6 TA-6
FIG 6H-32 (CA) TA-32

THIS PROJECT REQUIRES A CONTRACTOR'S LICENSE CLASS "A"

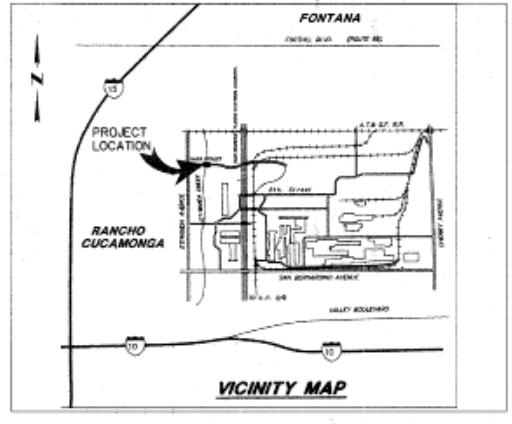
GENERAL NOTES

(U) The fact that any Utility Facility is shown or not shown upon the plans shall not relieve the Contractor of the responsibility under Section 8-1.10 "Utility and Non-Highway Facilities," of the State Standard Specifications. It shall be the Contractor's responsibility, pursuant thereto, to ascertain the location of any Utility Facility which may be subject to damage by reason of the Contractor's operations.

1. All Stationing Notes on plan refer to the C.L. imp. NAPA STREET
2. Dimensions are subject to tolerances specified in the State Standard Specifications.
3. All Pavement Width Dimensions shown on the plans are to the Edge of Pavement, unless otherwise noted.
4. Transitions and Warping shall be as shown and as determined by the Engineer.
5. Asphalt Concrete Overlays shall be feathered to meet existing as shown on the plans or as determined by the Engineer.
6. All Trees & Vegetation outside the limits of excavation and embankment slope lines, shall be protected in place.

BENCH MARK: S.B.CO. SURVEYOR DISK STAMPED 700-22 1968

LOCATION: 5.00 FEET BELOW RR TRACKS (MAIN LINE) 0.4 MI. EAST OF ETIWANDA AVE. AT AT&SF RR, 38.2 FT SOUTH OF SOUTH RAIL (MAIN LINE), 96 FT WEST & 10 FT SOUTH OF SIDING SWITCH, 10.75 POLES WEST OF MILEPOLE 163, IN N/W CORNER CONCRETE SLAB FOR MND VALVES INSIDE A 6 FT HIGH CHAIN LINK FENCE CAGE. ELEVATION = 1125.014



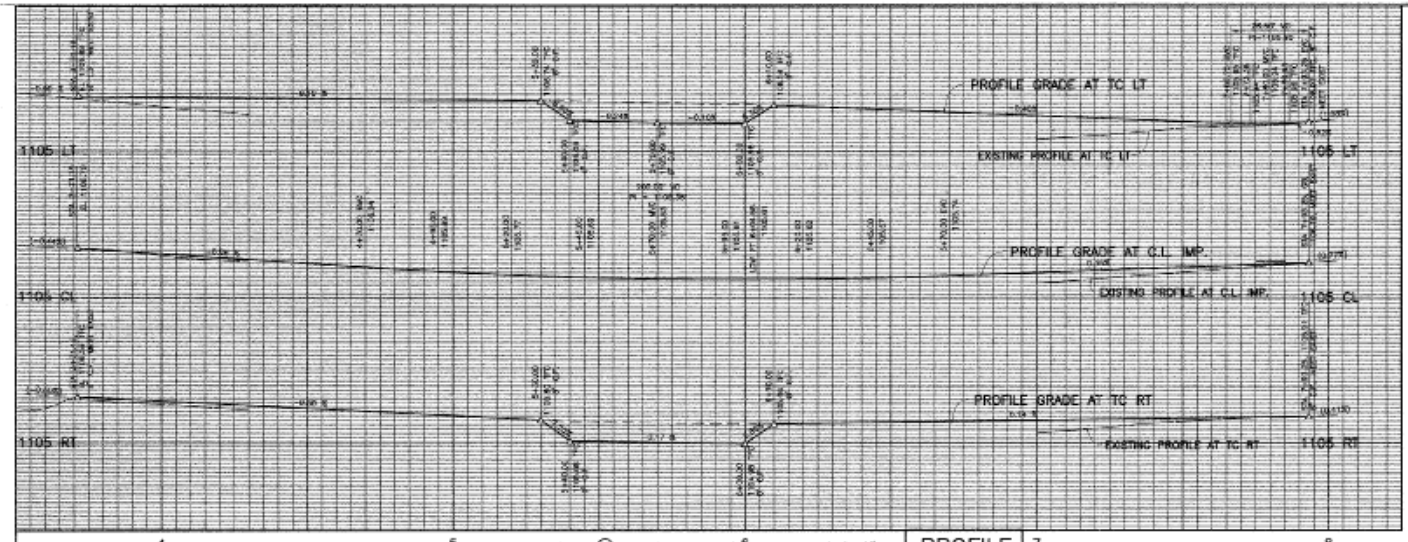
LOCATION MAP

NOT TO SCALE

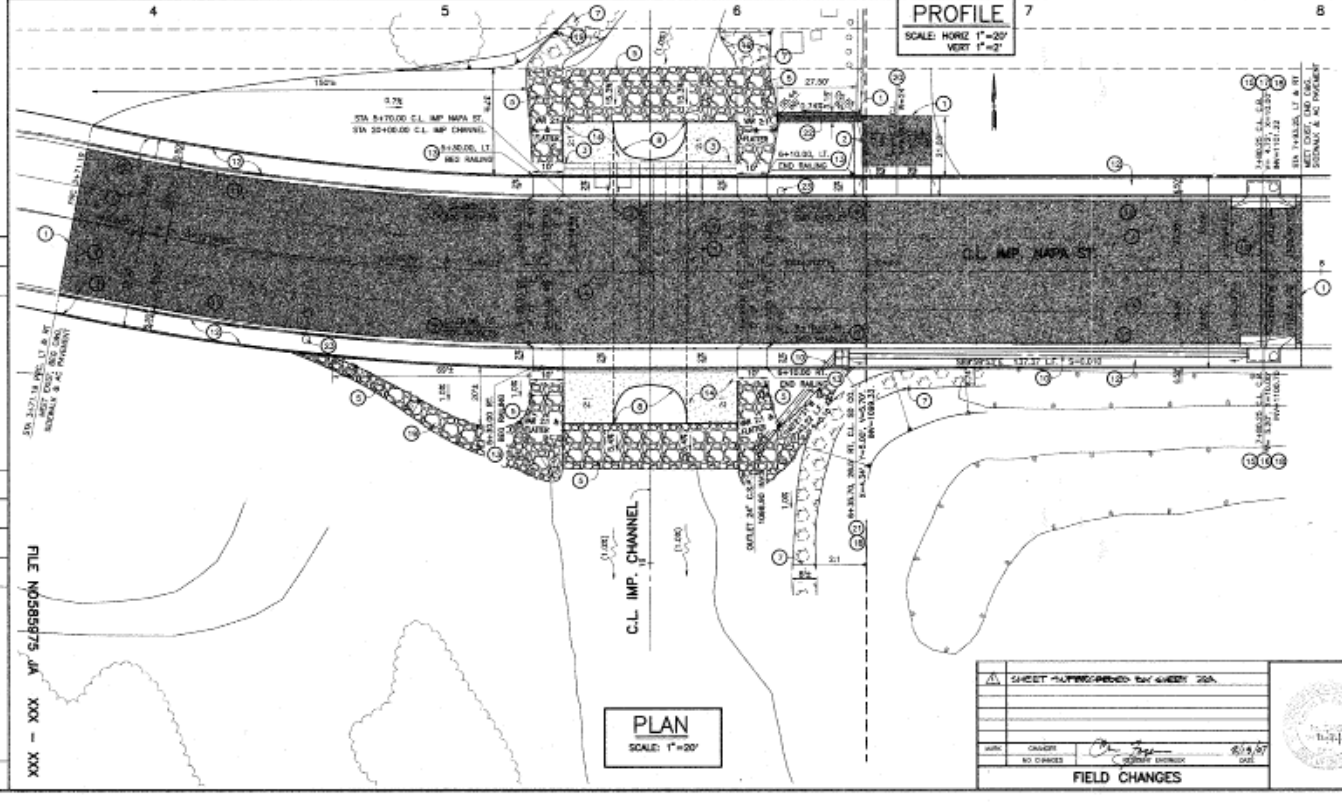
COUNTY OF SAN BERNARDINO

APPROVED BY: _____ 10/05
DIRECTOR OF PUBLIC WORKS R.C.E. 24903 DATE

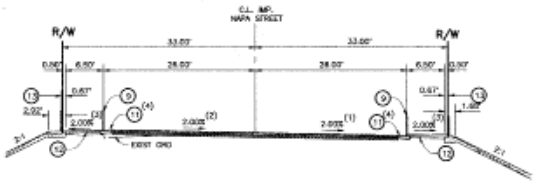
	PAGES SUPERSEDED BY 2A AND 3A		
	CHECKED CROSS SECTIONS		
	ADDITIONAL ENGINEERING		
MARK	CHANGES		
	NO CHANGES	RESIDENT ENGINEER	DATE
FIELD CHANGES		SHT. NO. 1	TOT. SHTS.



PROFILE
SCALE: HORIZ 1"=20'
VERT 1"=2'



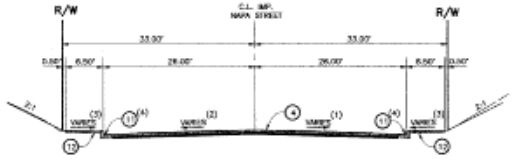
PLAN
SCALE: 1"=20'



(1) CROSS SLOPE -2.00% TILT SECTION FROM 5+40.00 TO 6+00.00.
(2) CROSS SLOPE 2.00% TILT SECTION FROM 5+40.00 TO 6+00.00.
(3) CROSS SLOPE VARIES FROM 2.00% TO -2.00% FROM STA 5+30.00 TO STA 5+40.00.
CROSS SLOPE VARIES FROM -2.00% TO 2.00% FROM STA 6+00.00 TO STA 6+10.00.
(4) CURB HEIGHT = 0" FROM STA 5+40.00 TO STA 6+00.00 LT & RT.

TYPICAL SECTION

STA 5+40.00 TO 6+00.00
NOT TO SCALE



(1) CROSS SLOPE VARIES -3Bz TO -2.00% FROM STA 3+71.19 TO STA 5+40.00.
CROSS SLOPE VARIES FROM -2.00% TO -3Bz FROM STA 6+00.00 TO STA 7+80.25
(2) CROSS SLOPE VARIES -3Bz TO 2.00% FROM 3+71.19 TO STA 5+40.00.
CROSS SLOPE VARIES FROM 2.00% TO -3Bz FROM STA 6+00.00 TO STA 7+80.25
(3) CROSS SLOPE VARIES FROM 2.00% TO -2.00% FROM STA 5+30.00 TO STA 5+40.00.
CROSS SLOPE VARIES FROM -2.00% TO 2.00% FROM STA 6+00.00 TO STA 6+10.00.
(4) CURB HEIGHT = 6" FROM STA 3+71.19 TO STA 5+30.00 LT & RT.
CURB HEIGHT VARIES FROM 6" TO 0" FROM STA 5+30.00 TO STA 5+40.00 LT & RT.
CURB HEIGHT VARIES FROM 0" TO 6" FROM STA 6+00.00 TO STA 6+10.00 LT & RT.
CURB HEIGHT = 6" FROM STA 6+10.00 TO STA 7+80.25 LT & RT.

TYPICAL SECTION

STA 3+71.19 TO 5+40.00
STA 6+10.00 TO 7+80.25
NOT TO SCALE

CONSTRUCTION NOTES:

1. SAWCUT EXISTING AC AND/OR CONCRETE.
2. REMOVE & DISPOSE EXISTING AC PAVEMENT, CONCRETE CURB, GUTTER & SIDEWALK.
3. REMOVE & DISPOSE OF EXISTING CONCRETE PIPE & HEADWALL & CONCRETE RACKWALL.
4. PLACE 0.45' TYPE "A" ASPHALT CONCRETE OVER 0.35' CLASS 2 AGGREGATE BASE.
5. PLACE 1/2 TON C.M.U.P. PLACEMENT METHOD "M", SEE SPECIAL PROVISIONS.
6. PLACE 8' MIN WALL GRADED GRANULAR MED. SEE SPECIAL PROVISIONS.
7. PLACE LOOSE ROCK, 1/4 TON, 2' THK, SEE SPECIAL PROVISIONS.
8. INSTALL 28'-2" X 6'-2" ARCH CULVERT, SEE SPECIAL PROVISIONS.
9. INSTALL TYPE CA (-1 (30x2-2V) PER AASHTO 2003 CALIFORNIA SUPPLEMENTAL FIGURE 2C-101 (30x2-2V), 7.5'O.C. SPACING.
10. INSTALL 24" DRAIN PIPES, SEE SPECIAL PROVISIONS.
11. CONSTRUCT CURB & GUTTER PER CO. STD. 119.
12. CONSTRUCT 8' CONCRETE SIDEWALK TYPE "C" PER CO. STD. 109.
13. CONSTRUCT METAL HAND RAILING TYPE "M" PER A.P.W.A. STANDARD PLAN 608-1.
14. CONSTRUCT CONCRETE SLOPE PROTECTION & CUT-OFF WALL PER DETAIL SHEET 3A.
15. CONSTRUCT TYPE "A" CATCH BASIN PER CO. STD. 206.
16. CONSTRUCT TYPE "A" LOCAL DEPRESSION PER CO. STD. 203B, X=10.00'.
17. CONSTRUCT TYPE "B" LOCAL DEPRESSION PER CO. STD. 203B, X=12.00'.
18. CONSTRUCT 36" MANHOLE FRAME & COVER PER CO. STD. 205.
19. CONSTRUCT LEVEE SLOPES.
20. CONSTRUCT COMMERCIAL DRIVEWAY APPROACH WITH CURB PER SPEC. DWG. 1.
21. CONSTRUCT STORM DRAIN CLEANOUT PER CO. STD. 208.
22. CONSTRUCT ASPHALT ENTRIES DRAIN PER SPEC. DWG. 11.
23. REMOVE & REPLACE EXISTING STREET LIGHT.

SHEET TYPE CHANGED BY SHEET 2A.

DATE	CHANGES	
	NO CHANGES	6/19/07

FIELD CHANGES

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DRAWN BY	CHECKED BY	PROJ. ENGR.
WCH	WCH	BPB

SUBMITTED BY
CHIEF DESIGN ENGINEER — DATE

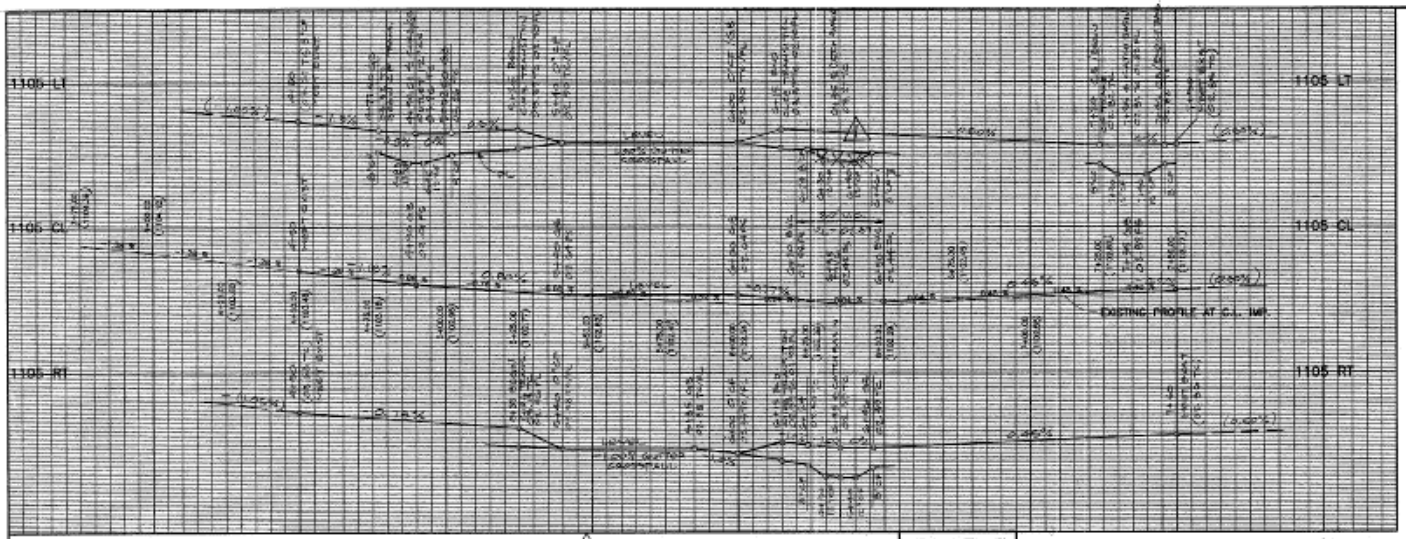
RECOMMENDED / APPROVED BY
ASSISTANT DIRECTOR — DATE
DIRECTOR OF PUBLIC WORKS — DATE

NAPA STREET
AT ETIWANDA CREEK
FROM STA. 3+71.19 TO STA. 7+80.25

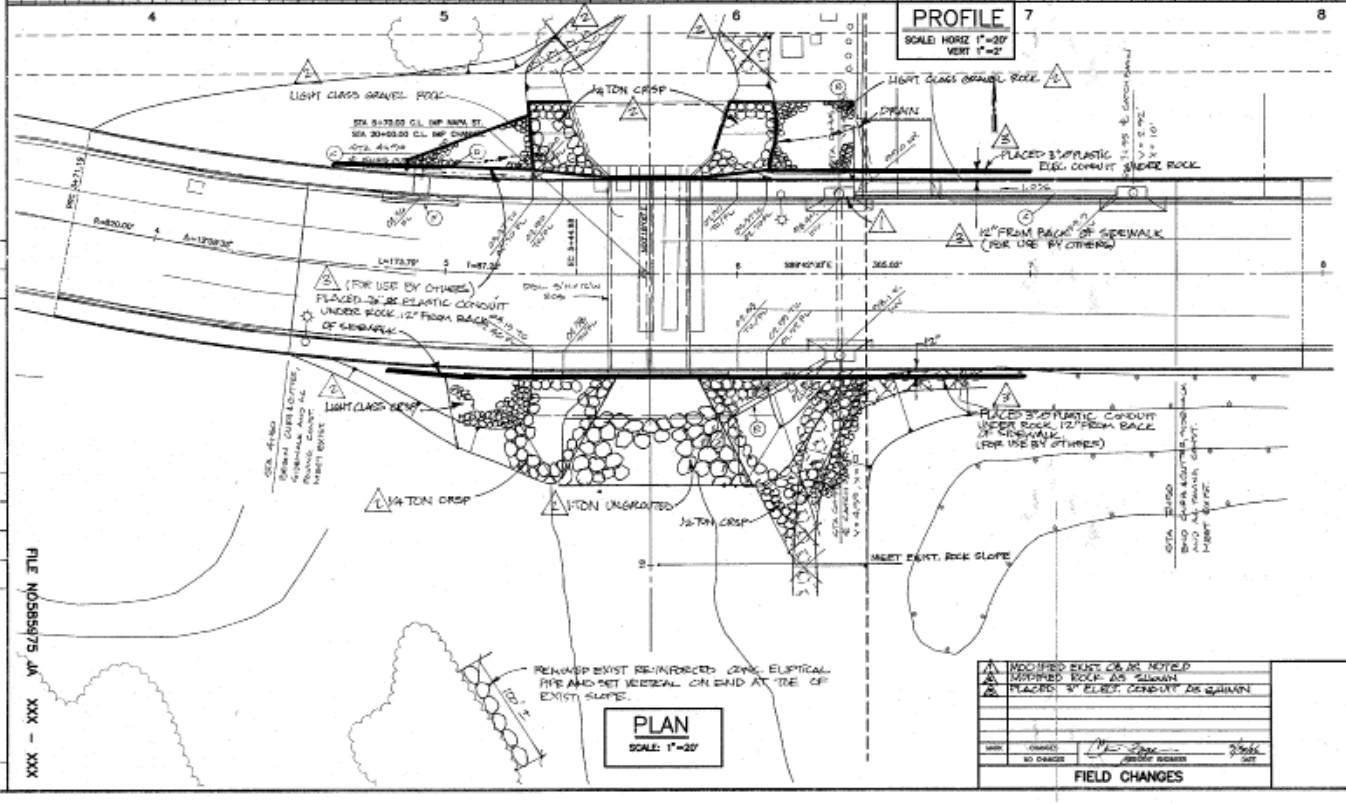
JOB NO.	WO. NO.	PLAN SCALE	SHT. NO.	TOT. SHTS.
JL XXXX	H13870	1" = 20'	2	3

FILE NO.585975 JA XXX - XXX

FILE NO585975 JA XXX - XXX



PROFILE
SCALE: HORIZ 1"=20'
VERT 1"=2'



PLAN
SCALE: 1"=20'

RENUMBER EXIST REINFORCED CONC. ELLIPTICAL PIPE AND SET VERTICAL ON END AT TOE OF EXIST. SLOPE.

△1 Ⓑ MODIFIED EXIST. C.B. TO PIPE JUNCTION STRUCT. NO CURB OPENING, NO LOCAL DEPRESSION

CONSTRUCTION NOTES:

Ⓐ CONST. CHAN OUTLET PER CO. STD. 816 (MODIFY PER PLAN)
Ⓑ REMOVE / RECONSTRUCT EXIST. CATCH BASIN I.O. AS DIRECTED IN FIELD
Ⓒ CONST. 18" CHAN IN RCP PER PLAN
Ⓓ CONST. 5' WIDE, 6" THK., VAR. DEPTH (15" MIN) CONCRETE "V" DITCH
Ⓔ CONST. 24" CHAN IN RCP PER PLAN
Ⓕ CONST. LOCAL DEPRESSION (SEE CO. STD. 834) (TYP. 2)

△1	MODIFIED EXIST. C.B. AS NOTED
△2	MODIFIED ROCK AS SHOWN
△3	PLACED 3" ELEC. CONDUIT AS SHOWN

MARK	CHANGES		DATE
	NO CHANGES		

FIELD CHANGES

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DRAWN BY	CHECKED BY	PREL. PACK.
WDH	MDH	BPB

SUBMITTED BY
"CHIEF DEPUTY ENGINEER" DATE

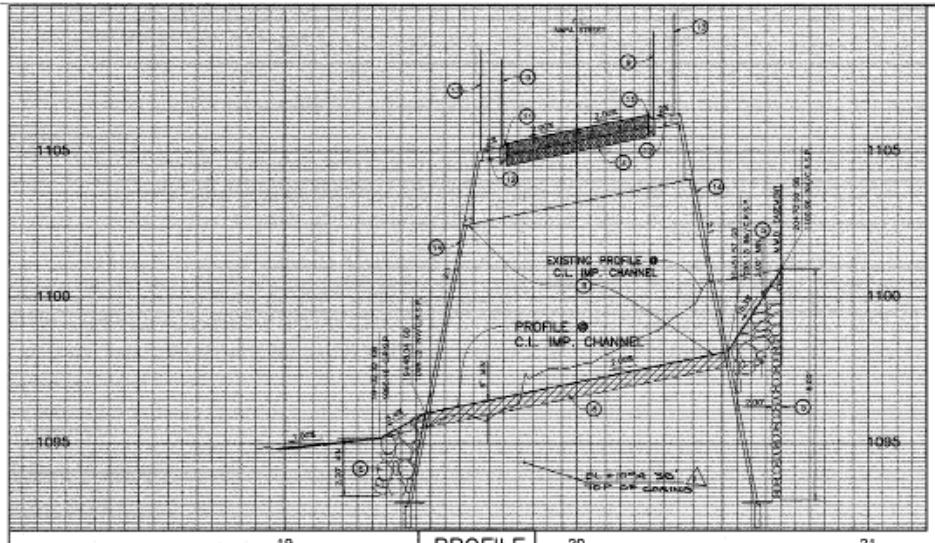
RECOMMENDED / APPROVED BY
ASSISTANT DIRECTOR DATE
DIRECTOR OF PUBLIC WORKS DATE

NAPA STREET
AT ETIWANDA CREEK
FROM STA. 3+71.19 TO STA. 7+80.25

JL NO.	W.O. NO.	PLAN SCALE	SHT. NO.	TOT. SHTS.
JL XXXX	H13870	1" = 20'	2A	3

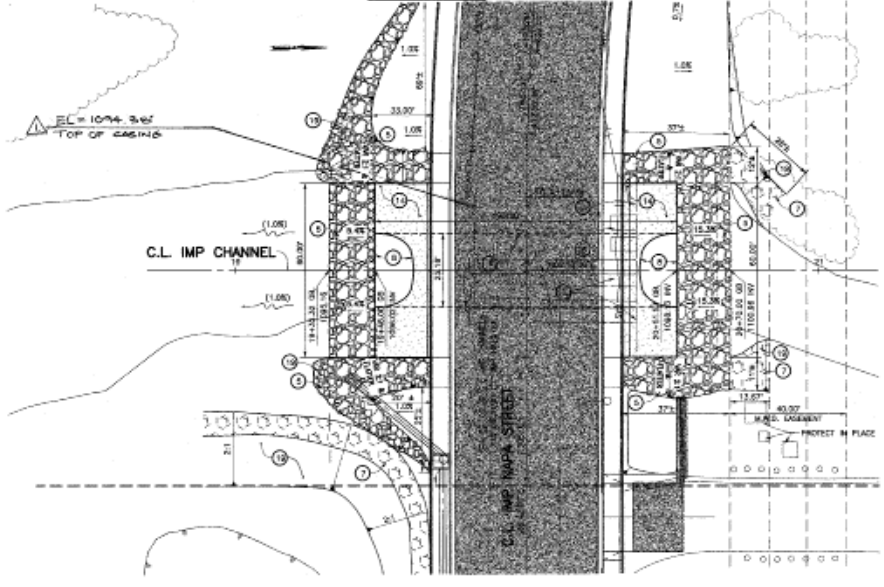
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FILE NO.535975 JA XXX – XXX



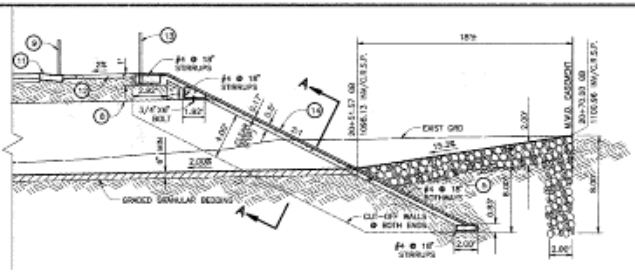
PROFILE

SCALE: HORIZ 1"=20'
VERT 1"=2'



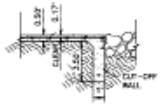
PLAN

SCALE: 1"=20'



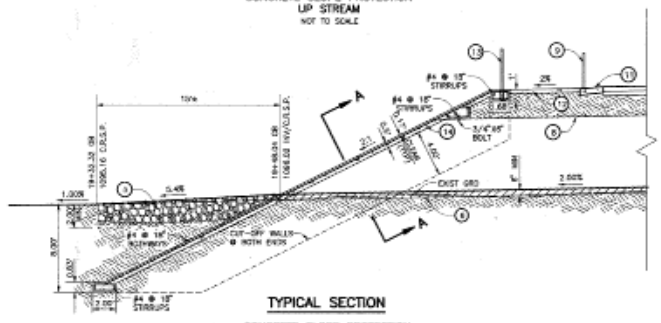
TYPICAL SECTION

CONCRETE SLOPE PROTECTION
UP STREAM
NOT TO SCALE



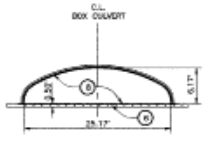
SECTION A–A

CUT-OFF WALL
NOT TO SCALE



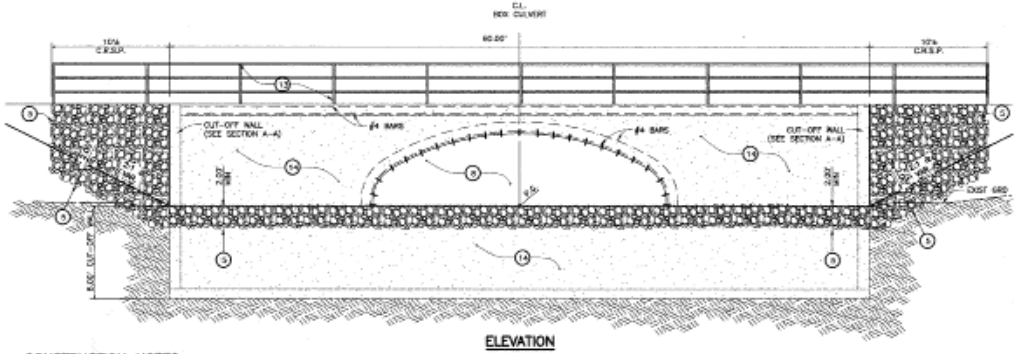
TYPICAL SECTION

CONCRETE SLOPE PROTECTION
DOWN STREAM
NOT TO SCALE



TYPICAL SECTION

BOX CULVERT
(MINIMUM DIMENSIONS)
NOT TO SCALE



ELEVATION

ARCH CULVERT & SLOPE PROTECTION
NOT TO SCALE

CONSTRUCTION NOTES:

1. REMOVE & DISPOSE OF EXISTING CONCRETE PIPES, HEADWALL & CONCRETE BACKFILL.
2. PLACE 0.65' TYPE "A" ASPHALT CONCRETE OVER 0.35' CLASS 2 AGGREGATE BASE.
3. PLACE 1/2 TON C.R.S.P. PLACEMENT METHOD "B", SEE SPECIAL PROVISIONS.
4. PLACE 8" MIN WELL GRADED GRANULAR BED, SEE SPECIAL PROVISIONS.
5. PLACE LOOSE ROCK, 1/4 TON, 2' THK, SEE SPECIAL PROVISIONS.
6. INSTALL 126"-3" C @ 6"-2" ARCH CULVERT, SEE SPECIAL PROVISIONS.
7. INSTALL TYPE CA L-1 (30#2-2K) PER MUTCD 2003 CALIFORNIA SUPPLEMENTAL FIGURE XC-101 (30#2-2K), 7 X7.0 C. SPACING
8. CONSTRUCT CURB & GUTTER PER CO. STD. 115.
9. CONSTRUCT 6" CONCRETE SIDEWALK TYPE "C" PER CO. STD. 109.
10. CONSTRUCT METAL HAND RAILING TYPE "A" PER A.P.W.A. STANDARD PLAN #28-1.
11. CONSTRUCT CONCRETE SLOPE PROTECTION & CUT-OFF WALL PER DETAIL SHEET 3A.
12. CONSTRUCT LEVEE SLOPES.

MARK	CHANGES	APPROVED CHANGES	DATE
1	ADDED ELEVATION TO PLAN & PROFILE VIEWS. SHEET CONFORMED BY SHEET 3A.		
2	NO CHANGES		2/13/07

FIELD CHANGES

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DRAWN BY	DESIGNED BY	PROJ. MGR.
WCH	WCH	BPS

SUBMITTED BY

RECOMMENDED / APPROVED BY

ASSISTANT DIRECTOR — DATE

DIRECTOR OF PUBLIC WORKS — DATE

NAPA STREET

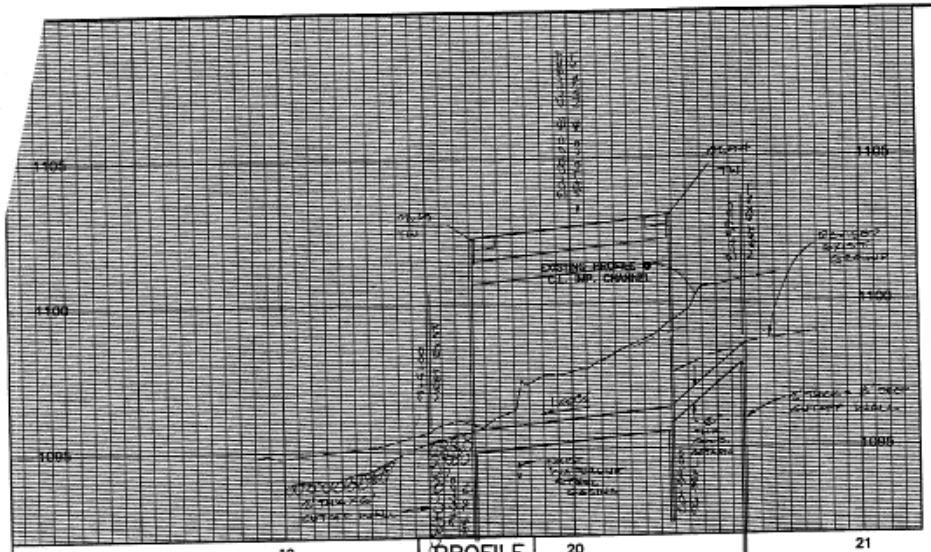
AT ETIWANDA CREEK

FROM 175'± SOUTH OF C.L. NAPA ST TO M.W.D. EASEMENT

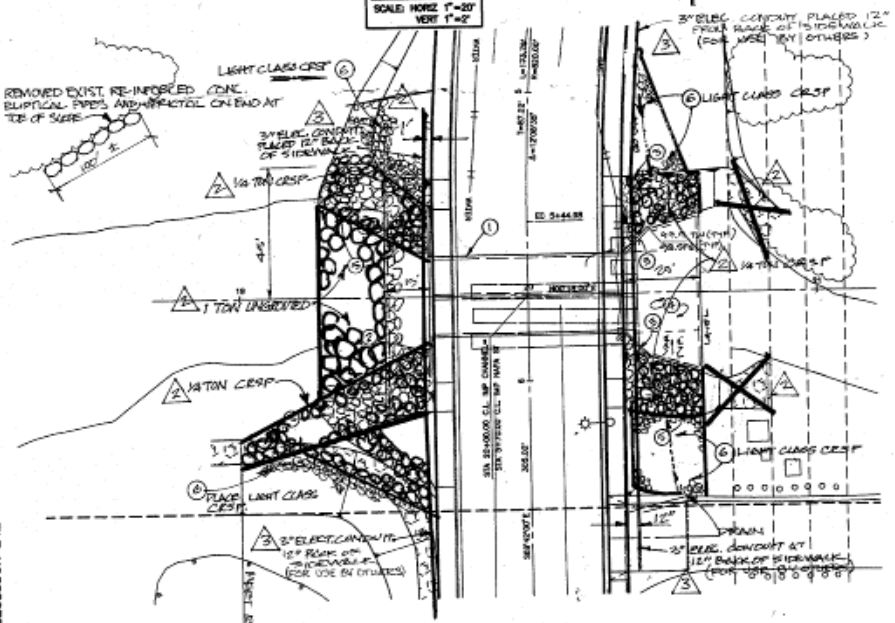
C.L. REF.	W.O. NO.	PLAN SCALE	SHT. NO.	TOT. SHTS.
JL XXXX	H13870	1" = 20'	3	3

FILE NO.585975 JA XXX – XXX

FILE NO.585975 JA XXX – XXX



PROFILE
SCALE: HORIZ 1"=20'
VERT 1"=2'



PLAN
SCALE: 1"=20'

CONSTRUCTION NOTES:

1. CONST. DBL. 6'H x 12'W RCB, PER CALTRANS STD D81C
2. CONST. TYPE "B" STRAIGHT WINGWALL, PER CALTRANS STD D84, LENGTH= 12'
3. CONST. TYPE "A" STRAIGHT WINGWALL PER CALTRANS STD D84, LH= 11'
4. CONST. 6" TH. CONC. APRON
5. PLACE 1/4 X TON C.S.S.R., PLACEMENT "A", SEE SPECIAL PROVISIONS
6. PLACE LIGHT CLASS CONCRETED ROCK SLOPE PROTECTION.

MARK	CHANGES	ENGINEER	DATE
1	MODIFIED EXIST. C.B. AS NOTED		
2	MODIFIED ROCK AS SHOWN		
3	PLACED 3" ELEC. CONDS. PER STANDARD		
	NO CHANGE		

FIELD CHANGES

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DRAWN BY	DESIGNED BY	PREV. DWG.
WCH	WCH	BPB

SUBMITTED BY
CHIEF DESIGN ENGINEER DATE

RECOMMENDED /APPROVED BY
ASSISTANT DIRECTOR DATE
DIRECTOR OF PUBLIC WORKS DATE

NAPA STREET
AT ETIWANDA CREEK
FROM 175'± SOUTH OF C.L. NAPA ST TO M.W.D. EASEMENT

FIL. NO.	R.O. NO.	PLAN SCALE	DWG. NO.	TOT. SHTS.
JL XXXX	H13870	1" = 20'	3A	3

FILE NO.585975 JA XXX – XXX

FILE NO.585975 JA XXX – XXX

Preliminary Water Quality Management Plan (WQMP)

For:

Hillwood - Rancho Cucamonga Industrial Property

APN: 0229-291-46-0000 & 0229-291-54-0000

Prepared for:

Hillwood Enterprises Limited Partnership

901 Via Piemonte, Suite 175

Ontario, CA 91764

909-382-0033

Prepared by:

Albert A. Webb Associates

3788 McCray Street

Riverside, CA 92506

951-686-1070

Submittal Date: April 2020

Revision Date: June 2020

Approval Date:_____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Hillwood Enterprises Limited Partnership by Albert A. Webb Associates. The WQMP is intended to comply with the requirements of the City of Rancho Cucamonga and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

.

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	*TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	*TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0229-291-46-0000 & 0229-291-54-0000

Owner's Signature			
Owner Name: Hillwood Enterprises Limited Partnership			
Title	Owner		
Company	Hillwood Enterprises Limited Partnership		
Address	901 Via Piemonte, Suite 175, Ontario, CA 91764		
Email	John.Grace@hillwood.com		
Telephone #	909-256-5924		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	*TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	*TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0229-291-46-0000 & 0229-291-54-0000

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: DJ Arellano		PE Stamp Below
Title	Senior Engineer	
Company	Albert A. Webb Associates	
Address	3788 McCray Street, Riverside, CA 92506	
Email	dj.arellano@webbassociates.com	
Telephone #	951-686-1070	
Signature		
Date		

Table of Contents

Section 1 Discretionary Permits 1-1

Section 2 Project Description 2-1

2.1 Project Information 2-1
2.2 Property Ownership / Management 2-2
2.3 Potential Stormwater Pollutants 2-3
2.4 Water Quality Credits 2-4

Section 3 Site and Watershed Description 3-1

Section 4 Best Management Practices 4-1

4.1 Source Control BMP 4-1
4.1.1 Pollution Prevention 4-1
4.1.2 Preventative LID Site Design Practices 4-6
4.2 Project Performance Criteria 4-7
4.3 Project Conformance Analysis 4-12
4.3.1 Site Design Hydrologic Source Control BMP 4-14
4.3.2 Infiltration BMP 4-16
4.3.3 Harvest and Use BMP 4-18
4.3.4 Biotreatment BMP 4.19
4.3.5 Conformance Summary 4-23
4.3.6 Hydromodification Control BMP 4-24
4.4 Alternative Compliance Plan (if applicable) 4-25

Section 5 Inspection & Maintenance Responsibility Post Construction BMPs 5-1

Section 6 Site Plan and Drainage Plan 6-1

6.1. Site Plan and Drainage Plan 6-1
6.2 Electronic Data Submittal 6-1

Forms

Form 1-1 Project Information 1-1
Form 2.1-1 Description of Proposed Project 2-1
Form 2.2-1 Property Ownership/Management 2-2
Form 2.3-1 Pollutants of Concern 2-3
Form 2.4-1 Water Quality Credits 2-4
Form 3-1 Site Location and Hydrologic Features 3-1
Form 3-2 Hydrologic Characteristics 3-2
Form 3-3 Watershed Description 3-3
Form 4.1-1 Non-Structural Source Control BMP 4-2
Form 4.1-2 Structural Source Control BMP 4-4
Form 4.1-3 Site Design Practices Checklist 4-6
Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume 4-7
Form 4.2-2 Summary of HCOC Assessment 4-8
Form 4.2-3 HCOC Assessment for Runoff Volume 4-9
Form 4.2-4 HCOC Assessment for Time of Concentration 4-10

Form 4.2-5 HCOC Assessment for Peak Runoff..... 4-11
Form 4.3-1 Infiltration BMP Feasibility 4-13
Form 4.3-2 Site Design Hydrologic Source Control BMP 4-14
Form 4.3-3 Infiltration LID BMP..... 4-17
Form 4.3-4 Harvest and Use BMP 4-18
Form 4.3-5 Selection and Evaluation of Biotreatment BMP 4-19
Form 4.3-6 Volume Based Biotreatment – Bioretention and Planter Boxes w/Underdrains 4-20
Form 4.3-7 Volume Based Biotreatment- Constructed Wetlands and Extended Detention 4-21
Form 4.3-8 Flow Based Biotreatment 4-22
Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate 4-23
Form 4.3-10 Hydromodification Control BMP 4-24
Form 5-1 BMP Inspection and Maintenance 5-1

Appendix A: Maps and Site Plan

Appendix B: Water Quality BMP Calculations

Appendix C: Soils Report

Appendix D: HCOC Exemption

Appendix E: Educational Materials (To be provided during Final WQMP Report)

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Rancho Cucamonga Industrial Property				
Project Owner Contact Name:	John Grace				
Mailing Address:	901 Via Piemonte, Suite 175, Ontario, CA 91764	E-mail Address:	john.grace@hillwood.com	Telephone:	909-256-5924
Permit/Application Number(s):			Tract/Parcel Map Number(s):		
Additional Information/ Comments:	None				
Description of Project:	This project is proposing the development of two industrial warehouse buildings totaling approximately 652,054 SF on approximately 36 acres of vacant land. The site is located to the north of Napa Street between Etiwanda Avenue and W Perimeter Road in the City of Rancho Cucamonga and County of San Bernardino.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A				

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more
☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	1,375,639	**3** Number of Dwelling Units:	N/A	**4** SIC Code:	4225, 4226

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

All facilities within the property boundary will be maintained privately. Any facility in the public right-of-way will be maintained by that facility's governing agency.
Water quality features requiring ongoing maintenance are implemented into this project, all of which will be the responsibility of the property owner. Should the property be sold to a third party at a later date, maintenance will then be the responsibility of the new property owner. A Stormwater Treatment Device and Control Measure Access and Maintenance Agreement (Maintenance Agreement) will be signed during final approval to ensure ongoing maintenance.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	In industrial developments this can include petroleum hydrocarbons. Bacterial Indicators are routinely detected in pavement runoff.
Nutrients - Phosphorous	E ☒	N ☐	Runoff from landscaped areas can bring with it nutrients including phosphorous.
Nutrients - Nitrogen	E ☒	N ☐	Runoff from landscaped areas can bring with it nutrients including nitrogen.
Noxious Aquatic Plants	E ☒	N ☐	Aquatic plants are not highly expected with this project but may come from runoff from landscaped areas.
Sediment	E ☒	N ☐	Runoff along areas can erode slopes and carry sediment.
Metals	E ☒	N ☐	The primary source of metals would come from vehicular traffic.
Oil and Grease	E ☒	N ☐	The primary source of oil and grease would come from vehicular traffic.
Trash/Debris	E ☒	N ☐	The primary source of oil and grease would come from parking lot area.
Pesticides / Herbicides	E ☒	N ☐	Runoff from landscaped areas can bring with it pesticides/herbicides.
Organic Compounds	E ☒	N ☐	Organic compounds can be introduced due to improper storage and disposal procedures.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit % *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)	N/A - No water quality credit		

Section 3 Site and Watershed Description

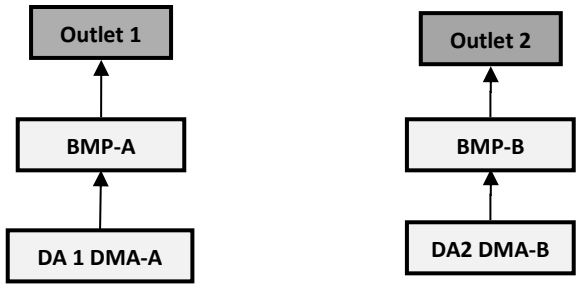
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34°05'27.36"N	Longitude 117°31'03.45"W	Thomas Bros Map page Page 643, Grid H3 & J3

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☒ No☐ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Example only – modify for project specific WQMP using additional form

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA A to Outlet 1	Inlets and sub-surface storm drain pipes will be used to collect and convey runoff generated by DA-1 to a proposed underground infiltration system for water quality treatment and infiltration. The rest of the runoff that the exceeds water quality volume will be directed to the existing catch basin along Napa Street and will ultimately discharge into the San Sevaine Channel.
DA2 DMA B to Outlet 2	Inlets and sub-surface storm drain pipes will be used to collect and convey runoff generated DA-2 to a proposed underground infiltration system for water quality treatment and infiltration. The rest of the runoff that the exceeds water quality volume will be directed to the existing RCB culvert that crosses Napa Street and will ultimately discharge into the Etiwanda Creek.
DA2 to Outlet 2	

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	1,025,576			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	III			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	A			
5 Longest flowpath length (ft)	1,456			
6 Longest flowpath slope (ft/ft)	586			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 2				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)		350,063		
2 Existing site impervious area (ft^2)		0		
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*		III		
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*		A		
5 Longest flowpath length (ft)		978		
6 Longest flowpath slope (ft/ft)		478		
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*		Barren		
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*		Poor		

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/ See 'Drainage Facilities" link at this website*	DA-1: San Sevaine Channel, Santa Ana River Reach 3 DA-2: East Etiwanda Creek, Day Canyon Creek, Santa Ana River Reach 3
Applicable TMDLs *Refer to Local Implementation Plan*	Middle Santa Ana River Bacterial Indicator TMDL
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Santa Ana River Reach 3-Pathogens, Copper, Lead
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	No
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	Yes, Portions of the East Etiwanda Creek & Santa Ana River are unlined
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The property owner(s), tenant(s), operator(s), and/or occupant(s) will receive training on the importance of water quality treatment. The training should incude reading the educational materials on Appendix C. The property owner should bring awareness to all employees of the impacts of littering and improper water disposal.
N2	Activity Restrictions	☒	☐	Restrictions will include requiring dumpster lids to be closed at all times and prohibiting the blowing, sweeping , or hosing of debris into streets, storm drain inlets, and other conveyances. In particular, pesticide application in areas must be performed by an applicator certified by the California Department of Pesticide Regulation. No activity shall be allowed for which a specific BMP has not been included.
N3	Landscape Management BMPs	☒	☐	Landscape planning shall employ strategies to maximize water storage and conservation and minimize runoff, promote infiltration, and protect slopes from erosion. Such strategies include extensive mulching, low water use shrubs, and grouping of plants with similar water requirements. Maintenance personnel will regularly mow, remove all sediment, inspect and keep any equipment in good repair, i.e. broken sprinkler heads, leaking pipes, adjusting timers for seasonal changes, replacing dead or sick plants, and repairing any erosion. Any repairs will be done promtly. In addition, fertilizer and pesticide use will be consistent with instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation.
N4	BMP Maintenance	☒	☐	Create regularly scheduled times for inspection and maintenance of CMP detention system. The frequency shall meet the current minimum County Standard, but shall be at a minimum once a month. A time in the late summer or ealy fall, prior to the storm season (October 1 to May 1), shall also be part of this schedule to reduce the amount of sediment and trash entering the storm drain system.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Title 22 deals with hazardous waste in terms of the preservation of social security and health. As such, hazardous waste materials and wastes shall be collected and stored in covered containers in designated areas; they shall be disposed at county approved disposal sites. In addition, signs shall be placed to ensure all hazardous waste is collected, removed and disposed of only at authorized disposal areas. Inspections shall

Form 4.1-1 Non-Structural Source Control BMPs				
				be conducted regularly to check all containers and other equipment, used in handling hazardous waste, to minimize potential leaks and spills. Regular maintenance of all equipment will be conducted and repairs will be carried out promtly after identification. Owner shall ensure all operations are in conformance with Title 22 Division 4.5 - Environmental Health Standards for the Management of Hazardous Materials.
N6	Local Water Quality Ordinances	☒	☐	This WQMP meets or exceeds local water quality ordinances.
N7	Spill Contingency Plan	☒	☐	Spill Contingency Plan to be determined by building owner prior to occupancy. See SC-11 “Spill Prevention, Control, and Cleanup” in “BMP Fact Sheets”) for guidance and recommended procedures.
N8	Underground Storage Tank Compliance	☐	☒	There are no underground storage tanks on the project site.
N9	Hazardous Materials Disclosure Compliance	☒	☐	Compliance through the Phase 1 Site Assessment

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Hazardous waste materials and wastes shall be collected and stored in covered containers in designated areas. In addition, signs shall be placed to ensure all hazardous waste is collected, removed and disposed of only at authorized disposal areas. Inspections shall be conducted regularly to check all containers and other equipment, used in handling hazardous waste, to minimize potential leaks and spills. Regular maintenance of all equipment will be conducted, and repairs will be carried out promptly after identification. Owner shall ensure all operations are in conformance with the Uniform Fire Code Article 80.
N11	Litter/Debris Control Program	☒	☐	Litter control and trash management will be provided by a contracted maintenance company under the direction of the building owner.
N12	Employee Training	☒	☐	Training will be required within 6 months of hire dates for new employees, and then annually thereafter.
N13	Housekeeping of Loading Docks	☒	☐	Employees shall be trained in loading/unloading procedures as well as proper spill containment and cleanup per the recommendations in the spill contingency plan and in CASQA BMP Handbook SD-31. Maintenance records shall be kept to ensure regular maintenance and inspection of loading dock areas.
N14	Catch Basin Inspection Program	☒	☐	Drainage facilities such as on-site inlets and manholes shall be inspected annually, in the late summer or early fall, and cleaned as needed, or if accumulated sediment/debris fills 25% or more of the sediment /debris storage capacity of the facility. All portions of the drainage facilities will be evaluated annually to determine the adequacy of the inspection and maintenance frequency.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Create regularly scheduled times for the sweeping of drive isles and parking lot areas. The frequency shall be at a minimum once a month, but shall meed the current minimum County Standard. A time in the late summer or early fall, prior to the storm season (October 1 to May 1), shall also be part of this schedule to reduce the amount of sediment, garden waste, and trash entering the storm drain system.

N16	Other Non-structural Measures for Public Agency Projects	☐	☒	N/A. Not a Public Agency Project.
N17	Comply with all other applicable NPDES permits	☒	☐	Construction general permit compliance will be accomplished via filing an NOI with SMARTS and preparing a project specific SWPPP document.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Storm drain signage shall be employed along with previously mentioned owner environmental awareness education prohibiting dumping, littering, or discharges into storm drain inlets. The stencil or signage shall employ the phrase "No Dumping – Drains to River" or an equaly effective and approved phrase that will be stensiled on all catch basins and inlets to alert employees and the public of the destination of pollutants discharged into the storm drains. Legibility will be checked and repainted annually. Owner will be responsible for maintaining this signage.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	There are no outdoor material storage areas proposed on the project site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	All waste storage areas are to be enclosed within specified trash enclosure areas to contain the waste. Dumpsters will be located within the trash enclosures for easy litter removal. Trash enclosures will conform to the CASQA BMP Handbook SD-32 standard.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Landscape planning shall employ strategies to maximize water storage and conservation and minimize runoff, promote infiltration, and protect slopes from erosion. Such strategies include extensive mulching, low water use shrubs, and grouping of plants with similar water requirements. Maintenance personnel will regularly inspect and keep in good repair, i.e. broken sprinkler heads, etc. will be repaired promptly. In addition, fertilizer and pesticide use will be consistent with instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Where possible, landscape areas will be depressed below the top of curb throughout the project site.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	All side slopes (varying between 4:1 to 2:1) will be protected from erosion with landscaping in accordance with the recommendations CASQA SD-10.

S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	There are no covered loading dock areas proposed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	There are no outdoor maintenance bays proposed.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Vehicle washing is prohibited on-site.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	There are no outdoor processing areas proposed for this project.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Equipment washing is prohibited on-site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Fueling areas are prohibited on-site.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillsides on this project.
S14	Wash water control for food preparation areas	☐	☒	Project is not a food establishment.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Vehicle and equipment washing is prohibited on-site.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: This project has maximized the open landscaped areas to the maximum extent allowed by the proposed land use.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Underground infiltration systems are proposed for both Drainage Areas.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Existing site drains towards the South, and the proposed condition preserves the same drainage pattern.
Disconnect impervious areas: Yes ☐ No ☒ Explanation: The project has been disconnected to the maximum extent practical given the project land use.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: The site is vacant. No environmentally sensitive or natural, undisturbed areas exist. The site will be landscaped.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: All disturbed areas not imperviously covered by pavement will be landscaped to the fullest extent possible.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Proposed infiltration system will be underground, therefore no compaction will be taking place at infiltration system.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: The site layout and size does not allow for vegetated swales, but the project minimizes the use of underground piping.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: All landscaped areas shall be roped off to keep unwanted equipment from driving over these areas. This shall also be noted on the plans.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 1,025,576	**2** Imperviousness after applying preventative site design practices (Imp%): 0.91	**3** Runoff Coefficient (Rc): _0.745 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.523 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.774 *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 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 ☒
7 Compute design capture volume, DCV (ft^3): 96,740 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 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*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 1 (ft^2): 350,063	**2** Imperviousness after applying preventative site design practices (Imp%): 0.91	**3** Runoff Coefficient (Rc): _0.745 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.523 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.774 *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 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 ☒
7 Compute design capture volume, DCV (ft^3): 33,020 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 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*		

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** *Item 4 – Item 1*	**8** *Item 2 – Item 5*	**9** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** % *Item 7 / Item 1*	**11** % *Item 8 / Item 2*	**12** % *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), *S_o = Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) *T_c = Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): *$T_{C\text{-}HCOC}$ = (Item 13 * 0.95) – Item 14*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs):	*Maximum of Item 8, 9, and 10 (including additional forms as needed)*	
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs):	*Maximum of Item 11, 12, and 13 (including additional forms as needed)*	
15 Peak runoff reduction needed to meet HCOC Requirement (cfs):	$Q_{p\text{-}HCOC}$ = *(Item 14 * 0.95) – Item 10*	

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3):	$V_{retention}$ *=Sum of Item 4 for all BMPs*		
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3):	$V_{retention}$ *=Sum of Item 12 for all BMPs*		

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrel/cisterns: Yes☒ No ☐ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: N/A *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 96,740 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type Underground Infiltration	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	4.5		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.8		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.61		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48 hr		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	12.5		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	6.4		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	17,955		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	N/A		
10 Amended soil porosity	N/A		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	N/A		
12 Gravel porosity	N/A		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	N/A		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	N/A		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	97,060		

16 Total Retention Volume from LID Infiltration BMPs: 97,060 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 100.3% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 2)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 33,020 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 2 DMA B BMP Type Underground Infiltration	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	6.3		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.8		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	2.25		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48 hr		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	10.9		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	9		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	7,176		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	N/A		
10 Amended soil porosity	N/A		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	N/A		
12 Gravel porosity	N/A		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	N/A		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	N/A		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	33,225		

16 Total Retention Volume from LID Infiltration BMPs: 33,225 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 100.6% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): N/A

V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			

9 Total Retention Volume (ft^3) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☐ No ☐

If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): N/A *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 96,740 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): N/A *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 97,060 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): N/A *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): N/A *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): N/A *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 2)

1 Total LID DCV for the Project DA-1 (ft^3): 33,020 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): N/A *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 33,225 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): N/A *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): N/A *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): N/A *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1&DA 2)

1 Volume reduction needed for HCOC performance criteria (ft^3): N/A *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Education for Property Owners and Employees	Property Owner	Distribute educational materials and conduct annual awareness training.	Upon first occupancy and yearly thereafter
Activity Restrictions	Property Owner	The owner will restrict activities which may have a negative impact on storm water quality. Restrictions shall include prohibiting the storage of outdoor material, vehicle and equipment washing, outdoor processing, fueling up and wash water control for food preparation.	Continuous
Street Sweeping of Private Street & Parking Lots	Property Owner	Inspect parking lots for trash and accumulation of dust and debris. Street sweeping shall be conducted monthly.	Inspections -Monthly. Maintenance - Monthly.
Drainage Facility Inspection and Maintenance	Property Owner	Inspect twice annually in the early fall before the rainy season and in the late Spring after the rainy season. Remove debris/sediment build-up.	Inspect twice annually, once before and after the rainy season and after extreme storm events. Inspect for standing water 48 hours after a every rainstorm. Maintenance as needed.
Landscape Planning & maintenance	Property Owner	Mow, weed, & trim vegetation. Inspect inlet & outlet structures. Re-vegetate bare areas. See below for further details.	Inspect weekly. Maintenance as needed.
Efficient Irrigation	Property Owner	Repair and maintain leaky/broken sprinkler heads and pipes. Adjust timers for seasonal changes.	Inspect weekly and maintain as needed

Litter Control	Property Owner	Inspect areas for accumulation of trash and debris and haul trash off-site to City refuse.	Check Daily and empty as needed.
CMP Detention System	Property Owner	Monthly inspections should occur for debris and litter removal and signs of ponding issues such as odors, insects, and overgrowth. Prior to October 1, conduct annual inspections and maintenance for erosion, clogging of outlets, standing water issues, and adequacy of infiltration. Visually inspect underground CMP retention chambers on a monthly basis because of their importance for water quality management and post-construction storm water pollution prevention. One of these inspections should be before October 1 and one should be after May 1. Remove litter, debris, and dead vegetation. Check for signs of ponding issues such as odors, clogging of outlets, standing water, erosion, and adequacy of infiltration. Remove accumulated sediment.	Inspect twice annually, once before and after the rainy season and after extreme storm events. Maintenance as needed.

