Appendix I-2

Soil Cement Bank Projection

Drainage Concept Report
Smiser Ranch Soil Cement Bank Protection

May 2020

Prepared For:

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PACE JN A969

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1 Introduction

Pacific Advanced Civil Engineering, Inc. (PACE) has been retained by Sheridan Ebbert Development to prepare a Drainage Concept Report for the proposed creek improvements at Smiser Ranch (Assessors ID 2825-012-011 and 2825-012-010). The proposed creek improvements associated with the project include soil cement bank protection along the west bank of South Fork Santa Clara River (SCR), a tributary to the Santa Clara River. The analysis presented in the following report will focus on the improvements located along South Fork SCR.

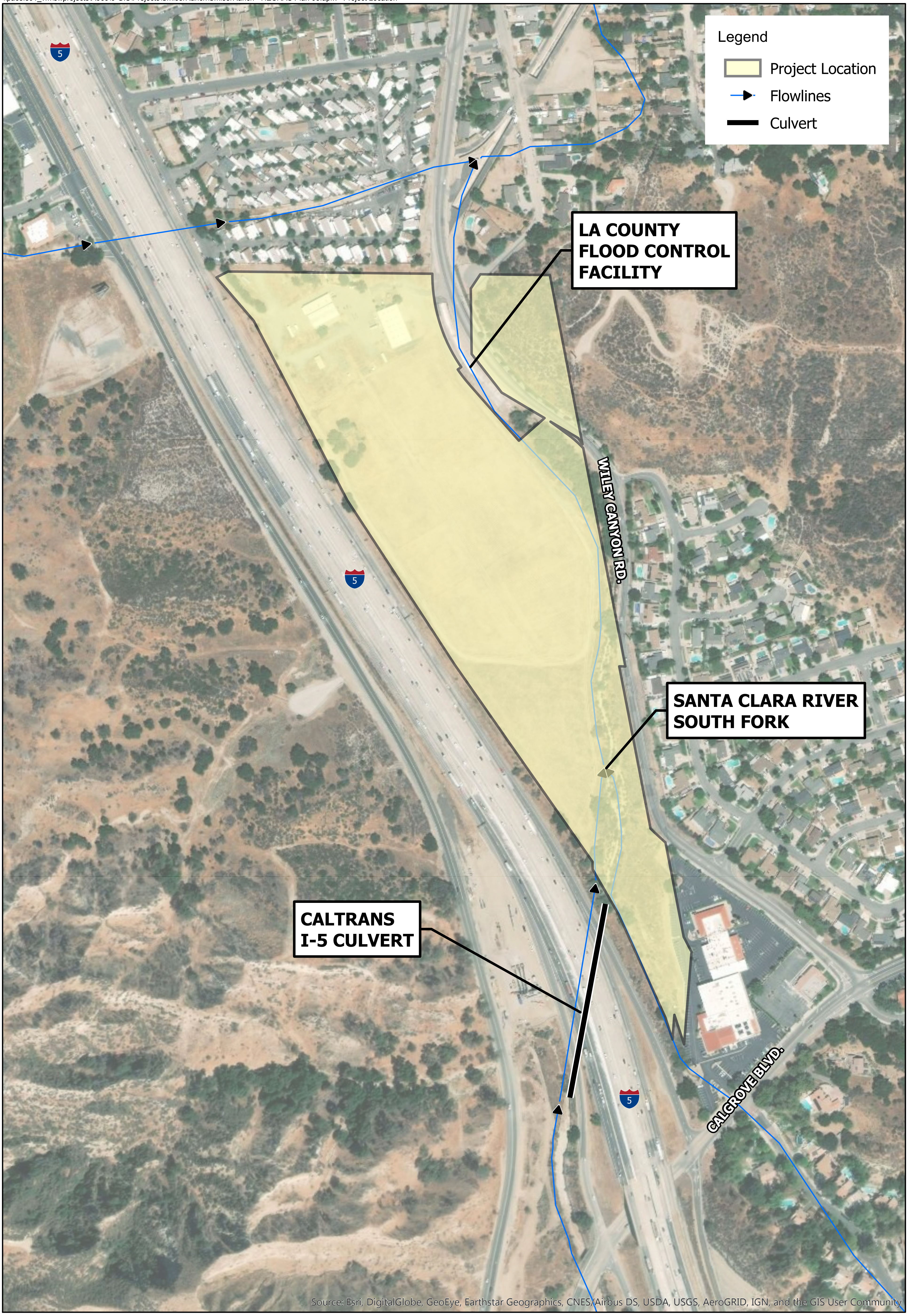
The Smiser Ranch project site is situated in Los Angeles County, east of the Interstate 5 (I-5) and just north of Calgrove Boulevard. A location map for the project site is shown on **Figure 1-1**. The proposed improvements along South Fork SCR consist of approximately 1,500 lineal feet (LF) of soil cement bank protection along the west bank. The bank protection will be constructed as a continuous section beginning at the downstream end of the I-5 culvert and extending roughly 1,500 LF downstream, where it will join the existing concrete slope lining (Gavin Channel - MMS No. F02000089) of the LA County flood control channel crossing beneath Wiley Canyon Road (not to be confused with Old Wiley Canyon Road, which passes over the South Fork SCR channel further downstream).

As part of this DCR, PACE performed a hydraulic analysis of South Fork SCR in the vicinity of the Smiser Ranch project. The purpose of the hydraulic analysis is to provide design guidelines for the proposed bank protection and to evaluate potential floodplain impacts caused by the project.

Design of the proposed improvements along South Fork SCR is in accordance with current Los Angeles County Department of Public Works (LACDPW) hydrology and hydraulic design criteria; however, revised Capital Flood flow rates (Q_{CAP}) were not used as the design flow rate for the channel. Analysis of existing channel conditions showed that the LA County owned portion of channel at the downstream end of the project overtops under both Q_{CAP} (13,857 cfs) and Q_{Design} (10,800 cfs) flow rates, creating a backwater condition upstream. The Q_{Design} flow rate was obtained from as-builts of the LACFCD channel crossing beneath Wiley Canyon Road (see **Appendix B**). The analysis of the flood control system's reactions to various flow rate thresholds was presented in a technical memo presented to the Los Angeles Department of Public Works and the City of Santa Clarita on June 25, 2019 (see **Appendix A**). The technical memo presented a recommended design flow rate equal to the FEMA Q_{100} (8,500 cfs) clearwater flow rate, and was agreed to by the LACDPW and City of Santa Clarita in email correspondence November 4, 2019 (see **Appendix A**). All water surface elevations and topographic data presented in this report are referenced to the North American Vertical Datum of 1988 (NAVD 88). Topographic data shown on the figures was collected in 2016 and is the same topographic data used for the HEC-RAS modeling analysis. As-builts used in preparing the hydraulic model were converted from NGVD 29 to NAVD 88 (as-builts and datum conversion in **Appendix B**).

Hydraulic models of South Fork SCR were prepared and analyzed for existing (pre-project) and proposed (post-project) conditions. **Section 3** describes these hydraulic models in detail. Results of the post-project analysis were compared to results from the fluvial analysis. This comparison is described in **Section 6**. These analyses were also used to evaluate the potential offsite impacts and to determine the appropriate design top and toe elevations for the bank protection. **Table 3-3** presents the results of the post-project HEC-RAS model (Q_{100}, Manning's roughness value of 0.06).

The hydraulic analysis evaluates impacts of changes in the floodplain fluvial mechanics over the long-term. The fluvial adjustment values were incorporated into the hydraulics to determine the top and toe elevations of the South Fork SCR bank protection. An overview of the fluvial analysis is provided in **Section 5**. The design top and toe elevations for the South Fork bank protection will be based on the more conservative values between the Q_{100} freeboard analysis and the Q_{Design} water surface elevations.



SMISER RANCH

PROJECT LOCATION

PACE Advanced Water Engineering

0 150 300 600 Feet

Date: 10/29/2018

Job Number: A969

Figure 1-1

2 Project Hydrology

2.1 Regional South Fork SCR Hydrology

The study reach is situated within the South Fork Santa Clara River Watershed, draining the 7,315 acre Towsley Watershed (see **Figure 2-1**). The hydrology used for the hydraulic analysis was obtained from FEMA Flood Insurance Study (FIS) No. 06037CV002C revised April 4, 2018. The Capital Flood event flow rate was calculated using data gleaned from the LACDPW water resources division (see **Appendix C** for calculations), but was not used in the freeboard or fluvial analyses. The calculated Q_{CAP} is in excess of the flow anticipated by the 100-year FEMA storm event (see **Table 2-1**); however, the existing LA County owned portion of channel is undersized where a constriction occurs just upstream of the Wiley Canyon Bridge, overtopping in a Q_{CAP} storm event. Because this flow rate constriction occurs downstream of the project site, LACDPW and the City of Santa Clarita are not requiring the Smiser Ranch project to be designed for the Q_{CAP} flood event with freeboard. Instead, all parties are in agreement that the project will be designed for the FEMA Q_{100} clearwater flow rate, which passes through the LA County owned portion of channel without overtopping in existing conditions. The development will be protected from the Q_{100} flow rate plus adequate freeboard, and will also contain the Q_{Design} flood event, not including freeboard

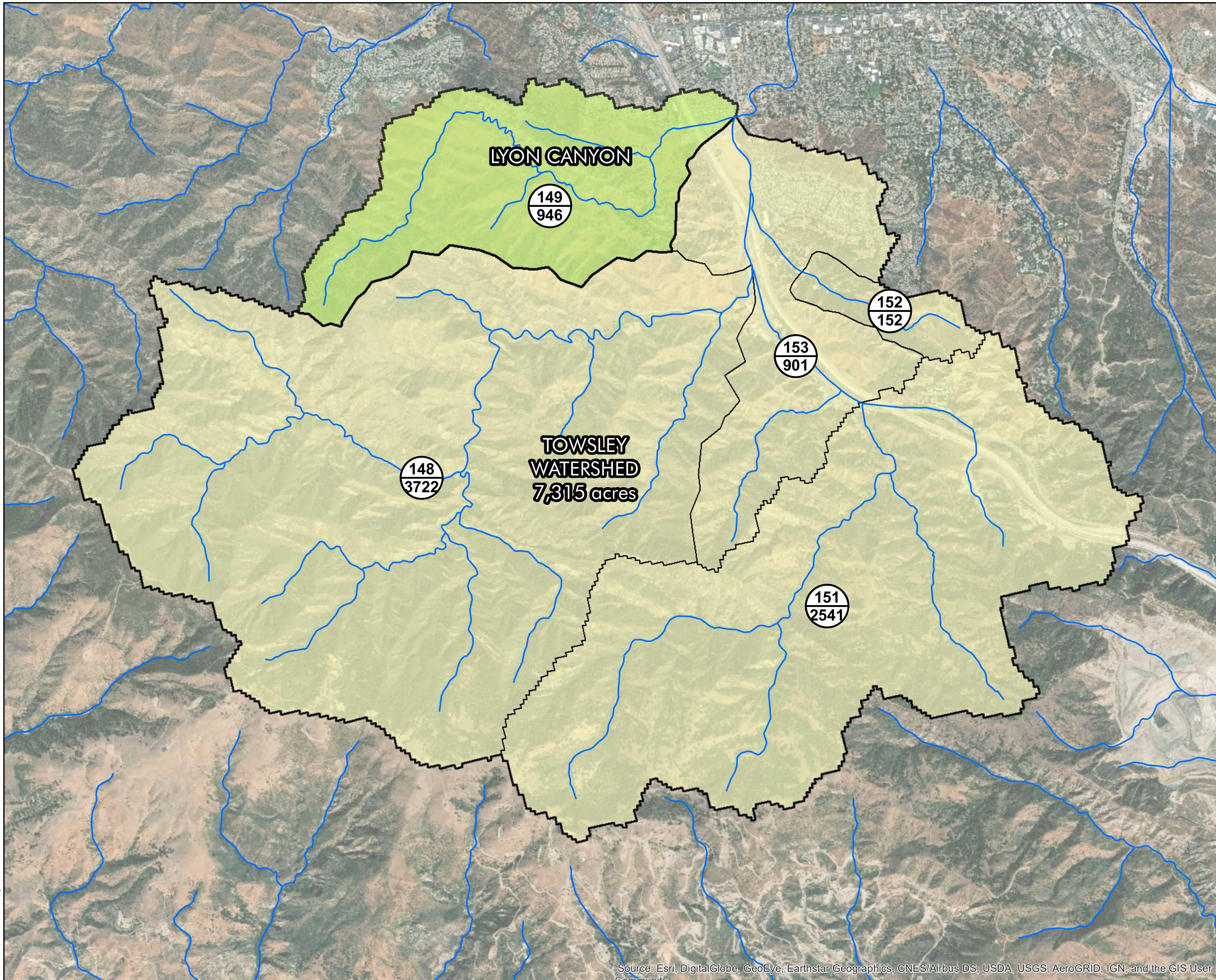
All proposed grading located behind the proposed bank protection for South Fork SCR will be filled to be above the FEMA 100yr floodplain. Current elevations of Wiley Canyon Road, along the eastern bank of South Fork SCR, are not proposed to be altered; however, the proposed modifications to the channel section will lower water surface elevations in this area, reducing flooding that is currently experienced on Wiley Canyon Road in large storm events. Therefore, the Smiser Ranch project will not have an adverse flood hazard impact on adjacent sites.

Various flow rates analyzed at the project site are summarized in **Table 2-1**.

Table 2-1: Design Hydrology Summary

Return Period	Design Flow (cfs)	Location within South Fork SCR
100-Year [(1)]	8,483	Approx. 500 feet D/S of Wiley Canyon Rd.
Q_{CAP} (b&b) [(2)]	13,857	Approx. 1,000 feet U/S of Wiley Canyon Rd. (Node 126AN from LACDPW Hydrology)
Q_{Design} [(3)]	10,800	At Wiley Canyon Rd.

Notes:
(1) Source: FEMA FIS No. 06037CV002C revised April 4, 2018.
*(2) Source: LACDPW burned & bulked flow – See calculations in **Appendix C**.*
(3) Source: LACFCD As-Built Dwg. No. 337-D22.1



Smiser Ranch Site

LOS ANGELES CO. CA

Legend

- Flowlines
- Lyon Canyon
- Towsley Watershed

0 1,250 2,500 5,000 Feet

PACE Advanced Water Engineering

Date: 10/9/2018

Job Number A969

Drawn By thowze

Figure 2-1

South Fork SCR Watersheds

P:\A969\6-GIS\Mxds\Workspace\CalGroveHSPFWatershed.mxd

3 HEC-RAS Modeling

An extensive hydraulic analysis was performed to determine floodplain limits, as well as the top and toe elevations for the proposed bank protection along South Fork SCR associated with the project.

3.1 HEC-RAS Models Developed for Smiser Ranch

Analyses and calculations for the Q_{100} event using a Manning's roughness value of 0.060 are presented to identify the changes in water surface elevation and velocity between the existing and proposed conditions. To establish the top and toe elevations for the soil cement bank protection per LACDPW design requirements, a proposed condition model was developed for two scenarios: (i) full vegetation (Manning's roughness value of 0.085) to estimate top of bank elevations and (ii) no vegetation (Manning's roughness value of 0.025) to estimate toe of bank elevations. The HEC-RAS models used in the hydraulic analysis are summarized in **Table 3-1**.

Table 3-1: South Fork SCR HEC-RAS Model Descriptions

HEC-RAS File Name	Description	Purpose
Plan 01 - Existing Condition	Existing vegetation, n=0.060	Determine existing condition 100yr flood water surface elevations and flow velocities within South Fork SCR.
Plan 04 - Proposed Condition	Existing vegetation, n=0.060	Determine proposed condition 100yr flood water surface elevations and flow velocities to compare with existing conditions for hydraulic impacts.
Plan 06 - Proposed Condition	**Full vegetation, n=0.085**	**Determine proposed condition 100yr flood maximum water surface elevations within South Fork SCR.**
Plan 05 - Proposed Condition	**No vegetation, n=0.025**	**Determine proposed condition 100yr flood maximum flow velocities within South Fork SCR.**

Notes:

(1) HEC-RAS models for South Fork SCR included in this report are based on 2016 topography data.

(2) Items in bold are HEC-RAS models that are pertinent to the soil cement bank protection design.

The HEC-RAS models were assigned upstream and downstream boundary conditions. The upstream boundary conditions consist of a normal depth with a slope of 0.016 (proposed and existing conditions). The downstream boundary conditions are also set to normal depth, with a slope of 0.012 (proposed and existing conditions). **Table 3-2** lists the boundary conditions used in the HEC-RAS model plans.

Table 3-2: HEC-RAS Model Boundary Conditions for 100yr Flood (Q_{100})

HEC-RAS Model Plan	Downstream Boundary Condition (STA 5716)	Upstream Boundary Condition (STA 8326)
Plan 01 - Existing Conditions n = 0.060	Normal Depth S = 0.012	Normal Depth S = 0.016
Plan 04 - Proposed Conditions n = 0.060	Normal Depth S = 0.012	Normal Depth S = 0.016
Plan 06 - Proposed Conditions n = 0.085	Normal Depth S = 0.012	Normal Depth S = 0.016
Plan 05 - Proposed Conditions n = 0.025	Normal Depth S = 0.012	Normal Depth S = 0.016

In an effort to verify that the boundary conditions chosen for the analysis did not have an impact on the area of interest (between the Wiley Canyon Road Bridge and the I-5 culvert as indicated by the red box in **Table 3-3**), a sensitivity analysis was performed using the following combinations of boundary conditions:

- *Condition 1* – Normal depth was selected as the upstream boundary condition, and normal depth was selected as the downstream boundary condition.
- *Condition 2* – Critical depth was selected as the upstream boundary condition, and normal depth was selected as the downstream boundary condition.
- *Condition 3* – Normal depth was selected as the upstream boundary condition, and critical depth was selected as the downstream boundary condition.
- *Condition 4* – Critical depth was selected as the upstream boundary condition, and critical depth was selected as the downstream boundary condition.

Table 3-3 lists the water surface elevations from the models run for the four conditions discussed above. Changing the boundary conditions does not change the water surface elevation within the area of interest. Therefore, the model has been extended far enough above and below the area of concern.

Table 3-3: Comparison of HEC-RAS Hydraulic Model Boundary Conditions (n=0.06)

HEC-RAS River Station	Proposed Condition WSE[1] (ft)	Condition 1 WSE[2] (ft)	Condition 2 WSE[3] (ft)	Condition 3 WSE[4] (ft)	Condition 4 WSE[5] (ft)
I-5 Caltrans Culvert					
8326.00	1324.12	1324.12	1324.12	1324.12	1324.12
8126.00	1320.80	1320.80	1320.80	1320.80	1320.80
7926.00	1318.52	1318.52	1318.52	1318.52	1318.52
7726.00	1314.61	1314.61	1314.61	1314.61	1314.61
7546.00	1312.86	1312.86	1312.86	1312.86	1312.86
7362.00	1310.12	1310.12	1310.12	1310.12	1310.12
7203.00	1308.68	1308.68	1308.68	1308.68	1308.68
7053.00	1307.97	1307.97	1307.97	1307.97	1307.97
6903.00	1307.57	1307.57	1307.57	1307.57	1307.57
6842.00	1306.56	1306.56	1306.56	1306.56	1306.56
6744.00	1305.05	1305.05	1305.05	1305.05	1305.05
6702.00	1301.21	1301.21	1301.21	1301.21	1301.21
6660.00	1300.05	1300.05	1300.05	1300.05	1300.05
6624.19	1299.00	1299.00	1299.00	1299.00	1299.00
6480.00	1296.85	1296.85	1296.85	1296.85	1296.85
6425.00	1295.85	1295.85	1295.85	1295.85	1295.85
6287.00	1292.92	1292.92	1292.92	1292.92	1292.92
6207.00	1288.56	1288.56	1288.56	1288.56	1288.56
Wiley Canyon Rd. Bridge					
5884.00	1283.91	1283.91	1283.91	1283.91	1283.91
5840.00	1283.37	1283.37	1283.37	1283.37	1283.37
5803.00	1282.84	1282.84	1282.84	1282.84	1282.84
5760.00	1290.35	1290.35	1290.35	1290.35	1290.35
5721.00	1292.33	1292.33	1292.33	1292.33	1292.33
5716.00	1284.93	1284.93	1284.93	1284.93	1284.93

Notes:

1. *Proposed Conditions n=0.06 WSE – Boundary Conditions shown in* ***Table 3-2***
2. *Condition 1 – U/S Boundary Condition: Normal Depth, D/S Boundary Condition: Normal Depth*
3. *Condition 2 – U/S Boundary Condition: Critical Depth, D/S Boundary Condition: Normal Depth*
4. *Condition 3 – U/S Boundary Condition: Normal Depth, D/S Boundary Condition: Critical Depth*
5. *Condition 4 – U/S Boundary Condition: Critical Depth, D/S Boundary Condition: Critical Depth*
6. *The limits of the project reach are indicated by the red box*

For stations 8326 to 6660, topographic data from 2016 aerial survey was used to develop the geometry of the model. Some areas outside of project boundaries were not included in the 2016 survey data, so 2006 LiDAR was joined to the 2016 data on any cross-section that covered area outside the survey limits. Stations 6624.19 to 5716.00 used as-built data from 1986 (Dwg. No. 337-D22.1), to which a vertical datum shift of 2.726 ft. was applied (see **Appendix B** for as-built and datum conversion). It should be noted that no FEMA hydraulic model was available for this location (see email correspondence in **Appendix F**).

4 Summary of HEC-RAS Results

4.1 Existing vs. Proposed Condition (n=0.060)

Results of the hydraulic analysis for the existing and proposed conditions modeling are summarized in **Table 4-1** for the Q_{100} flow rate and Manning's roughness value of 0.060. Comparison of the existing and proposed hydraulic results indicate there are no negative off-site impacts due to the proposed South Fork SCR bank protection. Flooding that currently exists on the project site is eradicated and flooding that currently exists on Wiley Canyon Road is reduced. Water surface elevations are reduced at all but two locations in South Fork SCR in proposed conditions. These increases occur where the widened channel is becoming more narrow in order to tie into the existing LACFCD concrete portion of channel. This constriction creates some hydraulic turbulence that cannot be avoided, resulting in the minor increases in water surface elevation shown in **Table 4-1**. However, despite the increases, adequate freeboard is provided on the development side, and on the Wiley Canyon Road side, water surface elevations remain off the road and do not increase the flooding risk there. No homes are impacted by this rise in water surface elevation. All other points along the creek show a reduction in water surface elevation in proposed conditions, compared to existing conditions. Velocity in proposed conditions is generally lower than in existing conditions upstream of the concrete lined portion leading to Wiley Canyon Bridge. Within the concrete lined portion, increases in velocity range from 0.17 ft/s to 3.62 ft/s. However, since this portion of the channel is concrete lined, the increases in velocity will not have an erosive effect on the channel.

The existing and proposed conditions HEC-RAS output data are included in **Appendices D and E**, respectively.

Table 4-1: Existing vs. Proposed Hydraulic Analysis (Q_{100} and n=0.06)

HEC-RAS River Station	Existing Floodplain(1)		Proposed Floodplain(2)		∆WSE (prop – exist) (ft)	∆Velocity (prop – exist) (ft/s)
	WSE (ft)	Velocity (ft/s)	WSE (ft)	Velocity (ft/s)		
8326	1325.49	10.59	1324.12	14.3	-1.37	3.71
8126	1323.42	9.85	1320.80	8.36	-2.62	-1.49
7926	1322.24	8.89	1318.52	9.00	-3.72	0.11
7726	1317.70	15.51	1314.61	11.97	-3.09	-3.54
7546	1316.48	9.26	1312.86	8.47	-3.62	-0.79
7362	1313.05	13.60	1310.12	10.14	-2.93	-3.46
7203	1311.26	11.97	1308.68	8.10	-2.58	-3.87
7053	1309.73	11.13	1307.97	6.42	-1.76	-4.71
6903	1308.18	11.00	1307.57	6.03	-0.61	-4.97
6842	1305.95	11.90	1306.56	7.86	0.61	-4.04
6744	1304.96	11.19	1305.05	10.60	0.09	-0.59
6702	1303.49	12.55	1301.21	16.17	-2.28	3.62
6660	1300.51	16.87	1300.05	17.77	-0.46	0.90
6624.19	1299.50	18.25	1299.00	19.28	-0.50	1.03
6480	1299.27	17.78	1296.85	21.72	-2.42	3.94
6425	1296.70	21.34	1295.85	22.69	-0.85	1.35
6287	1293.07	25.24	1292.92	25.54	-0.15	0.30
6207	1288.62	29.51	1288.56	29.68	-0.06	0.17
6056	Wiley Canyon Road Bridge					

Notes:

1. *Existing floodplain WSEs and velocities are based on Q_{100} flow rate and n = 0.060 (see* ***Appendix D****)*

2. *Proposed floodplain WSEs and velocities are based on Q_{100} flowrate and n = 0.060 (see **Appendix E**)*
3. *Gray highlight indicates existing concrete or riprap lined channel between RS 6660 and RS 6056*

4.2 Proposed Condition Model Results and Top of Bank Determination

The HEC-RAS analyses of the Q_{Design} event applying a Manning's roughness value (n) of 0.085 was used to determine the proposed condition water surface elevations for the purpose of determining minimum freeboard based on LACDPW requirements. Summary output tables containing results of the n=0.085 HEC-RAS model is provided in **Appendix E**. Bank protection must be designed to contain the design flood and have adequate freeboard. The freeboard represents the additional height required to ensure overtopping does not occur due to factors not accounted for in the design water surface calculations. Calculated freeboard considers possible long-term aggradation, super-elevation at curved reaches of the channel, and bed forms, in addition to less identifiable components such as excessive turbulence, wave action and variation of loss coefficients. The calculated top of bank elevations are summarized in **Table 4-2**. In order to provide capacity for the Q_{Design} design event (10,800 cfs), the calculated top of bank elevation (based on Q_{100} flow rate) was compared to the water surface elevation of a Q_{Design} storm event. Any locations where the Q_{Design} water surface elevation exceeded the calculated top of bank elevation, the top of bank elevation was raised to match the Q_{Design} water surface elevation. This ensures that, should a Q_{Design} event occur, the proposed development at Smiser Ranch is still protected. However, freeboard will not be provided to the Q_{Design} event, as outlined in the approved proposal to LA County shown in **Appendix A**.

Table 4-2: Calculated Top Elevations for Soil Cement Bank Protection

HEC-RAS Section	Bank Station	WSE for n = 0.085(1) Q_{100} = 8,483 cfs (Appendix E) (ft)	Minimum Required Freeboard(2) (Table G-1) (ft)	Calculated Top Elevation (ft)
8326	- -	1324.94	6.0	1330.93
8126	24+24.23	1322.24	4.2	1326.44
7926	22+13.47	1319.63	4.0	1323.59
7726	20+28.14	1316.25	3.2	1319.40
7546	18+38.41	1314.17	2.8	1316.94
7362	16+81.60	1311.88	2.5	1314.38
7203	15+20.52	1310.38	2.5	1312.88
7053	13+75.72	1309.53	2.5	1312.03
6903	12+55.67	1308.97	2.5	1311.47
6842	12+11.74	1307.88	2.5	1310.38
6744	11+16.80	1306.26	2.5	1308.76
6702	10+79.31	1301.21	3.5	1304.74
6660	10+35.58	1300.14	4.2	1304.31

Notes:
(1) *Water Surface Elevation (WSE) is from the proposed condition HEC-RAS model with a Manning's roughness value (n) of 0.085 and FEMA 100yr flow rate of 8,483 cfs for entire reach. See **Appendix E** for detailed results*
(2) *Freeboard calculations are shown in **Table G-1**, included in **Appendix G**.*

4.3 Proposed Condition Model Results and Toe of Bank Determination

The HEC-RAS analyses of the Q_{100} event applying a Manning's roughness value of 0.025 was used to determine proposed condition flow velocities for the purpose of calculating required toe-down. Summary output tables consisting results of the n=0.025 HEC-RAS model is provided in **Appendix E**. The primary failure mechanism of rigid bank protection revetments is generally scouring at the toe. The bank protection toe-down or cut-off depth must provide adequate scour protection below the earthen creek invert to account for dynamic changes in streambed elevations during storm events. The calculated toe-down accounts for the potential general bed degradation; bend scour, bedform height, abutment or contraction scour, and scour associated with hydraulic structures. The calculated toe-down values and minimum toe of bank elevations are summarized in **Table 4-3**.

Table 4-3: Calculated Toe Elevations for Soil Cement Bank Protection

HEC-RAS Section	Bank Station	Minimum Channel Invert(1) (Appendix D) (ft)	Toe-Down(2) (Table G-2) (ft)	Calculated Toe Elevation (ft)
8326	- -	1315.35	14.6	1300.75
8126	24+24.23	1311.80	14.0	1297.80
7926	22+13.47	1308.60	12.5	1296.10
7726	20+28.14	1306.45	12.5	1293.95
7546	18+38.41	1303.20	14.0	1289.20
7362	16+81.60	1300.72	12.5	1288.22
7203	15+20.52	1298.98	14.0	1284.98
7053	13+75.72	1296.27	8.0	1288.27
6903	12+55.67	1292.33	8.0	1284.33
6842	12+11.74	1291.55	8.0	1283.55
6744	11+16.80	1288.96	10.0	1278.96
6702	10+79.31	1288.12	12.5	1275.62
6660	10+35.58	1287.22	14.0	1273.22

Notes:

(1) Minimum Channel Invert is from the existing condition HEC-RAS model and is included in ***Appendix D****.*

(2) Toe-Down calculations are shown in ***Table G-2****, included in* ***Appendix G****.*

NO	BY	DATE		DATE	APP.

SMISER RANCH/SOUTH FORK SCR

SOIL CEMENT BANK PROTECTION

DRAINAGE CONCEPT REPORT

LOS ANGELES COUNTY CA.

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EXP. 06/30/2020
DRAWN BDP
SCALE AS SHOWN
DESIGNED JC
CHECKED MEK
DATE 5/19/2020

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STATE OF CALIFORNIA

TITLE

EXISTING AND PROPOSED CONDITION FLOODPLAIN MAPPING

FIGURE 4-1

JOB NO. A969-11

5 Fluvial Analysis

5.1 Introduction

The fluvial analysis utilized SAM Hydraulic Design Package in order to determine long-term bed adjustment within the project reach. This analysis required study of hydraulics and sediment transport capacity not just within the project reach, but also the reach between Calgrove Boulevard and the Interstate 5 culvert, the reach within the culvert running beneath Interstate 5, and the LA County owned portion of channel between Wiley Canyon Road bridge and the Old Wiley Canyon Road bridge. Results from the hydraulic analysis and results from the fluvial analysis were compared, then the most conservative values for top and toe elevations were adopted for the bank protection design. The following is a description of the fluvial analysis.

The South Fork SCR study reach is located in western Los Angeles County, California, between I-5 and the Santa Clara River, and is upstream of the confluence with Lyon Canyon. The existing floodplain generally consists of a natural hillsides and canyons draining towards the project from the south. Existing flow paths join concrete lined channels along The Old Road and Calgrove Boulevard. From here, the various reaches combine before flowing under Calgrove Boulevard. The proposed buried soil cement bank protection on the west bank of South Fork SCR is intended to provide long-term erosion protection from lateral migration of the bank and flood protection for the adjacent proposed development areas. These modifications to the stream system may result in adjustment to the fluvial operation of the floodplain and changes to the stream mechanics. The intent of this analysis is to evaluate these impacts from changes in the floodplain fluvial operation over the long-term.

5.2 Types of Adjustments

Modifications to the South Fork SCR system are measured as bed adjustment in feet. Positive adjustment indicates bed aggradation while negative adjustment indicates bed degradation. Types of adjustment considered in the fluvial analysis included long-term, and other scour adjustments. For example, aggradation describes a situation where sediment inflow is higher than sediment outflow for the same reach. In contrast, if sediment outflow exceeds inflow for a given reach, degradation in the form of scour will occur. Long-term adjustment consists of fluvial processes that occur over many rainy seasons and contribute to fluctuation of bed elevation of a river or creek.

5.3 Objectives

The primary objective of the fluvial analysis was to assess creek bed impacts from potential modifications of fluvial operation from the proposed Smiser Ranch development. The intent was to provide a comprehensive assessment of long-term bed adjustment based on the level of information available. The fluvial analysis describes the following: (1) soil gradation within the study reach, (2) HEC-RAS modeling, (3) SAM modeling and analysis, (4) proposed versus existing sediment transport capacity, (5) long-term adjustment, and (6) total scour potential for the purpose of determining soil cement bank protection toe-down and freeboard. The objectives of the fluvial assessment for the proposed development project included:

1. Quantify fluvial parameters that are representative of the creek bed characteristics;
2. Model the existing and proposed conditions;
3. Conduct a preliminary assessment of streambed stability; and,
4. Estimate toe-down depth and freeboard height assessment.

The final design top and toe elevations from the fluvial analysis are included in **Appendix G**.

5.3.1 *Study Reach Gradation*

A sediment sampling analysis was performed by Allan E. Seward Engineering Geology, Inc. on February 2, 2020 in order to conduct a sieve analysis and obtain a grain size distribution curve to be used in the sediment transport modeling. Two sample points were taken along the Creek invert, shown on **Figure 5-5**. The results and report provided by Seward are shown in **Appendix H**.

Additionally, a count-by-grid grain size analysis was performed by PACE on February 2, 2020 in order to more accurately capture the nature of the bed armoring present in the Creek. While the sieve analysis performed by Seward was useful in determining average grain size of a whole layer of soil up to five feet deep, the grain size distribution from this does not necessarily take into account the significance of the armoring layer on the Creek surface (See **Figure 5-1**). The armoring layer is important to include, as it protects against erosion of finer layers of soil that are not directly in contact with the erosive forces of water. The count-by-grid analysis involves laying a square, uniform grid over the armored surface, and measuring the size of each pebble that falls under that grid (See **Figures 5-2 and 5-3**). The resulting data can be converted into a grain size distribution curve that accurately captures the characteristics of the top armor layer. The count-by-grid samples were taken from the same areas of the creek as the sieve analysis sediment samples. **Appendix I** contains the calculations used to obtain the grain size distribution curve of the count-by-grid method.

Figure 5-1: Armor Layer of South Fork SCR (Facing Downstream)

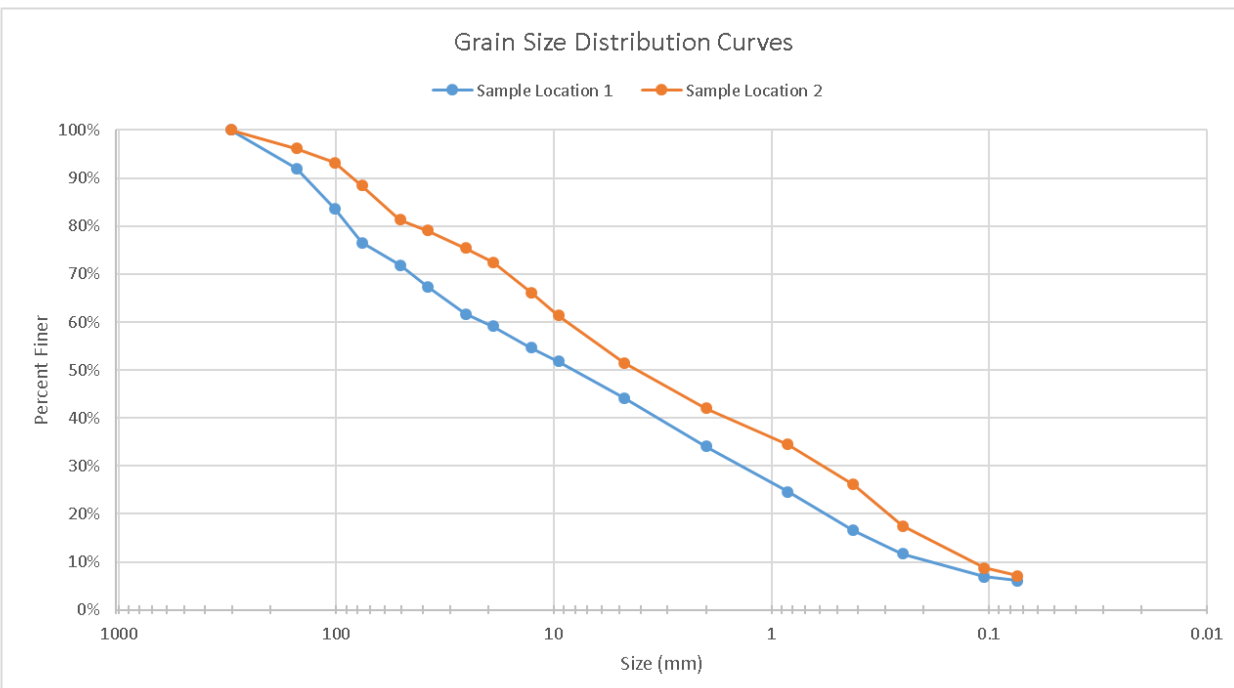
Figure 5-2: Grid Over Sample Location 1

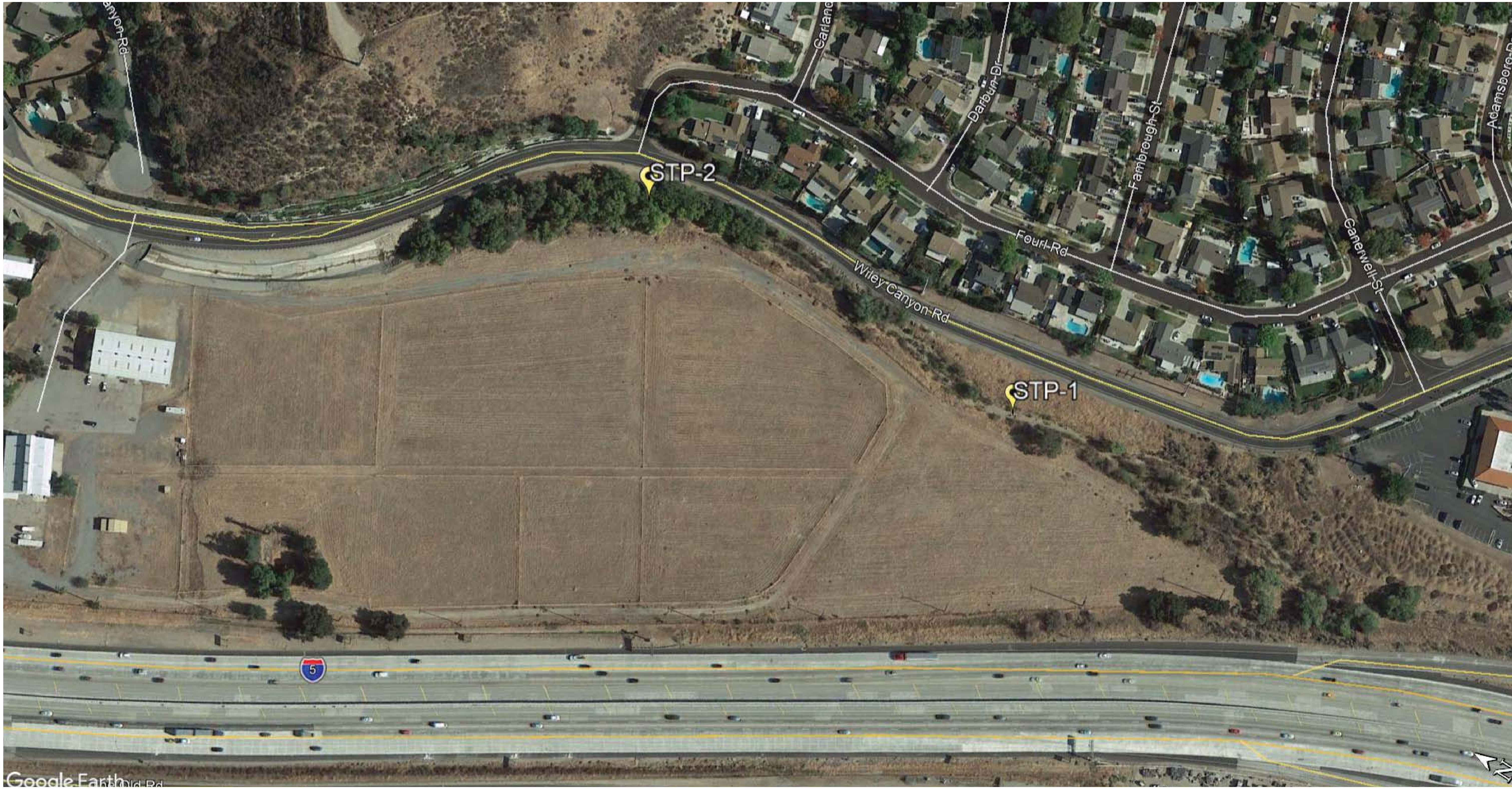
Figure 5-3: Grid Over Sample Location 2

A second method was used to quantify the grain size distribution of the armor layer, known as the Wolman Pebble Count. This method involves a person walking in a zig-zag pattern along the stream bed, moving from one bank to another. At a uniform interval, the surveyor selects a pebble from the Creek bed, measures it, records it, and moves on to the next sample. A minimum of 100 samples must be selected at each sample location. Field notes from this analysis are included in **Appendix J**. The results from this method were combined (averaged) with the results from the count-by-grid analysis (averaged) to create a single gradation curve for the armor layer. The benefit of using two methods to quantify the armor layer is that any anomalies captured in one method are eradicated or adjusted by the other.

The final step in creating a grain size distribution curve to use in the sediment transport modeling was combining the curves of the armor layer and sieve analyses. The grain size distribution curves from the sieve analysis were split into layers 0-2.5 ft. deep and 2.5-5 ft. deep for Sample Location 1. Sample Location 2 was split into layers 0-2.3 ft. deep and 3.4-5 ft. deep. Both curves for the respective depths were compared individually to the distribution curve of the armor layer at that sample location. Any points along the sieve analysis curves which were lower than the points along the corresponding armor layer curves were adjusted to match the armor layer. All other points from the sieve analysis were unaltered. The resulting curves for each layer of depth were combined (averaged) to create a single grain size distribution curve at each sample point. Out of the two resulting curves, the curve from Sample Location 2 produced the smallest D_{50} value. A smaller grain size will be transported easier and, if used in sediment transport modeling, will produce higher sediment transport capacity volumes. The adjusted grain size distribution curve from Sample Location 2 was used in the sediment transport modeling, since this provided more conservative results. **Figure 5-4** shows the grain size distribution curves and **Table 5-1** compares the adjusted grain size distribution values between Sample Locations 1 and 2.

Figure 5-4: Adjusted Grain Size Distribution Curve for Sample Locations 1 and 2





Source: *Google Earth Pro V 7.3.2.5776 (11/19/18 Imagery Date)*

Figure 5-5

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC. Geological and Geotechnical Consultants	
SEDIMENT SAMPLE LOCATION MAP	
JOB NO.: *20-2593-4*	
DATE: *3/20/20*	PLATE 1

Table 5-1: Grain Size Distribution Data Comparison – Sample Locations 1 and 2

Sample Location 1	
Grain Size (mm)	% Finer
304.8	100.0%
152.4	92.0%
101.6	83.6%
76.2	76.5%
50.8	71.9%
38.1	67.4%
25.4	61.7%
19.05	59.2%
12.7	54.6%
9.525	51.8%
4.76	44.2%
2	34.1%
0.841	24.6%
0.42	16.6%
0.25	11.7%
0.105	7.0%
0.074	6.1%
D_{50} =	8.40 mm

Sample Location 2	
Grain Size (mm)	% Finer
304.8	100.0%
152.4	96.2%
101.6	93.2%
76.2	88.5%
50.8	81.4%
38.1	79.1%
25.4	75.4%
19.05	72.5%
12.7	66.1%
9.525	61.4%
4.76	51.5%
2	42.0%
0.841	34.5%
0.42	26.1%
0.25	17.5%
0.105	8.7%
0.074	7.1%
D_{50} =	4.32 mm

5.3.2 HEC-RAS Modeling

The fluvial study utilized HEC-RAS models in addition to the models discussed in **Section 3.1**. The following section describes these additional HEC-RAS models.

5.3.2.1 Geometric Configurations

The fluvial study utilized the following HEC-RAS geometry files:

1) **Design Slope Geometry** – The design slope geometry represents a condition where the South Fork SCR improvements related to the Smiser Ranch development have been constructed, but the invert slope within the channel is the same as the existing condition. The Design Slope HEC-RAS model is described in **Section 3.1.**

2) **Stable Slope Geometry** – This geometric configuration depicts the situation in which the design reaches have aggraded to their long-term equilibrium condition. This long-term equilibrium slope was determined in an iterative process, where the channel slope was increased to the point where the sediment transport capacity of the project reach roughly matched the capacity of the supply reach (reach between Calgrove Boulevard and Interstate 5 Caltrans culvert).

3) **Supply Reach Geometry** – The supply reach supplies sediment to the design reach and is located between Calgrove Boulevard and Interstate 5 Caltrans culvert. The I-5 culvert was not used as the supply reach, since it is concrete lined and cannot generate sediment. The I-5 culvert effectively acts as a constriction point in sediment transport capacity from the upstream reaches, so, in order to be conservative, the long-term aggradation analysis was performed as though the constriction did not exist. HEC-RAS models with this geometry generated results used to

determine the supply reach's sediment transport rate. The Supply Reach geometry originates from 2016 survey data and 2006 LiDAR.

5.3.2.2 Manning's Roughness

The Manning's roughness values used for the long-term adjustment analysis applied to the HEC-RAS geometry with horizontal variation to accommodate varying vegetation and channel material roughness. These Manning's roughness values were applied to the models used to determine long-term adjustment and general adjustment values in order to represent the true site conditions. For existing conditions of South Fork SCR, Manning's values of 0.079 were used for the main channel, 0.045 for the left overbank, and 0.06 for the right overbank. In proposed conditions, the buried soil cement bank has a Manning's value of 0.035 and the flat terraced section adjacent to the low flow channel has a value of 0.04. Concrete portions in existing and proposed portions have a Manning's value of 0.015.

5.3.2.3 Reach Delineation

South Fork SCR was divided into five sub-reaches for sediment transport calculations (see **Table 5-2**). Hydraulic parameters were then averaged across each reach for the long-term adjustment calculations. Due to the relatively short length of the project reach, the design reach was not divided into smaller parts.

5.3.2.4 Flow Rates

As discussed in **Section 2**, Q_{100} (8,483 cfs) was used for the toe-down and freeboard calculations.

5.3.2.5 Flow Regime

All models were run with the mixed flow regime. The mixed flow regime applies subcritical and supercritical profiles and uses the momentum equation to model hydraulic jumps.

5.3.2.6 Boundary Conditions

The upstream and downstream boundary conditions of the HEC-RAS models are normal depth for each geometry configuration (see **Section 3**).

5.3.3 <u>SAM Modeling and Analysis</u>

The results from the HEC-RAS models described above were averaged for each reach and entered into the Hydraulic Design Package for Channels (SAM) to perform the sediment transport calculations. There are over 20 equations available in SAM to calculate sediment transport. PACE used the Meyer-Peter-Mueller (D_{50}) method. According to the software documentation, SAM is a zero-dimensional computational package that is based on a single cross section at a particular point in time. Therefore, the hydraulic parameters for each cross section for the modeled supply reach were averaged to create a representative cross section. PACE used the hydraulic parameters for this representative cross section, the FEMA Q_{100} discharge, and the sediment data described in **Section 5.3.1** to calculate sediment transport with the MPMD50 equation. The results of that analysis are summarized in **Table 5-2**.

Table 5-2: Summary of SAM Results

Section No.	Description	Sediment Transport (tons/day) *MPM(1948)D50
1	U/S Existing (XS 8920)	87,292
2	I-5 CulvertExisting	120,499
3	Proj. Reach **Existing**	71,289
	Proj. Reach **Proposed**	69,333
	Proj. Reach Prop. **S_{EQ}=1.74%**	83,720
4	LACFCD U/S Wiley Bridge	290,917
5	LACFCD D/S Wiley Bridge	78,217

5.3.4 Proposed Versus Existing Sediment Transport Capacity

As can be seen from **Table 5-2**, the sediment transport capacity of Reach 3 (the project reach) in existing and proposed conditions is roughly equal. This means that sediment discharging to the LA County owned portion of channel will not increase from existing conditions. Comparing proposed condition sediment discharge values of Reach 3 to the discharge values of Reach 5 (LACFCD channel downstream of Wiley Canyon Bridge), it can be seen that the capacity of the LACFCD portion will not be exceeded.

5.3.5 Long-term Adjustment

Furthermore, at a stable slope of 1.74%, the sediment transport capacity of the proposed channel in Reach 3 is roughly equal to the supply reach capacity (approximately 87,000 tons/day). This is the transport capacity that Reach 3 will be approaching in the future, regardless of whether or not the project exists. The results of the stable slope model were then used to calculate long-term bed adjustment used in freeboard calculations, shown in the calculations in **Table G-2**. The difference in invert elevation between design conditions and stable slope conditions is shown in **Table 5-3**.

Table 5-3: Long-term Adjustment Invert Change

River Station	Difference in Invert Elev (Stable - Design) (ft)
8326	3.9
8126	3.6
7926	3.2
7726	2.0
7546	2.1
7362	1.5
7203	0.4
7053	0.2
6903	1.7
6842	-0.3
6744	0.6
6702	0.0
6660	0.0

5.3.6 Total Scour Potential

The project reach is dominantly aggradational, so scour is not anticipated. However, when looking at the stable slope analysis, there is a single river station (6842.00) where the natural invert elevation is higher than the projected stable slope elevation. Minor erosion at this section is expected in the long-term, in order for the stable slope to be achieved.

6 Proposed Bank Top and Bank Toe Elevations

In the previously approved project proposal to LA County, it was agreed upon that the design top of bank elevations for the Smiser Ranch development would be based on a Q_{100} (8,483 cfs) water surface elevation plus adequate freeboard, with capacity for the Q_{Design} (10,800 cfs) water surface elevation. In order to meet this requirement, freeboard was calculated using results from the Q_{100} (8,483 cfs), and compared to the water surface elevation results of the Q_{Design} model. Anywhere the calculated top of bank elevation was less than the Q_{Design} water surface elevation, the design top of bank elevation was altered to meet the Q_{Design} water surface elevation. Design toe elevations were calculated using results from the Q_{100} (8,483 cfs) model. The hydraulic analysis provided in this report involved determining the bank top and toe elevations based on the proposed channel configuration.

6.1 Proposed Bank Top and Toe Elevations

In an effort to satisfy the conditions agreed upon with LACDPW, the more conservative values were selected as the design top and toe elevations. **Table 6-1** lists the calculated top and toe elevations using results from the Q_{100} (8,483 cfs) model, the calculated water surface elevation from the Q_{Design} (10,800 cfs) model, and the design elevations for each HEC-RAS section.

Table 6-1: Proposed Top and Toe Elevations for Soil Cement Bank Protection

HEC-RAS Section	Bank Station	Calculated Toe Elevation(1) (ft)	Design Toe Elevation (ft)	Calculated Top Elevation(2) (ft)	Q_{Design} WSE(3) (ft)	Design Top Elevation (4) (ft)	Proposed Min. Bank Height (5) (ft)
8326	- -	1300.71	1300.71	**1330.93**	1326.01	1330.93	30.22
8126	24+24.23	1297.80	1297.80	**1326.44**	1323.54	1326.44	28.64
7926	22+13.47	1296.10	1296.10	**1323.59**	1320.82	1323.59	27.49
7726	20+28.14	1293.95	1293.95	**1319.40**	1317.29	1319.40	25.45
7546	18+38.41	1289.20	1289.20	**1316.94**	1315.47	1316.94	27.74
7362	16+81.60	1288.22	1288.22	**1314.38**	1313.41	1314.38	26.16
7203	15+20.52	1284.98	1284.98	**1312.88**	1312.16	1312.88	27.90
7053	13+75.72	1288.27	1288.27	**1312.03**	1311.53	1312.03	23.76
6903	12+55.67	1284.33	1284.33	**1311.47**	1310.99	1311.47	27.14
6842	12+11.74	1283.55	1283.55	**1310.38**	1310.00	1310.38	26.83
6744	11+16.80	1278.96	1278.96	**1308.76**	1308.56	1308.76	29.80
6702	10+79.31	1275.62	1275.62	1304.74	**1306.34**	1306.34	30.72
6660	10+35.58	1273.22	1273.22	1304.31	**1305.88**	1305.88	32.66

Notes:

(1) *Calculated Toe Elevation based on calculations shown in **Table 4-3***

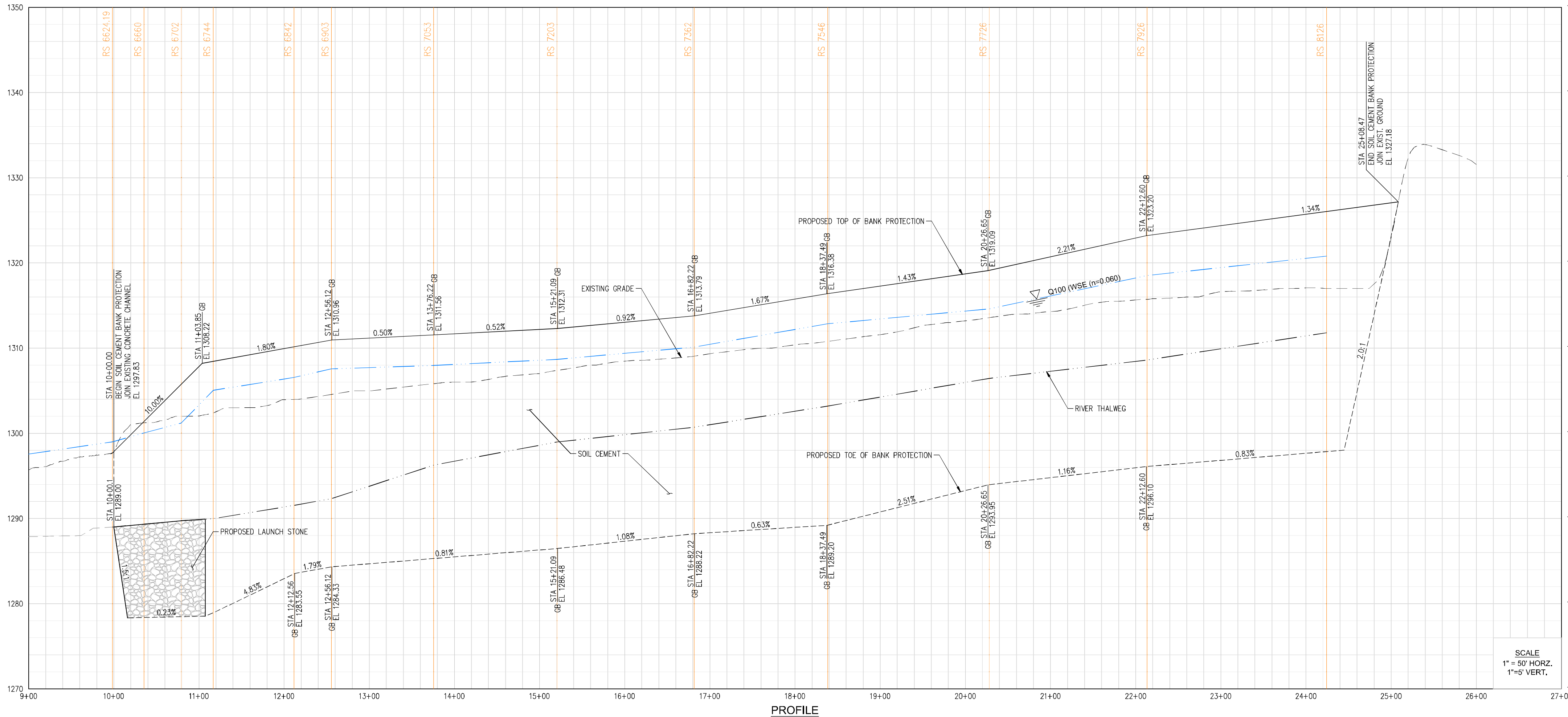
(2) *Calculated Top Elevation based on Q_{100} (8,483 cfs) water surface elevation plus calculated freeboard shown in **Table 4-2***

(3) *Q_{Design} (10,800 cfs) water surface elevation based on Manning's n=0.085 model*

(4) *"Design Top Elevation" based on higher of either "Calculated Top Elevation" or "Q_{Design} (10,800 cfs) Water Surface Elevation"*

(5) *Proposed min. bank height is difference between Design Top Elevation and Design Toe Elevation*

The profiles for the bank top and toe are shown on **Figure 6-1**. Locations of grade breaks were selected to ensure the top of bank met or exceeded the freeboard requirements.

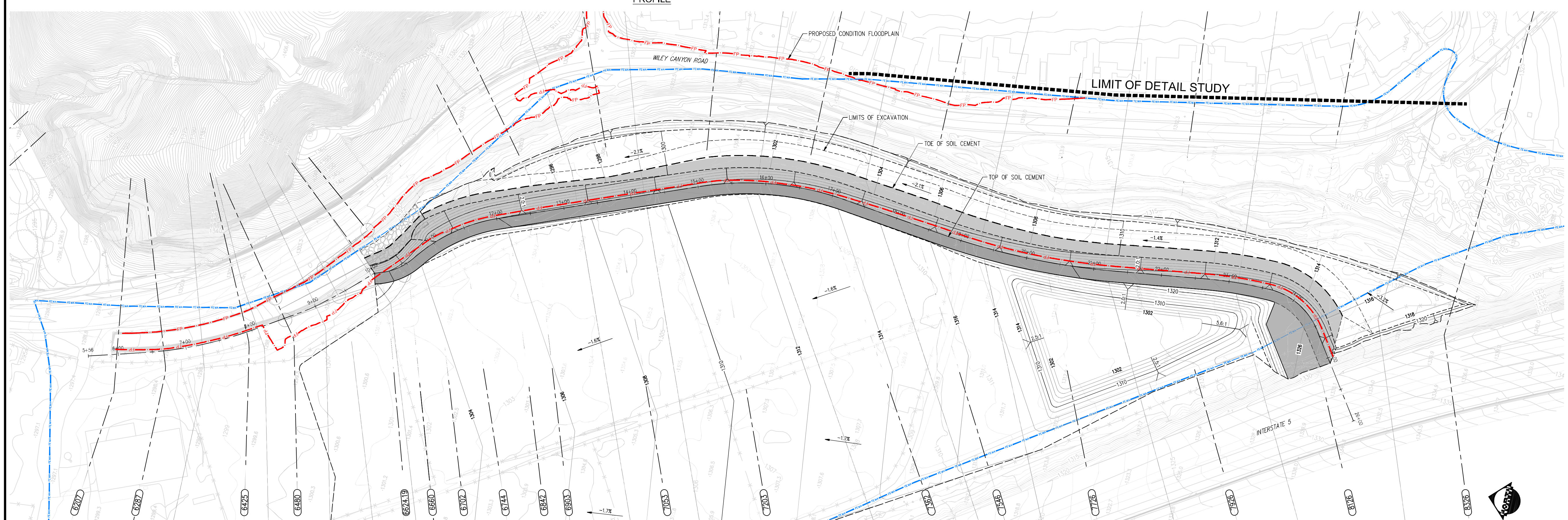


PROFILE

LEGEND

PROPOSED CONDITION FLOODPLAIN

EFFECTIVE FEMA 100 YEAR FLOODPLAIN (PER FIRM PANEL 06037C1031F DATED SEPT 26, 2008)



PLAN

NO	BY	DATE		DATE	APP.

SMISER RANCH/SOUTH FORK SCR

SOIL CEMENT BANK PROTECTION

DRAINAGE CONCEPT REPORT

LOS ANGELES COUNTY CA.

PACE Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

PREPARED JOSE CRUZ
PROJECT ENGINEER
R.C.E. NO. 72249
EXP. 06/30/2020
DRAWN BDP | SCALE AS SHOWN
DESIGNED JC
CHECKED MEK | DATE 5/19/2020

REGISTERED PROFESSIONAL ENGINEER JOSE CRUZ No. 72249 Exp. 06-30-20 CIVIL STATE OF CALIFORNIA

TITLE
SOIL CEMENT BANK PLAN AND PROFILE

FIGURE 6-1

JOB NO. A969-11

7 Soil Cement Bank Protection

7.1 Bank Protection Project Description

The proposed bank protection will consist of conventional soil cement bank protection to provide the appropriate level of freeboard and scour protection for all storm events up to the 100yr storm (Q_{100}). The following criteria was considered when designing the bank protection:

1. Flood control stability;
2. Durability of bank protection;
3. Safety concerns regarding access to and from the channel;
4. Bank protection maintenance;
5. Environmental compatibility with the native area and aesthetics;
6. Constructability; and
7. Cost of construction.

The purpose of the proposed bank protection is to provide erosion and flood control protection. The soil cement bank protection will be completely buried with soil backfill sloped at 3H:1V over the soil cement face. The excavation required to construct the bank protection will be backfilled and returned to existing grade or slightly lower to facilitate vegetation regrowth. Soil cement bank protection is constructed as a monolithic and homogenous structure consisting of approximately 90% native soils and 10% cement. The typical section consists of 8-foot wide and 6- to 12-inch thick layers of soil cement. Each layer of soil cement is set back from the edge of the previous layer, at a 1.5H:1V slope. The entire section varies in total height based on varying freeboard, flow depth and toe-down requirements.

The proposed soil cement bank protection addresses the above design criteria as follows:

1. Soil cement provides a stable riverbank protection material, in terms of both surface erosion and structural stability. Analysis of site soils will be performed to determine if they are suitable for use in soil cement. If unsuitable, off-site soils will be used.

2. The soil cement bank protection will be completely buried with a 3:1 slope soil backfill. Due to transitions from proposed soil cement bank protection (buried condition) to existing concrete and rip-rap bank protection (exposed conditions), some soil cement areas will be exposed.

7.2 Soil Cement Bank Protection Design Elements

This section describes design elements related to the proposed soil cement bank protection system along South Fork SCR associated with the development project. The proposed improvements along South Fork SCR consist of a total of approximately 1,500 lineal feet (LF) of bank protection.

7.2.1 Soil Cement Connections

At the upstream end of the project, the west bank soil cement will tie into existing embankment for the I-5 freeway between HEC-RAS River Stations 8126 and 8326. On the downstream end, the west bank soil cement protection will tie into the existing concrete bank protection per MMS No. F02000089 (Between HEC-RAS River Station 6660 and 6624.19). Soil cement placed behind the existing concrete bank protection shall be hand compacted using a vibrator plate to ensure compaction requirements are met and to achieve a good seal. Given the narrow base width of the channel section at the downstream tie-in point, the standard soil cement section will need to be altered in order to achieve the required toe-down depths of the soil cement bank protection.

7.2.2 *Storm Drain Penetrations*

There will be several storm drains from the proposed on-site development penetrating through the soil cement bank protection. The storm drain lines will be penetrating through the bank protection on the west bank. Storm drain penetrations are typically constructed after the soil cement bank protection has been completed. A section of the soil cement bank protection is removed in order to install storm drain pipe and outlet. The area around the pipe is then backfilled with concrete slurry up to the top of bank. Storm drain pipes can also be installed concurrently with the soil cement bank protection, but may not be practical in some instances, as it slows down the soil cement construction operation.

7.2.3 *Maintenance Access Road*

The bank protection incorporates a 16-foot wide multi-purpose maintenance/pedestrian access road that follows the alignment of the bank protection. The maintenance road is located directly above the uppermost layer of soil cement. Runoff from the maintenance road will be directed towards the proposed development and will be treated prior to being discharged to the storm drain system.

7.2.4 *Horizontal and Vertical Scour Gauges*

In order to measure abrasion of the soil cement, several scour gauges will be incorporated into the bank protection system. There are two ways that scour gauges are installed, either they are core drilled horizontally into the soil cement banks after completion of the project or installed concurrently during soil cement construction. If scour gauges are core drilled, they will be filled in with grout to secure scour gauge inside soil cement bank. In addition, vertical scour gauges are also installed adjacent to the toe alignment along the river bottom. The vertical scour gauges will be used to measure scour or degradation of the river bottom in the event of any significant storm event.

7.3 Material Suitability

The following soil cement material suitability analysis excerpts were taken from various ACI and PCA publications referenced in **Section 11.**

The erosion and overtopping of river banks by floodwaters is a significant flood concern in the southwest. In order to protect valuable land, bridges, and buildings from such erosion, many communities have found that stabilized soil, in the form of soil cement, meets the criteria of cost-effectiveness, performance, functional life, and aesthetics.

The American Concrete Institute (ACI 116R) defines soil cement as “a mixture of soil and measured amounts of Portland Cement and water compacted to a high density.” Soil cement can be further defined as a material produced by blending, compacting, and curing a mixture of soil/aggregate, Portland Cement, possibly admixtures including pozzolans, and water, to form a hardened material with specific engineering properties. The soil/aggregate particles are bonded by cement paste, but unlike concrete, the individual particle is not completely coated with cement paste.

A wide variety of soils can be used to make durable soil cement. In fact, most soils in Southern California are suitable for use with soil cement. Ideally, sand to silty sand with the highest dry unit weight possible should be used to make soil cement, as this material is more likely to be well graded. For maximum economy and most efficient construction, the Portland Cement Association (PCA) recommends the following soil gradation:

Sieve Size	% Passing
3/4”	80% - 100%
#4	60% - 90%
#40	30% - 50%
#200	5% - 25%

The Plasticity Index (PI) of the fines should not exceed 8.

The following is the soil classification, cement content for the borrow area/earthwork and groundwater levels as stated in the geotechnical report for TPM No. 18108 dated May 31, 2007, prepared by GeoLabs:

7.3.1 *Soil Classification*

Most of the native on-site soils are expected to be suitable as aggregate for the soil cement mix. The ideal material calls for a well-graded sand with some gravels and fine sands, and no or minimal clays.

7.3.2 *Cement Content*

An efficient mix utilizes the minimum cement content necessary to reach the specified design strengths. Based on strength and durability relationships developed by the Portland Cement Association, the minimum requirement for compressive strength at 7-day is 750 psi. A cement content of 8% to 10%, by weight, is anticipated based on several projects within the vicinity. The final cement content will be based on testing results from the actual base material stockpile.

7.3.3 *Aggregate Location*

It is assumed that on-site soils will be suitable for soil cement production, but future geotechnical investigations will be conducted to confirm this. Based on a myriad of tests performed by PCA, the ideal base material for soil cement, in general, is well-graded sand with some gravel and some fines. The soils that are extracted from the trench excavations typically are well graded sands and therefore used for the soil cement mix.

7.3.4 *Groundwater Levels*

All dewatering activities (if necessary) will be limited to the area from the soil cement grading daylight line to a maximum of 15 feet towards the creek. The contractor may request in writing an extension of the area for dewatering, except that in no case shall any dewatering or construction activities take place within the United States Army Corps of Engineers (ACOE) or California Department of Fish and Wildlife (CDFW) resource area without prior authorization.

Any groundwater data should not be assumed to be accurate during the period of construction. The contractor is responsible for obtaining and reviewing copies of the project geotechnical report and should independently determine groundwater levels and appropriate dewatering efforts necessary to prepare excavation for soil cement construction.

8 Existing and Proposed Floodplain Mapping

8.1 FEMA Floodplain Mapping

The 100-year floodplain for South Fork SCR was mapped by FEMA as shown on Flood Insurance Rate Map (FIRM) No. 06037C1031F, dated September 26, 2008. Currently, the proposed project is located in flood hazard area Zone A/AO. Upon approval of this Drainage Concept Report, a CLOMR application will be prepared for the project and will be submitted to the City of Santa Clarita and FEMA for concurrence and approval.

8.2 LACDPW Floodplain Mapping

The reach of South Fork SCR in the vicinity of the project does not have an established LACDPW ML Floodway/Floodplain; therefore, Letter of Map Revision Analysis will not be required for the Smiser Ranch development project. The existing and proposed condition floodplain mapping for South Fork SCR is shown on **Figure 4-1**.

9 Conclusion

The purpose of this report is to present the results of the hydraulic analysis in order to provide design guidelines for the proposed bank protection measures and to evaluate potential floodplain impacts caused by the project. The hydraulic analysis evaluates impacts changes in the floodplain fluvial mechanics over the long-term. Long-term adjustment values were obtained from the fluvial analysis described in **Section 5***.* The fluvial adjustment values are used in the hydraulic analyses to establish the final top and toe design of the bank protection.

The previous sections demonstrate that the proposed development and modifications to the South Fork SCR will not create any adverse off-site impacts or increase the flood hazard to the surrounding homes. It has also been shown that the changes to the South Fork SCR will not increase sediment transport capacity to the downstream channel owned and maintained by LACDPW.

Upon approval of this Drainage Concept Report, a CLOMR application will be prepared for the project and will be submitted to the City of Santa Clarita and FEMA for concurrence and approval.

10 Bibliography

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"Soil-Cement for Water Control: Laboratory Tests" (IS166.02W), Portland Cement Association, 1976.

"State-of-the-Art Report on Soil Cement" (230.1R-90), American Concrete Institute.

Appendix A – Approved Proposal to LA County Department of Public Works

Christine Huch

From: Dianne Lora
Sent: Monday, May 18, 2020 1:19 PM
To: Cherise Thompson
Subject: FW: Smiser Ranch - Update
Attachments: Smiser Ranch Proposal to LA County 6-6-19.pdf

From: Aracely Lasso
Sent: Monday, November 4, 2019 10:58 AM
To: Mark Krebs
Cc: Vilong Truong
Subject: Smiser Ranch - Update

Hi Mark,

Land Development Division has reviewed the attached proposal dated June 2019 and is supportive of the concept. Our Administration concurs and has authorized moving forward with the proposal. Please submit additional data and documentation that supports the proposed improvements to connect to the existing LACFCD channel.

If you have any questions, please feel free to contact me or you may contact Vilong Truong at vitruong@dpw.lacounty.gov.

Aracely C. Lasso, P.E.
Senior Civil Engineer
Los Angeles County Public Works
Office: (626) 458-5915
Mobile: (626) 759-0354

June 3, 2019

Art Vander Vis
Los Angeles County Department of Public Works
900 Fremont Ave.
Alhambra, CA 91803

Re: Development Proposal for Smiser Ranch Property/Wiley Canyon Creek, Santa Clarita, CA

Dear Mr. Vander Vis:

Wiley Canyon LLC and the City of Santa Clarita (City) have been working together to address drainage and flood protection for the Smiser Ranch property (property). Wiley Canyon LLC's development team, the City, and the Los Angeles County Department of Public Works (LACDPW) met in November 2018 and January 2019 to strategize on a concept to address the watershed drainage concerns. As a result of those meetings, a drainage concept was generated by Wiley Canyon LLC's development team with the common goal of obtaining project conceptual approval from LACDPW.

Attachment A, enclosed hereto, identifies current facts of the proposed drainage concept, the critical components, the proposed responsibilities of each party, and a summary of previous project meetings and memorandums produced. Additionally, enclosed are the following documents: **Exhibit A** (Parcel Information & Proposed Grading), **Exhibit B** (Floodplain Comparison), **Appendix A** (Draft Proposed Design Concept), and **Appendix B** (1-5 Culvert Capacity Investigation).

We understand the proposed concept is for discussion purposes. A final design would be subject to future City entitlements for the property and would be consistent with this drainage concept pursuant to the LACDPW's agreement.

If you have any questions regarding this letter, please contact Scott Sheridan directly at Wiley Canyon LLC at (818) 364-7505 or Robert Newman directly at the City of Santa Clarita at (661) 255-4842.

Sincerely,

Scott Sheridan
Wiley Canyon LLC

Robert Newman
City of Santa Clarita

cc: Mike Hennawy, City of Santa Clarita
Tom Clark, Wiley Canyon LLC
Glenn Adamick, RT Real Estate Corp
Mark Krebs, PACE

Enclosures: As stated

Attachment A
Smiser Ranch Property/Wiley Canyon Creek, Santa Clarita, CA

Current Facts

1) Wiley Canyon LLC intends to purchase and develop the subject property. The subject property is approximately 31 acres, of which approximately 20 acres will be developed and approximately 11 acres will be designated for widening of Wiley Canyon Creek and creation of storm water basins. The portion of Wiley Canyon Creek that flows adjacent to the property is semi-vegetated and earthen, bounded by concrete, engineered channels on its upstream (I-5 Caltrans) and downstream (Los Angeles County Flood Control District - LACFCD) ends. Upstream of the proposed site reach, flow passes beneath the I-5 Freeway in a triple 12'x12' box culvert. Downstream, flow exits the proposed site reach through the Wiley Canyon Road bridge and into the LACFCD concrete channel.

2) It is understood that the Los Angeles County Department of Public Works' (LACDPW) approval of this drainage concept is critical to proceeding with land planning of the site.

3) The City would like to improve existing flooding conditions on Wiley Canyon Road by reducing the water surface elevation in the creek and on the road.

4) Previous attempts at developing this property have been stalled based on potential LACDPW conditions that included implementation of an upstream debris basin and/or expansion of downstream concrete channel capacity.

5) The current published FEMA 100-year flow rate is 8,483 cfs and the LACFCD downstream concrete channel design flow rate is 10,800 cfs according to as-builts.

6) Current FEMA floodplain mapping puts a majority of the Smiser Ranch site in Zone "AO" (shallow flooding zone) and the existing Wiley Canyon Creek in Zone "A" (approximate flooding limits).

7) The LACFCD Capital floodway "ML Maps" maps do not include mapping of this reach of Wiley Canyon Creek.

Development Proposal/Elements Agreed to by the City and Wiley Canyon LLC

The following issues are critical components of the proposed drainage concept and are accepted by the City and Wiley Canyon LLC. Both agree to the following:

Attachment A
Smiser Ranch Property/Wiley Canyon Creek, Santa Clarita, CA

1) Development of the site will include approximately 1,500 LF of expanded earthen channel, added adjacent to the existing Wiley Canyon Creek reach (see attached Exhibit A). The proposed development side (west) of the channel will include ± 1,500 LF of soil cement or other suitable bank erosion protection. The expanded Wiley Canyon Creek will be graded so it minimizes impact to existing California Department of Fish and Wildlife (CDFW) and Army Corps of Engineers (ACOE) jurisdictional areas.

2) The design flow rate of the proposed project reach will be the FEMA Q100 of 8,483 cfs plus adequate freeboard. Channel capacity for LACFCD design flow rate of 10,800 cfs will be provided within the freeboard of the FEMA flow rate.

3) Development of the site will provide water quality BMP and detention as needed so as to not increase run-off from the proposed development in the pre vs. post condition.

4) Development of the site will reduce (not eliminate) flooding on Wiley canyon road (see Exhibit B). The lowered water surface elevation will be accomplished by widening the flood conveyance channel (see Exhibit A).

   The improvements will maintain or reduce existing sediment transport capacity through the proposed site reach, as well as provide sediment transport conveyance greater than or equal to that of the delivery reach (upstream of the I-5 culvert) (evaluated at the FEMA 100-yr flow rate – 8,483 cfs - and the design flow rate of the LACFCD channel downstream - 10,800 cfs).

