American River Flood Control District
CA CVFPB Encroachment Permit – Installation of Swimming Pool
5091 Teichert Ave, Sacramento
Staff Report

Discussion:

The homeowner at 5091 Teichert Avenue in River Park requests endorsement of the attached permit application for the installation of a concrete lined swimming pool adjacent to the landside levee toe in River Park. The pool is to be installed entirely on the homeowner's side of the property line. The proposed pool will be placed approximately 10-feet from the toe, will be 6 to 7-feet deep and will have a 4-feet wide concrete apron sidewalk around its perimeter.

Typically, swimming pools adjacent to levees are a concern due to the possibility that a homeowner could leave the pool empty during a high-water event. An empty pool has a very small relative weight, or downward force, so it is essentially a magnet for seepage to surge up to it from the saturated levee foundation. A filled pool has a high weight relative to the surrounding soil and does not present this seepage threat mechanism. Accordingly, all proposed pools adjacent to the levee must be supported by a geotechnical analysis that looks at the conditions of the proposed pool if it were kept empty during a high-water event. The applicant worked with a geotechnical engineer to perform the required analysis and has submitted it with the application. The geotechnical analysis concluded that the pool would not exacerbate the existing seepage conditions under the worse-case empty pool scenario.

Recommendation:

The General Manager recommends that the Board of Trustees endorse the permit application for installation of the pool at 5091 Teichert Avenue.

State of California CENTRAL VALLEY FLOOD PROTECTION BOARD California Natural Resources Agency

APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD
ENCROACHMENT PERMIT

Application No. _____
(For Office Use Only)

1. Description of proposed work being specific to include all items that will be covered under the issued permit.

Our family/applicant requests approval for construction of a concrete lined swimming pool placed approximately 10-feet from the landside levee toe. The pool will be 6 to 7-feet deep and will be ringed with a 4-foot wide concrete sidewalk apron. I've attached geotechnical evaluation and seepage analysis for a complete description of the proposed pool with no signs of concern.

2. Project Location: 5091 TEICHERT AVE SACRAMENTO County, in Section Sacramento

Township: _____ (N) (S), Range: _____ (E) (W), M. D. B. & M.

Latitude: 38.58120 Longitude: -121.43906

Stream: American River , Levee : Unit No. 04 American F Designated Floodway: _____

APN: 005-0041-014-0000

3. Dominic & Chelsea Leber of 5091 Teichert Ave
Name of Applicant / Land *Owner* Address

Sacramento (City) CA (State) 95819 (Zip Code) 916-715-4719 (Telephone Number)

dominicleber@yahoo.com (E-mail)

4. _____ of _____
Name of Applicant's Representative Company

_____ (City) _____ (State) _____ (Zip Code) _____ (Telephone Number)

_____ (E-mail)

5. Endorsement of the proposed project from the Local Maintaining Agency (LMA):

We, the Trustees of American River Flood Control District approve this plan, subject to the following conditions:
Name of LMA

☐ Conditions listed on back of this form ☐ Conditions Attached ☐ No Conditions

_____ Trustee Date _____ Trustee Date

_____ Trustee Date _____ Trustee Date

APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD
ENCROACHMENT PERMIT

6. Names and addresses of adjacent property owners sharing a common boundary with the land upon which the contents of this application apply. If additional space is required, list names and addresses on back of the application form or an attached sheet.

Name	Address	Zip Code
William & Shaye Schrick	5081 TEICHERT AVE	
Ben Hagan	5101 TEICHERT AVE	

7. Has an environmental determination been made of the proposed work under the California Environmental Quality Act of 1970? ☐ Yes ☑ No ☐ Pending

If yes or pending, give the name and address of the lead agency and State Clearinghouse Number:

SCH No. _____

8. When is the project scheduled for construction? Nothing will be scheduled until this is approved.

9. Please check exhibits accompanying this application.

A. ☐ Regional and vicinity maps showing the location of the proposed work.

B. ☐ Drawings showing plan view(s) of the proposed work to include map scale.

C. ☐ Drawings showing the cross section dimensions and elevations (vertical datum?) of levees, berms, stream banks, flood plain,

D. ☐ Drawings showing the profile elevations (vertical datum?) of levees, berms, flood plain, low flow, etc.

E. ☐ A minimum of four photographs depicting the project site.

Signature of Applicant — 11/05/202 Date

Date

Include any additional information:

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. S2658-05-01
September 22, 2023

Dominic Leber
5091 Teichert Avenue
Sacramento, California 95819
dominicleber@yahoo.com

Subject: TECHNICAL MEMORANDUM
LEVEE SEEPAGE AND STABILITY EVALUATION FOR
PROPOSED SWIMMING POOL
5091 TEICHERT AVENUE
SACRAMENTO, CALIFORNIA

References

1) United States Army Corps of Engineers (USACE), Sacramento District, *Record Drawings – American River Watershed Project (Common Features), California, Left (South) Bank Levee Strengthening Contract 2),* October 9, 2012.

2) USACE, Sacramento District, *American River, California, Common Features Project, General Reevaluation Report – Final Report,* December 2015.

3) Pool Plan Excerpt – Unattributed, provided via email by Client on August 16, 2023.

4) California Department of Water Resources, *Urban Levee Design Criteria,* May 2012.

Mr. Leber:

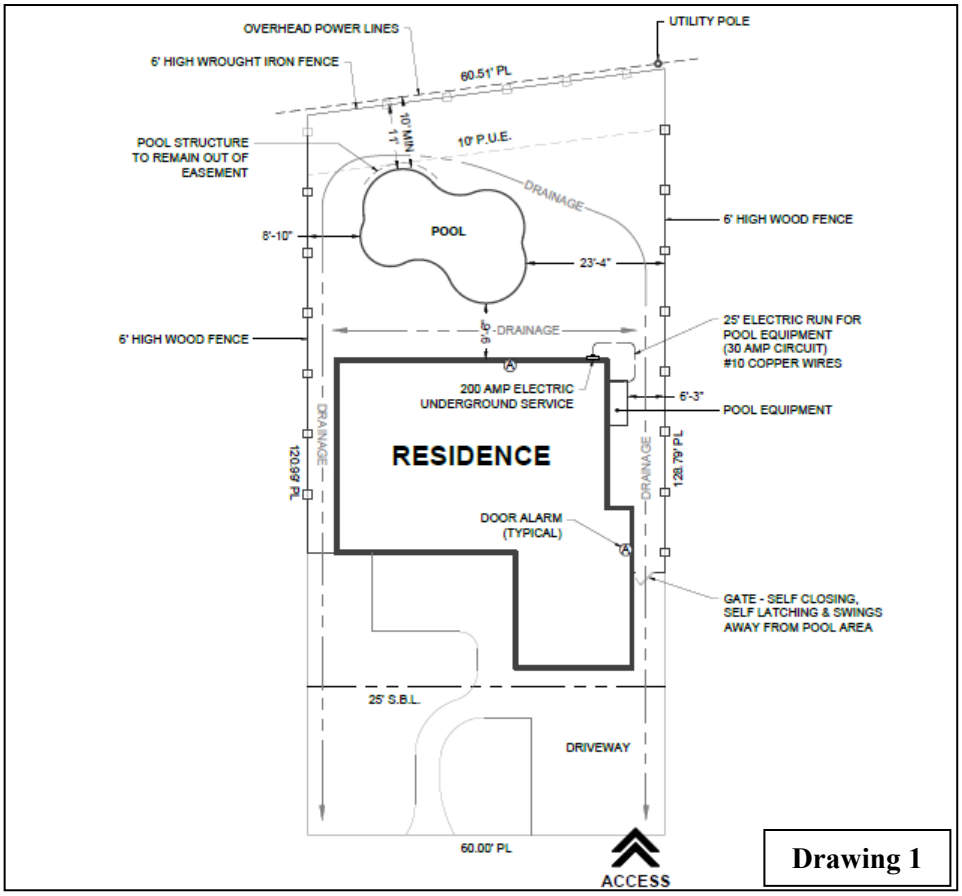
In accordance with your authorization of our proposal (Geocon Proposal No. LS-23-305, dated August 25, 2023), we have prepared this Technical Memorandum summarizing our evaluation of potential adverse impacts to levee seepage and stability from the proposed swimming pool at your residence, located at 5091 Teichert Avenue in Sacramento, California. The approximate site location is shown on the Vicinity Map, Figure 1.

INTRODUCTION AND PURPOSE

The proposed pool will be located approximately 10 feet away from the toe of an existing levee embankment which is part of the flood protection system for the lower American River. This levee is operated and maintained by the Central Valley Flood Protection District (CVFPD) and is currently a Federally certified flood control levee. Per the CVFPD, a geotechnical analysis of slope stability and seepage (through-seepage and under-seepage) is required for proposed pools within 300 feet of levee embankments.

The purpose of our services was to evaluate the impact of construction and long-term use of the proposed swimming pool with respect to seepage and stability characteristics of the levee. Our services are not intended to evaluate the overall integrity or function of the levee, but only evaluate the potential *change* in seepage and stability characteristics of the levee caused by the proposed improvements (e.g. technical comparison of existing and proposed conditions). Specifically, we analyzed seepage conditions (through seepage and underseepage) and stability on the land-side of the levee at American River Common Features (ARCF) Station 7+800. Other analyses and evaluations including (but not limited to) levee geometry requirements, erosion protection, setbacks, and vegetation placement are by others and are not a part of this evaluation.

The proposed swimming pool will be located north of your existing residence as shown in Drawing 1 below.



The configuration of the site and location with respect to the levee and American River are shown on Figures 2 and 3. Figure 4 is an interpreted geologic cross-section (A-A') through the river, levee, and the site.