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

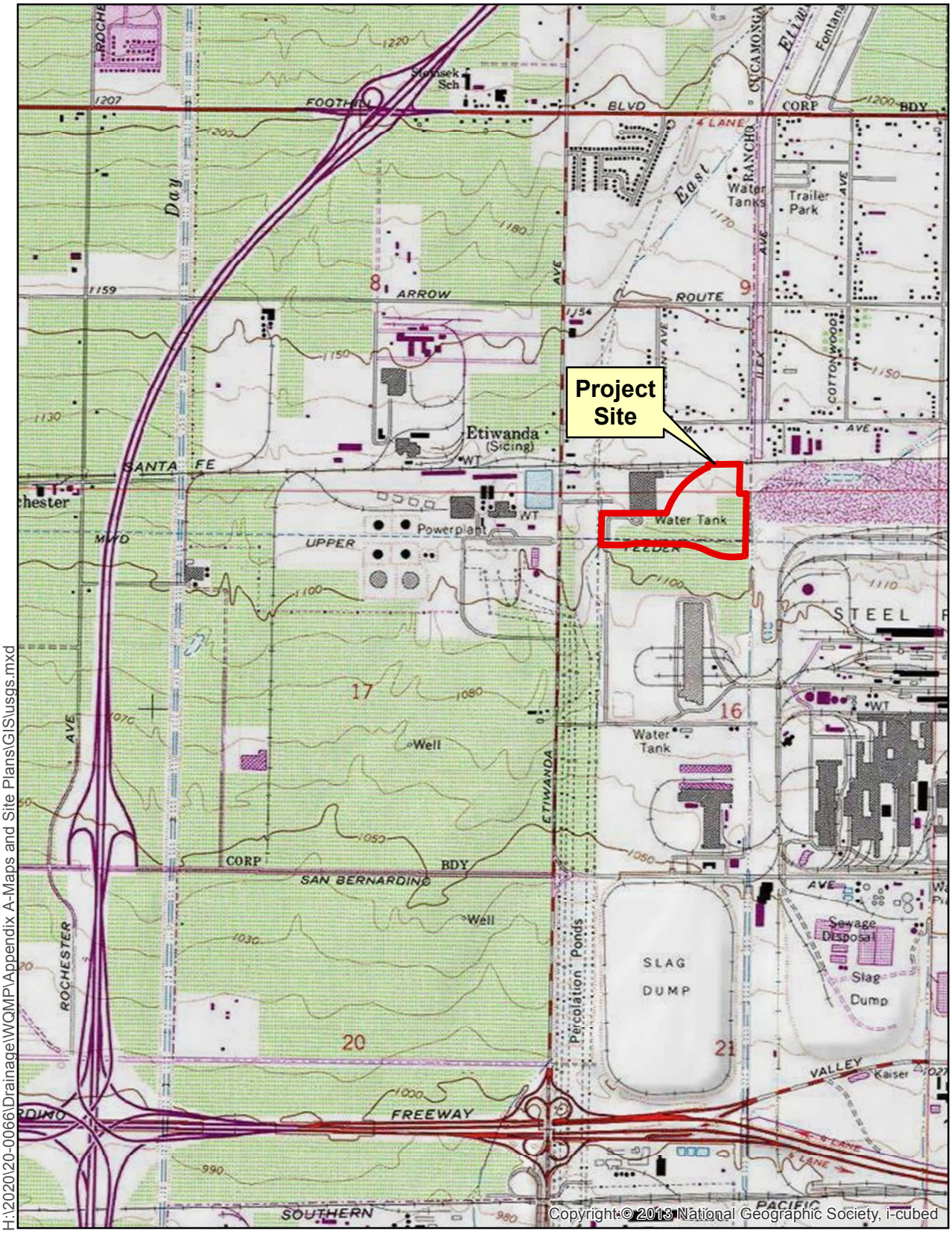
6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements

APPENDIX A – MAPS AND SITE PLAN



Figure 1. Vicinity Map



H:\2020\20-0066\Drainage\WQMP\Appendix A-Maps and Site Plans\GIS\usgs.mxd

Sources: ESRI / USGS 7.5min Quad

Figure 2. USGS Topography Map

0 1,000 2,000 Feet

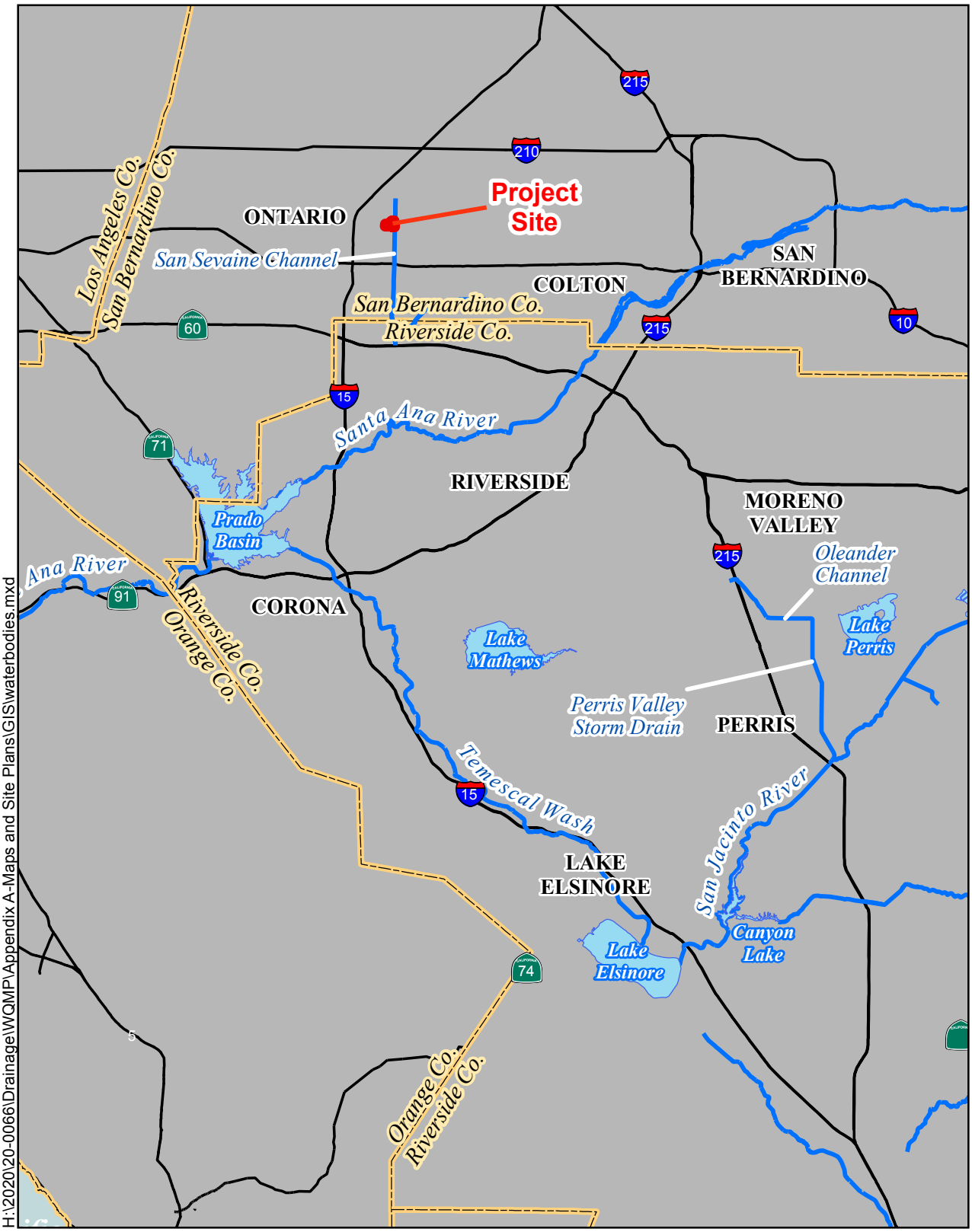


H:\2020\20-0066\Drainage\WQMP\Appendix A-Maps and Site Plans\GIS\aerial.mxd

Sources: County of Riverside GIS, 2013; Eagle Aerial, April 2012.

Figure 3. Aerial Photograph

0 400 800 Feet



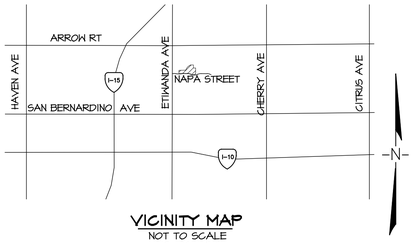
H:\2020\20-0066\Drainage\WQMP\Appendix A-Maps and Site Plans\GIS\waterbodies.mxd

Sources: USGS 30 Meter DEM;
USGS Digital Line Graph

Figure 4. Receiving Waterbodies

Flowpath

0 2 4 6
Miles



VICINITY MAP
NOT TO SCALE
T1S, R6W, S16

SOURCE CONTROL NOTES

1. ALL INLETS SHALL BE MARKED PER S1 IN FORM 4.1-2.
2. IF NECESSARY, INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT SUMP PUMPS WILL BE PLUMBED TO SANITARY SEWER.
3. MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES.
4. ALL SLOPES GREATER THAN 4:1 SHOULD BE PROTECTED FROM EROSION USING CASQA SD-10 LANDSCAPE RECOMMENDATIONS
5. TRASH ENCLOSURE AREA SHALL BE COVERED PER CITY STANDARDS AND SHALL HAVE A SIGN THAT STATES "DO NOT DUMP HAZARDOUS MATERIALS HERE".
6. ALL INDUSTRIAL PROCESS ACTIVITIES ARE TO BE PERFORMED INDOORS. NO PROCESSES SHALL DRAIN TO EXTERIOR STORM DRAIN SYSTEM.
7. ROOF DOWNSPOUTS SHALL BE POSITIONED TO DIRECT STORMWATER AWAY FROM LOADING AREA. PROVIDE ROOF OVERHANG OVER THE LOADING AREA OR INSTALL DOOR SKIRTS AT EACH BAY THAT ENCLOSE THE END OF THE TRAILER.
8. PROVIDE A MEANS TO DRAIN FIRE SPRINKLER WATER TO SANITARY SEWER SYSTEM.
9. BOILER DRAIN LINES AND CONDENSATE DRAIN LINES SHALL BE DIRECTLY OR INDIRECTLY CONNECTED TO THE SANITARY SEWER SYSTEM AND MAY NOT DISCHARGE TO THE STORM DRAIN SYSTEM.
10. ROOFTOP EQUIPMENT WITH POTENTIAL TO PRODUCE POLLUTANTS SHALL BE ROOFED OR HAVE A SECONDARY CONTAINMENT.
11. ANY DRAINAGE SUMPS ON-SITE SHALL FEATURE SEDIMENT SUMP TO REDUCE THE QUANTITY OF SEDIMENT IN PUMPED WATER.

SITE PLAN RESTRICTION

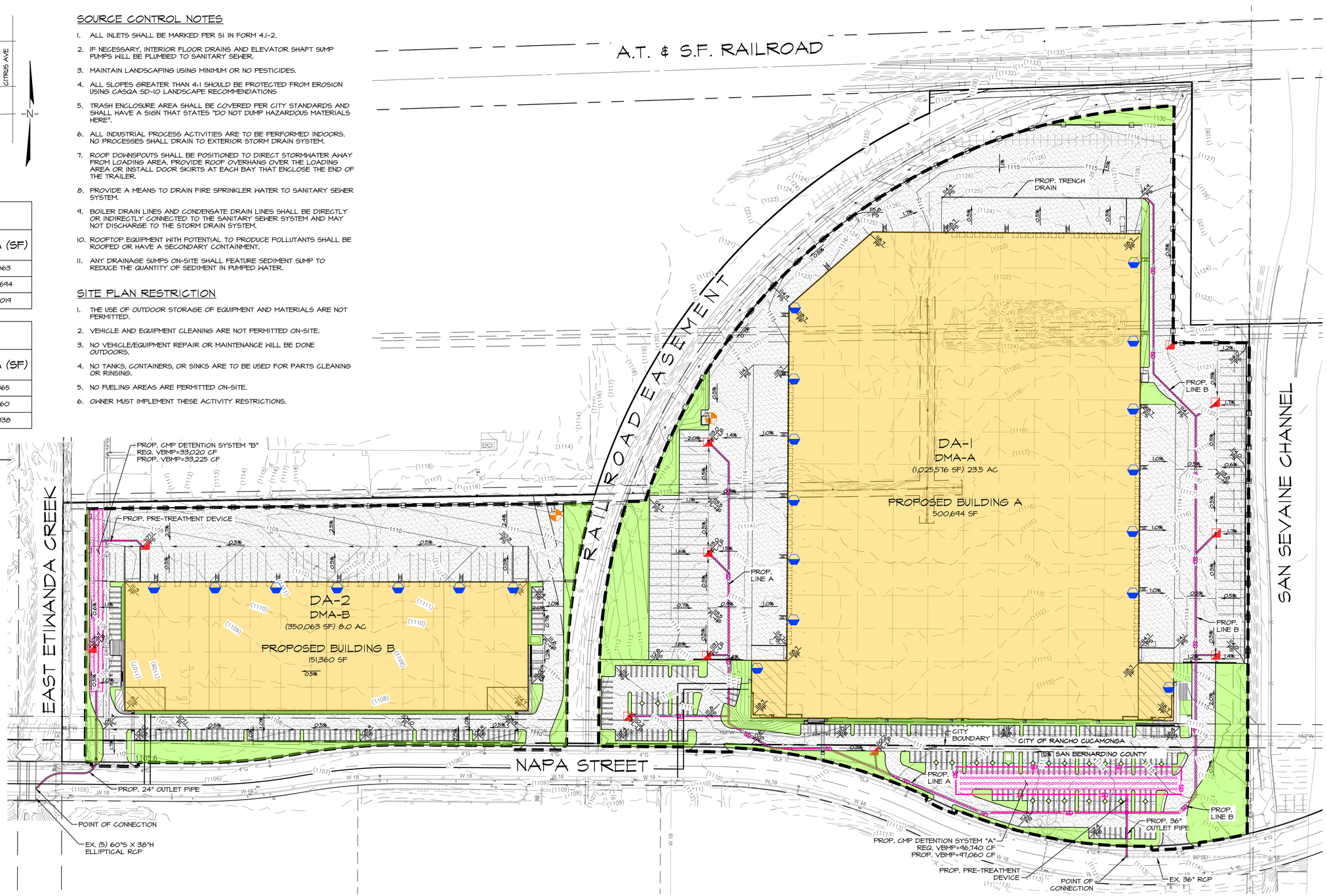
1. THE USE OF OUTDOOR STORAGE OF EQUIPMENT AND MATERIALS ARE NOT PERMITTED.
2. VEHICLE AND EQUIPMENT CLEANING ARE NOT PERMITTED ON-SITE.
3. NO VEHICLE/EQUIPMENT REPAIR OR MAINTENANCE WILL BE DONE OUTDOORS.
4. NO TANKS, CONTAINERS, OR SINKS ARE TO BE USED FOR PARTS CLEANING OR RINSING.
5. NO FUELING AREAS ARE PERMITTED ON-SITE.
6. OWNER MUST IMPLEMENT THESE ACTIVITY RESTRICTIONS.

DRAINAGE AREA 1			
LEGEND	DMA-ID	TYPE	AREA (SF)
	L-A	LANDSCAPE	88,863
	R-A	ROOF	500,694
	H-A	HARDSCAPE	436,019

DRAINAGE AREA 2			
LEGEND	DMA-ID	TYPE	AREA (SF)
	L-A	LANDSCAPE	32,365
	R-A	ROOF	151,360
	H-A	HARDSCAPE	166,338

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- LANDSCAPING
- ROOF
- CONCRETE OR ASPHALT
- FLOW DIRECTION
- SD — STORM DRAIN PIPE
- ROOF DRAIN DOWNSPOUT
- CURB OPENING/CUT
- STORM INLET
- TRASH ENCLOSURE



N
W WEBB E
S

1" = 80'
40 0 80 160 240

PRELIMINARY WATER QUALITY MANAGEMENT PLAN SITE AND DRAINAGE PLAN

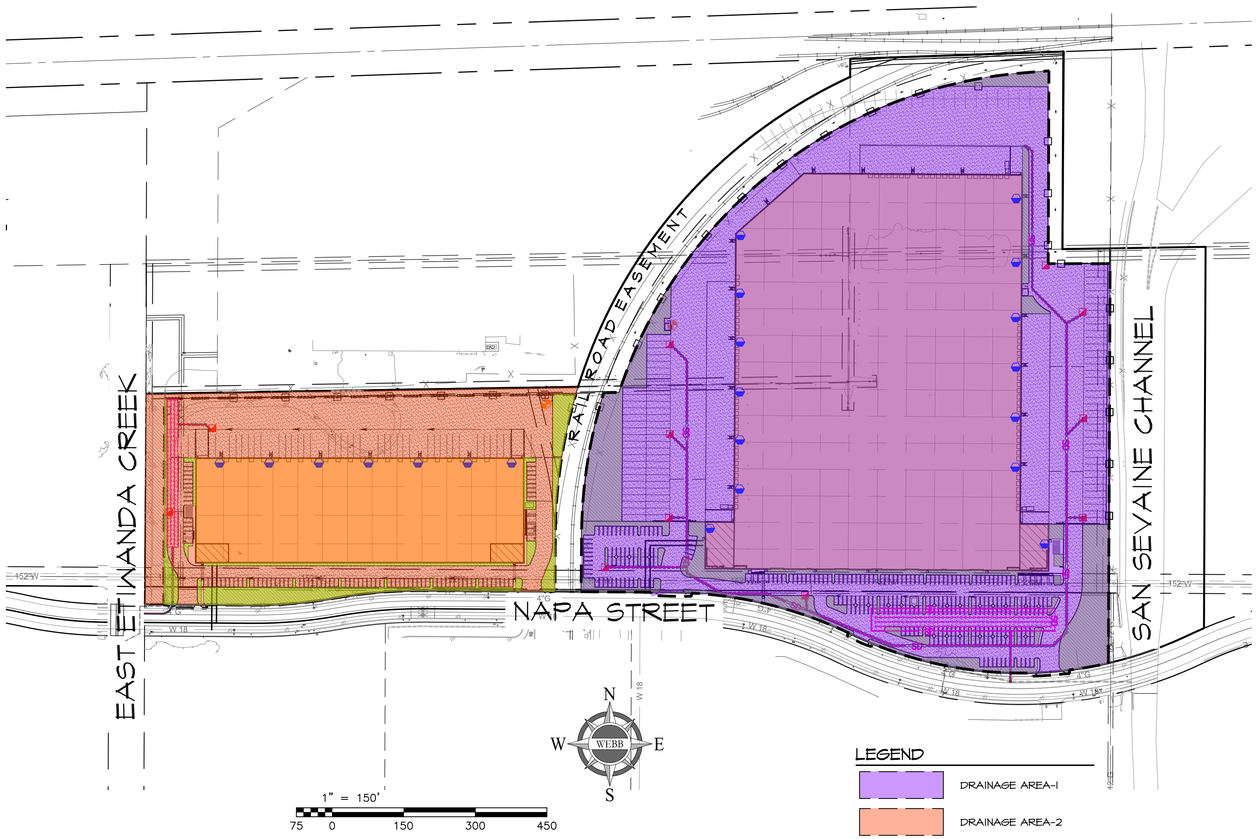
CITY OF RANCHO CUCAMONGA

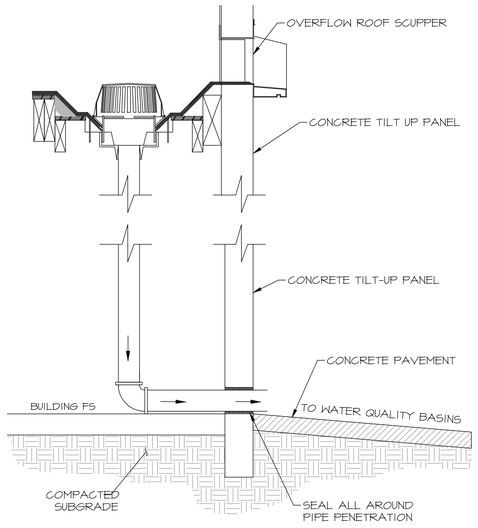
HILLWOOD ENTERPRISE - RANCHO CUCAMONGA INDUSTRIAL PROPERTY
PRELIMINAY WATER QUALITY MANAGEMENT PLAN SITE AND DRAINAGE PLAN

SCALE:	1"=80'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0066
DATE:	6/25/20	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET 1
DESIGNED:	CV		OF 2 SHEETS
CHECKED:	DJA		
PLN CK REF:			DWG. NO.
F.B.			

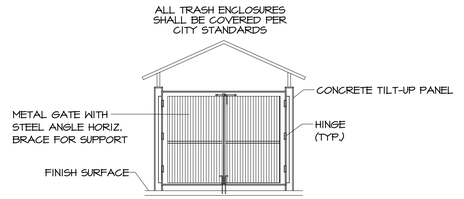
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ORIGINAL

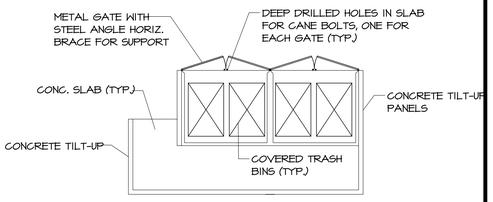




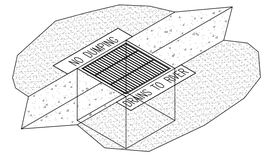
ROOF DRAIN DETAIL
N.T.S.

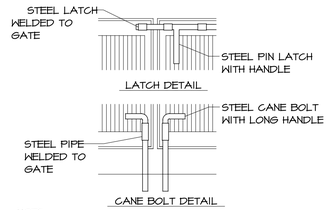


TRASH ENCLOSURE GATE ELEVATION
N.T.S.



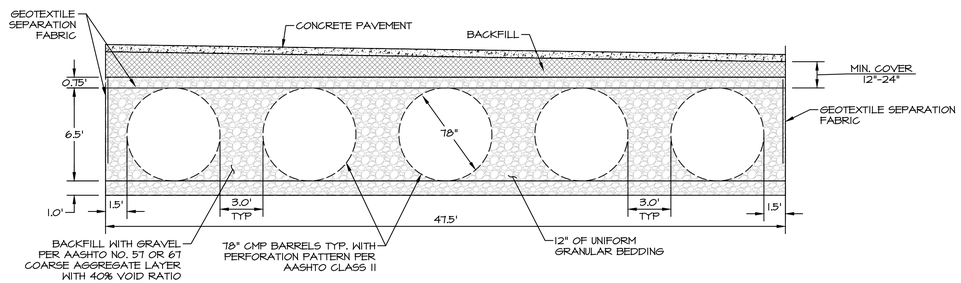
TRASH ENCLOSURE PLAN DETAIL
N.T.S.



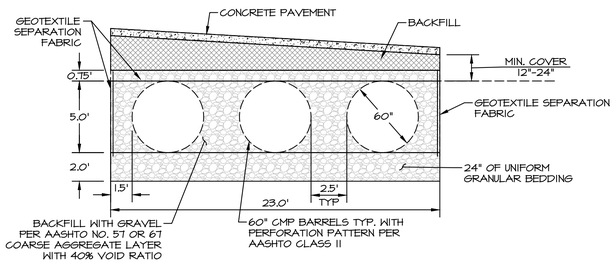


NOTE:
LATCH AND CANE TO BE AT EXTERIOR SIDE OF GATES

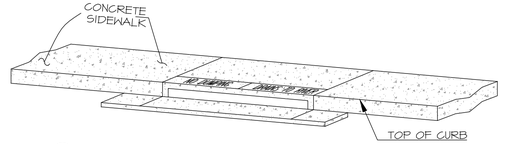
TRASH ENCLOSURE GATE LATCHES DETAIL
N.T.S.



CMP DETENTION SYSTEM A TYPICAL DETAIL
NOT TO SCALE



CMP DETENTION SYSTEM B TYPICAL DETAIL
NOT TO SCALE



1. STENCILS TO HAVE 2" LETTERS AS FOLLOWS: "NO DUMPING - DRAINS TO RIVER"
2. PLACE BOTH STENCILS CENTERED WITHIN THE CATCHBASIN OPENINGS AND WITHIN THE TOP OF THE CURB.
3. SPRAY BOTH STENCILS WITH WHITE PAINT.
4. REMOVE STENCILS WHEN PAINT IS DRY.

CATCH BASIN STENCILING DETAIL
NTS

CITY OF RANCHO CUCAMONGA

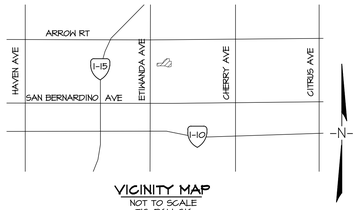
HILLWOOD ENTERPRISE - RANCHO CUCAMONGA INDUSTRIAL PROPERTY
PWQMP SITE AND DRAINAGE PLAN DETAILS

SCALE:	1"=80'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0066
DATE:	6/25/20	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE, CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET 2
DESIGNED:	CV		OF 2 SHEETS
CHECKED:	DJA		
PLN CK REF:			DWG. NO.
F.B.			

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CRISTINA V

IN THE CITY OF RANCHO CUCAMONGA
HILLWOOD - NAPA
CONCEPTUAL GRADING & DRAINAGE PLAN



VICINITY MAP
NOT TO SCALE
T1S, R6W, S16

OWNER:
COMPANY: CALIFORNIA SPEEDWAY CORPORATION
ADDRESS: 9300 CHERRY AVENUE
FONTANA, CA 92335
PHONE: (909) 429-5000

APPLICANT:
COMPANY: HILLWOOD ENTERPRISE, L.P.
CONTACT: JOHN GRACE
ADDRESS: 901 VIA PIEMONTE, SUITE 175
ONTARIO, CA 91764
PHONE: (909) 382-0033

TOPOGRAPHY:
INLAND AERIAL
DATED 04-15-2020

PROJECT DATA

ACREAGE			
GROSS SITE AREA:	1,541,166 S.F.	35.38 AC.	
SITE A	1,151,647 S.F.	26.44 AC.	
SITE B	384,814 S.F.	8.94 AC.	
40' ACCESS EASEMENT	17,208 S.F.	0.40 AC.	
RAIL EASEMENT	84,240 S.F.	1.93 AC.	
MWD. EASEMENT	77,218 S.F.	1.77 AC.	
SCE EASEMENT	63,041 S.F.	1.45 AC.	
NET DISTURBED SITE AREA:	1,299,009 S.F.	29.82 AC.	

BUILDING AREA	BUILDING A	BUILDING B	TOTAL
WAREHOUSE	460,694 S.F.	141,360 S.F.	624,205 S.F.
OFFICE	10,000 S.F.	10,000 S.F.	20,000 S.F.
TOTAL AREA	500,694 S.F.	151,360 S.F.	644,205 S.F.
LOT COVERAGE:	43.41%	38.86%	42.12%
PARKING REQUIREMENTS			
OFFICE @ 1/250 S.F.	40 STALLS	40 STALLS	80 STALLS
WAREHOUSE			
1ST 20K @ 1/1,000 S.F.	20 STALLS	20 STALLS	40 STALLS
2ND 20K @ 1/2,000 S.F.	10 STALLS	10 STALLS	20 STALLS
ABOVE 40K @ 1/5,000 S.F.	112 STALLS	26 STALLS	138 STALLS
TOTAL PARKING REQUIRED	182 STALLS	96 STALLS	278 STALLS
PARKING PROVIDED			
AUTO			
STANDARD (9'X19')	275 STALLS	92 STALLS	368 STALLS
HANDICAP (11'X19')	8 STALLS	5 STALLS	13 STALLS
TRAILER			
STANDARD (14'X50')	84 STALLS	22 STALLS	111 STALLS
LANDSCAPED AREA			
PROVIDED:	7.1% (88,863 SF)	8.3% (32,365 SF)	16.0% (121,228 SF)
DRAINAGE AREA			
EXISTING IMPERVIOUS AREA	0 S.F.	0 S.F.	0 S.F.
REMOVAL & REPLACEMENT	0 S.F.	0 S.F.	0 S.F.
PROPOSED IMPERVIOUS AREA	936,713 S.F.	317,698 S.F.	1,254,411 S.F.

ENGINEER:
COMPANY: ALBERT A. WEBB ASSOCIATES
CONTACT: D.J ABELLANO
ADDRESS: 3788 MCGRAY ST
RIVERSIDE, CA 92506
PHONE: (951) 686-1070
FAX: (951) 788-1256

ARCHITECT:
COMPANY: HPA ARCHITECTURE
CONTACT: INKON KIM
ADDRESS: 18831 BARDEEN AVENUE, SUITE 100
IRVINE, CA 92612
PHONE: (949) 863-1770

A.P.N.
0224-241-46, 0224-241-54

PROJECT DESCRIPTION:
PLOT PLAN FOR BUILDING A AND B OF DUAL WAREHOUSE FACILITIES. BUILDING A TOTALS 447,845 SQUARE FEET AND BUILDING B TOTALS 151,360 SQUARE FEET ON 35.38± ACRES.

NOTES:
1. FEMA COMMUNITY PANEL NO. 06071C8634J, ZONE X.
2. CONTOUR INTERVAL, ONE FOOT.
3. THIS PROJECT IS WITHIN CITY OF RANCHO CUCAMONGA
4. ALL TRAILER PARKING STALLS ARE 14' X 50'.

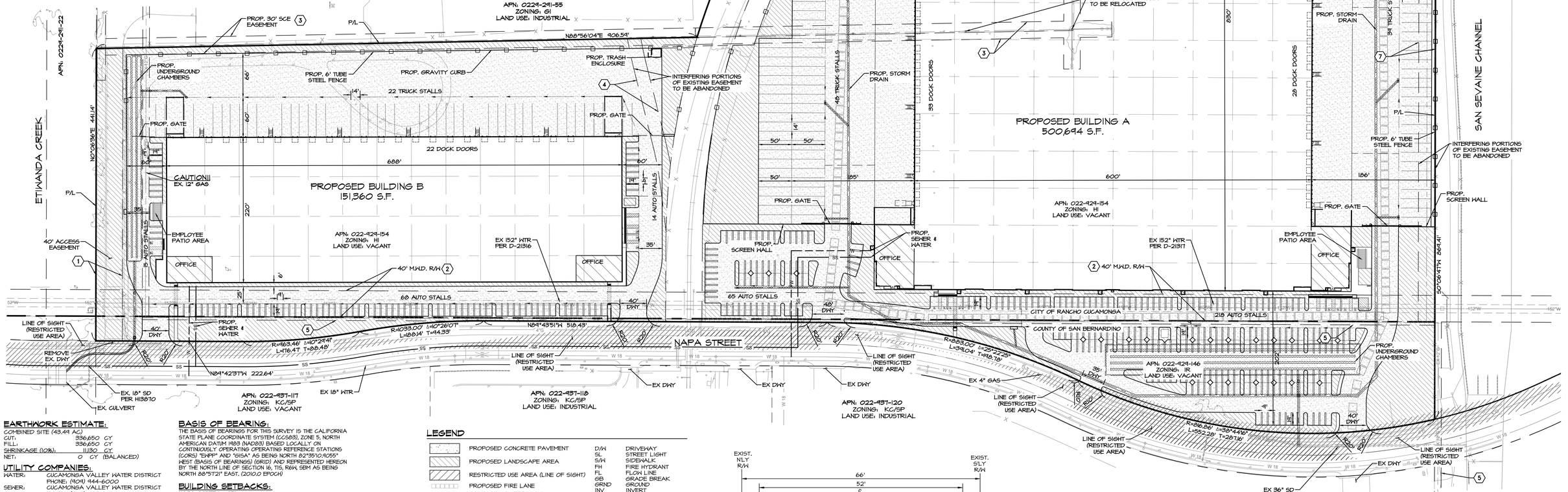
LAND USE / ZONING:

EXISTING LAND USE:	VACANT
PROPOSED LAND USE:	HEAVY INDUSTRIAL
EXISTING ZONING:	HEAVY INDUSTRIAL
PROPOSED ZONING:	HEAVY INDUSTRIAL

LEGAL DESCRIPTION:
THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF FONTANA, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THOSE POTIONS OF THE FOLLOWING DESCRIBED LAND LYING WITHIN THOSE CERTAIN PARCELS OF LAND GRANTED TO KAISER STEEL LAND DEVELOPMENT, INC., A DELAWARE CORPORATION, AND DESCRIBED AS PARCELS 1, 2, 3, AND 4, AND A PORTION PARCEL NO. 6, BY DOCUMENT RECORDED JULY 29, 1994 AS INSTRUMENT NO. 94-323332 OF OFFICIAL RECORDS OF THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, IN THE WEST ONE-HALF OF SECTION 9 AND SECTION 16, TOWNSHIP 1 SOUTH, RANGE 6 WEST, SAN BERNARDINO MERIDIAN, AND THAT PORTION OF THE EAST ONE-HALF OF SECTION 16, TOWNSHIP 1 SOUTH, RANGE 6 WEST, SAN BERNARDINO MERIDIAN, IN SAID COUNTY.

EASEMENT NOTES:
1. THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED "ACCESS AND UTILITY EASEMENT AGREEMENT" RECORDED JANUARY 17, 2002 AS INSTRUMENT NO. 20020026848 OF OFFICIAL RECORDS. (SAID 40' WIDE EASEMENT PLOTTED HEREON)
2. AN EASEMENT FOR CONDUITS FOR WATER TRANSPORTATION AND INCIDENTAL PURPOSES, RECORDED NOVEMBER 23, 1938 IN BOOK 1309, PAGE 465 OF OFFICIAL RECORDS. IN FAVOR OF: THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA AFFECTS: A PORTION OF SAID LAND AS MORE PARTICULARLY DESCRIBED IN SAID DOCUMENT (SAID 40' WIDE EASEMENT PLOTTED HEREON)
3. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED MARCH 26, 1965 IN BOOK 6358, PAGE 325 OF OFFICIAL RECORDS. IN FAVOR OF: SOUTHERN CALIFORNIA EDISON COMPANY AFFECTS: A PORTION OF SAID LAND AS MORE PARTICULARLY DESCRIBED IN SAID DOCUMENT (SAID EASEMENT PLOTTED HEREON)
4. AN EASEMENT FOR RAILROAD TRACK OR TRACKS AND ASSOCIATED APPURTENANT EQUIPMENT AND FACILITIES AND INCIDENTAL PURPOSES, RECORDED JANUARY 17, 2002 AS INSTRUMENT NO. 20020026849 OF OFFICIAL RECORDS. IN FAVOR OF: DAVID F. BOLGER, TRUSTEE, ET AL. AFFECTS: A PORTION OF SAID LAND AS MORE PARTICULARLY DESCRIBED IN SAID DOCUMENT (SAID EASEMENT PLOTTED HEREON)
5. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT. GRANTED TO: SOUTHERN CALIFORNIA EDISON GAS COMPANY PURPOSE: PUBLIC UTILITIES, INGRESS AND EGRESS RECORDING DATE: MAY 06, 1965 RECORDING NO: BOOK 6385, PAGE 623 OF OFFICIAL RECORDS (SAID EASEMENT PLOTTED HEREON)
6. EASEMENTS(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT. GRANTED TO: SOUTHERN CALIFORNIA EDISON COMPANY PURPOSE: PUBLIC UTILITIES RECORDING DATE: JULY 16, 1958 RECORDING NO: BOOK 4557, PAGE 241 OF OFFICIAL RECORDS (SAID 25' WIDE EASEMENT PLOTTED HEREON)
7. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT. GRANTED TO: SOUTHERN CALIFORNIA GAS COMPANY PURPOSE: PUBLIC UTILITIES RECORDING DATE: MARCH 01, 1967 RECORDING NO: BOOK 6719, PAGE 830 OF OFFICIAL RECORDS AFFECTS: A PORTION OF SAID LAND AS MORE PARTICULARLY DESCRIBED IN SAID DOCUMENT (SAID EASEMENT PLOTTED HEREON)



EARTHWORK ESTIMATE:
COMBINED SITE (43.49 AC)

CUT:	336,650	CY
FILL:	336,650	CY
SHRINKAGE (10%):	33,650	CY
NET:	0	CY (BALANCED)

UTILITY COMPANIES:

WATER:	CUCAMONGA VALLEY WATER DISTRICT PHONE: (909) 944-6000
SEWER:	CUCAMONGA VALLEY WATER DISTRICT PHONE: (909) 944-6000
ELECTRIC:	SOUTHERN CALIFORNIA EDISON PHONE: (800) 655-4555
TELEPHONE:	FRONTIER COMMUNICATIONS PHONE: (855) 306-1691
GAS:	SOUTHERN CALIFORNIA GAS COMPANY PHONE: (800) 427-2200
FIRE:	CITY OF RANCHO CUCAMONGA PHONE: (909) 477-2770

BENCHMARK:
SAN BERNARDINO COUNTY BENCHMARK NO. "700-22"

ELEV. = 1125.014 FEET (NGVD '29)

SET 2" BRASS DISK STAMPED "700-22 1968", 0.4 MILES EAST OF ETIWANDA AVENUE AT AT&SF RAILROAD, 58.2 FEET SOUTH OF SOUTH RAIL (MAIN LINE), 96 FEET WEST AND 10 FEET SOUTH OF SIDING SWITCH, 10.75 POLES WEST OF MILEPOLE 65, IN NORTHWEST CORNER CONCRETE SLAB FOR MWD VALVES INSIDE 6 FT HIGH CHAIN LINK FENCE CAGE.

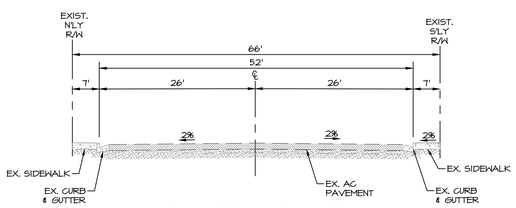
BASIS OF BEARING:
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA STATE PLANE COORDINATE SYSTEM (CCS83), ZONE 5, NORTH AMERICAN DATUM 1983 (NAD83) BASED LOCALLY ON CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS) "ENPP" AND "SIOA" AS BEING NORTH 82°35'10.9055" WEST (BASIS OF BEARINGS) (GRID) AND REPRESENTED HEREON BY THE NORTH LINE OF SECTION 16, T1S, R6W, SBM AS BEING NORTH 88°57'21" EAST. (2010.0 EPOCH)

BUILDING SETBACKS:
NAPA STREET - 25'
SIDE - 5'
REAR - NONE

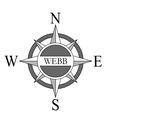
FEMA FLOOD ZONE DESIGNATION:
FEMA COMMUNITY PANEL NO. 06071C8634J, ZONE X.
DATED 09/26/2014.

LEGEND

	PROPOSED CONCRETE PAVEMENT	D/W	DRIVEWAY
	PROPOSED LANDSCAPE AREA	S/L	STREET LIGHT
	RESTRICTED USE AREA (LINE OF SIGHT)	S/W	SIDEWALK
	PROPOSED FIRE LANE	FH	FIRE HYDRANT
	PROPOSED SCREEN WALL	FL	FLOW LINE
X—X	CHAINLINK FENCE	GB	GRADE BREAK
		GRND	GROUND
O—O	TUBE STEEL FENCE	INV	INVERT
	GRADEBREAK/RIDGELINE	LS	LANDSCAPE AREA
	FLOWLINE	LP	LOW POINT
(1475)	EXISTING CONTOURS	MAX	MAXIMUM
1475	PROPOSED CONTOURS	PL	PROPERTY LINE
W	EXISTING WATER LINE	RG	ROUGH GRADE
EX 55	EXISTING SEWER LINE	R/W	RIGHT OF WAY
SD	EXISTING STORM DRAIN	TYP	TYPICAL
G	EXISTING GAS LINE	EP	EDGE OF PAVEMENT
E	EXISTING ELECTRICAL LINE	ULT	ULTIMATE
	PROPOSED ON-SITE LIGHT FIXTURE		
	PROPOSED STREET LIGHT		
	EXISTING STREET LIGHT		



NAPA STREET TYPICAL SECTION
COLLECTOR ROAD
TYPICAL SECTION
NOT TO SCALE



1" = 60'
60 0 60 120 180

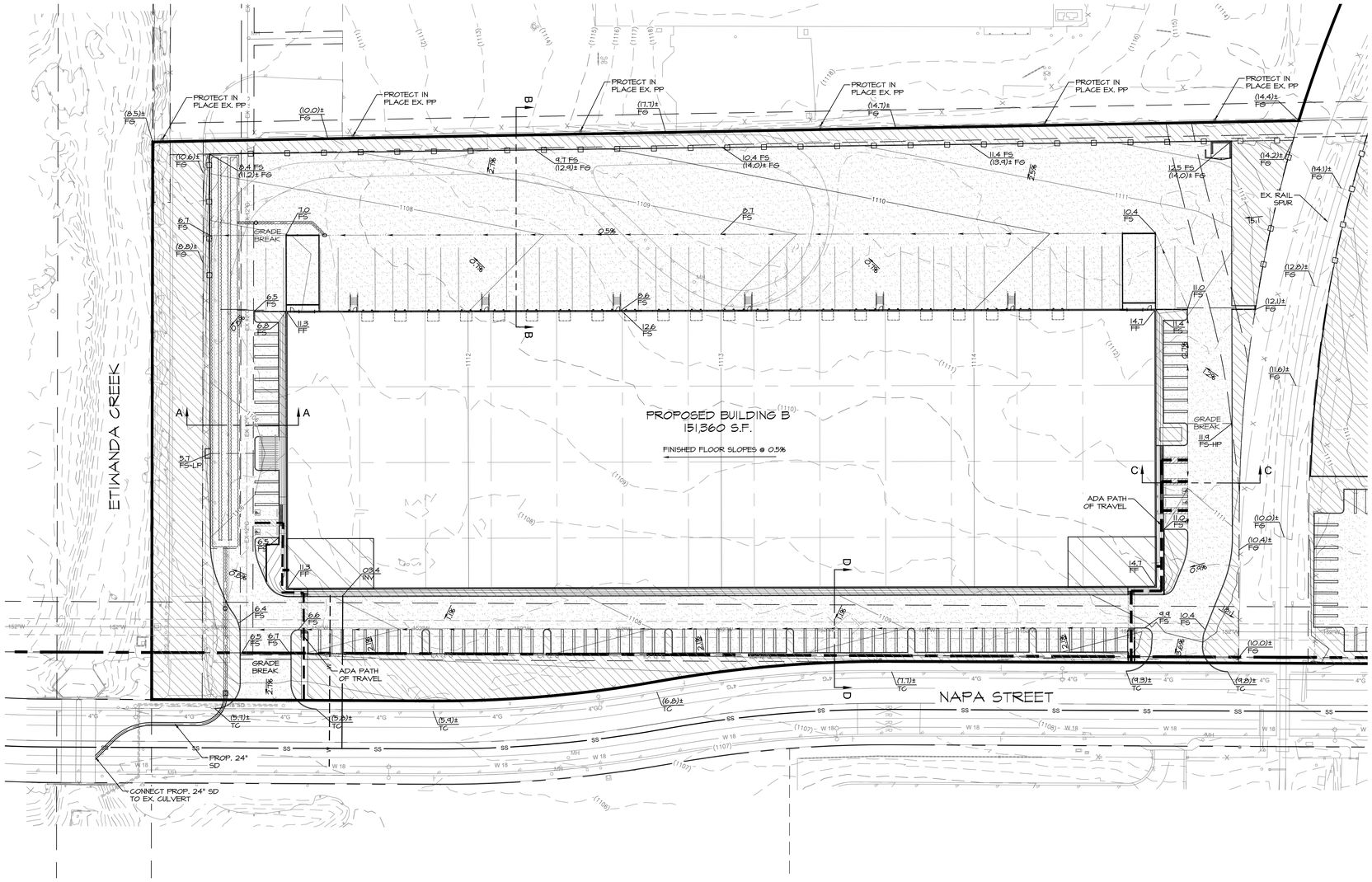
CITY OF RANCHO CUCAMONGA

HILLWOOD - NAPA
CONCEPTUAL GRADING & DRAINAGE PLAN

SCALE:	1"=60'	ALBERT A. WEBB ASSOCIATES	ENGINEERING CONSULTANTS 3788 McGRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256
DATE:	6/25/20		
DESIGNED:	EA		
CHECKED:	DJA		
PLN CK REF:		CASE FILE NO. DRC2020-00177	
F.B.			

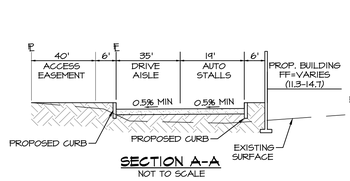
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SHEET 1
OF 3 SHEETS
DWG. NO.

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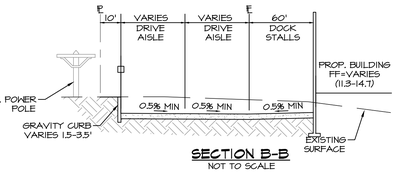


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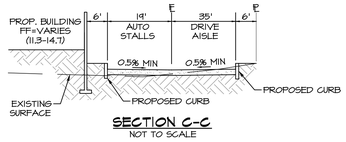
- PROPOSED CONCRETE PAVEMENT
- PROPOSED LANDSCAPE AREA
- ADA PATH OF TRAVEL



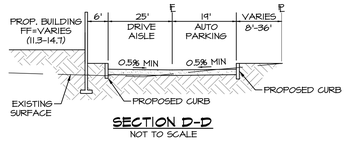
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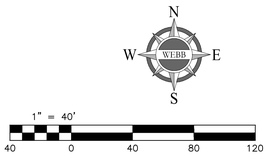
SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE



SECTION D-D
NOT TO SCALE



CITY OF RANCHO CUCAMONGA

HILLWOOD – NAPA
CONCEPTUAL GRADING & DRAINAGE PLAN
BUILDING B

SCALE:	1"=60'
DATE:	6/25/20
DESIGNED:	EA
CHECKED:	DJA
PLN CK REF:	
F.B.	

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

CASE FILE NO. DRC2020-00177

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OF	3 SHEETS
DWG. NO.	

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PROPOSED BUILDING A
500,694 S.F.

PROP. TRENCH DRAIN

PROTECT IN PLACE EX. PP

RELOCATE EX. PP

ADA PATH OF TRAVEL

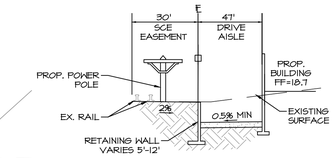
RIDGE LINE

SAN SEVAINE CHANNEL

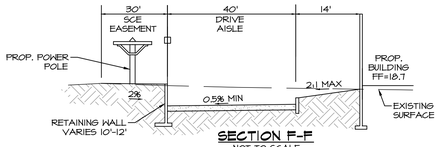
NAPA STREET

EX. 30' SD

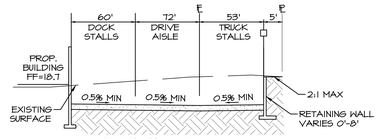
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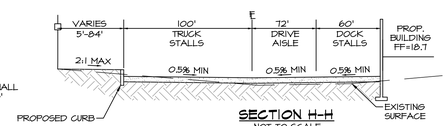
SECTION F-F
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SECTION G-G
NOT TO SCALE



SECTION H-H
NOT TO SCALE



LEGEND

- PROPOSED CONCRETE PAVEMENT
- PROPOSED LANDSCAPE AREA
- ADA PATH OF TRAVEL
- PROPOSED RELOCATED POWER POLE

N W E S

1" = 60'

60 0 60 120 180

CITY OF RANCHO CUCAMONGA

HILLWOOD – NAPA
CONCEPTUAL GRADING & DRAINAGE PLAN
BUILDING A

SCALE:	1"=60'
DATE:	6/25/20
DESIGNED:	EA
CHECKED:	DJA
PLN CK REF:	
F.B.	

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
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CASE FILE NO. DRC2020-00177

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OF 3 SHEETS
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APPENDIX B – WATER QUALITY BMP CALCULATIONS

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	1	0.50
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	2	0.50
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.25
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.8
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					6.3
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					2.25

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Double Ring Infiltrometer Test was performed.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

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and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

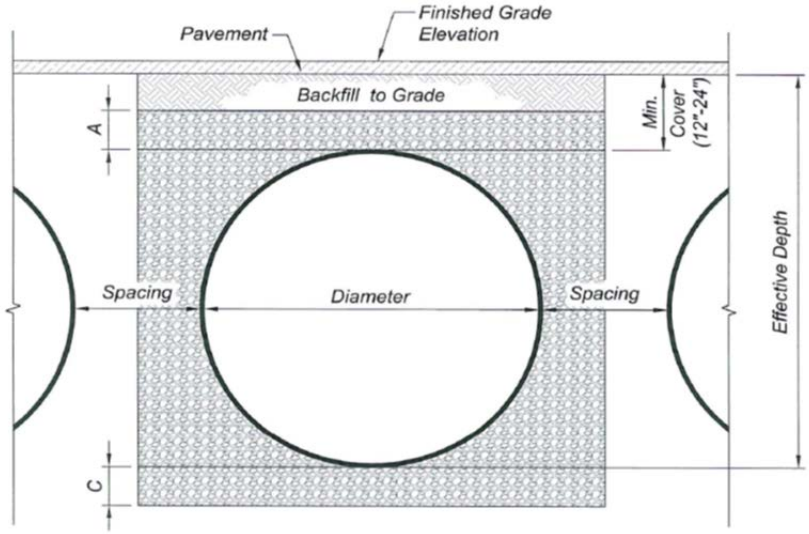
Date:	6/25/2020
Project Name:	Hillwood - Napa BLDG A
City / County:	Rancho Cucamonga
State:	CA
Designed By:	CV
Company:	Albert A. Webb Associates
Telephone:	(951) 686-1070

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	96,740
Limiting Width (ft):	53.50
Invert Depth Below Asphalt (ft):	9.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	78
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1.5
Depth A: Porous Stone Above Pipe (in):	9
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

33.18 ft^2 Pipe Area



System Sizing

Pipe Storage:	63,015	cf	
Porous Stone Storage:	34,046	cf	
Total Storage Provided:	97,060	cf	100.3% Of Required Storage
Number of Barrels:	5	barrels	
Length per Barrel:	362.0	ft	
Length Per Header:	44.5	ft	
Rectangular Footprint (W x L):	47.5 ft x 378. ft		

CONTECH Materials

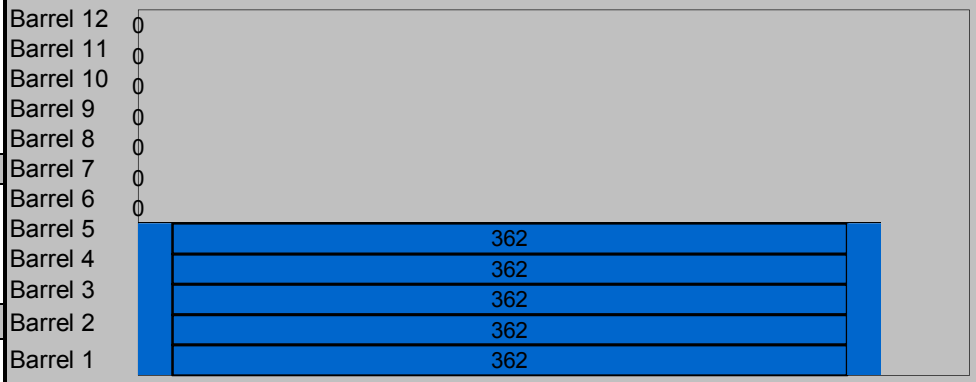
Total CMP Footage:	1,899	ft
Approximate Total Pieces:	84	pcs
Approximate Coupling Bands:	87	bands
Approximate Truckloads:	42	trucks

Construction Quantities**

Total Excavation:	5985	cy
Porous Stone Backfill For Storage:	3152	cy stone
Backfill to Grade Excluding Stone:	499	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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and pricing send completed worksheet to:
dyods@contech-cpi.com



Project Summary

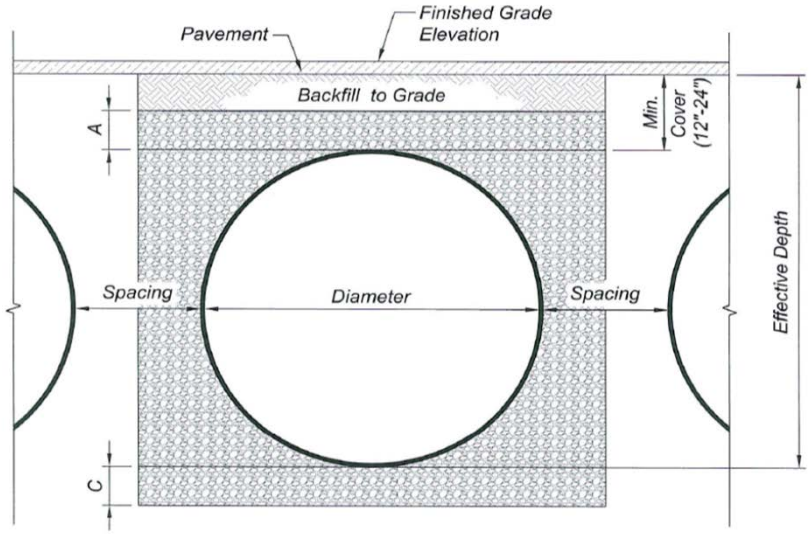
Date:	6/25/2020
Project Name:	Hillwood-Napa BLDG B
City / County:	Rancho Cucamonga
State:	CA
Designed By:	CV`
Company:	Albert A. Webb Associates
Telephone:	(951) 686-1070

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	33,020
Limiting Width (ft):	23.00
Invert Depth Below Asphalt (ft):	7.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	60
Number Of Headers:	1
Spacing between Barrels (ft):	2.50
Stone Width Around Perimeter of System (ft):	1.5
Depth A: Porous Stone Above Pipe (in):	9
Depth C: Porous Stone Below Pipe (in):	24
Stone Porosity (0 to 40%):	40

19.63 ft^2 Pipe Area



System Sizing

Pipe Storage:	18,300	cf	
Porous Stone Storage:	14,926	cf	
Total Storage Provided:	33,225	cf	100.6% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	304.0	ft	
Length Per Header:	20.0	ft	
Rectangular Footprint (W x L):	23. ft x 312. ft		

CONTECH Materials

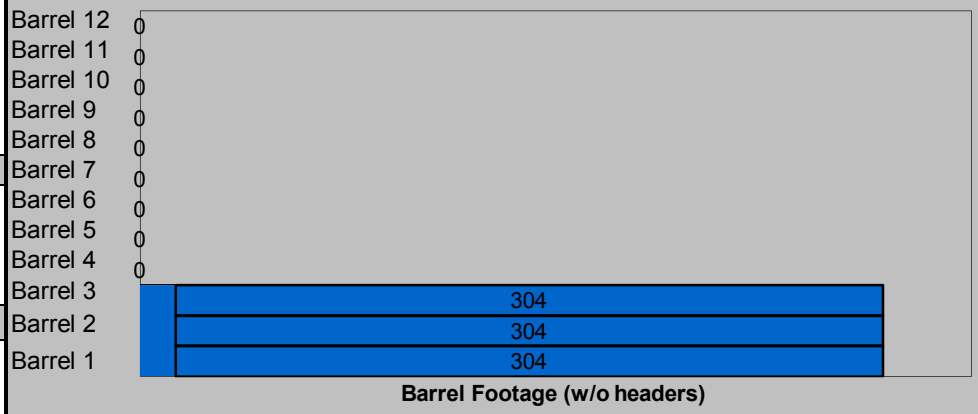
Total CMP Footage:	932	ft
Approximate Total Pieces:	40	pcs
Approximate Coupling Bands:	39	bands
Approximate Truckloads:	10	trucks

Construction Quantities**

Total Excavation:	1861	cy
Porous Stone Backfill For Storage:	1382	cy stone
Backfill to Grade Excluding Stone:	-199	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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Underground Storage System A
Drawdown Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

Designer: CV
Date: 6/25/2020
Project: Hillwood- Napa BLDG A
Location: City of Rancho Cucamonga
Area: DA-1

(1)	VBMP =	96,740 ft^3
(2)	Basin Bottom Area=	17955 ft^2
(3)	Infiltration Rate =	1.61 in/hr*

$$Drawdown = \frac{V_{BMP}\ (ft^3)}{Infiltration\ Rate\left(\frac{in}{hr}\right) \times \left(\frac{1ft}{12in}\right) \times Bottom\ Area\ (ft^2)}$$

Water Quality Drawdown Time= 40.2 hr

* Infiltration rate 4.5 in/hr and has a Factor of Safety of 2.8 (per Worksheet H in Appendix C)

Underground Storage System B
Drawdown Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

Designer: CV
Date: 4/21/2020
Project: Hillwood- Napa BLDG B
Location: City of Rancho Cucamonga
Area: DA-1

(1)	VBMP =	33,020 ft^3
(2)	Basin Bottom Area=	7176 ft^2
(3)	Infiltration Rate =	2.25 in/hr*

$$Drawdown = \frac{V_{BMP}\ (ft^3)}{Infiltration\ Rate\left(\frac{in}{hr}\right) \times \left(\frac{1ft}{12in}\right) \times Bottom\ Area\ (ft^2)}$$

Water Quality Drawdown Time= 24.5 hr

* Infiltration rate 6.3 in/hr and has a Factor of Safety of 2.8 (per Worksheet H in Appendix C)

APPENDIX C – SOILS REPORT

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

North Side of Napa Street East of
Etiwanda Avenue
Rancho Cucamonga, California
for
Hillwood

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

April 23, 2020

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Hillwood Investment Properties
901 Via Piemonte, Suite 175
Ontario, California 91764

Attention: Mr. Ned Sciortino
Vice President, California Development Lender

Project No.: 20G132-1

Subject: Geotechnical Investigation
Proposed Commercial/Industrial Development
North Side of Napa Street, East of Etiwanda Avenue
Rancho Cucamonga, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Daniel W. Nielsen, RCE 77195
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
DANIEL W. NIELSEN
No. 77915
CIVIL
STATE OF CALIFORNIA

Robert G. Trazo, M.Sc., GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
No. 2655
GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: (1) Addressee

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 SCOPE OF SERVICES 3

3.0 SITE AND PROJECT DESCRIPTION 4

3.1 Site Conditions 4
3.2 Proposed Development 4

4.0 SUBSURFACE EXPLORATION 6

4.1 Scope of Exploration/Sampling Methods 6
4.2 Geotechnical Conditions 6

5.0 LABORATORY TESTING 8

6.0 CONCLUSIONS AND RECOMMENDATIONS 10

6.1 Seismic Design Considerations 10
6.2 Geotechnical Design Considerations 12
6.3 Site Grading Recommendations 14
6.4 Construction Considerations 18
6.5 Foundation Design and Construction 18
6.6 Floor Slab Design and Construction 20
6.7 Retaining Wall Design and Construction 21
6.8 Pavement Design Parameters 23

7.0 GENERAL COMMENTS 25

APPENDICES

A Plate 1: Site Location Map
Plate 2: Boring and Trench Location Plan
B Boring and Trench Logs
C Laboratory Test Results
D Grading Guide Specifications
E Seismic Design Parameters

1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Geotechnical Design Considerations

- Artificial fill soils were encountered at most of the boring and trench locations, extending from the ground surface to depths of 1½ to 5½± feet. Some large concrete blocks and fragments were encountered in the existing fill soils (extending to a depth of 2½± feet) at Trench No. T-1 located in the southwest portion of the site. Concrete debris should be disposed of or crushed in accordance with the demolition recommendations in Section 6.3 of this report.
- The fill soils and near-surface alluvial soils possess varying strengths and densities. Some of the near surface fill and alluvial soils possess a minor potential for hydrocolapse. The existing fill soils are considered to represent undocumented fill. The near-surface soils, in their present condition, are not considered suitable to support of the foundations and floor slabs for the new structures.
- Remedial grading will be necessary to remove the existing fill soils and a portion of the near-surface alluvial soils and replace them as compacted structural fill. Generally, the on-site soils may be reused as structural fill. However, some optional selective grading may be beneficial based on the presence of cobbly soil layers present throughout the depths explored at the boring and trench locations.
- Based on a site plan provided by the client, an existing 12-foot-diameter Metropolitan Water District water supply line is present in the southern portion of the subject site, near Napa Street. This water line is expected to remain in place with the proposed development and should be protected in place during excavation and construction activities.
- The site plans indicate the two existing building will be located relatively close to the existing 12-foot-diameter water line. New building foundations located near the existing water line should be embedded to a depth sufficient to avoid surcharging the existing water line.

Site Preparation Recommendations

- Initial site stripping should include removal of any surficial vegetation from the site. Stripping should include any weeds, grasses, and any organic top soils.
- Demolition of the existing asphaltic concrete pavements, overhead power lines, and railroad tracks will be necessary to facilitate the proposed development. Debris resultant from demolition should be disposed of off-site. Alternatively, asphalt debris may be pulverized to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills. It may also be crushed and made into crushed miscellaneous base (CMB), if desired.
- We recommend that remedial grading be performed within the proposed building areas in order to remove all of the artificial fill soils and a portion of the near-surface alluvium. The soils present within the proposed building areas should be overexcavated to a depth of at least 5 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevation. The proposed foundation influence zones should also be overexcavated to a depth of at least 2 feet below proposed foundation bearing grade.

Additional overexcavation may be necessary in areas where loose or otherwise unsuitable soils are encountered at the base off the overexcavation.

- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be overexcavated. The resulting soils should be scarified and moisture conditioned to 0 to 4 percent above the optimum moisture content, to a depth of at least 12 inches. The overexcavation subgrade soils should then be recompacted under the observation of the geotechnical engineer. The previously excavated soils may then be replaced as compacted structural fill.
- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least two (2) No. 5 rebars (1 top and 1 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab Design Recommendations

- Conventional Slabs-on-Grade: minimum 6-inch thickness.
- Modulus of Subgrade Reaction: k = 150 psi/in.
- Reinforcement is not expected to be necessary for geotechnical considerations.
- The actual thickness and reinforcement of the floor slab should be determined by the structural engineer.