5) The development area will be removed from the FEMA AO flood zone through both a reduction of water surface elevation from the proposed channel improvements and raising the ground surface of the proposed development area. The portion of the existing FEMA AO floodplain that overlaps the proposed channel expansion area will be altered form AO to A (only within the limits of the soil cement bank protection – see Exhibit B). This is subject to FEMA approval of a Letter of Map Revision (LOMR) for title site.

6) The City agrees to accept fee title ownership of Assessor Parcel No. 2825-001-904 from the County of Los Angeles (County) (see Exhibit A).

7) The City agrees to accept the proposed project bank protection and Wiley Canyon Creek flood control improvements on the property for maintenance via a Drainage Benefit Assessment District which would be established over the property if a future project is approved.

Attachment A
Smiser Ranch Property/Wiley Canyon Creek, Santa Clarita, CA

Development Proposal to LACDPW

Wiley Canyon LLC and the City propose the following to LACDPW:

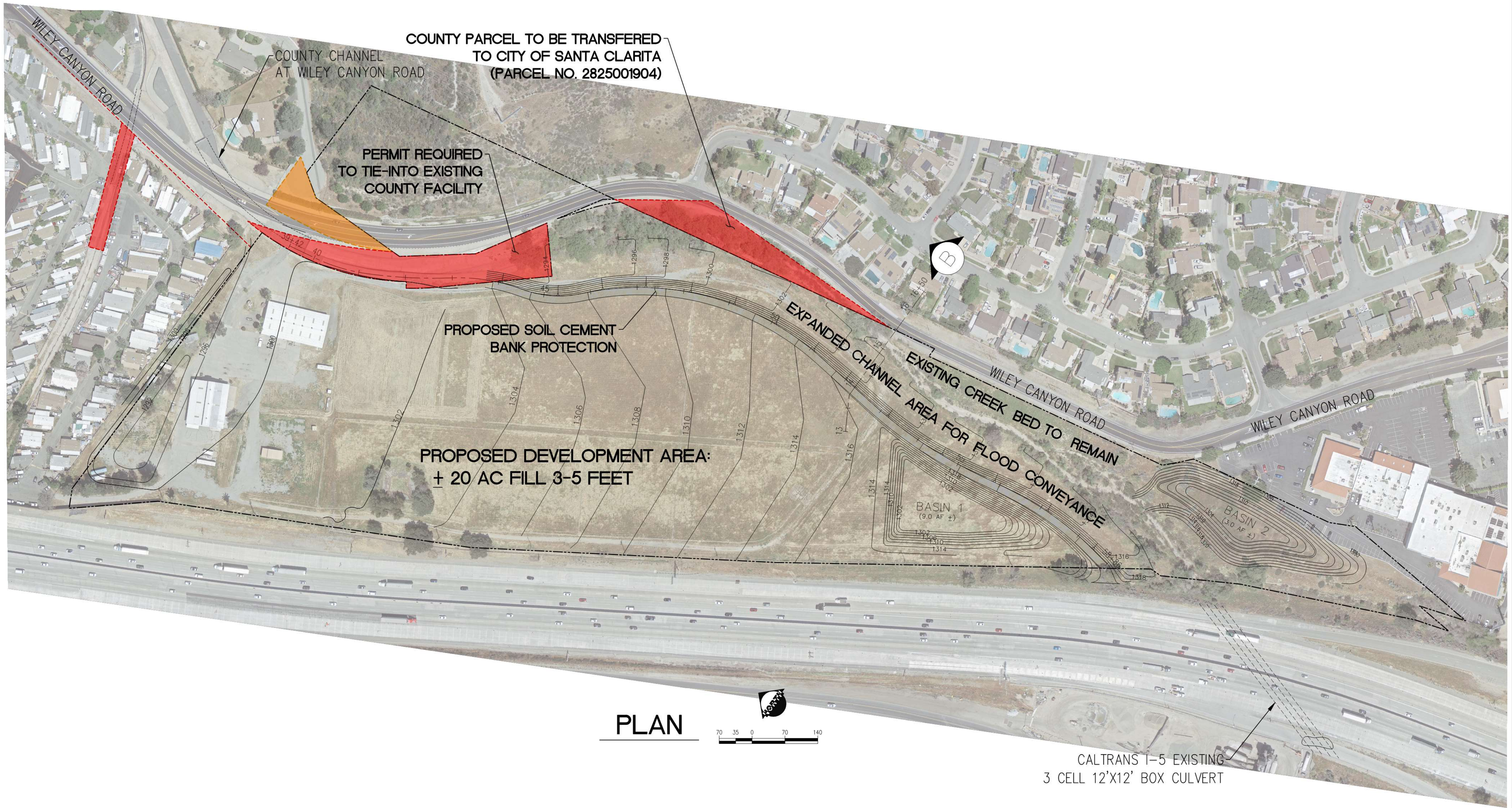
1) The County will issue a permit to connect to the existing LACFCD channel (Asset (MMS) No. F02000089). This includes extension of the existing concrete channel upstream to meet the proposed channel section (see Exhibit A). The proposed design will maintain or reduce existing flow rate and sediment volume entering the LACFCD channel (evaluated at the FEMA 100-yr flow rate – 8,483 cfs - and the design flow rate of the LACFCD channel at Wiley Canyon Road - 10,800 cfs). This will be established by a report subject to LACDPW review and approval, to be submitted by PACE, our Stormwater Management Consultant, at a later date. The County understands that the City will maintain the portions of the proposed drainage concept associated with bank stabilization.

2) The County agrees to transfer fee title ownership of Assessor Parcel No. 2825-001-904 to the City (see Exhibit A). The City will need to be informed by the County on the subsequent procedure for property transfer.

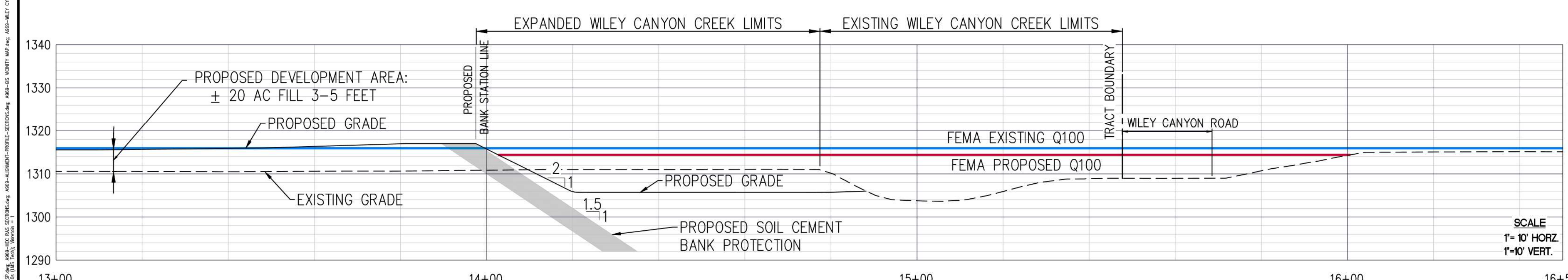
Summary of Previous Meetings/Memorandums Produced

1) Conceptual Design: As requested by the Developer and the City, PACE prepared a memorandum demonstrating the conceptual proposed project design including elevated developed area and expanded Wiley Canyon Creek, dated June 25, 2018. This information was presented to the City / County at the October 4, 2018 meeting. This memorandum also included a history of flow rates relevant to the proposed drainage concept, which can be found in a table in the full memorandum, attached in Appendix A. At this meeting, the County requested an evaluation of the existing floodplain condition upstream of the I-5 culvert.

2) 1-5 Culvert Capacity Analysis: As requested, PACE prepared this analysis in a memorandum dated January 9, 2019 and presented this to the City and County at the January 10, 2019 meeting. This analysis concluded that 7,000 cfs passes through the Caltrans 1-5 culvert before overtopping the LACDPW channel banks onto Calgrove Boulevard and adjacent private property in the upstream reach (see Appendix B for the full analysis). Using the results of this analysis and the research into other published flow rates for the proposed site reach, it was determined that the proposed site reach could be reasonably designed for the FEMA 100-yr flow of 8,483 cfs with adequate freeboard.



PLAN



SECTION B

LEGEND

- PROJECT BOUNDARY (SOURCE: ALLIANCE 5-1-18)
- LACFCD PARCEL (SOURCE: SMISER 10-3-18)
- CITY OF SANTA CLARITA PARCEL (SOURCE: SMISER 10-3-18)
- EXISTING CULVERT
- PROPOSED SOIL CEMENT BANK PROTECTION

WILEY CANYON PROJECT
EXHIBIT A
PARCEL INFORMATION
DATE: 2-04-2019

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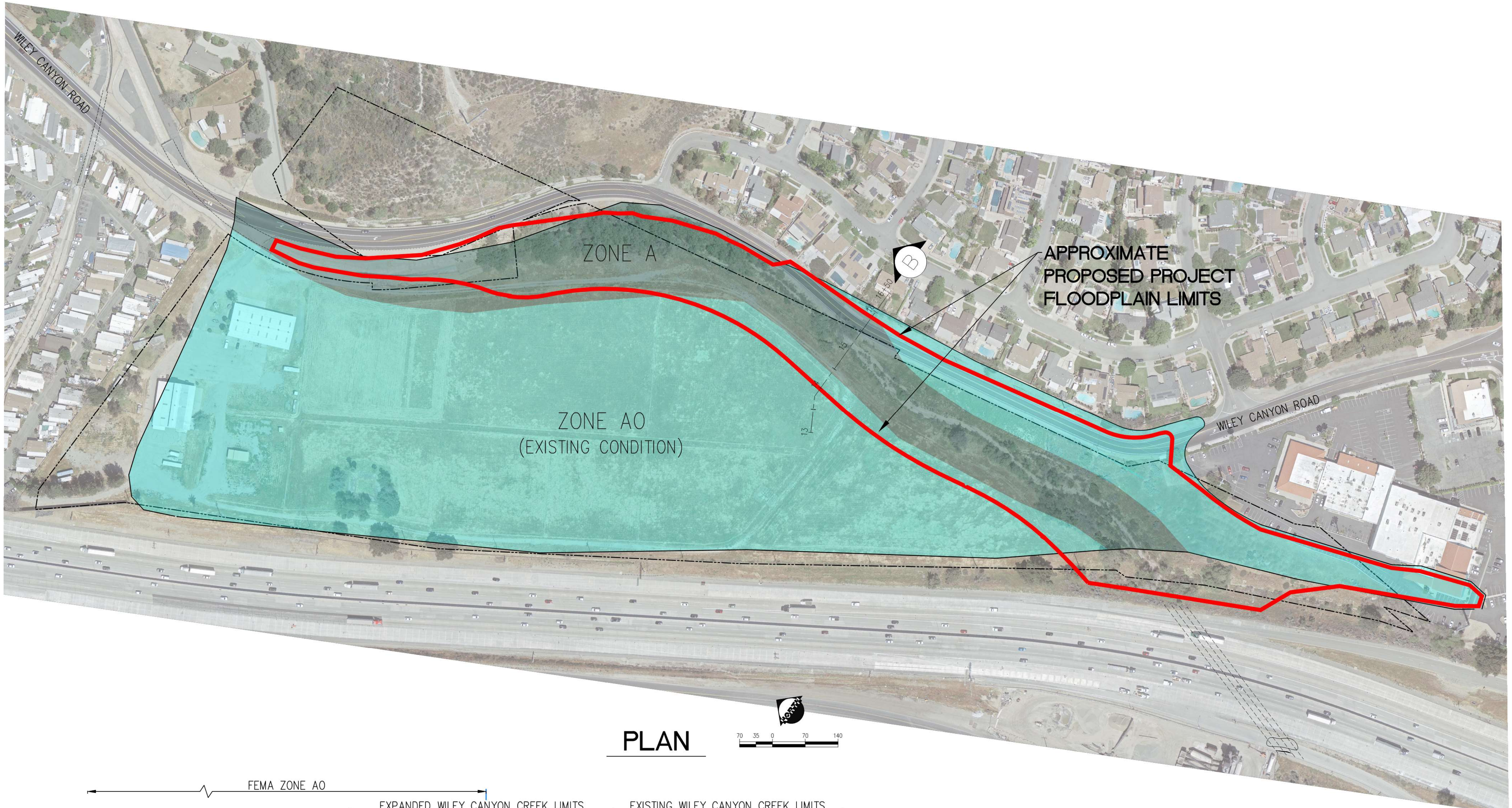

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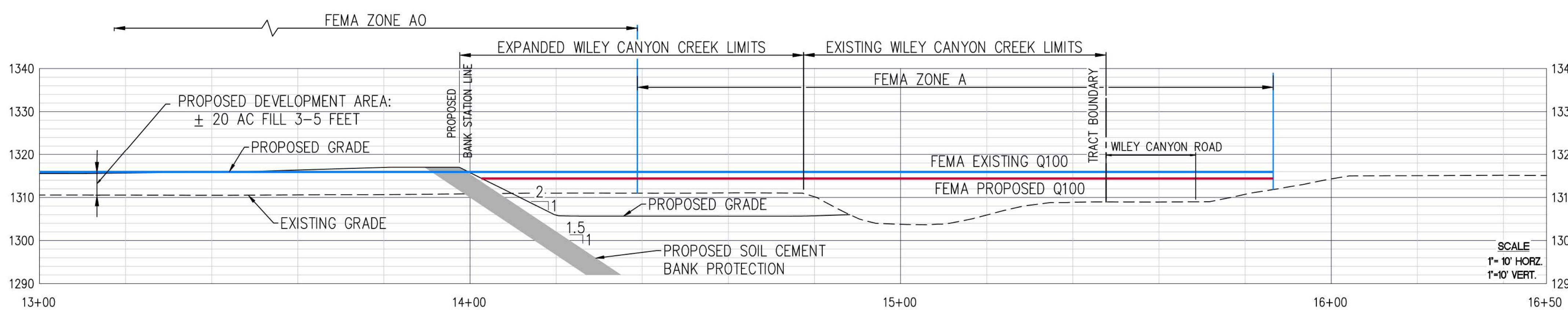

SECTION B

LEGEND

- PROJECT BOUNDARY (SOURCE: ALLIANCE 5-1-18)
- APPROXIMATE FEMA EFFECTIVE ZONE AO (DATE: 2-11-16)
- APPROXIMATE FEMA EFFECTIVE ZONE A (DATE: 2-11-16)
- PROPOSED FLOODPLAIN LIMITS
- EXISTING CULVERT

WILEY CANYON PROJECT

EXHIBIT B
FLOODPLAIN COMPARISON

DATE: 2-04-2019

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P:\A969\Engineering\GlobalExhibits\A969-70 SC - (36x48) FLOOD PLAIN EXHIBIT B.dwg

Appendix A – Draft Proposed Design Summary

PACE
Advanced Water Engineering

Technical Memorandum

Date: June 25, 2018

To: Tom Clark
Scott Sheridan
Glenn Adamick

From: Cherise Thompson, EIT
Mark Krebs, PE, President

Re: Wiley Canyon – Proposed Channel Design Executive Summary #A969

1 Introduction

The Sheridan Ebbert Development & Royal Clark Development companies are proposing to develop a located between the I-5 and the west bank of the "South Fork" Santa Clara River. This area, known as Smiser Ranch, is mostly within the FEMA 100-year floodplain (the creek area is in Zone A – the approximate limits of the 100-yr floodplain). There does not currently exist any detailed floodplain modeling of this area by FEMA and most of the proposed development area is in FEMA Zone AO with flooding of less than 3 feet of depth. From a flood protection stand point the area has challenges with flooding from the South Fork onto Smiser Ranch to the west and the adjacent Wiley Canyon Road, which is directly east. In order to mitigate this potential flooding, changes to the South Fork must be made without negatively impacting the existing creek conditions or increasing flooding on Wiley Canyon Road. PACE believes that implementation of the proposed conceptual channel design can be the foundation to providing an acceptable flood management system addressing these obstacles while preserving reasonable amount of land to develop.

The portion of the South Fork upstream of the project site collects flows from East, Rice, Leaming, Wiley, and Towsley Canyons before routing them in a triple 12' x 12' RCB under Interstate 5, which outlets into an earthern channel within and just adjacent to Smiser Ranch. Upon exiting Smiser Ranch, flows enter a 28'w x 14.5'h RC box beneath Wiley Canyon Road. The existing portion of channel within the project reach is earthen and vegetated. The channel becomes concrete lined approximately 450' upstream of the face of the Wiley Canyon Road 28'w x 14.5'h culvert.

The proposed changes to the South Fork reach along Smiser Ranch include expanding the channel section to the west of the existing flowline, which shall remain untouched to preserve the vegetation and wildlife habitat there. This widened channel will be trapezoidal in shape and approximately 100' wide, from the point where it meets the undisturbed portion of existing channel to its western bank on the development side of the river. In addition to the proposed channel modifications, two stormwater detention basins are proposed to negate the additional runoff created by developing the land, as well as provide BMP treatment capacity for the 85th percentile storm flows. This results in the creation of approximately 18 acres of developable land, outside of the proposed condition 100-year FEMA floodplain. The developable portion of the land will also be raised above the FEMA 100-yr floodplain elevation. Soil cement will be incorporated into the design of the bank adjacent to the 18-acre pad to protect against creek bank erosion.

This concept will collect and convey 100-yr storm flows while decreasing depth and velocity, protecting existing creek vegetation and wildlife habitat, and improving potential flooding conditions on Wiley Canyon Road. Preliminary HEC-RAS hydraulic modeling was used to address the modifications to the South Fork under this concept.

2 Hydrology

2.1 Off-site Hydrology

Flow rates obtained from the FEMA FIS study revised April 4, 2018 were used for the design of the channel. The flow rate listed in the FIS for the 1% annual chance storm approximately 500' downstream of Wiley Canyon Road is 8,483 cfs. Additionally, a larger flow rate of 10,800 cfs was identified in the as-built drawings for the 28'w x 15.4'h RC box beneath Wiley Canyon Road, dated March 1986. The proposed Smiser Ranch development project incorporates 3' of freeboard for the FEMA 100-yr flow rate. Additionally, the top of channel bank is designed to ensure the proposed development is protected from 10,800 cfs WSE.

In addition to these two flow rates, there is a third flow rate, which PACE obtained from the LA County Stormwater Engineering Division. At node 126AN, the Q50 clear water flow rate is listed as 11,699 cfs and the Q50 burn flow rate is 12,428 cfs. After performing the necessary calculations, a bulked flow rate of 13,857 cfs was obtained (this would be LACDPW "Capital Flood Flow Rate". This flow rate was used in the design of the proposed channel because the existing RC box beneath Wiley Canyon Rd. at the downstream end of the project site was not designed for a flow this large, so even if the proposed Smiser Ranch channel design accommodated this larger flow rate, water would inevitably back up and overtop the Wiley Canyon Road culvert. Additionally, the triple 12' x 12' culvert under I-5 can not accommodate this larger (Capital Flood) flow. A summary of these different flow rates can be found below in Table 2.1.

Table 2.1 Channel Design Flow Data

Source	Date	Design Flow (cfs)	Existing Condition	Proposed Smiser Ranch Project
FEMA	April 4, 2018	8,483	Overtops	Contained w/3' FB
As-Builts	March 1986	10,800	Overtops	Contained
LA County	2001	13,857	Not Evaluated	Not Evaluated

2.2 On-site Hydrology

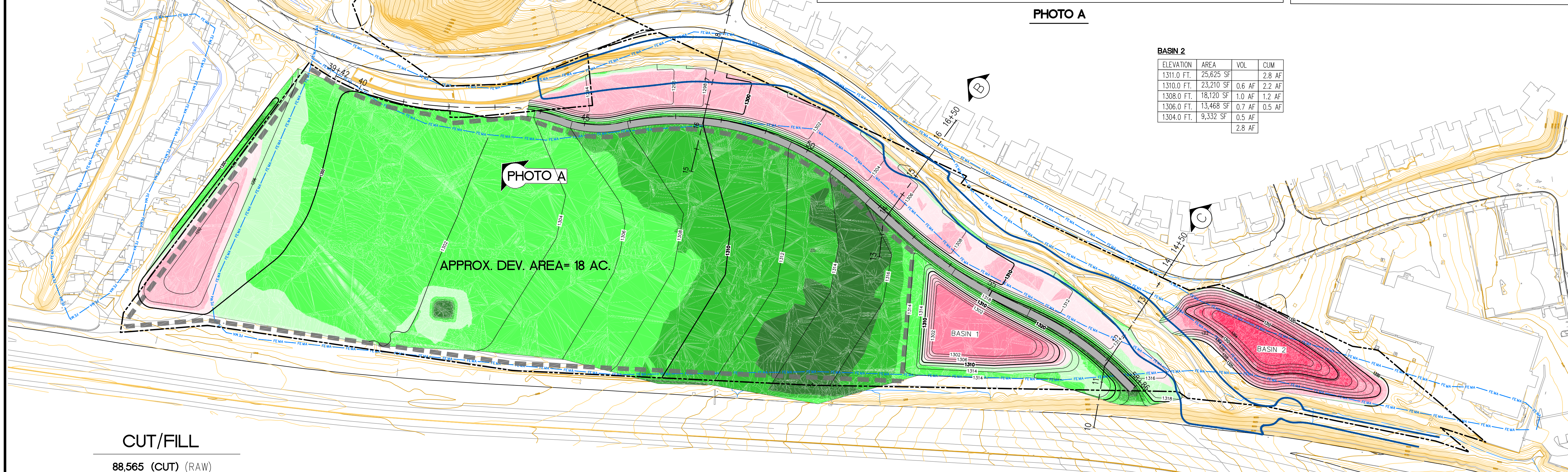
Due to the development of what is partially developed land, there is an increase of runoff that is expected to be added to the existing channel flows. This change, in addition to the 85th percentile flows, make up 4.05 and 1.22 acre-ft of volume respectively. A combined total of 5.27 acre-ft must be prevented from being added to the existing peak flow in the channel. It is proposed that two basins with a combined storage of up to 11.6 acre-ft will be constructed at the upstream end of the property, as shown in Figure 2.2.1. Directing storm runoff flows from the development to a point on the upstream end of the property would be extremely difficult, so it is proposed that the basins on the upstream end capture a volume of water from the upstream portion of the watershed which exceeds the 5.27 acre-ft created by the development, while all development flows enter the channel at the downstream end of the property after undergoing the required water quality treatments. Since the volume of water the basins will be capturing exceeds the volume of runoff from development of the site, the project can discharge to the river and present no increase in river peak flow rate as a result.

PACE

PHOTO A

LEGEND

- PROJECT BOUNDARY (SOURCE: ALLIANCE 5-1-18)
- JURISDICTIONAL LIMITS (SOURCE: ALLIANCE 5-1-18)
- CURRENT FEMA EFFECTIV (MAP 1031F DATE: 9-26-08)
- PROPOSED BANK PROTECTION
- APPROX. DEVELOPABLE AREA



BASIN 2

ELEVATION	AREA	VOL	CUM
1311.0 FT.	25,625 SF		2.8 AF
1310.0 FT.	23,210 SF	0.6 AF	2.2 AF
1308.0 FT.	18,120 SF	1.0 AF	1.2 AF
1306.0 FT.	13,468 SF	0.7 AF	0.5 AF
1304.0 FT.	9,332 SF	0.5 AF	
		2.8 AF	

CUT/FILL

88,565 (CUT) (RAW)
75,385 (FILL) (RAW)

13,181 (NET CUT) (RAW)

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-28.11	-20.00	
2	-20.00	-10.00	
3	-10.00	-5.00	
4	-5.00	-3.00	
5	-3.00	0.00	
6	0.00	3.00	
7	3.00	5.00	
8	5.00	7.80	

BASIN 1

ELEVATION	AREA	VOL	CUM
1314 FT.	45,872 SF		8.8 AF
1312 FT.	40,128 SF	2.0 AF	6.8 AF
1310 FT.	35,412 SF	1.7 AF	5.1 AF
1308 FT.	31,308 SF	1.5 AF	3.5 AF
1306 FT.	27,408 SF	1.4 AF	2.2 AF
1304 FT.	23,769 SF	1.2 AF	1.0 AF
1302 FT.	20,342 SF	1.0 AF	
		8.8 AF	

NORTH

100 50 0 100 200

DRAFT

WILEY CANYON PROJECT
OVERALL PLAN-CUT/FILL

DATE: 6-21-2018

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3 Hydraulics

3.1 Existing Conditions Model

The existing conditions HEC-RAS model was developed using both County topographic data and information from the as-builts of the downstream portion of the project reach and the portion of channel downstream of the project site. The furthest upstream cross-section begins just downstream of the I-5 culvert exit and the furthest downstream cross-section ends between the Old Wiley Canyon Rd. culvert and the De Wolfe Rd. culvert. Manning's values for the overbanks and main channel were kept at a uniform value of 0.06 with exception to concrete-lined portions of channel, which were kept at a value of 0.015. Ineffective flow areas were added to the cross-sections where the FEMA floodplain boundary line intersected to avoid calculation errors within RAS dealing with velocity changes within a cross-section and calculating critical depth with split flows.

3.2 Proposed Conditions Model

Three proposed conditions models were created, each with a different manning's value: n = 0.025 for designing the bank protection toe, n = 0.06 for floodplain determination and evaluation of pre vs post-project impacts, and n = 0.085 for max water surface elevation used for freeboard determination. In all three models, a manning's of n = 0.015 was still maintained for concrete lined portions. The ineffective flow areas included in the existing conditions model were also included in each of the proposed models and levees were added to the top of the proposed left bank. The existing channel geometry within the jurisdiction of the regulatory agencies was left untouched for the most part (see Figure 3.2.1). Proposed channel changes begin at the west end of this jurisdiction line, where the channel is widened approximately 100' into the development. Typical cross sections and profile helping to illustrate the proposed changes are shown in Figure 3.2.2.

LEGEND

Project boundary line	PROJECT BOUNDARY (SOURCE: ALLIANCE 5-1-18)
Jurisdictional limits line	JURISDICTIONAL LIMITS (SOURCE: ALLIANCE 5-1-18)
FEMA line	CURRENT FEMA EFFECTIV (MAP 1031F DATE: 9-26-08)
5162	HEC RAS SECTIONS
Bank protection symbol	PROPOSED BANK PROTECTION
Dashed lines	EXISTING CULVERT DRAINAGE

BASIN 2

ELEVATION	AREA	VOL	CUM
1311.0 FT.	25,625 SF		2.8 AF
1310.0 FT.	23,210 SF	0.6 AF	2.2 AF
1308.0 FT.	18,120 SF	1.0 AF	1.2 AF
1306.0 FT.	13,468 SF	0.7 AF	0.5 AF
1304.0 FT.	9,332 SF	0.5 AF	
		2.8 AF	

BASIN 1

ELEVATION	AREA	VOL	CUM
1314 FT.	45,872 SF		8.8 AF
1312 FT.	40,128 SF	2.0 AF	6.8 AF
1310 FT.	35,412 SF	1.7 AF	5.1 AF
1308 FT.	31,308 SF	1.5 AF	3.5 AF
1306 FT.	27,408 SF	1.4 AF	2.2 AF
1304 FT.	23,769 SF	1.2 AF	1.0 AF
1302 FT.	20,342 SF	1.0 AF	
		8.8 AF	

NORTH

100 50 0 100 200

DRAFT

WILEY CANYON PROJECT
OVERALL AERIAL PLAN

DATE: 6-21-2018

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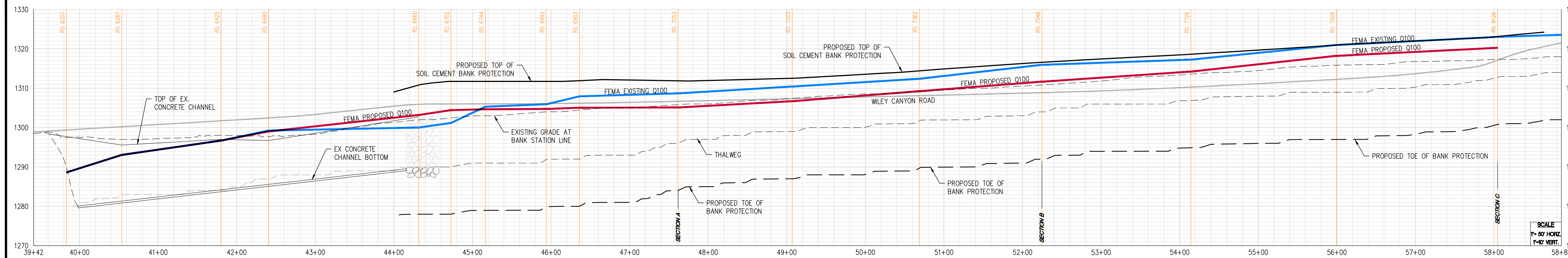
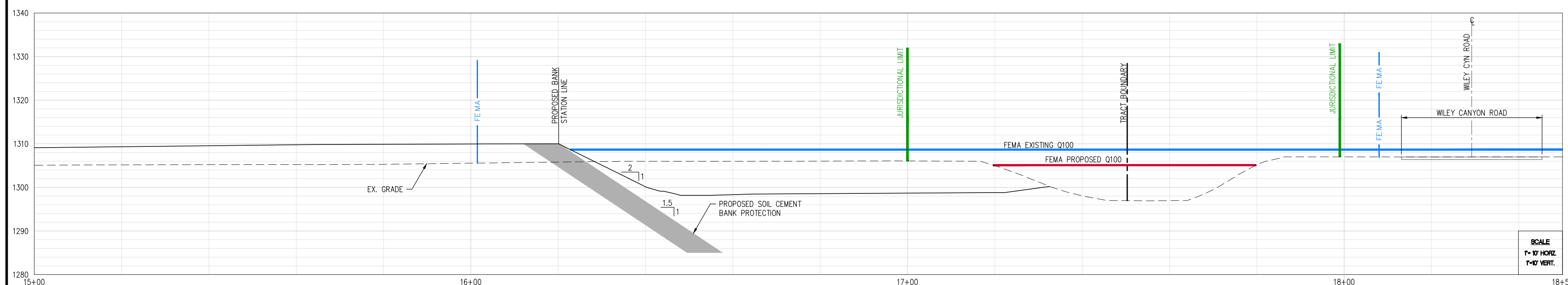
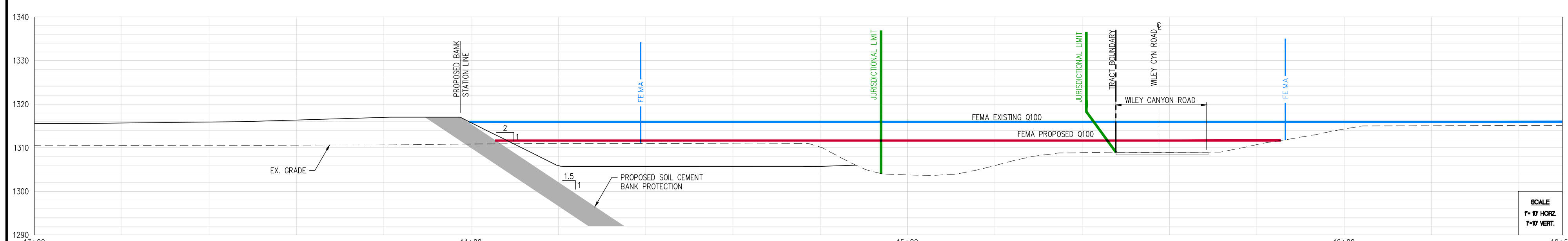


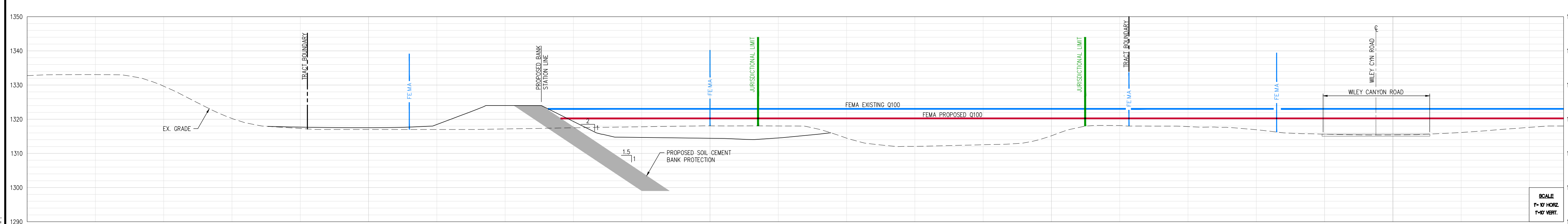
A969-PROPOSED BANK PROTECTION - PROFILE



A969-SECTION A (HEC-RAS-7053)



A969-SECTION B (HEC-RAS-7546)



A969-SECTION C (HEC-RAS-8126)

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WILEY CANYON PROJECT

PROFILE - SECTIONS

DATE: 6-21-2018

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3.3 HEC-RAS Hydraulic Model Results

The results of the proposed conditions HEC-RAS model are summarized and compared to existing conditions in the tables below. For simplicity, the cross-sections downstream of the Wiley Canyon Rd. culvert entrance were not included.

Table 3.3.1 – Proposed vs. Existing WSE (n = 0.06)

Channel Type	River Sta.	Existing WSE Q = 8,483 cfs n = 0.06	Proposed WSE Q = 8,486 cfs n = 0.06	Δ WSE E – P (ft)
Natural Bottom	8326	1324.9	1324.1	0.8
Natural Bottom	8126	1323.0	1320.2	2.8
Natural Bottom	7926	1321.0	1318.2	2.7
Natural Bottom	7726	1317.3	1314.2	3.0
Natural Bottom	7546	1315.9	1311.7	4.3
Natural Bottom	7362	1312.4	1309.3	3.1
Natural Bottom	7203	1310.4	1306.7	3.7
Natural Bottom	7053	1308.7	1305.1	3.6
Natural Bottom	6903	1307.9	1305.1	2.9
Natural Bottom	6842	1305.9	1304.7	1.2
Natural Bottom	6744	1305.3	1304.6	0.7
Natural Bottom	6702	1301.2	1304.4	-3.2
Concrete Trap	6660	1300.0	1303.2	-3.1
Concrete Rect	6480	1299.2	1299.0	0.2
Concrete Rect	6425	1296.7	1296.7	0.0
Concrete Rect	6287	1293.1	1293.1	0.0
Concrete Rect	6207	1288.6	1288.6	0.0

Table 3.3.2 – Proposed Top of Left Bank

Channel Type	River Sta.	Proposed WSE Q = 8,483 cfs n = 0.085	Proposed Top of Left Bank Elev.	Freeboard (ft)
Natural Bottom	8326	1324.5	1327.5	3
Natural Bottom	8126	1321.7	1324.7	3
Natural Bottom	7926	1319.3	1322.3	3
Natural Bottom	7726	1315.8	1318.8	3
Natural Bottom	7546	1313.1	1316.1	3
Natural Bottom	7362	1310.6	1313.6	3
Natural Bottom	7203	1308.2	1311.2	3
Natural Bottom	7053	1306.1	1309.1	3
Natural Bottom	6903	1305.6	1308.6	3
Natural Bottom	6842	1305.0	1308.6	3.6

Natural Bottom	6744	1304.8	1308.6	3.8
Natural Bottom	6702	1304.4	1308.4	4
Concrete Trap	6660	1303.0	1307.3	4.3
Concrete Rect	6480	1299.0	1303.4	4.4
Concrete Rect	6425	1296.7	1299.7	3
Concrete Rect	6287	1293.1	1296.1	3
Concrete Rect	6207	1288.6	1291.6	3

Table 3.3.3 – Proposed WSE for Q = 10,800 cfs vs. Top of Left Bank (n = 0.06)

Channel Type	River Sta.	Proposed WSE Q = 10,800 cfs n = 0.06	Proposed Top of Left Bank Elev.	Freeboard (ft)
Natural Bottom	8326	1325.2	1327.5	2.3
Natural Bottom	8126	1321.4	1324.7	3.3
Natural Bottom	7926	1319.3	1322.3	3
Natural Bottom	7726	1315.0	1318.8	3.8
Natural Bottom	7546	1312.7	1316.1	3.4
Natural Bottom	7362	1310.5	1313.6	3.1
Natural Bottom	7203	1309.0	1311.2	2.2
Natural Bottom	7053	1308.6	1309.1	0.5
Natural Bottom	6903	1308.5	1308.6	0.1
Natural Bottom	6842	1308.3	1308.6	0.3
Natural Bottom	6744	1308.3	1308.6	0.3
Natural Bottom	6702	1308.1	1308.4	0.3
Concrete Trap	6660	1307.0	1307.3	0.3
Concrete Rect	6480	1303.1	1303.4	0.3
Concrete Rect	6425	1299.5	1299.7	0.2
Concrete Rect	6287	1295.5	1296.1	0.6
Concrete Rect	6207	1290.7	1291.6	0.9

Table 3.3.4 – Proposed vs. Existing Velocity (n = 0.025)

Channel Type	River Sta.	Existing Vel (ft/s) Q = 8,483 cfs n = 0.025	Proposed Vel (ft/s) Q = 8,483 cfs n = 0.025	Δ Vel E – P (ft/s)
Natural Bottom	8326	21.4	21.4	0.0
Natural Bottom	8126	20.9	22.2	-1.3
Natural Bottom	7926	17.6	16.2	1.4
Natural Bottom	7726	19.4	15.9	3.4
Natural Bottom	7546	23.4	19.0	4.5
Natural Bottom	7362	19.6	17.7	1.9

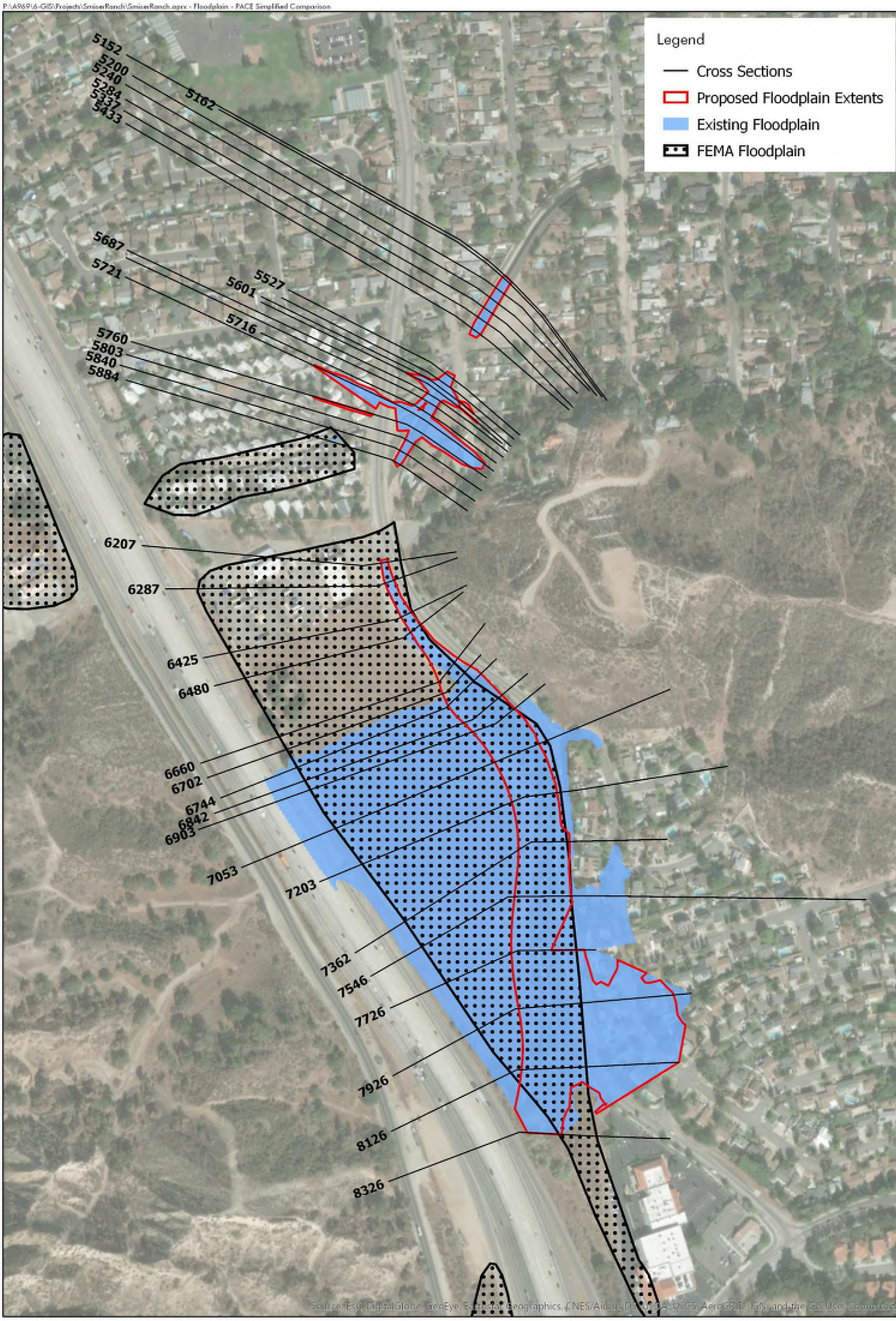
Natural Bottom	7203	21.2	16.2	4.9
Natural Bottom	7053	20.4	17.2	3.3
Natural Bottom	6903	23.7	5.6	18.2
Natural Bottom	6842	17.0	5.4	11.7
Natural Bottom	6744	22.6	4.6	18.0
Natural Bottom	6702	16.3	5.2	11.0
Concrete Trap	6660	18.5	7.1	11.4
Concrete Rect	6480	16.8	18.1	-1.3
Concrete Rect	6425	21.3	21.4	0.0
Concrete Rect	6287	25.2	25.2	0.0
Concrete Rect	6207	29.5	29.5	0.0

4 Conclusion

As shown in the tables in Section 3.3, the proposed concept for the South Fork would lower the water surface profile in nearly all locations along the project reach, reducing flooding on Wiley Canyon Road, and providing adequate freeboard of 3 feet to the development. There is one area where water surface elevations are increased in the proposed condition. This area can be seen on the profile in Figure 3.3.2. PACE will continue to work on potential design changes in this area to minimize the increase. Despite this increase in water surface elevation at this location (river stations 6702 and 6660), water does not overtop Wiley Canyon Road.

In addition, velocities are lowered in the proposed condition with only a couple of exceptions, ensuring existing vegetation and wildlife habitat in the river are not negatively impacted. Furthermore, the velocity is not lowered to the point where increased sedimentation is likely to be an issue. Figure 4.1 demonstrates the difference in floodplain extents between existing and proposed conditions, helping further illustrate the improvements the proposed changes will have on the development and neighboring areas. It should be noted that the “Existing Floodplain” was derived from the HEC-RAS model with existing conditions topography and is not meant to replace the FEMA floodplain boundary. It is simply useful to contrast the proposed conditions HEC-RAS results with an equivalent baseline.

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch.aprx - Floodplain - PACE Simplified Comparison



DRAFT

SMISER RANCH

PACE PROPOSED MODEL FLOODPLAIN COMPARISON

PACE Advanced Water Engineering

0 150 300 600 Feet

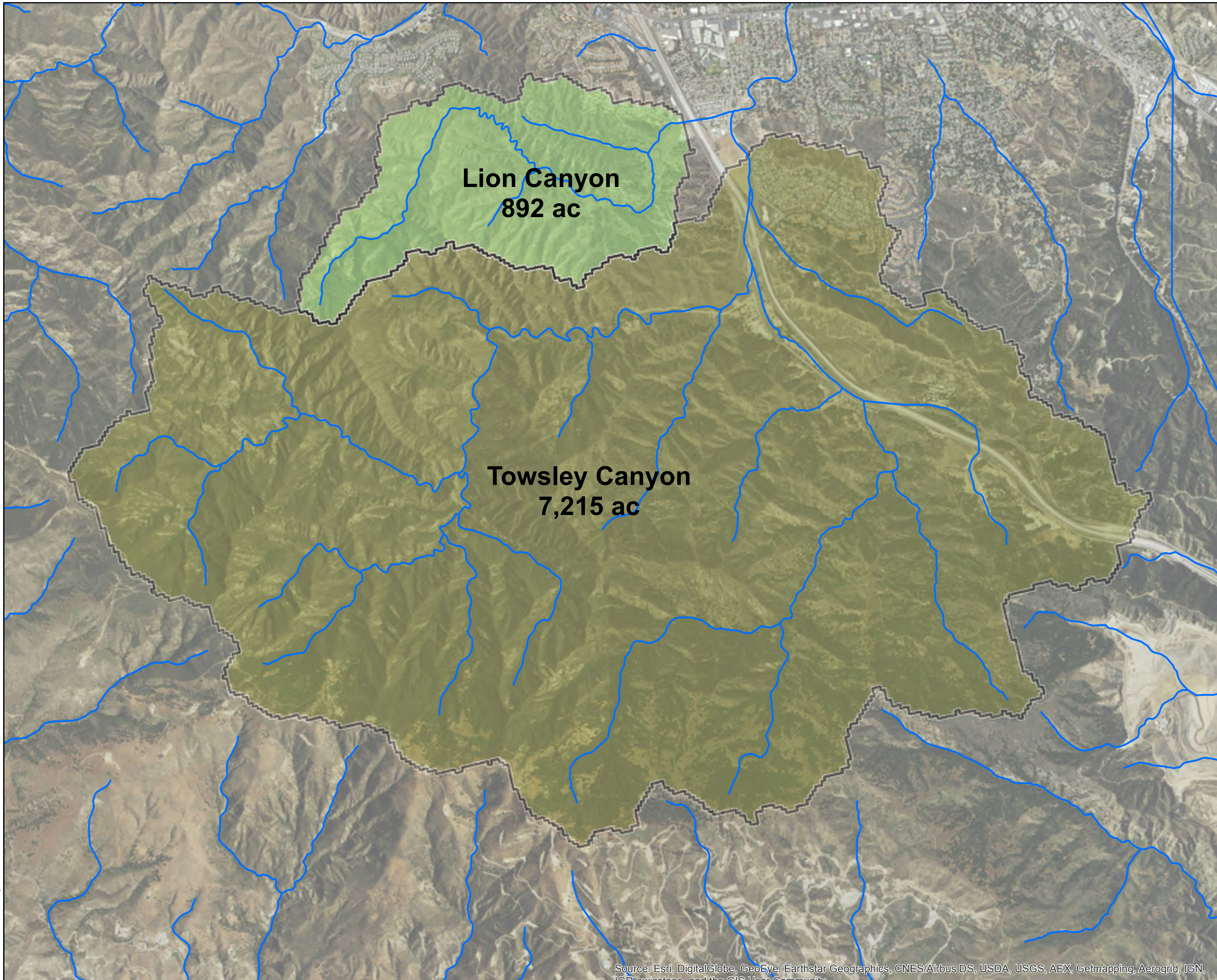
Date: 6/20/2018

Job Number: A969

Figure 4.1

PACE
Advanced Water Engineering

Appendix



CALGROVE SITE

LOS ANGELES CO. CA

Legend

- Flowlines
- Lion Canyon Watershed
- Towsley Watershed

0 1,500 3,000 6,000 Feet

PACE Advanced Water Engineering

Date: 2/12/2016

Job Number JOB#

Drawn By thowze

Figure 1

WATERSHEDS

P:\A969\6-GIS\Mxds\Workspace\CalGroveWatershed.mxd

...e Flood Insurance Study report for this jurisdiction.

...ce is available in this community, contact your insurance ...d Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

PANEL 1031F

FIRM

FLOOD INSURANCE RATE MAP

LOS ANGELES COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1031 OF 2350

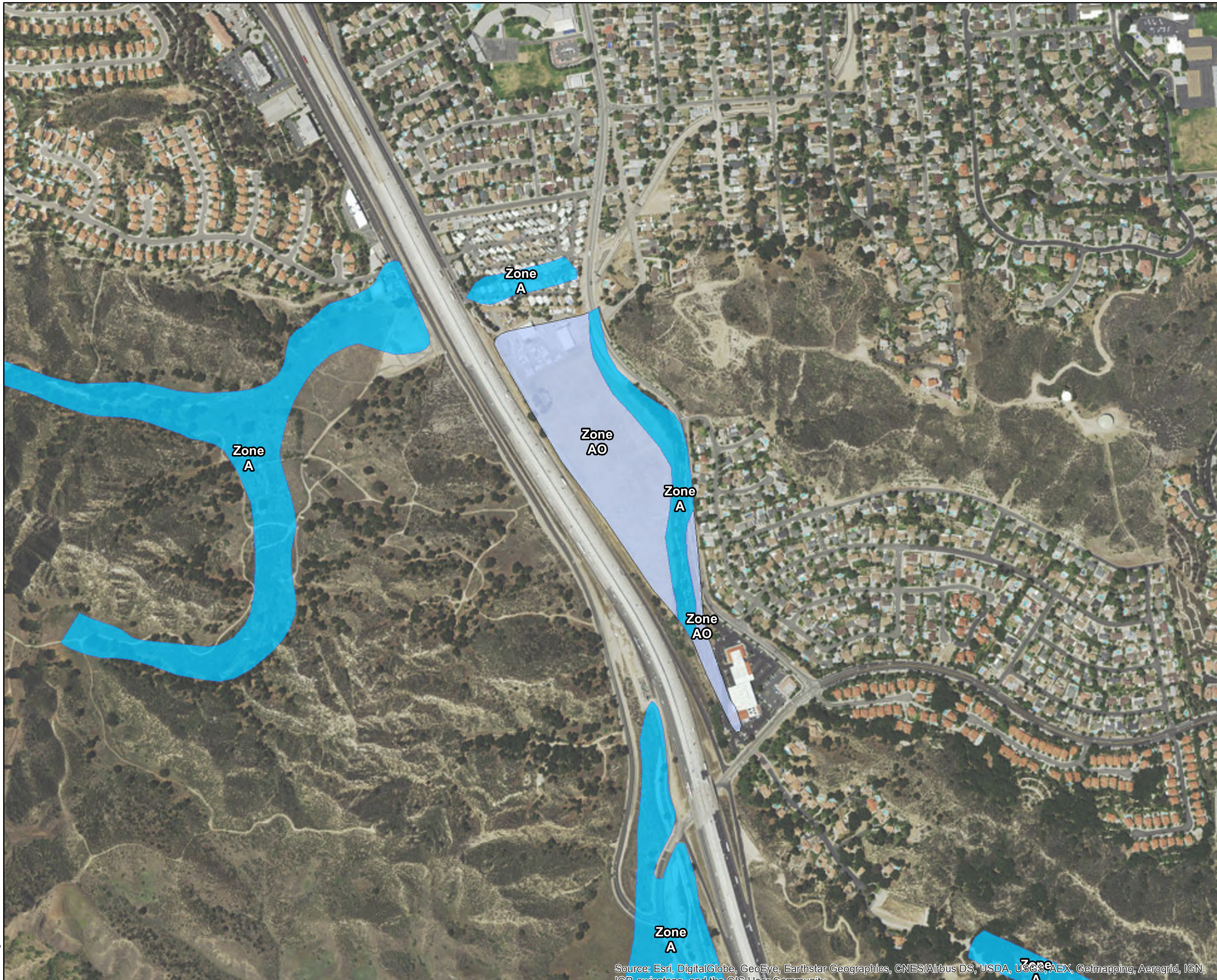
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

MAP NUMBER 06037C1031F

EFFECTIVE DATE SEPTEMBER 26, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



T:\MEK\Calgrove\CalGroveFema.mxd

CALGROVE SITE

LOS ANGELES CO. CA

Legend

FEMA Flood Hazard Zones

A

AO

0 350 700 1,400 Feet

PACE Advanced Water Engineering

Date: 2/11/2016

Job Number JOB#

Drawn By thowze

Figure 1

FEMA FLOODPLAIN

Appendix B – 1-5 Culvert Capacity Investigation

PACE

PACE Advanced Water Engineering

REGISTERED PROFESSIONAL ENGINEER
MARK EDWARD KREBS
No. 049292
Exp.
CIVIL
STATE OF CALIFORNIA

[DRAFT] Technical Memorandum

Date: January 9, 2019

To: LA County / City of Santa Clarita

From: Mark E. Krebs, P.E., President
Cherise Thompson, E.I.T.

Re: Smiser Ranch – I-5 Culvert Capacity Investigation # A969

Following the meeting which occurred on Thursday, October 4, 2018 at LADPW between PACE, the Sheridan Ebbert Development, and representatives of the City of Santa Clarita and LADPW, it was made clear that an investigation of the capacity of the I-5 Caltrans culvert upstream of the project site was necessary (see **Figure 1** for project site location and key components). This investigation is necessary to conclude the debate about what flow rates and capacity for sediment capture the project should be required to accommodate. See **Table 1** for a list of flow rates relevant to the project. Flows from the LADPW 2009 Hydrology report are referenced here to show that studies other than the 2001 LADPW Hydrology report have been done, which show far less flow reaching the project site, even when burned and bulked. Portions of the LADPW 2009 Hydrology report have been included in **Appendix A**. Also included in **Appendix A** are the as-built plans for the LACFC concrete channel, which show the design flow rate, as well as LADPW 2001 Hydrology 50-year clearwater and burned / bulked flow rates.

Flow Passing Through I-5 Culvert Just Before Overflow onto Calgrove Blvd. & Adjacent Private Property	**7,000 cfs**

Table 1

Description	Q_{100} Clearwater Flow Rate (cfs)	Q_{50} Clearwater Flow Rate (cfs)	Q_{50} Burned & Bulked Flow Rate (cfs)	Percent of Flow Passing Through I-5 Culvert
LACFC Concrete Channel Design Q		10,800		91%
FEMA Q_{100}	8,500			99%
LADPW 2001 Hydrology Q_{50}		11,700	13,900	83% / 73%
LADPW 2009 Hydrology Q_{100}	5,560			100%
LADPW 2009 Hydrology Q_{50}		3,750	4,880**	100% / 100%

**Estimated burn & bulk flow using a factor of 1.30 applied to the clearwater flow (LADPW 2001 Hydrology is 1.19)

As it stands, the 10,800 cfs that the LA County flood control channel downstream of the project site was designed for is not contained within (a) the Caltrans culvert, (b) the natural channel reach adjacent to the project, or (c) the LA County flood control facility without backing up and overtopping the channel banks at multiple locations. The FEMA 100-yr flow rate of 8,483 cfs (rounded to 8,500 in **Table 1**) overtops the channel banks upstream of the I-5 Caltrans culvert but is contained in the LA County flood control facility before passing beneath Wiley Canyon Road. PACE and the Client argue that the proposed project should only be required to handle flows and sediment that are able to pass through the I-5 Caltrans culvert without overtopping (a) at Calgrove Blvd. or (b) downstream of the I-5 culvert entrance on the West side of the freeway (referenced hereafter as “the weir”). The point at which the I-5 culvert reaches maximum capacity without overtopping either Calgrove Blvd. or the weir was found to be 7,000 cfs.

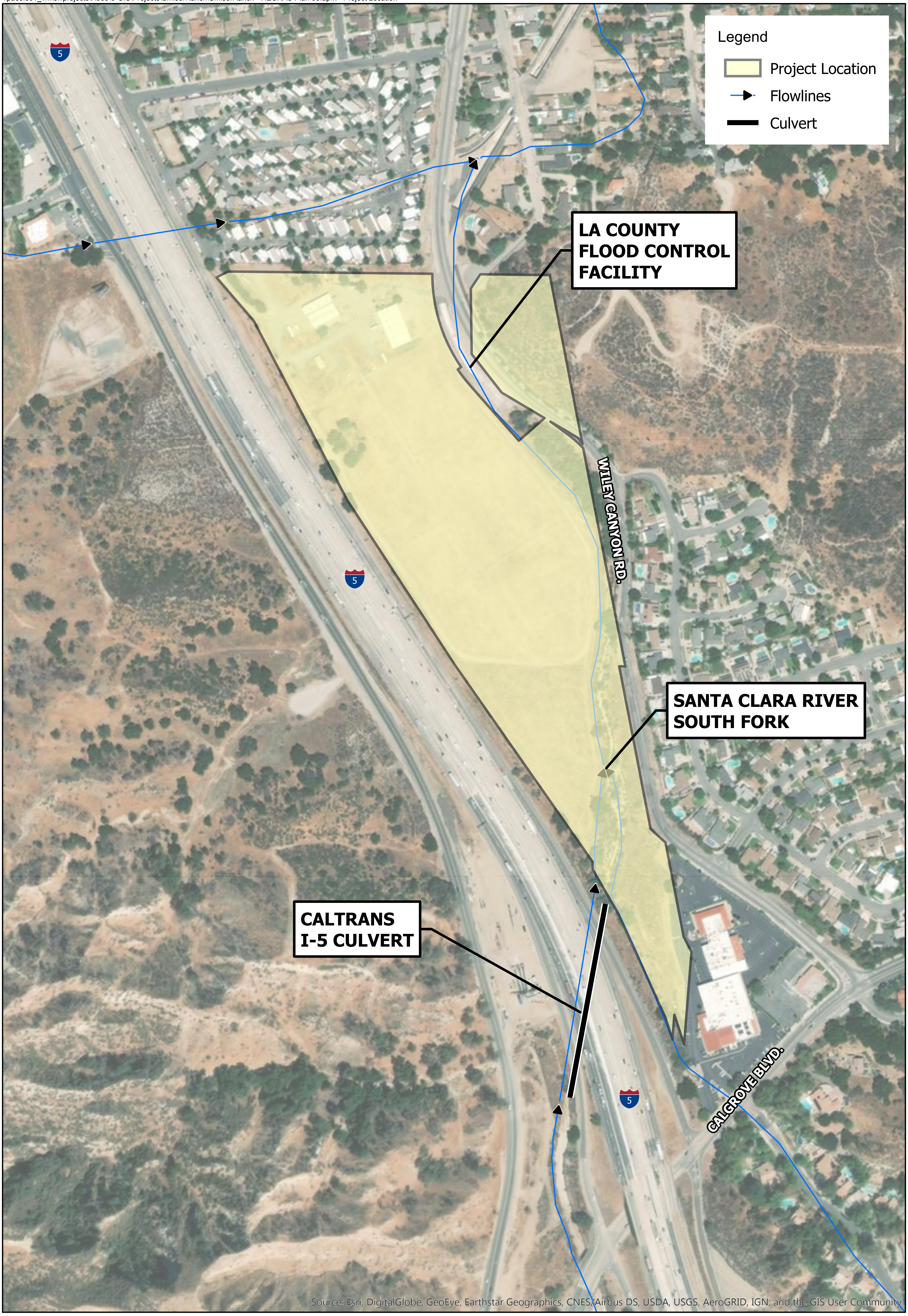
Figures 2-4 show the depth plot results of the HEC-RAS 2-D model that was created to simulate existing conditions, for flow rates of 7,000 cfs, 8,500 cfs, and 10,800 cfs. **Figure 2** (7,000 cfs) shows the maximum capacity of the I-5 culvert without any flow overtopping onto Calgrove Blvd. or over the weir. **Figure 3** (8,500 cfs) shows how the FEMA 100-yr flow rate flows over Calgrove Blvd. and the weir. These exhibits also show the amount of flow splitting into each of the three key directions: through the I-5 culvert, over Calgrove Boulevard, and over the weir.

Figures 5-7 show water surface elevation contour plots for each of the flow rate conditions, and **Figure 8** shows what properties are impacted by the floodplain boundary when the system is flowing at 7,000 cfs.

Additionally, PACE wanted to consider the amount of sediment that might be expected to reach the open channel just upstream of the I-5 culvert and possibly accumulate in the project reach. While the entire 7,315 acre Towsley watershed drains to the project reach and carries a certain amount of sediment / debris with it, it is not likely that all of that sediment would be carried to the project reach (see **Figure 9** for Towsley and Lyon Canyon watershed boundaries). Various structures upstream of the project reach such as the drop structure, Calgrove Blvd. bridge, and the I-5 culvert entrance itself are inhibitors to the transport of sediment. It is, however, much more likely that the 80-acres of hillsides immediately west of the project reach would drain into the channel, along with all of their associated sediment / debris (see **Figure 10** for local hillsides watershed boundary). Following LA County Sedimentation Manual methodology, the debris production of the 80-acre sub-watershed is 126,000 CY / mi^2 per storm, or 9.8 acre-ft (see Appendix A for more information on this process). This translates to 25% of the potential storage volume in water in the floodplain area west of the I-5 when 7,000 cfs is travelling through the channel (see **Figure 11**).

As part of this investigation, PACE had communication with Alliance Land Planning & Engineering, which is designing a storage facility adjacent to the South Fork SCR, between the Calgrove Blvd. bridge and the Caltrans I-5 Fwy bridge (Parcel No. 2826-023-040). They confirmed that their project has been approved with the requirement to design for the FEMA 100-yr flow rate, not capital flow rate. This fact, in addition to the fact that the I-5 Fwy culvert restricts incoming flow, provides reasonable grounds for the Smiser Ranch project to only be required to design to the FEMA 100-yr flow rate, not the capital flood flow rate and should only have to provide sediment capacity for the particles that pass through the I-5 Fwy culvert in existing conditions.

\\pacefs01_vm\swprojects\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 05.aprx - Project Location



SMISER RANCH

PROJECT LOCATION

PACE Advanced Water Engineering

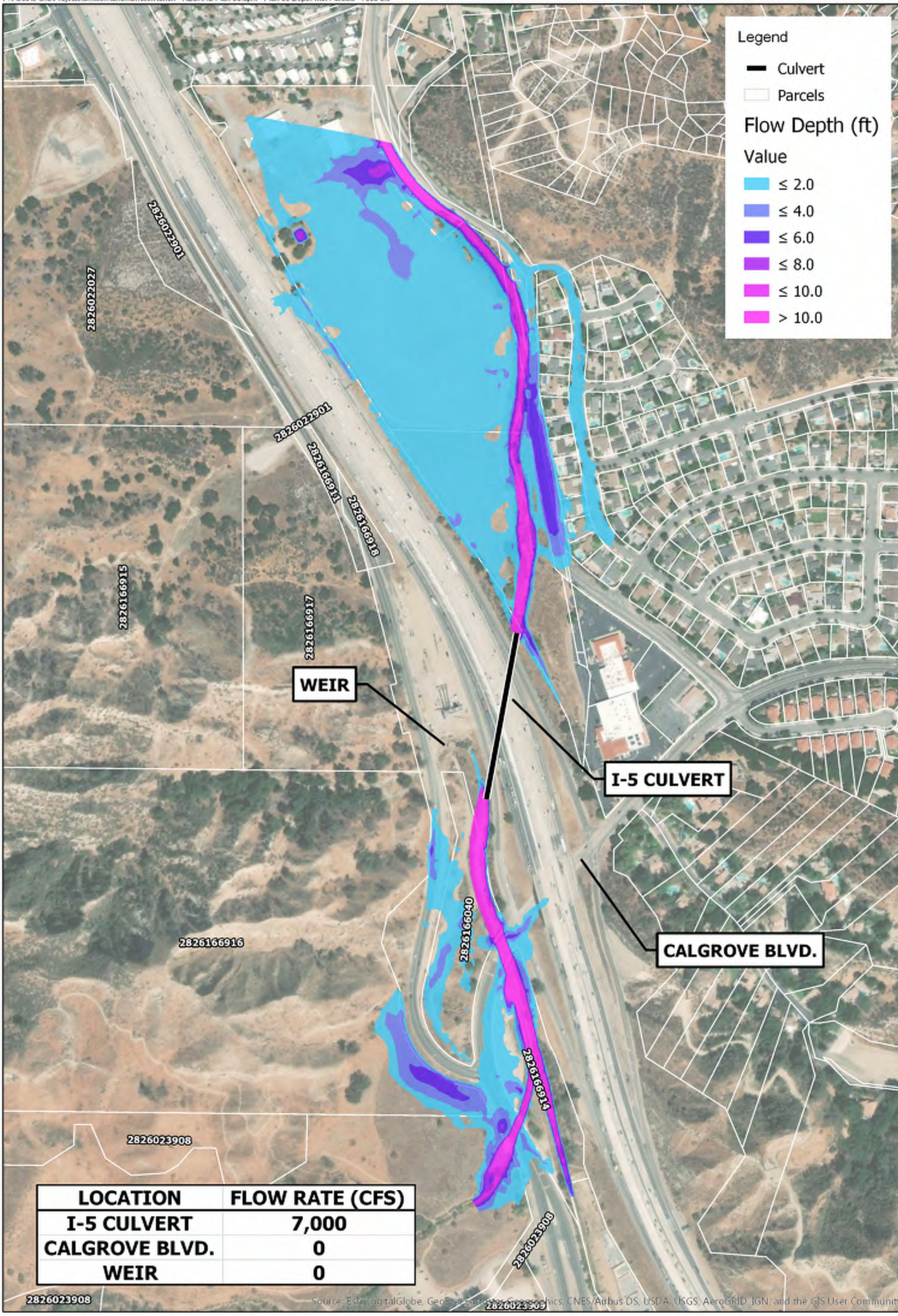
0 150 300 600 Feet

Date: 10/29/2018

Job Number: A969

Figure 1

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 06.aprx - Plan 06 Depth with Parcels - 7000 cfs



LOCATION	FLOW RATE (CFS)
I-5 CULVERT	7,000
CALGROVE BLVD.	0
WEIR	0

PLAN 06
FLOW DEPTH (7,000 cfs)

SMISER RANCH

0 175 350 700 Feet

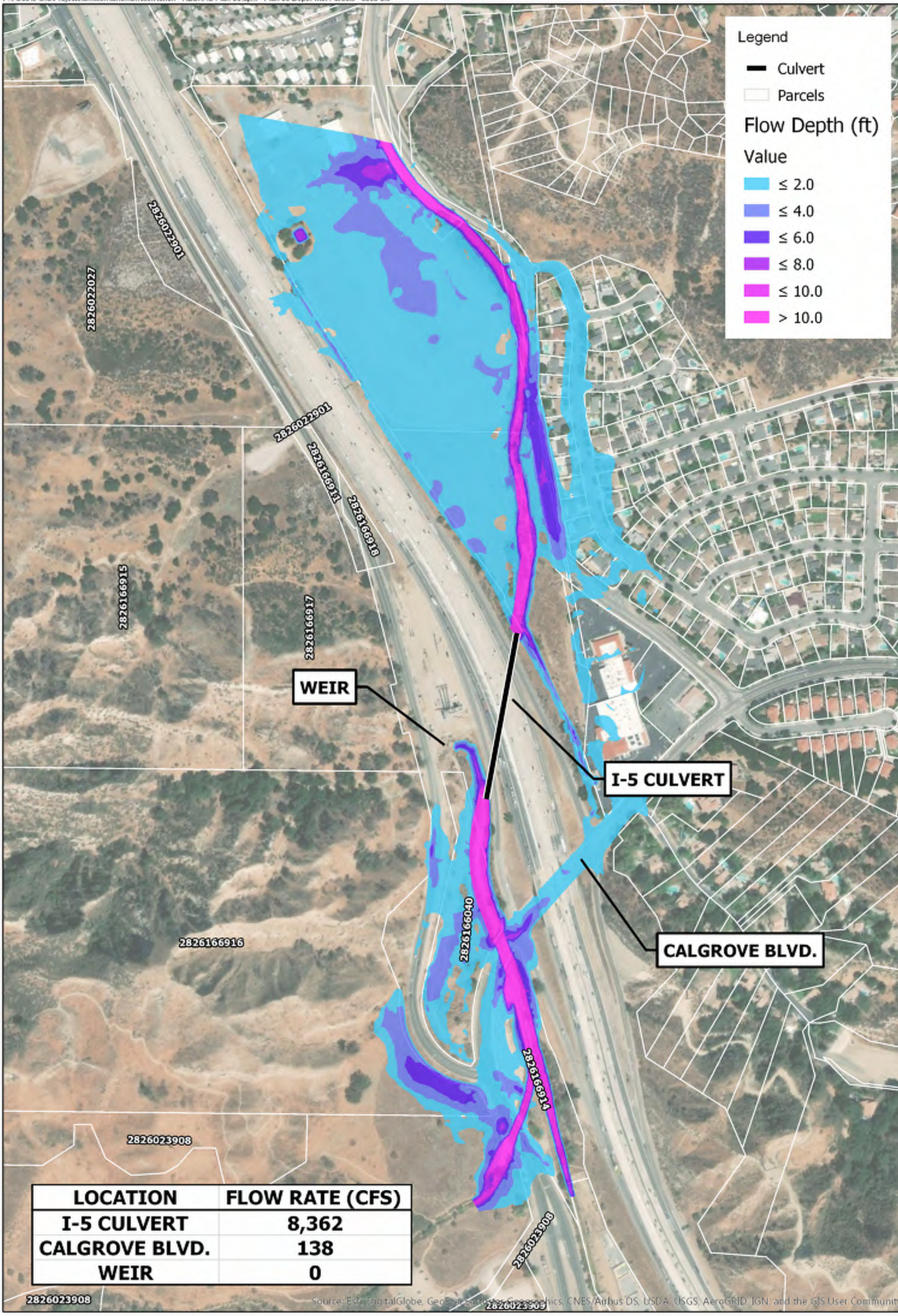
Date: 1/7/2019

Job Number: A969

Figure XX

PACE Advanced Water Engineering

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 06.aprx - Plan 06 Depth with Parcels - 8500 cfs



LOCATION	FLOW RATE (CFS)
I-5 CULVERT	8,362
CALGROVE BLVD.	138
WEIR	0

SMISER RANCH

PLAN 06
FLOW DEPTH (8,500 cfs)

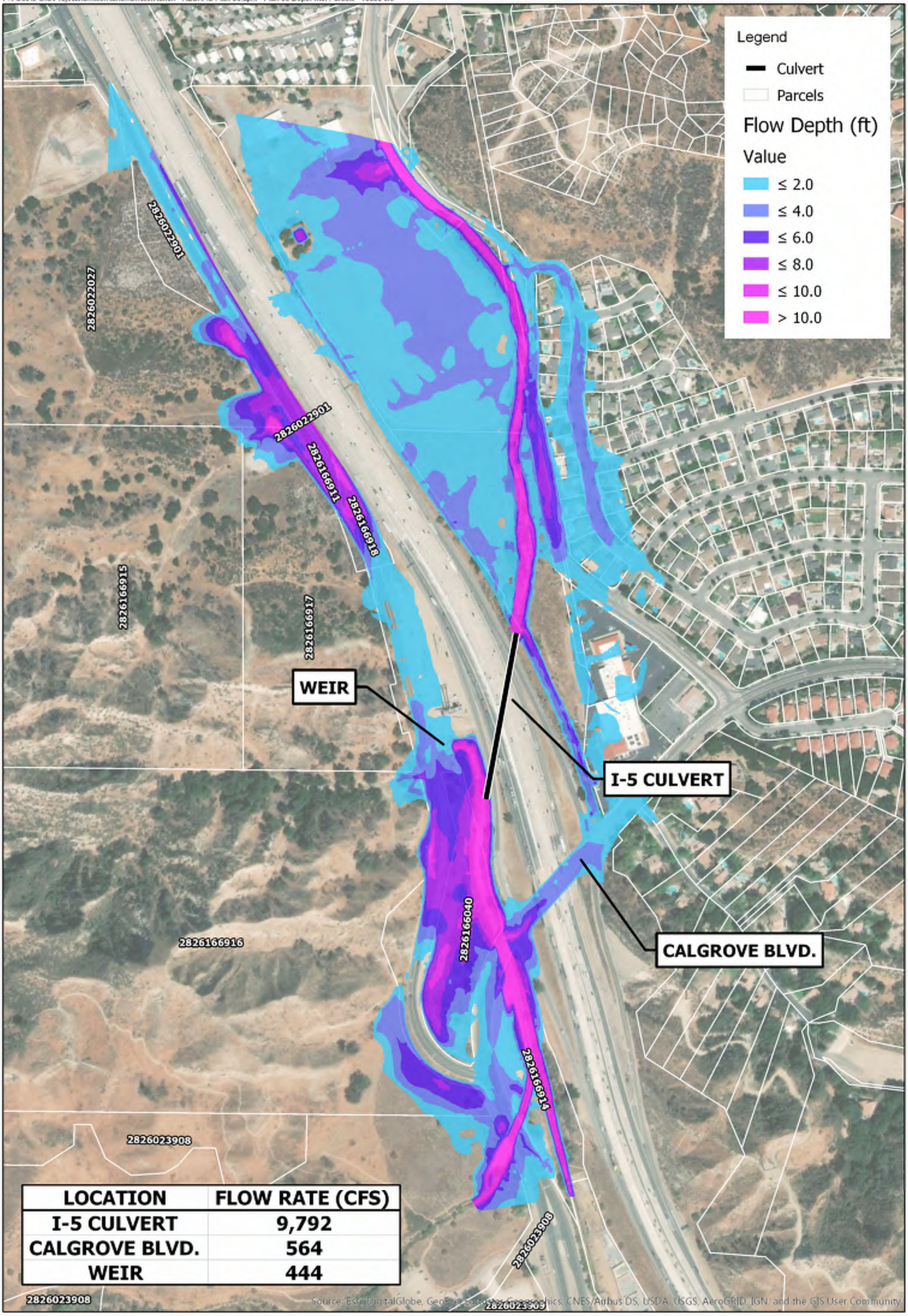
PACE Advanced Water Engineering

0 175 350 700 Feet

Date: 1/8/2019

Job Number: A969

Figure XX



LOCATION	FLOW RATE (CFS)
I-5 CULVERT	9,792
CALGROVE BLVD.	564
WEIR	444

SMISER RANCH

PLAN 06 FLOW DEPTH (10,800 cfs)

