URBAN LEVEE DESIGN CRITERIA EVALUATION

Mossdale Tract Reclamation District No. 17 San Joaquin County, California

Expect Excellence

Submitted to:

Mr. Dave Peterson Peterson Brustad Inc. 1180 Ironpoint Road, Suite 260 Folsom, CA 95630

> Prepared by: ENGEO Incorporated

> > October 30, 2015

Project No: 5747.005.000

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Project No. **5747.005.000**

October 30, 2015

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Subject: Mossdale Tract Reclamation District No. 17 San Joaquin County, California

URBAN LEVEE DESIGN CRITERIA EVALUATION

Dear Mr. Peterson:

In conjunction with the project team, we performed a geotechnical levee evaluation of the Reclamation District No. 17 levee system using Urban Levee Design Criteria (ULDC); our evaluation studies seepage, slope stability, settlement, and seismic vulnerability. This study is tied to California Senate Bill 5 (SB5), which outlines that urban or urbanizing areas provide a 200-year level of flood risk protection by July 2016. Our detailed findings are presented in this report.

It is a pleasure to be of service to this project and significant study. If you have any questions regarding the contents of this report, please do not hesitate to contact us.

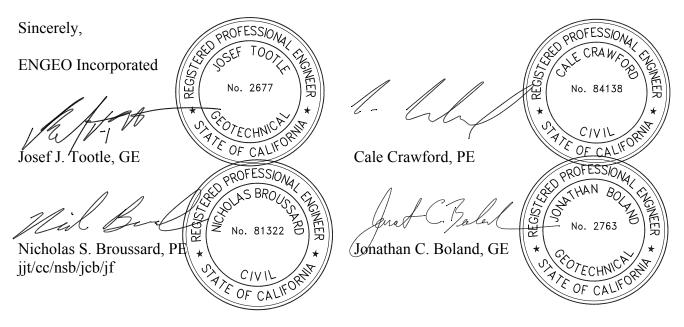


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1.0 INTRODUCTION

1.1 SCOPE

In 2007, California Senate Bill 5 (SB5) was signed into law, which mandates that urban and urbanizing areas provide a 200-year level of flood risk (0.005 Annual Exceedance Probability - AEP) protection in the Central Valley of California by July 2016. The Urban Levee Design Criteria (ULDC) and Urban Level of Flood Protection (ULOP) requirements were developed by the California Department of Water Resources (DWR) pursuant to SB5.

This report presents our levee evaluation of the Project levee portion as well as the northern and southern Non-Project levee portions of the Reclamation District No. 17 (RD 17) levee system. We used ULDC criteria to develop the documentation needed to allow the City of Lathrop and the City of Manteca (Cities) to make a "Finding" that an Urban Level of Flood Protection exists within the area that approximately follows the limits of RD 17.

Our authorized scope of services included evaluation of the following ULDC Section tasks and preparation of this report with the results of our evaluation:

- Section 7.3: Soil Sampling, Testing and Logging
- Section 7.4: Slope Stability for Intermittently Loaded Levees
- Section 7.5: Underseepage for Intermittently Loaded Levees
- Section 7.7: Seismic Vulnerability

This report was prepared for the exclusive use of our client and their design team consultants. In the event that any changes are made in the character, design or layout of the project, we must be contacted to review the conclusions and recommendations contained in this report to determine whether modifications are necessary.

1.2 REACH LIMIT SUMMARY

As part of our ULDC evaluation, the project team divided up the levee alignment into 56 separate reaches characterized by similar surface features, subsurface soil conditions, and/or past levee performance. The reaches and stationing limits for this evaluation are summarized in Table 1.2-1.

TABLE 1.2-1

Reach Summary								
Project Reach	Approximate Station Limits	Project Reach	Approximate Station Limits					
NPL	(-)35+00 to 00+00	J1A	506+00 to 515+50					
A1	00+00 to 15+00	J1B	515+50 to 534+00					
A2	15+00 to 60+00	J2	534+00 to 544+50					
В	60+00 to 90+00	J3A	544+50 to 548+50					



Project Reach	Approximate Station Limits	Project Reach	Approximate Station Limits
C1	90+00 to 121+00	J3B	548+50 to 555+70
C2	121+00 to 142+00	J3C	555+70 to 569+50
C3A	142+00 to 158+00	J4A	569+50 to 574+50
C3B	158+00 to 161+00	J4B	574+50 to 585+50
C4A	161+00 to 174+45	K	585+50 to 608+00
C4B	174+45 to 192+00	L1	608+00 to 655+00
D1	192+00 to 212+00	L2	655+00 to 703+00
D2A	212+00 to 247+00	M1	703+00 to 724+50
D2B	247+00 to 255+50	M2A	724+50 to 741+30
D2C	255+50 to 259+50	M2B	741+30 to 760+50
E1A	259+50 to 270+00	M3A	760+50 to 763+00
E1B	270+00 to 297+75	M3B	763+00 to 768+00
E2	297+75 to 305+75	M3C	775+00 to 781+00
F1A	305+75 to 312+30	M4	781+00 to 799+50
F1B	312+30 to 315+00	N1	799+50 to 806+00
F1C	315+00 to 321+00	N2	806+00 to 825+00
F2	321+00 to 339+00	O1	825+00 to 835+00
F3	339+00 to 362+50	O2A	835+00 to 849+65
G	362+50 to 388+00	O2B	849+65 to 853+50
H1A	388+00 to 411+00	P1	853+50 to 867+00
H1B	411+00 to 420+00	P2	867+00 to 909+00
H2	420+00 to 445+00	Q1	909+00 to 944+00
Н3	445+00 to 466+00	R1	944+00 to 959+00
Ι	466+00 to 506+00	S1	959+00 to 972+00

2.0 BACKGROUND

2.1 DISTRICT DESCRIPTION

RD 17 is situated along the south bank of French Camp Slough, the east bank of the San Joaquin River, and the north bank of Walthall Slough. The continuous levee extends approximately 19 miles from Stockton to Manteca, California.

The RD 17 levee system protects approximately 10,698 residential units, and 182 nonresidential (commercial/industrial and public) properties with a total floor area of approximately 11,858,000 square feet. Examples of some large commercial facilities within RD 17 include the Del Monte Foods Distribution Center, In and Out Burger Distribution Center, Ghirardelli Chocolate Factory Outlet, and Daimler Chrysler. Main transportation arteries within RD 17 include Interstate 5 and State Route 120. Other facilities within RD 17 include Lathrop City Hall, San Joaquin General Hospital, San Joaquin County Jail, San Joaquin County Honor Farm,



San Joaquin County Juvenile Hall, two high schools, six elementary schools, and 28 other facilities that house and/or provide services to special needs populations. RD 17 contains over 6,345 acres of agricultural lands that produce tomatoes, alfalfa, and corn (among other crops). The potential structural and content value of property damages for a levee breach within the area protected by the RD 17 levee system is estimated to be greater than \$900 million.

2.2 **PREVIOUS STUDIES**

The RD 17 levee system has been previously studied by many agencies and consulting firms.

In March 2008, ENGEO published a preliminary evaluation of RD 17, which included the Phase III Project elements. In February 2009, ENGEO published a report evaluating the potential for under seepage throughout RD 17. Both reports evaluated probable under seepage and provided mitigation improvements that consisted mostly of landside seepage berms. In January 2010, ENGEO published Preliminary Seepage Evaluation reports for all LSRP Phase III Project Elements. In 2011, ENGEO published the Phase 3 Levee Seepage Project report, a single 60 percent design report encompassing all of the LSRP Phase III Project Elements. Similarly, in 2014, ENGEO published the Reclamation District 17 – Mossdale Tract, Phase III Levee Seepage Repair Program, Seepage Evaluation; the proposed improvements recommended in that report have been incorporated into this evaluation. The engineering analyses contained in this report consider recent and previous subsurface explorations and laboratory analysis that were published in the following reports:

- 1. Urban Levee Evaluations, April 2014 Supplemental Geotechnical Data Report Addendum, Reclamation District 17.
- 2. ENGEO, 2014 Reclamation District 17, Mossdale Tract, Phase III Levee Seepage Repair Program, Seepage Evaluation.
- 3. ENGEO, 2011 Reclamation District 17, Mossdale Tract, Phase 3 Levee Seepage Project.
- 4. Urban Levee Evaluations, July 2010 Supplemental Geotechnical Data Report, Reclamation District 17, Draft 2.
- 5. Urban Levees Evaluations, October 2008 Phase 1 Geotechnical Data Report, Reclamation District 17.
- 6. Kleinfelder West, Inc. 1989 Geotechnical Exploration for the Weston Ranch project.
- 7. Kleinfelder West, Inc. 1987 Evaluation of Levees Bordering Reclamation District 17.
- William Lettis & Associates, Inc. 2008 Surficial Geologic Map of the Eastern Side of the San Joaquin River, along RD 17 Levee System near Stockton and Lathrop, California. (provided by DWR)



- 9. ENGEO, 2004 Draft Preliminary Geotechnical Report of the 220-Acre Mixed Use development along the eastern side of the San Joaquin River in South Lathrop.
- 10. ENGEO, 2004 Geotechnical Exploration, Central Lathrop Specific Plan.
- 11. ENGEO, 2006 Geotechnical Exploration and Levee Evaluation for the River Run Project.

Subsurface explorations and laboratory analysis by others that were published in the ENGEO 2014 report are included in Appendices A and B, respectively. The current subsurface explorations and laboratory analysis conducted by ENGEO are presented in Appendices C and D, respectively. Locations of explorations are presented on the Plan and Profile, Figures 2A through 2MM.

2.3 DISTRICT HISTORY

The RD 17 levee system, like other flood protection systems in the San Joaquin Valley, was initially designed to reduce the risk of flooding for the purposes of facilitating agricultural development of the extensive floodplains encompassed by the San Joaquin Valley. Like much of the Delta, RD 17 was originally designated swamp and overflow lands prior to levee construction; during times of high flows, water overflowed the banks and inundated adjacent lands. Natural high ground was formed adjacent to the San Joaquin River due to sedimentation of the materials carried by the high river flows. Farmers constructed levees on top of the high ground deposits; horses and hand labor were utilized to construct the levees out of readily available material adjacent to the river. Once levees were in place, the protected lands were reclaimed for agriculture use. Starting in about 1863, Reclamation District 17 was formed to maintain the RD 17 levee system (Reference 17).

Several decades later, Congress authorized the Lower San Joaquin River and Tributaries Project (LSRTP) in the Flood Control Act of 1944. The USACE (U.S. Army Corps of Engineers) subsequently commenced work to improve the RD 17 levee system. The LSRTP was completed by the USACE in 1963, and included the following RD 17 levee segment.

- Left bank of French Camp Slough
- Right bank of the San Joaquin River
- Right bank of Walthall Slough

These levee segments thereby became Federal Project Levees; the continuous dry land levees to the north (*upstream* of Station 0+00) and southeast (*upstream* of Station 853+50) of these Project levee segments are considered Non-Project levees.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at a number of locations along the RD 17 levees. The United States Army Corps of Engineers (USACE), the California Department of Water Resources (DWR), the California Central Valley Flood Protection Board (formerly known as the Reclamation Board) (CVFPB), and RD 17 actively and successfully contained the seepage and boils and the levees were not breeched.



After the 1997 event, USACE, CVFPB, and RD 17 funded a project to repair the seepage and boil areas under the Public Law 84-99 Rehabilitation Assistance Program (PL 84-99). The project referred to as "Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17" consisted of the installation of landside drained seepage berms. The berms generally consisted of soil placed on drain rock, with woven geotextile fabrics lining the top and bottom of the drain rock layer. Design and construction was performed by the USACE. In October 2004, the USACE provided an addendum to the Standard Operation and Maintenance Manual for the PL 84-99 work completed as of October 2001.

2.4 PAST PERFORMANCE

Seepage-related distress has been the primary detrimental issue identified at RD 17; this was the likely cause of the most recent levee breach that occurred in 1950, which involved a breach south of Dos Reis Road, between reaches J3B and J3C.

The State of California Urban Levee Evaluation (ULE) of the RD 17 levees, the Addendum to the 2014 SGDR by URS, provides a comprehensive historical distress history that compiles both DWR's and RD 17's understanding of the past performance of the levees. The majority of the information regarding performance history comes from observations during the 1997 high water event. Specific historic distress and performance history interpretations for this ULDC evaluation are discussed in the Conclusions Section of this report, with specific reference to discrete levee reaches.

2.5 RD 17 LEVEE SEEPAGE REPAIR PROGRAM

2.5.1 Purpose and Background

The overall purpose of the LSRP is to implement levee improvement projects at various and specific locations throughout the RD 17 Levee System with the intent of reducing flood risk associated with under and through seepage. By reducing flood risk through this program and RD 17's continued maintenance of the approximately 19-mile levee system in compliance with applicable Federal standards, the RD 17 has been working towards the ultimate goal of meeting 200-year ULDC standards for levees protecting urban areas.

The approach to meet the purpose of the LSRP is to assess the entire Project levee system, develop strategies for improvement, and provide a basis for partnerships with Federal and State agencies to implement these strategies. The objectives under this approach are to:

- Construct levee repairs as soon as possible to reduce flood risk as quickly as possible.
- Construct repairs that are politically, socially, economically, and environmentally acceptable.

The intent of the improvement projects is to design and construct projects that do not strand funds; projects are to be expandable to adapt to changing standards as practically necessary.



RD 17, in cooperation with DWR and the CVFPB, is the local project sponsor for the ongoing LSRP.

In the fall of 2007, RD 17 initiated the LSRP. To identify repair locations (segments of the levee system) for the LSRP and facilitate the EIP funding agreement, RD 17 contracted with ENGEO to prepare an Under Seepage Evaluation Report (ENGEO, 2009). In addition to those areas identified by geotechnical evaluation as requiring under seepage repair, historical seepage locations identified by RD 17 maintenance and inspection crews were also included in the LSRP.

Design and construction of the LSRP was undertaken in three phases (Phases I, II, and III). Construction of the first two phases has been completed and design of Phase III was at a 65 percent state of completion at the time of the publication of this report. Further details of the LSRP project phasing is provided in Section 2.6.7.

2.5.2 Project Design Team

The Project Design Team for the LSRP consists of a number of consultants working directly for RD 17. The LSRP team members consist of survey, hydraulic, geotechnical, environmental, permitting, real estate, legal, civil design, and construction management consultants.

The team's responsibilities include the preparation of construction documents utilizing data, analyses, and design recommendations provided by the Design Team and government agencies including RD 17. The project teams, with their respective responsibilities and contact information, are listed in the following table.

KD 17 110ject Design Team						
Responsibility	Company	Primary Contact Phone #		E-Mail		
EIP Program Manager	Nomellini, Grilli & McDaniel, PLCS	Dante Nomellini	209.465.5883	ngmplcs@pacbell.net		
District Engineer	Kjeldsen, Sinnock & Neudeck, Inc.	Chris Neudeck	209.946.0268	cneudeck@ksninc.com		
EIP Project Manager	Kjeldsen, Sinnock & Neudeck, Inc.	Barry O'Regan	209.323.9864	boregan@pbieng.com		
Construction Management	Kjeldsen, Sinnock & Neudeck, Inc.	Jerry Hadley	209.946.0268	jhadley@ksninc.com		
Civil Engineering Design Lead	MacKay & Somps Civil Engineers Inc.	Chris Gunther	925.225.0690	cguenther@msce.com		
Geotechnical Design Lead	ENGEO	Joe Tootle	209.684.7602	jtootle@engeo.com		
Environmental Team Lead	AECOM	Andrea Shephard	916.414.5800	Andrea.Shephard@aeco m.com		

TABLE 2.5.2-1RD 17 Project Design Team



2.5.3 Safety Assurance Review

The purpose of a Safety Assurance Review (SAR) Plan is to review the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health, safety, and welfare for the design of the proposed LSRP. The SAR Plan includes an Independent External Peer Review (IEPR) by impartial experts in the fields of geotechnical and hydraulic engineering. The IEPR team consists of the Board of Senior Consultants (BOSC). The LSRP BOSC includes Dr. Robert Pyke, Mr. Edwin M. Hultgren, Mr. Don Babbitt, and Dr. John DeGeorge. Dr. Pyke, Mr. Hultgren and Mr. Babbit are recognized experts in civil engineering and geotechnical engineering related to the planning, design and construction of flood control projects. Dr. DeGeorge is a recognized expert in hydrologic and hydraulic engineering.

The panel has provided independent review of the engineering design, geotechnical reports, and the project alternatives descriptions, and they have provided a letter commenting on the adequacy, appropriateness, and acceptability of the final engineering for Phases I and II of the LSRP. It is very likely that the future Phase III of the LSRP will utilize this current BOSC.

2.5.4 Quality Assurance/Quality Control Program

RD 17 has implemented a quality assurance/quality control (QA/QC) program for all planning and design documents for the LSRP. The QA/QC program includes reviews at three levels:

- 1. Consultant and internal quality control reviews.
- 2. Reviews by RD 17 and other LSRP team members.
- 3. Reviews by other agencies and an independent Board of Senior Consultants.

Agencies that are involved in reviewing the geotechnical reports, construction documents and project specifications include USACE, DWR, CVFPB and the LSRP BOSC. The BOSC consists of four technical experts that provide technical guidance and reviews of levee improvement evaluations and designs. As part of the QA/QC process, all external QC review comments on key deliverables are documented, responded to and closed out for each deliverable.

2.5.5 Design Guidance

Levee design and/or construction guideline criteria have been developed, for varying purposes, by several State and Federal agencies, including the USACE, FEMA, DWR, and CVFPB. Primarily as a result of Hurricane Katrina and the court decision in Paterno vs. The State of California, levee design standards are being reevaluated and revised by a number of associated agencies. The design criteria chosen for the RD 17 LSRP Phase III are primarily based on the following documents:

- Code of Federal Regulations 44, Section 65.10
- Title 23 California Code of Regulations
- USACE Engineering Manual 1110-2-1913



- USACE Engineering Technical Letter 1110-2-569
- DWR's Urban Levee Design Criteria

2.5.6 LSRP Considered Mitigation Alternatives

Mitigation alternatives for LSRP work were evaluated based on their ability to achieve the following results:

- Mitigation of historic performance concerns
- Reduction in underseepage exit gradient at the levee toe
- Reduction in through seepage induced slope instability
- Flood fighting flexibility
- Seismic resiliency
- Adaptability to varying water surface elevations (higher than the DWSE)
- Reduction of long-term maintenance
- Reduction of hydraulic impacts

Where mitigations have been recommended based on the LSRP evaluation and input from stakeholders, alternatives have been considered both independently and/or in combination. In general, seepage berms to mitigate underseepage and drained stability berms or chimney drains to mitigate through seepage are the preferred mitigation alternatives. In locations where seepage berms are not feasible due to landside encroachments or construction constraints, seepage cutoff walls were generally considered as the preferred alternative for both underseepage and through seepage.

2.5.7 Design and Construction Phasing

The RD 17 LSRP has divided the design and construction of the improvement projects into three separate construction phases: Phases I, II, and III. The construction phasing plan was developed to facilitate accelerated construction schedules for those elements thought to have the highest seepage concerns and were perceived as being the most ready for construction.

Phase I underseepage improvements were completed in 2009 and consisted of drained seepage berms at Project Elements III-a and VI-b. The construction of these improvements was permitted by the Central Valley Flood Protection Board under a USACE Section 208.10 permit.

Phase II improvements were completed in 2010 and consisted of drained seepage berms, a drainage trench, and chimney drains. Similar to the preceding construction phase, Phase II was completed under Section 208.10 authority.

Previously, ENGEO published seepage evaluation reports in support of the Phase III improvement projects for 30 percent, 60 percent, and 65 percent design levels. ENGEO's 65 percent design report was published and submitted for review in May 2014. Construction of the LSRP Phase III is scheduled to begin after 2015.



Constructed and proposed levee repairs associated with the LSRP include drained seepage berms, cutoff walls and setback levees to address under seepage, chimney drains and cutoff walls to address through seepage, and modification of levee slopes and crown widths where identified by the Civil Engineer to achieve ULDC levee geometry requirements. To date, the constructed and proposed LSRP improvement projects do not consist of raising of the existing levee or performing any work on the waterside of the levee with the exception of vegetation control and minor degradation of the levee crown during cutoff wall construction.

2.5.8 LSRP Levee Segmenting

To facilitate the implementation of the LSRP improvement projects, the RD 17 levees have been divided into seven distinct "reaches", known as Project Areas. The Project Areas are generally based on similar subsurface soil stratigraphy (identified by Roman numerals I through VII). The Project Areas are further subdivided into "elements", known as Project Elements. Elements are identified by the reach number followed by a lower case letter and, in some cases, a decimal and Arabic number.

In the case of Project Areas I and II, Project Elements were defined at specific locations where levee improvements were proposed within the larger Project Area. Project Areas III through VII generally have improvement projects either constructed and/or proposed throughout their limits. In these areas, Project Elements are generally a segment, or sub-area, of an improvement throughout the Project Area. The decision to segment the levee system Project Areas into smaller Project Elements largely considers the following:

- Political boundaries and right-of-ways.
- Land ownership.
- Land use adjacent to the levee (agricultural, urbanizing, urban, park, etc.).
- Type of levee improvement (drained berm, drainage trench, cutoff wall, etc.).
- Ease of construction (being that a certain Project Element may have an improvement project that is capable of being *fast tracked* to construction).

Project Area and Project Element (and the Element's associated LSRP phase) stationing limits, as well as constructed and proposed improvements, are presented in the following table. To date, the LSRP has only considered the Project Levee portion of the RD 17 system: the Non-Project levee reaches *upstream* of Station 0+00 and *upstream* of Station 853+50 have not been included in Phases I, II, and III of the LSRP. It should be noted that some of the Project Elements overlap between LSRP Phases to account for transitions between improvements.

Project Area	Approximate Station Limits	Project Element	Approximate Station Limits	LSRP Phase	Improvement
Area 1	0+00 to 362+50	I-a	247+00 to 252+90	III	Proposed Drained Seepage Berm with Chimney Drain
Area 1		I-b	254+00 to 255+25	III	Proposed Fill and Drained Seepage Berm with Chimney Drain

TABLE 2.5.8-1LSRP Project Area and Project Element Summary

Project Area	Approximate Station Limits	Project Element	Approximate Station Limits	LSRP Phase	Improvement
		I-c	259+50 to 267+00	II	Constructed Drained Seepage Berm with Chimney Drain
		I-d	297+75 to 306+00	Π	Constructed Drained Seepage Berm with Chimney Drain
		I-e	305+75 to 312+30	III	Proposed Drained Seepage Berm with Chimney Drain
Area 2	362+50 to 515+50	II-a/b	362+50 to 388+00	III	Proposed Cutoff Wall
		III-a (North)	515+50 to 548+50	I & III*	Constructed Drained Seepage Berm Proposed Chimney Drain
Area 3	515+50 to 569+50	III-b	548+50 to 555+70	III	Proposed Drained Seepage Berm with Chimney Drain
		III-a (South)	555+70 to 569+50	I & III*	Constructed Drained Seepage Berm Proposed Chimney Drain
		IV-a	569+50 to 574+80	III	Proposed Drained Seepage Berm with Chimney Drain
Area 4	569+50 to 608+00	IV-b	574+50 to 587+00	II	Constructed Drainage Trench with Chimney Drain
		IV-c	585+50 to 608+00	III	Proposed Setback Levee with Cutoff Wall
Area 5	608+00 to 684+50	V-a	608+00 to 684+50	III	Proposed Cutoff Wall
		VI-a.1	684+50 to 703+00	III	Proposed Cutoff Wall
		VI-a.2	700+15 to 723+50	II	Constructed Drained Seepage Berm with Chimney Drain
		VI-a.3	723+50 to 741+00	II	Constructed Drained Seepage Berm with Chimney Drain
Area 6	684+50 to 769+00	VI-a.4	740+60 to 741+30	III	Proposed Cutoff Wall
		VI-b	741+00 to 760+50	I & III*	Constructed Drained Seepage Berm Proposed Cutoff Wall
		VI-c	760+50 to 763+00	III	Proposed Cutoff Wall
		VI-d	763+00 to 765+40	III	Proposed Cutoff Wall
		VI-e	765+40 to 769+00	III	Proposed Cutoff Wall
		VII-a	769+00 to 775+00	N/A	N/A – Roadway Approach Fills
		VII-b	775+00 to 778+00	III	Proposed Drained Seepage Berm with Chimney Drain
		VII-c	778+00 to 799+50	II	Constructed Drained Seepage Berm with Chimney Drain
Area 7	769+00 to 853+50	VII-d	799+50 to 803+00	N/A	N/A – Previous Study Found Levee to Meet Minimum Criteria
		VII-e	803+00 to 828+00	III	Proposed Cutoff Wall
		VII-f	825+00 to 850+00	Π	Constructed Drained Seepage Berm with Chimney Drain
		VII-g	849+65 to 853+50	III	Proposed Fill and Drained Seepage Berm with Chimney Drain

* Phase 1 construction only involved under seepage mitigation; through seepage improvements for Phase 1 (Project Elements III and VI-b) is part of the LSRP Phase III.



2.6 **RECENT DWR ACTIVITIES**

2.6.1 Urban Levee Evaluations Program

The following excerpt is taken from ULE's 2013 Supplemental Geotechnical Data Report Addendum for the RD 17 Study Area; some form of this standardized language is generally included in the ULE publications to establish a brief purpose, general scope, and progression of the ULE Program's work.

The California Department of Water Resources (DWR) Urban Levee Evaluations (ULE) Project evaluates levee systems estimated to protect more than 10,000 people. The ULE Project, through investigation and analyses:

- Evaluates levees relative to established United States Army Corps of Engineers (USACE) and DWR Urban Levee Design Criteria (ULDC) dated May 2012.
- *Identifies potential levee deficiencies with recommended improvements.*
- *Identifies potential levee repair alternatives and associated costs.*

The project team performs levee system evaluations progressively, incorporating the results of each step into the planning and execution of subsequent tasks. The project team prepares reports documenting the task results and planning subsequent work.

The following table identifies the ULE publications that study RD 17 levees, and provides generalized descriptions of the documents.

Deliverable	General Description	Date Published				
Phase 1 Geotechnical Data Report (P1GDR)	Reports the Phase 1 field investigation, associated lab testing results, and other paper study findings. Typically, the field investigation was conducted along the levee crown with CPT's every 1,000 feet on center and borings every 5,000 feet on center.	Oct 2008 (Field activities occurred from Dec 2006 to Mar 2007)				
Phase 1 Geotechnical Evaluation Report (P1GER)	Utilized information and data published in the P1GDR, preliminary geotechnical analyses were conducted; perceived data gaps were assessed and identified.	DRAFT 1 – Dec 2007				
Supplemental Geotechnical Data Report (SGDR)	A supplemental field and laboratory soil testing program was conducted to supplement the P1GDR; the supplemental data was intended to resolve perceived data gaps identified by the P1GER assessment.	DRAFT 2 – July 2010 (Field activities occurred from Nov 2007 to May 2008)				

TABLE 2.6.1-1ULE Tasks and Deliverables Relative to RD 17



Deliverable	General Description	Date Published
Supplemental Geotechnical Data Report Addendum (SGDR Addendum)	Further supplemental field and laboratory soil testing program was conducted as an addendum to the SGDR; the addendum data was intended to further resolve perceived data gaps identified by the P1GER assessment following the SGRD. The SGDR Addendum often follows a revised P1GER draft that had incorporated SGDR information.	April 2014 (Field activities occurred from May through September 2012)
Geotechnical Evaluation Report (GER)	Utilizing the data from the P1GDR, SGDR, and SGDR Addendum, the levee system is again evaluated (in similar fashion as the P1GER). GER publishes analytical results regarding seepage, stability, erosion, settlement, and seismic vulnerability. Finding results that do not meet the ULE criteria, mitigations are proposed and associated project costs are estimated.	April 2015

2.6.2 DWR Involvement with the RD 17 LSRP

Following the submittal of the LSRP 60 percent design plans and geotechnical evaluation in 2011, the report was reviewed by DWR and their consultants and there was a desire by the ULE team to have additional subsurface information collected prior to project completion. At the time, ULE had not published their SGDR and were just beginning to plan their SGDR Addendum program. Completion of the planned ULE SGDR Addendum explorations was believed to result in the collection of sufficient subsurface information to further inform the Phase III LSRP design.

In 2012, ENGEO began working in conjunction with ULE on their SDGR Addendum. The cooperative work involved selecting exploration locations, observing ULE field operation, and collaborating on laboratory testing selection. Following the SGDR Addendum work, ENGEO was also involved with ULE's GER work. ENGEO was included in the discussion for seepage and slope stability analysis, with the goal that ENGEO's design report would be consistent with the results published in the forthcoming GER. Source and analytical files prepared as part of the ULE Program were shared with ENGEO; often, the same seepage and slope stability model utilized in the ULE program was also utilized in the LSRP 65 percent evaluation.

2.7 CALIFORNIA 200-YEAR FINDING

The Central Valley Flood Protection Act of 2008, primarily enacted by the 2007 Senate Bill 5, puts into State law that local stakeholders of levee systems operating in urban and urbanizing areas provide a 200-year level of protection. California Government Code Section 65007(n) defines an urban level of flood protection as follows:

"Urban level of flood protection" means the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources. "Urban level of flood protection" shall not mean shallow flooding or



flooding from local drainage that meets the criteria of the national Federal Emergency Management Agency standard of flood protection.

A levee system with an urban level of flood protection is established upon a Finding, as defined in the 2013 Urban Level of Flood Protection Criteria (ULOP) and the 2012 Urban Levee Design Criteria (ULDC), both published by DWR. Without an adequate 200-year Finding, land use limitations will be placed upon the affected locals. At this time, a 200-year Finding has not been made for any areas within RD 17.

Local stakeholders in RD 17 system, which include the Cities of Lathrop and Manteca, have a goal to arrive at a 200-Year Finding for the RD 17 levee system, as evidenced by the authorization and submission of this report. In a continued cooperative effort between the local stakeholders and DWR, source and analytical files prepared as part of the ULE Program were shared with ENGEO for the LSRP evaluation.

3.0 **REGIONAL GEOLOGY**

The RD 17 levee system is located in the Great Valley Geomorphic Province of California. This valley is an asymmetric trough filled with a thick sequence of sediments from the Jurassic (180 million years ago) to Recent age. The sediments within the Valley are reported to vary between 5 and 10 kilometers in thickness and were mostly derived from erosion of the Sierra Nevada mountain range to the east, with lesser material from the Coast Range Mountains to the west.

Most of the sediments deposited in the Sacramento-San Joaquin Delta more than 25 million years ago were accumulated in marine environments and the younger deposits (less than 25 million years) are generally described as non-marine (Burroughs 1967). However, Hackel (1966) indicates that some of the younger deposits must have formed in shallow seas and estuaries as marine deposits. According to Atwater (1982), the depositional history of the Delta during the late Quaternary period was probably controlled by several cycles related to fluctuations in regional and global climate in which each cycle consisted of a period of deposition followed by a period of non-deposition and erosion. Thus, according to Atwater (1982), the Delta region during the late Quaternary time experienced scenarios of wetlands and flood plain creation as the tidewater rose in the valley from the west; areas of erosion when tidewaters receded; deposition of alluvial fans that were reworked by wind to create extensive sand dunes; and alluvial fan deposition from streams emanating from the adjacent mountain ranges (Atwater, 1982).

4.0 GEOMORPHOLOGY

Within RD 17 and to the west, the San Joaquin River splits into several distributary channels as it enters the Sacramento – San Joaquin Delta. Prior to levee construction in the late 1800s, the distributary channels flowed into and through tidal marshes. According to Atwater (1982) and WLA (2003), the modern San Joaquin River system flows along the western edge of older alluvial fan deposits (Modesto Formation). The RD 17 Levees are located along the eastern edge



of Holocene deposits or on older Modesto Formation. The distribution of Holocene alluvium and the morphology of the river channels has been influenced over the last several thousand years by rising sea levels, tidal effects from the adjacent Delta, and by man-made modifications.

On the 1913 and 1915 United States Geological Survey (USGS) topographic maps, the locations of the main channel of the San Joaquin River and the bifurcation to the Old River appear to be essentially the same as the modern condition. The locations of the levees on the 1915 map also appear to be essentially the same as the modern condition, although the original levees were widened and raised in the 1960s. Review of aerial images from 1937 and 2010 show that the channel morphology and levee conditions have remained relatively stable over the last three decades. Modifications to the levee system during that time have included local maintenance of rip-rap levee toe protection, repairs of local areas of sloughing, and construction of seepage berms at the landside toe of the levee at several locations.

WLA (2007, 2010) performed detailed surficial mapping of the east bank of the San Joaquin River, presented as Figure 5 of this report. They identified map units of recent (historic) age, including crevasse splays, channel deposits and overbank deposits, and units of Holocene age, including channel and point bar deposits associated with the modern and prehistoric channels of the San Joaquin River, and basin deposits formed by overbank flooding away from the main channel. These map units were defined on the basis of aerial image analysis, review of soil survey maps and limited field reconnaissance.

We evaluated the mapping of WLA based on review of surficial mapping by Atwater (1982), the 1915 and 1913 USGS topographic maps for the Lathrop and Stockton quadrangles, aerial photography flown in 1937, modern aerial imagery and maps, and the available subsurface explorations. Based on our review, we concur with the surficial mapping by WLA. The subtle geomorphic features used by WLA to define map units have been largely obscured on recent aerial images by man-made activities such as field leveling and tilling, construction of drainage and irrigation canals, road construction and land development. However, many of the original geomorphic features are visible in the 1937 aerial photographs, including small channels on the alluvial fan east of the levees and crevasse splays/levee breaches adjacent to the river channel. In general, the density of obscured channel and crevasse splay deposits is much greater on the western side of the San Joaquin River, on Stewart Tract and Upper Roberts Island, relative to the east side within RD 17.

5.0 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking and liquefaction. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of seismically induced landslides or tsunamis is considered low at the site.



5.1 **REGIONAL FAULTING**

Numerous active earthquake faults are located in the Northern California region and within relatively close proximity to the Sacramento – San Joaquin Delta. An active fault is defined by the California Geologic Survey as one that has had surface displacement within Holocene time, considered about the last 11,000 years (Hart, 1997). Table 5.1-1 below provides a summary of nearby active and potentially active faults including their proximity to the project.

Fault Name	Approximate Distance and Direction From Site	Characteristic Magnitude	California Building Code Classification	Estimated Age of Most Recent Activity
Great Valley 7 fault	15 miles west	6.9	Not Classified (Blind Thrust fault)	unknown
Greenville Connected fault	25 miles west	7.0	А	Late Quaternary
Mount Diablo Thrust faults	33 miles west	6.7	Not Classified (Blind Thrust fault)	unknown
Pittsburg Kirby Hills fault	38 miles northwest	6.7	Not Classified (Reverse Fault)	unknown
Green Valley Connected fault	47 miles northwest	6.8	А	Late Quaternary
Calaveras fault	36 miles west	7.0	А	Late Quaternary
Ortigalita fault	41 miles south	7.1	А	Late Quaternary
Hayward – Rodgers Creek fault	67 miles northwest	7.3	А	Holocene
San Andreas fault	63 miles west	7.9	А	Holocene

TABLE 5.1-1Active and Potentially Active Faults

5.2 **GROUND RUPTURE**

The RD 17 levee system, in its existing alignment, is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist along the alignment. Fault rupture through the levee, therefore, is not anticipated.

5.3 GROUND SHAKING

An earthquake of moderate to high magnitude generated within the Northern California region could cause ground shaking at the site. To quantify potential ground shaking acceleration we determined site-specific Peak Ground Accelerations (PGA) along the levee alignments at



10,000-foot stationing intervals using a Probabilistic Seismic Hazard deaggregation from the United States Geological Survey. Seismic parameters were evaluated using an exceedance probability of 20 percent in 50 years, which is equivalent to a 224-year return period. Our opinion is that the PGA from a 224-year seismic event is approximately equivalent to the 200-year seismic event specified by the ULDC. Based on existing CPT and boring data and previous reports regarding RD 17, we used a shear wave velocity (V_{s30}) of 335 m/s, which corresponds to a Site Class D, stiff soil condition. We selected a moment magnitude of 6.8, which consists of the weighted average of the characteristic moment magnitudes of the faults contributing more than 2 percent to the probabilistic seismic event. A summary of the PGAs selected for our analysis is provided in Table 5.3-1 below. For reference, we have also included a factored acceleration (K) used in seismic slope stability analyses, which is discussed later in this report.

I OA alid K values					
Stationing	Latitude (degrees)	Longitude (degrees)	PGA* (g)	K (0.5*PGA)	
0+00	37.9092	-121.2909	0.182	0.09	
100+00	37.9157	-121.3204	0.187	0.09	
200+00	37.8915	-121.3275	0.193	0.10	
300+00	37.8666	-121.3268	0.198	0.10	
400+00	37.8492	-121.3219	0.201	0.10	
500+00	37.8283	-121.3100	0.201	0.10	
600+00	37.8143	-121.3188	0.207	0.10	
700+00	37.8027	-121.3120	0.208	0.10	
800+00	37.7798	-121.3002	0.210	0.11	
900+00	37.7645	-121.2767	0.207	0.10	
1000+00	37.7654	-121.2507	0.201	0.10	
1079+00	37.7665	-121.2249	0.195	0.10	

TABLE 5.3-1 PGA and K Values

* PGA values were obtained from USGS Website and assume a Shear Wave Velocity (Vs) of 335 m/s and a return period of 20% in 50 years: http://geohazards.usgs.gov/deaggint/2008/

5.4 LIQUEFACTION AND LATERAL SPREADING

Seismically induced soil liquefaction is a process by which soil undergoes a significant loss of strength due to cyclic loading and corresponding increase in pore water pressure. The effects of liquefaction can be a decrease in soil shear strength, reduction in soil volume, ground settlement, and lateral spreading. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded fine sands below the groundwater table. Empirical evidence and laboratory testing indicates that loose to medium dense gravels, silty sands, low-plasticity silts, and some low-plasticity clays are also potentially liquefiable.



Seismic vulnerability analyses, in the form of seismic slope stability analyses, have been considered in this evaluation. If an intermittently loaded urban levee is found to be seismically vulnerable, DWR 2012 ULDC states that a plan should be in place to "restore grade and dimensions for at least the 10-year WSE plus 3 feet of freeboard or higher for wind setup and wave runup within 8 weeks" (DWR, 2012). Provided that a sufficient plan can be prepared and implemented, mitigation of potential liquefaction and lateral spreading impacts prior to the occurrence of a design-level earthquake is not required.

6.0 GEOTECHNICAL HAZARDS

Potential geotechnical hazards resulting from long-term settlement or instability can occur because of time-dependent soil deformation or a degradation of soil strength or embankment integrity, with time. Reduction in levee height over time can result from imposing new surcharge pressure on potentially compressible soil. A loss in soil strength, or integrity, can result in failure of the levee embankment and inland inundation. The following sections present a discussion of these hazards as they apply to the site.

6.1 FLOODING DUE TO SOIL INTEGRITY DEGRADATION

The soil strengths and associated integrity, assumed as part of this levee evaluation, are based on the characteristics observed and tested as part of this, and the previously referenced, evaluations. These soil characteristics can change with time, generally as a result of insufficient maintenance and abatement of erosion, vegetation, and bioturbation.

Waterways adjacent to RD 17 include French Camp Slough, the San Joaquin River, and Walthall Slough. These waterways have been identified as potential sources of floodwaters. It should be understood that with any levee system there is an inherit risk of flooding, as previously discussed in this report. This risk increases if the previously mentioned lack of maintenance is allowed to degrade the existing soil integrity characteristics.

6.2 COMPRESSIBLE SOIL

Potentially compressible layers of soft clay were encountered in our explorations in both the levee prism and foundation soils. When subjected to additional loads from fills, these soils are susceptible to consolidation settlement that could result in ground surface settlement. However, based on our experience with consolidation settlement due to fill placement at this project, and in the general project vicinity, we do not anticipate future settlement due to compressible soils to occur under the existing levee geometry and improvements. Settlement from seismically induced settlement is discussed in Section 5.4.

7.0 **PROJECT DATUM**

Several previously published documents utilize National Geodetic Vertical Datum 1929 (NGVD29). If necessary, to convert the vertical datum to National Geodetic Vertical Datum



1929 (NGVD29) from North American Vertical Datum 1988 (NAVD88), 2.46 feet should be subtracted.

8.0 FIELD EXPLORATION AND LABORATORY TESTING – ULDC SECTION 7.3

Our field exploration, for the current ULDC evaluation, included drilling 20 borings and advancing 135 Cone Penetration Test (CPT) soundings at various locations on both the levee crown, landside toe and landside field locations along the RD 17 levee alignment. We performed our current field explorations between October 2014 and July 2015.

The location and elevations of our explorations are approximate and were estimated using handheld GPS equipment; they should be considered accurate only to the degree implied by the method used.

8.1 **BORINGS**

We observed drilling of 20 borings at the locations shown on the Site Plan and Geologic Profile, Figures 2A though 2MM. An ENGEO representative observed the drilling and logged the subsurface conditions at each location. We retained truck-mounted Mayhew 1000 and CME-75 drill rigs and crew to advance the borings using 8-inch-diameter mud rotary and hollow-stem auger drilling methods. The borings were advanced to depths ranging from 40¹/₂ to 116¹/₂ feet below existing grade. We permitted and backfilled the borings in accordance with the requirements of the San Joaquin County Environmental Health Department. The borings were also drilled and backfilled in general conformance with the methodology outlined in the USACE guidance for drilling in earth embankment dams and levees (ER 1110-1-1807).

We obtained bulk soil samples from drill cuttings and retrieved both disturbed and relatively undisturbed soil samples at various intervals in the borings using standard penetration tests, 2¹/₂-inch O.D. Modified California Sampler, and 3 inch O.D. Shelby Tubes.

The blow counts were obtained using an auto-trip 140-pound hammer with a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. In addition, 2.5-inch I.D. samples were obtained using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows to drive the last 1 foot of penetration; the blow counts have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for 50 hammer blows.

We used the field logs to develop the report logs in Appendix C. The logs depict subsurface conditions at the exploration locations for the date of exploration; however, subsurface conditions may vary with time.



8.2 CONE PENETRATION TESTING

We retained a CPT rig to push the cone penetrometer to a maximum depth of about 100 feet. The CPT has a 20-ton compression-type cone with a 15-square-centimeter (cm2) base area, an apex angle of 60 degrees, and a friction sleeve with a surface area of 225 cm². The cone, connected with a series of rods, is pushed into the ground at a constant rate. Cone readings are taken at approximately 5-cm intervals with a penetration rate of 2 cm per second in accordance with ASTM D-3441. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). CPT logs are presented in Appendix C.

8.3 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed moisture content, dry density, unconfined compression, plasticity index, gradation, hydrometer, direct shear, triaxial compression, and consolidation testing. Moisture contents and dry densities are recorded on the boring logs in Appendix C; other laboratory data is included in Appendix D.

9.0 ENGINEERING EVALUATION

Using the information from recent and previously published geotechnical and levee-related reports, accompanied by our current subsurface evaluation and laboratory testing, ENGEO evaluated settlement, seepage, slope stability, and seismic vulnerability (seismic slope stability) for the reaches within the RD 17 levee system. Our evaluation assumed that all the improvements associated with the Phase III LSRP, described in Section 2.5 of this report, had been completed as recommended in the associated 2014 ENGEO report. We summarize our engineering evaluations below.

9.1 WATER SURFACE ELEVATIONS

Numerous hydraulic analyses have been performed for this section of the San Joaquin River system. For this evaluation, we are using a 200-year Design Water Surface Elevation (DWSE) provided by PBI. The 200-year DWSE is plotted in profile on Figures 2A through 2MM and Figures 7A through 7G.

In addition to evaluation of the 200-year DWSE, the levees are evaluated for seepage and slope stability for a flood elevation at the hydraulic top of levee (HTOL). The purpose of the HTOL analysis is to evaluate the stability of the levee during extreme loading conditions and to demonstrate the primary anticipated mode of failure during such an event would be erosion due to overtopping. The ULDC defines the HTOL as the higher water surface of option A or B, described below:



A. The lower flood elevation of:

- 1. The median 200-year water surface elevation plus 3 feet.
- 2. The median 500-year water surface elevation.
- 3. The minimum top of levee (MTOL).

B. The DWSE

In general, the HTOL elevation was controlled by the 200-year water surface elevation plus 3 feet, with the exception of the southern non-project levee (Walthall Slough), which was generally controlled by the 500-year water surface elevation.

PBI utilized the FEMA approach in modeling the various design water surfaces. In addition, PBI utilized existing water level data to conclude that the RD 17 levees are intermittently loaded (Peterson, Brustad Inc., 2014).

9.2 **REACH SELECTION**

Similar to what has been done for the LSRP and the ULE studies, continuous segments of the levee system have been selected for this evaluation; each continuous segment is designated as a reach. The limits of the reaches are generally based on similar subsurface soil stratigraphy, but also consider:

- Political boundaries and right-of-ways.
- Land ownership.
- Land use adjacent to the levee (agricultural, urbanizing, urban, park, etc.).
- LSRP Project Element and Project Area limits.
- ULE reach limits.

Reach stationing limits are tabulated in the Conclusions section of this report; reach limits are also identified on the Plan and Profile figures (Figures 2A through 2MM). Please note that the reach limits identified for this evaluation have a naming/numeration scheme separate, but not entirely independent, from the LSRP. The reaches are, however, similar to those selected by the ULE studies. Political boundaries, land ownership, and adjacent land use do not dictate the identification and/or limits of levee improvement projects; they are, however, considered in the construction phasing of the LSRP's implementation and are thereby considered in the reach selections for this evaluation.

9.3 IDEALIZED SUBSURFACE STRATIGRAPHY

An idealized subsurface stratigraphy is a modeling or depiction of the various soil layers and their respective thicknesses and depths. Exploration logs, lab data, and geologic conditions were interpreted to develop a subsurface cross section representative of the location being analyzed. These analytical locations, identified by stationing, were chosen as representations of the respective reach based largely on their geometry, soil stratigraphy, and historical seepage



performance. Seepage and stability analyses for this evaluation incorporate idealizations of the subsurface stratigraphy as well as geometric surface information.

ENGEO reviewed and updated the geometry and subsurface stratigraphy for some models that DWR used for ULE Project Levees. A summary of the DWR models that were modified are listed below; details of geometry and subsurface stratigraphy are provided in the figures and appendices.

Reach	Station	Geometric Modification*	Substantiation for Change
Н3	455+55	Surface Geometry	Removed berm due to limited lateral extent
C2	130+85	Subsurface Stratigraphy	New ENGEO boring

TABLE 9.3-1ULE Models with Geometric Modifications

To supplement the models we received from DWR, we developed new seepage and stability models both within and outside of the ULE study area.