Pavement Design Recommendations

ASPHALT PAVEMENTS (R=50)					
Materials	Thickness (inches)				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	4	5	5	7
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R=50)				
Materials	Thickness (inches)			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 20P129R2, dated February 18, 2020. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slabs, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located on the north side of Napa Street, approximately 630 feet east of the intersection of Napa Street and Etiwanda Avenue in Rancho Cucamonga, California. The southern portion of the subject site is located within the city of Fontana city limits. The site is bounded to the north by commercial/industrial developments and a Metrolink rail line, to the east by the Etiwanda San Sevaine Flood Control Channel, to the south by Napa Street, and to the west by the Etiwanda Creek Channel. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of several contiguous irregular-shaped parcels totaling 35.38± acres in size. The majority of the site is presently vacant and undeveloped, with the exception of asphaltic concrete driveways in the western portion of the site, overhead powerlines, and a railroad easement. The asphaltic concrete driveways are located along the west property line, and a portion of the north property line, extending 475± feet eastward from the west property line. The pavements are in poor condition, with moderate cracking throughout. The railroad easement is present along the northern boundary of the site from the northeast property corner to the center of the northern property line. This easement extends southward from the north property line, crossing through the center of the site in the north-south direction. Ground surface cover west of the railroad easement generally consists of sparse to moderate native grass and weed growth with limited areas of debris and trash and limited areas of open-graded-gravel driveways transecting the western portion of this area in the north/south and east/west directions. Ground surface cover east of the railroad easement generally consists of exposed soils, limited areas of open-graded-gravel, and some areas with sparse to moderate native grass and weed growth. A soil berm, located in the northeast area of the site, is approximately 3± feet in height, and about 310 feet long. To the west of this berm, a "plateau," is present, approximately 7 feet higher than the surrounding portions of the site to the east and south. The sides of this elevated area consist of slopes with estimated inclinations of about 2h:1v on the east and south sides. This elevated area appears to slope gently downward to the north and west toward the railroad easement.

As a part of our research for this project, we reviewed readily available historical aerial photographs from NETRonline. Based on these photographs, the site was previously used to grow crops, between the time of the earliest available photograph from 1938 until sometime between later photographs which were taken in 1966 and 1994.

Overhead powerlines are present along the northern property line in the western half of the site. These powerlines extend eastward through the central portion of the eastern half of the site.

Site plans provided by the client indicate that a 12-foot diameter Metropolitan Water District water supply pipeline is present north of Napa Street, near the southern property line.

Detailed topographic information was not available at the time of this report. Based on visual observations made at the time of the subsurface investigation and from elevation data obtained from Google Earth, the overall site topography generally slopes downward to the south at a gradient of 2± percent, excluding the northwest plateau, northeast berm, and the southeast corner of the site. The southeast corner slopes gently to north at a gradient of 2½± percent.

3.2 Proposed Development

A conceptual site plan for the proposed development, identified as Scheme 5, was provided to our office by the client. Based on the conceptual site plan prepared by HPA Architecture, the site will be developed with two (2) new commercial/industrial buildings, identified as Buildings A and B. Building A will be 497,845± ft² in size and will be located in the eastern region of the property. Dock-high doors will be located on the north, east, and west sides of this building. Building B will be 152,992± ft^2 in size and will be located in the western region of the property. This building will possess dock-high doors along the northern building wall. The buildings are expected to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and concrete flatwork and landscape planters throughout the site.

An alternative site plan (entitled AMZL – Large Test Fit, dated January 31, 2020) was also provided to our office. In this plan the site will be developed with one (1) new delivery station building, 145,419± ft^2 in size, located in the eastern area of the property. The building is expected to be surrounded by either Portland cement concrete or Asphaltic concrete pavements in the parking and driving lanes and concrete flatwork and landscape planters throughout the site.

We expect that the overhead powerlines will have to be relocated from the eastern portion of the site in order to construct the proposed building(s) for either of these schemes.

Detailed structural information has not been provided. It is assumed that the new buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundations with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Grading plans for the proposed development were not available at the time of this report. The proposed development is not expected to include any significant amounts of below-grade construction such as basements or crawl spaces. Based on the existing topography, and assuming a relatively balanced site, cuts and fills of 5 to 7 ± feet are expected to be necessary to achieve the proposed site grades.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration performed for this project consisted of ten (10) borings advanced to depths of 15 to 25± feet below the existing site grades. Additionally, six (6) trenches were excavated to depths of 9½ to 10± feet below the existing site grades. All of the borings and trenches were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a conventional truck-mounted drilling rig. The trenches were excavated using a backhoe with a 24-inch-wide bucket. Representative bulk and relatively undisturbed soil samples were taken during drilling. Relatively undisturbed soil samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. Samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate boring and trench locations are indicated on the Boring and Trench Location Plan, included as Plate 2 in Appendix A of this report. The Boring and Trench Logs, which illustrate the conditions encountered at the boring and trench locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Artificial Fill

Artificial fill soils were encountered at the ground surface most of the boring and trench locations, extending to depths of 1½ to 5½± feet below the existing site grades. At these boring and trench locations, the artificial fill soils generally consist of loose to medium dense silty fine sands with trace to little medium to coarse sand, and little to some fine to coarse gravel content. The fill soils possess a disturbed appearance and some samples contain artificial debris, such as plastic and Portland cement concrete fragments, resulting in their classification as artificial fill. Trench No. T-1 encountered several concrete blocks within the fill soils, the largest of which possessed dimensions of about 1½ x 1½ by 2½± feet.

Alluvium

Native alluvium was encountered at the ground surface at Boring Nos. B-5 and B-7, and beneath the artificial fill soils at the remaining borings and all of the trench locations, extending to at least the maximum depth explored of 25± feet below the existing ground surface. The native alluvial

soils extending from the ground surface to 5½ to 12± feet generally consist of loose to medium dense silty fine sands, fine sands, and fine to medium sands with variable amounts of medium to coarse sand and fine to coarse gravel. Deeper alluvial soils generally consist of medium dense to very dense well-graded sands with trace to some fine to coarse gravel content and sandy gravels. Occasional cobbles were encountered throughout the depths explored at boring and trench locations. Soil strata containing extensive cobble content were encountered at various depths greater than 3½± feet at the boring and trench locations.

Groundwater

Groundwater was not encountered at any of the borings or trenches. Based on the lack of any water within the borings and trenches, and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 25± feet below existing site grades, at the time of the subsurface investigation.

As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well on record is located approximately 8,051 feet east of the site. Water level readings within this monitoring well indicate a groundwater level of 467± feet below the ground surface in April 2017.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring and Trench Logs and are periodically referenced throughout this report.

Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring and Trench Logs.

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-12 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

Representative bulk samples were tested for their maximum dry densities and optimum moisture contents. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557 and are presented on Sheets C-13 and C-14 in Appendix C of this report. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

Three (3) representative samples of the near-surface soils were submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete

which comes into contact with these soils. The results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	Severity
B-3 @ 0 to 5 feet	0.003	Not Applicable (S0)
B-5 @ 0 to 5 feet	0.003	Not Applicable (S0)
B-8 @ 0 to 5 feet	<0.001	Not Applicable (S0)

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

The recommendations are contingent upon all grading and foundation construction activities being monitored by the geotechnical engineer of record. The recommendations are provided with the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to verify compliance with these recommendations. Maintaining Southern California Geotechnical, Inc., (SCG) as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structures should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Furthermore, SCG did not identify any evidence of faulting during the geotechnical investigation. Therefore, the possibility of significant fault rupture on the site is considered to be low.

The potential for other geologic hazards such as seismically induced settlement, lateral spreading, tsunamis, inundation, seiches, flooding, and subsidence affecting the site is considered low.

Seismic Design Parameters

The 2019 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of

the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2019 edition of the California Building Code (CBC), which was adopted on January 1, 2020.

The 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.4.8 applies to the proposed structure at this site. However, the structural engineer should verify that this exception is applicable to the proposed structure. Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.789
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.669
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.789
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.137
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.192
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.758

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1

obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed buildings at this site.

Liquefaction

Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and plasticity characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Non-sensitive clayey (cohesive) soils which possess a plasticity index of at least 18 (Bray and Sancio, 2006) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The California Geological Survey (CGS) has not yet conducted detailed seismic hazards mapping in the area of the subject site. The general liquefaction susceptibility of the site was determined by research of the San Bernardino County Land Use Plan, General Plan, Geologic Hazard Overlays. Map FH28 for the Guasti 7.5-Minute Quadrangle indicates that the subject site is not located within an area of liquefaction susceptibility. Based on the mapping performed by the county of San Bernardino and the subsurface conditions encountered at the boring and trench locations, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The near-surface soils encountered at the boring and trench locations consist of artificial fill soils and native alluvium. The artificial fill soils, where encountered, extend to depths of 1½ to 5½± feet below the existing site grades. The fill soils possess variable strengths and densities and based on the results of consolidation/collapse testing, some of the fill materials possess a minor potential for hydrocollapse when inundated with water. Based on these considerations, and a lack of documentation of the placement and compaction of these soils, the existing fill materials are considered to consist of undocumented fill, unsuitable for the support of the proposed structures. The near surface alluvium also possesses variable strengths, densities, and composition. Therefore, remedial grading is considered warranted within the proposed building areas in order to remove all of the undocumented fill soils in their entirety, as well as the upper portion of the near-surface native alluvial soils, and replace recompact them as compacted structural fill.

The site plans indicate that a 12-foot-diameter MWD water supply line is present near the southern walls of the proposed buildings. Building foundations should be embedded to a sufficient depth that the foundation loads of the building do not surcharge the existing water line. Additionally, if the full lateral extent of the recommended overexcavation can not be completed due to the presence of this water line, the foundations should be designed for a reduced allowable soil bearing pressure.

Some large concrete blocks and debris were encountered within the existing fill soils at Trench No. T-1. It may be desirable to perform additional exploration in the southern portion of the site to further characterize the extent of the soils containing concrete debris.

Settlement

The recommended remedial grading will remove the existing undocumented fill soils and a portion of the near-surface native alluvial soils and replace these materials as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation will not be subject to significant stress increases from the foundations of the new structures. Therefore, following completion of the recommended grading, post-construction settlements are expected to be within tolerable limits.

Expansion

The near-surface soils generally consist of sands and silty sands with no appreciable clay content. These materials have been visually classified as non-expansive. Therefore, no design considerations related to expansive soils are considered warranted for this site.

Soluble Sulfates

The result of the soluble sulfate testing indicate a sulfate concentrations of less than 0.001 to approximately 0.003 percent for the selected samples of the on-site soils. This concentration is considered to be not applicable (S0) with respect to the American Concrete Institute (ACI) Publication 318-14 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building areas.

Shrinkage/Subsidence

Based on the results of the laboratory testing, removal and recompaction of the loose to medium dense near-surface fill and alluvial soils, extending to depths of 5± feet, is estimated to result in an average shrinkage of 8 to 12 percent. It should be noted that this shrinkage estimate is based on the results of dry density testing performed on small-diameter samples of the existing soils taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.1± feet. This estimate may be used for grading in areas that are underlain by native alluvial soils.

These estimates are based on previous experience in the area of the subject site and the subsurface conditions encountered at the boring and trench locations. The actual amount of

subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

Grading and foundation plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the preliminary grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring and trench locations and our understanding of the proposed development. We recommend that all grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping and Demolition

Initial site stripping should include removal of any surficial vegetation from the site. Stripping should include any grass and weed growth as well as any organic top soils. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

Demolition of the existing asphaltic concrete pavements, overhead power lines, and railroad tracks will be necessary to facilitate the proposed development. Additionally, any other existing subsurface improvements that will not remain in place for use with the new development should be removed in their entirety. This should include any utilities or other subsurface improvements. Debris resultant from demolition should be disposed of offsite. Alternatively, concrete and asphalt debris may be pulverized to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills. It may also be crushed and made into crushed miscellaneous base (CMB), if desired.

We understand that an existing 12-foot-diameter Metropolitan Water District water supply line is present in the southern portion of the subject site, near Napa Street. This water line is expected to remain in place with the proposed development and should be protected in place during stripping demolition activities.

Treatment of Existing Soils: Building Pads

Remedial grading should be performed within the proposed building pad areas in order to remove any soils disturbed during stripping and demolition, the existing undocumented fill soils, and the upper portion of the near-surface native alluvium. Based on conditions encountered at the boring and trench locations, we recommend that the existing soils within the proposed building areas be overexcavated to a depth of at least 5 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevations, whichever is greater. The depth of the overexcavation should also extend to a depth sufficient to remove all undocumented fill soils. The

undocumented fills extend to depths of 1½ to 5½± feet at most of the boring and trench locations. Additional overexcavation should be performed within the influence zones of the new foundations, to provide for a new layer of compacted structural fill extending to a depth of at least 2 feet below proposed bearing grades.

The overexcavation areas should extend at least 5 feet beyond the building and foundation perimeters, and to an extent equal to the depth of fill below the new foundations. If the proposed structures incorporate any exterior columns (such as for a canopy or overhang) the overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structures. This evaluation should include proofrolling and probing to identify any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if additional fill materials or loose, porous, or low-density native soils are encountered at the base of the overexcavation. It should be noted that some of the borings, including Boring Nos. B-2, B-3, and B-4 encountered loose soils extending to depths of 8½ to 10± feet.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and moisture treated to 0 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 2 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pads. Any undocumented fill soils within any of these foundation areas should be removed in their entirety. The overexcavation areas should extend at least 5 feet beyond the foundation perimeters, and to an extent equal to the depth of fill below the new foundations. Any erection pads for tilt-up concrete walls are considered to be part of the foundation system. Therefore, these overexcavation recommendations are applicable to erection pads. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils, as discussed for the building areas. The previously excavated soils may then be replaced as compacted structural fill.

If the recommended remedial grading cannot be completed for screen walls located along property lines, such walls should be designed for a reduced allowable bearing pressure. The allowable bearing pressure will be determined based on the actual extent of remedial grading that can be accomplished.

Treatment of Existing Soils: Flatwork, Parking and Drive Areas

Based on economic considerations, overexcavation of the existing near-surface existing soils in the new flatwork, parking and drive areas is not considered warranted, with the exception of

areas where lower strength or unstable soils are identified by the geotechnical engineer during grading.

ese organic soils should not be reused as structural fill in any pavement areas. Subgrade preparation in the new flatwork, parking and drive areas should initially consist of removal of all soils disturbed during stripping and demolition operations

The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. Any such materials should be removed to a level of firm and unyielding soil. The exposed subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 0 to 4 percent above the optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength surficial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

The grading recommendations presented above for the proposed flatwork, parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed flatwork, parking and drive areas. The grading recommendations presented above do not completely mitigate the extent of existing fill soils that may be present in the flatwork, parking and drive areas. As such, some settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the flatwork, parking and drive areas should be overexcavated to a depth of 2 feet below proposed pavement subgrade elevation, with the resulting soils replaced as compacted structural fill.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 0 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2019 CBC and the grading code of the city of Rancho Cucamonga.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Selective Grading and Oversized Material Placement

Some of the native alluvial soils encountered at the boring and trench locations, especially at depths greater than 3½± feet possess significant cobble content. Additionally, some large concrete debris was encountered at trench location T-1 within the existing artificial fill soils. It is expected that large scrapers (Caterpillar 657 or equivalent) will be adequate to move the cobble containing soils. However, some large concrete debris greater than 2± feet in size, was

encountered within the upper 2½ feet of the fill soils at Trench T-1. It will likely be necessary to move such larger concrete debris individually, to be disposed in accordance with the recommendations for demolition above.

Since the proposed grading will require excavation of cobble containing soils, it may be desirable to selectively grade the proposed building pad areas. The presence of particles greater than 3 inches in diameter within the upper 1 to 3 feet of the building pad subgrade will impact the utility and foundation excavations. Depending on the depths of fills required within the proposed parking areas, it may be feasible to sort the on-site soils, placing the materials greater than 3 inches in diameter within the lower depths of the fills, and limiting the upper 1 to 3 feet of soils to materials less than 3 inches in size. Oversized materials could also be placed within the lower depths of the recommended overexcavations. In order to achieve this grading, it would likely be necessary to use rock buckets and/or rock sieves to separate the oversized materials from the remaining soil. Although such selective grading will facilitate further construction activities, it is not considered mandatory and a suitable subgrade could be achieved without such extensive sorting. However, in any case, it is recommended that all materials greater than 6 inches in size be excluded from the upper 1 foot of the surface of any compacted fills.

The placement of any oversized materials should be performed in accordance with the Grading Guide Specifications included in Appendix D of this report. If disposal of oversized materials is required, rock blankets or windrows should be used and such areas should be observed during construction and placement by a representative of the geotechnical engineer.

Imported Structural Fill

All imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, all utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Rancho Cucamonga. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near-surface soils generally consist of silty sands underlain, well graded sands and occasional sandy silt, clayey sandy and silty clay strata. These materials will likely be subject to minor to moderate caving within shallow excavations. Where caving does occur, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

As previously discussed, an existing 12-foot-diameter Metropolitan Water District water supply line is present in the southern portion of the subject site, near Napa Street. This water line is expected to remain in place with the proposed development and should be protected in place during excavation and construction activities.

Groundwater

The static groundwater table is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration. Therefore, groundwater is not expected to impact the grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pads will be underlain by structural fill soils used to replace the existing fill soils and a portion of the near-surface alluvial soils. These new structural fill soils are expected to extend to depths of at least 2 feet below proposed foundation bearing grade, underlain by 1± foot of additional soil that has been scarified, moisture conditioned, and recompacted. Based on this subsurface profile, the proposed structures may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2. A reduced allowable bearing pressure of 1,500 lbs/ft^2 should be used where it is not practical to perform the full lateral extent of the recommended overexcavation, such as in the area of the existing water supply line, if applicable.

- Minimum wall/column footing width: 14 inches/24 inches.

- Minimum longitudinal steel reinforcement within strip footings: Two (2) No. 5 rebars (1 top and 1 bottom).

- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab. Foundations should also be embedded to a sufficient depth that the foundation loads do not surcharge the existing water supply line.

- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressures presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on geotechnical considerations; additional reinforcement may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils suitable for direct foundation support should consist of newly placed structural fill, compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 0 to 4 percent of the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

Post-construction total and differential settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively. Differential movements are expected to occur over a 30-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 300 lbs/ft^3
- Friction Coefficient: 0.30

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill soils. The maximum allowable passive pressure is 3,000 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support the new floor slabs should be prepared in accordance with the recommendations contained in the *Site Grading Recommendations* section of this report. Based on the anticipated grading which will occur at this site, the floors of the proposed structures may be constructed as conventional slabs-on-grade supported on newly placed structural fill (or densified existing soils), extending to a depth of at least 3 feet below finished pad grades. Based on geotechnical considerations, the floor slabs may be designed as follows:

- Minimum slab thickness: 6 inches.

- Modulus of Subgrade Reaction: k = 150 psi/in.

- Minimum slab reinforcement: Reinforcement is not considered necessary from a geotechnical standpoint. The actual floor slab reinforcement should be determined by the structural engineer, based on the imposed slab loading.

- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of the proposed slabs where such moisture sensitive floor coverings are anticipated. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 0 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

The actual design of the floor slabs should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring and trench locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The near-surface soils generally consist of silty sands. Based on their composition, the on-site soils have been assigned a friction angle of 30 degrees.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for the imported select fill, this material must be placed within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type: On-site Silty Sands and Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		130 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	43 lbs/ft^3
	Active Condition (2h:1v backfill)	70 lbs/ft^3
	At-Rest Condition (level backfill)	65 lbs/ft^3

The walls should be designed using a soil-footing coefficient of friction of 0.30 and an equivalent passive pressure of 300 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive

resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

Seismic Lateral Earth Pressures

In accordance with the 2019 CBC, any retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 2 feet below proposed foundation bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

On-site soils may be used to backfill the retaining walls. However, all backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

It is recommended that a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls be used. If the drainage composite material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The drainage composite should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system.

6.8 Pavement Design Parameters

Site preparation in the pavement areas should be completed as previously recommended in the *Site Grading Recommendations* section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring, and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near-surface soils generally consist of silty sands and sands with occasional interbedded sandy silt, sandy clay, and silty clay strata. These soils are generally considered to possess good pavement support characteristics, with R-values in the range of 50 to 60. The subsequent pavement design is therefore based upon an assumed R-value of 50. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It is recommended that R-value testing be performed after completion of rough grading to verify that the pavement design recommendations presented herein are valid.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI's) indicated. The client and/or civil engineer should verify that these TI's are representative of the anticipated traffic volumes. If the client and/or civil engineer determine that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20-year design life, assuming six operational traffic days per week.

Traffic Index	No. of Heavy Trucks per Day
4.0	0
5.0	1
6.0	3
7.0	11
8.0	35
9.0	93

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. All of the traffic indices allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R=50)					
Materials	Thickness (inches)				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	4	5	5	7
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as determined by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

The preparation of the subgrade soils within concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS (R=50)				
Materials	Thickness (inches)			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. Any reinforcement within the PCC pavements should be determined by the project structural engineer. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness.

7.0 GENERAL COMMENTS

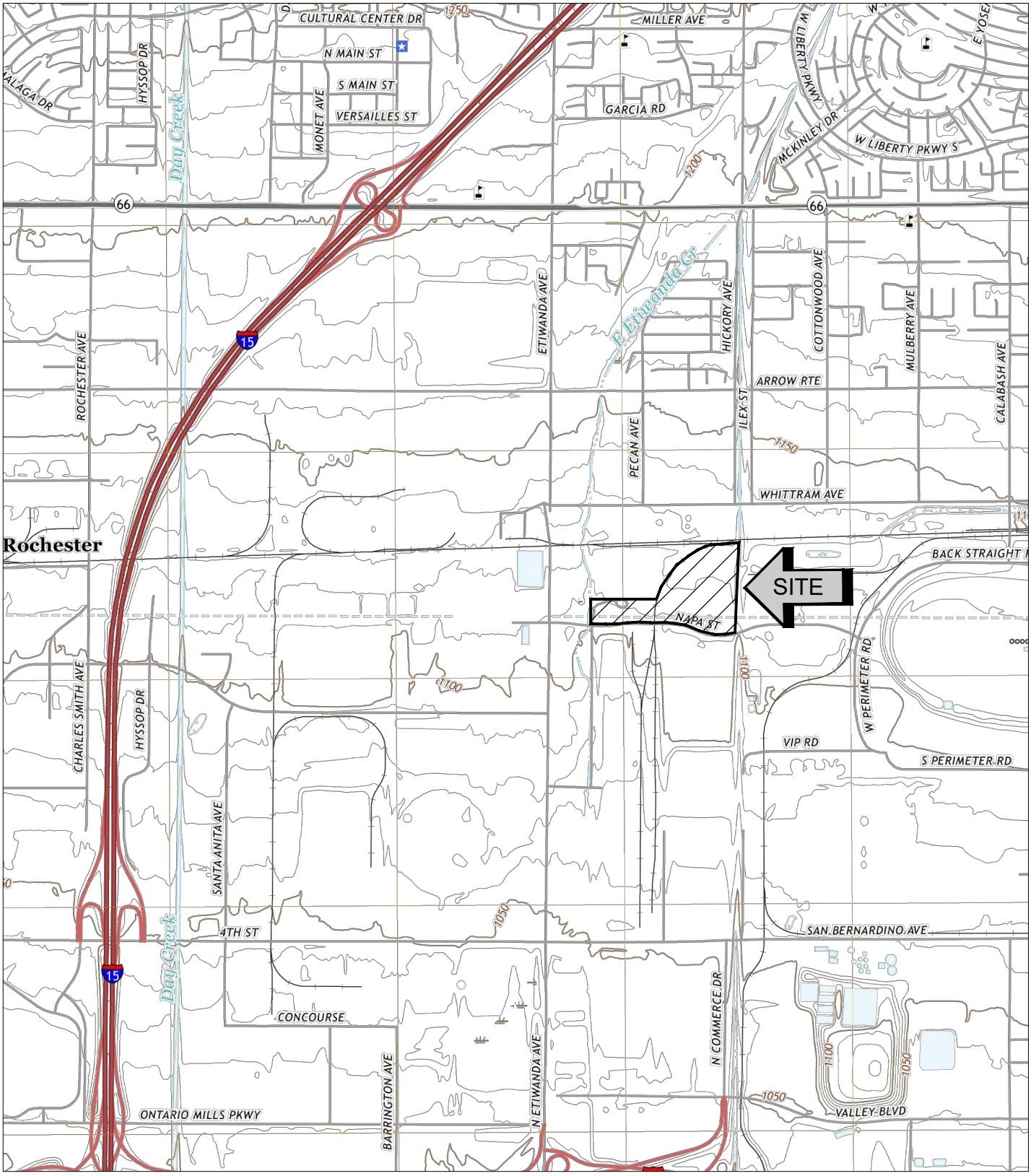
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring and trench locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A



SOURCE: USGS TOPOGRAPHIC MAP OF SIMI VALLEY EAST QUADRANGLE, VENTURA COUNTY, CALIFORNIA, 2018.

SITE LOCATION MAP

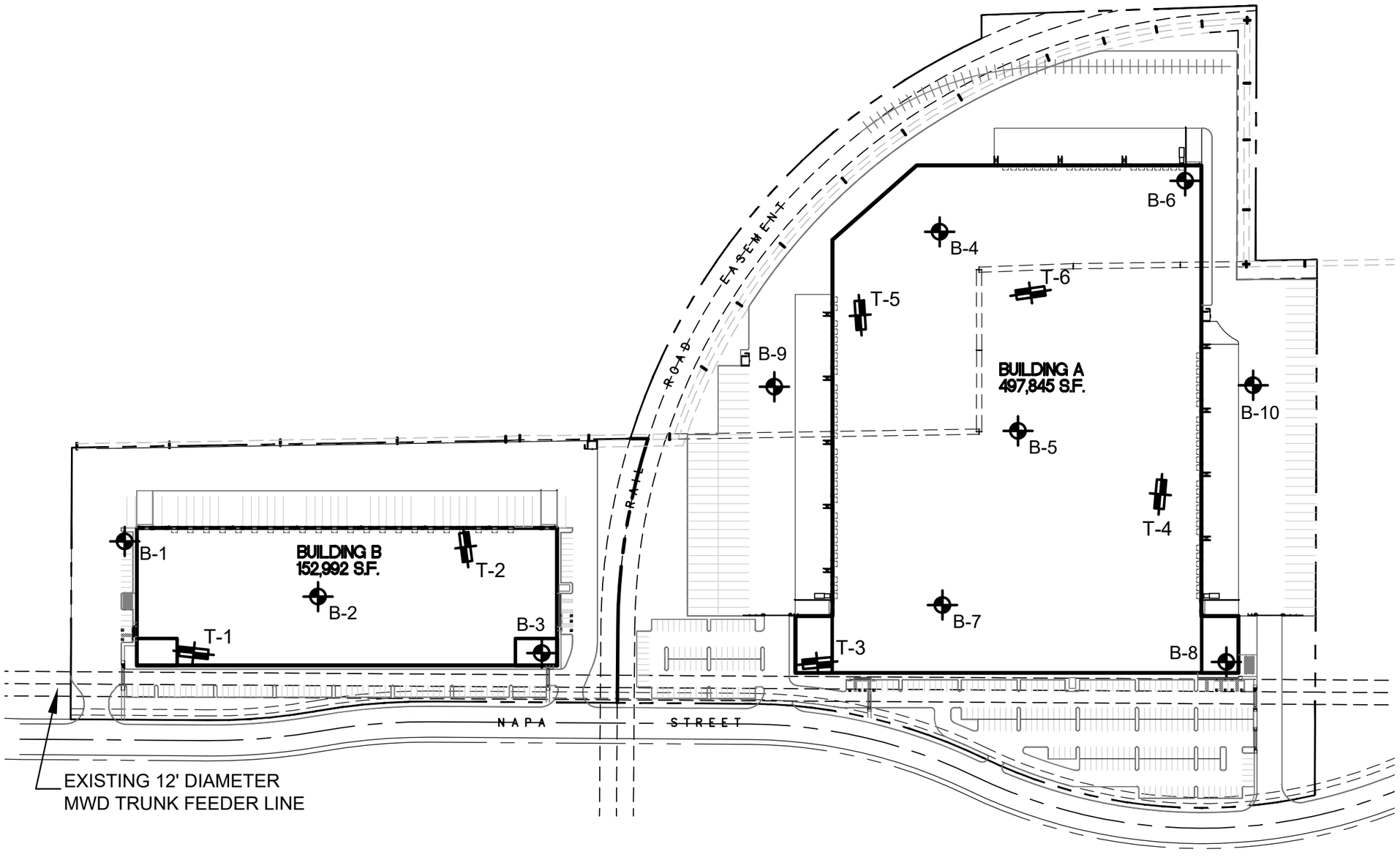
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: JAH CHKD: RGT	
SCG PROJECT 20G132-1	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

APPROXIMATE BORING LOCATION

APPROXIMATE TRENCH LOCATION

NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.

BORING LOCATION PLAN

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 180'

DRAWN: JAH
CHKD: RGT

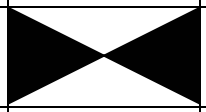
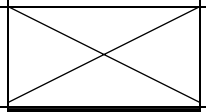
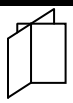
SCG PROJECT
20G132-1

PLATE 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

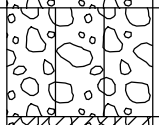
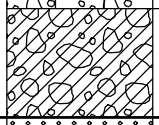
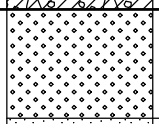
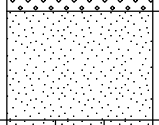
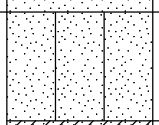
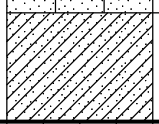
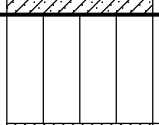
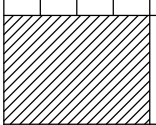
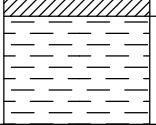
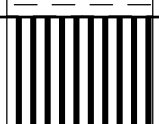
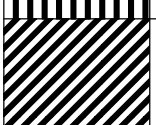
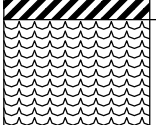
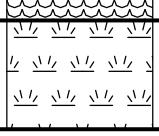
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		25			FILL: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace to little fine Gravel, medium dense-damp	111	4					
		26			ALLUVIUM: Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, medium dense to dense-dry to damp	107	3					
5		52			@ 5 feet, occasional Cobbles		2					Disturbed Sample
		31				97	4					
		38			Gray Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp	110	3					
10					Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense-damp							
		15					3					
15					Boring Terminated at 15'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 10 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		14			FILL: Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-dry to damp		3					
		6			ALLUVIUM: Gray Brown fine to medium Sand, little coarse Sand, trace fine Gravel, loose-moist		11					
5		8			Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, loose-damp to moist		3 12					
		7			Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-moist		8					
10		38			Gray Brown fine to coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, medium dense-dry to damp	114	2					
		28					3					
15												
		73/4"			@ 18½ to 25 feet, very dense		2					
20												
		74/3"					2					
25					Boring Terminated at 25'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 9 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		14			FILL: Gray Brown Silty fine to medium Sand, trace coarse Sand, loose-dry to damp	97	3					
		20			ALLUVIUM: Gray Brown fine Sand, trace medium to coarse Sand, loose to medium dense-dry to damp	101	3					
5		13			Gray Brown fine to medium Sand, trace coarse Sand, occasional Cobbles, loose-dry	103	2					
		14			Brown Silty fine Sand, trace medium to coarse Sand, loose-damp to moist	111	7					
		33			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-damp	111	5					
10					Gray Brown fine Sand, trace medium to coarse Sand, medium dense-damp							
		19			Gray Brown fine coarse Sand, trace fine to coarse Gravel, medium dense-dry		2					
15												
		46			@ 18½ feet, occasional Cobbles, dense		2					
20					Boring Terminated at 20'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		21			FILL: Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, trace Silt, medium dense-moist		8					
		13			ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-moist		9					
5		14			Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, medium dense-damp to moist		7					
		16					4					
10					Gray Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp							
		17					4					
15					Boring Terminated at 15'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG **PLATE B-4**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		13			ALLUVIUM: Dark Brown Silty fine Sand, trace medium to coarse Sand, loose-moist	111	11					
		16			Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp	103	4					
5		30			Gray Brown fine to coarse Sand, little to some fine Gravel, occasional Cobbles, medium dense-dry to damp		2					Disturbed Sample
		19				111	4					
		38				103	3					
10												
		18					4					
15												
		34			@ 18½ to 25 feet, dense		2					
20												
		40					3					
25					Boring Terminated at 25'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 14 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		35			FILL: Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp	115	5					
		15			ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, loose-damp	106	4					
5		13				105	6					
		12			Gray Brown fine to coarse Sand, little fine to coarse Gravel, loose to medium dense-dry to damp	111	3					
		37					2					Disturbed Sample
10												
		27			@ 13½ to 15 feet, moist		9					
15												
		23					2					
20					Boring Terminated at 20'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-6

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-7

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 9 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		15			ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, medium dense-moist		9					
		16			Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, trace to little Silt, medium dense-damp		5					
5		18			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense to very dense-dry to damp		2					
		20					2					
10												
		20			@ 13½ feet, 3 inch lense of Silty fine Sand		3					
15												
		50					2					
20					Boring Terminated at 20'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG

PLATE B-7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		27			FILL: Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, trace Silt, medium dense-damp	112	5					
		20			ALLUVIUM: Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, medium dense-dry to damp	109	3					
5		22				112	3					
		29				109	2					
		33			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense to very dense-dry to damp		3					Disturbed Sample
10												
		44					1					
15												
		51					2					
20												
		50/5"					2					
25					Boring Terminated at 25'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG **PLATE B-8**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 7 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Brown Silty fine to medium Sand, trace coarse Sand, little fine to coarse Gravel, medium dense-damp to very moist							
		21					6					
		19					13					
5												
		20			ALLUVIUM: Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, medium dense-dry		2					
		14			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense to dense-dry to damp		2					
10												
		32					3					
15												
		25					3					
20					Boring Terminated at 20'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG **PLATE B-9**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-10

JOB NO.: 20G132-1
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: 7 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		17			FILL: Dark Brown Silty fine Sand, trace medium to coarse Sand, medium dense-moist		9					
		10			ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, medium dense-moist		8					
5		17			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense-dry to damp		3					
		16					2					
10												
		46					2					
15												
		12			Brown Silty fine Sand, trace medium to coarse Sand, little fine to coarse Gravel, medium dense-moist		11					
20					Boring Terminated at 20'							

TBL 20G132-1.GPJ SOCALGEO.GDT 4/23/20

TEST BORING LOG **PLATE B-10**

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-1

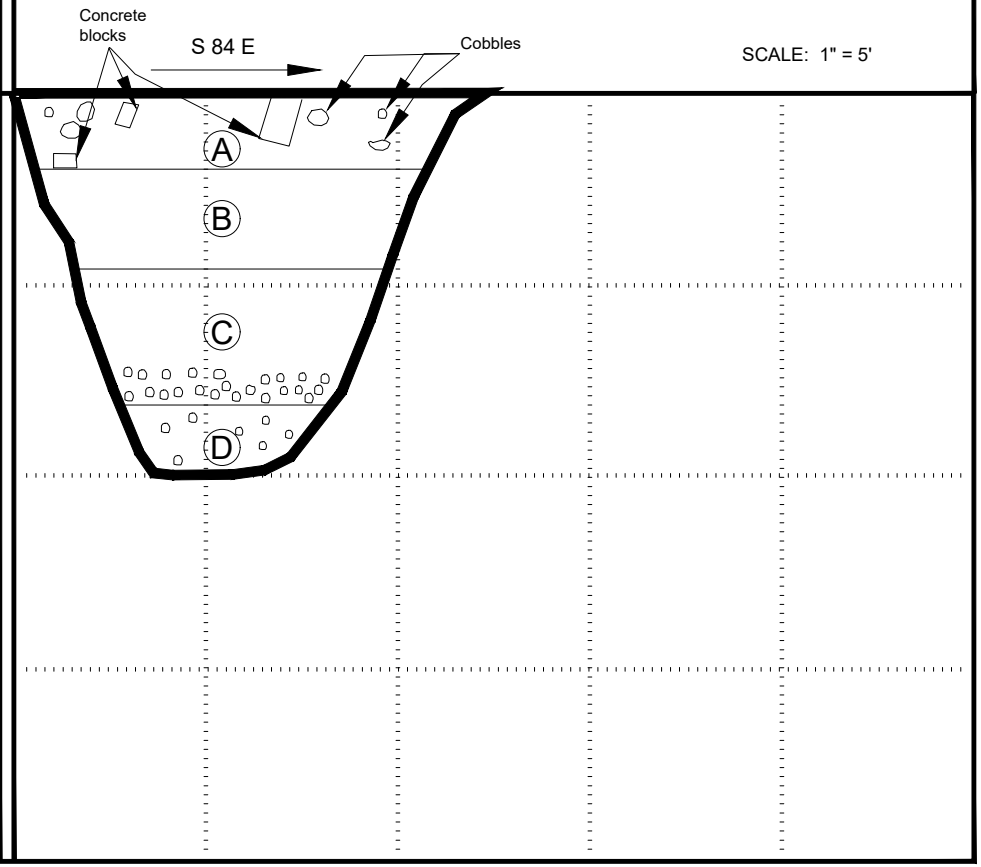
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: S 84 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: FILL: Brown to Dark Brown Silty fine to coarse Sand, little fine to coarse Gravel, trace fine root fibers, occasional Cobbles, occasional concrete debris, loose-damp
	b		5	
	b		5	B: ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, loose-damp
5				
	b		2	C: Dark Brown fine to coarse Sand, trace fine to coarse Gravel, medium dense-dry
				@ 7 to 8 feet, extensive Cobbles
	b		8	
				D: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, occasional Cobbles, medium dense-moist
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-2

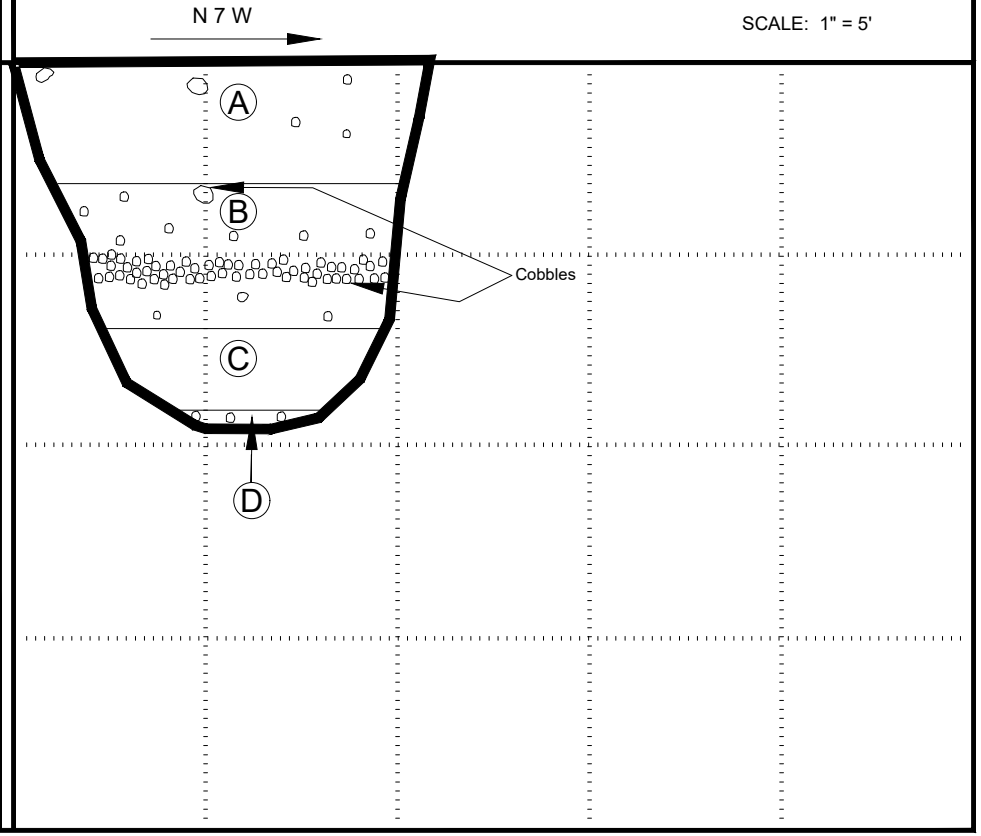
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: N 7 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		1	A: FILL: Dark Brown Silty fine Sand, little medium to coarse Sand, some fine to coarse Gravel, trace plastic mesh, occasional Cobbles, mottled, loose-dry
	b		4	B: ALLUVIUM: Brown fine to medium Sand, some coarse Sand, some fine to coarse Gravel, occasional Cobbles, little Silt, loose-damp
5				@ 5 to 6 feet, extensive Cobbles
	b		7	C: Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp to moist
	b		9	D: Brown fine to medium Sand, some fine to coarse Gravel, little coarse Sand, little Silt, occasional Cobbles, medium dense-moist
10				Trench Terminated @ 9.5 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-3

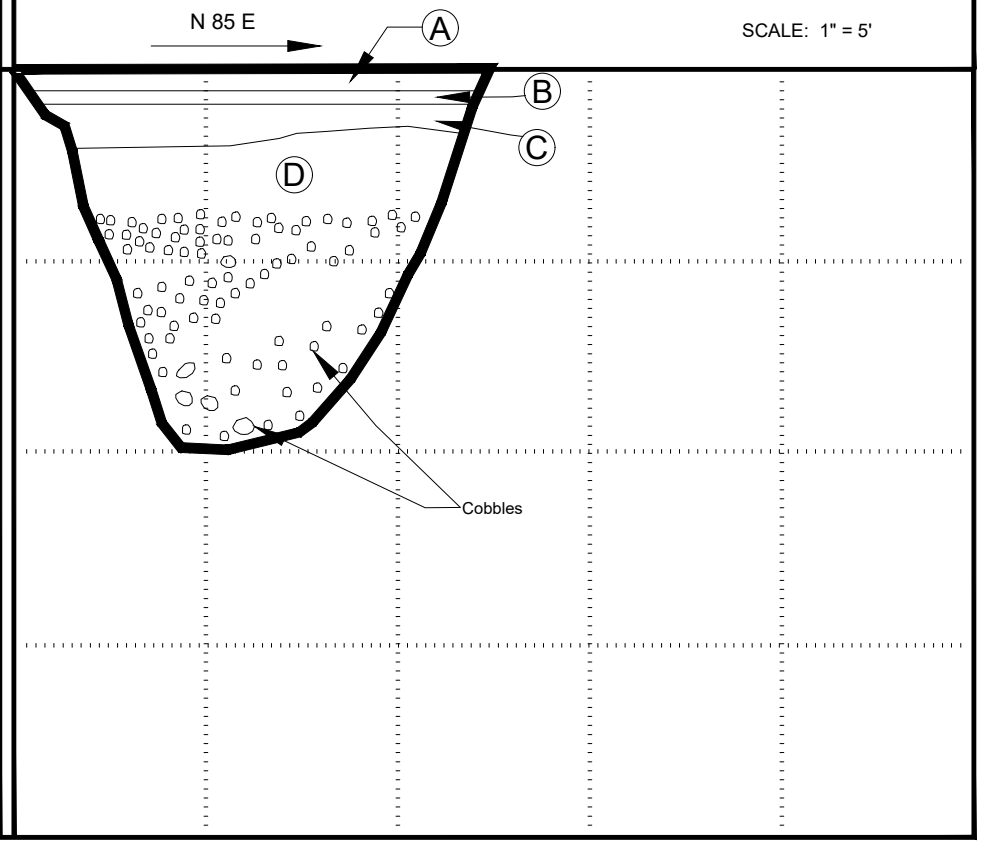
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: N 85 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		6	A: FILL: Brown Gravelly fine to coarse Sand, some Silt, trace fine root fibers, mottled, loose-damp to moist
	b		7	B: Dark Brown fine Sand, some Silt, trace to little fine to coarse Gravel, loose-damp
	b		4	C: ALLUVIUM: Brown fine to coarse Sand, trace to little fine to coarse Gravel, trace Silt, medium dense-damp
5				D: Brown Gravelly fine to coarse Sand, some Silt, dense-damp @ 3.5 to 10 feet, extensive Cobbles
	b		5	
	b		5	
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-4

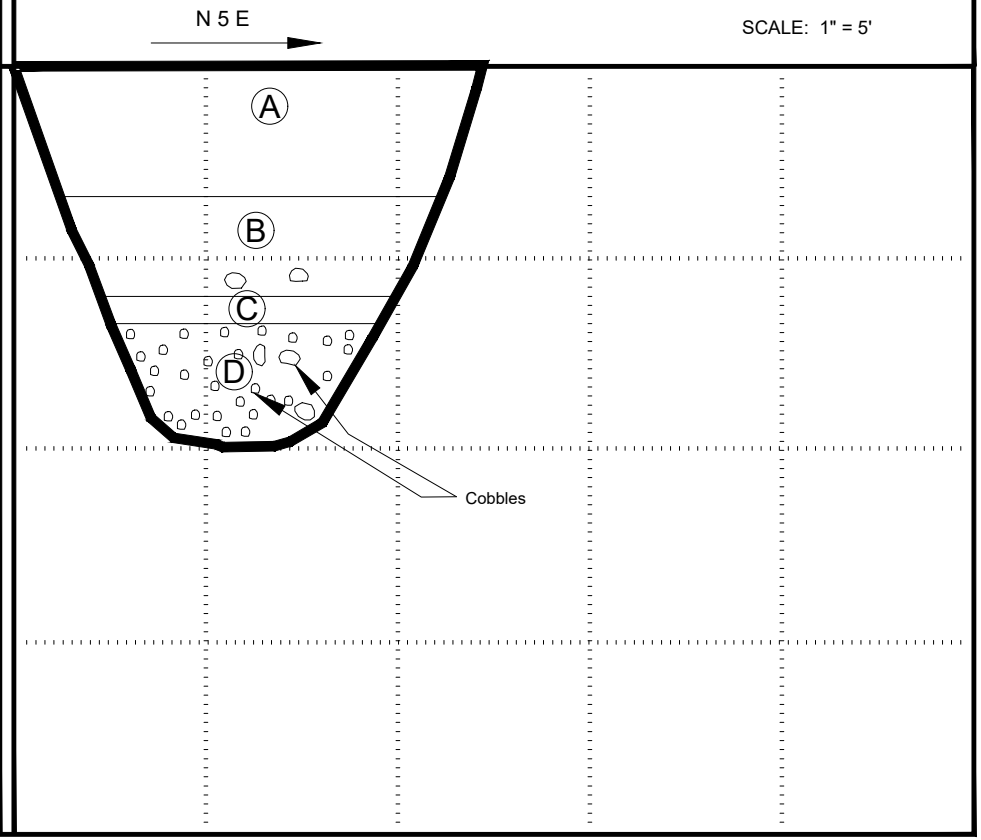
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: N 5 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		4	A: FILL: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, trace fine root fibers, loose to medium dense-damp to moist
	b		12	
	b		5	B: ALLUVIUM: Gray Brown fine to medium Sand, some Silt, trace coarse Sand, trace fine to coarse Gravel, occasional Cobbles, loose-damp
5				
	b		4	C: Light Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp
	b		2	D: Gray Brown Gravelly fine to coarse Sand, trace Silt, extensive Cobbles, medium dense-dry
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-5

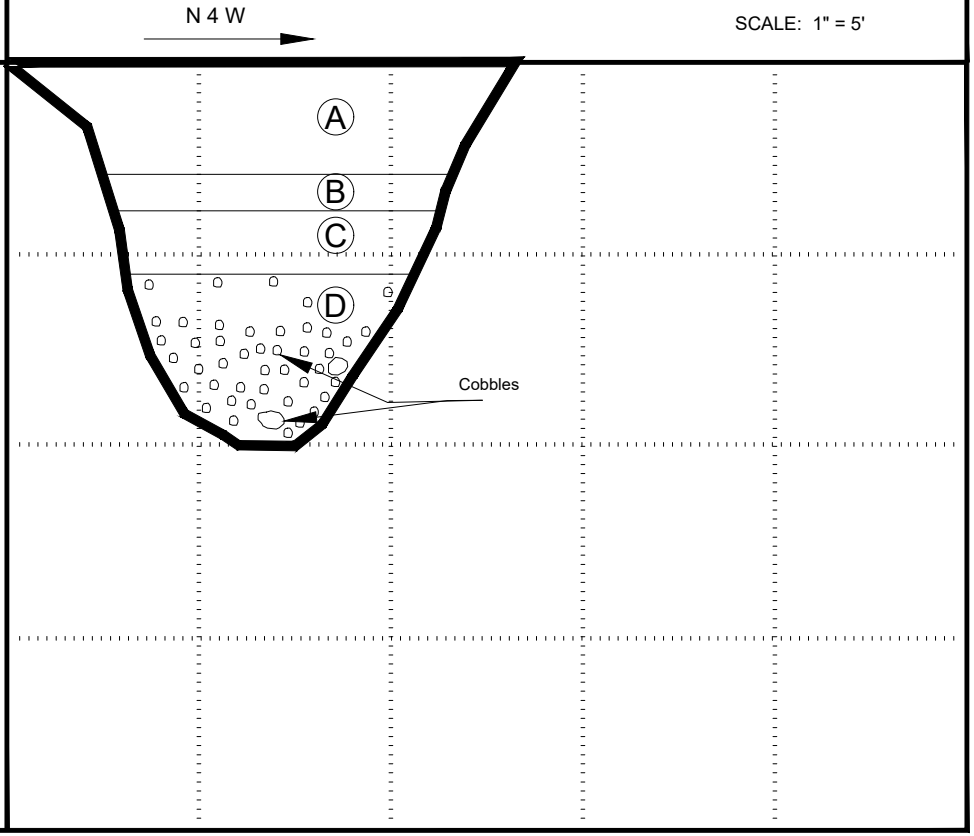
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: N 4 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: FILL: Light Brown to Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, trace fine root fibers, medium dense-damp to moist
	b		10	B: ALLUVIUM: Brown Silty fine to medium Sand, some coarse Sand, trace fine to coarse Gravel, medium dense-damp
	b		5	C: Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-damp
5				D: Gravelly fine to coarse Sand, trace Silt, occasional Cobbles, medium dense-dry
				@ 7 to 10 feet, extensive cobbles
	b		2	
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-6

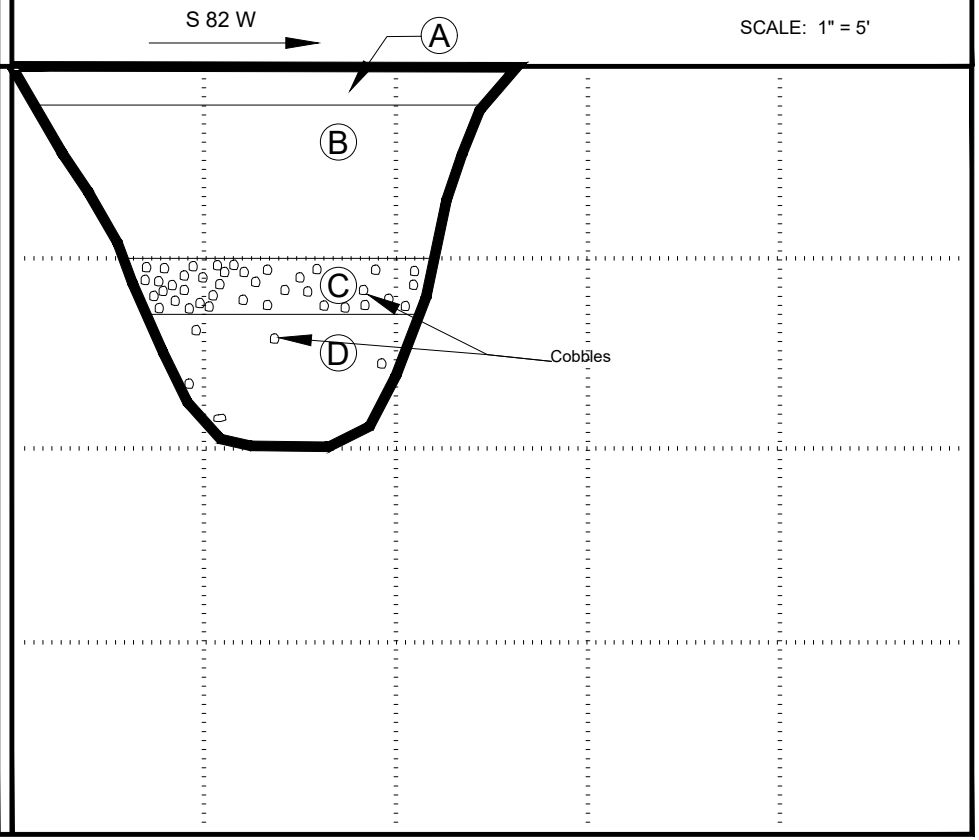
JOB NO.: 20G132-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, California
DATE: 4/2/2020

EQUIPMENT USED: Backhoe
LOGGED BY: Ryan Bremer
ORIENTATION: S 82 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		3	A: FILL: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, loose-dry to damp B: ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, loose-damp to moist
	b		7	
5				C: Brown Gravelly fine to coarse Sand, trace Silt, extensive Cobbles, medium dense-dry
	b		2	D: Brown Gravelly fine to medium Sand, some coarse Sand, trace Silt, occasional Cobbles, medium dense-dry
10	b		2	Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



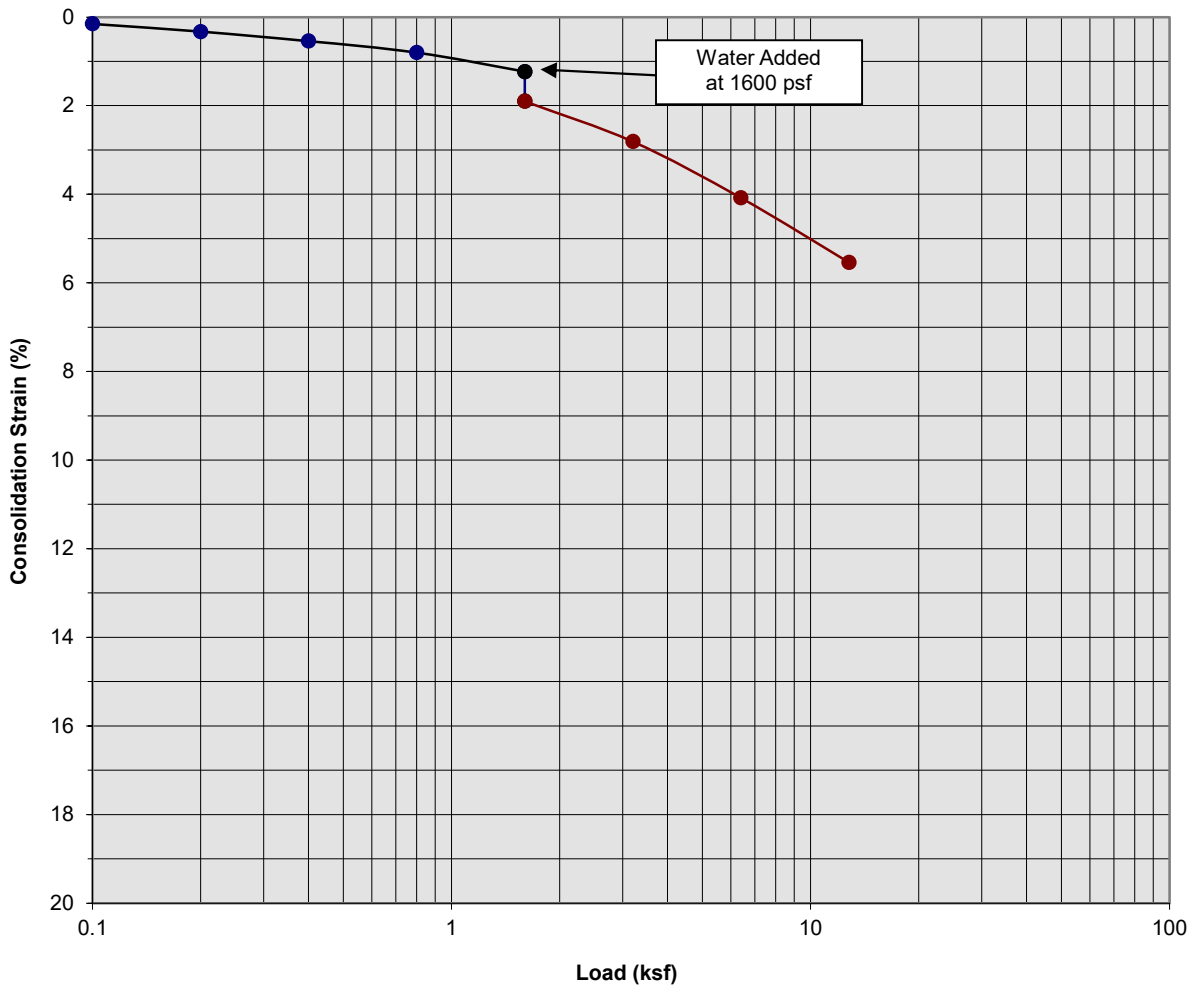
KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-6

APPENDIX C

Consolidation/Collapse Test Results



Classification: Fill: Gray Brown Silty fine to medium Sand, trace coarse Sand

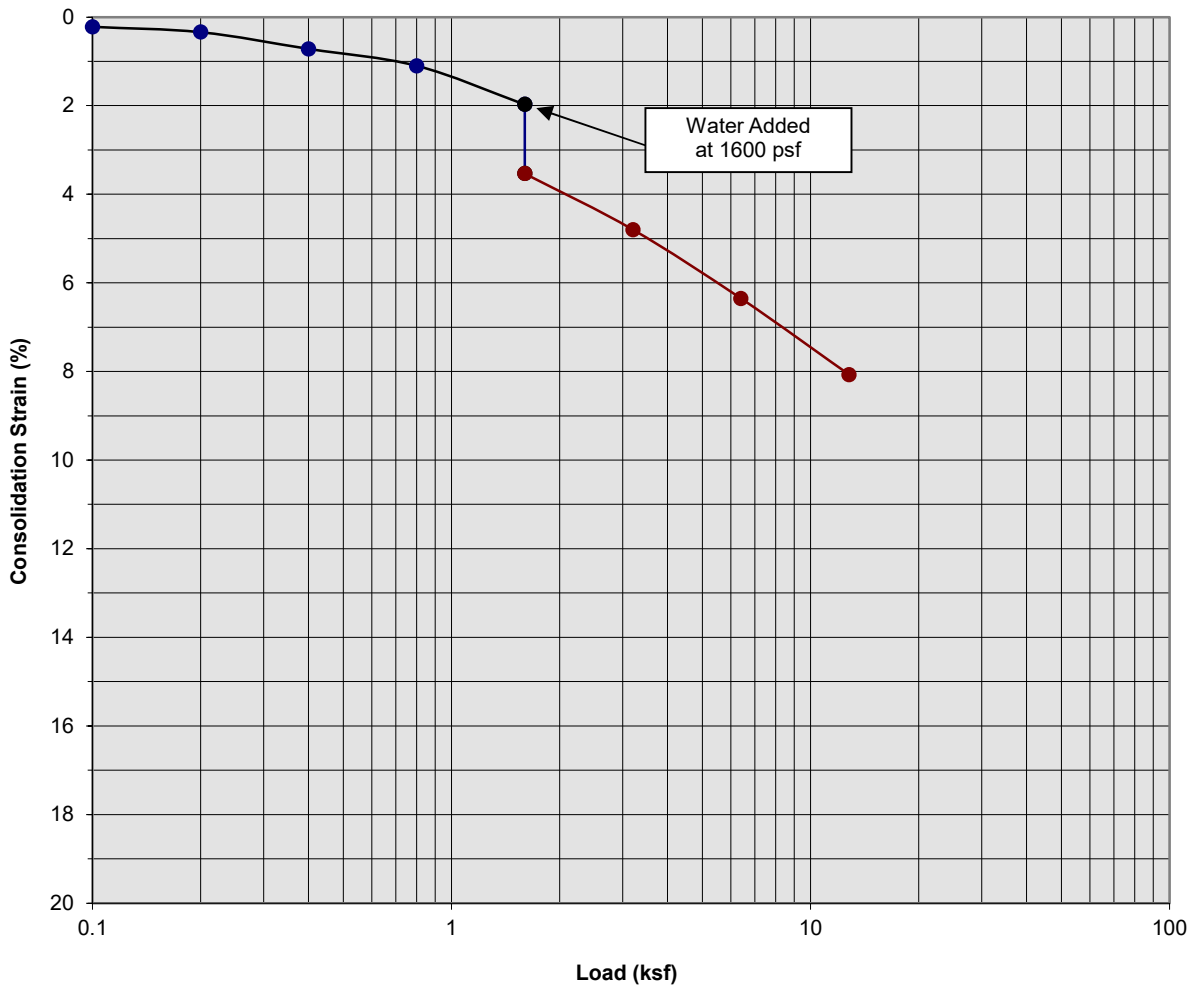
Boring Number:	B-3	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	1 to 2	Initial Dry Density (pcf)	97.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	103.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.67