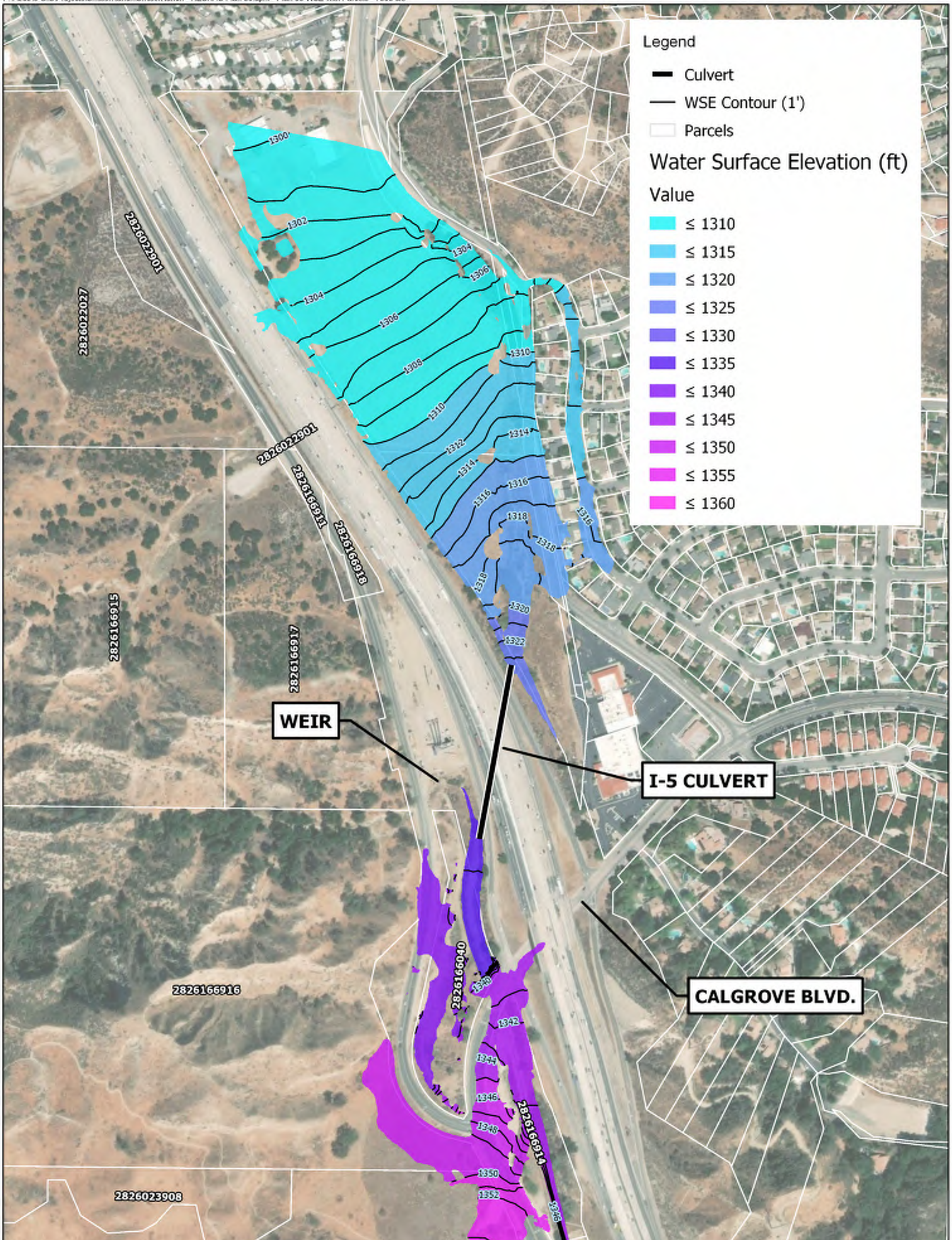
0 175 350 700 Feet

PACE Advanced Water Engineering

Date: 1/8/2019

Job Number: A969

Figure XX



SMISER RANCH

PLAN 06
WATER SURFACE ELEVATION (7,000 cfs)

PACE Advanced Water Engineering

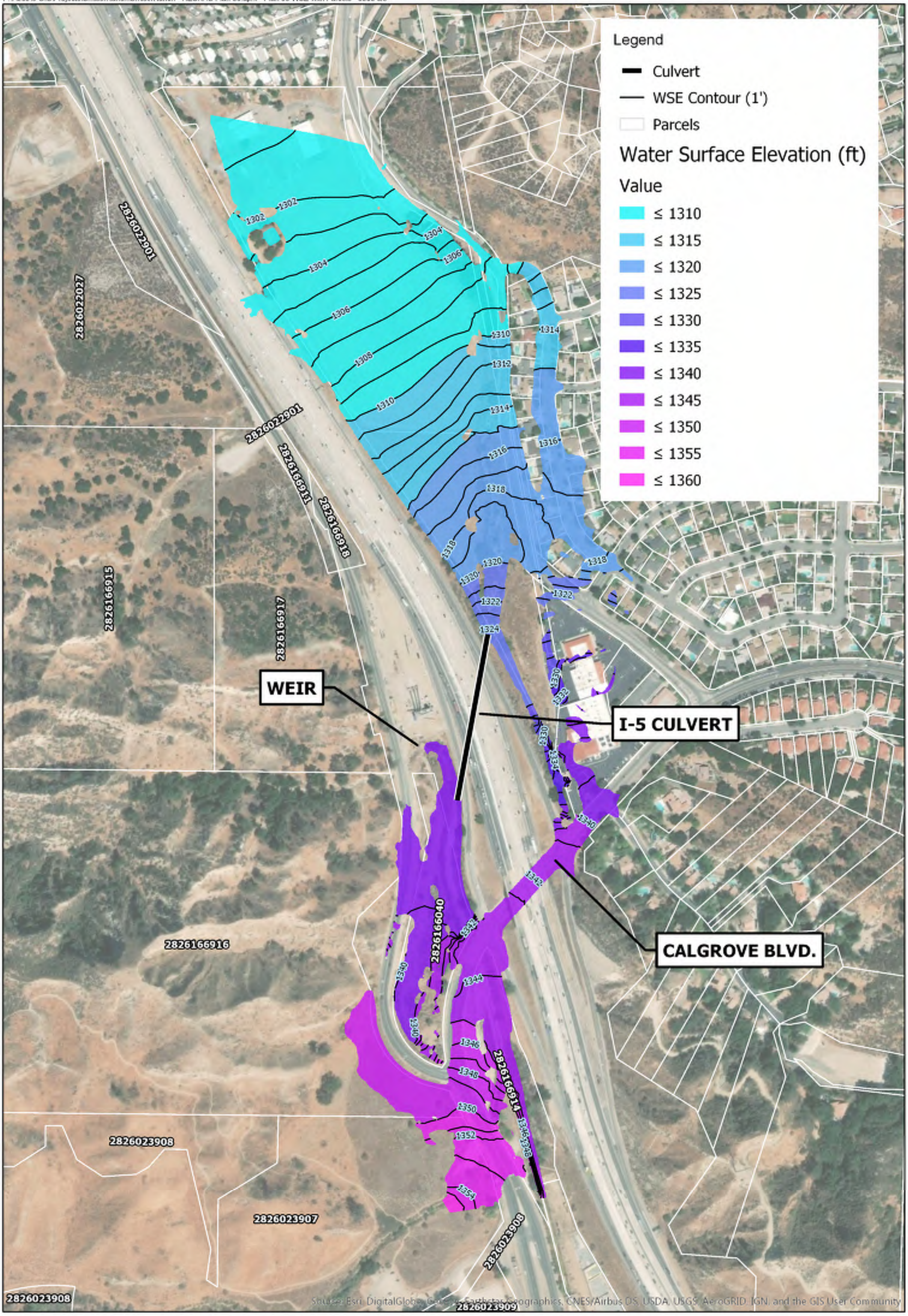
0 175 350 700 Feet

Date: 1/8/2019

Job Number: A969

Figure XX

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 06.aprx - Plan 06 WSE with Parcels - 8500 cfs



SMISER RANCH

PLAN 06
WATER SURFACE ELEVATION (8,500 cfs)

0 175 350 700 Feet

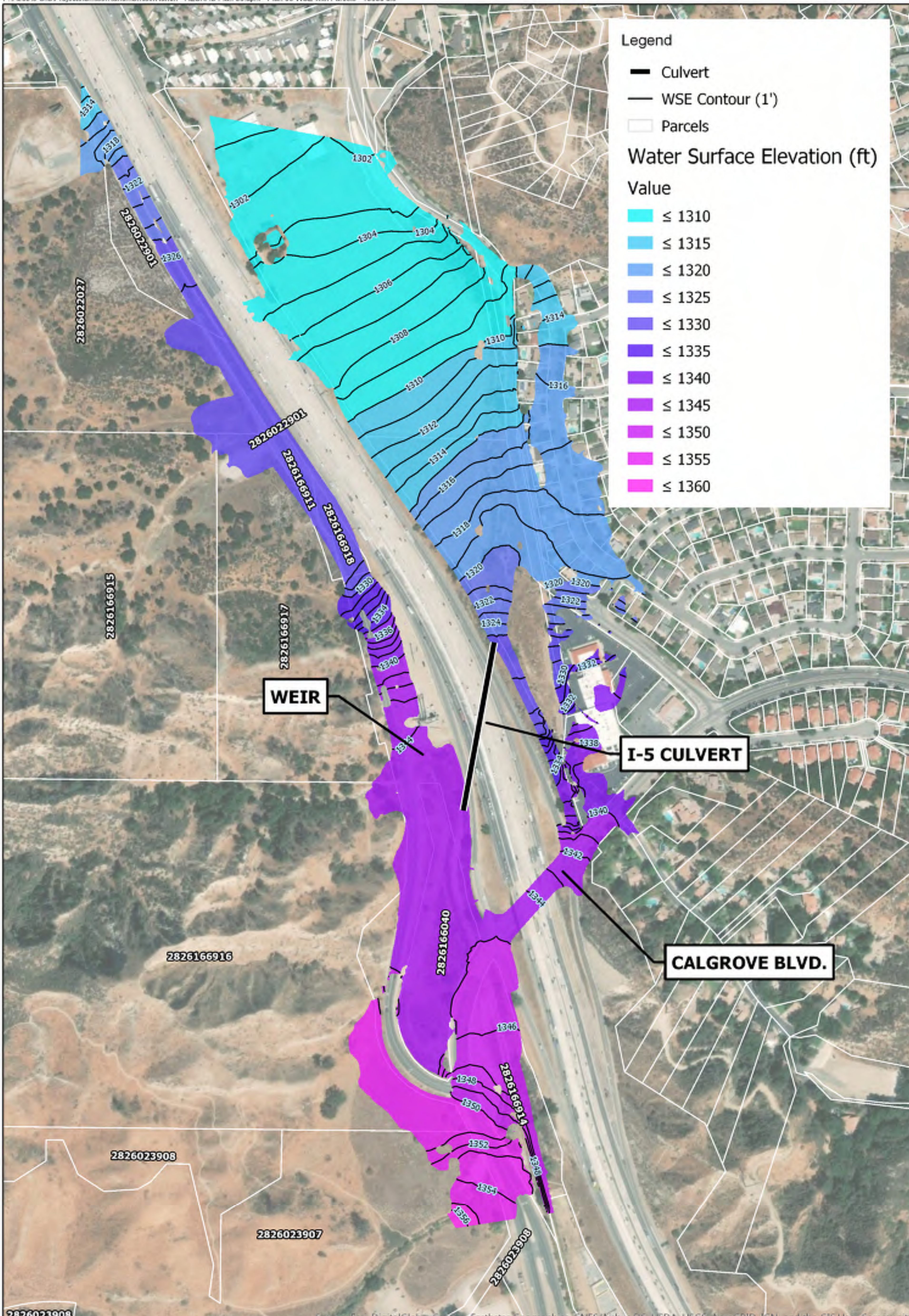
Date: 1/8/2019

Job Number: A969

PACE Advanced Water Engineering

Figure XX

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 06.aprx - Plan 06 WSE with Parcels - 10800 cfs



SMISER RANCH

PLAN 06
WATER SURFACE ELEVATION (10,800 cfs)

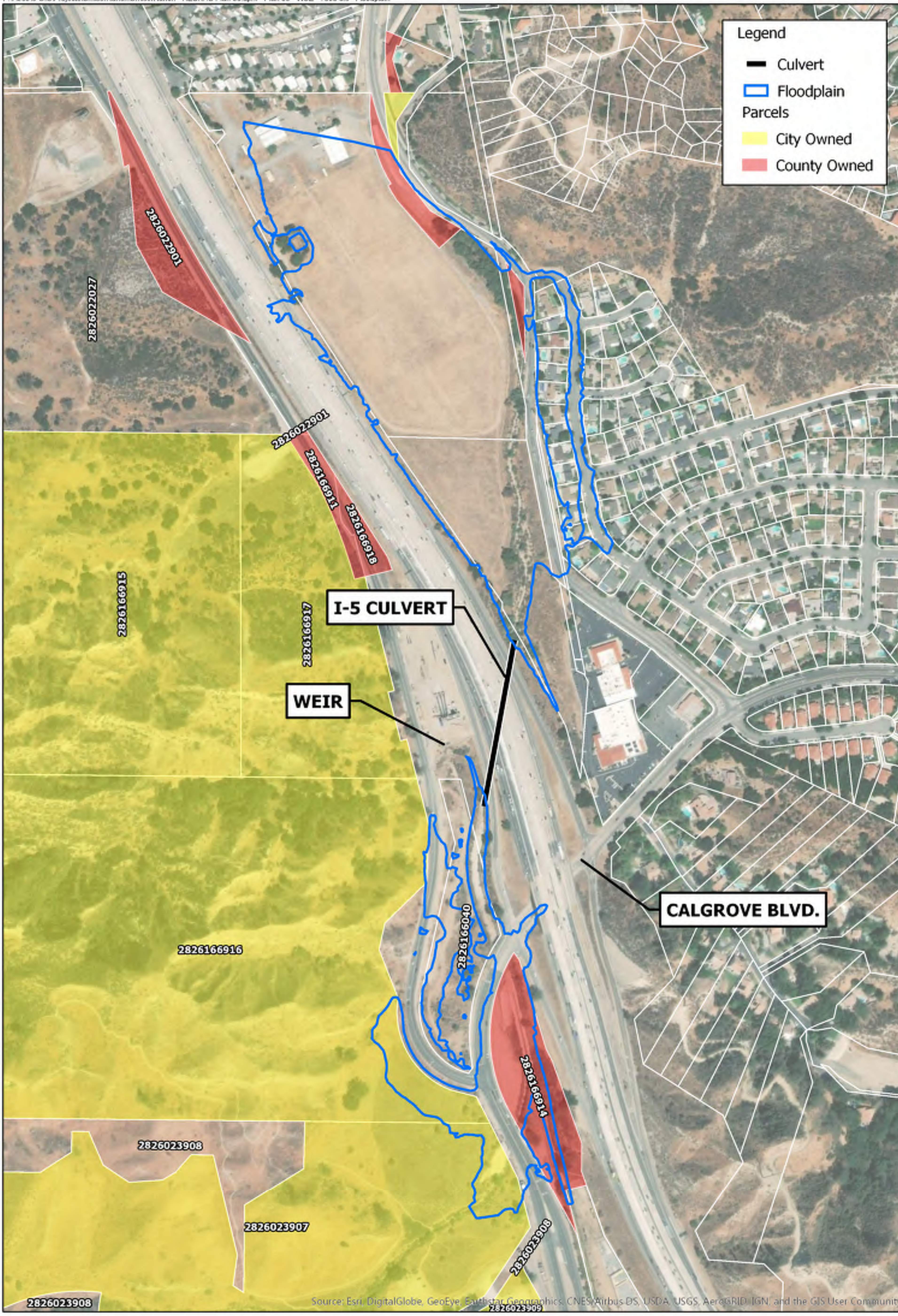
0 175 350 700 Feet

PACE Advanced Water Engineering

Date: 1/8/2019

Job Number: A969

Figure XX



SMISER RANCH

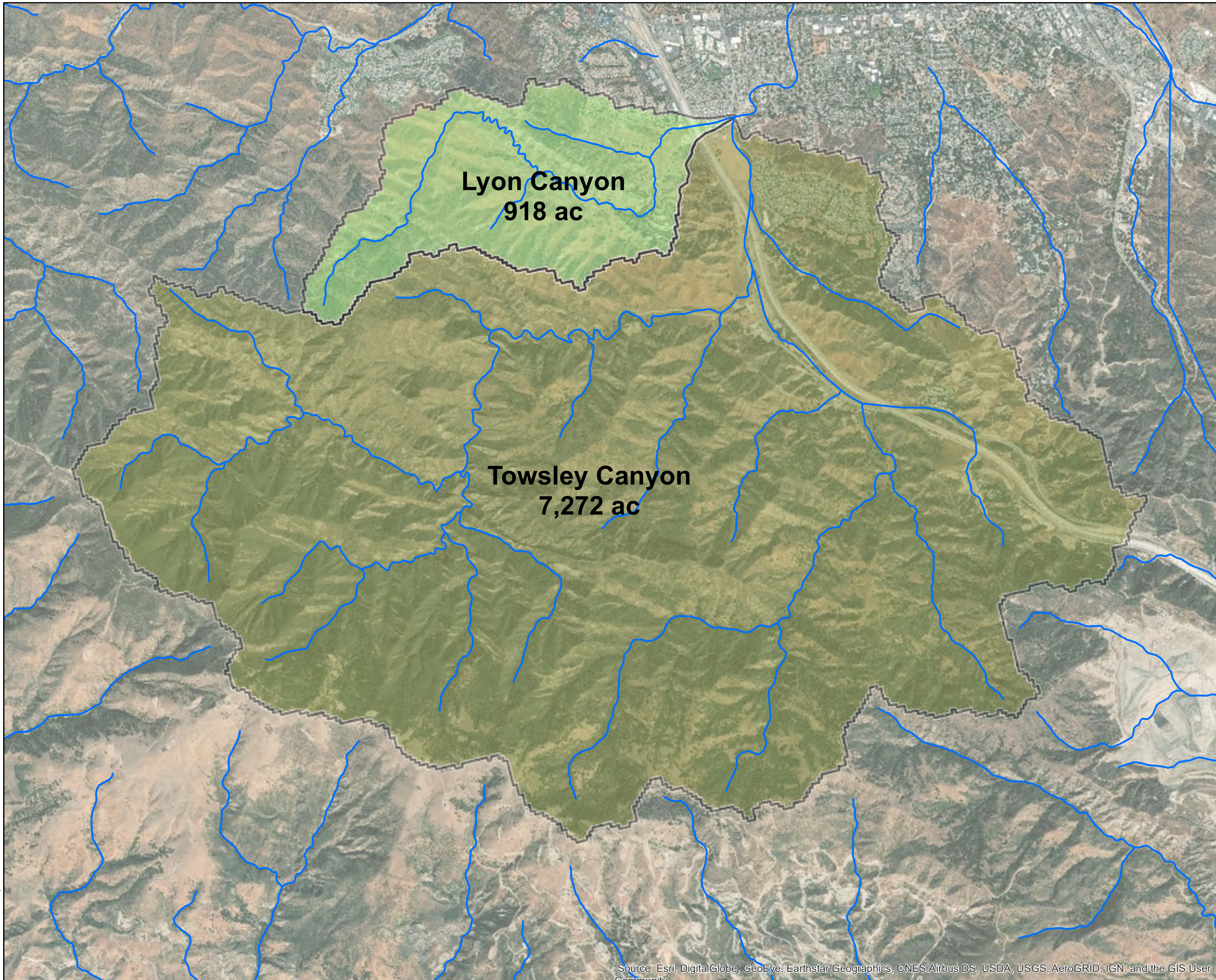
FLOODPLAIN
PARCEL IMPACTS (7,000 cfs)

0 175 350 700 Feet

Date: 1/7/2019

Job Number: A969

Figure 8



CALGROVE SITE

LOS ANGELES CO. CA

Legend

- Flowlines
- Lyon Canyon Watershed
- Towsley Watershed

0 1,250 2,500 5,000 Feet

Date: 10/30/2018

Job Number A969

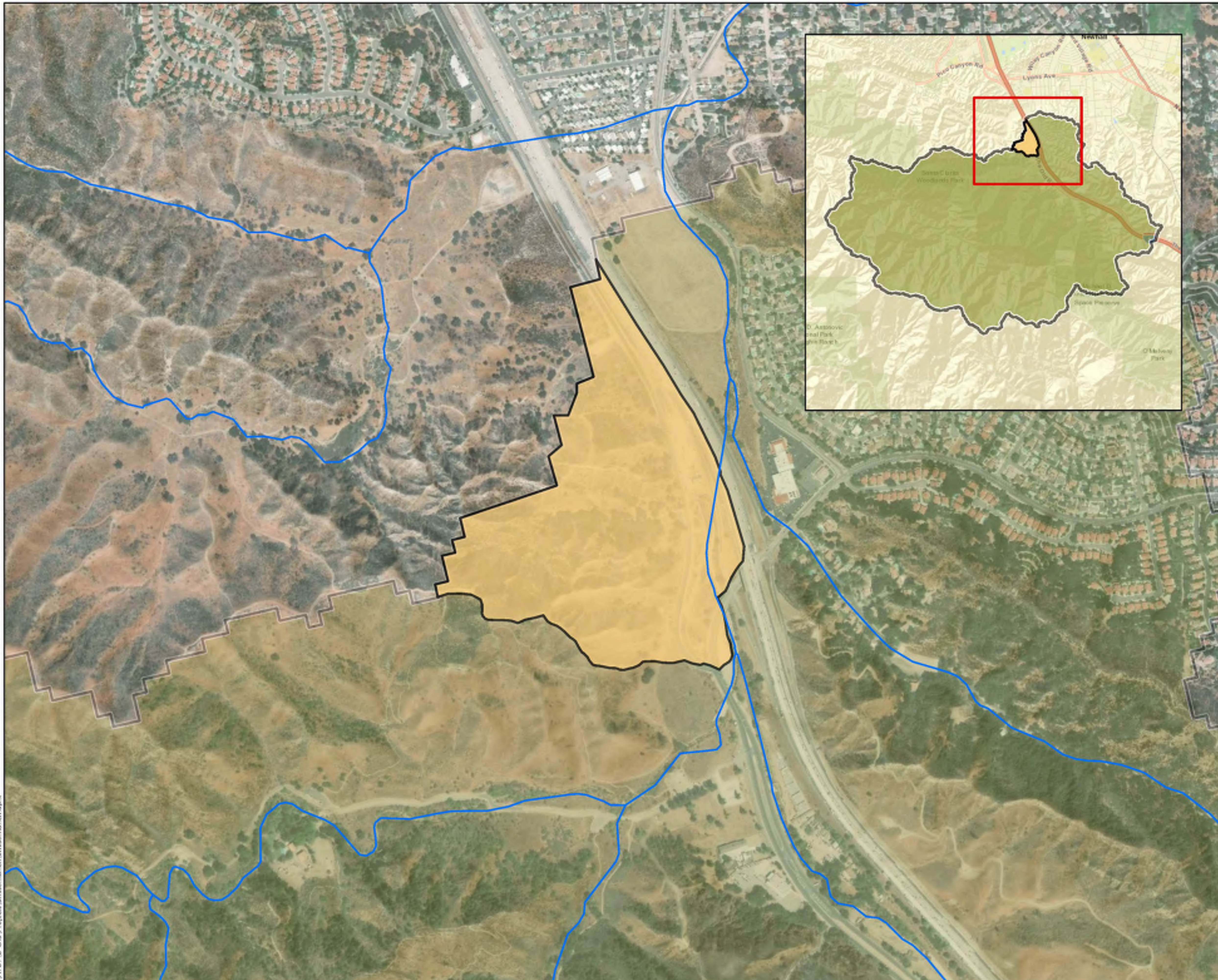
Drawn By sfifield

PACE Advanced Water Engineering

Figure 9

WATERSHEDS

P:\A969\6-GIS\Mxds\Workspace\CalGroveWatershed.mxd



CALGROVE SITE

LOS ANGELES CO. CA

Legend

- Flowlines
- Drainage Area (80 ac)
- Towsley Watershed

0 350 700 1,400 Feet

Date: 10/24/2018

Job Number A969

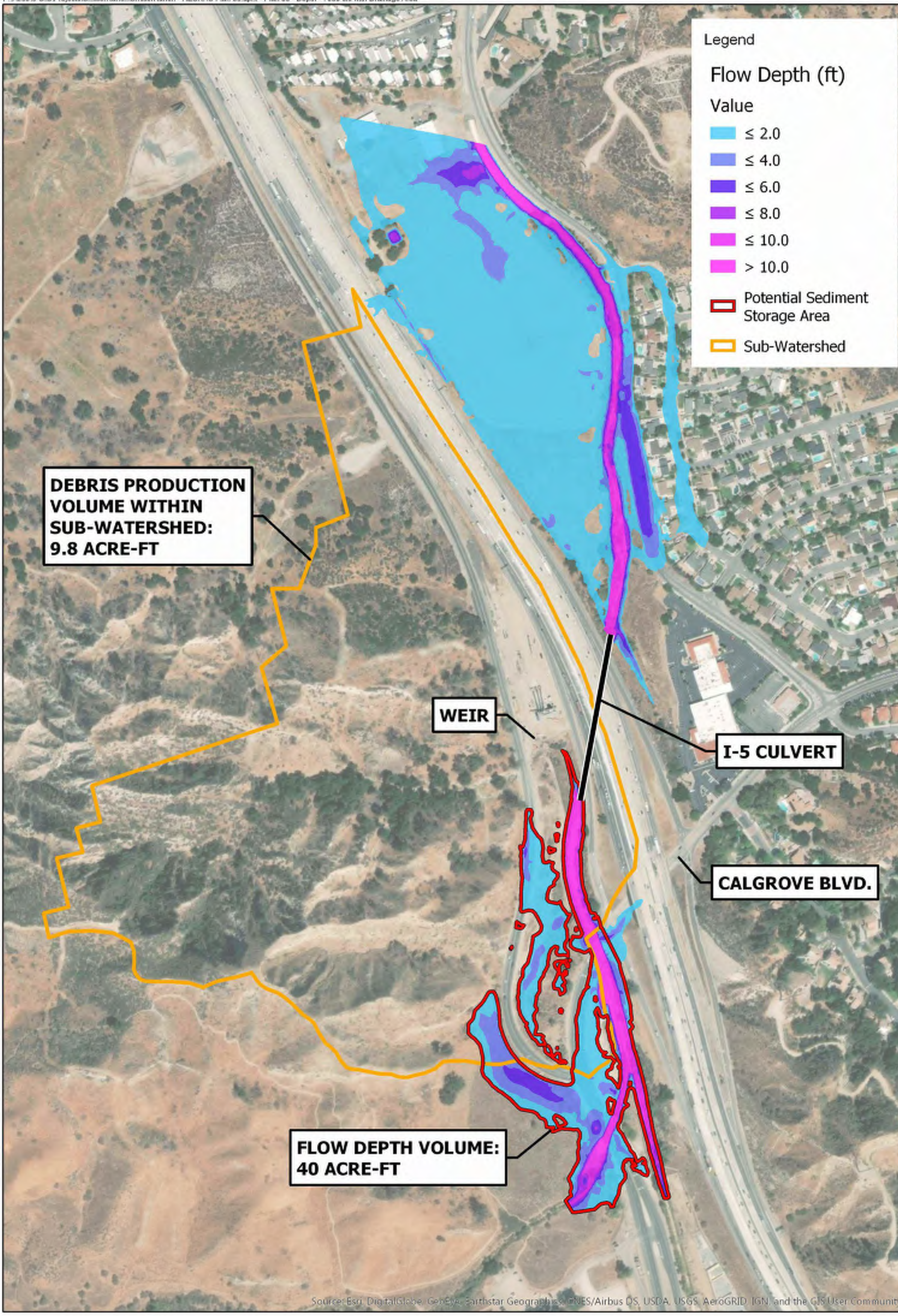
Drawn By sfifield

PACE Advanced Water Engineering

Figure 10

PROJECT DRAINAGE AREA

P:\A969\6-GIS\Projects\SmiserRanch\SmiserRanch - HECRAS Plan 06.aprx - Plan 06 - Depth - 7000 cfs with Drainage Area



SMISER RANCH

FLOW DEPTH (7,000 cfs)

PACE Advanced Water Engineering

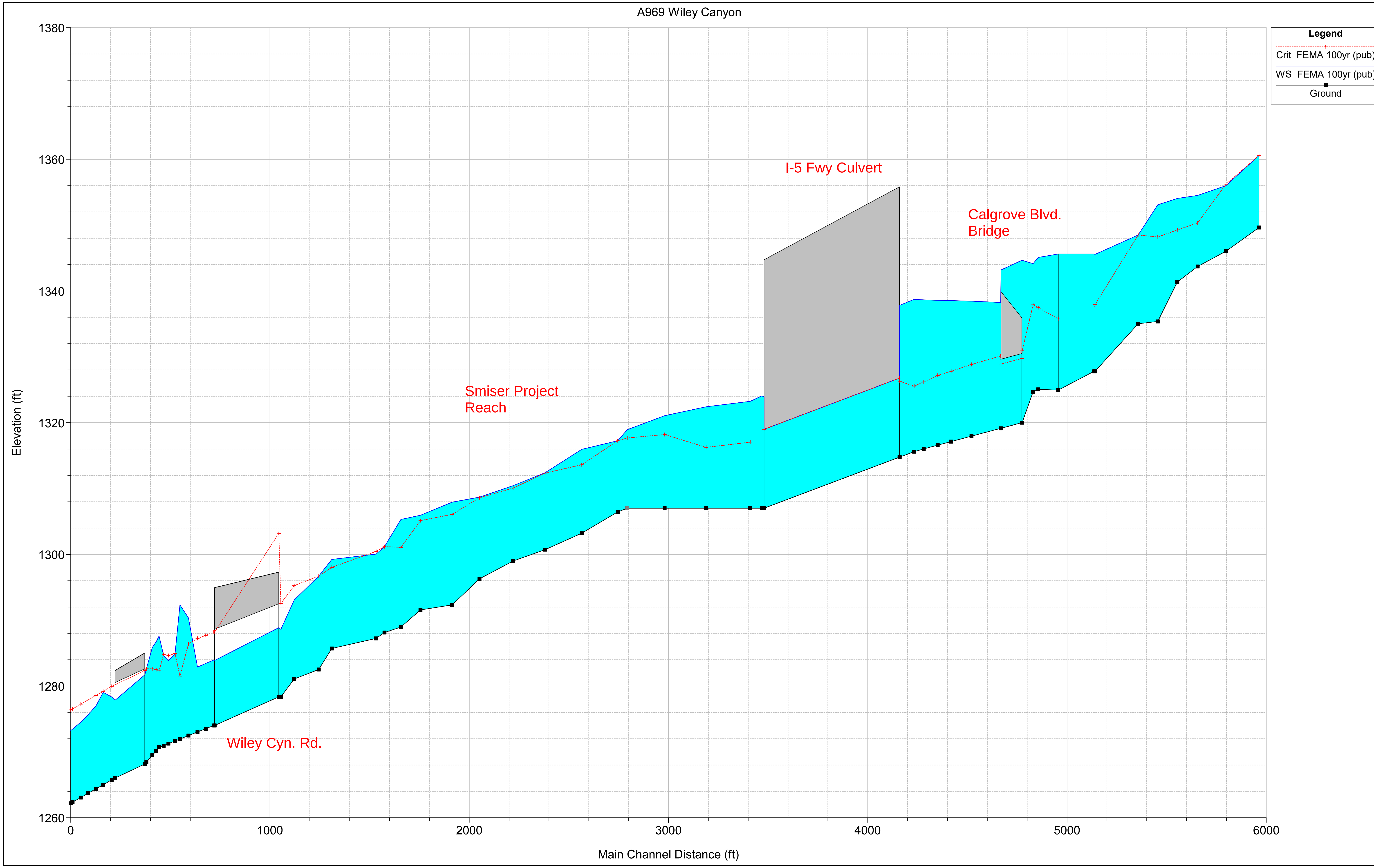
0 175 350 700 Feet

Date: 1/7/2019

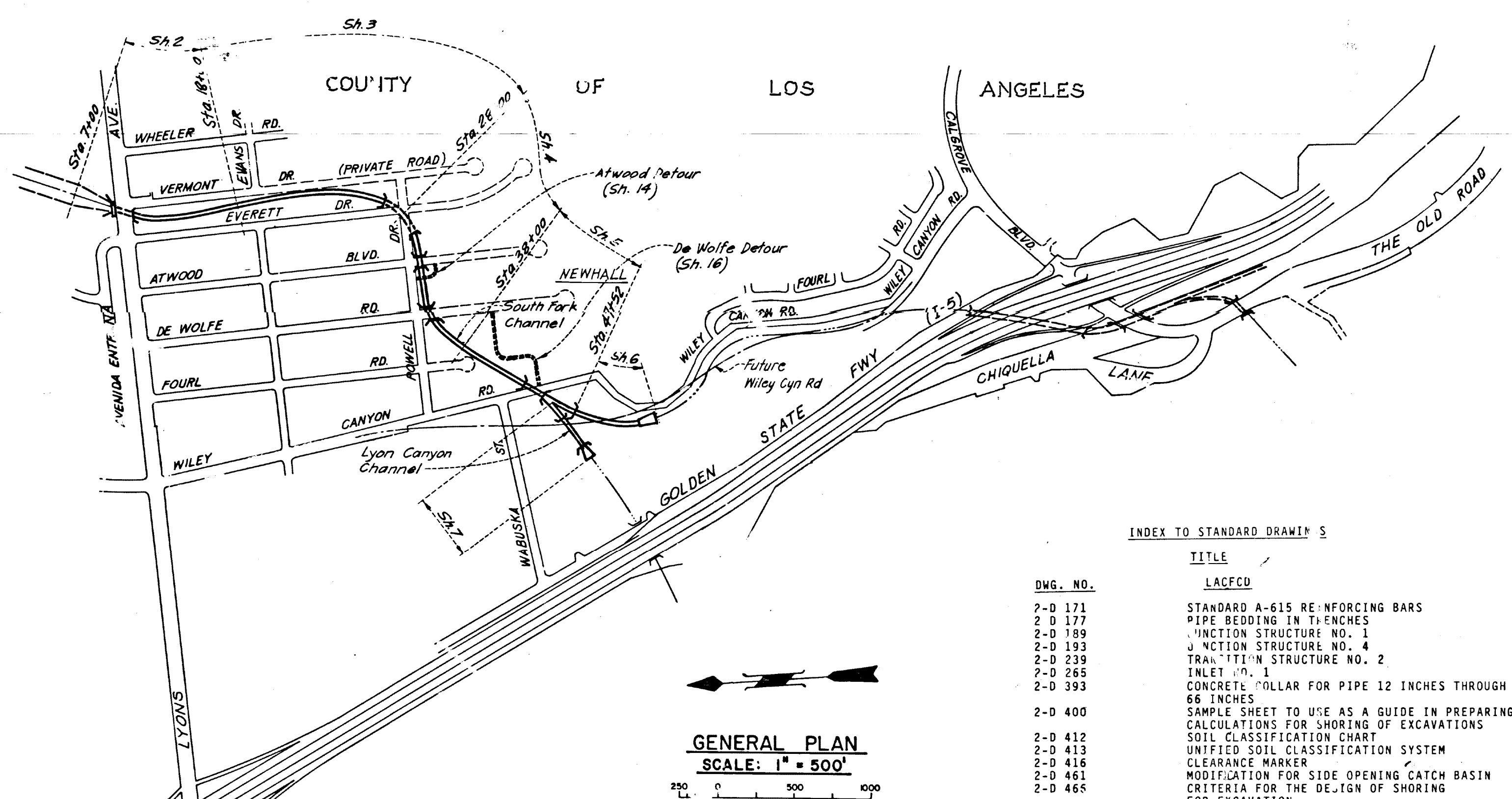
Job Number: A969

Figure 11

Figure 12


A969 Wiley Canyon
Legend
Crit FEMA 100yr (pub)
WS FEMA 100yr (pub)
Ground
I-5 Fwy Culvert
Calgrove Blvd.
Bridge
Smiser Project
Reach
Wiley Cyn. Rd.
Elevation (ft)
Main Channel Distance (ft)
1380
1360
1340
1320
1300
1280
1260
0
1000
2000
3000
4000
5000
6000

Appendix B – As-Built Plan Set



GENERAL PLAN

SCALE: 1" = 500'

250 0 500 1000

GENERAL NOTES

1. NUMBERS IN CIRCLES INDICATE ITEMS UNDER WHICH PAYMENT WILL BE MADE.
2. ELEVATIONS SHOWN ARE BASED ON FOLLOWING DATA: UPSTREAM OF STA. 43+01.28 PER USCE NGVD 1929 ADJ, DOWNSTREAM OF STA. 43+01.28 PER USC & GS 1955 ADJ.
3. STATION SHOWN ON THE DRAWINGS ARE ALONG CENTER LINE OF CONDUIT OR ON A LINE NORMAL TO CENTER LINE OF CONDUIT.
4. STATIONS AND INVERT ELEVATIONS OF PIPE INLETS SHOWN ON THE PROFILES ARE AT THE INSIDE FACE OF THE CONDUIT, UNLESS OTHERWISE SHOWN.
5. ALL FIELD BOOK REFERENCES ARE TO LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS FIELD BOOKS, UNLESS OTHERWISE NOTED.
6. PIPE CONNECTIONS TO STORM DRAINS SHALL CONFORM TO STANDARD DRAWING NO. 2-D 193, UNLESS OTHERWISE SHOWN.
7. ALL PIPE IN OPEN TRENCH SHALL BE BEDDED ACCORDING TO STANDARD DRAWING NO. 2-D 177, CASE III, EXCEPT BELL AND SPIGOT PIPE WHICH SHALL BE CASE II BEDDING, UNLESS OTHERWISE SHOWN "W" VALUES SHALL BE AS SPECIFIED ON STANDARD DRAWING NO. 2-D 177 CASE III BEDDING, NOTES 3(a), 3(b), AND 3(c). IF THE "W" VALUE AT THE TOP OF THE PIPE IS EXCEEDED, THE BEDDING SHALL BE MODIFIED, AND/OR PIPE OF ADDITIONAL STRENGTH SHALL BE PROVIDED. THE PROPOSED MODIFICATION SHALL BE APPROVED BY THE DISTRICT.
8. THE DEPTH AT THE UPSTREAM END OF CATCH BASIN 10 FEET OR MORE IN LENGTH SHALL BE CURB FACE PLUS 12 INCHES, UNLESS OTHERWISE SHOWN.
9. LOCATIONS OF CATCH BASIN CONNECTOR PIPE JUNCTIONS WITH CATCH BASINS AS SHOWN ON THE DRAWINGS ARE SCHEMATIC. IT IS INTENDED THAT SUCH JUNCTIONS BE LOCATED AT THE DOWNSTREAM ENDS OF THE CATCH BASINS, UNLESS SPECIFICALLY INDICATED OTHERWISE. IN ALL CASES, THE EXACT LOCATIONS WILL BE DETERMINED IN THE FIELD BY THE ENGINEER TO MEET FIELD CONDITIONS.
10. EXISTING UTILITIES SHALL BE MAINTAINED IN PLACE BY THE CONTRACTOR, UNLESS OTHERWISE NOTED.
11. UTILITIES DESIGNATED BY THE SYMBOL "*" WILL BE ABANDONED IN PLACE AND *THE OWNER WILL INSTALL A NEW SECTION OF THE AFFECTED UTILITY AT A* LOCATION IN CLOSE PROXIMITY TO, BUT WHICH DOES NOT PHYSICALLY INTERFERE WITH, THE PROPOSED STORM DRAIN CONDUIT AND APPURTENANT STRUCTURES.
12. ALL OPENINGS RESULTING FORM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES SHALL BE SEALED WITH 8 INCHES OF BRICK AND MORTAR OR 6 INCHES OF CONCRETE, UNLESS OTHERWISE SHOWN.
13. ALL RESURFACING, CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS, AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED SHALL BE CONSTRUCTED AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS, UNLESS OTHERWISE NOTED.
14. STRUCTURAL NOTES WILL BE FOUND ON THE APPLICABLE STRUCTURAL SHEETS.
15. EXISTING TREES SHALL BE REMOVED ONLY IF SO DESIGNATED. ALL OTHER TREES SHALL BE PROTECTED IN PLACE.
16. RIGHT OF WAY FENCING SHALL BE PLACED 6 INCHES INSIDE THE RIGHT OF WAY LINE
17. NUMBERS AND LETTERS IN BRACKETS, SUCH AS [3] OR [A-3], IDENTIFY STR[illegible] FOR CONTRACT ADMINISTRATION PURPOSES.
18. THE WORK SHOWN ON THESE PLANS REQUIRES THE PRIME CONTRACTOR TO HAVE A VALID CLASS "A" CONTRACTOR'S LICENSE ISSUED BY THE STATE OF CALIFORNIA.

INDEX TO STANDARD DRAWINGS

DWG. NO.	TITLE
	LACFCD
2-D 171	STANDARD A-615 REINFORCING BARS
2 D 177	PIPE BEDDING IN TRENCHES
2-D 189	JUNCTION STRUCTURE NO. 1
2-D 193	JUNCTION STRUCTURE NO. 4
2-D 239	TRANSITION STRUCTURE NO. 2
2-D 265	INLET NO. 1
2-D 393	CONCRETE COLLAR FOR PIPE 12 INCHES THROUGH 66 INCHES
2-D 400	SAMPLE SHEET TO USE AS A GUIDE IN PREPARING CALCULATIONS FOR SHORING OF EXCAVATIONS
2-D 412	SOIL CLASSIFICATION CHART
2-D 413	UNIFIED SOIL CLASSIFICATION SYSTEM
2-D 416	CLEARANCE MARKER
2-D 461	MODIFICATION FOR SIDE OPENING CATCH BASIN
2-D 465	CRITERIA FOR THE DESIGN OF SHORING FOR EXCAVATION
2-D 476	PORTABLE SECURITY FENCE FOR OPEN TRENCHES
2-D TR 1.1 TO 1.2	TRASH RACK (INCLINED)

LOS ANGELES COUNTY ROAD DEPARTMENT

	LACRD
84-01	GUIDE MARKER

STATE OF CLAIFORNIA, DEPARTMENT OF TRANSPORTATION

	CALTRANS
A75-A	CONCRETE BARRIER TYPE 50
A77-A	METAL BEAM BARRIER

INDEX TO STANDARD PLANS

PUBLIC WORKS CONSTRUCTION

PLAN NO.	TITLE
	APWA-AGC
101-0	DRIVEWAY APPROACHES
104-0	CURB AND GUTTER-BARRIER
300-0	CURB OPENING CATCH BASIN CONNECTION
308-0	MONOLOTHIC CATCH BASIN
309-0	CATCH BASIN REINFORCEMENT
310-0	CATCH BASIN FACE PLATE
312-0	~~CATCH BASIN MANHOLE FRAME AND COVER~~
313-0	LOCAL DEPRESSION AT CATCH BASINS
500-0	LANDSCAPE IRRIGATION SYMBOLS
510-0	VACUUM BREAKER ASSEMBLY (PRESSURE TYPE)
521-0	PRESSURE REGULAR INSTALLATION
600-0	CHAIN LINK FENCE AND GATES
606-0	METAL HAND RAILINGS
614-0	REINFORCED CONCRETE RETAINING WALL TYPE 5
617-0	REINFORCED CONCRETE RETAINING WALL DETAILS
635-0	STEEL STEP
106-0	CROSS AND LONGITUDINAL GUTTERS

LIST OF ABBREVIATIONS

ACI	AMERICAN CONCRETE INSTITUTE
∠	ANGLE
A.S.	AS SHOWN
@	AT
BUR. CA.	BURIED CABLE
CONST. JT.	CONSTRUCTION JOINT
CU. YDS.	CUBIC YARDS
D	D-LOAD
DM	DEADMAN
DR.	DRIVE
D/S OR DNSTR.	DOWNSTREAM
DU	DUCT-TELEPHONE
EFP	EQUIVALENT FLUID PRESSURE
EQ. SPC.	EQUALLY SPACED
ESMT.	EASEMENT
EXT.	EXTERIOR
FN.	FENCE
G	GAS LINE
GASO.	GASOLINE LINE
GC	GRADE CHANGE
GUT.	GUTTER
INT.	INTERIOR
INV.	INVERT
LF.	LINEAL FOOT
MOD.	MODIFIED
O	OIL
OPT.	OPTIONAL
P	POWER CONDUIT
PCF	POUNDS PER CUBIC FOOT
PT.	POINT
RD.	ROAD
SH.	SHEET
SYM.	SYMMETRICAL
TB	TEST BORING
THW	TOP OF HEADWALL
TP	TELEPHONE POLE
TYP.	TYPICAL
UPSTR. OR U/S	UPSTREAM
W	WATER LINE
WV	WATER VALVE

FOR ADDITIONAL ABBREVIATIONS USED ON THE DRAWINGS SEE SECTION 1-3 OF STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.

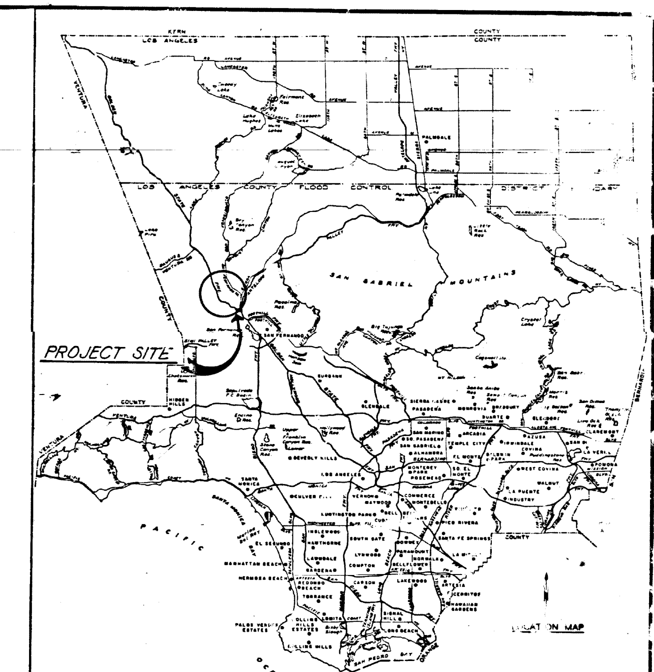
REFERENCE

TOPOGRAPHY: 337-T11 AND T 12, 394-F4
SURVEY FIELD BOOK:
AS BUILT DRAWINGS: 337-D4.1 THROUGH [illegible] 20
337-F16
LACRD
RIGHT OF WAY: 337-RW 1 THROUGH RW 5, RW 9 AND RW 10

UTILITIES

TELEPHONE------------------------PACIFIC BELL
WATER----------------------------SANTA CLARITA WATER CO.
POWER----------------------------SOUTHERN CALIFORNIA EDISON CO.
GAS------------------------------SOUTHERN CALIFORNIA GAS COMPANY
OIL------------------------------CHEVRON USA
SEWER----------------------------LOS ANGELES COUNTY SANITATION DIVISION
CABLE T.V.-----------------------VALLEY CO. CABLE T.V.

■ "AS BUILT DRAWINGS"



Thomas Bros. Pg. 127, A4, A5

INDEX TO DRAWINGS

SHEET NO.	TITLE
1	LOCATION MAP, GENERAL PLAN INDEX TO STANDARD DRAWINGS, INDEX TO DRAWINGS AND GENERAL NOTES
2	PLAN AND PROFILE - STA. 7+00 TO STA. 18+00
3	PLAN AND PROFILE - STA. 18+00 TO STA. 28+00
4	PLAN AND PROFILE - STA. 28+00 TO STA. 38+00
5	PLAN AND PROFILE - STA. 38+00 TO STA. 47+52
6	PLAN AND PROFILE - STA. 47+52 TO STA. 53+60
7	PLAN AND PROFILE - LYON CANYON CHANNEL
8	CROSS SECTIONS
9	CROSS SECTIONS
10	CROSS SECTIONS
11	CROSS SECTIONS
12	LYONS AVENUE, EVANS DRIVE, AND WILEY CANYON ROAD ACCESS ROAD DETAILS
13	ATWOOD BOULEVARD CROSSING-STREET PLAN, PROFILE AND CROSS SECTION
14	ATWOOD BOULEVARD CROSSING-DETOUR PLAN
15	DEWOLFE ROAD CROSSING-STREET PLAN, PROFILE AND CROSS SECTIONS
16	DEWOLFE ROAD CROSSING-DETOUR PLAN
17	INLET STRUCTURE-PLAN, PROFILE, SECTIONS AND STRUCTURAL DETAILS
18	LYON CANYON INLET AND UTILITY RELOCATION-PLAN, PROFILE AND MISCELLANEOUS DETAILS
19	R.C. RECTANGULAR CHANNEL STEEL SCHEDULE
20	R.C. RECTANGULAR CHANNEL STEEL SCHEDULE
21	R.C. BOX STEEL SCHEDULE AND SIDE DRAIN INLET STRUCTURE DETAILS
22	R.C. TRAPEZOIDAL CHANNEL STRUCTURAL DETAILS, WEAR INDICATOR AND MISCELLANEOUS DETAILS
23	ENERGY DISSIPATORS-PLAN AND STRUCTURAL DETAILS
24	CHANNEL WALL AND WINGWALL EXTENSION-PLAN AND STRUCTURAL DETAILS
25	LYON CANYON CHANNEL CONFLUENCE-PLAN AND STRUCTURAL DETAILS
26	INVERT ACCESS RAMP AT STA. 45+70-PLAN, PROFILE, AND CROSS SECTION
27	INVERT ACCESS RAMP AT STA. 45+70-STRUCTURAL DETAILS
28	~~SIDE DRAINS-PLAN AND PROFILE~~
29	PLANTING AND IRRIGATION DETAILS
30	SUBDRAINAGE SYSTEM
31	LOGS OF BORINGS
32	LOGS OF BORINGS

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-89	"As built."

DESIGNED BY D. Chen
CHECKED BY R. Hashima
DRAWN BY E. Mondek, A. Castro
PROJECT ENGINEER [signature] 017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

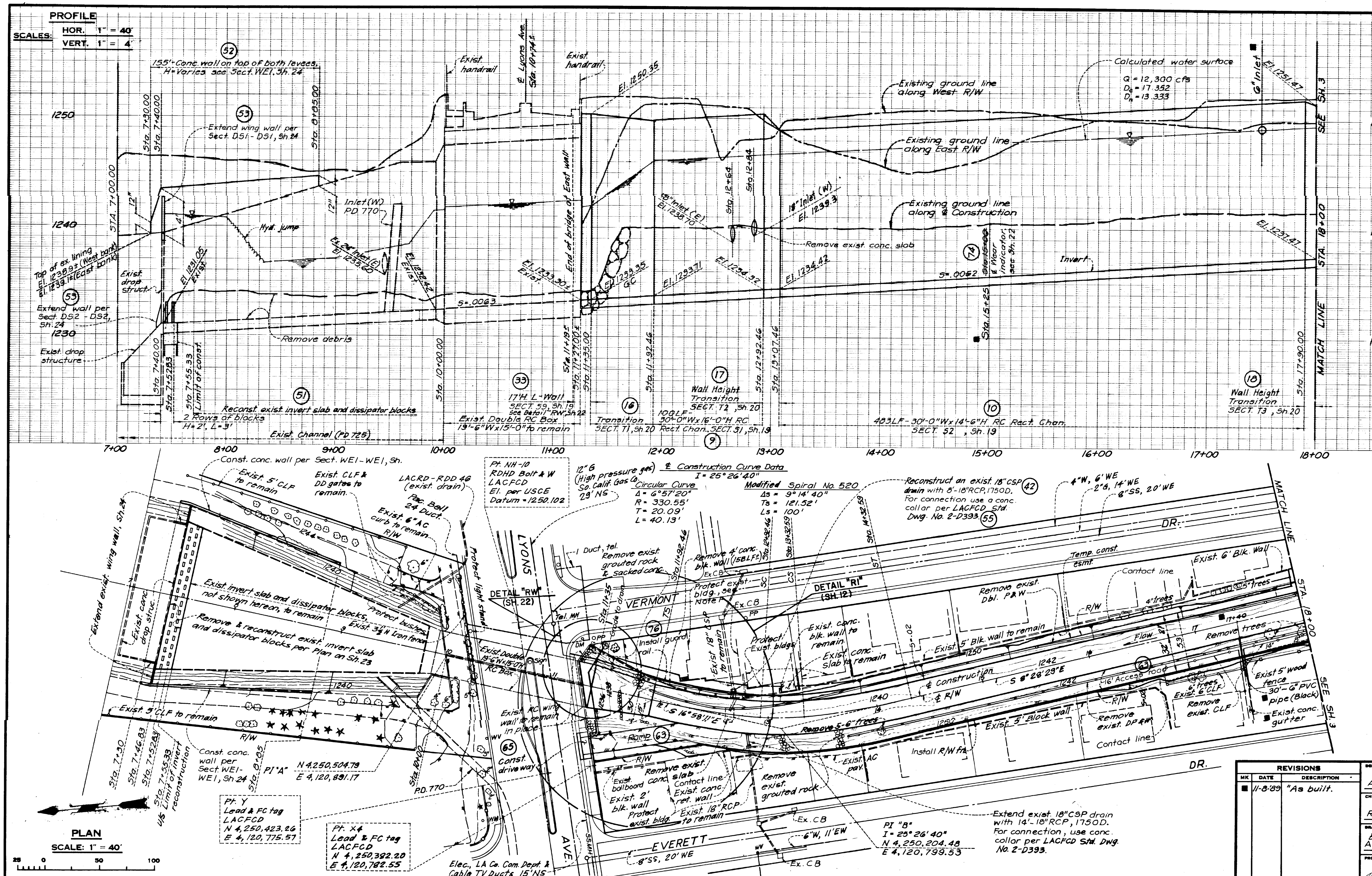
SANTA CLARA RIVER - SOUTH FORK
LYONS AVE TO WILEY CYN. RD & LYON CYN. CHAN
REINFORCED CONCRETE CHANNEL

LOCATION MAP, GENERAL PLAN, INDEX TO STANDARD DRAWINGS, INDEX TO DRAWINGS & GENERAL NOTES

RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)
DWGS. APPR. T.A. TIDEMANSON DIRECTOR OF PUBLIC WORKS
BY M. Nagami DEPUTY DIRECTOR DATE 4/4/86

DATE Mar '86 SCALE AS.
NO. 337-D22.1
SHEET 1 OF 32

"AS BUILT" DRAWINGS



Notes:

1. During excavation of Lt. bank (East) between Sta. 11+50 and Sta. 13+80±, the contractor shall use a vertical solid shoring to protect exist. bldgs. See Cross Section (Sta. 12+20 on Sh. 8).
2. For Cross Sections, see Sh. 8
3. For Fencing & Gate Details, see APWA Std. Plan 600-0
4. For Planting and Irrigation Plans, see Sh. 29 & 30
5. Pave access road with 2" AC on 6" CAB

(68) (69)

CHANNEL WALL FENCE			
STATION		HEIGHT (FT.)	
From	To	East Wall	West Wall
11+20	11+35	5	—
11+35	11+45	5	5
11+45	18+00	5	4

PD017326

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-'89	"As built.

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok, A. Castro
PROJECT ENGINEER [signature] C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

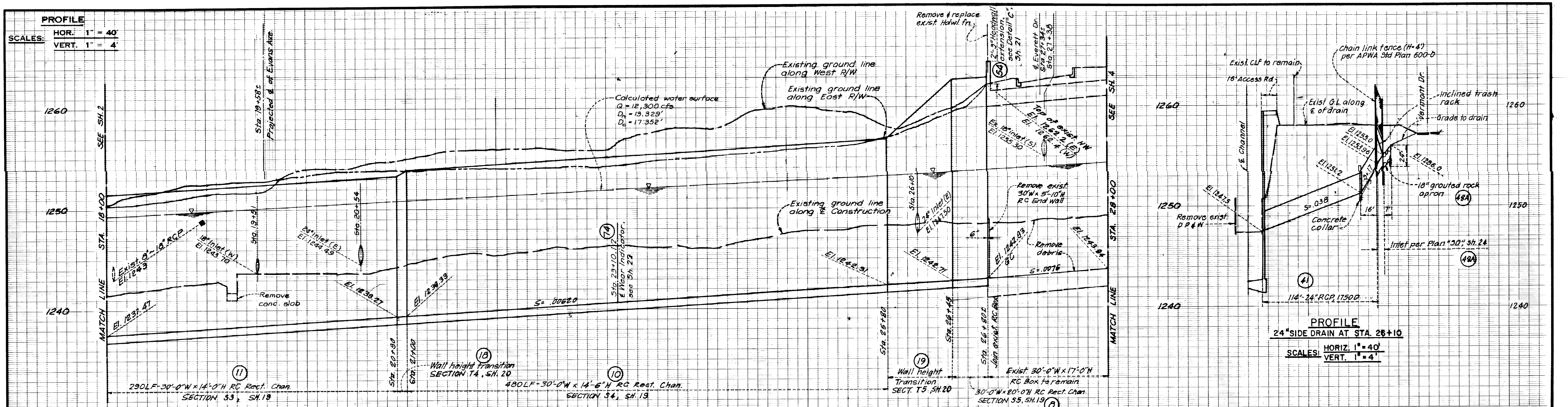
SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

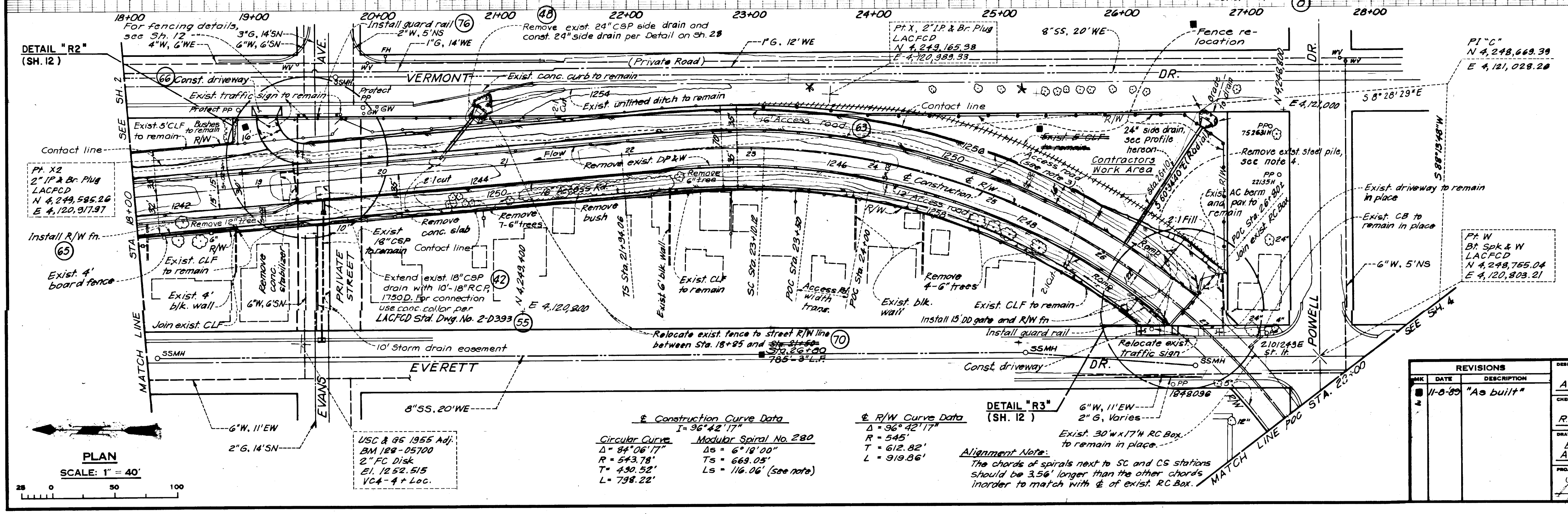
PLAN AND PROFILE
STA. 7+00 TO STA. 18+00

RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

DATE Mar '86 SCALE A.S.
NO. 337-D22.2
SHEET 2 OF 32

"AS BUILT" DRAWINGS





Notes:
1. For Irrigation Plans, see Sh. 29.
2. For Fencing & Gate Details, see APWA Std. Plan 600-0
3. Pave access road with 2" AC on 6" CAB
4. Remove interfering portion of exist. steel sheet pile. The sheet piles remaining in place shall be cut two feet below finished grade.
5. For Cross Section, see Sh. 8.

(68) (69)

CHANNEL WALL FENCE

STATION		HEIGHT (FT.)	
From	To	East Wall	West Wall
18+00	18+85	5	4
18+85	26+45	4	4
26+45	26+80	5	5

PD017327

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-89	"As built"

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok, A. Castro
PROJECT ENGINEER C017461
RECOMMENDED BY DIVISION ENGINEER (DESIGN)

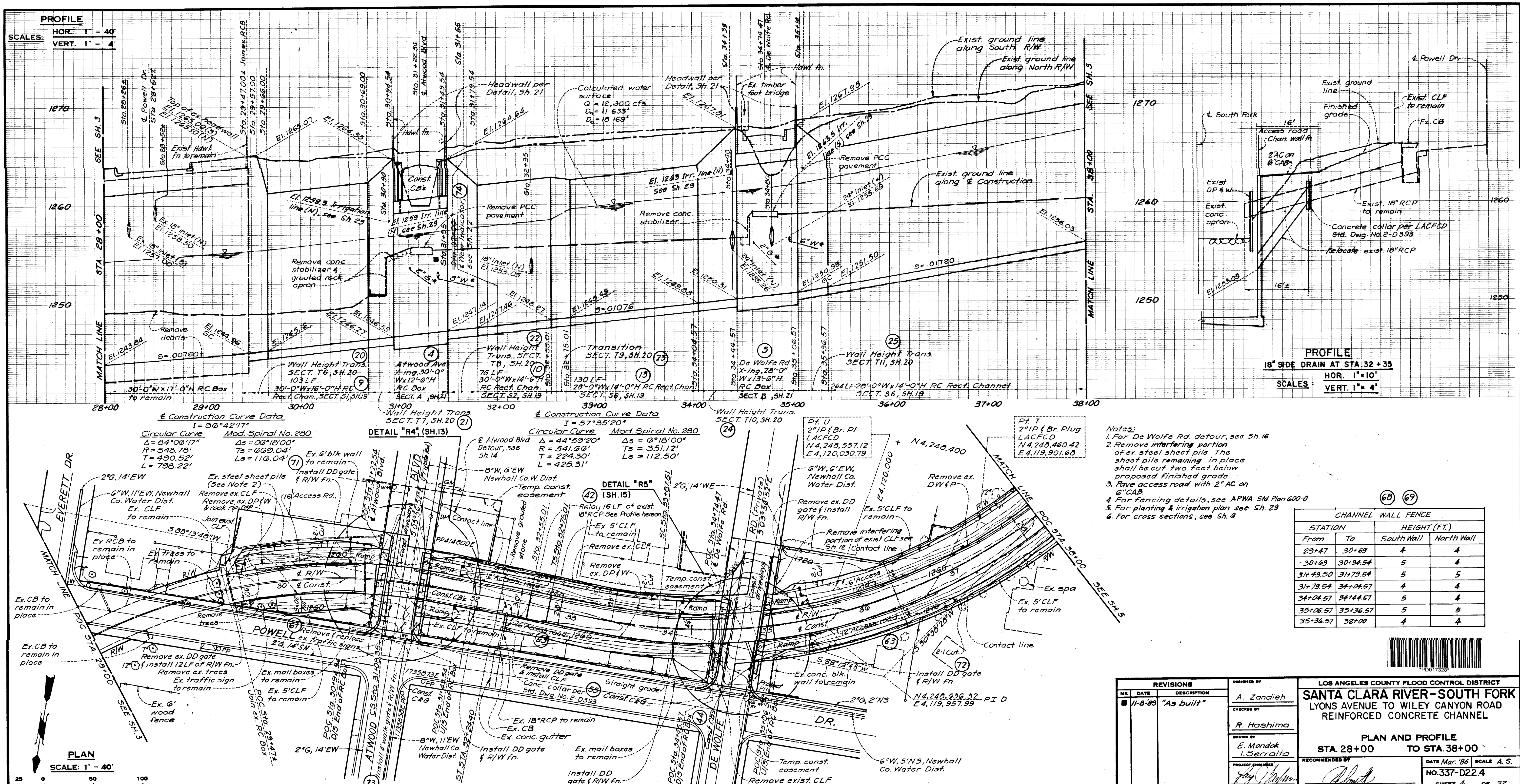
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

PLAN AND PROFILE
STA. 18+00 TO STA. 28+00

DATE Mar. '86 SCALE A.S.
NO. 337-D22.3
SHEET 3 OF 32

"AS BUILT" DRAWINGS



Notes:
1. For De Wolfe Rd. detour, see Sh.16
2. Remove interfering portion of ex. steel sheet pile. The sheet pile remaining in place shall be cut two feet below proposed finished grade.
3. Pave access road with 2" AC on 6" CAB.
4. For fencing details, see APWA Std Plan 600-0
5. For planting & irrigation plan see Sh. 29
6. For cross sections, see Sh. 8

(68) (69)

CHANNEL WALL FENCE			
STATION		HEIGHT (FT.)	
From	To	South Wall	North Wall
29+47	30+69	4	4
30+69	30+94.54	5	4
31+49.50	31+79.54	5	5
31+79.54	34+04.57	4	4
34+04.57	34+44.57	5	4
35+06.57	35+36.57	5	5
35+36.57	38+00	4	4

PD017328

REVISIONS		
MK	DATE	DESCRIPTION
B	11-8-89	"As built"

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER-SOUTH FORK

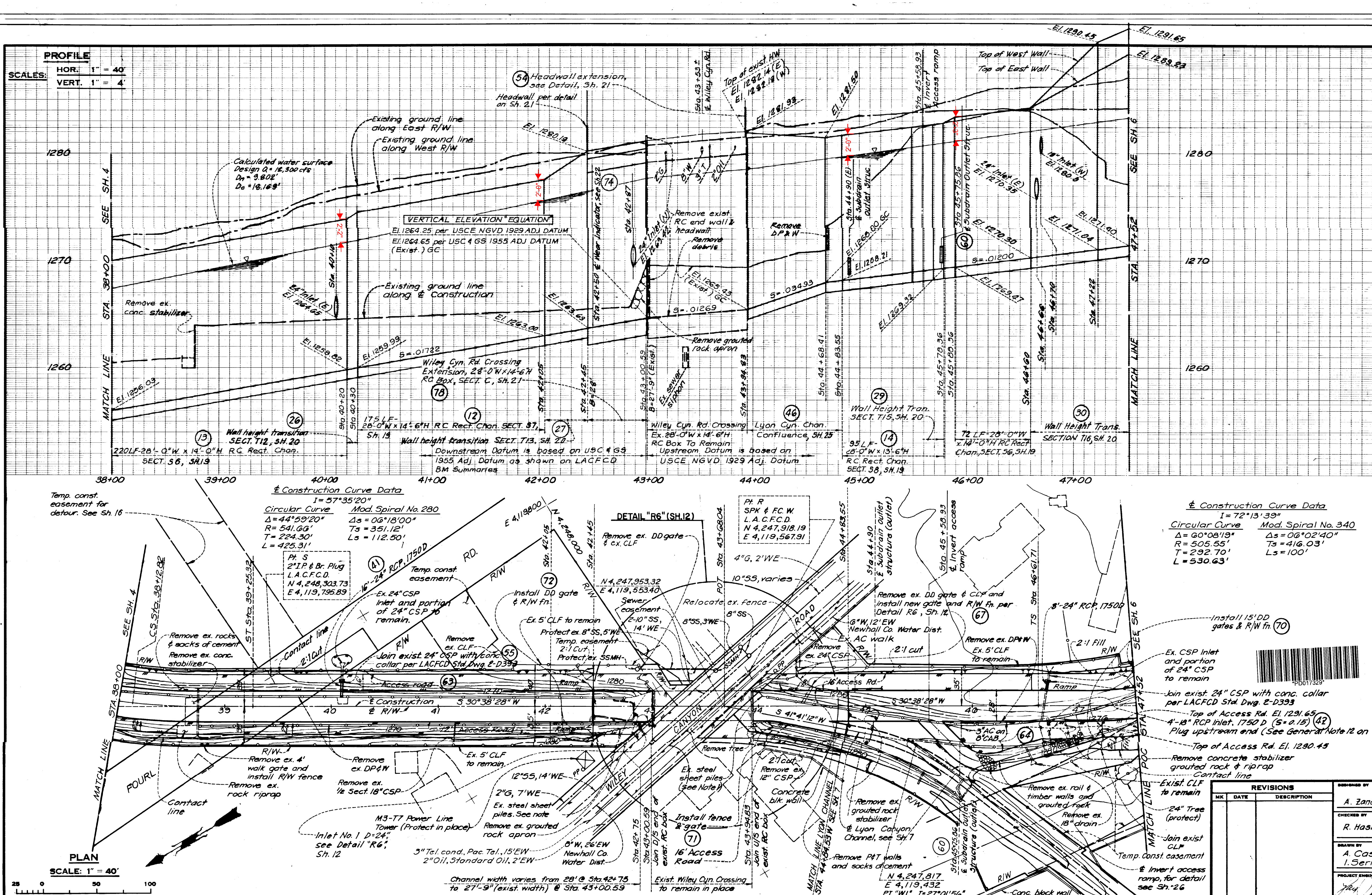
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

PLAN AND PROFILE

STA. 28+00 TO STA. 38+00

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok, I. Serralta
PROJECT ENGINEER [signature]
RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)
DATE Mar. '86 SCALE A.S.
NO. 337-D22.4
SHEET 4 OF 32

"AS BUILT" DRAWINGS



CHANNEL WALL FENCE			
STATION		HEIGHT (FT.)	
From	To	East Wall	West Wall
38+00	42+05	4	4
42+05	42+45	5	4
43+94.83	44+35	5	5
44+35	44+84.53W	—	5
44+35	44+83.55	4	—
44+83.55	45+47.62	4	4
45+47.62	45+74	4	—
45+74	47+22	4	4
47+22	47+52	4	5

Notes:

1. Remove interfering portion of exist. steel sheet piles. The sheet piles remaining in place shall be cut two feet below finished grade.
2. Pave access road with 2" AC on 6" CAB.
3. For fencing details, see APWA Std. Plan 600-0.
4. For Cross Sections, see Sh. 9 & 10
5. For subdrain system details, see Sh. 30

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY A. Castro, I. Serralta
PROJECT ENGINEER C 017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

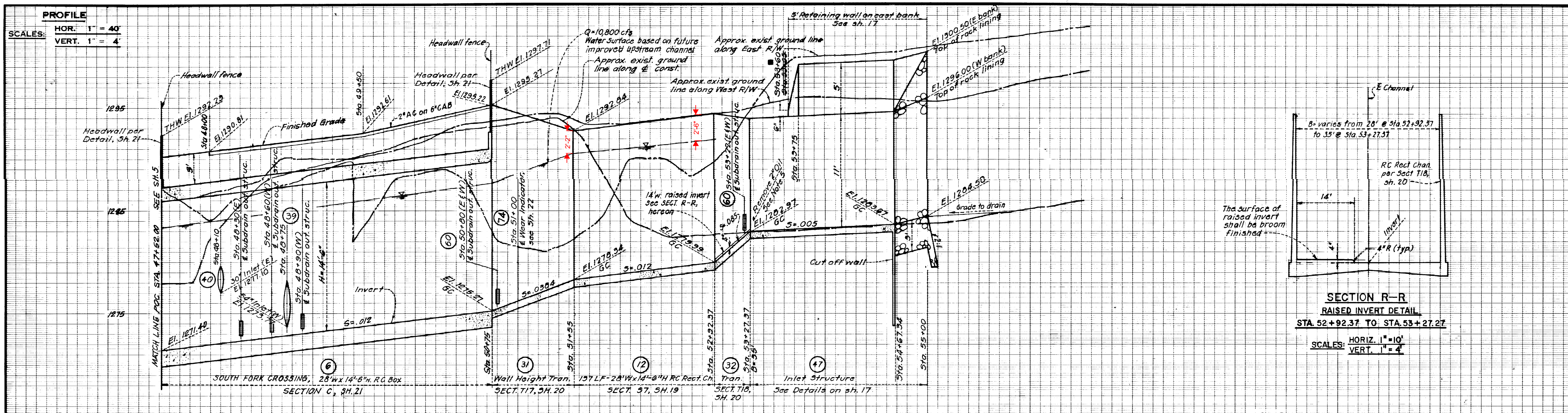
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

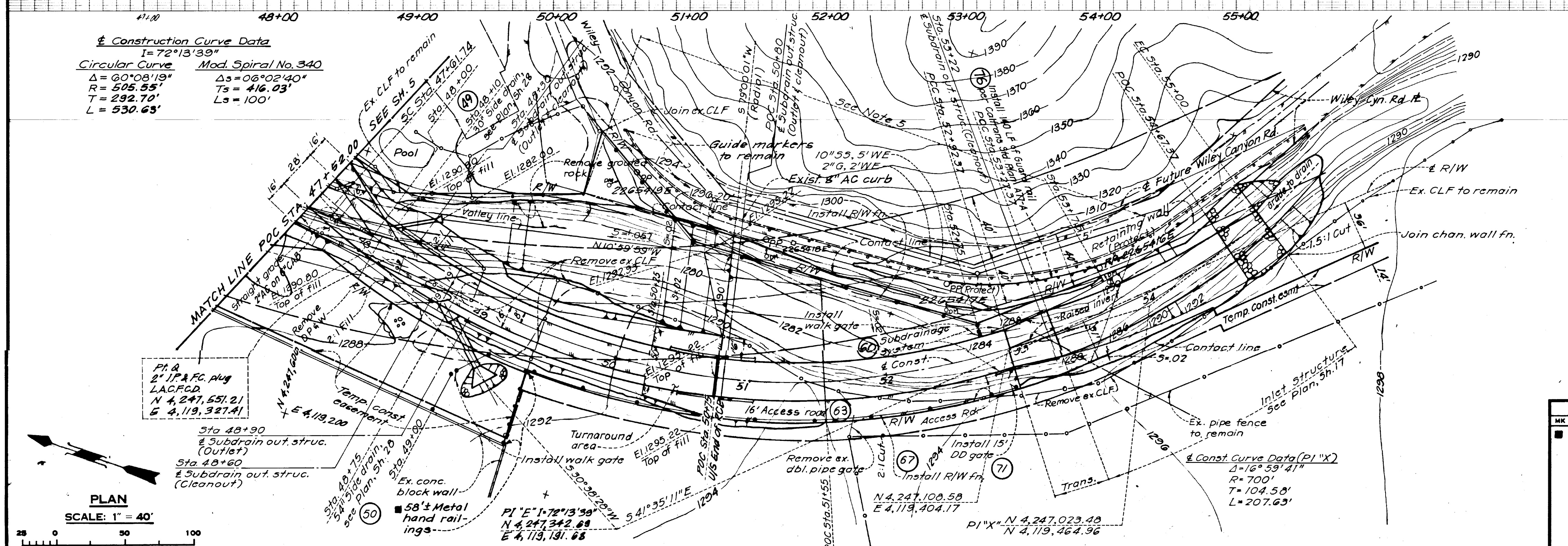
PLAN AND PROFILE
STA. 38+00 TO STA. 47+52

RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

DATE Mar., 86 SCALE A.S.
NO. 337-D22.5
SHEET 5 OF 32

"AS BUILT" DRAWINGS





CHANNEL WALL FENCE			
STATION		HEIGHT (FT.)	
From	To	East Wall	West Wall
50+75	55+00	5	5

Notes:

1. Pave access road with 2"AC on 6" CAB.
2. For fencing details, see APWA Std. Plan 600-0
3. For Cross Sections, see Sh. 10 & 11
4. For subdrain system details, see sh. 30.
5. Remove approx. 395 LF of ex. Chevron USA Inc. 2" Newhall Line (Idle). Contact Chevron's Bob Fragione (213) 694-7363, 2 working days prior to the removal of line.

REVISIONS		
MK	DATE	DESCRIPTION
■	11-6-85	"As built."