9.4 SEEPAGE EVALUATIONS – ULDC SECTION 7.5

We performed an evaluation of levee under and through seepage incorporating new and existing subsurface information and laboratory data along with existing, or proposed, LSRP Phases I, II and III levee improvements. Our models do not incorporate landside berms associated with PL84-99 improvements.

9.4.1 Analytical Software

We performed seepage calculations using the GeoStudio 2012 v8.13.1.9253 software program Seep/w in this levee evaluation. Seep/w is a two-dimensional finite element software program that is widely used in soil and other material seepage evaluations.

9.4.2 Steady State Seepage

The effect that steady state seepage has on the stability of the levee is evaluated in a steady state seepage scenario. The steady state condition occurs when a water level remains long enough for the embankment soils to become fully saturated, resulting in a condition of steady seepage. Seep/w was used to perform steady state evaluations for the sections modeled in this evaluation. When necessary to perform slope stability analysis, the pore water pressures determined by Seep/w were incorporated into the Slope/w analysis for stability calculations. Boundary conditions and model limits in these analyses were consistent with those recommended in the Version 14 - 2013 URS Guidance Document for Geotechnical Analysis. It is our opinion that the modeling parameters recommended by this publication are suitable for this evaluation, and are summarized as follows:



- The model was extended 2,000 feet landward of the levee centerline and to the approximate center of the river, on the waterside of the levee centerline.
- No-flow boundary conditions were assigned along the vertical face of the model on the waterside, and along the bottom of the model.
- The water level was assumed to be at the ground surface on the landside; a total head boundary condition, corresponding to the landside ground level, was applied along the vertical face of the model on the landside.

9.4.3 Under Seepage Analysis and Criteria

Under seepage occurs when hydraulic head forces water to seep through the foundation soils. A hydraulic gradient is the drop in head over a given distance; an exit gradient is the vertical hydraulic gradient of the modeled condition where seepage exists onto a ground surface. Where a blanketing/confining soil layer occurs above a more permeable soil, average gradients (drop in head across the thickness of a blanket layer) were calculated and reported as representing the exit gradient. The calculation for average gradient is shown here.

$$i_{avg} = \frac{\Delta h}{t}$$

$$i_{avg}, \text{Average Gradient}$$

$$\Delta h, \text{Drop In Head Across Blanketing Soil}$$
t, Vertical Thickness of Blanketing Soil

Where a blanketing soil was not present, we reported the local y gradient (as representing the exit gradient) by selecting a Gaussian area along the surface of the Seep/w model with limited influence from calculated points of singularity. If modeled conditions are such that seepage does not exit onto the ground surface, the gradient is negative (indicating seepage as not exiting) and reported as *no positive y-gradient*.

Factors of safety against under seepage instability can be determined by comparing the calculated exit gradient to the critical gradient. Critical gradients are dependent upon the saturated unit weight of the surface material. For our analysis, we used a saturated unit weight of soil equal to 112 pcf, and therefore, the associated critical gradient is approximately 0.8 (factor of safety, FS = 1.0). If the factor of safety against under seepage is less than 1.0, the calculation is indicative of a *quick* condition.



$FS = i_{critical} / i_{exit}$ $i_{critical}, Critical Gradient$ $i_{exit}, Exit Gradient$	$i_{critical} = (\gamma_{sat} - \gamma_w) / \gamma_w$ $i_{critical} = (112 \text{ pcf} - 62.4 \text{ pcf}) / 62.4 \text{ pcf}$ $i_{critical} = (49.6 \text{ pcf}) / 62.4 \text{ pcf}$ $i_{critical} = 0.8$ $\gamma_{sat}, \text{ Saturated soil unit weight}$
	γ_{sat} , Saturated son unit weight γ_{w} , Unit weight of water

Based on USACE Engineering Manual 1110-2-1913 (as modified by ETL 1110-2-569) and the ULDC, the current guidance for acceptable exit gradients through soils with a minimum saturated unit weight of 112 pcf at the toe of the levee (average exit gradient) should be no greater than 0.5 and no greater than 0.8 at the toe of a seepage berm with a minimum width equal to four times the height of the levee crown above the landside toe. When modeling a scenario that incorporates the HTOL, the allowable exit gradient is no greater than 0.6 at the levee toe. At the toe of a seepage berm for berms less than 100 feet wide for HTOL, the allowable gradient is a less than 20 percent degradation of the calculated DWSE exit gradient (note that there are no berms within the limits of the study area that are 100 feet or greater in width). For cases where a ditch, canal, or depression is located beyond the landside toe. Where drained or undrained seepage berms exist or are proposed, the landside ground surface is not assumed to represent a "ditch, canal, or depression" condition as described in Section 7.5 of the ULDC. A summary of our under seepage criteria is provided in Section 9.7.

9.4.4 Through Seepage Analysis and Criteria

Through seepage is a condition that occurs when the upstream water stage in a cross section rises above the landside embankment toe elevation and the phreatic water surface through the levee embankment daylights onto the landside slope. This can cause localized instability, unraveling of the landside levee slope soils, and potentially progressive erosion of embankment soils causing levee failure.

Where the analyses show through seepage, the reported through seepage height is the difference in elevation between the landside toe of slope and the elevation at which the phreatic water surface daylights on the slope. Where applicable, the creep ratio, or the ratio of seepage path length through the embankment and the head difference on either side of an erodible layer, was calculated. The allowable creep ratio represents the minimum seepage path length per unit of head, and is controlled by the soil type through which the water is seeping. We selected allowable creep ratios based on the International Levee Handbook (USACE, 2013).

Considerations for through seepage evaluation are:

• Exit height of through seepage above the landside levee toe of the embankment (also called the "breakout" point).



- The types of soil in the embankment and what type of soil the through seepage is exiting onto the surface from.
- Slope of the embankment over which the through seepage is exiting onto.
- The allowable creep ratio though an erodible layer.
- Quantity of through seepage flow.

9.4.5 Hydraulic Conductivity

To determine appropriate soil hydraulic conductivities (K) of the levee and the foundation soils for seepage analyses, we utilized the following resources:

- Previous hydraulic conductivity evaluations in the region, and
- Specific hydraulic conductivity laboratory test results.

In sedimentary units, it is common to have anisotropic porous media. This occurs when the geometry of the voids between the soil particles is not uniform in all directions; therefore, the permeability in one direction may be greater. The ratio of horizontal conductivity to vertical conductivity, or anisotropy ratio (Kv/Kh), is generally based on the values determined through model calibration and laboratory soil testing in relation to gradational and plasticity characterization. Most soils were modeled with an anisotropy ratio of 0.25; however, each soil model was evaluated on a case-by-case basis with respect to depositional environment and sensitivity of the model.

The hydraulic conductivities of the materials in this evaluation were determined for saturated materials; hydraulic conductivities are generally much higher for saturated soils and, therefore, represent a more conservative condition by calculating a greater amount of flow through the soils. The specific hydraulic conductivities used in the analyses are presented on the seepage analysis figures in Appendix E.

9.4.6 Three-Dimensional Seepage Effects

In 2012, URS published a Technical Memorandum to provide guidance for assessing the three dimensional effects associated with a waterway meander. The concern at the time was that additional hydraulic head would be generated at the toe of levee on an inside bend, with a high-water stage potentially surrounding an area landside. The memorandum proposed that an additional 10 to 30 percent of the calculated exit gradient be added to account for the additional head that potentially could have been generated due to a river bend. We recognize that this methodology is intended for screening level evaluations; however, it is our opinion that this conservative approach to three-dimensional effects is acceptable for our current design analyses. At locations where this method of analysis could be applied, an additional percentage of exit gradient has been included, and noted, in the analyses presented in Appendix E.



9.4.7 Seepage Model Calibration

Consistent with previous evaluations by both ENGEO and ULE, sensitivity analyses were performed on the Seep/w models used in this evaluation. The anisotropic ratio and hydraulic conductivity of the blanket and/or landside surface soils were varied and the resulting exit gradient was then compared to other variations of the model and the observed historic performance. This process occurred through workshop meetings held for the ULE Program (in which models generated by the ULE Program were considered), as well as through internal review meetings at ENGEO (for models that were generated by ENGEO). Multiple iterations of this analysis were performed for each of the models to develop confidence in how the variation of the material properties in the models affected the results of the evaluation.

Based on the sensitivity analyses conducted on the sections published in this report, the analyses presented herein consider the observed historical performance of the levee system and can be considered a reasonable representation of the actual existing conditions.

9.5 SLOPE STABILITY EVALUATION – ULDC SECTION 7.4

We performed levee slope stability analysis by incorporating new and existing subsurface information and laboratory data along with existing or proposed LSRP Phases I, II and III levee improvements. Our models did not incorporate landside berms associated with PL84-99 improvements.

9.5.1 Analytical Software

We performed slope stability analyses using the GeoStudio 2012 v8.13.1.9253 software program Slope/w in this levee evaluation. Slope/w is a two-dimensional limit equilibrium program that is widely used in slope stability evaluations.

9.5.2 Soil Strength Parameters

As part of a cooperative effort between ENGEO and ULE, soil strength parameters were discussed and a general methodology for selecting strength parameters in workshop meetings. The SGDR Addendum discusses the special strength testing program that was conducted in support of the ULE GER evaluation. Ultimately, the ULE Program determined the soil strength parameters for the cross sectional slope stability models utilized in their screening level evaluation. The soil strength parameters used in our study are in general accordance with those values utilized by ULE for their screening level analysis, and are, in our opinion, conservative. Where analytical results revealed apparent over-conservative results, more appropriate soil strength parameters used in the ULDC analyses are presented on the analytical figures in Appendix E.

In selecting strength parameters, we distinguished between free-draining materials and non-free-draining materials. Free-draining materials are defined as coarse-grained materials with



little or no plastic fines such that when sheared these materials do not generate excess pore water pressure.

Free-draining materials were assumed to remain drained and hence their shear strength was characterized with a Mohr-Coulomb failure envelope for effective stress parameters for all loading conditions. The effective cohesion intercept (c') was assumed to be zero for all drained materials. In general, SPT blow counts and the results and findings of a special laboratory soil testing program were utilized in selecting the effective drained friction angle (ϕ ') of cohesionless soils.

Fine-grained soils were also modeled using Mohr-Coulomb failure envelopes. Effective soil strengths, used for steady state stability conditions, were defined by the effective friction angle, ϕ' and the effective cohesion intercept, c'; undrained soil strengths, used for rapid drawdown loading conditions, are defined by the total stress friction angle, ϕ and the total stress cohesion intercept, c. Soil strength parameters for fine-grained soils were selected and largely based on SPT blow counts, results of a special and laboratory soil testing.

For seismic loading, the use of the Stress History and Normalized Soil Engineering Properties (SHANSEP) method was utilized. The SHANSEP method is based upon the undrained strength as a function of stress history and effective overburden stresses. We performed three Triaxial Isotropically Consolidated Undrained (TXICU) tests on fine-grained deposits at different levels of overconsolidation to understand the behavior of the soil under rapid loading and undrained conditions. We compared the results of our laboratory testing with TXICU tests performed in previous studies of RD 17, from ENGEO and from DWR, and used the results to develop a strength profile based on the current stress state and the maximum past pressure of the soil.

We calibrated the correlations of undrained shear strength from CPTs with the laboratory data and our SHANSEP results.

9.5.3 Levee Slope Stability Analyses and Criteria

Circular and non-circular slope stability analyses were performed in Slope/w using Spencer's Method. This analytical method is an iterative solution that satisfies both force and moment equilibrium and assumes all slice side forces have the same inclination. This method is appropriate for both circular and non-circular failure surfaces, both of which are utilized in this study. However, because Spencer's method does not discriminate between realistic side force inclinations and instead only selects the inclination that provides the most critical inter-wedge forces, the results of non-circular slope stability analyses can be overly conservative; when this occurred, we used the Morgenstern-Price method for non-circular slope stability analyses. Similar to Spencer's Method, the Morgestern-Price method is also an iterative solution except the method assumes the direction of inter-slice forces varies across the slip surface as a function of distance. The results of either method of analysis were then compared to evaluate the level of conservatism for each.



The Factor of Safety (FS) is defined as the sum of available resisting forces divided by driving forces along a failure plane. A FS value less than 1.0 indicates slope instability, and the greater the FS, the greater the anticipated stability of the slope. For this levee evaluation, we are considering a non-circular failure surface for cross sections that incorporate a cutoff wall or contain a relatively thin weak soil layer that could provide a preferential failure plane.

Our stability analyses considered various loading conditions and water surface elevations. Our analysis framework was based on ULDC guidance. The minimum acceptable slope stability factors of safety are tabulated here:

TABLE 9.5.3-1

Minimum Acceptable Slope Stability Factors of Safety (FS)					
Rapid	Steady Seepage		Pseudostatic	Post Earthquake	
Drawdown	DWSE	HTOL			
1.0 - 1.2*	1.4	1.2	1.0	1.0	

* $FS \ge 1.0$ applies to pool levels prior to drawdown for conditions where the water levels are unlikely to persist for long periods preceding drawdown. $FS \ge 1.2$ applies to pool level, likely to persist for long periods prior to drawdown. For this evaluation, a $FS \ge 1.0$ is being utilized for Rapid Drawdown analyses, per USACE Guidance.

The ULDC specifies that the rapid drawdown shall be considered from the DWSE, and that the amount of drawdown should be established based on site-specific hydrologic data. For the purposes of this study, we utilized a drawdown water surface elevation provided by PBI. It is our understanding that this drawdown water surface elevation was based on a specific hydrologic and river hydraulic study for RD 17.

9.5.3.1 <u>Steady State Seepage</u>

This condition occurs when the water remains at or near full-flood stage long enough so the embankment becomes fully saturated and steady seepage is achieved. Pore water pressures used during steady state seepage were based on the DWSE or HTOL, respective to the analysis conducted. Steady state seepage pore pressures were calculated in Seep/w and then incorporated directly into Slope/w for slope stability analysis.

9.5.3.2 <u>Rapid Drawdown</u>

Rapid drawdown occurs when prolonged flood stage water levels saturate waterside embankment slope and then the water surface falls faster than the soil can drain. For this study, we utilized a specific drawdown water surface elevation provided by PBI. It is our understanding that this drawdown is based on a specific hydrologic and river hydraulic study on RD 17. Based on information provided by PBI, the flood water levels may persist for several weeks preceding a drawdown condition.



9.5.3.3 <u>Pseudostatic Seismic Analysis</u>

We utilized the higher of the average summer water surface elevation and the average winter water surface elevation provided by PBI to evaluate the levees under seismic conditions. Using undrained soil strengths due to the rapid seismic loading, we analyzed the stability of both the land and waterside slopes using a horizontal ground acceleration equal to one-half of the 200-year return period peak ground acceleration (PGA), as defined in Section 5.2, to simulate earthquake shaking. Where potentially liquefiable soils were identified in the subsurface profile, we performed a liquefaction triggering analysis and then assigned reduced post-earthquake strengths to these layers and ran stability analyses on both land and waterside slopes.

9.5.3.4 Post-Earthquake Slope Stability

We evaluated the liquefaction potential of the foundation soils utilizing the methodology presented in Youd et al., 2001. Liquefaction triggering was also considered using the methodologies proposed by Cetin et al. (2004) and Boulanger and Idriss (2014). In accordance with the ULDC, the higher of the average summer water surface elevation and the average winter water surface elevation was used for both liquefaction triggering analysis and limit equilibrium slope stability analysis.

The factor of safety against liquefaction triggering (FS_{liq}) was defined as the cyclic resistance of the soil to the cyclic stress acting on the soil due to the seismic loading. We considered a FS_{liq} less than 1.0 to indicate liquefaction triggering and a FS_{liq} between 1.0 and 1.4 to be "marginally liquefiable." When different methodologies yielded different liquefaction potential results for a given soil layer, we generally chose the conservative lower factor of safety in our analyses.

Liquefied soils for the "post-earthquake" condition were modeled in our stability analyses with residual undrained shear strength proportional to the effective overburden stress, according to the methodology proposed in Olson and Stark (2002). Marginally liquefiable soils were modeled in our stability analyses with a reduced friction angle (ϕ ') to account for a reduced shear strength caused by the buildup of pore water pressure due to cyclic loading. Soil strengths used in our analyses are shown on the analysis figures in Appendix E.

9.6 SEISMIC VULNERABILITY – ULDC SECTION 7.7

We evaluated the deformation anticipated from the 200-year seismic event, both from inertial lateral displacement and from post-earthquake loss of shear strength to estimate the total volume of soil needed to restore grades to the 10-year WSE plus 3 feet of freeboard elevation. We used the pseudostatic accelerations discussed in Section 5.3 to evaluate the stability of the levee under the design seismic loads. For cross sections that indicated a factor of safety less than 1.0 with respect to slope stability, we performed a Newmark-type displacement analysis based on the methodology proposed by Bray and Travasarou (2007) to estimate lateral deformations.

Locations that indicated significant or marginal liquefaction triggering were modeled with the reduced soils strengths discussed in Section 9.5.3.4. The cross sections were modeled to include



liquefiable soils layers that were identified at the model cross section, or were modified to include liquefiable layers that are indicated to exist in other locations within the same reach. Where the analysis indicated a factor of safety less than 1.0 with respect to slope stability, lateral deformations were estimated using the methodology proposed by Zhang et al (2004). The free face height and the lateral distance to free face was measured from the ground surface at each exploration location analyzed.

As a qualitative estimate of loss of freeboard, the vertical deformation of the levee crown was estimated for both pseudostatic and post-earthquake conditions as approximately 70 percent of the total lateral deformation. For cross sections that indicated both landside and waterside factors of safety less than 1.0, the total vertical deformation was assumed to be the sum of both the landside and waterside estimates of vertical deformation.

Using the vertical deformation data tabulated above, we compared the post-earthquake settlement levee crown elevation with the 10-year WSE plus 3 feet. This is minimum elevation required for flood protection that must be maintained following a seismic event. If the post-earthquake crown elevation was calculated to be higher than the 10-year WSE plus 3 feet, normal operations and maintenance are acceptable to restore the levee crown with no time constraint. If the post-earthquake crown elevation was calculated to be lower than the 10-year WSE plus 3 feet, we anticipate the volume of soil needed to restore the levee prism to at least this elevation within 8 weeks, as required by the ULDC.

The results of our lateral deformation evaluation and estimated fill volumes are presented in Table 10.0-3.

9.7 SUMMARY OF DESIGN CRITERIA

A summary of the analytical design criteria is provided here, which is identical to the ULDC's Table 7.2 – Urban Levee Design Criteria Summary for Intermittently Loads Levees.

Evaluation	Analysis	Analysis Case / Condition	Criteria
Seepage	Through Seepage		Phreatic water surface exits onto the landside levee slope in erodible material, above the landside levee toe.
	Under Seepage	Hydraulic Top of Levee	Exit Gradient ≤ 0.6 at the Levee Landside Toe
		(HTOL)	<20% FS Degradation for Berms Less Than 100 feet
		Design Water Surface Elevation	Exit Gradient ≤ 0.5 at the Levee Landside Toe
		(DSWE)	Exit Gradient ≤ 0.8 at a Seepage Berm Toe

TABLE 9.7-1Summary of Analytical Criteria for 200-Year Analysis



Evaluation	Analysis	Analysis Case / Condition	Criteria
Landside Slope Stability	Steady State Seepage	DWSE	Factor of Safety \geq 1.4 (for both circular and non-circular failure planes)
Waterside Slope Stability	Rapid Drawdown	Drawdown Water Elevation Provided by PBI	Factor of Safety ≥ 1.0 to 1.2^* (for both circular and non-circular failure planes)

* FS \geq 1.0 applies to pool levels prior to drawdown for conditions where the water levels are unlikely to persist for long periods preceding drawdown. FS \geq 1.2 applies to pool level, likely to persist for long periods prior to drawdown. For this evaluation, a FS \geq 1.0 is being utilized for Rapid Drawdown analyses, per USACE Guidance.

9.8 **REPORTING SEEPAGE AND SLOPE STABILITY**

The results of the seepage and slope stability analyses are presented on graphics in Appendix E as well as in Section 10 in a tabular summary format.

9.8.1 Idealized Subsurface Graphic

For each cross section analyzed, an initial graphic is presented showing the surface geometry, idealized subsurface stratigraphy, the exploration(s) utilized, the DWSE, and material parameters. Specific details regarding the boring logs (blow counts, percent fines content, laboratory test result, etc.) are not provided on these graphics since the addition of this information makes the graphic difficult to read. Subsurface explorations and associated laboratory testing results are provided in the appendices of this report.

9.8.2 Analytical Seepage Graphics

The seepage results figures present a "Geometry Model" showing the idealized stratigraphy utilized in the Seep/w software. Below that graphic is a "Total Head Contours" cross section showing the idealized stratigraphy and the calculated total head contours. This total head graphic is where potential through seepage breakouts are identified (relative to the landside levee toe), and exit gradients are calculated/called out.

On the total head graphic, where the ground surface soils are free-draining non-cohesive materials (sands), the local y-gradient was noted. Where a blanketing layer exists, an average gradient was calculated and reported across the blanketing layer. Either the average gradient or local gradient can be considered the exit gradient. Where occurring, a negative gradient was indicative of seepage flows not exiting on the ground surface; for this condition, we reported "*no positive y-gradient*".

The critical locations to determine exit gradients are the landside levee toe, seepage berm toe (where one is modeled), and ditch or depression within 150 feet of the levee toe. Multiple gradients are presented on the seepage analysis figures; this has been done to convey a better understanding of the model to the reader. When a drained seepage berm was incorporated into



the seepage model, the resulting total head at the ground surface was typically less than the elevation at the same point. This is because the phreatic surface was below the ground surface.

Also noted on the total head graphic is the occurrence of calculated through seepage. A breakout point is indicated on the graphic and the approximate height of the through seepage relative to the landside levee toe is noted.

When a drained seepage berm was modeled, the location of the phreatic water surface within the berm section was checked to determine if the drainage section had sufficient capacity to convey seepage flows. If the drainage section of the berm has sufficient capacity to convey the seepage flows collected by the filter and drainage layer, the phreatic surface will remain below the surface of the berm. Should a positive gradient be measured between the drain rock section and the top of the berm fill material, the capacity of the drainage section in the berm is considered to be fully utilized.

9.8.3 Factor of Safety Calculations

The results of the slope stability analyses are presented on graphics showing the idealized subsurface stratigraphy and existing or proposed improvements (if any). A factor of safety against failure that was calculated by Slope/w is also presented on this graphic. As previously discussed, potential failure surfaces were forced to intersect the levee crest to prevent the program from converging to shallow slumps on the levee slopes; results of slope stability analysis represent the occurrence of a potential slide plane of sufficient size to potentially impact levee integrity. Particularly in non-circular slope stability calculations, the most critical and *reasonable* failure plane was reported, which may not necessarily be the lowest factor of safety calculated by Slope/w. Engineering judgment was utilized when reporting the appropriate of safety.

9.9 INTERFACES AND TRANSITIONS – ULDC SECTION 7.9

Interfaces and transition designs of future improvements were not evaluated as part of this evaluation. Transitions between different mitigation methods, such as cutoff walls and seepage berms, should overlap sufficiently for the system to perform holistically, such that no reach is more susceptible to seepage or stability issues than any adjacent reach. Once final mitigation alternatives for each reach have been selected, final interface and transition evaluations should be performed.

9.10 FLOODWALL, RETAINING WALLS, AND CLOSURE STRUCTURES – ULDC SECTION 7.14

There are currently no floodwalls, retaining walls, or closure structures within the RD 17 levee system; therefore, no evaluations for these structures were performed. If floodwalls, retaining walls, and/or closure structures are incorporated into the levee system in the future, they should be evaluated, as necessary.



QUALITY ASSURANCE/QUALITY CONTROL 9.11

ENGEO implemented a detailed framework for quality assurance and quality control as part of our RD 17 levee evaluation. We set up quality assurance systems to intentionally generate quality deliverables. Our quality assurance protocols include many facets, a few of which are summarized below:

- 1. Field work (drilling and CPTs) performed by California licensed contractors using calibrated and current equipment and ASTM procedures (where applicable).
- 2. Use of in-house Army Corps and AASHTO accredited laboratory facilities following ASTM test procedures.
- 3. Utilizing tested and approved engineering design and analysis programs, including Geostudios (Seep/W and Slope/W) and CPeT-IT.
- 4. Engineering analyses performed and/or overseen by degreed and California licensed engineering and geology professionals.

Quality control procedures were used to check engineering analyses, boring logs, laboratory data, calculations, figures, and report text. Our process included an independent review by at least one other person with tasks tracked on a spreadsheet. This served as an independent quality control check for accuracy, thoroughness, and overall presentation. Refer to Appendix G for details on our quality control documentation.

10.0 CONCLUSIONS

With the inclusion of the proposed and constructed LSRP improvements, the Reclamation District 17 levee system does not meet the ULDC within the limits of the following reaches:

Re	aches Found Not Meeting	ULDC - Seepage
Reach	Approximate Station Limits	Analyses Not Meeting Steady State Criteria
C2	121+00 to 142+00	Through seepage
C3A	142+00 to 158+00	Under seepage
C4B	174+45 to 192+00	Through seepage
D1	192+00 to 212+00	Under seepage
D2A	212+00 to 247+00	Through and under seepage
D2C	255+00 to 259+50	Through and under seepage
E1B	270+00 to 297+75	Through seepage
F1B	312+30 to 315+00	Through seepage
F1C	215+00 to 321+00	Through and under seepage
F2	321+00 to 339+00	Through and under seepage

TABLE 10.0-1



Reach	Approximate Station Limits	Analyses Not Meeting Steady State Criteria
F3	339+00 to 362+50	Through and under seepage
H1A	388+00 to 411+00	Through and under seepage
H1B	411+00 to 420+00	Under seepage
H2	420+00 to 445+00	Through and under seepage
Н3	445+00 to 466+00	Through seepage
Ι	466+00 to 506+00	Through and under seepage
J1A	506+00 to 515+50	Through seepage
P2	867+00 to 909+00	Through seepage
Q1	909+00 to 944+00	Through seepage
R1	944+00 to 959+00	Through seepage
S1	959+00 to 972+00	Through seepage

Pursuant to the ULDC, a plan should be in place to "restore grade and dimensions for at least 10-year WSE plus 3 feet of freeboard or higher for wind setup and wave runup within 8 weeks" (DWR, 2012) for urban levees found to be seismically vulnerable. Based on our seismic vulnerability analysis, we conclude that a seismic restoration plan should be prepared for the following reaches:

Reach	Approximate Station Limits	Analysis(es) Not Meeting Seismic Criteria
C3A	142+00 to 158+00	Waterside Pseudo Static, Waterside Liquefaction
D1	192+00 to 212+00	Waterside Pseudo Static, Waterside/Landside Liquefaction
F1B	312+30 to 315+00	Waterside Liquefaction
F2	321+00 to 339+00	Waterside Liquefaction
G	362+50 to 388+00	Waterside Liquefaction
H1B	411+00 to 420+00	Waterside Pseudo Static
H3	455+00 to 466+00	Waterside Liquefaction
L2	655+00 to 703+00	Waterside Liquefaction
M2B	741+30 to 760+50	Waterside Liquefaction
M3A	760+50 to 763+00	Waterside Liquefaction
M3B	763+00 to 768+00	Waterside Liquefaction
M3C	775+00 to 781+00	Waterside Liquefaction
M4	781+00 to 799+50	Waterside Liquefaction
N2	806+00 to 825+00	Waterside Liquefaction
01	825+00 to 835+00	Waterside Liquefaction

TABLE 10.0-2 Reaches Found to be Seismically Vulnerable



	Anticip	alcu Restoration	10110willg a 200	- Year Seismic Event	
Reach	Estimated Length of Damaged Levee (feet)	Estimated Lateral Displacement (feet)	Estimated Vertical Displacement (feet)	Fill Volume* (10-Year WSE + 3 feet Freeboard) (cubic yards)	Fill Volume* (Fully Restored Levee Geometry) (cubic yards)
C3A	2,000	7	5	No Fill Anticipated	2,600
D1	1,235	3.5	2	No Fill Anticipated	350
F1B	650	2	1.5	No Fill Anticipated	100
F2	750	2	1.5	No Fill Anticipated	100
G	1,700	3.5	2.5	No Fill Anticipated	575
H1B	2,000	2	1.5	No Fill Anticipated	250
H3	1,600	3	2	No Fill Anticipated	375
L2	2,000	5.5	4	No Fill Anticipated	1,650
M2B	1,350	7.5	5.5	No Fill Anticipated	2,100
M3A	250	23	16	1,500	3,400
M3B	500	9	6	No Fill Anticipated	1,000
M3C	600	30	21	7,000	14,000
M4	1,850	3	2	No Fill Anticipated	450
N1	650	9	6	No Fill Anticipated	1,300
N2	1,900	11	8	200	6,200
01	745	14	10	1,500	3,900
		Tota	al Estimated Fill	10,200	38,350

 TABLE 10.0-3

 Anticipated Restoration Following a 200-Year Seismic Event

* Fill volumes are based on limited information and are only provided as estimates to allow for development of an appropriate emergency response plan.

To summarize pertinent information relevant to each analytical cross section and associated reach (including geometry, subsurface conditions, physical constraints and seepage and slope stability results), we created cutsheets for each of the 71 transverse cross sections analyzed as part of our scope. Each cutsheet summarizes the results of the seepage and slope stability analyses and a general description of the reach including levee dimensions, previous improvements and subsurface conditions. This data is presented in the subsequent report sections.

Based on the results of our evaluation, KSN has provided a technical memorandum specifying the improvements required to meet criteria specified in ULDC Sections 7.4, 7.5, 7.9 and 7.14 (KSN, 2016) for deficient reaches. The memorandum identifies the type of remediation selected and the approximate dimensions required to mitigate the adverse effects of seepage for each reach, as identified in this report. With the implementation of these improvements, we anticipate that the identified deficiencies will meet the criteria specified by the ULDC.



10.1 PROJECT REACH A1, STATION 7+56

]	REA	CH A	1 - ST	A 7 +	56	
Record on (our ovoluoti	on, this reac				- 8-		••	
	Evaluation S		in meets ui	e olde en	wi ia.	Slope Stabilit	v Evaluation	Summory	
Seepage L		WSEL, Unde	er Seenage.	Meets	Criteria	-	-	ge 200-Year DW SEL, LS:	Meets Criteria
20		SEL, Throug			Criteria	Steady		State Seepage HTOL, LS:	Meets Criteria
20		HTOL, Unde			Criteria		Steady L	Rapid Drawdown, WS:	Meets Criteria
		III OL, Olla	n beepuge.		Crittin	L	Sei	smic Slope Stability, WS:	Meets Criteria
								eismic Slope Stability, LS:	Meets Criteria
Reach Des	scription						54	Reach Overview	
	<u>-</u>		Sta	tion Limits:	0+00	to	15+00		L S S S S S S S
	Fe	eature(s) at U	Jpstream St	ation Limit:	South Manth	ey Road/dry la	and levee		think the stand
			1		Downing Ave	5 5		1 1 C 7 3/ 1	A RACE
Ar		n Elevation I			0	to	22		
1	-	Approx. Leve				to	10.5		
		Approx. Crov	-		17	to	47	PSEMILIAR STREET	
		prox. Lands		• • •	2:1	to	4.5:1	A DECEMBER OF THE OWNER	
	-	orox. Waters			1.7:1	to	3:1	St. 8	
	11			. –	Waterside be	nch between S	STA 0+00		
					and 8+00, ove STA 0+00 to 2	erhead power l 3+00 - agricult	ines ural land,		5
	Landsid	le repairs as	sociated w	ith PL84-99:	development	15+00 - comme in 1989 along F			
					Slough			1 -1	C IN COMMENT
	-	vements ass						The second second	
		vements ass						5955757-65°	
1		vements ass		th LSRP P3:	None			VOR AL TO	
Generaliz		ce Conditio							
		Prism Soils:							
					feet thick at le				
		-	Approx. 10	to 15 feet o	f Silty SAND	over Lean CLA	ΑY		
	erformance ed events in	<u>ule's 2014</u>	SGDR Add	endum					
Liquefiabl									
			ment, we are	e not consid	ering liquefiab	le soils in our	slope stabilit	y analyses.	
Seepage A	Analysis Res			r			1		
	Station	Water	Figure	ļ	Exit Gradien	-	Through	Breakout	
		Surface		Levee Toe	Toe of Berm	Field	Seepage	Height (ft)*	
	7+56	200-Year	E-2-B	0.02			Yes**	0.2	
		HTOL	E-2-C	0.03			n/a	n/a	
	Through see	epage under H	ITOL condit	tions are not j	part of this eval	uation.		ulated to day light on the lev	ee slope.
Zlong C4 1		-	i than 5:1 (H	.v), therefore	e we report me	ets criteria" for	urougn seepag	ge.	
stope Stat	bility Analys	sis kesults			F .	60.64	F .	<u> </u>	
	Store .	Case	Water	E		of Safety		of Safety	
	Station	Analyzed	Surface (ft)	Figure		ular)		Circular)	
		00.000	(ft)	E G E	Waterside	Landside	Waterside	Landside	
		SS - 200yr	14.5	E-2-D		4.9	n/a	n/a	
		SS - HTOL	15.7	E-2-E		4.8	n/a	n/a	
	<u>7+56</u>	RDD	10.8	E-2-D	1.3		n/a	n/a	
	1	PS	2.9	E-2-F	1.2	3.3	n/a	n/a	
		Post-EQ	n/a	n/a	n/a	n/a	n/a	n/a	



10.2 PROJECT REACH A2, STATION 28+05

			R	EAC	CH A2	2 - ST.	A 28-	⊦05			
Based on our	. evaluati	on, this reac									
Seepage Eval						Slope Stabilit	v Evaluation	Summarv			
		WSEL, Unde	er Seepage:	Meets	Criteria	1 -	-	e 200-Year DW	SEL, LS:	Meets	Criteria
		SEL, Throug			Criteria			tate Seepage H		Meets	Criteria
]	HTOL, Unde	er Seepage:	Meets	Criteria		-	Rapid Drawdo	own, WS:	Meets	Criteria
							Seis	mic Slope Stab	ility, WS:	Meets	Criteria
							Se	ismic Slope Sta	bility, LS:	Meets	Criteria
leach Descr	<u>iption</u>							Reach Overvi	ew		
			Sta	tion Limits:	15+00	to	60+00	I Pass I			
						power pole alig	gnment			10+00- mail	
	Featu	re(s) at Dov	vnstream St	ation Limit:	Downing Ave	enue crossing		14	1 -1	1313	
Appr	ox. Crowi	n Elevation I	Range (feet	, NAVD88):	19.5	to	22		2		
	Α	Approx. Leve	e Height R	ange (feet):	9	to	14		-		
	А	pprox. Crov	vn Width R	ange (feet):	10	to	53	100/100		3-1	Rope SI
	Ap	prox. Lands	ide Slope (H	H:V) Range:	1.9:1	to	5.5:1	And the Distance	Jel 10	apie -	Sur Ann
	App	rox. Waters			1:1	to	4.4:1		Carry 1	i.	market and and
		W	aterside Co	onstraint(s):	Extensive veg	getated watersi	de bench			<u>i</u> ar	N
				onstraint(s):	STA 15+00 to	30+00 open sj	pace				
	Landsid	le repairs as	sociated wi			60+00 residen	tial	10000		-	
		vements ass							14 ST		
	-				None			Roto		1 1 1	S States
			ociated wit	h I CPD D2	None					And in case of the local division of the loc	THE BUILD
Propos	-			th LSRP P2:				212.2	1111		
	sed Impro	vements ass	ociated wit						111		
	sed Impro Subsurfa	vements ass ce Condition	ociated wit	th LSRP P3:				3.2	111		
Generalized	sed Impro Subsurfa Levee	vements ass ce Condition Prism Soils:	ociated wit n <u>s</u> Lean CLA	th LSRP P3:	None	/ee toe			1112		
Generalized	sed Impro Subsurfa Levee	vements ass ce Condition Prism Soils: rface Layer:	ociated wit ns Lean CLA Lean Clay,	th LSRP P3: Y approx. 10 f	None		CLAY	1.2	11		
Generalized S Lan Soils	sed Impro Subsurfa Levee idside Sur below su	vements ass ce Conditio Prism Soils: rface Layer: urface layer:	ociated wit ns Lean CLA Lean Clay,	th LSRP P3: Y approx. 10 f	None	vee toe AND and Lean	CLAY				
Generalized S Lan Soils Historic Perf	sed Impro Subsurfa Levee Idside Sun below su formance	vements ass ce Conditio Prism Soils: rface Layer: urface layer:	ns ILean CLA Lean CLA Lean Clay, Interbedde	th LSRP P3: Y approx. 10 f d layers of §	None eet thick at lev SAND, Silty S	AND and Lean					
Generalized S Lan Soils Historic Perf	sed Impro Subsurfa Levee Idside Sun below su formance	vements ass ce Conditio Prism Soils: rface Layer: urface layer:	ns ILean CLA Lean CLA Lean Clay, Interbedde	th LSRP P3: Y approx. 10 f d layers of §	None eet thick at lev SAND, Silty S						
Generalized : Lan Soils Historic Perf Geepage and	sed Impro Subsurfa Levee dside Sun below su formance erosion d	vements ass ce Conditio Prism Soils: rface Layer: urface layer:	ns ILean CLA Lean CLA Lean Clay, Interbedde	th LSRP P3: Y approx. 10 f d layers of §	None eet thick at lev SAND, Silty S	AND and Lean					
Generalized : Lan Soils fistoric Perf deepage and iquefiable S	sed Impro Subsurfa Levee below su formance erosion c Soils	vements ass cce Condition Prism Soils: rface Layer: urface layer: luring the 19	sociated wit ns Lean CLA ^N Lean Clay, Interbedde 997 flood ev	th LSRP P3: Y approx. 10 f d layers of S vent were rep	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean	Addendum	Reach (Refer to	Appendix E	and App	endix F)
Generalized S Lan Soils Historic Perf Geepage and Liquefiable S Based c	sed Impro Subsurfa Levee dside Sur below su formance erosion c Soils on our liq	vements ass cce Condition Prism Soils: rface Layer: urface layer: luring the 19 uefaction as	sociated wit ns Lean CLA ^N Lean Clay, Interbedde 997 flood ev	th LSRP P3: Y approx. 10 f d layers of S vent were rep	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean	Addendum	Reach (Refer to	Appendix E	and App	endix F)
Generalized : Lan Soils Fistoric Perf Geepage and Liquefiable S Based of Geepage Ana	sed Impro Subsurfa Levee ddside Sun below su formance erosion o Soils on our liq dysis Res	vements ass cce Condition Prism Soils: rface Layer: urface layer: luring the 19 uefaction as	sociated with ns Lean CLAN Lean Clay, Interbedde 1997 flood ev sessment, v	th LSRP P3: Y approx. 10 f d layers of S vent were rep	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean	Addendum within this R	Reach (Refer to		and App Through	1
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Geepage Ana	sed Impro Subsurfa Levee dside Sur below su formance erosion c Soils on our liq	vements ass cce Condition Prism Soils : rface Layer: urface layer: luring the 19 uefaction as cults	sociated wit ns Lean CLA ^N Lean Clay, Interbedde 997 flood ev	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean 's 2014 SGDR A quefiable soils	Addendum within this R dient	Reach (Refer to Field	1		Breakout
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Geepage Ana	sed Impro Subsurfa Levee idside Sur below su formance erosion o Soils on our liq Usis Res Station	vements ass cce Condition Prism Soils : rface Layer: urface layer: luring the 19 uefaction as uuts Water	sociated with ns Lean CLAN Lean Clay, Interbedde 1997 flood ev sessment, v	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean 's 2014 SGDR 4 quefiable soils Exit Gra	Addendum within this R dient	1	1	Through	Breakout
Generalized : Lan Soils Elistoric Perf Seepage and Liquefiable S Based of Seepage Ana	sed Impro Subsurfa Levee ddside Sun below su formance erosion o Soils on our liq dysis Res	vements ass cc Condition Prism Soils : rface Layer: urface layer: luring the 19 uefaction as cuts Water Surface	iociated with ns Lean CLAN Lean Clay, Interbedde 997 flood ev sessment, v Figure	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Leve 0	None eet thick at lev SAND, Silty S ported in ULE	AND and Lean 's 2014 SGDR 4 quefiable soils Exit Gra	Addendum within this R dient	Field	1	Through Seepage	Breakout Height (ft)
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Seepage Ana	sed Impro Subsurfa Levee idside Sur below su formance erosion o Soils on our liq lysis Res Station 28+05	vements ass cce Condition Prism Soils: rface Layer: urface layer: urface layer: urface layer: urface layer: urface layer: Uning the 15 Uning the 1	inciated with ns Lean CLAN Lean Clay, Interbedde 097 flood ev sessment, v Figure E-2-B E-2-C	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Leve 0 0 0 0	None Teet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30	A ND and Lean 's 2014 SGDR A quefiable soils Exit Gra Toe of	Addendum within this R dient Berm - -	Field	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Tistoric Perf Seepage and Liquefiable S Based of Seepage Ana	sed Impro Subsurfa Levee idside Sur below su formance erosion o Soils on our liq lysis Res Station 28+05	vements ass ice Condition Prism Soils: iface Layer: inface layer: urface layer: uuring the 19 uuefaction as uuts Water Surface 200-Year HTOL stance from th	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Leve () levee (ground	None Teet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30	AND and Lean (s 2014 SGDR A quefiable soils Exit Gra Toe of	Addendum within this R dient Berm - -	Field 	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Ceneralized : Lan Soils Elistoric Perf Seepage and Ciquefiable S Based of Seepage Ana Seepage Ana Seepage Ana	sed Impro Subsurfa Levee idside Sub below su formance erosion o Soils on our liq dysis Res Station 28+05 Vertical dis hrough see	vements ass ice Condition Prism Soils: rface Layer: inface layer: urface layer: uurfaction as uuts Water Surface 200-Year HTOC stance from the page under H	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S yent were rep we identified Leve C levee (ground ions are not p	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30 d surface) to wh part of this eval	AND and Lean (s 2014 SGDR A quefiable soils Exit Gra Toe of	Addendum within this R dient Berm - - surface is calc	Field ulated to day ligh	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Historic Perf Geepage and Liquefiable S Based of Geepage Ana Seepage Ana Seepage Ana Seepage Ana Ti	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq Uvsis Res Station 28+05 Vertical dis hrough sec *Exits onto	vements ass ace Condition Prism Soils: rface Layer: urface layer: uuefaction as uuefaction	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S yent were rep we identified Leve C levee (ground ions are not p	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30 d surface) to wh part of this eval	AND and Lean as 2014 SGDR A quefiable soils Exit Gra Toe of tere the phreatic uation.	Addendum within this R dient Berm - - surface is calc	Field ulated to day ligh	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Elistoric Perf Seepage and Liquefiable S Based of Seepage Ana Seepage Ana 	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq Uvsis Res Station 28+05 Vertical dis hrough sec *Exits onto	vements ass cc Condition Prism Soils : rface Layer: urface layer: luring the 19 uefaction as uuts Water Surface 200-Year HTOL stance from the page under H o fine grained is Results	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S yent were rep we identified Leve C levee (ground ions are not p	None eet thick at lev SAND, Silty S ported in ULE d potentially li ee Toe).21).30 d surface) to who part of this eval V), therefore w Factor of	AND and Lean (s 2014 SGDR A quefiable soils Exit Gra Exit Gra Toe of tere the phreatic uation. e report "meets of of Safety	Addendum within this R dient - - surface is calc criteria" for th Factor of	Field culated to day ligh rough seepage. of Safety	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Elistoric Perf Seepage and Liquefiable S Based of Seepage Ana Seepage Ana Seepage Ana *** *** ***	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq Uvsis Res Station 28+05 Vertical dis hrough sec *Exits onto	vements ass cc Condition Prism Soils : rface Layer: urface layer: urface layer: uefaction as uefaction as	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S yent were rep we identified Leve C levee (ground ions are not p	None eet thick at lev SAND, Silty S ported in ULE d potentially li ee Toe).21).30 d surface) to who part of this eval V), therefore w Factor of	AND and Lean (s 2014 SGDR A quefiable soils Exit Gra Exit Gra Toe of tere the phreatic uation. e report "meets of	Addendum within this R dient - - surface is calc criteria" for th Factor of	Field rulated to day ligh rough seep age.	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq dysis Res Station 28+05 Vertical dis hrough sec *Exits onto ty Analys	vements ass cc Condition Prism Soils : rface Layer: urface layer: luring the 19 uefaction as uuts Water Surface 200-Year HTOL stance from the page under H o fine grained is Results	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified we identified Leve (c) levee (ground ions are not p than 5:1 (H:	None eet thick at lev SAND, Silty S ported in ULE d potentially li ee Toe).21).30 d surface) to who part of this eval V), therefore w Factor of	AND and Lean (s 2014 SGDR A quefiable soils Exit Gra Exit Gra Toe of tere the phreatic uation. e report "meets of of Safety	Addendum within this R dient - - surface is calc criteria" for th Factor of	Field culated to day ligh rough seepage. of Safety	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Eistoric Perf Geepage and Joguefiable S Based of Geepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq dysis Res Station 28+05 Vertical dis hrough sec *Exits onto ty Analys	vements ass cc Condition Prism Soils : rface Layer: urface layer: urface layer: uefaction as uefaction as	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified we identified Leve (c) levee (ground ions are not p than 5:1 (H:	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe).21).30 d surface) to wh part of this eval V), therefore w Factor of (Cirr	AND and Lean (s 2014 SGDR # quefiable soils Exit Gra Exit Gra Toe of erere the phreatic uation. e report "meets o of Safety :ular)	Addendum within this R dient - - surface is calc criteria" for th Factor o (Non-C	Field rulated to day ligh rough seep age. of Safety Circular)	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana Seepage Ana	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq dysis Res Station 28+05 Vertical dis hrough sec *Exits onto ty Analys	vements ass ce Condition Prism Soils : fface Layer: urface layer: uuefaction as cuts Water Surface 200-Year HTOL stance from the page under Fi o fine grained cis Results Case Analyzed	inciated with inside the second seco	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Leve (C) (C) levee (ground ions are not p than 5:1 (H: Figure	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30 1 surface) to wh part of this eval V), therefore w Factor of (Circ Waterside	A ND and Lean (s 2014 SGDR A quefiable soils Exit Gra Exit Gra Toe of eree the phreatic uation. e report "meets of of Safety cular) Landside	Addendum within this R dient Berm - - surface is calc criteria" for th Factor o (Non-C Waterside	Field culated to day ligh rough seep age. of Safety Circular) Landside	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based of Seepage Ana Seepage Ana *** Ti ***	sed Impro Subsurfa Levee idside Sub below su formance erosion of Soils on our liq dysis Res Station 28+05 Vertical dis hrough sec *Exits onto ty Analys	vements ass ce Condition Prism Soils : fface Layer: urface layer: uuefaction as uuefaction as as as as as as as as as as	inciated with the second secon	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Leve (C) (C) levee (ground ions are not p than 5:1 (H: Figure E-3-D	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30 d surface) to wh part of this eval V), therefore w Factor of (Circ Waterside 	AND and Lean (s 2014 SGDR 4 (guefiable soils) Exit Gra Exit Gra Toe of ereport "meets of of Safety cular) Landside 2.8	Addendum within this R dient Berm - - surface is calc criteria" for th Factor of (Non-O Waterside n/a	Field culated to day ligh rough seepage. of Safety Circular) Landside n/a	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2
Generalized : Lan Soils Historic Perf Seepage and Liquefiable S Based c Seepage Ana Seepage Ana *** Ti ***	ed Impro Subsurfa Levee idside Sur below su formance erosion of Soils on our liq dysis Res Station 28+05 Vertical dis hrough see *Exits onte ty Analys Station	vements ass ce Condition Prism Soils : face Layer: urface layer: uurfaction as cuts Water Surface 200-Year HTOL stance from tl page under H o fine grained is Results Case Analyzed SS - 200yr SS - HTOL	inciated with the second secon	th LSRP P3: Y approx. 10 f d layers of S vent were rep we identified Ueve (ground ions are not p than 5:1 (H: Figure E-3-D E-3-E	None eet thick at lev SAND, Silty S ported in ULE 1 potentially li ee Toe 0.21 0.30 1 surface) to wh part of this eval V), therefore w Factor of (Circ Waterside 	AND and Lean (s 2014 SGDR 4 (guefiable soils Exit Gra Toe of Content of the phreatic (uation) (state)	Addendum within this R dient Berm 	Field ulated to day ligh rough seepage. of Safety Circular) Landside n/a n/a	1 1	Through Seepage Yes** n/a	Breakout Height (ft) 2