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine Sand, trace medium to coarse Sand

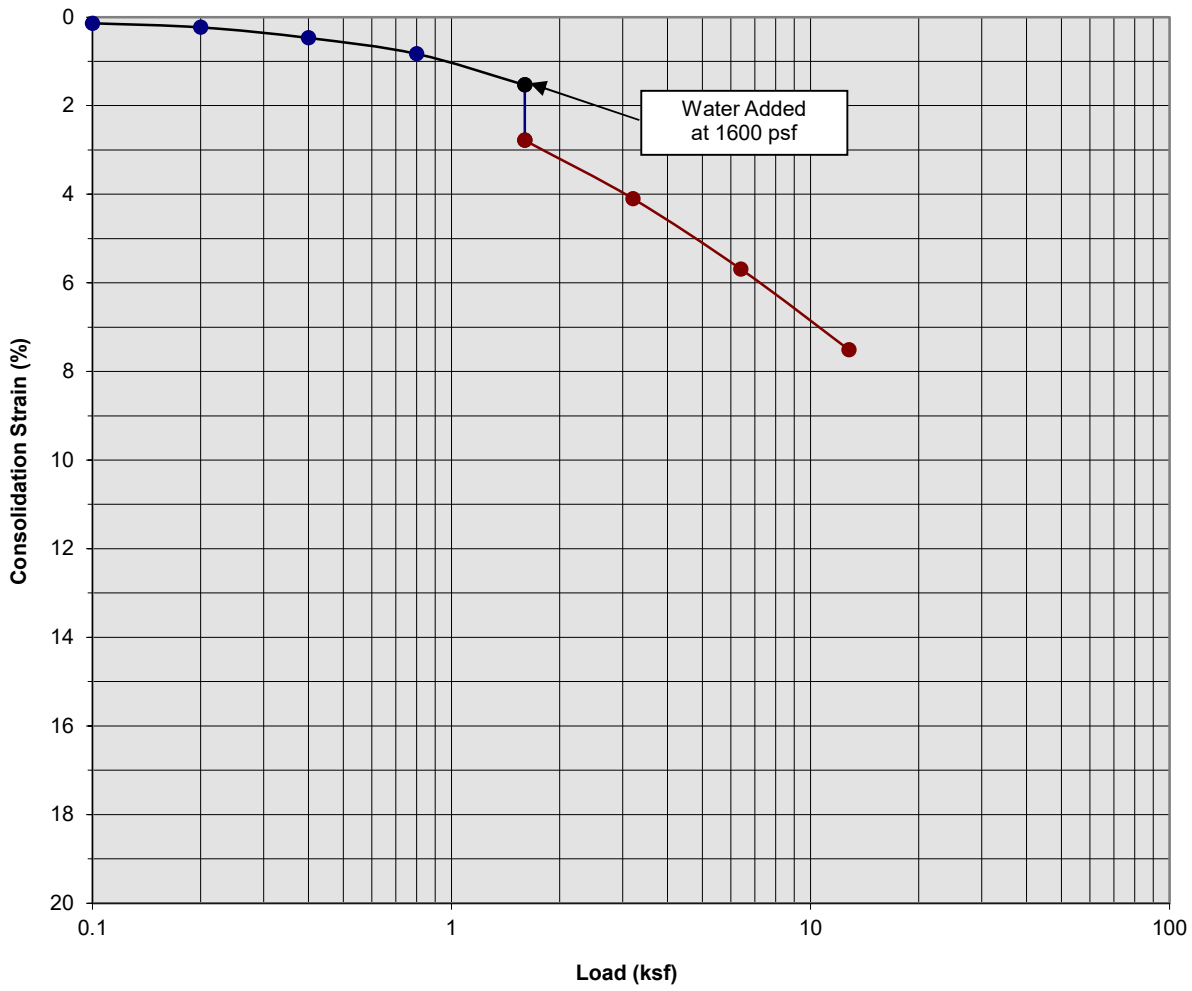
Boring Number:	B-3	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	3 to 4	Initial Dry Density (pcf)	101.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	109.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.56

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to medium Sand, trace coarse Sand, occasional Cobble

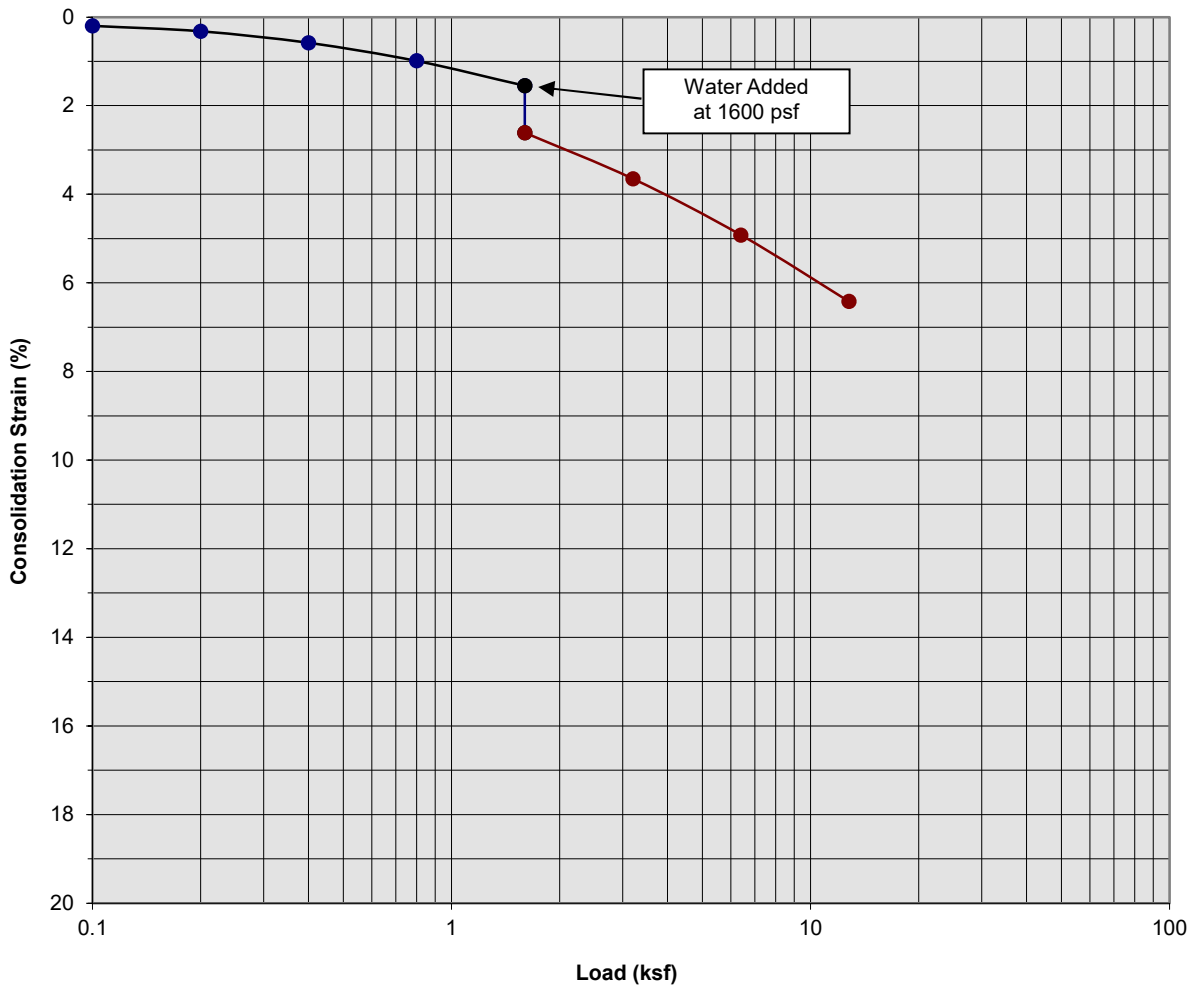
Boring Number:	B-3	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	5 to 6	Initial Dry Density (pcf)	102.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	111.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.25

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown Silty fine Sand, trace medium to coarse Sand

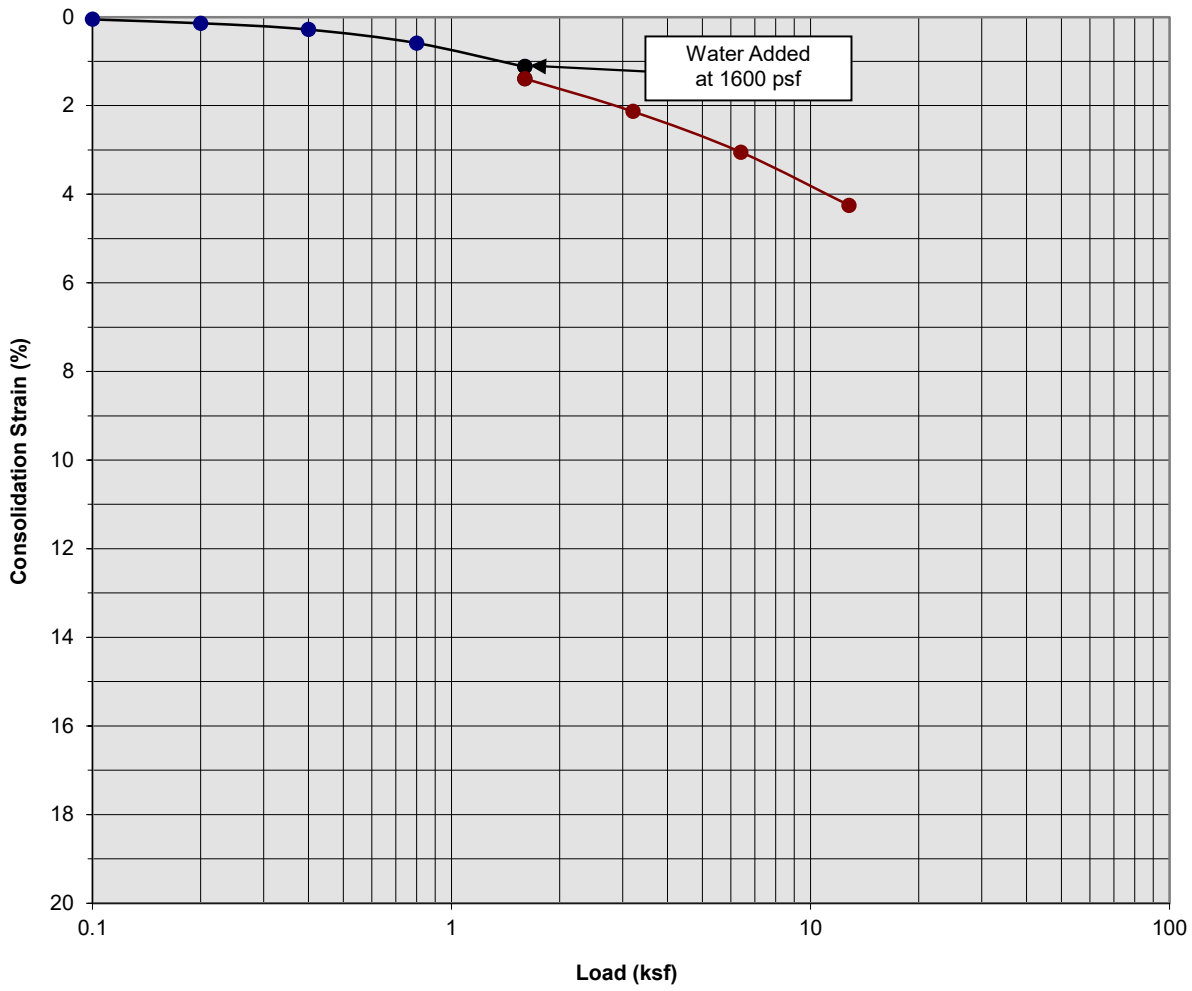
Boring Number:	B-3	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	7 to 8	Initial Dry Density (pcf)	111.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	118.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.06

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Dark Brown Silty fine Sand, trace medium to coarse Sand

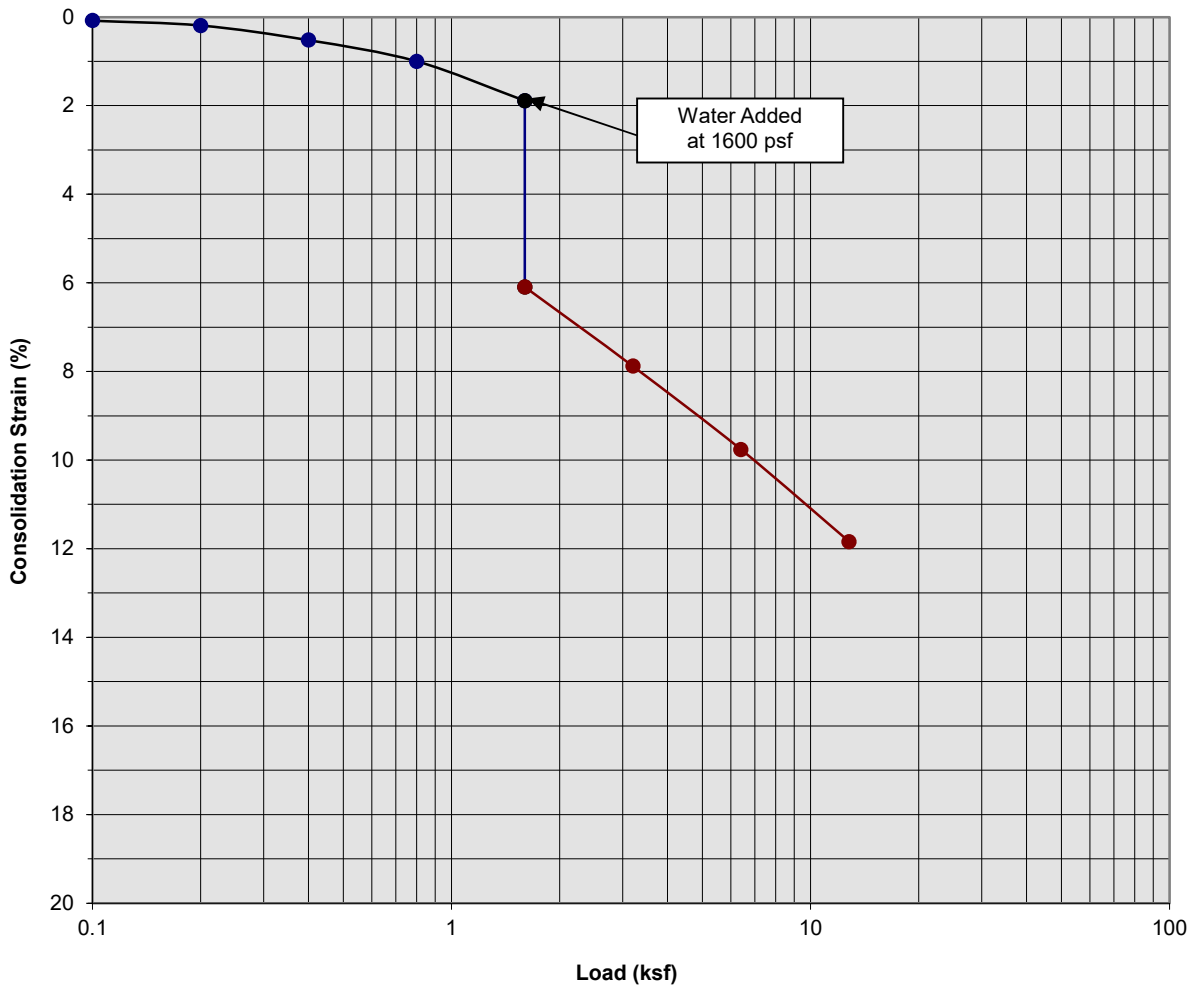
Boring Number:	B-5	Initial Moisture Content (%)	10
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	1 to 2	Initial Dry Density (pcf)	110.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	115.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.27

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel

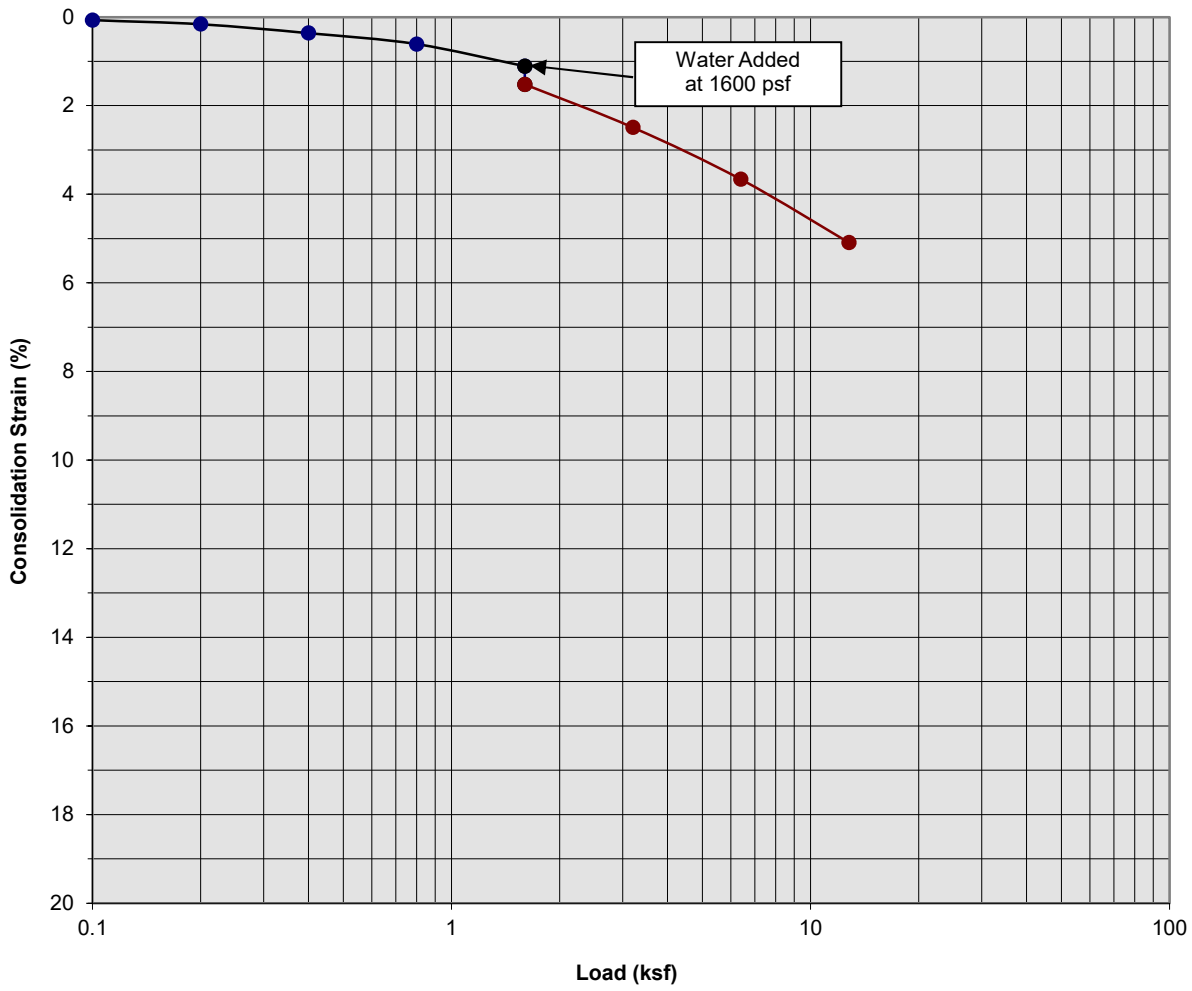
Boring Number:	B-5	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	3 to 4	Initial Dry Density (pcf)	102.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	4.20

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to coarse Sand, little to some fine Gravel

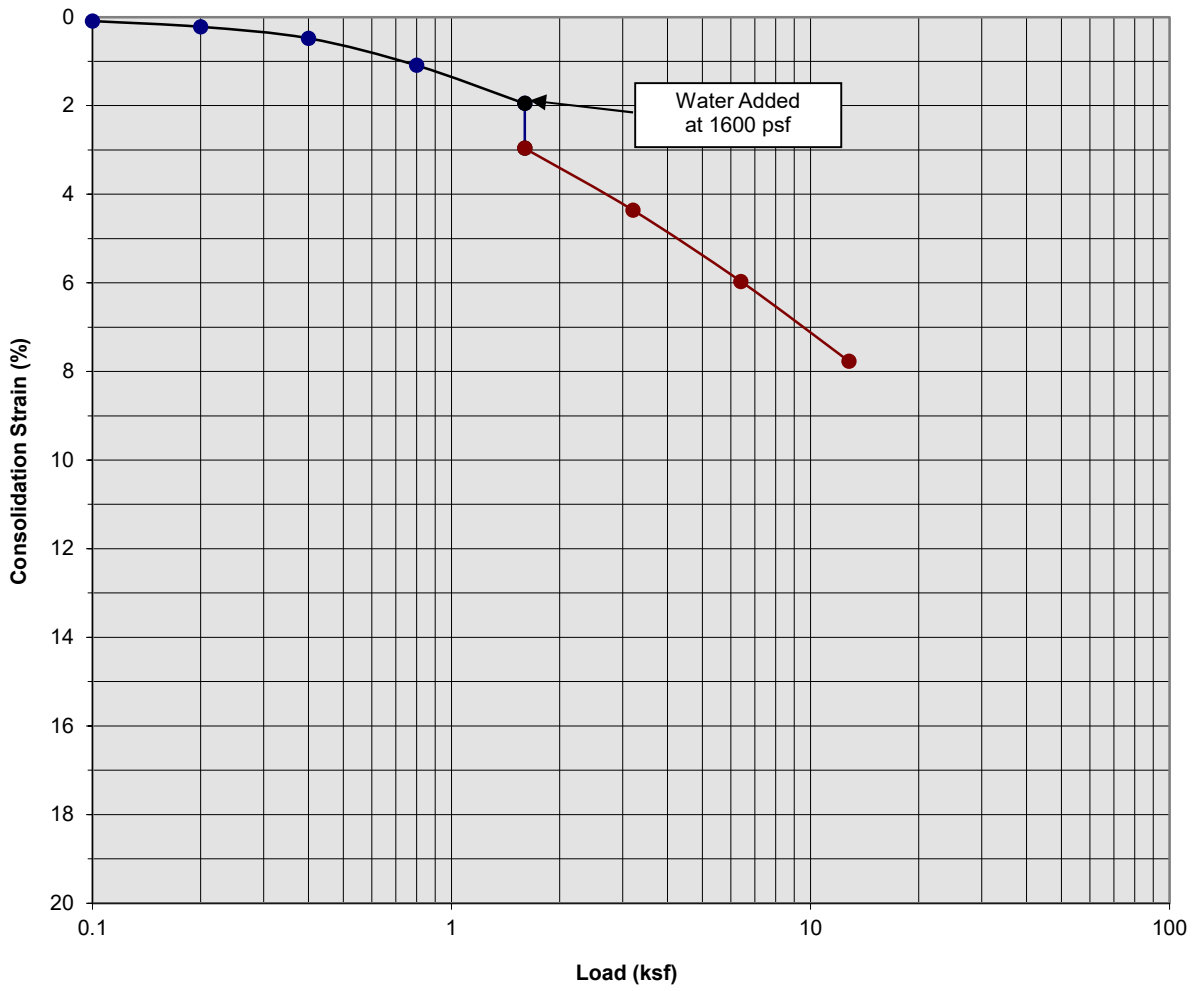
Boring Number:	B-5	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	7 to 8	Initial Dry Density (pcf)	110.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	117.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.41

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to coarse Sand, little to some fine Gravel, occasional Cobble

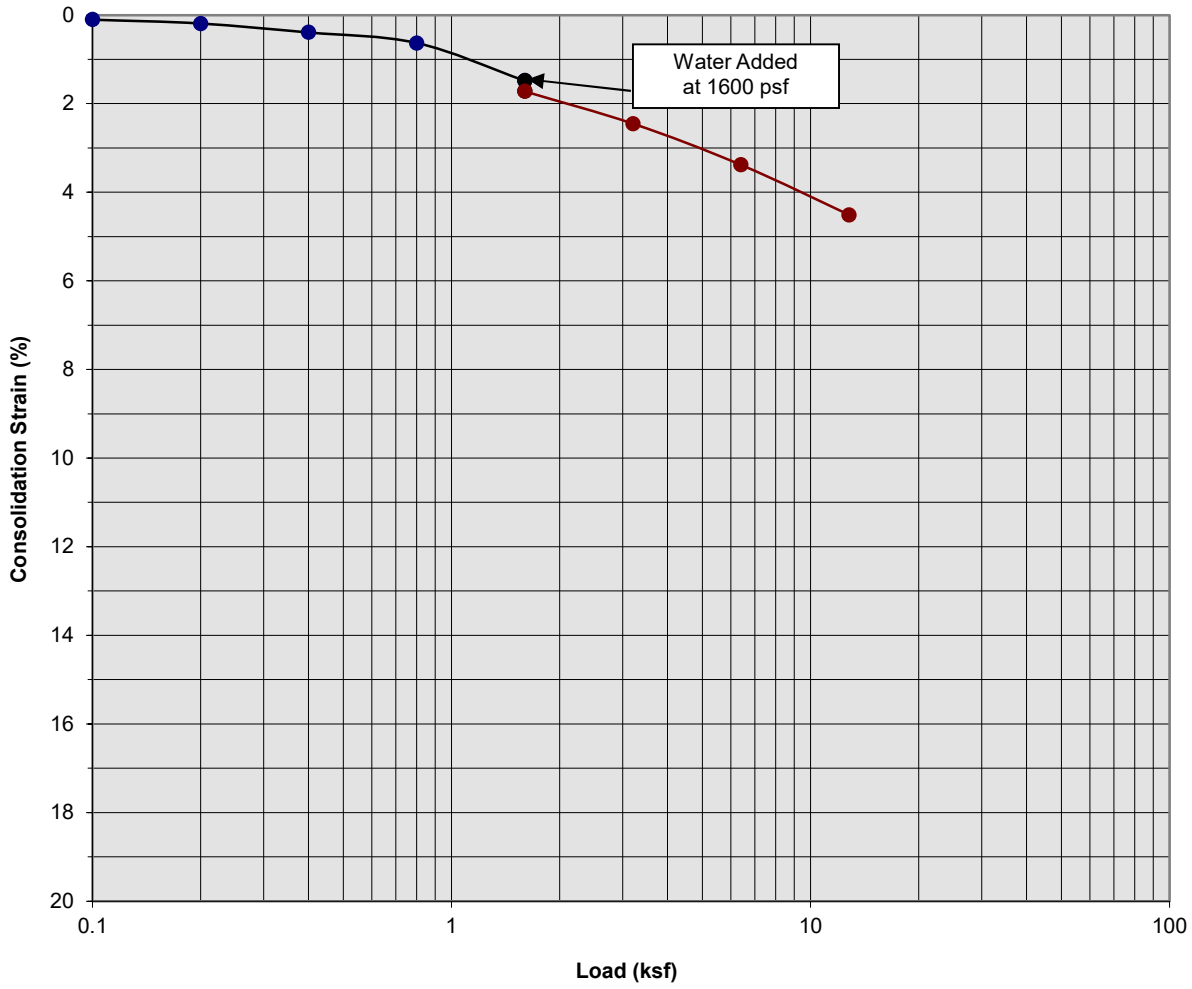
Boring Number:	B-5	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	9 to 10	Initial Dry Density (pcf)	102.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.01

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 8

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Fill: Brown fine Sand, trace medium to coarse Sand, trace fine Gravel

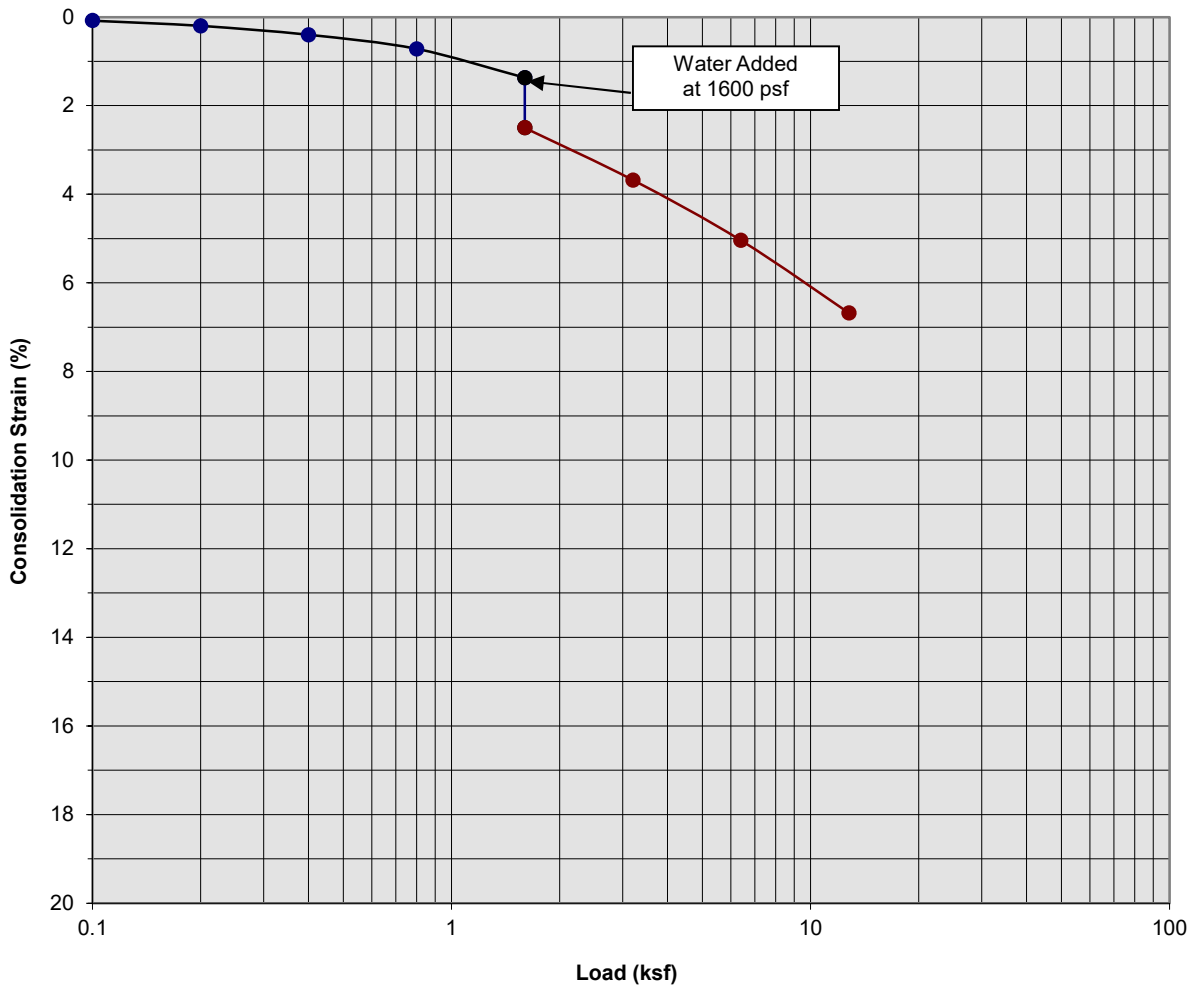
Boring Number:	B-8	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	1 ot 2	Initial Dry Density (pcf)	111.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	116.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.24

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 9

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel

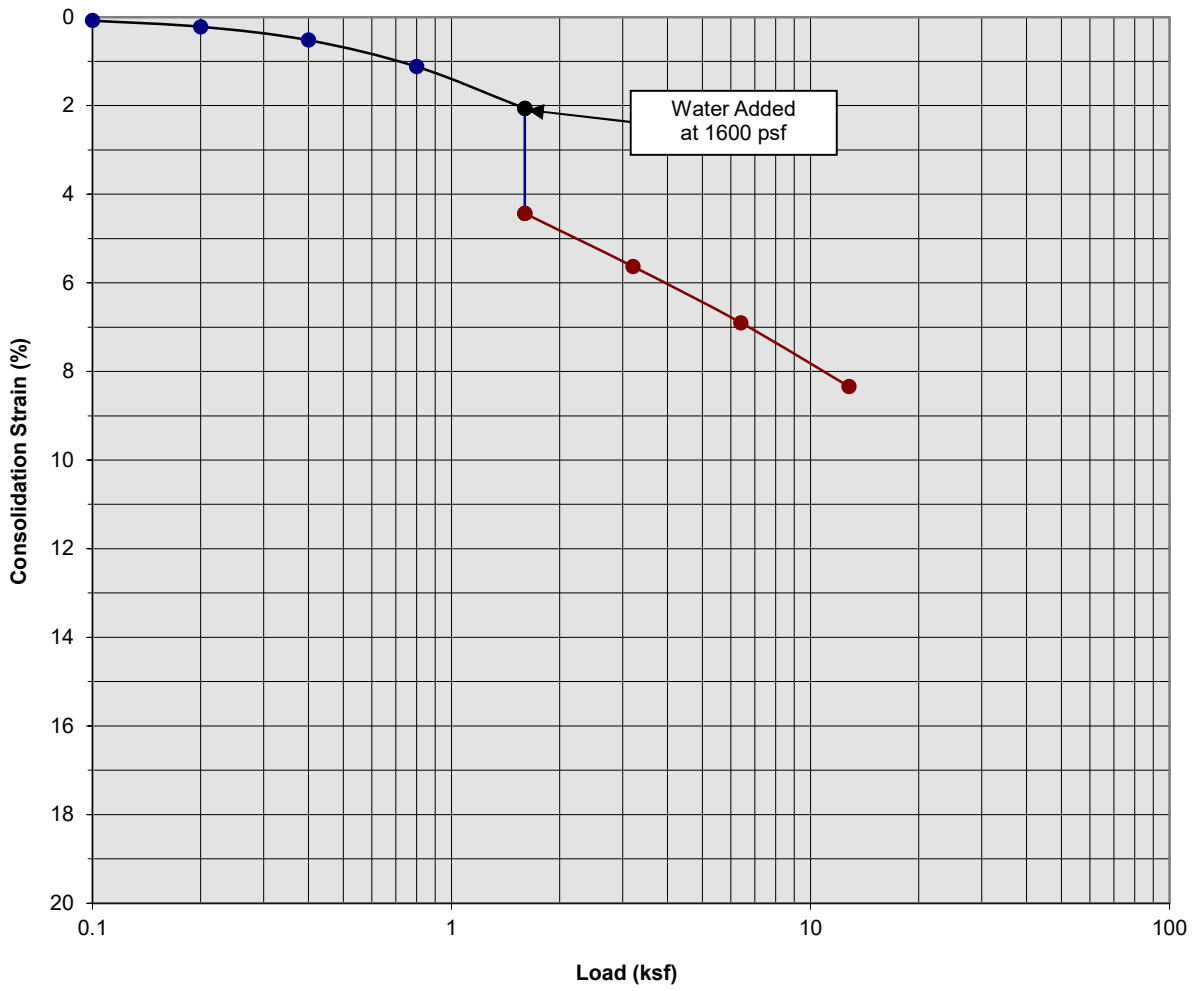
Boring Number:	B-8	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	3 to 4	Initial Dry Density (pcf)	109.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	115.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.13

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 10

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel

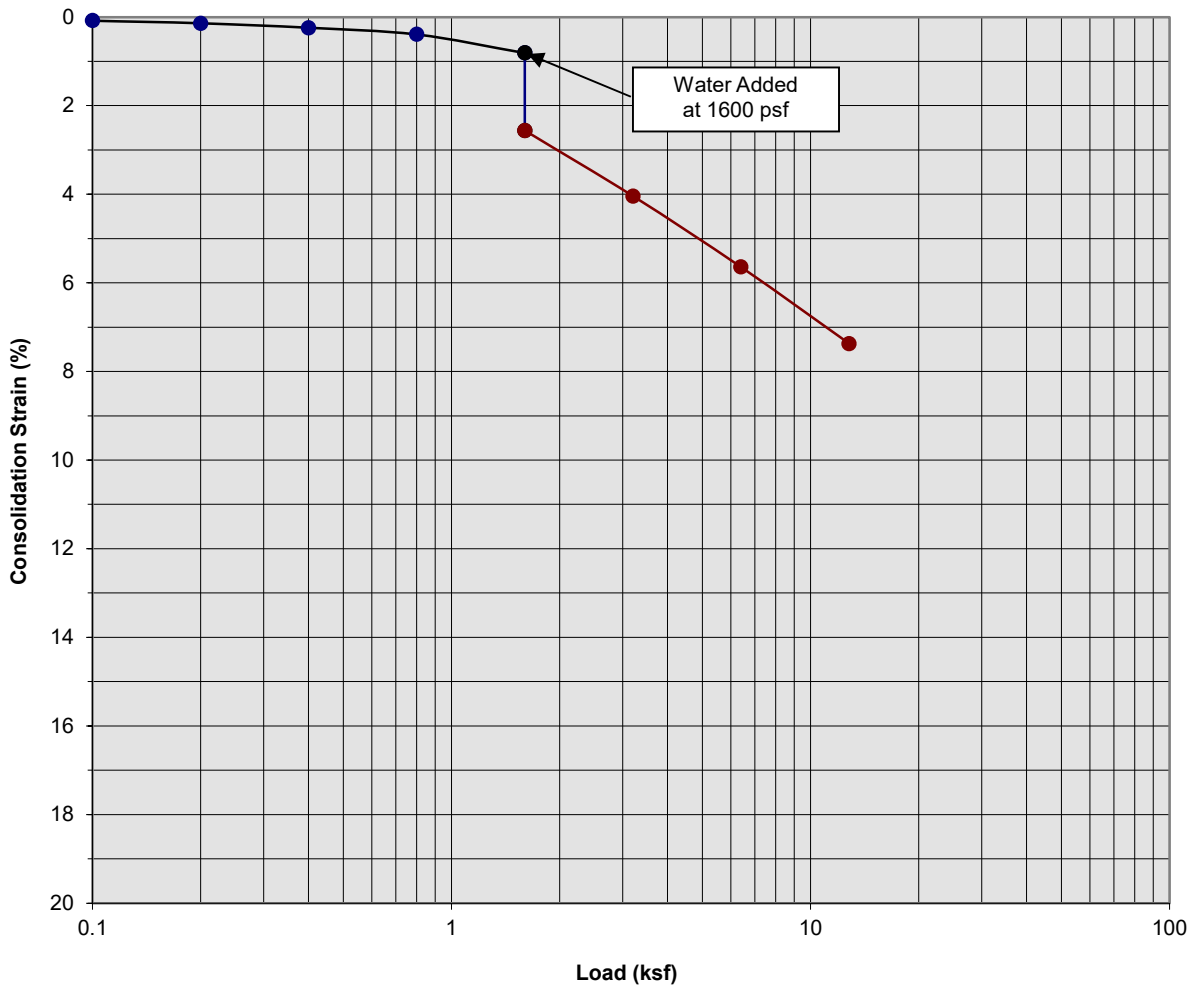
Boring Number:	B-8	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	5 to 6	Initial Dry Density (pcf)	111.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	122.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.37

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 11

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel

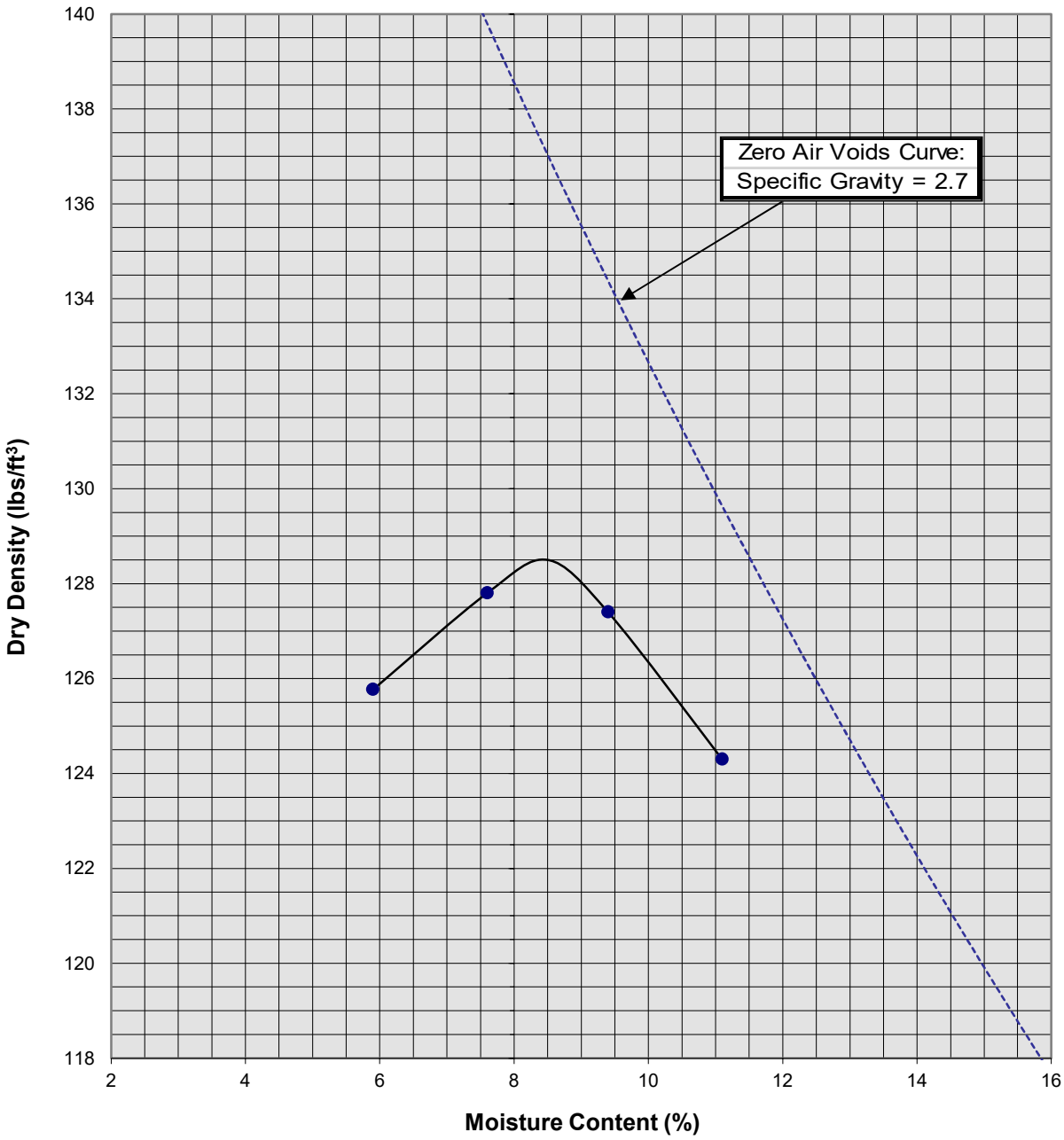
Boring Number:	B-8	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	7 to 8	Initial Dry Density (pcf)	108.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	116.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.75

Proposed Commercial/Industrial Development
Rancho Cucamonga, California
Project No. 20G132-1

PLATE C- 12

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Moisture/Density Relationship
ASTM D-1557



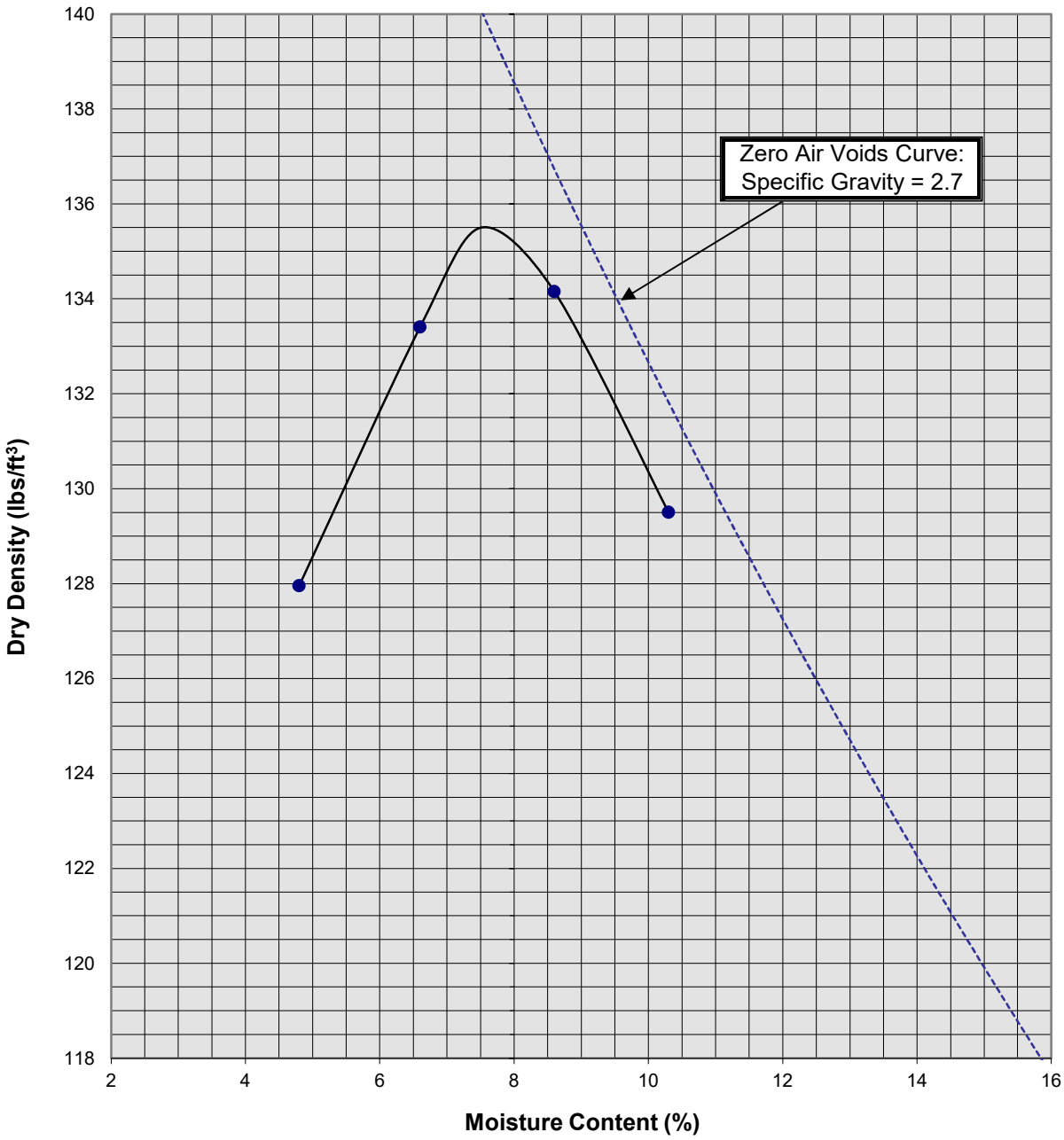
Soil ID Number	B-3 @ 0-5'
Optimum Moisture (%)	8.5
Maximum Dry Density (pcf)	128.5
Soil Classification	Gray Brown Silty fine to medium Sand, trace coarse Sand

Proposed Commercial/Industrial Development
Rancho Cucamonga
Project No. 20G132-1

PLATE C-13

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Moisture/Density Relationship
ASTM D-1557



Soil ID Number	B-5 @ 0-5'
Optimum Moisture (%)	7.5
Maximum Dry Density (pcf)	135.5
Soil Classification	Gray Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel

Proposed Commercial/Industrial Development
Rancho Cucamonga
Project No. 20G132-1

PLATE C-14

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

Compacted Fills

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated," and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

    - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

    - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or

concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.

- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.

- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core

- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.

- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.

- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).

- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.

- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.

- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.

- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

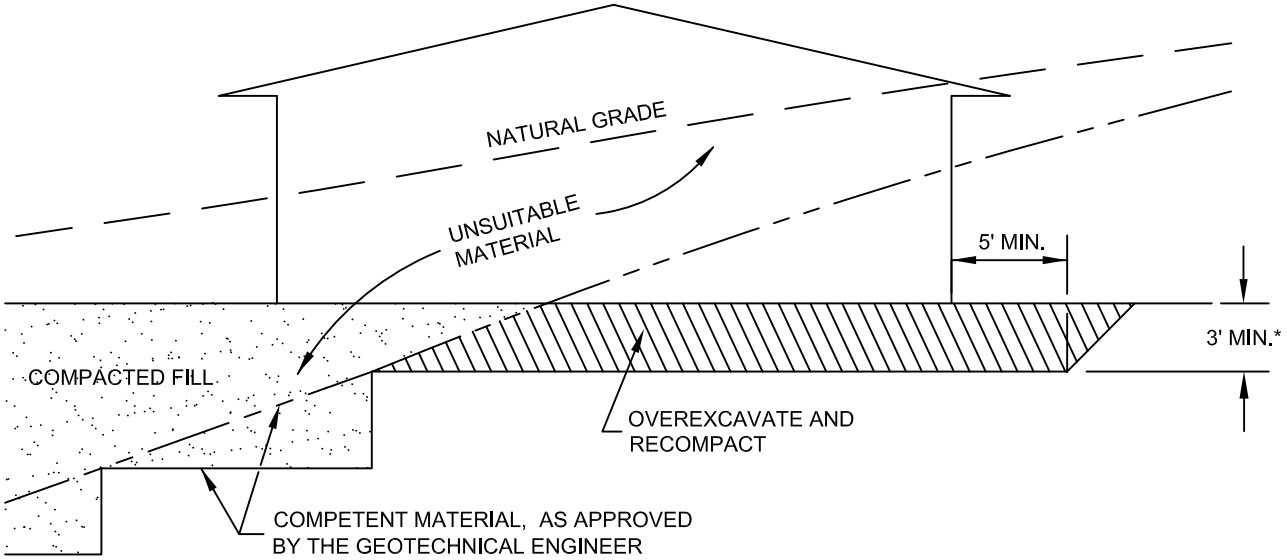
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

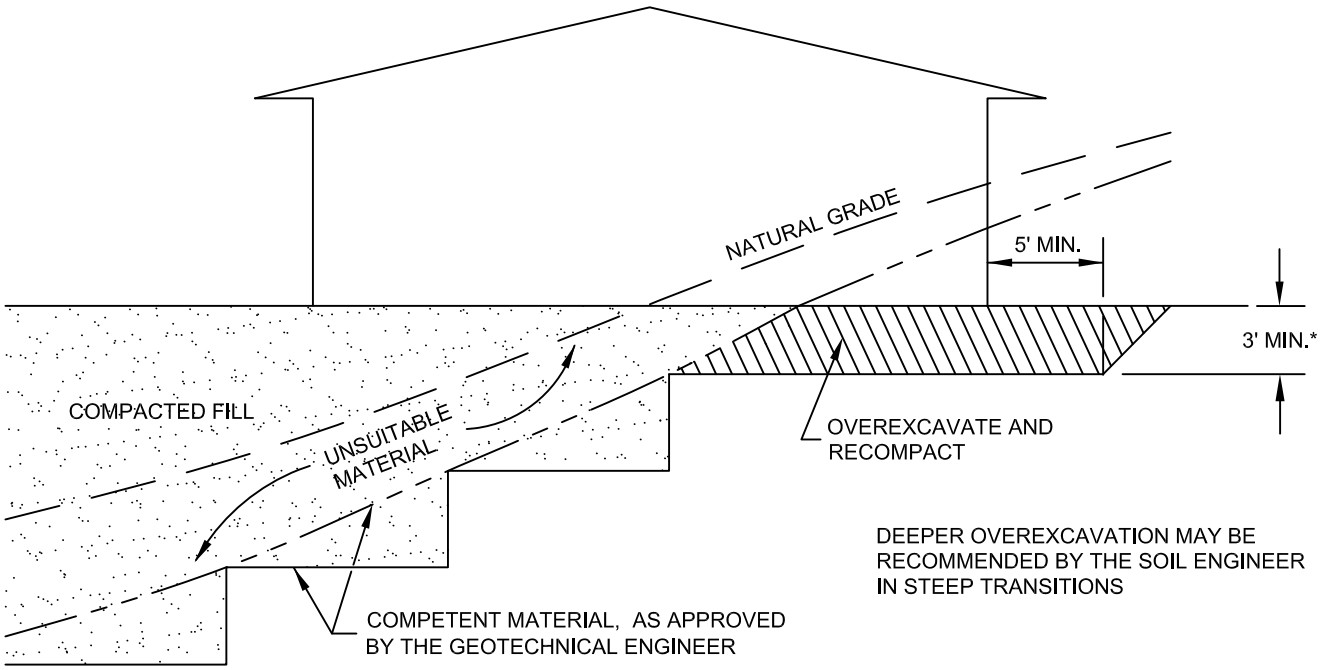
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION. ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL

GRADING GUIDE SPECIFICATIONS

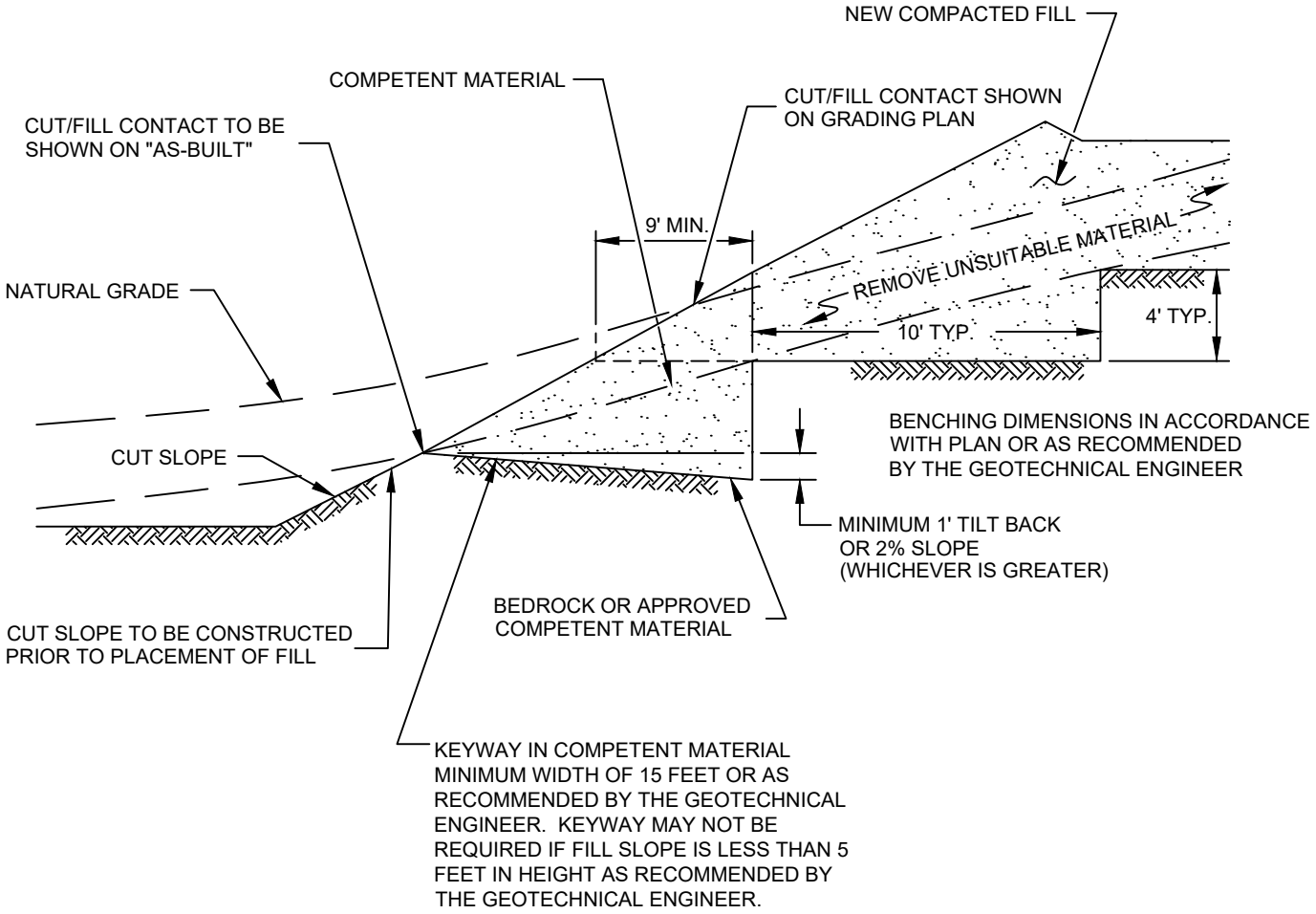
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

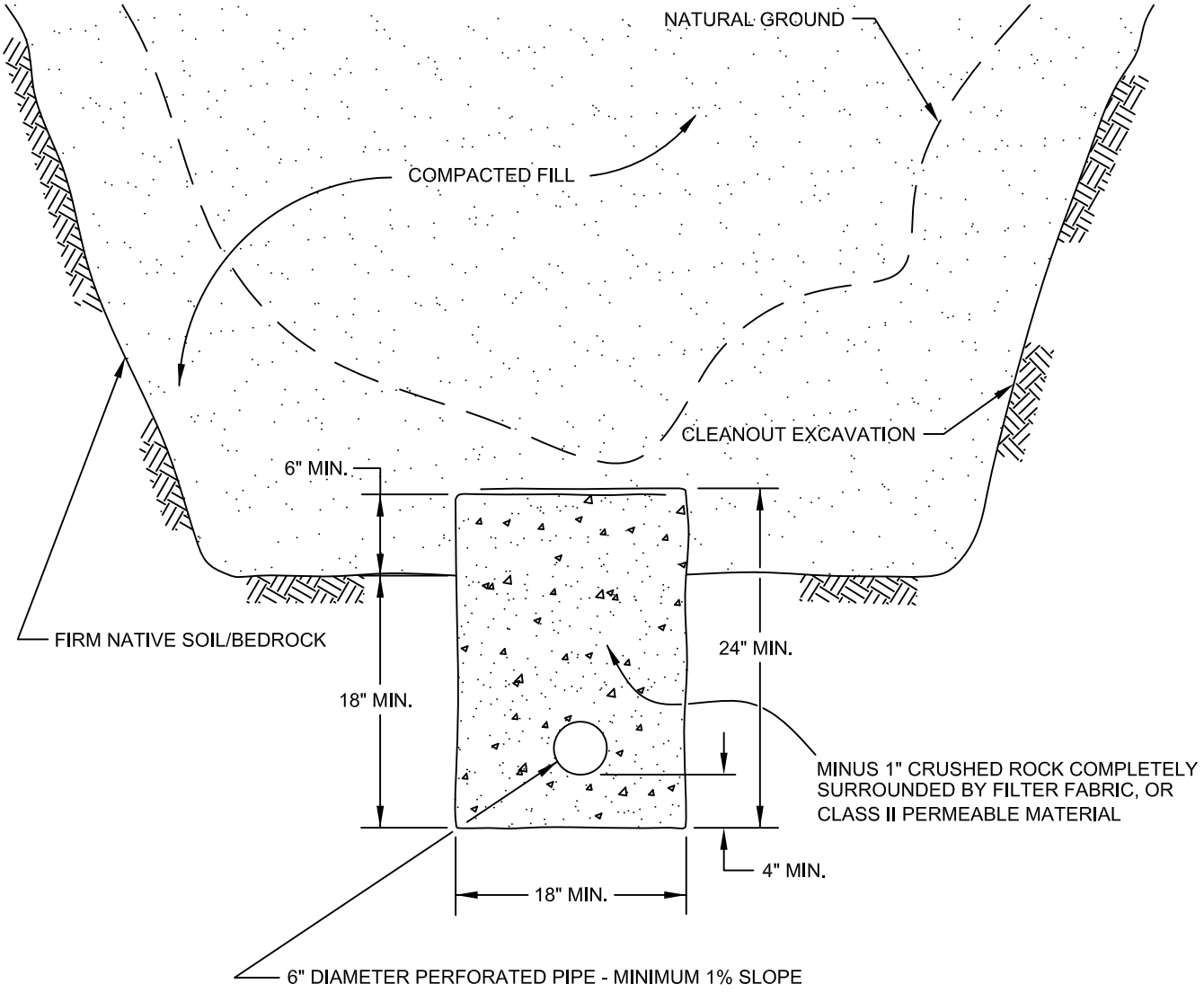
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