SCOPE OF SERVICES

To prepare this Technical Memorandum, we:

- Performed a limited geologic/geotechnical literature review to aid in evaluating the geologic conditions present at the site.
- Reviewed the levee improvement record drawings.
- Performed a site reconnaissance to observe current site conditions.
- Developed a geotechnical cross-section using topography and subsurface information from the record drawings. Copies of pertinent portions of the record drawings are included in Appendix A.
- Performed numerical slope stability and seepage analysis considering the current and proposed conditions. Details and results of our stability and seepage analyses are presented in Appendix B.
- Prepared this technical memorandum describing our analytical methods and presenting our findings, conclusions, and recommendations.

BACKGROUND AND DISCUSSION

As part of the WRDA 1996/1999 levee improvements to the ARCF, the levee adjacent to the site was re-graded and improved with a seepage cutoff wall (slurry cutoff wall). Based on available documentation, we understand the work was done within the past 10 years, however an exact timeline for the improvements is unclear at this time. Record drawings for the project (*American River Watershed Project (Common Features), California, Left (South) Bank Levee Strengthening – Contract 2*) show the topography of the levee, width and depth of the slurry cutoff wall, and geotechnical subsurface information from an exploratory boring within approximately 100 feet of the site. This information was used to perform the required geotechnical analysis to evaluate slope stability and seepage of the levee with respect to the proposed pool.

The site is bounded by Teichert Avenue on the south, the American River South Levee on the north, and single-family homes to the east and west. Based on topographic data in the Record Drawings, average site elevation is approximately 32 feet relative to the North American Datum 1983 (NAD 83). Elevation of the top (crown) of the adjacent levee is approximately 47 feet.

The existing levee crown width ranges from approximately 25 to 30 feet. The levee slope inclination ranges from approximately 2.5:1 (horizontal:vertical) to 3:1. The height of the levee with respect to the adjacent landside toe ranges from approximately 13 to 15 feet. Based on the record drawings, the slurry cut-off wall is approximately 2½ feet wide and extends about 70 feet below the top of the levee. Site topography and a representative cross-section (A-A') are presented in Appendices A and B.

The proposed improvements generally consist of excavating and constructing a reinforced-concrete, in-ground swimming pool to a maximum depth of 6 or 7 feet below existing grade in the backyard. The proposed improvements are limited to the "overbuild" portion of the levee landside slope, with a setback of at least 11 feet. The proposed site configuration is shown illustratively in Drawing 1 above.

EVALUATION AND ANALYSIS

As previously discussed, the purpose of our services was to evaluate the impact of the proposed improvements with respect to seepage and stability characteristics of the levee. Our services were not intended to evaluate the overall integrity or function of the levee, but only evaluate the potential *change* in seepage and stability characteristics caused by the proposed improvements. Other analyses and evaluations including (but not limited to) levee geometry requirements, erosion protection, setbacks, and vegetation placement are by others and are not a part of this evaluation.

Representative Cross-Section

Based on the available subsurface data provided in the USACE record drawings, we prepared a representative section (A-A') across the site and adjacent levee (Figure 4). The section shows the existing geometry along with the proposed swimming pool.

Soil Conditions and Parameters

To develop the design subsurface soil profile for our analyses, we reviewed data provided in the Record Drawings, including the boring log for Boring DH-25, located about 100 feet east of the site. Pertinent excerpts from these drawings are included as Attachment 1).

In general, the subsurface soil conditions consist of silty to sandy levee fill overlying layers of silt and poorly graded sand at depth. For our analyses, we assumed typical unit weight and shear strength parameters based on engineering judgment and our experience with similar soils in the local area. The material parameters used in our analyses are summarized in Table 1.

TABLE 1
SOIL PARAMETERS FOR SEEPAGE AND SLOPE STABILITY ANALYSES

Soil Type	Total Unit Weight (pcf)	Shear Strength Parameters[1]		Permeability (cm/sec)[2]	
		Cohesion, C (psf)	Friction Angle, ϕ (degrees)	Vertical	Horizontal
Stiff Silt	115	400	26	$5x10^{-6}$	$5x10^{-7}$
Soft Silt	110	300	24	$5x10^{-6}$	$5x10^{-7}$
Silty Sand	120	150	27	$2x10^{-5}$	$5x10^{-6}$
Sand	115	0	29	$2.5x10^{-4}$	$2.5x10^{-4}$

Notes:
1. Assumed shear strength parameters based on typical values

Water and Groundwater Conditions

The Design Water Surface Elevation (DWSE) of the river used in our analysis was the 200,000 cubic feet per second (CFS) water surface elevation (approximate elevation 42½ feet NAD 83) as shown on the USACE Record Drawings. A review of reported groundwater elevations measured at three monitoring wells within 1½-miles of the site between 1968 to 2023 suggests that groundwater depths fluctuate seasonally and range from about 13 to 35 feet below the ground surface with an average of about 20 feet (approximate Elevation 13 feet NAVD 88). For our analysis, we used a groundwater elevation of 13 feet (approximately 20 feet below the toe of levee elevation) which is considered representative groundwater conditions during a flood event.

Analysis and Results

Using the geometry and DWSE discussed above as well as the soil and groundwater conditions presented herein, we performed finite-element seepage analysis and slope stability analysis of the representative Cross-Section A-A' for both existing and proposed conditions. We used the computer software SEEP/W 2018 and SLOPE/W 2007 by GeoSlope International to perform our analyses.

Under the DWSE, we modeled the seepage front over an infinite time period to mimic steady-state conditions. We calculated the average vertical exit gradient for both the existing and proposed conditions. Using the steady-state potentiometric water surface developed in SEEP/W, we evaluated steady-state static slope stability under static and seismic conditions for both existing and proposed conditions using SLOPE/W. Because the proposed improvements are limited to the land-side of the levee, we did not perform stability analyses for the waterside slope (water-side stability analyses were not requested by the CVFPB). Our evaluation of slope stability under seismic conditions consisted of a pseudostatic analysis that applies a seismic coefficient representing a portion of the slide mass applied as an equivalent horizontal force through the slide mass centroid. Our analysis incorporated a pseudostatic (i.e. seismic) coefficient of 0.1 which was estimated as one-third of the site-modified peak ground acceleration (PGA) obtained from the online *ATC Hazards by Location* application that is maintained by the Applied Technology Council. Results of our seepage and stability analyses are presented in Tables 2 and 3. Details and graphical presentations of our seepage and stability analyses are attached to this Technical Memorandum.

TABLE 2
SEEPAGE ANALYSIS RESULTS

Location	Average Vertical Exit Gradient at Toe (Steady-State 200-year WSE)		Difference
	Existing	Proposed	
A-A'	0.00	0.00	--
**Cross-Section A-A' considers the sheet pile wall located approximately 45 feet north of the landside levee toe.*			

TABLE 3
STABILITY ANALYSIS RESULTS

Location	Condition	Factor of Safety (Steady-State)		Difference	Typical Requirement
		Existing	Proposed		
A-A'	Static	2.5	2.4	-0.1	≥1.5
A-A'	Seismic	1.9	1.8	-0.1	≥1.5

As shown in Table 2, the average vertical exit gradient near the land-side toe of the levee at the location of the proposed swimming pool is calculated as zero for both the existing and proposed condition. As shown in Table 3, the proposed condition results in minor decreases in the factors of safety (FS) against slope failure. This decrease is likely due to our conservative modeling of the pool as being a vertical cut face without reinforcement from the pool walls. Because the static and seismic stability factors of safety are well in excess of the typical minimum requirements (≥1.5), we did not analyze rapid-drawdown stability.

CONCLUSIONS

Based on the results of our analyses, seepage and stability characteristics of the levee are not adversely impacted by the planned improvements as presently proposed, even if the proposed pool is empty during a flood event. Neither seepage conditions nor landslide slope stability appear to appreciably change. Therefore, from a seepage and stability viewpoint, the present level of protection provided by the levee does not appear to be compromised by the proposed project, including the slurry cutoff wall.

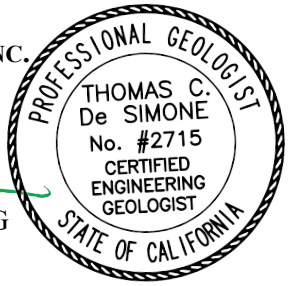
LIMITATIONS

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices used in the project area at this time. No warranty is provided, express or implied.

Please contact the undersigned if there are any questions concerning the contents of this Technical Memorandum or if we may be of further service.

Sincerely,

GEOCON CONSULTANTS, INC.