10.3 PROJECT REACH B, STATION 79+72

		F	REA	CH B	- STA	A 79 +	72			
Based on our ev	duation, this rea									
Seepage Evaluati					Slope Stabilit	ty Evaluation	Summary			
	ear DWSEL, Und	er Seepage:	Meets	Criteria	r –	-	ge 200-Year DW	SEL, LS:	Meets	Criteria
200-Year	DWSEL, Throug	gh Seepage:	Meets	Criteria		Steady S	tate Seepage H	TOL, LS:	Meets	Criteria
	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Drawd	own, WS:	Meets	Criteria
					•	Seis	mic Slope Stab	oility, WS:	Meets	Criteria
						Se	ismic Slope Sta	bility, LS:	Meets	Criteria
Reach Descripti	<u>on</u>						Reach Overvi	ew		
		Sta	tion Limits:	60+00	to	90+00	PERLE		Stan and	THE .
	Feature(s) at	-					1 to 10		Mation	
	Feature(s) at Do	wnstream St	ation Limit:		ramp/overhea	d high	1			Res al
A	Course Electrica	Danas (frat		tension lines		22				No. Co
Approx.	Crown Elevation			20.5	to	23				12 mar
	Approx. Lev	-		10.5 10	to	13 27	State and state of the	ALL DE LE		
	Approx. Cro Approx. Lands			2.2:1	to to	6:1		S and	PIS IS	The second
	Approx. Waters		· -	2.2:1	to to	4.1:1		h	3	N
		/aterside Co	-		10	4.1.1		The former	5	
				Residential de	evelopment			5		
Li	andside repairs as				, elopitent		I ASSA	e te	7.66 - C	
	Improvements as							TOULU	ALL S	Service -
	Improvements as						100			A DEPENDENT
D.,	• •									
<mark>eneralized Sub</mark> L Landsic Soils bel	surface Condition evee Prism Soils: de Surface Layer: ow surface layer:	<u>ms</u> Lean CLA Silty SANI	O at toe STA	SAND 79+72, Lean	0				CLAY in t	the field
eneralized Sub L Landsid Soils bel istoric Perforn	surface Condition evee Prism Soils: de Surface Layer: ow surface layer:	<u>ms</u> Lean CLA Silty SANI	Y and Silty S D at toe STA	SAND 79+72, Lean	0				CLAY in t	the field
eneralized Sub L Landsia Soils bel istoric Perforn one noted iquefiable Soils	surface Condition evee Prism Soils : de Surface Layer: ow surface layer: nance	<u>ms</u> Lean CLA ^N Silty SANI Lean CLA ^N	Y and Silty S O at toe STA Y with Silty :	SAND 3 79+72, Lean SAND lenses,	approx 5 feet	thick at a dep	oth of approx. 2		CLAY in t	the field
eneralized Sub L Landsic Soils bel istoric Perform one noted iquefiable Soils asea on our uqu	surface Conditioner evee Prism Soils: de Surface Layer: ow surface layer: nance nance	<u>ms</u> Lean CLA ^N Silty SANI Lean CLA ^N	Y and Silty S O at toe STA Y with Silty :	SAND 3 79+72, Lean SAND lenses,	approx 5 feet	thick at a dep	oth of approx. 2			the field
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eneralized Sub L Landsio Soils bel istoric Perforn one noted iquefiable Soils ased on our liqu eepage Analysi Stati 79- *Vert Throu lope Stability A	surface Condition evee Prism Soils: de Surface Layer: ow surface layer: nance ueraction assession is Results tion Water Surface +72 200-Year HTOL ical distance from to nalvsis Results	ms Lean CLAN Silty SANI Lean CLAN ment, we are Figure E-4-B E-4-C the toe of the HTOL condit	Y and Silty S D at toe STA Y with Silty S e not constant Lev No Positi (levee (ground	SAND 5 79+72, Lean (SAND lenses, ering liquenation ee Toe ive Gradient 0.01 d surface) to who part of this eval Factor of (Circ	approx. 5 feet	thick at a dep stope stabilit idient f Berm surface is calc Factor of (Non-C	y analyses. y analyses. Field 0.18 0.22 culated to day ligh of Safety Circular)	25 feet.	Through Seepage No n/a	Breakout Height (ft) n/a
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iguefiable Soils assed on our liquefiable Soils assed on our l	surface Condition event Prism Soils: de Surface Layer: ow surface layer: nance sueraction assess: is Results tion Water Surface +72 200-Year HTOL ical distance from to analysis Results tion Case Analyzed SS - 200yr SS - HTOL	ILEAN CLAN Silty SANI Lean CLAN Meent, we are Figure E-4-B E-4-C he toe of the HTOL condit Water Surface 14.5 15.6 10.8	Y and Silty S D at toe STA Y with Silty : e not constant te not constant Leve (ground ions are not p Figure E-4-D E-4-E E-4-D	SAND A 79+72, Lean (SAND lenses, ering iiquenable ee Toe ive Gradient).01 d surface) to who bart of this eval Factor of (Circ Waterside 2.2	approx. 5 feet	thick at a dep stope stabilit dient f Berm 	y analyses. y analyses. Field 0.18 0.22 culated to day light of Safety Circular) Landside n/a n/a n/a	25 feet.	Through Seepage No n/a	Breakout Height (ft) n/a
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10.4 PROJECT REACH C1, STATION 100+10

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ased on or	ur evaluati	on. this read		e ULDC Cri							
	aluation S	· · ·				Slope Stabilit	y Evaluation (Summary			
		WSEL, Unde	er Seepage:	Meets	Criteria	1		e 200-Year DV	WSEL, LS:	Meets	Criteria
		SEL, Throug			Criteria			ate Seepage I		Meets	Criteria
]	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawo	down, WS:	Meets	Criteria
						-	Seis	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
each Desc	cription							Reach Overv	view		
			Sta	tion Limits:	90+00	to	121+00	Terat	The second		
	Fe	ature(s) at U	Jpstream St	ation Limit:	Transition to park area	thinner blanke	t, landside			MIHIO IN	A A
	Featu	re(s) at Dov	wnstream St	ation Limit:	Transition to	thinner blanke	t in Reach B		2		
App	prox. Crowi	n Elevation l	Range (feet	, NAVD88):	21	to	24			27428	1.
	A	Approx. Leve	ee Height R	ange (feet):	10	to	16	A STATE OF STATE	Hales and	A L	AN POR
	А	pprox. Crov	vn Width R	ange (feet):	12	to	40		23	State.	E / Ker
	•	prox. Lands	• •	, 0		to	6.9:1		Carles -	1000	
	App	rox. Waters	• •	, 0	1.7:1	to	4.2:1				N
		W	aterside Co	onstraint(s):		e of slope at th	e waterway -		anne a stanne	P ter	
					no waterside				3		
					None - agricu	iltural land.		S	TRUER	10 1	Anne C
		ie repairs as	sociated wi	th PL84-99:	None			Part Barrie	A REAL PROPERTY OF		State and the state
		-							and the lot of the lot		Property in the second
	Impro	vements ass	sociated wit	th LSRP P1:	None						
Drong	Impro Impro	vements ass vements ass	sociated wit	th LSRP P1: th LSRP P2:	None None			12.20	1 AC		
	Impro Impro osed Impro	vements ass vements ass vements ass	sociated wit sociated wit sociated wit	th LSRP P1:	None None			the second			
	Impro Impro osed Impro d Subsurfa	vements ass vements ass vements ass ce Conditio	sociated wit sociated wit sociated wit	th LSRP P1: th LSRP P2: th LSRP P3:	None None None			Mar No			
eneralized	Impro Impro osed Impro dSubsurfa Levee	vements ass vements ass vements ass ce Conditio Prism Soils:	sociated wit sociated wit sociated wit <u>ns</u> Silty SANI	th LSRP P1: th LSRP P2: th LSRP P3: D to Lean Cl	None None None ay	toe of levee			(M)		40
eneralized	Impro Impro osed Impro d Subsurfa Levee andside Sur	vements ass vements ass vements ass ce Conditio Prism Soils: fface Layer:	sociated wit sociated wit sociated wit sociated wit Silty SANI Lean CLAY	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15	None None None ay 5 feet thick at t		CAND over 5	O fast of Laon			
eneralize La Soil	Impro Impro osed Impro d Subsurfa Levee andside Sus ils below su	vements ass vements ass vements ass ce Conditio Prism Soils: fface Layer: urface layer:	sociated wit sociated wit sociated wit sociated wit Silty SANI Lean CLAY	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15	None None None ay 5 feet thick at t	toe of levee 4 feet of Silty S	SAND, over 5	0 feet of Lean	CLAY		
eneralized La Soil istoric Pe	Impro Impro osed Impro d Subsurfa Levee andside Su ils below su e rformance	vements ass vements ass vements ass ce Conditio Prism Soils: fface Layer: urface layer:	sociated wit sociated wit sociated wit ns Silty SANI Lean CLA Approx 12	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 t feet of Lean	None None None ay 5 feet thick at t		SAND, over 5	0 feet of Lean	CLAY		
eneralized La Soil istoric Pe	Impro Impro osed Impro d Subsurfa Levee andside Sur ils below su erformance d events in	vements ass vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer:	sociated wit sociated wit sociated wit ns Silty SANI Lean CLA Approx 12	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 t feet of Lean	None None None ay 5 feet thick at t		SAND, over 5	0 feet of Lean	CLAY		
eneralized La Soil istoric Pe o recorded	Impro Impro osed Impro d Subsurfa Levee andside Su is below su erformance d events in <u>Soils</u>	vements ass vements ass <u>ce Conditio</u> Prism Soils: fface Layer: urface layer: ULE's 2014	sociated wit sociated sociated wit sociated sociated sociated sociated sociated sociated sociate	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum	None None ay 5 feet thick at t n CLAY, over	4 feet of Silty S				Annendix	Đ
eneralized La Soil istoric Pe o recorded iquefiable ased on o	Impro Impro osed Impro d Subsurfa Levee andside Sur is below su erformance d events in <u>Soils</u> ur liquefact	vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer: ULE's 2014	sociated wit sociated sociated wit sociated sociated sociated sociated sociated sociated sociate	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum	None None ay 5 feet thick at t n CLAY, over					Appendix	F)
La La Soil istoric Pe o recordeo iquefiable ased on o	Impro Impro osed Impro d Subsurfa Levee andside Su is below su erformance d events in <u>Soils</u>	vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer: ULE's 2014 tion assessr ults	sociated wit sociated sociated wit sociated sociated sociated sociated sociated sociated sociate	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum	None None ay 5 feet thick at t n CLAY, over	4 feet of Silty 5	n this Reach (1
Eneralized La Soil Storic Pe Direcorded quefiable ased on ou	Impro Impro osed Impro d Subsurfa Levee andside Sur is below su erformance d events in <u>Soils</u> ur liquefact	vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer: ULE's 2014	sociated wit sociated sociated wit sociated sociated sociated sociated sociated sociated sociate	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum	None None ay 5 feet thick at t n CLAY, over ntially liquefia	4 feet of Silty S	n this Reach (dient	Refer to App	endix E and	Through	Breakou
Eneralized La Soil Storic Pe Direcorded quefiable ased on ou	Impro Impro osed Impro d Subsurfa Levee andside Sur ils below su erformance d events in e Soils ur liquefact nalysis Res Station	vements ass vements ass ce Conditio Prism Soils: fface Layer: urface layer: ULE's 2014 ULE's 2014 tion assess ults Water Surface	sociated wit sociated wit sociated wit ms Silty SANI Lean CLAN Approx. 12 SGDR Add ment, we ide Figure	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 endum endum	None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe	4 feet of Silty S able soils within Exit Gra	n this Reach (dient	Refer to App Fiel	endix E and	Through Seepage	Breakou Height (ft
eneralized La Soil istoric Pe o recorded iquefiable ased on o	Impro Impro osed Impro dSubsurfa Levee andside Sur ils below su erformance d events in e Soils ur liquefact nalysis Res	vements ass vements ass vements ass ce Conditio Prism Soils: frace Layer: urface layer: ULE's 2014 tion assess ults Water	sociated wit sociated wit sociated wit sociated wit ms Silty SANI Lean CLA ^N Approx. 12 SGDR Add ment, we ide	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote	None None ay 5 feet thick at t n CLAY, over ntially liquefia	4 feet of Silty S able soils within Exit Gra	n this Reach (dient	Refer to App	endix E and Id 2	Through	F) Breakout Height (ft 0.6 n/a
La Soil istoric Pe o recordeo quefiable used on ou repage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in e Soils ur liquefact nalysis Res Station 100+10	vements ass vements ass vements ass cc Conditio Prism Soils: fface Layer: rface layer: ULE's 2014 ULE's 2014 tion assess ULE's 2014 tion assess ULE's 2014 tion assess ULE's 2014 tion assess ULE's 2014 tion assess ULE's 2014	sociated wit sociated wit sociated wit sociated wit men Silty SANI Lean CLA ^N Approx. 12 SGDR Add ment, we ide Figure E-5-B E-5-C	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote	None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05	4 feet of Silty 5 able soils within Exit Gra Toe of	n this Reach (dient Berm - -	Refer to App Fiel 0.0 0.0	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil istoric Pe o recordec quefiable used on or cepage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10	vements ass vements ass vements ass ce Conditio Prism Soils: fface Layer: urface layer: ULE's 2014 ULE's 2014 tion assess ults Water Surface 200-Year HTOL stance from th	sociated wit sociated wit sociated wit sociated wit ms Silty SANI Lean CLA ^N Approx 12 SGDR Add ment, we ide Figure E-5-B E-5-C he toe of the	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Lev (c) levee (ground	None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05	4 feet of Silty 5 able soils within Exit Gra Toe of nere the phreatic	n this Reach (dient Berm - -	Refer to App Fiel 0.0 0.0	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
Eneralized La Soil istoric Pe o recorded iquefiable ased on ou eepage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dia Through se	vements ass vements ass vements ass ce Conditio Prism Soils : fface Layer: inface layer: ULE's 2014 ULE's 2014 tion assess ULE's 2014	sociated wit sociated wit sociated wit sociated wit men Silty SANI Lean CLA ^N Approx. 12 SGDR Add ment, we ide Figure E-5-B E-5-C he toe of the ITOL condit	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Lev (levee (ground ions are not p	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to wh	4 feet of Silty 5 able soils within Exit Gra Toe of nere the phreatic	n this Reach (dient Berm - - surface is calci	Refer to App Fiel 0.0 0.0 ulated to day lig	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil istoric Pe o recordeo iquefiable ased on ou cepage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dia Through se	vements ass vements ass vements ass cc Conditio Prism Soils: face Layer: rface layer: ULE's 2014 ULE's 2014 tion assess ULE's 200-Year tion assess State from tion topped under F topped latter	sociated wit sociated wit sociated wit sociated wit men Silty SANI Lean CLA ^N Approx. 12 SGDR Add ment, we ide Figure E-5-B E-5-C he toe of the ITOL condit	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Lev (levee (ground ions are not p	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to wh	4 feet of Silty S able soils within Exit Gra Toe of here the phreatic luation.	n this Reach (dient Berm - - surface is calci	Refer to App Fiel 0.0 0.0 ulated to day lig	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil storic Pe precordeo quefiable used on ou repage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in e Soils ur liquefact nalysis Res Station 100+10 *Vertical di Through see **Exits ont	vements ass vements ass vements ass vements ass ce Conditio Prism Soils: face Layer: urface layer: ULE's 2014 tion assess ULE's 2014 tion asses tion asse	sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit nest Approx 12 SGDR Add ment, we ide Figure E-5-B E-5-C he toe of the ITOL condit r than 5:1 (H	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Lev (levee (ground ions are not p	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to whether the set part of this eval	4 feet of Silty S able soils within Exit Gra Toe of 	n this Reach (dient - - surface is calco through seepag	Refer to App Fiel 0.0 0.0 ulated to day lig ge.	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil storic Pe precordeo quefiable used on ou repage An	Impro Impro osed Impro dSubsurfa Levee andside Sur is below su erformance d events in e Soils ur liquefact nalysis Res Station 100+10 *Vertical di Through see **Exits ont	vements ass vements ass ce Conditio Prism Soils: frace Layer: urface layer: ULE's 2014 tion assess ULE's 2014 tion	sociated wit sociated wit sociated wit sociated wit main sociated wit sociated wit sociated wit Approx. 12 SGDR Add nent, we ide Figure E-5-B E-5-C he toe of the ITOL condit r than 5:1 (H	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Lev (levee (ground ions are not p	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to whether the set part of this eval e we report "me Factor of	4 feet of Silty S able soils within Exit Gra Toe of here the phreatic luation.	n this Reach (dient - - surface is calc through seepag Factor o	Refer to App Fiel 0.0 0.0 ulated to day lig ge.	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil istoric Pe o recordeo iquefiable ased on ou cepage An	Impro Impro dSubsurfa Levee andside Sur ils below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dir Through sec **Exits onte	vements ass vements ass vements ass vements ass ce Conditio Prism Soils: face Layer: urface layer: ULE's 2014 tion assess ULE's 2014 tion asses tion asse	sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit nest Approx 12 SGDR Add ment, we ide Figure E-5-B E-5-C he toe of the ITOL condit r than 5:1 (H	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Leve (ground ions are not p :V), therefore	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to whether the set part of this eval e we report "me Factor of	4 feet of Silty S able soils within Exit Gra Toe of 	n this Reach (dient - - surface is calc through seepag Factor o	Refer to App Fiel 0.0 0.0 ulated to day lig ge.	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil istoric Pe o recordeo quefiable ased on ou eepage An	Impro Impro dSubsurfa Levee andside Sur ils below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dir Through sec **Exits onte	vements ass vements ass ce Conditio Prism Soils: frace Layer: urface layer: ULE's 2014 tion assess ULE's 2014 tion	sociated wit sociated wit sociated wit sociated wit main sociated wit sociated wit sociated wit Approx. 12 SGDR Add nent, we ide Figure E-5-B E-5-C he toe of the ITOL condit r than 5:1 (H	th LSRP P1: th LSRP P2: th LSRP P3: O to Lean Cl Y, approx. 15 feet of Lean endum entified pote Leve (ground ions are not p :V), therefore	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe).03).05 d surface) to whether the second part of this evalue e we report "me Factor of (Cirr	4 feet of Silty S able soils within Exit Gra Toe of 	n this Reach (dient - - - surface is calco through seepag Factor o (Non-C	Refer to App Fiel 0.0 0.0 ulated to day lig ge. f Safety Zircular)	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
La Soil istoric Pe o recordeo quefiable ased on ou eepage An	Impro Impro dSubsurfa Levee andside Sur ils below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dir Through sec **Exits onte	vements ass vements ass vements ass ce Conditio Prism Soils: face Layer: urface layer: ULE's 2014 tion assess ults Water Surface 200-Year HTOL stance from th opage under F o slope flatter is Results Case Analyzed	sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit Approx 12 SGDR Add nent, we ide Figure E-5-B E-5-C he toe of the TOL condit r than 5:1 (H Water Surface	th LSRP P1: th LSRP P2: th LSRP P3: D to Lean Cl Y, approx. 15 feet of Lean endum entified pote the control of the control (C) levee (ground ions are not p :V), therefore Figure	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe .03 .05 d surface) to wh part of this eval e we report "me Factor of .03 .05	4 feet of Silty S able soils within Exit Gra Toe of nere the phreatic luation. wets criteria" for of Safety cular) Landside	n this Reach (dient Berm - - surface is calco through seepag Factor o (Non-C Waterside	Refer to App Fiel 0.0 0.0 ulated to day lig ge. f Safety Sarcular) Landside	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
Eneralized La Soil istoric Pe o recorded iquefiable ased on ou eepage An	Impro Impro osed Impro d Subsurfa Levee andside Sur is below su erformance d events in 2 Soils ur liquefact nalysis Res Station 100+10 *Vertical di Through see **Exits onte ility Analys	vements ass vements ass vements ass ce Conditio Prism Soils: face Layer: urface layer: uLE's 2014 tion assess uLE's 2014 tion assess ults Water Surface 200-Year HTOL stance from th page under F o slope flatter is Results Case Analyzed SS - 200yr	sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit Approx 12 SGDR Add nent, we ide Figure E-5-B E-5-C he toe of the toe of the tot condit r than 5:1 (H Water Surface 14.8	th LSRP P1: th LSRP P2: th LSRP P3: D to Lean Cl Y, approx. 15 feet of Lean endum entified pote the control of the control () () () () () () () () () () () () ()	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to whether part of this eval e we report "me Factor of (Circ Waterside 	4 feet of Silty S able soils within Exit Gra Toe of here the phreatic luation. exts criteria" for of Safety cular) Landside 3.2	n this Reach (dient Berm - - surface is calco through seepag Factor o (Non-C Waterside n/a	Refer to App Fiel 0.0 0.0 ulated to day lig ge. f Safety Sircular) Landside n/a	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6
Eneralized La Soil istoric Pe o recorded iquefiable ased on ou eepage An	Impro Impro dSubsurfa Levee andside Sur ils below su erformance d events in eSoils ur liquefact nalysis Res Station 100+10 *Vertical dir Through sec **Exits onte	vements ass vements ass vements ass ce Conditio Prism Soils: face Layer: urface layer: ULE's 2014 tion assess uts Water Surface 200-Year HTOL stance from th page under F o slope flatter is Results Case Analyzed SS - 200yr SS - HTOL	sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit sociated wit Approx 12 SGDR Add nent, we ide Figure E-5-B E-5-C he toe of the tTOL condit r than 5:1 (H Water Surface 14.8 15.8	th LSRP P1: th LSRP P2: th LSRP P3: D to Lean Cl Y, approx. 15 feet of Lean endum entified pote teve (ground ions are not p :V), therefore Figure E-5-D E-5-E	None None None ay 5 feet thick at the n CLAY, over ntially liquefia ee Toe 0.03 0.05 d surface) to whether part of this eval e we report "me Factor of (Circ Waterside 	4 feet of Silty S able soils within Exit Gra Toe of 	n this Reach (dient Berm - - - surface is calco through seepag Factor o (Non-C Waterside n/a n/a	Refer to App Fiel 0.0 0.0 ulated to day lig ge. f Safety Sircular) Landside n/a n/a	endix E and Id 2 2	Through Seepage Yes** n/a	Breakou Height (ft 0.6



10.5 PROJECT REACH C2, STATION 130+85

		R	EAC	H C2	- ST A	A 130-	+85			
							100			
Based on our evaluat		ch does not	meet ULDC	Criteria.	Slama Stabilit	- Frainstinn (a			
Seepage Evaluation S			Mooto	Cuitonia	Slope Stabilit				Mooto	Cuitania
	WSEL, Und			Criteria	Steady	State Seepage				Criteria
200-Year DW	-			Criteria Criteria		Steady Sta	ate Seepage H			Criteria Criteria
	HTOL, Unde	er seepage:	wieets	Criteria	1	Soint	Rapid Drawd			Criteria
							mic Slope Stat smic Slope Sta			
Reach Description						Ser	•		wieets	Criteria
Reach Description		Sta	tion Limits:	121+00	to	142+00	Reach Overv	<u>lew</u>		
г	aatura(c) at I				levee penetra				Q+60-	
		-		William Moss		lions		AL AL	APR-	EX SI
Approx. Crov				23.3	to	25		L M anton		- March
	Approx. Leve	-			to	20 20			1 88	
	Approx. Crov	-			to	20 46	A STATE OF STATE (1)		12	SUP.
	pprox. Lands				to	40 3:1		1	Side	
	prox. Waters				to	2.8:1		Curr 1		
Ар	-	-			e of slope at th				- AL	
			nistranit(3).	no waterside	-	e waterway -		CITER OF COMPANY		
	Ι	andside Co	onstraint(s):	Residential in drain	nprovements, g	gravel trench	Sel .	2		
Landsi	de Repairs as	sociated wi	ith PL84-99:	Partial LS sub	drain, 3 LS Be	rms		Touch and and	AL	
Impr	ovements as:	sociated wit	th LSRP P1:	None			too l			
Impr	ovements as:	sociated wit	th LSRP P2:	None				11 11 2		2
Proposed Impr	ovements as:	sociated wit	th LSRP P3:	None				10-		
Generalized Subsurf	ace Conditio	<u>ns</u>								
Levee	Prism Soils:	Poorly Gra	ded SAND,	SILT & Silty S	SAND transitio	oning to Lean	Clay towards	south		
Landside St	ırface Layer:	Lean CLA	Y , approx. 1	0 to 40 feet thi	ick at toe of lev	/ee				
Soils below s	urface layer:	Interlayere	d Silty SAN	D and Lean C	LAY					
Historic Performanc	<u>e</u>									
Seepage,landside bo	ls, and water	side erosion	n during 199	97 flood event	were reported	in ULE's 2014	SGDR Adder	ıdum.		
<u>Liquefiable Soils</u>										
Based on our liquefa	ction assessr	nent, we ide	entified pote	ntially liquefia	ble soils withi	n this Reach (Refer to Appe	endix E and A	Appendix	F)
<u>Seepage Analysis Re</u>	<u>sults</u>									
Station	Water	Figure			Exit Gra	dient		Г	hrough	Breakout
Station	Surface	Figure	Lev	ee Toe	Toe of	Berm	Field	i S	Seepage	Height (ft)
	200-Year	E-6-B		0.0			0.06	5	Yes	1.7
120.95		1	(0.01		-	0.06	5	n/a	n/a
<u>130+85</u>	HTOL	E-6-C								
*Vertical d	istance from t	he toe of the	levee (ground		nere the phreatic		ulated to day lig	ht on the levee	e slope.	
*Vertical d Through s	istance from t eep age under F	he toe of the	levee (ground	d surface) to wh part of this eval	-		ulated to day lig	ht on the levee	e slope.	
*Vertical d	istance from t eep age under F	he toe of the	levee (ground		-		ulated to day lig	ht on the levee	e slope.	
*Vertical d Through s	istance from t eep age under F r <u>sis Results</u>	he toe of the	levee (ground	part of this eval	-			ht on the levee	e slope.	
*Vertical d Through s	istance from t eep age under H zsis Results Case	he toe of the ITOL condit Water Surface	levee (ground	part of this eval	uation.	surface is calcu	f Safety	ht on the levee	e slope.	
*Vertical d Through s Slope Stability Analy	istance from t eep age under F r <u>sis Results</u>	he toe of the ITOL condit Water	levee (ground ions are not	part of this eval	uation.	surface is calcu Factor o	f Safety	ht on the levee	e slope.	
*Vertical d Through s Slope Stability Analy	istance from t eep age under H zsis Results Case	he toe of the ITOL condit Water Surface	levee (ground ions are not	part of this eval Factor o (Ciro	uation. of Safety cular)	Factor o	f Safety ïrcular)	ht on the leves	e slope.	
*Vertical d Through s Slope Stability Analy	istance from t eep age under F rsis Results Case Analyzed	he toe of the ITOL condit Water Surface (feet)	levee (ground ions are not p Figure	Factor of this eval Factor of (Circ Waterside	uation. of Safety cular) Landside	Factor o (Non-C) Waterside	f Safety fircular) Landside	ht on the leved	e slope.	
*Vertical d Through s Slope Stability Analy	istance from t eep age under F rsis Results Case Analyzed SS - 200yr	he toe of the ITOL condit Water Surface (feet) 15.8	levee (ground ions are not p Figure E-6-D	Factor of this eval Factor of (Circ Waterside 	uation. of Safety cular) Landside 1.6	Factor o (Non-C) Waterside	f Safety ircular) Landside n/a	ht on the levee	e slope.	
*Vertical d Through so Slope Stability Analy Station	istance from t sep age under F sis Results Case Analyzed SS - 200yr SS - HTOL	Water Surface (feet) 15.8 16.8	levee (ground ions are not) Figure E-6-D E-6-E	Factor of this eval	uation. of Safety cular) Landside 1.6 1.5	Factor o (Non-C) Waterside n/a n/a	f Safety ircular) Landside n/a n/a	ht on the levee	e slope.	
*Vertical d Through so Slope Stability Analy Station	istance from t seep age under F sis Results Case Analyzed SS - 200yr SS - HTOL RDD	Water Surface (feet) 15.8 16.8 11.2	Figure E-6-D E-6-D E-6-D	Factor of this eval Factor of (Circ Waterside 1.7	uation. of Safety cular) Landside 1.6 1.5 	Factor o (Non-C) Waterside n/a n/a n/a	f Safety ircular) Landside n/a n/a n/a	ht on the levee	e slope.	



10.6 PROJECT REACH C2, STATION 138+25

			K	EAC	HC2		4 130	+43			
Rased on a	our evaluatio	on this read				nt Sta 130+85.					
	Evaluation St		in does not	the fact of		Slope Stabilit	v Evaluation S	Summary			
cepage 1		WSEL, Unde	er Seenage.	Meets	Criteria	1	State Seepag		WSEL IS.	Meets	Criteria
20	0-Year DWS				Criteria	Steady		ate Seepage l			Criteria
20		HTOL, Unde			Criteria		Steady St	Rapid Draw	· · · · ·		Criteria
		III OL, Ullu	i scepage.	Meets	Criteria	1	Sais	mic Slope Sta			Criteria
								-	· · ·		Criteria
Doooh Do	scription						361	smic Slope St		wieets	Criteria
teach De	scription		Sta	tion Limits:	121+00	to	142+00	Reach Overv	<u>Mew</u>	And and	
	Fe	atura(c) at I				levee penetra			HE MAN	10+CGF	
					William Mos:		10115	200 - 100			K Y
Δ.	pprox. Crowi				23.3	to	25		1		- Aller
11		Approx. Leve			12					1 1 1 2	1
			-			to	20 46	Contraction	FOR	3*1	CO PART
				ange (feet):		to	46	AND IN SIDE OF THE REAL OF	2	lide p	AN A BUT
	-	-		H:V) Range:		to	3:1		CINE -	-	
	Арр	rox. Waters			1.5:1 Watawida ta	to a of along at th	2.8:1				N
		W	aterside Co	onstraint(s):	Waterside to no waterside	e of slope at th	e waterway -		and and	5	
		I	andside Co	onstraint(s).		nprovements, g	vravel trench				
		-			drain		, a v er a en en en	All and		2.46-1	
	Landsid	e Repairs as	sociated wi	ith PL84-99:	Partial LS sub	drain, 3 LS Be	rms	P S	Thursday -		
									States and the second states in some	ALC: NOT THE REAL PROPERTY OF	P COMPANY OF CASE
		vements ass	sociated wit	th LSRP P1:	None			Solo L			ALL PROPERTY
	Impro			th LSRP P1: th LSRP P2:				12.20	111		al St
Proj	Impro	vements ass	sociated wit	th LSRP P2:	None			11.20	11x		
	Impro Impro	vements ass vements ass	sociated wit	th LSRP P2:	None			20 3.9			
	Impro Impro posed Impro ed Subsurf a	vements ass vements ass ce Conditio	sociated wit sociated wit <u>ns</u>	th LSRP P2: th LSRP P3:	None None	SAND in north	to Lean Clav	towards south	th		
Generaliz	Impro Impro posed Impro red Subsurfa Levee	vements ass vements ass ce Conditio Prism Soils:	sociated wit sociated wit ns Poorly Gra	th LSRP P2: th LSRP P3: ded SAND,	None None SILT & Silty S	SAND in north	-	towards sout	th		
Generaliz I	Impro Impro posed Impro red Subsurfa Levee Landside Sub	vements ass vements ass ce Conditio Prism Soils: fface Layer:	sociated wit sociated wit <u>ns</u> Poorly Gra Lean CLA	th LSRP P2: th LSRP P3: ded SAND, Y , approx. 1	None None SILT & Silty S 0 to 40 feet th	ick at toe of lev	-	towards sour	th		
Generaliz I So	Impro Impro posed Impro ed Subsurfa Levee Landside Sur pils below su	vements ass vements ass ice Conditio Prism Soils: face Layer: irface layer:	sociated wit sociated wit <u>ns</u> Poorly Gra Lean CLA	th LSRP P2: th LSRP P3: ded SAND, Y , approx. 1	None None SILT & Silty S	ick at toe of lev	-	towards sour	th		
Generaliz I So Historic F	Impro Impro posed Impro ted Subsurfa Levee Landside Sus pils below su Performance	vements ass vements ass ce Conditio Prism Soils: face Layer: inface layer:	sociated wit sociated wit ns Poorly Gra Lean CLA Interlayere	th LSRP P2: th LSRP P3: ded SAND, Y , approx. 1 d Silty SAN	None None SILT & Silty 5 0 to 40 feet th D and Lean C	ick at toe of lev	/ee				
Generaliz I Sc Historic F	Impro Impro posed Impro ted Subsurfa Levee Landside Sus pils below su Performance	vements ass vements ass ce Conditio Prism Soils: face Layer: inface layer:	sociated wit sociated wit ns Poorly Gra Lean CLA Interlayere	th LSRP P2: th LSRP P3: ded SAND, Y , approx. 1 d Silty SAN	None None SILT & Silty 5 0 to 40 feet th D and Lean C	ick at toe of lev LAY	/ee				
Generaliz I Sc Historic F Seepage,k	Impro Impro posed Impro ced Subsurfa Levee Landside Sur bils below su Performance andside boil	vements ass vements ass ce Conditio Prism Soils: face Layer: inface layer:	sociated wit sociated wit ns Poorly Gra Lean CLA Interlayere	th LSRP P2: th LSRP P3: ded SAND, Y , approx. 1 d Silty SAN	None None SILT & Silty 5 0 to 40 feet th D and Lean C	ick at toe of lev LAY	/ee				
Seneraliz I So Iistoric F Seepage, la Liquefiabl	Impro Impro posed Impro ced Subsurfa Levee Landside Sur Dils below su Performance andside boils	vements ass vements ass ce Conditio Prism Soils: fface Layer: inface layer: s and waters	sociated wit sociated wit ns Poorly Gra Lean CLA ^V Interlayere side erosion	th LSRP P2: th LSRP P3: ded SAND, Y, approx. 1 d Silty SAN	None None SILT & Silty S 0 to 40 feet th D and Lean C 7 flood event	ick at toe of lev LAY	n ULE's 2014	SGDR Adder	ıdum.	Appendix	F)
Seneraliz I So fistoric F deepage, la deepage, la deep	Impro Impro posed Impro ced Subsurfa Levee Landside Sur bils below su Performance andside boils le Soils our liquefact	vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer: s and waters	sociated wit sociated wit ns Poorly Gra Lean CLA ^V Interlayere side erosion	th LSRP P2: th LSRP P3: ded SAND, Y, approx. 1 d Silty SAN	None None SILT & Silty S 0 to 40 feet th D and Lean C 7 flood event	ick at toe of lev LAY were reported :	n ULE's 2014	SGDR Adder	ıdum.	Appendix	F)
Generaliz I So Historic F Geepage, la Geepage, la Geepage, la Geografiab Based on	Impro Impro posed Impro ced Subsurfa Levee Landside Sui bils below su Performance andside boils le Soils our liquefact Analysis Res	vements ass vements ass cc Conditio Prism Soils: rface Layer: urface layer: s and waters s and waters tion assessr ults	sociated wit sociated wit ms Poorly Gra- Lean CLA ^N Interlayere side erosion ment, we ide	th LSRP P2: th LSRP P3: ded SAND, Y, approx. 1 d Silty SAN	None None SILT & Silty S 0 to 40 feet th D and Lean C 7 flood event	ick at toe of lev LAY were reported :	n this Reach (SGDR Adder	ıdum.		1
Generaliz I So Historic F Geepage, la Geepage, la Geepage, la Geografiab Based on	Impro Impro posed Impro ced Subsurfa Levee Landside Sur bils below su Performance andside boils le Soils our liquefact	vements ass vements ass ce Conditio Prism Soils: rface Layer: urface layer: s and waters	sociated wit sociated wit ns Poorly Gra Lean CLA ^V Interlayere side erosion	th LSRP P2: th LSRP P3: ded SAND, Y, approx. 1 d Silty SAN a during 199 entified pote	None None SILT & Silty S 0 to 40 feet th D and Lean C 7 flood event ntially liquefia	ick at toe of lev LAY were reported : uble soils withi Exit Gra	ree in ULE's 2014 n this Reach (dient	SGDR Adder (Refer to App	ndum. endix E and	Appendix Through Seepage	Breakout
Seneraliz I So fistoric F deepage, la deepage, la deep	Impro Impro posed Impro ced Subsurfa Levee Landside Su bils below su Performance andside boik le Soils our liquefact Analysis Res Station	vements ass vements ass cc Conditio Prism Soils: fface Layer: urface layer: s and waters and waters tion assess tion assess wuts Water Surface	sociated wit sociated wit ns Poorly Gra- Lean CLA ^N Interlayere side erosion ment, we ide Figure	th LSRP P2: th LSRP P3: ded SAND, Y, approx. 1 d Silty SAN a during 199 entified pote	None None SILT & Silty S 0 to 40 feet th D and Lean C 7 flood event ntially liquefia ee Toe	ick at toe of lev LAY were reported : able soils withi	ree in ULE's 2014 n this Reach (dient Berm	SGDR Adder Refer to App Fiel	ndum. endix E and	Through Seepage	Breakout Height (ft)
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10.7 PROJECT REACH C3A, STATION 150+99

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eepage Ev	aluation St	ummary				Slope Stabilit	v Evaluation	Summary			
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200	-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage I	HTOL, LS:	Fails	Criteria
	1	HTOL, Unde	er Seepage:	Fails	Criteria			Rapid Drawe	lown, WS:	Meets	Criteria
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each Desc	<u>cription</u>							Reach Over	<u>iew</u>		
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		I	andside Co	onstraint(s):	Residential in	nprovements		15 the	and and a second	- 48 S	
		Repairs as	sociated wi	ith PL84-99:	Yes, berm con	nstructed near	STA 153+00	The second	TUCED	ALL .	
	Impro	vements as	sociated wit	th LSRP P1:	None			17 400			
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10.8 PROJECT REACH C3B, STATION 158+00

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	valuation Su	/	in niceus er			Slope Stabilit	v Evaluation (Summary			
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20	0-Year DWS				Criteria			ate Seepage H	· · · · ·		Criteria
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Reach Des	cription							Reach Overv	-		
			Sta	tion Limits:	158+00	to	161+00	PERIC	- Aleman -		TH
	F		T (C)		Transition to	agricultural lar	nd on the			g+00+	
	Fe	ature(s) at U	Jpstream St	ation Limit:	landside	-				Aber	18 S.
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Aŗ	prox. Crowi			· · · ·		to	23	States and the states	C. C. C.	3×L	2010
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				ange (feet): H:V) Range:		to	30 2:1	and the second	Const.	1. 11	1000-0
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	Арр		• •	H:V) Range:		to e of slope at th			that is a company	5	
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		I	andside Co			Farm improven	ents			2 de -	
	Landsid	e Repairs as	sociated wi	th PL84-99:	None				routing and		te un alle alle
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	Impro	vements ass	sociated wit	h I SRP P2	None			A DEC	10 30 50		
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Prop	osed Impro	vements ass						-47			
	oosed Impro ed Subsurfa		sociated wit					1			
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10.9 PROJECT REACH C4A, STATION 174+45

			RE	CACH	H C4A	A - ST	A 174	1+45			
Based on ou	r evaluati	on. this read									
Seepage Eva						Slope Stabilit	v Evaluation S	Summary			
		WSEL, Unde	er Seepage:	Meets	Criteria	T ⁻	- State Seepage	-	WSEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria			ate Seepage I		Meets	Criteria
		HTOL, Unde			Criteria			Rapid Draw		Meets	Criteria
						I	Seist	mic Slope Sta		Meets	Criteria
							Seis	smic Slope St	ability, LS:	Meets	Criteria
Reach Desci	ription							Reach Over	view		
			Sta	tion Limits:	161 + 00	to	174+45	Para	- Second		14 41
	Fe	eature(s) at U	Jpstream St	ation Limit:	Levee access	ramp from Gal	ley Way		HE	11+02	
	Featu	re(s) at Dov	vnstream St	ation Limit:	Transition to	farm structure	s landside		-1	A last	ASK ST
App	rox. Crowi	n Elevation I	Range (feet,	, NAVD88):	22	to	25		7		
	A	Approx. Leve	ee Height R	ange (feet):	12	to	20	A CONTRACTOR	And and	188	hora -
	А	Approx. Crov	vn Width R	ange (feet):	11	to	46	V- Warden	Hole and the second	1	Sale -
	Ap	prox. Lands	ide Slope (H	I:V) Range:	1.5:1	to	3.3:1	And in the second second	Parts	1300	
	App	orox. Waters	ide Slope (H	I:V) Range:	1.5:1	to	2.8:1		5		N
		W	aterside Co	onstraint(s):	Waterside too	e of slope at th	e waterway -		The Court	5	
		L	andside Co	onstraint(s):	Agricultural la	and beteen ST ential betweer					
	Landsic	de repairs as	sociated wi	th PL84-99:		lentiar betweer			TOULDA		alanta a la companya da serie da s
		vements ass						and the	1	167	
	-	vements ass						P.G. A.A.	18 11 2		Val Sta
	r .							August 1 Contract Contract			
	lSubsurfa		<u>ns</u>		None	Lean CLAY, ar	nd a 5-foot Sil	ty SAND lay	er beneath.		
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Generalized Lar Soils Historic Per Seepage and Liquefiable S Based on ou	ISubsurfa Levee ndside Sus s below su formance I sand boi Soils ur liquefac	nce Conditio Prism Soils: rface Layer: urface layer: ls reported c tion assessm	ns Uppe 5 fee Silty SANI beneath the at depth luring the 1	t SAND, a 5 D at toe and e Silty SAN 997 flood ev e not conside	None foot layer of 1 Lean CLAY ir D approx. 10 fo vent in ULE's 2	a the field eet of Lean CL 2014 SGDR Ad ele soils in our	AY with a thii dendum slope stability dient	n (3-foot) lay	er of Silty SA		
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10.10 PROJECT REACH C4B, STATION 181+00