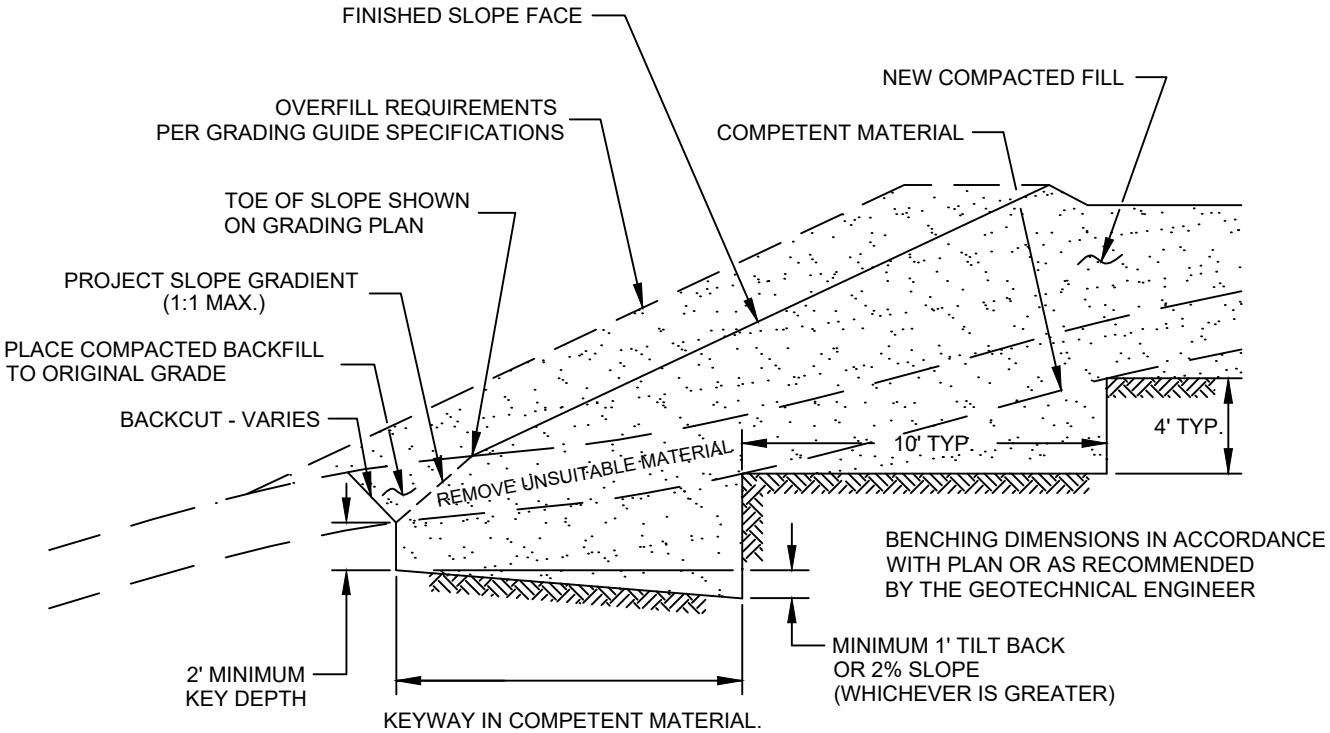
SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE
DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

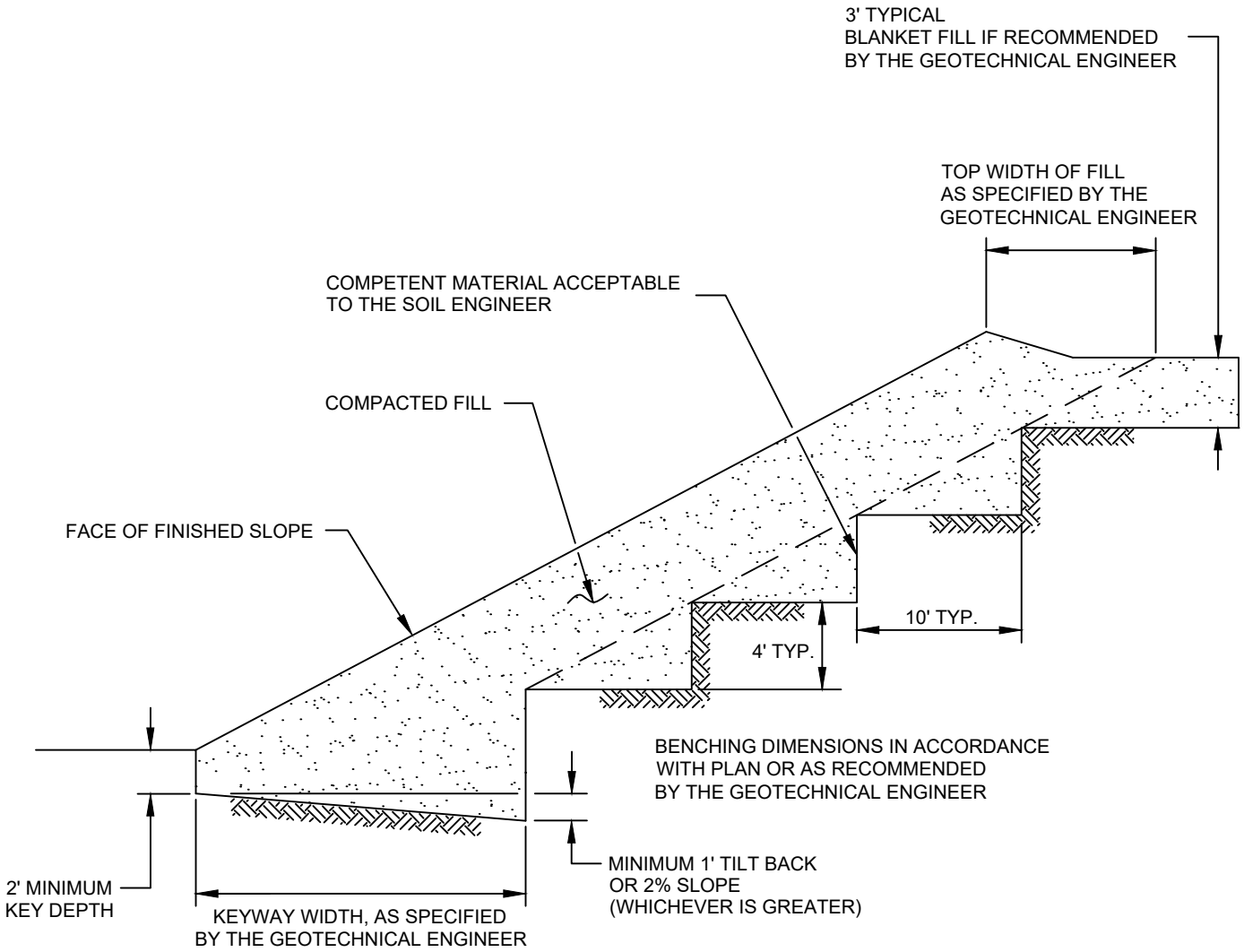
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

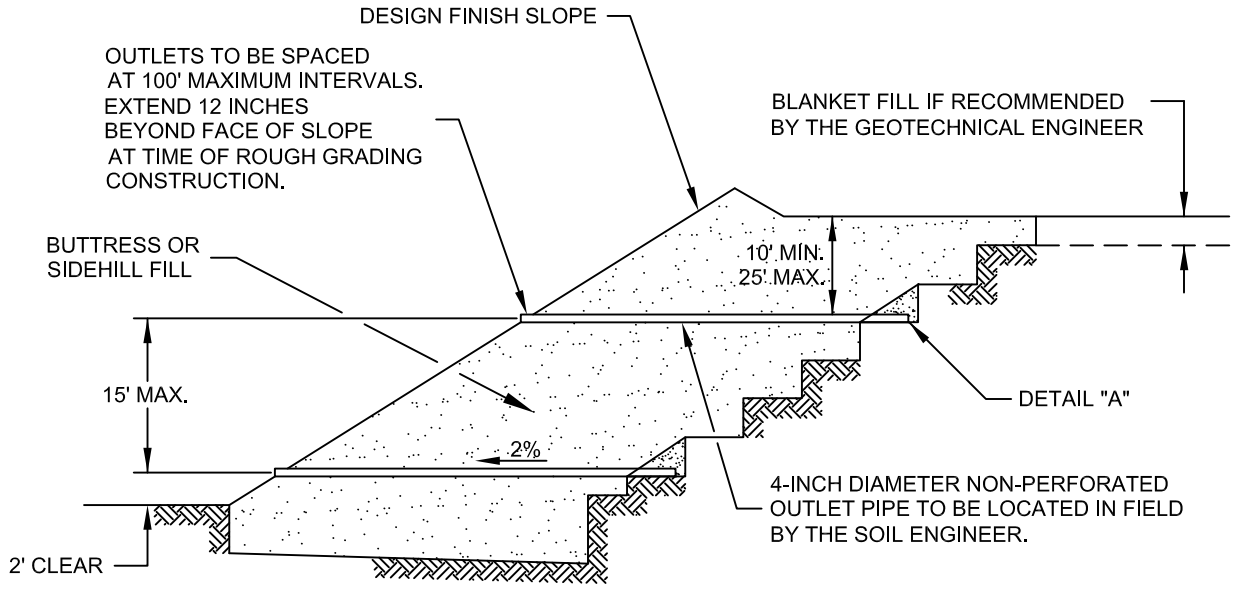
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



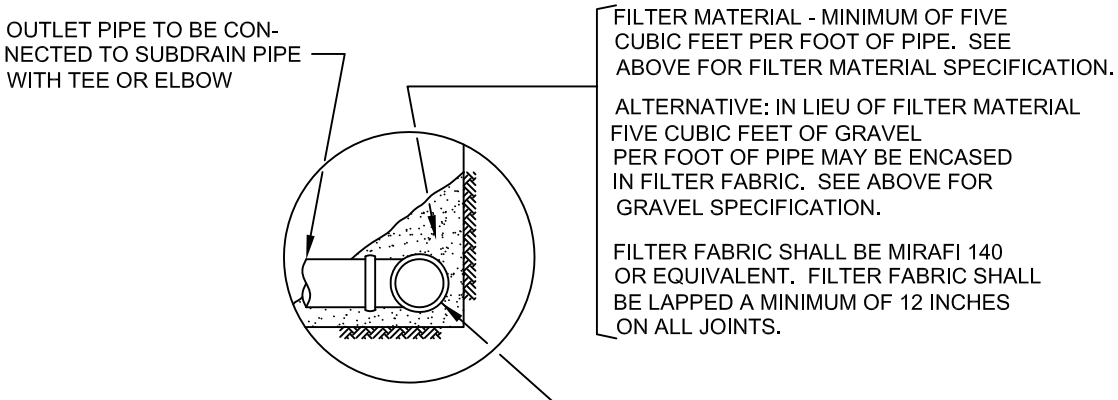
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

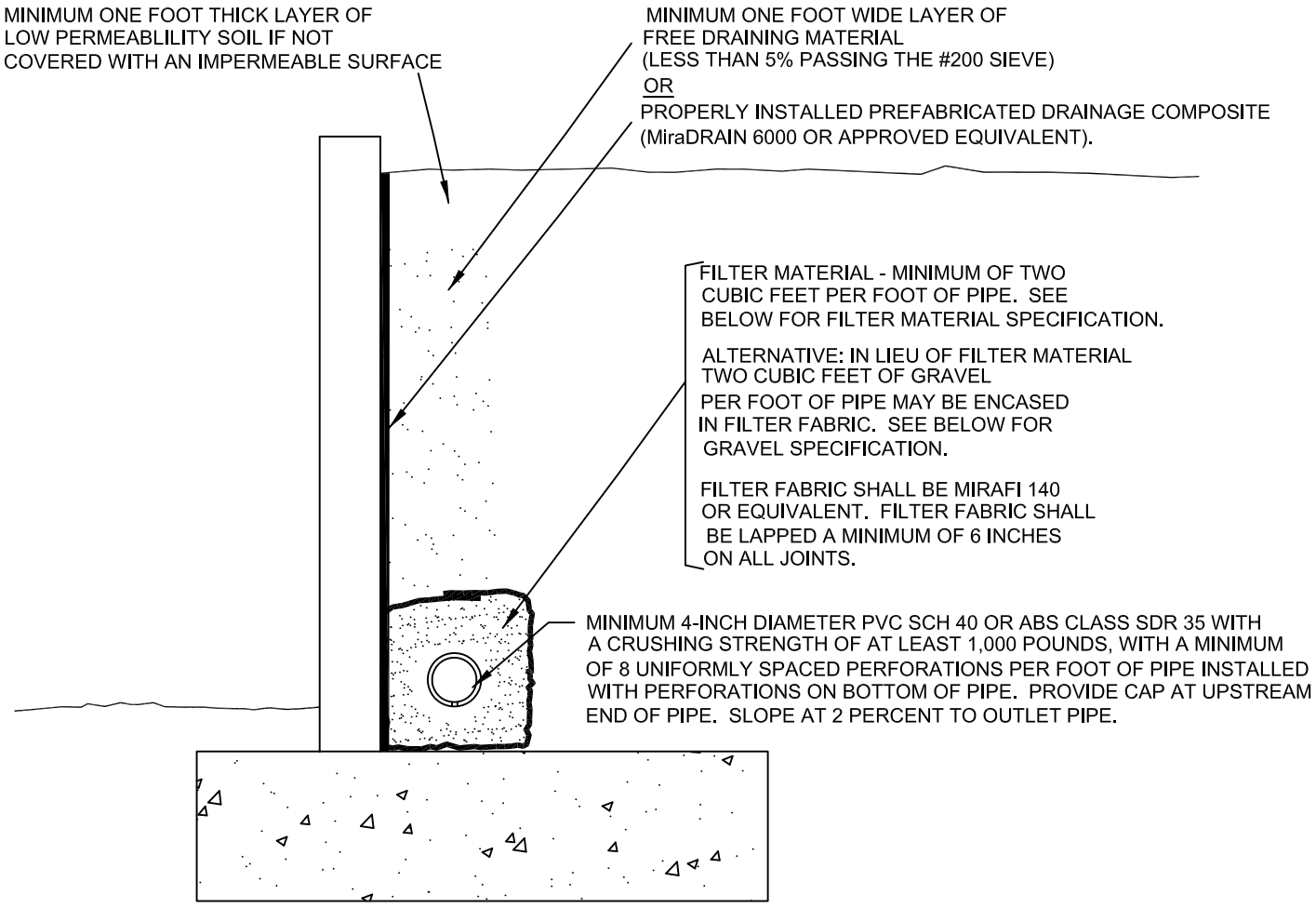
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

GRADING GUIDE SPECIFICATIONS

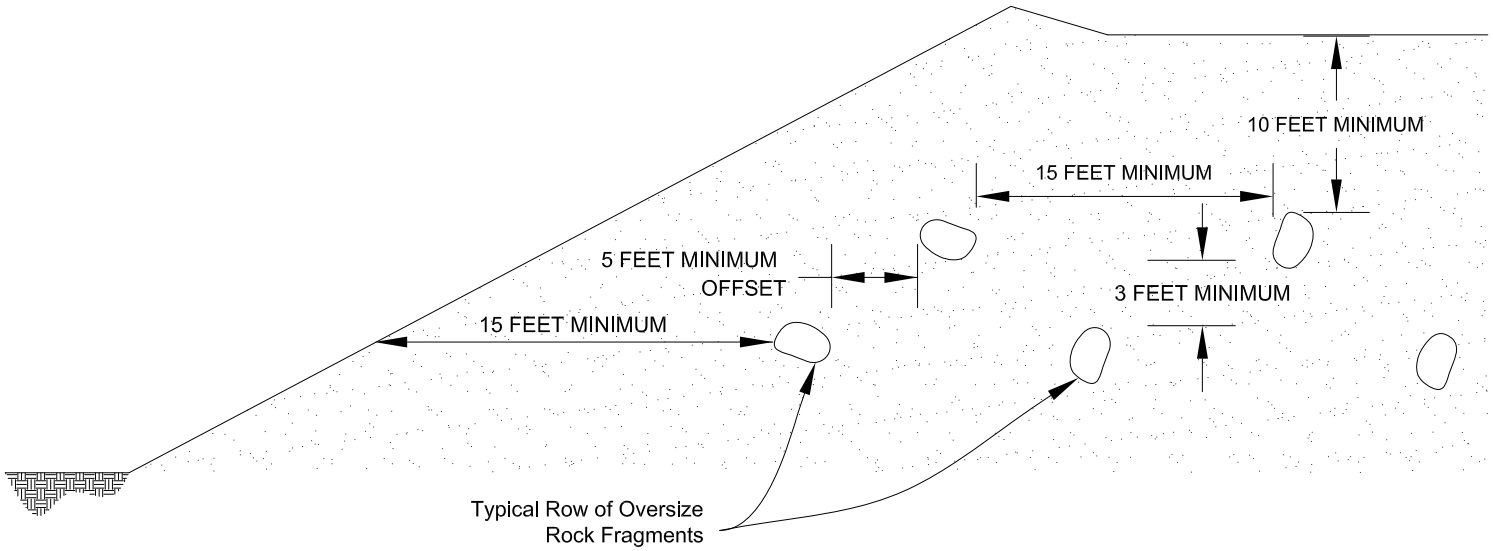
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

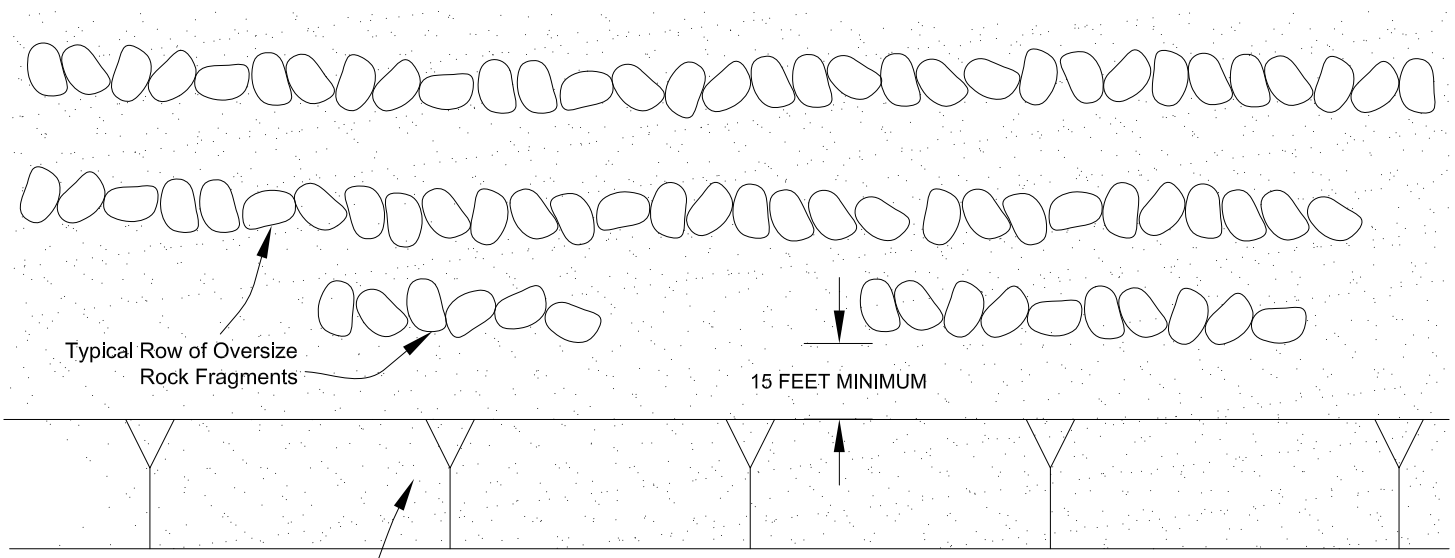
PLATE D-7

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

OSHPD

Latitude, Longitude: 34.091245, -117.516451



Date	3/25/2020, 12:57:50 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.789	MCE_R ground motion. (for 0.2 second period)
S_1	0.669	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.789	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.192	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	0.762	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.839	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.789	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.916	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.114	Factored deterministic acceleration value. (0.2 second)
S1RT	0.669	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.735	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.687	Factored deterministic acceleration value. (1.0 second)
PGAd	0.862	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.934	Mapped value of the risk coefficient at short periods
C_{R1}	0.91	Mapped value of the risk coefficient at a period of 1 s

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

DRAWN: JAH
CHKD: GKM

SCG PROJECT
20G132-1

PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

April 28, 2020

Hillwood Investment Properties
901 Via Piemonte, Suite 175
Ontario, California 91764

Attention: Mr. Ned Sciortino
Vice President, California Development Lender

Project No.: 20G132-2

Subject: Results of Infiltration Testing
Proposed Commercial/Industrial Development
North Side of Napa Street, East of Etiwanda Avenue
Rancho Cucamonga, California

Reference: Geotechnical Investigation, Proposed Commercial/Industrial Development, Rancho Cucamonga, California prepared for Hillwood Investment Properties, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 20G132-1, dated April 23, 2020.

Mr. Sciortino:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 20P129R2, dated February 18, 2020; and Change Order No. 20G132-CO, dated March 30, 2020. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the Technical Guidance Document for Water Quality Management Plans prepared for the County of San Bernardino Areawide Stormwater Program dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Site and Project Description

The subject site is located on the north side of Napa Street, approximately 630 feet east of the intersection of Napa Street and Etiwanda Avenue in Rancho Cucamonga, California. The southern portion of the subject site is located within the city of Fontana city limits. The site is bounded to the north by commercial/industrial developments and a Metrolink rail line, to the east by the Etiwanda San Sevaine Flood Control Channel, to the south by Napa Street, and to the west by the Etiwanda Creek Channel. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of several contiguous irregular-shaped parcels totaling 35.38± acres in size. The majority of the site is presently vacant and undeveloped, with the exception of asphaltic concrete driveways in the western portion of the site, overhead powerlines, and a railroad easement. The asphaltic concrete driveways are located along the west property line, and a portion of the north property line, extending 475± feet eastward from the west property line. The pavements are in poor condition, with moderate cracking throughout. The railroad easement is present along the northern boundary of the site from the northeast property corner to the center of the northern property line. This easement extends southward from the north property line, crossing through the center of the site in the north-south direction. Ground surface cover west of the railroad easement generally consists of sparse to moderate native grass and weed growth with limited areas of debris and trash and limited areas of open-graded-gravel driveways transecting the western portion of this area in the north/south and east/west directions. Ground surface cover east of the railroad easement generally consists of exposed soils, limited areas of open-graded-gravel, and some areas with sparse to moderate native grass and weed growth. A soil berm, located in the northeast area of the site, is approximately 3± feet in height, and about 310 feet long. To the west of this berm, a "plateau," is present, approximately 7 feet higher than the surrounding portions of the site to the east and south. The sides of this elevated area consist of slopes with estimated inclinations of about 2h:1v on the east and south sides. This elevated area appears to slope gently downward to the north and west toward the railroad easement.

As a part of our research for this project, we reviewed readily available historical aerial photographs from NETRonline. Based on these photographs, the site was previously used to grow crops, between the time of the earliest available photograph from 1938 until sometime between later photographs which were taken in 1966 and 1994.

Overhead powerlines are present along the northern property line in the western half of the site. These powerlines extend eastward through the central portion of the eastern half of the site.

Site plans provided by the client indicate that a 12-foot diameter Metropolitan Water District water supply pipeline is present north of Napa Street, near the southern property line.

Detailed topographic information was not available at the time of this report. Based on visual observations made at the time of the subsurface investigation and from elevation data obtained from Google Earth, the overall site topography generally slopes downward to the south at a gradient of 2± percent, excluding the northwest plateau, northeast berm, and the southeast corner of the site. The southeast corner slopes gently to north at a gradient of 2½± percent.

Proposed Development

A conceptual site plan for the proposed development, identified as Scheme 5, was provided to our office by the client. Based on the conceptual site plan prepared by HPA Architecture, the site will be developed with two (2) new commercial/industrial buildings, identified as Buildings A and B. Building A will be 497,845± ft² in size and will be located in the eastern region of the property. Dock-high doors will be located on the north, east, and west sides of this building. Building B will be 152,992± ft2 in size and will be located in the western region of the property. This building will possess dock-high doors along the northern building wall. The buildings are expected to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement

concrete pavements in the loading dock areas, and concrete flatwork and landscape planters throughout the site.

An alternative site plan (entitled AMZL – Large Test Fit, dated January 31, 2020) was also provided to our office. In this plan the site will be developed with one (1) new delivery station building, 145,419± ft2 in size, located in the eastern area of the property. The building is expected to be surrounded by either Portland cement concrete or Asphaltic concrete pavements in the parking and driving lanes and concrete flatwork and landscape planters throughout the site.

We expect that the overhead powerlines will have to be relocated from the eastern portion of the site in order to construct the proposed building(s) for either of these schemes.

Detailed structural information has not been provided. It is assumed that the new buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundations with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Grading plans for the proposed development were not available at the time of this report. The proposed development is not expected to include any significant amounts of below-grade construction such as basements or crawl spaces. Based on the existing topography, and assuming a relatively balanced site, cuts and fills of 5 to 7 ± feet are expected to be necessary to achieve the proposed site grades.

The proposed development will use on-site storm water infiltration. Based on our experience with similar projects in the area, the infiltration system is assumed to consist of below-grade chambers located in the proposed truck court areas. The bottom of the infiltration system is expected to be approximately 9 to 10± feet below the existing site grades.

Concurrent Study

The subsurface exploration conducted for this project consisted of ten (10) borings advanced to depths of 15 to 25± feet below the existing site grades. Additionally, six (6) trenches were excavated to depths of 9½ to 10± feet below the existing site grades. All of the borings and trenches were logged during drilling by a member of our staff.

Artificial fill soils were encountered at the ground surface most of the boring and trench locations, extending to depths of 1½ to 5½± feet below the existing site grades. At these boring and trench locations, the artificial fill soils generally consist of loose to medium dense silty fine sands with trace to little medium to coarse sand, and little to some fine to coarse gravel content. The fill soils possess a disturbed appearance and some samples contain artificial debris, such as plastic and Portland cement concrete fragments, resulting in their classification as artificial fill. Trench No. T-1 encountered several concrete blocks within the fill soils, the largest of which possessed dimensions of about 1½ x 1½ by 2½± feet.

Native alluvium was encountered at the ground surface at Boring Nos. B-5 and B-7, and beneath the artificial fill soils at the remaining borings and all of the trench locations, extending to at least the maximum depth explored of 25± feet below the existing ground surface. The native alluvial soils extending from the ground surface to 5½ to 12± feet generally consist of loose to medium dense silty fine sands, fine sands, and fine to medium sands with variable amounts of medium to coarse sand and fine to coarse gravel. Deeper alluvial soils generally consist of medium dense to very dense well-graded sands with trace to some fine to coarse gravel content and sandy gravels. Occasional cobbles were encountered throughout the depths explored at boring and trench locations. Soil strata containing extensive cobble content were encountered at various depths greater than 3½± feet at the boring and trench locations.

Groundwater was not encountered at any of the borings or trenches. Based on the lack of any water within the borings and trenches, and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 25± feet below existing site grades, at the time of the subsurface investigation.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of ten (10) infiltration borings, extending to depths of 9 to 10± feet below existing site grades. The borings were logged during excavation by a member of our staff. The approximate locations of the infiltration test borings (identified as Boring Nos. I-1 through I-10) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Undocumented fill was encountered at most of the boring locations. Infiltration Boring Nos. I-1, I-4, and I-5 did not contain discernable fill material. The fill soils from the ground surface to 6½ ± feet, generally consist of medium dense silty fine to coarse sands with little to some fine to coarse gravel. The presence of asphalt fragments and mottled appearance indicate the presence of undocumented fill.

Native alluvium was encountered at the ground surface at Boring Nos. I-1, I-4, and I-5 and beneath the undocumented fill at all of the remaining infiltration boring locations. The alluvial soils generally consist of loose to medium dense silty fine to coarse sands with trace to little fine gravel, extending to depths of 10± feet below the ground surface. Infiltration Boring No. I-6 possessed occasional cobbles from 9 to 10± feet.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with Technical Guidance Document for Water Quality Management Plans, prepared for the County of San Bernardino Areawide Stormwater Program.

Pre-soaking

In accordance with the county infiltration standards for sandy soils, all infiltration test borings were pre-soaked 2 hours prior to the infiltration testing or until all of the water had percolated through the test holes. The pre-soaking process consisted of filling test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of each hole. Pre-soaking was completed after all of the water had percolated through the test holes.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of the test holes. In accordance with the San Bernardino County guidelines, since "sandy soils" were encountered at the bottom of all of the infiltration test borings (where 6 inches of water infiltrated into the surrounding soils for two consecutive 25-minute readings), readings were taken at varying intervals for a total of 1 hour at all test locations. After each reading, water was added to the borings so that the depth of the water was at least 5 times the radius of the hole. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	9.5	Fine to coarse Sand, little fine to coarse Gravel	12.2
I-2	9	Silty fine to coarse Sand, little fine Gravel	6.3
I-3	9.5	Fine to coarse Sand, trace fine Gravel, trace to little Silt	21.8
I-4	10	Fine to coarse Sand, little fine Gravel, little Silt	13.6
I-5	10.1	Fine to coarse Sand, little fine Gravel, trace to little Silt	19.4
I-6	10.1	Fine to coarse Sand, some fine to coarse Gravel, little Silt, occasional Cobbles	11.1
I-7	9	Silty fine to coarse Sand	0.4
I-8	10.1	Fine to coarse Sand, little fine Gravel, trace to little Silt	7.2
I-9	9	Silty fine to coarse Sand, trace fine Gravel	4.6
I-10	10	Fine to coarse Sand, little fine to coarse Gravel, little Silt	16.9

Laboratory Testing

Moisture Content

The moisture contents for selected soil samples from the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring has been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the grainsize analysis are presented on Plates C-1 and C-10 of this report.

Design Recommendations

Ten (10) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range from 0.4 to 21.8 inches per hour. The difference in infiltration rates appears to be due to the relative densities, test depth, and the amount of silt present within the soils at the base of the borings. Based on the infiltration test results, we recommend that an infiltration rate of 6.3 inches per hour be used in the design of the infiltration chamber system located in the southwest portion of the site. If the infiltration system located in the southeastern portion of the site is extended to a depth of 9 feet below the existing site grades, then an infiltration rate of 4 inches per hour may be used to design the proposed infiltration system for this area. However, if the infiltration chamber system is installed at a depth of at least 10 feet below the existing site grades, an infiltration rate of 7 inches per hour may be used in the design of the chamber system.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each chamber system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Rancho Cucamonga and/or San Bernardino County guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates. It should be noted that the recommended

infiltration rates are based on infiltration testing at ten (10) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Therefore, the subgrade soils within proposed infiltration system areas should not be overexcavated, undercut or compacted in any significant manner. It is recommended that a note to this effect be added to the project plans and/or specifications.

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rates presented herein were determined in accordance with the ASTM Test Method D-3385-03 standard and are considered valid for the time and place of the actual test. Changes in soil moisture content will affect these infiltration rates. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration areas could potentially be damaged due to saturation of subgrade soils. The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls. Even with this provision of locating the infiltration systems at least 25 feet from the building, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project.

However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

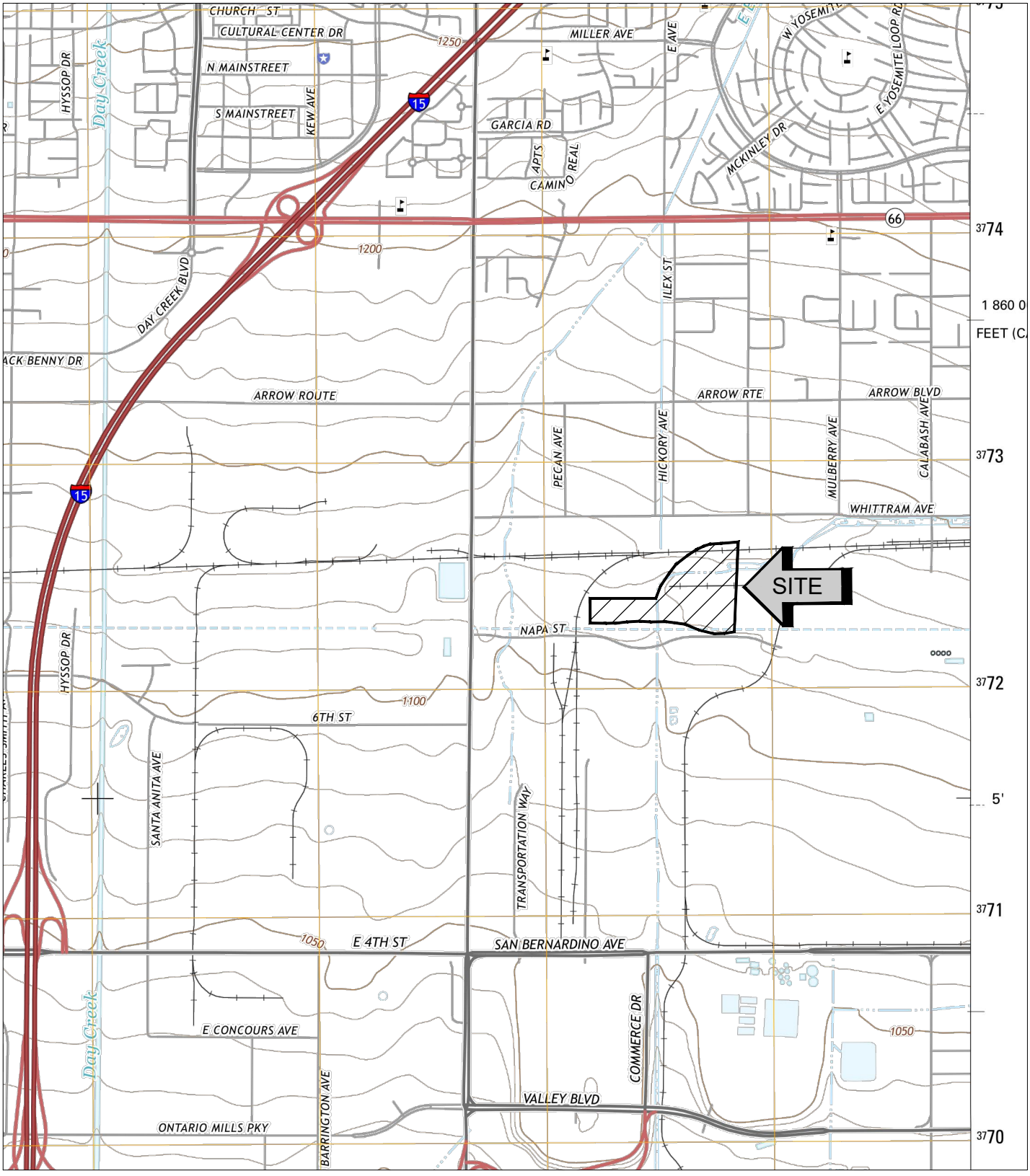
Jose A. Zuniga
Staff Engineer



Daniel W. Nielsen, RCE 77915
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (12 pages)
Infiltration Test Results Spreadsheets (10 pages)
Grain Size Distribution Graphs (10 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF GUASTI QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA, 2015.

SITE LOCATION MAP

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: JZ CHKD: RGT	
SCG PROJECT 20G132-2	
PLATE 1	

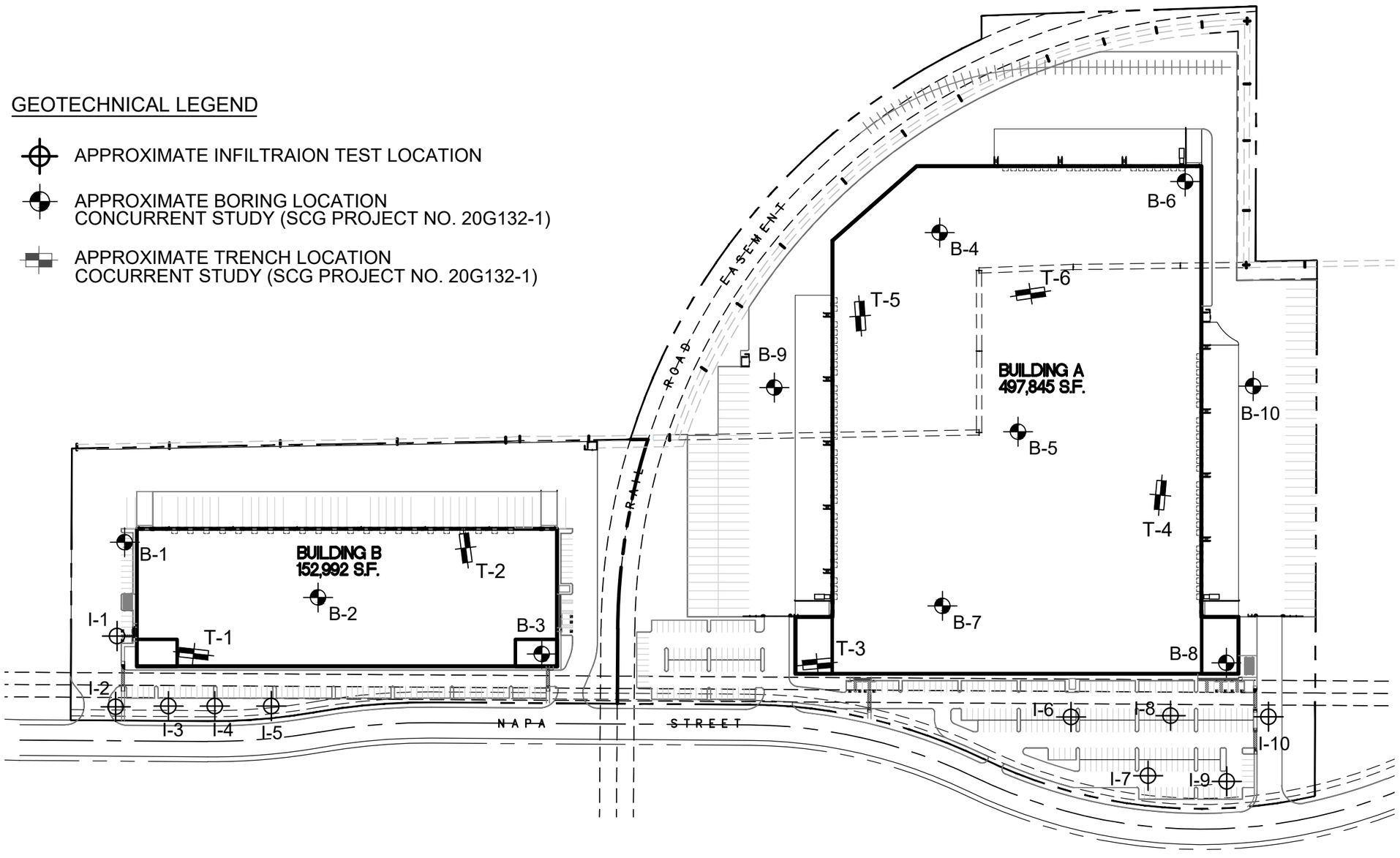
SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

NORTH
SoCalGeo

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRAION TEST LOCATION
- APPROXIMATE BORING LOCATION
  CONCURRENT STUDY (SCG PROJECT NO. 20G132-1)
- APPROXIMATE TRENCH LOCATION
  COCURRENT STUDY (SCG PROJECT NO. 20G132-1)



NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.

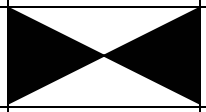
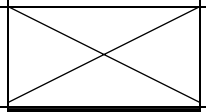
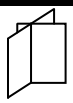
INFILTRATION TEST LOCATION PLAN

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 180'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JZ CHKD: RGT	
SCG PROJECT 20G132-2	
PLATE 2	

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

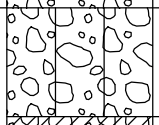
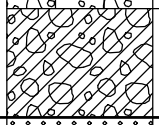
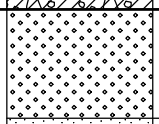
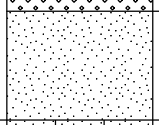
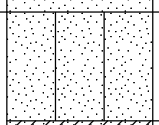
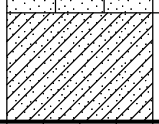
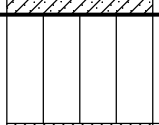
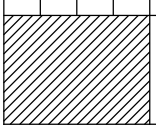
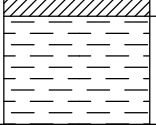
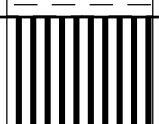
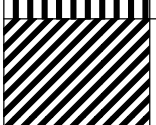
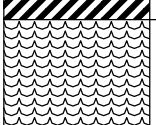
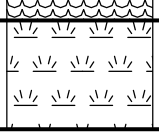
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		22			ALLUVIUML: Gray Brown fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-moist		9					
		23			@ 3½ feet trace coarse Gravel, damp		5					
5												
		21			Gray Brown fine to coarse Sand, little fine to coarse Gravel, medium dense-dry to damp		4					
		18					3			4		
					Boring Terminated at 9½'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		28			FILL: Dark Brown Silty fine to medium Sand, trace coarse Sand, trace to little fine to coarse Gravel, medium dense-damp to moist		9					
		14					7					
5					ALLUVIUML: Gray Brown Silty fine to coarse Sand, little fine Gravel, medium dense-damp to moist		7					
		12					5			15		
					Boring Terminated at 9'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		14			FILL: Dark Brown Silty fine Sand, trace medium coarse Sand, trace fine to coarse Gravel, trace fine root fibers, slight hydrocarbon odor, medium dense-moist		10					
		12			ALLUVIUML: Dark Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, medium dense-damp		5					
5		17			Gray Brown fine to coarse Sand, trace fine Gravel, trace to little Silt, medium dense-damp		4					
		18					4			7		
					Boring Terminated at 9½'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		4			ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, trace Silt, trace fine root fibers, loose-damp		3					
		6			Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, little Silt, loose-damp to moist		8					
5		9					3					
		22					6			10		
10					Gray Brown fine to coarse Sand, little fine Gravel, little Silt, medium dense-damp		4					
					Boring Terminated at 10'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-5

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		8			ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, loose-moist		10					
		6			@ 3½ feet little medium to coarse Sand, trace fine Gravel		9					
5												
		8			Gray Brown fine to coarse Sand, little fine Gravel, trace to little Silt, loose to medium dense-damp to moist		7					
		21					4			8		
10					Boring Terminated at 10½'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-6

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		4			FILL: Dark Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, loose-moist		10					
		15			ALLUVIUM: Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, loose to medium dense-damp		5					
5		9					4					
		30			Gray Brown fine to coarse Sand, some fine to coarse Gravel, little Silt, occasional Cobbles, dense-damp		5			10		
10					Boring Terminated at 10'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-6

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-7

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		16			FILL: Dark Brown Silty fine to coarse Sand, little fine to coarse Gravel, trace asphalt fragments, medium dense-damp to moist		7					
		11			@ 3½ feet trace plastic fragments		8					
5												
		9			ALLUVIUM: Brown Silty fine to coarse Sand, loose-moist		13			30		
					Boring Terminated at 9'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-8

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		15			FILL: Dark Brown Silty fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, trace asphalt fragments, loose to medium dense-damp to moist		7					
		8					9					
5		9			ALLUVIUM: Gray Brown fine to coarse Sand, little fine Gravel, trace to little Silt, loose to medium dense-dry to damp		3					
		21					2			8		
10					Boring Terminated at 10'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-8

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-9

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		16			FILL: Brown Silty fine to medium Sand, trace coarse Sand, little fine to coarse Gravel, trace AC fragments, medium dense-damp		6					
		15			@ 3½ feet trace plastic fragments		4					
5												
		8			ALLUVIUM: Brown Silty fine to coarse Sand, trace fine Gravel, loose-damp		9			24		
					Boring Terminated at 9'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG

PLATE B-9

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-10

JOB NO.: 20G132-2
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 4/2/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jamie Hayward

WATER DEPTH: Dry
CAVE DEPTH: --
READING TAKEN: --

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		24			FILL: Dark Brown Silty fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, trace fine root fibers, trace AC fragments, medium dense-damp		6					
		20			ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, medium dense-moist		11					
5		13			Gray Brown fine to coarse Sand, little fine to coarse Gravel, little Silt, medium dense-dry to damp		3					
		24					2			9		
10					Boring Terminated at 10'							

TBL 20G132-2.GPJ SOCALGEO.GDT 5/1/20

TEST BORING LOG **PLATE B-10**

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	9.5	(ft)

Infiltration Test Hole: I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	6:50 AM	25.0	8.70	0.80	0.40	6.78
	Final	7:15 AM		9.50			
2	Initial	7:15 AM	25.0	8.70	0.80	0.40	6.78
	Final	7:40 AM		9.50			
3	Initial	7:45 AM	10.0	8.70	0.71	0.45	13.93
	Final	7:55 AM		9.41			
4	Initial	7:56 AM	10.0	8.70	0.71	0.45	13.93
	Final	8:06 AM		9.41			
5	Initial	8:08 AM	10.0	8.70	0.71	0.45	13.93
	Final	8:18 AM		9.41			
6	Initial	8:20 AM	10.0	8.70	0.72	0.44	14.24
	Final	8:30 AM		9.42			
7	Initial	8:30 AM	10.0	8.70	0.70	0.45	13.62
	Final	8:40 AM		9.40			
8	Initial	8:41 AM	10.0	8.70	0.65	0.48	12.16
	Final	8:51 AM		9.35			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	9	(ft)

Infiltration Test Hole: I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:10 AM	25.0	8.20	0.80	0.40	6.78
	Final	8:35 AM		9.00			
2	Initial	8:35 AM	25.0	8.20	0.80	0.40	6.78
	Final	9:00 AM		9.00			
3	Initial	9:10 AM	10.0	8.20	0.50	0.55	8.37
	Final	9:20 AM		8.70			
4	Initial	9:21 AM	10.0	8.20	0.45	0.58	7.28
	Final	9:31 AM		8.65			
5	Initial	9:32 AM	10.0	8.20	0.47	0.57	7.71
	Final	9:42 AM		8.67			
6	Initial	9:43 AM	10.0	8.20	0.50	0.55	8.37
	Final	9:53 AM		8.70			
7	Initial	10:03 AM	10.0	8.20	0.47	0.57	7.71
	Final	10:13 AM		8.67			
8	Initial	10:15 AM	10.0	8.20	0.40	0.60	6.26
	Final	10:25 AM		8.60			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	9.5	(ft)

Infiltration Test Hole: I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:30 AM	25.0	8.70	0.80	0.40	6.78
	Final	9:55 AM		9.50			
2	Initial	9:55 AM	25.0	8.70	0.80	0.40	6.78
	Final	10:20 AM		9.50			
3	Initial	10:29 AM	10.0	8.70	0.95	0.33	23.19
	Final	10:39 AM		9.65			
4	Initial	10:41 AM	10.0	8.70	0.92	0.34	21.79
	Final	10:51 AM		9.62			
5	Initial	10:53 AM	10.0	8.70	0.93	0.34	22.25
	Final	11:03 AM		9.63			
6	Initial	11:05 AM	10.0	8.70	0.92	0.34	21.79
	Final	11:15 AM		9.62			
7	Initial	11:17 AM	10.0	8.70	0.93	0.34	22.25
	Final	11:27 AM		9.63			
8	Initial	11:29 AM	10.0	8.70	0.92	0.34	21.79
	Final	11:39 AM		9.62			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	10	(ft)

Infiltration Test Hole: I-4

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:45 AM	25.0	9.20	0.80	0.40	6.78
	Final	11:10 AM		10.00			
2	Initial	11:10 AM	25.0	9.20	0.80	0.40	6.78
	Final	11:35 AM		10.00			
3	Initial	11:42 AM	10.0	9.20	0.75	0.43	15.21
	Final	11:52 AM		9.95			
4	Initial	11:54 AM	10.0	9.20	0.75	0.43	15.21
	Final	12:04 PM		9.95			
5	Initial	12:06 PM	10.0	9.20	0.65	0.48	12.16
	Final	12:16 PM		9.85			
6	Initial	12:18 PM	10.0	9.20	0.70	0.45	13.62
	Final	12:28 PM		9.90			
7	Initial	12:30 PM	10.0	9.20	0.65	0.48	12.16
	Final	12:40 PM		9.85			
8	Initial	12:42 PM	10.0	9.20	0.70	0.45	13.62
	Final	12:52 PM		9.90			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	10.1	(ft)

Infiltration Test Hole: I-5

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	11:45 AM	25.0	9.30	0.80	0.40	6.78
	Final	12:10 PM		10.10			
2	Initial	12:10 PM	25.0	9.30	0.80	0.40	6.78
	Final	12:35 PM		10.10			
3	Initial	1:02 PM	4.5	9.30	0.80	0.40	38.07
	Final	1:06 PM		10.10			
4	Initial	1:08 PM	4.3	9.30	0.80	0.40	39.86
	Final	1:12 PM		10.10			
5	Initial	1:14 PM	4.8	9.30	0.80	0.40	35.67
	Final	1:18 PM		10.10			
6	Initial	1:21 PM	4.8	9.30	0.80	0.40	35.05
	Final	1:25 PM		10.10			
7	Initial	1:27 PM	5.0	9.30	0.80	0.40	33.77
	Final	1:32 PM		10.10			
8	Initial	1:34 PM	5.0	9.30	0.80	0.40	34.00
	Final	1:38 PM		10.10			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	10.1	(ft)

Infiltration Test Hole: I-6

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	1:35 PM	25.0	9.30	0.80	0.40	6.78
	Final	2:00 PM		10.10			
2	Initial	2:00 PM	25.0	9.30	0.80	0.40	6.78
	Final	2:25 PM		10.10			
3	Initial	2:30 PM	10.0	9.30	0.58	0.51	10.29
	Final	2:40 PM		9.88			
4	Initial	2:42 PM	10.0	9.30	0.58	0.51	10.29
	Final	2:52 PM		9.88			
5	Initial	2:53 PM	10.0	9.30	0.59	0.50	10.54
	Final	3:03 PM		9.89			
6	Initial	3:04 PM	10.0	9.30	0.59	0.50	10.54
	Final	3:14 PM		9.89			
7	Initial	3:17 PM	10.0	9.30	0.60	0.50	10.80
	Final	3:27 PM		9.90			
8	Initial	3:29 PM	10.0	9.30	0.61	0.49	11.06
	Final	3:39 PM		9.91			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	9	(ft)

Infiltration Test Hole: I-7

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	7:00 AM	25.0	8.20	0.13	0.74	0.69
	Final	7:25 AM		8.33			
2	Initial	7:25 AM	25.0	8.20	0.11	0.75	0.58
	Final	7:50 AM		8.31			
3	Initial	7:54 AM	30.0	8.20	0.17	0.72	0.77
	Final	8:24 AM		8.37			
4	Initial	8:26 AM	30.0	8.20	0.10	0.75	0.44
	Final	8:56 AM		8.30			
5	Initial	8:58 AM	30.0	8.20	0.10	0.75	0.44
	Final	9:28 AM		8.30			
6	Initial	9:30 AM	30.0	8.20	0.10	0.75	0.44
	Final	10:00 AM		8.30			
7	Initial	10:02 AM	30.0	8.20	0.10	0.75	0.44
	Final	10:32 AM		8.30			
8	Initial	10:34 AM	30.0	8.20	0.10	0.75	0.44
	Final	11:04 AM		8.30			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	10.1	(ft)

Infiltration Test Hole: I-8

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	7:10 AM	25.0	9.20	0.90	0.45	7.01
	Final	7:35 AM		10.10			
2	Initial	7:35 AM	25.0	9.20	0.90	0.45	7.01
	Final	8:00 AM		10.10			
3	Initial	8:12 AM	10.0	9.20	0.55	0.63	8.34
	Final	8:22 AM		9.75			
4	Initial	8:24 AM	10.0	9.20	0.55	0.63	8.34
	Final	8:34 AM		9.75			
5	Initial	8:35 AM	10.0	9.20	0.54	0.63	8.13
	Final	8:45 AM		9.74			
6	Initial	8:47 AM	10.0	9.20	0.50	0.65	7.35
	Final	8:57 AM		9.70			
7	Initial	9:00 AM	10.0	9.20	0.49	0.66	7.16
	Final	9:10 AM		9.69			
8	Initial	9:11 AM	10.0	9.20	0.49	0.66	7.16
	Final	9:21 AM		9.69			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	9	(ft)

Infiltration Test Hole: I-9

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:20 AM	25.0	8.20	0.70	0.45	5.45
	Final	8:45 AM		8.90			
2	Initial	8:45 AM	25.0	8.20	0.65	0.48	4.86
	Final	9:10 AM		8.85			
3	Initial	9:41 AM	10.0	8.20	0.19	0.71	2.62
	Final	9:51 AM		8.39			
4	Initial	9:52 AM	10.0	8.20	0.30	0.65	4.41
	Final	10:02 AM		8.50			
5	Initial	10:04 AM	10.0	8.20	0.30	0.65	4.41
	Final	10:14 AM		8.50			
6	Initial	10:15 AM	10.0	8.20	0.31	0.65	4.58
	Final	10:25 AM		8.51			
7	Initial	10:27 AM	10.0	8.20	0.33	0.64	4.94
	Final	10:37 AM		8.53			
8	Initial	10:38 AM	10.0	8.20	0.31	0.65	4.58
	Final	10:48 AM		8.51			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed C/I Development
Project Location	Rancho Cucamonga, California
Project Number	20G132-2
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	10	(ft)

Infiltration Test Hole: I-10

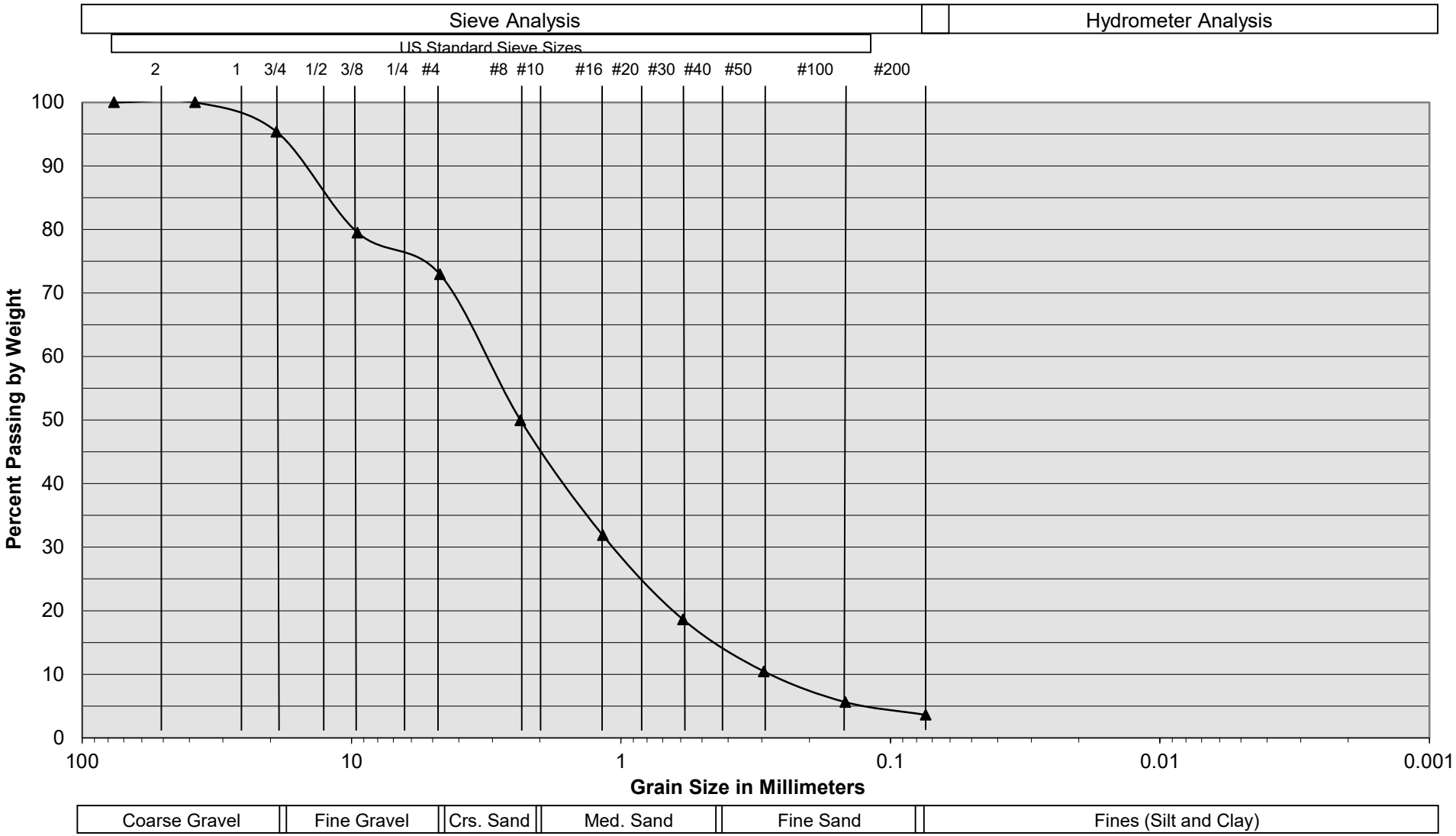
Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:45 AM	25.0	9.20	0.80	0.40	6.78
	Final	10:10 AM		10.00			
2	Initial	10:10 AM	25.0	9.20	0.80	0.40	6.78
	Final	10:35 AM		10.00			
3	Initial	10:40 AM	10.0	9.00	1.00	0.50	18.00
	Final	10:50 AM		10.00			
4	Initial	10:52 AM	10.0	9.10	0.90	0.45	17.51
	Final	11:02 AM		10.00			
5	Initial	11:04 AM	10.0	8.70	1.30	0.65	19.10
	Final	11:14 AM		10.00			
6	Initial	11:16 AM	10.0	9.10	0.90	0.45	17.51
	Final	11:26 AM		10.00			
7	Initial	11:28 AM	10.0	9.10	0.90	0.45	17.51
	Final	11:38 AM		10.00			
8	Initial	11:40 AM	10.0	9.20	0.80	0.40	16.94
	Final	11:50 AM		10.00			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