DESIGNED BY: A. Zandieh
CHECKED BY: D. Chen
DRAWN BY: E. Mondok, I. Serralta
PROJECT ENGINEER: C01746
RECOMMENDED BY: DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER–SOUTH FORK

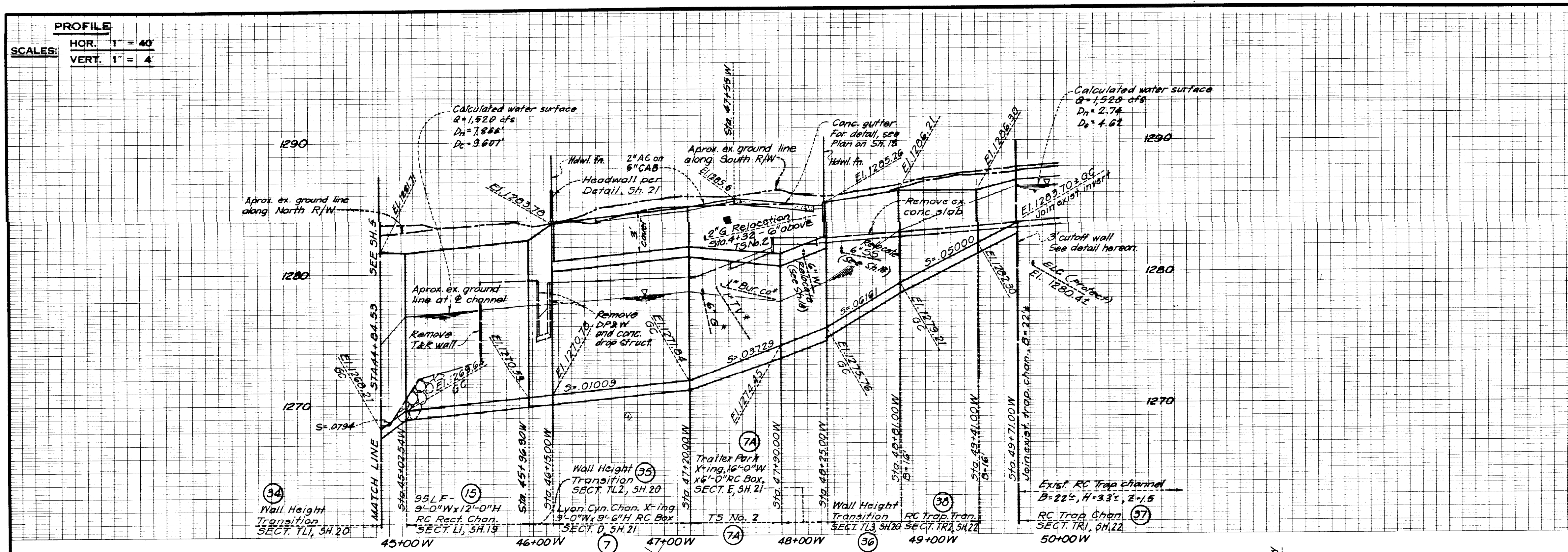
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

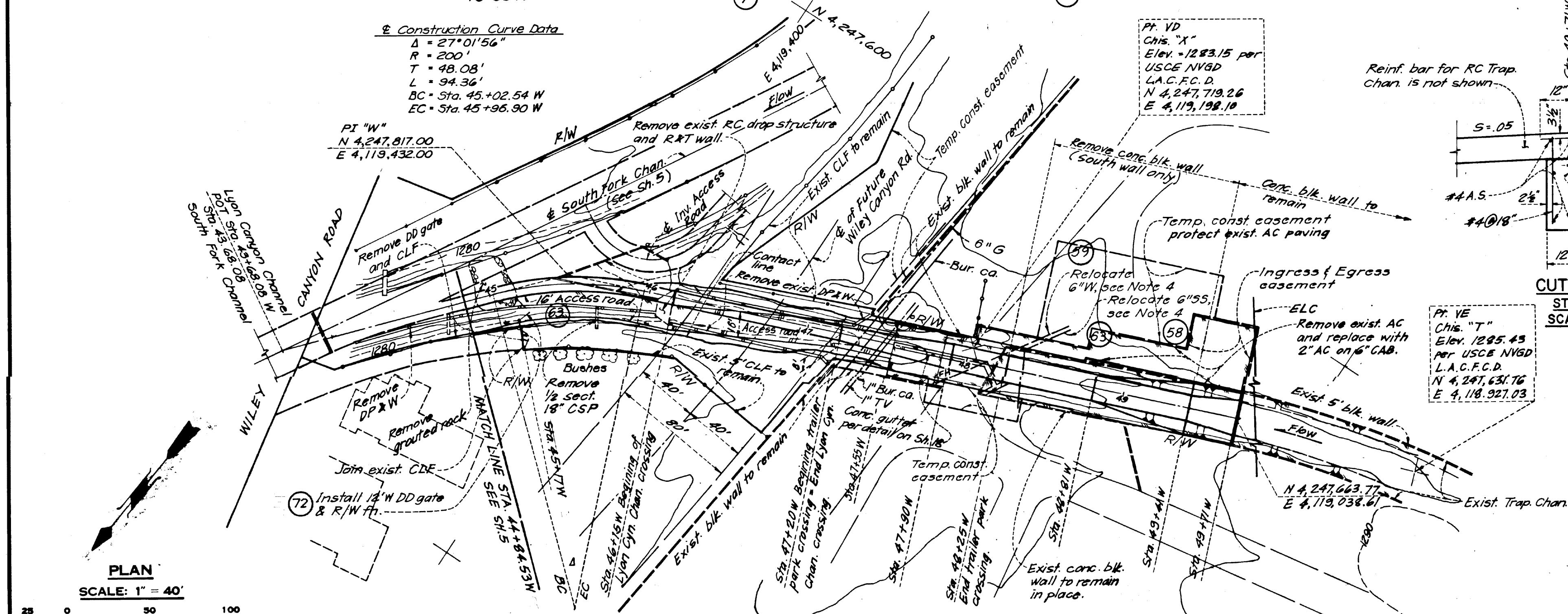
PLAN AND PROFILE

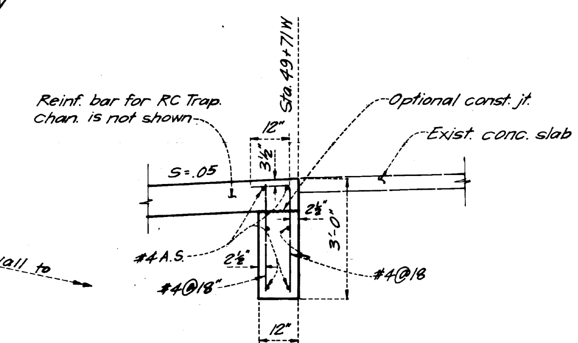
STA. 47+52 TO STA. 55+00

DATE Mar. '86 SCALE A.S.
NO. 337-D22.6
SHEET 6 OF 37

"AS BUILT" DRAWINGS







CUTOFF DETAIL
STA. 49+71 W
SCALE: 1/2"=1'-0"

(68) (69)

CHANNEL WALL FENCE			
STATION		HEIGHT (FT.)	
From	To	South Wall	North Wall
44+83.53W	45+17W	4	5
45+17W	45+96.90W	4	4
45+96.90W	46+15W	4	5
48+25W	49+41W	5	5

Notes:

1. Pave access road with 2" AC on 6" CAB.
2. For fencing details, see APWA Std. Plan 600-0
3. For Cross Sections, see Sh. 11
4. For utility relocation, grading and fencing details from Sta. 47+55W to Sta. 49+71W, see Sh. 18

PD017331

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-'89	"As built."

DESIGNED BY A. Zandieh
CHECKED BY D. Chen
DRAWN BY E. Mondok, A. Castro
PROJECT ENGINEER [signature] C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

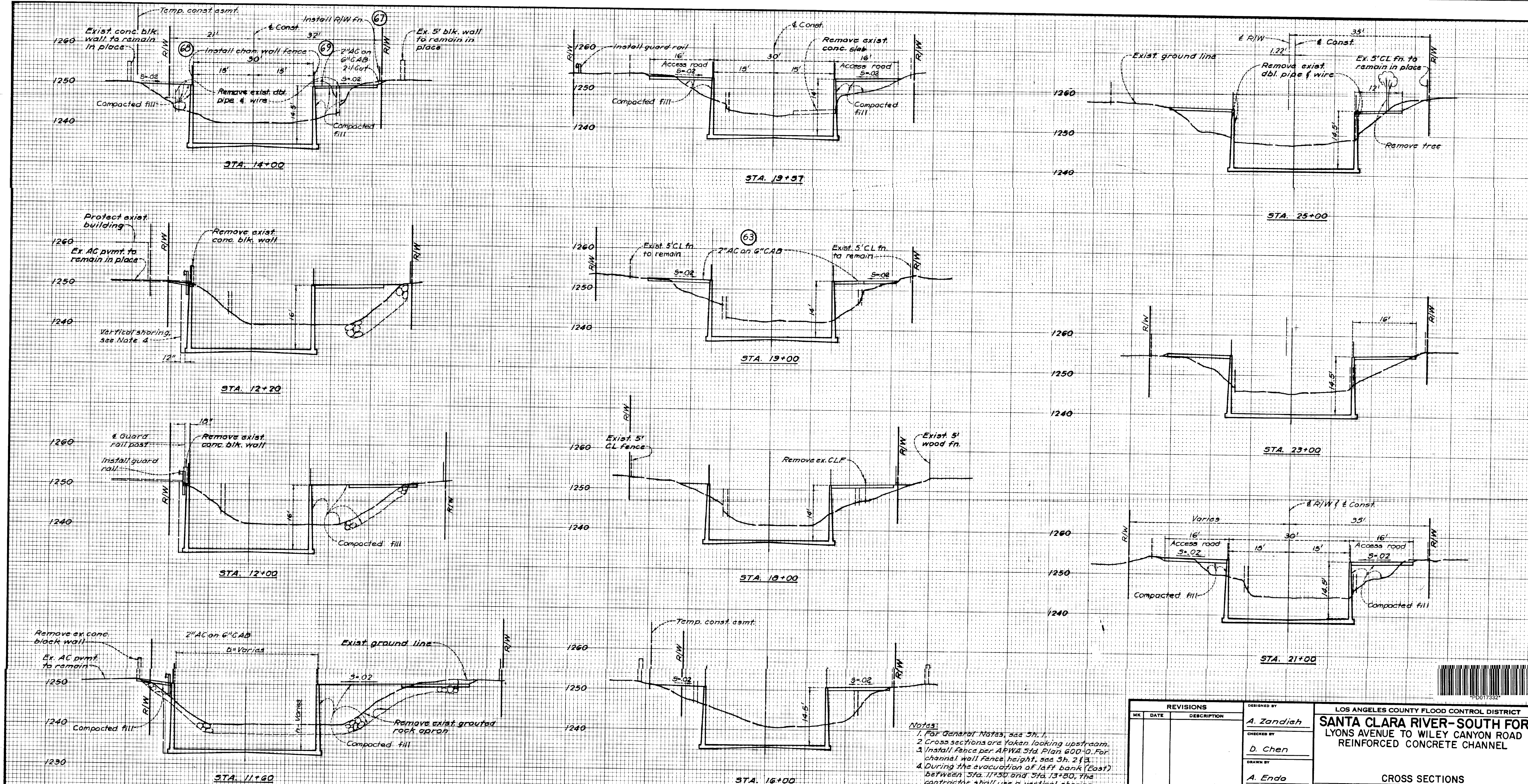
SANTA CLARA RIVER-SOUTH FORK
LYON CANYON CHANNEL
REINFORCED CONCRETE CHANNEL

PLAN AND PROFILE
STA. 43+63.08 W TO STA. 49+71 W

RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

DATE Mar. '86 SCALE A.S.
NO. 337-D22.7
SHEET 7 OF 32

"AS BUILT" DRAWINGS



Notes:

1. For General Notes, see Sh. 1.
2. Cross sections are taken looking upstream.
3. Install fence per APWA Std. Plan 600-0. For channel wall fence height, see Sh. 2 & 3.
4. During the evacuation of left bank (East) between Sta. 11+50 and Sta. 13+80, the contractor shall use a vertical shoring to protect the exist. bldg. See cross section @ Sta. 12+20.

PD017332

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY D. Chen
DRAWN BY A. Endo
PROJECT ENGINEER [signature] 001746?

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

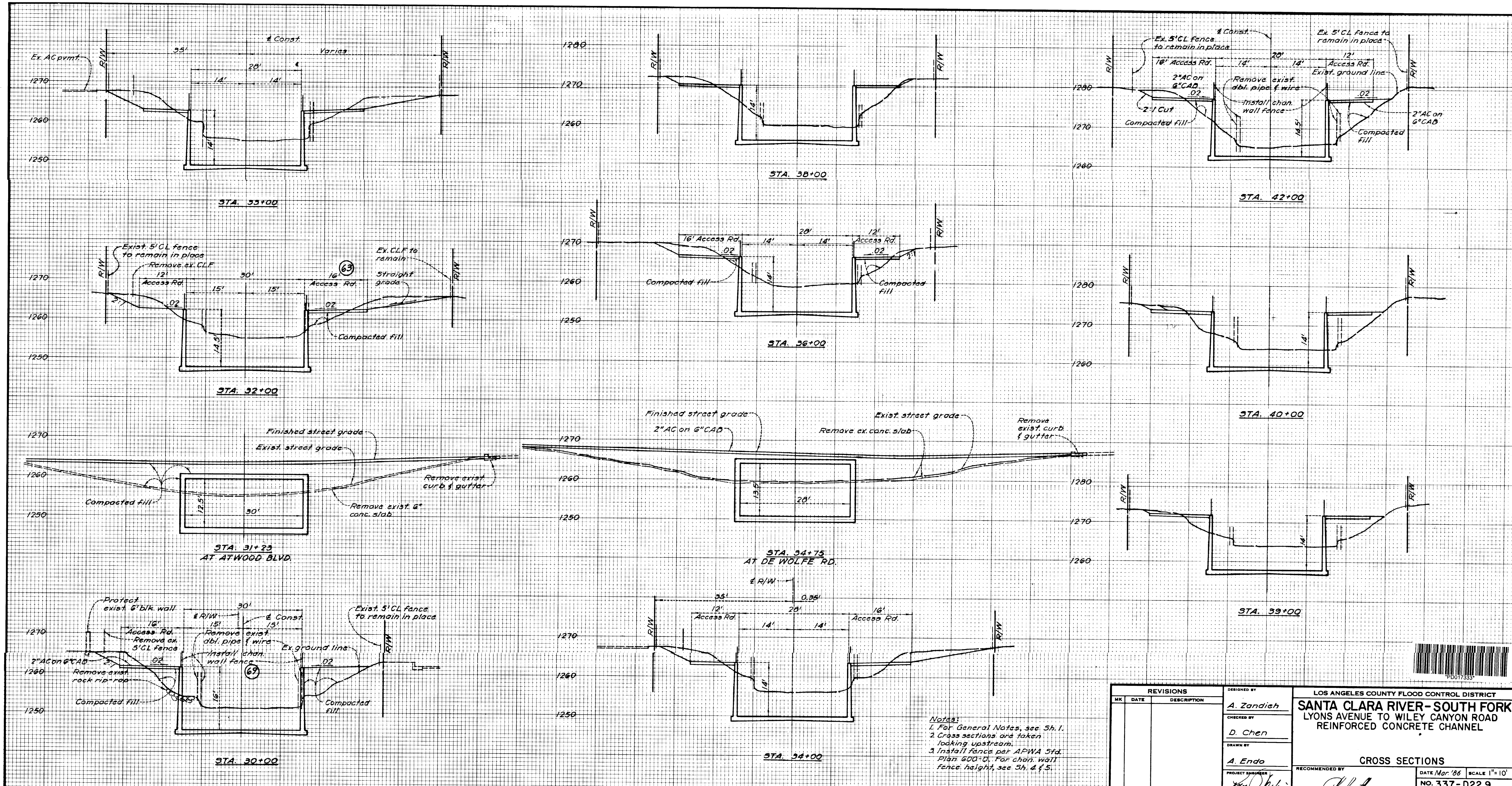
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

CROSS SECTIONS

RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

DATE Mar. '86 SCALE 1"=10'
NO. 337-D22.8
SHEET 8 OF 32

"AS BUILT" DRAWINGS



Notes:
1. For General Notes, see Sh. 1.
2. Cross sections are taken looking upstream.
3. Install fence per APWA Std. Plan 600-0. For chan. wall fence height, see Sh. 4 & 5.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY D. Chen
DRAWN BY A. Endo
PROJECT ENGINEER [signature]

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

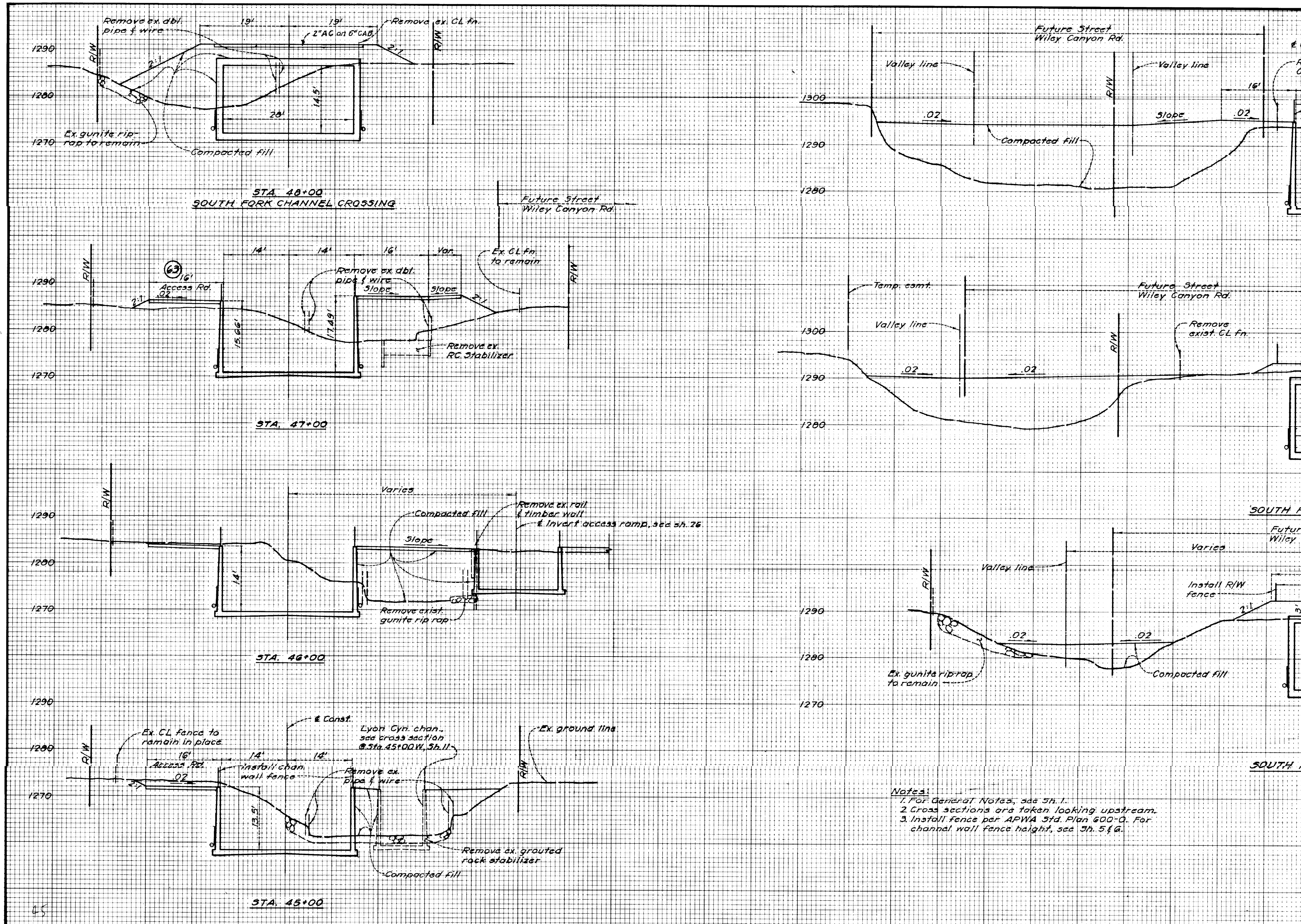
CROSS SECTIONS

RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

DATE Mar '86 SCALE 1" = 10'
NO. 337-D22.9
SHEET 9 OF 32

PD017333

"AS BUILT" DRAWINGS



Notes:
1. For General Notes, see Sh. 1.
2. Cross sections are taken looking upstream.
3. Install fence per APWA Std. Plan 600-0. For channel wall fence height, see Sh. 5 & 6.

PD017334

REVISIONS		
MK	DATE	DESCRIPTION

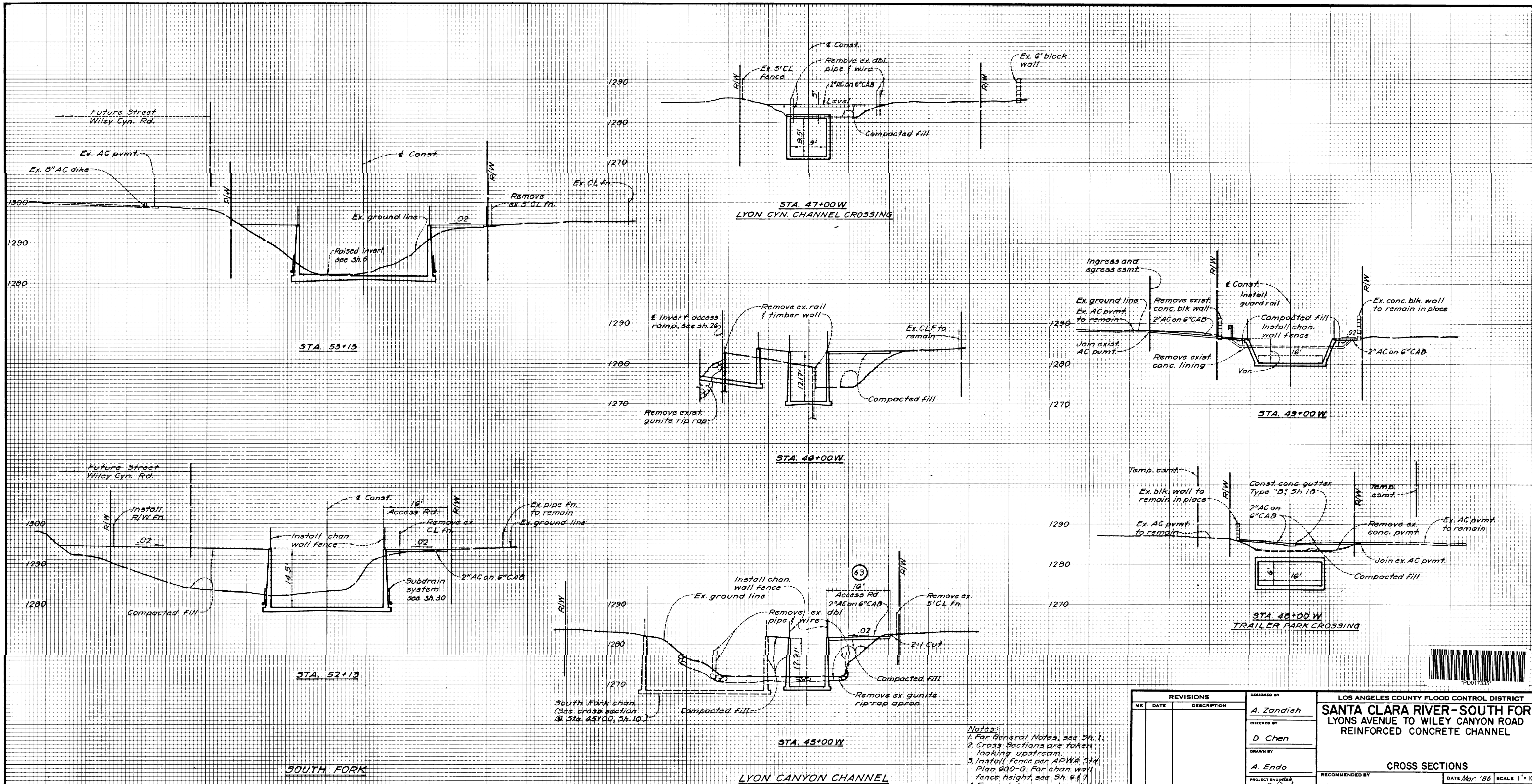
DESIGNED BY A. Zandieh
CHECKED BY D. Chan
DRAWN BY A. Endo
PROJECT ENGINEER [signature] 20146
RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

CROSS SECTIONS

DATE Mar. '86 SCALE 1"=10'
NO. 337-D22.10
SHEET 10 OF 32

"AS BUILT" DRAWINGS



Notes:
1. For General Notes, see Sh. 1.
2. Cross Sections are taken looking upstream.
3. Install fence per APWA Std. Plan 600-0. For chan. wall fence height, see Sh. 6 & 7.
4. For subdrain system details, see Sh. 30.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY D. Chen
DRAWN BY A. Endo
PROJECT ENGINEER

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

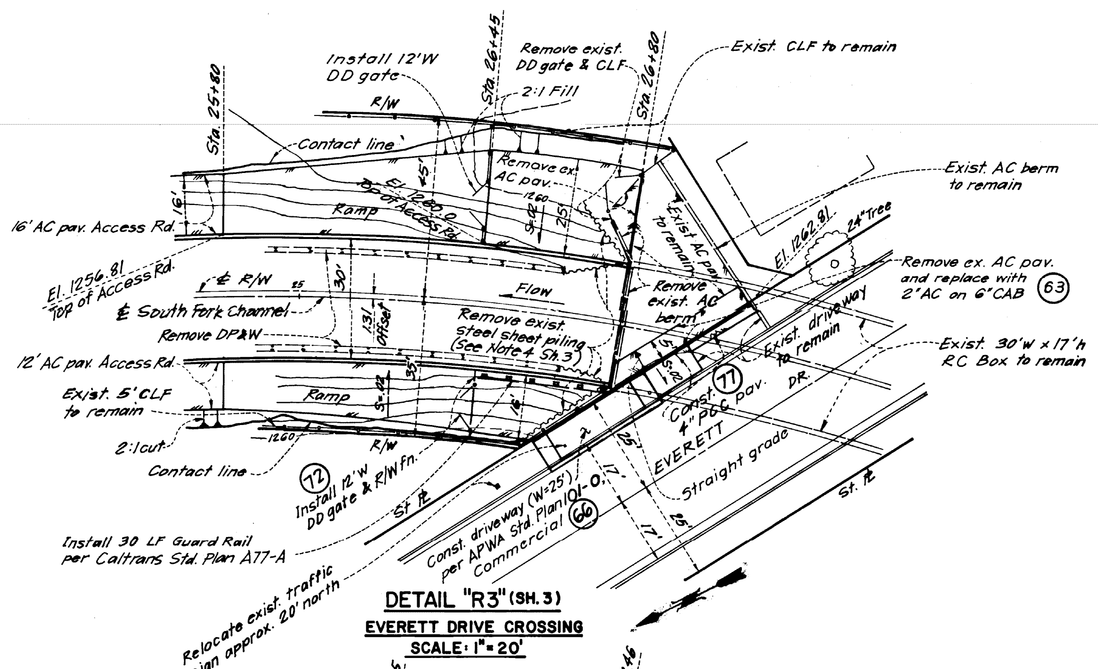
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

CROSS SECTIONS

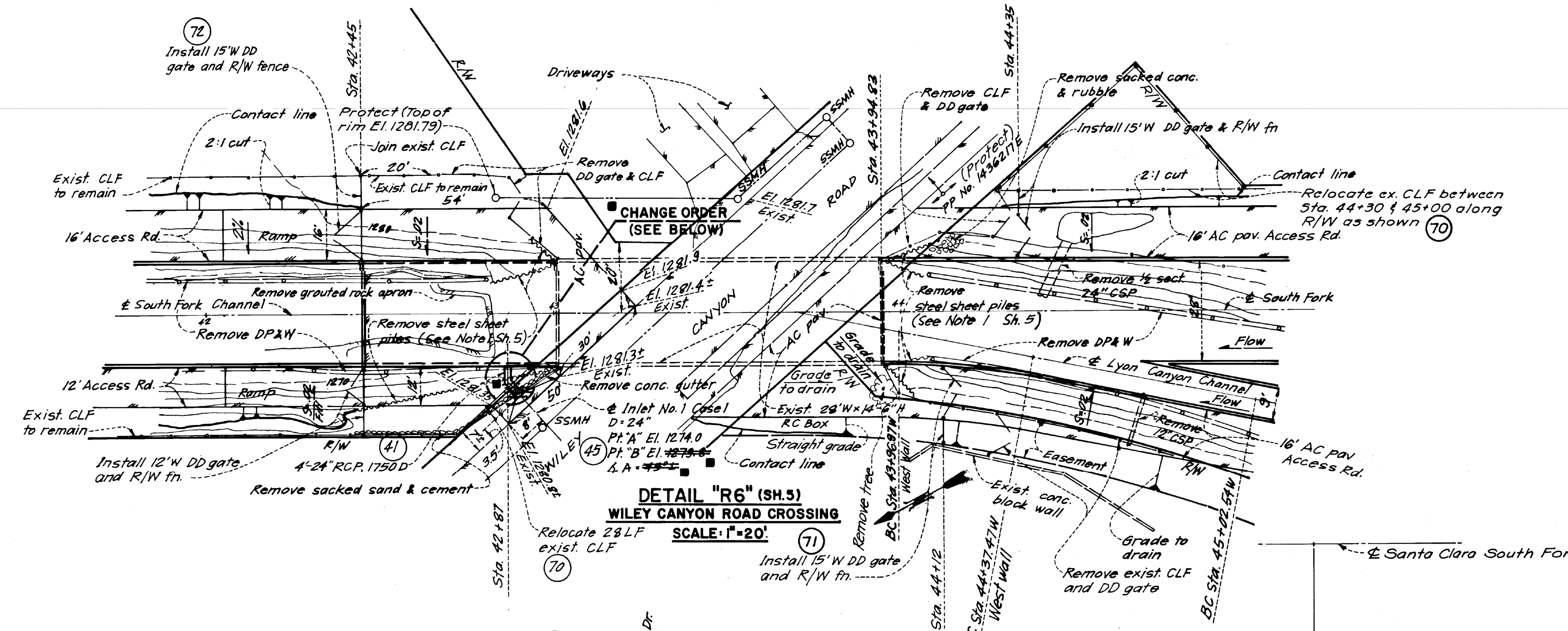
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

DATE Mar. '86 SCALE 1"=10'
NO. 337-D22.11
SHEET 11 OF 32

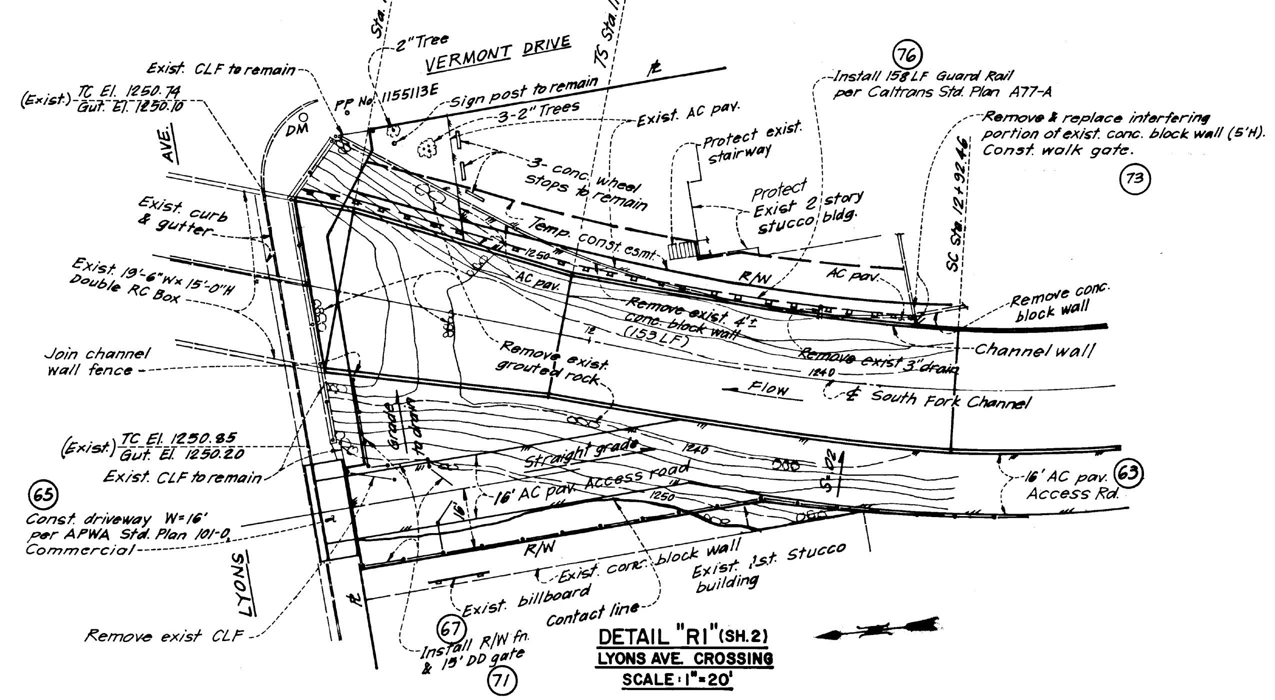
"AS BUILT" DRAWINGS



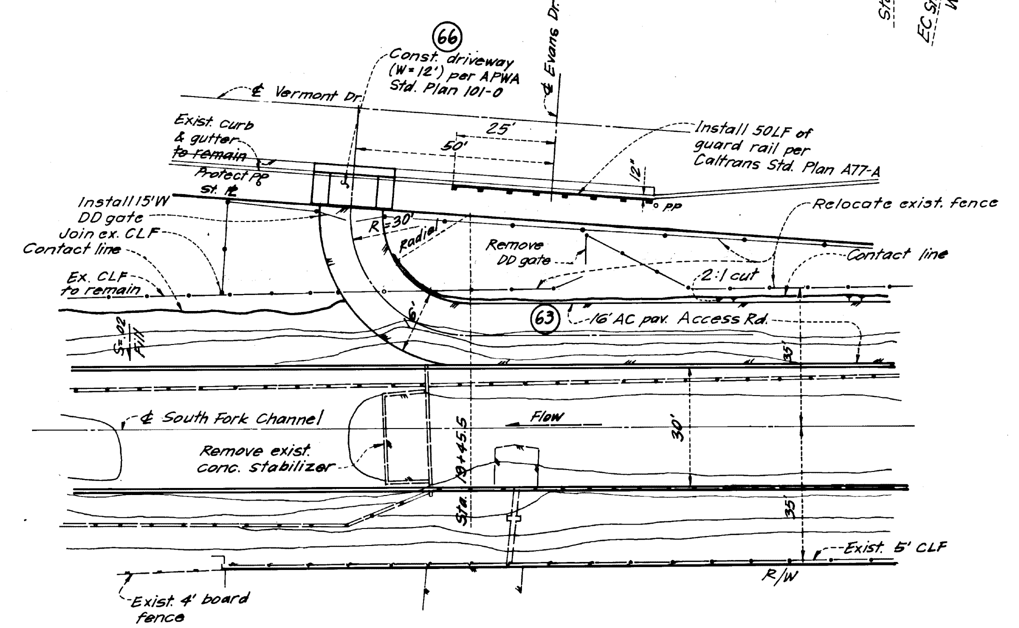
DETAIL "R3" (SH. 3)
EVERETT DRIVE CROSSING
SCALE: 1"=20'



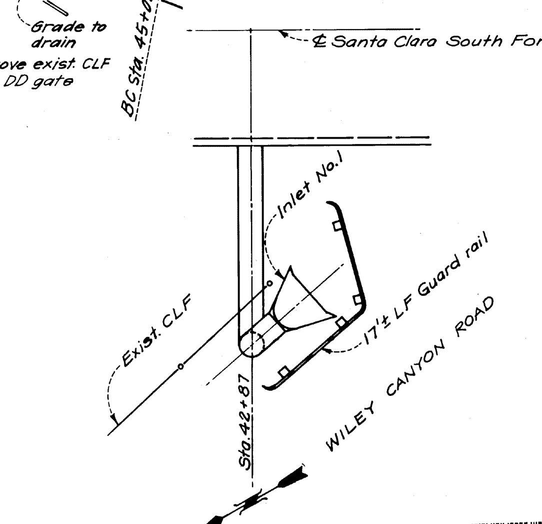
DETAIL "R6" (SH. 5)
WILEY CANYON ROAD CROSSING
SCALE: 1"=20'



DETAIL "R1" (SH. 2)
LYONS AVE. CROSSING
SCALE: 1"=20'



DETAIL "R2" (SH. 3)
ACCESS ROAD RAMP
STA. 19+16±
SCALE: 1"=20'



■ CHANGE ORDER
PLAN
NOT TO SCALE

Notes:
1. Install Chain Link Fence and Gate per APWA Std. Plan 600-0
2. AC pavement shall be 2" AC on 6" CAB

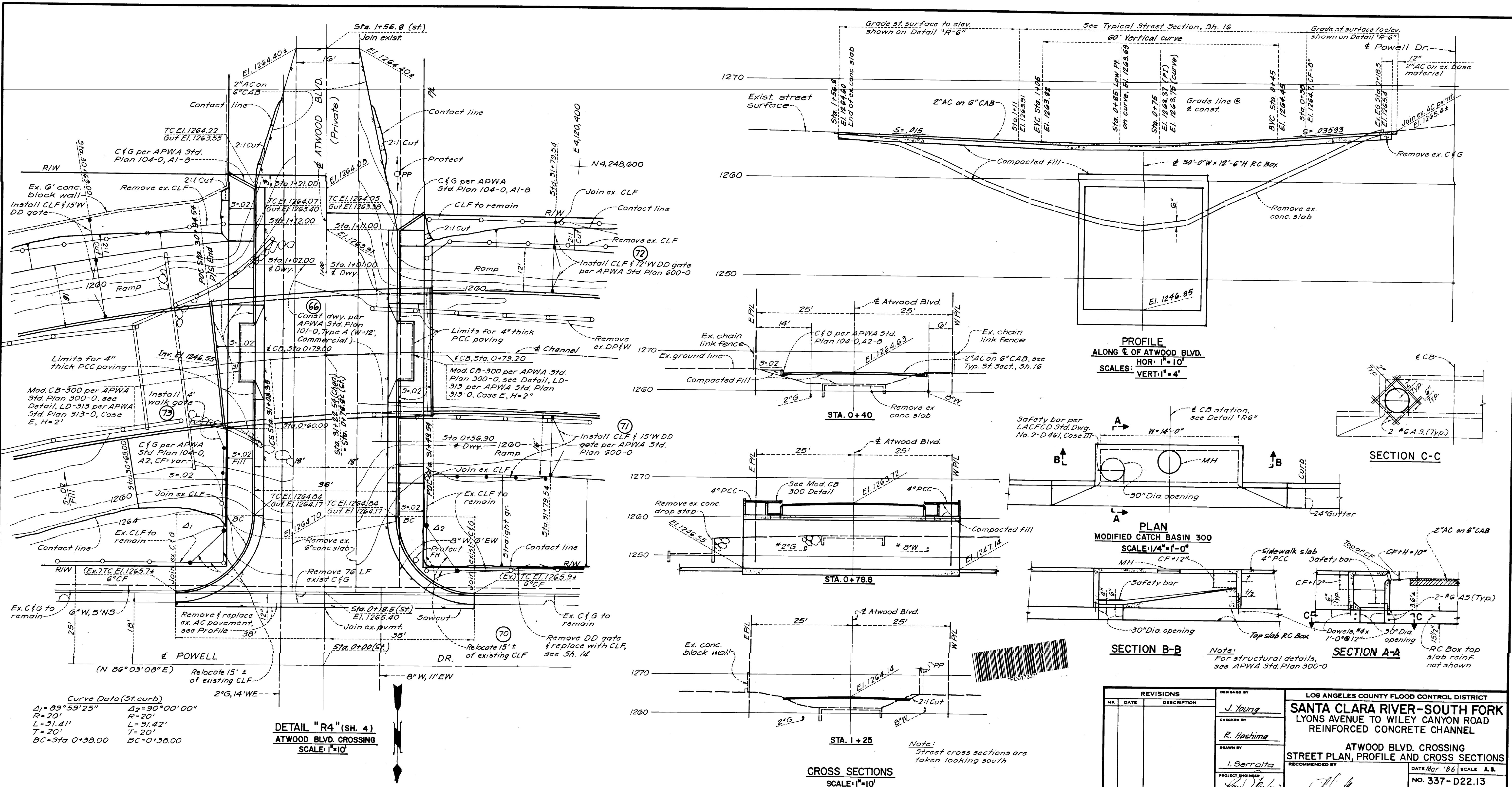
REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-89	"As built"

DESIGNED BY: A. Zandieh
CHECKED BY: R. Hashima
DRAWN BY: E. Mondok
PROJECT ENGINEER: [signature] 601746
RECOMMENDED BY: [signature] DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL
LYONS AVE., EVANS DR., EVERETT DR., AND WILEY CANYON RD. ACCESS RAMP DETAILS

DATE Mar. '86 SCALE A.S.
NO. 337-D22.12
SHEET 12 OF 32

"AS BUILT" DRAWINGS



REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY J. Young
CHECKED BY R. Hashima
DRAWN BY I. Serralta
PROJECT ENGINEER C 011461
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

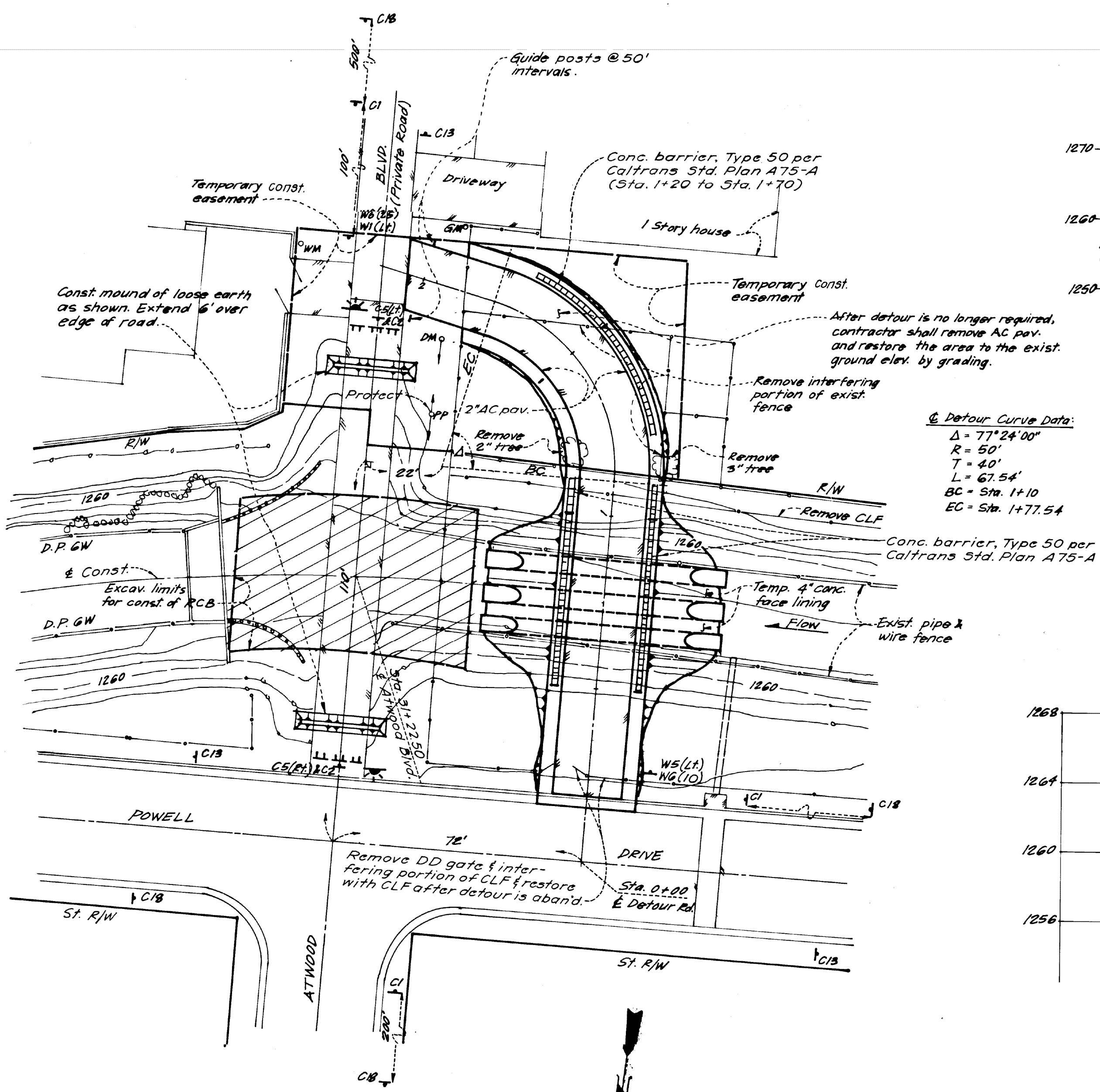
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

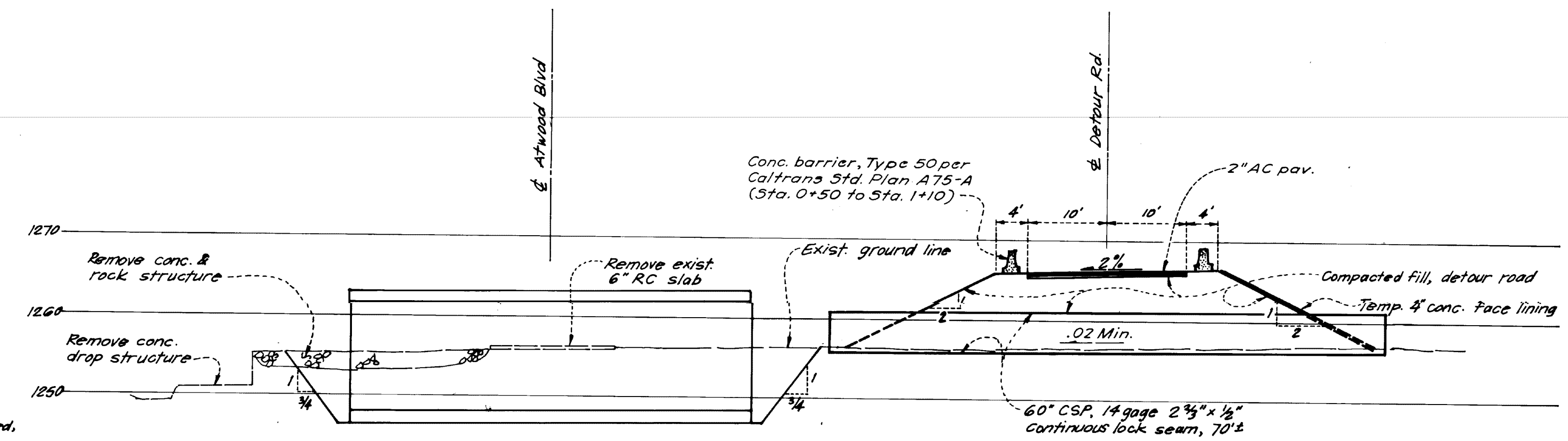
ATWOOD BLVD. CROSSING
STREET PLAN, PROFILE AND CROSS SECTIONS

DATE Mar. '86 SCALE A.S.
NO. 337-D22.13
SHEET 13 OF 32

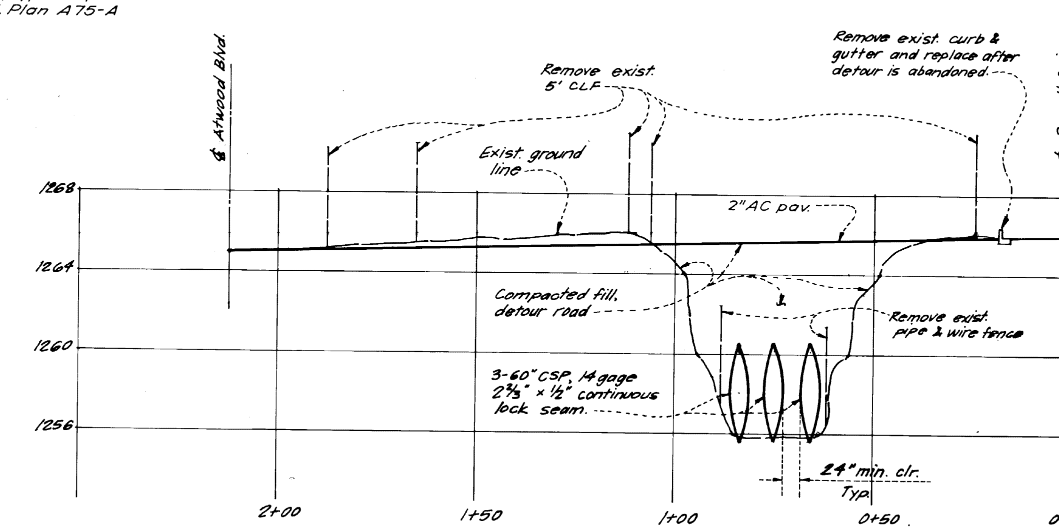
"AS BUILT" DRAWINGS



DETOUR PLAN (61)
FOR ATWOOD BLVD.
SCALE: 1" = 20'



CROSS SECTION
AT STA. 0+75
SCALE: 1" = 10'



PROFILE
SCALES: HOR. 1" = 20' VERT. 1" = 4'

Sign Legend:

- Guide Post
- Temporary flashing beacon (12" Amber)
- Post with sign attached
- TT Type III Barricades
- C1 Detour Ahead
- C2 Road Closed
- C5 Left & right detour arrow
- C13 End Construction
- C18 Road Construction Ahead
- W1 Left & right reverse curve
- W5 Left & right curve
- W6(10) 10 mph advisory speed

Notes:

1. Barricades, Guide Post and Traffic Sign Details per American Public Works Association, WORK AREA TRAFFIC CONTROL HANDBOOK, Sixth Edition.
2. Install fence per APWA Std. Plan 600-0.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY J. Young
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER C01746

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

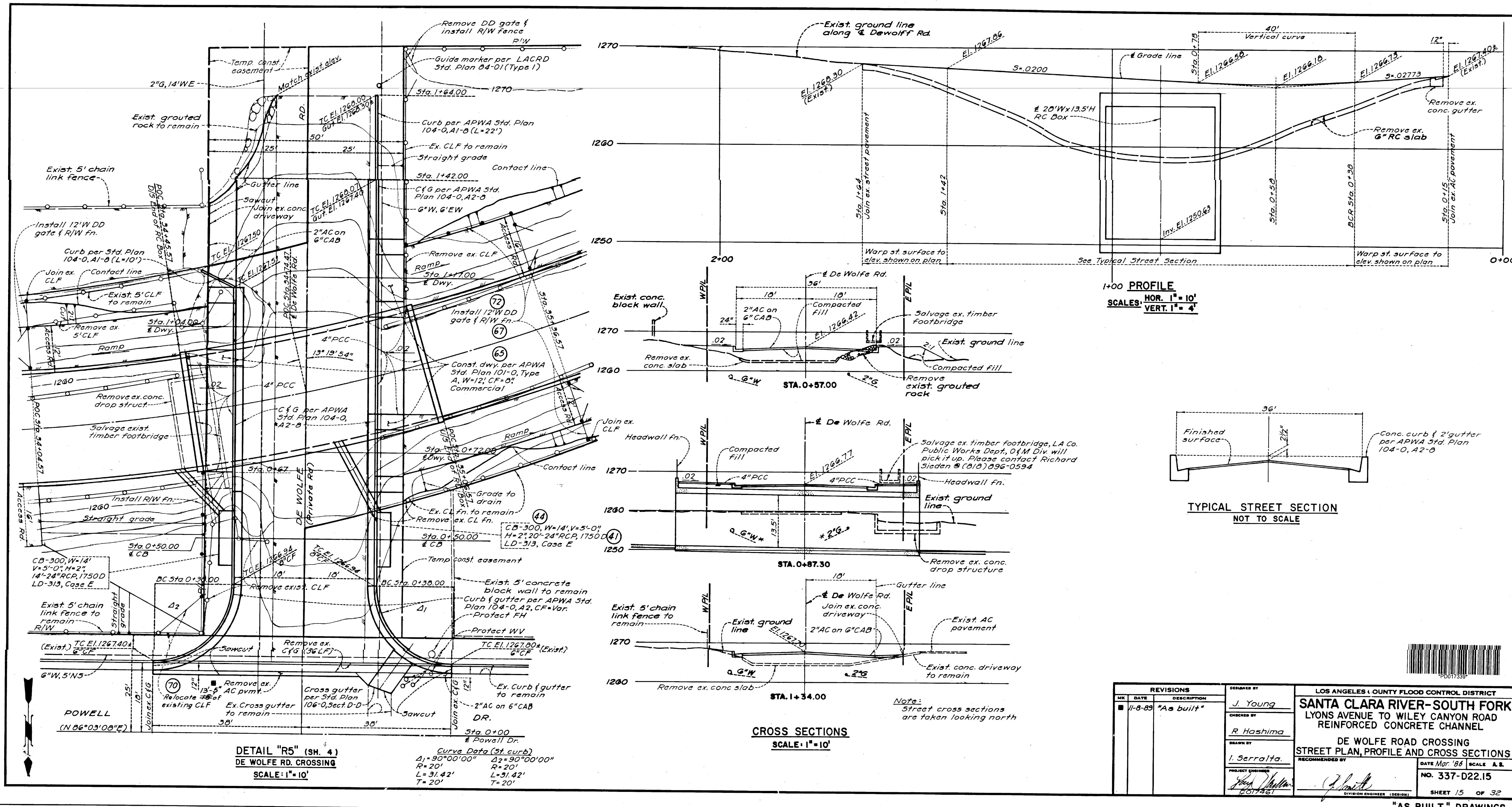
SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

ATWOOD BOULEVARD CROSSING - DETOUR PLAN

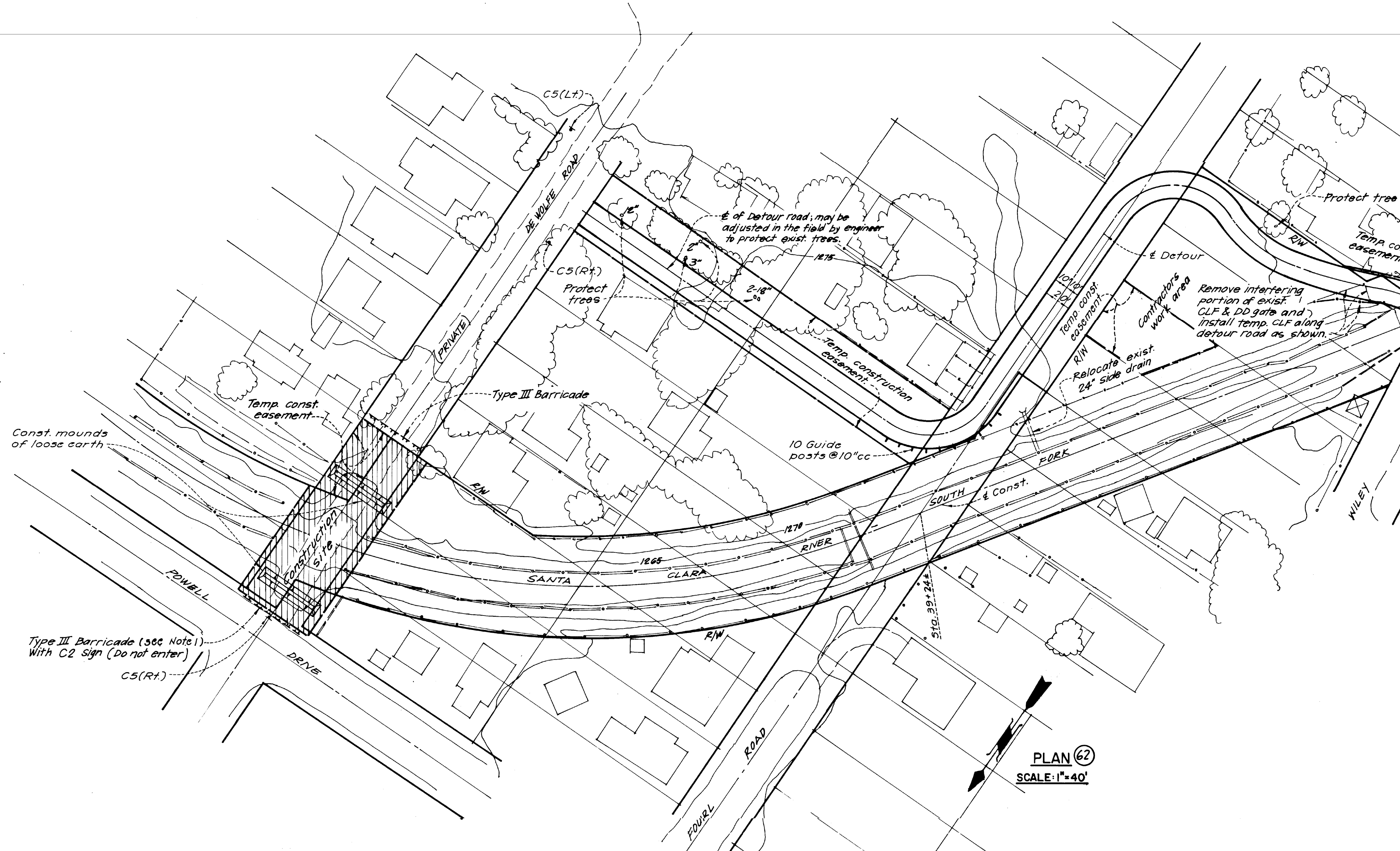
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

DATE Mar. '86 | SCALE A.S.
NO. 337-D22.14
SHEET 14 OF 32

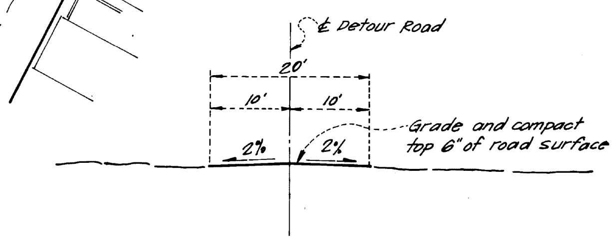
"AS BUILT" DRAWINGS



DETAIL "R5" (SH. 4)
DE WOLFE RD. CROSSING
SCALE: 1" = 10'
POWELL
(N 86°03'08"E)
DR.
DE WOLFE (Private Rd.)
Curve Data (St. curb)
Δ1 = 90°00'00" R = 20' L = 31.42' T = 20'
Δ2 = 90°00'00" R = 20' L = 31.42' T = 20'
Remove DD gate & install R/W fence
Guide marker per LACRD Std. Plan 84-01 (Type 1)
Curb per APWA Std. Plan 104-0, A1-8 (L=22')
Ex. CLF to remain
Straight grade
C&G per APWA Std. Plan 104-0, A2-8
Install 12'W DD gate & R/W fn.
Const. dwy. per APWA Std. Plan 101-0, Type A, W=12', CF=8", Commercial
CB-300, W=14', V=5'-0", H=2', 20'-24"RCP, 1750D, LD-313, Case E
Exist. 5' concrete block wall to remain
Curb & gutter per APWA Std. Plan 104-0, A2, CF=Var.
Protect FH
Protect WV
Exist. 5' chain link fence
Exist. grouted rock to remain
Install 12'W DD gate & R/W fn.
Salvage exist. timber footbridge
Remove ex. conc. drop struct.
Ex. Curb & gutter to remain
Cross gutter per Std. Plan 106-0, Sect. D-D
Ex. Cross gutter to remain
Relocate existing CLF
Sawcut
Sta. 0+00 ℄ Powell Dr.
PROFILE
SCALES: HOR. 1" = 10' VERT. 1" = 4'
Exist. ground line along ℄ Dewolff Rd.
40' Vertical curve
S = .0200
S = .02773
℄ 28'W x 13.5'H RC Box
Inv. El. 1250.63
Remove ex. conc. gutter
Remove ex. 6" RC slab
Warp st. surface to elev. shown on plan
See Typical Street Section
CROSS SECTIONS
SCALE: 1" = 10'
STA. 0+57.00
STA. 0+87.30
STA. 1+34.00
Note: Street cross sections are taken looking north
Salvage ex. timber footbridge, LA Co. Public Works Dept., O&M Div. will pick it up. Please contact Richard Sieden @ (818) 896-0594
TYPICAL STREET SECTION
NOT TO SCALE
Conc. curb & 2' gutter per APWA Std. Plan 104-0, A2-8
Finished surface
REVISIONS
MK | DATE | DESCRIPTION
■ | 11-8-89 | "As built"
DESIGNED BY J. Young
CHECKED BY R. Hashima
DRAWN BY I. Serralta
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL
DE WOLFE ROAD CROSSING
STREET PLAN, PROFILE AND CROSS SECTIONS
DATE Mar. '86 SCALE A.S.
NO. 337-D22.15
SHEET 15 OF 32
"AS BUILT" DRAWINGS



PLAN 62
SCALE: 1"=40'



TYPICAL CROSS SECTION
SCALE: 1"=10'

Notes:
1. Barricade and guide post details per American Public Works Association, WORK AREA TRAFFIC CONTROL HANDBOOK, Sixth Edition.
2. Alignment of proposed detour follows route of exist. unimproved private road.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY J. Young
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER 601746

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

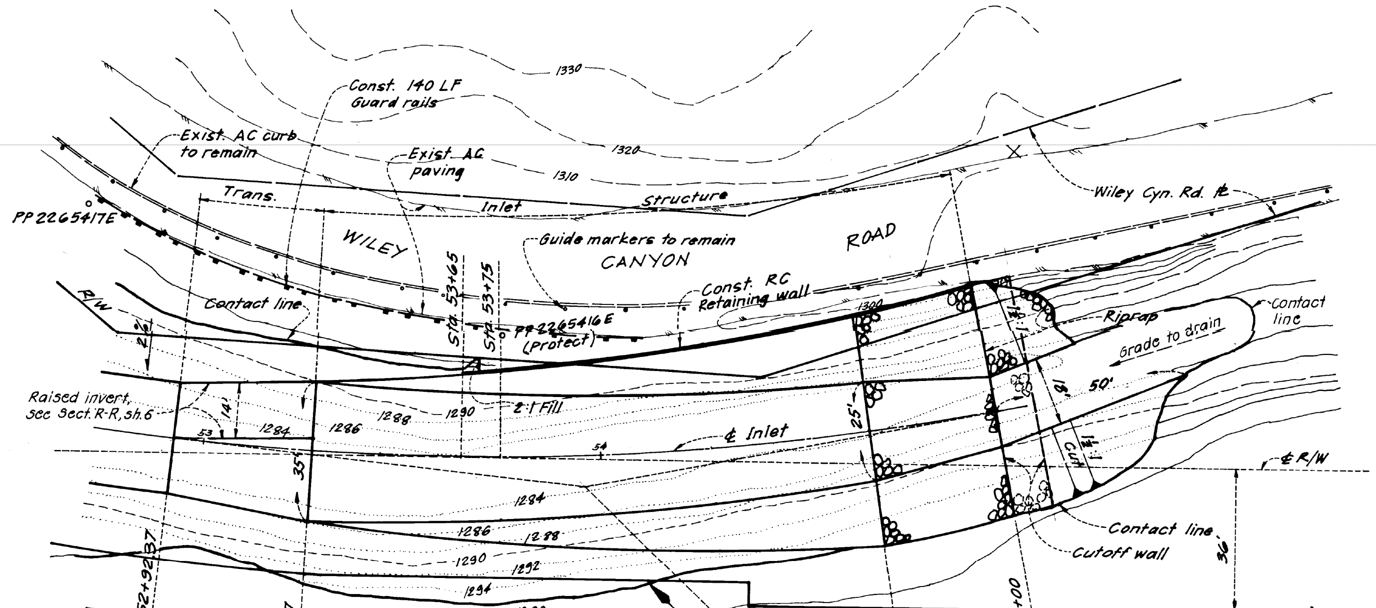
SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

DE WOLFE ROAD CROSSING - DETOUR PLAN

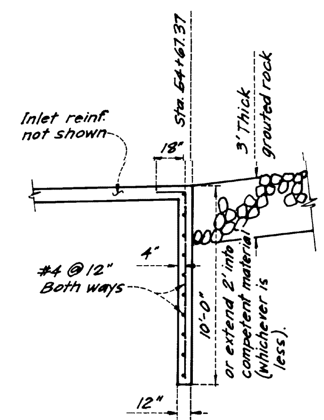
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

DATE Mar. '86 SCALE A.S.
NO. 337-D22.16
SHEET 16 OF 32

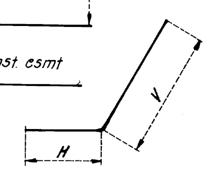
"AS BUILT" DRAWINGS



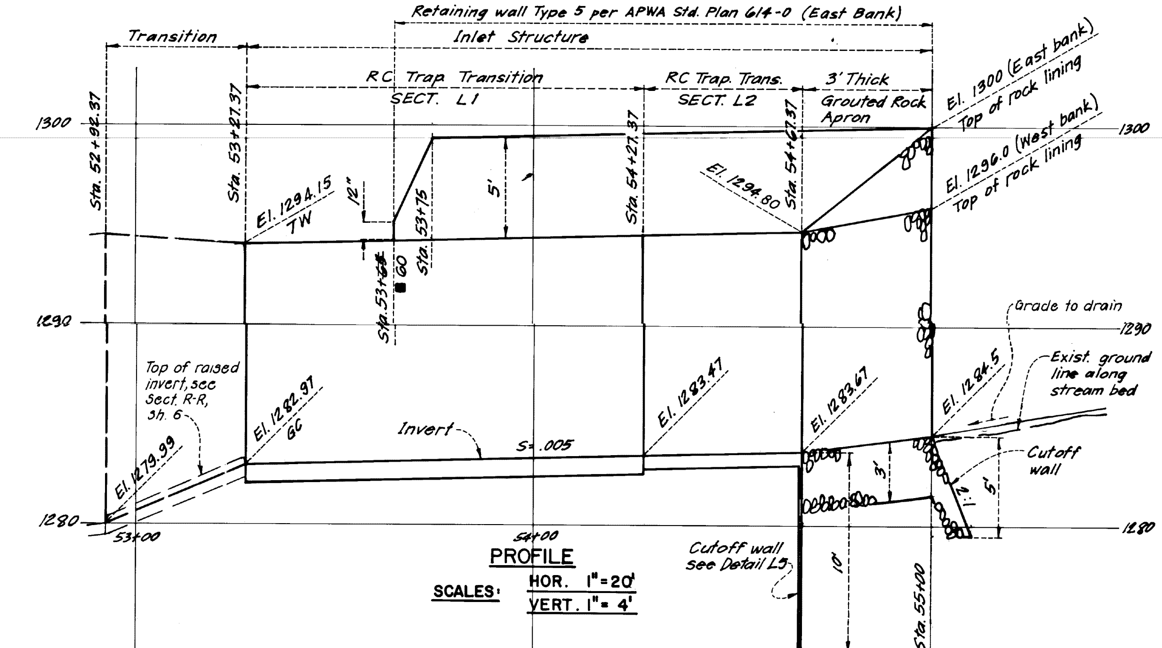
PLAN (SH. 6)
INLET STRUCTURE
SCALE: 1" = 20'

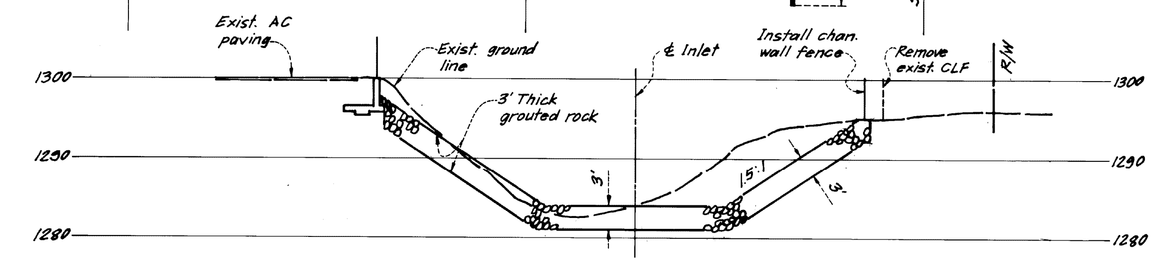


DETAIL L5
SCALE: 1/4" = 1'-0"

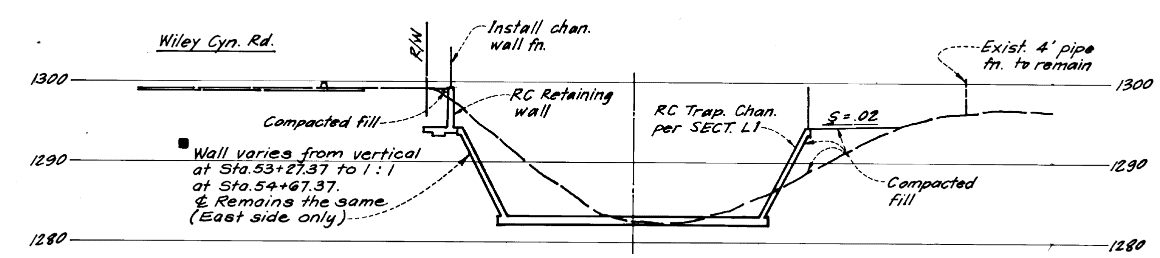


BAR DETAIL
NOT TO SCALE



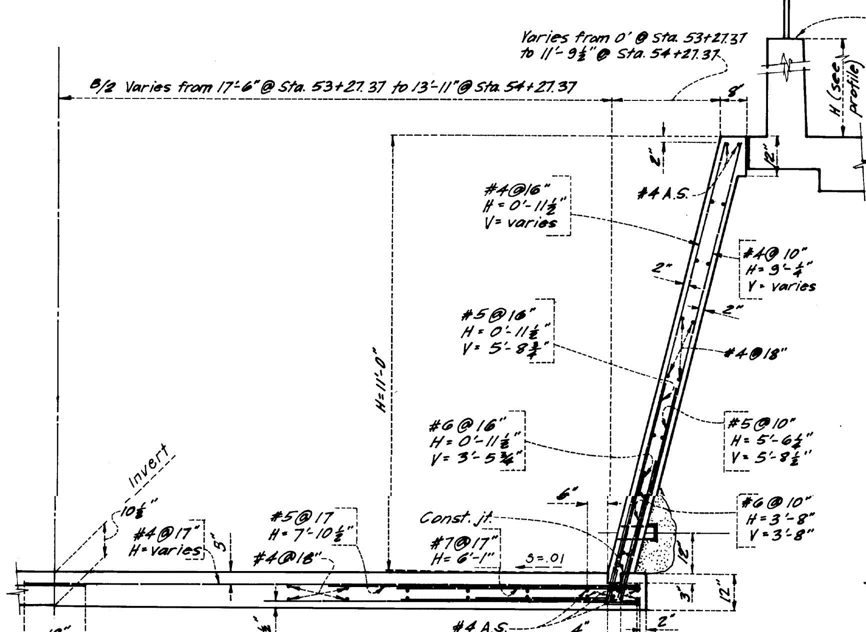


STA. 54+80

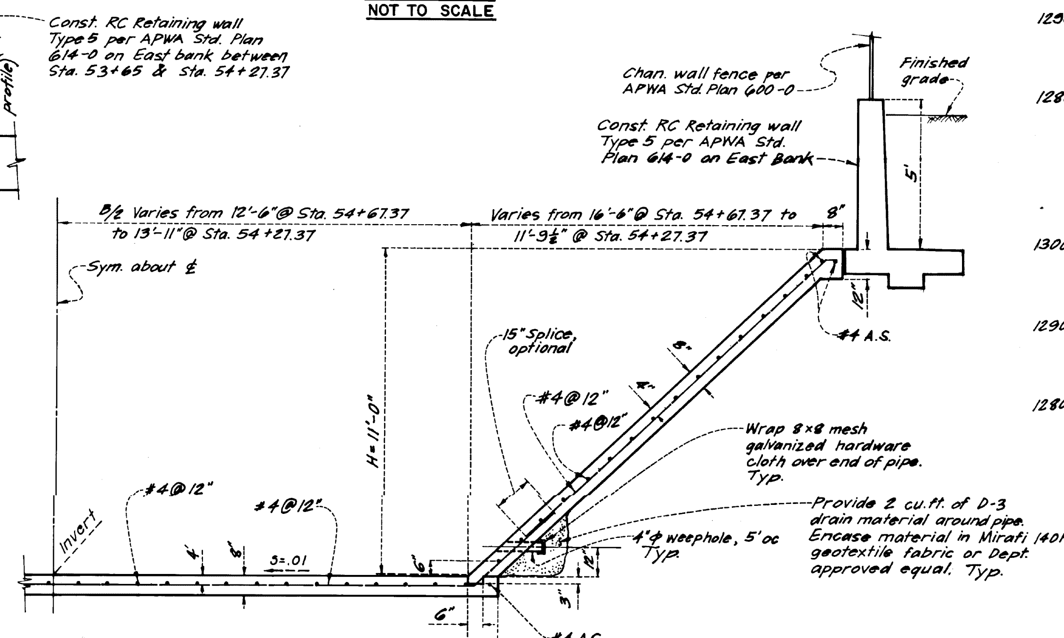


STA. 53+75

CROSS SECTIONS
SCALE: 1" = 10'



SECTION L1
STA. 53+27.37 TO STA. 54+27.37
SCALE: 1/2" = 1'-0"



SECTION L2
STA. 54+27.37 TO STA. 54+67.37
SCALE: 3/8" = 1'-0"

Notes:
1. For chan. wall fencing, see Table, Sh. 6.
2. For General Notes, see Sh. 1.
3. For Structural Notes & Design Data see Sh. 19.
4. Cross sections are taken looking upstream.