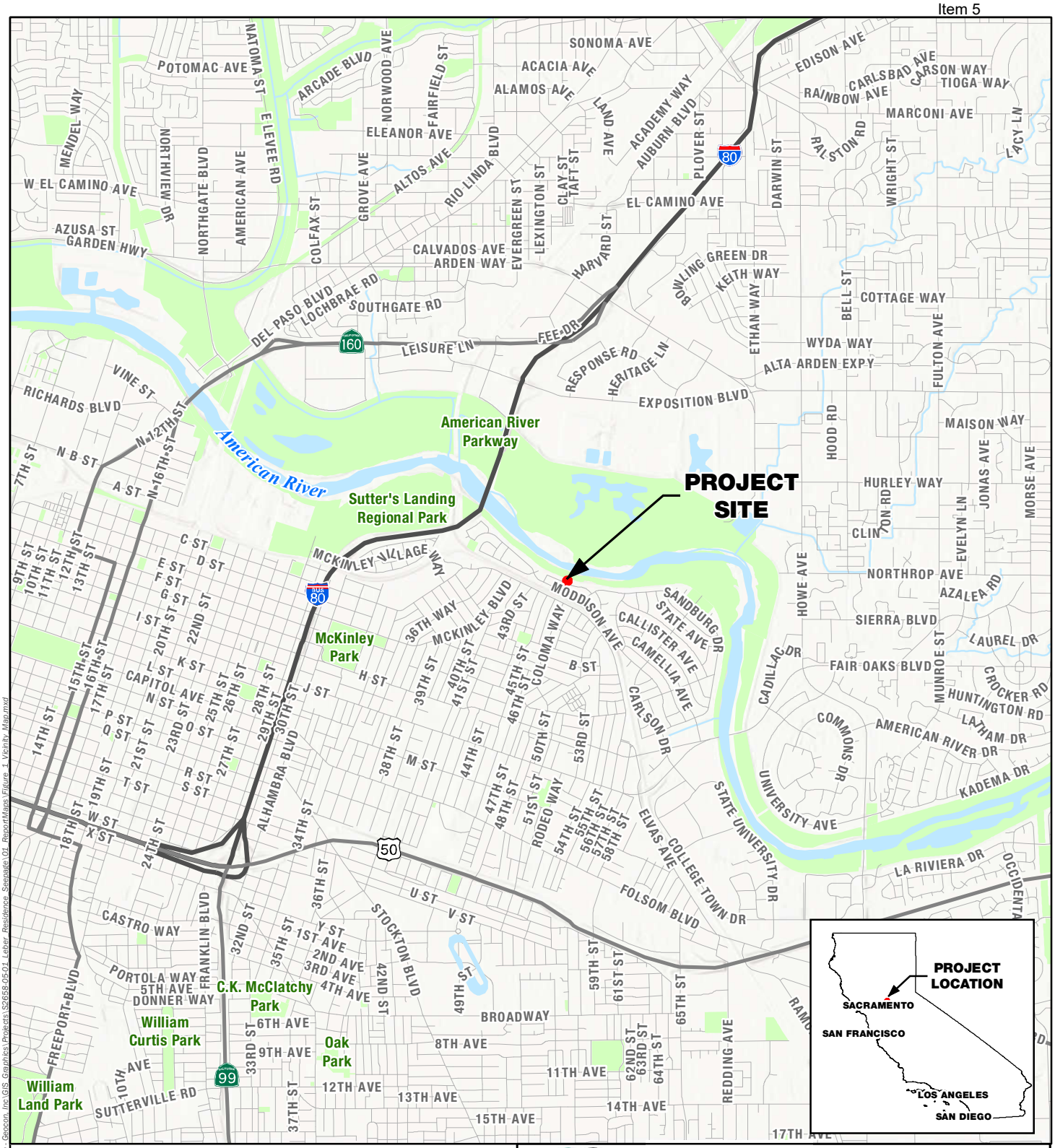


Tom C. DeSimone, PG, CEG
Senior Geologist

Jeremy J. Zorne, PE, GE
Senior Engineer

Figures:
Figure 1 – Vicinity Map
Figure 2 – Aerial Site Map
Figure 3 – Digital Surface Model
Figure 4 – Cross Section A-A'

Attachments:
Appendix A – USACE Record Drawings
Appendix B – Seepage and Slope Stability Analyses (Geocon)
Figure B1 – Seepage Analysis – 100,000 CFS
Figure B2 – Seepage Analysis – 150,000 CFS
Figure B3 – Seepage Analysis – 200,000 CFS
Figure B4 – Slope Stability Analysis – Case 1
Figure B5 – Slope Stability Analysis – Case 2
Figure B6 – Slope Stability Analysis – Case 3
Figure B7 – Slope Stability Analysis – Case 4



GEOCON
CONSULTANTS, INC.
3160 GOLD VALLEY DR - SUITE 800 - RANCHO CORDOVA, CA 95742
PHONE 916.852.9118 - FAX 916.852.9132

Leber Residence Seepage Study

5091 Teichert Avenue
Sacramento, California

VICINITY MAP

S2658-05-01	September 2023	Figure 1

Aerial Imagery Captured by Geocon on August 31, 2023 using DJI Air 2S Unmanned Aerial Vehicle.
Orthomosaic created using WebODM.

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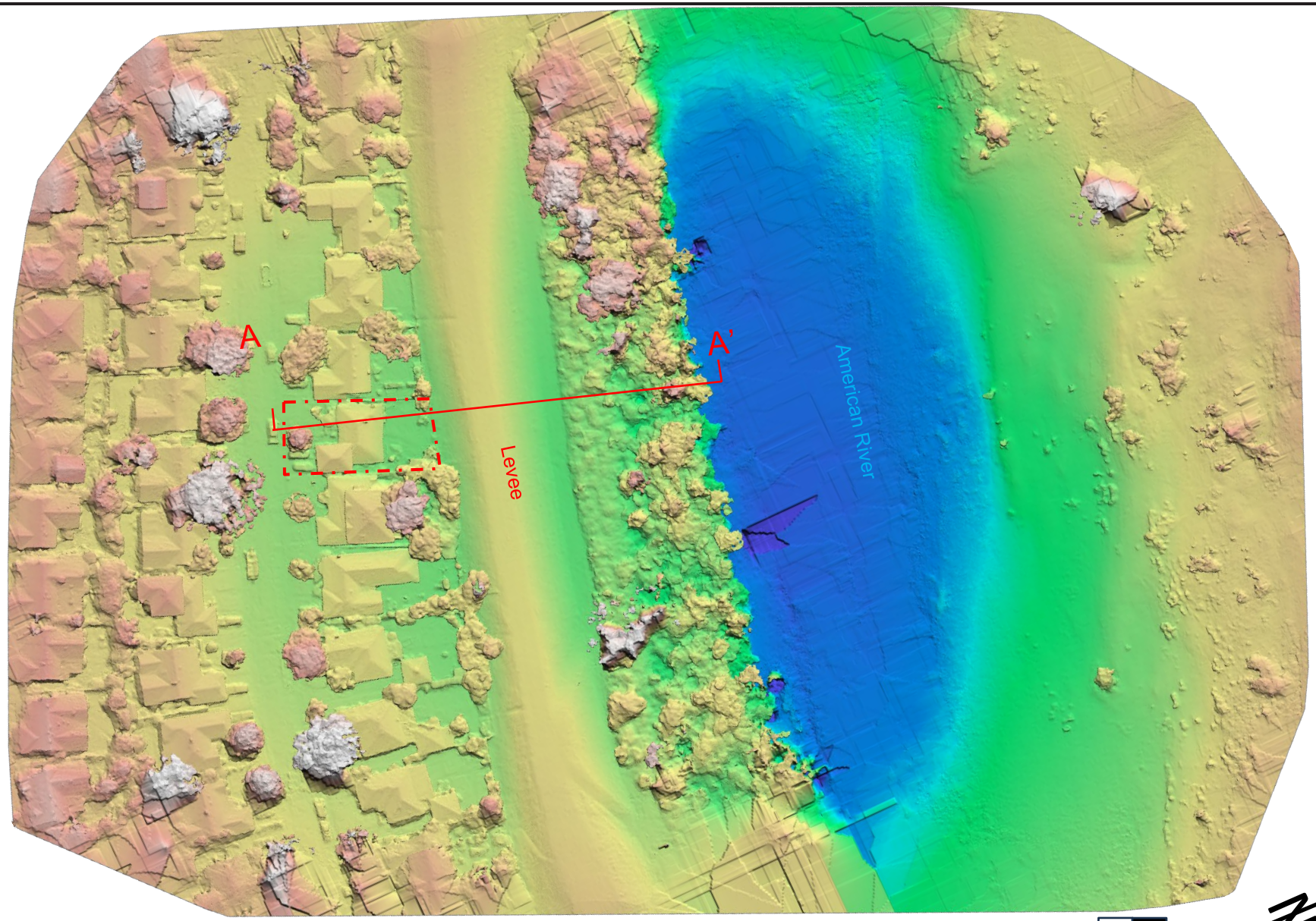
AERIAL SITE MAP

FIGURE 2

5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



Digital Surface Model based on Aerial Imagery Captured by Geocon on August 31, 2023 using DJI Air 2S Unmanned Aerial Vehicle. Orthomosaic created using WebODM.

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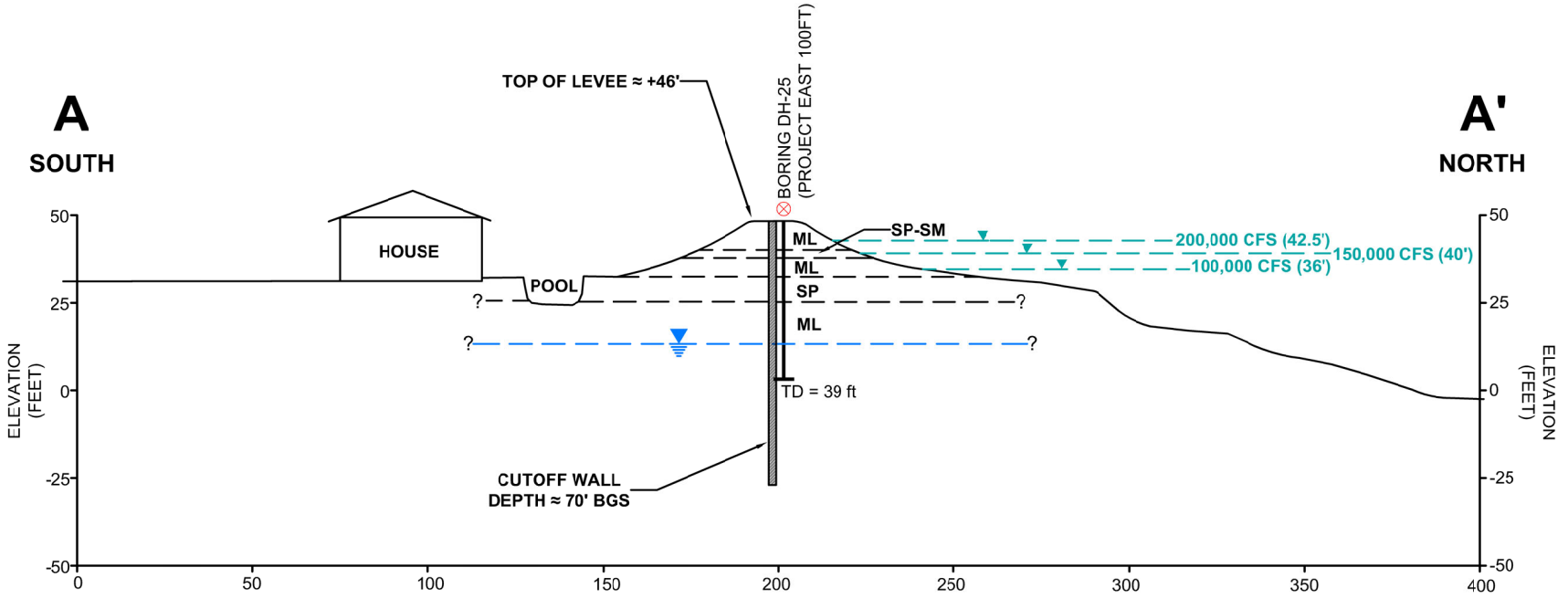
DIGITAL SURFACE MODEL