Grain Size Distribution

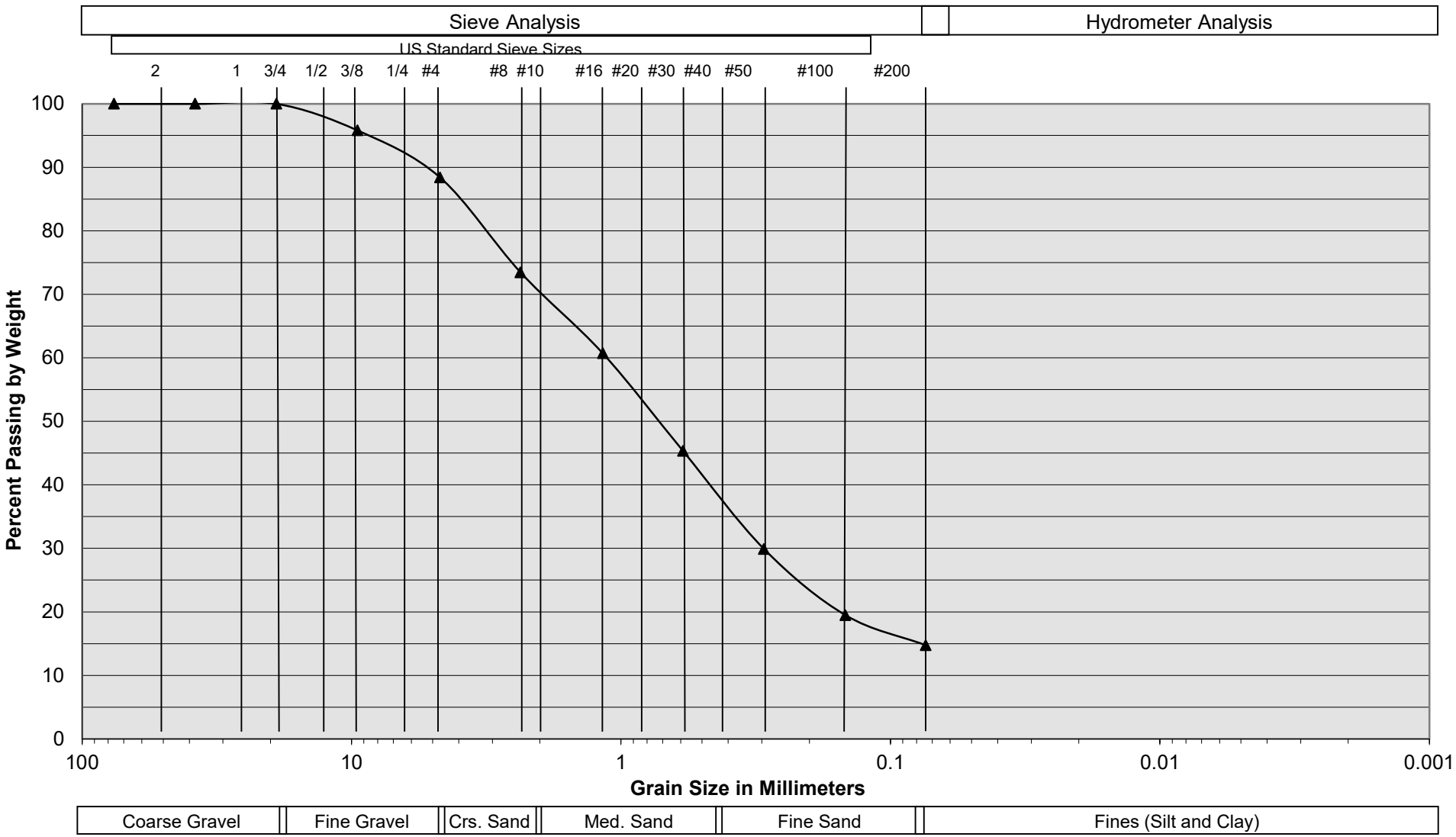


Sample Description	I-1 @ 8 feet
Soil Classification	Gray Brown fine to coarse Sand, little fine to coarse Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 1

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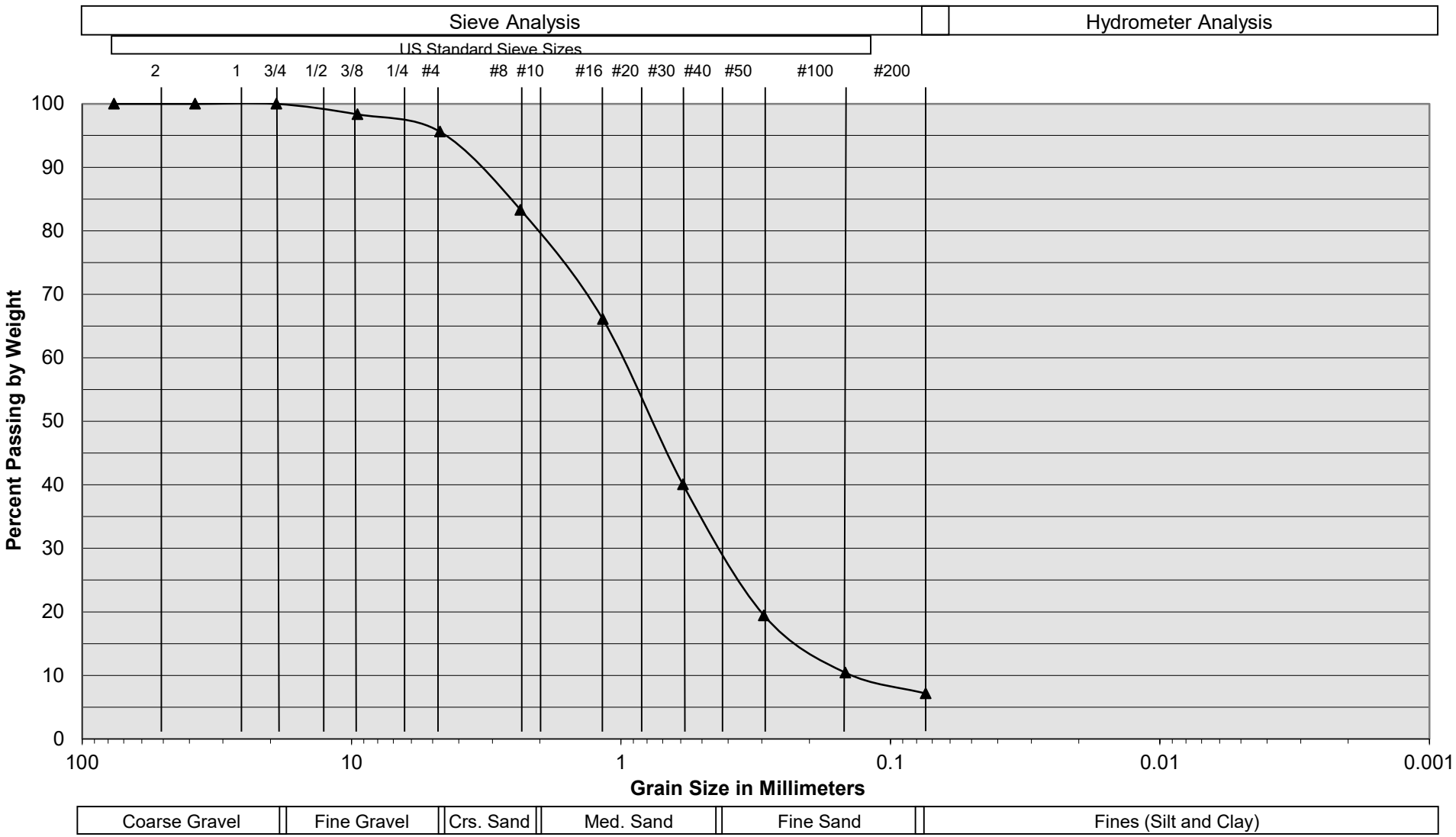


Sample Description	I-2 @ 7 1/2 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, few to little fine Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 2

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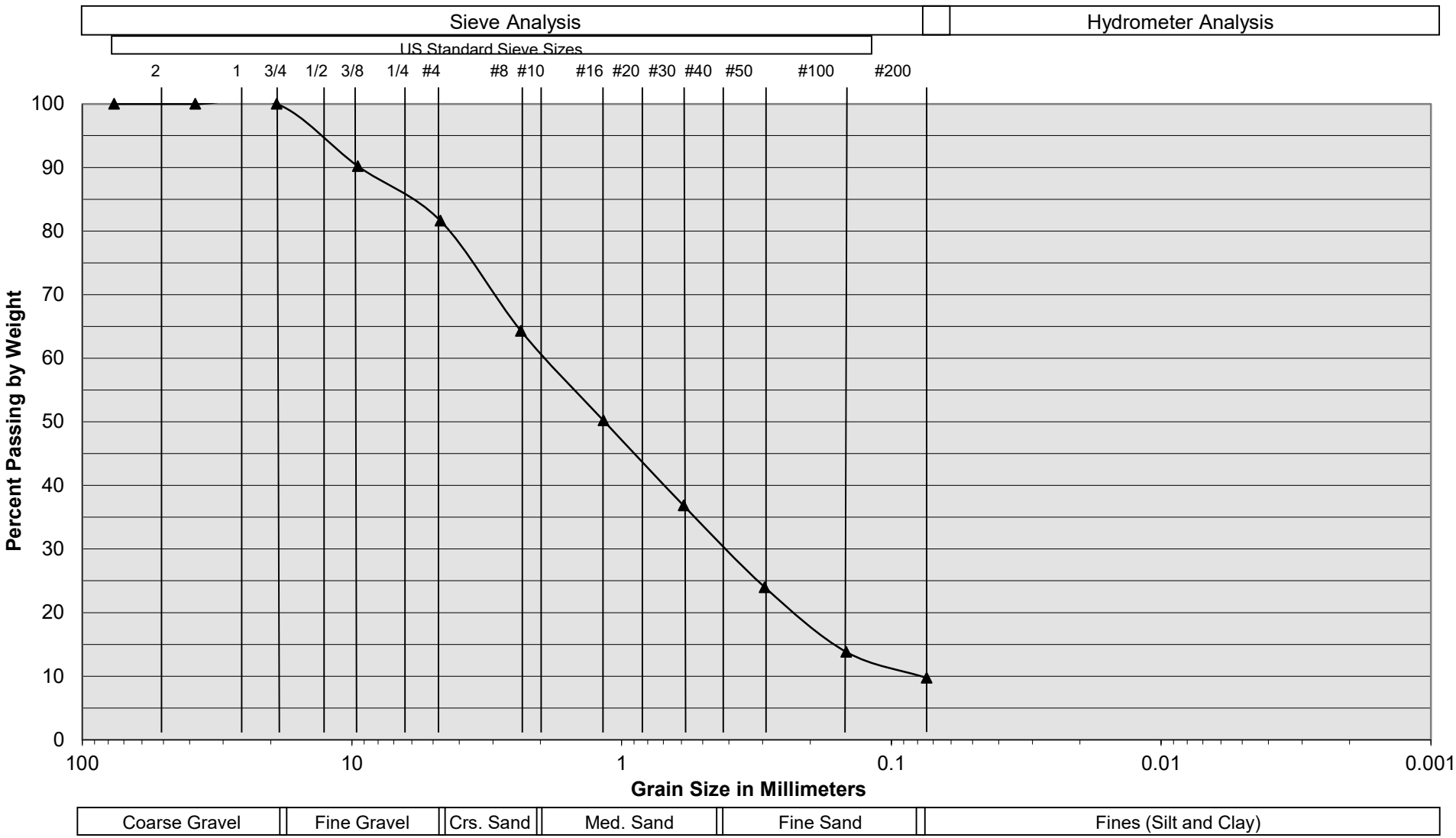


Sample Description	I-3 @ 8 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, trace fine Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 3

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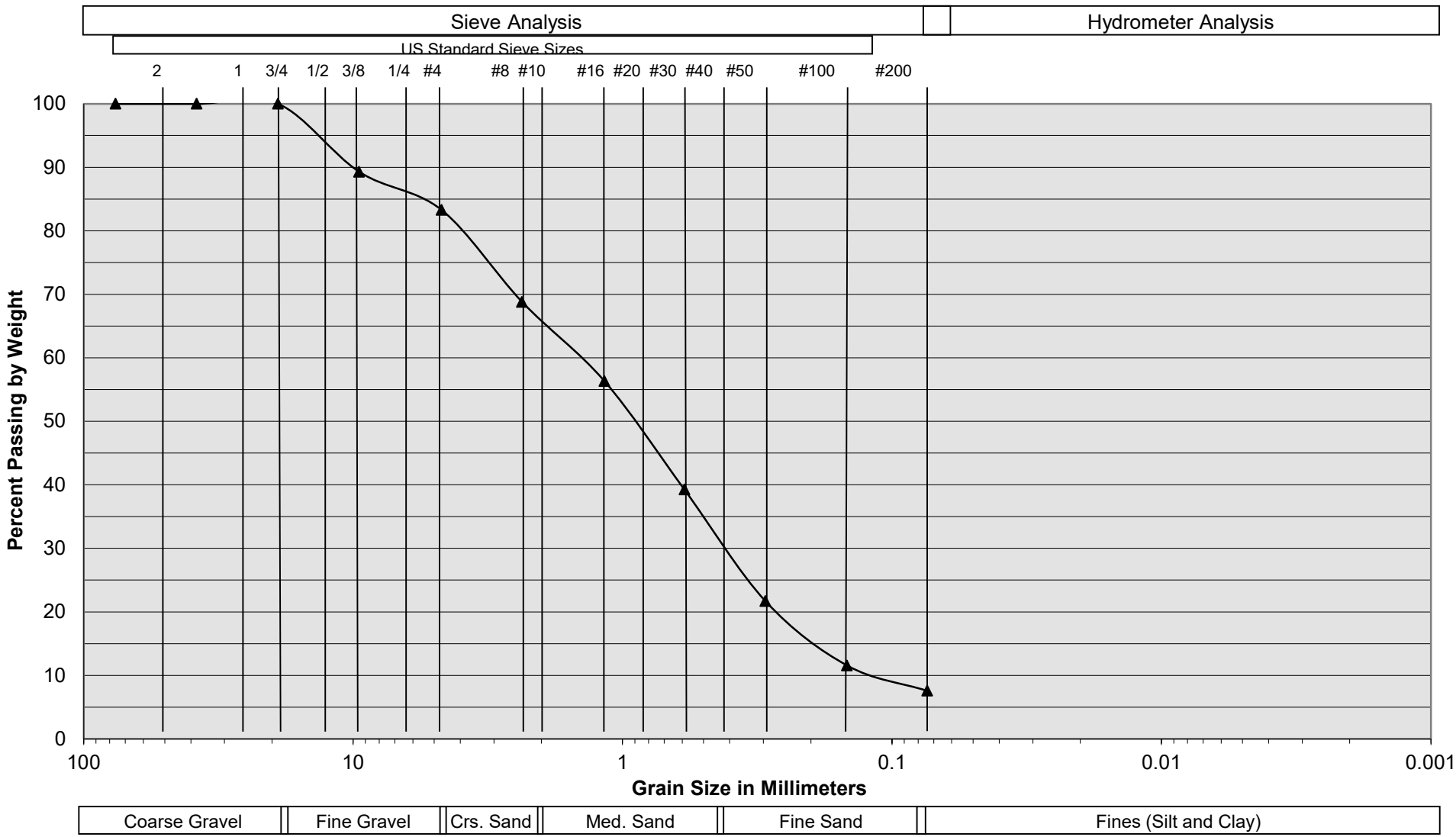


Sample Description	I-4 @ 9 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, little fine Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 4

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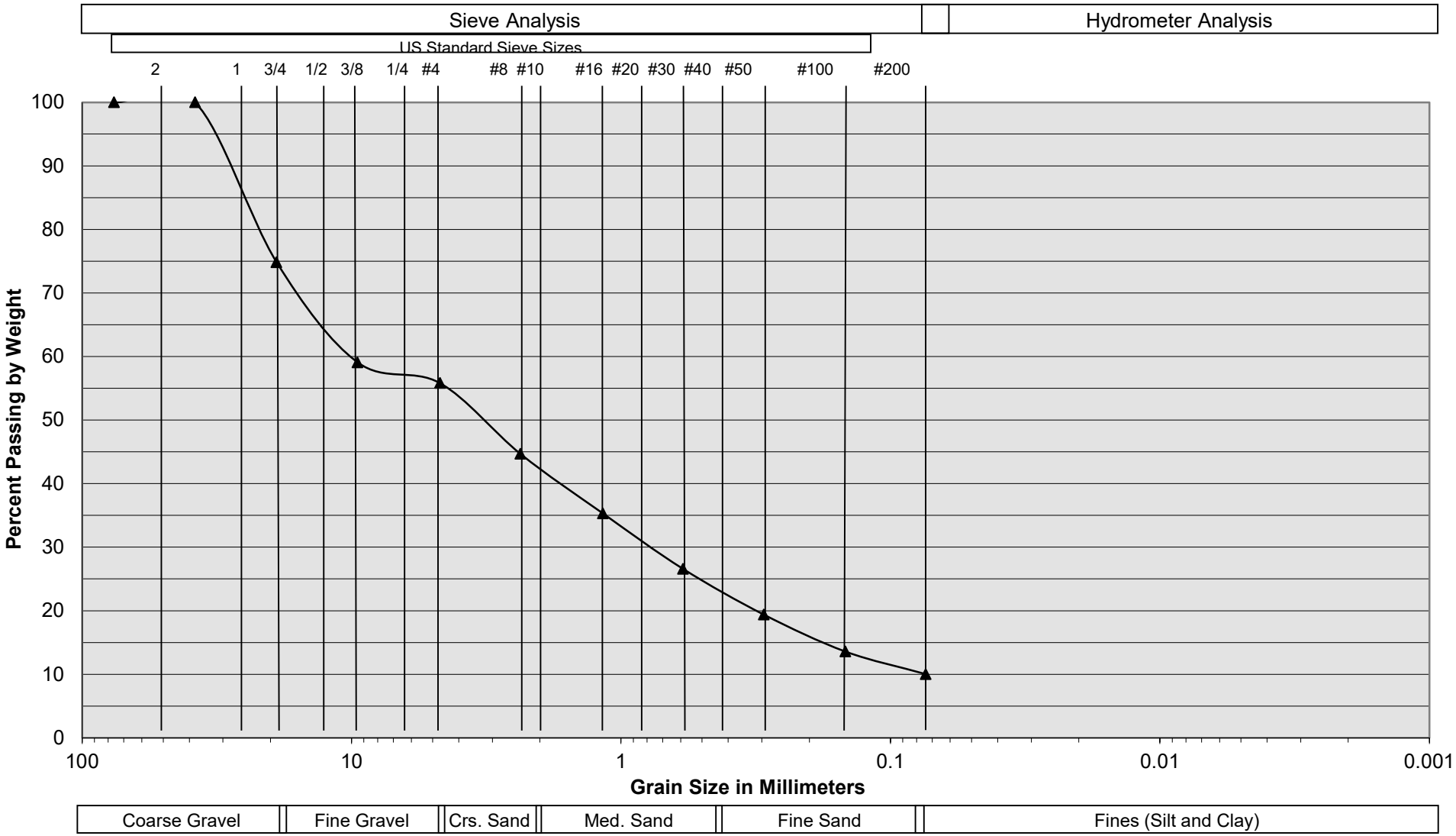


Sample Description	I-5 @ 9 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, little fine Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 5

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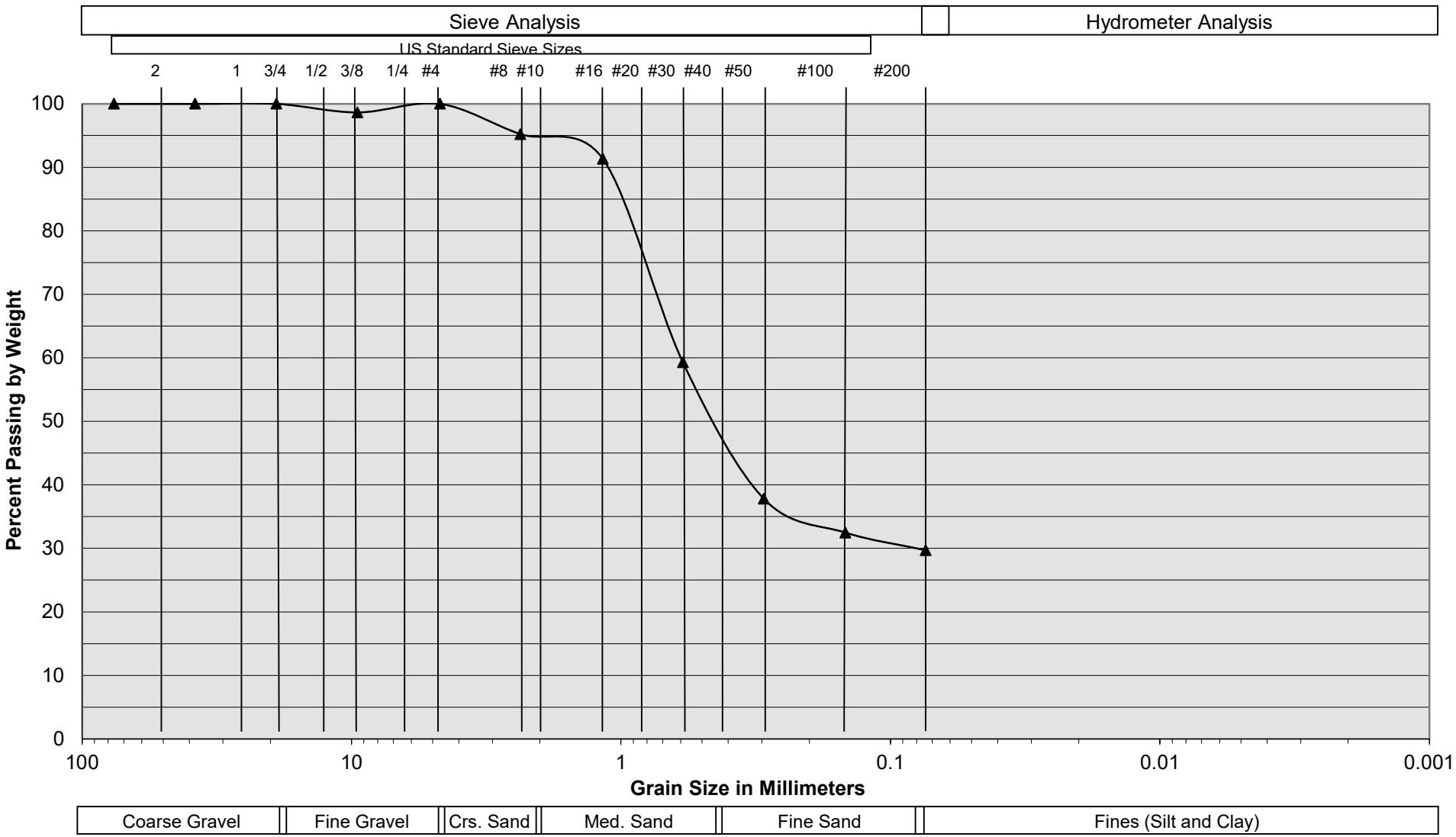


Sample Description	I-6 @ 8 1/2 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, some fine to coarse Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 6

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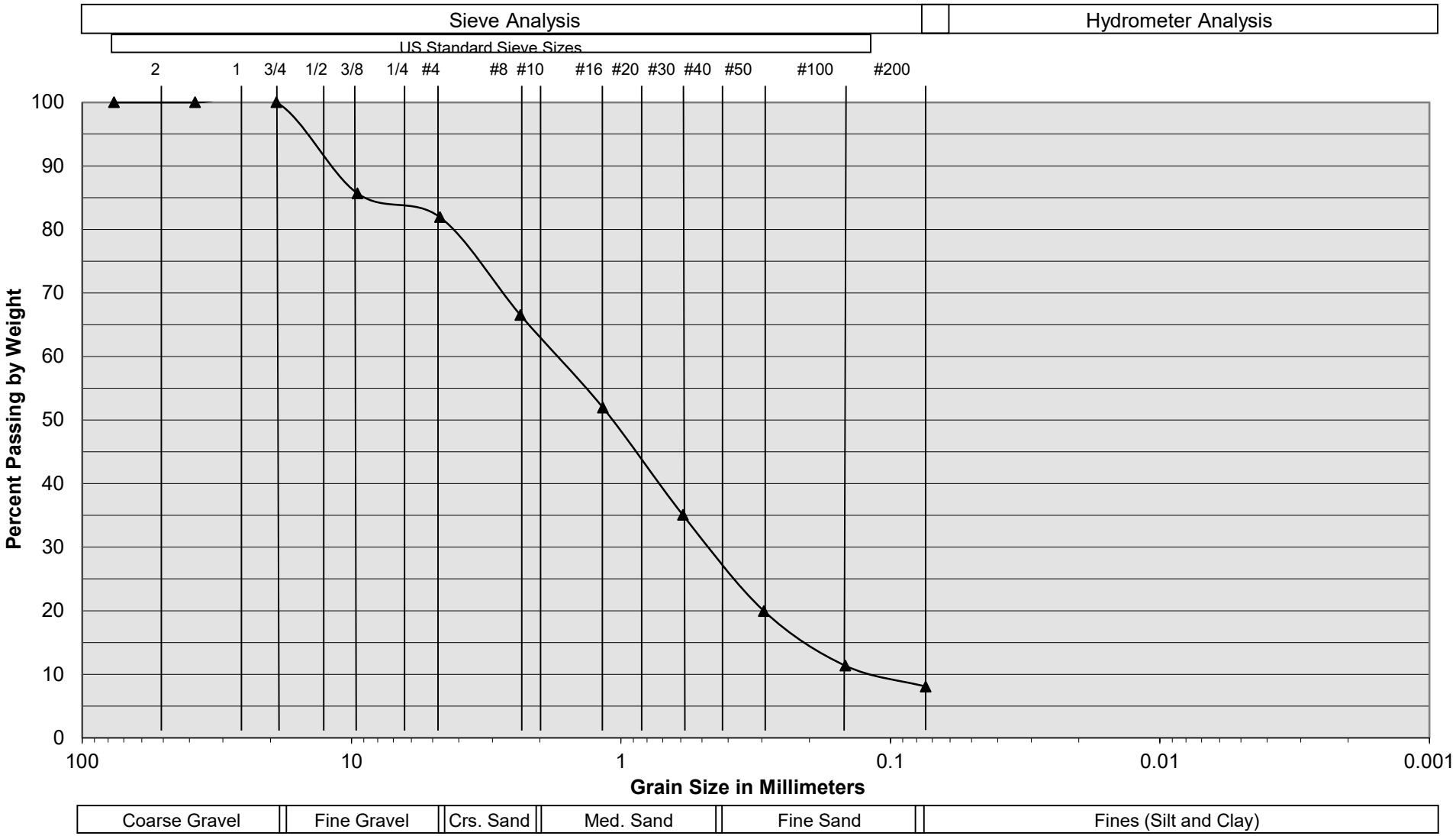


Sample Description	I-7 @ 7 1/2 feet
Soil Classification	Brown Silty fine to coarse Sand

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 7

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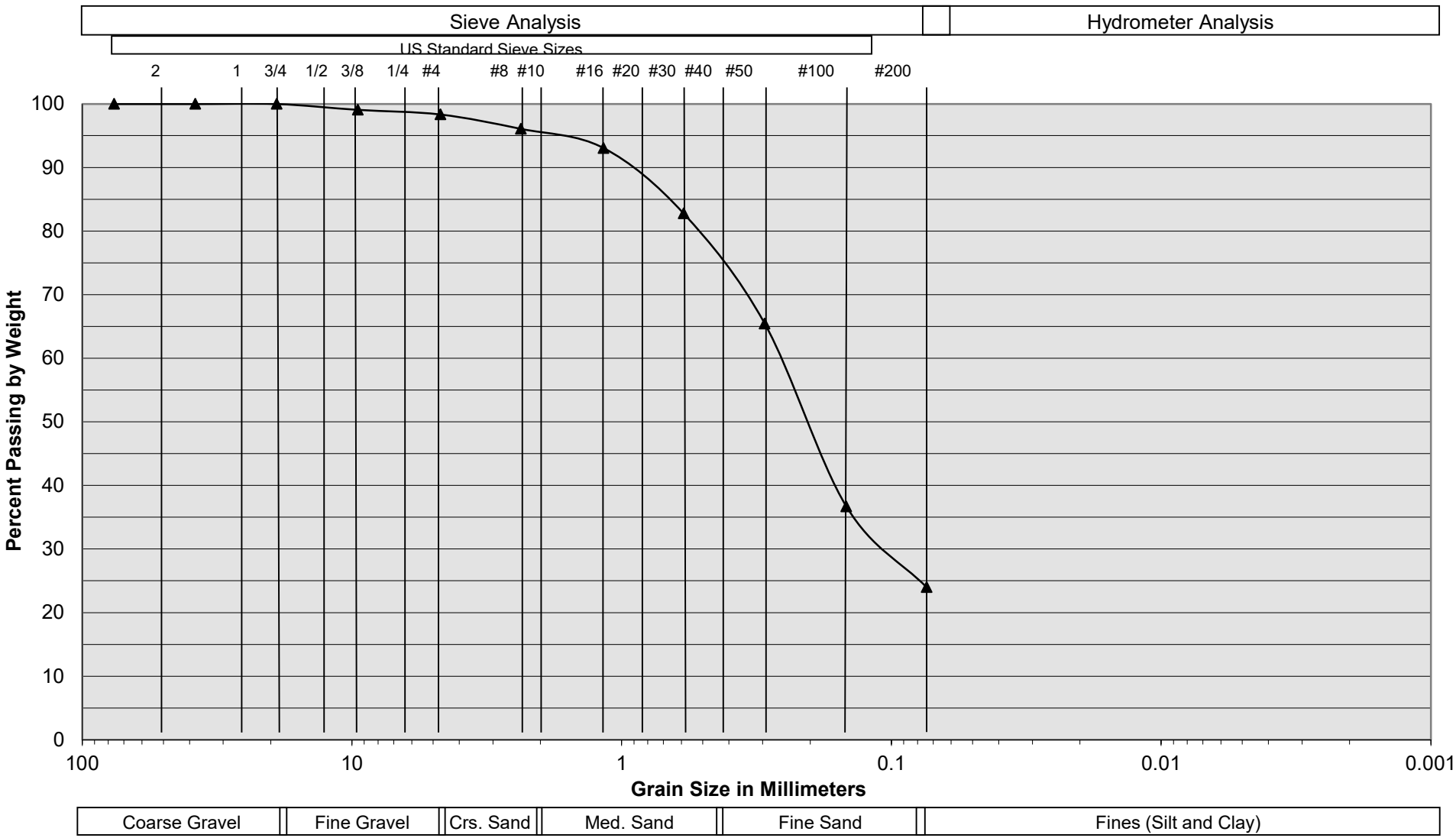


Sample Description	I-8 @ 8 1/2 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, little fine Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 8

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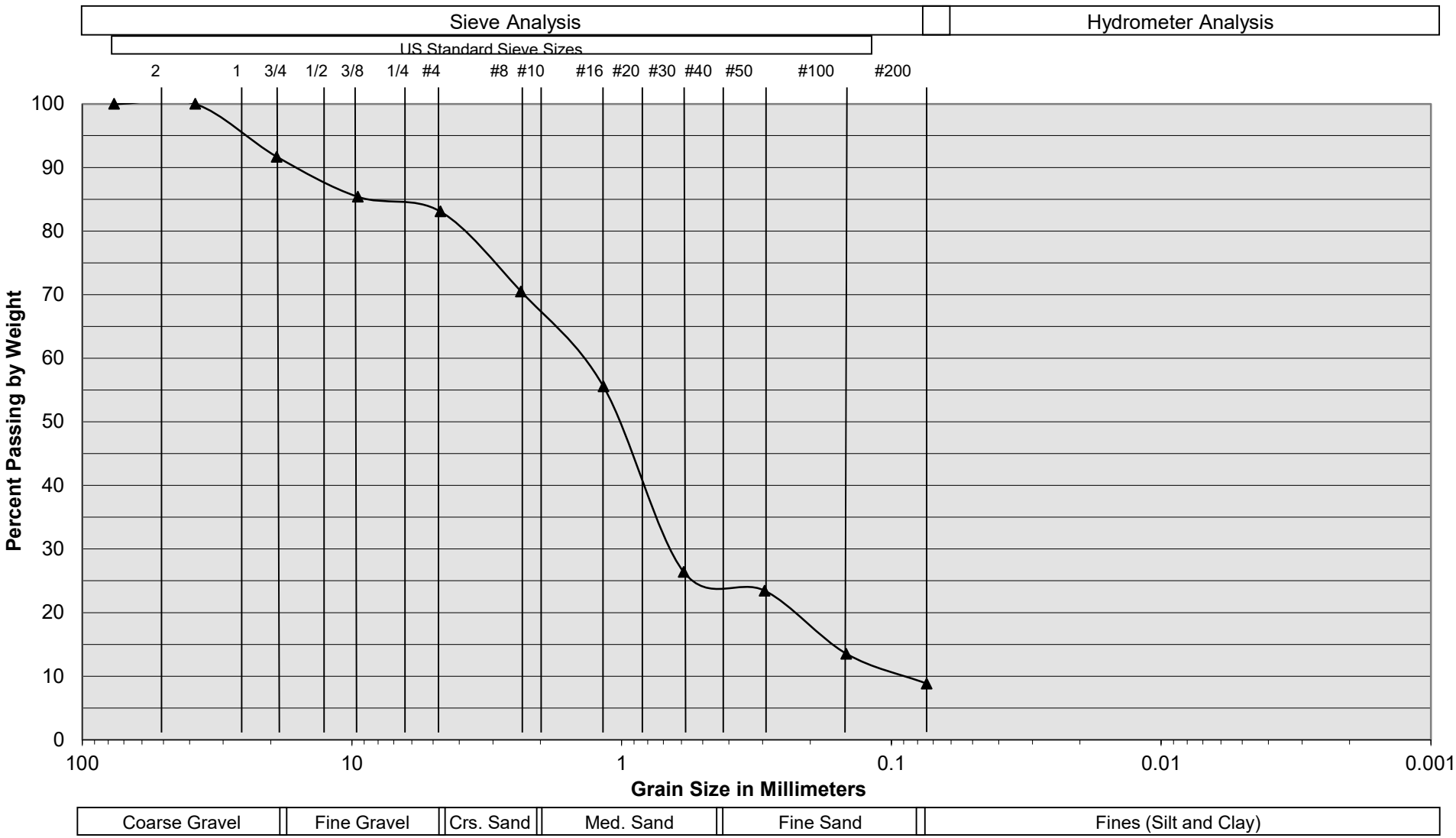


Sample Description	I-9 @ 7 1/2 feet
Soil Classification	Brown Silty fine to coarse Sand, trace fine Gravel

Proposed Commercial/Industrial Building
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Project No. 20G132-2
PLATE C- 9

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Grain Size Distribution



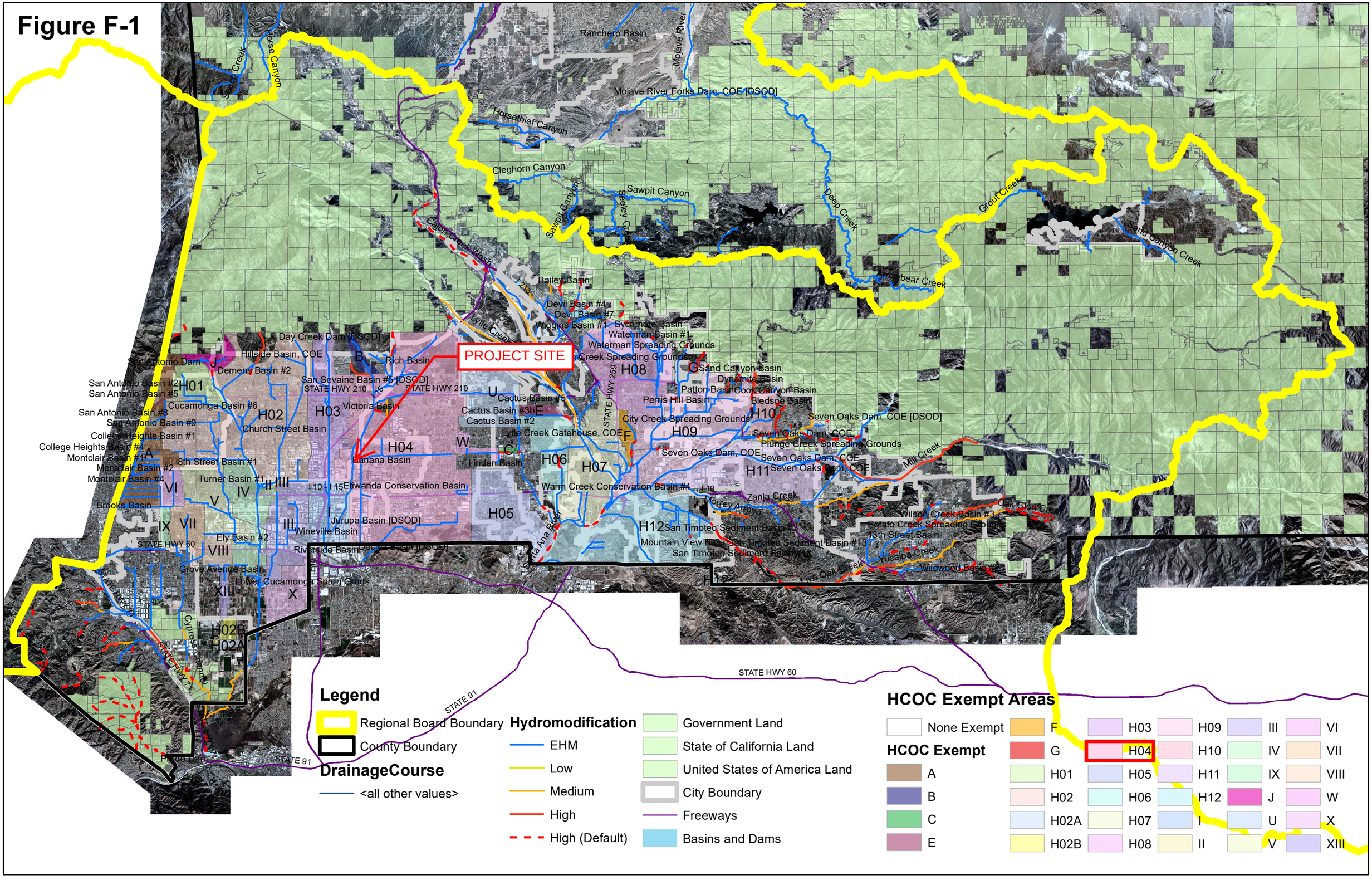
Sample Description	I-10 @ 8 1/2 feet
Soil Classification	Gray Brown Silty fine to coarse Sand, little fine to coarse Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 20G132-2
PLATE C- 10

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D – HCOC EXEMPTION

Figure F-1



Legend

- Regional Board Boundary
- County Boundary

DrainageCourse

- <all other values>

Hydromodification

- EHM
- Low
- Medium
- High
- High (Default)

- Government Land
- State of California Land
- United States of America Land
- City Boundary
- Freeways
- Basins and Dams

HCOC Exempt Areas

- None Exempt

HCOC Exempt

- A
- B
- C
- E
- F
- G
- H01
- H02
- H02A
- H02B
- H03
- H04
- H05
- H06
- H07
- H08
- H09
- H10
- H11
- H12
- I
- II
- III
- IV
- V
- VI
- VII
- VIII
- IX
- J
- U
- W
- X
- XIII

Hydromodification

A.1 Hydrologic Conditions of Concern (HCOC) Analysis

HCOC Exemption:

1. **Sump Condition:** All downstream conveyance channel to an adequate sump (for example, Prado Dam, Santa Ana River, or other Lake, Reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

2. **Pre = Post**: The runoff flow rate, volume and velocity for the post-development condition of the Priority Development Project do not exceed the pre-development (i.e, naturally occurring condition for the 2-year, 24-hour rainfall event utilizing latest San Bernardino County Hydrology Manual.

    a. Submit a substantiated hydrologic analysis to justify your request.

3. **Diversion to Storage Area**: The drainage areas that divert to water storage areas which are considered as control/release point and utilized for water conservation.

    a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbcounty.permitrack.com/wap) for reference.

4. **Less than One Acre**: The Priority Development Project disturbs less than one acre. The Co-permittee has the discretion to require a Project Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The project disturbs less than one acre and is not part of a common plan of development.

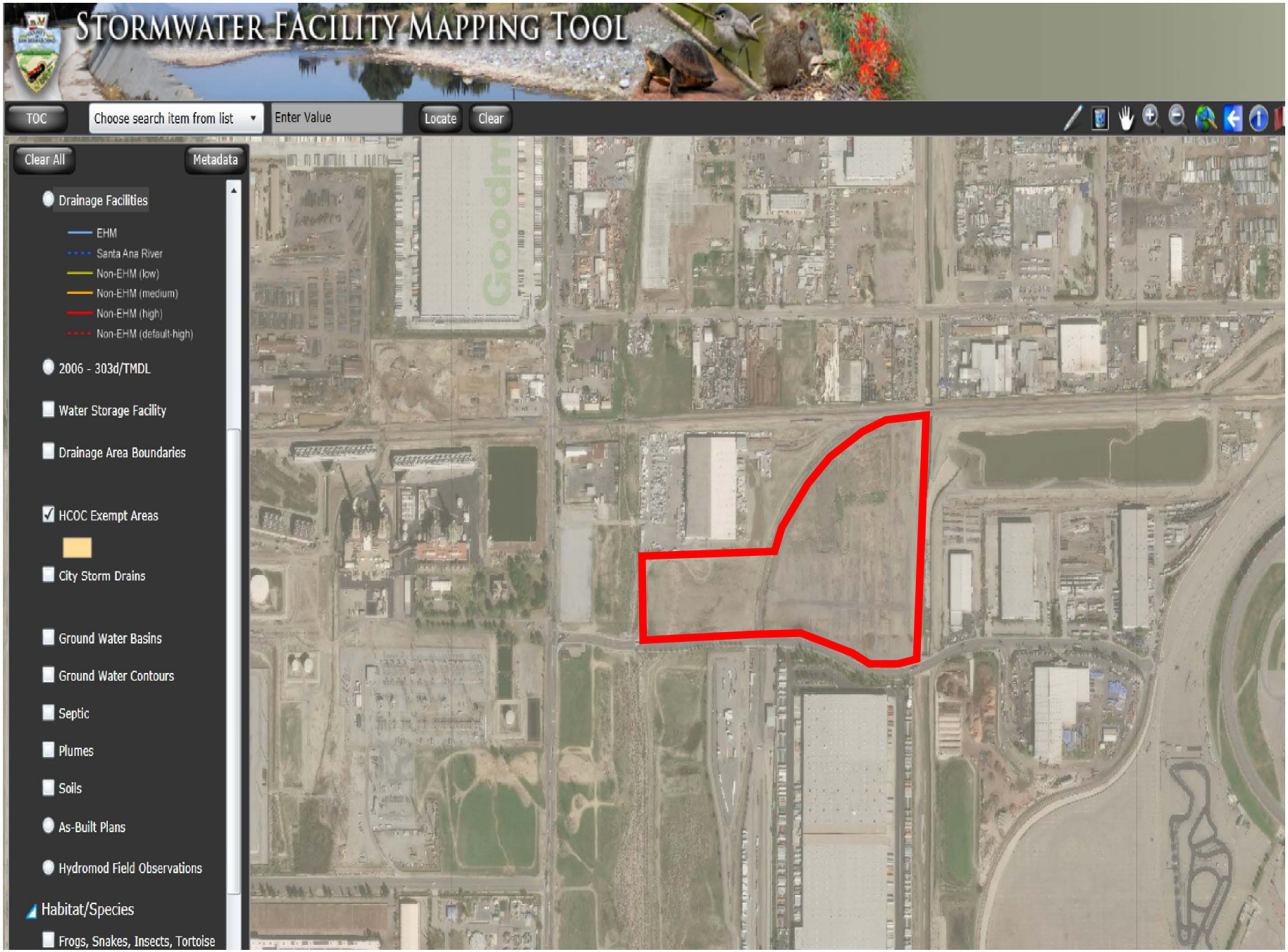
5. **Built Out Area**: The contributing watershed area to which the project discharges has a developed area percentage greater than 90 percent.

    a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbcounty.permitrack.com/wap) for reference.

Summary of HCOC Exempted Area

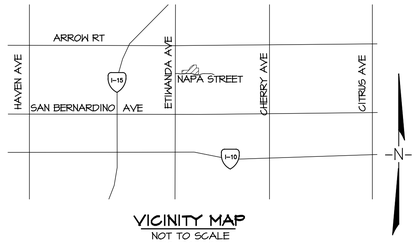
	HCOC Exemption reasoning				
	1	2	3	4	5
Area					
A			X		X
B			X		
C					X
E			X		
F					X
G			X		X
H01	X		X		
H02	X		X		
H02A	X		X		
H02B			X		
H03			X		
H04	X		X		
H05	X				
H06			X		
H07	X				
H08	X		X		
H09	X				
H10	X		X		
H11	X		X		
H12	X				
J			X		
U			X		
W			X		
I			X		
II			X		
III					X
IV			X		X
V			X*		
VI					X
VII					X
VIII			X		
IX					X
X			X		
XIII			X		

*Detention/Conservation Basin


STORMWATER FACILITY MAPPING TOOL
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Drainage Facilities
EHM
Santa Ana River
Non-EHM (low)
Non-EHM (medium)
Non-EHM (high)
Non-EHM (default-high)
2006 - 303d/TMDL
Water Storage Facility
Drainage Area Boundaries
HCOC Exempt Areas
City Storm Drains
Ground Water Basins
Ground Water Contours
Septic
Plumes
Soils
As-Built Plans
Hydromod Field Observations
Habitat/Species
Frogs, Snakes, Insects, Tortoise

APPENDIX E – EDUCATIONAL MATERIALS

(TO BE INCLUDED IN FINAL WQMP REPORT)



VICINITY MAP
NOT TO SCALE
T1S, R6W, S16

SOURCE CONTROL NOTES

1. ALL INLETS SHALL BE MARKED PER S1 IN FORM 4.1-2.
2. IF NECESSARY, INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT SUMP PUMPS WILL BE PLUMBED TO SANITARY SEWER.
3. MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES.
4. ALL SLOPES GREATER THAN 4:1 SHOULD BE PROTECTED FROM EROSION USING CASQA SD-10 LANDSCAPE RECOMMENDATIONS
5. TRASH ENCLOSURE AREA SHALL BE COVERED PER CITY STANDARDS AND SHALL HAVE A SIGN THAT STATES "DO NOT DUMP HAZARDOUS MATERIALS HERE".
6. ALL INDUSTRIAL PROCESS ACTIVITIES ARE TO BE PERFORMED INDOORS. NO PROCESSES SHALL DRAIN TO EXTERIOR STORM DRAIN SYSTEM.
7. ROOF DOWNSPOUTS SHALL BE POSITIONED TO DIRECT STORMWATER AWAY FROM LOADING AREA. PROVIDE ROOF OVERHANG OVER THE LOADING AREA OR INSTALL DOOR SKIRTS AT EACH BAY THAT ENCLOSE THE END OF THE TRAILER.
8. PROVIDE A MEANS TO DRAIN FIRE SPRINKLER WATER TO SANITARY SEWER SYSTEM.
9. BOILER DRAIN LINES AND CONDENSATE DRAIN LINES SHALL BE DIRECTLY OR INDIRECTLY CONNECTED TO THE SANITARY SEWER SYSTEM AND MAY NOT DISCHARGE TO THE STORM DRAIN SYSTEM.
10. ROOFTOP EQUIPMENT WITH POTENTIAL TO PRODUCE POLLUTANTS SHALL BE ROOFED OR HAVE A SECONDARY CONTAINMENT.
11. ANY DRAINAGE SUMPS ON-SITE SHALL FEATURE SEDIMENT SUMP TO REDUCE THE QUANTITY OF SEDIMENT IN PUMPED WATER.

SITE PLAN RESTRICTION

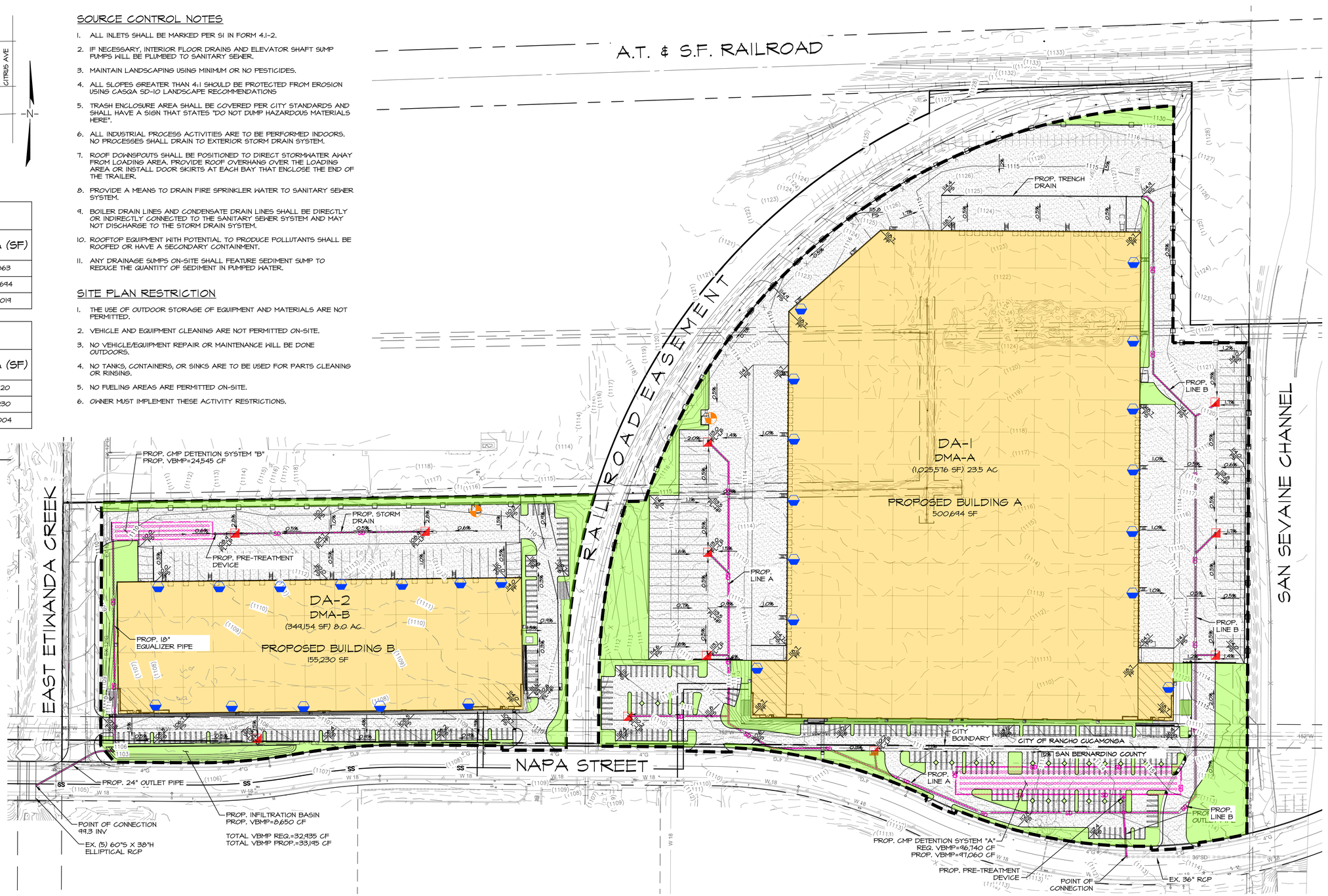
1. THE USE OF OUTDOOR STORAGE OF EQUIPMENT AND MATERIALS ARE NOT PERMITTED.
2. VEHICLE AND EQUIPMENT CLEANING ARE NOT PERMITTED ON-SITE.
3. NO VEHICLE/EQUIPMENT REPAIR OR MAINTENANCE WILL BE DONE OUTDOORS.
4. NO TANKS, CONTAINERS, OR SINKS ARE TO BE USED FOR PARTS CLEANING OR RINSING.
5. NO FUELING AREAS ARE PERMITTED ON-SITE.
6. OWNER MUST IMPLEMENT THESE ACTIVITY RESTRICTIONS.

DRAINAGE AREA 1			
LEGEND	DMA-ID	TYPE	AREA (SF)
	L-A	LANDSCAPE	88,863
	R-A	ROOF	500,694
	H-A	HARDSCAPE	436,019

DRAINAGE AREA 2			
LEGEND	DMA-ID	TYPE	AREA (SF)
	L-A	LANDSCAPE	45,920
	R-A	ROOF	155,230
	H-A	HARDSCAPE	148,004

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- LANDSCAPING
- ROOF
- CONCRETE OR ASPHALT
- FLOW DIRECTION
- SD STORM DRAIN PIPE
- ROOF DRAIN DOWNSPOUT
- CURB OPENING/CUT
- STORM INLET
- TRASH ENCLOSURE



PRELIMINARY WATER QUALITY MANAGEMENT PLAN

CITY OF RANCHO CUCAMONGA

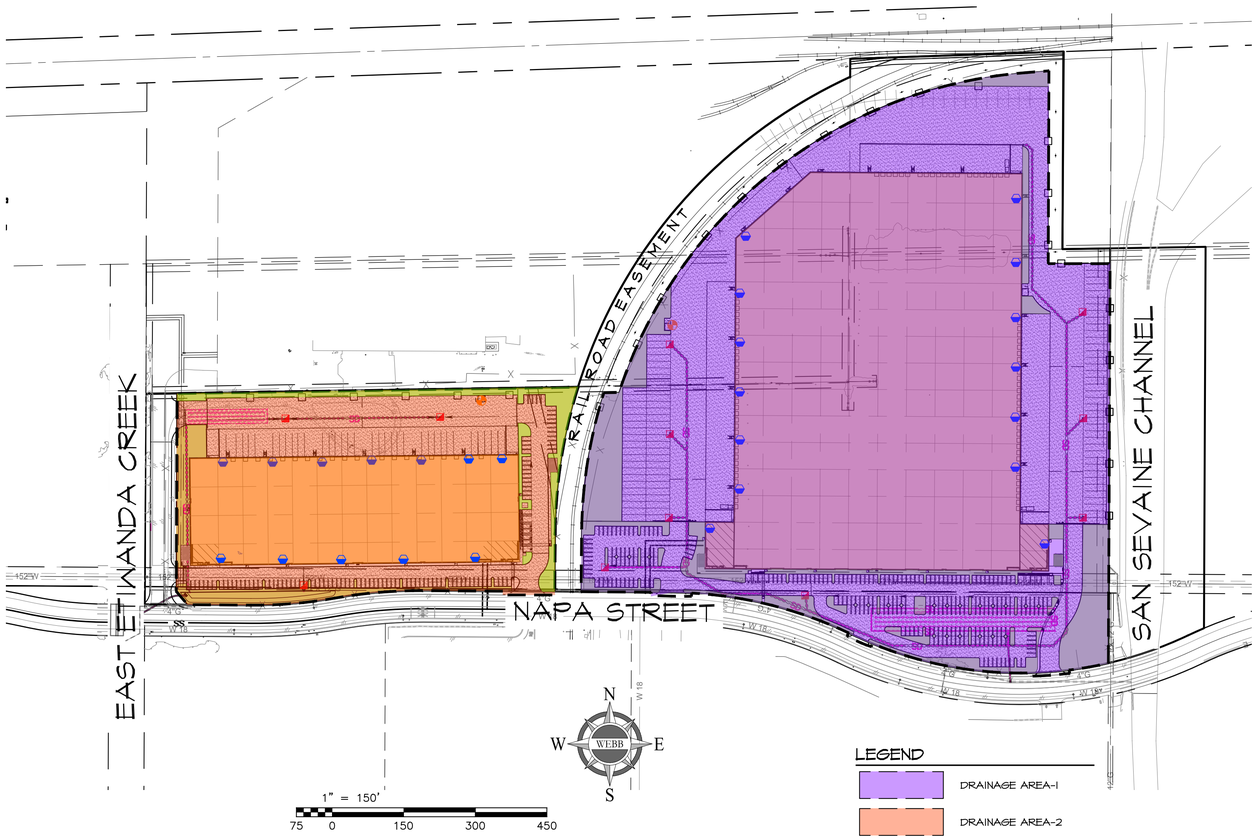
HILLWOOD ENTERPRISE - RANCHO CUCAMONGA INDUSTRIAL PROPERTY

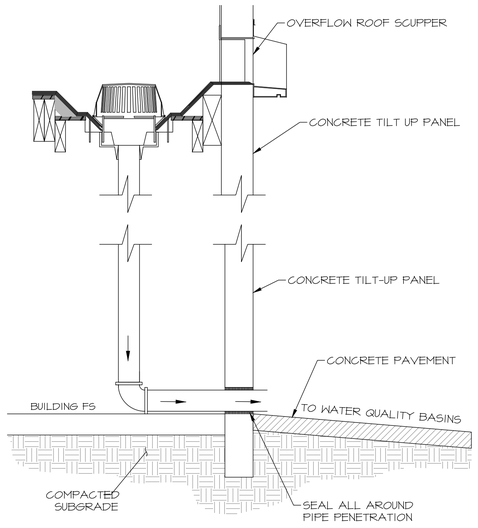
PRELIMINAY WQMP

SCALE:	1"=80'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0066
DATE:	1/20/21	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET 1
DESIGNED:	CV		OF 2 SHEETS
CHECKED:	DJA		DWG. NO.
PLN CK REF:			
F.B.			

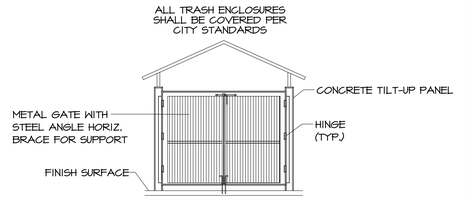
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PLOTTED:

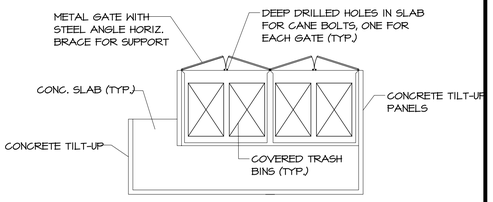




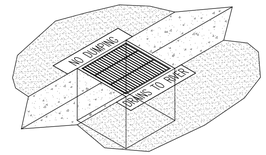
ROOF DRAIN DETAIL
N.T.S.

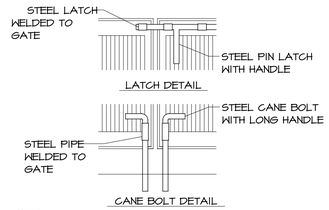


TRASH ENCLOSURE GATE ELEVATION
N.T.S.



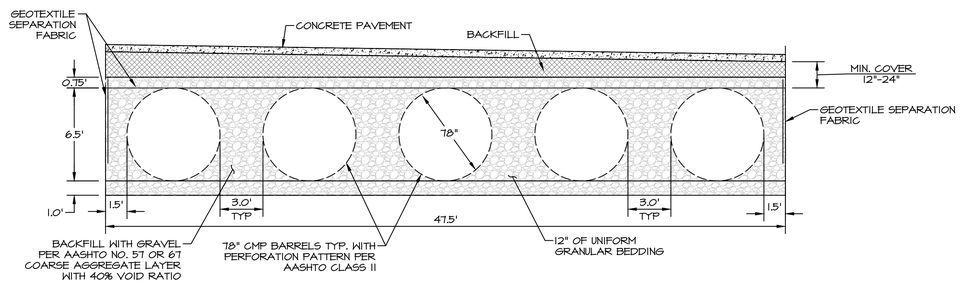
TRASH ENCLOSURE PLAN DETAIL
N.T.S.