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-89	"As built"

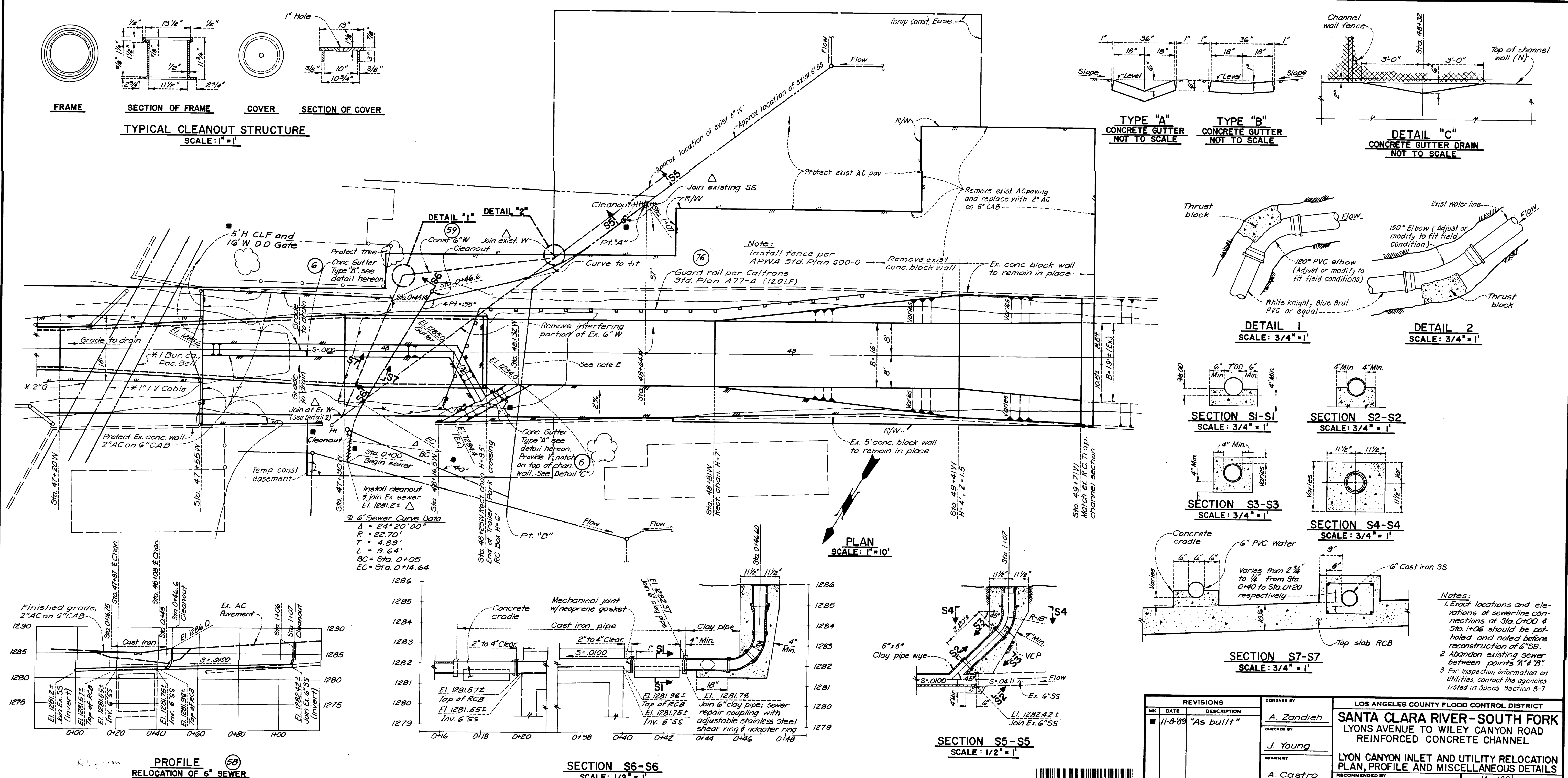
DESIGNED BY: D. Greenwood
CHECKED BY: R. Hashima
DRAWN BY: E. Mondok
PROJECT ENGINEER: [signature] C 30746
RECOMMENDED BY: [signature] DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL
INLET STRUCTURE
PLAN, PROFILE, SECTIONS, STRUCTURAL DETAILS

DATE Mar '86 SCALE A.S.
NO. 337-D22.17
SHEET 17 OF 32

"PD017341"

"AS BUILT" DRAWINGS



Notes:

1. Exact locations and elevations of sewerline connections at Sta 0+00 & Sta 1+06 should be potholed and noted before reconstruction of 6" SS.
2. Abandon existing sewer between points "A" & "B".
3. For inspection information on utilities, contact the agencies listed in Specs Section B-7.

REVISIONS		
MK	DATE	DESCRIPTION
■	11-8-89	"As built"

DESIGNED BY A. Zandieh
CHECKED BY J. Young
DRAWN BY A. Castro
PROJECT ENGINEER C01461
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

LYON CANYON INLET AND UTILITY RELOCATION
PLAN, PROFILE AND MISCELLANEOUS DETAILS

DATE Mar. '86 SCALE A.S.
NO. 337-D22.18
SHEET 18 OF 32

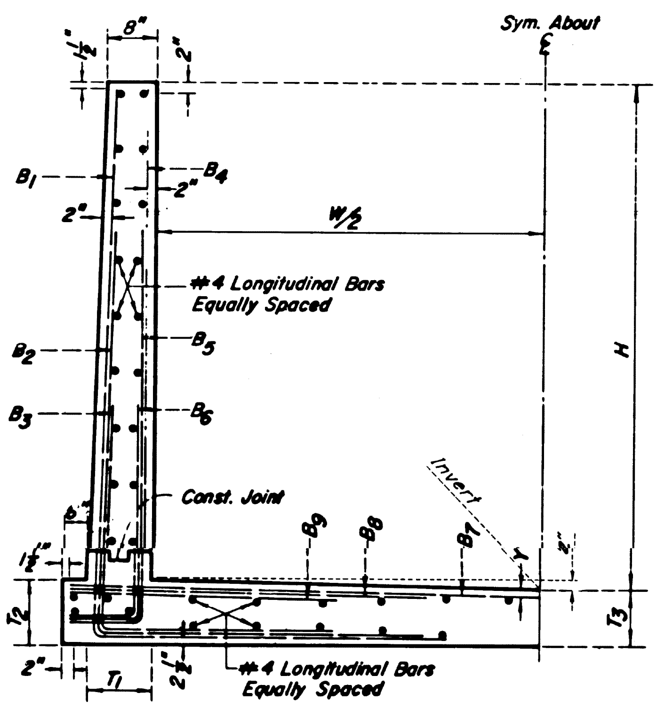
"AS BUILT" DRAWINGS

PD017342

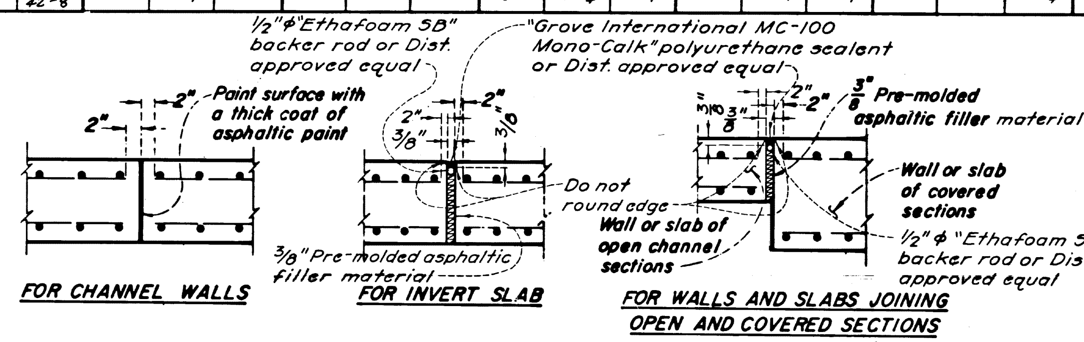
REINFORCED CONCRETE RECTANGULAR CHANNEL

SECTION	STATION LIMITS FROM	STATION LIMITS TO	SIZE (FEET) W	SIZE (FEET) H	THICKNESS (INCHES) T_1	T_2	T_3	CONC. COVER (INCHES) Y	CONCRETE CU. YDS./LIN. FT.	STEEL LBS./LIN. FT.	B1 BAR NO. & SPACING	B1 VERT. LENGTH	B1 HORIZ. LENGTH	B2 BAR NO. & SPACING	B2 VERT. LENGTH	B2 HORIZ. LENGTH	B3 BAR NO. & SPACING	B3 VERT. LENGTH	B3 HORIZ. LENGTH	B4 BAR NO. & SPACING	B4 VERT. LENGTH	B4 HORIZ. LENGTH
S1	11+92.46 29+66	12+92.46 30+69	30	16	14	14½	9	3½	2.3	495	5@9	16'-10½"	16'-9½"	7@9	9'-3"	8'-4¾"	7@9	4'-10¼"	5'-0"	4@9	16'-10½"	1'-4½"
S2	13+07.46 31+79.54	17+90 32+55.01	30	14.5	12½	12¾	9	3½	2.03	395.9	4@10	15'-2¾"	16'-6"	6@10	9'-2¼"	8'-4½"	8@10	5'-9¼"	5'-9¼"	4@14	15'-2¾"	1'-3"
S3	18+00	20+90	30	14	12	12¼	9	3½	1.95	367.5	4@9	14'-8¼"	16'-5½"	6@9	8'-5"	7'-7¾"	7@9	4'-9¼"	4'-10½"	4@10	14'-8¼"	1'-2½"
S4	21+00	25+80	30	14.5	12½	12¾	9	3½	2.03	395.9	4@10	15'-2¾"	16'-6"	6@10	9'-2¼"	8'-4½"	8@10	5'-9¼"	5'-9¼"	4@14	15'-2¾"	1'-3"
S5	26+45	26+80	30	20	19	19¼	9	3½	3.16	834.5	7@9	21'-3¼"	17'-6¼"	8@9	10'-5"	9'-7½"	8@9	5'-8"	6'-1"	4@10	21'-3¼"	1'-9½"
S6	32+75.01 35+36.57 45+88.36	34+04.57 40+20 46+60	28	14	12	12¼	9	3½	1.88	363.8	4@9	14'-8¼"	15'-5½"	6@9	8'-5"	7'-8¼"	7@9	4'-9¼"	4'-10¾"	4@10	14'-8¼"	1'-2½"
S7	40+30 51+55	42+05 52+92.37	28	14.5	12½	12¾	9	3½	1.96	390.8	4@10	15'-2¾"	15'-6"	6@10	9'-2¼"	8'-2¾"	8@10	5'-9¼"	5'-9½"	4@14	15'-2¾"	1'-3"
S8	44+83.55	45+78.36	28	13.5	11½	11¾	9	3½	1.80	333.9	4@11	14'-1¾"	15'-5"	7@11	8'-6¾"	7'-10½"	7@11	4'-3¼"	4'-5½"	4@12	14'-1¾"	1'-2"
L1	45+02.54W	45+96.9W	9	12	10	10¼	9	3½	1.01	218.9	4@9	12'-6¼"	5'-9½"	5@9	6'-4¾"	5'-11½"	6@9	3'-10½"	6'-1¼"	4@14	12'-6¼"	1'-½"
S9	11+19	11+23	40	17	15¼	15¾	15¾	3½	1.44	300	6@10	17'-11¾"	1'-1¼" to 10'-6"	7@10	9'-3¼"	1'-1¼" to 8'-6"	8@10	5'-7"	1'-1¼" to 5'-8"	4@11	17'-11¾"	1'-1¼" to 3'-2"
S9	11+23	11+35	40	17	15¼	15¾	15¾	3½	1.44	300	6@10	17'-11¾"	10'-6" to 42'-8"	7@10	9'-3¼"	8'-6"	8@10	5'-7"	5'-8"	4@11	17'-11¾"	1'-5¾"

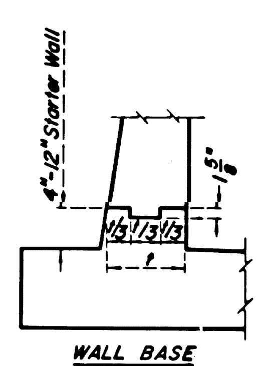
SECTION	B5 BAR NO. & SPACING	B5 VERT. LENGTH	B5 HORIZ. LENGTH	B6 BAR NO. & SPACING	B6 VERT. LENGTH	B6 HORIZ. LENGTH	B7 BAR NO. & SPACING	B7 HORIZ. LENGTH	B8 BAR NO. & SPACING	B8 HORIZ. LENGTH	B9 BAR NO. & SPACING	B9 HORIZ. LENGTH	LONGITUDINAL BARS TOTAL	WALLS	SLAB
S1	5@9	8'-10¾"	1'-4½"	6@9	5'-3¾"	1'-4½"	6@13	33'-1"	6@13	9'-9½"	7@13	7'-5"	93	44	49
S2	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	32'-10"	6@12	9'-3½"	6@12	6'-3¼"	89	40	49
S3	4@10	7'-1½"	1'-2½"	6@10	5'-1½"	1'-2½"	4@10	32'-9"	5@10	9'-4"	6@10	6'-9"	89	40	49
S4	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	32'-10"	6@12	9'-3½"	6@12	6'-3¼"	89	40	49
S5	6@10	13'-3½"	1'-9½"	8@10	8'-3"	1'-9½"	7@10	33'-11"	6@10	11'-8"	7@10	8'-1"	107	56	51
S6	4@10	7'-1½"	1'-2½"	6@10	5'-1½"	1'-2½"	4@9	30'-9"	4@9	8'-10½"	6@9	7'-3½"	88	40	48
S7	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	30'-10"	6@12	9'-2½"	6@12	6'-3½"	88	40	48
S8	5@12	7'-4¼"	1'-2"	6@12	4'-5¼"	1'-2"	4@9	30'-8"	5@9	8'-8"	5@9	5'-8½"	84	36	48
L1	5@14	6'-4½"	1'-½"	6@14	3'-9½"	1'-½"	8@17	11'-5"	4@17	11'-5"	5@17	11'-5"	53	32	21
S9 (11+19 to 11+23)	6@11	10'-7¼"	1'-1¼" to 3'-2"	7@11	6'-1"	1'-1¼" to 3'-2"	4@10	1'-3¼" to 12'-8"	6@10	1'-3¼" to 12'-8"	7@10	1'-3¼" to 8'-6½"	88	24	64
S9 (11+23 to 11+35)	6@11	10'-7¼"	1'-5¾"	7@11	6'-1"	1'-5¾"	4@10	12'-8" to 41'-7¾"	6@10	12'-8"	7@10	8'-6½"			



TYPICAL CHANNEL SECTION
NOT TO SCALE



TRANSVERSE CONSTRUCTION JOINT DETAILS
NOT TO SCALE



LONGITUDINAL CONSTRUCTION JOINT
NOT TO SCALE

STRUCTURAL DESIGN CRITERIA
L.A.C.F.C.D. STRUCTURAL DESIGN MANUAL DATED APRIL 1982

Loads
External 62.5 p.s.f. E.F.P.
Internal 40.0 p.s.f. E.F.P.
$f_c' = 4000$ p.s.i.
$f_c = 1800$ p.s.i.
$f_s = 24000$ p.s.i
$n = 8$
shear and bond stresses per A.C.I. 318-63
foundation modulus $k = 165$ p.c.i.

STRUCTURAL NOTES

GENERAL

1. DIMENSIONS FROM FACE OF CONCRETE TO STEEL ARE TO CENTER BAR AND SHALL BE TWO INCHES UNLESS OTHERWISE SHOWN.
2. CONCRETE DIMENSIONS SHALL BE MEASURED HORIZONTALLY OR VERTICALLY ON THE PROFILE, AND PARALLEL TO OR AT RIGHT ANGLES (OR RADIALLY) TO CENTERLINE OF CONDUIT ON THE PLAN EXCEPT AS OTHERWISE SHOWN.
3. ALL BAR BENDS AND HOOKS SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", 1971 EDITION, SECTION 7.1.
4. PLACING OF REINFORCEMENT SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", 1971 EDITION, SECTION 7.3.
5. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 30 INCHES OF INLETS.
6. TRANSVERSE CONSTRUCTION JOINTS IN WALLS AND SLABS SHALL BE IN THE SAME PLANE. NO STAGGERING OF JOINTS WILL BE PERMITTED. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO THE CENTERLINE OF CONSTRUCTION.
7. THE TRANSVERSE REINFORCING STEEL SHALL TERMINATE ONE AND ONE-HALF INCHES FROM THE CONCRETE SURFACES UNLESS OTHERWISE SHOWN ON THE STRUCTURAL DETAILS.
8. EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE ROUNDED OR BEVELED.
9. NO SPLICES IN TRANSVERSE STEEL REINFORCEMENT WILL BE PERMITTED OTHER THAN SHOWN ON THE DRAWING WITHOUT APPROVAL OF THE ENGINEER. NO MORE THAN TWO SPLICES WILL BE PERMITTED IN ANY LONGITUDINAL BAR BETWEEN TRANSVERSE JOINTS. SPLICES SHALL BE STAGGERED.
10. LONGITUDINAL STEEL SHALL BE LAPPED 20 BAR DIAMETERS AT SPLICES. TRANSVERSE STEEL SHALL BE LAPPED 30 BAR DIAMETERS AT SPLICES.
11. LONGITUDINAL STEEL SHALL TERMINATE TWO INCHES FROM TRANSVERSE CONSTRUCTION JOINTS.
12. TRANSVERSE JOINTS SHALL BE SPACED NOT TO EXCEED 50 FEET NOR BE LESS THAN 10 FEET, MEASURED ALONG THE CENTERLINE OF CONSTRUCTION, EXCEPT AS OTHERWISE SHOWN ON THE DRAWINGS.
13. TRANSVERSE JOINTS SHALL BE PLACED AT THE JUNCTION OF RECTANGULAR OPEN CHANNEL SECTIONS WITH CLOSED CONDUIT SECTIONS.
14. ALL RECTANGULAR OPEN CHANNEL WALLS SHALL BE FENCED IN ACCORDANCE WITH STANDARD DRAWING APWA STD. PLAN 600-0 EXCEPT AS OTHERWISE SHOWN ON THE DRAWINGS.
15. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, IN CURVED SECTIONS, THE MAXIMUM SPACING OF BARS SHALL NOT EXCEED THAT SHOWN ON THE TYPICAL SECTIONS. STEEL SHALL BE PLACED RADIALLY FROM THE MAXIMUM SPACING.
16. AT THE BEGINNING AND ENDING OF ALL POURS, A COMPLETE CURTAIN OF REINFORCEMENT COMPOSED OF B1, B4, AND B7, BARS SHALL BE PLACED THREE INCHES FROM THE TRANSVERSE CONSTRUCTION JOINT.

PD017343

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER [signature] C01746?
RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVE. TO WILEY CYN. RD. & LYON CYN. CHAN.
REINFORCED CONCRETE CHANNEL

R.C. RECTANGULAR CHANNEL
STEEL SCHEDULE

DATE Mar. '86 SCALE A.S.
NO. 337-D22.19
SHEET 19 OF 32

"AS BUILT" DRAWINGS

REINFORCED CONCRETE RECTANGULAR CHANNEL

SECTION DATA									QUANTITIES		REINFORCEMENT STEEL SCHEDULE								
SECTION	STATION LIMITS		SIZE (FEET)		THICKNESS (INCHES)			CONC. COVER (INCHES)	CONCRETE	STEEL	B1			B2			B3		
	FROM	TO	W	H	T1	T2	T3	Y	CU. YDS./ LIN. FT.	LBS./ LIN. FT.	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH
T1	11+35	11+92.46	40 to 30	17 to 16	15¼	15¾	9	3½	2.70	586	6@10	17'-11¾" to 16'-11¾"	22'-⅛" to 17'-⅛"	7@10	9'-3¼"	8'-6"	8@10	5'-7"	5'-8"
T2	12+92.46	13+07.46	30	16 to 14.5	14	14½	9	3½	2.26	491	5@9	16'-10½" to 15'-4½"	16'-9½"	7@9	9'-3"	8'-4¾"	7@9	4'-10¼"	5'-0"
T3	17+90	18+00	30	14.5 to 14	12½	12¾	9	3½	2.02	395	4@10	15'-2¾" to 14'-8¾"	16'-6"	6@10	9'-2¼"	8'-4½"	8@10	5'-9¼"	5'-9¼"
T4	20+90	21+00	30	14 to 14.5	12½	12¾	9	3½	2.02	395	4@10	14'-8¾" to 15'-2¾"	16'-6"	6@10	9'-2¼"	8'-4½"	8@10	5'-9¼"	5'-9¼"
T5	25+80	26+45	30	14.5 to 20	19	19¼	9	3½	3.00	815	7@9	15'-9¼" to 21'-3¼"	17'-6¼"	8@9	10'-5"	9'-7½"	8@9	5'-8"	6'-1"
T6	29+47	29+66	30	20 to 16	19	19¼	9	3½	3.05	820	7@9	21'-3¼ to 17'-3¼"	17'-6¼	8@9	10'-5"	9'-7½"	8@9	5'-8"	6'-1"
T7	30+69	30+94.54	30	16 to 18	16½	16¾	9	3½	2.65	634	4@9	17'-¾" to 19'-¾"	16'-10"	8@9	12'-8¼"	11'-0"	8@9	6'-1¾"	6'-4¼"
T8	31+49.54	31+79.54	30	17.5 to 14.5	16½	16¾	9	3½	2.59	631	4@9	18'-6¾" to 15'-6¾"	16'-10"	8@9	12'-8¼"	11'-0"	8@9	6'-1¾"	6'-4¼"
T9	32+55.01	32+75.01	30 to 28	14.5 to 14	12½	12¾	9	3½	1.99	393	4@10	15'-2¾" to 14'-8¾"	16'-6" to 15'-6"	6@10	9'-2¼"	8'-4½"	8@10	5'-9¼"	5'-9¼"
T10	34+04.57	34+44.57	28	14 to 17.5	15¾	16¼	9	3½	2.43	594	4@9	15'-¼" to 18'-6¼"	15'-9¼"	8@9	12'-2¾"	10'-2¾"	8@9	5'-9¼"	5'-11¾"
T11	35+06.57	35+36.57	28	17 to 14	15¾	16¼	9	3½	2.41	594	4@9	18'-¼" to 15'-¼"	15'-9¼"	8@9	12'-2¾"	10'-2¾"	8@9	5'-9¼"	5'-11¾"
T12	40+20	40+30	28	14 to 14.5	12½	12¾	9	3½	1.95	390	4@10	14'-8¾" to 15'-2¾"	15'-6"	6@10	9'-2¼"	8'-2¾"	8@10	5'-9¼"	5'-9½"
T13	42+05	42+45	28	14.5 to 16.5	14¾	15	9	3½	2.27	511	5@9	15'-5" to 17'-5"	15'-10¼"	6@9	9'-6¼"	8'-6¼"	8@9	6'-3½"	6'-4"
T15	45+78.36	45+88.36	28	13.5 to 14	12	12¼	9	3½	1.87	363	4@9	14'-2¼" to 14'-8¼"	15'-5½"	6@9	8'-5"	7'-8¼"	7@9	4'-9¼"	4'-10¾"
T16	46+60	47+52	28	14 to 20.25	19	19¼	9	3½	2.90	779	7@9	15'-3¼" to 21'-3½"	12'-10"	8@9	10'-5"	9'-6¾"	8@9	5'-8"	6'-1¼"
T17	50+75	51+55	28	20 to 14.5	19	19¼	9	3½	2.87	780	7@9	21'-3¼" to 15'-9½"	12'-10"	8@9	10'-5"	9'-6¾"	8@9	5'-8"	6'-1¼"
T18	52+92.37	53+27.37	28 to 35	14.5 to 11	12½	14½	10½	5"	1.98	392	4@10	15'-2¾" to 11'-8¾"	15'-6" to 19'	6@10	9'-2¼"	8'-2¾"	8@10	5'-9¼"	5'-9½"
TL1	44+84.53W	45+02.54W	9	13.5 to 12	11½	11¾	9¾	3½	1.17	283	5@12	14'-1¾" to 12'-7¾"	6'-1"	6@12	7'-6¾"	6'-2¾"	8@12	5'-¼"	6'-6½"
TL2	45+96.9W	46+15W	9	12 to 13	11½	11¾	9¾	3½	1.16	282	5@12	12'-7¾" to 13'-7¾"	6'-1"	6@12	7'-6¾"	6'-2¾"	8@12	5'-¼"	6'-6½"
TL3	48+25W	48+81W	16	9.5 to 7	8	9	9	3½	.92	132	4@12	9'-11" to 7'-5"	5'-10½"	4@12	4'-7½"	4'-5½"	6@12	3'-5¼"	3'-5¼"

SECTION	B4			B5			B6			B7		B8		B9		LONGITUDINAL BARS		
	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	TOTAL	WALLS	SLAB
T1	4@11	17'-11¾" to 16'-11¾"	1'-5¾"	6@11	10'-7¼"	1'-5¾"	7@11	6'-1"	1'-5¾"	4@10	43'-3½" to 33'-3½"	6@10	12'-6¼"	7@10	8'-6½"	112	48	64
T2	4@9	16'-10½" to 15'-4½"	1'-4½"	5@9	8'-10¾"	1'-4½"	6@9	5'-3¾"	1'-4½"	6@13	33'-1"	6@13	9'-9½"	7@13	7'-5"	93	44	49
T3	4@14	15'-2¾" to 14'-8¾"	1'-3"	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	32'-10"	6@12	9'-3½"	6@12	6'-3¼"	89	40	49
T4	4@14	14'-8¾" to 15'-2¾"	1'-3"	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	32'-10"	6@12	9'-3½"	6@12	6'-3¼"	89	40	49
T5	4@10	15'-9¼" to 21'-3¼"	1'-9½"	6@10	13'-3½"	1'-9½"	8@10	8'-3"	1'-9½"	7@10	33'-11"	6@10	11'-8"	7@10	8'-1"	107	56	51
T6	4@10	21'-3¼" to 17'-3¼"	1'-9½	6@10	13'-3½"	1'-9½"	8@10	8'-3"	1'-9½"	7@10	33'-11"	6@10	11'-8"	7@10	8'-1"	107	56	51
T7	4@9	17'-¾" to 19'-¾"	1'-7"	5@9	10'-8¾"	1'-7"	7@9	7'-1"	1'-7"	7@12	33'-6"	6@12	10'-5¼"	7@12	8'-¾"	99	48	51
T8	4@9	18'-6¾" to 15'-6¾"	1'-7"	5@9	10'-8¾"	1'-7"	7@9	7'-1"	1'-7"	7@12	33'-6"	6@12	10'-5¼"	7@12	8'-¾"	99	48	51
T9	4@14	15'-2¾" to 14'-8¾"	1'-3"	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	32'-10" to 30'-10"	6@12	9'-3½"	6@12	6'-3¼"	89	40	49
T10	4@9	15'-¼" to 18'-6¼"	1'-6¼"	6@9	10'-5½"	1'-6¼"	6@9	5'-3½"	1'-6¼"	6@9	31'-4½"	5@9	9'-11"	6@9	7'-7¾"	96	48	48
T11	4@9	18'-¼" to 15'-¼"	1'-6¼"	6@9	10'-5½"	1'-6¼"	6@9	5'-3½"	1'-6¼"	6@9	31'-4½"	5@9	9'-11"	6@9	7'-7¾"	96	48	48
T12	4@14	14'-8¾" to 15'-2¾"	1'-3"	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	30'-10"	6@12	9'-2½"	6@12	6'-3½"	88	40	48
T13	4@10	15'-5" to 17'-5"	1'-5¼"	6@10	9'-9¾"	1'-5¼"	6@10	4'-11¾"	1'-5¼"	6@10	31'-2½"	6@10	9'-4½"	5@10	6'-2"	92	44	48
T15	4@10	14'-2¼ to 14'-8¼"	1'-2½"	4@10	7'-1½"	1'-2½"	6@10	5'-1½"	1'-2½"	4@9	30'-9"	4@9	8'-10½"	6@9	7'-3½"	88	40	48
T16	4@10	15'-3¼" to 21'-3½"	1'-9½"	6@10	13'-3½"	1'-9½"	8@10	8'-3"	1'-9½"	8@10	31'-11"	7@10	10'-7"	4@10	6'-2½"	100	56	44
T17	4@10	21'-3¼" to 15'-9½"	1'-9½"	6@10	13'-3½"	1'-9½"	8@10	8'-3"	1'-9½"	8@10	31'-11"	7@10	10'-7"	4@10	6'-2½"	100	56	44
T18	4@14	15'-2¾" to 11'-8¾"	1'-3"	6@14	8'-10"	1'-3"	7@14	5'-1"	1'-3"	5@12	30'-10" to 37'-10"	6@12	9'-2½"	6@12	6'-3½"	88	40	48
TL1	4@12	14'-1¾" to 12'-7¾"	1'-2"	5@12	7'-4¼"	1'-2"	6@12	4'-5¼"	1'-2"	7@10	11'-8"	4@10	11'-8"	4@10	11'-8"	57	36	21
TL2	4@12	12'-7¾" to 13'-7¾"	1'-2"	5@12	7'-4¼"	1'-2"	6@12	4'-5¼"	1'-2"	7@10	11'-8"	4@10	11'-8"	4@10	11'-8"	57	36	21
TL3	4@16	9'-11" to 7'-5"	0'-10½"	4@16	4'-3½"	0'-10½"	5@16	2'-10¼"	0'-10½"	4@16	18'-1"	4@16	6'-5¾"	5@16	4'-11¾"	54	28	26

Note:
For details, structural notes & design criteria, see Sh. 19

PD017344

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER [signature] C017461

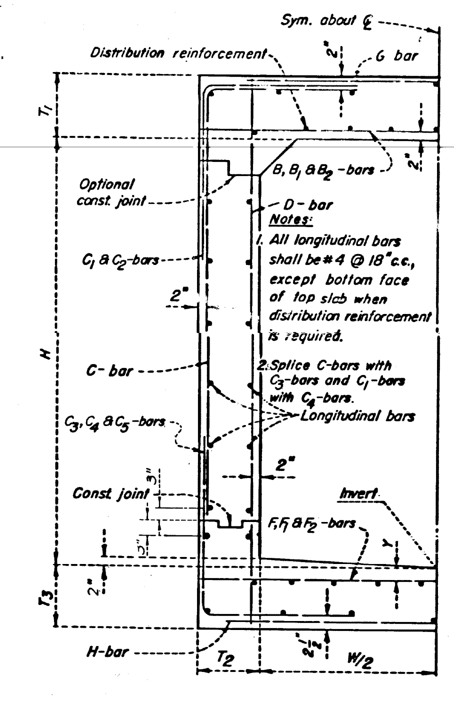
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVE. TO WILEY CYN. RD. & LYON CYN. CHAN.
REINFORCED CONCRETE CHANNEL

R.C. RECTANGULAR CHANNEL
STEEL SCHEDULE

RECOMMENDED BY [signature]
DIVISION ENGINEER (DESIGN)

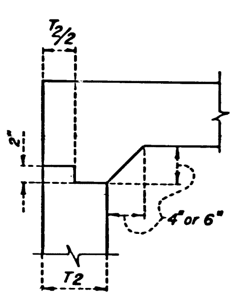
DATE Mar. '86 SCALE A.S.
NO. 337-D22.20
SHEET 20 OF 32

"AS BUILT" DRAWINGS

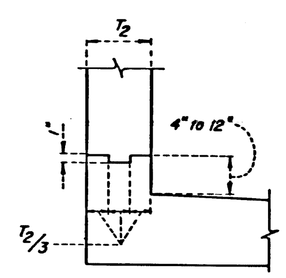


TYPICAL R C BOX SECTION

NOT TO SCALE

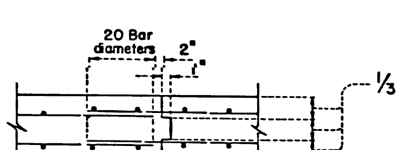


TOP OF WALL

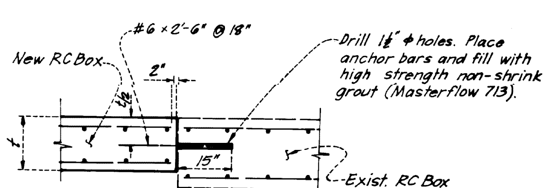


BASE OF WALL

LONGITUDINAL JOINT



TRANSVERSE JOINT



TRANSVERSE JOINT
NEW BOX TO EXIST. BOX

CONSTRUCTION JOINT DETAILS

NOT TO SCALE

STRUCTURAL NOTES

1. DIMENSIONS FROM FACE OF CONCRETE TO STEEL ARE TO CENTER OF BAR, UNLESS OTHERWISE SHOWN.
2. CONCRETE DIMENSIONS SHALL BE MEASURED HORIZONTALLY OR VERTICALLY ON THE PROFILE, AND PARALLEL TO OR AT RIGHT ANGLES (OR RADIALLY) TO CENTERLINE OF CONDUIT ON THE PLAN EXCEPT AS OTHERWISE SHOWN.
3. ALL BAR BENDS AND HOOKS SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" 1971 EDITION, SECTION 7.1.
4. PLACING OF REINFORCEMENT SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" 1971 EDITION, SECTION 7.3.
5. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 30 INCHES OF MANHOLE OR JUNCTION STRUCTURE OPENINGS.
6. TRANSVERSE CONSTRUCTION JOINTS IN WALLS AND SLABS SHALL BE IN THE SAME PLANE. NO STAGGERING OF JOINTS WILL BE PERMITTED. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO THE CENTERLINE OF CONSTRUCTION.
7. THE TRANSVERSE REINFORCING STEEL SHALL TERMINATE ONE AND ONE-HALF INCHES FROM THE CONCRETE SURFACES UNLESS OTHERWISE SHOWN ON THE STRUCTURAL DETAILS.
8. EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE ROUNDED OR BEVELED.
9. NO SPLICES IN TRANSVERSE STEEL REINFORCEMENT WILL BE PERMITTED OTHER THAN SHOWN ON THE DRAWINGS WITHOUT APPROVAL OF THE ENGINEER. NO MORE THAN TWO SPLICES WILL BE PERMITTED IN ANY LONGITUDINAL BAR BETWEEN TRANSVERSE JOINTS. SPLICES SHALL BE STAGGERED.
10. LONGITUDINAL STEEL SHALL BE LAPPED 20 BAR DIAMETERS AT SPLICES. TRANSVERSE STEEL SHALL BE LAPPED 30 BAR DIAMETERS AT SPLICES.
11. LONGITUDINAL STEEL SHALL BE CONTINUOUS AND EXTEND THROUGH ALL CONSTRUCTION JOINTS.
12. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, TRANSVERSE CONSTRUCTION JOINTS (IN BOTH SLABS AND WALLS), SHALL BE PLACED AT THE END OF EACH POUR, BUT THE SPACING THEREOF SHALL NOT EXCEED 50 FEET OR BE LESS THAN 10 FEET.
13. UNLESS OTHERWISE SHOWN ON THE DETAILS, IN CURVED SECTIONS TRANSVERSE BARS SHALL BE PLACED RADIALLY. THE SPACING OF STRAIGHT TRANSVERSE BARS IN TOP AND BOTTOM SLABS SHALL BE MEASURED AT THE CENTERLINE OF CONSTRUCTION. THE SPACING OF STRAIGHT BARS AND L-BARS IN WALLS SHALL BE MEASURED BETWEEN THE VERTICAL LEGS OF BARS.
14. AT THE BEGINNING AND ENDING OF ALL POURS, A CURTAIN OF REINFORCEMENT COMPOSED OF B, C, C3, D, F, G, AND H BARS SHALL BE PLACED 3 INCHES FROM THE TRANSVERSE CONSTRUCTION JOINT.
15. D-BARS MAY BE SPLICED 20 BAR DIAMETERS AT THE LOWER LONGITUDINAL CONSTRUCTION JOINT, AT CONTRACTOR'S OPTION.
16. IN ALL SECTIONS LAP C AND C3 BARS. THE VERTICAL LENGTH OF C AND C2 HAS BEEN CALCULATED FOR A FOUR INCH STARTER WALL. IF THE HEIGHT OF THE STARTER WALL IS VARIED, THE VERTICAL LENGTH OF THE C AND C3 BARS SHALL BE VARIED CORRESPONDINGLY SO AS TO MAINTAIN A 30 DIAMETER LAP BETWEEN THE TWO BARS. THE LAPS SHALL BE BASED ON THE SMALLER BAR.
17. CONCRETE QUANTITIES ARE BASED ON A SIX-BY-SIX INCH FILLET AND THE STEEL QUANTITIES DO NOT INCLUDE ANY OPTIONAL SPLICES.
18. IF WALL THICKNESS IS SIX INCHES, PLACE REINFORCEMENT AT THE CENTERLINE OF THE WALL.
19. SUBDRAINAGE SYSTEM FOR SOUTH FORK CROSSING, SEE DETAILS ON SH. 30.

BOX SECTION			A	B	C	D	E
Design Cover			4'	2'-4'	2'~6'	4'~6'	4'
Width		W	30'-0"	28'-0"	28'-0"	9'-0"	16'-0"
Height		H	12'-6"	13'-6"	14'-6"	9'-6"	6'-0"
Top Slab Thickness		T_1	15½"	14"	16"	7½"	10¼"
Side Wall Thickness		T_2	16½"	14½"	16½"	8"	8½"
Bottom Slab Thickness		T_3	18"	16"	19½"	9"	12½"
Concrete Cover (3" Min.)		Y	3½"	3½"	3½"	3½"	3½"
B Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#7@18"	#7@11"
	Length		32'-6"	30'-2"	30'-6"	10'-1"	17'-2"
B_1 Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#7@18"	#9@11"
	Length		22'-0"	22'-6"	21'-0"	8'-9"	10'-3"
B_2 Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#7@18"	—
	Length		16'-0"	16'-6"	15'-0"	6'-0"	—
C Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#6@18"	#5@9"
	Hor. Length		8'-0"	7'-0"	7'-6"	6'-0"	6'-1"
	Vert. Length		8'-0"	13'-6"	8'-9"	5'-0"	6'-3½"
C_1 Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#6@18"	#7@9"
	Hor. Length		5'-0"	4'-6"	5'-0"	3'-0"	2'-5"
	Vert. Length		11'-0"	13'-6"	11'-9"	3'-0"	6'-3½"
C_2 Bars	Bar No. & Spacing		#10@18"	#9@18"	#10@18"	#6@18"	—
	Hor. Length		4'-0"	3'-3"	3'-6"	2'-0"	—
	Vert. Length		5'-6"	5'-0"	3'-6"	2'-0"	—
C_3 Bars	Bar No. & Spacing		#9@18"	#9@18"	#9@18"	#6@18"	#4@9"
	Hor. Length		6'-9"	7'-0"	6'-6"	6'-0"	5'-9"
	Vert. Length		10'-0	5'-½"	11'-6"	6'-6"	2'-4½"
C_4 Bars	Bar No. & Spacing		#9@18"	#9@18"	#9@18"	#7@18"	#6@9"
	Hor. Length		4'-9"	4'-6"	4'-6"	3'-0"	2'-3½"
	Vert. Length		7'-0"	5'-½"	8'-6"	1'-9"	3'-0"
C_5 Bars	Bar No. & Spacing		#9@18"	#9@18"	#9@18"	#7@18"	—
	Hor. Length		3'-6"	3'-0"	4'-0"	2'-0"	—
	Vert. Length		5'-6"	3'-0"	4'-0"	2'-0"	—
D Bars	Bar No. & Spacing		#4@18"	#4@18"	#4@18"	#6@9"	#4@18"
	Length		14'-11½"	16'-1"	17'-1"	10'-6"	7'-7½"
F Bars	Bar No. & Spacing		#10@16"	#9@16"	#11@18"	#6@18"	#9@12"
	Length		32'-6"	30'-2"	30'-6"	10'-1"	17'-2"
F_1 Bars	Bar No. & Spacing		#10@16"	#9@16"	#11@18"	#6@18"	#8@12"
	Length		22'-0"	21'-6"	21'-6"	8'-0"	12'-2"
F_2 Bars	Bar No. & Spacing		#10@16"	#9@16"	#11@18"	#6@18"	—
	Length		16'-0"	16'-0"	15'-6"	6'-0"	—
G Bars	Bar No. & Spacing		#4@18"	#4@18"	#4@18"	—	#5@9"
	Length		18'-5"	18'-1"	17'-5"	—	8'-0"
H Bars	Bar No. & Spacing		#4@18"	#4@18"	#4@18"	—	#4@9"
	Length		20'-11"	18'-1"	19'-5"	—	8'-0"
NUMBER OF LONGITUDINAL REINFORCEMENT #4 BARS							
Top Slab (includes distribution reinforcement)			84	80	90	27	48
Bottom Slab			44	42	42	14	25
Side Walls			40	40	40	28	20
TOTAL			168	162	172	69	93
QUANTITIES							
Concrete Cu.Yds./Lin. Ft.			4.76	4.12	4.95	1.04	1.59
Steel Lbs./Lin. Ft.			770.2	629.3	772.0	159.5	319.1

STRUCTURAL DESIGN CRITERIA

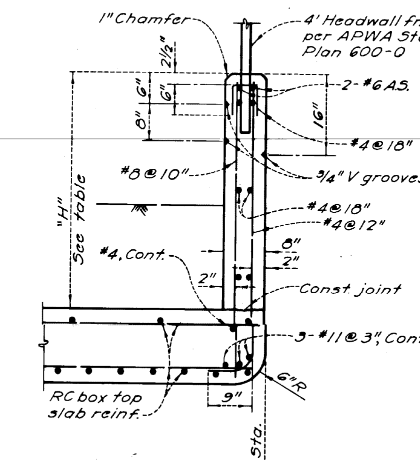
L.A.C.F.C.D. STRUCTURAL DESIGN MANUAL
DATED APRIL 1982

LIVE LOAD
H20-S16-44 unless otherwise noted

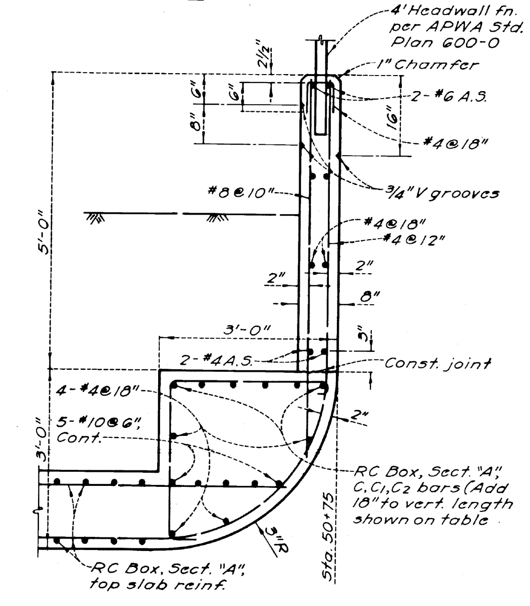
DEAD LOAD
Earth load per Marston's formula: w = 120 p c f
Ku = Ku' = 0.150
Bd = Outside width of box plus 3 feet
Side earth 36 p s f per foot of depth
Internal water pressure: 62.4 p s f per foot of depth
Weight of concrete: 150 p c f

ALLOWABLE STRESSES
f_c' = 4000 psi at 28 days
f_c = 1800 psi
f_s = 24,000 psi
n = 8
Shear and bond stresses per A.C.I. 318-63

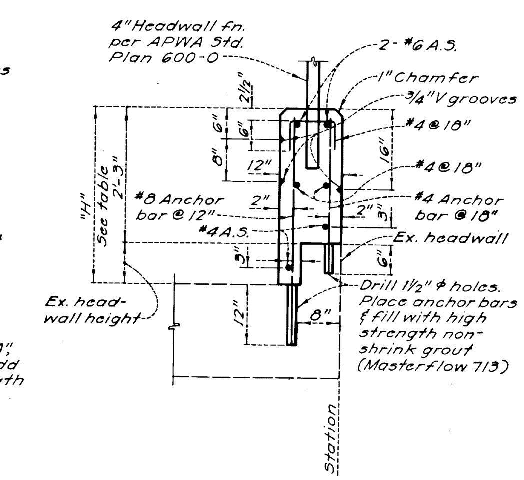
R C BOX LOCATION SCHEDULE			
Box Sect.	Station From	Station To	REMARK
South Fork Channel			
A	30+94.57	31+49.54	Atwood Blvd. Crossing
B	34+44.57	35+06.57	De Wolfe Road Crossing
C	42+45	43+00.59	Wiley Cyn. Road Crossing
C	47+52	50+75	South Fork Chan. Crossing
Lyon Canyon Channel			
D	46+15W	47+20W	Lyon Cyn. Chan. Crossing
E	47+90W	48+20W	Trailer Park Crossing



DETAIL "A"



DETAIL "B"



DETAIL "C"
EXISTING HEADWALL EXTESION

HEADWALL DETAIL

NOT TO SCALE

SCHEDULE FOR "H" DIMENSION			
Station	"H"	Detail	Crossing
26+80±	3'±	C	Powell
30+94.54	6.5'	A	Atwood Blvd.
31+49.54	6.0'	A	
34+44.53	4.75'	A	De Wolfe Rd.
35+06.53	4.25'	A	
42+45	4.25'	A	Wiley Canyon Rd.
43+94.83	3'±	C	
47+52	5'	A	South Fork
50+75	—	B	
46+15W	5.51'	A	Lyon Canyon
48+25W	2.75'	A	Trailer Park

PD017345

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER [signature] C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER - SOUTH FORK

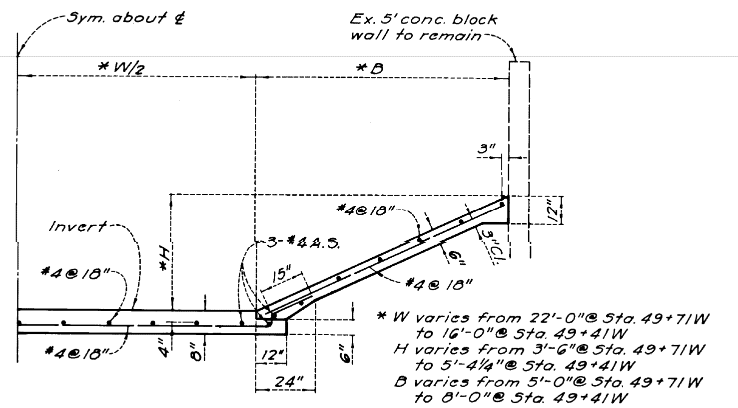
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

RC BOX STEEL SCHEDULE AND
SIDE DRAIN INLET STRUCTURAL DETAIL

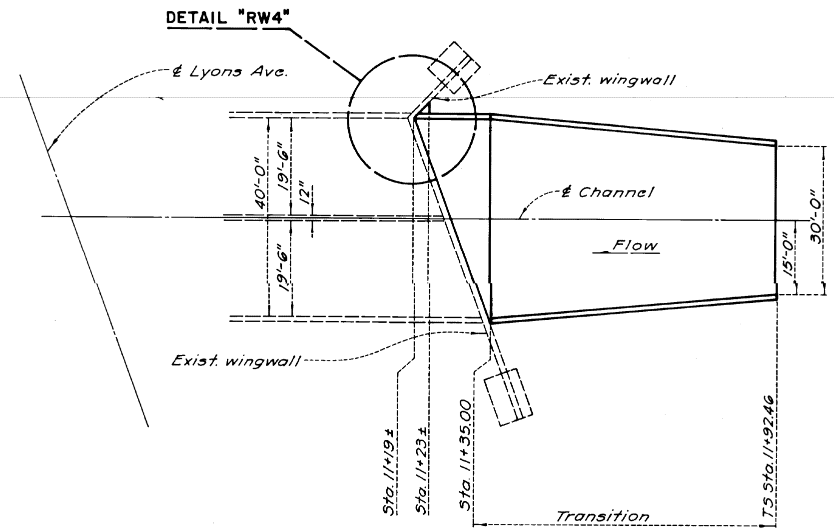
RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

DATE Mar. '86 SCALE A.S.
NO. 337-D22.21
SHEET 21 OF 32

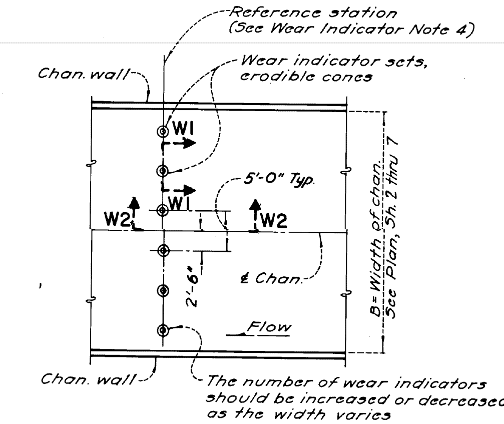
"AS BUILT" DRAWINGS



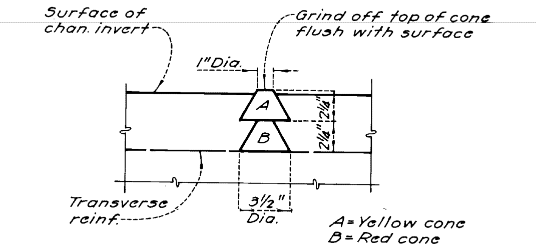
SECTION "TR1" (PROFILE, SH. 7)
LYON CANYON CHANNEL
STA. 49+41W TO STA. 49+71W
NOT TO SCALE



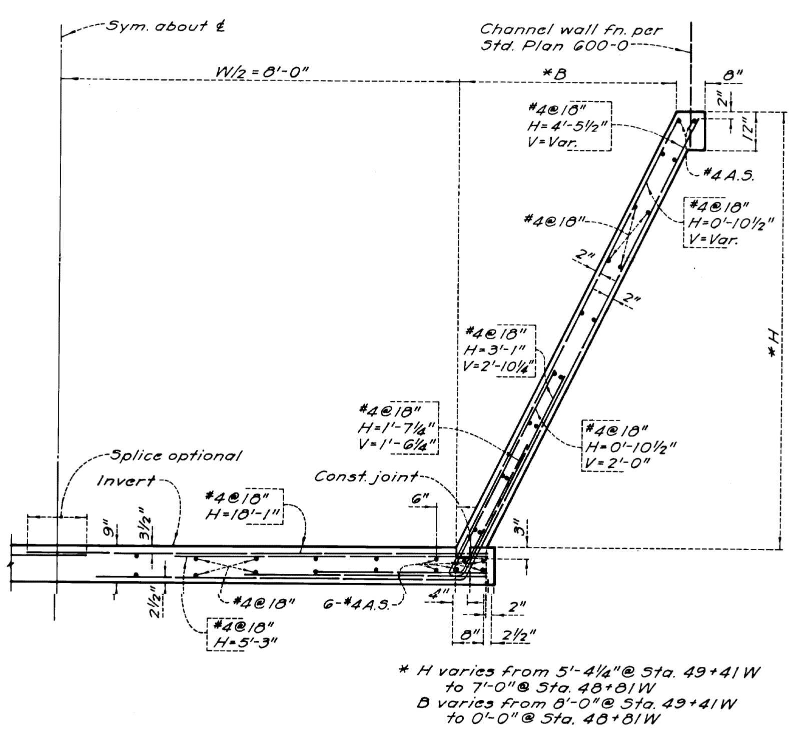
DETAIL "RW" (SH. 2)
SCALE: 1/16" = 1'-0"



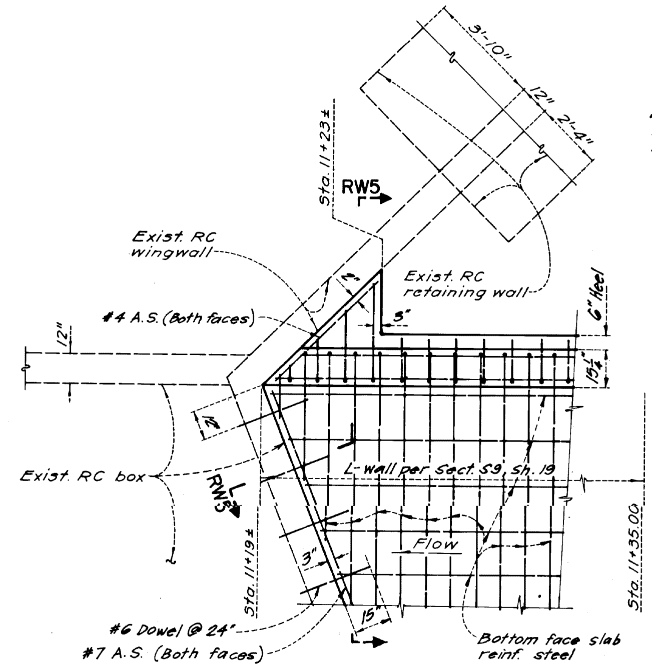
PLAN "W" (74)
WEAR INDICATOR GROUP
NOT TO SCALE



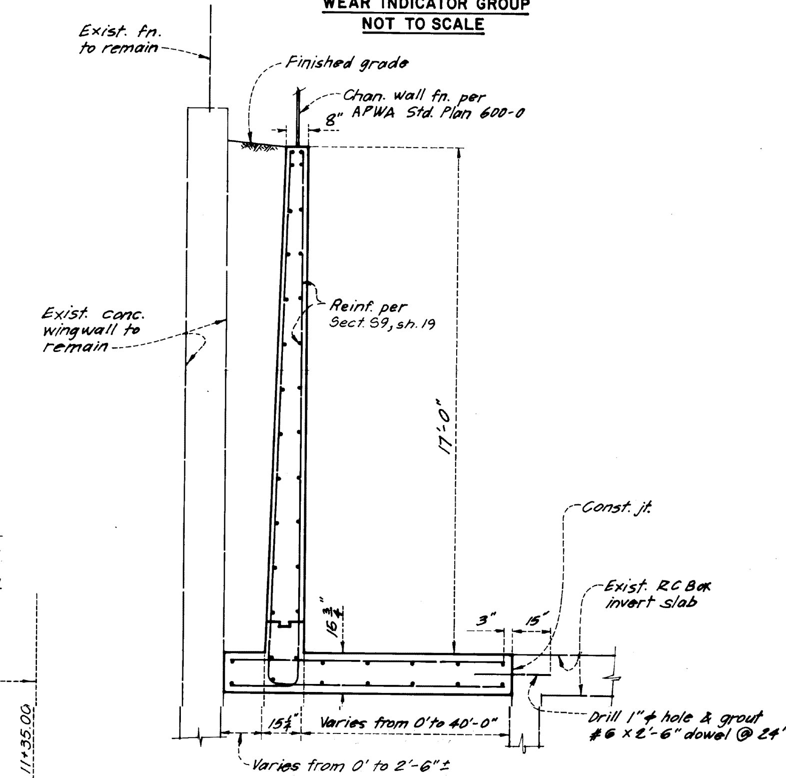
SECTION W1-W1
TYPICAL WEAR INDICATOR SET
NOT TO SCALE



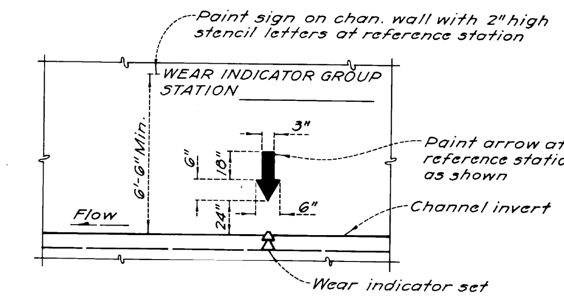
SECTION "TR2" (PROFILE, SH. 7)
LYON CANYON CHANNEL
STA. 48+81W TO STA. 49+41W
NOT TO SCALE



DETAIL "RW4"
SCALE: 3/8" = 1'-0"



SECTION RW5-RW5
SCALE: 3/8" = 1'-0"



SECTION W2-W2
CHANNEL WALL SIGN
NOT TO SCALE

Wear Indicator Notes:
1. The Los Angeles County Department of Public Works will provide, at no extra charge, red & yellow erodible cones for the invert wear indicator sets. Call (213) 226-4274 regarding erodible cones. Allow at least 5 days for delivery.
2. The lower cone "B" shall always be red & placed on top of the transverse reinf. steel. See Section W1-W1.
3. The uppermost cone "A" shall always be exposed. The contractor shall grind off the top of the cone flush with the surface of the overlay.
4. Invert wear cones shall be placed at the following stations: 51+00, 42+50, 32+00, 23+10, 15+00.

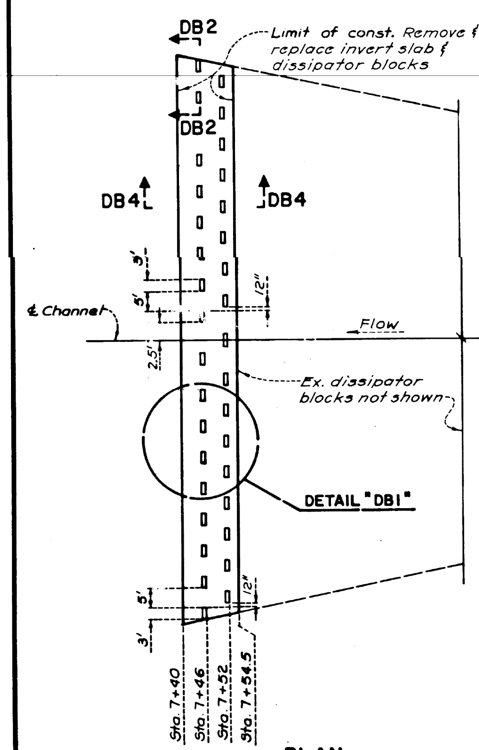
Notes:
1. For General Notes, see Sh. 1.
2. For Structural Notes, Details, Reinforcements and Design Data see Sh. 19.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashimo
DRAWN BY A. Endo
PROJECT ENGINEER 20174

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL
RC TRAPEZOIDAL CHANNEL STRUCTURAL DETAILS, WEAR INDICATOR AND MISC. DETAILS
RECOMMENDED BY — DIVISION ENGINEER (DESIGN)
DATE Mar. '86 SCALE A.S.
NO. 337-D22.22
SHEET 22 OF 32

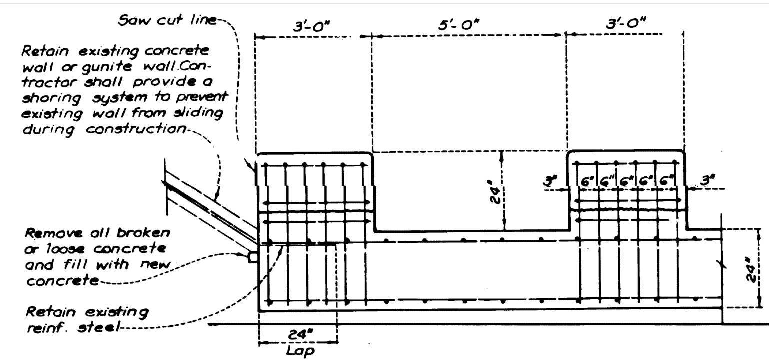
"AS BUILT" DRAWINGS



PLAN

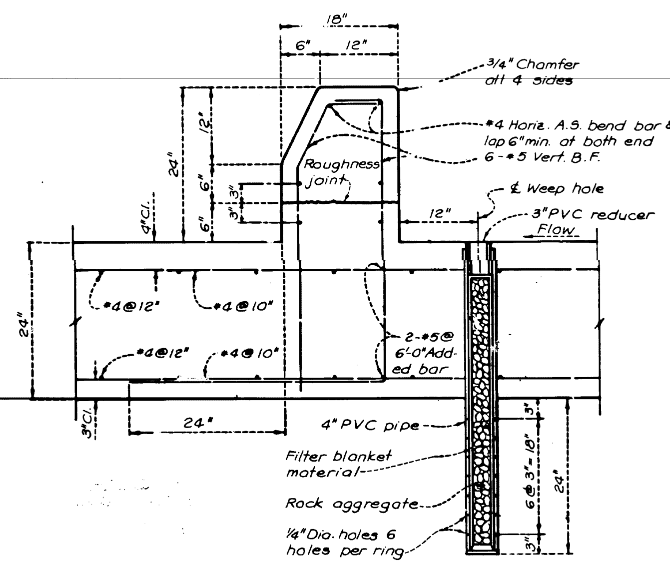
DISSIPATOR BLOCKS

SCALE : 1" = 20'



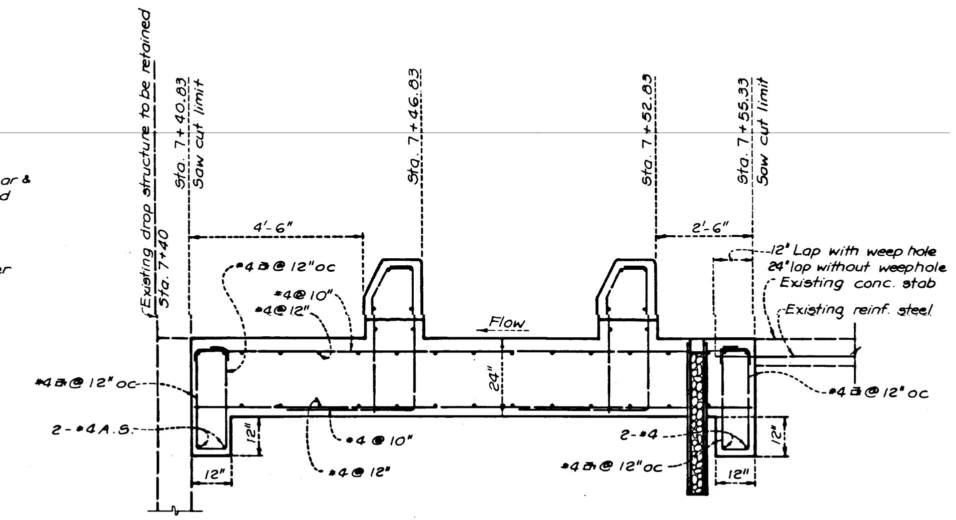
SECTION DB2 - DB2

SCALE : 1" = 2'-0"



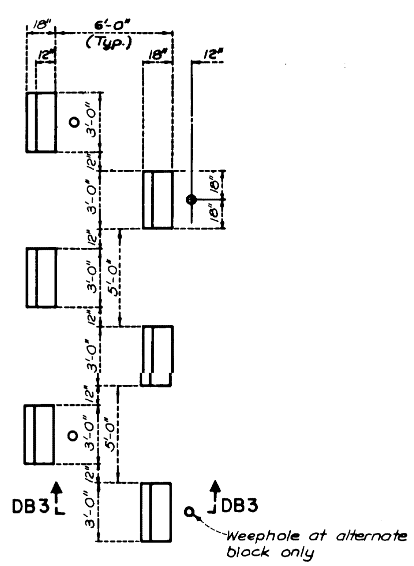
SECTION DB3 - DB3

SCALE : 1" = 1'-0"



SECTION DB4 - DB4

SCALE : 1" = 2'-0"



DETAIL "DB1"

SCALE : 1" = 4'-0"

BREAKOUT STRUCTURAL NOTES

TO BE USED WHERE NEW CONSTRUCTION JOINS AN EXISTING STRUCTURE AND BREAKOUT IS REQUIRED.

1. FOR INVERT SLAB, SLOPE SLAB, WALL OR WALL FOOTING REMOVAL, WHERE REINFORCEMENT IS TO BE RETAINED THROUGH THE JOINT, MAKE A SAW CUT ONE AND ONE-HALF INCHES DEEP ON THE EXPOSED FACES OF THE CONCRETE AT THE REMOVAL LIMITS. CUT A GROOVE IN THE CONCRETE ADJACENT TO THE SAW CUT, ON THE SIDE TO BE REMOVED TO THE DEPTH OF THE SAW CUT, WITH A CHIPPIN HAMMER. EXISTING REINFORCEMENT SHALL BE RESTORED AND RETAINED OR CUT AND LAPPED WITH NEW REINFORCEMENT.
2. CARE SHALL BE EXERCISED IN SAWING AT THE REMOVAL LIMITS SO AS NOT TO CUT THE REINFORCEMENT IN THE REMAINING WALL. AFTER MAKING SAW CUTS THE CONCRETE SHALL BE REMOVED WITH HAND-OPERATED EQUIPMENT. USE OF EXPLOSIVES, WRECKING BALLS, STOMPERS OR OTHER EQUIPMENT, WHICH WOULD CAUSE DAMAGE TO THE EXISTING FACILITY REMAINING IN PLACE, WILL NOT BE PERMITTED WITHIN THE CHANNEL RIGHT OF WAY. THE ENGINEER SHALL BE THE SOLE JUDGE OF THE USAGE OF ANY EQUIPEMNT FOR THE CONCRETE REMOVAL OPERATION.

Notes:

1. For General Notes, see Sh. 1.
2. For Structural Notes & Design Data, see Sh. 19.
3. PVC pipe shall conform to ASTM D3034 Type PSM
4. Filter blanket material shall be Mirafi 140 N Geotextile fabric or department approved equal.
5. Drain material shall meet the requirements for drain material D3 as specified in Section L-8 of the Additional Provisions.

PD017347

REVISIONS			
MK	DATE	DESCRIPTION	

DESIGNED BY E. Chang

CHECKED BY G. Drogin

DRAWN BY K. Yi

PROJECT ENGINEER C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER-SOUTH FORK

LYONS AVENUE TO WILEY CANYON ROAD

REINFORCED CONCRETE CHANNEL

ENERGY DISSIPATORS

PLAN AND STRUCTURAL DETAILS

RECOMMENDED BY

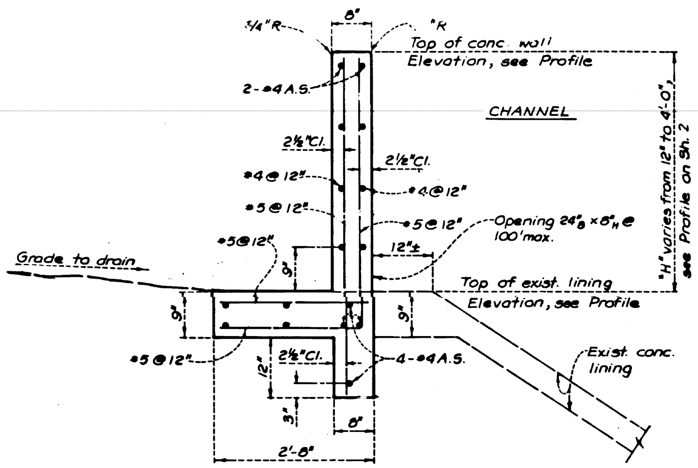
DIVISION ENGINEER (DES.)

DATE Mar. '86 SCALE A.S.

NO. 337-D22.23

SHEET 23 OF 32

"AS BUILT" DRAWINGS

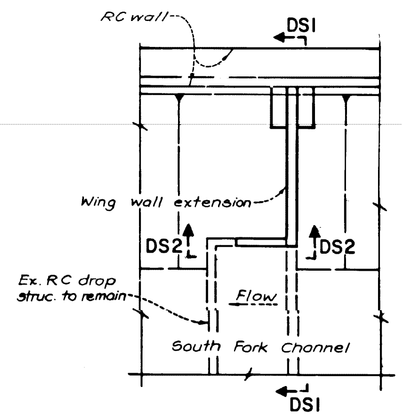


(52)

SECTION WE1 (SEE PROFILE ON SH 2)

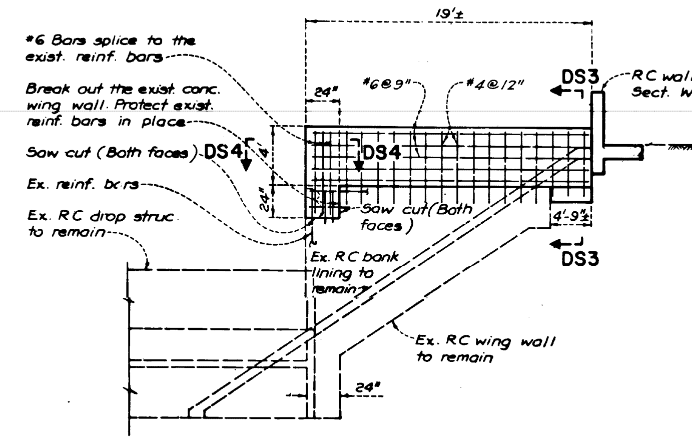
TYPICAL WALL ON TOP OF EXISTING LEVEE

SCALE: 3/4" = 1'-0"



PLAN (SH. 2)

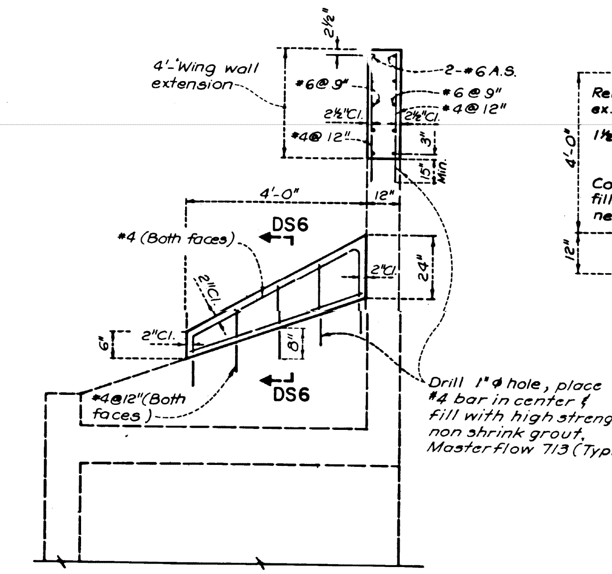
NOT TO SCALE



(53)

SECTION DS1 - DS1

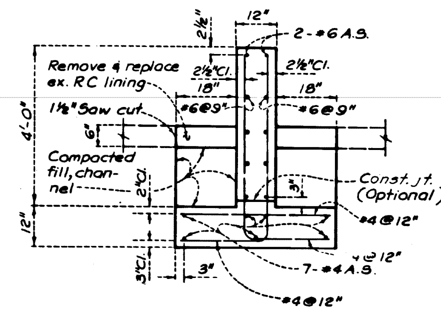
NOT TO SCALE



(53)

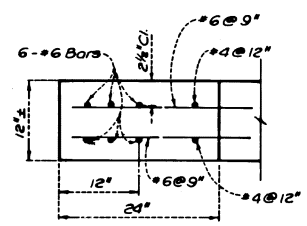
SECTION DS2 - DS2

NOT TO SCALE



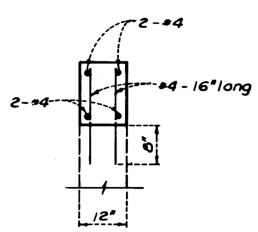
SECTION DS3 - DS3

NOT TO SCALE



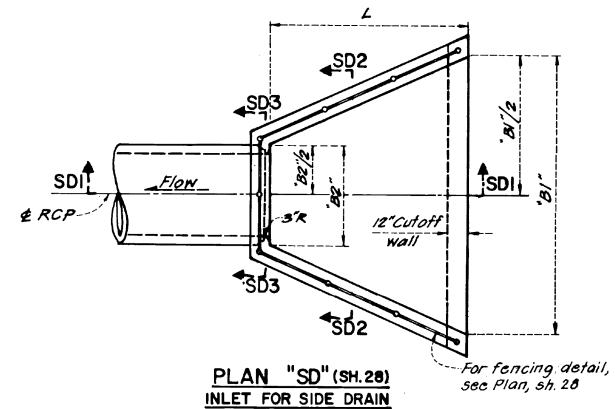
SECTION DS4 - DS4

NOT TO SCALE



SECTION DS6 - DS6

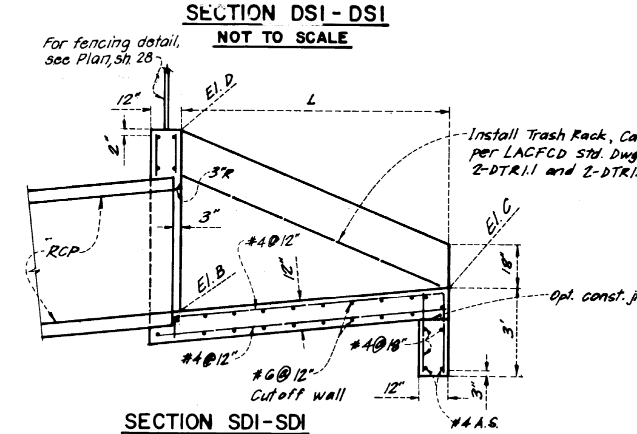
NOT TO SCALE



PLAN "SD" (SH. 28)

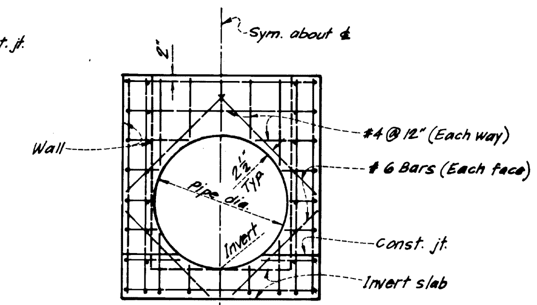
INLET FOR SIDE DRAIN

NOT TO SCALE



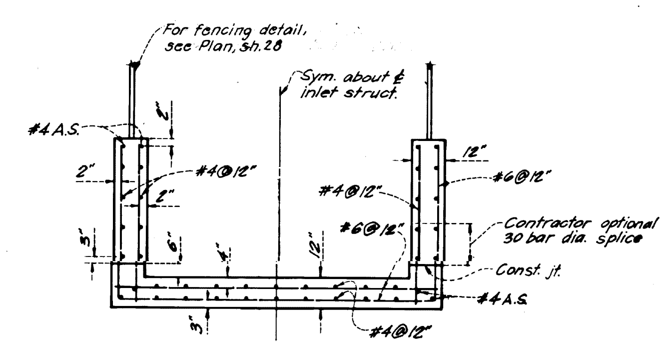
SECTION SD1-SD1

NOT TO SCALE



SECTION SD3-SD3

NOT TO SCALE



SECTION SD2 - SD2

NOT TO SCALE

SIDE DRAIN STATION	ELEVATION B	ELEVATION C	ELEVATION D	"B1"	"B2"	L
20+54	1249.63	1250.6	1253.63	9'	2'-6"	6'
48+75	1283.5	1287.5	1290.0	22'	5'-0"	14'
26+10*	1253.96	1255.0	1257.96	9'	2'-6"	6'

* For details for side drain @ Sta. 26+10, see Plan and Profile on Sh. 3.