			RE	CACH	I C4I	8 - ST	A 18	1 + 00			
Based on o	ur evaluati	on, this read	h fails to n	eet ULDC c	riteria based	on the cross s	ection at Sta	191+45.			
	valuation S					Slope Stabilit					
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepag	ge 200-Year DW	SEL, LS:	Meets	Criteria
200)-Year DW	SEL, Throug	h Seepage:	Meets	Criteria		Steady S	tate Seepage H	TOL, LS:	Meets	Criteria
		HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdo	own, WS:	Meets	Criteria
						-	Seis	smic Slope Stab	ility, WS:	Meets	Criteria
							Se	ismic Slope Sta	bility, LS:	Meets	Criteria
leach Des	cription							Reach Overvi	ew		
			Sta	tion Limits:	174+45	to	192+00	Pare a l	-		A T
	Fe	eature(s) at U	Jpstream St	ation Limit:	Galley Way				HE AN	Q+60#	
	Featu	ure(s) at Dov	vnstream St	ation Limit:	Drainage Dite	ches (lined and	unlined)		-1 -1 -1	AP.	Tex-St
Ар	prox. Crow	n Elevation I	Range (feet,	, NAVD88):	22.5	to	23.5			- Nor	- Mar Al
	-	Approx. Leve			11	to	14.5	and the second	-	100	1 -
		Approx. Crov	-		20	to	46	Wa SHARE SHARIDA	A CONTRACT		Roperte
		prox. Lands			2:1	to	3:1		E The	Stole	
	-	prox. Waters		-	1.5:1	to	4:1	and the second second	COME !	1	
	• PI					enetrations at S				1- 41	N
					and STA 189				Sumo 19 a	5	Contraction of the
		L	andside Co	onstraint(s):	Residential/a	gricultural land		in the second	2		
	Landsid	e Repairs as	sociated wi	ith PL84-99:	None				7000400		
	Impro	vements ass	ociated wit	th LSRP P1:	None			Ante -			
	Impro	vements ass	ociated wit	th LSRP P2:	None			10 10	442		Land Bar
Pron	osed Impro	vements ass	contrad wit								And in case of the local division of the loc
P	obed impro	venientes use	sociated wit	th LSRP P3:	None						
		ace Conditio		th LSRP P3:	None			-		<u>8</u>	
	ed Subsurfa	ace Condition	ns								
eneralize	ed Subsurfa Levee	ace Conditio Prism Soils :	<u>ns</u> Lean CLA	Y with some	Silty SAND	x. 12 to 14 feet t	hick)				
Generalize	ed Subsurfa Levee andside Su	ace Conditio Prism Soils : rface Layer:	<u>ns</u> Lean CLA Silty SANI	Y with some D and Lean C	Silty SAND LAY (approx	x 12 to 14 feet t Graded SAND					
Generalize L So	ed Subsurfa Levee andside Su	ace Condition Prism Soils : rface Layer: urface layer:	<u>ns</u> Lean CLA Silty SANI	Y with some D and Lean C	Silty SAND LAY (approx	x 12 to 14 feet t Graded SAND					
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Eeneralize L So Listoric Pe Vaterside	ed Subsurf: Levee andside Su ils below su erformance erosion, lo e Soils	Acce Condition Prism Soils: rface Layer: arface layer: 2 w to medium	<u>ns</u> Lean CLA ^N Silty SANI Lean CLA ^N seepage ar	Y with some O and Lean C Y with interland nd pin boils,	Silty SAND CLAY (approx yyered Poorly and longitud	Graded SAND	with SILT		in ULEs 201	14 SGDR .	Addendum.
Eeneralize L So Iistoric Pe Vaterside	ed Subsurf: Levee andside Su ils below su erformance erosion, lo e Soils	Acce Condition Prism Soils: rface Layer: arface layer: 2 w to medium	<u>ns</u> Lean CLA ^N Silty SANI Lean CLA ^N seepage ar	Y with some O and Lean C Y with interland nd pin boils,	Silty SAND CLAY (approx yyered Poorly and longitud	Graded SAND	with SILT		in ULEs 201	14 SGDR 2	Addendum.
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Eeneralize L So flistoric Pe Vaterside Liquefiable Based on c	ed Subsurfa Levee andside Su ils below su erformance erosion, lo <u>e Soils</u> pur liquefac	ace Conditio Prism Soils : rface Layer: irface layer: 2 w to medium tion assessm sults Water	<u>ns</u> Lean CLA ^N Silty SANI Lean CLA ^N seepage ar	Y with some O and Lean O Y with interland pin boils, e not conside	Silty SAND CLAY (approx yered Poorly and longitud ering liquefiat	Graded SAND inal cracking or ble soils in our Exit Gra	9 with SILT n waterside c slope stabilit dient	y analyses.		Гhrough	Breakout
Eeneralize L So Jistoric Pe Vaterside Liquefiable Based on c	ed Subsurfi Levee andside Su ils below su erformance erosion, lo <u>e Soils</u> our liquefac nalysis Res	ace Conditio Prism Soils : rface Layer: inface layer: 2 w to medium tion assessn sults Water Surface	ns Lean CLA Silty SANI Lean CLA seepage ar nent, we are Figure	Y with some O and Lean O Y with interland pin boils, e not conside Leve	Silty SAND CLAY (approx yered Poorly and longitud ering liquefiat	Graded SAND inal cracking or ole soils in our	9 with SILT n waterside c slope stabilit dient	y analyses. Field		Fhrough Seepage	Breakout Height (ft)
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Eeneralize L So flistoric Pe Vaterside Liquefiable Based on c	ed Subsurfa Levee andside Su ils below su erformance erosion, lo e Soils our liquefac nalysis Res Station 181+00 *Vertical di	Acc Condition Prism Soils : rface Layer: inface layer: w to medium tion assessm sults Water Surface 200-Year HTOL stance from th	ns Lean CLA' Silty SANI Lean CLA' seepage ar nent, we are Figure E-11-B E-11-C ne toe of the	Y with some D and Lean C Y with interland pin boils, e not conside Leve 0 levee (ground	Silty SAND CLAY (approx yered Poorly and longitud ering liquefiat ee Toe .27 .32 surface) to wh	Graded SAND inal cracking or ble soils in our Exit Gra Toe of 	with SILT n waterside c slope stabilit dient - -	y analyses. Field		Through Seepage No n/a	Breakout Height (ft)
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L So flistoric P Vaterside iquefiable Based on c	ed Subs urfa Levee and side Su ils below su erformance erosion, lov e Soils our liquefac Station 181+00 *Vertical di Through se	Ace Conditio Prism Soils : rface Layer: irface layer: w to medium tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results	ns Lean CLA Silty SANI Lean CLA seepage ar nent, we are Figure E-11-B E-11-C ne toe of the ITOL condit	Y with some D and Lean C Y with interland pin boils, e not conside Leve 0 levee (ground ions are not p	Silty SAND CLAY (approx yered Poorly and longitud ering liquefiat ere Toe .27 .32 surface) to wh art of this eval Factor of	Graded SAND inal cracking or ole soils in our Exit Gra Toe of 	with SILT n waterside c slope stabilit dient - - surface is calc Factor of	y analyses. Field 0.55 0.60 culated to day ligh		Through Seepage No n/a	Breakout Height (ft) n/a
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ieneralize L So listoric Pe Vaterside ased on c eepage A	ed Subs urfa Levee and side Su ils below su erformance erosion, lov e Soils our liquefac Station 181+00 *Vertical di Through se	Acce Condition Prism Soils: rface Layer: urface layer: w to medium tion assessm sults Water Surface 200-Year HTOL stance from the epage under F sis Results Case Analyzed	ns Lean CLA Silty SANI Lean CLA seepage ar nent, we are Figure E-11-B E-11-C ne toe of the ITOL condit Water Surface (feet)	Y with some D and Lean C Y with interland and pin boils, e not consider Leve 0 levee (ground ions are not p Figure	Silty SAND CLAY (approx ayered Poorly and longitud ering liquefiab ere Toe .27 .32 i surface) to wh surface) to wh Factor of (Cin Waterside	Graded SAND inal cracking or ole soils in our Exit Gra Toe of ere the phreatic luation. of Safety cular) Landside	v with SILT n waterside c slope stabilit dient ⁷ Berm - - surface is calc (Non-C Waterside	y analyses. Field 0.55 0.60 culated to day ligh of Safety Circular) Landside		Through Seepage No n/a	Breakout Height (ft) n/a
keneralize L So listoric P Vaterside iaguefiable iaged on c	ed Subs urfa Levee and side Su ils below su erformance erosion, lov e Soils our liquefac Station 181+00 *Vertical di Through se	Acce Condition Prism Soils: rface Layer: urface layer: w to medium tion assessm sults Water Surface 200-Year HTOL stance from tl epage under F sis Results Case Analyzed SS - 200yr	ns Lean CLA Silty SANI Lean CLA Seepage ar ent, we are Figure E-11-B E-11-C ne toe of the ITOL condit Water Surface (feet) 17.2	Y with some D and Lean C Y with interland pin boils, e not conside Leve 0 0 levee (ground ions are not p Figure E-11-D	Silty SAND CLAY (approx ayered Poorly and longitud ering liquefiab ee Toe .27 .32 I surface) to wh art of this eval Factor of (Cin Waterside 	Graded SAND inal cracking or ole soils in our Exit Gra Toe of Content of Safety Cular) Landside 1.7	vith SILT n waterside c slope stabilit dient "Berm - surface is calc (Non-C Waterside n/a	y analyses. Field 0.55 0.60 culated to day ligh of Safety Circular) Landside n/a		Through Seepage No n/a	Breakout Height (ft) n/a
Eeneralize L So listoric P Vaterside iquefiable assed on c	ed Subsurfa Levee andside Su ils below su erformance erosion, lo e Soils our liquefac station 181+00 *Vertical di Through se ility Analys	ace Condition Prism Soils: rface Layer: urface layer: ace condition with the operation of the	ns Lean CLAN Silty SANI Lean CLAN seepage ar nent, we are Figure E-11-B E-11-C ne toe of the TTOL condit Water Surface (feet) 17.2 18.2	Y with some D and Lean C Y with interland pin boils, e not conside Leve 0 0 0 levee (ground ions are not p Figure E-11-D E-11-E	Silty SAND CLAY (approx and longitud ering liquefiab ee Toe .27 .32 I surface) to wh art of this eval Factor of (Cin Waterside 	Graded SAND inal cracking or ole soils in our Exit Gra Toe of Cracking or Exit Gra Toe of Cracking or Cracking or	vith SILT n waterside c slope stabilit dient FBerm - - surface is calc (Non-C Waterside n/a n/a	y analyses. Field 0.55 0.60 culated to day ligh of Safety Circular) Landside n/a n/a		Through Seepage No n/a	Breakout Height (ft) n/a



10.11 PROJECT REACH C4B, STATION 191+45

			- KH	CACF	H C4F	3 - ST	A 191	1+45			
los od on	our evaluati	on this read									
	Evaluation St		in does not		Criteria.	Slope Stabilit	v Evaluation S	Summary			
cepage 1		WSEL, Unde	er Seenage.	Meets	Criteria	-		e 200-Year DV	VSEL LS	Meets	Criteria
20	0-Year DWS				Criteria	~~~~,		ate Seepage F			Criteria
		HTOL, Und			Criteria		~, ~-	Rapid Drawd			Criteria
		,	10			4	Seis	mic Slope Stat			Criteria
								smic Slope Sta	· · ·		Criteria
Reach Des	scription							Reach Overv			
			Sta	tion Limits:	174+45	to	192+00	Para a C	-		TH P
	Fe	ature(s) at U	Jpstream St	ation Limit:	Galley Way					NHOST	
	Featu	re(s) at Dov	vnstream St	ation Limit:	Drainage Dite	ches (lined and	unlined)	Contraction of the	1		KY ST
Al	pprox. Crowi	n Elevation	Range (feet	, NAVD88):	22.5	to	23.5		<u> </u>		- All Charles
	A	Approx. Leve	ee Height R	ange (feet):	11	to	14.5	STATISTICS		83	he and
	A	pprox. Crov	vn Width R	ange (feet):	20	to	46	A Stranger		A.L	Coper a
	Ар	prox. Lands	ide Slope (I	H:V) Range:	2:1	to	3:1		12	State	
	App	rox. Waters	ide Slope (I	H:V) Range:	1.5:1	to	4:1			No.	
					and STA 189				Time a	3	
		Ι	andside Co	onstraint(s):	Residential/a	gricultural land	l	- A			
		-		th PL84-99:				Pro-	TOULED	AL	
	Impro	vements as	sociated wit	th LSRP P1:	None			Mar -	AL MAN		
	mpio	venients as	soonaced an						A CONTRACTOR OF	A COLORADOR OF A COLORADOR	And the second se
	Impro	vements as:	sociated wit	th LSRP P2:				The way	1111		LALS:
<mark>Generaliz</mark> I	Impro posed Impro <u>red Subsurfa</u> Levee Landside Sur	vements ass vements ass nee Conditio Prism Soils: rface Layer:	sociated wit sociated wit ns Lean CLA Silty SANI	th LSRP P2: th LSRP P3: Y with some O and Lean (None Silty SAND CLAY (approx	. 12 to 14 feet t			112		
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<mark>eneraliz</mark> I Sc listoric F Vaterside iquefiabl	Impro posed Impro ed Subsurfa Levee Landside Sus pils below su Performance e erosion, low le Soils	vements as: vements as: ce Conditio Prism Soils: rface Layer: urface layer: v to medium	sociated wit sociated wit ns Lean CLA Silty SANI Lean CLA a seepage an	th LSRP P2: th LSRP P3: Y with some O and Lean (Y with interland of pin boils,	None Silty SAND CLAY (approx ayered Poorly and longitud	Graded SAND	with SILT	-			
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10.12 PROJECT REACH D1, STATION 201+57

			<u> </u>	EAC	H D1	<u>- STA</u>	201	+57			
Based on feet.	our evaluati	on, this read	ch does not	meet the UI	DC Criteria. S	Seismic deform	mations are r	ot anticipate	d to degrade	below 10-	Year WSE
Seepage 1	Evaluation St	ummary				Slope Stabilit	v Evaluation S	Summary			
	200-Year D	WSEL, Und	er Seepage:	Fails	Criteria	Steady	State Seepage	e 200-Year D	VSEL, LS:	Fails	Criteria
20	00-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage l	HTOL , LS:	Fails	Criteria
	1	HTOL, Und	er Seepage:	Fails	Criteria			Rapid Drawe	lown, WS:	Meets	Criteria
							Seis	mic Slope Sta	bility, WS:		Criteria
							Sei	smic Slope St		Fails	Criteria
leach De	escription		C.	,. . ,	102 00		212 00	Reach Over	<u>view</u>	1.210 Jan - 10	
	Ea	atura(c) at I		tion Limits:	192+00 Agricultural la	to	212+00			NI+LO-	- 建煤水-
					Agricultural la				· · ·	A A A	K S
А	.pprox. Crowi				e	to	25		4		All Cal
			-	ange (feet):		to	18	P. Station			1
			-	ange (feet):		to	48		AND DE LOS		
				H:V) Range:		to	2.3:1	NL PERM	Star Star		
	App	rox. Waters	ide Slope (I	I:V) Range:	1.4:1	to	2.1:1		and the second	2	N
		W	aterside Co	onstraint(s):	Levee penetra	tion near STA	209+00		and them	3	
		I	andside Co	onstraint(s):	None - agricul	tural land					
	Landsic	le repairs as	sociated wi	ith PL84-99:	Yes, berms at \$ 204+00	STA 201+00 a	nd STA		Thomas	1.41	
	Impro	vements as	sociated wit	th LSRP P1:				Hate 1			
	Impro	vements as:	sociated wit	th LSRP P2:	None				411		100 3
Pro	posed Impro	vements as	sociated wit	th LSRP P3:	None				10		
enerali											
S listoric l	Levee Landside Sur oils below su Performance	urface layer:	Lean CLA Lean CLA Interbedde	Y, approx. 7 d layers of s	feet thick at too silty SAND and endum.		d SAND and	CLAY			
S listoric l eepage a	Levee Landside Sur oils below su Performance and pin boils	Prism Soils: rface Layer: urface layer:	Lean CLA Lean CLA Interbedde	Y, approx. 7 d layers of s	silty SAND and		ed SAND and	CLAY			
S listoric l eepage a .iquefiab Based on	Levee Landside Sur ioils below su Performance and pin boils ble Soils our liquefact	Prism Soils: rface Layer: urface layer: reported in tion assessi	Lean CLA Lean CLA Interbedde ULEs 2014	Y, approx. 7 d layers of : SGDR Add	silty SAND and	l poorly-grade			endix E and	Appendix	F)
S listoric l eepage a .iquefiab Based on	Levee Landside Sur oils below su Performance and pin boils de Soils	Prism Soils: rface Layer: irface layer: reported in tion assessi	Lean CLA Lean CLA Interbedde ULEs 2014	Y, approx. 7 d layers of : SGDR Add	silty SAND and	l poorly-grade ble soils within	n this Reach (
S listoric l eepage a .iquefiab Based on	Levee Landside Sur ioils below su Performance and pin boils ble Soils our liquefact	Prism Soils: rface Layer: urface layer: reported in tion assessi ults Water	Lean CLA Lean CLA Interbedde ULEs 2014	Y, approx. 7 d layers of a SGDR Add	silty SAND and endum. ntially liquefiat	l poorly-grade ble soils within Exit Gra	n this Reach (dient	Refer to App		Through	Breakout
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S listoric l eepage a iquefiab Based on	Levee Landside Sur ioils below su Performance and pin boils de Soils our liquefact Analysis Res Station <u>201+57</u>	Prism Soils: rface Layer: rrface layer: reported in tion assessi ults Water Surface 200-Year HTOL	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C	Y, approx. 7 d layers of s SGDR Add entified pote	silty SAND and endum. entially liquefiat ee Toe 1.11	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm -	Refer to App Fie 1.8 2.0	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft
S listoric l eepage a iquefiab Based on	Levee Landside Sur ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di	Prism Soils: rface Layer: reported in tion assessi sults Water Surface 200-Year HTOL stance from t	Lean CLA' Lean CLA' Interbedde ULEs 2014 ment, we ide Figure E-13-B E-13-C he toe of the	Y, approx. 7 d layers of s SGDR Add entified pote	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24	l poorly-grade ble soils within Exit Grav Toe of ere the phreatic	n this Reach (dient Berm -	Refer to App Fie 1.8 2.0	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
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S listoric I eeepage a .iquefiab ased on .eepage A	Levee Landside Sui ioils below su Performance and pin boils our liquefact our liquefact our liquefact Station 201+57 *Vertical dir Through sec **Exits onto	Prism Soils: rface Layer: rrface layer: reported in tion assessi sults Water Surface 200-Year HTOL stance from t page under F o a fine graind	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the HTOL condit	Y, approx. 7 d layers of s SGDR Add entified pote Lev levee (ground ions are not	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circe	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm - - surface is calcu seep age. Factor o (Non-C	Refer to App Fie 1.8 2.0 Ilated to day lig f Safety ircular)	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
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S listoric I eeepage a .iquefiab ased on .eepage A	Levee Landside Su ioils below su Performance and pin boils our liquefact our liquefact Station 201+57 *Vertical di Through sec **Exits onto	Prism Soils: rface Layer: irface Layer: irface layer: reported in tion assessi tion assessi water Surface 200-Year HTOL stance from t page under H page under H page under H to a fine graind is Results Case Analyzed SS - 200yr	Lean CLA ^V Lean CLA ^V Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the fTOL condit ed slope, then Water Surface 17.8	Y, approx. 7 d layers of : SGDR Add entified pote Lev Levee (groun- ions are not refore we rep Figure E-13-D	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside	l poorly-grade ble soils within Exit Grad Toe of 	n this Reach (dient Berm - - surface is calcu seep age. Factor o (Non-C Waters ide n/a	Refer to App Fie 1.8 2.0 alated to day lig f Safety ircular) Landside n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric I eeepage a .iquefiab ased on .eepage A	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di Through see **Exits onto bility Analys	Prism Soils: rface Layer: irface layer: irface layer: irface layer: irface layer: iults Water Surface 200-Year HTOL stance from t page under H o a fine graine is Results Case Analyzed SS - 200yr SS - HTOL	Lean CLA ^V Lean CLA ^V Interbedde ULE's 2014 ment, we idde Figure E-13-B E-13-C he toe of the HTOL condit ed slope, then Water Surface 17.8 18.9	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve levee (groun- ions are not refore we rep Figure E-13-D E-13-E	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 alated to day lip f Safety ircular) Landside n/a n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric I eeepage a .iquefiab ased on .eepage A	Levee Landside Su ioils below su Performance and pin boils our liquefact our liquefact Station 201+57 *Vertical di Through sec **Exits onto	Prism Soils: rface Layer: irface Layer: irface layer: irface layer: irface layer: iults Water Surface 200-Year HTOL stance from t page under H o a fine graind is Results Case Analyzed SS - 200yr SS - HTOL RDD	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we idde Figure E-13-B E-13-C he toe of the HTOL condit ed slope, then Water Surface 17.8 18.9 12.7	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve levee (groun- ions are not refore we rep Figure E-13-D E-13-D E-13-D	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 1.3	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 alated to day lig f Safety ircular) Landside n/a n/a n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric I eepage a iquefiab ased on eepage 4	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di Through see **Exits onto bility Analys	Prism Soils: rface Layer: irface Layer: irface layer: irface layer: irface layer: ition assessi isults Water Surface 200-Year HTOL stance from t page under F to a fine graine is Results Case Analyzed SS - 200yr SS - HTOL RDD PS	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the HTOL condit ad slope, then Water Surface 17.8 18.9 12.7 4.1	Y, approx. 7 d layers of 1 SGDR Add entified pote Lev levee (groun- ions are not p refore we rep Figure E-13-D E-13-D E-13-F	silty SAND and endum. entially liquefial ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 1.3 0.8	l poorly-grade ble soils within Exit Gra Toe of ret the phreatic ation. ia" for through f Safety ular) Landside 0.7 0.6 1.0	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 alated to day lig f Safety ircular) Land side n/a n/a n/a n/a n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric I eepage a iquefiab ased on eepage 4	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di Through see **Exits onto bility Analys	Prism Soils: rface Layer: irface Layer: irface layer: irface layer: irface layer: iults Water Surface 200-Year HTOL stance from t page under H o a fine graind is Results Case Analyzed SS - 200yr SS - HTOL RDD	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we idde Figure E-13-B E-13-C he toe of the HTOL condit ed slope, then Water Surface 17.8 18.9 12.7	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve levee (groun- ions are not refore we rep Figure E-13-D E-13-D E-13-D	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 1.3	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 alated to day lig f Safety ircular) Landside n/a n/a n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric l eepage a iquefiab ased on eepage a	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di Through see **Exits onto bility Analys	Prism Soils: rface Layer: rrface layer: reported in tion assessi water Surface 200-Year HTOL stance from t spage under H o a fine graine is Results Case Analyzed SS - 200yr SS - HTOL RDD PS Post-EQ	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the TTOL condit ed slope, theu Water Surface 17.8 18.9 12.7 4.1 4.1 toration Es	Y, approx. 7 d layers of s SGDR Add entified pote Lev Lev levee (ground ions are not) refore we rep Figure E-13-D E-13-E E-13-F E-13-G'H timates	silty SAND and endum. entially liquefial ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 1.3 0.8	l poorly-grade ble soils within Exit Gra Toe of ret the phreatic ation. ia" for through f Safety ular) Landside 0.7 0.6 1.0	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 alated to day lig f Safety ircular) Land side n/a n/a n/a n/a n/a	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric l eepage a iquefiab ased on eepage a	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical dir Through sec **Exits onto billity Analys Station 201+57	Prism Soils: rface Layer: rrface layer: reported in tion assessi water Surface 200-Year HTOL stance from t spage under H o a fine graine is Results Case Analyzed SS - 200yr SS - HTOL RDD PS Post-EQ	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the fTOL condit ed slope, then Water Surface 17.8 18.9 12.7 4.1 4.1 toration Es Estimated	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve Leve (groun- ions are not refore we rep Figure E-13-D E-13-F E-13-G/H timates Estimated	silty SAND and endum. entially liquefial ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circu Waterside 1.3 0.8	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 Ilated to day lig f Safety ircular) Lands ide n/a n/a n/a 0.7	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric l deepage a iquefiab Based on deepage a	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical dir Through sec **Exits onto billity Analys Station 201+57	Prism Soils: rface Layer: rface layer: reported in tion assess water Surface 200-Year HTOL stance from t case Analyzed SS - 200yr SS - HTOL RDD PS Post-EQ Damage Length	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we idde Figure E-13-B E-13-B E-13-C he toe of the d slope, then TOL condit ed slope, then ULE's 2014 National States National States Nationale	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve Leve (groun- ions are not refore we rep Figure E-13-D E-13-E E-13-C E-13-G'H timates Estimated Vertical	silty SAND and endum. entially liquefiat ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor or (Circe Waterside 1.3 0.8 0.7 Fill Volume (10 feet Free	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 Idated to day lig f Safety ircular) Landside n/a n/a n/a 0.7 me (Fully d Levee	ld 6 3	Through Seepage Yes** n/a	Breakou Height (ft 4.5
S listoric l deepage a iquefiab Based on deepage a	Levee Landside Su ioils below su Performance and pin boils our liquefact Analysis Res Station 201+57 *Vertical di Through see **Exits onto bility Analys Station 201+57	Prism Soils: rface Layer: irface l	Lean CLA' Lean CLA' Interbedde ULE's 2014 ment, we ide Figure E-13-B E-13-C he toe of the fTOL condit ed slope, then Water Surface 17.8 18.9 12.7 4.1 4.1 toration Es Estimated	Y, approx. 7 d layers of 1 SGDR Add entified pote Leve Leve (groun- ions are not refore we rep Figure E-13-D E-13-F E-13-G/H timates Estimated	silty SAND and endum. entially liquefial ee Toe 1.11 1.24 d surface) to whe part of this evalu ort "meets criter Factor o. (Circe Waterside 1.3 0.8 0.7 Fill Volume (10	l poorly-grade ble soils within Exit Gra Toe of 	n this Reach (dient Berm 	Refer to App Fie 1.8 2.0 Idated to day lig f Safety ircular) Landside n/a n/a n/a 0.7 me (Fully d Levee	ld 6 3	Through Seepage Yes** n/a	Breakout Height (ft) 4.5



10.13 PROJECT REACH D2A, STATION 231+75

			RF	CACH	H D2A	- ST	A 231	1+75			
Record on a	ur orducti	on this room			DC Criteria.						
	valuation Su		in does not	meet the OI	DC Criteria.	Slope Stabilit	v Evaluation 9	Summary			
		WSEL, Unde	er Seenage:	Fails	Criteria			e 200-Year D	WSFL LS	Meets	Criteria
		SEL, Throug	10		Criteria	Steady		ate Seepage 1			Criteria
200		HTOL, Unde			Criteria	•	Steady St	Rapid Draw	· · · ·		Criteria
		,				L	Seis	mic Slope Sta	_		Criteria
								smic Slope St	-		Criteria
Reach Des	cription						501	Reach Over	-		
	<u></u>		Sta	tion Limits:	212+00	to	247+00	A Parat	The second second		the faith
	Fe	ature(s) at U	Jpstream St	ation Limit:	Just south of	levee pipe pen	etration		HE	1402 m	
			-		Agricultural l						EX-ST
Ар		n Elevation I			23	to	25	The F	7	AN	- Alie Contraction
	A	Approx. Leve	ee Height R	ange (feet):	14	to	18.5			180	
		pprox. Crov	-		11	to	34	A PART AND AND	FDI - L		20 Mar 1
	Ap	prox. Lands:	ide Slope (H	I:V) Range:	1.4:1	to	2.5:1		2 ST	Store	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	App	rox. Waters	ide Slope (H	I:V) Range:	1.5:1	to	2.9:1			Sugar 1	N
					246+30.	ГА 218+60, 241	+00, and		The second	5	
		L	andside Co	onstraint(s):	None - agricu	ltural land					a later
								200	TODED	2 (A -	ALCONT OF THE
		•			· 1	berms constru	cted		1000	3 AN	1 Sector
	•	vements ass						MAR .			
	-	vements ass vements ass						14.39	4403		
So fistoric P o	ils below su erformance	rface layer:	Approx. 5 f	feet of Silty	feet thick at to SAND underla GDR Addendu	ain by interbed	ded layers of	f Lean CLAY	and Poorly-g	raded SA	ND
	e Soils										
		tion assessn	nent, we ide	entified pote	ntially liquefia	ble soils within	n this Reach ((Refer to App	endix E and A	Appendix	F)
	nalysis Res		,		5 1			11		11.	,
		Water				Exit Gra	dient		r	Through	Breakout
	Station	Surface	Figure	Lev	ee Toe	Toe of		Fie		Seepage	Height (ft)
		200-Year	E-14-B).54		-	0.8		Yes	3.5
	<u>231+75</u>	HTOL	E-14-C).62		-	0.8		n/a	n/a
		stance from tl	he toe of the	levee (ground		here the phreatic	surface is calcu				
Slone Stab	ility Analys										
<u></u>					Factor	of Safety	Factor o	of Safety			
	Station	Case	Water	Figure		cular)		Circular)			
		Analyzed	Surface	Barro	Waterside	Landside	Waterside	Landside			
		SS - 200yr	18.8	E-14-D		1.5	n/a	n/a			
		SS - HTOL	19.9	E-14-E		1.5	n/a n/a	n/a n/a			
	231+75	RDD	13.5	E-14-D	1.2		n/a	n/a n/a			
	<u></u>	PS	4.6	E-14-F	1.2	1.3	n/a n/a	n/a n/a			
		Post-EQ	4.6	E-14-G/H	1.0	1.5	1.0	1.7			



10.14 PROJECT REACH D2B, STATION 251+50

			RF	CACI	H D2F	B - ST	A 251	1+50		
ased on ou	r evaluatio	on, this reac								
eepage Eva		· · · ·	n nices un			Slope Stabilit	v Evaluation S	Summary		
		WSEL, Unde	r Seepage:	Meets	Criteria		-	e 200-Year DWSEL	, LS: Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria	_		ate Seepage HTOL		Criteria
	1	HTOL, Unde	r Seepage:	Meets	Criteria			Rapid Drawdown,		Criteria
			·			-	Seis	mic Slope Stability,	WS: Meets	Criteria
							Sei	ismic Slope Stability	, LS: Meets	Criteria
each Desci	ription							Reach Overview	·	
				tion Limits:	247+00	to	255+50	TELLER-	- F	J.L
						ramp from farm			A DECK	2 Cart
					Just south of	levee pipe pen	etration	ST-TE Wat-		to the state
Appi		n Elevation H			24	to	25			The state
		Approx. Leve	-		14	to	18.5		Par- 1915	R. State
		pprox. Crow				to	48	AL ON A DESCRIPTION OF		- And
	-	prox. Landsi		-		to	2.5:1	S FEINERS		
	App	rox. Watersi	• ·		1.5:1	to	2.9:1		3	N
				nstraint(s):			40.00.		5	
		L	andside Co	nstraint(s):	0 0	towers STA 2 loward Road S'				
	Landsic	le repairs as:	sociated wi	th PL84-99:		etween STA 24		6 Car	A A A A A A A A A A A A A A A A A A A	
		1			252+00				ALL ALL	Settle Street
	Impro	vements ass	ociated wit	h LSRP P1:	None			1		
	Impro	vements ass	ociated wit	h LSRP P2:	None			7 20 10 1		A
Propos	sed Impro	vements ass	ociated wit	h LSRP P3:	-	age berm and c	-	The Art		
		ce Conditio			urani, nii low	area south of I	lowalu Ku			All Road Tables
		Prism Soils:	-							
Soils	ndside Sui s below su	rface Layer: rface layer:	Silty to Cla	yey SAND	near levee toe	, approx. 12 fee ain by interbed		ear berm toe f CLAY and Poorly-g	graded SAND	
Soils istoric Per	ndside Sun s below su formance	face Layer: irface layer:	Silty to Cla Approx. 5 f	yey SAND eet of Silty	near levee toe SAND underl	ain by interbed			graded SAND	
Soils i storic Per	ndside Sun s below su formance	face Layer: irface layer:	Silty to Cla Approx. 5 f	yey SAND eet of Silty	near levee toe	ain by interbed			graded SAND	
Soils storic Per	ndside Sun s below su formance	face Layer: irface layer:	Silty to Cla Approx. 5 f	yey SAND eet of Silty	near levee toe SAND underl	ain by interbed			graded SAND	
Soils storic Per epage and	ndside Sun s below su formance l sixto eig	face Layer: irface layer:	Silty to Cla Approx. 5 f	yey SAND eet of Silty	near levee toe SAND underl	ain by interbed			graded SAND	
Soils storic Per epage and quefiable S	ndside Sun s below su formance l six to eig Soils	rface Layer: irface layer: ght pin boils	Silty to Cla Approx. 5 f reported in	yey SAND eet of Silty ULE's 2014	near levee toe SAND underl SGDR Adder	ain by interbed	ded layers of	f CLA Y and Poorly-ş	graded SAND	
Soils storic Per epage and quefiable S	ndside Sun s below su formance l six to eig Soils	rface Layer: irface layer: ght pin boils	Silty to Cla Approx. 5 f reported in	yey SAND eet of Silty ULE's 2014	near levee toe SAND underl SGDR Adder	ain by interbed	ded layers of	f CLA Y and Poorly-ş	graded SAND	
Soils storic Per epage and quefiable S ised on ou	ndside Sun s below su formance l six to eig Soils r liquefact	rface Layer: rface layer: tht pin boils	Silty to Cla Approx. 5 f reported in	yey SAND eet of Silty ULE's 2014	near levee toe SAND underl SGDR Adder	ain by interbed	ded layers of	f CLA Y and Poorly-ş	graded SAND	
Soils storic Per epage and quefiable S sed on ou	ndside Sun s below su formance l six to eig Soils r liquefact alysis Res	rface Layer: rface layer: th pin boils tion assessn	Silty to Cla Approx. 5 f reported in nent, we are	yey SAND eet of Silty ULE's 2014	near levee toe SAND underl SGDR Adder	ndum.	ded layers of	f CLA Y and Poorly-ş		Breakou
Soils storic Per epage and quefiable S sed on ou	ndside Sun s below su formance l six to eig Soils r liquefact	rface Layer: rface layer: tht pin boils	Silty to Cla Approx. 5 f reported in	yey SAND eet of Silty ULE's 2014 not consid	near levee toe SAND underl SGDR Adder ering liquefiat	ain by interbed idum. Die soils in our Exit Gra	ded layers of slope stability dient	f CLAY and Poorly-5 y analyses.	graded SAND	
Soils storic Per epage and quefiable S sed on ou	ndside Sun s below su formance l sixto eig Soils r liquefact alysis Res Station	rface Layer: rface layer: th pin boils tion assessn ults Water	Silty to Cla Approx. 5 f reported in nent, we are	yey SAND eet of Silty ULE's 2014 not consid	near levee toe SAND underl SGDR Adder	ndum.	ded layers of slope stability dient Berm	f CLA Y and Poorly-ş	Through	
Soils storic Per epage and quefiable S sed on ou	ndside Sun s below su formance l six to eig Soils r liquefact alysis Res	rface Layer: rrface layer: the pin boils tion assessin tults Water Surface 200-Year	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient	ain by interbed adum. Dele soils in our Exit Gra Toe of 0.1	ded layers of slope stability dient Berm 8	f CLAY and Poorly-5 y analyses. Field	Through Seepage No	Height (ft n/a
Soils storic Per epage and quefiable S used on ou eepage Ana	ndside Sun s below su formance l sixto eig Soils r liquefact alysis Res Station 251+50	rface Layer: rrface layer: tht pin boils tion assessn tults Water Surface 200-Year HTOL	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient	ain by interbed adum. ble soils in our Exit Gra Toe of 0.1 0.2	ded layers of slope stability dient 7 Berm 8 8 20	f CLAY and Poorly-5 y analyses. Field 	Through Seepage No n/a	Breakout Height (ft) n/a n/a
Soils storic Per eepage and quefiable S used on ou eepage Ana	ndside Sun s below su formance l six to eig Soils r liquefact alysis Res Station 251+50 Vertical dis	rface Layer: rface layer: the pin boils tion assesses ults Water Surface 200-Year HTOL stance from the	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C ne toe of the	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit levee (ground	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient	ble soils in our Exit Gra De soils in our Exit Gra 0.1 0.2 here the phreatic	ded layers of slope stability dient 7 Berm 8 8 20	f CLAY and Poorly-5 y analyses. Field	Through Seepage No n/a	Height (ft n/a
Soils istoric Per repage and quefiable S ised on ou repage Ana repage Ana repage Ana repage Ana repage Ana repage Ana repage Ana	ndside Sun s below su formance l sixto eig Soils r liquefact alysis Res Station 251+50 Vertical dia Through see	rface Layer: rface layer: the pin boils tion assesses ults Water Surface 200-Year HTOL stance from the	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C ne toe of the	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit levee (ground	near levee toe SAND underf SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient d surface) to wh	ble soils in our Exit Gra De soils in our Exit Gra 0.1 0.2 here the phreatic	ded layers of slope stability dient 7 Berm 8 8 20	f CLAY and Poorly-5 y analyses. Field 	Through Seepage No n/a	Height (ft n/a
Soils storic Per epage and quefiable S ised on ou repage Ana * * * T	ndside Sun s below su formance l sixto eig Soils r liquefact alysis Res Station 251+50 Vertical dia Through see	rface Layer: rface layer: th pin boils tion assessn ults Water Surface 200-Year HTOL stance from th page under H	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C ne toe of the ITOL condit	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit levee (ground	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient d surface) to wh part of this eval	ble soils in our Exit Gra Toe of 0.1 0.2 here the phreatic luation.	ded layers of slope stability dient Berm 18 20 surface is calcu	f CLAY and Poorly-5 y analyses. Field ulated to day light on t	Through Seepage No n/a	Height (ft n/a
Soils storic Per epage and quefiable S ised on ou repage Ana * * * T	ndside Sun s below su formance l sixto eig Soils r liquefact alysis Res Station 251+50 Vertical dia Through see	tion assessn witts water Surface 200-Year HTOL stance from th page under H is Results Case	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C ne toe of the TOL condit	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit levee (ground ions are not p	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient d surface) to wh part of this eval	ble soils in our Exit Gra De soils in our Exit Gra 0.1 0.2 here the phreatic	ded layers of slope stability dient Berm 8 20 surface is calcu Factor o	f CLAY and Poorly-5 y analyses. Field ulated to day light on t	Through Seepage No n/a	Height (ft n/a
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Soils storic Per epage and quefiable S ised on ou repage Ana * * * T	ndside Sun s below su formance l sixto eig Soils r liquefact alvsis Res Station 251+50 Vertical di: 'hrough sec ity Analys	rface Layer: rrface layer: the pin boils tion assesses tion assessesses tion assesses tion assesses tion assesses tion	Silty to Cla Approx. 5 f reported in nent, we are Figure E-15-B E-15-C ne toe of the TOL condit Water Surface 19.2	yey SAND eet of Silty ULE's 2014 not consid Lev No Posit No Posit levee (groun ions are not p Figure E-15-D	near levee toe SAND underl SGDR Adder ering liquefiat ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ	ble soils in our Exit Gra Toe of 0.1 0.2 here the phreatic tuation. of Safety cular) Landside 2.2	ded layers of slope stability dient Berm 8 20 surface is calcu Factor o (Non-C Waterside n/a	f CLAY and Poorly-5 y analyses. Field ulated to day light on t of Safety Circular) Landside n/a	Through Seepage No n/a	Height (ft n/a
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10.15 PROJECT REACH D2B, STATION 254+50

		RF	CACE	H D2H	8 - ST	A 254	4+50		
Based on our evalu	nation this read								
Seepage Evaluatio		ch meets th	e ende en		Slope Stabili	ty Evaluation	Summary		
	r DWSEL, Und	er Seenage.	Meets	Criteria	T		ge 200-Year DW	SEL IS Mee	ts Criteria
	WSEL, Throug			Criteria	Steady		tate Seepage H		ts Criteria
200 10011	HTOL, Und			Criteria	•	Stoudy 5	Rapid Drawd		ts Criteria
	,				Į	Seis	mic Slope Stab		ts Criteria
							ismic Slope Sta		ts Criteria
Reach Description	1						Reach Overvi	5	
<u>-</u>	_	Sta	tion Limits:	247+00	to	255+50	1 PERCE		
	Feature(s) at U	Upstream St	ation Limit:	Levee access	ramp from far	m road		HE ALL MARDE	
F	eature(s) at Dov	wnstream St	ation Limit:	Just south of	levee pipe per	netration	19		
Approx. C	own Elevation	Range (feet	, NAVD88):	24	to	25			
	Approx. Leve	ee Height R	ange (feet):	14	to	18.5			
	Approx. Crov	wn Width R	ange (feet):	17	to	48	- and management		A CONTRACT
	Approx. Lands	ide Slope (H	H:V) Range:	1.4:1	to	2.5:1			
	Approx. Waters	ide Slope (H	H:V) Range:	1.5:1	to	2.9:1			N
	W	aterside Co	onstraint(s):	None			8 8		
	Ι	andside Co	onstraint(s):		towers (STA		X II AL		
				,	Howard Road		- State C	and the second second	
Lan	dside repairs as	sociated wi	th PL84-99:	Yes, berms be 252+00	etween STA 24	48+00 and	200	TOCHON	And the second second
In	provements as:	sociated wit	th LSRP P1:				The second second		17
	provements as						10 22		5.41.8×
	provements as:				age berm and	chimnev	a valo		
Generalized Subs					0				
	ee Prism Soils:	Silty to Cla	vey SAND						
	vee Prism Soils: Surface Layer:	-		near levee toe	, approx. 12 fe	et of CLAY n	ear berm toe		
Landside	Surface Layer:	Silty to Cla	yey SAND					orly-graded SAND	
Landside Soils belov	Surface Layer: w surface layer:	Silty to Cla	yey SAND					orly-graded SAND	
Landside Soils belov Historic Performa	Surface Layer: w surface layer: mce	Silty to Cla Approx. 5 f	yey SAND feet of Silty	SAND underl	ain by interbed	dded layers o	f CLAY and Po	orly-graded SAND	
Landside Soils belov Historic Performa	Surface Layer: w surface layer: mce	Silty to Cla Approx. 5 f	yey SAND feet of Silty	SAND underl	ain by interbed	dded layers o	f CLAY and Po	orly-graded SAND	
Landside Soils belov fistoric Perform ow to medium la	Surface Layer: w surface layer: mce	Silty to Cla Approx. 5 f	yey SAND feet of Silty	SAND underl	ain by interbed	dded layers o	f CLAY and Po	orly-graded SAND	
Landside Soils belov fistoric Performa ow to medium la iquefiable Soils	Surface Layer: w surface layer: mce ndside seepage	Silty to Cla Approx 5 f and six to o	yey SAND feet of Silty eight pin bo	SAND underl	ain by interbec ULE's 2014 S	dded layers o GDR Addend	f CLAY and Po um.	orly-graded SAND	
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Landside Soils below Historic Performa Low to medium la Liquefiable Soils Based on our lique	Surface Layer: v surface layer: <u>nce</u> ndside seepage faction assess	Silty to Cla Approx 5 f and six to o	yey SAND feet of Silty eight pin bo	SAND underl	ain by interbec ULE's 2014 S	dded layers o GDR Addend	f CLAY and Po um.	orly-graded SAND	
Landside Soils below distoric Performa ow to medium la Liquefiable Soils Based on our lique Seepage Analysis	Surface Layer: v surface layer: ndside seepage faction assess Results Water	Silty to Cla Approx. 5 f and six to o nent, we are	yey SAND feet of Silty eight pin bo	SAND underl	ain by interbec ULE's 2014 S	dded layers o GDR Addend slope stabilit	f CLAY and Po um.	orly-graded SAND	h Breakout
Landside Soils below Historic Performa Low to medium la Liquefiable Soils Based on our lique	Surface Layer: v surface layer: ndside seepage faction assess Results Water	Silty to Cla Approx 5 f and six to o	yey SAND feet of Silty eight pin bo	SAND underl	ULE's 2014 SO Dele soils in our Exit Gra	dded layers o GDR Addend slope stabilit	f CLAY and Po um.	Throug	
Landside Soils below fistoric Performa ow to medium la Liquefiable Soils Based on our lique Geepage Analysis Static	Surface Layer: v surface layer: ndside seepage faction assessi Results Mater 200-Year	Silty to Cla Approx. 5 f and six to o nent, we are	yey SAND feet of Silty eight pin bo e not consid	SAND underliis reported in ering liquefiab	ULE's 2014 SO De soils in our Exit Gra Toe o	dded layers o GDR Addend slope stabilit adient	f CLAY and Po um. y analyses.	Throug	
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Landside Soils below fistoric Performa ow to medium la iquefiable Soils Based on our lique Geepage Analysis Static 254+: *Vertic Throug	Surface Layer: w surface layer: mce adside seepage faction assess Results on Water Surface 200-Year HTOL al distance from t a seepage under F alysis Results	Silty to Cla Approx. 5 f and six to o ment, we are Figure E-16-B E-16-C he toe of the TTOL condit	eight pin bo	SAND underli ils reported in ering liquefiab ee Toe).06).10 d surface) to wh part of this eval	ULE's 2014 SC ULE's 2014 SC ole soils in our Exit Gra Toe o 0. 0. 0. 0.	dded layers o GDR Addend slope stabilit adient f Berm 34 37 c surface is calc	f CLAY and Po um. y analyses. Field 	Throug Seepage No n/a	e Height (ft) ³ n/a
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Landside Soils below istoric Performa ow to medium la iquefiable Soils Based on our lique cepage Analysis Static 254+ *Vertic Throug Cope Stability An	Surface Layer: w surface layer: mce adside seepage adside seepage faction assessi Results m Water Surface 200-Year HTOL al distance from t a seepage under F alysis Results m Case	Silty to Cla Approx. 5 f and six to o ment, we are Figure E-16-B E-16-C he toe of the tTOL condit	yey SAND feet of Silty eight pin bo not consid Lev (levee (ground ions are not)	SAND underli ils reported in ering liquefiab ee Toe).06).10 d surface) to wh part of this eval Factor o (Circ	ULE's 2014 Se ULE's 2014 Se ole soils in our Exit Gra Toe o 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	dded layers o GDR Addend slope stabilit adient f Berm 34 37 c surface is calc Factor o (Non-C	f CLAY and Po um. y analyses. Field culated to day light of Safety Circular)	Throug Seepage No n/a	e Height (ft) ³ n/a
Landside Soils below istoric Performa ow to medium la iquefiable Soils ased on our lique eepage Analysis Static 254+ *Vertic Throug	Surface Layer: w surface layer: masside seepage efaction assessin Results Mathematical Surface 200-Year HTOL al distance from t a seepage under F alysis Results on Case Analyzed	Silty to Cla Approx. 5 f and six to o ment, we are Figure E-16-B E-16-C he toe of the tTOL condit Water Surface 19.4	eight pin bo enot consid Lev (levee (ground ions are not) Figure	SAND underl ils reported in ering liquefiat ee Toe 0.06 0.10 d surface) to wh part of this eval Factor o (Circ Waterside	ULE's 2014 Se ULE's 2014 Se ole soils in our Exit Gra Toe o 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	dded layers o GDR Addend slope stabilit adient f Berm 34 37 c surface is calc (Non-C Waterside	f CLAY and Po um. y analyses. Field culated to day light Dircular) Landside	Throug Seepage No n/a	e Height (ft) n/a
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Landside Soils below fistoric Performa ow to medium la Liquefiable Soils Based on our lique Geepage Analysis Static 254+ *Vertic Throug Glope Stability An	Surface Layer: w surface layer: masside seepage efaction assessin Results m Water Surface 200-Year HTOL al distance from t alysis Results on Case Analyzed SS - 200yr SS - HTOL RDD	Silty to Cla Approx. 5 1 and six to o ment, we are Figure E-16-B E-16-C he toe of the tTOL condit Water Surface 19.4 20.5 13.6	yey SAND feet of Silty eight pin bo not consid Lev (levee (ground ions are not) Figure E-16-D E-16-E E-16-D	SAND underli ils reported in ering liquefiat ee Toe 0.06 0.10 d surface) to wh part of this eval Factor of (Circ Waterside 1.2	ULE's 2014 SC ULE's 2014 SC Dele soils in our Exit Gra Toe o 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	dded layers o GDR Addend slope stabilit adient f Berm 34 37 c surface is calc Factor o (Non-C Waterside n/a n/a n/a	f CLAY and Po um. y analyses. Field culated to day ligh of Safety Circular) Landside n/a n/a n/a n/a	Throug Seepage No n/a	e Height (ft) ³ n/a
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10.16 PROJECT REACH D2C, STATION 259+00