FIGURE 3

3091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



Legend

DH-25
Boring Location

Lithology Contact

ML Silt

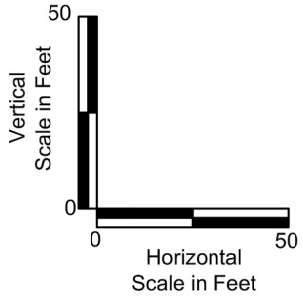
SM Silty sand

SP Poorly graded sand

High Groundwater Based on Monitoring Well data within 1.5 miles offsite (+13')

Approximate river elevation during set flow

Abbreviations:
CFS = cubic feet per second
ft = Feet
TD = Total Depth



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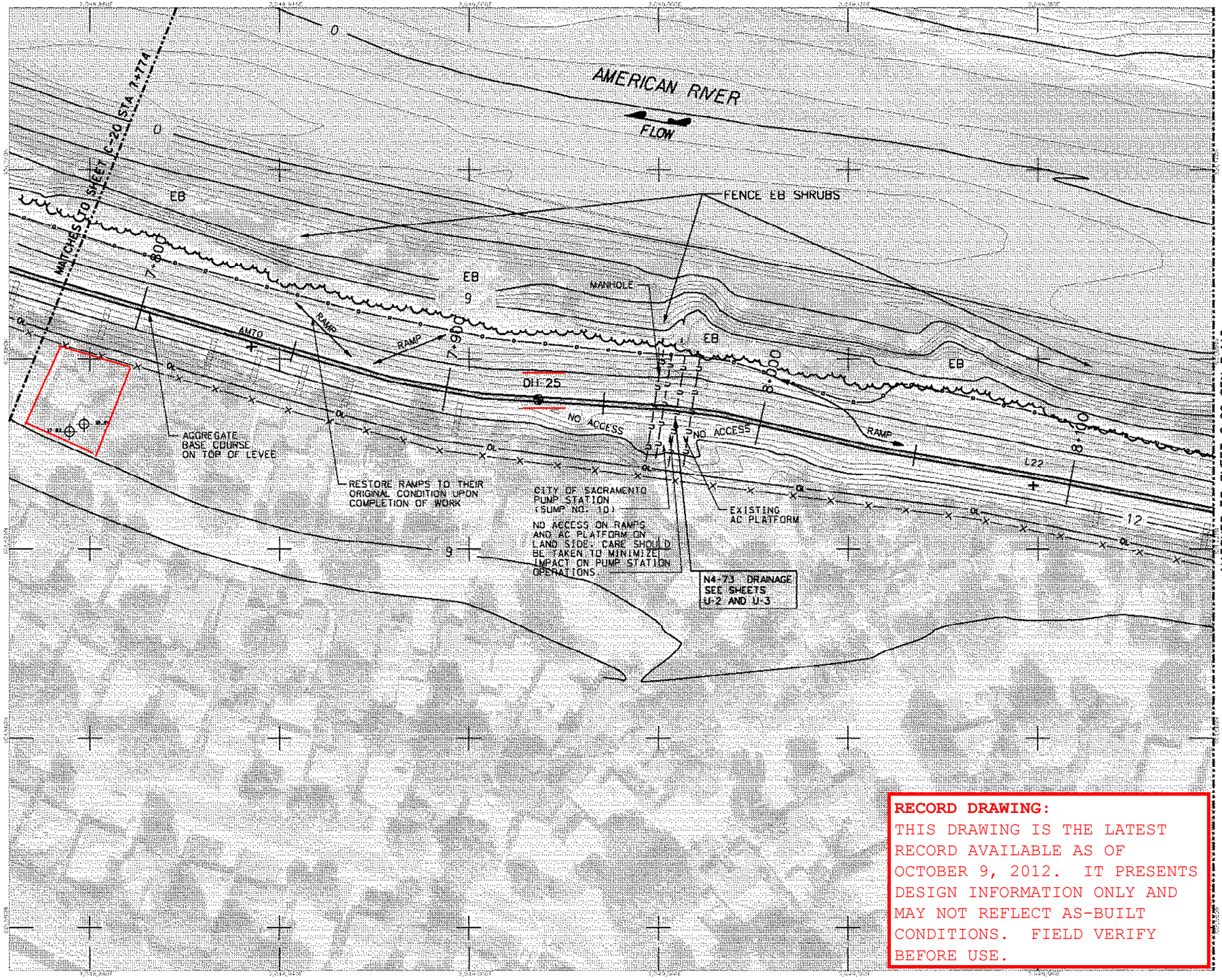
Leber Residence Seepage Study

5091 Teichert Avenue
Sacramento, California

CROSS SECTION A-A'

S2658-05-01	September 2023	Figure 4

APPENDIX A



GENERAL NOTES:

GRID COORDINATES ARE IN METERS AND REFER TO THE CALIFORNIA STATE COORDINATE SYSTEM ZONE II, NAD 83/91

THIS ORTHOPHOTO WAS PRODUCED FROM AERIAL PHOTOGRAPHY DATED 10-2-96

THIS MAP MEETS THE NATIONAL STANDARDS OF ACCURACY FOR ORTHOPHOTO MAPS BY PHOTOGRAMMETRIC METHODS

LEGEND

SYMBOL	DESCRIPTION
	LEVEE ALIGNMENT
	SLURRY CUTOFF WALL
—U—U—U—	UTILITY LINE
—OL—OL—OL—	OVERHEAD UTILITY LINE
N4-73	UTILITY IDENTIFICATION
	SOIL BORING
DH-25	BORING IDENTIFICATION
+	CONTROL POINT
AM70	CONTROL POINT IDENTIFICATION
	PHOTO CENTER
EB	ELDERBERRY SHRUB
	STAIRWAY
—X—X—	FENCE
	LEVEE TOE ACCESS (SEE SHEET G-3 NOTE 2)

SLURRY CUTOFF WALL PROFILE

STATION	DEPTH (METERS)
7+800	21.5
7+900	21.5
8+000	21.5
8+100	21.5

CONSTRUCTION NOTE:

CONSTRUCT SLURRY CUTOFF WALL TO THE DEPTHS AS SHOWN ABOVE. SEE SLURRY CUTOFF WALL PROFILES ON SHEETS B-2 AND B-3 AND DETAILS ON SHEETS C-37, C-38, AND C-39.

GRAPHIC SCALE

0 10 20 30 40
METERS

RECORD DRAWING:
THIS DRAWING IS THE LATEST RECORD AVAILABLE AS OF OCTOBER 9, 2012. IT PRESENTS DESIGN INFORMATION ONLY AND MAY NOT REFLECT AS-BUILT CONDITIONS. FIELD VERIFY BEFORE USE.