Notes:
1. For General Notes, see Sh. 1.
2. For Structural Notes & Design Data, see Sh. 19.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY: E. Chang, J. Young
CHECKED BY: G. Drogin, R. Hashima
DRAWN BY: K. Yi
PROJECT ENGINEER: C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER - SOUTH FORK

LYONS AVENUE TO WILEY CANYON ROAD

REINFORCED CONCRETE CHANNEL

CHANNEL WALL AND WINGWALL EXTENSION PLAN AND STRUCTURAL DETAILS

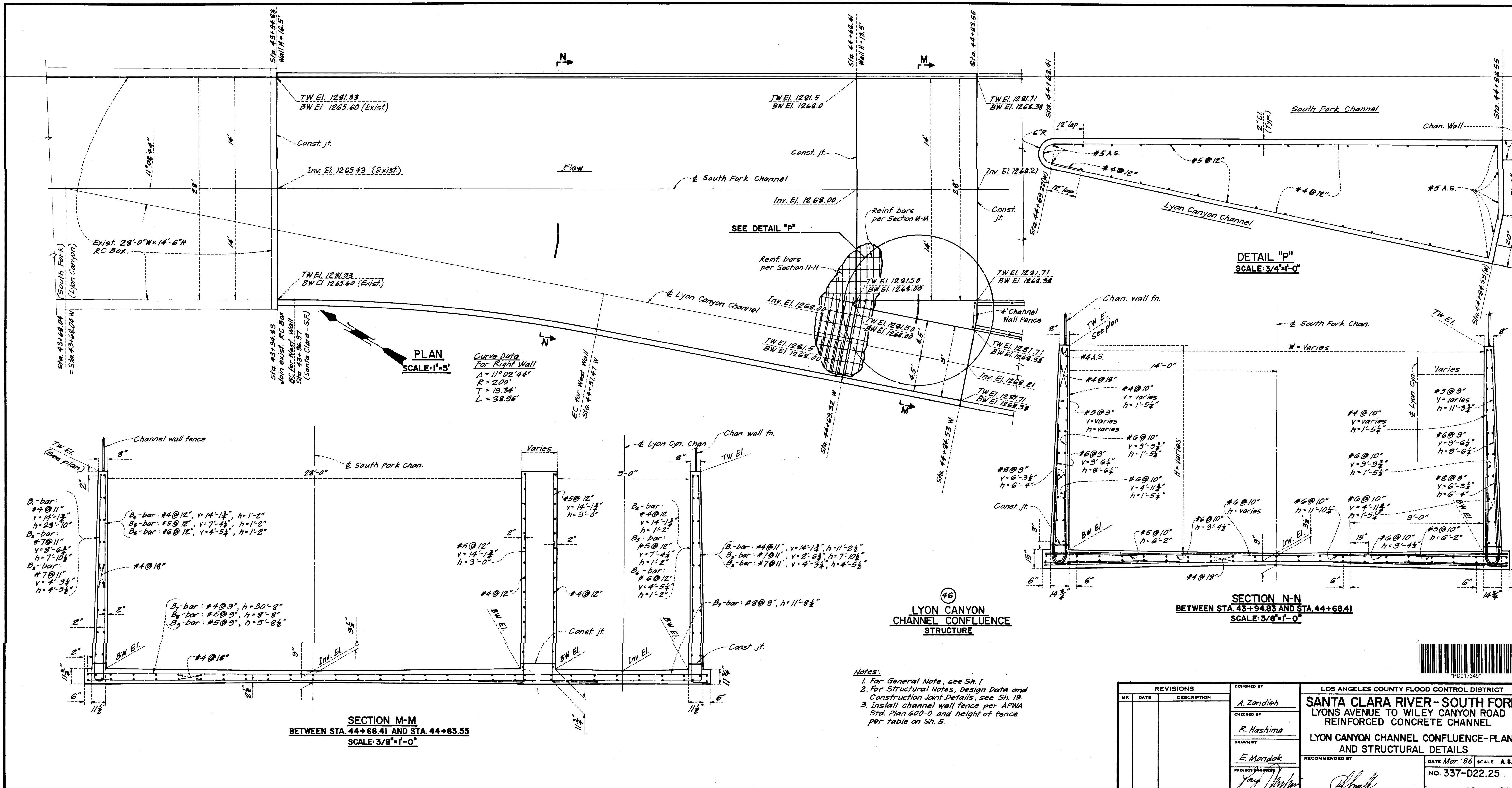
RECOMMENDED BY

DATE Mar. '86 SCALE A.S.

NO. 337-D22.24

SHEET 24 OF 32

"AS BUILT" DRAWINGS



Notes:
1. For General Note, see Sh. 1
2. For Structural Notes, Design Data and Construction Joint Details, see Sh. 19.
3. Install channel wall fence per APWA Std. Plan 600-0 and height of fence per table on Sh. 5.

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

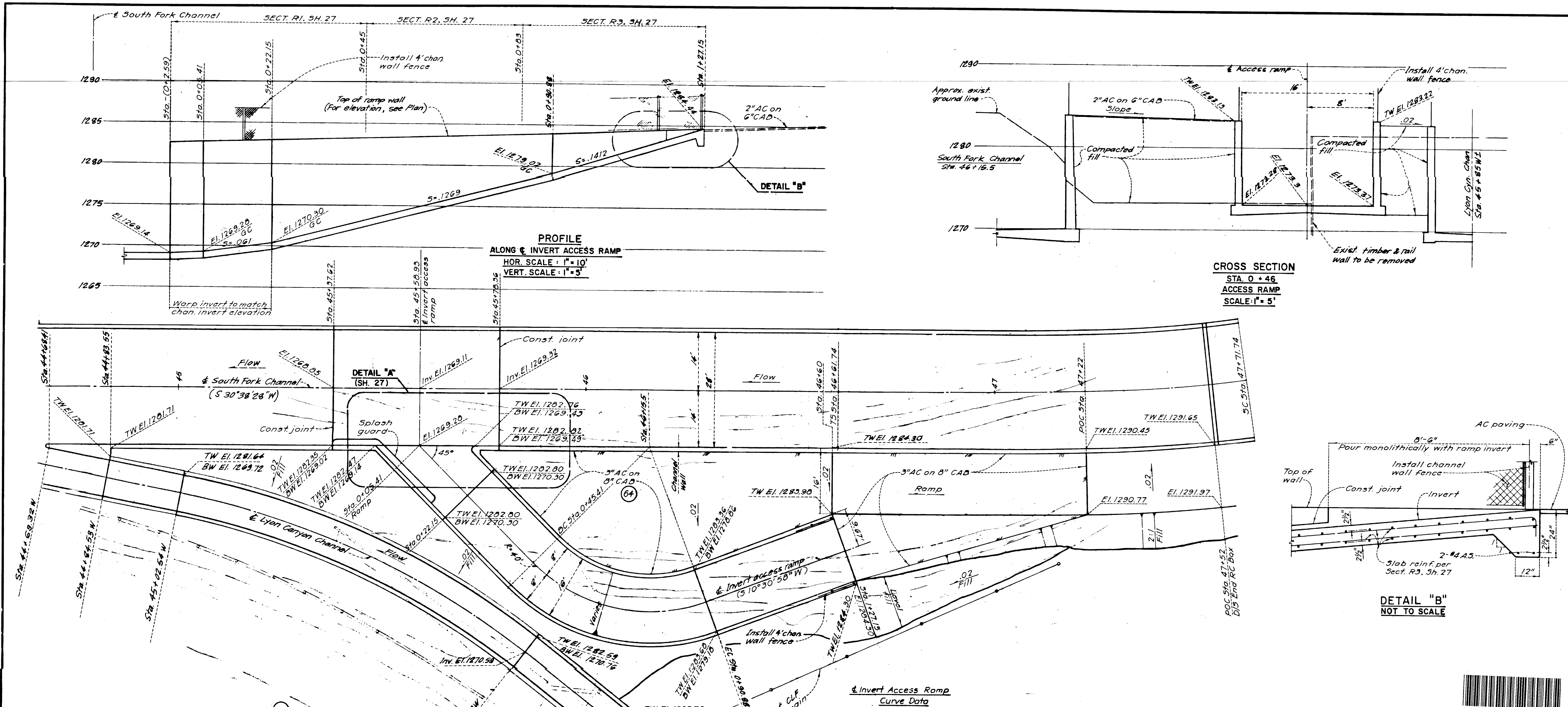
SANTA CLARA RIVER - SOUTH FORK

LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

LYON CANYON CHANNEL CONFLUENCE-PLAN AND STRUCTURAL DETAILS

DATE Mar. '86 SCALE A.S.
NO. 337-D22.25
SHEET 25 OF 32

"AS BUILT" DRAWINGS



Notes:
1. For General Notes, see Sh. 1.
2. Install fence & double drive gate per APWA Std. Plan 600-0.

REVISIONS		
MK	DATE	DESCRIPTION

Designed by: A. Zandieh
Checked by: R. Hashima
Drawn by: E. Mondok
Project Engineer: C017461

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER - SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

INVERT ACCESS RAMP AT STA. 45+70
PLAN, PROFILE AND CROSS SECTION

Recommended by: Division Engineer (Design)

DATE Mar. '86 SCALE A.S.
NO. 337-D22.26
SHEET 26 OF 32

"AS BUILT" DRAWINGS

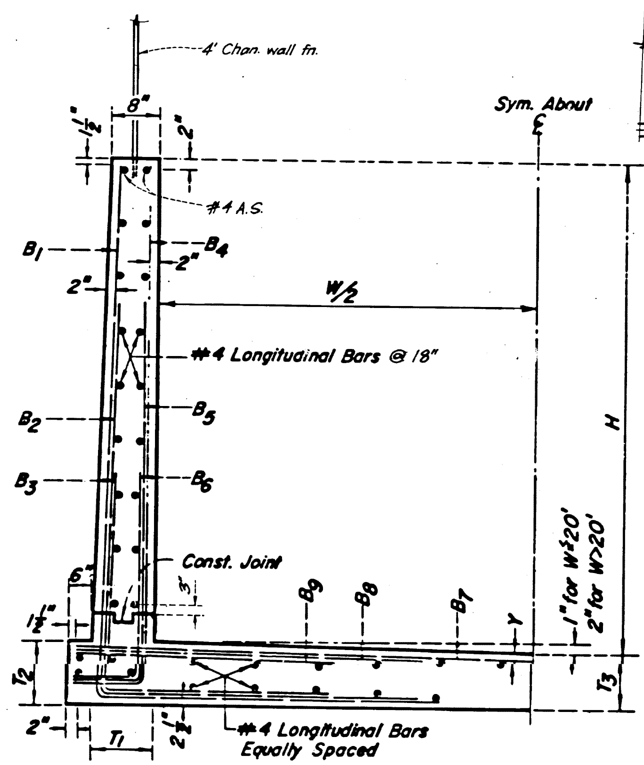
REINFORCED CONCRETE RECTANGULAR CHANNEL

SECTION DATA									QUANTITIES (See Note 2)		REINFORCEMENT STEEL SCHEDULE								
SECTION	STATION LIMITS		SIZE (FEET)		THICKNESS (INCHES)			CONC. COVER (INCHES)	CONCRETE	STEEL	B_1			B_2			B_3		
	FROM	TO	W	H	T_1	T_2	T_3	Y	CU. YDS./ LIN. FT.	LBS./ LIN. FT.	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH
R1	-0+02.59	0+45	16	Varies	12	12¼	9	2½	1.49	324.2	5@9"	Varies	9'-7½"	6@9"	7'-2"	6'-7"	6@9"	3'-11½"	4'-2"
R2	0+45	0+83	16	Varies	8	9	9	2½	1.00	153.1	4@10"	Varies	6'-¾"	5@10"	4'-11"	4'-7½"	5@10"	2'-8¼"	2'-7¼"
R3	0+83	1+27.15	16	Varies	8	9	9	2½	0.81	55.0	4@9"	Varies	3'-6"	—	—	—	—	—	—

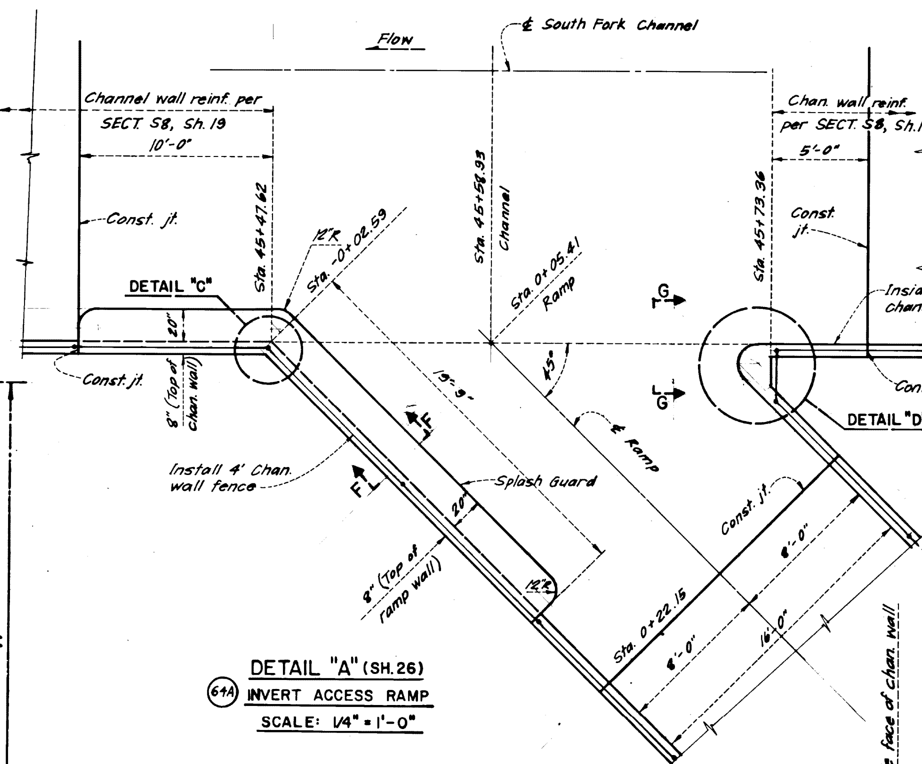
SECTION	B_4			B_5			B_6			B_7		B_8		B_9		LONGITUDINAL BARS		
	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	VERT. LENGTH	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	BAR NO. & SPACING	HORIZ. LENGTH	TOTAL	WALLS	SLAB
R1	4@10"	Varies	1'-2½"	4@10"	7'-1½"	1'-2½"	6@10"	5'-1½"	1'-2½"	6@9"	18'-9"	4@9"	7'-¼"	4@9"	5'-1¼"	varies	varies	32
R2	4@18"	Varies	0'-10½"	5@18"	5'-1¾"	0'-10½"	6@18"	3'-2"	0'-10½"	4@16"	18'-1"	5@16"	6'-10¼"	5@16"	4'-7"	varies	varies	26
R3	4@18"	Varies	0'-10½"	—	—	—	—	—	—	4@15"	18'-1"	—	—	—	—	varies	varies	24

Notes:

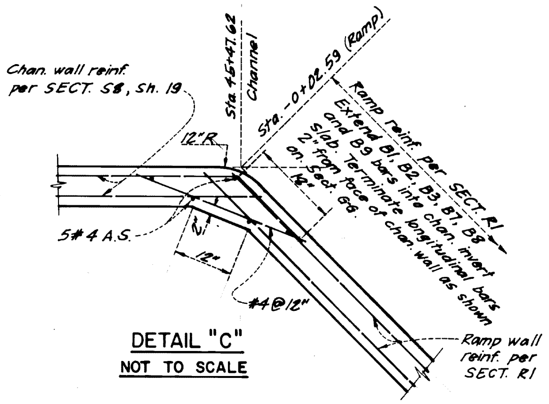
1. For Structural Notes, Design Criteria and const. joint details see Sh. 19.
2. The quantities shown on table are based on average wall height (H).
3. Install fence per APWA Std. Plan 600-0.



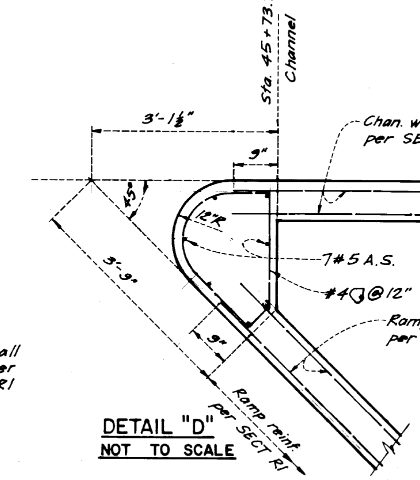
TYPICAL CHANNEL SECTION
NOT TO SCALE



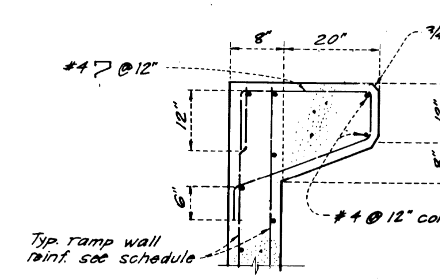
DETAIL "A" (SH. 26)
(64A) INVERT ACCESS RAMP
SCALE: 1/4" = 1'-0"



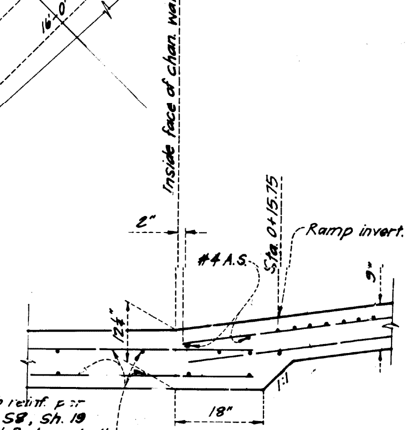
DETAIL "C"
NOT TO SCALE



DETAIL "D"
NOT TO SCALE



SECTION F-F
NOT TO SCALE



Chan. slab reinf. per SECTION S8, Sh. 19
B_1, B_2 and B_3 bar shall be straightened and cut 16" from face of channel wall as shown

SECTION G-G
NOT TO SCALE

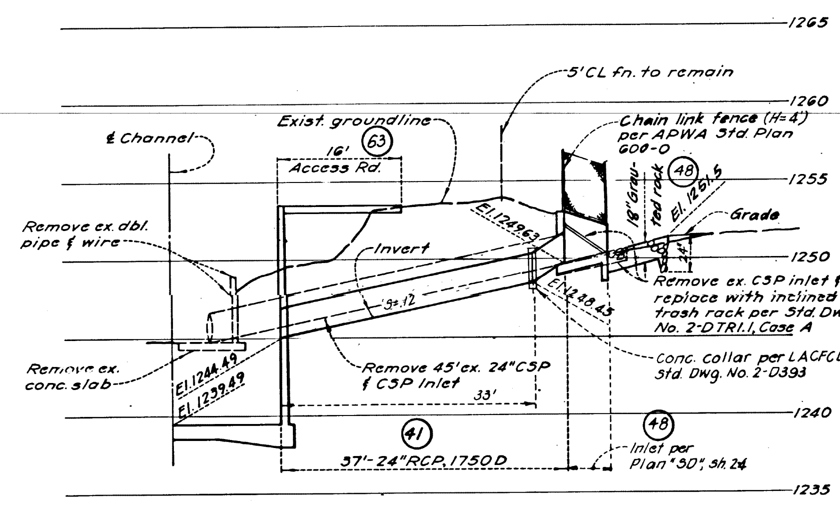
REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER C01746
RECOMMENDED BY
DIVISION ENGINEER (DESIGN)

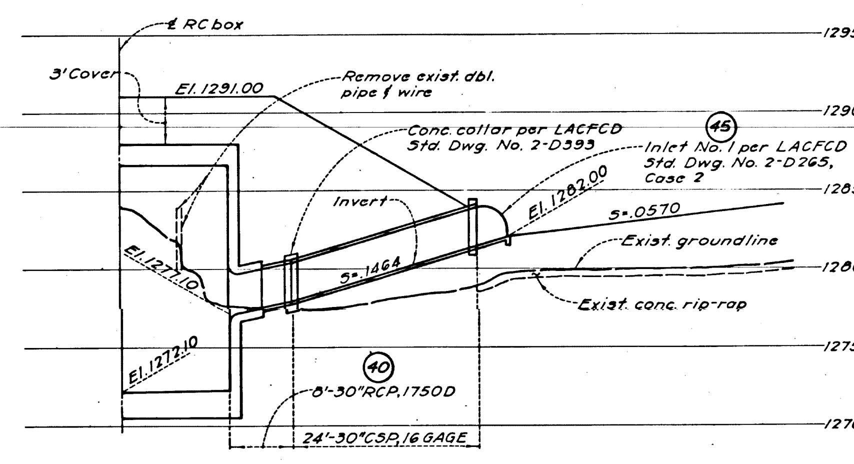
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL
INVERT ACCESS RAMP AT STA. 45+70
STRUCTURAL DETAILS

DATE Mar. '86 SCALE A.S.
NO. 337-D22.27
SHEET 27 OF 32

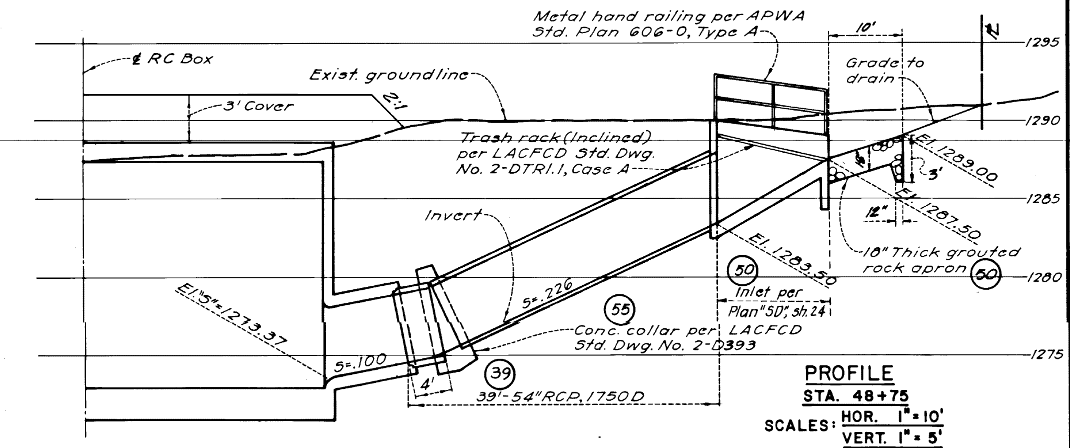
"AS BUILT" DRAWINGS



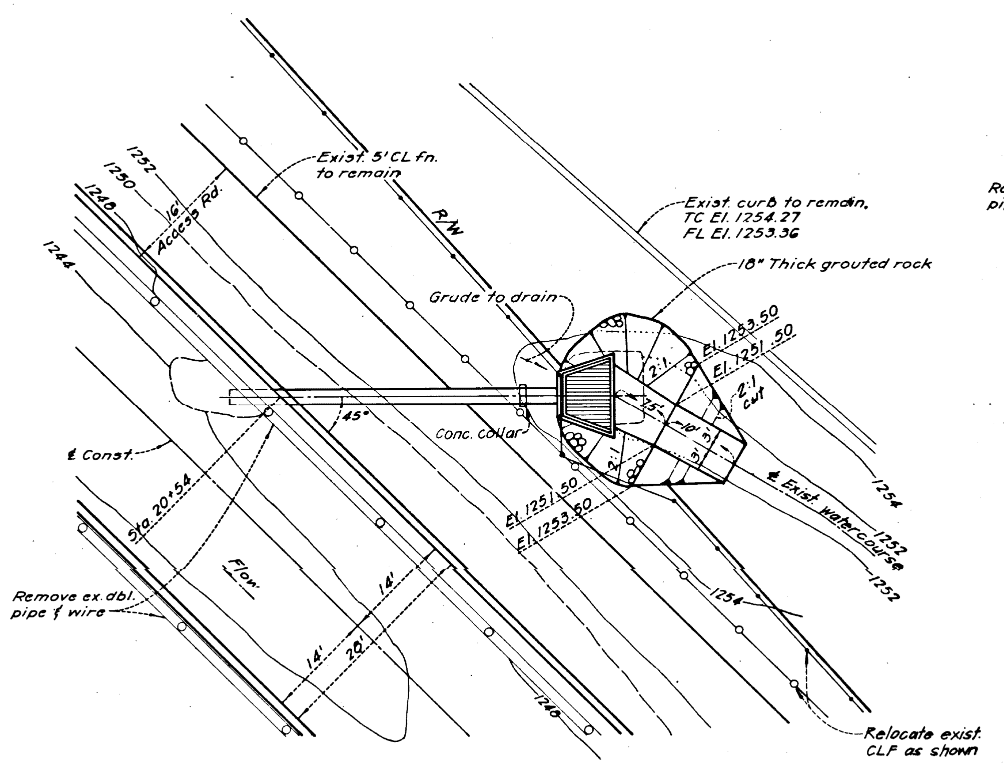
PROFILE
STA. 20+54
SCALES: HOR. 1"=10' VERT. 1"=5'



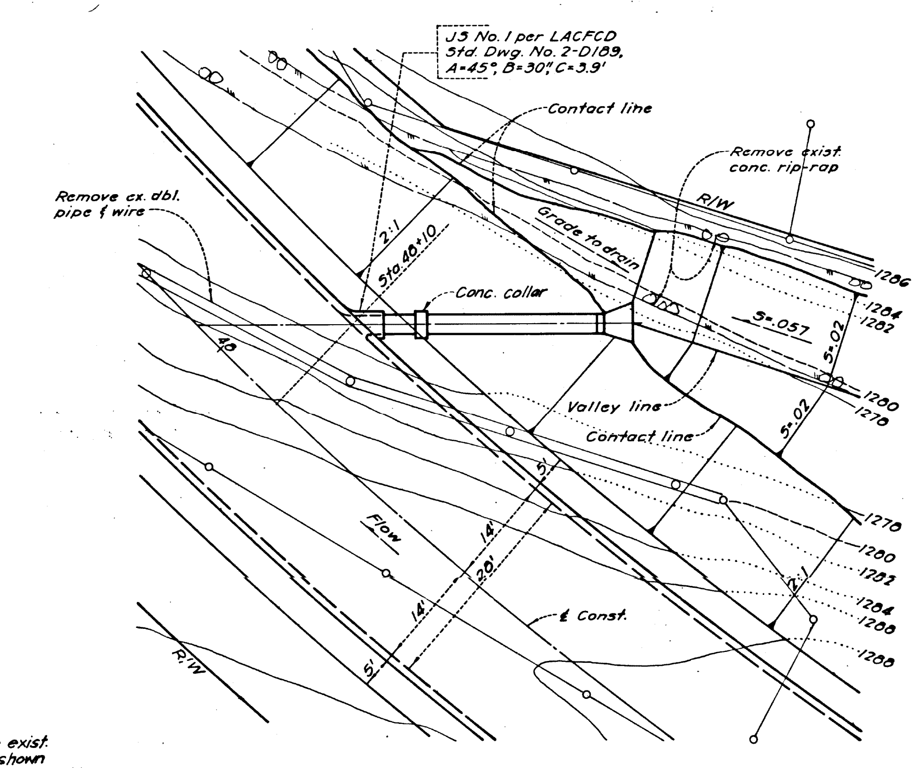
PROFILE
STA. 48+10
SCALES: HOR. 1"=10' VERT. 1"=5'



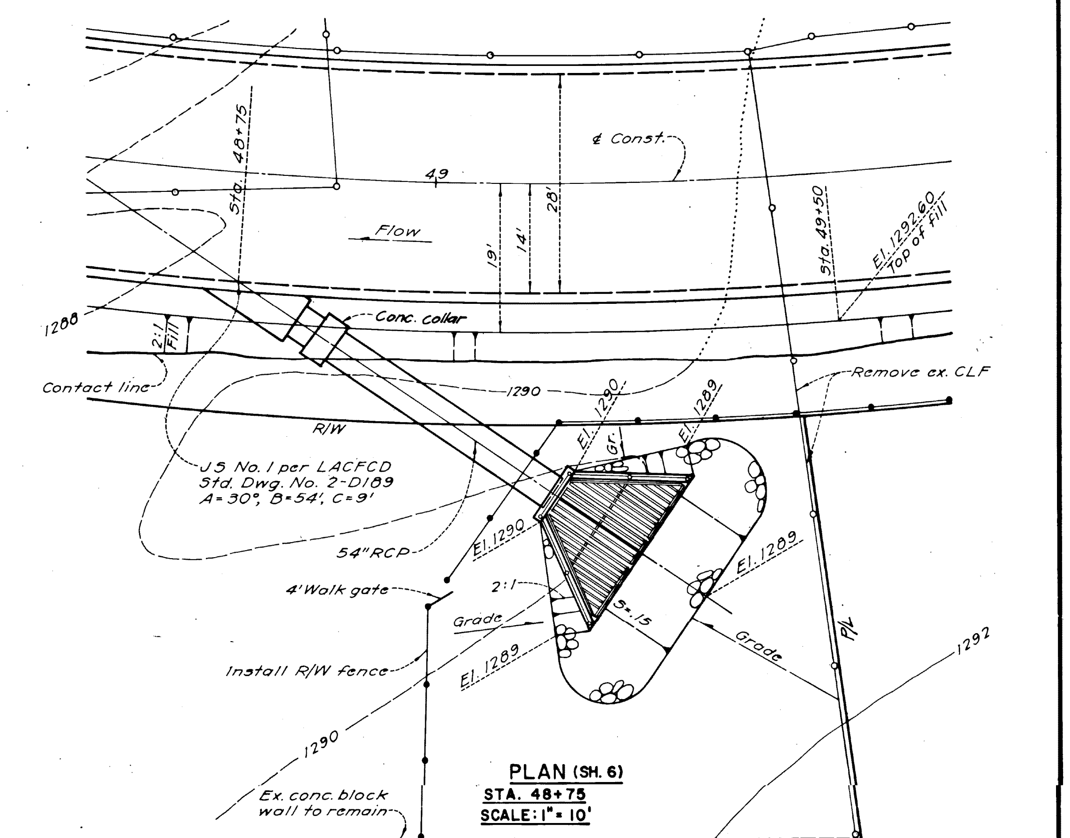
PROFILE
STA. 48+75
SCALES: HOR. 1"=10' VERT. 1"=5'



PLAN (SH. 3)
48 STA. 20+54
SCALE: 1"=10'



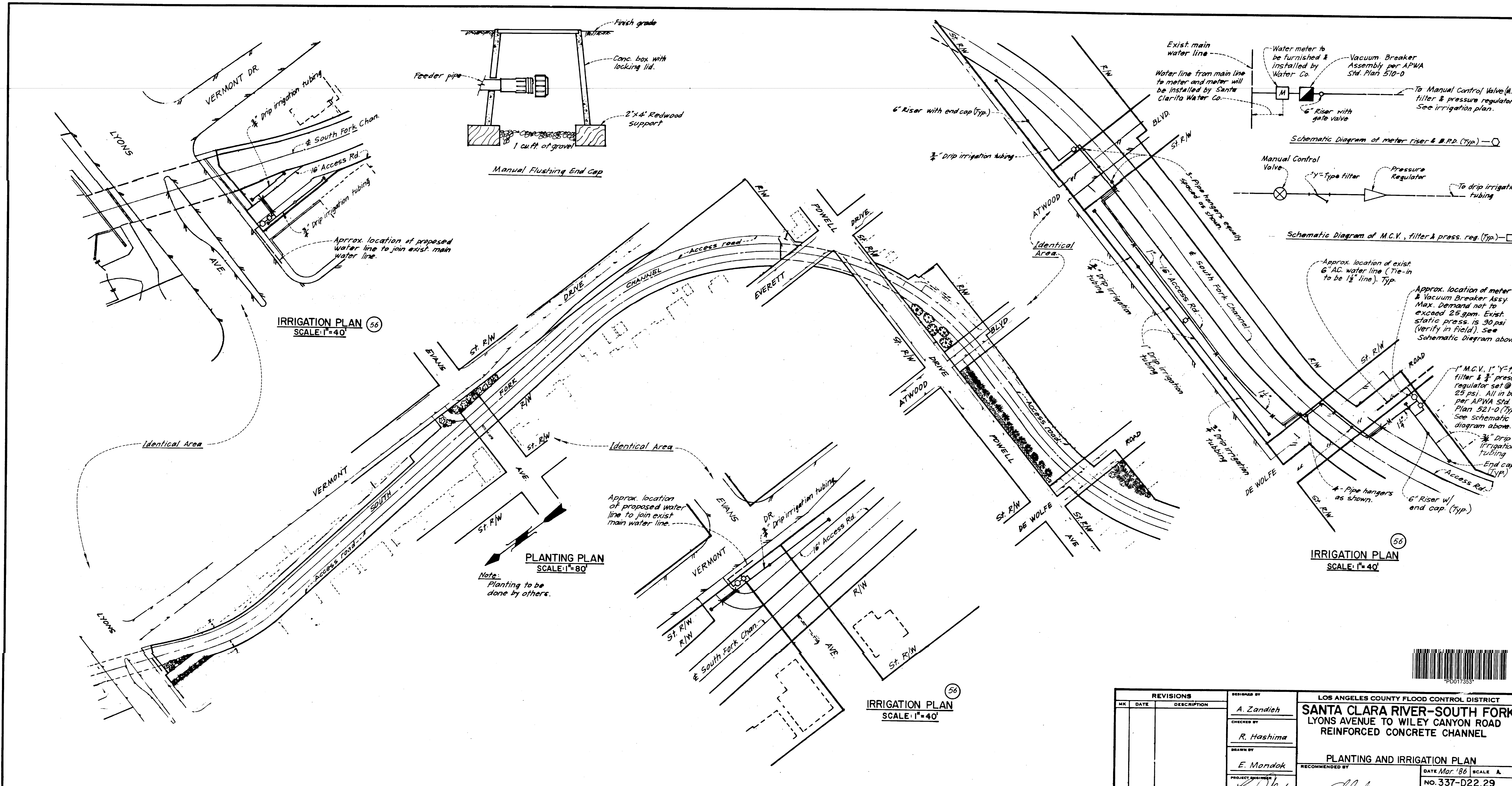
PLAN (SH. 6)
49 STA. 48+10
SCALE: 1"=10'



PLAN (SH. 6)
STA. 48+75
SCALE: 1"=10'

REVISIONS			DESIGNED BY	LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MK	DATE	DESCRIPTION	J. Young	SANTA CLARA RIVER-SOUTH FORK
			CHECKED BY: A. Zandieh	LYONS AVENUE TO WILEY CANYON ROAD REINFORCED CONCRETE CHANNEL
			DRAWN BY: A. Endo	SIDE DRAINS-PLAN AND PROFILE
			PROJECT ENGINEER: C01746	RECOMMENDED BY: DIVISION ENGINEER (DESIGN) — DATE Mar. '86 SCALE A.S. — NO. 337-D22.28 — SHEET 28 OF 32

"AS BUILT" DRAWINGS



REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY A. Zandieh
CHECKED BY R. Hashima
DRAWN BY E. Mondok
PROJECT ENGINEER

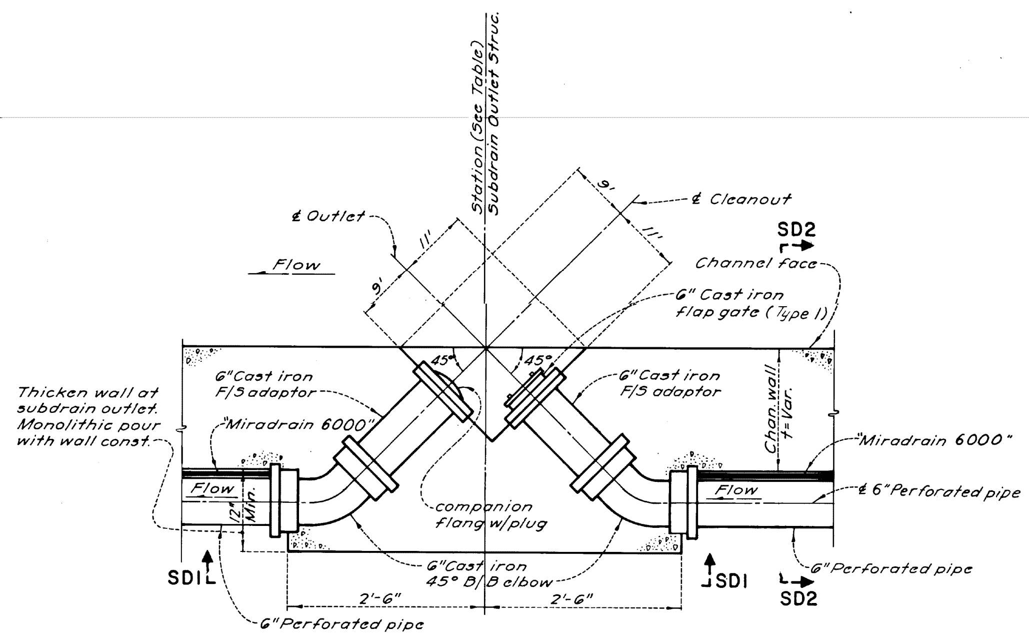
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER–SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

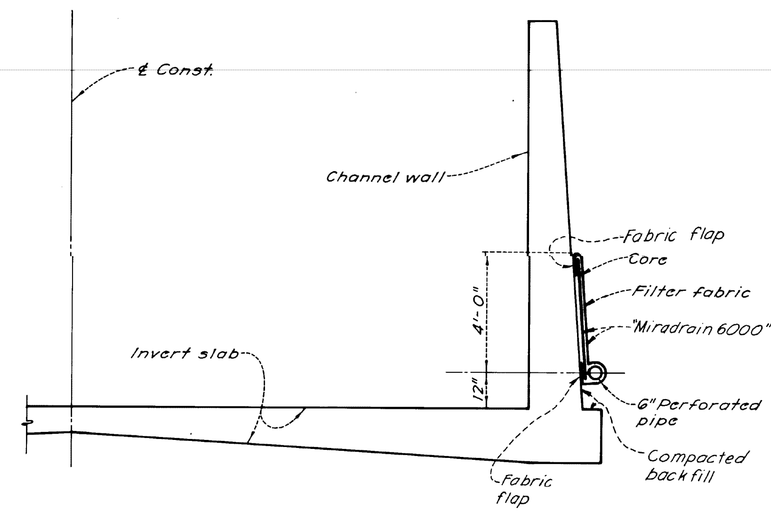
PLANTING AND IRRIGATION PLAN

RECOMMENDED BY — DIVISION ENGINEER (DESIGN)
DATE Mar '86 SCALE A.
NO. 337-D22.29
SHEET 29 of 32

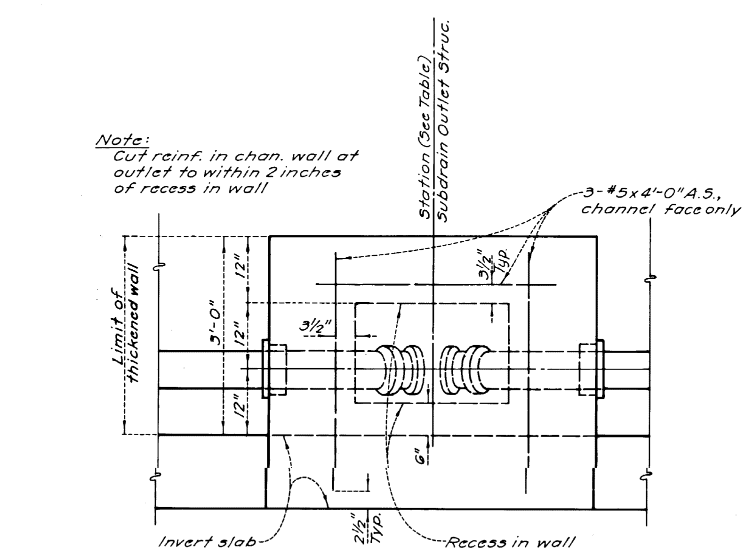
"AS BUILT" DRAWINGS



PLAN (SH.5&6)
SUBDRAIN OUTLET STRUCTURE
SCALE: 1"=1'-0"



SECTION SD2 - SD2
NOT TO SCALE



SECTION SD1-SD1
NOT TO SCALE

SUBDRAIN OUTLET STRUCTURE LOCATIONS			
STATION	WALL LOCATION	OUTLET	CLEANOUT
44+90	East	Yes	No
45+75.86	West	Yes	No
48+30	East	Yes	Yes
48+60	West	No	Yes
48+90	West	Yes	No
50+80	East & West	Yes	Yes
53+22	East & West	No	Yes

DRAINAGE SYSTEM NOTES

1. THE DRAINAGE SYSTEM CONSISTS OF "MIRADRAIN 6000", A PERFORATED 6-INCH DIAMETER PIPE, AND OUTLET STRUCUTRES, AS SHOWN HEREON. THE "MAINDRAIN 6000" CONSISTS OF A 4-FOOT-HIGH PREFABRICATED CORE WITH FILTER FABRIC ATTACHED (SEE SPECIFICATIONS TO LOCAL DISTRIBUTOR OF "MIRADRAIN 6000").
2. DURING PLACEMENT, THE FILTER FABRIC SHALL BE SECURELY TUCKED BEHIND THE CORE AT THE TOP AND BOTTOM, AND AT TERMINAL EDGES. THE CORE SHALL BE OVERLAPPED 2 INCHES AT EACH JOINT.
3. TO ATTACH TO THE CHANNEL WALLS, DRIVE NAILS THROUGH LATCHING STRIPS AND THEN THROUGH THE MIRADRAIN INTO THE CONCRETE. OTHER METHODS OF ATTACHMENT THAT KEEP THE MIRADRAIN IN PLACE DURING BACKFILLING AND MAINTAIN ITS INTEGRITY WILL BE ACCEPTABLE.
4. THE PIPE SHOULD BE PERFORATED IN 2 ROWS OF 1/4-INCH DIAMETER HOLES SPACED APPROXIMATELY 6 INCHES C.C. THE ROWS SHOULD BE ALONG THE TOP OF THE PIPE, APPROXIMATELY 60 DEGREES APART.

PD017354

REVISIONS		
MK	DATE	DESCRIPTION

DESIGNED BY T. Coe
CHECKED BY R. Hashimo
DRAWN BY A. Endo
PROJECT ENGINEER [signature]
RECOMMENDED BY [signature] DIVISION ENGINEER (DESIGN)

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
SANTA CLARA RIVER-SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

SUBDRAINAGE SYSTEM

DATE Mar.'86 SCALE A.S.
NO. 337-D22.30
SHEET 30 OF 32

"AS BUILT" DRAWINGS

BORING NO. 1

STATION 12+35
OFFSET 23' East
ELEVATION 1250.1
DATE DRILLED April 1, 1969

DEPTH	LOG	MC	DRY DENSITY	-4	-200	N	DESCRIPTION
	ML	22	80	99	68		SANDY SILT; brown.
9.0'							
	SM	4	119	62	15		SILTY GRAVELLY SAND; brown, gravel to 3."
		6	107	79	13		hit large rock at 16.5.'
		6	113	72	19		
25.0'							

BORING NO. 2

STATION 20+10
OFFSET 33' East
ELEVATION 1253
DATE DRILLED 1979

EL. 1253±	LOG	MC	LL	PI	-4	-200	N	DESCRIPTION
3.0'	SP SM	7		NP	63	11	*	GRAVELLY SAND/SILTY GRAVELLY SAND, brown, 2% cobbles to 6" — boulder to 12".
	SM	10		NP	64	20	* *	SILTY GRAVELLY SAND, brown pieces of brick, glass, iron, etc., 5% cobbles and boulders to 6"
		9		NP	83	23	* *	more steel, rags, plastic, etc., 2% cobbles and boulders to 7"
11.0'		10		NP	75	22	*	trash in fill
13.0'	GW	9		NP	50	4	20	SILTY SANDY GRAVEL, light brown, medium dense, no more trash, 2% cobbles to 5".
16.0'	GP GM			NP	54	12	* * *	SANDY GRAVEL/SILTY SANDY GRAVEL, light brown, 15% cobbles and boulders to 7".
17.0'	ML	20	32	9	100	74		SANDY SILT, yellow brown.
	SM	12		NP	76	31	6, 10	GRAVELLY SILTY SAND, yellow brown, fine grained, loose, occasional gravel to 3"
		12		NP	83	35	17, 14, 18	medium dense, 5% cobbles and boulders to 12".
27.0'		8		NP	96	31	12, 27	SILTY SAND, yellow brown, medium dense,
30.0'	SP SM	10		NP	58	11	* *	GRAVELLY SAND/SILTY GRAVELLY SAND, brown 5% cobbles to 4".

* NO PENETROMETER DRIVE DUE TO ROCKS.

BORING NO. 3

STATION 26+10
OFFSET 44' East
ELEVATION 1258
DATE DRILLED 1979

EL. 1258±	LOG	MC	LL	PI	-4	-200	N	DESCRIPTION
	SM	12		NP	80	32	* *	GRAVELLY SILTY SAND, brown, 5% cobbles to 5".
		12		NP	98	34	16	SILTY SAND, yellow brown, medium dense, fine grained, gravel to 1 1/2".
9.0'		8		NP	79	18	23, *, *	SILTY GRAVELLY SAND, brown, medium dense, 15% cobbles and boulders to 9".
	SP SM	7		NP	63	11	* *	GRAVELLY SAND/SILTY GRAVELLY SAND, brown, 10% cobbles and boulders to 20".
				NP	59	7	11, *	boulders to 9".
20.0'		5		NP	54	6	* * *	20% cobbles and boulders to 12".
21.0'	SC	14	27	9	100	50	*	CLAYEY SAND, brown.
22.5'	SM	8		NP	76	27	10	GRAVELLY SILTY SAND, brown, loose, 2% cobbles to 5.
25.0'	CL ML	6	28	7	95	53	12, 17	SANDY CLAY/SANDY SILT, yellow brown, medium dense, gravel to 1".
	SM	9		NP	100	28	17, 33	SILTY SAND, yellow brown, medium dense to dense
30.0'		12		NP	92	37	33	gravel to 1 1/2" 33 blows in 1ST 10", hit rock.

* NO PENETROMETER DRIVE DUE TO ROCKS.

BORING NO. 4

STATION 31+70
OFFSET 46' North
ELEVATION 1265
DATE DRILLED 1979

EL. 1265±	LOG	MC	LL	PI	-4	-200	N	DESCRIPTION
	SM	4		NP	94	39	36, 19	SILTY SAND, brown, dense, fine grained, gravel to 3".
6.0'		5		NP	70	18	6	SILTY GRAVELLY SAND, brown, loose to medium dense, 2% cobbles to 4".
9.0'	SW SM			NP	73	12	*, 19	GRAVELLY SAND/SILTY GRAVELLY SAND, brown, medium dense, medium grained, 5% cobbles to 5".
13.0'	GP GM	7		NP	54	12	* *	SANDY GRAVEL/SILTY SANDY GRAVEL 10% cobbles and boulders to 9". — boulders to 13"
14.0'	SM	15		NP	67	28	*, 16	SILTY GRAVELLY SAND, yellow brown, find grained, occasional gravel to 3".
17.5'	SP SM	7		NP	65	9	*	GRAVELLY SAND/SILTY GRAVELLY SAND, brown, medium dense, 5% cobbles to 6". — 20% cobbles and boulders to 10" @ 15'
18.5'	SM	7		NP	69	16	*	SILTY GRAVELLY SAND, brown, 2% cobbles to 4".
23.0'	CL ML	14	26	7	99	55	9, 10, 10	SANDY CLAY/SANDY SILT, yellow brown, loose, find grained, gravel to 3/8" occasional cobbles to 4".
	SM	8		NP	87	28	9, 10, 9	GRAVELLY SILTY SAND, yellow brown, loose, 2% cobbles to 4", 1-9" rock.
29.5'		9		NP	79	22	* *	brown, 10% cobbles to 6".

* NO PENETROMETER DRIVE DUE TO ROCKS.

BORING NO. 5

STATION 35+50
OFFSET 43' South
ELEVATION 1269
DATE DRILLED 1979

EL. 1269±	LOG	MC	LL	PI	-4	-200	N	DESCRIPTION
	SM	8		NP	98	37		SILTY SAND, yellow brown, fine grained, occasional gravel to 1 1/2".
5.0'				NP	99	26	27, 8	loose to medium dense, gravel to 3".
11.0'	SP SM	8		NP	58	12	28, *, *, *	GRAVELLY SAND/SILTY GRAVELLY SAND, brown, medium dense, 2% cobbles to 4", hard drilling. — 15% cobbles and boulders to 8".
	SM	10		NP	91	29	*, 10	SILTY SAND, yellow brown, loose, gravel to 1 1/2".
15.0'		10		NP	91	21	16	1" rock in SPT tube.
17.0'	SP SM			NP	65	12	21	GRAVELLY SAND/SILTY GRAVELLY SAND, medium dense, 5% cobbles & boulders to 8". 1" rock in SPT tube.
	SM	9		NP	86	19	12, *	GRAVELLY SILTY SAND, brown, medium dense gravel to 1 1/2".
		11		NP	74	19	*, 18	SILTY GRAVELLY SAND, brown, medium dense gravel to 1 1/2".
		19		NP	100	49	20	SILTY SAND, yellow brown, some cohesion, medium dense.
		17		NP	91	34	13	brown, cohesive, medium dense, gravel to 3".
30.0'		9		NP	66	18	35, *, *	SILTY GRAVELLY SAND, dense, 5% cobbles to 6".

* NO PENETROMETER DRIVE DUE TO ROCKS.

BORING NO. 6

STATION 44+56
OFFSET 31' EAST
ELEVATION 1281.3
DATE DRILLED April 30, 1984

EL. 1281±	LOG	MC	γ_d	-4	-200	LL	PI	N	DESCRIPTION
3.5'	SM								GRAVELLY SILTY SAND; brown moist, slightly plastic, some clay.
4.5'	SC								boulder to 13"; debris (wood, nails, etc.)
	SM	8.9	100	84	22		NP		GRAVELLY CLAYEY SAND; mottled, light brown with brown and grey brown, moist, medium dense, plastic, cobbles to 8".
8.0'				74	26		NP		GRAVELLY SILTY SAND; brown, moist. medium dense, occasional cobble. severe caving, stopped drilling at 8.0' due to cobbles and boulders.

PD017355

NOTE: For logs of soil borings numbered 7, 8, and 9, a boring location sketch, notes, and a legend of symbols and abbreviations used in the logs of borings, refer to the following sheet.

REVISIONS		
MK	DATE	DESCRIPTION

LOGGED BY T. Dudley
REVIEWED BY T. Coe
SUBMITTED BY V. Martinez
PROJECT ENGINEER Thomas Coe RCE [illegible]

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER–SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

LOGS OF BORINGS

RECOMMENDED BY Kehler V. Russell, Assistant Chief, Contract Construction

DATE Mar. '86 SCALE NONE
NO. 337-D22.31
SHEET 31 OF 32

"AS BUILT" DRAWINGS

BORING NO. 7

STATION 45+94
OFFSET 24' East
ELEVATION 1283.3
DATE DRILLED April 30, 1984

EL. 1283±	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								*GRAVELLY SILTY SAND; brown, occasional cobbles.* The soil formation is moist, dense and rocky.
24.0'	SW-SM			65	9		NP		WELL GRADED SAND WITH SILT; gray, moist, very dense.
27.5'									

BORING NO. 8

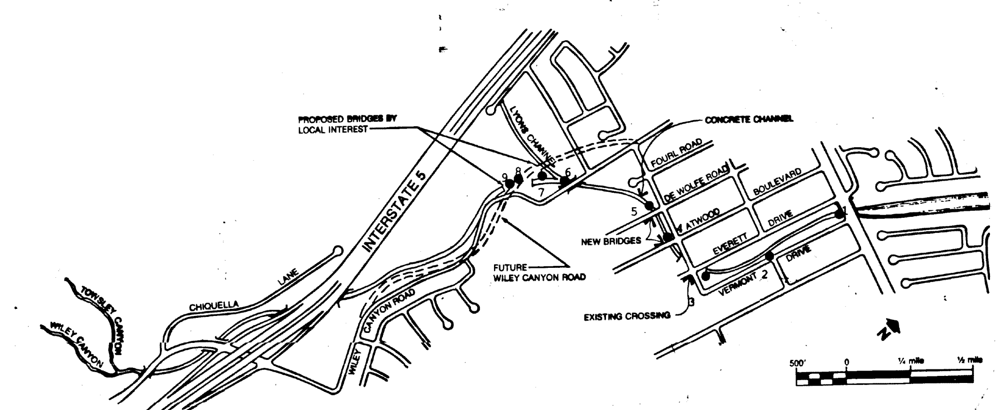
STATION 47+43
OFFSET 28' East
ELEVATION 1285.9
DATE DRILLED April 26, 1984

EL. 1286±	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
	SM								*SILTY GRAVELLY SAND; brown, medium dense to dense, slightly plastic.*
		3.6	108	65	17		NP		*moist, medium dense, easy to drill, non plastic.*
									cobbles to 9", severe caving.
				70	20		NP		*medium dense.*
									trace of clay, slight cohesion.
		4.7	110	85	14		NP		*cobbles to 12".*
									no gravel, no cobbles.
19.2'									*many cobbles to 12".*

BORING NO. 9

STATION 52+22
OFFSET 39' West
ELEVATION 1293.8
DATE DRILLED May 1, 1984

EL. 1294±	LOG	MC	γd	-4	-200	LL	PI	N	DESCRIPTION
4.0'	SM								*SILTY SAND; light brown, moist, medium dense, fine to medium grained sand.*
	GM			52	17		NP		SILTY SANDY GRAVEL; brown, moist, moderately dense. Some cobbles up to approximately 7 inches in size.
		5.7	122	59	18		NP		
12.0'									Many cobbles up to 9 inches in size.
20.0'	SM								SILTY SAND; dense to very dense. Trace of gravel.



9 ● Indicates approximate boring locations.

NOTES

1. Group symbols and soil descriptions are based on the Unified Soil Classification System (Standard Drawing No. 2-D 413).
2. Unless otherwise indicated, borings were stopped at the last indicated depth because further information was not needed.
3. The location of boring number one is referenced from Log of Borings (drawing number 337-03) and Design Drawing 337-D4.2.
4. Borings numbered two through five are referenced from a U.S. Army Corps of Engineers, Los Angeles District report entitled "Appendix C, Geology, Soils and Materials, Detailed Project Report for Flood Control, South Fork of the Santa Clara River, Santa Clarita Valley, California," and dated January 1983, and preliminary design drawings, unnamed and unnumbered.
5. The location of borings numbered six through nine are referenced from drawing number 394-P4.
6. All stations and offsets are measured at a right angle to the centerline of construction for the proposed channel.
7. The depth to the existing channel invert and the depth to subgrade for the proposed channel construction are both measured at the centerline of the proposed construction.
8. Groundwater was not encountered to the depths explored.

SYMBOLS

➡	Indicates the depth to the existing invert elevation.
⟶	Indicates the depth to conduit subgrade.
MC	FIELD MOISTURE CONTENT IN PERCENT OF DRY WEIGHT.
LL	LIQUID LIMIT.
PI	PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT).
NP	NONPLASTIC
-4	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE.
-200	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SIEVE.
N	NUMBER OF BLOWS OF A 140-POUND DROPHAMMER FALLING 30 INCHES REQUIRED TO DRIVE A SAMPLING SPOON ONE FOOT. OUTSIDE DIAMETER OF SPOON IS 2 INCHES; INSIDE DIAMETER IS 1-3/8 INCHES. PROCEDURE IS CALLED STANDARD PENETRATION TEST.

PD017356

REVISIONS		
MK	DATE	DESCRIPTION

LOGGED BY T. Dudley
REVIEWED BY T. Coe
SUBMITTED BY V. Martinez
PROJECT ENGINEER [signature] RCE 036[illegible]

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

SANTA CLARA RIVER–SOUTH FORK
LYONS AVENUE TO WILEY CANYON ROAD
REINFORCED CONCRETE CHANNEL

LOGS OF BORINGS

RECOMMENDED BY Kahler V. Russell, Assistant Chief, Contract Construction

DATE Mar. '86 SCALE NONE
NO. 337-D22.32
SHEET 32 OF 32

"AS BUILT" DRAWINGS

Questions concerning the VERTCON process may be mailed to NGS

Latitude: 34 22 06.470

Longitude: 118 33 25.590

NGVD 29 height: 000.00 ft

Datum shift(NAVD 88 minus NGVD 29): 2.726 feet

Converted to NAVD 88 height: 2.726 feet

Appendix C

Appendix C – Flow Rate Data and Calculations

Table 10: Summary of Discharges, Continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Silver Lake Shallow Flooding	Between Hyperion Avenue and Griffith Park Boulevard, North of Fountain Avenue	0.9	290	*	650	830	*	1,300
Silver Lake Shallow Flooding	Griffith Park Boulevard at Tracy Street	0.6	220	*	490	620	*	970
South Fork Santa Clara River	Approximately 500 feet Downstream of Wiley Canyon Road	12.9	*	*	*	8,483	*	13,704
South Fork Santa Clara River	Approximately 600 feet Downstream of Golden State Freeway	12.8	*	*	*	8,417	*	13,596
Spade Springs Canyon	At confluence with Mint Canyon	4.5	471	*	1,099	1,364	*	1,839
Spade Springs Canyon	At boundary of Angeles National Forest	3.4	428	*	911	1,118	*	1,491
Stokes Canyon	Cross Section C	2.9	1,089	*	2,403	3,067	*	4,799
Stokes Canyon	Cross Section B	2.4	934	*	2,062	2,631	*	4,117
Surface Runoff	At Intersection of Garfield Avenue and Beverly Boulevard	2.9	820	*	1,810	2,310	*	3,610

SHEET ____ OF ____

CALCULATIONS FOR Q_{CAP} FLOW – SOUTH FORK SCR

- PROJECT SITE LOCATION (APPROX):

  34° 22′ 04.63″ N

  118° 33′ 24.61′ W

- SITE LOCATED ON OAT MOUNTAIN QUAD (1-H1-35) PER LADPW SEDIMENTATION MANUAL (APPENDIX B)

  ZONE – DPA-9 (DEBRIS PRODUCTION AREA)

- PER HYDROLOGY DATA PROVIDED BY LADPW (PETER IMAA) ON 5/31/18

  AT NODE 126 AN

  TOTAL AREA = 7205.9 AC = 11.3 SQ. MI.

  TOTAL Q_{50} BURN = 12428.3 cfs

- USING PEAK BULKING FACTOR CHART FOR SANTA CLARA BASIN

  FOR DRAINAGE AREA = 11.3 SQ. MI.

  PEAK BULKING FACTOR FOR DPA-9 = 1.115

- CALCULATE $Q_{50_{BB}}$ FLOW (Q_{CAP})

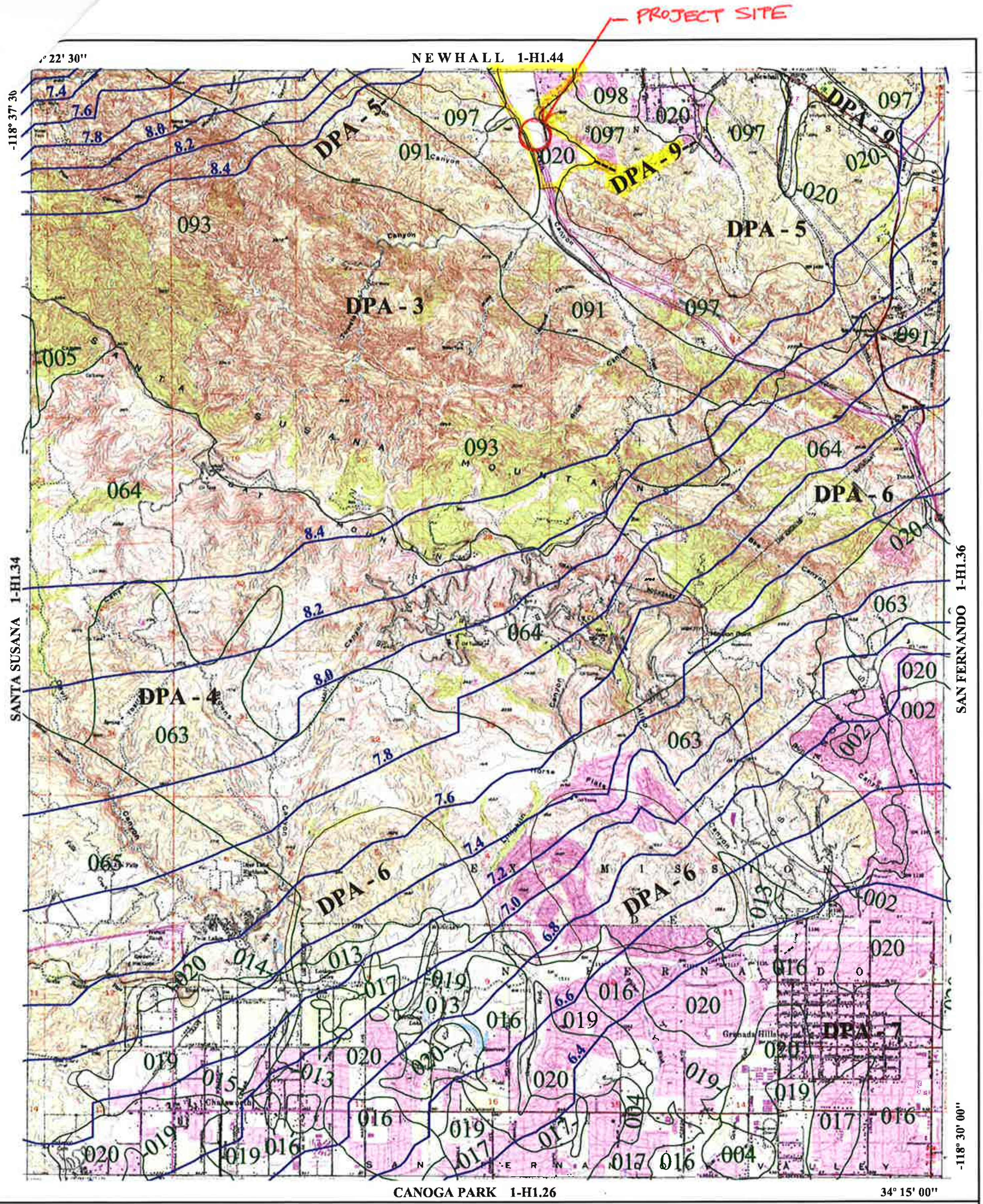
$$Q_{CAP} = Q_{50_B} \times BF$$

$$= 12428.3 \text{ cfs} \times 1.115$$

$$\boxed{Q_{CAP} = 13{,}857.6 \text{ cfs}}$$

PACE Advanced Water Engineering	DRAWN	CHKD JC	TITLE CAPITAL FLOOD CALCULATIONS WILEY CANYON / SMIZER RANCH
	DATE 6/6/18		JOB NO. A969

17520 Newhope Street • Suite 200 • Fountain Valley, California 92708 • tel: 714.481.7300 • fax: 714.481.7299



016	SOIL CLASSIFICATION AREA
7.2	INCHES OF RAINFALL
DPA - 6	DEBRIS POTENTIAL AREA

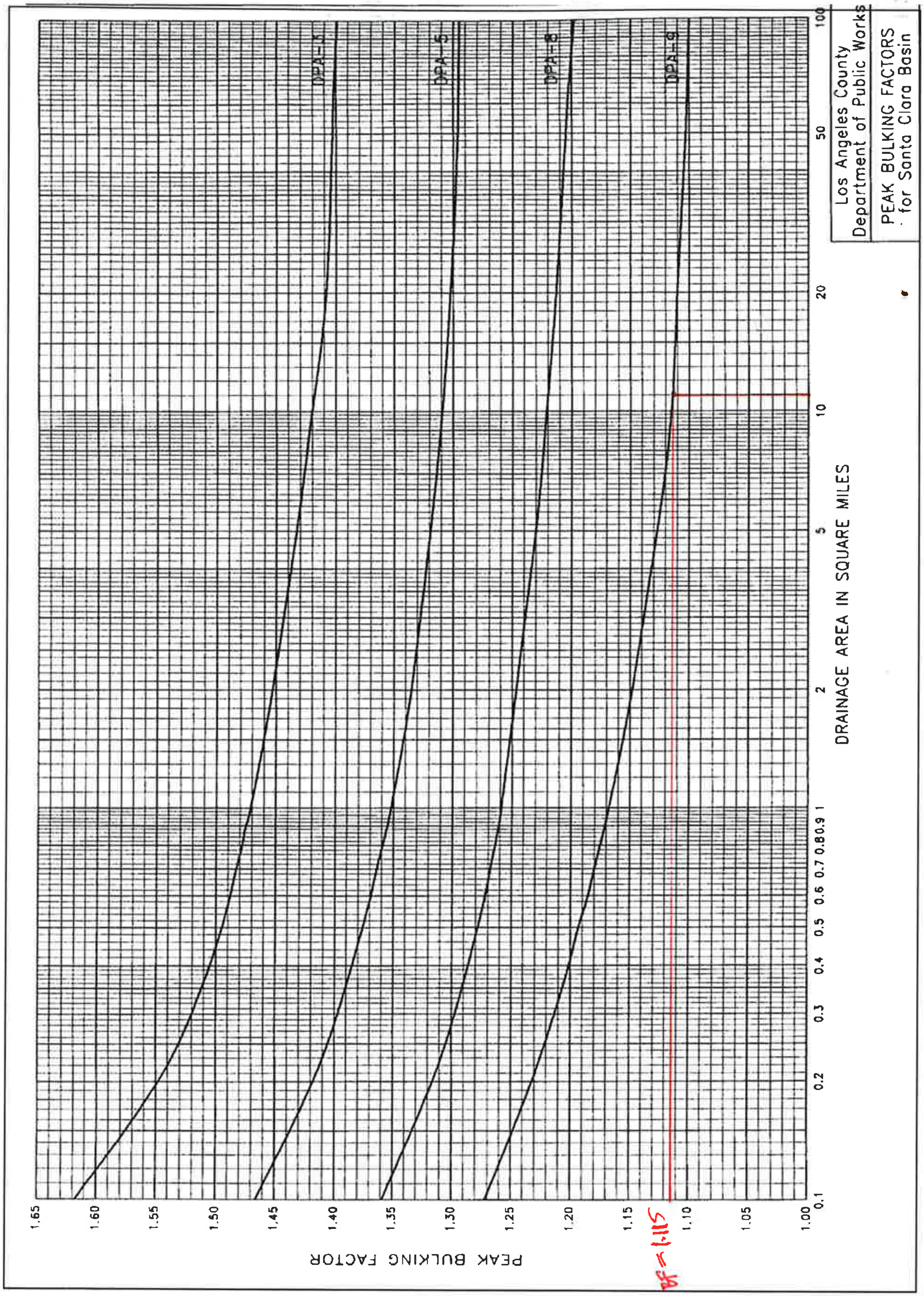
1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

OAT MOUNTAIN
50-YEAR 24-HOUR ISOHYET

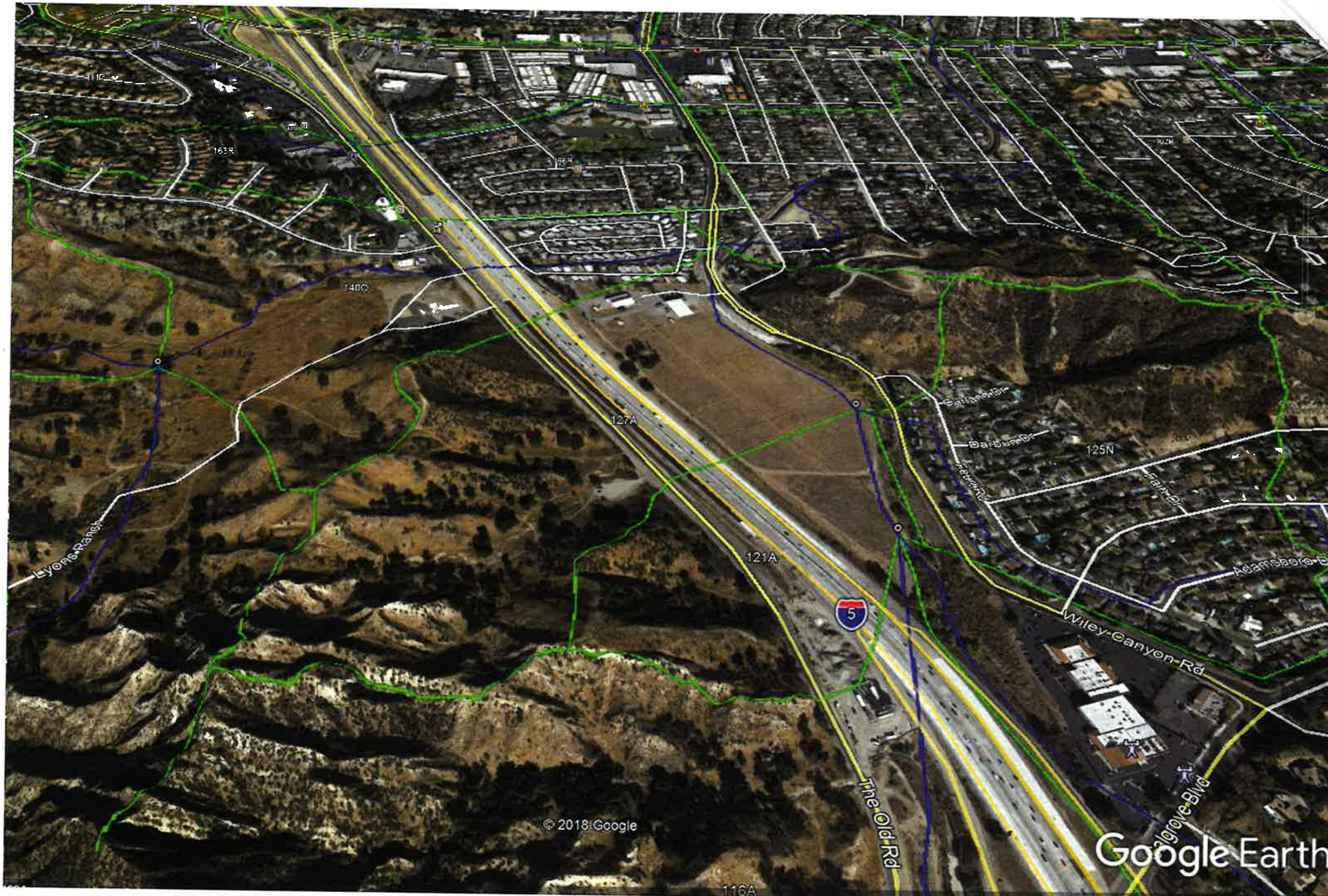
1-H1.35

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works


Los Angeles County
Department of Public Works
PEAK BULKING FACTORS
for Santa Clara Basin
DRAINAGE AREA IN SQUARE MILES
PEAK BULKING FACTOR
DPA-5
DPA-8
DPA-9
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
5
10
20
50
100
1.00
1.05
1.10
1.15
1.20
1.25
1.30
1.35
1.40
1.45
1.50
1.55
1.60
1.65
BF=1.115

126AN
TotalArea (ac): 7205.9
TotalQ50Clear (cfs): 11699.3
TotalQ50Burn (cfs): 12428.3
Year 2001 Hydrology
126AN
127A
125N
121A
5
Wiley-Canyon-Rd
The-Old-Rd
Calgrove-Blvd
Adamsboro-Dr
© 2018 Google
Google Earth
116A
Imagery Date: 12/31/2017 34°22'03.85" N 118°33'33.07" W elev 1341 ft eye alt 4136 ft

120AM
TotalArea (ac): 6996.6
TotalQ50Clear (cfs): 11549.4
TotalQ50Burn (cfs): 12288.6
Year 2001 Hydrology
120AM
127A
121A
125N
116A
5
Wiley-Canyon-Rd
Adamsboro-Dr
The Old Rd
© 2018 Google
Google Earth



140D
127A
121A
5
125N
Lyons Ranch
Wiley Canyon Rd
The Old Rd
Adamsboro Dr
© 2018 Google
Google Earth
116A

WATER RESOURCES DIVISION
Hydrology Section
INFORMATION REQUEST SUMMARY

Date: 12/29/04

Project Name: Wiley Canyon - South Fork, SCR

Project Location: Lyons and Calgrove on Wiley Canyon Road, Santa Clarita (TG 4640 – F2, F3)

Project Engineer: Peter Imaa PS (626) 458-6174

Technical Review by:

Information Requested: Subarea Qs and Reach Qs.

Information Requested By: Hassan Harirchi/Mary Melville of SR Consultants West, Inc. (661)257-6570

Information To Be Used For: Hydrology of project's area.

Will Information Be Used In Any Litigation? ☐ *Yes* x *No*

Information Provided: Drainage map and the following data:

Location	Area	Subarea Q_{50}	Subarea Q_{50burn}	Total Area	Reach Q_{50}	Reach Q_{50burn}
116A	69 ac	190 cfs	190 cfs	6,802 ac	11,297 cfs	12,005 cfs
121A	25 ac	72 cfs	72 cfs	7,021 ac	11,554 cfs	12,283 cfs
127A	76 ac	193 cfs	193 cfs	7,282 ac	Clear water 11,722 cfs	Burn Flow 12,446 cfs
140O	77 ac	203 cfs	203 cfs	913 ac	1,702 cfs	1,775 cfs
142A	108 ac	242 cfs	242 cfs	8303 ac	13,028 cfs	13,843 cfs

Date Provided: December 29, 2004

References: Year 2000 Santa Clara River Hydrology Study.

Calculations, Comments, Etc...: The information provided above is for planning only, and **not** to be used for **design** purposes. Burned and bulked flow rates should be calculated for bridge/culvert design or for floodway mapping purposes.