			RF	ACH	H D20	C - ST	A 259	9+00			
ased on o	ur evaluati	on, this reac			DC Criteria.						
	valuation St					Slope Stabilit	y Evaluation S	Summary			
2	200-Year D	WSEL, Unde	er Seepage:	Fails	Criteria	Steady	State Seepage	e 200-Year DWSE	EL, LS:	Fails	Criteria
200	-Year DWS	SEL, Throug	h Seepage:	Fails	Criteria	•	Steady St	ate Seepage HTC	DL, LS:	Meets	s Criteria
		HTOL, Unde	er Seepage:	Fails	Criteria			Rapid Drawdow	n, WS:	Meets	s Criteria
						-	Seisi	mic Slope Stabilit	y, WS:	Meets	s Criteria
							Seis	smic Slope Stabili	ity, LS:	Meets	s Criteria
each Des	<u>cription</u>							Reach Overview			
			Sta	tion Limits:	255+50	to	259+50	I PE-LE	-	E	TIM
	Fe	ature(s) at U	Jpstream St	ation Limit:		Phase II drain			E N N		17 BA
	Foots	ro(c) at Dou	unstroom St	ation Limit.		ted with Rach ramp near Ho		La la anti the			
	reatt	lie(s) at DOW	viistieain st	ation Linut.	crossing	Tamp near 110	walu Koau	and the free	A AND A A	1 Ales	
Ap	prox. Crowi	n Elevation I	Range (feet,	NAVD88):	23	to	25	P.S. Million Sta	THE T		12 million
	A	Approx. Leve	e Height R	ange (feet):	14	to	18.5	AND ADD THE ADD	-16		
	Α	pprox. Crow	vn Width R	ange (feet):	17	to	21.5	C. FRANKS	State State	T and	12/3
	Ap	prox. Landsi	ide Slope (H	I:V) Range:	1.4:1	to	2.5:1			The second	N
	App	rox. Watersi	ide Slope (H	I:V) Range:	1.5:1	to	2.9:1		5	L	
		W	aterside Co	nstraint(s):	Levee penetra	ation at STA 2	59+00		5 11	ALL Y	
		L	andside Co	nstraint(s):	Farm road/rar	mp at STA 255	+50	100 and a	-	(i)	
	Landsic	le repairs as	sociated wi	th PL84-99:	None					44.1	and the second
	Impro	vements ass	ociated wit	h LSRP P1:	None			Mate 1			
	Impro	vements ass	ociated wit	h LSRP P2:	None			10 39 6	11		
Prop	osed Impro	vements ass	sociated wit	h LSRP P3:	None				LON		
L	andside Su		-	yey SAND	V near levee i	toe					
Soi istoric Pe o events i iquefiable	ils below su erformance reported in e Soils	rface Layer: 1rface layer: 2 ULE's 2014 :	Approx. 10 Approx. 5 f	feet of CLA eet of Silty endum.		ain by interbed		CLAY and Poorl			
Soi istoric Pe o events i iquefiable ased on o	ils below su erformance reported in e <u>Soils</u> ur liquefact	rface Layer: urface layer: ULE's 2014 s tion assessn	Approx. 10 Approx. 5 f	feet of CLA eet of Silty endum.	SAND underl	ain by interbed		CLAY and Poorl			(F)
Soi listoric Pe lo events i iquefiable ased on o	ils below su erformance reported in e Soils	rface Layer: urface layer: ULE's 2014 : tion assessn sults	Approx. 10 Approx. 5 f	feet of CLA eet of Silty endum.	SAND underl	ain by interbed	n this Reach (ixEand App	oendix	1
Soi listoric Pe lo events i iquefiable ased on o	ils below su erformance reported in e <u>Soils</u> ur liquefact	rface Layer: Inface layer: ULE's 2014 : tion assessn sults Water	Approx. 10 Approx. 5 f	feet of CLA eet of Silty endum. ntified pote	SAND underli ntially liquefia	ain by interbed ble soils withi Exit Gra	n this Reach (dient	Refer to Append	ix E and App	oendix ough	Breakou
Soi listoric Pe lo events i iquefiable ased on o	lls below su erformance reported in e <u>Soils</u> ur liquefac nalysis Res	rface Layer: urface layer: ULE's 2014 : tion assessn ults Water Surface	Approx. 10 Approx. 5 f SGDR Addo nent, we ide Figure	feet of CLA eet of Silty endum. ntified pote	SAND underli ntially liquefiz ee Toe	ain by interbed ble soils withi Exit Gra Toe of	n this Reach (dient Berm	Refer to Append Field	ix E and App Thr See	oendix ough page	Breakout Height (ft)
Soi istoric Pe io events i iquefiable ased on o	lls below su erformance reported in e <u>Soils</u> ur liquefac nalysis Res	rface Layer: urface layer: ULE's 2014 : tion assessn ults Water Surface 200-Year	Approx. 10 Approx. 5 f SGDR Addo ment, we ide Figure E-17-B	feet of CLA eet of Silty endum. ntified pote	SAND underla ntially liquefia ee Toe).54	ain by interbed ble soils withi Exit Gra	n this Reach (dient Berm	Refer to Append	ix E and App Thr See	oendix ough page ⁄es	Breakou Height (ft 3.7
Soi listoric Pe lo events r iquefiable ased on o eepage An	Is below su erformance reported in 2 Soils ur liquefact nalysis Res Station 259+00	rface Layer: urface layer: ULE's 2014 : tion assessn sults Water Surface 200-Year HTOL	Approx. 10 Approx. 5 f SGDR Addo ment, we ide Figure E-17-B E-17-C	reet of CLA reet of Silty endum. ntified pote Lev	SAND underla ntially liquefia ee Toe).54).61	ain by interbed ble soils withi Exit Gra Toe of	n this Reach (dient Berm -	Refer to Append Field 	ix E and App Thr See Y	oendix ough page Zes	Breakou Height (ft
Soi listoric Pe lo events n iquefiable ased on o eepage An	erformance reported in 2 Soils ur liquefact nalysis Res Station 259+00 *Vertical di	tion assessn sults 2004: 400 Year 2000 Year 2000 Year 2000 Year 2000 Year 2000 Year	Approx. 10 Approx. 5 f SGDR Addo ment, we ide Figure E-17-B E-17-C me toe of the	reet of CLA eet of Silty endum. ntified pote Lev (levee (ground	SAND underla ntially liquefia ee Toe).54).61	ain by interbed ble soils withi Exit Gra Toe of 	n this Reach (dient Berm -	Refer to Append Field	ix E and App Thr See Y	oendix ough page Zes	Breakou Height (ft 3.7
Soi listoric Pe lo events n iquefiable ased on o eepage An	lls below su erformance reported in 2 Soils ur liquefact nalysis Res Station 259+00 *Vertical di Through see	tion assessn sults 2004: 400-Year 400-Year 400-Year 400-Year 400-Year 400-Year 400-Year 400-Year 400-Year	Approx. 10 Approx. 5 f SGDR Addo ment, we ide Figure E-17-B E-17-C me toe of the	reet of CLA eet of Silty endum. ntified pote Lev (levee (ground	SAND underla ntially liquefia ee Toe).54).61 d surface) to wh	ain by interbed ble soils withi Exit Gra Toe of 	n this Reach (dient Berm -	Refer to Append Field 	ix E and App Thr See Y	oendix ough page Zes	Breakou Height (ft 3.7
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Soi istoric Pe o events r iquefiable ased on o ecpage An	ils below su erformance reported in e Soils ur liquefac: nalysis Res Station 259+00 *Vertical di Through sec ility Analys	rface Layer: Inface layer: ULE's 2014 : tion assessm sults Water Surface 200-Year HTOL stance from the page under H tist Results Case	Approx. 10 Approx. 5 f SGDR Addo nent, we ide Figure E-17-B E-17-C ne toe of the TTOL condit Water Surface	reet of CLA eet of Silty endum. ntified pote Lev ((levee (ground ions are not p Figure	sAND underla entially liquefia ee Toe).54).61 d surface) to wh part of this eval Factor of	ain by interbed able soils withi Exit Gra Toe of 	n this Reach (dient Berm 	Refer to Append Field ulated to day light o	ix E and App Thr See Y	oendix ough page Zes	Breakou Height (ft 3.7
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Soi istoric Pe o events r iquefiable ased on o eepage An	ils below su erformance reported in e Soils ur liquefact nalysis Res Station 259+00 *Vertical di Through see ility Analys Station	rface Layer: Inface layer: ULE's 2014 : tion assessm sults Water Surface 200-Year HTOL stance from th tp age under H stance from th tp age under H Sis Results Case Analyzed	Approx. 10 Approx. 5 f SGDR Addo nent, we ide Figure E-17-B E-17-C ne toe of the TTOL condit Water Surface	rtified pote Lev (constant of pote Lev (constant of pote Lev (constant of pote E-17-D E-17-E	SAND underla entially liquefia ee Toe).54).61 d surface) to wh part of this eval Factor of (Circ Waterside	ain by interbed able soils withi Exit Gra Toe of 	n this Reach (dient Berm 	Refer to Append Field alated to day light o f Safety fircular) Landside	ix E and App Thr See Y	oendix ough page Zes	Breakou Height (ft 3.7
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10.17 PROJECT REACH E1A, STATION 281+41 WITH BERM

	REA									
Based on our eval	uation, this rea	ch meets th	e ULDC cri	teira.						
Seepage Evaluation					<u>Slope Stabilit</u>	-				
	r DWSEL, Und			Criteria	Steady	State Seepage				Criteria
200- Year I	OWSEL, Throug			Criteria		Steady St	ate Seepage l			Criteria
	HTOL, Und	er Seepage:	Meets	Criteria		C	Rapid Draw			Criteria
							mic Slope Sta smic Slope St	-		Criteria Criteria
leach Descriptio	1					301	Reach Over	-	wieets	Ciliena
leuch Descriptio	-	Sta	tion Limits:	259+50	to	270+00	Reach Over	the main is a second se		F
	Feature(s) at	Upstream St	ation Limit:	End of Phase	II drained berr			E	0+00	- But -
				E1A			100	1 2 2		N. 5
	eature(s) at Do				1 grade or PL84	4-99 berm			TUP	
Approx. C	own Elevation				to	25	OF STREET		THE REAL	La car
	Approx. Lev	-			to	18			REL	230 10 -
	Approx. Cro				to	40	THE REAL	22 300	196 E	
	Approx. Lands		-		to	3:1		Conser.	St 1. 1	The second
	Approx. Waters		-		to e of slope at th	2:1				N
	v	aterside Co	onstraint(s).	no waterside	-	e waterway -		CULTURE OF A CONTRACT	5	
	1	Landside Co	onstraint(s):		ields/occasion	al overhead	NO	2		
				poles			The state		2464	
	Iside Repairs a						No. a	10		T
Ir	provements as	sociated wit	h I SRP PL	None						
	-					· .				
	provements as			Drained Seep		nimney Drain	13.0	in		
Ir	-	sociated wit	h LSRP P2:	Drained Seep - STA 259+50		nimney Drain		ing-		
Ir Proposed Ir	nprovements as	sociated wit	h LSRP P2:	Drained Seep - STA 259+50		nimney Drain				
Ir Proposed Ir Generalized Subs	nprovements as	sociated wit sociated wit ons	th LSRP P2:	Drained Seep - STA 259+50 None		nimney Drain		10		
Ir Proposed Ir Generalized Subs Le	provements as provements as urface Condition	sociated wit sociated wit <u>ms</u> : Silty SANI	th LSRP P2: th LSRP P3: D and Claye	Drained Seep - STA 259+50 None y SAND	0 to 270+00	nimney Drain		1		
Ir Proposed Ir <mark>Seneralized Subs</mark> Le Landside	nprovements as nprovements as urface Condition vee Prism Soils	sociated wit sociated wit ms Silty SANI	th LSRP P2: th LSRP P3: D and Claye Y (10 to 30 fe	Drained Seep - STA 259+50 None y SAND eet thick) and	0 to 270+00	nimney Drain		-		
Ir Proposed Ir <mark>Seneralized Subs</mark> Le Landside Soils belo	provements as provements as urface Condition vee Prism Soils : Surface Layer w surface layer	sociated wit sociated wit ms Silty SANI	th LSRP P2: th LSRP P3: D and Claye Y (10 to 30 fe	Drained Seep - STA 259+50 None y SAND eet thick) and	0 to 270+00	nimney Drain		+		
Ir Proposed Ir Generalized Subs Le Landside Soils belo listoric Perform	provements as provements as urface Condition wee Prism Soils : Surface Layer w surface layer unce	sociated wit sociated wit <u>ms</u> Silty SANI Lean CLA Lean CLA	th LSRP P2: th LSRP P3: D and Claye Y (10 to 30 for Y and Silty S	Drained Seep - STA 259+50 None y SAND eet thick) and SAND	Silty SAND			16		
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Ir Proposed Ir Seneralized Subs Le Landside Soils belo listoric Perform andside seepage liquefiable Soils Based on our lique Seepage Analysis Stati <u>281+</u> W/BE	provements as provements as urface Conditional vee Prism Soils Surface Layer w surface layer w surface layer and pin boils n effaction assess Results on Water Surface 41 200-Year RM HTOL	sociated wit sociated wit ms : Silty SANI : Lean CLA : Lean CLA eported duri ment, we are Figure E-18-B E-18-C	th LSRP P2: th LSRP P3: O and Claye Y (10 to 30 ft Y and Silty S ng 1997 floc e not consid Lev No Posit No Posit	Drained Seep - STA 259+50 None y SAND eet thick) and SAND od event in UI ering liquefiab ee Toe ive Gradient ive Gradient	Silty SAND Es 2014 SGDI ele soils in our Exit Grad Toe of 0.0	R Addendum. slope stability ient** Berm 06 17	/ analyses. Fie 0.1 0.1	6 6	Seepage No n/a	Height (ft)*
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Ir Proposed Ir Seneralized Subs Le Landside Soils belo listoric Perform andside seepage iquefiable Soils Based on our lique iquefiable Soils Stati 281+ W/BE *Vertic Throug	provements as provements as urface Conditional vee Prism Soils Surface Layer w surface layer w surface layer and pin boils n effaction assess Results on Water Surface 41 200-Year RM HTOL	sociated wit sociated wit ms : Silty SANI : Lean CLA : Lean CLA eported duri ment, we are Figure E-18-B E-18-C the toe of the HTOL condit	th LSRP P2: th LSRP P3: O and Claye Y (10 to 30 fr Y and Silty S ng 1997 floc e not consid Lev No Posit levee (ground	Drained Seep - STA 259+50 None y SAND set thick) and SAND od event in UI ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh	Silty SAND LE's 2014 SGDI le soils in our Exit Grad Toe of 0.0 0.0	R Addendum. slope stability ient** Berm 06 17	/ analyses. Fie 0.1 0.1	6 6	Seepage No n/a	Height (ft) ³ n/a
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10.18 PROJECT REACH E1B, STATION 281+41 WITHOUT BERM

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	ir evaluation Su		h does not	meet the UL	DC Criteria.	Slope Stabilit	v Evaluation 9	Summary			
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each Desc	cription							Reach Overviev	-		
			Sta	tion Limits:	270+00	to	297+75			Sal F	THE F
	Fe	ature(s) at U	Jpstream St	ation Limit:	Begin Phase	II drained seep	age berm		E A	1+00-	
					associated wi			ST. T. Park	1 -1 -		
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· • PP		Approx. Leve	-		24 14	to	18	A STATE OF THE STA	Contraction of the second	A A	and the second
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10.19 PROJECT REACH E2, STATION 301+07

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ased on (our evaluati	on, this read									
	Evaluation Su					Slope Stabilit	y Evaluation S	Summary			
	0-Year DWS	W SEL, Unde SEL, Throug HTOL, Unde	h Seepage:	Meets	Criteria Criteria Criteria	Steady	Seis	ate Seepage l Rapid Drawo mic Slope Sta	HTOL , LS: lown, WS: bility, WS:	Meets Meets Meets	Criteria Criteria Criteria Criteria
Reach Des	arintian						Sei	smic Slope St Reach Overv		Meets	Criteria
teach Des	scription		Sta	tion Limits:	297+75	to	305+75	Reach Over	<u>new</u>	5 - 1 - 5	1-1-1-1
			Jpstream St	ation Limit:	Transition to berm associat End of Phase	Phase III drain ted with Reach II seepage ber	ed seepage F		A A A A A A A A A A A A A A A A A A A		
Aı	oprox. Crowi	n Elevation 1	Range (feet	NA VD88).	associated wi	th Reach E2 to	26		A AND A		
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		prox. Lands			2:1	to	3:1		STREET ST	A DESCRIPTION OF	1/3
	-	rox. Waters		. –	1.6:1	to	3.4:1			The state	N
		L le repairs as	andside Co sociated wi	nstraint(s): th PL84-99:	no waterside None - agricu Yes, berms be Drained Seep		3+00 and imney drain				
-	Impro posed Impro ed Subsurfa		sociated wit					A	6		
	Levee	D · <i>G</i> · · ·									
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So listoric P eepage, p	Landside Sur pils below su Performance pin boils and	rface Layer: urface layer:	Lean CLA	Y, approx. 17 d layers of S	7 feet thick at t Silty SAND, S	toe of berm AND and Lean					
So listoric P eepage, p iquefiabl	Landside Sur pils below su Performance pin boils and le Soils	rface Layer: Irface layer: I scour repo	Lean CLAY Interbedde rted during	Y, approx. 17 d layers of 9 1997 flood o	7 feet thick at t Silty SAND, S event in ULE:	toe of berm AND and Lean	ddendum.	Refer to App	endix E and 4	Appendix	F)
So fistoric P eepage, p iquefiabl ased on o	Landside Sur pils below su Performance pin boils and le Soils	rface Layer: Irface layer: I scour repo tion assessr	Lean CLAY Interbedde rted during	Y, approx. 17 d layers of 9 1997 flood o	7 feet thick at t Silty SAND, S event in ULE:	oe of berm AND and Lean s 2014 SGDR A	ddendum.	Refer to App	endix E and A	Appendix	
So listoric P eepage, p iquefiabl	Landside Sur oils below su Performance oin boils and le Soils our liquefact	rface Layer: Inface layer: I scour repo tion assess sults Water	Lean CLAN Interbedde rted during ment, we ide	Y, approx. 17 d layers of 5 1997 flood o ntified pote	7 feet thick at t Silty SAND, S event in ULE: ntially liquefia	oe of berm AND and Lean s 2014 SGDR A able soils within Exit Grad	.ddendum. n this Reach (ient**		-	Through	Breakout
So listoric P eepage, p iquefiabl	andside Sun bils below su Performance pin boils and le <u>Soils</u> our liquefact Analysis Res	rface Layer: Inface layer: I scour repo tion assess sults Water Surface	Lean CLAN Interbedde rted during ment, we ide Figure	Y, approx. 17 d layers of 5 1997 flood o ntified pote	7 feet thick at t Silty SAND, S event in ULE: ntially liquefia ee Toe	oe of berm AND and Lean s 2014 SGDR A able soils within Exit Grad Toe of	ddendum. n this Reach (ient** Berm	Fie	ld S	Гhrough Seepage	Breakout Height (ft)
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10.20 PROJECT REACH F1A, STATION 311+00

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	valuation St		ii iikets tii			Slope Stabilit	v Evaluation S	Summary			
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		SEL, Throug			Criteria	Steady		ate Seepage H	-		Criteria
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each Des	cription							Reach Overvi			
			Sta	tion Limits:	305+75	to	312+30	1	Participation in	SIL TOP	A F
	Fe	ature(s) at U	Jpstream St	ation Limit:	Transition to	landside farm			STE I	100-	
					improvement				1 11	ABS -	
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	-	prox. Lands	• •			to to	3:1 2:1			3	N
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10.21 PROJECT REACH F1B, STATION 313+75

			RE		<u>H F1</u> E	B - ST	<u>A 313</u>	8+75			
ased on feet.	our evaluati	on, this rea	ch does not	meet the U	LDC Criteria.	Seismic deform	nations are r	not anticipated	to degrade	e below 10-	Year WSE
	Evaluation St	ummary				Slope Stabilit	v Evaluation S	Summary			
		WSEL, Und	er Seepage:	Meets	Criteria			e 200-Year DW	SEL, LS:	Meets	Criteria
20	00-Year DWS	SEL, Throug	h Seepage:	Fails	Criteria		Steady St	ate Seepage H	TOL, LS:	Meets	Criteria
		HTOL, Und	er Seepage:	Meets	Criteria			Rapid Drawd	own, WS:	Meets	Criteria
						•	Seis	mic Slope Stab	ility, WS:	Fails	Criteria
							Sei	smic Slope Sta	bility, LS:	Meets	Criteria
each De	scription							Reach Overvi	ew		
			Sta	tion Limits:	312+30	to	315+00	1 THE A	- And	Frank Fr	Rel F
	Fe	ature(s) at V	Upstream St	ation Limit:	Bowman Roa	d				NHO	
	Featu	re(s) at Dov	wnstream St	ation Limit:	Transition to	Phase III Seepa	age berm	197	And the second		R. Cal
А	pprox. Crowi	n Elevation	Range (feet	, NAVD88):	25	to	26				hard
	A	Approx. Lev	ee Height R	ange (feet):	12	to	13	ALL STREET	San Barran of	- 128	the seal
	Α	pprox. Crov	wn Width R	ange (feet):	12	to	30	A. S. Barrertine		100 *	2010
	Ap	prox. Lands	ide Slope (I	H:V) Range:	2:1	to	3.5:1		Carlos I.	200	
	App	rox. Waters	ide Slope (I	H:V) Range:	2:1	to	3:1		Scale -		N
		W	aterside Co	onstraint(s):	Levee penetra	ation near STA	314+50				N
									and a -		· Alle
		1	andside Co	onstraint(s):	Rural farm im	provements, str	uctures	100	See 1	1	A STATE
	Landsid	le renairs as	sociated wi	ith PI 84-99·	Possibly eith	er berm or raise	ed grades		TOUERO	如 清言	
		-		th LSRP P1:	-		a grades	-	10-070	167 16 7 - Q	
	-			th LSRP P2:				The second	10 10		
Pro	posed Impro							120	9 46 S	K.14	Constant - 17
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10.22 PROJECT REACH F1C, STATION 320+65

			RF	CACE	H F1(C - ST	A 320)+65			
Based on ou	r evaluati	on. this read			DC Criteria.						
Seepage Eva						Slope Stabilit	y Evaluation	Summary			
20	00-Year D	WSEL, Unde	er Seepage:	Fails	Criteria			e 200-Year DV	VSEL, LS:	Fails	Criteria
		SEL, Throug			Criteria		Steady St	tate Seepage I	HTOL, LS:	Fails	Criteria
]	HTOL, Unde	er Seepage:	Fails	Criteria			Rapid Drawo	lown, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	ismic Slope St	ability, LS:	Meets	Criteria
Reach Desci	ription							Reach Overv	<u>view</u>		
			Sta	tion Limits:	315+00	to	321+00	I PETAL	E	AND THE	1 th
			-		Gate on levee					U HUM	1-1- Mart
					Bowman Roa	d					
App		n Elevation I			25	to	26				1-1
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		Approx. Crov			20	to	35	ALL BRANES		150	a lan
	-	prox. Lands			2:1	to	2.2:1		Contra la	300	The star
	Арр	orox. Waters:		nstraint(s):	1.5:1 None	to	2.4:1			B AL	N
		vv		nstraint(s).	1 One				Surrey and	5	
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10.23 PROJECT REACH F2, STATION 329+00

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ased on ou feet.	ır evaluatio	on, this read	ch does not	meet the UI	LDC Criteria.	Seismic defor	mations are i	not anticipated to deg	rade below 10-	Year WSE
eepage Eva	aluation Su	<u>ımmary</u>				Slope Stabilit	v Evaluation	Summary		
2	00-Year D	WSEL, Und	er Seepage:	Fails	Criteria	Steady	State Seepag	e 200-Year DWSEL, I	LS: Meets	Criteria
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		pprox. Lev	-	-		to	19.5	President and the	PIE-	1 and
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	Landsic	le repairs as	sociated wi	ith PL84-99:	Seepage bern	n repairs betwe	en STA	The second second		No.
	-	vements as:						MAT LIT		
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Propo	osed Impro	vements as:	sociated wit	th LSRP P3:	None					
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Soil istoric Pe andside se iquefiable ased on ou eepage An [] lope Stabii [] []]]]	Levee ndside Sun is below su rformance repage and Soils ar liquefact alysis Res Station 329+00 *Vertical dif Through sec *Exit Grad lity Analys Station 329+00 ear Seismi	Prism Soils: rface Layer: irface layer: pin boils re ion assessi ults Water Surface 200-Year HTOL stance from t page under H ient includes is Results Case Analyzed SS - 200yr SS - HTOL RDD PS Post-EQ c Event Res Damage	Silty SANI Lean CLA ^V Interbedde ported in U ment, we ide Figure E-24-B E-24-C he toe of the HTOL condit 3D effects Water Surface 21.0 22.1 14.4 5.3 5.3 toration Es Estimated Lateral	Y, approx. 5 d layers of i LE's 2014 Se entified pote Leve (groun ions are not E-24-D E-24-E E-24-C/H E-24-G/H Estimated Vertical	silty SAND, L GDR Addendu entially liquefia ee Toe 1.19 1.33 d surface) to wh part of this eval Factor c (Cirr Waterside 1.7 1.3 0.8 Fill Volume (1 feet Fre (cubic	ean CLAY, and um. tible soils withi Exit Grad Toe of 	Poorly Grad	ed SAND with Silt (Refer to Appendix E Field 0.34 0.38 ulated to day light on th Of Safety Circular) Landside n/a n/a n/a n/a n/a n/a n/a m/a m/a m/a m/a m/a m/a m/a m/a m/a m	Through Seepage Yes n/a	Breakout Height (ft) 1



10.24 PROJECT REACH F3, STATION 350+00

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ased on o	ur evaluati	on, this read			DC Criteria.			100			
	valuation S					Slope Stabilit	v Evaluation	Summary			
	200-Year D	WSEL, Unde	er Seepage:	Fails	Criteria			ge 200-Year DWS	SEL, LS:	Fails	Criteria
200)-Year DW	SEL, Throug	h Seepage:	Fails	Criteria		Steady S	tate Seepage HT	OL, LS:	Meets	Criteria
		HTOL, Unde	er Seepage:	Fails	Criteria			Rapid Drawdov	vn, WS:	Meets	Criteria
						-	Seis	mic Slope Stabili	ty, WS:	Meets	Criteria
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each Des	<u>cription</u>							Reach Overview	<u>v</u>		
				tion Limits:		to	362+50			hund E	and seal -
			-			Phase III cutor			高川。		15 4
						cess ramp fron			Seattle State	A Sec	
Ap	-	n Elevation I			26	to	27.5		180	a la construction	1-1
		Approx. Leve	-			to	19.5	Contraction of the second		-	Leon and the
		Approx. Crov				to	25		2	100	and a sta
	-	prox. Lands				to	3.8:1		COLUMN OF	1	1.20 0 -0
	App	orox. Waters: W				to ation (STA 354	3.1:1 +00)	A DECEMBER OF THE OWNER OWNER OF THE OWNER OWNE			N
		**	aterside Co	instraint(s).	Levee peneu	ation (STA 334	+00)		and in a	5	
		L	andside Co	nstraint(s):	None - agricu	ltural land			3		
	Landsid	le repairs as	sociated wi	th PL84-99:	None				NOTED A		Pro-
	Impro	vements ass	sociated wit	h LSRP P1:	None			Roto The	-	AND NO	
	Impro	vements ass	sociated wit	h LSRP P2:	None			10 340 4	11/2		
D	o and Immuno									A REAL PROPERTY AND A REAL PROPERTY.	And a second
Prop	osed impro	venients ass	sociated wit	h LSRP P3:	None				LO		
	-	ce Condition		h LSRP P3:	None			-01	LO		
	d Subsurfa		ns		None						
eneralize	ed Subsurfa Levee	ce Conditio Prism Soils :	<u>ns</u> Silty SANI)	None 5 feet thick at 1	oe of levee				No. 1	
eneralize	ed Subsurfa Levee andside Su	rface Condition Prism Soils : rface Layer:	<u>ns</u> Silty SANI Lean CLA) Y, approx. 15	5 feet thick at 1		Lean CLAY,	and Poorly Grade	ed SAND		
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eneralize La Soi storic Pe	ed Subsurfa Levee andside Su ils below su erformance	ce Conditio Prism Soils : rface Layer: ırface layer:	ns Silty SANI Lean CLA Interbedde) Y, approx. 15 d layers of 5	5 feet thick at t Silty SAND, C		Lean CLAY,	and Poorly Grade	ed SAND		
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neralize Soi storic Pe o observa quefiable sed on o	ed Subsurfa Levee andside Su ils below su erformance ations repo e Soils our liquefac nalysis Res	tee Condition Prism Soils: rface Layer: urface layer: tread in ULE's tion assessm sults Water	ns Silty SANI Lean CLA ^N Interbedde 2014 SGDI ment, we are) Y, approx. 15 d layers of S R Addendur not consid	5 feet thick at t Silty SAND, C n. ering liquefiat	layey SAND, the soils in our Exit Grad	slope stabilit ient**	y analyses			Height (ft
neralize Soi storic Pe o observa quefiable sed on o	ed Subsurfa Levee andside Su ils below su erformance ations repo e Soils our liquefac nalysis Res Station 350+00	ce Conditio Prism Soils: rface Layer: nrface layer: tread in ULEs tion assessm cults Water Surface 200-Year HTOL	ns Silty SANI Lean CLA ^N Interbedde S 2014 SGDI nent, we are Figure E-25-B E-25-C) Y, approx. 15 d layers of S R Addendur not consid	5 feet thick at t Silty SAND, C n. ering liquefiat ee Toe).81	layey SAND, le soils in our Exit Grad Toe of 	slope stabilit ient** Berm - -	y analyses Field 0.78 0.86		Seepage Yes n/a	Height (ft 2
La Soi storic Pe o observa quefiable sed on o	ed Subsurfa Levee andside Su ils below su erformance ations repo e Soils uur liquefac nalysis Res Station 350+00 *Vertical di	tee Condition Prism Soils: rface Layer: urface layer: tread in ULE's tion assessm sults Water Surface 200-Year HTOL stance from th	ns Silty SANI Lean CLAN Interbedde s 2014 SGDI nent, we are Figure E-25-B E-25-C he toe of the	C) Y, approx. 15 d layers of S R Addendur e not consid	5 feet thick at t Silty SAND, C n. ering liquefiat ee Toe).81	layey SAND, le soils in our Exit Grad Toe of 	slope stabilit ient** Berm - -	y analyses Field 0.78		Seepage Yes n/a	Height (ft 2
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La Soi storic Pe o observa quefiable sed on o	ed Subsurfa Levee andside Su ils below su erformance ations repo e Soils our liquefac station <u>350+00</u> *Vertical di Through se **Exit Grac illity Analys	tion assessm with the formula of th	ns Silty SANI Lean CLA ^N Interbedde s 2014 SGDI nent, we are Figure E-25-B E-25-C he toe of the ITOL condit 3D effects Water Surface) Y, approx. 15 d layers of S R Addendur e not consid Lev (levee (ground ions are not p Figure	5 feet thick at thick at thick at thick at thick at thick at this same constraints of this evaluation of the same constraints of the same constraint	layey SAND, le soils in our Exit Grad Toe of ere the phreatic uation. of Safety ular) Landside	slope stabilit ient** Berm - - surface is calc Factor o (Non-C Waterside	y analyses Field 0.78 0.86 culated to day light of Safety Circular) Landside		Seepage Yes n/a	Height (ft 2
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10.25 PROJECT REACH G, STATION 375+50

			R	EAC	CHG	- STA	375+	-50			
Based on our	r ovolouti	on this read				R = 1 - 1		••			
Seepage Eval			in meets th	e olde en	willa.	Slope Stabilit	v Evaluation S	Summary			
		WSEL, Unde	er Seenage.	Meets	Criteria	1	State Seepage		VSEL LS	Meets	Criteria
200-Year DW					Criteria	Steady	10	ate Seepage I	· · –		Criteria
		HTOL, Unde			Criteria		Steady St	Rapid Drawd			Criteria
		in ol, end	n beepuge.	in a cus	Crittin	I	Seisi	mic Slope Sta			Criteria
								smic Slope Sta			Criteria
Reach Descr	ription						Ben	Reach Overv	-	in the table	Criteria
<u>neuen besei</u>	<u></u>		Sta	tion Limits:	362+50	to	388+00	7 24 2 4			
	Fe	ature(s) at U	Jpstream St	ation Limit:	Waterside mo	bile home parl			E H	-00-	- 化现入市
			•			cess ramp fron			-	ABER	
Appi	rox. Crowi	n Elevation I	Range (feet.	NAVD88):	27	to	28		1 25-3		Will Com
		Approx. Leve			13.5	to	21		and the second	100	he -
		Approx. Crov	-		17	to	37	IN TOUR WAR	and the second second	F L	De Parto
		prox. Lands:			1.8:1	to	2.7:1	and the second second	States	ale.	
	-	rox. Waters			1.7:1	to	3.2:1				
		W	aterside Co	nstraint(s):	Waterside too	e of slope at th	e waterway -			日日日	N
						ich begins at S	TA 377+75			College Barrie	
					Lake and equ			- An	2		
	Landsic	le repairs as	socaited wi	th PL84-99:		structed from	STA 374+50	Star and		4.8-	
	Impro	vements ass	ociated wit	h I SPD D1.	to 382+00					Aller	CINE AND AND
	-	vements ass						to la	-		
Propos	•					ting cutoff wal	ISTA	R Asper	11/10-		
	1				362+50 to 388	0			104	C m	The Ball
Generalized	Subsurfa	ce Conditio	ns								
	Levee	Prism Soils	a								
		i nomoono.	Clayey SA	ND to Sitly	SAND						
Lan	ndside Su			-	SAND eet thick at lev	vee toe					
		rface Layer:	Lean CLA	Y approx. 6 f	eet thick at lev	vee toe feet of Lean C	lay, over 23 fe	eet of Silty SA	.ND		
Soils	s below su	rface Layer: urfcae layer:	Lean CLA	Y approx. 6 f	eet thick at lev		lay, over 23 fe	eet of Silty SA	ND		
Soils Historic Per	s below su formance	rface Layer: urfcae layer:	Lean CLA Approx 41	Y approx. 6 f	èet thick at lev SAND, over 4		lay, over 23 fe	eet of Silty SA	ND		
Soils Historic Per Seepage and	s below su formance l boils rep	rface Layer: urfcae layer:	Lean CLA Approx 41	Y approx. 6 f	èet thick at lev SAND, over 4		lay, over 23 fe	eet of Silty SA	ND		
Soils Historic Per Seepage and Liquefiable S	s below su formance l boils rep Soils	rface Layer: Irfcae layer: Sorted in ULF	Lean CLAN Approx. 41 E's 2014 SGI	Y approx. 6 f feet of Silty DR Addendu	eet thick at lev SAND, over 4 um.	feet of Lean C			ND		
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Soils Historic Per Seepage and Liquefiable S Based on ou	s below su formance l boils rep Soils r liquefact	rface Layer: irfcae layer: orted in ULE tion assessn	Lean CLAN Approx. 41 E's 2014 SGI	Y approx. 6 f feet of Silty DR Addendu	eet thick at lev SAND, over 4 um.	feet of Lean C			ND		
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10.26 PROJECT REACH G, STATION 377+65

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						deformations a	are not antici	ipated to deg	ade below 1	0-Year W	SE+3 feet.
	valuation Su					<u>Slope Stability</u>			_		
		WSEL, Unde			Criteria	Steady S		e 200-Year D			Criteria
0-Year DV		ugh Seepag			Criteria		Steady St	ate Seepage			Criteria
	1	HTOL, Unde	er Seepage:	Meets	Criteria	l		Rapid Draw			Criteria
								mic Slope Sta	-		Criteria
							Sei	smic Slope St		Meets	Criteria
Reach Des	<u>cription</u>		S	tion Limits:	0.00 50		200 00	Reach Over	<u>view</u>		
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			•			cess ramp from			1 .1	NB-	AN SP
4.5						1	28				
Ар	-	n Elevation I	-			to	28 21			1 8 3	hi -
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	-	rox. Waters	-	-		to to	2.7:1 3.2:1		ų,	S III	
	чрр		-	-		to e of slope at the		State Line		ALC: HILL	N
					waterside ber	ich begins at S			Come		C.C.
		L	andside Co	nstraint(s):	Lake and equ	estrian arena		in the second	2	- 44 L	
	Landsic	le repairs as	socaited wi	th PL84-99:	Yes, berm cor	structed from	STA 374+50	A Car	ADDELLA	ALL	
	Impro	vements as	sociated wit	h LSRP P1:	None			04			
	Impro	vements as	sociated wit	h LSRP P2:	None			16 3 m	11 11 20		Call Str
Prop	osed Impro	vements as	sociated wit	h LSRP P3:	Fully penetra	ting cutoff wall	STA	A CONTRACTOR	1 00		and the second
eneralize											
Jener unit	ed Subsurfa	ce Conditio	ns								
o cinci anno		ce Conditio Prism Soils:		ND to Sitly	SAND						
	Levee	Prism Soils:	Clayey SA	-	SAND eet thick at lev	vee toe					
L	Levee andside Su	Prism Soils: rface Layer:	Clayey SA	Y approx. 6 f	eet thick at lev	vee toe feet of Lean Cl	ay, over 23 fe	eet of Silty SA	AND		
L So	Levee andside Su	Prism Soils: rface Layer: urfcae layer:	Clayey SA	Y approx. 6 f	eet thick at lev		ay, over 23 fe	eet of Silty SA	AND		
L So Historic P e	Levee andside Sur andside Sur ils below su erformance	Prism Soils: rface Layer: urfcae layer:	Clayey SA Lean CLA Approx. 4 f	Y approx. 6 f	èet thick at lev SAND, over 4		ay, over 23 fa	eet of Silty SA	AND		
L So Historic Po Seepage ar	Levee andside Sur ils below su erformance nd boils rep	Prism Soils: face Layer: irfcae layer:	Clayey SA Lean CLA Approx. 4 f	Y approx. 6 f	èet thick at lev SAND, over 4		ay, over 23 fe	eet of Silty Sz	AND		
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L So Historic Pa Seepage ar Liquefiable Based on c	Levee and side Sun ils below su erformance ad boils rep e Soils pur liquefact nalysis Res	Prism Soils: rface Layer: irfcae layer: orted in ULI tion assessm ults Water	Clayey SA Lean CLAN Approx. 4 f Es 2014 SGI	Y approx. 6 f feet of Silty DR Addende	eet thick at lev SAND, over 4 um. ntially liquefia	feet of Lean Cl ble soils within Exit Grac	this Reach (lient	Refer to App	endix E and A	Through	Breakout
L So Historic Pe Seepage ar Liquefiable Based on c	Levee and side Sur ils below su erformance nd boils rep e <u>Soils</u> our liquefact	Prism Soils: rface Layer: irfcae layer: orted in ULI tion assessm sults Water Surface	Clayey SA Lean CLAN Approx. 4 f Es 2014 SGI nent, we ide Figure	Y approx. 6 f Feet of Silty DR Addende Intified pote	eet thick at lev SAND, over 4 um. ntially liquefia ee Toe	feet of Lean Cl	this Reach (lient		endix E and A		Breakout
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10.27 PROJECT REACH H1A, STATION 408+00

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	valuation S		h does not	meet the UI	DC Criteria.	Slope Stabilit	v Evoluction (Summory			
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Reach Des	cription							Reach Over			
			Sta	tion Limits:	388+00	to	411+00	A Para		ET	
	Fe	ature(s) at U	Jpstream St	ation Limit:	End of PL84-9	99 berm within	Reach H1B			-0+00-	一世以上
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					None					COLUMN TWO IS NOT	AND DESCRIPTION OF THE OWNER.
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10.28 PROJECT REACH H1B, STATION 416+86

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ased on o feet.	our evaluatio	on, this read	ch does not	meet the UI	DC criteria.	Seismic deforr	nations are n	ot anticipated	to degrade h	ælow 10-`	Year WSE-
eepage E	valuation Su	<u>ımmary</u>				Slope Stabilit	v Evaluation	<u>Summary</u>			
	200-Year DV	WSEL, Und	er Seepage:	Fails	Criteria	Steady	State Seepag	e 200-Year DW	SEL, LS:	Meets	Criteria
20	0-Year DWS	EL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage H	TOL, LS:	Meets	Criteria
	I	HTOL, Und	er Seepage:	Fails	Criteria			Rapid Drawd	own, WS:	Meets	Criteria
								mic Slope Stab	-		Criteria
							Sei	smic Slope Sta		Meets	Criteria
each Des	scription		C 4-	tion Limits:	411.00		420+00	Reach Overvi	ew		AND SHALL PART
	Fe	ature(c) at I				to e access road	420+00			dente -	
			-			99 berm within	Reach H1B			115	The state
Ar	oprox. Crowr					to	28				- Kerner
1	-		-	ange (feet):		to	11.5	DSL 1		-12 5	1 - C
			-	ange (feet):		to	30	A STATE OF A STATE OF		18	and the second
				H:V) Range:		to	2.5:1	AND PERSON	Contraction of the second	State 1	
			-	H:V) Range:		to	3.2:1			8	N
		W	aterside Co	onstraint(s):	Levee penetra	ation at STA 4	3+40		The Comp	5	-
		I	andside Co	onstraint(s):	Existing struc	tures at toe of	levee		5		
	Landsid	e repairs as	sociated wi	ith PL84-99:		nstructed betw	een STA	10000	S		
	Immedia	vomente es	opiotod wit	LICDD D1.	411+00 and 42	20+00			interes and		
	-			th LSRP P1: th LSRP P2:				Top -		1	
Pror	posed Impro								6 46 CH		
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I So istoric P eepage a iquefiabl ased on o	Levee l Landside Sur Dils below su Performance nd boils repo e Soils Dur liquefact	Prism Soils: face Layer: rface layer: orted in ULI	Variable lay Lean CLA Approx 16 E's 2014 SGI	Y to Fat CLA 5-feet of Silty DR Addend	AY, approx. 4 f y SAND to Po um.	eet thick at toe	of levee, less ND, underla	in by approxim	ately 25 feet	t of Lean	CLAY
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I So istoric P eepage a iquefiabl ased on o	Levee l Landside Sur Dils below su Performance nd boils repo e Soils Dur liquefact	Prism Soils: face Layer: rface layer: orted in ULI	Variable lay Lean CLA Approx 16 E's 2014 SGI	Y to Fat CLA -feet of Silty DR Addend	AY, approx. 4 f y SAND to Po um. entially liquefia	eet thick at toe orly Graded SA able soils within Exit Gra	of levee, less ND, underla n this Reach (dient	in by approxim (Refer to Appe	ndix E and A	t of Lean (Appendix Fhrough	CLAY F) Breakou
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10.29 PROJECT REACH H2, STATION 437+26

			R	EAC	H H2	- STA	437	+26			
Record on	our oplusti	on this room			DC Criteria.		1 107				
	Evaluation St		in utes not	nicet the Of		Slope Stabilit	v Evaluation S	Summary			
<u>seemeer</u>		WSEL, Unde	er Seenage.	Fails	Criteria		-	e 200-Year D'	VSEL LS	Fails	Criteria
20	00-Year DWS				Criteria	Steady		ate Seepage I			Criteria
20		HTOL, Unde			Criteria		Steady St	Rapid Drawd			Criteria
		,					Seis	mic Slope Stal			Criteria
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Reach De	scription							Reach Overv			
			Sta	tion Limits:	420+00	to	445+00	A Wast	-	The Art	all tes
	Fe	ature(s) at U	Jpstream St	ation Limit:	250 feet north	of levee acces	s ramp			DE09-	
			•			99 berm within					
A	pprox. Crowi					to	29				- Kar A
	••	Approx. Leve				to	18	Dista Maria			here -
		Approx. Crov	-			to	40	Ar and a service	ALL DAY		September 1
		prox. Landsi				to	2.5:1		-	d stae	
	•	rox. Watersi	· ·	, 0		to	7.5:1		N.	3	N
			-			nch/residence	from STA		- The	5	
					438+00 to 445	5+00			- and -	T SI	
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	Londaia	la ronaira aa	coninted wi	+h DI 94 00.		m STA 423+00	to 443+00	S. 1.9	TOULD	ALL ALL	
		le repairs as vements ass							1	CE?	
		vements ass							11 2		
Duc	posed Impro									No.4	and the Party of the
	ed Subsurfa			II LOKI I J.	None						
				d Silty SAN	ND and Lean C	LAY					
]				-							
				r, approx. 3	feet thick at to	be of levee					
	oils below su	rface layer:			feet thick at to SAND to Po		nd with Silt, o	over 30 feet of	Lean CLA	Y	
		· ·				e of levee orly Graded Sa	nd with Silt, o	over 30 feet of	Lean CLA	Y	
Historic I	oils below su Performance eported in Ul	1	Approx. 20	feet of Silty			nd with Silt, o	over 30 feet of	Lean CLA	Y	
Historic I	Performance	1	Approx. 20	feet of Silty			nd with Silt, o	over 30 feet of	Lean CLA	Y	
Historic I No data re	Performance eported in Ul	1	Approx. 20	feet of Silty			nd with Silt, o	over 30 feet of	Lean CLA	Y	
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10.30 PROJECT REACH H3, STATION 455+55

					<u> </u>		455	155			
ased on feet.	our evaluatio	on, this read	ch does not	meet the UI	DC criteria.	Seismic deforr	nations are n	ot anticipated	l to degrade	below 10-`	Year WSE+
eepage l	Evaluation Su	<u>ımmary</u>				Slope Stabilit	v Evaluation	Summar <u>y</u>			
	200-Year D	WSEL, Und	er Seepage:	Fails	Criteria	Steady	State Seepag	e 200-Year DV	WSEL, LS:	Fails	Criteria
20	00-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage I	HTOL, LS:	Fails	Criteria
	1	HTOL, Und	er Seepage:	Fails	Criteria			Rapid Drawe	lown, WS:	Meets	Criteria
						-	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
each De	escription							Reach Overv	<u>iew</u>		
			Sta	tion Limits:	445+00	to	466+00		4	0+00-	-
			-		Small waters i				3 34	ANA	Kert
	Featu	re(s) at Dov	wnstream St	ation Limit:	250' north of	levee access ra	mp			1	
A	pprox. Crowi	n Elevation	Range (feet	, NAVD88):	28	to	29	0		The page	
	A	Approx. Leve	ee Height R	ange (feet):	15	to	17	Part of the second	The second	- BAL	the part of
	А	pprox. Crov	vn Width R	ange (feet):	15	to	50	A ST. BUS FIELD		No.	
	-	-	-	H:V) Range:		to	2.8:1		- Ann	R	100-0
	App		-	H:V) Range:		to	3.6:1			1. 19	N
						nch/residence			A PORT	•	
		I	andside Co	onstraint(s):	Well/levee pe	enetration at ST	A 459+00				
	Landsic	le repairs as	sociated wi	ith PL84-99:	Possibly, ber 452+00 to 456	m constructed :	from STA	*	They -		
	Impro	vements as:	sociated wit	th LSRP P1:				Mars 1			5
	Impro	vements as:	sociated wit	th LSRP P2:	None			16 20	11 11.1		141. B -
Pro	posed Impro	vements as:	sociated wit	th LSRP P3:	None				~ ~	No-	States States
eneraliz	zed Subsurfa	ce Conditio	ne								
		ce condituo	115								
				to Clayey Sl	ILT						
1	Levee	Prism Soils:	Lean Clay		ILT feet thick at to	e of levee					
	Levee Landside Sur	Prism Soils: rface Layer:	Lean Clay Silty SANI	D, approx. 5	feet thick at to		ver Lean CL4	ΛY			
S	Levee Landside Sur oils below su	Prism Soils: rface Layer: ırface layer:	Lean Clay Silty SANI	D, approx. 5	feet thick at to	e of levee ND with Silt, o	ver Lean CLA	ΔY			
S Storic I	Levee Landside Sur oils below su Performance	Prism Soils: rface Layer: urface layer:	Lean Clay Silty SANI Approx. 20	D, approx. 5) feet of Poo	feet thick at to rly Graded SA		ver Lean CL4	ΔY			
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Solution Storic I epage, Quefiab Base	Levee Landside Sui oils below su boils and ero de Soils ed on our liq Analysis Res	Prism Soils: rface Layer: rface layer: ssion reporte uefaction as ults Water Surface	Lean Clay : Silty SANI Approx. 20 ed in ULEs ssessment, v Figure	D, approx. 5 D feet of Poo 2014 SGDR we identified Lev	feet thick at to rly Graded SA Addendum. d potentially li ee Toe	ND with Silt, o quefiable soils Exit Gra Toe of	within this R dient Berm	each (Refer to	ld	Through Seepage	Breakout Height (ft)
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10.31 PROJECT REACH I, STATION 476+00