REGISTERED PROFESSIONAL ENGINEER
SAID SALAHUDDIN
No. C 050445
Exp. 09/30/01
CIVIL
STATE OF CALIFORNIA

US Army Corps of Engineers Sacramento District

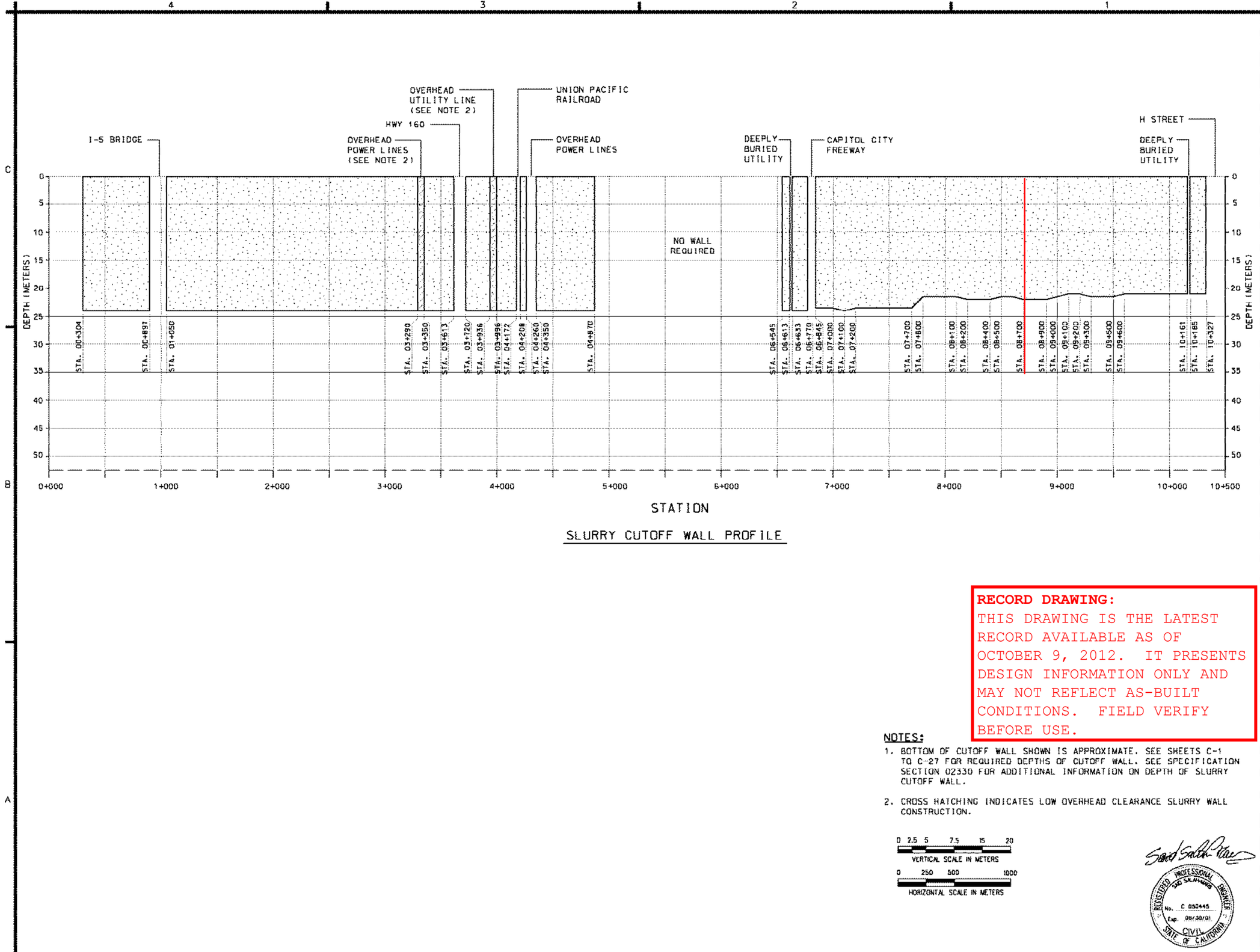
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

URS Greiner Woodward Clyde
OAKLAND, CALIFORNIA

AMERICAN RIVER
AMERICAN RIVER WATERSHED PROJECT
(COMMON FEATURES), CALFORNIA
LEFT (SOUTH) BANK LEVEE STRENGTHENING
CONTRACT 2

ORTHOPHOTO/PLAN
STA. TO 7+774 TO 8+146

Sheet reference number:
C-21
SEQ. 30



SLURRY CUTOFF WALL PROFILE

RECORD DRAWING:
THIS DRAWING IS THE LATEST RECORD AVAILABLE AS OF OCTOBER 9, 2012. IT PRESENTS DESIGN INFORMATION ONLY AND MAY NOT REFLECT AS-BUILT CONDITIONS. FIELD VERIFY BEFORE USE.

NOTES:

1. BOTTOM OF CUTOFF WALL SHOWN IS APPROXIMATE. SEE SHEETS C-1 TO C-27 FOR REQUIRED DEPTHS OF CUTOFF WALL. SEE SPECIFICATION SECTION 02330 FOR ADDITIONAL INFORMATION ON DEPTH OF SLURRY CUTOFF WALL.
2. CROSS HATCHING INDICATES LOW OVERHEAD CLEARANCE SLURRY WALL CONSTRUCTION.

0 2.5 5 7.5 15 20
VERTICAL SCALE IN METERS

0 250 500 1000
HORIZONTAL SCALE IN METERS

REGISTERED PROFESSIONAL ENGINEER
No. C 050445
Exp. 09/30/01
CIVIL
STATE OF CALIFORNIA

US Army Corps of Engineers
Sacramento District

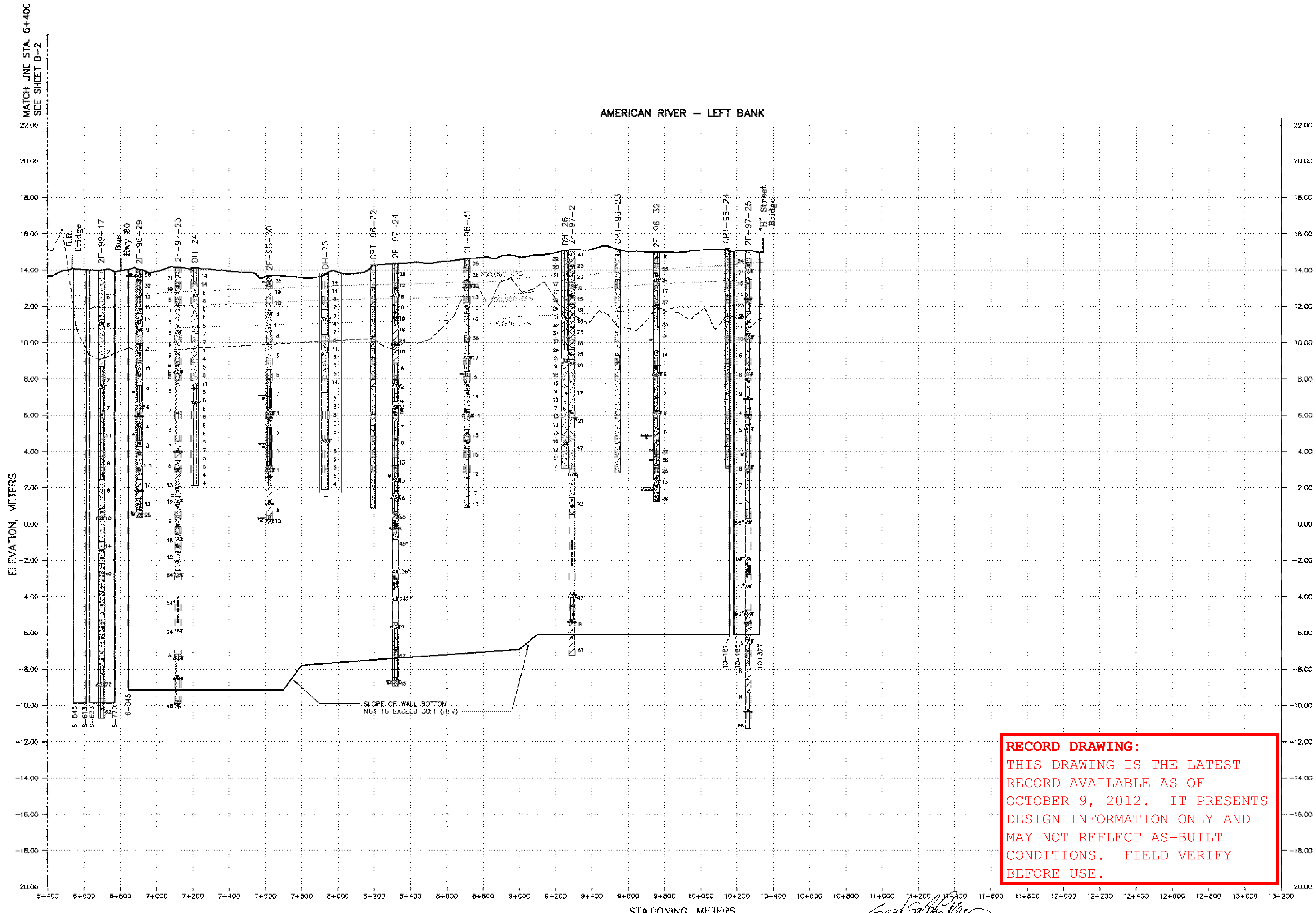
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA
URS Greiner Woodward Clyde
OAKLAND, CALIFORNIA

AMERICAN RIVER
AMERICAN RIVER WATERSHED PROJECT
(COMMON FEATURES), CALIFORNIA
LEFT (SOUTH) BANK LEVEE STRENGTHENING
CONTRACT 2
SLURRY CUTOFF WALL
LOCATION DRAWING

Sheet reference number:
C-40
SEQ. 49

MATCH LINE STA. 6+400
SEE SHEET B-2

AMERICAN RIVER – LEFT BANK



RECORD DRAWING:
THIS DRAWING IS THE LATEST RECORD AVAILABLE AS OF OCTOBER 9, 2012. IT PRESENTS DESIGN INFORMATION ONLY AND MAY NOT REFLECT AS-BUILT CONDITIONS. FIELD VERIFY BEFORE USE.

LEGEND

- BASE OF SLURRY WALL
- TOP OF LEVEE
- LANDSIDE TOE OF LEVEE
- FLOOD LEVEL WATERLINE

NOTES:

1. WATER SURFACES SHOWN ARE FOR THE 115,000 CFS, THE 150,000 CFS AND THE 200,000 CFS FLOW QUANTITIES. THE 115,000 WATER SURFACE PROFILE REPRESENTS THE EXISTING DESIGN FLOW. THE 150,000 CFS WATER SURFACE PROFILE REPRESENTS THE PNP DESIGN STAGE FOR THE DETENTION DAM PLAN. THE 200,000 CFS WATER SURFACE PROFILE REPRESENTS THE PNP DESIGN STAGE FOR THE STEPPED RELEASE PLAN.
2. ELEVATION OF TOP OF LEVEE AND TOE OF LEVEE SHOWN ARE APPROXIMATE AND BASED ON SURVEY INFORMATION PROVIDED BY USACE. SEE SHEETS C-1 TO C-27 FOR ADDITIONAL TOPOGRAPHIC INFORMATION.
3. ELEVATIONS OF THE BOTTOM OF CUTOFF WALL SHOWN ON THIS SHEET ARE APPROXIMATE. SEE SHEETS C-1 THROUGH C-27 FOR THE REQUIRED DEPTH OF CUTOFF WALL. MAXIMUM DEPTH OF CUTOFF WALL IS LIMITED TO 24 METERS. SEE SPECIFICATION SECTION 02330, FOR DETAILS.
4. ADDITIONAL LEGEND AND NOTES ARE SHOWN ON SHEET B-1.