Appendix D – Existing Condition HEC-RAS Model Results

Appendix D

HEC-RAS Plan: Plan 01 River: River Reach: 1 Profile: FEMA 100yr (pub)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	8326	FEMA 100yr (pub)	8483.00	1315.35	1325.49	1324.14	1326.94	0.011450	10.59	1041.80	342.53	0.65
1	8126	FEMA 100yr (pub)	8483.00	1311.80	1323.42	1320.72	1324.86	0.007829	9.85	899.94	623.22	0.55
1	7926	FEMA 100yr (pub)	8483.00	1308.60	1322.24	1319.23	1323.34	0.005936	8.89	1037.97	785.66	0.48
1	7726	FEMA 100yr (pub)	8483.00	1306.45	1317.70	1317.70	1321.14	0.023354	15.51	590.67	573.96	0.92
1	7546	FEMA 100yr (pub)	8483.00	1303.20	1316.48	1313.64	1317.38	0.005967	9.26	1367.72	789.88	0.48
1	7362	FEMA 100yr (pub)	8483.00	1300.72	1313.05	1312.46	1315.55	0.015395	13.60	720.02	698.74	0.75
1	7203	FEMA 100yr (pub)	8483.00	1298.98	1311.26	1310.08	1313.27	0.011508	11.97	810.48	868.91	0.64
1	7053	FEMA 100yr (pub)	8483.00	1296.27	1309.73	1309.04	1311.36	0.009670	11.13	978.98	1003.11	0.59
1	6903	FEMA 100yr (pub)	8483.00	1292.33	1308.18	1304.92	1310.03	0.009190	11.00	786.13	869.09	0.58
1	6842	FEMA 100yr (pub)	8483.00	1291.55	1305.95	1304.23	1308.15	0.015136	11.90	712.70	842.68	0.72
1	6744	FEMA 100yr (pub)	8483.00	1288.96	1304.96	1301.05	1306.91	0.009567	11.19	761.59	773.20	0.58
1	6702	FEMA 100yr (pub)	8483.00	1288.12	1303.49	1301.18	1305.93	0.013591	12.55	684.10	630.55	0.69
1	6660	FEMA 100yr (pub)	8483.00	1287.22	1300.51	1300.51	1304.93	0.028975	16.87	506.10	59.86	0.99
1	6624.19*	FEMA 100yr (pub)	8483.00	1286.92	1299.50	1299.99	1304.67	0.002199	18.25	466.74	54.63	1.07
1	6480	FEMA 100yr (pub)	8483.00	1285.69	1299.27	1298.03	1304.16	0.001904	17.78	501.71	67.27	0.85
1	6425	FEMA 100yr (pub)	8483.00	1282.50	1296.70	1296.70	1303.77	0.003433	21.34	397.55	28.00	1.00
1	6287	FEMA 100yr (pub)	8483.00	1281.06	1293.07	1295.26	1302.96	0.005391	25.24	336.14	28.00	1.28
1	6207	FEMA 100yr (pub)	8483.00	1278.35	1288.62	1292.53	1302.15	0.008284	29.51	287.42	28.00	1.62
1	6056		Bridge									
1	5884	FEMA 100yr (pub)	8483.00	1274.00	1283.95	1288.20	1298.36	0.009037	30.45	278.54	28.00	1.70
1	5840	FEMA 100yr (pub)	8483.00	1273.51	1283.41	1287.71	1297.96	0.009158	30.60	277.22	28.00	1.71
1	5803	FEMA 100yr (pub)	8483.00	1273.02	1282.87	1287.24	1297.57	0.009281	30.75	275.90	28.00	1.73
1	5760	FEMA 100yr (pub)	8483.00	1272.47	1290.35	1286.39	1294.10	0.001402	15.98	978.03	290.51	0.67
1	5721	FEMA 100yr (pub)	8483.00	1271.94	1292.33	1281.52	1293.22	0.000194	7.77	1858.26	663.16	0.31
1	5716	FEMA 100yr (pub)	8483.00	1271.65	1284.93	1284.93	1292.54	0.003938	22.35	479.91	37.00	1.08

Appendix E – Proposed Condition HEC-RAS Model Results

Appendix E

HEC-RAS Plan: Plan 04 River: River Reach: 1 Profile: FEMA 100yr (pub)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	8326	FEMA 100yr (pub)	8483.00	1315.35	1324.12	1324.12	1326.99	0.026662	14.30	642.23	112.71	0.96
1	8126	FEMA 100yr (pub)	8483.00	1311.80	1320.80	1318.79	1321.87	0.009528	8.36	1035.62	518.50	0.57
1	7926	FEMA 100yr (pub)	8483.00	1308.60	1318.52	1316.38	1319.77	0.010377	9.00	949.27	511.91	0.60
1	7726	FEMA 100yr (pub)	8483.00	1306.45	1314.61	1314.18	1316.82	0.024535	11.97	719.98	236.99	0.89
1	7546	FEMA 100yr (pub)	8483.00	1303.20	1312.86	1311.05	1313.89	0.009325	8.47	1088.37	193.63	0.56
1	7362	FEMA 100yr (pub)	8483.00	1300.72	1310.12	1308.93	1311.67	0.015410	10.14	881.31	174.29	0.69
1	7203	FEMA 100yr (pub)	8483.00	1298.98	1308.68	1306.00	1309.69	0.008611	8.10	1069.22	190.48	0.53
1	7053	FEMA 100yr (pub)	8483.00	1296.27	1307.97	1303.59	1308.61	0.004123	6.42	1379.76	256.75	0.38
1	6903	FEMA 100yr (pub)	8483.00	1292.33	1307.57	1300.88	1308.13	0.002700	6.03	1408.69	130.21	0.32
1	6842	FEMA 100yr (pub)	8483.00	1291.55	1306.56	1301.33	1307.53	0.004911	7.86	1079.62	106.27	0.43
1	6744	FEMA 100yr (pub)	8483.00	1288.96	1305.05	1301.09	1306.79	0.009577	10.60	800.47	75.92	0.58
1	6702	FEMA 100yr (pub)	8483.00	1288.12	1301.21	1301.21	1305.27	0.030006	16.17	524.45	64.33	1.00
1	6660	FEMA 100yr (pub)	8483.00	1287.22	1300.05	1300.45	1304.95	0.002203	17.77	477.38	56.03	1.07
1	6624.19*	FEMA 100yr (pub)	8483.00	1286.92	1299.00	1300.19	1304.77	0.002715	19.28	439.92	52.55	1.17
1	6480	FEMA 100yr (pub)	8483.00	1285.69	1296.85	1297.95	1304.18	0.003707	21.72	390.60	35.25	1.15
1	6425	FEMA 100yr (pub)	8483.00	1282.50	1295.85	1296.70	1303.85	0.004046	22.69	373.83	28.00	1.09
1	6287	FEMA 100yr (pub)	8483.00	1281.06	1292.92	1295.26	1303.06	0.005572	25.54	332.09	28.00	1.31
1	6207	FEMA 100yr (pub)	8483.00	1278.35	1288.56	1292.55	1302.25	0.008415	29.68	285.80	28.00	1.64
1	6056		Bridge									
1	5884	FEMA 100yr (pub)	8483.00	1274.00	1283.91	1288.20	1298.44	0.009143	30.58	277.38	28.00	1.71
1	5840	FEMA 100yr (pub)	8483.00	1273.51	1283.37	1287.71	1298.04	0.009259	30.72	276.13	28.00	1.72
1	5803	FEMA 100yr (pub)	8483.00	1273.02	1282.84	1287.24	1297.64	0.009377	30.86	274.88	28.00	1.74
1	5760	FEMA 100yr (pub)	8483.00	1272.47	1290.35	1286.39	1294.10	0.001402	15.98	978.03	290.51	0.67
1	5721	FEMA 100yr (pub)	8483.00	1271.94	1292.33	1281.52	1293.22	0.000194	7.77	1858.26	663.16	0.31
1	5716	FEMA 100yr (pub)	8483.00	1271.65	1284.93	1284.93	1292.54	0.003938	22.35	479.91	37.00	1.08

HEC-RAS Plan: Plan 05 River: River Reach: 1 Profile: FEMA 100yr (pub)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	8326	FEMA 100yr (pub)	8483.00	1315.35	1322.02	1324.12	1328.97	0.016007	22.07	419.03	100.91	1.71
1	8126	FEMA 100yr (pub)	8483.00	1311.80	1316.43	1318.79	1324.05	0.031950	22.14	383.15	124.07	2.22
1	7926	FEMA 100yr (pub)	8483.00	1308.60	1315.29	1316.38	1319.35	0.010924	16.16	525.02	119.96	1.36
1	7726	FEMA 100yr (pub)	8483.00	1306.45	1313.05	1314.18	1317.26	0.011155	16.47	515.02	116.98	1.38
1	7546	FEMA 100yr (pub)	8483.00	1303.20	1309.17	1311.05	1314.68	0.017007	18.82	450.73	112.20	1.66
1	7362	FEMA 100yr (pub)	8483.00	1300.72	1307.59	1308.93	1311.80	0.011068	16.46	515.31	109.57	1.34
1	7203	FEMA 100yr (pub)	8483.00	1298.98	1304.47	1306.00	1309.53	0.017079	18.06	469.80	125.77	1.65
1	7053	FEMA 100yr (pub)	8483.00	1296.27	1305.25	1303.59	1306.62	0.002304	9.37	905.82	143.86	0.66
1	6903	FEMA 100yr (pub)	8483.00	1292.33	1305.42	1300.88	1306.28	0.000890	7.44	1139.82	121.05	0.43
1	6842	FEMA 100yr (pub)	8483.00	1291.55	1304.60	1301.33	1306.04	0.001545	9.64	880.42	97.46	0.57
1	6744	FEMA 100yr (pub)	8483.00	1288.96	1303.19	1301.09	1305.73	0.002778	12.77	664.08	71.06	0.74
1	6702	FEMA 100yr (pub)	8483.00	1288.12	1301.21	1301.21	1305.27	0.005209	16.17	524.45	64.33	1.00
1	6660	FEMA 100yr (pub)	8483.00	1287.22	1299.76	1300.45	1305.01	0.002418	18.38	461.43	55.26	1.12
1	6624.19*	FEMA 100yr (pub)	8483.00	1286.92	1298.83	1300.19	1304.84	0.002853	19.67	431.19	51.85	1.20
1	6480	FEMA 100yr (pub)	8483.00	1285.69	1296.73	1297.98	1304.22	0.003836	21.96	386.26	35.06	1.17
1	6425	FEMA 100yr (pub)	8483.00	1282.50	1295.70	1296.70	1303.89	0.004174	22.96	369.53	28.00	1.11
1	6287	FEMA 100yr (pub)	8483.00	1281.06	1292.88	1295.26	1303.09	0.005629	25.64	330.85	28.00	1.32
1	6207	FEMA 100yr (pub)	8483.00	1278.35	1288.54	1292.55	1302.28	0.008457	29.73	285.29	28.00	1.64
1	6056		Bridge									
1	5884	FEMA 100yr (pub)	8483.00	1274.00	1283.89	1288.20	1298.47	0.009177	30.62	277.02	28.00	1.72
1	5840	FEMA 100yr (pub)	8483.00	1273.51	1283.36	1287.71	1298.06	0.009282	30.75	275.88	28.00	1.73
1	5803	FEMA 100yr (pub)	8483.00	1273.02	1282.83	1287.24	1297.66	0.009399	30.89	274.64	28.00	1.74
1	5760	FEMA 100yr (pub)	8483.00	1272.47	1290.35	1286.39	1294.10	0.001402	15.98	978.03	290.51	0.67
1	5721	FEMA 100yr (pub)	8483.00	1271.94	1292.33	1281.52	1293.22	0.000194	7.77	1858.26	663.16	0.31
1	5716	FEMA 100yr (pub)	8483.00	1271.65	1284.93	1284.93	1292.54	0.003938	22.35	479.91	37.00	1.08

HEC-RAS Plan: Plan 06 River: River Reach: 1 Profile: FEMA 100yr (pub)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	8326	FEMA 100yr (pub)	8483.00	1315.35	1324.94	1324.12	1327.13	0.035101	12.50	737.44	117.18	0.80
1	8126	FEMA 100yr (pub)	8483.00	1311.80	1322.24	1318.79	1322.94	0.009937	6.78	1276.77	521.34	0.42
1	7926	FEMA 100yr (pub)	8483.00	1308.60	1319.63	1316.38	1320.55	0.012975	7.74	1104.50	537.01	0.48
1	7726	FEMA 100yr (pub)	8483.00	1306.45	1316.25	1314.18	1317.50	0.020764	9.06	960.66	249.91	0.60
1	7546	FEMA 100yr (pub)	8483.00	1303.20	1314.17	1311.05	1314.82	0.009864	6.79	1384.00	258.65	0.41
1	7362	FEMA 100yr (pub)	8483.00	1300.72	1311.88	1308.93	1312.72	0.013145	7.58	1195.85	183.01	0.47
1	7203	FEMA 100yr (pub)	8483.00	1298.98	1310.38	1306.00	1310.99	0.008289	6.36	1396.33	194.30	0.38
1	7053	FEMA 100yr (pub)	8483.00	1296.27	1309.53	1303.59	1309.92	0.004434	5.18	1806.58	293.40	0.29
1	6903	FEMA 100yr (pub)	8483.00	1292.33	1308.97	1300.88	1309.38	0.003531	5.20	1735.97	204.43	0.26
1	6842	FEMA 100yr (pub)	8483.00	1291.55	1307.88	1301.33	1308.60	0.006578	6.84	1312.69	177.17	0.36
1	6744	FEMA 100yr (pub)	8483.00	1288.96	1306.26	1301.09	1307.63	0.013855	9.42	931.25	132.33	0.49
1	6702	FEMA 100yr (pub)	8483.00	1288.12	1301.21	1301.21	1305.27	0.060220	16.17	524.45	64.33	1.00
1	6660	FEMA 100yr (pub)	8483.00	1287.22	1300.14	1300.45	1304.94	0.002140	17.58	482.48	56.27	1.06
1	6624.19*	FEMA 100yr (pub)	8483.00	1286.92	1299.04	1300.19	1304.76	0.002679	19.18	442.29	52.73	1.17
1	6480	FEMA 100yr (pub)	8483.00	1285.69	1299.02	1297.90	1304.15	0.002153	18.18	470.72	38.61	0.88
1	6425	FEMA 100yr (pub)	8483.00	1282.50	1296.70	1296.70	1303.77	0.003431	21.33	397.65	28.00	1.00
1	6287	FEMA 100yr (pub)	8483.00	1281.06	1293.07	1295.26	1302.96	0.005390	25.24	336.15	28.00	1.28
1	6207	FEMA 100yr (pub)	8483.00	1278.35	1288.62	1292.55	1302.15	0.008284	29.51	287.43	28.00	1.62
1	6056		Bridge									
1	5884	FEMA 100yr (pub)	8483.00	1274.00	1283.95	1288.20	1298.36	0.009035	30.45	278.57	28.00	1.70
1	5840	FEMA 100yr (pub)	8483.00	1273.51	1283.41	1287.71	1297.96	0.009156	30.60	277.25	28.00	1.71
1	5803	FEMA 100yr (pub)	8483.00	1273.02	1282.87	1287.24	1297.56	0.009278	30.74	275.92	28.00	1.73
1	5760	FEMA 100yr (pub)	8483.00	1272.47	1290.35	1286.39	1294.10	0.001402	15.98	978.03	290.51	0.67
1	5721	FEMA 100yr (pub)	8483.00	1271.94	1292.33	1281.52	1293.22	0.000194	7.77	1858.26	663.16	0.31
1	5716	FEMA 100yr (pub)	8483.00	1271.65	1284.93	1284.93	1292.54	0.003938	22.35	479.91	37.00	1.08

HEC-RAS Plan: Plan 06 River: River Reach: 1 Profile: RCB Q_Dsn

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	8326	RCB Q_Dsn	10800.00	1315.35	1326.01	1325.20	1328.58	0.035057	13.63	875.12	364.76	0.81
1	8126	RCB Q_Dsn	10800.00	1311.80	1323.54	1319.65	1324.36	0.009767	7.35	1497.44	523.91	0.43
1	7926	RCB Q_Dsn	10800.00	1308.60	1320.82	1317.35	1321.94	0.013488	8.56	1273.22	575.85	0.50
1	7726	RCB Q_Dsn	10800.00	1306.45	1317.29	1315.28	1318.78	0.021270	9.93	1116.31	273.40	0.62
1	7546	RCB Q_Dsn	10800.00	1303.20	1315.47	1311.77	1316.14	0.009013	7.06	1747.98	332.69	0.40
1	7362	RCB Q_Dsn	10800.00	1300.72	1313.41	1310.06	1314.27	0.011350	7.77	1514.89	249.22	0.45
1	7203	RCB Q_Dsn	10800.00	1298.98	1312.16	1306.93	1312.79	0.007004	6.51	1764.64	247.42	0.36
1	7053	RCB Q_Dsn	10800.00	1296.27	1311.53	1304.53	1311.90	0.003453	5.08	2426.40	315.94	0.26
1	6903	RCB Q_Dsn	10800.00	1292.33	1310.99	1301.94	1311.42	0.003280	5.44	2152.10	208.27	0.26
1	6842	RCB Q_Dsn	10800.00	1291.55	1310.00	1302.59	1310.71	0.005734	6.97	1692.72	181.78	0.34
1	6744	RCB Q_Dsn	10800.00	1288.96	1308.56	1302.76	1309.88	0.011648	9.42	1242.99	137.67	0.46
1	6702	RCB Q_Dsn	10800.00	1288.12	1306.34	1302.76	1308.51	0.021567	11.95	959.20	130.72	0.62
1	6660	RCB Q_Dsn	10800.00	1287.22	1305.88	1302.26	1308.39	0.000688	12.74	947.12	126.99	0.63
1	6624.19*	RCB Q_Dsn	10800.00	1286.92	1306.02	1301.92	1308.30	0.000545	12.26	1165.61	157.33	0.57
1	6480	RCB Q_Dsn	10800.00	1285.69	1303.19	1300.13	1307.93	0.001525	17.53	703.56	115.75	0.74
1	6425	RCB Q_Dsn	10800.00	1282.50	1299.37	1299.37	1307.46	0.003341	22.82	487.45	41.12	0.98
1	6287	RCB Q_Dsn	10800.00	1281.06	1295.43	1297.84	1306.63	0.005392	26.85	402.28	28.00	1.25
1	6207	RCB Q_Dsn	10800.00	1278.35	1290.74	1295.02	1305.80	0.008024	31.14	346.87	28.00	1.56
1	6056		Bridge									
1	5884	RCB Q_Dsn	10800.00	1274.00	1290.67	1290.67	1298.99	0.003645	23.14	466.78	54.10	1.00
1	5840	RCB Q_Dsn	10800.00	1273.51	1289.35	1290.29	1298.57	0.004158	24.35	443.78	159.07	1.08
1	5803	RCB Q_Dsn	10800.00	1273.02	1290.79	1290.66	1297.81	0.002535	21.40	658.44	496.38	0.89
1	5760	RCB Q_Dsn	10800.00	1272.47	1292.69	1290.33	1296.87	0.001386	17.24	1337.72	355.10	0.68
1	5721	RCB Q_Dsn	10800.00	1271.94	1294.84	1283.13	1295.92	0.000203	8.60	2354.17	946.25	0.32
1	5716	RCB Q_Dsn	10800.00	1271.65	1290.05	1290.05	1295.47	0.001943	19.41	1226.68	492.92	0.80

Appendix F

Appendix F – FEMA Hydraulic Model Data Request

From: Adams, John <John.Adams@mbakerintl.com>
Sent: Thursday, May 31, 2018 11:10 AM
To: Cherise Thompson
Cc: Adams, John
Subject: B1809105
Attachments: B1809105 Receipt.pdf; B1809105 Zone A Letter.pdf

Categories: Blue category

Hello Ms. Thompson,

The area for Santa Clara River, on FIRM 1031F, is Zone A with no revisions. We have no data for the Zone A area.
See the attached letter regarding Zone A areas.
Your receipt is attached.

John Adams
FEMA Engineering Library
(571)357-6059

Plastic Card Sale Transaction

Thank you.
Your transaction has been successfully completed.

Plastic Card Sale Confirmation

Transaction Information

Agency Application Name:	FEMAMSC
Pay.gov Tracking ID:	26A17VOS
Agency Tracking ID:	B1809105-1
Account Holder Name:	Mark E Krebs
Transaction Type:	Plastic Card Sale
Billing Address:	17520 Newhope Street #200
Billing Address 2:	
City:	
State/Province:	
ZIP/Postal Code:	92708
Country:	USA
Email:	
Phone:	
Card Type:	MasterCard
Plastic Card Number:	************2625
Payment Amount:	$300.00
Current Date and Time:	05/31/2018 09:41 EDT
Order ID:	
Order Tax Amount:	
Level 3 Data:	
Agency Memo:	

Note: Please avoid navigating the site using your browser's Back Button - this may lead to incomplete data being transmitted and pages being loaded incorrectly. Please use the links provided whenever possible.

Michael Baker Jr., Inc.
FEMA Engineering Library
3601 Eisenhower Avenue
Alexandria, Virginia 22304

May 31, 2018

IN REPLY REFER TO:
Request No.: B1809105

Cherise Thompson
Pacific Advanced Civil Engineering
17520 Newhope Street, Suite 200
Fountain Valley, CA 92708

Dear Ms. Thompson,

This is in response to your **5/31/18**, letter requesting FEMA back up data for **South Fork Santa Clara River (FIRM 1031F)** in **City of Santa Clarita and Los Angeles County**. The area you have requested is designated as Zone A on the Flood Insurance Rate Map. The Zone A designation identifies areas having a one-percent chance of being equaled or exceeded in any given year (base flood) that is determined by approximate methods. There is no detailed modeling for this area. Please go to www.FEMA.gov and obtain a copy of the FEMA publication "Managing Floodplain Development in Approximate Zone A Areas". This will help you in developing the base flood elevations for the Zone A area. Thank you for your request and we look forward to serving you again in the future

If you have any questions regarding your request or this letter please contact me by telephone at (571)357-6059.

Sincerely,

John Adams
FEMA Engineering Library

Appendix G

Appendix G –Freeboard and Toe-Down Calculations Spreadsheets

CALCULATIONS FOR FREEBOARD BASED ON LACDPW SEDIMENTATION MANUAL AND LACFCD HYDRAULIC DESIGN MANUAL

SECTION	Y_{MAX}	Y_{TOT}	V (FPS)	FLOW DEPTH (FT)	Y_{AGG}+	Y_{GA}+	CHANNEL TYPE	BOTTOM WIDTH (FT)	TOP WIDTH (FT)	Y_{SE}+	BEND COEFF	SIDE SLOPE	RADIUS	H/2	Y_{DM}
8326	**6.0**	6.0	12.5	9.6	3.9	0.0	2	35.0	121.0	0.0	0	2.0	1030	2.1	2.5
8126	**4.2**	4.2	6.8	10.4	3.6	0.0	2	127.0	146.0	0.0	0	2.0	1030	0.6	2.5
7926	**4.0**	4.0	7.7	11.0	3.2	0.0	2	103.0	132.0	0.0	0	2.0	1030	0.8	2.5
7726	**3.1**	3.1	9.1	9.8	2.0	0.0	2	97.0	126.0	0.0	0	2.0	0	1.1	2.5
7546	**2.8**	2.8	6.8	11.0	2.1	0.0	2	102.0	115.0	0.0	0	2.0	0	0.6	2.5
7362	**2.5**	2.3	7.6	11.2	1.5	0.0	2	111.0	126.0	0.0	0	2.0	720	0.8	2.5
7203	**2.5**	0.9	6.4	11.4	0.4	0.0	2	125.0	143.0	0.0	0	2.0	720	0.5	2.5
7053	**2.5**	0.5	5.2	13.3	0.2	0.0	2	129.0	159.0	0.0	0	2.0	720	0.4	2.5
6903	**2.5**	2.1	5.2	16.6	1.7	0.0	2	85.0	137.0	0.0	0	2.0	720	0.4	2.5
6842	**2.5**	0.6	6.8	16.3	0.0	0.0	2	62.0	115.0	0.0	0	2.0	720	0.6	2.5
6744	**2.5**	1.8	9.4	17.3	0.6	0.0	2	34.0	79.0	0.0	0	2.0	0	1.2	2.5
6702	**3.5**	3.5	16.2	13.1	0.0	0.0	2	18.0	74.0	0.0	0	2.0	0	3.5	2.5
6660	**4.2**	4.2	17.6	12.9	0.0	0.0	2	18.0	64.0	0.0	0	2.0	0	4.2	2.5
MAX=	6.0	6.0								0.0				4.2	2.5
MIN=	2.5	0.5								0.0				0.4	2.5

DEFINITIONS

Y_{MAX} = MAXIMUM EMBANKMENT PROTECTION (FREEBOARD) VALUE IN FEET BETWEEN LACDPW SEDIMENTATION MANUAL AND LACFCD HYDRAULIC DESIGN MANUAL

Y_{TOT} = TOTAL EMBANKMENT PROTECTION (FREEBOARD) IN FEET BASED ON THE LACDPW SEDIMENTATION MANUAL

V(FPS) = VELOCITY IN FEET PER SECOND

FLOW DEPTH = WATER DEPTH IN CHANNEL IN FEET

Y_{AGG} = LONG TERM AGGRADATION IN FEET

Y_{GA} = GENERAL AGGRADATION IN FEET

CHANNEL TYPE = CHANNEL SHAPE/FLOW FACTOR:
IF Fr < 1, RECTANGULAR = **0**; IF Fr > 1, RECTANGULAR = **1**;
IF Fr < 1, TRAPEZOIDAL = **2**; IF Fr > 1, TRAPEZOIDAL = **3**.

Y_{SE} = SUPER ELEVATION IN FEET

BEND COEFF = BEND COEFFICIENT; IF NO BEND=**0**, BEND=**1**

SIDE SLOPE = CHANNEL SIDE SLOPE (H:V), UNITLESS

BOTTOM WIDTH = CHANNEL BOTTOM WIDTH IN FEET, 2-YEAR WATER SURFACE WIDTH

RADIUS = RADIUS OF CURVATURE TO CENTERLINE IN FEET

H/2 = HALF BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH, AFTER KENNEDY (1963)

Y_{DM} = EMBANKMENT PROTECTION (FREEBOARD) IN FEET REQUIRED BY THE LACFCD HYDRAULIC DESIGN MANUAL

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE EMBANKMENT PROTECTION (FREEBOARD) BASED ON THE LACDPW SEDIMENTATION MANUAL (2006), PAGES 59-60 AND ASSOCIATED APPENDICES. FREEBOARD VALUES BASED ON LACFCD HYDRAULIC DESIGN MANUAL ARE PRESENTED AS PART OF THE CALCULATIONS FOR COMPARISON. THE SPREADSHEET DETERMINES THE GREATER VALUE OF FREEBOARD BETWEEN THE TWO METHODOLOGIES (Y_{MAX}). ALL VELOCITIES ARE IN FEET PER SECOND (FPS), WITH NO MAXIMUM VALUE. THE USER SHOULD CONSIDER A PRACTICAL MAXIMUM VELOCITY OF APPROXIMATELY 20 TO 30 FPS. LONG TERM AGGRADATION IS USER SUPPLIED. GENERAL AGGRADATION IS ALSO USER SUPPLIED. SUPER ELEVATION AT BENDS IS BASED ON EQUATIONS IN SECTION C-3.1 (PAGE C-10) OF THE LACFCD HYDRAULIC DESIGN MANUAL. BEDFORM HEIGHT, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963), IS BASED ON EQUATIONS IN APPENDIX C OF THE LACDPW SEDIMENTATION MANUAL. IF FLOW IS SUPERCRITICAL, SPREADSHEET REPORTS LACFCD HYDRAULIC DESIGN MANUAL TOTAL WALL HEIGHT INSTEAD OF FREEBOARD. BOTTOM WIDTH IS BASED ON THE 2-YEAR WATER SURFACE WIDTH AFTER U.S. ARMY CORPS OF ENGINEERS PROCEDURES.

LACDPW = LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
LACFCD = LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

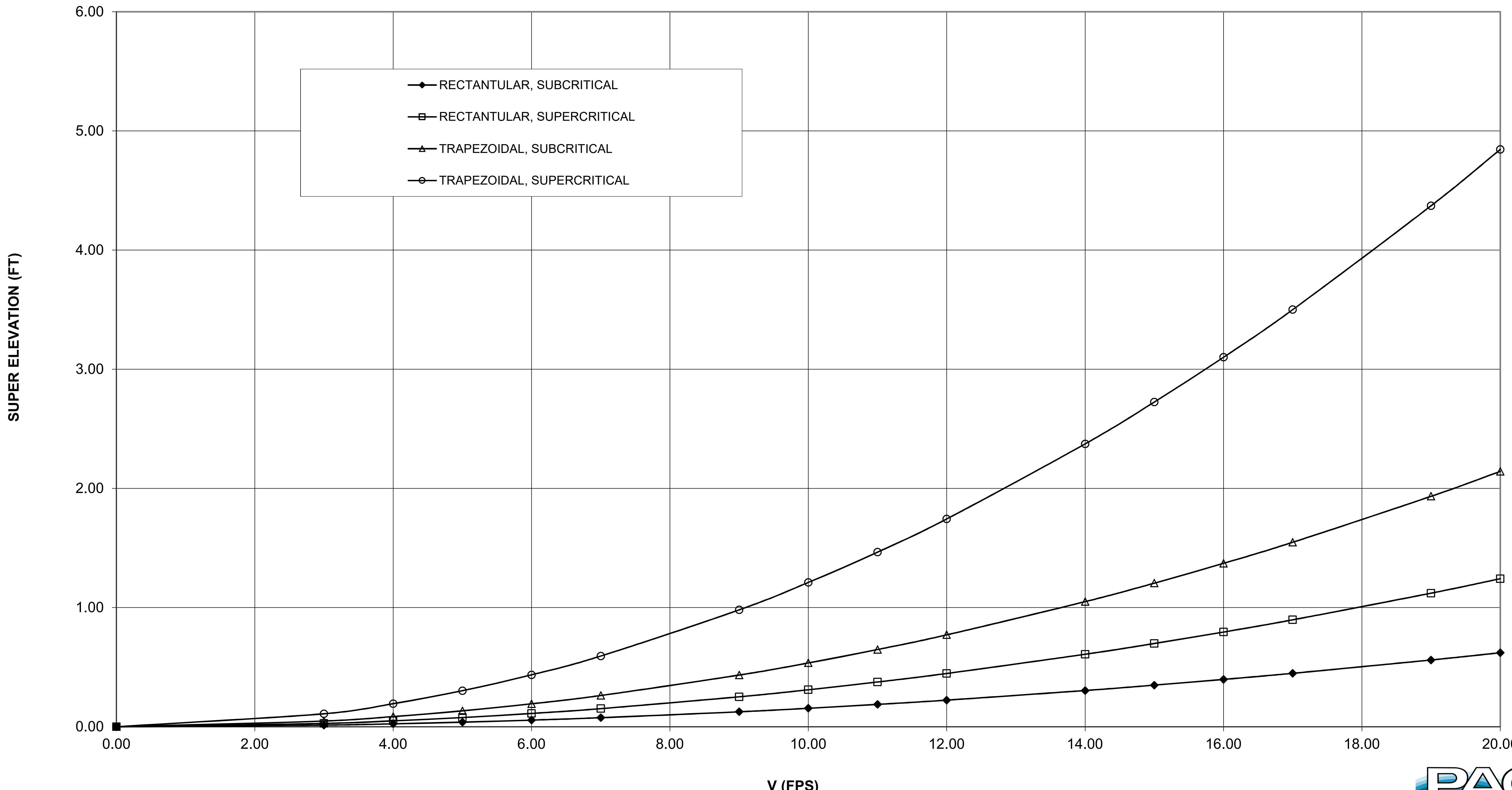
COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
AUGUST, 2005
FEBRUARY, 2009, REVISED
FEBRUARY, 2014, REVISED

PACE
Advanced Water Engineering

LACFCDDM C-3.1



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CIVIL ENGINEERING, INC.

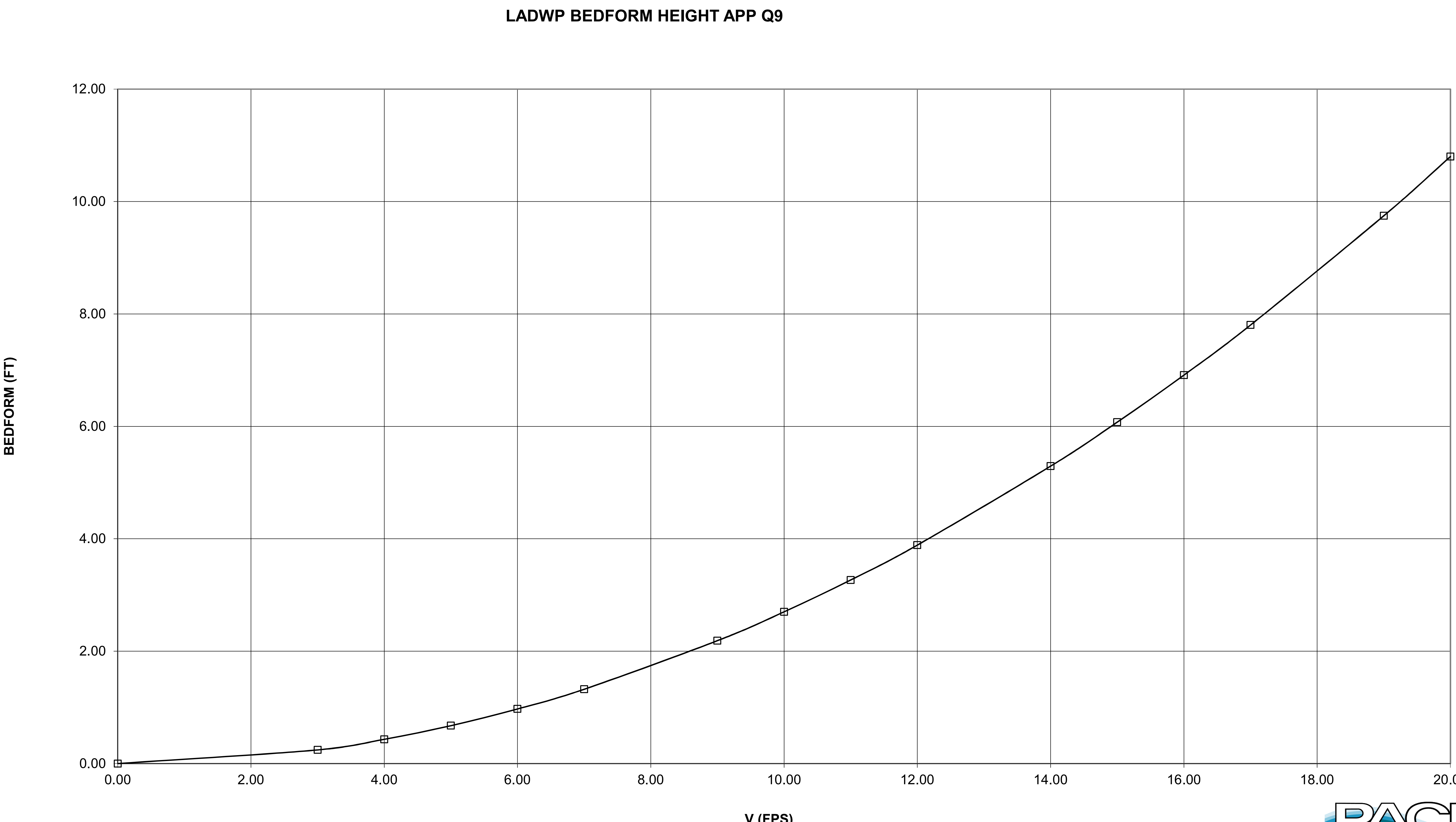
SUPER ELEVATION (FT)

V(FPS)	RECTANTULAR, SUBCRITICAL	RECTANTULAR, SUPERCRITICAL	TRAPEZOIDAL, SUBCRITICAL	TRAPEZOIDAL, SUPERCRITICAL
0.00	0.00	0.00	0.00	0.00
3.00	0.01	0.03	0.05	0.11
4.00	0.02	0.05	0.09	0.19
5.00	0.04	0.08	0.13	0.30
6.00	0.06	0.11	0.19	0.44
7.00	0.08	0.15	0.26	0.59
9.00	0.13	0.25	0.43	0.98
10.00	0.16	0.31	0.54	1.21
11.00	0.19	0.38	0.65	1.47
12.00	0.22	0.45	0.77	1.74
14.00	0.30	0.61	1.05	2.37
15.00	0.35	0.70	1.21	2.73
16.00	0.40	0.80	1.37	3.10
17.00	0.45	0.90	1.55	3.50
19.00	0.56	1.12	1.93	4.37
20.00	0.62	1.24	2.14	4.84

LACFCD DATA B=10, R=100, Z=2, D=5
SE=
(V^2)B/(2GR)
(V^2)B/(GR)
1.15(V^2)(B+2ZD)/(2GR)
1.3(V^2)(B+2ZD)/(GR)

DATA FROM MAIN

		V (FPS)	B - BOTTOM WIDTH (FT)	R - RADIUS (FT)	Z - SIDE SLOPE (FT)	D - FLOW DEPTH (FT)	CHANNEL TYPE	SUPER ELEVATION
XSECTION	1	12.50	35.00	1030	2.00	9.59	2	0.198726
	2	6.78	127.00	1030	2.00	10.44	2	0.134494
	3	7.74	103.00	1030	2.00	11.03	2	0.152802
	4	9.06	97.00	0	2.00	9.80	2	#DIV/0!
	5	6.79	102.00	0	2.00	10.97	2	#DIV/0!
	6	7.58	111.00	720	2.00	11.16	2	0.221789
	7	6.36	125.00	720	2.00	11.40	2	0.171148
	8	5.18	129.00	720	2.00	13.26	2	0.121145
	9	5.20	85.00	720	2.00	16.64	2	0.101641
	10	6.84	62.00	720	2.00	16.33	2	0.147737
	11	9.42	34.00	0	2.00	17.30	2	#DIV/0!
	12	16.17	18.00	0	2.00	13.09	2	#DIV/0!
	13	17.58	18.00	0	2.00	12.92	2	#DIV/0!



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	V(FPS)	BEDFORM (FT)		
	0.00	0.00	LADWP DATA	H=0.027*V^2
	3.00	0.24		
	4.00	0.43		
	5.00	0.68		
	6.00	0.97		
	7.00	1.32		
	9.00	2.19		
	10.00	2.70		
	11.00	3.27		
	12.00	3.89		
	14.00	5.29		
	15.00	6.08		
	16.00	6.91		
	17.00	7.80		
	19.00	9.75		INITIAL CALCULATION
	20.00	10.80		

XSECTION					
	1	12.50	4.22	4.22	CALCULATION CHECK
	2	6.78	1.24	1.24	
	3	7.74	1.62	1.62	
	4	9.06	2.22	2.22	
	5	6.79	1.24	1.24	
	6	7.58	1.55	1.55	
	7	6.36	1.09	1.09	
	8	5.18	0.72	0.72	
	9	5.20	0.73	0.73	
	10	6.84	1.26	1.26	
	11	9.42	2.40	2.40	
	12	16.17	7.06	7.06	
	13	17.58	8.34	8.34	

SECTION	CHANNEL TYPE	V (FPS)	Y_{SF}+	FLOW DEPTH (FT)	RADIUS	CONJUGATE DEPTH	RECTANGLE STRAIGHT	RECTANGLE CURVED	RECTANGLE Fr<1	RECTANGLE Fr>1	TRAP STRAIGHT	TRAP CURVE	TRAP Fr<1	TRAP Fr>1	YDM
8326	2	12.5	0.0	9.6	1030	3.6	2.0	2.0	2.0	11.6	2.5	2.5	2.5	12.1	2.5
8126	2	6.8	0.0	10.4	1030	0.4	2.0	2.0	2.0	12.4	2.5	2.5	2.5	12.9	2.5
7926	2	7.7	0.0	11.0	1030	0.6	2.0	2.0	2.0	13.0	2.5	2.5	2.5	13.5	2.5
7726	2	9.1	0.0	9.8	0	1.2	2.0	2.0	2.0	11.8	2.5	2.5	2.5	12.3	2.5
7546	2	6.8	0.0	11.0	0	0.4	2.0	2.0	2.0	13.0	2.5	2.5	2.5	13.5	2.5
7362	2	7.6	0.0	11.2	720	0.5	2.0	2.0	2.0	13.2	2.5	2.5	2.5	13.7	2.5
7203	2	6.4	0.0	11.4	720	0.3	2.0	2.0	2.0	13.4	2.5	2.5	2.5	13.9	2.5
7053	2	5.2	0.0	13.3	720	0.1	2.0	2.0	2.0	15.3	2.5	2.5	2.5	15.8	2.5
6903	2	5.2	0.0	16.6	720	0.1	2.0	2.0	2.0	18.6	2.5	2.5	2.5	19.1	2.5
6842	2	6.8	0.0	16.3	720	0.3	2.0	2.0	2.0	18.3	2.5	2.5	2.5	18.8	2.5
6744	2	9.4	0.0	17.3	0	0.8	2.0	2.0	2.0	19.3	2.5	2.5	2.5	19.8	2.5
6702	2	16.2	0.0	13.1	0	6.7	2.0	2.0	2.0	15.1	2.5	2.5	2.5	15.6	2.5
6660	2	17.6	0.0	12.9	0	8.6	2.0	2.0	2.0	14.9	2.5	2.5	2.5	15.4	2.5

CHANNEL TYPE=CHANNEL SHAPE/FLOW FACTOR:
IF Fr<1, RECTANGULAR = 0; IF Fr>1, RECTANGULAR = 1;
IF Fr<1, TRAPEZOIDAL = 2; IF Fr>1, TRAPEZOIDAL = 3.

CALCULATIONS FOR TOTAL TOE-DOWN BY INDIVIDUAL ADJUSTMENT COMPONENT BASED ON LACDPW SEDIMENTATION MANUAL AND LACFCD HYDRAULIC DESIGN MANUAL

SECTION	Z_{MAX}	Z_{TOT}	V (FPS)	FLOW DEPTH (FT)	Z_{DEG}+	Z_{GS}+	PIER TYPE	B	ABUT TYPE	A	BANK PROT	Z_{LS}+ BANK	Z_{LS}+ BRIDGE	BEND COEFF	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	Z_{BS}+	Z_I+	H/2	Z_{DM}
8326	**14.6**	14.6	22.1	6.7	0.0	7.3	0	0.0	1	0.0	0	2.0	0.0	0	4.2	0.016	101.6	1030	0.0	2.0	3.3	14.0
8126	**14.0**	13.7	22.1	4.6	0.0	7.3	0	0.0	1	0.0	0	2.0	0.0	0	3.1	0.032	136.5	1030	0.0	2.0	2.3	14.0
7926	**12.5**	11.7	16.2	6.7	0.0	4.4	0	0.0	1	0.0	0	2.0	0.0	0	4.4	0.011	121.8	1030	0.0	2.0	3.3	12.5
7726	**12.5**	11.8	16.5	6.6	0.0	4.5	0	0.0	1	0.0	0	2.0	0.0	0	4.4	0.011	117.9	0	0.0	2.0	3.3	12.5
7546	**14.0**	12.6	18.8	6.0	0.0	5.6	0	0.0	1	0.0	0	2.0	0.0	0	4.0	0.017	116.0	0	0.0	2.0	3.0	14.0
7362	**12.5**	12.0	16.5	6.9	0.0	4.5	0	0.0	1	0.0	0	2.0	0.0	0	4.7	0.011	118.9	720	0.0	2.0	3.4	12.5
7203	**14.0**	12.0	18.1	5.5	0.0	5.3	0	0.0	1	0.0	0	2.0	0.0	0	3.7	0.017	134.6	720	0.0	2.0	2.7	14.0
7053	**8.0**	7.1	9.4	9.0	0.0	1.9	0	0.0	1	0.0	0	2.0	0.0	0	6.3	0.002	150.8	720	0.0	2.0	1.2	8.0
6903	**8.0**	6.1	7.4	13.1	0.0	1.4	0	0.0	1	0.0	0	2.0	0.0	0	9.4	0.001	121.0	720	0.0	2.0	0.7	8.0
6842	**8.0**	7.5	9.6	13.1	0.3	2.0	0	0.0	1	0.0	0	2.0	0.0	0	9.0	0.002	99.0	720	0.0	2.0	1.3	8.0
6744	**10.0**	9.2	12.8	14.2	0.0	3.0	0	0.0	1	0.0	0	2.0	0.0	0	9.4	0.003	74.1	0	0.0	2.0	2.2	10.0
6702	**12.5**	11.9	16.2	13.1	0.0	4.4	0	0.0	1	0.0	0	2.0	0.0	0	8.2	0.005	67.0	0	0.0	2.0	3.5	12.5
6660	**14.0**	14.0	18.4	12.5	0.0	5.4	0	0.0	1	0.0	0	2.0	0.0	0	8.4	0.002	59.8	0	0.0	2.0	4.6	14.0
MAXIMUM=		14.6			0.3	7.3							0.0						0.0		4.6	14
MINIMUM=		6.1			0.0	1.4							0.0						0.0		0.7	8

DEFINITIONS

V(FPS) = VELOCITY IN FEET PER SECOND
Z_{MAX} = GREATER OF **Z_{TOT}** AND **Z_{DM}**
Z_{TOT} = TOTAL POTENTIAL VERTICAL ADJUSTMENT IN FEET
Z_{DEG} = LONG TERM DEGRADATION IN FEET
Z_{GS} = GENERAL SCOUR IN FEET
Z_{LS} = LOCAL SCOUR IN FEET [**Z_{LS} BANK + Z_{LS} BRIDGE**]
Z_{LS} BRIDGE = BRIDGE LOCAL SCOUR IN FEET [PIER (APP C-4) + ABUTMENT (APP C-6)]
Z_{LS} BANK = LEVEE/BANK LOCAL SCOUR = **2.0'** IF BANK PROTECTION PRESENT
BANK PROT = BANK PROTECTION ON CHANNEL BANK
0 = YES; **1** = NO
PIER TYPE = PIER SHAPE FACTOR; IF NO PIERS = **0**
1.0 = SQUARE NOSE; **0.9** = ROUND NOSE; **0.9** = CYLINDER;
0.8 = SHARP NOSE; **0.9** = GROUP OF CYLINDERS
FLOW DEPTH = WATER DEPTH IN CHANNEL IN FEET
B = WIDTH OF PIERS IN FEET; NO PIER = **0**
ABUT TYPE = VERT WALL FACTOR; IF VERT = **2**; NON VERT = **1**
A = ABUTMENT PROTRUSION INTO FLOW PATH IN FEET
Z_{BS} = BEND SCOUR IN FEET
BEND COEFF = BEND COEFFICIENT; IF NO BEND = **0**, BEND = **1**
HYD DEPTH = HYDRAULIC DEPTH IN FEET
E SLOPE = ENERGY SLOPE, UNITLESS
TOP WIDTH = CHANNEL TOP WIDTH IN FEET
RADIUS = RADIUS OF CURVATURE TO CENTERLINE IN FEET
Z_I = LOW-FLOW INCISEMENT IN FEET, MEASURED OR 2'; VALUE **NOT LESS THAN 2'**
H = BEDFORM HEIGHT IN FEET, LIMITED TO FLOW DEPTH AFTER KENNEDY (1963)
Z_{DM} = CUT-OFF DEPTH REQUIRED BY LACFCD HYDRAULIC DESIGN MANUAL

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE SCOUR PROTECTION (TOE DOWN) BASED ON LACDPW COUNTY SEDIMENTATION MANUAL (2006) PAGES 51-59 AND ASSOCIATED APPENDICES (APPENDIX C). VALUES FOR TOE-DOWN BASED ON THE CUT-OFF DEPTHS TABLE (PAGE F-31) IN THE LACFCD HYDRAULIC DESIGN MANUAL ARE PRESENTED AS PART OF THE CALCULATIONS FOR COMPARISON. THE SPREADSHEET DETERMINES THE GREATER VALUE OF TOE-DOWN BETWEEN THE TWO METHODOLOGIES (Z_{MAX}). THE CALCULATION DOES NOT CONSIDER ADJUSTMENTS TO CUT-OFF DEPTH BASED ON FIGURE F-06 (PAGE F-37). LONG TERM DEGRADATION IS USER SUPPLIED. GENERAL SCOUR VALUES ARE INTERPOLATED FROM THE GENERAL DEGRADATION GRAPH IN APPENDIX C (PAGE C-3) OF THE LACDPW SEDIMENTATION MANUAL. BEND SCOUR AND LOCAL SCOUR AT BENDS AND ABUTMENTS ARE BASED ON APPENDIX C (PAGES C-6 TO C-8) OF THE LACDPW SEDIMENTATION MANUAL. A LONGITUDINAL EXTENT BASED ON SECONDARY CURRENTS IS NOT INCLUDED. BEDFORM HEIGHT IS BASED ON APPENDIX C-9 OF THE SEDIMENTATION MANUAL. THE OCTOBER, 2005 REVISION INCLUDES ADDITIONAL TOEDOWN AT BRIDGES/ABUTMENTS WITH SOFT BOTTOMS. THE OCTOBER, 2006 REVISION INCLUDES BLOCKAGES AT BRIDGE PIERS. THE MAY REVISION INCLUDES THE Z_{MAX} CALCULATION AND UPDATES FOR THE 2006 SEDIMENTATION MANUAL.

LACDPW = LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
LACFCD = LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

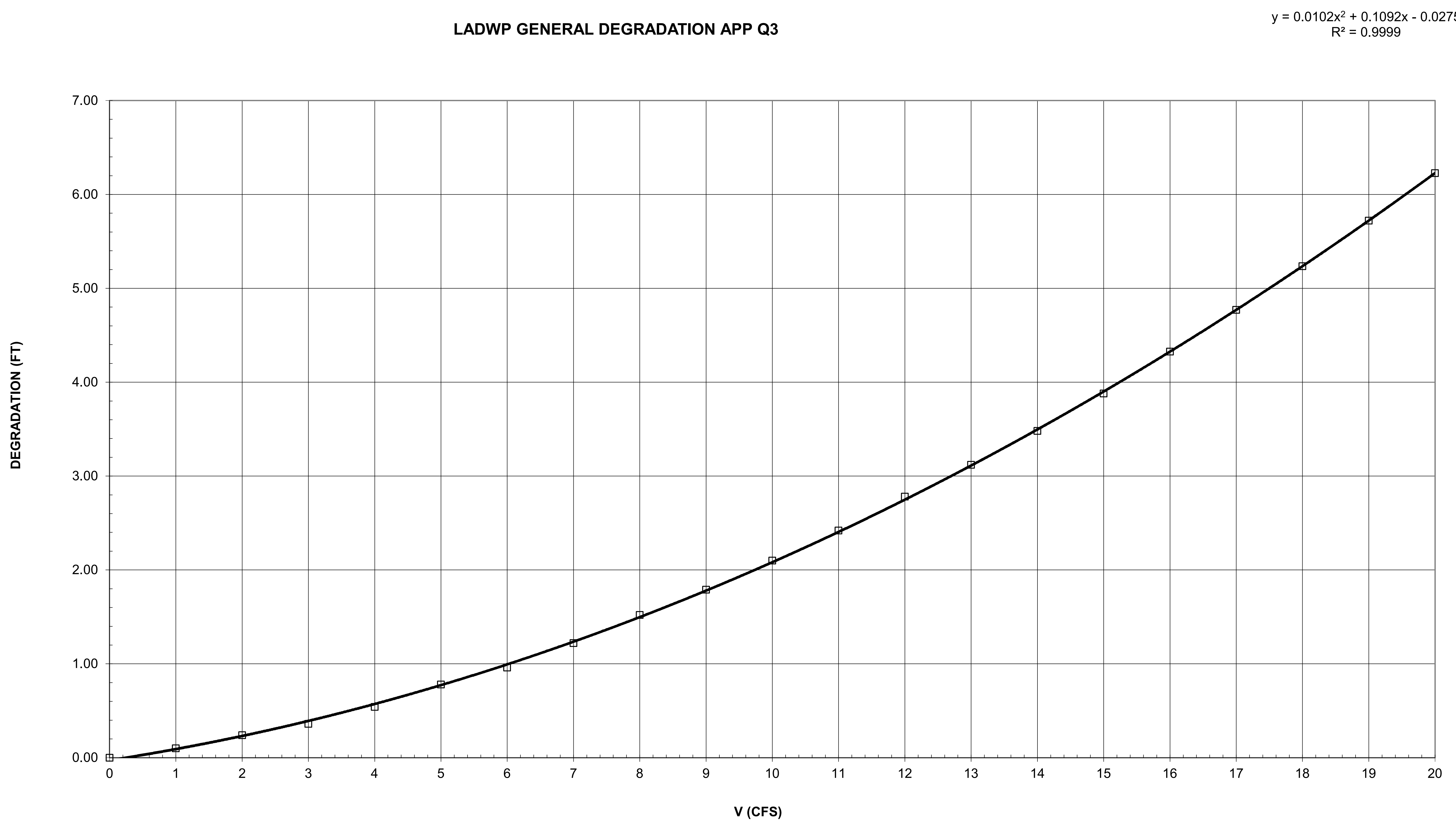
COLOR CODES

OUTPUT
DATA FROM HEC-RAS
USER SUPPLIED DATA
INTERMEDIATE CALCULATIONS (INDIVIDUAL SHEETS ONLY)

DESIGNED BY DAVID A JAFFE, PHD, PE
PACIFIC ADVANCED CIVIL ENGINEERING, INC
OCTOBER, 2004
OCTOBER, 2005, REVISED
OCTOBER, 2006, REVISED
MAY, 2008, REVISED
FEBRUARY, 2009, REVISED
FEBRUARY, 2014, REVISED

PACE
Advanced Water Engineering

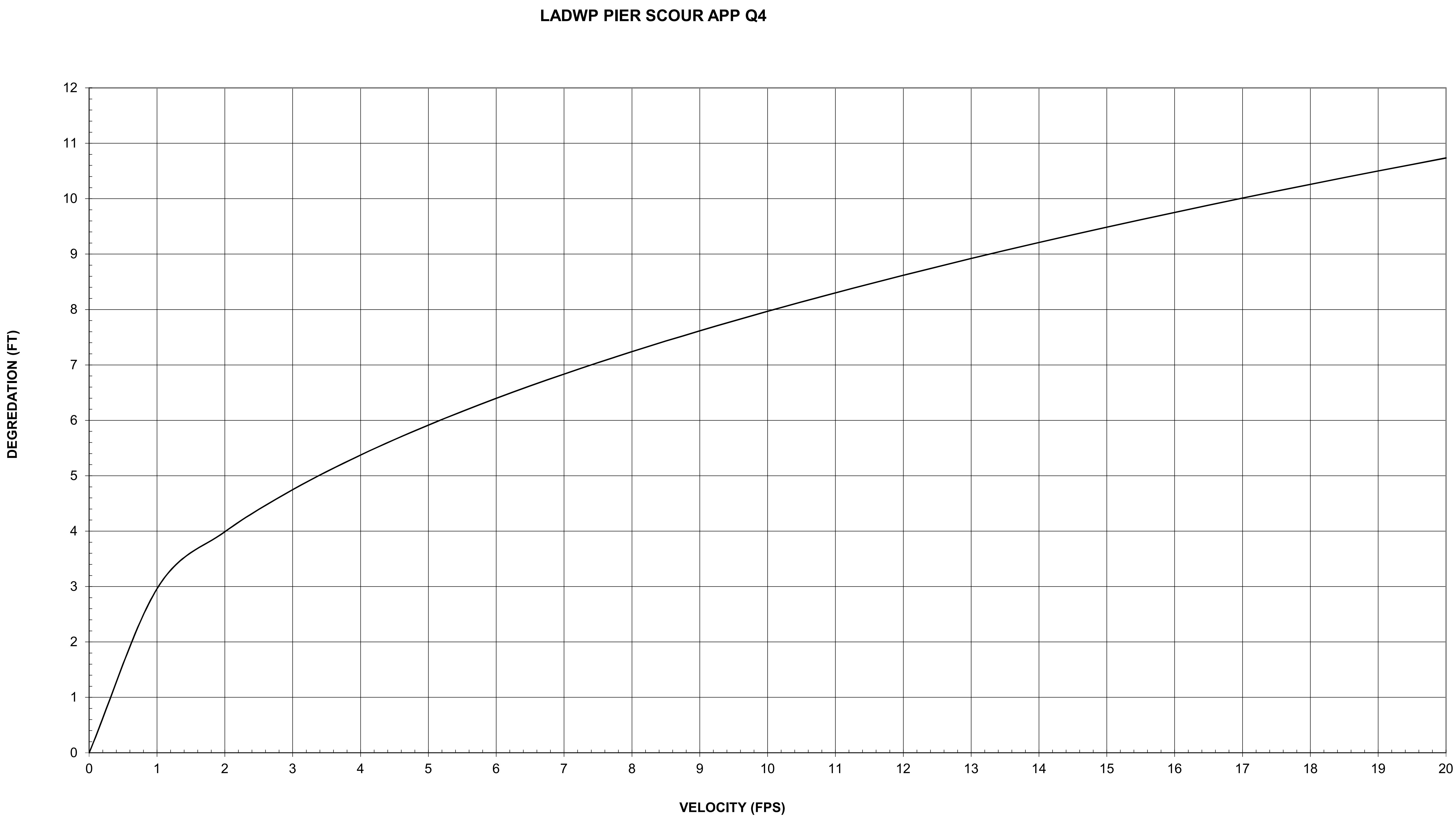
		V(FPS)	DEGREDATION (FT)		
		0.00	0.00	LADWP DATA, INTERPOLATED	
		1.00	0.10		
		2.00	0.24		
		3.00	0.36		
		4.00	0.54		
		5.00	0.78		
		6.00	0.96		
		7.00	1.22		
		8.00	1.52		
		9.00	1.79		
		10.00	2.10		
		11.00	2.42		
		12.00	2.78		
		13.00	3.12		
		14.00	3.48		
		15.00	3.88		
		16.00	4.33	CALCULATED DATA	
		17.00	4.77		
		18.00	5.24		
		19.00	5.72		
		20.00	6.23		
XSECTION	1	22.07	7.31	7.31	TO CALCULATE VALUES
	2	22.14	7.35	7.35	
	3	16.16	4.39	4.39	
	4	16.47	4.52	4.52	
	5	18.82	5.62	5.62	
	6	16.46	4.52	4.52	
	7	18.06	5.25	5.25	
	8	9.37	1.89	1.89	
	9	7.44	1.35	1.35	
	10	9.64	1.97	1.97	
	11	12.77	3.03	3.03	
	12	16.17	4.39	4.39	
	13	18.38	5.40	5.40	



LADWP GENERAL DEGRADATION APP Q3
y = 0.0102x² + 0.1092x - 0.0275
R² = 0.9999
DEGRADATION (FT)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
V (CFS)

V(FPS)	DEGREDATION (FT)	
0.00	0.00	LADWP DATA; B=5, Y=1
1.00	2.96	K3 - BLOCKAGE COEFFICIENT
2.00	3.99	
3.00	4.75	
4.00	5.37	Z=1.04*B^0.65*V^0.43*Y^0.135
5.00	5.91	
6.00	6.40	
7.00	6.84	
8.00	7.24	
9.00	7.62	
10.00	7.97	
11.00	8.30	
12.00	8.62	
13.00	8.92	
14.00	9.21	
15.00	9.49	
16.00	9.75	
17.00	10.01	
18.00	10.26	
19.00	10.50	
20.00	10.74	

			DATA FROM MAIN					
		K3	TYPE	B	Y			
XSECTION	1	0	0	0.00	6.67	22.07	0.00	TO CALCULATE VALUES
	2	0	0	0.00	4.63	22.14	0.00	
	3	0	0	0.00	6.69	16.16	0.00	
	4	0	0	0.00	6.60	16.47	0.00	
	5	0	0	0.00	5.97	18.82	0.00	
	6	0	0	0.00	6.87	16.46	0.00	
	7	0	0	0.00	5.49	18.06	0.00	
	8	0	0	0.00	8.98	9.37	0.00	
	9	0	0	0.00	13.09	7.44	0.00	
	10	0	0	0.00	13.05	9.64	0.00	
	11	0	0	0.00	14.23	12.77	0.00	
	12	0	0	0.00	13.09	16.17	0.00	
	13	0	0	0.00	12.54	18.38	0.00	


LADWP PIER SCOUR APP Q4
DEGREDATION (FT)
VELOCITY (FPS)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

LADWP DATA; A=5, Y=5

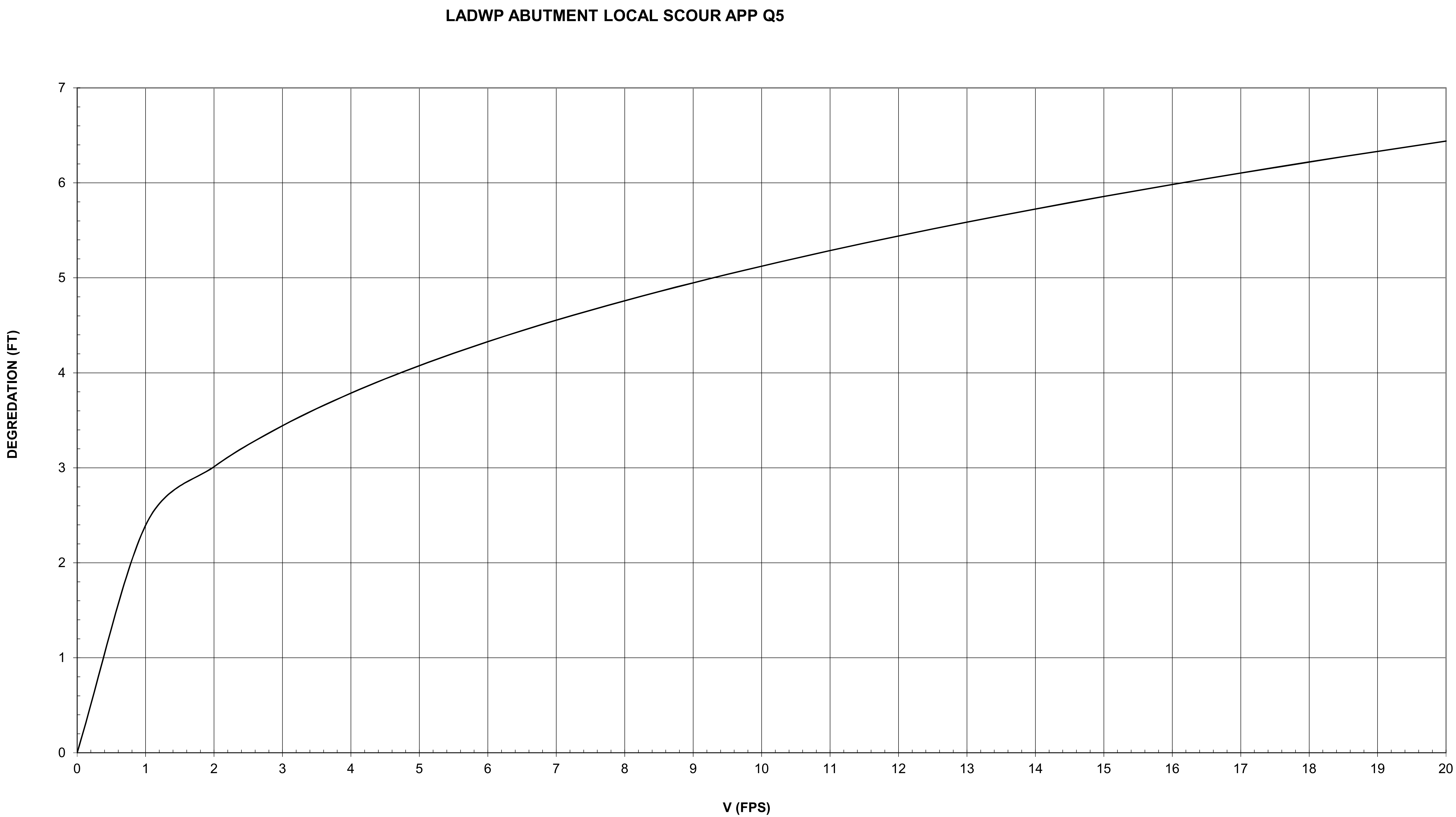
A=0.62*A^0.40*V^0.33*Y^0.44

V(FPS)	DEGREDATION (FT)
0.00	0.00
1.00	2.40
2.00	3.01
3.00	3.44
4.00	3.79
5.00	4.08
6.00	4.33
7.00	4.55
8.00	4.76
9.00	4.95
10.00	5.12
11.00	5.29
12.00	5.44
13.00	5.59
14.00	5.72
15.00	5.86
16.00	5.98
17.00	6.10
18.00	6.22
19.00	6.33
20.00	6.44

DATA FROM MAIN

TO CALCULATE VALUES

XSECTION		TYPE	A	Y		
	1	1	0.00	6.67	22.07	0.00
	2	1	0.00	4.63	22.14	0.00
	3	1	0.00	6.69	16.16	0.00
	4	1	0.00	6.60	16.47	0.00
	5	1	0.00	5.97	18.82	0.00
	6	1	0.00	6.87	16.46	0.00
	7	1	0.00	5.49	18.06	0.00
	8	1	0.00	8.98	9.37	0.00
	9	1	0.00	13.09	7.44	0.00
	10	1	0.00	13.05	9.64	0.00
	11	1	0.00	14.23	12.77	0.00
	12	1	0.00	13.09	16.17	0.00
	13	1	0.00	12.54	18.38	0.00


LADWP ABUTMENT LOCAL SCOUR APP Q5
DEGREDATION (FT)
V (FPS)
0
1
2
3
4
5
6
7
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

LADWP DATA; Y=5, Yh=5, S=.001, W=1, R=1

$$Z = \frac{.0685*Y*V^{0.8}*(1.59(W/R)^{0.2}-1)}{Yh^{0.4}*S^{0.3}}$$

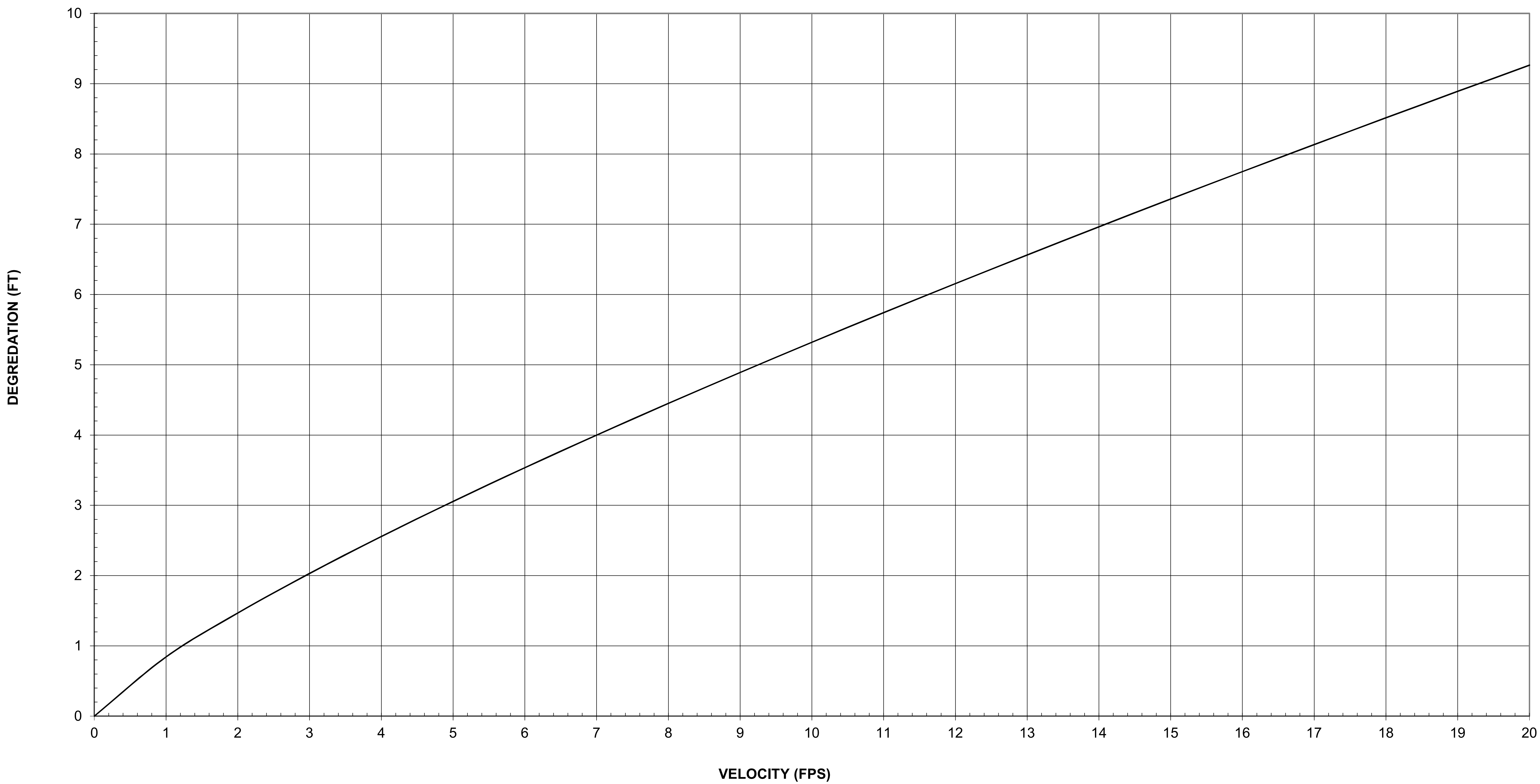
V(FPS)	DEGREDATION (FT)
0.00	0.00
1.00	0.84
2.00	1.47
3.00	2.03
4.00	2.56
5.00	3.06
6.00	3.54
7.00	4.00
8.00	4.45
9.00	4.89
10.00	5.32
11.00	5.74
12.00	6.16
13.00	6.56
14.00	6.96
15.00	7.36
16.00	7.75
17.00	8.13
18.00	8.51
19.00	8.89
20.00	9.26

DATA FROM MAIN

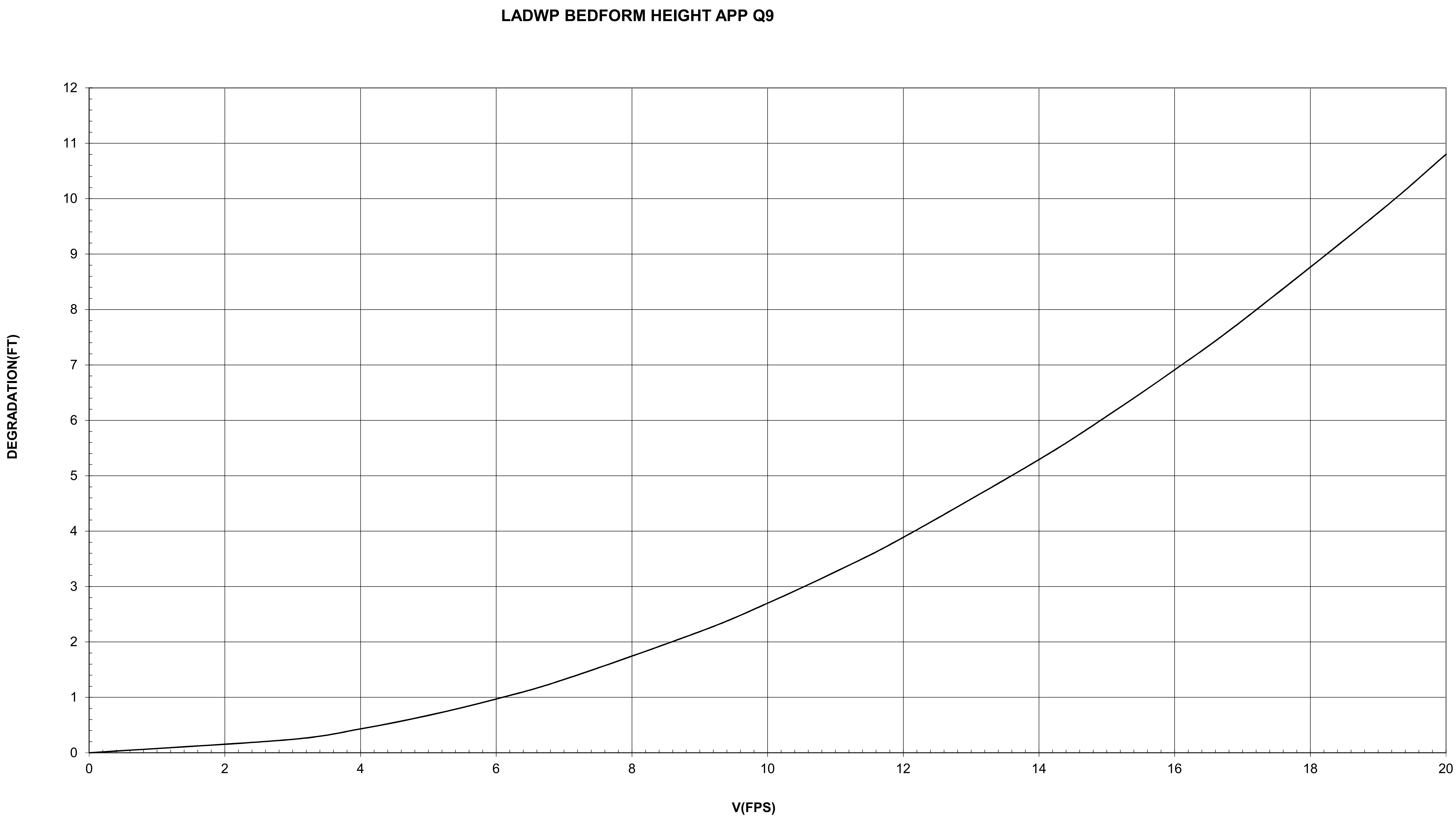
TO CALCULATE VALUES

XSECTION		BEND COEFF	MAX DEPTH	HYD DEPTH	E SLOPE	TOP WIDTH	RADIUS	V(FPS)	DEGREDATION (FT)
	1	0	6.67	4.15	0.02	101.58	1030.00	22.07	0.00
	2	0	4.63	3.09	0.03	136.49	1030.00	22.14	0.00
	3	0	6.69	4.38	0.01	121.83	1030.00	16.16	0.00
	4	0	6.60	4.40	0.01	117.91	0.00	16.47	#DIV/0!
	5	0	5.97	4.02	0.02	116.02	0.00	18.82	#DIV/0!
	6	0	6.87	4.70	0.01	118.85	720.00	16.46	0.00
	7	0	5.49	3.74	0.02	134.63	720.00	18.06	0.00
	8	0	8.98	6.30	0.00	150.82	720.00	9.37	0.00
	9	0	13.09	9.42	0.00	121.04	720.00	7.44	0.00
	10	0	13.05	9.03	0.00	99.04	720.00	9.64	0.00
	11	0	14.23	9.35	0.00	74.05	0.00	12.77	#DIV/0!
	12	0	13.09	8.15	0.01	67.04	0.00	16.17	#DIV/0!
	13	0	12.54	8.35	0.00	59.83	0.00	18.38	#DIV/0!

BEND SCOUR AFTER APP Q7



		V(FPS)	DEGREDATION (FT)		
		0.00	0.00	LADWP DATA	H=0.027*V^2
		3.00	0.24		
		4.00	0.43		
		5.00	0.68		
		6.00	0.97		
		7.00	1.32		
		9.00	2.19		
		10.00	2.70		
		11.00	3.27		
		12.00	3.89		
		14.00	5.29		
		15.00	6.08		
		16.00	6.91		
		17.00	7.80		
		19.00	9.75		
		20.00	10.80		
XSECTION	1	22.07	13.15	TO CALCULATE VALUES	
	2	22.14	13.23		
	3	16.16	7.05		
	4	16.47	7.32		
	5	18.82	9.56		
	6	16.46	7.32		
	7	18.06	8.81		
	8	9.37	2.37		
	9	7.44	1.49		
	10	9.64	2.51		
	11	12.77	4.40		
	12	16.17	7.06		
	13	18.38	9.12		


LADWP BEDFORM HEIGHT APP Q9
DEGRADATION(FT)
V(FPS)
0
1
2
3
4
5
6
7
8
9
10
11
12
0
2
4
6
8
10
12
14
16
18
20

		V	STRAIGHT	CURVE	ZBS	ZTOT	
XSECTION	1	22.07	14.00	21.00	0.00	14	TO CALCULATE VALUES
	2	22.14	14.00	21.00	0.00	14	
	3	16.16	12.50	18.00	0.00	12.5	
	4	16.47	12.50	18.00	0.00	12.5	
	5	18.82	14.00	21.00	0.00	14	
	6	16.46	12.50	18.00	0.00	12.5	
	7	18.06	14.00	21.00	0.00	14	
	8	9.37	8.00	12.00	0.00	8	
	9	7.44	8.00	12.00	0.00	8	
	10	9.64	8.00	12.00	0.00	8	
	11	12.77	10.00	15.00	0.00	10	
	12	16.17	12.50	18.00	0.00	12.5	
	13	18.38	14.00	21.00	0.00	14	

Appendix H

Appendix H – Sediment Grain Size Analysis

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

March 20, 2020 Job No.: 20-2593-4

Wiley Canyon LLC
c/o Sheridan Ebbert Development
13120 Telfair Avenue
Sylmar, California 91342

Attention: Mr. Scott Sheridan

Subject: **GEOTECHNICAL REPORT**
Sediment Sampling and Grain Size Analysis Data

Project: Tentative Tract Map
Smiser Ranch
Santa Clarita, California

Dear Mr. Sheridan:

This report presents the results of grain-size analyses performed on alluvial sediments collected in the Gavin Canyon drainage, along the north side of the project site, for use in a scour study to be performed by Pacific Advanced Civil Engineering (PACE).