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10.32 PROJECT REACH I, STATION 496+28

			F	REA	CHI-	- STA	496+	28			
Based on ou	ır evaluati	on, this read									
Seepage Eva						Slope Stabilit	v Evaluation S	Summary			
		WSEL, Unde	r Seepage:	Fails	Criteria		-	e 200-Year DW	SEL, LS:	Meets	Criteria
200-	-Year DWS	SEL, Throug	h Seepage:	Fails	Criteria			ate Seepage H		Meets	Criteria
	1	HTOL, Unde	r Seepage:	Fails	Criteria			Rapid Drawd	own, WS:	Meets	Criteria
						•	Seist	mic Slope Stab	ility, WS:	Meets	Criteria
							Seis	smic Slope Sta	bility, LS:	Meets	Criteria
leach Desc	ription							Reach Overvi	ew		
			Sta	tion Limits:	466+00	to	506+00		a com		-
	Fe	ature(s) at U	Jpstream St	ation Limit:	Lathrop High	School Improv	ements		B/ P A	ALL H	E CA
	Featu	re(s) at Dov	vnstream St	ation Limit:	500 feet north	of De Lima Ro	ad	man and	and the second		
App	orox. Crowi	n Elevation I	Range (feet,	NAVD88):	28	to	30		A DETERMINE		
	A	Approx. Leve	e Height R	ange (feet):	15.5	to	18			1 ISM	Al and a
	А	pprox. Crov	vn Width R	ange (feet):	15	to	42	TO LOY AND	C D D		Strate -
	Ap	prox. Lands	ide Slope (F	I:V) Range:	1.7:1	to	3.8:1	Strange of the lot of			
	App	rox. Waters	ide Slope (F	H:V) Range:	1.6:1	to	4.6:1		New Mar		A
		W	aterside Co	nstraint(s):		ear STA 478+5		All and and		四月上	N
						np near STA 4		16 Min 1		Contraction of the local division of the loc	
		L	andside Co	nstraint(s):	Dos Reis Rd. 483+00 to 493	and parking lo	t from STA		3	See 1	
	Landsid	e Repairs as	sociated wi	th PL84-99:		nstructed from	STA 472+00	70	-	19-	A DE CONTRACTOR
					to 477+00			ALL ALL	5	10-7-2-5-	
								A DESCRIPTION OF A DESC			
	Impro	vements ass	ociated wit	h LSRP P1:	None					8-	
	Impro	vements ass	ociated wit	h I SRP P2	None			120 11	11 22		
Propo	Impro	vements ass	ociated wit	h I SRP P2	None	age berm with	chimney				
	Impro osed Impro	vements ass	ociated wit	h I SRP P2	None	age berm with	chimney		1		
	Impro osed Impro d Subsurfa	vements ass vements ass ce Conditio	ociated wit ociated wit	h LSRP P2: h LSRP P3:	None		chimney		1		
Generalized	Impro osed Impro d Subsurfa Levee	vements ass vements ass ce Conditio Prism Soils:	ociated wit ociated wit ns Clayey SA	h LSRP P2: h LSRP P3: ND and Poo	None Dramed seep	ND with Silt	chimney		11-5-		
<mark>Jeneralizeo</mark> La	Impro osed Impro d Subsurfa Levee ndside Sur	vements ass vements ass ce Condition Prism Soils: face Layer:	ociated wit ociated wit ns Clayey SA Lean CLAY	h LSRP P2: h LSRP P3: ND and Poo ť, approx. 10	None Dramed seep drain orly Graded SA	ND with Silt		ean CLAY	AL ST		40
<mark>Seneralizeo</mark> La Soil	Impro osed Impro d Subsurfa Levee ndside Sun s below su	vements ass vements ass ce Condition Prism Soils: face Layer: irface layer:	ociated wit ociated wit ns Clayey SA Lean CLAY	h LSRP P2: h LSRP P3: ND and Poo ť, approx. 10	None Dramed seep drain orly Graded SA	AND with Silt of levee		ean CLAY	11		46
<mark>Generalized</mark> La Soil fistoric Pe r	Impro osed Impro I Subsurfa Levee ndside Sun s below su rformance	vements ass vements ass ce Conditio Prism Soils: face Layer: irface layer:	ociated wit ociated wit ns Clayey SA Lean CLA Alternating	h LSRP P2: h LSRP P3: ND and Poo r, approx. 10 g layers of P	None Dramed seep drain orly Graded SA of thick at too oorly Graded	AND with Silt of levee	SAND and La		ndum.		40
Generalized La Soil Historic Per	Impro osed Impro I Subsurfa Levee ndside Sun s below su rformance	vements ass vements ass ce Conditio Prism Soils: face Layer: irface layer:	ociated wit ociated wit ns Clayey SA Lean CLA Alternating	h LSRP P2: h LSRP P3: ND and Poo r, approx. 10 g layers of P	None Dramed seep drain orly Graded SA of thick at too oorly Graded	AND with Silt of levee SAND to Silty	SAND and La		ndum.		40
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Eeneralized La Soil listoric Per eepage, lar iquefiable sased on ou	Impro osed Impro d Subsurfa Levee ndside Sun s below su rformance ndside boil Soils ri iqueract	vements ass vements ass ce Conditio Prism Soils: face Layer: rface layer: s, and water toon assessm	ociated wit ociated wit ns Clayey SA Lean CLA Alternating side erosio	h LSRP P2: h LSRP P3: ND and Poo Y, approx. 10 g layers of P n during 199 not consid	None Dramed seep denis orly Graded SA) ft thick at too oorly Graded 97 flood event	AND with Silt of levee SAND to Silty were reported be sous in our	SAND and La in ULE's 2014 stope stability dient	4 SGDR Adder	1	Chrough Seepage	Breakout Height (ft)
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La La Soil Historic Per icepage, lar Liquefiable fased on ou	Impro osed Impro d Subsurfa Levee ndside Sun s below su rformance ndside boil Soils ur inqueract adysis Res	vements ass vements ass ce Conditio Prism Soils: face Layer: rface layer: s, and water con assessm ults Water Surface	Clayey SA Lean CLAY Alternating side erosio ment, we are Figure	h LSRP P2: h LSRP P3: ND and Poo X, approx. 10 g layers of P n during 19 not consid not consid	None Dramed seep drain orly Graded SA) ft thick at too 'oorly Graded 97 flood event ering iiquenat ering iiquenat	AND with Silt of levee SAND to Silty were reported be sous in our Exit Gra	SAND and La in ULE's 2014 stope stability dient	4 SGDR Adder 7 anaiyses	1	Seepage	Height (ft)
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10.33 PROJECT REACH J1A, STATION 511+00

			RF		H J1A	- ST	A 511	.+00			
ased on o	our evaluati	on, this read	ch does not	meet the UL	.DC criteria.						
eepage E	valuation S	<u>ummary</u>				Slope Stabili	y Evaluation S	<u>Summary</u>			
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
20	0-Year DWS	SEL, Throug	h Seepage:	Fails	Criteria		Steady St	ate Seepage l	HTOL, LS:	Meets	Criteria
		HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawe	down, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
leach Des	cription							Reach Over	view		
			Sta	tion Limits:	506+00	to	515+50	18115	10 mail	ME	All and
	Fe	eature(s) at U	Jpstream St	ation Limit:	0	l drained seep	age berm		著 一世		
					associate wit					1	
					Levee pipe po			MATER	Altone	MR S	No. Al
Ap	-	n Elevation 1			29	to	30			1200	181 See
		Approx. Leve	-			to	18.5	The register of	A DECK	2	33 pr -
		Approx. Crov				to	35		1 510	SIGE	States and a state
	-	prox. Lands	• •			to	2.5:1	Contraction in the local division in the loc	Car 18		
	App	orox. Waters				to	3.1:1				N
		w	aterside Co	onstraint(s):		TA 510+00 to t STA 509+20	515+50 and			-	A DE LA DE L
		I	andside Co	nstraint(s):	•	1 STA 309+20					
	Landsid					m or raised gra	de between	The state	The sector	199-1	A GALLA
					STA 508+00 a	-			0	All States	
	Impro	vements as	sociated wit	h LSRP P1:	None			A	-		THE REAL
	Impro	vements ass	opiotod wit	L CDD D2							
	mpro	venients us	sociated wit	In LSKP P2:	None				11/10-		26
Prop	•					n with chimney	drain				
-	osed Impro		sociated wit			n with chimney	drain				
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10.34 PROJECT REACH J1B, STATION 516+00

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iquefiable S ased on our eepage Ana 	Soils r nqueract station 516+00 Vertical dis 'hrough sec ity Analys	ion assessin Water Surface 200-Year HTOL trance from th page under H is Results Case	Figure E-35-B E-35-C ne toe of the ITOL condit Water Surface	Lev No Posit No Posit levee (ground ions are not p	ering liqueflab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ	Exit Gra Toe of 0.1 0.1 ere the phreatic uation.	dient Berm 4 4 surface is calcu Factor o (Non-C	/ anaiyses Field lated to day light f Safety ircular)	Seep No n/	age D	Height (ft n/a
iquefiable S ased on our eepage Ana 	Soils r nqueract station 516+00 Vertical dis 'hrough sec ity Analys	ion assessn Water Surface 200-Year HTOL tance from tl page under H is Results Case Analyzed SS - 200yr	Figure E-35-B E-35-C te toe of the ITOL condit Water Surface (feet) 24.1	Lev No Positi No Positi levee (ground ions are not p Figure E-35-D	ering liquerian ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside 	Exit Gra Toe of 0.1 0.1 0.1 ere the phreatic uation. of Safety cular) Landside 2.3	dient Berm 4 4 surface is calcu Factor o (Non-C Waterside n/a	/ anaiyses Field ilated to day light f Safety ircular) Landside n/a	Seep No n/	age D	Height (ft)
iquefiable S sased on our seepage Ana (seepage Ana (see)(see)(seepage Ana (seepage Ana (see)(se	Soils r nqueract alysis Res Station 516+00 Vertical dis Through see ity Analys Station	ion assessn water Surface 200-Year HTOL tance from tl page under H is Results Case Analyzed SS - 200yr SS - HTOL	Figure E-35-B E-35-C the toe of the ITOL condit Water Surface (feet) 24.1 25.4	Lev No Positi No Positi levee (ground ions are not p Figure E-35-D E-35-E	ering liquerian ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside 	Exit Gra Exit Gra Toe of 0.1 0.1 ere the phreatic uation. of Safety cular) Landside	dient Berm 4 4 surface is calcu Factor o (Non-C Waterside n/a n/a	r anaiyses Field Jalated to day light f Safety ircular) Landside n/a n/a	Seep No n/	age D	Height (ft) n/a
iquefiable S sased on our Seepage Ana (Seepage Ana)(Seepage Ana (Seepage Ana)(Seepage Ana)(Seepage Ana)(Seepage Ana)(Seepage Ana)(Seepage Ana)(Seepage Ana)(Seepage Ana)(Seep	Soils r nqueract station 516+00 Vertical dis 'hrough sec ity Analys	ion assessin Water Surface 200-Year HTOL trance from th page under H is Results Case Analyzed SS - 200yr SS - HTOL RDD	Figure E-35-B E-35-C ne toe of the ITOL condit Water Surface (feet) 24.1 25.4 15.3	Lev No Positi No Positi levee (ground ions are not p Figure E-35-D E-35-E E-35-D	ering liquenab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside 1.8	Exit Gra Toe of 0.1 0.1 0.1 tere the phreatic uation. of Safety cular) Landside 2.3 2.3 	dient Berm 4 4 surface is calcu Factor o (Non-C Waterside n/a n/a n/a	r anaiyses Field alated to day light f Safety frcular) Lands ide n/a n/a n/a n/a	Seep No n/	age D	
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10.35 PROJECT REACH J1B, STATION 528+45

			RF	EACI	H J1B	- ST	A 528	8+45		
lased on o	ur evaluatio	on, this read								
	valuation St					Slope Stabilit	v Evaluation S	Summary		
		WSEL, Unde	er Seenage:	Meets	Criteria	_	-	e 200-Year DWSEL	LS: Meets	Criteria
		SEL, Throug			Criteria	~,		ate Seepage HTOL		Criteria
		HTOL, Unde			Criteria		~, ~	Rapid Drawdown,		Criteria
		,				1	Seist	mic Slope Stability.		Criteria
								smic Slope Stability		Criteria
Reach Des	cription							Reach Overview	,	
			Sta	tion Limits:	515+50	to	534+00	IN VERSION		
	Fe	ature(s) at U	Jpstream St	ation Limit:	Landside agri	cultural land			A PARTICIPALITY OF THE PARTICI	Land and
			•		Levee access					1.23
Ap		n Elevation 1			29	to	30	STATE OF		
	-	pprox. Leve			14.5	to	18.5	PSS BAR	THE SE	A Car
		pprox. Crov	-			to	35	Contraction of the second		2000
		prox. Lands				to	2.5:1	Provide C	13100	
	-	rox. Waters				to	3.1:1			N
				-		en STA 515+00) to 529+00			
				. ,	None - agricu					
	Landsid	e Repairs as						Line Car		
	-				Drained seep	age berm from e reach limits	STA 151+50			Andread Provide State
	Impro	vements ass	sociated wit	th LSRP PI:	to 534+00 - th	e reach limits		an	20 - 16 The P	
	Impro	vements as	sociated wit	th LSRP P2:	None			14 3 3 10	1	
Prop	osed Impro	vements ass	sociated wit	th LSRP P3:	Chimney Drai	n				
Jeneralize	ed Subsurfa	ce Conditio	ns							
	Levee	Prism Soils:	Silty to Cla	yey SAND	and Lean CLA	Y				
L	andside Su	face Layer:	Silty SANI	D, approx. 20) feet thick at l	evee toe				
So	ils below su	rface layer:	Alternating	g layers of L	ean CLAY and	d Poorly Grade	d SAND with	Silt		
<u>listoric Po</u>	erformance									
lo records	of docume	nted seepag	ge, slope sta	ability, or ero	osion events a	ccording to U	LE's 2015 GER	R Volume 1.		
iquefiable	e Soils									
Based	d on our liq	uefaction as	sessment,	we identified	l potentially li	quefiable soils	within this Re	each (Refer to App	endix E and App	endix F)
eepage A	nalysis Res	<u>ults</u>		-						
	Station	Water	Figure			Exit Grad	ient**		Through	Breakout
	Station	Surface	Tiguic	Lev	ee Toe	Toe of	Berm	Field	Seepage	Height (ft)
	<u>528+45</u>	200-Year	E-36-B	No Posit	ive Gradient	0.4	17		No	n/a
	<u>320++3</u>	HTOL	E-36-C	No Posit	ive Gradient	0.5	51		n/a	n/a
	*Vertical dis	stance from t	he toe of the	levee (ground	d surface) to wh	ere the phreatic	surface is calcu	ulated to day light on	the levee slope.	
	Through see	epage under H	ITOL condit		part of this eval					
	**Exit Grad	ient includes	3D effects							
lope Stabi	ility Analys	<u>is Results</u>								
		Carr	Water		Factor	of Safety	Factor o	of Safety		
	Station	Case Analyzed	Surface	Figure	(Circ	cular)	(Non-C	Sircular)		
		' mary zed	(feet)		Waterside	Landside	Waterside	Landside		
				D 0 4 D		22	n/a	n/a		
		SS - 200yr	24.1	E-36-D		2.3	11/a	11/ a		
		SS - 200yr SS - HTOL	24.1 25.4	E-36-D E-36-E		2.3	n/a n/a	n/a n/a		
	<u>528+45</u>									
	<u>528+45</u>	SS - HTOL	25.4	Е-36-Е		2.3	n/a	n/a		



10.36 PROJECT REACH J2, STATION 544+33

			R	EAC	H J2	- STA	544-	+33			
Basedon	our evaluati	on, this reac	h meets th	e ULDC Cri	teria.						
Seepage I	Evaluation S	ummar <u>y</u>				Slope Stabilit	y Evaluation S	Summar <u>y</u>			
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
20	00-Year DW	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage l	HTOL, LS:	Meets	Criteria
		HTOL, Unde	r Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
							Seist	mic Slope Sta	bility, WS:	Meets	Criteria
							Seis	smic Slope St	ability, LS:	Meets	Criteria
<u>Reach De</u>	<u>scription</u>					ection used for	or Reach J3A)	Reach Over	<u>view</u>		
				tion Limits:		to	544+50	1 B L	James de		
	Fe	eature(s) at U	Jpstream St	ation Limit:		ase 1 LSRP dra	ained		考古/ 1	and the second	
	Featu	re(s) at Dov	vnstream St	ation Limit:	seepage bern Adjoining Ph	ase 1 LSRP dra	nined	We		THE ASS	
	1 out				seepage bern		lineu	A BEL	1 1 100		
Α	pprox. Crow	n Elevation I	Range (feet	, NAVD88):	29	to	30	Serling.		- 6-15-	
	A	Approx. Leve	e Height R	ange (feet):	18	to	19	ALL OF A DESCRIPTION	The state	- Hand	2 AND
	A	Approx. Crov	vn Width R	ange (feet):	16	to	27	L TRANS	Section of the	Disto.	
	Ар	prox. Landsi	ide Slope (H	I:V) Range:	3:1	to	3:1	and the second		8	N
	App	orox. Watersi				to	3:1	-	Constant C	5	
						e of slope at th			5		
		L	andside Co	nstraint(s):		age berm and a	agricultural	the C		- (A.)	
	Landei	de repairs as	sociated wi	th DI 8/ 00.	land. None			K AV	TODED	44	arrive and the
					Drained Seep	aga Barm		A THE			
	-	vements ass				age benn		HE HAN	18 11 5		LAL ST
Pro	•				Chimney Drai					2.8	Constant of the later
1	Levee Landside Su	-	<u>ns</u> Silty SANI Lean CLA	D to Clayey Y, approx. 15	SAND 5 feet thick at t	oe of levee	and Silty CLA	V over 20 fe	at of Loop (TAV	
l So Historic I	Levee Landside Su oils below su Performance	Prism Soils: rface Layer: urface layer: 2	n <u>s</u> Silty SANI Lean CLA Approx. 30	D to Clayey Y, approx. 15 feet of inter	SAND 5 feet thick at t	oe of levee SAND, SAND	and Silty CL ^A	AY, over 30 fe	eet of Lean C	CLAY	
l So Historic I Seepage a	Levee Landside Su oils below su Performance Ind landside	Prism Soils: rface Layer: urface layer: 2	n <u>s</u> Silty SANI Lean CLA Approx. 30	D to Clayey Y, approx. 15 feet of inter	SAND 5 feet thick at t rlayered Silty S	oe of levee SAND, SAND	and Silty CLA	ΔY, over 30 fe	eet of Lean C	CLAY	
] So Historic I Seepage a Liquefiab	Levee Landside Su oils below su Performance and landside le Soils	Prism Soils: rface Layer: urface layer: 2 boils were r	n <u>s</u> Silty SANI Lean CLA ^N Approx. 30 eported in U	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S	SAND 5 feet thick at t rlayered Silty S GGDR Addend	oe of levee SAND, SAND um.			eet of Lean C	CLAY	
] <u>Seepage</u> a Seepage a Liquefiab	Levee Landside Su oils below su Performance und landside le Soils our liquefac	Prism Soils: rface Layer: irface layer: boils were n boils were n	n <u>s</u> Silty SANI Lean CLA ^N Approx. 30 eported in U	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S	SAND 5 feet thick at t rlayered Silty S GGDR Addend	oe of levee SAND, SAND			eet of Lean C	CLAY	
l Historic I Seepage a Liquefiab Based on	Levee Landside Su oils below su Performance and landside le Soils	Prism Soils: rface Layer: irface layer: boils were n tion assessn sults	n <u>s</u> Silty SANI Lean CLA ^N Approx. 30 eported in U	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S	SAND 5 feet thick at t rlayered Silty S GGDR Addend	oe of levee SAND, SAND um. Je soils in our	slope stability		eet of Lean C		
l Historic I Seepage a Liquefiab Based on	Levee Landside Su oils below su Performance und landside le Soils our liquefac	Prism Soils: rface Layer: irface layer: boils were n tion assessn sults Water	n <u>s</u> Silty SANI Lean CLA ^N Approx. 30 eported in U	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty S GCDR Addend ering liquefiab	oe of levee SAND, SAND um. de soils in our Exit Gra	slope stability dient	/ analyses.		Through	Breakout
l Historic I Seepage a Liquefiab Based on	Levee Landside Su oils below su Performance und landside le Soils our liquefac Analysis Res	Prism Soils: rface Layer: irface layer: boils were n tion assessn sults Water Surface	ns Silty SANI Lean CLA Approx. 30 eported in U nent, we are Figure	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty S GDR Addend ering liquefiab	oe of levee SAND, SAND um. ele soils in our Exit Gra Toe of	slope stability dient Berm	/ analyses. Fie	ld	Through Seepage	Height (ft) ³
] <u>Seepage</u> a Seepage a Liquefiab	Levee Landside Su oils below su Performance und landside le Soils our liquefac Analysis Res	Prism Soils: rface Layer: Irface layer: boils were re tion assessn sults Water Surface 200-Year	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty S GDR Addend ering liquefiab ee Toe).11	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.4	slope stability dient Berm 45	y analyses. Fie 0.4	ld 7	Through Seepage No	Height (ft) ^a
l Historic I Seepage a Liquefiab Based on	Levee Landside Su oils below su Performance und landside le Soils our liquefac Analysis Res Station 544+33	Prism Soils: rface Layer: inface layer: boils were re tion assessn sults Water Surface 200-Year HTOL	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.4 0.5	slope stability dient Berm 45 50	y analyses. Fie 0.4 0.5	ld 7 3	Through Seepage No n/a	Height (ft) ³
l Historic I Seepage a Liquefiab Based on	Levee Landside Su oils below su Performance und landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di	Prism Soils: rface Layer: Irface layer: boils were re tion assesses sults Water Surface 200-Year HTOL stance from th	ns Silty SANI Lean CLA Approx. 30 eported in U nent, we are Figure E-37-B E-37-C ne toe of the	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh	oe of levee SAND, SAND um. De soils in our Exit Gra Toe of 0.4 0.5 nere the phreatic	slope stability dient Berm 45 50	y analyses. Fie 0.4 0.5	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance und landside le Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se	Prism Soils: rface Layer: inface layer: boils were re boils were re sults Water Surface 200-Year HTOL stance from the eage under H	ns Silty SANI Lean CLA Approx. 30 eported in U nent, we are Figure E-37-B E-37-C ne toe of the	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16	oe of levee SAND, SAND um. De soils in our Exit Gra Toe of 0.4 0.5 nere the phreatic	slope stability dient Berm 45 50	y analyses. Fie 0.4 0.5	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance und landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di	Prism Soils: rface Layer: inface layer: boils were re boils were re sults Water Surface 200-Year HTOL stance from the eage under H	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the ITOL condit	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.2	slope stability dient Berm 45 50 surface is calcu	7 analyses. Fie 0.4 0.5 ilated to day li	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance and landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se bility Analys	Prism Soils : rface Layer: irface layer: boils were re tion assessm sults Water Surface 200-Year HTOL stance from the engage under H sis Results Case	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the ITOL condit	D to Clayey Y, approx. 15 I feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval Factor of	oe of levee SAND, SAND um. De soils in our Exit Gra De soils in our Exit Gra O.4 0.5 here the phreatic uation.	slope stability dient FBerm 45 50 surface is calcu Factor o	7 analyses. Fie 0.4 0.5 Ilated to daylig	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance und landside le Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se	Prism Soils: rface Layer: irface layer: boils were re tion assesses sults Water Surface 200-Year HTOL stance from the enge under H sis Results	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the ITOL condit	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid	SAND 5 feet thick at t rlayered Silty 5 GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval Factor of (Circ	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.4 0.5 nere the phreatic uation.	slope stability dient 7 Berm 45 50 surface is calcu Factor o (Non-C	7 analyses. Fie 0.4 0.5 Ilated to day li f Safety ircular)	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance and landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se bility Analys	Prism Soils : rface Layer: irface layer: boils were n tion assessm sults Water Surface 200-Year HTOL stance from the epage under H sis Results Case Analyzed	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the ITOL condit Water Surface (ft)	D to Clayey Y, approx. 15 feet of inter JLE's 2014 S not consid Leve (c) levee (ground ions are not p Figure	SAND 5 feet thick at t rlayered Silty S 5GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval Factor of (Circ Waterside	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.2 0.5 here the phreatic uation.	slope stability dient Berm 45 50 surface is calcu Factor o (Non-C Waterside	7 analyses. Fie 0.4 0.5 alated to daylig f Safety frcular) Landside	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance and landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se bility Analys	Prism Soils : rface Layer: irface layer: boils were n tion assessm sults Water Surface 200-Year HTOL stance from the epage under H sis Results Case Analyzed SS - 200yr	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the TOL condit Water Surface (ft) 24.4	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S not conside Leve () () () levee (ground ions are not p Figure E-37-D	SAND 5 feet thick at t rlayered Silty S 3GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval Factor of (Circ Waterside	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.2 0.5 here the phreatic uation. of Safety cular) Landside 2.3	slope stability dient Berm 45 50 surface is calcu Factor o (Non-C Waterside n/a	/ analyses. Fie 0.4 0.5 alated to daylig f Safety frcular) Landside n/a	ld 7 3	Through Seepage No n/a	Height (ft)
l Seepage a Liquefiabl Based on Seepage A	Levee Landside Su oils below su Performance and landside our liquefac Analysis Res Station 544+33 *Vertical di Through se bility Analys	Prism Soils : rface Layer: irface layer: boils were n tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results Case Analyzed SS - 200yr SS - HTOL	ns Silty SANI Lean CLAN Approx. 30 eported in U nent, we are Figure E-37-B E-37-C ne toe of the ITOL condit Water Surface (ft) 24.4 25.8	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S not conside Leve () () levee (ground ions are not p Figure E-37-D E-37-E	SAND 5 feet thick at t rlayered Silty S 3GDR Addend ering liquefiab ee Toe 0.11 0.16 d surface) to wh part of this eval Factor o (Circ Waterside 	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.2 0.3 here the phreatic uation. of Safety cular) Landside 2.3 2.3	slope stability dient Berm 45 50 surface is calcu Factor o (Non-C Waterside n/a n/a	r analyses. Fie 0.4 0.5 alated to day lip f Safety ircular) Landside n/a n/a	ld 7 3	Through Seepage No n/a	Height (ft)
l Scepage a Liquefiabl Based on Scepage A	Levee Landside Su oils below su Performance and landside de Soils our liquefac Analysis Res Station 544+33 *Vertical di Through se bility Analys	Prism Soils : rface Layer: irface layer: boils were n tion assessm sults Water Surface 200-Year HTOL stance from the epage under H sis Results Case Analyzed SS - 200yr	ns Silty SANI Lean CLAN Approx. 30 eported in U ment, we are Figure E-37-B E-37-C ne toe of the TOL condit Water Surface (ft) 24.4	D to Clayey Y, approx. 15 feet of inter JLEs 2014 S not conside Leve () () () levee (ground ions are not p Figure E-37-D	SAND 5 feet thick at t rlayered Silty S 3GDR Addend ering liquefiab ee Toe).11).16 d surface) to wh part of this eval Factor of (Circ Waterside	oe of levee SAND, SAND um. le soils in our Exit Gra Toe of 0.2 0.5 here the phreatic uation. of Safety cular) Landside 2.3	slope stability dient Berm 45 50 surface is calcu Factor o (Non-C Waterside n/a	/ analyses. Fie 0.4 0.5 alated to daylig f Safety frcular) Landside n/a	ld 7 3	Through Seepage No n/a	Height (ft) ^a



10.37 PROJECT REACH J3A, STATION 544+33

			RF	EACI	H J3A	- ST	A 544	1+33			
Based on our ev	aluatio	n this rose									
Seepage Evaluat			n nices un			Slope Stabilit	v Evaluation	Summary			
		/ SEL, Unde	r Seenage.	Meets	Criteria	-	-	e 200-Year DV	VSEL LS	Meets	Criteria
		EL, Throug			Criteria	Steady		tate Seepage I			Criteria
200 104		ITOL, Unde			Criteria		Steady 5	Rapid Drawd			Criteria
			i beepage.		0110110	1	Seis	mic Slope Stal			Criteria
								ismic Slope St	-		Criteria
Reach Descripti	on				(Same cross s	section used for		Reach Overv	-		
			Sta	tion Limits:	544+50	to	548+50		- And		
	Fea	ture(s) at U	Jpstream St	ation Limit:	Southern end	Phase 1 LSRP	drained		HE HAN	HOP IN	
					seepage bern	n - Reach J3A		10 10 100			Extended in
	Featur	e(s) at Dow	/nstream St	ation Limit:		ase 1 LSRP dra	ained			NRE	- Mar Con
A mmm	Cuorum	Elevation I	Domas (foot	NA 1/000).	seepage bern		20		10 10 10 10 10		her and
Approx.				NAVD88):	29 18	to	30			A L	CO PART
	-		-	ange (feet):	18 16	to	19 27		12 . 30	Side	1. 1. 1. 1. 1.
	-			ange (feet): H:V) Range:		to	27 3:1		SCINY D	Real Property in the second	
				H:V) Range:	5:1 1.5:1	to to	3:1			王月福	N
	дрр					e of slope at th			FUTURE C	i ma	Contraction of
						age berm and a			िंदी हि		
		L		nstraint(s).	land.	age bern and a	igneununai	200	TOTAL CAR	74	and the second
L	andside	e repairs as:	sociated wi	th PL84-99:	None				5		
	Improv	ements ass	ociated wit	h LSRP P1:	Drained Seep	age Berm		93		1 4	
	Improv	ements ass	ociated wit	h LSRP P2:	None			78 - 299	416 m		10.00 m
Proposed	Improv	ements ass	a aiata d mit								
L Landsi	ævee P de Surf	e Condition Prism Soils : Face Layer:	n <u>s</u> Silty SANE Lean CLAY	D to Clayey Y, approx. 15	5 feet thick at t	oe of levee					
L Landsie Soils bel Historic Perfor r	evee P de Surf low sur nance	e Condition Prism Soils: Face Layer: face layer:	n <u>s</u> Silty SANI Lean CLAN Approx. 30	D to Clayey I, approx. 15 feet of inter	SAND 5 feet thick at t rlayered Silty 3	toe of levee SAND, SAND	-			AY	
L Landsi Soils bel Historic Perfori Extensive seepag	evee P de Surf low sur nance ge and	e Condition Prism Soils: Face Layer: face layer:	n <u>s</u> Silty SANI Lean CLAN Approx. 30	D to Clayey I, approx. 15 feet of inter	SAND 5 feet thick at t rlayered Silty 3	toe of levee SAND, SAND	-			AY	
L Landsi Soils bel Historic Perforr Extensive seepag Liquefiable Soil:	evee P de Surf low sur nance ge and <u>s</u>	rism Soils: rism Soils: face Layer: face layer: landside bo	n <u>s</u> Silty SANI Lean CLAN Approx. 30 bils were rej	D to Clayey Y, approx. 15 feet of inte ported in UI	SAND 5 feet thick at t rlayered Silty ; Es 2014 SGD	coe of levee SAND, SAND R Addendum,	in addition to	waterside ero		AY	
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L Landsi Soils bel Historic Perforr Extensive seepaş Liquefiable Soils Based on our liq Seepage Analysi	evee P de Surf low sur nance ge and <u>s</u> uefacti <u>is Rest</u>	rism Soils: face Layer: face layer: landside bo	ns Silty SANE Lean CLAN Approx. 30 bils were rep bils were rep	D to Clayey Y, approx. 15 feet of inte ported in UI	SAND 5 feet thick at t rlayered Silty ; Es 2014 SGD	coe of levee SAND, SAND R Addendum,	in addition to	waterside ero	osion.	AY	Breakout
L Landsi Soils bel Historic Perforr Extensive seepaş Liquefiable Soils Based on our liq Seepage Analysi	evee P de Surf low sur nance ge and <u>s</u> uefacti	e Condition rism Soils: face Layer: face layer: landside bo on assessn <u>alts</u>	n <u>s</u> Silty SANI Lean CLAN Approx. 30 bils were rej	D to Clayey Y, approx. 15 feet of inter ported in UI not consid	SAND 5 feet thick at t rlayered Silty ; Es 2014 SGD	oe of levee SAND, SAND R Addendum, le soils in our	in addition to slope stabilit dient	waterside ero	osion.		Breakout Height (ft)
L Landsi Soils bel Historic Perforr Extensive seepag Liquefiable Soils Based on our liq Seepage Analysi Sta	evee P de Surf low sur nance ge and <u>s</u> uefacti <u>is Resu</u> tion	rism Soils: rism Soils: face Layer: face layer: landside bo on assessn <u>alts</u> Water	ns Silty SANE Lean CLAN Approx. 30 bils were rep bils were rep	D to Clayey Y, approx. 15 feet of inter ported in UI not consid	SAND 5 feet thick at t rlayered Silty 7 LE's 2014 SGD ering liquefiat	coe of levee SAND, SAND R Addendum, ole soils in our Exit Gra	in addition to slope stabilit dient Berm) waterside ero y analyses.	psion.	Through	
L Landsi Soils bel Historic Perforr Extensive seepag Liquefiable Soils Based on our liq Seepage Analysi Sta	evee P de Surf low sur nance ge and <u>s</u> uefacti <u>is Rest</u>	e Condition Prism Soils: Price Layer: face Layer: landside bo on assessn alts Water Surface	ns Silty SANE Lean CLAN Approx. 30 bils were rep bils were rep Figure	D to Clayey Y, approx. 15 feet of inter ported in UI not consid	SAND 5 feet thick at t rlayered Silty 7 LE's 2014 SGD ering liquefiat ee Toe	oe of levee SAND, SAND R Addendum, ole soils in our Exit Gra Toe of	in addition to slope stabilit dient Berm	waterside erc y analyses. Fiel	255ion. 7	Through Seepage	Height (ft)
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10.38 PROJECT REACH J3B, STATION 553+71

		RF	EACI	H J3B	- ST	A 553	6+71			
Based on our evalu	ation, this rea									
Seepage Evaluation					Slope Stabilit	v Evaluation S	Summary			
	DWSEL, Und	er Seenage.	Meets	Criteria	1	-	e 200-Year DWS	EL LS	Meets	Criteria
	WSEL, Throug			Criteria	Steady		ate Seepage HT			Criteria
	HTOL, Und			Criteria		~, ~-	Rapid Drawdov			Criteria
	111 0 <u>2</u> , end	er beepage.	112000		1	Seis	mic Slope Stabili	· ·		Criteria
							smic Slope Stabi			Criteria
Reach Description						501	Reach Overviev			<u></u>
		Sta	tion Limits:	548+50	to	555+70	BILL CAR	States of the second second		
	Feature(s) at U	Upstream St	ation Limit:	Northern end	Phase 1 LSRP	drained		THE MILLOUT	THE	
				seepage bern			200 1		1-1	
Fe	ature(s) at Dov	wnstream St				drained	-7			
		D (C)		seepage bern				Contraction of the		
Approx. Cr	own Elevation			29	to	31	A STATE OF		\mathbf{h}	
	Approx. Lev	-		15	to	18	Supplied to the	E D		
	Approx. Crov			18	to	20	Filling &	Tellin B	T	-
	Approx. Lands			3:1	to	3:1		3	1 7	N
I	pprox. Waters	•		1.5:1	to	3:1			1 inte	
	W	aterside Co	. ,		e of slope at th	e waterway -		AND WEAKING	the little	A Line and
	т	andaida Ca	onstraint(s):	no waterside	bench.			J	1	A PARTY OF
Lan	Iside repairs as				ushu da aumant	ha	A DIMAN			A CONTRACTOR
	provements as				very document	eu	A PARTY		10.00	
111	DIOVEILEIUS as	sociated wi	LII LOKE FI.				And and a second s	AND PROPERTY AND ADDRESS	A PROPERTY OF	
In			th I CDD D2					No.	- 6-	C Barrielle
	provements as provements as	sociated wit	th LSRP P3:	None	age berm with	chimney	1200			
Proposed Im Generalized Subst Lev Landside	provements as provements as rface Conditio ee Prism Soils: Surface Layer:	sociated wit sociated wit <u>ns</u> Sandy SIL ² Silty SANI	th LSRP P3: T to Silty SA D, approx. 3	None Drained seep drain AND feet thick at to	be of levee		interbedded Silty	y SAND, SAN	ND and	d Lean CLA
Proposed In Generalized Subsr Lev Landside Soils belov	provements as: provements as: <u>rface Conditio</u> ee Prism Soils: Surface Layer: y surface layer:	sociated wit sociated wit <u>ns</u> Sandy SIL ² Silty SANI	th LSRP P3: T to Silty SA D, approx. 3	None Drained seep drain AND feet thick at to	be of levee		interbedded Silty	y SAND, SAN	ND and	d Lean CLA
Proposed In Generalized Subsu Lev Landside Soils belov distoric Performa	provements as: provements as: rface Conditio ee Prism Soils: Surface Layer: / surface layer: nce	sociated wit sociated wit ns Sandy SIL' Silty SANI Approx 15	th LSRP P3: T to Silty SA D, approx. 3 5 feet of Silty	None Drained seep drain AND feet thick at to SAND, over	be of levee 10 feet of Lear	CLAY, over	interbedded Silty	y SAND, SAN	ND and	d Lean CLA
Proposed In Generalized Subsu Lev Landside Soils belov Historic Performa Extensive seepage	provements as: provements as: rface Conditio ee Prism Soils: Surface Layer: / surface layer: nce	sociated wit sociated wit ns Sandy SIL' Silty SANI Approx 15	th LSRP P3: T to Silty SA D, approx. 3 5 feet of Silty	None Drained seep drain AND feet thick at to SAND, over	be of levee 10 feet of Lear	CLAY, over	interbedded Silty	y SAND, SAN	ND and	d Lean CLA
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10.39 PROJECT REACH J3C, STATION 557+50

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ased on ou	ır evaluati	on, this reac									
eepage Eva						Slope Stabilit	v Evaluation S	Summary			
2	00-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
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		HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawe	down, WS:	Meets	Criteria
							Seis	mic Slope Sta	ıbility, WS:	Meets	Criteria
							Sei	smic Slope St	tability, LS:	Meets	Criteria
leach Desc	ription							Reach Over	<u>view</u>		
				tion Limits:	000110	to	569+50		it it		-442
	Fe	ature(s) at U	Jpstream St	ation Limit:		of Phase 1 LS	RP drained			NAS-+	
	Featu	ure(s) at Dov	vnstream St	ation Limit:		n (at oak trees) of Phase 1 LS	RP drained			1	
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App	orox. Crown	n Elevation I	Range (feet,	NAVD88):	29	to	30	Belle Inter		1 57	
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		I	andside Co	nstraint(s):	None - agricu	ltural land					
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	Impro	vements ass	sociated wit	h LSRP P1:	Drained Seep	age Berm		They		-	A DECISION
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	and Impro								- 10° 5		ine and - the
-	-			h LSRP P3:	Chimney Drai	n				S-id	
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10.40 PROJECT REACH J3C, STATION 564+00

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Based on our	oplusti	n this room									
seepage Evalu			in meets un	e ulbe en	iterra.	Slope Stabilit	v Evaluation 9	Summary			
		WSEL, Unde	r Saanaga.	Moote	Criteria	1 ⁻	State Seepag	-	WSEL IS.	Moote	Criteria
		EL, Throug			Criteria	Steady		ate Seepage			Criteria
200 1		HTOL, Unde			Criteria		Steady St	Rapid Draw			Criteria
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Reach Descri	intion						501	Reach Over		meets	Crittina
leuen Deserr	iption		Sta	tion Limits:	555+70	to	569+50	<u>Reach Oriel</u>	the second se		Seal and the seal
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			1			n(at oak trees)		100			
	Featu	re(s) at Dov	vnstream St	ation Limit:	Northern end	of Phase 1 LS	RP drained				
	~				10	n(at oak trees)				the star	4 martin
Appro		Elevation I	-			to	30	CALL OF COLLEGE	- Contraction		ALL ALL
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		pprox. Crov				to	27		A LAN ST	The second second	- Ala
	•	prox. Lands	• ·			to	3:1		3		N
	App	rox. Waters				to	3:1	-	5	C. La	
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		T	andside Co	nstraint(s).	None - agricu	ltural land		7 - P- 3		1 1 1	C. More
	Landsid				0	istructed from	STA	St. 2 1004	Dea Sunt		
	Landon	e repuis us	sounder m		555+70 to 564		5111		5	7.2	
	Impro	vements ass	ociated wit	h LSRP P1:	Drained Seep	age Berm		A CC	- K	. 8	Taxa ta ta
	Impro	vements ass	ociated wit	h LSRP P2:	None			18 11	1		
Propose	ed Impro	vements ass	ociated wit	h LSRP P3:	Chimney Drai	in			22	5-11	
Generalized S	Subsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Clayey SIL	T to SAND							
Land	dside Sur	face Laver:	011 0 A MT								
Soils			Silty SANL), approx. 2	feet thick at to	e of levee					
	below su	-	-			e of levee interbeded lay	ers of Silty SA	AND, Lean C	LAY and SA	ND	
listoric Perf		rface layer:	-				ers of Silty SA	AND, Lean C	LAY and SA	ND	
	formance	rface layer:	Approx. 21	feet of Lear	n CLAY, over						eported
Extensive see	formance epage and	rface layer: landside be	Approx. 21 pils were rep	feet of Lean	n CLAY, over LE's 2014 SGD	interbeded lay	An approxima	ate 400 foot w	vide levee br	each was 1	-
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Extensive see etween STA iquefiable S Based on our seepage Anal 5 5 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	formance ppage and 560+00 t Soils r liquefact lysis Res Station 564+00 Vertical dis hrough see *Exit Grad	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from tl page under F ient includes is Results Case	Approx 21 bils were rep sociated with ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects	feet of Lean ported in Ul th the 1950 not consid Lev No Posit No Posit levee (ground	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of	interbeded lay R Addendum. Waterside eros De soils in our Exit Grad Toe of 0.3 eret the phreatic uation.	An approxima ion was reported slope stability ient** Berm 22 66 surface is calco Factor o	ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) ¹ n/a
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xtensive see etween STA iquefiable S ased on our eepage Anal 5 5 5 5 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8	formance ppage and 560+00 t Soils r liquefact lysis Res Station 564+00 Vertical dis hrough see *Exit Grad ty Analys	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from tl page under F ient includes is Results Case	Approx 21 pils were rep sociated wi ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects Water Surface	feet of Lean ported in Ul th the 1950 not consid Lev No Posit No Posit levee (groun- ions are not	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ	interbeded lay R Addendum. Waterside eros De soils in our Exit Grad Toe of 0.3 erere the phreatic uation.	An approxima ion was reported slope stability ient** Berm 22 36 surface is calco Factor o (Non-C	ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) n/a
xtensive see etween STA iquefiable S ased on our eepage Anal 5 5 5 5 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8	formance ppage and 560+00 t Soils r liquefact lysis Res Station 564+00 Vertical dis hrough see *Exit Grad ty Analys	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from th page under H page under H page under S is Results Case Analyzed SS - 200yr	Approx 21 bils were rep sociated with ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects Water Surface (ft) 24.7	feet of Lean ported in Ul th the 1950 not consid Lev No Posit No Posit levee (ground ions are not Figure E-40-D	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 	interbeded lay R Addendum. Waterside eros Dele soils in our Exit Grad Toe of 0.3 nere the phreatic uation. of Safety cular) Landside 2.1	An approxima ion was repo- slope stability ient** Berm 22 66 surface is calco Factor o (Non-C Waterside n/a	ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) ¹ n/a
iquefiable S iquefiable S ased on our eepage Anal s <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u>s</u> <u></u>	formance ppage and 560+00 t Solls r liquefact Ivsis Res Station 564+00 Vertical dis hrough see *Exit Grad ty Analys Station	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from tl page under H page under H ient includes is Results Case Analyzed SS - 200yr SS - HTOL	Approx 21 bils were rep sociated with ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects Water Surface (ft) 24.7 26.2	feet of Lean ported in Ul th the 1950 not consid Lev No Posit levee (ground ions are not Figure E-40-D E-40-E	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 	interbeded lay R Addendum. Waterside eros De soils in our Exit Grad Toe of 0.3 0.3 nere the phreatic uation. of Safety cular) Landside 2.1 2.1	An approxima ion was reportion slope stability ient** Berm 22 16 surface is calcu Factor o (Non-C Waterside n/a n/a	ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) n/a
iquefiable S iquefiable S Based on our Seepage Anal Sepage Anal S	formance ppage and 560+00 t Soils r liquefact lysis Res Station 564+00 Vertical dis hrough see *Exit Grad ty Analys	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from tl page under H page under H page under H ient includes is Results Case Analyzed SS - 200yr SS - HTOL RDD	Approx. 21 bils were rep sociated with ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects Water Surface (ft) 24.7 26.2 15.6	feet of Lean ported in Ul th the 1950 not consid Lev No Posit levee (ground ions are not Figure E-40-D E-40-E E-40-D	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 1.5	interbeded lay R Addendum. Waterside eros De soils in our Exit Grad Toe of 0.3 0.3 nere the phreatic uation. of Safety cular) Landside 2.1 2.1 	An approxima ion was reportion was reported slope stability ient** Berm 22 66 surface is calcu Factor o (Non-C Waterside n/a n/a n/a	Ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) ¹ n/a
iquefiable S iquefiable S Based on our seepage Anal S S S S S S S S S S S S S	formance ppage and 560+00 t Solls r liquefact Ivsis Res Station 564+00 Vertical dis hrough see *Exit Grad ty Analys Station	rface layer: landside bo o 564+00 as ion assessm ults Water Surface 200-Year HTOL tance from tl page under H page under H ient includes is Results Case Analyzed SS - 200yr SS - HTOL	Approx 21 bils were rep sociated with ment, we are Figure E-40-B E-40-C ne toe of the ITOL condit 3D effects Water Surface (ft) 24.7 26.2	feet of Lean ported in Ul th the 1950 not consid Lev No Posit levee (ground ions are not Figure E-40-D E-40-E	n CLAY, over LE's 2014 SGD flood event. V ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 	interbeded lay R Addendum. Waterside eros De soils in our Exit Grad Toe of 0.3 0.3 nere the phreatic uation. of Safety cular) Landside 2.1 2.1	An approxima ion was reportion slope stability ient** Berm 22 16 surface is calcu Factor o (Non-C Waterside n/a n/a	ate 400 foot w rted at two lo y analyses. Fie 	ride levee brications duri	each was 1 ng the 199 Through Seepage No n/a	7 event. Breakout Height (ft) ¹ n/a