GRAPHIC SCALES
VERTICAL SCALE 1 : 1 — 0 1 2 4 6 8 10 METERS
HORIZONTAL SCALE 1 : 100 — 0 100 200 400 600 800 1000 METERS

REGISTERED PROFESSIONAL ENGINEER — SAID SALAH-MARS — No. C 050445 — Exp. 06/30/01 — CIVIL — STATE OF CALIFORNIA

US Army Corps of Engineers
Sacramento District

Designed by: S. PUNYAMURTHULA	Date: 18 JAN 2000	Rev.
Dwn by: M. IBRAHIM / Ckd by: U. LUSCHER	Design file no: 1-04-477	
Reviewed by: M. FORREST	SPEC. No: 2140	
Submitted by: Chief, Civil Design Section A	File name: ARB5-02.DWG Plot date: 24 JAN 2000 Plot scale: 1 : 1	

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

URS Greiner Woodward Clyde
OAKLAND, CALIFORNIA

SAID SALAH-MARS

AMERICAN RIVER — CALIFORNIA
AMERICAN RIVER WATERSHED PROJECT
(COMMON FEATURES), CALIFORNIA
LEFT (SOUTH) BANK LEVEE STRENGTHENING
CONTRACT 2

LEFT BANK LEVEE SLURRY CUTOFF WALL PROFILE AND STICK LOGS STA. 6+400 TO STA. 13+200

Sheet reference number: B-3
SEQ. 58

Item 5

DH-25

STA. 7+930

EL. 13.78 m (45.2')

DEPTH	Symbol	N	GR	SA	FI	LL	PI	MC	Description
0	ML	14	–	–	–	–	–	–	At surface, POORLY GRADED GRAVEL, GP (road gravel), 91 mm (0.3') thick. SILT, ML: Stiff; moist; moderate to dark yellowish-brown; nonplastic fines; traces of fine, rounded gravel; traces of coarse sand
		14							
(3.5') 1.07 m		8	–	–	–	–	–	–	SILT WITH SAND, ML to SANDY SILT, ML: Firm; moist; about 60–80% nonplastic fines; about 20–40% fine sand
(4.4') 1.34 m	SP-SM/SM	7	–	–	–	–	–	–	POORLY GRADED SAND WITH SILT, SP-SM to SILTY SAND, SM: Loose; moist; pale to moderate yellowish-brown; about 75–90% fine sand; about 10–25% nonplastic fines
(6.5') 1.98 m									
(6.9') 2.10 m	ML	3	0	49	51	–	–	–	SANDY SILT, ML: Soft; moist; moderate yellowish-brown; nonplastic fines; fine to medium, mostly fine sand; occasional pods of POORLY GRADED SAND WITH SILT, SP-SM to SILTY SAND, SM, pale to moderate yellowish-brown; about 75–90% fine sand; about 10–25% nonplastic fines
		4							
(9.5') 2.90 m		7	–	–	–	–	–	–	At 3.0 m (10.0'), as above except firm; light brown mottling; iron oxide staining
(10.7') 3.26 m	SP	6	–	–	–	–	–	–	
(12.5') 3.81 m		11	0	97	3	–	–	–	POORLY GRADED SAND, SP: Loose to firm; moist; pale yellowish-brown; fine to medium, mostly medium sand; fines present; occasional pods of SILTY CLAY, ML/CL
(15.5') 4.72 m		8	–	–	–	–	–	–	
		8							At 4.9 m (16.1'), as above except fine with trace of medium to coarse sand; trace of fine, rounded gravel maximum particle size 6 mm (1/4")
		5							
(19.2') 5.85 m	ML	14	–	–	–	–	–	–	SILT, ML: Stiff; moist; moderate yellowish-brown; nonplastic fines. At 5.9 m (19.5'), speculate gravel layer present; rough drilling; no recovery
(21.5') 6.55 m		8	–	–	–	–	–	–	SILT, ML to SILT WITH SAND, ML: Firm; moist; moderate brown; about 80–90% nonplastic fines; about 10–20% fine sand; traces of charcoal present; foundation contact at 6.6 m (21.5')
		8							
(24.5') 7.47 m		8	–	–	–	–	–	–	SILT WITH SAND, ML to SANDY SILT, ML: Firm; moist; moderate brown; about 60–80% nonplastic fines; about 20–40% fine sand. At 7.9 m (26.0'), as above except occasional sand lenses present
		6							
		6							
(29.0') 8.84 m	ML	TUBE #1	0	42	58	–	NP	–	SANDY SILT, ML: Moderate brown; moist; nonplastic fines; fine to medium, mostly fine sand; traces of charcoal material present
(31.3') 9.54 m		5							At 9.8 m (32.0'), as above except firm
		6							
(35.5') 10.82 m		5	–	–	–	–	–	–	At 10.8 m (35.5'), as above except wet; soft to firm
		5							
(39.0') 11.89 m		4							B.O.H.

DH-26

STA. 9+250

EL. 15.1 m (49.5')

DEPTH	Symbol	N	GR	SA	FI	LL	PI	MC	Description
0	SM	32	–	–	–	–	–	–	At surface, POORLY GRADED GRAVEL, GP (road gravel), 61 mm (0.2') thick. SILTY SAND, SM: Dense; moist; moderate yellowish-brown; about 70–80% fine sand; about 20–30% nonplastic fines; occasional lenses of CLAYEY SILT, CL/ML, 13 mm (1/2") maximum thickness; occasional lenses of POORLY GRADED SAND, SP
(2.0') 0.61 m	SP-SM/SM	20							POORLY GRADED SAND WITH SILT, SP-SM to SILTY SAND, SM: Very firm to firm; moist; moderate yellowish-brown; about 85–90% fine sand; about 10–15% nonplastic fines
		21							
		17	–	–	–	–	–	–	
		17							
		16							
		26							
(11.0') 3.35 m	SM	31	0	87	13	–	–	–	SILTY SAND, SM: Very firm to dense; moist; moderate yellowish-brown; fine to medium, mostly medium sand; nonplastic fines
		32							
(14.0') 4.27 m		37	–	–	–	–	–	–	
		37							
		29							
(18.2') 5.55 m									
(18.5') 5.64 m	SP	11	0	97	3	–	–	3	POORLY GRADED SAND, SP: Loose to firm; moist; pale yellowish-brown; fine to coarse, mostly medium sand; fines present; foundation contact at 5.5 m (18.2')
		9							
(21.5') 6.55 m		15	–	–	–	–	–	–	
(23.8') 7.25 m	ML	15							SANDY SILT, ML: Stiff; very moist; moderate yellowish-brown
(24.0') 7.32 m	SP-SM	9							POORLY GRADED SAND WITH SILT, SP-SM: Loose to firm; pale yellowish-brown; about 90% fine sand; about 10% nonplastic fines
		10							
		7							At 8.84 m (29.0'), as above except light brown; weak iron oxide staining. At 9.0 m (29.5'), as above except occasional lenses of SILTY SAND, SM, traces of fine, rounded gravel maximum particle size 6 mm (1/4")
		13							
		12							
		10							
(33.5') 10.21 m	SP	16	0	95	5	–	–	–	POORLY GRADED SAND, SP: Loose to firm; moderate yellowish-brown; fine to medium, mostly medium sand; nonplastic fines; strong iron oxide staining
(36.5') 11.13 m		12							
		11							
(39.5') 12.04 m		7							B.O.H.

NOTES:

1. THE LEGENDS AND NOTES ARE SHOWN ON SHEET B-1.

REGISTERED PROFESSIONAL ENGINEER, SAID SALAH-MARS, No. C 056445, Exp. 06/30/01, CIVIL, STATE OF CALIFORNIA

GRAPHIC SCALE

SCALE 1 : 25 — 0, 0.5, 1, 1.5, 2, 2.5 METERS

RECORD DRAWING:
THIS DRAWING IS THE LATEST RECORD AVAILABLE AS OF OCTOBER 9, 2012. IT PRESENTS DESIGN INFORMATION ONLY AND MAY NOT REFLECT AS-BUILT CONDITIONS. FIELD VERIFY BEFORE USE.

US Army Corps of Engineers, Sacramento District

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

URS Greiner Woodward Clyde
OAKLAND, CALIFORNIA

SAID SALAH-MARS

Designed by: R. IWASA (USACE)	Date: 18 JAN. 2000
Dwn by: R. AQUINO / Ckd by: U. LUSCHER	Design file no: 1-04-477
Reviewed by: S. PUNTAMURTHULA	SPEC. No: 1141
Submitted by: Chief, Civil Design Section A	File name: ARB15-02.DWG; Plot date: 14 JAN. 2000; Plot scale: 1 : 1

AMERICAN RIVER, CALIFORNIA
AMERICAN RIVER WATERSHED PROJECT (COMMON FEATURES), CALIFORNIA
LEFT (SOUTH) BANK LEVEE STRENGTHENING
CONTRACT 2