1.0 INTRODUCTION

The sampling and laboratory testing programs were developed based on discussions with PACE in order to provide a representative sample basis for their studies. Two locations along the channel alignment were selected and samples were collected from test pits excavated at each location. The test pit locations were chosen in order to provide data representative of the observed variability along the creek alignment. The two test pit locations are summarized below and are shown on the appended **Sediment Sample Location Map** (Plate I).

Test Pit Designation	Coordinates	Approx. Station Location	Sample Depths (ft)
STP-1	N 34.366809°, W 118.555738°	1,300 ft downstream of I-5 overcrossing	0 to 2.5'
			2.5 to 5'
STP-2	N 34.368706°, W 118.555815°	450 ft upstream of lined channel	0 to 2’4"
			3 to 4.5’

2.0 EXCAVATION AND SAMPLING PROCEDURES

Two independent samples were collected at each test pit location described above, which were excavated by hand to a target depth of 5 feet. At each location, the field weight (with moisture) of all material excavated from the test pit was incrementally determined as the excavation progressed, then processed over a sieve tray with a 2-inch nominal maximum size (square openings). Samples were collected from Test Pit STP-1 at a depth of 0 to 2.5 ft and at 2.5 to 5 ft, and from Test Pit STP-2 at a depth of 0 to 2'4" and at 3 to 4.5 ft.

The material retained on the 2-inch sieve tray was subsequently sieved in the field to determine the surface-dry weight of material retained on the 2-inch, 3-inch, 4-inch, 6-inch, and 12-inch sieve sizes.

The material passing the 2-inch sieve tray was stockpiled and a representative bulk sample was collected and transported to our laboratory to complete the particle-size analyses of this fraction. The size of the bulk sample was selected to achieve a minimum dry weight of at least 25 kg based on criteria in ASTM D6913 test method (particle-size distribution of soils using sieve analysis) for a 2-inch maximum particle size.

The test pits were excavated by hand laborers to eliminate potential environmental impacts from heavy equipment. Neither caving nor groundwater was encountered during excavation of STP-1 and the target depth of 5 feet was reached. At STP-2 groundwater seepage was encountered at a depth of 2'4" and the total depth achieved was limited to 4.5 feet due to large cobbles and groundwater. The general stratigraphy of the alluvium observed in each test pit was logged (see Appendix A for logs) and photos were taken to illustrate the general conditions of the channel during excavation and sampling (see **Figures A1** and **A2).**

3.0 LABORATORY TEST PROCEDURES

The collected samples were processed and tested as follows in our laboratory:

- A representative portion of material was obtained from the bulk sample to determine the field moisture content and the dry weight of all material passing the 2-inch sieve size in the field.
- The total dry sample weight was calculated as the sum of the surface-dry weight of material retained on the 2-inch sieve (as measured in the field) and the dry weight of all material passing the 2-inch sieve (based on the laboratory oven-dried sample).
- Remaining material in each bulk sample was processed through the 1.5-inch, 1-inch, 0.75-inch, 0.375-inch and #4 sieve trays and oven-dried to determine the dry weight retained for each sieve size.

- The remaining sample passing through the #4 sieve was split again for washing per ASTM criteria.
- The split sample passing the #4 sieve was washed, dried and passed through the #10, #20, #40, #60, #140 and #200 sieves to determine the weight retained on each and the weight of sediment passing the #200 sieve (i.e., silt and clay sizes).
- The sample weights were adjusted to correct for the noted sample splits and the moisture content to obtain the percent retained on each sieve for the entire dry sample weight.
- The data obtained were input into the Geosystem program to generate graphical particle size distribution test reports and backup test data sheets.

4.0 RESULTS OF TESTING

Sampling and laboratory testing of sediments obtained at 2 sample sites along the Santa Clara River were completed in compliance with ASTM Test Method D6913. The results of our sampling and testing are summarized below.

1. Geotechnical logs and photographs of each sample site are presented in **Appendix A**.
2. The location of each sample site is illustrated on the attached Sediment Sample Location Map (**Plate I**).
3. The results of laboratory sediment gradation testing are presented on graphical, particle size distribution test reports (see **Figures B1** and **B2** in **Appendix B**). The backup grain size distribution test data sheets for each site are also provided. Many of the significant test parameters and results are presented in the summary table of sediment sampling and testing (**Appendix B**).
4. The observed sediments consist dominantly of poorly graded sands with silt and gravel with varying quantities of cobbles. Interbeds of well graded sand, well graded gravel, and sandy silt were locally observed. The maximum cobble/boulder size observed in Test Pit TP-1 exceeded 12 inches (see Photo Exhibit, Figure A1), though these were not fully excavated and not included in the laboratory testing. The maximum cobble size observed in Test Pit TP-2 and included in the laboratory testing was between 6 and 12 inches. At each location larger rocks were observed elsewhere in the channel.
5. Water was actively flowing in the channel at the time of excavation. The test pits were located in representative areas on the bank adjacent to the flowing water. Groundwater seepage was observed in Test Pit STP-2 at a depth of 2’4”.

This opportunity to be of service is appreciated. Please contact us if you would like to discuss this report further.

Respectfully submitted,

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
KEVIN P. CALLAHAN
NO. 2989
EXP. 6/30/20
GEOTECHNICAL
STATE OF CALIFORNIA

The following attachments and appendices complete this report.

APPENDIX A – SUBSURFACE LOGS AND PHOTOS

- Test Pits STP-1 and STP-2
- Photo Exhibits – Test Pits and Channel Conditions — Figures A1 and A2

APPENDIX B – LABORATORY TEST RESULTS

- Particle Size Distribution Test Reports — Figures B1 and B2
- Grain Size Distribution Test Data Sheets (4 sheets)

Sediment Sample Location Map (**Plate I**)

Distribution via email in PDF format:

Sheridan-Ebbert Development
Attn: Mr. Scott Sheridan

PACE
Attn: Mr. Jose Cruz

Appendix A

TRENCH LOG NO. STP-1

CLIENT: Wiley Canyon LLC	JOB NO: 20-2593-9
PROJECT: Tentative Tract Map Smiser Ranch Santa Clarita, California	DATE: 3/20/20
	LOGGED BY: KPC
	EXCAVATED: 2/25/20
EXCAVATION METHOD: Hand labor	ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0				SP-SM	**ALLUVIUM; Qal (0 - 5')** @ 0 - 5' Poorly graded SAND with silt and gravel; medium dense; moist; abundant cobbles		8.5		Gradation % fines=6.7
2.5							8.4		Gradation % fines=5.4
5					NOTES: - Test pit consisted of approximately 3-ft diameter hole - All excavated material considered in sieve analysis				
7.5									
10									

TOTAL DEPTH: 5 feet

SCALE: 1 inch = 2.5 feet

No Ground Water
No Caving

TRENCH LOG NO. STP-2

CLIENT: Wiley Canyon LLC	JOB NO: 20-2593-9
PROJECT: Tentative Tract Map, Smiser Ranch, Santa Clarita, California	DATE: 3/20/20
	LOGGED BY: KPC
	EXCAVATED: 2/25/20
EXCAVATION METHOD: Hand labor	ELEVATION:

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0				SP-SM	**ALLUVIUM; Qal (0 - 4.5')** @ 0' Poorly graded SAND with silt and gravel; medium dense; moist; abundant small cobbles @ 1' - finer-grained sand with less cobbles; roots and rootlets to 2.5'		13.0		Gradation % fines=7.1
2.5				ML	@ 2.5' Sandy SILT; soft; wet; dark brown to black				
					@ 3' Well-graded SAND with silt and gravel; medium dense; wet		15.7		Gradation % fines=8.2
5					NOTES: - Test pit consisted of approximately 3-ft diameter hole - All excavated material considered in sieve analysis - Seep at depth of 2'4"				
7.5									
10									

TOTAL DEPTH: 4.5 feet

SCALE: 1 inch = 2.5 feet

2'4" Ground Water
No Caving

Site: STP-1 *View*: Upstream

Site: STP-1

View: Test pit excavation with cobbles/boulders > than 12"

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

PHOTO EXHIBIT

JOB NO.: 20-2593-4

DATE: 3/20/20 FIGURE: A1

Site: STP-2 *View*: Upstream (left); downstream (right)

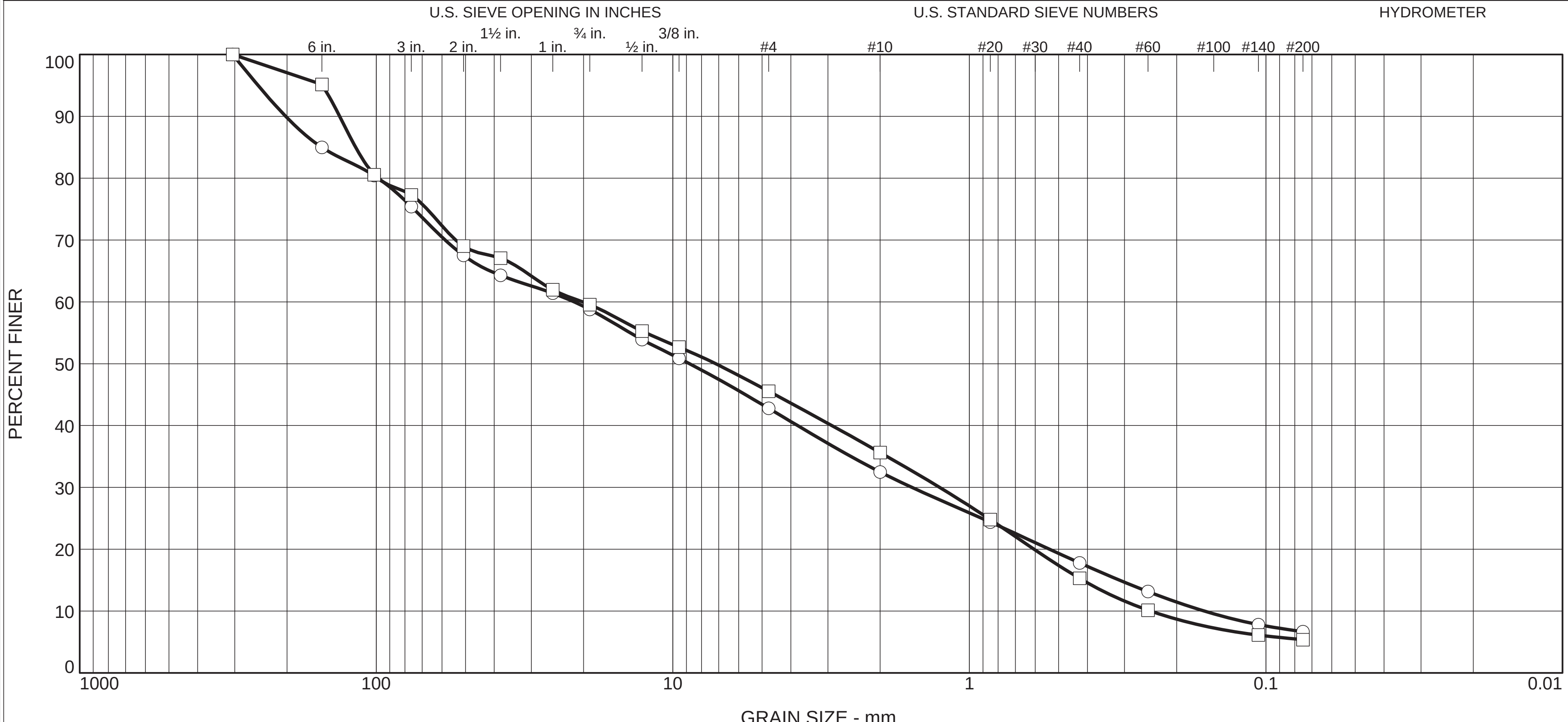
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

PHOTO EXHIBIT

JOB NO.: 20-2593-4	
DATE: 3/20/20	FIGURE: A2

Appendix B

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	24.6	16.6	16.0	10.3	14.7	11.1	6.7
□	22.7	17.8	14.0	9.9	20.3	9.9	5.4

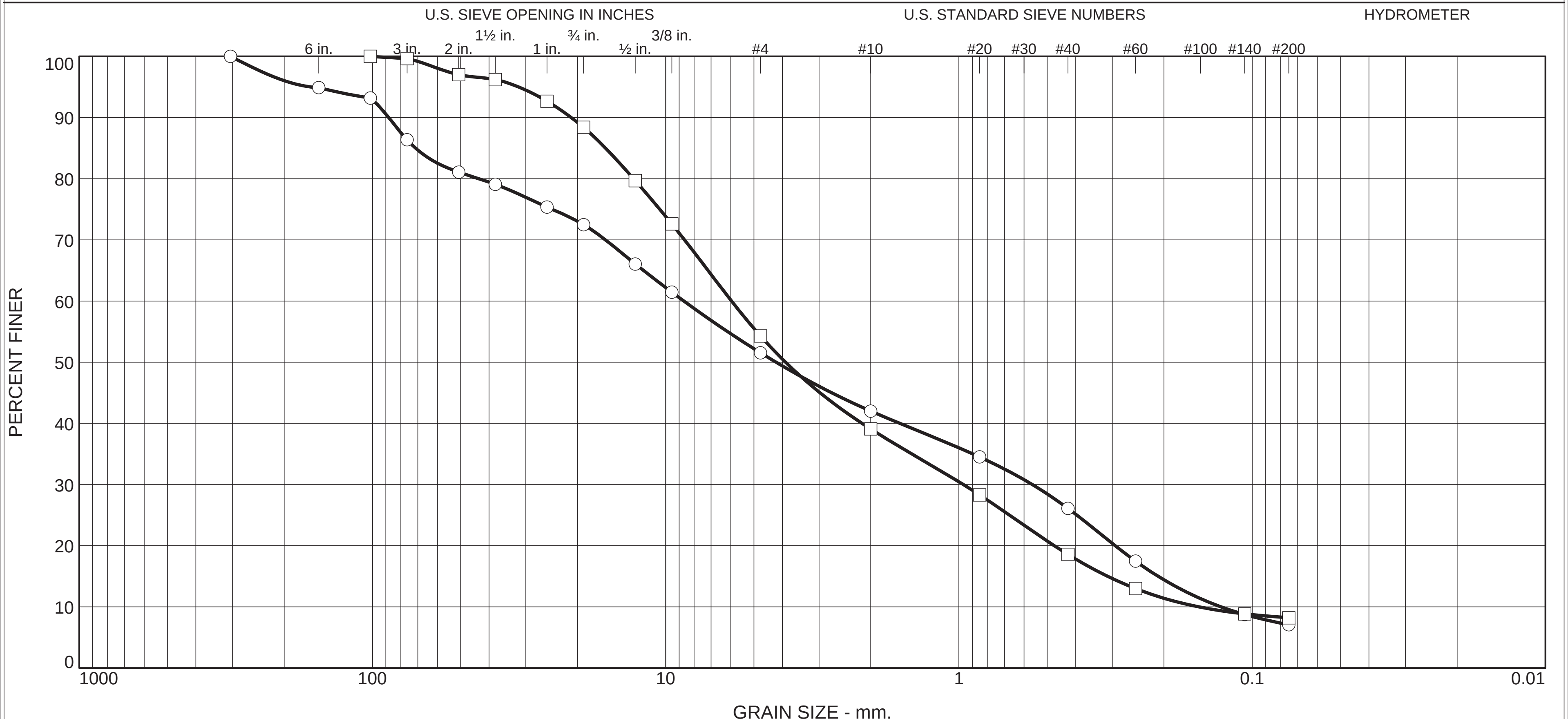
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	STP-1		0-2.5	2/25/20	SP-SM	poorly graded sand with silt, gravel and cobbles	8.5	NV	NP
□	STP-1		2.5-5	2/25/20	SP-SM	poorly graded sand with silt, gravel and cobbles	8.4	NV	NP

Client Wiley Canyon LLC
Project Tentative Tract Map
Smiser Ranch
Project No. 20-2593-9 Figure B1

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Valencia, California

○ Mixture of alluvial sediments
□ Mixture of alluvial sediments

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	13.6	13.9	21.0	9.5	15.9	19.0	7.1
□	0.4	11.2	34.1	15.2	20.5	10.4	8.2

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	STP-2		0-2.3	2/25/20	SP-SM	poorly graded sand with silt, gravel and cobbles	13.0	NV	NP
□	STP-2		3-4.5	2/25/20	SW-SM	well-graded sand with silt and gravel	15.7	NV	NP

Client Wiley Canyon LLC
Project Tentative Tract Map
Smiser Ranch
Project No. 20-2593-9 Figure B2

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Valencia, California

○ Mixture of alluvial sediments
□ Mixture of alluvial sediments

GRAIN SIZE DISTRIBUTION TEST DATA

3/20/2020

Client: Wiley Canyon LLC
Project: Tentative Tract Map
Smiser Ranch
Santa Clarita, California
Project Number: 20-2593-9
Location: STP-1
Depth: 0-2.5
Material Description: poorly graded sand with silt, gravel and cobbles
Date: 2/25/20 **Natural Moisture:** 8.5
Liquid Limit: NV **Plastic Limit:** NP **USCS Class.:** SP-SM
Testing Remarks: Mixture of alluvial sediments

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
608992.00	0.00	0.00	12	0.00	100.0
			6	91480.00	85.0
			4	119180.00	80.4
			3	149740.00	75.4
			2	197880.00	67.5
27792.70	0.00	0.00	1.5	1322.50	64.3
			1	2514.40	61.4
			0.75	3597.90	58.8
			.5	5597.30	53.9
			0.375	6848.50	50.9
			#4	10180.60	42.8
436.43	0.00	0.00	#10	105.00	32.5
			#20	187.59	24.4
			#40	255.08	17.8
			#60	302.16	13.2
			#140	356.83	7.8
			#200	368.44	6.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
24.6	16.6	16.0	32.6	10.3	14.7	11.1	36.1			6.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.1614	0.3119	0.5372	1.5621	3.7966	8.7762	21.5187	98.5367	152.6411	201.9098	250.2972

Fineness Modulus	C_u	C_c
6.16	133.34	0.70

GRAIN SIZE DISTRIBUTION TEST DATA

3/20/2020

Client: Wiley Canyon LLC
Project: Tentative Tract Map
Smiser Ranch
Santa Clarita, California
Project Number: 20-2593-9
Location: STP-1
Depth: 2.5-5
Material Description: poorly graded sand with silt, gravel and cobbles
Date: 2/25/20 **Natural Moisture:** 8.4
Liquid Limit: NV **Plastic Limit:** NP **USCS Class.:** SP-SM
Testing Remarks: Mixture of alluvial sediments

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
399085.00	0.00	0.00	12	0.00	100.0
			6	19340.00	95.2
			4	77600.00	80.6
			3	90660.00	77.3
			2	123700.00	69.0
30271.50	0.00	0.00	1.5	849.60	67.1
			1	3087.40	62.0
			0.75	4149.20	59.5
			.5	6029.60	55.3
			0.375	7157.00	52.7
			#4	10292.80	45.5
432.69	0.00	0.00	#10	94.16	35.6
			#20	197.12	24.8
			#40	287.30	15.3
			#60	336.40	10.1
			#140	374.43	6.1
			#200	381.72	5.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
22.7	17.8	14.0	31.8	9.9	20.3	9.9	40.1			5.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.2455	0.4144	0.6057	1.2602	2.9087	7.1867	20.1462	98.7690	117.2810	132.8219	151.6767

Fineness Modulus	C_u	C_c
5.97	82.06	0.32

GRAIN SIZE DISTRIBUTION TEST DATA

3/20/2020

Client: Wiley Canyon LLC
Project: Tentative Tract Map
Smiser Ranch
Santa Clarita, California
Project Number: 20-2593-9
Location: STP-2
Depth: 0-2.3
Material Description: poorly graded sand with silt, gravel and cobbles
Date: 2/25/20 **Natural Moisture:** 13.0
Liquid Limit: NV **Plastic Limit:** NP **USCS Class.:** SP-SM
Testing Remarks: Mixture of alluvial sediments

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
469827.00	0.00	0.00	12	0.00	100.0
			6	23960.00	94.9
			4	31960.00	93.2
			3	64060.00	86.4
			2	88900.00	81.1
28852.50	0.00	0.00	1.5	708.00	79.1
			1	2031.80	75.4
			0.75	3058.60	72.5
			.5	5347.20	66.1
			0.375	6986.40	61.4
			#4	10517.40	51.5
256.41	0.00	0.00	#10	47.39	42.0
			#20	84.69	34.5
			#40	126.56	26.1
			#60	169.48	17.5
			#140	212.93	8.7
			#200	221.28	7.1

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
13.6	13.9	21.0	34.9	9.5	15.9	19.0	44.4			7.1

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.1279	0.2094	0.2933	0.5633	1.5940	4.2102	8.6650	43.3268	71.2902	88.0105	161.8765

Fineness Modulus	C_u	C_c
5.11	67.73	0.29

GRAIN SIZE DISTRIBUTION TEST DATA

3/20/2020

Client: Wiley Canyon LLC
Project: Tentative Tract Map
Smiser Ranch
Santa Clarita, California
Project Number: 20-2593-9
Location: STP-2
Depth: 3-4.5
Material Description: well-graded sand with silt and gravel
Date: 2/25/20 **Natural Moisture:** 15.7
Liquid Limit: NV **Plastic Limit:** NP **USCS Class.:** SW-SM
Testing Remarks: Mixture of alluvial sediments

Sieve Test Data

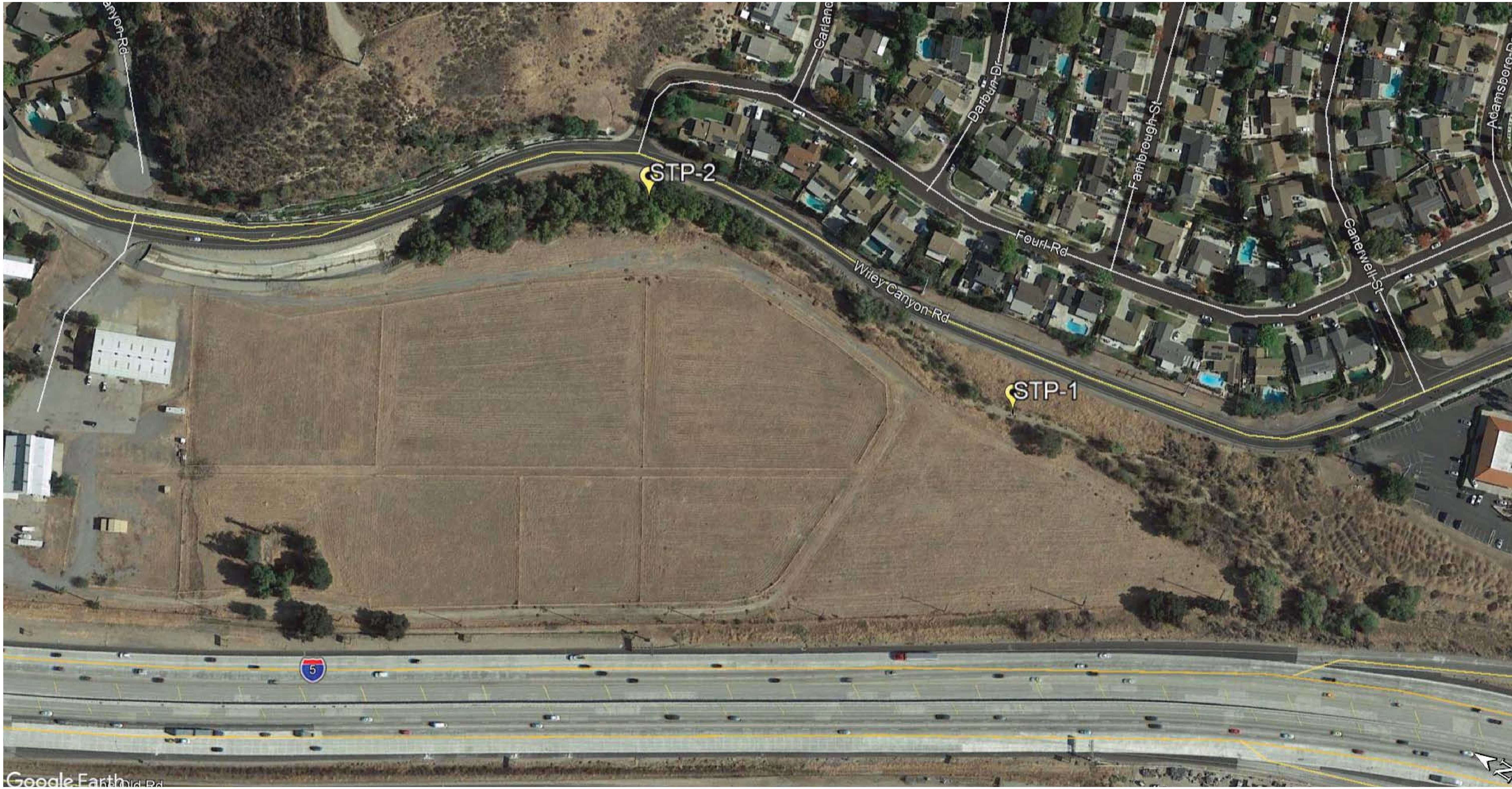
Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
146941.00	0.00	0.00	4	0.00	100.0
			3	520.00	99.6
			2	4400.00	97.0
31785.40	0.00	0.00	1.5	261.50	96.2
			1	1428.20	92.6
			0.75	2820.40	88.4
			.5	5679.70	79.7
			0.375	7998.00	72.6
			#4	13998.00	54.3
296.39	0.00	0.00	#10	83.00	39.1
			#20	141.90	28.3
			#40	194.97	18.6
			#60	225.49	13.0
			#140	248.11	8.8
			#200	251.60	8.2

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.4	11.2	34.1	45.3	15.2	20.5	10.4	46.1			8.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.1524	0.3116	0.4733	0.9673	2.1397	3.9042	5.9619	12.8771	16.0392	20.9740	31.6389

Fineness Modulus	C_u	C_c
4.67	39.12	1.03



Source: *Google Earth Pro V 7.3.2.5776 (11/19/18 Imagery Date)*

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

SEDIMENT SAMPLE LOCATION MAP

JOB NO.: *20-2593-4*	
DATE: *3/20/20*	PLATE 1

Appendix I – Grid County Analysis


Sample Point 1

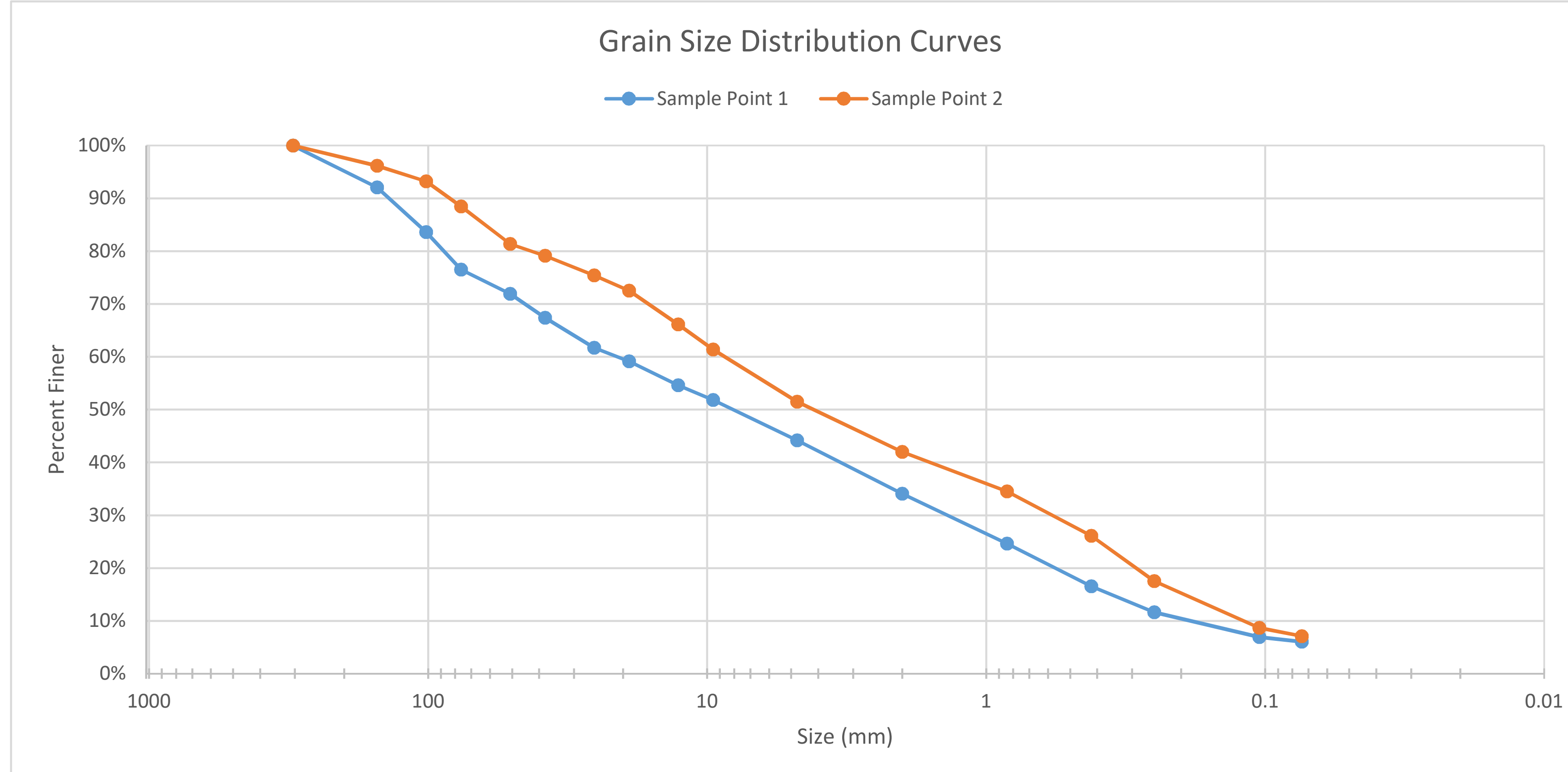
Sample Point 2

Appendix J – Pebble Walk Data Sheets and Armor Layer Grain Size Distribution Curves

Appendix J

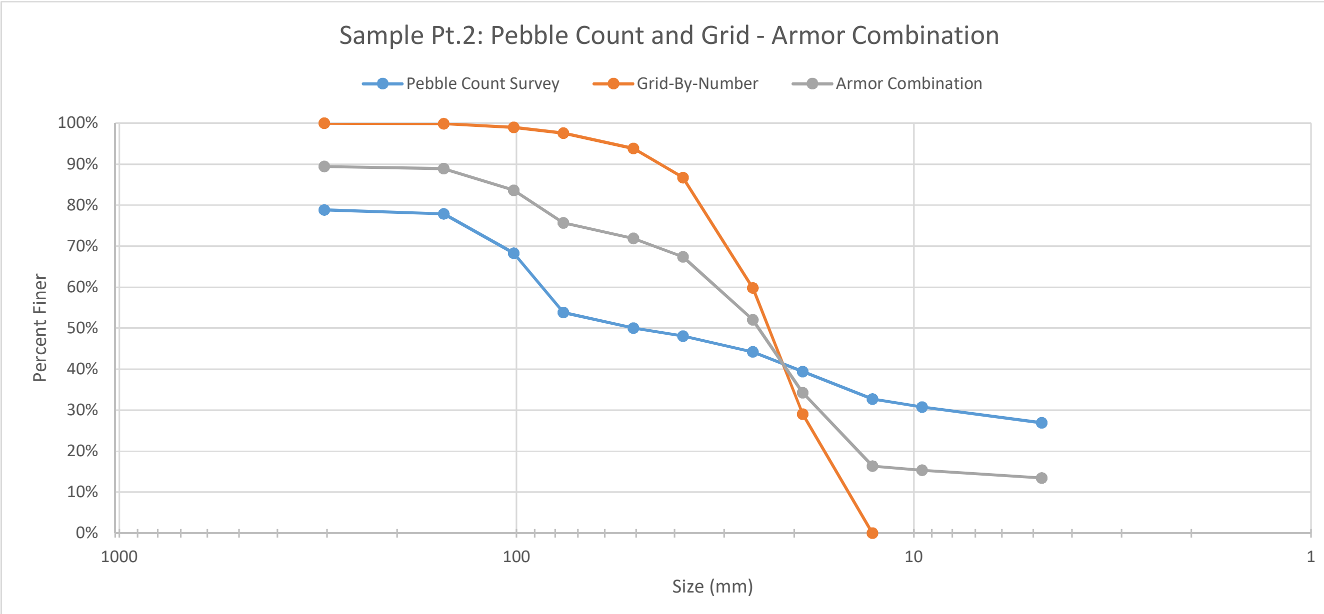
Sample Point 1	
Grain Size (mm)	% Finer
304.8	100.0%
152.4	92.0%
101.6	83.6%
76.2	76.5%
50.8	71.9%
38.1	67.4%
25.4	61.7%
19.05	59.2%
12.7	54.6%
9.525	51.8%
4.76	44.2%
2	34.1%
0.841	24.6%
0.42	16.6%
0.25	11.7%
0.105	7.0%
0.074	6.1%
D_{50} =	8.40 mm

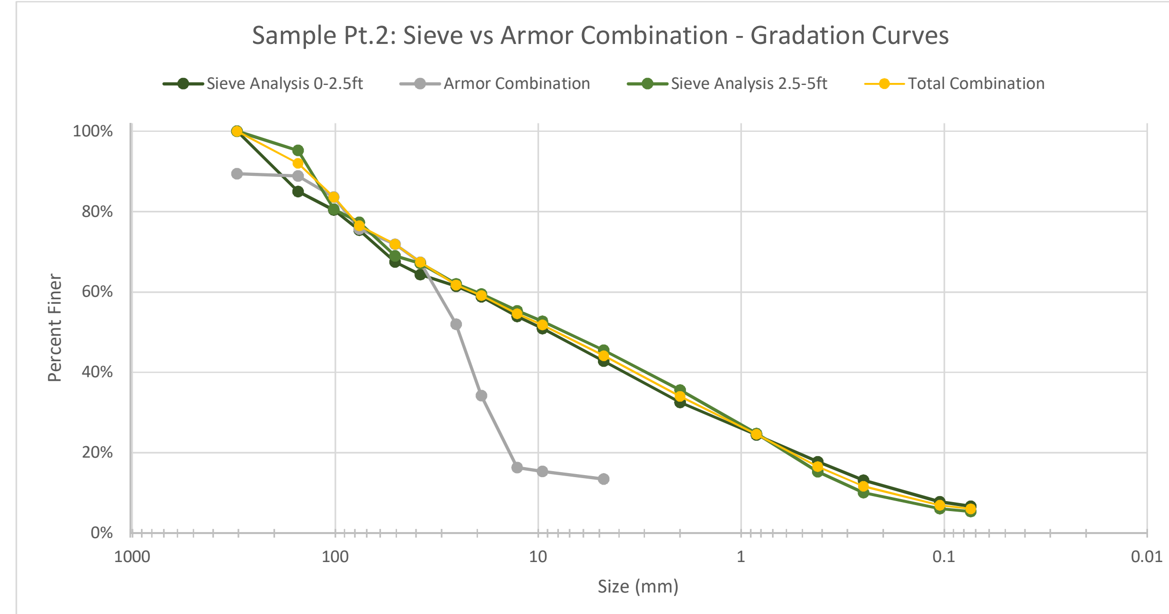
Sample Point 2	
Grain Size (mm)	% Finer
304.8	100.0%
152.4	96.2%
101.6	93.2%
76.2	88.5%
50.8	81.4%
38.1	79.1%
25.4	75.4%
19.05	72.5%
12.7	66.1%
9.525	61.4%
4.76	51.5%
2	42.0%
0.841	34.5%
0.42	26.1%
0.25	17.5%
0.105	8.7%
0.074	7.1%
D_{50} =	4.32 mm



NOTE: Sample Point 3 used in SAM modeling for sediment transport and toe-down calc's for bank protection

Sample Point 2





Grain Size	Pebble Count	Grid Count	Armor Combination	Sieve Analysis (0-2.5ft)	Sieve Analysis (2.5-5ft)	Combination (0-2.5ft)	Combination (2.5-5ft)	Total Combination
304.8	78.8%	100.0%	89.4%	100.0%	100.0%	100.0%	100.0%	100.0%
152.4	77.9%	99.9%	88.9%	85.0%	95.2%	88.9%	95.2%	92.0%
101.6	68.3%	99.0%	83.6%	80.4%	80.6%	83.6%	83.6%	83.6%
76.2	53.8%	97.5%	75.7%	75.4%	77.3%	75.7%	77.3%	76.5%
50.8	50.0%	93.8%	71.9%	67.5%	69.0%	71.9%	71.9%	71.9%
38.1	48.1%	86.7%	67.4%	64.3%	67.1%	67.4%	67.4%	67.4%
25.4	44.2%	59.8%	52.0%	61.4%	62.0%	61.4%	62.0%	61.7%
19.05	39.4%	29.1%	34.2%	58.8%	59.5%	58.8%	59.5%	59.2%
12.7	32.7%	0.0%	16.3%	53.9%	55.3%	53.9%	55.3%	54.6%
9.525	30.8%	0.0%	15.4%	50.9%	52.7%	50.9%	52.7%	51.8%
4.76	26.9%	0.0%	13.5%	42.8%	45.5%	42.8%	45.5%	44.2%
2	0.0%	0.0%	0.0%	32.5%	35.6%	32.5%	35.6%	34.1%
0.841	0.0%	0.0%	0.0%	24.4%	24.8%	24.4%	24.8%	24.6%
0.42	0.0%	0.0%	0.0%	17.8%	15.3%	17.8%	15.3%	16.6%
0.25	0.0%	0.0%	0.0%	13.2%	10.1%	13.2%	10.1%	11.7%
0.105	0.0%	0.0%	0.0%	7.8%	6.1%	7.8%	6.1%	7.0%
0.074	0.0%	0.0%	0.0%	6.7%	5.4%	6.7%	5.4%	6.1%
%of Combination	50.0%	50.0%						

Sieve Size (mm)	Total	% Finer
304.8	82	79%
152.4	81	78%
101.6	71	68%
76.2	56	54%
50.8	52	50%
38.1	50	48%
25.4	46	44%
19.05	41	39%
12.7	34	33%
9.525	32	31%
4.76	28	27%
2	0	0%
0.841	0	0%
0.42	0	0%
0.25	0	0%
0.105	0	0%
0.074	0	0%

Sieve Size (mm)	Total	% Finer
304.8	774	100%
152.4	773	100%
101.6	766	99%
76.2	755	98%
50.8	726	94%
38.1	671	87%
25.4	463	60%
19.05	225	29%
12.7	0	0%
9.525	0	0%
4.76	0	0%
2	0	0%
0.841	0	0%
0.42	0	0%
0.25	0	0%
0.105	0	0%
0.074	0	0%

Sieve Analysis (Seward pt.1)

0-2.5ft		2.5-5ft	
Size (mm)	% Passing	Size (mm)	% Passing
304.8	100%	304.8	100%
152.4	85%	152.4	95%
101.6	80%	101.6	81%
76.2	75%	76.2	77%
50.8	68%	50.8	69%
38.1	64%	38.1	67%
25.4	61%	25.4	62%
19.05	59%	19.05	60%
12.7	54%	12.7	55%
9.525	51%	9.525	53%
4.76	43%	4.76	46%
2	33%	2	36%
0.841	24%	0.841	25%
0.42	18%	0.42	15%
0.25	13%	0.25	10%
0.105	8%	0.105	6%
0.074	7%	0.074	5%

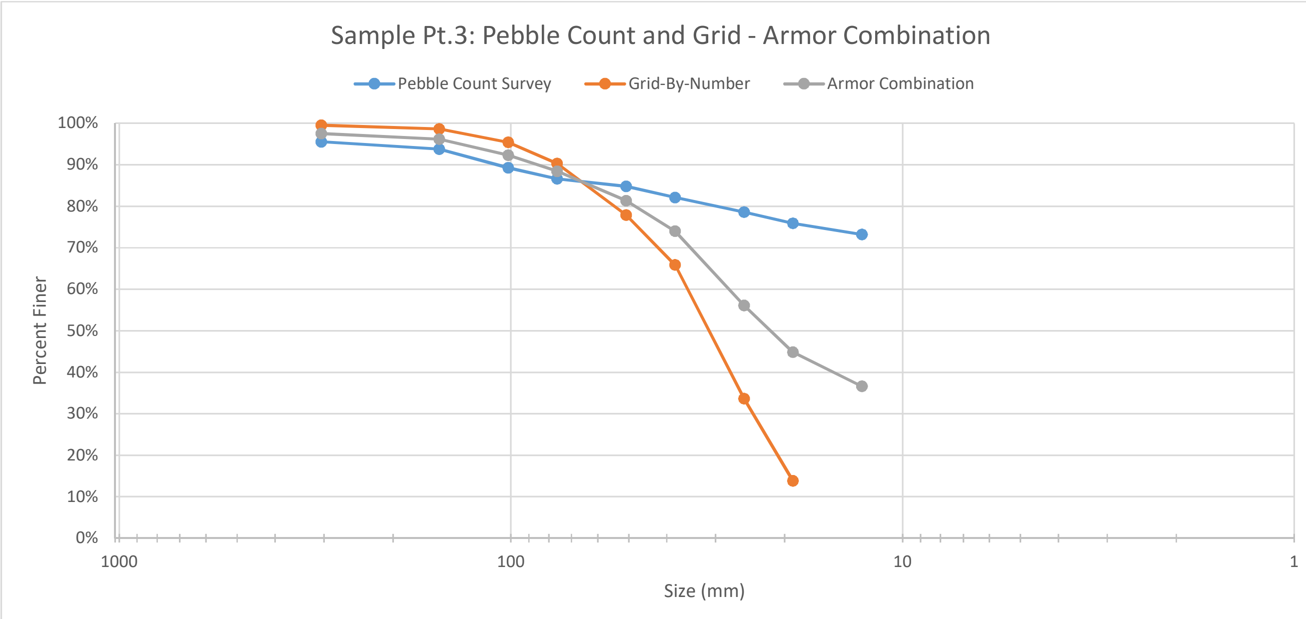
Pebble Count Survey

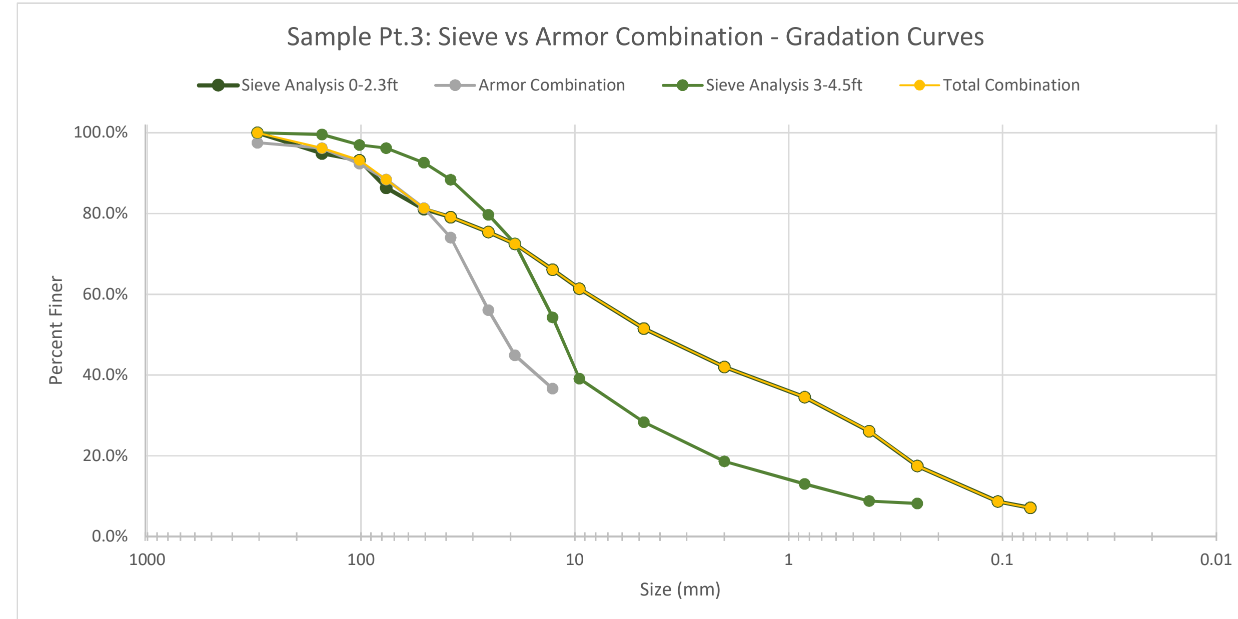
Sample Point No.	Pebble No.	Size (mm)	Size Category
1	1	<2	silt/clay/sand
	2	<2	silt/clay/sand
	3	>157.49	Large Cobble/Boulder
	4	50.12	Coarse Gravel
	5	>157.49	Large Cobble/Boulder
	6	91.55	Medium Cobble
	7	>157.49	Large Cobble/Boulder
	8	65.6	Small Cobble
	9	>157.49	Large Cobble/Boulder
	10	66.81	Small Cobble
	11	95.84	Medium Cobble
	12	11.47	Medium Gravel
	13	94.63	Medium Cobble
	14	<2	silt/clay/sand
	15	100.63	Medium Cobble
	16	<2	silt/clay/sand
	17	>157.49	Large Cobble/Boulder
	18	<2	silt/clay/sand
	19	<2	silt/clay/sand
	20	<2	silt/clay/sand
	21	<2	silt/clay/sand
	22	<2	silt/clay/sand
	23	31.17	Coarse Gravel
	24	<2	silt/clay/sand
	25	24.32	Coarse Gravel
	26	92.28	Medium Cobble
	27	22.8	Coarse Gravel
	28	86.46	Small Cobble
	29	89.14	Small Cobble
	30	18.5	Coarse Gravel
	31	10.36	Medium Gravel
	32	>157.49	Large Cobble/Boulder
	33	125.56	Medium Cobble
	34	102.23	Medium Cobble
	35	15.68	Medium Gravel
	36	<2	silt/clay/sand
	37	<2	silt/clay/sand
	38	82.79	Small Cobble
	39	13.57	Medium Gravel
	40	24.04	Coarse Gravel
	41	>157.49	Large Cobble/Boulder
	42	139.46	Large Cobble/Boulder

Size Category	Max Size (mm)	Total <or= to Max Size	% Finer
Silt/Sand	2	28	27%
Fine Gravel	9	32	31%
Medium Gravel	17	39	38%
Coarse Gravel	65	53	51%
Small Cobble	91	64	62%
Medium Cobble	129	78	75%
Large Cobble	257	104	100%
Small Boulder	513	104	100%
Medium Boulder	1024	104	100%
Large Boulder	>1024	104	100%

43	80.19	Small Cobble
44	86.39	Small Cobble
45	79.04	Small Cobble
46	>157.49	Large Cobble/Boulder
47	5.45	Fine Gravel
48	>157.49	Large Cobble/Boulder
49	>157.49	Large Cobble/Boulder
50	16.05	Medium Gravel
51	16.41	Medium Gravel
52	18.52	Coarse Gravel
53	<2	silt/clay/sand
54	28.03	Coarse Gravel
55	60.76	Coarse Gravel
56	21.16	Coarse Gravel
57	15.92	Medium Gravel
58	6.88	Fine Gravel
59	37.9	Coarse Gravel
60	7.42	Fine Gravel
61	102.9	Medium Cobble
62	5.69	Fine Gravel
63	79.82	Small Cobble
64	<2	silt/clay/sand
65	>157.49	Large Cobble/Boulder
66	>157.49	Large Cobble/Boulder
67	36.05	Coarse Gravel
68	<2	silt/clay/sand
69	<2	silt/clay/sand
70	>157.49	Large Cobble/Boulder
71	130.82	Large Cobble/Boulder
72	>157.49	Large Cobble/Boulder
73	77.15	Small Cobble
74	149	Large Cobble/Boulder
75	49.37	Coarse Gravel
76	>157.49	Large Cobble/Boulder
77	108.68	Medium Cobble
78	156.01	Large Cobble/Boulder
79	120.03	Medium Cobble
80	<2	silt/clay/sand
81	<2	silt/clay/sand
82	>157.49	Large Cobble/Boulder
83	>157.49	Large Cobble/Boulder
84	>157.49	Large Cobble/Boulder
85	>157.49	Large Cobble/Boulder
86	<2	silt/clay/sand
87	<2	silt/clay/sand
88	>157.49	Large Cobble/Boulder
89	<2	silt/clay/sand

90	124.27	Medium Cobble
91	<2	silt/clay/sand
92	99.11	Medium Cobble
93	107.48	Medium Cobble
94	>157.49	Large Cobble/Boulder
95	96.43	Medium Cobble
96	72.98	Small Cobble
97	23.6	Coarse Gravel
98	<2	silt/clay/sand
99	>157.49	Large Cobble/Boulder
100	<2	silt/clay/sand
101	<2	silt/clay/sand
102	<2	silt/clay/sand
103	<2	silt/clay/sand
104	<2	silt/clay/sand





Grain Size	Pebble Count	Grid Count	Armor Combination	Sieve Analysis (0-2.3ft)	Sieve Analysis (3-4.5ft)	Total Combination
304.8	95.5%	99.5%	97.5%	100.0%	0.0%	100.0%
152.4	93.8%	98.6%	96.2%	94.9%	0.0%	96.2%
101.6	89.3%	95.4%	92.3%	93.2%	100.0%	93.2%
76.2	86.6%	90.3%	88.5%	86.4%	99.6%	88.5%
50.8	84.8%	77.9%	81.4%	81.1%	97.0%	81.4%
38.1	82.1%	65.9%	74.0%	79.1%	96.2%	79.1%
25.4	78.6%	33.6%	56.1%	75.4%	92.6%	75.4%
19.05	75.9%	13.8%	44.9%	72.5%	88.4%	72.5%
12.7	73.2%	0.0%	36.6%	66.1%	79.7%	66.1%
9.525	0.0%	0.0%	0.0%	61.4%	72.6%	61.4%
4.76	0.0%	0.0%	0.0%	51.5%	54.3%	51.5%
2	0.0%	0.0%	0.0%	42.0%	39.1%	42.0%
0.841	0.0%	0.0%	0.0%	34.5%	28.3%	34.5%
0.42	0.0%	0.0%	0.0%	26.1%	18.6%	26.1%
0.25	0.0%	0.0%	0.0%	17.5%	13.0%	17.5%
0.105	0.0%	0.0%	0.0%	8.7%	8.8%	8.7%
0.074	0.0%	0.0%	0.0%	7.1%	8.2%	7.1%
%of Combination	50.0%	50.0%		80.0%		

Sieve Size (mm)	Total	% Finer
304.8	107	96%
152.4	105	94%
101.6	100	89%
76.2	97	87%
50.8	95	85%
38.1	92	82%
25.4	88	79%
19.05	85	76%
12.7	82	73%
9.525	0	0%
4.76	0	0%
2	0	0%
0.841	0	0%
0.42	0	0%
0.25	0	0%
0.105	0	0%
0.074	0	0%

Sieve Size (mm)	Total	% Finer
304.8	216	100%
152.4	214	99%
101.6	207	95%
76.2	196	90%
50.8	169	78%
38.1	143	66%
25.4	73	34%
19.05	30	14%
12.7	0	0%
9.525	0	0%
4.76	0	0%
2	0	0%
0.841	0	0%
0.42	0	0%
0.25	0	0%
0.105	0	0%
0.074	0	0%

Sieve Analysis (Seward pt.2)

0-2.3ft		3-4.5ft	
Size (mm)	% Passing	Size (mm)	% Passing
304.8	100%		
152.4	95%		
101.6	93%	101.6	100%
76.2	86%	76.2	100%
50.8	81%	50.8	97%
38.1	79%	38.1	96%
25.4	75%	25.4	93%
19.05	73%	19.05	88%
12.7	66%	12.7	80%
9.525	61%	9.525	73%
4.76	52%	4.76	54%
2	42%	2	39%
0.841	35%	0.841	28%
0.42	26%	0.42	19%
0.25	18%	0.25	13%
0.105	9%	0.105	9%
0.074	7%	0.074	8%

Pebble Count Survey

Sample Point No.	Pebble No.	Size (mm)	Size Category
2	1	<2	silt/clay/sand
	2	<2	silt/clay/sand
	3	<2	silt/clay/sand
	4	<2	silt/clay/sand
	5	<2	silt/clay/sand
	6	<2	silt/clay/sand
	7	21.21	Coarse Gravel
	8	<2	silt/clay/sand
	9	<2	silt/clay/sand
	10	>157.49	Large Cobble/Boulder
	11	128.06	Medium Cobble
	12	>157.49	Large Cobble/Boulder
	13	27.39	Coarse Gravel
	14	86.7	Small Cobble
	15	16.52	Medium Gravel
	16	<2	silt/clay/sand
	17	>157.49	Large Cobble/Boulder
	18	<2	silt/clay/sand
	19	<2	silt/clay/sand
	20	41.27	Coarse Gravel
	21	<2	silt/clay/sand
	22	<2	silt/clay/sand
	23	<2	silt/clay/sand
	24	<2	silt/clay/sand
	25	<2	silt/clay/sand
	26	<2	silt/clay/sand
	27	>157.49	Large Cobble/Boulder
	28	<2	silt/clay/sand
	29	71.22	Small Cobble
	30	157.82	Large Cobble/Boulder
	31	<2	silt/clay/sand
	32	123.73	Medium Cobble
	33	23.09	Coarse Gravel
	34	23.5	Coarse Gravel
	35	27.64	Coarse Gravel
	36	79.62	Small Cobble
	37	121.63	Medium Cobble
	38	121.29	Medium Cobble
	39	113.04	Medium Cobble
	40	27.82	Coarse Gravel
	41	<2	silt/clay/sand
	42	<2	silt/clay/sand

Size Category	Max Size (mm)	Total <or= to Max Size	% Finer
Silt/Sand	2	82	73%
Fine Gravel	9	82	73%
Medium Gravel	17	84	75%
Coarse Gravel	65	96	86%
Small Cobble	91	99	88%
Medium Cobble	129	105	94%
Large Cobble	257	112	100%
Small Boulder	513	112	100%
Medium Boulder	1024	112	100%
Large Boulder	>1024	112	100%

43	97.52	Medium Cobble
44	<2	silt/clay/sand
45	48.66	Coarse Gravel
46	15.51	Medium Gravel
47	<2	silt/clay/sand
48	56.23	Coarse Gravel
49	17.3	Coarse Gravel
50	31.84	Coarse Gravel
51	<2	silt/clay/sand
52	<2	silt/clay/sand
53	<2	silt/clay/sand
54	<2	silt/clay/sand
55	<2	silt/clay/sand
56	<2	silt/clay/sand
57	157.43	Large Cobble/Boulder
58	<2	silt/clay/sand
59	<2	silt/clay/sand
60	<2	silt/clay/sand
61	<2	silt/clay/sand
62	<2	silt/clay/sand
63	<2	silt/clay/sand
64	<2	silt/clay/sand
65	<2	silt/clay/sand
66	<2	silt/clay/sand
67	<2	silt/clay/sand
68	<2	silt/clay/sand
69	<2	silt/clay/sand
70	<2	silt/clay/sand
71	<2	silt/clay/sand
72	<2	silt/clay/sand
73	<2	silt/clay/sand
74	44.4	Coarse Gravel
75	<2	silt/clay/sand
76	<2	silt/clay/sand
77	<2	silt/clay/sand
78	<2	silt/clay/sand
79	<2	silt/clay/sand
80	<2	silt/clay/sand
81	<2	silt/clay/sand
82	<2	silt/clay/sand
83	<2	silt/clay/sand
84	>157.49	Large Cobble/Boulder
85	<2	silt/clay/sand
86	<2	silt/clay/sand
87	<2	silt/clay/sand
88	<2	silt/clay/sand
89	<2	silt/clay/sand

90	<2	silt/clay/sand
91	<2	silt/clay/sand
92	<2	silt/clay/sand
93	<2	silt/clay/sand
94	<2	silt/clay/sand
95	<2	silt/clay/sand
96	<2	silt/clay/sand
97	<2	silt/clay/sand
98	<2	silt/clay/sand
99	<2	silt/clay/sand
100	<2	silt/clay/sand
101	<2	silt/clay/sand
102	<2	silt/clay/sand
103	<2	silt/clay/sand
104	<2	silt/clay/sand
105	<2	silt/clay/sand
106	<2	silt/clay/sand
107	<2	silt/clay/sand
108	<2	silt/clay/sand
109	<2	silt/clay/sand
110	<2	silt/clay/sand
111	<2	silt/clay/sand
112	<2	silt/clay/sand

Pebble Count Survey

Sample Point No. 1

Data Sheet

Date: 2/25/2020

Name(s): Cherise Thompson

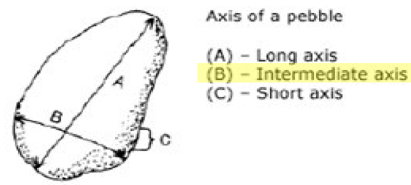
Project Number: A969 (Wiley Canyon)

No. of times the river was crossed (bank to bank): 6

Starting Bank (LHS or RHS looking downstream): LHS

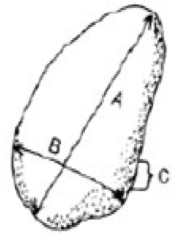
Ending Bank (LHS or RHS looking downstream): LHS

Pebble No.	Size (mm)	Size Category
1	<2	silt/clay/sand
2	<2	silt/clay/sand
3	>157.49	Large Cobble/Boulder
4	50.12	Coarse Gravel
5	>157.49	Large Cobble/Boulder
6	91.55	Medium Cobble
7	>157.49	Large Cobble/Boulder
8	65.6	Small Cobble
9	>157.49	Large Cobble/Boulder
10	66.81	Small Cobble
11	95.84	Medium Cobble
12	11.47	Medium Gravel
13	94.63	Medium Cobble
14	<2	silt/clay/sand
15	100.63	Medium Cobble
16	<2	silt/clay/sand
17	>157.49	Large Cobble/Boulder
18	<2	silt/clay/sand
19	<2	silt/clay/sand
20	<2	silt/clay/sand
21	<2	silt/clay/sand
22	<2	silt/clay/sand
23	31.17	Coarse Gravel
24	<2	silt/clay/sand
25	24.32	Coarse Gravel
26	92.28	Medium Cobble
27	22.8	Coarse Gravel
28	86.46	Small Cobble
29	89.14	Small Cobble
30	18.5	Coarse Gravel
31	10.36	Medium Gravel
32	>157.49	Large Cobble/Boulder
33	125.56	Medium Cobble
34	102.23	Medium Cobble



Pebble No.	Size (mm)	Size Category
35	15.68	Medium Gravel
36	<2	silt/clay/sand
37	<2	silt/clay/sand
38	82.79	Small Cobble
39	13.57	Medium Gravel
40	24.04	Coarse Gravel
41	>157.49	Large Cobble/Boulder
42	139.46	Large Cobble/Boulder
43	80.19	Small Cobble
44	86.39	Small Cobble
45	79.04	Small Cobble
46	>157.49	Large Cobble/Boulder
47	5.45	Fine Gravel
48	>157.49	Large Cobble/Boulder
49	>157.49	Large Cobble/Boulder
50	16.05	Medium Gravel
51	16.41	Medium Gravel
52	18.52	Coarse Gravel
53	<2	silt/clay/sand
54	28.03	Coarse Gravel
55	60.76	Coarse Gravel
56	21.16	Coarse Gravel
57	15.92	Medium Gravel
58	6.88	Fine Gravel
59	37.9	Coarse Gravel
60	7.42	Fine Gravel
61	102.9	Medium Cobble
62	5.69	Fine Gravel
63	79.82	Small Cobble
64	<2	silt/clay/sand
65	>157.49	Large Cobble/Boulder
66	>157.49	Large Cobble/Boulder
67	36.05	Coarse Gravel
68	<2	silt/clay/sand
69	<2	silt/clay/sand
70	>157.49	Large Cobble/Boulder
71	130.82	Large Cobble/Boulder
72	>157.49	Large Cobble/Boulder
73	77.15	Small Cobble
74	149	Large Cobble/Boulder
75	49.37	Coarse Gravel
76	>157.49	Large Cobble/Boulder
77	108.68	Medium Cobble

Sample Point No. 1



Axis of a pebble

(A) – Long axis
(B) – Intermediate axis
(C) – Short axis

Pebble No.	Size (mm)	Size Category
78	156.01	Large Cobble/Boulder
79	120.03	Medium Cobble
80	<2	silt/clay/sand
81	<2	silt/clay/sand
82	>157.49	Large Cobble/Boulder
83	>157.49	Large Cobble/Boulder
84	>157.49	Large Cobble/Boulder
85	>157.49	Large Cobble/Boulder
86	<2	silt/clay/sand
87	<2	silt/clay/sand
88	>157.49	Large Cobble/Boulder
89	<2	silt/clay/sand
90	124.27	Medium Cobble
91	<2	silt/clay/sand
92	99.11	Medium Cobble
93	107.48	Medium Cobble
94	>157.49	Large Cobble/Boulder
95	96.43	Medium Cobble
96	72.98	Small Cobble
97	23.6	Coarse Gravel
98	<2	silt/clay/sand
99	>157.49	Large Cobble/Boulder
100	<2	silt/clay/sand
101	<2	silt/clay/sand
102	<2	silt/clay/sand
103	<2	silt/clay/sand
104	<2	silt/clay/sand
105		
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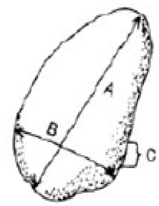
120		

Sample Point No. 1

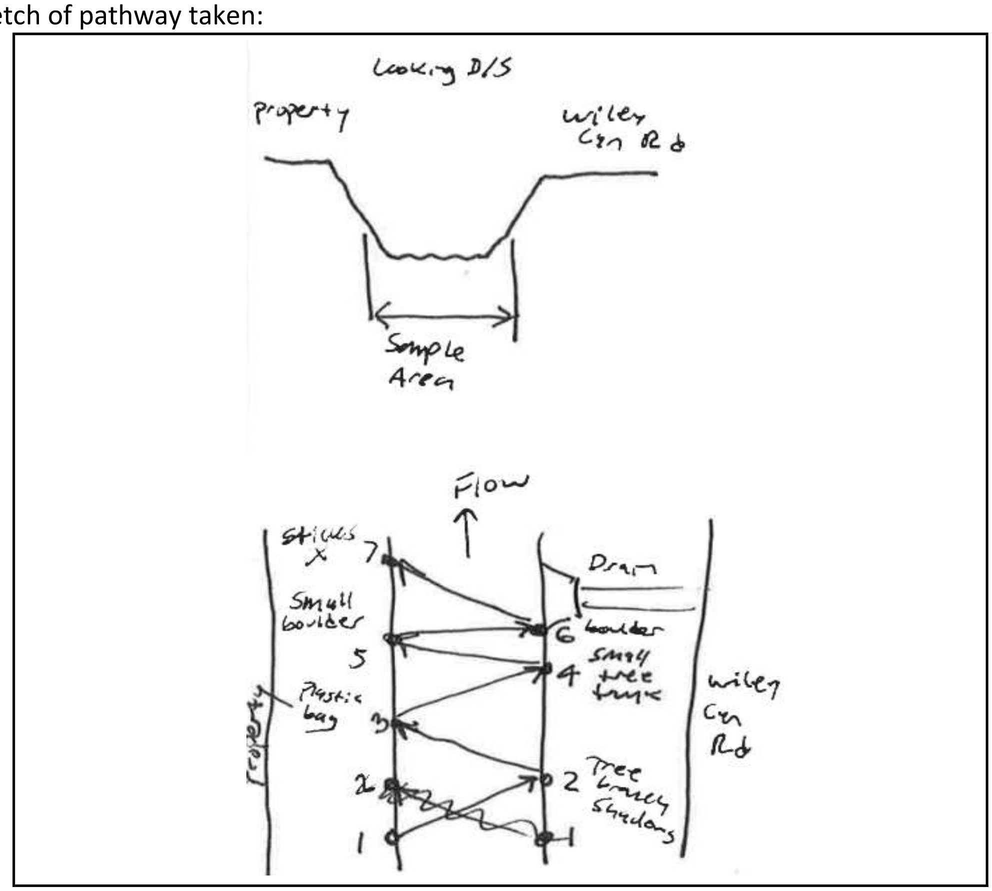


Axis of a pebble

(A) - Long axis
(B) - Intermediate axis
(C) - Short axis

Size categories	Size ranges (mm)
(BC) Silt/clay Very small (smooth feel)	
(BC) Sand (Small grainy feel)	< 2
(BC) Gravel (Pea to tennis ball diameter)	
1. Fine gravel	2 – 8
2. Medium gravel	9 – 16
3. Coarse gravel	17 – 64
(BC) Cobble (Tennis ball to basket ball diameter)	
1. Small cobble	65 – 90
2. Medium cobble	91 – 128
3. Large cobble	129 – 256
(BC) Boulder (Basketball to car diameter)	
1. Small boulder	257 – 512
2. Medium boulder	513 – 1024
3. Large boulder	> 1024
(BC) Bedrock Large solid surface	

Rough sketch of pathway taken:



Notes/Photos:

Sample Point No. **1**

Midway creek sample point. ~across from Darbun Dr. right where drain enters creek. Foliage/Vegetation very dense immediately u/s and d/s of this sample point.

IMG_1917 - IMG_1927

Pebble Count Survey

Data Sheet

Sample Point No. 2

Date: 2/25/2020

Name(s): Cherise Thompson

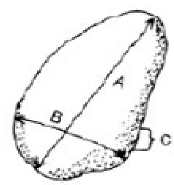
Project Number: A969 (Wiley Canyon)

No. of times the river was crossed (bank to bank): 4

Starting Bank (LHS or RHS looking downstream): LHS

Ending Bank (LHS or RHS looking downstream): LHS

Pebble No.	Size (mm)	Size Category
1	<2	silt/clay/sand
2	<2	silt/clay/sand
3	<2	silt/clay/sand
4	<2	silt/clay/sand
5	<2	silt/clay/sand
6	<2	silt/clay/sand
7	21.21	Coarse Gravel
8	<2	silt/clay/sand
9	<2	silt/clay/sand
10	>157.49	Large Cobble/Boulder
11	128.06	Medium Cobble
12	?157.49	NA
13	27.39	Coarse Gravel
14	86.7	Small Cobble
15	16.52	Medium Gravel
16	<2	silt/clay/sand
17	>157.49	Large Cobble/Boulder
18	<2	silt/clay/sand
19	<2	silt/clay/sand
20	41.27	Coarse Gravel
21	<2	silt/clay/sand
22	<2	silt/clay/sand
23	<2	silt/clay/sand
24	<2	silt/clay/sand
25	<2	silt/clay/sand
26	<2	silt/clay/sand
27	>157.49	Large Cobble/Boulder
28	<2	silt/clay/sand
29	71.22	Small Cobble
30	157.82	Large Cobble/Boulder
31	<2	silt/clay/sand
32	123.73	Medium Cobble
33	23.09	Coarse Gravel
34	23.5	Coarse Gravel

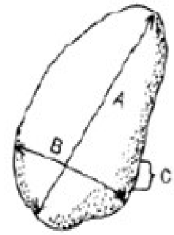


Axis of a pebble

(A) – Long axis
(B) – Intermediate axis
(C) – Short axis

Pebble No.	Size (mm)	Size Category
35	27.64	Coarse Gravel
36	79.62	Small Cobble
37	121.63	Medium Cobble
38	121.29	Medium Cobble
39	113.04	Medium Cobble
40	27.82	Coarse Gravel
41	<2	silt/clay/sand
42	<2	silt/clay/sand
43	97.52	Medium Cobble
44	<2	silt/clay/sand
45	48.66	Coarse Gravel
46	15.51	Medium Gravel
47	<2	silt/clay/sand
48	56.23	Coarse Gravel
49	17.3	Coarse Gravel
50	31.84	Coarse Gravel
51	<2	silt/clay/sand
52	<2	silt/clay/sand
53	<2	silt/clay/sand
54	<2	silt/clay/sand
55	<2	silt/clay/sand
56	<2	silt/clay/sand
57	157.43	Large Cobble/Boulder
58	<2	silt/clay/sand
59	<2	silt/clay/sand
60	<2	silt/clay/sand
61	<2	silt/clay/sand
62	<2	silt/clay/sand
63	<2	silt/clay/sand
64	<2	silt/clay/sand
65	<2	silt/clay/sand
66	<2	silt/clay/sand
67	<2	silt/clay/sand
68	<2	silt/clay/sand
69	<2	silt/clay/sand
70	<2	silt/clay/sand
71	<2	silt/clay/sand
72	<2	silt/clay/sand
73	<2	silt/clay/sand
74	44.4	Coarse Gravel
75	<2	silt/clay/sand
76	<2	silt/clay/sand
77	<2	silt/clay/sand

Sample Point No. 2



Axis of a pebble

(A) – Long axis
(B) – Intermediate axis
(C) – Short axis

Pebble No.	Size (mm)	Size Category
78	<2	silt/clay/sand
79	<2	silt/clay/sand
80	<2	silt/clay/sand
81	<2	silt/clay/sand
82	<2	silt/clay/sand
83	<2	silt/clay/sand
84	>157.49	Large Cobble/Boulder
85	<2	silt/clay/sand
86	<2	silt/clay/sand
87	<2	silt/clay/sand
88	<2	silt/clay/sand
89	<2	silt/clay/sand
90	<2	silt/clay/sand
91	<2	silt/clay/sand
92	<2	silt/clay/sand
93	<2	silt/clay/sand
94	<2	silt/clay/sand
95	<2	silt/clay/sand
96	<2	silt/clay/sand
97	<2	silt/clay/sand
98	<2	silt/clay/sand
99	<2	silt/clay/sand
100	<2	silt/clay/sand
101	<2	silt/clay/sand
102	<2	silt/clay/sand
103	<2	silt/clay/sand
104	<2	silt/clay/sand
105	<2	silt/clay/sand
106	<2	silt/clay/sand
107	<2	silt/clay/sand
108	<2	silt/clay/sand
109	<2	silt/clay/sand
110	<2	silt/clay/sand
111	<2	silt/clay/sand
112	<2	silt/clay/sand
113		
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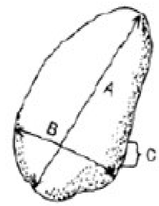
118		
119		
120		

Sample Point No. 2



Axis of a pebble

(A) - Long axis
(B) - Intermediate axis
(C) - Short axis

Size categories	Size ranges (mm)
(BC) Silt/clay Very small (smooth feel)	
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2. Medium gravel	9 – 16
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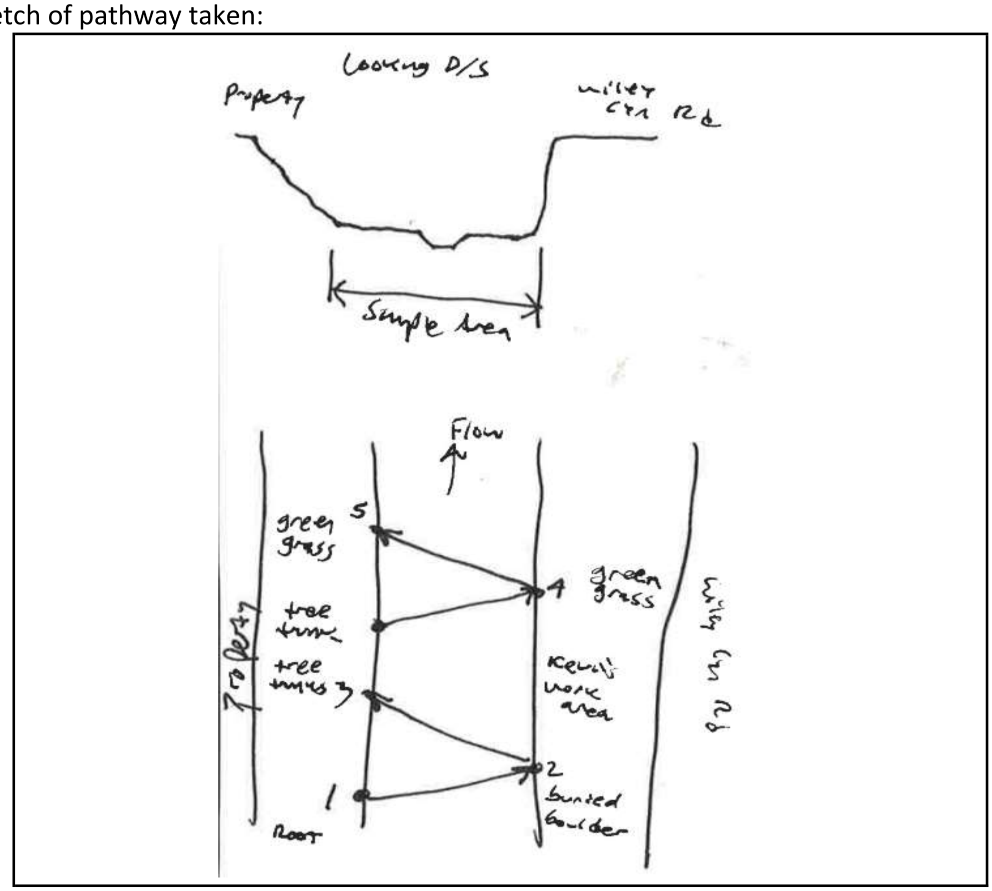
2. Medium cobble	91 – 128
3. Large cobble	129 – 256
(BC) Boulder (Basketball to car diameter)	
1. Small boulder	257 – 512
2. Medium boulder	513 – 1024
3. Large boulder	> 1024
(BC) Bedrock Large solid surface	

Rough sketch of pathway taken:



Notes/Photos:

Sample Point No. 2

Slightly upstream of beginning of rip-rap lining. ~Across from Fourl Rd. Vegetation here consists of large, mature trees adjacent to the flow path. Other than the trees on the sides, there is not much vegetation obstruction, unlike the rest of the creek upstream.

IMG_1928 - IMG_1963