10.41 PROJECT REACH J4A, STATION 573+10

			RF		H J4A	- ST	A 573	8+10		
Based on ou	ur evaluati	on, this read								
Seepage Ev						Slope Stabilit	v Evaluation	Summary		
		WSEL, Unde	er Seepage:	Meets	Criteria	1		e 200-Year DWS	EL, LS: Meets	s Criteria
200	-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	tate Seepage HT	OL , LS: Meets	. Criteria
	1	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdov	vn, WS: Meets	s Criteria
						-	Seis	mic Slope Stabili	ity, WS: Meets	s Criteria
							Sei	ismic Slope Stabi	ility, LS: Meets	s Criteria
Reach Desc	<u>cription</u>							Reach Overview	<u>w</u>	
				tion Limits:	203120	to	574+50		S March	
	Fe	eature(s) at U	Jpstream St	ation Limit:		ramp, Begin n		10.7		KA
	Featu	re(s) at Dov	vnstream St	ation Limit:		side berm/trend of Phase 1 LS				
	1 cuit					n (at oak trees)	ru urumou		A STATION	
App	prox. Crowi	n Elevation I	Range (feet,	NAVD88):	29.5	to	30.5	Seatone	THE ST	See La Contra
	A	Approx. Leve	ee Height R	ange (feet):	15	to	17		al arts	
		Approx. Crov				to	42	S PERSON A		10 1.02
	•	prox. Lands	• •			to	3:1			N
	App	orox. Waters				to	2:1		5	
		W	aterside Co	nstraint(s):	Approx. 40 ft downstream	wide waterside	e bench at			
		I	andside Co	nstraint(s):		and				A La Calada
	Landsic	le repairs as						100		KC PARTY
	Impro	vements ass	ociated wit	h LSRP P1:	None			the second		a Transferre
	Impro	vements ass	ociated wit	h LSRP P2:	None			16 340 4		AL. 13 T
Propo	osed Impro	vements ass	ociated wit	h LSRP P3:	Drained seep	age berm with	chimney	the second secon	CO-SE	
La	andside Su			O to Silty CI 4, approx. 24	AY feet thick at t	toe of levee				
Soi Historic Pe	ls below su e rformance	rface Layer: urface layer:	Lean CLAY Approx. 4 f	r, approx. 24 feet of Silty	4 feet thick at t SAND, over 1	2 feet of Lean		32 feet of SAND, DR Addendum	over 28 feet of Lea	n CLAY
Soi Historic Pe Seepage an	ls below su e rformance d landside	rface Layer: urface layer:	Lean CLAY Approx. 4 f	r, approx. 24 feet of Silty	4 feet thick at t SAND, over 1	2 feet of Lean			over 28 feet of Lea	n CLAY
Soi Historic Pe Seepage an Liquefiable	ls below su erformance d landside Soils	rface Layer: 11face layer: 2 boils during	Lean CLAN Approx. 4 f	Y, approx. 24 Seet of Silty and 1997 floc	4 feet thick at t SAND, over 1 od events were	2 feet of Lean	LE's 2014 SG	DR Addendum	over 28 feet of Lea	n CLAY
Soi Historic Pe Seepage an Liquefiable Based on o	ls below su erformance d landside : <u>Soils</u> ur liquefact	rface Layer: urface layer: boils during tion assessn	Lean CLAN Approx. 4 f	Y, approx. 24 Seet of Silty and 1997 floc	4 feet thick at t SAND, over 1 od events were	2 feet of Lean	LE's 2014 SG	DR Addendum	over 28 feet of Lea	n CLAY
Soi Historic Pe Seepage an Liquefiable Based on o	ls below su erformance d landside : Soils ur liquefact nalysis Res	rface Layer: urface layer: boils during tion assessn	Lean CLAN Approx. 4 f the 1986 an	Y, approx. 24 Seet of Silty and 1997 floc	4 feet thick at t SAND, over 1 od events were	2 feet of Lean	LE's 2014 SG slope stabilit	DR Addendum	over 28 feet of Lea	n CLAY
Soi Historic Pe Seepage an Liquefiable Based on o	ls below su erformance d landside : <u>Soils</u> ur liquefact	rface Layer: Irface layer: boils during tion assessn sults	Lean CLAN Approx. 4 f	Y, approx. 24 èet of Silty nd 1997 floc not consid	4 feet thick at t SAND, over 1 od events were	2 feet of Lean	LEs 2014 SG slope stabilit dient	DR Addendum		
Soi Historic Pe Seepage an Liquefiable	ls below su erformance d landside Soils ur liquefact nalysis Res Station	rface Layer: rrface layer: boils during tion assessm sults Water	Lean CLAN Approx. 4 f the 1986 an	Y, approx. 24 eet of Silty nd 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiat	2 feet of Lean e reported in U ole soils in our Exit Gra	LEs 2014 SG slope stabilit dient Berm	DR Addendum y analyses.	Through	Breakout
Soi Historic Pe Seepage an Liquefiable Based on o	ls below su erformance d landside : Soils ur liquefact nalysis Res	rface Layer: Irface layer: boils during tion assessm sults Water Surface	Lean CLAN Approx. 4 f the 1986 an nent, we are Figure	Y, approx. 24 eet of Silty nd 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiat ee Toe	2 feet of Lean e reported in U ple soils in our Exit Gra Toe of	LEs 2014 SG slope stabilit dient 'Berm 34	DR Addendum y analyses. Field	Through Seepage	Breakout Height (ft)
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dis	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl	Lean CLAN Approx. 4 f the 1986 an ment, we are Figure E-41-B E-41-C me toe of the	Y, approx. 24 eet of Silty ad 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiab ee Toe).09).13	2 feet of Lean e reported in U ole soils in our Exit Gra Toe of 0.3 nere the phreatic	LEs 2014 SG slope stabilit dient ⁷ Berm 34 39	DR Addendum y analyses. Field	Through Seepage No	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through see	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl page under H	Lean CLAN Approx. 4 f the 1986 an ment, we are Figure E-41-B E-41-C me toe of the	Y, approx. 24 eet of Silty ad 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiat ee Toe).09).13 d surface) to wh	2 feet of Lean e reported in U ole soils in our Exit Gra Toe of 0.3 nere the phreatic	LEs 2014 SG slope stabilit dient ⁷ Berm 34 39	DR Addendum y analyses. Field	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through see	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results	Lean CLAN Approx. 4 f the 1986 an ment, we are Figure E-41-B E-41-C me toe of the	Y, approx. 24 eet of Silty ad 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiab ee Toe).09).13 d surface) to wh part of this eval	2 feet of Lean e reported in U ble soils in our Exit Gra Toe of 0.3 0.3 here the phreatic luation.	LEs 2014 SG slope stabilit dient Berm 34 39 surface is calc Factor of	DR Addendum y analyses. Field ulated to day light	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through see	rface Layer: Irface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results Case	Lean CLAN Approx 4 f the 1986 an ment, we are Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface	/, approx. 2/ eet of Silty nd 1997 floc not consid	4 feet thick at t SAND, over 1 od events were ering liquefiab ee Toe 0.09 0.13 d surface) to wh part of this eval Factor of (Circ	2 feet of Lean e reported in U ple soils in our Exit Gra Toe of 0.3 here the phreatic tuation.	LEs 2014 SG slope stabilit dient Berm 34 39 surface is calc Factor of	DR Addendum y analyses. Field ulated to day light of Safety Circular)	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through sec lity Analysi	rface Layer: Inface layer: boils during boils during tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results Case Analyzed	Lean CLAN Approx. 4 f the 1986 an ment, we are Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface (ft)	/, approx. 2- eet of Silty nd 1997 floc not consid Lev (levee (groun- ions are not Figure	4 feet thick at t SAND, over 1 od events were ering liquefiab ee Toe).09).13 d surface) to wh part of this eval	2 feet of Lean e reported in U ple soils in our Exit Gra Toe of 0.3 nere the phreatic uation.	LEs 2014 SG slope stabilit dient Berm 34 39 surface is calc Factor of	DR Addendum y analyses. Field ulated to day light of Safety Circular) Landside	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through sec lity Analysi	rface Layer: Inface layer: boils during boils during tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H is Results Case Analyzed SS - 200yr	Lean CLAN Approx. 4 f the 1986 an nent, we area Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface (ft) 24.9	Y, approx. 2- eet of Silty and 1997 floc not consid Lev (levee (groum- ions are not Figure E-41-D	4 feet thick at t SAND, over 1 od events were ering liquefiab ee Toe 0.09 0.13 d surface) to wh part of this eval Factor of (Circ	2 feet of Lean e reported in U ple soils in our Exit Gra Toe of 0.3 0.4 nere the phreatic uation.	LEs 2014 SG slope stabilit dient 7 Berm 34 39 surface is calc Factor o (Non-C Waterside n/a	DR Addendum y analyses. Field sulated to day light of Safety Circular) Landside n/a	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside E Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through see lity Analys Station	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl page under H sis Results Case Analyzed SS - 200yr SS - HTOL	Lean CLAN Approx. 4 f the 1986 an nent, we area Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface (ft) 24.9 26.5	<pre>x', approx. 24 eet of Silty nd 1997 floc not consid Lev (levee (ground ions are not) Figure E-41-D E-41-E</pre>	4 feet thick at f SAND, over 1 od events were ering liquefiab ee Toe 0.09 0.13 d surface) to wh part of this eval Factor of (Circ Waterside 	2 feet of Lean e reported in U ple soils in our Exit Gra Toe of 0.3 nere the phreatic uation.	LEs 2014 SGI slope stabilit dient Ferm 34 39 surface is calc (Non-C Waterside n/a n/a	DR Addendum y analyses. Field ulated to day light Df Safety Circular) Landside n/a n/a n/a	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through sec lity Analysi	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl epage under H sis Results Case Analyzed SS - 200yr SS - HTOL RDD	Lean CLAN Approx. 4 f the 1986 an nent, we are Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface (ft) 24.9 26.5 15.8	<pre>x', approx. 24 veet of Silty ad 1997 floor not consid Lev (uevee (ground ions are not) Figure E-41-D E-41-E E-41-D</pre>	4 feet thick at f SAND, over 1 od events were ering liquefiab ee Toe 0.09 0.13 d surface) to wh part of this eval Factor o (Circ Waterside 1.5	2 feet of Lean e reported in U ble soils in our Exit Gra Toe of 0.3 0.3 here the phreatic tuation. Df Safety cular) Landside 2.3 2.3 	LEs 2014 SGI slope stabilit dient Ferm 34 39 surface is calc (Non-C Waterside n/a n/a n/a	DR Addendum y analyses. Field Field Circular) Landside n/a n/a n/a n/a	Through Seepage No n/a	Breakout Height (ft) n/a
Soi Historic Pe Seepage an Liquefiable Based on o Seepage Ar	Is below su erformance d landside E Soils ur liquefact nalysis Res Station 573+10 *Vertical dia Through see lity Analys Station	rface Layer: Inface layer: boils during tion assessm sults Water Surface 200-Year HTOL stance from tl page under H sis Results Case Analyzed SS - 200yr SS - HTOL	Lean CLAN Approx. 4 f the 1986 an nent, we area Figure E-41-B E-41-C ne toe of the ITOL condit Water Surface (ft) 24.9 26.5	<pre>x', approx. 24 eet of Silty nd 1997 floc not consid Lev (levee (ground ions are not) Figure E-41-D E-41-E</pre>	4 feet thick at f SAND, over 1 od events were ering liquefiab ee Toe 0.09 0.13 d surface) to wh part of this eval Factor of (Circ Waterside 	2 feet of Lean e reported in U ble soils in our Exit Gra Toe of 0.3 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	LEs 2014 SGI slope stabilit dient Ferm 34 39 surface is calc (Non-C Waterside n/a n/a	DR Addendum y analyses. Field ulated to day light Df Safety Circular) Landside n/a n/a n/a	Through Seepage No n/a	Breakout Height (ft) [*] n/a



10.42 PROJECT REACH J4B, STATION 579+70

			RF	EACI	H J4B	- ST	A 579	9+70			
lased on	our evaluati	on this read									
	Evaluation S		in nicets th			Slope Stabilit	v Evaluation	Summary			
- copage 1		WSEL, Unde	er Seenage:	Meets	Criteria	r [–]	-	ge 200-Year DW	SEL. LS:	Meets	Criteria
20	00-Year DWS				Criteria	,		tate Seepage H			Criteria
		HTOL, Unde			Criteria		~····) ~	Rapid Drawd			Criteria
		·	10			I	Seis	smic Slope Stat			Criteria
								ismic Slope Sta	-		Criteria
teach De	scription							Reach Overvi	-		
	_		Sta	tion Limits:	574+50	to	585+50				and state -
	Fe	eature(s) at U	Jpstream St	ation Limit:	Landside par	k/begin waters	ide bench				K
					Phase II lands	ramp, Begin n side berm/tren	ch for J4B	-ENER			
Aj	pprox. Crow				30	to	30.5	W AND THE REAL	and the second second	3-1	Copper -
		Approx. Leve	-		17	to	22		28 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	lide	5 1 6 1 F3
		Approx. Crov				to	32		-		A PARTY A
		prox. Lands	• •	, 0	2.1:1	to	3:1			T. 14	N
	App	orox. Waters			1.8:1	to	2.8:1	-	ward 2 5		
				onstraint(s):					5	100	
		1	andside Co		improvements	and residenti	11		- Hepo	10-	ALC: NO
	Landsid	de repairs as	sociated wi		•	,			NELING COM BUT DE LA	ALL	
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10.43 PROJECT REACH K, STATION 17+00

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Based on our	r evalautio					0171	و ا ه	00100	J		
Seepage Eval						Slope Stabilit	v Evaluation	Summary			
		WSEL, Unde	er Seepage:	Meets	Criteria		•	e 200-Year DW	SEL, LS:	Meets	Criteria
00-Year DW	SEL, Thro	ugh Seepag	e Seepage:	Meets	Criteria		Steady St	ate Seepage H	TOL, LS:	Meets	Criteria
]	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdo	own, WS:	Meets	Criteria
			I			-	Sies	mic Slope Stab	ility, WS:	Meets	Criteria
							Sei	smic Slope Stal	bility, LS:	Meets	Criteria
Reach Descr	ription							Reach Overvio	ew		
			Sta	tion Limits:	585+50	to	608+00		2 A	+00+	
	Fe	ature(s) at U	Jpstream St	ation Limit:	Approx. 400 f	t west of Old V	Wharf Court			NB-	
	Featu	re(s) at Dov	vnstream St	ation Limit:	10	n, drainage trer n, Approx. 200		ENER			
Appr	rox. Crowr	n Elevation I	Range (feet,	NAVD88):	30	to	30.5	STATE OF STATE	The second	Sx L	Parto -
	А	Approx. Leve	ee Height R	ange (feet):	16	to	18	No of the local division of the	all the	2013	A Part
	А	pprox. Crov	vn Width R	ange (feet):	20	to	20		S BALLY	S IS	1.5 5-17
	Ap	prox. Landsi	ide Slope (H	I:V) Range:	3:1	to	3:1			8	N
	App	rox. Watersi	ide Slope (F	I:V) Range:	3:1	to	3:1	A 10 -	1.5		
		W	aterside Co	nstraint(s):	Agricultural l and setback l	and between e	xisting levee		2		
		L	andside Co	nstraint(s):	None - agricu			The second		199-4	A Salat
	Landsid				0	age berm from	STA 591+00	- IM		ALL SA	
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	•	vements ass						115 1	11		ALR:
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				h LSRP P3:	Setback levee	e with cutoff w	all				
-	Subsurfa	ce Conditio	ns		Setback levee	e with cutoff w	all				
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10.44 PROJECT REACH L1, STATION 615+10

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Based on o	ur evaluatio	on, this read				~ = = -					
	valuation S		in nicets th			Slope Stabilit	v Evaluation S	Summarv			
		WSEL, Unde	er Seenage:	Meets	Criteria	T	State Seepag		WSEL. I.S:	Meets	Criteria
		SEL, Throug			Criteria	~,	10	ate Seepage			Criteria
		HTOL, Unde			Criteria			Rapid Draw			Criteria
		<i>,</i>	10			I	Seis	mic Slope Sta			Criteria
								smic Slope St	-	Meets	Criteria
Reach Des	cription							Reach Over	-		
	-		Sta	tion Limits:	608+00	to	655+00			autor -	all state -
	Fe	ature(s) at U	Jpstream St	ation Limit:	Agricultural l	and			18/11 S		A A
	Featu	re(s) at Dov	vnstream St	ation Limit:	Transition to	setback levee	(Reach K)	Mary I Mary			A. C.
Ap	prox. Crowi	n Elevation l	Range (feet	, NAVD88):	30	to	31.5				Jan All
	A	Approx. Leve	ee Height R	ange (feet):	15.5	to	24.5	Station in the			
	А	pprox. Crov	vn Width R	ange (feet):	14	to	67	ALL MIN VIEW OF			
	Ap	prox. Lands	ide Slope (H	H:V) Range:	1.9:1	to	3.6:1	a feries	Contraction of the second	T	
	App	rox. Waters	• •	, 0	1.2:1	to	5:1				N
		W	aterside Co	onstraint(s):		nch from appro	oximately		and Commis	5	
		т	andside Co	netraint(e).	STA 625+00 t None - agricu			- Con			ALL CARAGE
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	Landsk	ie iepaiis as	sociated wi	un i Lo+- <i>>></i> .	and 640+00 to		.0 017150		TUUTUN	Ho Alle	Gen and and a second
	Impro	vements ass	sociated wit	th LSRP P1:	None			MA I			
									Call Bar	AND DESCRIPTION OF	12 L B. B. B.
	Impro	vements ass	sociated wit	th LSRP P2:	None			712 - 49	11/12		
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10.45 PROJECT REACH L1, STATION 620+00

			R	EAC	HL1	- STA	620 -	+00			
Based on our	r evaluatio	on this read									
Seepage Eval						Slope Stabilit	v Evaluation (Summarv			
		WSEL, Unde	er Seenage:	Meets	Criteria	T		e 200-Year D	WSEL. LS:	Meets	Criteria
		SEL, Throug			Criteria	~,	10	ate Seepage			Criteria
		HTOL, Unde			Criteria		~, ~-	Rapid Draw	-		Criteria
		- ,	1.9			I	Seis	mic Slope Sta			Criteria
								smic Slope St	-		Criteria
Reach Descr	ription							Reach Over			
			Sta	tion Limits:	608+00	to	655+00		100		T. Jank
	Fe	ature(s) at U	Upstream St	ation Limit:	Agricultural l	and				CHOOL STREET	A.
	Featu	re(s) at Dov	- wnstream St	ation Limit:	Transition to	setback levee	(Reach K)	37		1943	Contraction of the second
Аррі	rox. Crowi	n Elevation 1	Range (feet	, NA VD88):	30	to	31.5				
	A	pprox. Leve	ee Height R	ange (feet):	15.5	to	24.5			- 1- 50	No and
	А	pprox. Crov	wn Width R	ange (feet):	14	to	67	A Re- BRANCE		in the second	
	Ap	prox. Lands	ide Slope (H	I:V) Range:	1.9:1	to	3.6:1	"Provident	Contraction in	P Sto	The state
	App	rox. Waters	ide Slope (H	I:V) Range:	1.2:1	to	5:1		No.	3	N
		W	aterside Co	nstraint(s):		nch from appro	oximately				
					STA 625+00 t				- Carlos and		
					None - agricu			in the	100 - 10 - 10 - 10 - 10 - 10 - 10 - 10		
	Landsic	le repairs as	sociated wi	th PL84-99:	Yes. Berms a and 640+00 to	t STA 610+50	to 619+50	N. NO	Tutting and	ALLA	artis and a
	Impro	vements as	sociated wit	h LSRP P1:		000+00.		1 - A		16 V	
	•	vements as						HI DEN	18 11 5	Sunr.	AL BA
	r .										
Propos	sed Impro	vements as	sociated wit	h LSRP P3:	Cutoff Wall			Mary S		No-	And States
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10.46 PROJECT REACH L1, STATION 631+50

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		,				1	Seis	mic Slope Stability,		Criteria
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each Desc	ription							Reach Overview		
	-		Sta	tion Limits:	608+00	to	655+00			
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	Featu	re(s) at Dov	vnstream St	ation Limit:	Transition to	setback levee	(Reach K)	Man Barry		A A
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10.47 PROJECT REACH L1, STATION 644+00

			R	EAC	HL1	- STA	644	+00			
Rased on ou	r evaluatio	on, this read									
Seepage Eva			in nicets th	c olde en		Slope Stabilit	v Evaluation S	Summary			
		WSEL, Unde	er Seenage.	Meets	Criteria	1	-	e 200-Year DV	VSEL LS	Meets	Criteria
		SEL, Throug			Criteria	Steady		ate Seepage F	-		Criteria
200		HTOL, Unde			Criteria		Steady St	Rapid Drawd	· · · · ·		Criteria
			or beepage.	1120040		1	Seist	mic Slope Stal			Criteria
								smic Slope Sta	-		Criteria
Reach Desc	ription							Reach Overv			0110114
			Sta	tion Limits:	608+00	to	655+00		10	LINE -	- Hereiter
			-		Agricultural l				B/P		K. A.
	Featu	re(s) at Dov	vnstream St	ation Limit:	Transition to	setback levee	(Reach K)				
App	rox. Crowi	n Elevation l	Range (feet	, NAVD88):	30	to	31.5				
	A	pprox. Leve	ee Height R	ange (feet):	15.5	to	24.5	Station .		-1-150	R.
		pprox. Crov				to	67			101	
	-	prox. Lands		· -		to	3.6:1	PL FRENERS	Star Mar	503	
	App	rox. Waters	· ·		1.2:1	to	5:1	-		8	N
		W	aterside Co	onstraint(s):	Waterside be STA 625+00 t	nch from appre to 636+00	oximately		and a		
		I	andside Co	onstraint(s):	None - agricu	ltural land				S IPA	
	Landsic	le repairs as	sociated wi	th PL84-99:	Yes. Berms a	t STA 610+50	to 619+50	243	San Print	2 (F	
	_				and 640+00 to	o 650+00.		10 4	070		
	-	vements ass						13.50	AN AN		
P	-	vements ass						14 3 X	946 CH		
-	-	vements ass	sociated wit	h LSRP P3:	Cutoff Wall				Contraction of the	121	A DESCRIPTION OF TAXABLE PARTY.
		C 1						15 1			AND REAL PROPERTY.
Generalized		<u>ce Conditio</u>									
	Levee	Prism Soils:	15 to 20 fee	-		y and Sandy S		177 Y			
La	Levee ndside Su	Prism Soils: face Layer:	15 to 20 fee Lean CLA	Y to Clayey	SILT, approx.	6-12 feet thick	at toe of leve		CI. A.V.		
La Soil:	Levee ndside Sur s below su	Prism Soils: face Layer: rface layer:	15 to 20 fee Lean CLA	Y to Clayey	SILT, approx.		at toe of leve		an CLAY		
La Soil: Historic Pe r	Levee ndside Sun s below su rformance	Prism Soils: face Layer: rface layer:	15 to 20 fee Lean CLA Approx. 35	Y to Clayey -40 feet of S	SILT, approx. SAND to Silty	6-12 feet thick Sand (w/occas	at toe of leved ional clay len	ses), over Lea			
Lan Soik Historic Per Extensive se	Levee ndside Sur s below su rformance eepage and	Prism Soils: face Layer: rface layer: l landside b	15 to 20 fee Lean CLA Approx. 35	Y to Clayey -40 feet of S	SILT, approx. SAND to Silty	6-12 feet thick	at toe of leved ional clay len	ses), over Lea		vere repor	ted in ULE's
La Soil: Historic Pe r	Levee ndside Sur s below su rformance eepage and	Prism Soils: face Layer: rface layer: l landside b	15 to 20 fee Lean CLA Approx. 35	Y to Clayey -40 feet of S	SILT, approx. SAND to Silty	6-12 feet thick Sand (w/occas	at toe of leved ional clay len	ses), over Lea		vere repor	ted in ULE's
Lan Soile Historic Per Extensive se 2014 SGDR 4	Levee ndside Sun s below su rformance eepage and Addendum	Prism Soils: face Layer: rface layer: l landside b	15 to 20 fee Lean CLA Approx. 35	Y to Clayey -40 feet of S	SILT, approx. SAND to Silty	6-12 feet thick Sand (w/occas	at toe of leved ional clay len	ses), over Lea		vere repor	ted in ULE's
Lai <u>Soik</u> Historic Per Extensive se 2014 SGDR A Liquefiable	Levee ndside Sun s below su rformance eepage and Addendum Soils	Prism Soils: face Layer: rface layer: l landside bo n.	15 to 20 fee Lean CLA Approx. 35 oils (1986 &	Y to Clayey -40 feet of S : 1997), a wa	SILT, approx. SAND to Silty terside slide (6-12 feet thick Sand (w/occas 1997 - STA 646	at toe of leved ional clay len +00) and wate	ses), over Lea	1997, 2006) v	_	
Lan Soil: Historic Per Extensive se 2014 SGDR A Liquefiable I Based on ou	Levee ndside Sur s below su rformance eepage and Addendum Soils nr liquefact	Prism Soils: face Layer: rface layer: l landside bo n. ion assessr	15 to 20 fee Lean CLA Approx. 35 oils (1986 &	Y to Clayey -40 feet of S : 1997), a wa	SILT, approx. SAND to Silty terside slide (6-12 feet thick Sand (w/occas	at toe of leved ional clay len +00) and wate	ses), over Lea	1997, 2006) v	_	
La <u>Soik</u> Historic Per Extensive se 2014 SGDR A Liquefiable	Levee ndside Sur s below su rformance eepage and Addendum Soils nr liquefact	Prism Soils: face Layer: rface layer: l landside bo n. ion assessr ults	15 to 20 fee Lean CLA Approx. 35 oils (1986 &	Y to Clayey -40 feet of S : 1997), a wa	SILT, approx. SAND to Silty terside slide (6-12 feet thick Sand (w/occas 1997 - STA 646 ble soils withi	at toe of leved ional clay len i+00) and wate n this Reach (ses), over Lea	1997, 2006) v endix E and 2	Appendix	F)
Lan Soil: Historic Per Extensive se 2014 SGDR A Liquefiable D Based on ou	Levee ndside Sur s below su rformance eepage and Addendum Soils nr liquefact	Prism Soils: face Layer: rface layer: l landside be n. <u>ion assessr</u> <u>ults</u> Water	15 to 20 fee Lean CLA Approx. 35 oils (1986 &	Y to Clayey -40 feet of S : 1997), a wa entified pote	SILT, approx. SAND to Silty terside slide (entially liquefia	6-12 feet thick Sand (w/occas 1997 - STA 646 able soils withi Exit Gra	at toe of leved ional clay len i+00) and wate n this Reach (dient	ses), over Lea erside scour (Refer to Appe	1997, 2006) v endix E and <i>i</i>	Appendix	F) Breakout
Lan Soil: Historic Per Extensive se 2014 SGDR A Liquefiable Based on ou	Levee ndside Sur s below su rformance eepage and Addendur Soils ur liquefact alysis Res	Prism Soils: face Layer: rface layer: l landside bo n. cion assessr ults Water Surface	15 to 20 fee Lean CLA Approx. 35 oils (1986 & nent, we ide Figure	Y to Clayey -40 feet of S : 1997), a wa entified pote	SILT, approx. SAND to Silty terside slide (entially liquefiz ee Toe	6-12 feet thick Sand (w/occas 1997 - STA 646 able soils withi Exit Gra Toe of	at toe of leved ional clay len i+00) and wate n this Reach (dient Berm	ses), over Lea erside scour (Refer to Appo Fiel	1997, 2006) v endix E and A d	Appendix Through Seepage	F) Breakout Height (ft)
Lan Soil: Historic Per Extensive se 2014 SGDR A Liquefiable D Based on ou	Levee ndside Sur s below su rformance eepage and Addendur Soils ur liquefact alysis Res	Prism Soils: face Layer: rface layer: l landside bo n. ion assessin ults Water Surface 200-Year	15 to 20 fee Lean CLAN Approx 35 oils (1986 & nent, we ide Figure E-47-B	Y to Clayey -40 feet of S : 1997), a wa entified pote Lev No Positi	SILT, approx. SAND to Silty terside slide (entially liquefia ee Toe ive Gradient	6-12 feet thick Sand (w/occas 1997 - STA 646 able soils withi Exit Gra	at toe of leved ional clay len i+00) and wate n this Reach (dient Berm	ses), over Lea erside scour (Refer to Appo Fiel 0.01	1997, 2006) v endix E and A d l	Appendix Through Seepage No	F) Breakout Height (ft) n/a
Lan Soik Historic Per Extensive se 2014 SGDR A Liquefiable Based on ou Seepage An	Levee ndside Sur s below su rformance eepage and Addendur Soils nr liquefact alysis Res Station 644+00	Prism Soils: face Layer: rface layer: l landside bo n. ion assessm ults Water Surface 200-Year HTOL	15 to 20 fee Lean CLA Approx 35 oils (1986 & nent, we ide Figure E-47-B E-47-C	Y to Clayey -40 feet of S : 1997), a wa entified pote Lev No Posit: No Posit:	SILT, approx. SAND to Silty terside slide (entially liquefia ee Toe ive Gradient ive Gradient	6-12 feet thick Sand (w/occas 1997 - STA 646 ible soils withi Exit Gra Toe of	at toe of leved ional clay len (+00) and wate n this Reach (dient - -	ses), over Lea erside scour (Refer to Appo Fiel 0.01 0.02	1997, 2006) v endix E and 2 d l 2	Appendix Through Seepage No n/a	F) Breakout Height (ft) ³
Lan Soil: Historic Per Extensive see 2014 SGDR / Liquefiable : Based on ou Seepage An	Levee ndside Sur s below su rformance eepage and Addendum Soils Ir liquefact alysis Res Station 644+00	Prism Soils: face Layer: rface layer: l landside bo n. ion assessr ults Water Surface 200-Year HTOL stance from th	15 to 20 fee Lean CLAN Approx. 35 oils (1986 & nent, we ide Figure E-47-B E-47-C he toe of the	Y to Clayey -40 feet of S : 1997), a wa entified pote Lev No Positi No Positi levee (ground	SILT, approx. SAND to Silty terside slide (entially liquefia ee Toe ive Gradient ive Gradient	6-12 feet thick Sand (w/occas 1997 - STA 646 able soils withi Exit Gra Toe of 	at toe of leved ional clay len (+00) and wate n this Reach (dient - -	ses), over Lea erside scour (Refer to Appo Fiel 0.01 0.02	1997, 2006) v endix E and 2 d l 2	Appendix Through Seepage No n/a	F) Breakout Height (ft) ⁸ n/a
Lan Soik Historic Per Extensive se 2014 SGDR A Liquefiable 1 Based on ou Seepage An	Levee ndside Sur s below su rformance eepage and Addendum Soils rr liquefact alysis Res Station 644+00	Prism Soils: face Layer: rface layer: l landside be n. cion assessi ults Water Surface 200-Year HTOL stance from tl page under F	15 to 20 fee Lean CLAN Approx. 35 oils (1986 & nent, we ide Figure E-47-B E-47-C he toe of the	Y to Clayey -40 feet of S : 1997), a wa entified pote Lev No Positi No Positi levee (ground	SILT, approx. SAND to Silty terside slide (entially liquefia ee Toe ive Gradient ive Gradient d surface) to wh	6-12 feet thick Sand (w/occas 1997 - STA 646 able soils withi Exit Gra Toe of 	at toe of leved ional clay len (+00) and wate n this Reach (dient - -	ses), over Lea erside scour (Refer to Appo Fiel 0.01 0.02	1997, 2006) v endix E and 2 d l 2	Appendix Through Seepage No n/a	F) Breakout Height (ft) ⁸ n/a
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10.48 PROJECT REACH L2, STATION 658+00

		R	EAC	HL2	- STA	A 658-	+00		
Based on our evaluation.	, this reac				~				
eepage Evaluation Sum					Slope Stabilit	y Evaluation S	Summary		
200-Year DWS	-	r Seepage:	Meets	Criteria	T -	-	e 200-Year DWSEL, L	S: Meets	Criteria
200-Year DWSE	L, Througl	h Seepage:	Meets	Criteria		Steady St	ate Seepage HTOL , L	S: Meets	Criteria
НТ	ГOL, Unde	r Seepage:	Meets	Criteria			Rapid Drawdown, W	S: Meets	Criteria
					•	Seis	mic Slope Stability, W	S: Meets	Criteria
						Sei	smic Slope Stability, L	S: Meets	Criteria
each Description							Reach Overview		
			tion Limits:	655+00	to	703+00		0+00-	
Feat	ure(s) at U	Jpstream St	ation Limit:	Transition to	Phase II Seepa	ige Berm	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Feature	e(s) at Dow	nstream St	ation Limit:	Agricultural l	and				
Approx. Crown E	Elevation F	Range (feet,	, NAVD88):	31	to	32		alter por	1
	-	-	ange (feet):	13	to	19	Station Station		Con Marine
	-		ange (feet):	13	to	35			A Rate
			I:V) Range:	2:1	to	3:1		Sills	The sal
Appro			I:V) Range:	1.5:1	to	3.2:1		3	N
	W	aterside Co		STA 689+00)	Parkway Bridg	ge (Approx.		5	
	L	andside Co	nstraint(s):	Landside imp	rovements (res , etc.) between	,			
Waterside r	repairs ass	ociated wit		Riprap waters		uppion.		·····································	
	-		h LSRP P1:						
Improve	ements ass	ociated wit	h LSRP P2:	None			18 2 3 11 11		Sel Sa
Proposed Improve	ements ass								Constant of the local division of the local
1		ociated wit	h LSRP P3:	Cutoff Wall				Della m	
eneralized Subsurface Levee Pri	e Condition ism Soils:	<u>ns</u> Silty SANE	D to SAND		k at toe of leve	e			
eneralized Subsurface Levee Pri Landside Surfa Soils below surfa	e Condition ism Soils: ace Layer:	<u>ns</u> Silty SANE Lean CLAY	D to SAND Y, approx. 5	to 10 feet thic			Graded SAND		
eneralized Subsurface Levee Pri Landside Surfa Soils below surfa istoric Performance eepage and landside bo	e Condition ism Soils: ice Layer: face layer: pils (STA 6	n <u>s</u> Silty SANE Lean CLA Y Approx. 15 568+00 to 66	D to SAND Y, approx. 5 t to 20 feet o 69+00) durin	to 10 feet thicl f Silty SAND,	over 25 to 30 f	eet of Poorly		51) during 200	06 flood even
eneralized Subsurface Levee Pri Landside Surfa Soils below surfa istoric Performance eepage and landside bo ere reported in ULE's 20	e Condition ism Soils: ice Layer: face layer: pils (STA 6	n <u>s</u> Silty SANE Lean CLA Y Approx. 15 568+00 to 66	D to SAND Y, approx. 5 t to 20 feet o 69+00) durin	to 10 feet thicl f Silty SAND,	over 25 to 30 f	eet of Poorly		51) during 200)6 flood eve
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10.49 PROJECT REACH L2, STATION 671+00

		R	EAC	HL2	- STA	671	+00			
Based on our eva	luption this res				~ = = -					
Seepage Evaluati		ich meets ur	e elbe en		Slope Stabilit	v Evaluation 9	Summary			
	ar DWSEL, Und	ler Seenage.	Meets	Criteria	r -	-	e 200-Year D	WSEL LS	Meets	Criteria
	DWSEL, Throu	10		Criteria	Steady	1.6	ate Seepage l			Criteria
		ler Seepage:		Criteria		~, ~-	Rapid Draw	· · · · · ·		Criteria
	- ,	1.0			1	Seis	mic Slope Sta	· · · ·		Criteria
							smic Slope St	-		Criteria
Reach Descriptio	<u>n</u>						Reach Over			
		Sta	tion Limits:	655+00	to	703+00	I CH	Contraction of	1400	
	Feature(s) at	Upstream St	ation Limit:	Transition to	Phase II Seepa	ge Berm		B		K A
1	Feature(s) at Do	wnstream St	ation Limit:	Agricultural l	and					
Approx. C	Crown Elevation	Range (feet	, NAVD88):	31	to	32				
	Approx. Lev	ee Height R	ange (feet):	13	to	19	Section of the			Park State
	Approx. Cro	wn Width R	ange (feet):	13	to	35	STAR - WEAT	Del Ma	E S	
	Approx. Land	side Slope (H	H:V) Range:	2:1	to	3:1	S. PERMIT	Contra State	Sus	
	Approx. Water			1.5:1	to	3.2:1	No. of Lot of Lo		3	N
	v	Vaterside Co	onstraint(s):		Parkway Bridg	e (Approx.		and in Come		
		Landaida Ca	netroint(c).	STA 689+00)	rovements (res	idantial	- Ab	Stall		
		Lanuside Ce	instraint(s).	-	, etc.) between			CT IN	1462	Real Property
Wat	erside repairs as	sociated wit	th PL84-99:					COLUMN ET	ALE	C. La Contraction
I	mprovements as	sociated wit	th LSRP P1:	None			Mart 1			
I	mprovements as	sociated wit	th LSRP P2:	None			The Acas	11/12	3	
Proposed I	mprovements as	sociated wit	th LSRP P3:	Cutoff Wall			11111	The Part of the		
				Cuton wan			and the second s	2 (20)		
Generalized Sub	surface Conditi	ons		Cuton wan			177			
	surface Conditie evee Prism Soils									
L		: Silty SANI	D to SAND		k at toe of leve	2				
Landsid	evee Prism Soils	: Silty SANI : Lean CLA	D to SAND Y, approx. 5	to 10 feet thic			Graded SAN	D		
Landsid Soils belo	evee Prism Soils e Surface Layer ow surface layer	: Silty SANI : Lean CLA	D to SAND Y, approx. 5	to 10 feet thic			Graded SAN	D		
La Landsid Soils bela Jistoric Perforn Geepage and land	evee Prism Soils e Surface Layer ow surface layer <mark>sance</mark> side boils (STA	: Silty SANI : Lean CLA : Approx. 15 . 668+00 to 6	D to SAND Y, approx. 5 5 to 20 feet o 69+00) durir	to 10 feet thic f Silty SAND,	over 25 to 30 f	eet of Poorly			during 200)6 flood eve
La Landsid Soils bela Jistoric Perforn Geepage and land	evee Prism Soils e Surface Layer ow surface layer <mark>sance</mark> side boils (STA	: Silty SANI : Lean CLA : Approx. 15 . 668+00 to 6	D to SAND Y, approx. 5 5 to 20 feet o 69+00) durir	to 10 feet thic f Silty SAND,	over 25 to 30 f	eet of Poorly			during 200	D6 flood eve
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Landsid Soils bele listoric Perforn eepage and land ere reported in b iquefiable Soils	evee Prism Soils e Surface Layer ow surface layer <mark>sance</mark> Iside boils (STA JLE's 2014 SGD	: Silty SANI : Lean CLA : Approx. 15 668+00 to 6 R Addendur	D to SAND Y, approx. 5 i to 20 feet o 69+00) durir n.	to 10 feet thic f Silty SAND, ng 1997 flood	over 25 to 30 f	eet of Poorly	(STA 699+7	1 to 700+51) o		
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10.50 PROJECT REACH L2, STATION 684+50

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Based on our evaluati	on this room				8 = 1					
seepage Evaluation S	· · · ·	in meets th	e ulbe en	lier la.	Slope Stabilit	v Evaluation (Summary			
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200-Year DW				Criteria	Steady		ate Seepage H			Criteria
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eneralized Subsurfa				Cutoff Wall						
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LUVUU		Silty SANI	to SAND							
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Landside Su Soils below su	rface Layer: urface layer:	Lean CLA	Y, approx. 5				Graded SAND			
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10.51 PROJECT REACH L2, STATION 700+00

			R	EAC	HL2	- STA	700-	+00			
ased on our	evaluatio	on, this read							de below 10-Yea	r WSE+31	eet.
eepage Evalu	uation Su	mmary				Slope Stabilit	v Evaluation S	Summary			
200)-Year DV	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year DW	SEL, LS: M	leets Criteri	a
200-Y	ear DWS	EL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage H	FOL, LS: M	leets Criteri	a
	I	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdo	wn, WS: M	leets Criteri	a
						-	Seis	mic Slope Stabi	lity, WS:	ails Criteria	a
							Sei	smic Slope Stat	oility, LS: M	leets Criteri	a
each Descri	iption							Reach Overvie	<u>ew</u>		
			Sta	tion Limits:	655+00	to	703+00		S handa		k -
			-			Phase II Seepa	ge Berm			the	t
					Agricultural l	and					
Appro	ox. Crown	Elevation	Range (feet	, NAVD88):	31	to	32			1-1-	~
	A	pprox. Leve	ee Height R	ange (feet):	13	to	19	- ALANA	THE THE	Sterre	
				ange (feet):		to	35	OF SHARES			
	Ap	prox. Lands	ide Slope (I	H:V) Range:	2:1	to	3:1	C. PERSONAL PROPERTY AND	State State	TITA	1
	App		· ·	H:V) Range:		to	3.2:1	And Designed in the local division of the lo	-	N	
		W	aterside Co	onstraint(s):		Parkway Bridg	e (Approx.		3 3		
		т	andaida Ca	natroint(a)	STA 689+00)	rovements (res	idantial		Section 201		
		1		onstraint(s).	1	, etc.) between	,			1000	
v	Watersid	e repairs as	sociated wit	th PL84-99:	Riprap waters		-F F		and all a	R. And Contraction	
	Impro	vements as:	sociated wit	th LSRP P1:	None			and the second			
	Impro	vements as	sociated wit	th LSRP P2:	None			7 22		C. Sall	1
Propose	ed Impro	vements as	sociated wit	th LSRP P3:	Cutoff Wall			N. L.Y	20		
eneralized S	Subsurfa	ce Conditio	ns								
	Levee l	Prism Soils:	Silty SANI	to SAND							
Lord	1.:1. C										
Lanc	uside Sur	face Layer:	Lean CLA	Y, approx. 5	to 10 feet thic	k at toe of leve	e				
Soils I listoric Perf e eepage and I	below su `ormance landside	rface layer: boils (STA	Approx. 15 668+00 to 6	69+00) duri	f Silty SAND,	over 25 to 30 f	eet of Poorly	Graded SAND (STA 699+71 t	o 700+51) durinş	g 2006 flood	eve
Soils I istoric Perfe eepage and I ere reported iquefiable Se ased on our	below su cormance landside in ULE's oils liquefact	rface layer: boils (STA 2014 SGDR ion assessr	Approx. 15 668+00 to 6 Addendur	69+00) durin	f Silty SAND, ng 1997 flood e	over 25 to 30 f	eet of Poorly rside erosion	(STA 699+71 t	o 700+51) durinş ndix E and Appe	-	eve
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Soils istoric Perfe eepage and ere reported iquefiable Se ased on our eepage Anal	below su cormance landside i in ULEs oils liquefact lysis Res	rface layer: boils (STA 2014 SGDR ion assessr ults Water Surface	Approx 15 668+00 to 6 Addendur nent, we ide Figure	69+00) durin n. entified pote	f Silty SAND, ng 1997 flood (ntially liquefia ee Toe	over 25 to 30 f event and wate able soils within	eet of Poorly rside erosion h this Reach (dient Berm	(STA 699+71 t Refer to Apper Field	ndix E and Appe	ndix F) igh Break age Height	cout c (ft)
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10.52 PROJECT REACH M1, STATION 704+92

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ased on our evalu	ation. this read									
eepage Evaluation					Slope Stabilit	v Evaluation	Summary			
	DWSEL, Unde	er Seepage:	Meets	Criteria		-	ge 200-Year DW	SEL, LS:	Meets	Criteria
	WSEL, Throug			Criteria			state Seepage H		Meets	Criteria
	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawd		Meets	Criteria
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each Description							Reach Overvi	-		
		Sta	tion Limits:	703+00	to	724+50				Sales -
	Feature(s) at U	Upstream St	ation Limit:	Levee access	ramp, transitio	on to Elemen	t	7 H	E L	C A
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Fe	ature(s) at Dov	wnstream St	ation Limit:			I berm and		and the second		Her Cha
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А	pprox. Waters	• •		1.3:1 Wataraida ba	to nch between S	3.2:1		3 5	LUN	
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	1			722+00 to 724				A BEN	74 25	L.
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Imp	provements ass	sociated wit	th LSRP P2:	Drained seep	age berm		200 -184			
Proposed Imp	provements ass	sociated wit	th LSRP P3:	None					Ser and	
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Generalized Subsu	rface Conditio	ns					1888 V	107 10		
	r <mark>face Conditio</mark> ee Prism Soils:		Y and Poorly	Graded SAN	D		75 X r			
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10.53 PROJECT REACH M2A, STATION 734+45

			RE	ACE	I M2/	A - ST	A 734	4+45			
Based on ou	r evaluati	on, this read		e ULDC Cri		- ~ -					
Seepage Eva	luation Su	ummary				Slope Stabilit	ty Evaluation (<u>Summary</u>			
20	00-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepag	ge 200-Year DW	SEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage H	FOL , LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Drawdo	own, WS:	Meets	Criteria
							Seis	mic Slope Stab	ility, WS:	Meets	Criteria
							Sei	smic Slope Stal	-	Meets	Criteria
Reach Desci	ription_							Reach Overvie	ew		
	-			tion Limits:	724+50	to	741+30		A MEDO		子供现代情
	Fe	ature(s) at l	Jpstream St			1 drained seep Sadler Oak Rd,				4-t	2.5
	Featu	re(s) at Dov	wnstream St	ation Limit:	Levee access	ramp, transitio e berm (Phase	on to Element				
App	rox. Crowi	n Elevation 1	Range (feet		32	to	33	The state		1484	A State of the
		Approx. Leve			16.5	to	19	A SATADAR	In the		2 Par la
	А	pprox. Crov	vn Width R	ange (feet):	30	to	50		Side		
	Ap	prox. Lands	ide Slope (H	H:V) Range:	3:1	to	3:1		1		N
	App	rox. Waters	ide Slope (I	H:V) Range:	1.6:1	to	4:1			1 Land	N
		W	aterside Co	• • •	Waterside be to 728+00	nch between S	STA 725+50				
		I	andside Co	. ,	Phase II bern improvement	and residentia	al	100			
	Landsic	le repairs as	sociated wi	ith PL84-99:	Yes, berm alo	ng entire reach	h		m -	Con the	1
	Imme	vements as	sociated wit	L CDD D1.	None				Statement of the second second	A DOWN OF A DOWN	
	-							40.000	A		
	Impro	vements as	sociated wit	th LSRP P2:	Drained Seep	age Berm		3.9 11			48. 23 ÷
	Impro sed Impro	vements ass vements ass	sociated wit		Drained Seep	age Berm		12/1	Child and		
	Impro sed Impro I Subsurfa	vements ass vements ass nce Conditio	sociated wit sociated wit <u>ns</u>	th LSRP P2: th LSRP P3:	Drained Seep None	age Berm		12/1	A State		
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Generalized	Impro sed Impro I Subsurfa Levee ndside Sur	vements ass vements ass nce Conditio Prism Soils: rface Layer:	sociated wit sociated wit <u>ns</u> Silty SANI Lean CLAY	th LSRP P2: th LSRP P3: D to Clayey 3 Y, approx. 20	Drained Seer None SAND) feet thick at	toe of levee		2.1	A STA		
Generalized Lar Soils	Impro sed Impro ISubsurfa Levee ndside Sur s below su	vements ass vements ass nee Conditio Prism Soils: rface Layer: urface layer:	sociated wit sociated wit <u>ns</u> Silty SANI Lean CLAY	th LSRP P2: th LSRP P3: D to Clayey S Y, approx. 20	Drained Seer None SAND) feet thick at		1 CLAY		AN A		
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10.54 PROJECT REACH M2B, STATION 744+73