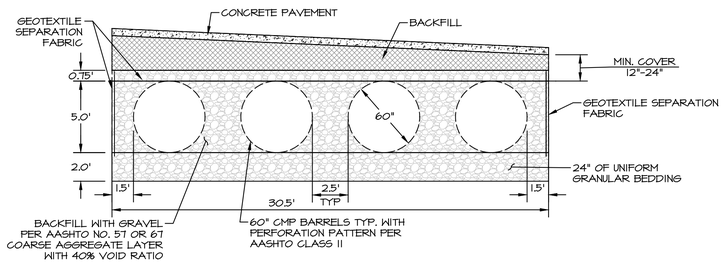


NOTE:
LATCH AND CANE TO BE AT EXTERIOR SIDE OF GATES

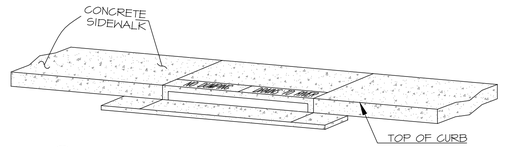
TRASH ENCLOSURE GATE LATCHES DETAIL
N.T.S.



CMP DETENTION SYSTEM A TYPICAL DETAIL
NOT TO SCALE



CMP DETENTION SYSTEM B TYPICAL DETAIL
NOT TO SCALE



1. STENCILS TO HAVE 2" LETTERS AS FOLLOWS: "NO DUMPING - DRAINS TO RIVER"
2. PLACE BOTH STENCILS CENTERED WITHIN THE CATCHBASIN OPENINGS AND WITHIN THE TOP OF THE CURB.
3. SPRAY BOTH STENCILS WITH WHITE PAINT.
4. REMOVE STENCILS WHEN PAINT IS DRY.

CATCH BASIN STENCILING DETAIL
NTS

CITY OF RANCHO CUCAMONGA

HILLWOOD ENTERPRISE - RANCHO CUCAMONGA INDUSTRIAL PROPERTY

PRELIMINAY WQMP

SCALE:	1"=80'	ALBERT A. WEBB ASSOCIATES	W.O. 20-0066
DATE:	1/20/21	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE, CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	SHEET 2
DESIGNED:	CV		OF 2 SHEETS
CHECKED:	DJA		
PLN CK REF:			DWG. NO.
F.B.			

H:\2020\20-0066\DRAINAGE\WQMP\DWG DRAWINGS\20-0066-PWQMP.DWG 1/20/2021 11:08:02 AM

CRISTINA V

FONTANA WATER

15966 ARROW ROUTE
FONTANA, CALIFORNIA 92335
www.fontanawater.com

FINAL

WATER SUPPLY ASSESMENT

for

SPEEDWAY COMMERCE DEVELOPMENT PROJECT

City of Rancho Cucamonga, CA





April 2021

Kimley»Horn

CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION 2
PROJECT DESCRIPTION 2
PURPOSE AND SCOPE OF ASSESSMENT 4
Water Supply Planning Provisions 5

3.0 FWC'S HISTORICAL WATER SUPPLIES AND USES 7
HISTORICAL WATER SUPPLIES 7
Chino Basin 10
Lytle Creek Region 11
Rialto Basin 11
No-Man's Land Basin 12
Inland Empire Utilities Agency 12
San Bernardino Valley Municipal Water District 18

4.0 FWC'S FUTURE WATER DEMANDS WITH THE PROJECT 19

5.0 FWC'S FUTURE WATER SUPPLIES 21
LYTLE BASIN 22
CHINO BASIN 22
RIALTO BASIN 22
NO-MAN'S LAND BASIN 23
RECYCLED WATER 24
IMPORTED WATER SUPPLIES 24
COLORADO RIVER WATER 25
STATE WATER PROJECT 25
DELTA CONVEYANCE 28
Imported Water from SBVMWD 30
Imported Water from IEUA 30
WATER SUPPLY SUMMARY 30

6.0 Conclusions 34

7.0 References 35

TABLES

Table 1. Existing Land Use and Zoning Designation..... 2
Table 2. Summary of FWC Water Rights..... 4
Table 3. Historical Annual Water Supply Production by FWC (AFY)..... 9
Table 4. MWD Historical Water Purchases by IEUA (AFY)..... 15
Table 5. Projected Population in IEUA's Service Area..... 16
Table 6. Projected Water Demands in IEUA's Service Area (AFY)..... 16
Table 7. IEUA Future Water Demand/Supply Balance in Normal Years (AFY)..... 16
Table 8. IEUA's 2020 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY)..... 18
Table 9. IEUA's 2040 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY)..... 18
Table 10. Project Water Demand Estimates (AFY) (Data from FWC 2015 UWMP)..... 20
TABLE 11 HISTORICAL LYTLE CREEK FLOWS (1999 – 2019)..... 21
Table 12. Historical Annual Production From the Rialto Basin (AFY)..... 23
Table 13. FWC's Future Water Supplies in Normal Years (AFY) for the Project..... 31
Table 14. Comparison of FWC 2020 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY) for the Project..... 32
Table 15. Comparison of FWC's 2040 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY) for the Project..... 33

ABBREVIATIONS AND ACRONYMS

AF	Acre-Feet
AFY	Acre-Feet per Year
APN	Assessor's Parcel Number
CEQA	California Environmental Quality Act
cfs	Cubic feet per second
CPUC	California Public Utilities Commission
CVWD	Cucamonga Valley Water District
DWR	Department of Water Resources
Fontana Union	Fontana Union Water Company
FUWC	Fontana Union Water Company
FWC	Fontana Water Company
gpm	Gallons per minute
IEUA	Inland Empire Utilities Agency
MGD	Million Gallons per Day
MWD	Metropolitan Water District of Southern California
PEIR	Programmatic Environmental Impact Report
SB	Senate Bill
SBVMWD	San Bernardino Valley Municipal Water District
sf	Square Feet
SWP	Surface water plant
SYR	Safe Yield Report
Project	Speedway Commerce Development Project
SWP	State Water Project
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WFA	Water Facilities Authority
WSA	Water Supply Assessment

1.0 EXECUTIVE SUMMARY

Kimley-Horn has prepared this Water Supply Assessment (WSA) for the proposed industrial development known as the Speedway Commerce Development Project (the "Project"). The water demands for the Project are included in this WSA.

The current and future water supplies available to Fontana Water Company (FWC) to provide water service to the Project are groundwater-pumped from Chino Basin, Lytle Basin, Rialto Basin, and No-Man's Land Basin; surface water diversions from Lytle Creek, imported State Water Project (SWP) water from Inland Empire Utilities Agency (IEUA) and San Bernardino Valley Municipal Water District (SBVMWD), and recycled water.

Chino Basin has enhanced reliability during drought and is FWC's most reliable source of water supply. The Chino Basin Watermaster and its technical staff ensure long-term reliability of water supplies from Chino Basin. The Watermaster, under the direct supervision of the San Bernardino County Superior Court, manages basin water supplies, arranges for local and supplemental groundwater recharge and implements and administers the Chino Basin physical solution as prescribed in the governing Superior Court groundwater pumping rights adjudication (the "Chino Basin Judgment").

The Chino Basin Watermaster's groundwater management responsibilities are closely coordinated with IEUA water management goals and implementation of strategies. IEUA's role as a regional water wholesaler includes delivery of supplemental, imported, untreated SWP water directly to water purveyors including FWC, delivery of water from Metropolitan Water District of Southern California (MWD) to the Chino Basin Watermaster for groundwater recharge, exchange, groundwater storage, and potential conjunctive use programs, as well as delivery of recycled water. IEUA has also analyzed future water demands and water supplies within its service area, which includes most of FWC's service area, including the Project, and concluded that sufficient water supplies will be available for the next 20 years through 2040, including during single and multiple dry years.

This WSA analyzes and evaluates FWC's historical water supplies, water rights, current Urban Water Management Plans (UWMPs) developed by FWC and IEUA, Chino Basin Optimum Basin Management Plan, and the historical and future availability of SWP water. Based on that analysis and evaluation, this WSA shows clearly that FWC's available water supplies will be sufficient to meet all of the water demands of the entire Project for the next 20 years (through 2040), including during single and multiple dry years.

2.0 INTRODUCTION

PROJECT DESCRIPTION

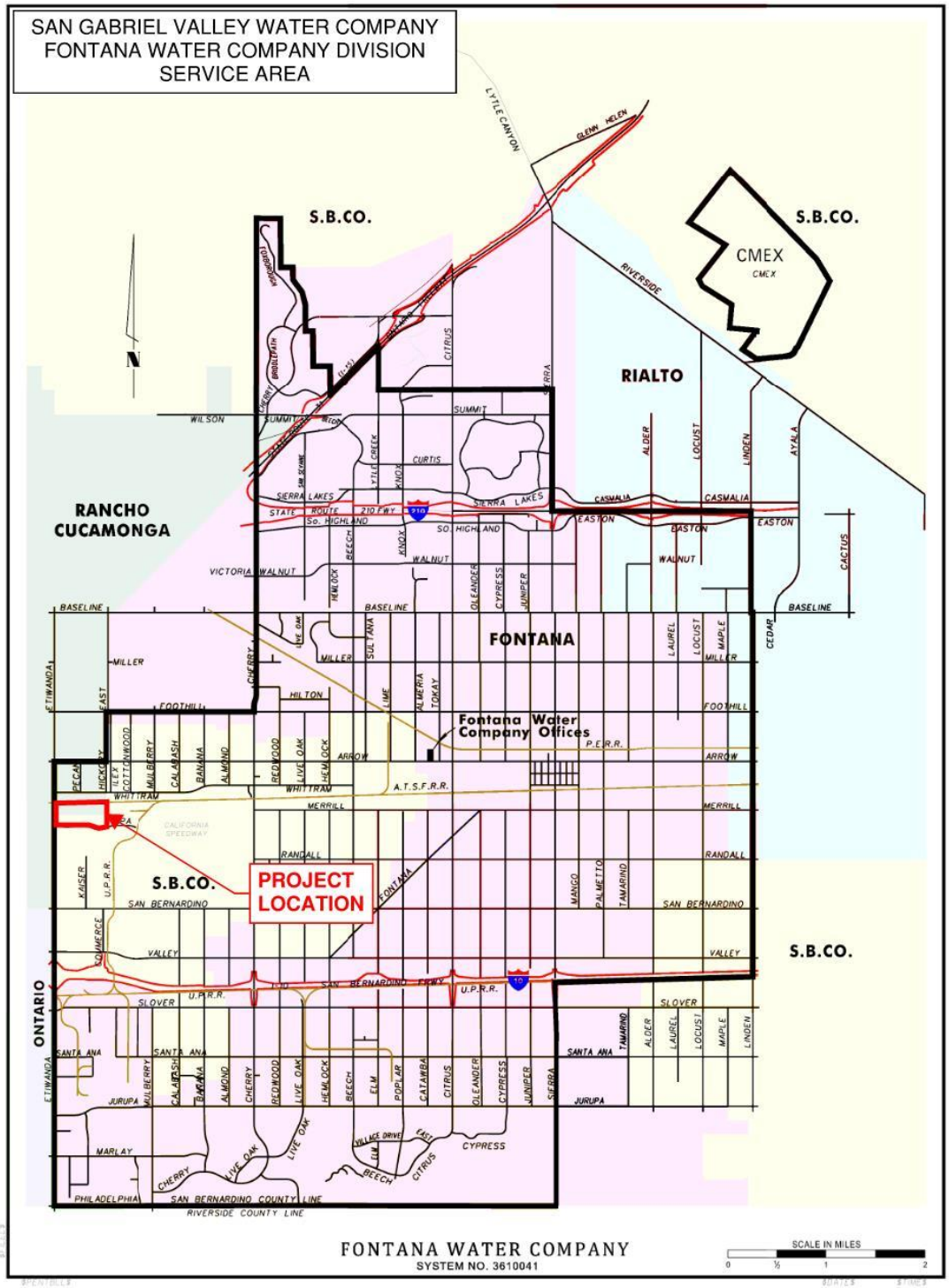
The Speedway Commerce Development Project ("Project") is a development plan for a 34.61-acre site located on the northeast corner of Etiwanda Avenue and Napa Street on the border between the City of Rancho Cucamonga ("City") and the County of San Bernardino ("County"). The project consists of two industrial (warehouse + office) buildings of approximately 500,648 square feet ("Building A") and 155,230 square feet ("Building B"), for a **total proposed building area of 655,878 square feet**. A Tentative Parcel Map/Site Plan has been submitted by Hillwood Enterprise, L.P., ("Client" or "Project Applicant"). The Site Plan further proposes 97,025 square feet of landscaping for the Building A parcel and 36,793 square feet of landscaping for the Building B parcel, for a **total proposed landscaped area of 133,818 square feet**.

Table 1. Existing Land Use and Zoning Designation

Parcel	Existing Land Use	Zoning Designation	Site Area (Ac)
0229-291-54	Vacant	HI	7.88
0229-291-46	Vacant	IR	26.73
Total			**34.61**

The Project site is in the southeastern portion of the City of Rancho Cucamonga, approximately 1.3 miles east of Interstate 15 (I-15) and approximately 1.5 miles north of Interstate 10 (I-10). The site is bounded to the north by A.T. & S.F. Railroad, to the east by San Sevaine Channel and the Auto Club Speedway, to the south by Napa Street, and to the west by Etiwanda Avenue.

FIGURE 1
PROJECT LOCATION AND FONTANA WATER COMPANY SERVICE AREA



PURPOSE AND SCOPE OF ASSESSMENT

The Project is located within FWC's present California Public Utilities Commission (CPUC) certificated service area, as shown in Figure 1. FWC is ready, willing, and able to provide all necessary water utility service to meet all of the water supply needs of the entire Project.

The purpose of this WSA is to evaluate and confirm FWC's ability to provide all public utility water service to the Project. The reliability of future water supplies available to FWC is based on FWC's longstanding water rights and access to local renewable groundwater and surface water supplies as listed in Table 2 (Summary of FWC Water Rights), as well as on the Chino Basin Watermaster's and IEUA's water management goals and implementation strategies, such as the Optimum Basin Management Plan, supplemental imported water distribution programs, and the use of recycled water. This WSA evaluates all of FWC's available water supply sources and projected water demands for the entire Project area.

Table 2. Summary of FWC Water Rights

Sources of Supply	Water Right	Description
Lytle Creek (Surface Water)	Lytle Judgments, (1897 McKinley Decree and January 28, 1924 Judgment)	• Entitled to divert up to 3,480.78 miner's inches (~50,400 AFY) from Lytle Creek Region, including up to 2,500 miner's inches (~36,200 AFY) of combined surface and groundwater extractions to augment surface water diversions. • Entitled to divert groundwater from Lytle Basin up to 1,300 miner's inches (~18,800 AFY).
Lytle Basin		
Chino Basin	Chino Basin Judgment, 1978	• Unrestricted pumping to provide water for beneficial use for FWC customers subject to existing appropriative rights, groundwater storage, leases, and replenishment through Watermaster (physical solution). • Safe yield of Chino Basin = 131,000 AFY as of 2020 SYR (subject to change). • 11.659 percent share of the "Operating Safe Yield." (FUWC & FWC)
Rialto Basin	1961 Rialto Basin Decree and 2015 Preliminary Injunction	• Unrestricted pumping in most years pursuant to the 1961 Rialto Basin Decree. • Preliminary injunction limits current production to 2,520 AFY.
No-Man's Land	Senior Appropriative Pumping Rights	• No pumping restriction.

Source: FWC 2015 UWMP, Amended December 2017

Water Supply Planning Provisions

Population growth in the State of California (State) has resulted in additional water demand on water systems. State legislature has enacted laws to ensure that the increased demands are adequately addressed and that a firm source of water supply is available prior to approval of certain new developments. The regulations relevant to water supply include California Water Code Division 6, Part 2.10, Sections 10910-10915 (Water Supply Planning to Support Existing and Planned Future Use) (California Water Code) which is briefly described below. The provisions of the California Water Code seek to promote more collaborative planning between local water suppliers and cities and counties and require detailed information regarding water availability to be provided to city and county land use planners prior to approval of certain specified large land use development projects.

This WSA was prepared pursuant to the requirements of the California Water Code for the approach, required information, and criteria confirming that FWC has sufficient water supplies to meet the projected demands of the Project, in addition to existing and planned future uses. The UWMP is a foundational document for compliance with the California Water Code. The provisions of the California Water Code repeatedly identify the UWMP as a planning document that can be used by a water supplier to meet the standards set forth in both statutes (California Water Code and UWMP). California Environmental Quality Act (CEQA) guidelines section 15083 contains similar provisions regarding consultation with agencies for certain projects. FWC's 2015 UWMP (Amended December 2017), Metropolitan Water District of Southern California's (MWD's) 2015 UWMP (June 2016), and IEUA's 2015 UWMP Update (June 2016) were prepared pursuant to California Water Code Division 6, Part 2.55, Section 10608 (Sustainable Water Use and Demand Reduction) and California Water Code Division 6, Part 2.6, Sections 10608-10656 (Urban Water Management Planning) and the Water Conservation Act of 2009 (also known as SB X7-7), describe future water demands and future availability of the water supply sources used by FWC and other water agencies operating within IEUA's service area. These UWMP documents were used to prepare this WSA.

This WSA includes specific Project water demand estimates and available sources of water supply. FWC will separately notify the Project developer of the specific water supply distribution system and infrastructure facilities required for FWC to provide water utility service to the Project. In addition to the annual Project water demand estimates shown in Section 4.0 of this WSA, FWC's notice to the Project developer also will include a review of any peaking factors (maximum day demands and peak hour demands), fire flow demands, storage, booster pump, and pipeline infrastructure requirements for the proposed Project together with FWC's estimate of the costs for all of the required facilities which the Project developer must deposit with FWC before those required facilities can be installed.

Several utility easements exist on the subject property. MWD of Southern California owns a 40' wide easement along the southern edge of APN 0229-291-54 (adjacent to Napa Street) site for installation, operation, and maintenance of water facilities and related access to the Project site.

California Water Code (Sections 10910-10915)

The existing California Water Code (Sections 10910-10915) requires every urban water supplier to identify, as part of its UWMP, the existing and planned sources of water available to the supplier. This existing law prohibits an urban water supplier that fails to prepare or submit its UWMP to the Department of Water Resources (DWR) from receiving financial or drought assistance from the state until the plan is submitted.

The California Water Code requires an urban water supplier to include in its UWMP a description of all water supply projects and programs that may be undertaken to meet total projected water use over the next 20 years. The California Water Code requires a city or county that determines a project is subject to CEQA to identify any public water system that may supply water for proposed developments and to request those public water systems to prepare a specific WSA. If the water demands for the proposed developments have been accounted for in a recently adopted UWMP, the water supplier may incorporate information contained in that plan to satisfy certain requirements of a WSA. The California Water Code requires the assessment to include, along with other information, an identification of existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project and the quantities of water received in prior years pursuant to those entitlements, rights, and contracts.

The California Water Code also requires the public water system, or the city or county, as applicable, to submit its plans for acquiring additional water supplies if that entity concludes that water supplies are, or will be, insufficient.

3.0 FWC'S HISTORICAL WATER SUPPLIES AND USES

HISTORICAL WATER SUPPLIES

FWC is a public utility water company subject to the regulatory jurisdiction of the CPUC. FWC provides public utility water service in most of the City of Fontana and in portions of the cities of Rialto and Rancho Cucamonga, as well as adjoining unincorporated areas of San Bernardino County. FWC's CPUC authorized certificated service area encompasses approximately 52 square miles bordered generally by the San Bernardino County/Riverside County line on the south, Etiwanda and Cherry Avenues on the west, Lytle Creek Wash and Linden Avenue on the east, and Renaissance Parkway and Summit Avenue on the north, as shown on Figure 1.

FWC currently derives its water supply from 29 active groundwater production wells and a surface water treatment plant, the Summit Water Treatment Plant. The water supply is produced from groundwater wells in Chino Basin, Rialto Basin, Lytle Basin, and the No-Man's Land Basin (an unnamed basin between Chino Basin and Rialto Basin), and surface water from Lytle Creek. FWC also receives untreated surface water plant (SWP) water from IEUA and SBVMWD which is treated at FWC's Summit Water Treatment Plant. The groundwater basins are shown on Figure 2. FWC receives well water, local surface water, imported water, or a combination of those sources at various points in its water distribution system. In addition, FWC has two emergency interconnections, with a total capacity of 2,500 gallons per minute (gpm), to receive water from Cucamonga Valley Water District (CVWD). Emergency interconnections are distribution system interconnections between water purveyors for use during critical situations where one system is temporarily unable to provide sufficient potable water to meet minimum health and/or fire protection needs. Emergency interconnections allow FWC to continue serving water during critical situations such as local water supply shortages as a result of earthquakes, fires, prolonged power outages, and droughts.

Table 2 summarizes FWC's water rights, most of which are held by Fontana Union Water Company (Fontana Union) and are subject to FWC's irrevocable right to utilize, pursuant to court-approved agreements with CVWD and Fontana Union of which FWC is a principal shareholder.

Historical annual water supplies utilized by FWC are summarized in Table 3. Annual water supplies from 1999 to 2019 ranged from 34,895 acre-feet (AF) in 2016 to 49,879 AF in 2007, with an average annual production of 43,023 AFY.

FIGURE 2
CHINO GROUNDWATER BASIN AND SURROUNDING BASINS

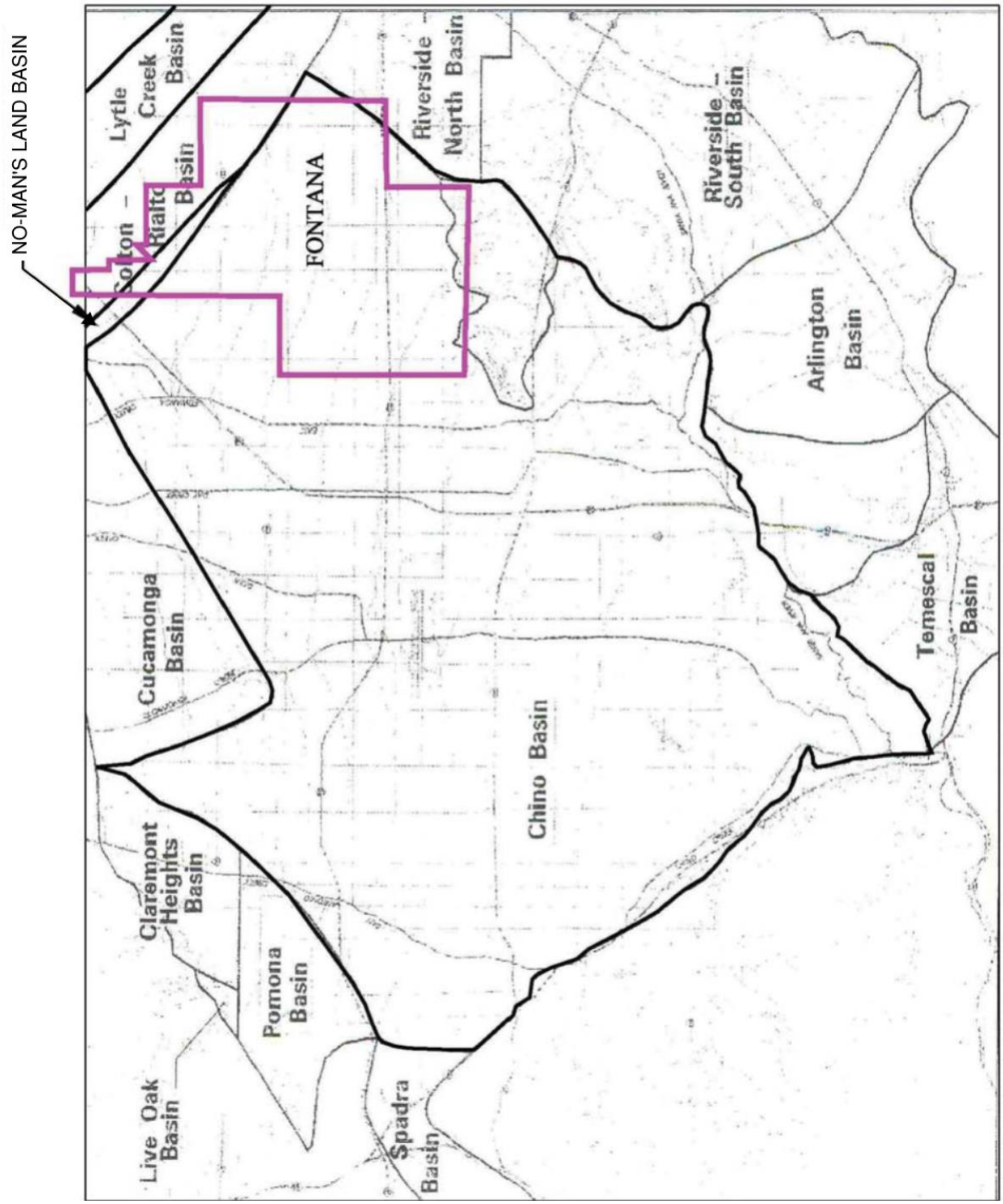


Table 3. Historical Annual Water Supply Production by FWC (AFY)

Year	Groundwater					Imported Water	Lytle Creek	Recycled Water	Total
	Lytle Basin	Chino Basin	Rialto Basin	No-Man's Land	Sub Total				
1999	15,540	17,175	2,935	0	35,650	--	5,734	--	41,385
2000	13,236	20,555	3,552	2,289	39,631	--	4,155	--	43,786
2001	8,869	18,766	6,106	3,123	36,864	--	6,235	--	43,098
2002	7,520	23,060	9,452	3,135	43,166	933	2,048	--	46,147
2003	6,029	22,110	9,321	3,783	41,243	2,040	3,502	--	46,785
2004	5,664	24,718	8,173	3,930	42,485	2,530	4,484	--	49,498
2005	11,424	18,499	7,252	3,550	40,726	520	6,352	--	47,597
2006	12,593	14,747	5,695	3,683	36,718	640	11,999	--	49,356
2007	15,021	19,622	7,325	3,930	45,899	0	3,980	--	49,879
2008	10,523	16,192	6,312	4,165	37,191	2,765	7,613	--	47,569
2009	7,789	14,490	8,480	4,293	35,051	3,923	5,390	--	44,363
2010	7,073	9,921	7,782	4,421	29,197	1,099	11,473	--	41,769
2011	9,573	2,509	6,386	3,392	21,860	977	18,576	--	41,413
2012	12,604	13,305	6,306	3,875	36,090	1,086	5,616	--	42,791
2013	8,025	11,604	7,358	4,119	31,105	9,898	3,301	--	44,304
2014	5,530	13,784	7,347	4,103	30,764	9,784	1,951	--	42,498
2015	3,768	14,504	2,728	4,523	25,523	7,657	1,784	--	34,964
2016	2,649	16,299	2,563	4,341	25,852	7,617	1,419	7	34,895
2017	4,111	10,640	2,378	4,533	21,662	11,824	3,867	128	37,481
2018	5,148	10,796	2,679	4,069	21,692	12,961	2,298	163	38,113
2019	6,046	9,350	2,469	3,143	21,008	10,770	3,869	149	35,796

Source: FWC 2015 UWMP, Amended December 2017 and FWC Records

The following sections describe each of the FWC's sources of water supplies and water rights in more detail.

Chino Basin

Chino Basin is FWC's largest and most reliable groundwater source. During the last 20 years, FWC's production from Chino Basin ranged from approximately 2,509 AFY in 2011 to 24,718 AFY in 2004, as shown in Table 3. In most years, Chino Basin accounted for a significant portion of FWC's total water supply.

Chino Basin, in San Bernardino County, is the largest groundwater basin in the Upper Santa Ana River Watershed. Chino Basin is bounded by the Rialto-Colton, Chino, San Jose, and Cucamonga faults, and by the Puente Hills and the San Gabriel Mountains. The total surface area of the basin is approximately 154,000 acres (240 square miles).

Chino Basin currently has over 5,000,000 AF of water in storage, with an additional unused storage capacity, based on historical water levels in the basin, of about 1,000,000 AF. Over the past 20 years, total groundwater production from Chino Basin has ranged from approximately 133,368 AFY (Production Year 2018-2019) to 188,910 AFY (2008-2009). A majority of production is pumped for municipal and industrial purposes and the remaining production is pumped by agricultural producers.

Chino Basin was adjudicated under the Chino Basin Judgment, entered on January 27, 1978 by the Superior Court for the County of San Bernardino. FWC is a party to the Chino Basin Judgment and is classified as an appropriator. The Chino Basin Judgment recently reset the Safe Yield in the Chino Basin at 131,000 AFY (July 1 to June 30) in 2020. The Safe Yield is defined in the Chino Basin Judgment as "the long-term average annual quantity of ground water (excluding replenishment of stored water but including return flow to the Basin from use of replenishment or stored water) which can be produced from Chino Basin under conditions of a particular year without causing an undesirable result." The 1978 Chino Basin Judgment's allocation of the Safe Yield of Chino Basin includes three separate Pools: the "Overlying Agricultural Pool (82,800 AFY)," the "Overlying Non-Agricultural Pool (7,366 AFY)," and the "Appropriative Pool (45,834AFY)." FWC's appropriative rights together with those of Fontana Union (of which FWC is a principal shareholder) amount to approximately 11.659 percent share of the Safe Yield. Appendix B provides the historical Chino Basin production by Pool presented in the Chino Basin Watermaster's "Fiscal Year 2018-19 Annual Report." Appropriators who are parties to the Chino Basin Judgment, such as FWC, are authorized to produce groundwater in excess of their rights. Appropriators pay assessments for such production to the Chino Basin Watermaster. The assessments are used to replenish the basin through imported surface water recharge and ensure its long-term and reliable use. The Chino Basin Watermaster purchases water to replenish Chino Basin from the MWD through IEUA or through Three Valley Municipal Water District. Additional supplemental sources of replenishment water come from recycled water and from increased recharge of local storm water.

Reliability of water purchased from IEUA to replenish Chino Basin is discussed in Section 4. In addition, the Chino Basin Watermaster reallocates the unused portion of the Chino Basin safe yield from the Overlying Agricultural Pool to the Appropriative Pool members as a supplement to the Appropriative Pool share of Operating Safe Yield rights in any year. These transfers are permanent if agricultural land has been converted to non-agricultural use, or temporary if agricultural pool extractions are less than their share of the safe yield. From fiscal year 1999-2000 to fiscal year 2018-19, the total portion of the annual Agricultural Pool available for reallocation to Appropriative Pool members has ranged from 38,399 AF (1999-2000) to 61,014 AF (2018-19), with an annual average of approximately 49,329 AF. As agricultural production declines within Chino Basin, the reallocation of water to the Appropriative Pool will increase.

Lytle Creek Region

FWC produces water from the Lytle Creek Region that consists of surface water from Lytle Creek and groundwater from Lytle Basin. The Lytle Creek Watershed is approximately 46.4 square miles. The area of Lytle Basin is approximately 22.3 square miles. Lytle Creek is located in the Lytle Creek Watershed which originates in the vicinity of Mount San Antonio in the San Bernardino National Forest and includes the Upper Santa Ana River Basin located in San Bernardino County. Lytle Creek includes the North Fork Lytle Creek, Middle Fork Lytle Creek, and South Fork Lytle Creek, each flowing eastward. Water from Lytle Creek is diverted by Southern California Edison to generate electricity from two hydroelectric power plants in the Lytle Creek Region. Following the power generation, Lytle Creek water is diverted to FWC's Afterbay where it is shared with other water purveyors pursuant to long standing agreements. FWC's share is diverted to FWC's Summit Water Treatment Plant where it is treated for domestic water use within FWC's distribution system. In addition to Lytle Creek surface flows, FWC obtains water from the Grapeland Tunnel, which is a groundwater infiltration system with extensive collector lines in Lytle Creek Canyon tributaries and a large line running below the streambed of Lytle Creek. Water from the Grapeland Tunnel historically flowed through a large transmission pipeline directly into FWC's water system. Because the threat of the Grapeland Tunnel water being under the influence of surface water, water from the Grapeland Tunnel is currently combined with the Lytle Creek stream flow in the Afterbay and then flows to the Summit Water Treatment Plant.

The 1897 McKinley Decree, which specifies surface water allocations, and the January 28, 1924 Judgment by the Superior Court for the County of San Bernardino, which confirms the McKinley Decree and specifies allowed groundwater diversions, allow Fontana Union Water Company and FWC to divert surface water and pump groundwater from the Lytle Creek Region up to a maximum of 3,480.78 miner's inches, or 69.6 cubic feet per second (cfs) (approximately 50,400 AFY). The amount includes up to 2,500 miner's inches, (approximately 36,200 AFY) of allowable combined surface and groundwater extractions to augment deficiencies in surface water diversions. FWC is allowed to extract and divert a combined 1,300 miner's inches, or 26 cfs (approximately 18,800 AFY) of groundwater from the Lytle Creek Region. Lytle Basin is managed by the San Bernardino Basin Area Groundwater Council which includes the successors to the parties of the 1897 McKinley Decree and the 1924 Judgment. FWC's diversion and production of water from the Lytle Creek Region can vary due to fluctuations in rainfall, snowpack and runoff, especially during dry years.

Rialto Basin

Rialto Basin underlies a portion of the Upper Santa Ana Valley in southwestern San Bernardino County and northwestern Riverside County. Rialto Basin is about 10 miles long and varies in width from about 3.5 miles in the northwestern part to about 1.5 miles in the southeastern part. Rialto Basin is bounded by the San Gabriel Mountains on the northwest, the San Jacinto fault on the northeast, the Badlands on the southeast, and the Chino Basin and No-Man's Land Basin on the southwest.

Under the December 22, 1961 Rialto Basin Court Decree, FWC, by virtue of its shareholdings in Fontana Union, is entitled to produce water from Rialto Basin with no extraction limit in most years. Parties to the Rialto Basin Decree, including FWC, are authorized to pump from Rialto Basin without limitation, except pumping during certain months in some water years can be affected by groundwater elevations measured between March and May for three specific "index" wells (Duncan Well, Willow Street Well, and Boyd Well). In February 2015, a San Bernardino Superior Court judge granted a request for a preliminary injunction from the Cities of Colton and Rialto and West Valley Water District. The 2015 preliminary injunction allows FWC to pump up to 2,520 AFY from Rialto Basin.

No-Man's Land Basin

FWC and Fontana Union hold senior appropriative pumping rights which entitle them to produce groundwater from No-Man's Land Basin. This basin is located between Rialto and Chino Basins and is hydrogeologically separate from them. Water production from this basin is not a part of either the Chino Basin Judgment or the Rialto Basin Decree and is not subject to adjudicated production limitations or assessments. Groundwater pumping rights in No-Man's Land Basin are governed by contractual arrangements approved by the U.S. Bankruptcy Court confirmed Plan of Reorganization for Fontana Union, which affects the Fontana Union, FWC, CVWD, City of Rialto, West Valley Water District and other parties.

Inland Empire Utilities Agency

IEUA, originally known as Chino Basin Municipal Water District, was formed by popular vote of its residents in June 1950, to become a member agency of MWD for the purpose of importing supplemental water to augment local stream and groundwater supplies. Since its formation in 1950, IEUA has significantly expanded its services. These include production of recycled water, wholesaling of untreated imported water and recycled water supplies, sewage treatment, co-composting of manure and municipal biosolids, desalinization of groundwater supplies and disposal of non-reclaimable industrial wastewater and brine. IEUA does not provide treated MWD water to retail water purveyors in its service area.

FWC is located within IEUA's service area. FWC has upgraded (including construction of conventional pretreatment facilities and capacity expansion) its existing surface water treatment plant (the Summit Water Treatment Plant) to treat SWP water from IEUA and SBVMWD, in addition to surface water from Lytle Creek. The Summit Water Treatment Plant upgrades increased the plant's combined capacity from 17 million gallons per day (MGD) to 29 MGD. FWC has the facilities and capacity to receive up to 40 cfs of untreated imported SWP water from IEUA and 14 cfs of untreated imported SWP water from SBVMWD. IEUA's water management goals and implementation strategies, such as its imported water distribution policy, groundwater banking, conjunctive use programs, and use of recycled water, enhances the reliability of water supplies utilized by FWC. The following discussion of water sources, future water demands, and future water supplies in IEUA's service area illustrates that sufficient water is available for FWC and the other purveyors within IEUA's service area in the future.

IEUA wholesales untreated water and provides industrial/municipal wastewater collection and treatment services, and other related services for the western portion of San Bernardino County. IEUA's service area is the southwestern section of San Bernardino County. The 242-square mile service area, which encompasses Chino Groundwater Basin, consists of a relatively flat alluvial valley from east to west which slopes downward from north to south at a one to two percent grade. IEUA's service area includes the cities of Chino, Chino Hills, Fontana, Montclair, Ontario, Rancho Cucamonga, Rialto, and Upland. According to IEUA's 2015 UWMP, approximately 856,200 people resided in IEUA's service area as of 2015. IEUA's service area, as shown in Figure 3, lies almost entirely within Chino Groundwater Basin.

Water used in IEUA's service area comes from both local and imported sources. Local sources include local groundwater, surface water and, most recently, recycled water. IEUA purchases untreated imported water from MWD for wholesale redistribution to local retail water purveyors within its service area, including FWC. The local retail water purveyors must first treat the imported MWD water before delivery to their potable water customers.

According to IEUA's 2015 UWMP, total local groundwater production by FWC and other local retail water agencies in IEUA's service area was approximately 112,600 AF in fiscal year 2014-15, which includes production from Chino Basin as well as the other local groundwater sources shown in Figure 2.

FWC and a number of other retail water agencies in IEUA's service area that produce groundwater from Chino Basin also obtain a portion of their water from local surface sources. The principal sources of surface water include Lytle Creek, San Antonio Canyon, Cucamonga Canyon, Day Creek, Deer Creek, and several smaller surface streams. According to IEUA's 2015 UWMP, annual production from all such local surface supplies was approximately 11,700 AF in fiscal year 2014-15.

FWC has capacity to receive up to 40 cfs of MWD imported SWP water from IEUA for treatment at FWC's existing Summit Water Treatment Plant. Historical MWD deliveries to IEUA's service area are shown in Table 4. Full service imported water deliveries from MWD to IEUA have fluctuated in the past 20 years from approximately 31,714 AF (FY2015-16) to a peak of approximately 81,616 AF in fiscal year 2008-09. Additional imported water supplies from IEUA are used for groundwater replenishment, thereby augmenting the annual yield and production from Chino Basin.

FIGURE 3
IEUA SERVICE AREA BOUNDARY

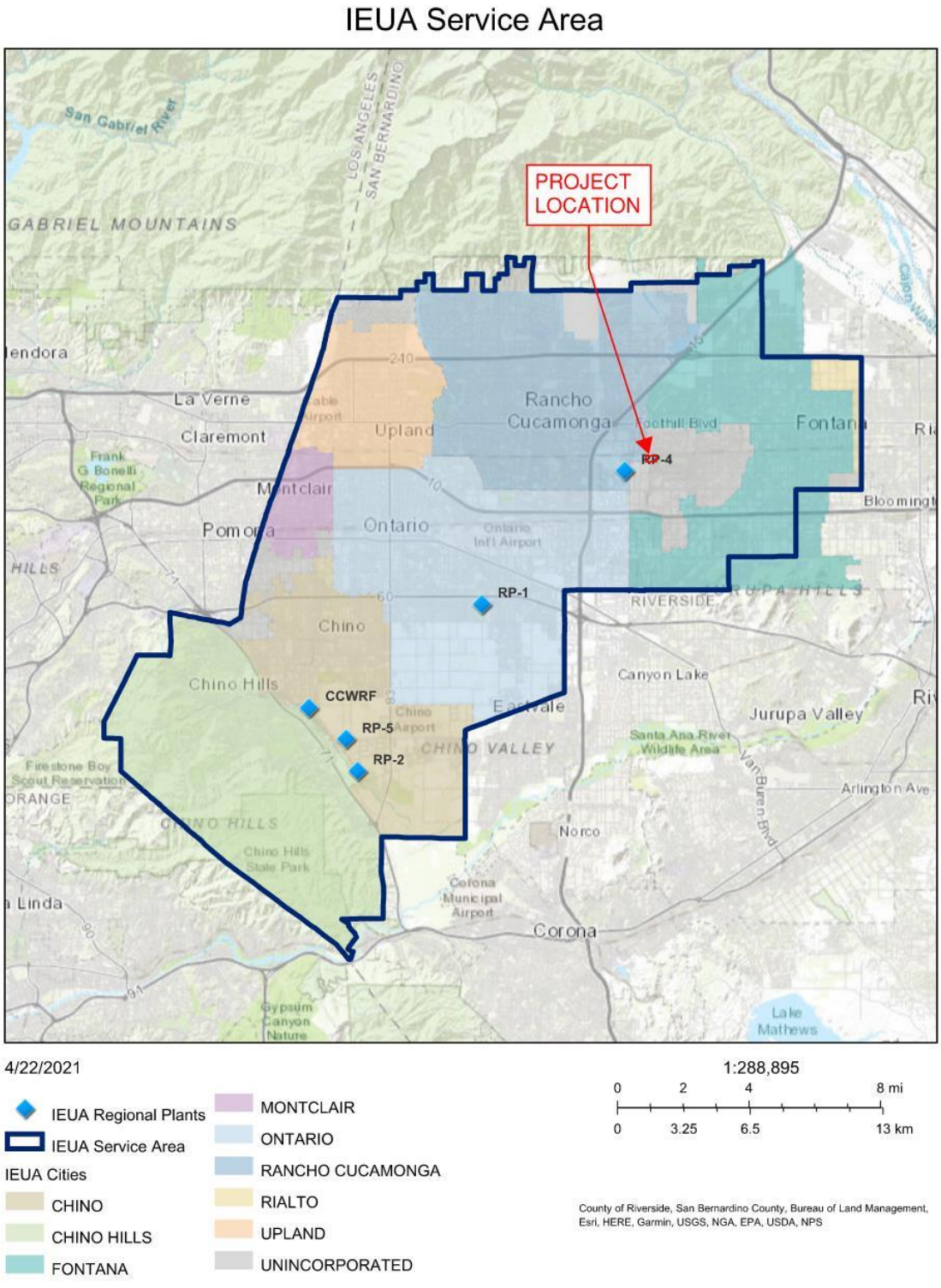


Table 4. MWD Historical Water Purchases by IEUA (AFY)

Fiscal Year	Full Service	Agricultural	Interruptible/ Local Projects	Storage	Total
1999-00	57,070.3	104.1	495.5	5,332.1	63,002.0
2000-01	57,735.6	45.1	3,841.8	11,742.5	73,365.0
2001-02	64,996.3	44.0	4,498.9	9,006.3	78,545.5
2002-03	60,082.5	43.3	5,637.2	13,449.9	79,212.9
2003-04	64,024.7	49.3	6,561.1	7,582.0	78,217.1
2004-05	54,841.4	56.4	5,653.0	42,259.4	102,810.2
2005-06	50,607.8	90.4	8,916.5	36,227.8	95,842.5
2006-07	52,869.1	89.7	11,331.2	24,759.1	89,049.1
2007-08	70,780.0	43.2	21,307.8	0.0	92,131.0
2008-09	81,615.9	3.0	24,664.2	0.0	106,283.1
2009-10	65,539.6		20,245.1	0.0	85,784.7
2010-11	51,134.4		20,646.1	9,650.6	81,431.1
2011-12	52,059.6		20,212.9	24,407.8	96,680.3
2012-13	59,050.9		25,435.0		84,485.9
2013-14	67,833.1		26,800.8		94,633.9
2014-15	58,907.7		23,734.6		82,642.3
2015-16	31,713.8		22,933.2		54,647.0
2016-17	47,848.4		25,390.7		73,239.1
2017-18	68,157.7		13,009.9		81,167.6
2018-19	63,870.4		13,244.6		77,115.0
2019-20	64,835.4		13,272.2		78,107.6

Source: MWD Operations Data

Water recycling involves treatment of wastewater to create a high quality, safe source of water for landscape irrigation, industrial uses, and groundwater recharge. A recycled water marketing program was initiated by IEUA in 1999. Recycled water is a critical component of the Optimum Basin Management Plan developed by the Chino Basin Watermaster in 2000 to address water supply and quality issues in Chino Basin. Recycled water has become an increasingly important source of renewable local water supply for the region. FWC has already taken steps in constructing a recycled water system and is preparing to provide recycled water, once it is available, to customers in its service area who are able to use recycled water. Based on the IEUA's "2018-2019 Annual Report," recycled water supplies from IEUA's facilities totaled approximately 55,666 AF in fiscal year 2018-19. The total recycled water demands in IEUA's service area in fiscal year 2018-19 were 28,345 AF, or approximately 50 percent of the available recycled water supply. The recycled water supply and demand from IEUA's facilities is expected to increase to 82,900 AF and 68,000 AF, respectively, by fiscal year 2039-40 (IEUA 2015 UWMP, Tables 2-8 and 3-3). Remaining future projected recycled water supplies will be used for groundwater recharge purposes and to meet Santa Ana River obligations.

The population within IEUA's service area is projected by the local retail water agencies (including FWC, according to FWC 2015 UWMP, Amended December 2017) to collectively increase from approximately 896,500 in 2020 to 1,125,200 people by the year 2040 (Table 5). This represents an increase of approximately 228,700 people over a 20-year period, an average annual growth rate of approximately 1.3 percent (2020-2040).

Table 5. Projected Population in IEUA's Service Area

Year	2020	2025	2030	2035	2040
Population	896,533	955,569	1,009,349	1,067,946	1,125,203

Source: IEUA 2015 UWMP

As a result of this projected regional population growth, water demand in IEUA's service area is expected to increase by approximately 32 percent over the 20-year period from 2020 to 2040. Table 6 presents the projected water demands for IEUA's service area. According to IEUA's 2015 UWMP, total annual water use is expected to increase from approximately 210,600 AF in fiscal year 2019-20 to approximately 278,000 AF in fiscal year 2039-40.

Table 6. Projected Water Demands in IEUA's Service Area (AFY)

Demand	2020	2025	2030	2035	2040
Residential, Commercial, Industrial, and Agricultural	165,854	176,389	188,705	196,831	210,048
Recycled Water (Direct Reuse)	44,734	49,534	54,027	57,890	67,969
Total Demand	210,588	225,923	242,732	254,721	278,017

Source: IEUA 2015 UWMP

Table 7. IEUA Future Water Demand/Supply Balance in Normal Years (AFY)

	Balance	2020	2025	2030	2035	2040
Water Supply	Groundwater	137,497	137,497	137,497	137,497	137,497
	Surface Water	11,651	11,651	11,651	11,651	11,651
	Recycled Water	41,836	47,657	47,657	47,657	47,657
	Imported Water	69,752	69,752	69,752	69,752	69,752
	Water Use Efficiency	9,788	11,984	17,257	22,570	27,802
	Supplemental Supply Opportunities	0	0	0	0	283
	Total Supply	270,524	278,541	283,814	289,127	294,642
Total Demand		210,588	225,923	242,732	254,721	278,017
Surplus		59,936	52,618	41,082	34,406	16,622

Source: IEUA 2015 UWMP

According to IEUA's 2015 UWMP, total production from Chino Basin and adjacent groundwater basins is projected at 137,500 AFY through fiscal year 2039-40 for normal years, although Chino Basin could accommodate much greater water production rates if necessary.

According to IEUA's 2015 UWMP, IEUA conservatively projected total production from surface water supplies within its service area at approximately 11,700 AFY through fiscal year 2039-40 for normal years. Surface water flows are substantially greater in wet years and less during dry years.

According to IEUA's 2015 UWMP, the direct use of recycled water within IEUA's service area in fiscal year 2014-15 was approximately 33,400 AF. Recycled water use during normal years is expected to increase to approximately 68,000 AFY by fiscal year 2039-40. As part of an existing agreement with IEUA, the City of Fontana is entitled to approximately 12,000 AFY of tertiary treated recycled water. FWC has undertaken a project with the City of Fontana for the direct use of recycled water in the southern portion of FWC's service area known as the 1158 Zone. This project will provide up to approximately 2,000 AFY of recycled water within the City of Fontana to schools, parks, and commercial customers as part of a multi-phased program. Additional discussion regarding recycled water is provided in Section 5.0.

The demand for untreated imported Colorado River and SWP water for Chino Basin in normal years is projected to be 69,800 AFY through fiscal year 2039-40.

FWC supports and works closely with IEUA to implement a mix of water management strategies to meet the region's long-term needs. IEUA's water management goals are the following:

- Implement an effective conservation program that will maximize efficient water use and reuse in IEUA's service area;
- Continue development the Groundwater Recharge (GWR) – a network of pipelines that direct stormwater run-off, imported water from the State of California Water Project and IEUA recycled water to 16 recharge sites, most of which consist of multiple recharge basins. These recharge basins are located throughout the IEUA service area and are designed to hold the water so that it can percolate into the ground and replenish the alluvial aquifers and groundwater supply.
    - Annually, IEUA currently recharges between 40,000 and 50,000 acre-feet of imported water from northern California; between 15,000 and 25,000 acre-feet of stormwater; and 10,000 acre-feet of recycled water.
- Increase the safe storage capacity of Chino Basin to 150,000 AFY and implement a conjunctive use/groundwater management program that provides dry year water supplies for the service area (the increased safe storage capacity potential is 600,000 AFY):
    - In 2008, IEUA completed a CEQA document for the proposed expansion of the program to 500,000 AFY and expanded to 600,000 AFY – through PEIR;
    - In 2021, IEUA completed "Addendum No. 2 to the Optimum Basin Management Program Project" which expended the program to 700,000 AFY through June 30, 2030 and to 620,000 SFY from July 1, 2030 through June 30, 2035 – after that, Safe Storage Capacity will revert to 500,000 AFY unless another amendment is completed;
- Achieve maximum use of all available storm water;
- Achieve maximum reuse of all available recycled water; and
- Minimize dependence on imported water supplies.

The water demands and supplies for IEUA's service area were analyzed by IEUA to assess the region's ability to meet demands given a repeat of California's severe drought from 2011 to 2014. Tables 8 and 9 present the supply-demand balance for single and multiple year drought scenarios for fiscal years 2019-20 and 2039-40. With the implementation of the local programs outlined above, the region is expected to meet 100 percent of its dry year demand.

Table 8. IEUA's 2020 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY)

Demand and Supply	Normal Year	Single Dry Year	Multiple Dry Years		
			Dry Year 1	Dry Year 2	Dry Year 3
Total Water Supply	270,524	270,524	270,524	270,524	270,524
Total Demand	210,588	213,213	214,786	214,786	214,786
Surplus	59,936	57,311	55,738	55,738	55,738

Source: IEUA 2015 UWMP

Table 9. IEUA's 2040 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY)

Demand and Supply	Normal Year	Single Dry Year	Multiple Dry Years		
			Dry Year 1	Dry Year 2	Dry Year 3
Total Water Supply	294,642	294,642	294,642	294,642	294,642
Total Demand	278,017	288,415	294,642	294,642	294,642
Surplus	16,622	6,228	0	0	0

Source: IEUA 2015 UWMP

San Bernardino Valley Municipal Water District

SBVMWD was formed in 1954. It is an independent SWP contractor and is not a member agency of MWD. Services include providing wholesale distribution of untreated imported SWP water, and wastewater, stormwater disposal, recreation, and fire protection services. SBVMWD, which covers approximately 325 square miles in southwestern San Bernardino County, serves a population of approximately 600,000. SBVMWD's service area includes the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley, and includes the cities and communities of San Bernardino, Colton, Fontana, Loma Linda, Redlands, Rialto, Bloomington, Highland, Grand Terrace, and Yucaipa. Groundwater from Colton, Rialto, Bunker Hill, Yucaipa, and San Timoteo Basins is the principal local source of supply in SBVMWD's service area. Other sources of water supply include surface water from Lytle Creek, Santa Ana River, and Mill Creek as well as imported SWP water.

SBVMWD's contract entitlement for SWP water was 1,677 AF in 1972, the initial year of deliveries, and increased to a maximum entitlement of 102,600 AF in 1991. The entitlement is the fifth largest of all SWP contractors.

FWC has the ability to purchase and use untreated imported water from SBVMWD. A portion of FWC's service area is within SBVMWD's service area. FWC did not receive any SWP water from SBVMWD from 2012 to 2019. FWC projects receiving up to 2,000 AFY of imported untreated SWP water from SBVMWD. FWC has upgraded its existing Summit Water Treatment Plant to treat approximately 29 MGD of Lytle Creek surface water and SWP water. The Summit Water Treatment Plant will treat the imported untreated SWP water from SBVMWD in addition to treating available Lytle Creek surface water and SWP water from IEUA. FWC expects to receive greater quantities of SWP water from SBVMWD as population growth and development increase in the SBVMWD portion of FWC's service area.

4.0 FWC'S FUTURE WATER DEMANDS WITH THE PROJECT

FWC's 2015 UWMP was completed and adopted in June 2016 (amended December 2017) and includes water demand projections for FWC's service area over the next 20 years (through 2040).

Water demands projected in FWC's 2015 UWMP were calculated based on the urban per capita water use target developed per the Water Conservation Bill of 2009 (SB X7-7) and population projections within FWC's service area. Methodologies for calculating urban per capita water use were published by DWR in its October 2010 guidance document. The methodology applied to FWC included an urban per capita water use reduction of 20 percent by 2020. DWR's guidance document was used by FWC to calculate urban per capita water use targets of 198 gallons per capita day, by 2015, and 176 gallons per capita day, by 2020.

Existing water demands for the Project area are not applicable, as the existing site is vacant. **The total existing demand for the Project area is 0 AFY.**

Projected water demands for the proposed Project include industrial and landscape irrigation demands. Based on the Project Site Plan (DAB-A1.1, DRC2020-00177, dated 12/8/2020), the proposed Project is estimated to include approximately 655,878 sf of industrial (warehouse + office) building space with parking and pavement on a Project site of approximately 35 acres. The total Project water demand was estimated by multiplying the planned Project site area by a water use rate of 2,200 gallons per day (gpd) per acre derived from recorded water use data in industrial areas within FWC's service area (FWC 2015 UWMP, Amended December 2017). **The estimated water demand for the commercial and industrial area of the Project is approximately 37 AFY** (or 655,878 sf x (1 acre / 43,560 sf) x 2,200 gpd per acre x (0.00112 AFY / 1 gpd)).

The Project landscape irrigation demand was estimated using a water budget calculator from DWR (https://data.cnra.ca.gov/dataset/water-budget-calculators). The water budget calculator estimates the water use of landscaped area based on the following:

- Reference Evapotranspiration (ETo)
  - ETo refers to the total water lost through evaporation in the soil and transpiration of plants
  - The average ETo in the vicinity of the Project site averaged 60.77 inches per year
- Plant Factor (PF)
  - PF is a factor (generally from 0 to 1) for each type of irrigated plant and is based on the water requirements for the plant.
  - Plants with a lower PF (0 to 0.3) require less water than plants with a higher PF (0.7 to 1.0). The PF for turf is approximately 0.7. PF for medium water use trees, shrubs and groundcover is approximately 0.5. PF of 0.6 has been estimated for the Project which is based on different landscaped areas consisting of turf, trees, shrubs and groundcover.
- Irrigated Area (IA)
  - Based on the Project Site Plan, the irrigated area is approximately 133,818 square feet.
- Irrigation Efficiency (IE)
  - The IE is a factor (generally from 0 to 1) which represents irrigation efficiency.
  - Irrigation systems which are well designed and operated can have an efficiency range of 0.8 to 0.9. Irrigation systems which are poorly designed and operated may have efficiencies less than 0.5. An irrigation efficiency of 0.7 (representing rotor and standard drip irrigation) has been estimated for the Project.

The estimated irrigation water demand at each site is then calculated based on the following formula:

Irrigation Water Demand = (ETo) x (0.62) x ([PF x IA] / IE)

It should be noted 0.62 represents a factor used to convert units from "inches per year" to "gallons per square foot per year." The potential irrigation water demand is in units of "gallons per year." **Based on the formula, the estimated irrigation water demand for the Project is approximately 4,321,640 gallons per year (or 60.77 inches x 0.62 x ([0.6 x 133,818 square feet] / 0.7)) or 13 AFY (or 4,321,640 gallons per year x (1 acre-foot / 325,851 gallons)).**

The total estimated water demand for the Project, which includes industrial water demands (37 AFY) and landscape irrigation (13 AFY), is approximately 50 AFY.

The total increase from existing water demand is 50 AFY (or 50 AFY - 0 AFY). Based on the past 3 years' data, FWC water system losses have averaged 8.1%. Assuming 8.1% system losses, the total additional Project water demand is 54 AFY, with 4 AFY being attributed to system losses.

It should be noted, the projected water demands for the four additional, currently proposed projects – Southwest Fontana Logistics Center Project (SFLCP), Goodman Industrial Park Fontana III, Sierra Business Center, and Fontana Foothills – were not included in the overall water demands identified in FWC's 2015 UWMP. As a result, the projected water demands from these projects are also incorporated in FWC's overall water demands for the purposes of this Speedway Commercial Development Project WSA. The overall projected water demands for FWC, which include water demand projections from FWC's 2015 UWMP, these additional projects, and the proposed Project are provided in Table 10.

Table 10. Project Water Demand Estimates (AFY) (Data from FWC 2015 UWMP)

Demand	2020	2025	2030	2035	2040
FWC Projected Water Demands	40,140	47,536	50,733	53,711	56,562
Additional Project Demands (Project)	**0**	**54**	**54**	**54**	**54**
Additional Project Demands (SFLCP)	104	104	104	104	104
Additional Project Demands (Goodman III)	69	69	69	69	69
Additional Project Demands (Sierra)	0	62	62	62	62
Additional Project Demands (Foothills)	0	48	48	48	48
Total FWC Projected Water Demands	40,313	47,873	51,070	54,048	56,899

Source: FWC 2015 UWMP, Amended December 2017

5.0 FWC'S FUTURE WATER SUPPLIES

FWC's principal future water supplies available and documented in its 2015 UWMP (amended December 2017) are groundwater pumped from Chino Basin, Lytle Basin, Rialto Basin, and No-Man's Land Basin, surface water from Lytle Creek, recycled water, and imported water from SBVMWD and IEUA. The following describes the potential yield from these sources.

LYTLE CREEK

FWC is entitled to divert up to 3,480.78 miner's inches (approximately 50,400 AFY) from the Lytle Creek Region, including up to 2,500 miner's inches (approximately 36,200 AFY) of combined surface and groundwater extractions to augment surface water diversions. Based on United States Geological Survey (USGS) data, recent drought periods relative to Lytle Creek occurred from 1999 to 2004, 2007 to 2009, and 2012 to 2018. Pursuant to FWC's 2015 UWMP, and based on historical diversions during normal rainfall years, FWC's projected water supplies from Lytle Creek during normal rainfall years are estimated at approximately 5,700 AFY over the next 20 years. FWC's 2015 UWMP estimates that Lytle Creek projected surface water supplies could be reduced by 70 percent (to 1,710 AFY) in single dry or multiple dry years. Table 11 illustrates the historical Lytle Creek flows from USGS records.

TABLE 11 HISTORICAL LYTLE CREEK FLOWS (1999 – 2019)

Source: USGS (https://waterdata.usgs.gov/nwis), downloaded 2019

Year	Flow	
	CFS	AFY
1999	9.66	6,993.53
2000	2.39	1,730.28
2001	3.05	2,208.10
2002	0.50	361.98
2003	5.50	3,981.82
2004	6.89	4,988.14
2005	154.80	112,070.25
2006	32.10	23,239.37
2007	3.22	2,331.18
2008	6.72	4,865.06
2009	3.22	2,331.18
2010	16.80	12,162.66
2011	57.30	41,483.37
2012	6.24	4,517.56
2013	1.01	731.21
2014	1.01	731.21
2015	1.11	803.60
2016	1.34	970.12
2017	7.01	5,075.02
2018	1.74	1,259.70
2019	22.40	16,216.88

LYTLE BASIN

FWC can pump and divert more than 18,800 AFY of groundwater from Lytle Basin. Lytle Basin is subject to changes in groundwater elevation depending on rainfall, snowpack, and stormwater runoff. This was demonstrated after the significant rainfall received during 1993 and 2010. In the months following a series of storms during those very wet years, basin static water levels increased as much as 200 feet in three months. However, basin static water levels could likewise decrease and thus affect groundwater production during sustained dry years. Pursuant to FWC's 2015 UWMP, and based on historical production during normal rainfall years, FWC's projected water supplies from Lytle Basin during normal rainfall years are estimated at 9,400 AFY over the next 20 years. FWC's 2015 UWMP estimates that Lytle Basin projected groundwater supplies could be reduced by 20 percent (to 7,520 AFY) in multiple dry years.