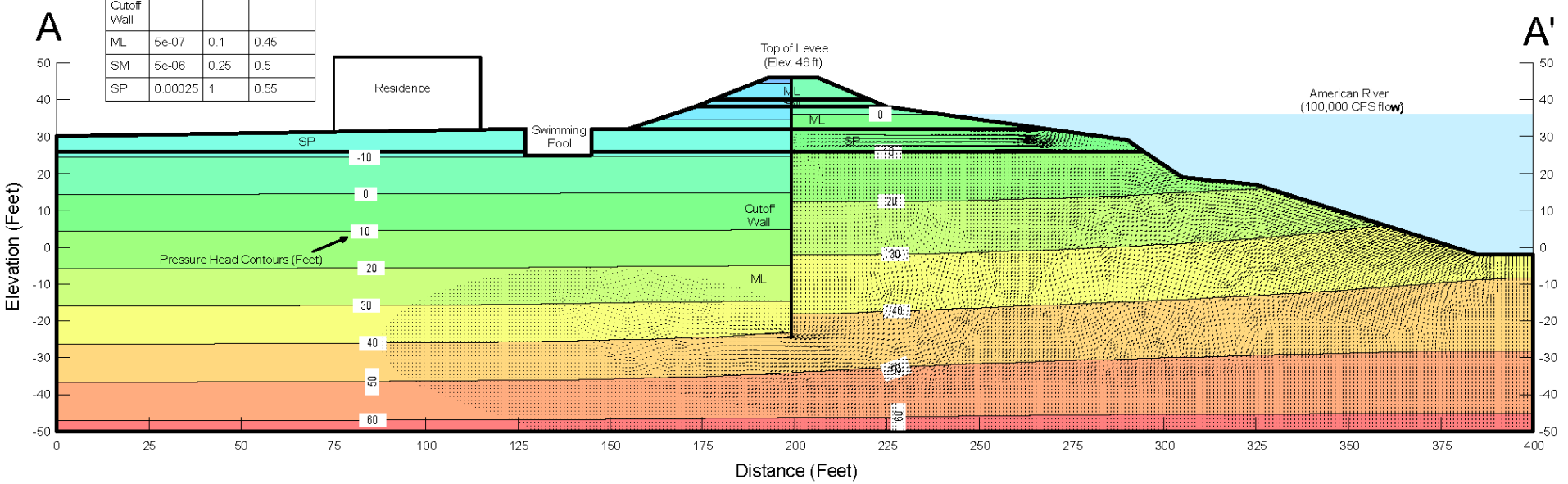
LOGS OF EXPLORATIONS
DH-25 & DH-26

Sheet reference number: B-11

SEQ. 60

APPENDIX B

Name	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content
Cutoff Wall			
ML	5e-07	0.1	0.45
SM	5e-06	0.25	0.5
SP	0.00025	1	0.55



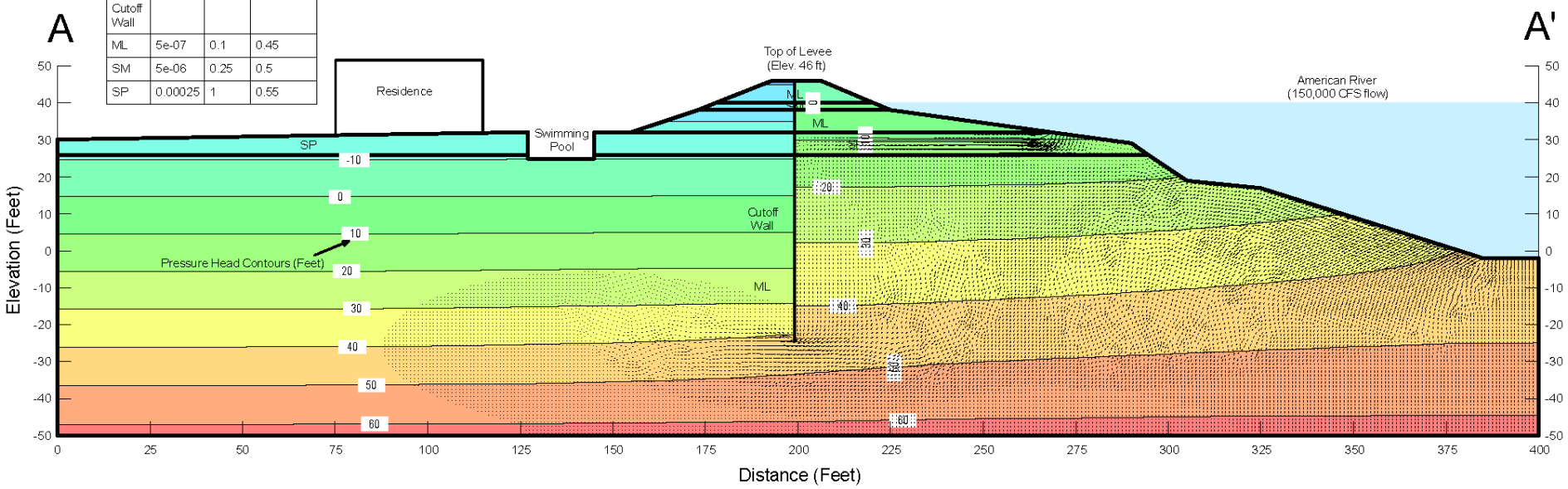
GEOCON CONSULTANTS, INC.
3160 GOLD VALLEY DR – SUITE 800 – RANCHO CORDOVA, CA 95742
PHONE 916.852.9118 – FAX 916.852.9132

SEEPAGE ANALYSIS – 100,000 CFS

FIGURE B1
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023

Name	Sat Kx (ft/sec)	Ky/Kx' Ratio	Volumetric Water Content
Cutoff Wall			
ML	5e-07	0.1	0.45
SM	5e-06	0.25	0.5
SP	0.00025	1	0.55



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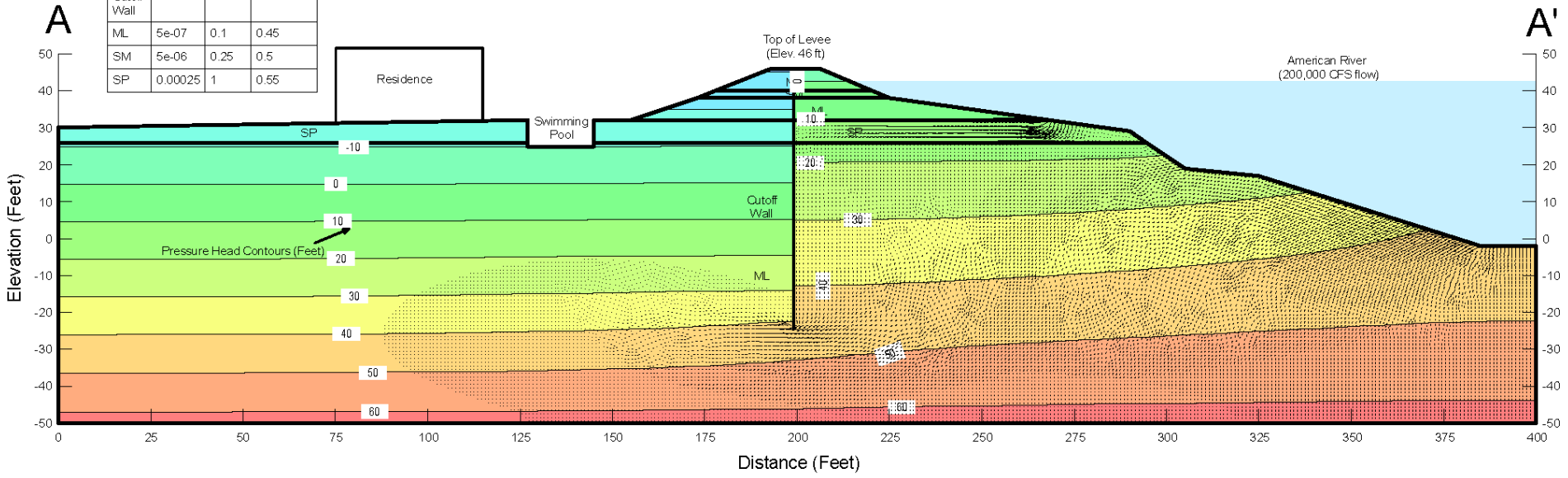
SEEPAGE ANALYSIS – 150,000 CFS

FIGURE B2
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023

Name	Sat Kx (ft/sec)	Ky/Kx' Ratio	Volumetric Water Content
Cutoff Wall			
ML	5e-07	0.1	0.45
SM	5e-06	0.25	0.5
SP	0.00025	1	0.55



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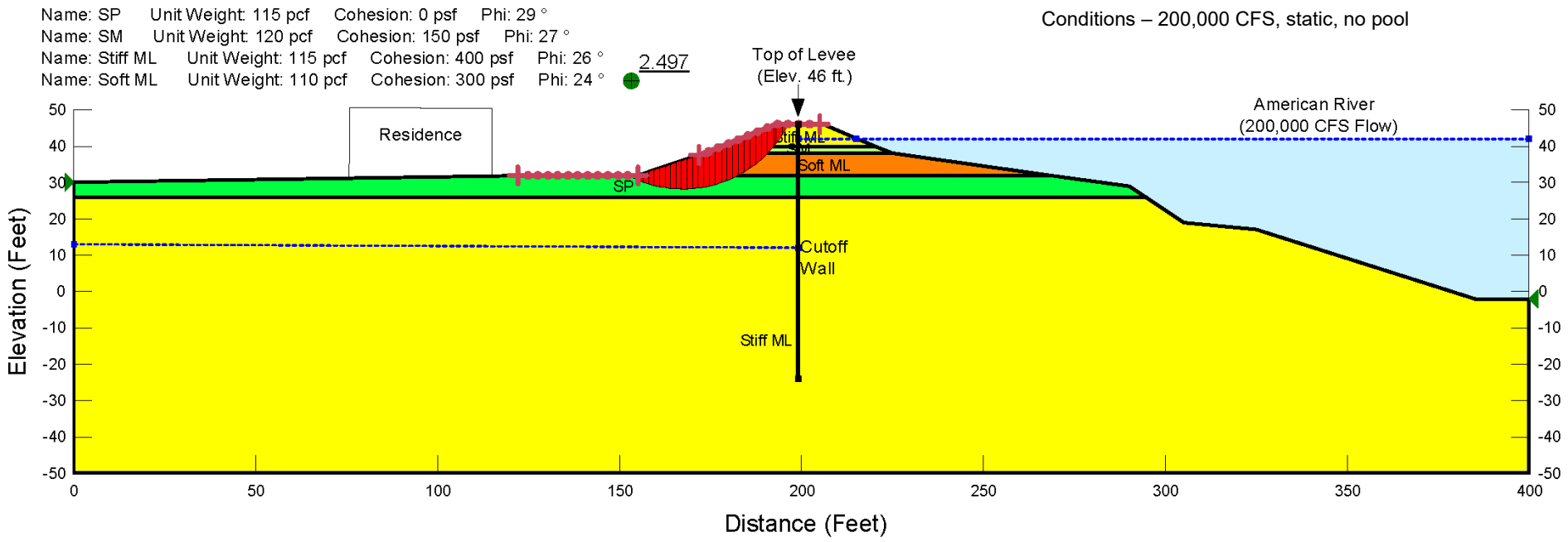
SEEPAGE ANALYSIS – 200,000 CFS

FIGURE B3
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



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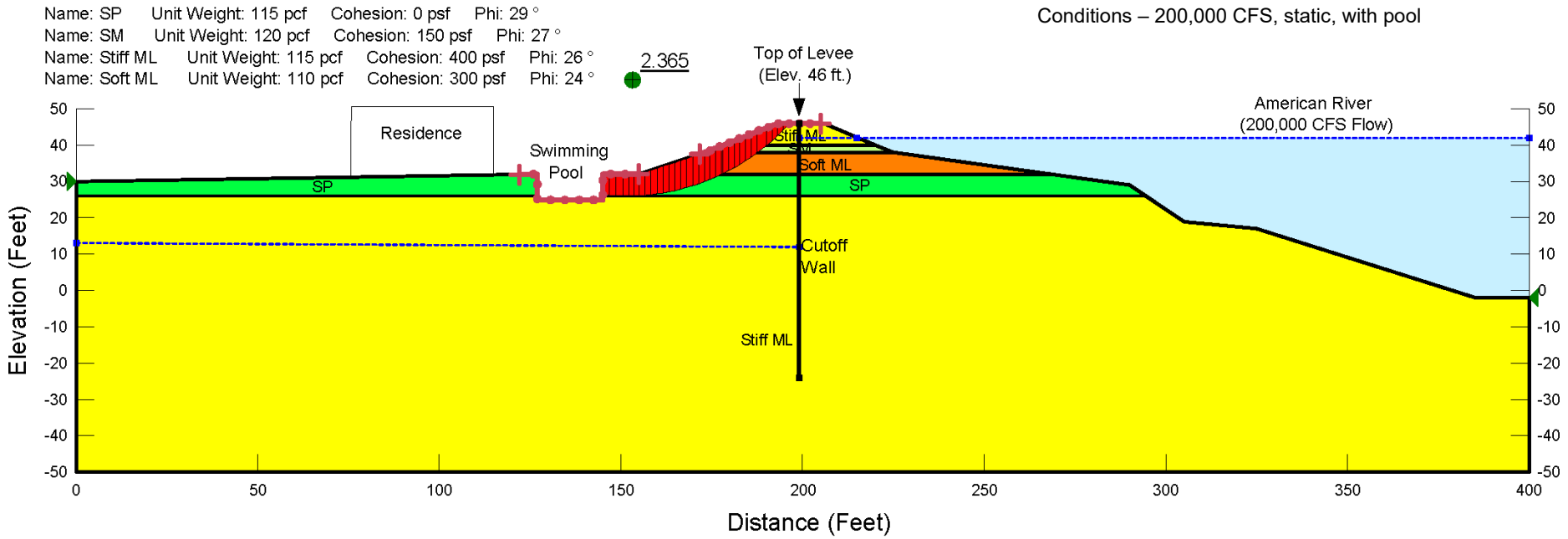
SLOPE STABILITY ANALYSIS
CASE 1

FIGURE B4
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



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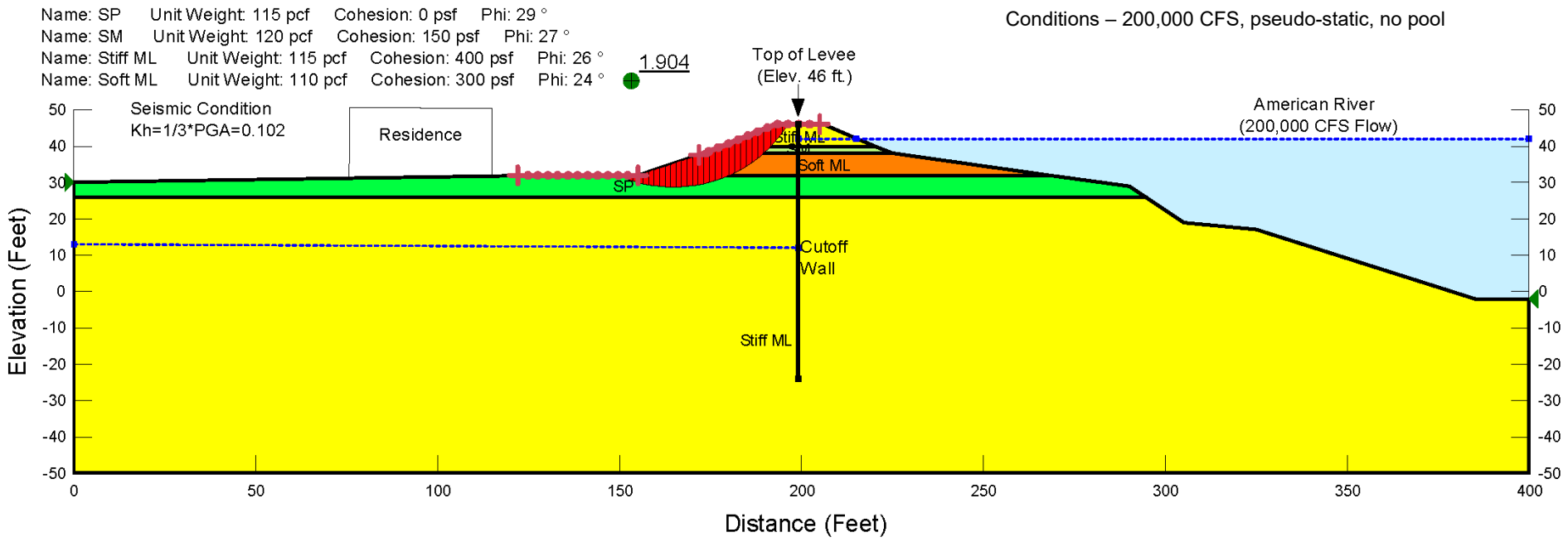
SLOPE STABILITY ANALYSIS
CASE 2

FIGURE B5
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



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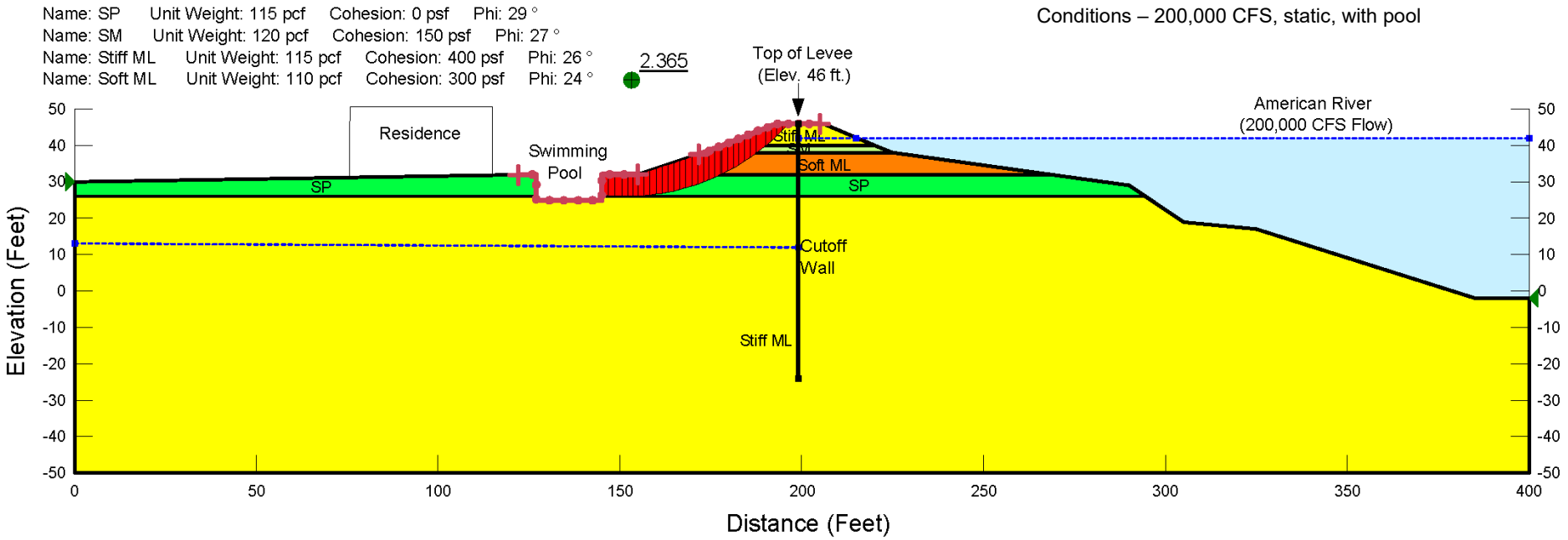
SLOPE STABILITY ANALYSIS
CASE 3

FIGURE B6
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023



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SLOPE STABILITY ANALYSIS
CASE 2

FIGURE B7
5091 Teichert Avenue
Sacramento, California

GEOCON Project No. S2658-05-01 | September 2023