CHINO BASIN

FWC's average annual production from Chino Basin from 1999 to 2019 was approximately 15,364 AFY. During the most recent five years, FWC's annual production ranged from approximately 9,350 AFY to 16,299 AFY. According to IEUA's 2015 UWMP, total groundwater production in IEUA's service area in a normal year is estimated to be 137,500 AFY through fiscal year 2039-40 (see Table 7). The Chino Basin Judgment authorizes FWC to produce all the water it requires from Chino Basin for beneficial use by FWC's customers, subject to replenishment requirements, and more than ample water is present in Chino Basin to allow FWC to do so. FWC will construct additional wells and associated infrastructure in Chino Basin to match additional water supply with additional water demands from growth in the number of customers. Because of groundwater contamination in Chino Basin from nitrate and perchlorate, production of groundwater from affected wells may be interrupted until wellhead treatment is installed. FWC has the necessary technical and financial resources available to allow FWC to quickly respond to any such water quality incidents to assure continuity and reliability of water service. FWC's Wells F17B, F17C, F21B, and F23A, which pump from Chino Basin, currently have perchlorate treatment equipment, which removes perchlorate from these sources. FWC will utilize best available treatment technologies to install additional treatment and drill replacement wells as needed to meet its water supply needs.

RIALTO BASIN

FWC and other pumpers subject to the 1961 Rialto Basin Decree are authorized to pump from Rialto Basin without limitation, although extractions for any given year may be curtailed depending on groundwater elevations in three key wells during March, April, and May of each year. However, in order to maintain water levels in Rialto Basin, a preliminary injunction was issued in February 2015, which limits FWC's groundwater production from Rialto Basin to 2,520 AFY. FWC's historical total groundwater production from Rialto Basin is shown in Table 12.

Table 12. Historical Annual Production From the Rialto Basin (AFY)

Year	Production by FWC
1999	2,935
2000	3,552
2001	6,106
2002	9,452
2003	9,321
2004	8,173
2005	7,252
2006	5,695
2007	7,325
2008	6,312
2009	8,480
2010	7,782
2011	6,386
2012	6,306
2013	7,358
2014	7,347
2015	2,728
2016	2,563
2017	2,378
2018	2,679
2019	2,469

Source: FWC 2015 UWMP, Amended December 2017

NO-MAN'S LAND BASIN

FWC and Fontana Union hold senior appropriative pumping rights to produce groundwater from No-Man's Land Basin. The United States Bankruptcy Court confirmed Plan of Reorganization for Fontana Union allocated groundwater production from this basin and water production restrictions are not applicable. FWC's groundwater production from No-Man's Land Basin from 2000 to 2010 has averaged approximately 4,052 AFY. FWC's annual production of approximately 4,000 AFY is estimated to be available from 2020 to 2040.

RECYCLED WATER

Achieving maximum use of all available recycled water is one of FWC's and IEUA's water management goals. Recycled water is used for groundwater recharge and storage as well as direct use by customers who are equipped and able to use recycled water. As shown in Table 3, FWC began using recycled water supplies within its service area in 2016 (with a recycled water demand of 149 AF in 2019). FWC strongly supports the use of recycled water and will provide recycled water to its customers who are able to use it when it is made available. FWC has undertaken a project with the City of Fontana for the direct use of recycled water in the southern portion of FWC's service area known as the 1158 Zone. This project will provide up to approximately 2,000 AFY of recycled water within the City of Fontana to schools, parks, and commercial customers as part of a multi-phased program. As part of an existing agreement with IEUA, the City of Fontana is entitled to approximately 12,000 AFY of tertiary treated recycled water. FWC has designed and is constructing recycled water distribution system facilities in the 1158 Zone to meet those needs. Recycled water will be provided by IEUA's Regional Water Recycling Plant 4. In addition, facilities also will be required to distribute recycled water from IEUA to FWC's customers beyond the 1158 Zone. Those additional facilities will include pipelines, booster stations and reservoirs. In 2015, FWC entered into separate agreements with IEUA, the California Speedway Corporation (Speedway), and California Steel Industries (CSI) in which FWC will deliver recycled water supplies from IEUA to the Speedway and CSI. FWC will deliver up to 450 AFY of recycled water to the Speedway and up to 550 AFY of recycled water to CSI over an initial term of 60 years. In addition, IEUA will construct the recycled water transmission and distribution facilities to Speedway and CSI.

IEUA's "Recycled Water Three Year Business Plan," dated November 28, 2007, and "Draft Three Year Business Plan Update Fiscal Year 2010-11," dated September 28, 2010, projected the total additional recycled water use (for direct use and groundwater recharge) within IEUA's service area at approximately 50,000 AFY. IEUA projected supplying approximately 6,656 AFY of recycled water for distribution within the City of Fontana. IEUA identified potential recycled water users including schools, parks, and commercial customers, for irrigation and other uses. Pursuant to FWC's 2015 UWMP (and similarly in IEUA's 2015 UWMP), FWC is projected to use approximately 1,000 AFY of recycled water within its service area by 2020, with a gradual increase to approximately 3,000 AFY of recycled water by 2040. FWC's increased future use of recycled water for landscape and agricultural irrigation (including potential landscaping for proposed developments such as the Project), construction, industrial cooling, and groundwater recharge use, will offset the need for potable water use within FWC's service area. In the future, the Project could be connected to IEUA's regional recycled water line if there are sufficient recycled water demands in the area.

IMPORTED WATER SUPPLIES

As noted, FWC can purchase untreated imported SWP water from SBVMWD and untreated imported water supplies from MWD (including SWP water, water storage, and water transfers) through IEUA. According to FWC's 2015 UWMP, FWC conservatively estimates it will receive up to 12,000 AFY of SWP water from IEUA and up to 2,000 AFY of SWP water from SBVMWD over the next 20 years. FWC has the capacity to purchase additional imported SWP water from IEUA and SBVMWD if needed to meet current and future water demands reported in the FWC's 2015 UWMP.

COLORADO RIVER WATER

In addition to obtaining water from the SWP, MWD obtains water from the Colorado River. MWD owns and operates the Colorado River Aqueduct which conveys water from Lake Havasu on the Colorado River to water transmission pipelines and to Lake Matthews for storage. MWD's Colorado River water right includes a fourth and fifth priority under the 1931 Seven Party Agreement relating to California's share in the Colorado River water supply. In 1964 a United States Supreme Court decree (Arizona v. California) limited California to 4.4 million AF per year from the Colorado River plus any available surplus water. An amount of 550,000 AF was allotted to California under the fourth priority right and an amount of 662,000 AF was allotted to California under the fifth priority right. MWD can receive water under the fifth priority right when the United States Secretary of the Interior determines that there is a surplus of water or if Arizona or Nevada does not use all of their allocated water.

Under a 2007 agreement reached by the seven States of the Colorado River Basin, if Lake Mead's level drops to 1,075 feet, an official shortage would be declared. That declaration would trigger cuts in water deliveries to Arizona and Nevada. During 2019, the seven States of the Colorado River Basin developed two drought contingency plans: the Upper Basin Drought Contingency Plan (Upper Basin DCP) and the Lower Basin Drought Contingency Plan (Lower Basin DCP). The Upper Basin DCP is designed to: a) protect critical elevations at Lake Powell and help assure continued compliance with the 1922 Colorado River Compact, and b) authorize storage of conserved water in the Upper Basin that could help establish the foundation for a Demand Management Program that may be developed in the future. The Lower Basin DCP is designed to: a) require Arizona, California and Nevada to contribute additional water to Lake Mead storage at predetermined elevations, and b) create additional flexibility to incentivize additional voluntary conservation of water to be stored in Lake Mead. Under the Lower Basin DCP, the state of California is required to make the following annual DCP contribution based on projected January 1st Lake Mead elevations:

- Elevation above 1,040 feet and at or below 1,045 feet – 200,000 AF
- Elevation above 1,035 feet and at or below 1,040 feet – 250,000 AF
- Elevation above 1,030 feet and at or below 1,035 feet – 300,000 AF
- Elevation at or below 1,030 feet – 350,000 AF

STATE WATER PROJECT

The SWP is a water storage and delivery system maintained and operated by DWR. MWD holds a long-term contract with DWR for SWP water. MWD currently has a contractual 'Table A' amount of 1,911,500 AFY of SWP water ('Table A' represents the proportion of available SWP water allocated and delivered to each SWP contractor). The delivery reliability of SWP water is discussed below.

The San Francisco Bay-Sacramento River Delta area (Bay-Delta) is a part of the SWP water delivery system. The reliability of the Bay-Delta to deliver water may be impacted by potential risks associated with endangered species, earthquakes, levee failure, and climate change. To mitigate these potential risks, State and Federal resources and environmental protection agencies and a broad range of stakeholders are involved in a multiyear planning process referred to as the CALFED process to develop programs to greatly improve the capacity and reliability of the SWP and the environmental conditions of the Bay-Delta. The Bay-Delta cooperating agencies approved a Record of Decision in August 2000 for a Programmatic Environmental Impact Report/Impact Statement (EIR/EIS) for a multi-year improvement program. The improvement program includes projects related to DWR's SWP conveyance capacity, water quality, and operation of the SWP. Those programs are undergoing thorough environmental review and public input is required.

The Bay Delta Conservation Plan (BDCP) grew out of the CALFED Bay-Delta Plan's Ecosystem Restoration Program Conservation Strategy. A draft BDCP was prepared through a collaboration of State, Federal, and local water agencies, State and Federal fish agencies, and a broad range of stakeholders. The BDCP identifies conservation strategies, water flow, and habitat restoration actions in California's Sacramento-San Joaquin Delta. The goal of the BDCP is to provide for both species/habitat protection and improved reliability of water supplies. During the extensive environmental review period for the BDCP, State and Federal agencies proposed that the California WaterFix Project replace the proposed BDCP as the State's proposed project. The California WaterFix Project consists of new water conveyance facilities with three new diversion points in the north Delta, Delta tunnel conveyance and ancillary facilities, operational elements, and habitat restoration and other environmental commitments. The California WaterFix Project was evaluated in a partially Recirculated Draft BDCP, EIR/EIS published on July 10, 2015. In December 2016, the Final EIR/EIS was made available to the public. This Final EIR/EIS has been certified as complying with CEQA as required under Section 15090, subd. (a)(1) of the CEQA Guidelines. The Final EIR/EIS describes the alternatives, discusses potential environmental impacts, and identifies mitigation measures that would help avoid or minimize impacts. It also provides responses to all substantive comments received on the 2013 Draft EIR/EIS and 2015 partially Recirculated Draft EIR/Supplemental Draft EIS. The BDCP is intended to meet the standards of the Sacramento-San Joaquin Delta Reform Act of 2009, described in the paragraph below.

On July 21, 2017, DWR certified the Final EIR, adopted the CEQA Findings and a Statement of Overriding Considerations, adopted the Mitigation Monitoring and Reporting Program, approved the California WaterFix, and filed the Notice of Determination (NOD) with the Governor's Office of Planning and Research for the California WaterFix project, which includes the three new diversion points in the north Delta, Delta tunnel conveyance and ancillary facilities, operational elements, habitat restoration and other environmental commitments.

On July 17, 2018, DWR issued for public review under CEQA a California WaterFix Draft Supplemental EIR/EIS that evaluated proposed changes to conveyance facilities previously evaluated in the December 2016 Final EIR/EIS. Reclamation is now issuing the California WaterFix Draft Supplemental EIR/EIS, including alternatives comparison, in compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality NEPA regulations. Public review of Reclamation's California WaterFix Draft Supplemental EIR/EIS began on September 21, 2018 and closed on November 5, 2018. DWR and the 29 State Water Contractors (also known as the Public Water Agencies (PWAs)) agreed to enter into the process for amending the SWP Water Supply Contracts (Contracts) to confirm and supplement certain provisions for several water management actions including to provide flexibility in water transfers of SWP water among other PWAs; clarify terms of water exchanges of SWP water among PWAs; and address cost allocation for California WaterFix among PWAs. On October 26, 2018, DWR released a Draft SWP Water Supply Contract Amendments for Water Management and California WaterFix EIR for a 45-day public comment period ending December 10, 2018. In response to the catastrophic events caused by the Camp Fire, the comment period was extended by 30 days to January 9, 2019. DWR will prepare written responses to all oral and written comments received and will prepare a Final SWP Water Supply Contract Amendments for Water Management and California WaterFix EIR. The contract amendments will not be finalized and signed until the CEQA compliance process is complete.

The State of California enacted comprehensive legislation, including the Sacramento-San Joaquin Delta Reform Act of 2009 (California Water Code Division 35) which provided for an independent state agency, the Delta Stewardship Council. Pursuant to that act, the Delta Stewardship Council developed a comprehensive management plan that provides more reliable water supply for California and protects and enhances the Delta ecosystem (through development and implementation of a Delta Plan). The Delta Stewardship Council adopted a final Delta Plan in May 2013 which is the comprehensive long-term management plan for the Delta to improve statewide water supply reliability and to protect the Delta. Subsequently its 14 regulatory policies were approved by the Office of Administrative Law and became effective with legally enforceable regulations on September 1, 2013. The Delta Stewardship Council also adopted a Programmatic Environmental impact Report (PEIR) on the Delta Plan in May 2013. The PEIR evaluates the potential impact of the Delta Plan and identifies mitigation measures. The Delta Plan was amended on February 2016, September 2016, and again in April 2018 to include refined performance measures; an exemption for single-year water transfers to be considered as covered actions; recommendations for conveyance, storage and operations; and policy for setting priorities for State investments in Delta levees.

In June 2013, a lawsuit was filed by the State Water Contractors and others seeking to overturn the Delta Stewardship Council's adoption of the Delta Plan, promulgation of related regulations, and certification of the above referenced PEIR. The litigation brought by the State Water Contractors and others claims that the Delta Stewardship Council exceeded its authority under the Sacramento-San Joaquin Delta Reform Act of 2009 and failed to analyze impacts under CEQA, particularly foreseeable impacts of the Delta Plan on water supplies around the state. In May 2016, the Superior Court upheld the Delta Stewardship Council on the vast majority of issues, including that the Council used best available science in developing the Delta Plan. The Court also ruled that the Delta Plan's regulations promote improved water quality, its flow recommendations promote conditions for species recovery, it promotes risk reduction strategies, and its conservation measures promote reduced reliance on the Delta. The Court, however, invalidated the entire Delta Plan because of what it identified as inadequacies in the following areas:

- A lack of enforceable, quantifiable targets for achieving reduced Delta reliance, reduced harm from invasive species, restoring more natural flows and increased water supply reliability, and

- Inadequate "promotion" of conveyance options to improve the way water projects move water across the Delta.

In November and December 2016, the Delta Stewardship Council and other parties appealed the Court's ruling. The Delta Plan remains in force and project proponents with covered actions remain legally required to file consistency certifications with the Delta Stewardship Council. In April 2020, the Third District Court of Appeal upheld the Delta Plan. In August 2020, the California Supreme Court denied the petition for review made by the State Water Contractors in response to the April decision; as a result, the Appellate Court decision remains intact and is governing law.

Governor Jerry Brown announced the creation of the California EcoRestore program in April 2015, committing to restore more than 30,000 acres of Delta habitat, which will be implemented on an accelerated timeline independent of the proposed water conveyance facilities. This comprehensive suite of habitat restoration actions under the California EcoRestore program includes specific targets for floodplain, tidal and sub-tidal, managed wetlands, and fish passage improvements to benefit native fish species and a commitment to adaptive management.

DWR's "State Water Project Final Delivery Capability Report 2019" (2019 Report), dated August 2020, indicates that there is a 72 percent likelihood (77 percent in the 2017 State Water Project Final Delivery Capability Report) that more than 2,000 thousand acre-feet per year (taf/year) of Table A water will be delivered under current conditions. The 2019 Report incorporated future impacts on water deliveries as a result of climate change and potential limited pumping of the SWP to protect salmon, smelt, and other species in the Sacramento-San Joaquin Delta and Central Valley areas, including operational restrictions of the biological opinions issued by the U.S. Fish and Wildlife Service (USFWS) in December 2008 and the National Marine Fisheries Service (NMFS) in June 2009 governing the SWP and Central Valley Project (a Federal water storage and conveyance facility) operations. Subsequently, a U.S. District Court Judge remanded the biological opinions to the USFWS and NMFS for further review and analysis. The Service finalized a biological opinion in October 2019 and concluded that Reclamation's proposed operations will not jeopardize threatened or endangered species or adversely modify their designated critical habitat. The Bureau of Reclamation released a Record of Decision in February 2020; actions identified in the ROD include new modernized operations:

- based on real-time conditions, with additional Delta pumping curtailments if monitoring and analysis show Delta smelt and salmon are sensitive to the effects of exports while also allowing for more pumping when species are not present in areas most influenced by pumping;
- provide better cold water management at Shasta Reservoir to directly benefit incubating salmon eggs;
- accelerate ongoing reintroduction efforts of imperiled winter-run Chinook salmon populations on Battle Creek; and,
- implement a strategy to supplement Delta smelt in the wild in the next 3 to 5 years.

The ROD also includes habitat restoration, facility improvements, hatchery actions, monitoring and science commitments estimated at approximately $1.5 billion. In March 2020, CDFW issued an Incidental Take Permit (ITP) to DWR for long0term operations of the SWP; this permit covers four species protected under the California Endangered Species Act: Delta smelt, longfin smelt, winter-run Chinook salmon and spring-run Chinook salmon. DWR plans to develop additional water supply facilities for the SWP to deliver contracted water beyond historical delivery quantities.

DELTA CONVEYANCE

The SWP was authorized in the Burns-Porter Act, also known as the California Water Resources Development Bond Act, passed by vote of the people in November 1960 (Proposition I). Construction on most of the basic facilities of the SWP was completed by 1975. Due to cost considerations, and the fact that initial project water demands were lower than design capacity, a number of the originally planned facilities were "scaled down" or deferred. Many have not been constructed to date for various reasons. One of these projects was the Cross-delta Facility known as the Peripheral Canal. As a result of the scaling down and facility deferments/cancelations, the SWP is not able to live up to its original delivery capacity. A number of other facilities were scaled down, deferred, or not constructed.

The Sacramento-San Joaquin Delta Levees are vulnerable to seismic shaking; the Delta ecosystem continues to decline; flooding and saline water intrusion into the Delta impacts water quality delivered to municipal and agricultural users during dry years; climate change, short-term (50 or 100 years) or long term (500 or more years), will cause increased water levels in the Delta further stressing vulnerable levees. The SWP dams and reservoirs were designed about 50 years ago with the hydrology of the times. Climate change will impact the operation of the SWP. Precipitation—which used to fall as snow and be stored in snowpack and slowly released into streams and reservoirs, will be in the form of rain which the reservoirs were not designed to accommodate. More water will be lost to the ocean in future years because of increased runoff and less storage.

The Delta Conveyance Project (DCP), intended to address some of these issues, proposed a dual, gravity tunnel conveyance system from north of the Delta extending south to the Clifton Court Forebay. This project has been scaled back by the current governor to a single tunnel. At the southerly end of the tunnel, a new Clifton Court Pumping Facility would lift water from the tunnels into Clifton Court Forebay. The water would be pumped from Clifton Court Forebay by the State and Federal Central Valley Project pumps as they now do. Water, ranging from 3,500 to 7,500 cfs, would be diverted from the Sacramento River into the tunnel and around (below) the Delta improving water supply reliability and export water quality TDS. The cost for the DCP was anticipated to be shared 55% by the State Water Contractors and 45% by federal Central Valley Project Contractors. This allocation share may change depending on the number of State and Central Valley Project Contractor participants.

Governor Newsom has stated his support for a "one-tunnel' (DCP) in his State of the State" address, February 12, 2019, originally planned as Phase I of CWF.

The Delta Conveyance Project (DCP) is moving forward; on January 15, 2020 DWR issued a Notice of Preparation (NOP) for the environmental work on the reduced-size project which started the scoping comments phase. The comment period ended on April 17, 2020; DWR will be considering the comments when the Environmental Impact Report (EIR) is prepared. The draft EIR is expected to be out for review and comment in early 2021.

A Delta Conveyance Project Authority has been established for the design and construction of the DCP; a Delta Conveyance Authority has been established to develop the financing. The DCP is anticipated to be funded by revenue bonds issued by the State or a Joint Powers Financing Agency with payment by State Water Contractors south of the Delta through their contracts with the DWR — extended as needed into the future. In addition to other federal, State, and local permits, DCP requires changes to water rights for the SWP and Federal Central Valley Project to authorize proposed new points of diversion and their recombination. The DCP is not expected to be operational until about 2035.

Imported Water from SBVMWD

FWC projects receiving up to 2,000 AFY of imported water supplies from SBVMWD. FWC expects to receive greater quantities of SWP water from SBVMWD as population and water use increase in the SBVMWD portion of FWC's service area.

The delivery reliability of SWP water from SBVMWD is similar to the previous discussion of SWP deliveries above. SBVMWD currently has a contractual 'Table A' amount of 102,600 AFY of SWP water. FWC's 2015 UWMP conservatively projects that it will receive up to 2,000 AFY of SWP water from SBVMWD in the next 20 years. Supplies from SBVMWD could be reduced by 50 percent in single or multiple dry years. SBVMWD anticipates storage of SWP water during normal and wet years for use, along with direct deliveries, during dry years. Imported water provided by SBVMWD will be treated at FWC's Summit Water Treatment Plant, which is discussed in the following section on imported water from IEUA.

Imported Water from IEUA

FWC's upgraded Summit Water Treatment Plant can treat imported water from IEUA and SBVMWD and local surface water from Lytle Creek. The Summit Water Treatment Plant, which has a capacity of up to 29 MGD, includes a 40 cfs connection with IEUA to receive untreated SWP water. FWC's 2015 UWMP conservatively assumed that FWC will receive up to approximately 12,000 AFY of SWP water from IEUA in the next 20 years. Imported water supplies will allow FWC flexibility in managing its water supply sources both short and long term, as well as in normal and dry years. Also, the upgraded Summit Water Treatment Plant allows FWC to treat and maximize the use of SWP supplies and turbid Lytle Creek storm water flows that could not be used in the past.

WATER SUPPLY SUMMARY

Based on the above discussion of the available water supply sources, FWC's water supply-demand balance in normal, single dry, and multiple dry years during the next 20 years are summarized in Tables 13, 14, and 15, respectively.

Chino Basin is an important source of groundwater for FWC now and will continue to be in the future. In addition, the Chino Basin Watermaster's Optimum Basin Management Program will greatly increase Chino Basin's reliability and safe yield through recharge of imported water, additional local storm water, and recycled water. FWC currently has a total pumping capacity from Chino Basin of approximately 24,700 gpm. At the present time FWC has five inactive wells (F2A, F4A, F18A, F22A, F30A) in Chino Basin (with a total pumping capacity of approximately 11,300 gpm or 18,200 AFY) which cannot be used because of high levels of perchlorate and nitrate contamination.

FWC is planning to restore most, if not all, of the lost pumping capacity in Chino Basin through construction of additional wells or installing wellhead treatment on existing wells in the near future. FWC is also planning to replace existing aging and poor producing wells, which will result in a net increase in production over existing capacity. Additional well capacity will provide emergency water supply in case of interruptions of water service due to migration of contamination, loss of power, physical damage to electrical power supply equipment, or failure of a water transmission pipeline.

Tables 13, 14, and 15 show that the water supplies available to FWC will be sufficient to meet all present and future water supply requirements of the Project for the next 20 years (through 2040), including during single and multiple dry years.

Table 13. FWC's Future Water Supplies in Normal Years (AFY) for the Project

Year		2020	2025	2030	2035	2040
Demands from 2015 UWMP		40,140	47,536	50,773	53,711	56,562
Additional Project Demands (Project)		0	54	54	54	54
Additional Project Demands (SFLCP)		104	104	104	104	104
Additional Project Demands (Goodman III)		69	69	69	69	69
Additional Project Demands (Sierra)		0	62	62	62	62
Additional Project Demands (Foothills)		0	48	48	48	48
Total FWC Projected Water Demands		40,313	47,873	51,070	54,048	56,899
Water Supplies	Surface Water	5,700	5,700	5,700	5,700	5,700
	Lytle Basin	5,000	9,400	9,400	9,400	9,400
	Chino Basin	10,097	10,753	13,450	15,928	18,279
	Rialto Basin	2,520	2,520	2,520	2,520	2,520
	No-Man's Land Basin	4,000	4,000	4,000	4,000	4,000
	Recycled Water	1,000	1,500	2,000	2,500	3,000
	Imported Water from SBCMWD	2,000	2,000	2,000	2,000	2,000
	Imported Water from IEUA	10,000	12,000	12,000	12,000	12,000
	Total	40,313	47,873	51,070	54,048	56,899

Source: FWC 2015 UWMP, Amended December 2017

Table 14. Comparison of FWC 2020 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY) for the Project

Demand and Supply		Normal Year	Single Dry Year	Multiple Dry Years		
				Dry Year 1	Dry Year 2	Dry Year 3
Demands from 2015 UWMP		40,140	29,998	37,757	36,462	29,998
Additional Project Demands (Project)		0	0	0	0	0
Additional Project Demands (SFLCP)		104	78	98	94	78
Additional Project Demands (Goodman III)		69	52	65	63	52
Additional Project Demands (Sierra)		0	0	0	0	0
Additional Project Demands (Foothills)		0	0	0	0	0
Total FWC Projected Water Demands		40,313	30,128	37,920	36,619	30,128
Water Supplies	Surface Water	5,700	1,710	1,710	1,710	1,710
	Lytle Basin	5,000	5,000	4,000	4,000	4,000
	Chino Basin	10,093	7,398	16,190	14,889	8,398
	Rialto Basin	2,520	2,520	2,520	2,520	2,520
	No-Man's Land Basin	4,000	4,000	4,000	4,000	4,000
	Recycled Water	1,000	1,000	1,000	1,000	1,000
	Imported Water from SBCMWD	2,000	1,000	1,000	1,000	1,000
	Imported Water from IEUA	10,000	7,500	7,500	7,500	7,500
	Total	40,313	30,211	37,920	36,619	30,128

Source: FWC 2015 UWMP, Amended December 2017

Table 15. Comparison of FWC's 2040 Water Supply and Demand in Normal, Single Dry, and Multiple Dry Years (AFY) for the Project

Demand and Supply		Normal Year	Single Dry Year	Multiple Dry Years		
				Dry Year 1	Dry Year 2	Dry Year 3
Demands from 2015 UWMP		56,562	42,271	53,204	51,379	42,271
Additional Project Demands (Project)		54	41	51	49	41
Additional Project Demands (SFLCP)		104	78	98	94	78
Additional Project Demands (Goodman III)		69	52	65	63	52
Additional Project Demands (Sierra)		62	46	58	56	46
Additional Project Demands (Foothills)		48	36	46	44	36
Total FWC Projected Water Demands		56,899	42,524	53,522	51,685	42,524
Water Supplies	Surface Water	5,700	1,710	1,710	1,710	1,710
	Lytle Basin	9,400	9,400	7,520	7,520	7,520
	Chino Basin	18,279	11,894	24,772	22,935	13,774
	Rialto Basin	2,520	2,520	2,520	2,520	2,520
	No-Man's Land Basin	4,000	4,000	4,000	4,000	4,000
	Recycled Water	3,000	3,000	3,000	3,000	3,000
	Imported Water from SBCMWD	2,000	1,000	1,000	1,000	1,000
	Imported Water from IEUA	12,000	9,000	9,000	9,000	9,000
	Total	56,899	42,524	53,522	51,685	42,524

Source: FWC 2015 UWMP, Amended December 2017

6.0 Conclusions

The Speedway Commerce Development Project is estimated to result in a net water demand of 54 AFY.

Based on the analysis presented in this report, FWC can meet the water demands for the Project.

- There is adequate water supply for the Project to 2040 and beyond. FWC can meet the Project's needs as well as FWC's existing demands and the demands of the other planned and potential developments within FWC's service area which were listed in this WSA and which will be constructed between now and 2040.
- Critical and multiple dry year reliability analysis demonstrated that FWC will be able to meet FWC's existing demands and the demands of the other planned and potential developments within FWC service area which were listed in this WSA and which will be constructed between now and 2040.
- Pursuant to §10910 of the California Water Code (SB 610) and information provided in this WSA, FWC has determined that sufficient currently available and planned supplies exist to meet the water demands of the proposed Project in addition to the existing and other projected demands during normal, single dry and multiple dry years over the next 20 years.
- Pursuant to the California Government Code Section §66473.7, (SB 221) FWC has determined that it has sufficient and adequate water supply available to serve long-term needs of the Project in addition to the existing and other projected demands during normal, single dry and multiple dry years over the next 20 years.

7.0 References

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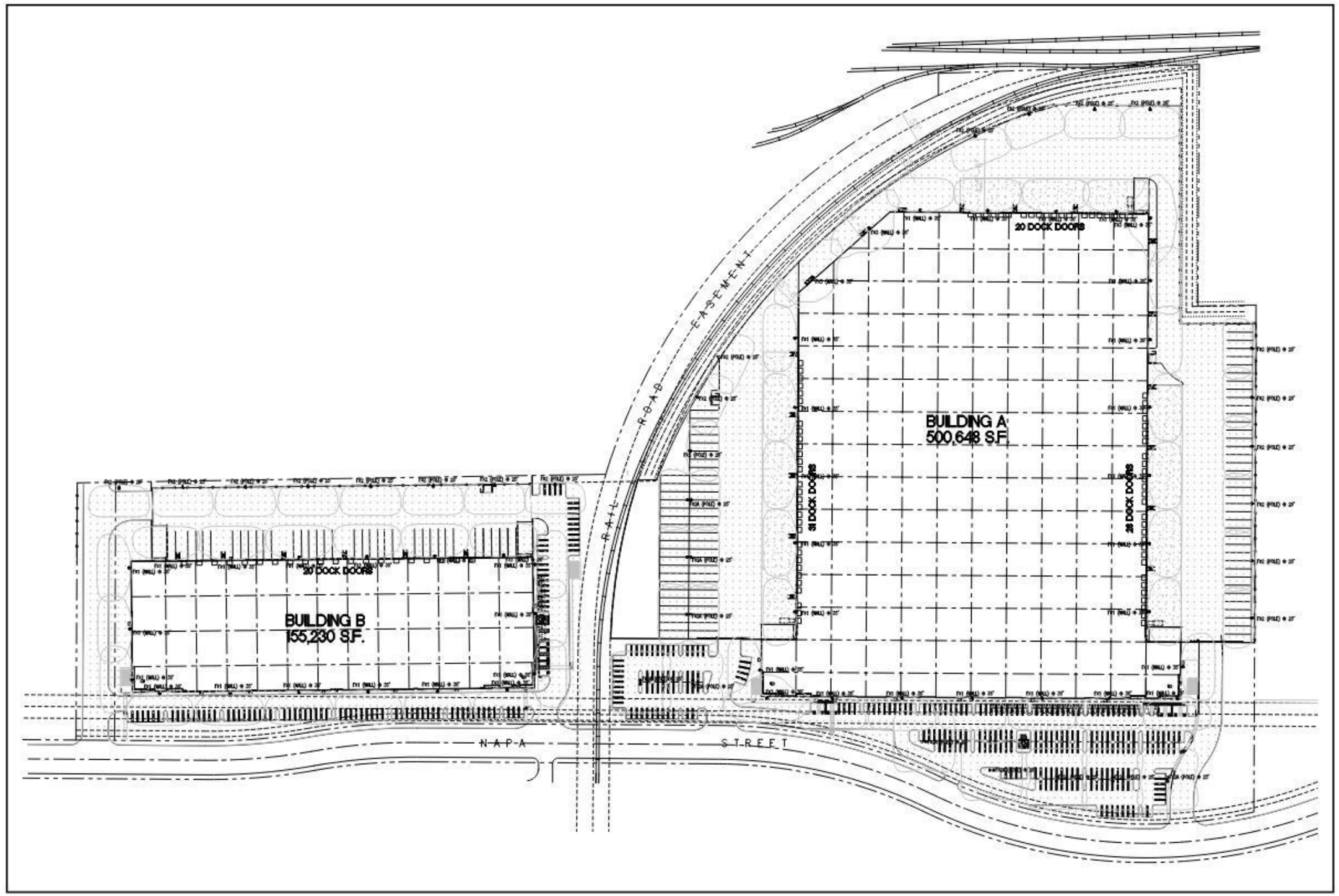
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APPENDICES

APPENDIX A

SITE PLAN



Graphic not to scale. For illustration purposes only.

FIGURE 3-6: Site Plan - Warehouse Scenario

Speedway Commerce Center

City of Rancho Cucamonga

Not to scale

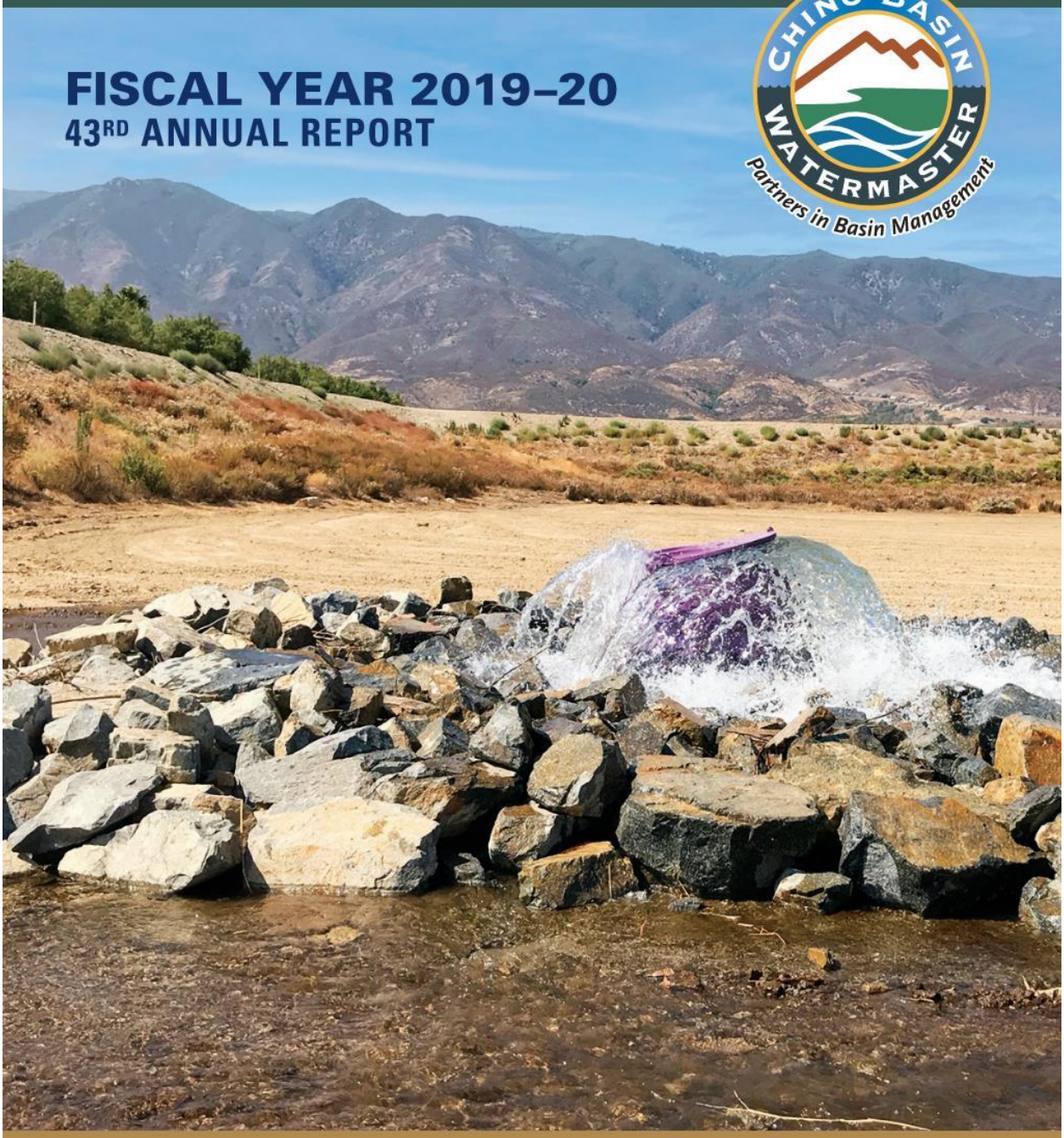
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APPENDIX B

CHINO BASIN HISTORIC GROUNDWATER PRODUCTION

FISCAL YEAR 2019–20
43RD ANNUAL REPORT

CHINO BASIN WATERMASTER
Partners in Basin Management



SUPPORTING FOUR DECADES OF
PARTNERSHIPS AND SOLUTIONS FOR A SUSTAINABLE FUTURE

HISTORY OF REALLOCATION OF UNPRODUCED AG POOL SAFE YIELD[1] (ACRE-FEET)

Production Year	Calculation of Water Rights Available for Reallocation due to Ag Pool Underproduction of Safe Yield [5]		Claims to Underproduced Ag Pool Safe Yield			Rights Available for Reallocation less Claimed Rights [9,11]	Total Reallocation of Unproduced Ag Pool Safe Yield [10]
	Assessable Ag Pool Production	Water Rights Available for Reallocation	Claims Resulting from Land Use Conversions [6]	Early Transfer Claims [5,8,11]	Total Claims		
	A	*B*	*C*	*D*	*E = C + D*	*F = B - E*	*G = B*
83-84 [2]	59,033	n/a [5]	593	n/a	593	n/a	26,355
84-85	55,543	n/a	593	n/a	593	n/a	19,136
85-86	52,061	n/a	811	n/a	811	n/a	21,902
86-87	59,847	n/a	811	n/a	811	n/a	37,159
87-88	57,865	n/a	4,056	n/a	4,056	n/a	78,489
88-89 [3]	46,762	24,935	811	n/a	811	24,124	24,935
89-90	48,420	36,038	811	n/a	811	35,227	36,038
90-91	48,085	34,380	811	n/a	811	33,569	34,380
91-92	44,682	34,715	811	n/a	811	33,904	34,715
92-93	44,092	38,118	811	n/a	811	37,307	38,118
93-94	44,298	38,708	811	n/a	811	37,897	38,708
94-95	55,022	38,502	3,652	n/a	3,652	34,850	38,502
95-96	43,639	27,778	11,711	n/a	11,711	16,067	27,778
96-97	44,809	39,161	12,620	n/a	12,620	26,541	39,161
97-98	43,345	37,991	14,426	n/a	14,426	23,565	37,991
98-99	47,538	39,455	17,022	n/a	17,022	22,433	39,455
99-00 [4]	44,401	38,399	10,471	32,800	43,271	-4,872	38,399
00-01	39,954	42,846	13,920	32,800	46,720	-3,874	42,846
01-02	39,495	43,306	14,133	32,800	46,933	-3,627	43,306
02-03	37,457	45,343	16,480	32,800	49,280	-3,937	45,343
03-04	41,978	40,822	17,510	32,800	50,310	-9,488	40,822
04-05	34,450	48,350	19,013	32,800	51,813	-3,464	48,350
05-06	33,900	48,900	20,370	32,800	53,170	-4,270	48,900
06-07	37,295	45,505	22,158	32,800	54,958	-9,454	45,505
07-08	30,910	51,890	22,461	32,800	55,261	-3,371	51,890
08-09	32,143	50,657	22,730	32,800	55,530	-4,873	50,657
09-10	31,855	50,945	22,943	32,800	55,743	-4,798	50,945
10-11	31,342	51,458	23,033	32,800	55,833	-4,375	51,458
11-12	34,353	48,447	23,237	32,800	56,037	-7,590	48,447
12-13	34,458	48,342	23,773	32,800	56,573	-8,231	48,342
13-14	33,639	49,161	26,162	32,800	58,962	-9,801	49,161
14-15	28,521	54,279	26,768	22,511	49,279	5,000	54,279
15-16	26,167	56,633	27,450	24,183	51,633	5,000	56,633
16-17	26,863	55,937	28,296	22,642	50,937	5,000	55,937
17-18	28,461	54,339	29,031	20,308	49,339	5,000	54,339
18-19	21,786	61,014	29,972	26,042	56,014	5,000	61,014
19-20	21,841	60,959	30,997	24,962	55,959	5,000	60,959

[1] Source: Watermaster Annual Reports and Assessment Packages.

[2] Fiscal year 83-84 was the first-year that reallocation occurred under the Judgment.

[3] During fiscal year 87-88 the Appropriators agree to pay Ag Pool assessments and the reallocation procedure changed by agreement. Effective FY 88-89, the Ag Pool's unused water rights from the prior year are made available for reallocation to the Appropriative Pool in the following year (i.e. 82,800 AF less the total assessable production).

[4] During fiscal year 99-00 the Peace Agreement is signed. The Appropriators agree to pay the Ag Pool assessments for the life of the Peace Agreement and the reallocation procedure is changed by agreement. The Ag Pool's unused water rights (i.e. 82,800 AF less the total assessable production) are made available for reallocation to the Appropriative Pool in the current year.

[5] *n/a* indicates the information is not applicable for the given year.

[6] When land is converted from agricultural to urban uses, water rights are permanently transferred to the appropriative pool. This column represents the sum of the cumulative transfers that have resulted from land use changes over time. For example, in 85-86 land use conversions resulted in 218 acre-feet of conversions. Thus the total claims for 85-86 were 811: the sum of the conversions from prior years plus the new conversions for 85-86 (*811 = 593 + 218*).

[7] After a duplication of conversion areas was identified, Jurupa's Pre-Peace Agreement acres were adjusted to 337.6 acres and the Post-Peace Agreement acres were adjusted to 846.4 acres.

[8] During fiscal year 99-00 the Peace Agreement is signed and establishes that each year 32,800 acre-feet of Ag Pool rights will be pre-emptively transferred to the Appropriative Pool and the transfer will be distributed proportional to each member's share of the Operating Safe

[9] If the total claims to underproduced Ag Pool Safe Yield (*C + D*) are greater than the water rights available for reallocation (*B*) then the reallocation is limited to the amount of rights available. The reduction is distributed among the Parties in proportion to their share of the

[10] For production years 83-84 through 87-88, the allocation was computed in a different manner and so the generalized formula does not apply for these years.

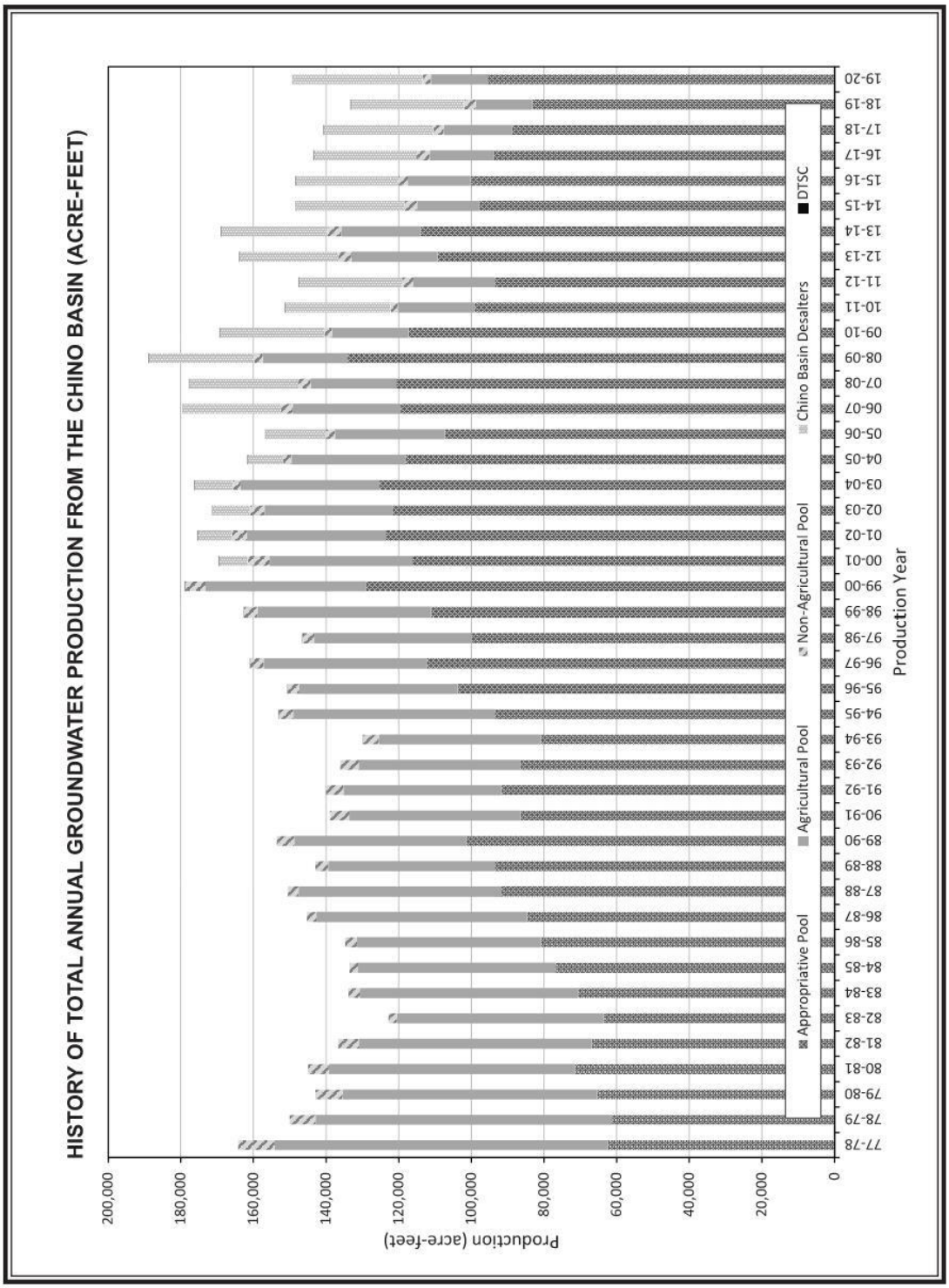
[11] For production years 83-84 through 87-88, the allocation was computed in a different manner and so the generalized formula does not apply for these years.

HISTORY OF TOTAL ANNUAL GROUNDWATER PRODUCTION FROM THE CHINO BASIN (ACRE-FEET)

Production Year	Appropriative Pool[13]	Agricultural Pool[13]	Non-Agricultural Pool[13]	Chino Basin Desalters[14]	Department of Toxic Substances Control[15]	Total Production[16]
77-78	62,408	91,714	10,102 [1]	-	-	164,224
78-79	61,372	81,479	7,263	-	-	150,114
79-80	65,371	70,050	7,541	-	-	142,961
80-81	71,443	67,726	5,777	-	-	144,945
81-82	66,844	64,032	5,801	-	-	136,676
82-83	63,557	56,858	2,448	-	-	122,864
83-84	70,544	60,076	3,258	-	-	133,877
84-85	76,903	54,248	2,446	-	-	133,598
85-86	80,885	50,611	3,255	-	-	134,751
86-87	84,662	57,964	2,696	-	-	145,322
87-88	91,579 [2]	55,949	3,018	-	-	150,545
88-89	93,617 [3]	45,683	3,692	-	-	142,992
89-90	101,344 [4]	47,358	4,927	-	-	153,629
90-91	86,513 [5]	47,011	5,479	-	-	139,003
91-92	91,736 [6]	43,456	4,900	-	-	140,092
92-93	86,584 [7]	44,300	5,226	-	-	136,110
93-94	80,934 [8]	44,492	4,322	-	45	129,793
94-95	93,608 [9]	55,415	4,091	-	45	153,159
95-96	103,729 [10]	43,639	3,240	-	60	150,668
96-97	112,205	44,923	3,779	-	76	160,983
97-98	99,810 [11]	43,370	3,274 [12]	-	83	146,537
98-99	111,048	47,792	3,734	-	81	162,655
99-00	128,892	44,242	5,605	-	82	178,821
00-01	116,204	39,285	5,991	7,989	100	169,570
01-02	123,531	38,196	4,150	9,458	81	175,416
02-03	121,748	35,168	3,979	10,439	79	171,413
03-04	125,320	38,192	2,057	10,605	79	176,253
04-05	118,030	31,505	2,246	9,854	81	161,715
05-06	107,249	30,253	2,641	16,542	80	156,765
06-07	119,438	29,653	3,251	27,077	79	179,498
07-08	120,650	23,539	3,421	30,121	81	177,813
08-09	134,119	23,277	2,420	29,012	83	188,910
09-10	117,299	21,043	2,039	28,857	85	169,323
10-11	99,172	21,030	1,986	29,043	87	151,319
11-12	93,615	22,319 [17]	3,162	28,411	89	147,595
12-13	109,294	23,718 [17]	3,686	27,098	87	163,883
13-14	113,976	21,796 [17]	3,834	29,282	85	168,973
14-15	97,842	17,118 [17]	3,371	30,022	84	148,436
15-16	100,297	17,109 [17]	2,670	28,191	85	148,352
16-17	93,699	17,715 [17]	3,636	28,284	104	143,438
17-18	88,740	18,827	2,919	30,088	83	140,656
18-19	83,280	15,478	3,204	31,233	80	133,275
19-20	95,418	15,722	2,350	35,630	72	149,190

* Total Production adjusted from prior annual reports to include previously omitted production from wells that have become non-active over time.

[1] Includes 3,945 AF of mined water pumped by Edison as agent for IEUA.
[2] Does not include 7,674.3 AF exchanged with MWDSC.
[3] Does not include 6,423.6 AF exchanged with MWDSC.
[4] Does not include 16,377.1 AF exchanged with MWDSC.
[5] Does not include 14,929.1 AF exchanged with MWDSC.
[6] Does not include 12,202.4 AF exchanged with MWDSC.
[7] Does not include 13,657.3 AF exchanged with MWDSC.
[8] Does not include 20,194.7 AF exchanged with MWDSC.
[9] Does not include 4,221.9 AF exchanged with MWDSC.
[10] Does not include 6,167.2 AF exchanged with MWDSC.
[11] Does not include 4,275.4 AF exchanged with MWDSC.
[12] Does not include 216.5 AF exchanged with MWDSC.
[13] Represents total physical production by Pools, not assessed production.
[14] Production by the Chino Basin Desalters is not considered assessable production; Desalter replenishment obligation accounting is shown in the Assessment Package.
[15] Production by DTSC is accounted separately, by agreement, such that the production is not assessed by Watermaster.
[16] Total reflects physical production by pumpers and does not account for any adjustments that are made in the Assessment Packages.
[17] Total Agricultural Pool production revised due to incorrect multiplier used on an irrigation well meter.


HISTORY OF TOTAL ANNUAL GROUNDWATER PRODUCTION FROM THE CHINO BASIN (ACRE-FEET)
Production (acre-feet)
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Appropriative Pool
Agricultural Pool
Non-Agricultural Pool
Chino Basin Desalters
DTSC
77-78
78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
87-88
88-89
89-90
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07-08
08-09
09-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
17-18
18-19
19-20
Production Year

SUMMARY OF SUPPLEMENTAL SUPPLIES USED BY THE CHINO BASIN PARTIES[1] FISCAL YEAR 2019-20 (ACRE-FEET)

Parties	Other Groundwater Basins	Surface Diversions	Imported Water Deliveries				Recycled Water [2]	Total
			SBVMWD	MWDSC				
				IEUA	TVMWD	WMWD		
Chino, City of	-	-	-	4,960	-	-	4,795	9,755
Chino Hills, City of	-	-	-	1,700	-	-	1,417	3,117
Cucamonga Valley Water District [3]	3,618	4,744	-	14,343	-	-	1,038	23,743
Inland Empire Utilities Agency	-	-	-	-	-	-	773	773
Fontana Water Company [4]	8,735	3,968	-	9,212	-	-	211	22,127
Golden State Water Company [5]	3,378	-	-	-	5,707	-	-	9,085
Jurupa Community Services District [6]	308	-	-	-	-	-	-	308
Marygold Mutual Water Company [7]	-	-	301	-	-	-	-	301
Monte Vista Water District	-	-	-	8,921	-	-	298	9,219
Norco, City of [8]	5,218	-	-	-	-	214	-	5,432
Ontario, City of	-	-	-	6,509	-	-	7,817	14,326
Pomona, City of [9]	2,274	2,574	-	-	2,976	-	1,616	9,440
San Antonio Water Company [10]	1,552	6,047	-	-	-	-	-	7,599
San Bernardino, County of	-	-	-	-	-	-	65	65
Santa Ana River Water Company [11]	31	-	-	-	-	-	-	31
State of California, CIM [12]	-	-	-	-	-	-	367	367
Upland, City of [13]	5,471	3,041	-	3,390	-	-	703	12,605
West End Consolidated Water Company [14]	1,850	-	-	-	-	-	-	1,850
West Valley Water District [15]	f	f	f	-	-	-	-	-
Total	32,435	20,374	301	49,035	8,683	214	19,099	130,142

[1] The values reported herein represent the total supplemental water supply used by each Party within its entire service area. Some Parties have service area boundaries which extend outside the adjudicated Chino Basin boundary.
[2] Recycled water is supplied by IEUA unless stated otherwise.
[3] Other groundwater is produced from Cucamonga Basin. Surface water diversions are from Lloyd Michaels, Royer-Nesbit, and Arthur H. Bridge WTPs, and Deer Canyon.
[4] Other groundwater is produced from Colton/Rialto, Lytle, and "unnamed" Basins. Surface water diversions are from Lytle Creek.
[5] Other groundwater is produced from Six Basins.
[6] Other groundwater is produced from Riverside Basins.
[7] Treated water is delivered by West Valley Water District (WVWD), and represents a blend of multiple water sources available to WVWD, including imporated water from SBVMWD and Lytle Creek Water.
[8] Other groundwater is produced from Arlington and Temescal Basins and a portion of the hydrologic Chino Basin that is outside the adjudicated boundary.
[9] Other groundwater is produced from Six Basins and Spadra Basin. Surface water diversions are from San Antonio Creek. Recycled water is served from the Pomona Water Reclamation Plant.
[10] Other groundwater is produced from Six Basins and Cucamonga Basin. Surface water diversions are from San Antonio Creek. Supplemental supplies shown herein do not include sales to the City of Upland - these supplies are shown as part of Upland's supply within this table.
[11] Other groundwater is produced from the portion of the hydrologic Chino Basin that is outside the adjudicated boundary.
[12] Recycled water includes water treated by CIM and reused on location for irrigation purposes.
[13] Other groundwater is produced from Six Basins and Cucamonga Basin. Supplemental supplies shown herein do not include sales to Golden State Water Company (GSWC) - these supplies are shown as part of GSWC's supply within this table.
[14] Other groundwater is produced from Six Basins and Cucamonga Basin.
[15] Other groundwater is produced from Rialto and Riverside Basins. Surface water diversions are from Lytle Creek.

SUMMARY OF IMPORTED WATER DELIVERIES FROM THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA TO THE CHINO BASIN PARTIES FOR FISCAL YEAR 2019-20 (ACRE-FEET)[1]

Month	Water Facilities Authority - CB-12						Reliant
	Upland	MVWD	Ontario	Chino	Chino Hills [2]	Sub-Total	CB-01
July	538	1,271	570	449	200	**2,825**	-
August	499	1,430	679	662	200	**2,685**	-
September	390	1,208	979	715	100	**3,426**	-
October	385	1,007	1,104	580	100	**2,765**	-
November	279	836	506	506	100	**2,859**	-
December	251	574	243	259	100	**920**	-
January	190	259	228	256	100	**1,294**	-
February	131	235	365	288	150	**913**	-
March	185	206	356	239	150	**1,134**	-
April	180	292	336	218	150	**1,281**	-
May	185	662	518	387	150	**1,358**	-
June	178	942	625	440	200	**2,100**	-
Total	3,391	8,922	6,509	4,999	1,700	**23,563**	-

Month	Fontana Water Co.	Cucamonga Valley Water District			Three Valleys MWD to Pomona	Three Valleys MWD to GSWC	Western MWD to Norco	Total
	CB-19	CB-07	CB-16	Sub-Total				
July	1,035	-	1,963	**1,963**	563	774	39	**7,198**
August	964	-	1,843	**1,843**	536	811	116	**6,955**
September	931	-	1,562	**1,562**	370	700	43	**7,032**
October	833	-	1,047	**1,047**	314	624	-	**5,583**
November	744	-	977	**977**	147	387	-	**5,114**
December	760	-	985	**985**	1	147	-	**2,813**
January	611	-	922	**922**	1	180	-	**3,008**
February	635	-	951	**951**	-	326	-	**2,825**
March	675	-	1,001	**1,001**	2	244	-	**3,056**
April	542	-	963	**963**	121	245	-	**3,152**
May	491	-	1,009	**1,009**	386	581	-	**3,825**
June	989	-	1,120	**1,120**	534	687	17	**5,448**
Total	9,210	-	14,343	**14,343**	2,975	5,706	214	**56,011**

[1] Does not include Dry Year Yield activity ("puts" or "takes").
[2] Total includes water delivered directly from WFA and from WFA through MVWD by agreement.

TOTAL WATER CONSUMPTION BY THE CHINO BASIN PARTIES[1]
(ACRE-FEET)

Year	Chino Basin Extractions [2]	Supplemental Supplies [3]	Total
77-78	164,224	61,567	225,791
78-79	150,114	75,864	225,978
79-80	142,961	70,727	213,688
80-81	144,945	77,765	222,710
81-82	136,676	67,491	204,167
82-83	122,864	76,000	198,864
83-84	133,877	99,257	233,134
84-85	133,598	92,952	226,550
85-86	134,751	114,624	249,375
86-87	145,322	126,493	271,815
87-88	150,545	116,175	266,720
88-89	142,992	128,167	271,159
89-90	153,629	139,004	292,633
90-91	139,003	116,493	255,496
91-92	140,092	104,480	244,572
92-93	136,110	117,205	253,315
93-94	129,793	136,038	265,831
94-95	153,159	116,797	269,956
95-96	150,668	130,494	281,162
96-97	160,983	115,031	276,014
97-98	146,537	106,360	252,897
98-99	162,655	113,040	275,695
99-00	178,821	129,208	308,029
00-01	169,570	128,596	298,166
01-02	175,416	140,907	316,323
02-03	171,413	134,154	305,567
03-04	176,253	143,989	320,242
04-05	161,715	145,644	307,359
05-06	156,765	171,896	328,661
06-07	179,498	176,807	356,305
07-08	177,813	162,465	340,278
08-09	188,910	131,819	320,729
09-10	169,323	144,354	313,677
10-11	151,319	154,760	306,079
11-12	147,595	171,808	319,403
12-13	163,883	154,870	318,753
13-14	168,973	183,699	352,672
14-15	148,436	162,477 [1]	310,913
15-16	148,352	114,780 [1]	263,132
16-17	143,438	147,767 [1]	291,205
17-18	140,656	185,964 [1]	326,620
18-19	133,275	153,828 [1]	287,103
19-20	149,190	130,142 [1]	279,332

[1] The values reported herein are intended to represent the supplemental water supply used by each Party within its entire service area. Some Parties have service area boundaries which extend outside the adjudicated Chino Basin boundary. During the preparation of the FY14/15 Annual Report, it was determined that the collection and reporting of supplemental water supplies has been inconsistent over time, such that some parties reported estimates of water used within the boundary of Chino Basin and others provided the entire service area use, and some agencies varied their reporting methods over time. In many years, the reported data also excluded some Watermaster Parties. And, in some cases, the supplemental supplies included recharge water volumes. The values reported for the noted years are representative of total water consumption by the Chino Basin parties and are not directly comparable to values reported for prior years. Watermaster staff will be working with the Parties to update the historical information for consistency in future annual reports.

[2] Represents the total groundwater extraction values reported in Appendix H-1.

[3] Total does not include cyclic deliveries, water delivered by exchange, or water from direct spreading that was used for replenishment.