			RE	ACH	I M2I	B - ST	A 74	4+73			
Based on our e	evaluatio	on, this reac									
Seepage Evalua	ation Su	<u>ımmary</u>				Slope Stabilit	y Evaluation	<u>Summary</u>	_		
200-	-Year DV	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year DV	WSEL, LS:	Meets	Criteria
200-Yea	ear DWS	EL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage I	HTOL , LS:	Meets	Criteria
	F	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawo	lown, WS:	Meets	Criteria
							Seis	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	smic Slope St		Meets	Criteria
Reach Descrip	<u>ption</u>		~					Reach Overv	<u>view</u>		
	E.	- 4 (-) - 4 T		tion Limits:	/ 11/00	to	760+50		HE	1+03-	
			-			1 drained seep Phase 1 draine	0			Ale	KAR.
					berm, Sadler	Oak Rd, resider	ntial				
Approx		Elevation I	-		33	to	34	Distantiana		THE S	No.
		pprox. Leve	-		15	to	16.5			A A	Sept.
		pprox. Crov				to	30	PE PERMIT	Se mail	W Sto	
		prox. Lands		. –		to	2.8:1			8	N
	App	rox. Waters	• •	, 0	1.8:1	to	3.1:1				
		w	aterside Co	nstraint(s):	waterside too	e of slope at th	e waterway -		5	A STREET	
		L	andside Co	nstraint(s):	None - agricu			State 1	2 12	N 46.4	
J	Landsid				-	berms constru	cted		700100	44	
	Improv	vements ass	sociated wit	h LSRP P1:	Drained Seep	age Berm		the second	EU		
	Improv	vements ass	sociated wit	h LSRP P2:	None			36 365	11/1/20		
Proposed	d Improv	vements ass	sociated wit	h LSRP P3:	Cutoff wall				1 200	Lot 6	
Cenerolized C.	1 0							111 / DF Y			AND DESCRIPTION OF
Joner anzeu St	ubsurfa	ce Conditio	ns								
		<u>ce Conditio</u> Prism Soils:		to Lean CI	AY						
Lands	Levee I side Sur	Prism Soils: face Layer:	Silty SANI	r to SILT, aj	prox. 6 to 12	feet thick at too	e of levee				
Lands	Levee I side Sur	Prism Soils: face Layer:	Silty SANI Lean CLA Approx. 40	r to SILT, aj	prox. 6 to 12	feet thick at too ND (with occa	e of levee sional interbo	eded SILT/CL	AY layers), o	over Lean	to Sandy
Lands Soils be	Levee I side Sur pelow su	Prism Soils: face Layer: rface layer:	Silty SANI	r to SILT, aj	prox. 6 to 12	feet thick at too ND (with occa	e of levee sional interbo	eded SILT/CL	AY layers), o	over Lean	to Sandy
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Lands Soils bo Historic Perfo	Levee I side Sur below su prmance	Prism Soils: face Layer: rface layer:	Silty SANI Lean CLA Approx. 40 CLAY.	r to SILT, ap -feet of Silty	pprox. 6 to 12 f 7 SAND to SA	ND (with occa	sional interb		AY layers), c	over Lean	to Sandy
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Lands Soils be Historic Perfo Seepage and la Liquefiable Soi	Levee I side Sur below su ormance andside I bils	Prism Soils: face Layer: rface layer: boils during	Silty SANI Lean CLA Approx. 40 CLAY. 5 1997 flood	to SILT, aj-feet of Silty event were	pprox. 6 to 12 t 7 SAND to SA reported in U	ND (with occa	sional interbo R Addendum		AY layers), c	over Lean	to Sandy
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Lands Soils be distoric Perfor deepage and la iquefiable Soi Based on our li Geepage Analy St St T4 *Ve Thr Stope Stability	Levee I side Sur below su prmance andside b ils liquefact vsis Res itation 44+73 ertical dis rough see v Analys	Prism Soils: face Layer: rface layer: boils during ion assessm ults Water Surface 200-Year HTOL tance from tl page under F is Results Case Analyzed SS - 200yr SS - HTOL RDD	Silty SANI Lean CLAN Approx. 40 CLAY. (1997 flood) ment, we are Figure E-54-B E-54-C he toe of the ITOL condit Water Surface (ft) 28.0 30.6 18.0	r to SILT, ap -feet of Silty event were not consid Lev No Positi No Positi levee (ground ions are not p Figure E-54-D/E E-54-F E-54-D/E	pprox. 6 to 12 f / SAND to SA reported in U ering liquefiab ee Toe ive Gradient d surface) to wh bart of this eval Factor of (Circ Waterside 2.0	ND (with occa LE's 2014 SGD le soils in our Exit Gra Toe of 0.0 0.1 ere the phreatic uation.	sional interbo R Addendum slope stability dient Berm 99 11 surface is calc (Non-C Waterside 2.1	y analyses. Fiel ulated to day lig f Safety Ircular) Landside 2.1 2.1 	1d 5	Fhrough Seepage No n/a	Breakout Height (ft) n/a
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10.55 PROJECT REACH M2B, STATION 755+00

			RE	ACH	I M2	B - ST	A 75	5+00			
Based on (our evaluati	on, this rea				c deformations			rade below	10-Year W	SE+3 feet.
	Evaluation St					Slope Stabilit					
	200-Year D	WSEL, Und	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
20	00-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL, LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	ability, WS:	Fails	Criteria
							Sei	smic Slope S	tability, LS:	Meets	Criteria
Reach De	<u>scription</u>							Reach Over	<u>view</u>		
			Sta	tion Limits:	741+30	to	760+50	I Ball	1	ALLAN A	
	Fe	ature(s) at U	Upstream St	ation Limit:	End of Phase	1 drained seep	age berm		28/2		A CO
	Featu	re(s) at Dov	wnstream St	ation Limit:	0 0	Phase 1 draine					
	C	- Elevetien l	D (f+	NA VDOOL	,	Dak Rd, residen					1
A	pprox. Crowi		-			to	34	- States			And and
		Approx. Leve Approx. Crov	-	-		to	16.5 30	STATE OF THE STATE OF		10	
		prox. Lands		-		to to	2.8:1		Contract of the	0100	10
	-	prox. Waters	-	-		to	2.8:1		and the second	8 1 2	N
	лрр		-	-		e of slope at the			and Come	3	
			aterside co	instraint(s).	no waterside	-	e water way	- Albe	5 4		and the second
		I	andside Co	onstraint(s):	None - agricu	ltural land		and a les		7.64	
	Landsic	le repairs as	sociated wi	ith PL84-99:	Yes - drained	berms constru-	cted		AUGELA CA	ALL L	
	Impro	vements as:	sociated wit	th LSRP P1:	Drained Seep	age Berm		to L	EU.		
	Impro	vements as:	sociated wit	th LSRP P2:	None			C. Real	11/12		
Prop	posed Impro	vements as:	sociated wit	th LSRP P3:	Cutoff wall				A 00	V-	
eneraliz	ed Subsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Silty SANI	O to Lean Cl	LAY						
I	andside Su	rface Laver	Lean CLA	Y to SILT a	nprox 6 to 12	feet thick at toe	oflevee				
I	andside Su	rface Laver	Lean CLA	Y to SILT a	nprox 6 to 12	feet thick at toe ND (with occas	of levee sional interbe	ded SILT/CI	AY layers)	, over Lean	to Sandy
I Sc	andside Su	rface Laver	Lean CLA	Y to SILT a	nprox 6 to 12	feet thick at toe ND (with occas	of levee sional interbe	ded SILT/CI	AY layers)	, over Lean	to Sandy
So	andside Su	rface Layer: ırface layer:	Lean CLA Approx. 40	Y to SILT a	nprox 6 to 12	feet thick at toe ND (with occas	of levee sional interbe	ded SILT/CI	AY layers)	, over Lean	to Sandy
Sc listoric F	Landside Sur bils below su Performance	rface Layer: urface layer:	Lean CLAY Approx. 40 CLAY.	Y to SILT, aj) feet of Silty	pprox. 6 to 12 t 7 SAND to SA	feet thick at toe ND (with occas LE's 2014 SGDF	sional interbe		AY layers)	, over Lean	to Sandy
So listoric F eepage a	Landside Sur bils below su Performance ind landside	rface Layer: urface layer:	Lean CLAY Approx. 40 CLAY.	Y to SILT, aj) feet of Silty	pprox. 6 to 12 t 7 SAND to SA	ND (with occas	sional interbe		AY layers)	, over Lean	to Sandy
Sc listoric F eepage a iquefiabl	Landside Sur pils below su Performance and landside le Soils	rface Layer: urface layer: boils during	Lean CLAY Approx. 40 CLAY. g 1997 flood	Y to SILT, ap feet of Silty event were	pprox. 6 to 12 t 7 SAND to SA reported in U	ND (with occas	sional interbe R Addendum				
So listoric F eepage a iquefiabl Base	Landside Sur oils below su Performance and landside le Soils ed on our liq	rface Layer: Irface layer: boils during uefaction as	Lean CLAY Approx. 40 CLAY. g 1997 flood	Y to SILT, ap feet of Silty event were	pprox. 6 to 12 t 7 SAND to SA reported in U	ND (with occas	sional interbe R Addendum				
So listoric F leepage a .iquefiabl Base	Landside Sur pils below su Performance and landside le Soils	rface Layer: urface layer: boils during uefaction as sults	Lean CLAY Approx. 40 CLAY. g 1997 flood	Y to SILT, ap feet of Silty event were	pprox. 6 to 12 t 7 SAND to SA reported in U	ND (with occas LE's 2014 SGDF quefiable soils	sional interbe R Addendum within this R			E and App	endix F)
So listoric F leepage a .iquefiabl Base	Landside Sur oils below su Performance and landside le Soils ed on our liq	rface Layer: urface layer: boils during uefaction as sults Water	Lean CLAY Approx. 40 CLAY. g 1997 flood	Y to SILT, aj feet of Silty event were we identified	pprox. 6 to 12 i / SAND to SA reported in U 1 potentially li	ND (with occas LE's 2014 SGDF quefiable soils Exit Grad	sional interbe R Addendum within this R dient	each (Refer t	o Appendix	E and App Through	endix F) Breakout
So listoric F eepage a iquefiabl Base	Landside Su oils below su Performance and landside le Soils ed on our liq Analysis Res	rface Layer: urface layer: boils during uefaction as uefaction suffact Water Surface	Lean CLA Approx 40 CLAY. g 1997 flood ssessment, v Figure	Y to SILT, ay feet of Silty event were we identified Lev	pprox. 6 to 12 i / SAND to SA reported in U d potentially li ee Toe	ND (with occas LE's 2014 SGDF quefiable soils Exit Grad Toe of	sional interbe Addendum within this Ra dient Berm	each (Refer t	o Appendix	E and App Through Seepage	endix F) Breakout Height (ft)
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So listoric F eepage a iquefiabl Base	Landside Sur pils below su Performance and landside le Soils ed on our liq Analysis Res Station 755+00	rface Layer: urface layer: boils during uefaction as uefaction as u	Lean CLA Approx 40 CLAY. g 1997 flood ssessment, v Figure E-55-B E-55-C	Y to SILT, ap feet of Silty event were we identified Lev No Posit No Posit	pprox. 6 to 12 i / SAND to SA reported in U d potentially li ee Toe ive Gradient ive Gradient	ND (with occas LE's 2014 SGDF quefiable soils Exit Grac Toe of 0.0 0.1	x Addendum within this R dient Berm 9 2	each (Refer t Fie	o Appendix eld 	E and App Through Seepage No n/a	endix F) Breakout Height (ft)
So fistoric F eepage a iquefiabl Base	Landside Sur pils below su Performance and landside le Soils ed on our liq Malysis Res Station <u>755+00</u> *Vertical di	rface Layer: urface layer: boils during uefaction as uefaction as uefactor as	Lean CLA Approx 40 CLAY. g 1997 flood ssessment, v Figure E-55-B E-55-C he toe of the	Y to SILT, ap feet of Silty event were we identified Lev No Posit No Posit levee (ground	pprox. 6 to 12 i / SAND to SA reported in U d potentially li ee Toe ive Gradient ive Gradient d surface) to wh	ND (with occas LE's 2014 SGDF quefiable soils Exit Grad Toe of 0.0 0.1 here the phreatic	x Addendum within this R dient Berm 9 2	each (Refer t Fie	o Appendix eld 	E and App Through Seepage No n/a	endix F) Breakout Height (ft) n/a
Sc listoric F eepage a iquefiabl Base eepage A	Landside Sur pils below su Performance and landside le Soils ed on our liq Analysis Res Station 755+00 *Vertical di Through see	rface Layer: urface layer: boils during uefaction as uefaction as uefactor as	Lean CLA Approx 40 CLAY. g 1997 flood ssessment, v Figure E-55-B E-55-C he toe of the	Y to SILT, ap feet of Silty event were we identified Lev No Posit No Posit levee (ground	pprox. 6 to 12 i / SAND to SA reported in U d potentially li ee Toe ive Gradient ive Gradient	ND (with occas LE's 2014 SGDF quefiable soils Exit Grad Toe of 0.0 0.1 here the phreatic	x Addendum within this R dient Berm 9 2	each (Refer t Fie	o Appendix eld 	E and App Through Seepage No n/a	endix F) Breakout Height (ft) n/a
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10.56 PROJECT REACH M3A, STATION 761+00

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		on, this read g the 200-y		e ULDC Cri	iteria. An Ope	erations and M	aintenance pl	lan should be	implemente	d for seisi	nic
Seepage Eva	duation Su	<u>ummary</u>				Slope Stabilit	y Evaluation	Summary			
20	00-Year D	WSEL, Und	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year D	WSEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL , LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
						-	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
leach Desc	<u>ription</u>							Reach Over	<u>view</u>		
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	Арр		-	-		to e of slope at th		-	- deter	3	
				nstraint(s).		bench. Railroa					
		Ι	andside Co	nstraint(s):	None - agricu		2	18 AL	George The	- 45-4	
	Landsic	le repairs as	sociated wi	th PL84-99:	None			a constant	700+00	The ALE	
	Impro	vements as:	sociated wit	h LSRP P1:	None			to to			- Talanta
	Impro	vements as	sociated wit	h LSRP P2:	None			1. 3.5	1110		
Propo	sed Impro	vements as	sociated wit	h LSRP P3:	Cutoff wall					1 miles	
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10.57 PROJECT REACH M3B, STATION 764+13

			RE	ACH	I M31	B - ST	A 764	4+13			
ased on ou	ır evaluatio	on, this read				deformations			rade below 1	0-Year W	SE+3 feet.
eepage Eva						Slope Stabilit					
20	00-Year DV	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year D	WSEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL, LS:	Meets	Criteria
	I	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
						-	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
each Desc	ription							Reach Over	<u>view</u>		
			Sta	tion Limits:		to	768+00		H	NO HOOT	
	Fe	ature(s) at U	Jpstream St	ation Limit:	Manthey Roa fill/crossing	id, I-5 approach	1			A SAS	\mathbb{K} \mathcal{A}
	Featu	ure(s) at Dov	vnstream St	ation Limit.	0	ge approach fill			Contraction of		- Nor of
Ann		n Elevation 1				to	33			100	h a
. . PP		Approx. Leve				to	17	A	Pol -	and the	NO PART
		pprox. Crov	-	_		to	33		A TON	1	
		prox. Lands		-		to	3:1	CORE I			N
	-	rox. Waters	-	_		to	3:1		- Ale	3	
	r r		-	_		amp, railroad b		201		1.13	Cardina and
						unty Park impr	0	1 de la	and the	-	
	Landsid	le repairs as						SX I.	70000 C	AL.	ACTION OF THE
	Impro	vements as	sociated wit	h LSRP P1:	None			State -	a EU	THE .	
	Impro	vements as	sociated wit	h LSRP P2:	None			1122			Lal Br
Propo	sed Impro	vements as	sociated wit	h LSRP P3:	Cutoff Wall/E	Drained Berm at	RR Tracks	and a			
eneralized	l Subsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Silty SANI	D to SAND							
La	1.1.1.0	c									
La	nasiae Sui	rface Layer:	Lean CLA	Y to Clayey	SILT, approx.	3 to 13 feet this	k at toe of le	vee			
						3 to 13 feet thic to SAND, over					
	s below su	irface layer:									
Soil: listoric Pe r	s below su rformance	urface layer:	Approx. 40	to 50 feet o	f Silty SAND		Lean CLAY				
Soils istoric Pe r eepage and	s below su rformance d landside	urface layer:	Approx. 40	to 50 feet o	f Silty SAND	to SAND, over	Lean CLAY				
Soils istoric Per cepage and iquefiable	s below su rformance d landside <u>Soils</u>	urface layer:	Approx. 40 g 1997 flood	to 50 feet o	f Silty SAND	to SAND, over LE's 2014 SGDI	Lean CLAY R Addendum		endix E and	Appendix	F)
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10.58 PROJECT REACH M3B, STATION 767+00

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loopogo Ev	ur evaluatio	on, this read	ch meets th	e ULDC cri		deformations			ade below 1	0-Year W	SE+3 feet.
Jeepage Ev	aluation Su	ummary				Slope Stabilit	v Evaluation S	Summary			
2	200-Year D	WSEL, Und	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
200)-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage l	HTOL, LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Drawe	iown, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
Reach Deso	cription							Reach Over	view		
			Sta	tion Limits:	763+00	to	768+00			10+05-1	-
	Fe	ature(s) at U	Upstream St	ation Limit:		d, I-5 approac	1		1	A	KC
					mi/crossing				1		-12
						ge approach fil		ar = 14	-		
Арј	-	n Elevation	-			to	33	Contraction of the second		-	Kopen.
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		approx. Crov		-		to	33		Carrie	-	
	-	prox. Lands		_		to	3:1	A Designed	t	4	N
	Арр	rox. Waters	• ·			to	3:1		and an		Con Conception
						amp, railroad b	0		3	A STATE	
	T 1.1					unty Park impr	ovements	Str.	TIDEUR	in the second	Same of the
		le repairs as							8	1 Cont	
	-	vements as:						Mar and		4	
Duom	•	vements as:				Nuclin of Domeso	DD Travelar		gage of		
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eneralize		Prism Soils :									
T.			•		SUT opprov	2 to 12 faat thi	als at too of la				
		-				3 to 13 feet this					
			Appiox 40	10 50-1661 0	Siny SAND	to SAND, over	Lean CLA I				
	erformance	2									
eepage an		hoile during	1007 flood	avant wara	reported in II		D Addandum				
	iu iunusiuo	boils during	g 1997 flood	event were	reported in U	LE's 2014 SGD	R Addendum				
iquefiable		boils during	g 1997 flood	event were	reported in U	LE's 2014 SGD	R Addendum				
	e Soils		-		-	LE's 2014 SGD			endix E and	Appendix	F)
Based on o	e Soils	tion assess	-		-				endix E and	Appendix	F)
Based on o	e Soils our liquefact nalysis Res	tion assess	ment, we ide		-		n this Reach (endix E and	Appendix	F) Breakout
Based on o	e <u>Soils</u> our liquefact	tion assessr	-	entified pote	-	ble soils within	n this Reach (dient				Breakout
ased on o	e Soils our liquefact nalysis Res Station	tion assessr sults Water	ment, we ide	entified pote	entially liquefia	ıble soils withi Exit Gra	n this Reach (dient	(Refer to App	ld	Through	Breakout
ased on o	e Soils our liquefact nalysis Res	tion assessr sults Water Surface	nent, we ide Figure	entified pote Lev No Posit	entially liquefia	ıble soils withi Exit Gra	n this Reach (dient Berm -	Refer to App Fie	ld	Through Seepage	Breakout Height (ft)
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Based on o	2 Soils ur liquefact nalysis Res Station 767+00 *Vertical dia Through see ility Analys	tion assess ults Water Surface 200-Year HTOL stance from t page under F is Results Case Analyzed SS - 200yr	Figure E-58-B E-58-C he toe of the TTOL condit Water Surface (ft) 28.6	Intified pote Lev No Posit No Posit levee (ground ions are not Figure E-58-D/E	entially liquefia ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside 	ble soils within Exit Gra Toe of ere the phreatic uation. of Safety zular) Landside 2.6	n this Reach (dient Berm - - surface is calcu Factor o (Non-C Waterside 	Refer to App Fiel 	ld	Through Seepage No n/a	Breakout Height (ft) n/a
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10.59 PROJECT REACH M3C, STATION 777+00

			KE	ACE	I M30	<u> </u>	A //	/+00			
	our evaluations followin			e ULDC Cri	iteria. An Ope	rations and M	aintenance pl	an should be	implement	ed for seisi	mic
Seepage E	valuation St	<u>ımmary</u>				Slope Stabilit	v Evaluation	Summary			
	200-Year D	WSEL, Und	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year D	WSEL, LS:	Meets	Criteria
20	0-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL, LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	ability, WS:	Fails	Criteria
							Sei	smic Slope S	tability, LS:	Meets	Criteria
Reach Des	scription							Reach Over	view		
			Sta	tion Limits:	775+00	to	781+00			1403-	-
			-			n/agricultural a		II St.	B/ 10	ARA	A. C.
	Featu	re(s) at Dov	vnstream St	ation Limit:	I-5 Bridge Cro	ossing Approa	ch		The state		
Ap	prox. Crow	n Elevation	Range (feet,	, NAVD88):	32 1/2	to	34.5				1
	A	Approx. Leve	ee Height R	ange (feet):	11	to	17	Selling A	The Party		A LAND
				ange (feet):		to	40	C STATE OF BELLEVILLE	al K.	150	
	-	-	-	H:V) Range:		to	3:1	PERSONAL DES	State and	A CA	7/4 5 2 7
	App		· ·	H:V) Range:		to	3.5:1		A State	3	N
		W	aterside Co	onstraint(s):		e of slope at th	•	-	200	3	
		T	andside Co	nstraint(s).		ot wide waters and agricultur			dente de la		Lingt
	Landsid					seepage berm	ai lanu	20	ST MAG		
		-		th LSRP P1:		seepage beim		1.9	TOTEL -		
	1					age Berm from	STA 778+50	1. 4	P	S ALT	
	mpro	vencints us.	sociated wit		to 781+00	age Benn nom	5111 //0150	B. A.	ALX -		
Prop	osed Impro	vomente ec	ociated wit	h I SDD D2.	Drained Seep	D C	CTA 775.00		1.80		LAND. AN AL
	Josed Impio	venients as:	sociated wit	in Lord 15.	Diamed Seep	age Berm from	SIA //5+00		19 m	Sec. Sec.	Contraction of the local division of the
I Sc listoric P	ed Subsurfa Levee andside Su vils below su erformance	ce Conditio Prism Soils : rface Layer: rface layer:	<u>ns</u> Silty SANI SAND Approx. 45	D to SAND	to 778+50	ayered Lean C		yey SAND			
I Sc listoric P beepage a iquefiabl	ed Subs urfa Levee andside Su ils below su erformance nd landside e Soils	ce Conditio Prism Soils: rface Layer: urface layer: boils were r	<u>ns</u> Silty SANI SAND Approx. 45 eported in U	D to SAND i feet of SAN JLE's 2014 S	to 778+50 ND, over interl	ayered Lean C um.	AY and Clay				
I Sc Historic P Geepage a Liquefiabl Based on o	ed Subs urfa Levee andside Sus ils below su erformance nd landside e Soils our liquefact	ce Conditio Prism Soils: face Layer: irface layer: boils were r	<u>ns</u> Silty SANI SAND Approx. 45 eported in U	D to SAND i feet of SAN JLE's 2014 S	to 778+50 ND, over interl	ayered Lean C	AY and Clay		pendix E and	l Appendix	.F)
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I Sc Historic P Geepage a Liquefiabl Based on o	ed Subs urfa Levee andside Sus ils below su erformance nd landside e Soils our liquefact	ce Conditio Prism Soils: rface Layer: inface layer: boils were r boils were r tion assess ults Water	<u>ns</u> Silty SANI SAND Approx. 45 eported in U	D to SAND i feet of SAN ULE's 2014 S entified pote	to 778+50 ND, over interl GGDR Addend	ayered Lean C um. ble soils within Exit Gra	AY and Clay	Refer to App		Through	Breakou
I Sc Listoric P Seepage a Liquefiabl Based on o	ed Subsurfa Levee andside Su ils below su erformance nd landside <u>e Soils</u> our liquefact	ce Conditio Prism Soils: rface Layer: inface layer: boils were r boils were r tion assessi tuts Water Surface	ns Silty SANI SAND Approx. 45 eported in U nent, we ide Figure	D to SAND i feet of SAN ULE's 2014 S entified pote	to 778+50 ND, over interl GGDR Addend Intially liquefia	ayered Lean C um. ble soils within Exit Gra Toe of	(AY and Clay n this Reach (dient Berm	Refer to App Fie	ld	Through Seepage	Breakout Height (ft)
I Sc Historic P Geepage a Liquefiabl Based on o	ed Subsurfa Levee andside Su ils below su erformance nd landside <u>e Soils</u> our liquefact	ce Condition Prism Soils: rface Layer: rface layer: boils were r boils were r tion assessi tuts Water Surface 200-Year	ns Silty SANI SAND Approx. 45 eported in U nent, we ide Figure E-59-B	D to SAND i feet of SAN ULE's 2014 S entified pote	to 778+50 ND, over interl GGDR Addend Intially liquefia ee Toe 0.01	ayered Lean C um. ble soils within Exit Gra Toe of 0.0	(AY and Clay n this Reach (dient Berm 9	Refer to App Fie	-	Through Seepage No	Breakout Height (ft) n/a
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10.60 PROJECT REACH M4, STATION 795+87

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Rased on o	ur evaluati	on this read				c deformations			rade below 1	0-Vear W	SE+3 feet
	valuation S		in nikets th			Slope Stabilit				o icui //	OL + 5 Iecu
		WSEL, Unde	er Seenage:	Meets	Criteria		State Seepag		WSELLIS:	Meets	Criteria
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		HTOL, Unde			Criteria			Rapid Draw		Meets	Criteria
			10			Į	Seis	mic Slope Sta		Fails	Criteria
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Reach Des	cription							Reach Over	view		
			Sta	tion Limits:	781+00	to	799+50		1 may	hanni -	and starts
	Fe	ature(s) at U	Jpstream St	ation Limit:	Railroad align	ment/approach	ı		B B		K. Ct
	Featu	re(s) at Dov	vnstream St	ation Limit:	Phase II Bern	n, agricultural la	nd				-
Ap	prox. Crowi	n Elevation I	Range (feet	, NAVD88):	33	to	34				1-1
	A	Approx. Leve	ee Height R	ange (feet):	13	to	18		1+01 - 1-0+1		Stor 10
	А	approx. Crov	vn Width R	ange (feet):	30	to	44	AND NO.	21 30	100	Barry Barry
	Ap	prox. Lands	ide Slope (I	H:V) Range:	3:1	to	3:1		Co.		
	App	rox. Waters	-	_		to	3.3:1	A start of			N
		W	aterside Co	onstraint(s):		e of slope at th	e waterway -		I THE REAL	2	
		т	andsida Co	netroint(c).	no waterside	bench. power lines an	d og lond		Contraction of the		
	Landsie					t STA 788+001		Ser.	Then	· 二十	and G
		vements as				1 51A 788+001	.0 799+50		a	Pier-	
	-				Drained Seep	age Berm		792 10	- maint		1 1 1 2 1
Prop	•	vements ass			1	age beim			19 18 Ja	S	
		ce Conditio			Hone			100 CT 100			and still
		Prism Soils:		Dand Lean	CLAY						
т			•								
	andside Sili	rface Laver	Lean CLA	Y approx 1	5 feet thick at	toe of levee					
Soi		irface layer:			5 feet thick at SAND and S	toe of levee AND, over 10	feet of lean C	LAY			
Soi Historic Pe Seepage an	ils below su e rformance nd landside	urface layer: boils were r	Approx. 40) feet of Silty	SAND and S	AND, over 10			aterside slope	e between	Station
Soi listoric Pe deepage an 90+00 to 7	ils below su <u>erformance</u> 1d landside 799+00 durii	urface layer: boils were r	Approx. 40) feet of Silty	y SAND and S 7 high-water e	AND, over 10			aterside slope	e between	Station
Soi listoric Pe eepage an 90+00 to 7 iquefiable	ils below su erformance nd landside 799+00 durin e Soils	urface layer: boils were n ng 1998 high	Approx. 40 eported dur i-water even) feet of Silty ring the 199 nt in ULE's 2	7 SAND and S 7 high-water e 2014 SGDR Ad	AND, over 10 t vent and minor dendum.	wave wash e	erosion on wa			
Soi listoric Pa eepage an 90+00 to 7 .iquefiable Based on o	ils below su erformance nd landside 799+00 durii e Soils pur liquefact	tion assessn	Approx. 40 eported dur i-water even) feet of Silty ring the 199 nt in ULE's 2	7 SAND and S 7 high-water e 2014 SGDR Ad	AND, over 10	wave wash e	erosion on wa			
Soi listoric Pa eepage an 90+00 to 7 .iquefiable Based on o	ils below su erformance nd landside 799+00 durin e Soils	nrface layer: boils were r ng 1998 high tion assessn	Approx. 40 eported dur i-water even) feet of Silty ring the 199 nt in ULE's 2	7 SAND and S 7 high-water e 2014 SGDR Ad	AND, over 10 t vent and minor Idendum.	wave wash o	erosion on wa	endix E and A	Appendix	F)
Soi listoric Pe eepage an 90+00 to 7 liquefiable lased on o	ils below su erformance nd landside 799+00 durii e Soils pur liquefact	tion assessn water water	Approx. 40 eported dur i-water even	o feet of Silty ring the 199 nt in ULE's 2	7 SAND and S 7 high-water e 2014 SGDR Ad entially liquefia	AND, over 10 t vent and minor ldendum. ble soils within Exit Gra	wave wash e n this Reach (dient	erosion on wa	endix E and A	Appendix Through	F) Breakout
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10.61 PROJECT REACH N1, STATION 804+50

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ased on o	our evaluatio	on, this read				N = = -					
eepage E	valuation St	ummary				Slope Stabilit	v Evaluation	Summary			
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	T -		e 200-Year DWS	SEL, LS:	Meets	Criteria
20	0-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage HT	OL, LS:	Meets	Criteria
	1	HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdo	wn, WS:	Meets	Criteria
						•	Seis	mic Slope Stabil	lity, WS:	Meets	Criteria
							Sei	smic Slope Stab	ility, LS:	Meets	Criteria
each Des	scription							Reach Overvie	W		
			Sta	tion Limits:	799+50	to	806+00			0400	
	Fe	ature(s) at U	Upstream St	ation Limit:	LSRP Phase 3	3 Cutoff Wall			B/H 01	ARE	A CA
	Featu	re(s) at Dov	wnstream St	ation Limit:	RR-Xing				The second second	The second	
Ap	oprox. Crowi	n Elevation 1	Range (feet	, NAVD88):	34	to	35			-42	
	A	Approx. Leve	ee Height R	ange (feet):	9	to	12	Sector Sector	R F. M.		and the
	A	approx. Crov	vn Width R	ange (feet):	50	to	50	STATISTICS.	Sel les	1 Co	
	-	prox. Lands	-	-		to	5:1	S PROVIDENCE	STE HA	Sal T	1/2
	App	rox. Waters	-	-		to	2:1	and a state of	-	3	N
		W	aterside Co	onstraint(s):		e of slope at th	e waterway -		1		
		т	andside Co	netroint(c):	no waterside Pond, RR X-ii				5		
	Landsid					ng at STA 799+501	o 806±00				
	Landsie	ie iepairs as	sociated wi	un i Lo + - <i>)</i>).	(excluding RF		0 000100	700		5.4 E	
	Impro	vements as	sociated wit	h LSRP P1:		6/		05-1-4			TYPE OF
	Impro	vements as	sociated wit	th LSRP P2:	None			10 300 1	1000		LAL B -
Prop	osed Impro	vements as	sociated wit	th LSRP P3:	None			The party	-		State of the local division of the local div
eneralize	ed Subsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Silty SANI)							
L	andside Su										
	and side Su	rface Layer:	Lean CLA	Y, approx. 5	to 15 feet thicl	k near toe of le	vee				
So		-				k near toe of le [.] 60 feet of Poorl [.]		ND			
		irface layer:				k near toe of le 60 feet of Poorl		ND			
listoric P	oils below su 'erformance	urface layer:	Approx. 20	feet of lean	CLAY, over 6		y Graded SA1	ND			
listoric P eepage ai	oils below su Performance nd landside	urface layer:	Approx. 20	feet of lean	CLAY, over 6	60 feet of Poorl	y Graded SA1	ND			
listoric P eepage ai iquefiable	oils below su Performance nd landside <u>e Soils</u>	urface layer: boils (sandl	Approx. 20 bag rings) v) feet of lean	d in ULE's 201	50 feet of Poorl	y Graded SA1 Idum.				
istoric P eepage an iquefiabl ased on c	oils below su erformance nd landside e Soils our liquefact	tion assessr	Approx. 20 bag rings) v) feet of lean	d in ULE's 201	50 feet of Poorl	y Graded SA1 Idum.	ND Refer to Appen	dix E and	Appendix	F)
istoric P eepage an iquefiabl ased on c	oils below su Performance nd landside <u>e Soils</u>	tion assessr	Approx. 20 bag rings) v) feet of lean	d in ULE's 201	50 feet of Poorly 4 SGDR Adder able soils within	y Graded SA1 udum. 1 this Reach (dix E and		
istoric P eepage an iquefiabl ased on c	oils below su erformance nd landside e Soils our liquefact	tion assessr	Approx. 20 bag rings) v ment, we ide	entified pote	CLAY, over 6 d in ULE's 201 entially liquefia	0 feet of Poorl 4 SGDR Adder ble soils within Exit Gra	y Graded SAI Idum. n this Reach (dient	Refer to Appen	dix E and	Through	Breakout
istoric P eepage an iquefiabl e ased on c	oils below su cerformance nd landside <u>e Soils</u> our liquefact malysis Res	tion assessr Water Surface	Approx. 20 bag rings) v nent, we ide Figure	entified pote	cLAY, over 6 d in ULE's 201 entially liquefia	50 feet of Poorly 4 SGDR Adder able soils within	y Graded SAI Idum. n this Reach (dient	Refer to Appen Field	dix E and	Through Seepage	Breakout
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istoric P eepage an iquefiabl e ased on c	oils below su cerformance nd landside <u>e Soils</u> our liquefact malysis Res	tion assessr Water Surface	Approx. 20 bag rings) v nent, we ide Figure	entified pote	cLAY, over 6 d in ULE's 201 entially liquefia	0 feet of Poorl 4 SGDR Adder ble soils within Exit Gra	y Graded SAI adum. h this Reach (dient Berm -	Refer to Appen Field	dix E and	Through Seepage	Breakout Height (ft)
istoric P eepage an iquefiabl e ased on c	vils below su verformance nd landside e Soils our liquefact nalysis Res Station 804+50 *Vertical dis	tion assess Water Surface 200-Year HTOL stance from t	Approx. 20 bag rings) v ment, we ide Figure E-61-B E-61-C he toe of the	entified pote No Posit No Posit levee (ground	d in ULE's 201 entially liquefia ee Toe ive Gradient ive Gradient d surface) to wh	4 SGDR Adder ble soils within Exit Gra Toe of 	y Graded SAI adum. h this Reach (dient Berm - -	Refer to Appen Field 0.06		Through Seepage No n/a	Breakout Height (ft) n/a
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10.62 PROJECT REACH N2, STATION 813+05

Based on our	r evaluatio	on, this read				c deformations	813		rade below	10-Year W	SE+3 feet.
eepage Eval			in naces in			Slope Stability		• <u> </u>	ruce below	io ica vi	on to neu
		WSEL, Unde	er Seepage:	Meets	Criteria			e 200-Year D	WSEL, LS:	Meets	Criteria
		EL, Throug			Criteria	, j	10	ate Seepage			Criteria
		HTOL, Und		Meets	Criteria			Rapid Draw		Meets	Criteria
						•	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	tability, LS:	Meets	Criteria
each Descr	ription							Reach Over	view		
			Sta	tion Limits:	806+00	to	825+00		1 Com	Mi+OA	September -
	Fe	ature(s) at U	Jpstream St	ation Limit:	Beginning of	Phase II Seepa	ge Berm			AN	Kart
	Featu	re(s) at Dov	vnstream St	ation Limit:	End of landsi	de residential					-18-11-
Appı	rox. Crowr	Elevation	Range (feet	, NAVD88):	34	to	35	0 · · ·		10 m 10 10	1-1
	A	pprox. Leve	ee Height R	ange (feet):	12.5	to	20	and the second second		- 8 - 1	an part of
				ange (feet):		to	18		2		San a Kath
		-	-	H:V) Range:		to	2.5:1	- And	Carry .		
	App		-	I:V) Range:		to	2.5:1	1-3		-	N
		W	aterside Co	onstraint(s):	Waterside to no waterside	e of slope at the	e waterway -		T ALLER .		L. K.A. IN
		I	andside Co	nstraint(s):	Residential/C			10	1		
	Landsid					rom 1806+00 to	1808+00		THE PARTY	11. 4	ALL OF THE
		-		h LSRP P1:				Ban .	a 7	10 mg 7 mg	
	Impro	vements as	sociated wit	h LSRP P2:	None			Containe.	and a		1.1.8 2
Propos	sed Impro	vements as:	sociated wit	th LSRP P3:	Fully Penetra	ting Cutoff Wa	11	114	× 7	the state	
											Stational Voter State
eneralized	Subsurfa	ce Conditio	ns								
eneralized		ce Conditio Prism Soils :		ND							
	Levee	Prism Soils:	Clayey SA) feet thick at t	oe of levee					
Lan Soils fistoric Per	Levee l ndside Sur s below su formance	Prism Soils : face Layer: rface layer:	Clayey SA Lean CLA Approx 35	Y, approx. 20 feet of SA1	ND, over 30 fe	et of lean CLAY		In the sold	2000' 24 6		
Lan Soils listoric Per eepage and vas installed	Levee 1 ndside Sur s below su f ormance 1 landside 1 in levee o	Prism Soils: face Layer: rface layer: boils during	Clayey SA Lean CLA Approx 35 g 1997 flood	Y, approx. 20 feet of SA1 event were	ND, over 30 fee			. In the mid 2	2000's a 24 fo	oot deep sh	ieet pile wal
Lan Soils fistoric Per eepage and as installed iquefiable S	Levee l ndside Sur s below su formance l landside d in levee o Soils	Prism Soils: face Layer: rface layer: boils during crown betwo	Clayey SA Lean CLA ^X Approx. 35 g 1997 flood een Station	Y, approx. 20 feet of SA1 event were 822+00 to 8	ND, over 30 fee reported in U 25+50.	et of lean CLAY	R Addendum				
Lan Soils listoric Per eepage and as installed iquefiable S ased on ou	Levee I ndside Sur s below su formance I landside I in levee o Soils r liquefact	Prism Soils: face Layer: rface layer: boils during crown betwo	Clayey SA Lean CLA ^X Approx. 35 g 1997 flood een Station	Y, approx. 20 feet of SA1 event were 822+00 to 8	ND, over 30 fee reported in U 25+50.	et of lean CLAY	R Addendum				
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10.63 PROJECT REACH N2, STATION 820+69

			R	EAC	H N2	- STA	A 820	+69			
Based on our leformations				e ULDC Cri	iteria. An Ope	rations and Ma	aintenance pl	lan should be	implement	ed for seisi	nic
Seepage Eval						Slope Stabilit	v Evaluation	Summary			
			er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year D	WSEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL, LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
							Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope S	tability, LS:	Meets	Criteria
Reach Desci	ription							Reach Over	<u>view</u>		
			Sta	tion Limits:	806+00	to	825+00			10+00+ m	- Herent -
			-			Phase II Seepa	•		1 1		Here Sta
						de residential /					-1920
Appi			Range (feet		34	to	35			1	the set
			ee Height R	-	12.5	to	20	Name and And	PHONE IN THE PHONE INTERPHONE I	A A	Cope -
			wn Width R	-	12	to	18		Carlo II	13146	- 13 - 13 - 13 - 13 - 13 - 13 - 13 - 13
	-	-	ide Slope (F	-	2.5:1 2:1	to	2.5:1		- K	1	N
	Арр		ide Slope (F	-		to e of slope at th	2.5:1 e waterway -				
		**		iistiaiiit(s).	no waterside	-	e waterway -				a state
		Ι	andside Co	nstraint(s):	Residential/O	akwood lake		1 States	(2		
	Landsid	le repairs as	sociated wi	th PL84-99:	None			skan.	JOUED	理人主	
	Impro	vements as	sociated wit	h LSRP P1:	None			alle to			
	Impro	vements as	sociated wit	h LSRP P2:	None			274 340	41		Las. Sa
Propos	sed Impro	vements as	sociated wit	h LSRP P3:	Fully Penetrat	ing Cutoff Wa	11	a lean	A 6	A store	
Generalized	lSubsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Clayey SA	ND to Lean	CLAY						
Lar	ndside Su	rface Layer:	Lean CLAY	Zannrov 13							
		-	Louin CL21	i, appiox 1.	s feet thick at t	oe of levee					
Soils	s below su	irface layer:				oe of levee et of Lean CLA	Y				
Historic Per	rformance		Approx. 40	feet of SAN	ND, over 12 fee	et of Lean CLA					
Historic Per Seepage and	r formance l landside	boils during	Approx. 40 g 1997 flood	feet of SAN	ND, over 12 fee reported in U			In the mid 2	2000's a 24 fe	oot deep sł	neet pile wall
Historic Per Seepage and	r formance l landside	boils during	Approx. 40 g 1997 flood	feet of SAN	ND, over 12 fee reported in U	et of Lean CLA		In the mid 2	2000's a 24 fe	oot deep sł	neet pile wall
Historic Per Seepage and was installed	r formance l landside l in levee o	boils during	Approx. 40 g 1997 flood	feet of SAN	ND, over 12 fee reported in U	et of Lean CLA		In the mid 2	2000's a 24 fe	oot deep sh	ieet pile wall
Historic Per Seepage and was installed Liquefiable S	r formance 1 landside 1 in levee o <u>Soils</u>	boils during crown betw	Approx. 40 g 1997 flood een Station	event were 822+00 to 8	ND, over 12 fee reported in UI 25+50.	et of Lean CLA	R Addendum				
Historic Per Seepage and was installed Liquefiable S Based on ou	r formance 1 landside 1 in levee o Soils 1 liquefact	boils during crown betwo	Approx. 40 g 1997 flood een Station	event were 822+00 to 8	ND, over 12 fee reported in UI 25+50.	et of Lean CLA LE's 2014 SGDI	R Addendum				
Historic Per Seepage and was installed Liquefiable S Based on ou	rformance 1 landside 1 in levee o Soils 11 liquefact alysis Res	boils during crown betwo	Approx. 40 g 1997 flood een Station ment, we ide	event were 822+00 to 8	ND, over 12 fee reported in UI 25+50.	et of Lean CLA LE's 2014 SGDI	R Addendum				F)
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Eistoric Per Seepage and was installed Liquefiable 5 Based on ou Seepage Ana	formance I landside d in levee o Soils Ir liquefact alysis Res Station	boils during crown betw tion assessi ults Water	Approx. 40 g 1997 flood een Station ment, we ide	feet of SAN event were 822+00 to 8 ntified pote	ND, over 12 fee reported in Ul 25+50. ntially liquefia	et of Lean CLA LEs 2014 SGDI ble soils within Exit Grad	R Addendum n this Reach (dient Berm	(Refer to App	pendix E and	l Appendix Through	
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10.64 PROJECT REACH NPL, STATION -12+00

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Based on	our evaluati	on, this read					- ()-				
Seepage H	Evaluation S	ummary				Slope Stabilit	v Evaluation S	Summary			
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	- State Seepage	e 200-Year D	WSEL, LS:	Meets	Criteria
20	00-Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage l	HTOL, LS:	Meets	Criteria
		HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Draw	lown, WS:	Meets	Criteria
							Seist	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
Reach De	scription							Reach Over	<u>view</u>		
			Sta	tion Limits:	(-)35+00	to	00+00	A DE LE			
	Fe	eature(s) at U	Jpstream St	ation Limit:	South Manth	ey Road/powe	r lines		青,田一叶	13-	
	Featu	re(s) at Dov	vnstream St	ation Limit:	South Manth	ey Road (North	1)	200		No. 1	
Aj	pprox. Crow	n Elevation I	Range (feet,	NAVD88):	19	to	23		THE NEW	NR CO	Real Co
	A	Approx. Leve	ee Height R	ange (feet):	8	to	10.5		and it	1000	ho -
	A	Approx. Crov	vn Width R	ange (feet):	17	to	47	Intentes a	A DESCRIPTION OF	S*L	Cope -
	Ар	prox. Lands	ide Slope (H	I:V) Range:	2:1	to	4.5:1		282 776	00 0	The Party
	App	orox. Waters	ide Slope (H	I:V) Range:	1.7:1	to	3:1				The sea
		W	aterside Co	nstraint(s):	Overhead por	wer lines, water	rway near				N
					William Moss			四二.	1111 D		
		L	andside Co	nstraint(s):		o -6+50 - agricu		A Aba	SAR		
						-6+50 - residen	tial	Se las		400 A	
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	posed Impro zed Subsurfa			II LSKP PS.	None			VOR DO			
<u>sener anz</u>			<u>115</u>								
-		Drig m Soile .	Cilty CANT	`							
1			Silty SANI		faat thick at la	vee too					
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So Historic I	Landside Su oils below su Performance	rface Layer: urface layer: 2	Silty SANI Interlayere), approx. 8 d SILT, Lea							
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So Historic I No record Liquefiab Based on	Landside Su oils below su Performance led events in <u>le Soils</u> our liquefac Analysis Res	rface Layer: Irface layer: ULE's 2014 tion assessm sults Water Surface	Silty SANI Interlayere SGDR Add nent, we are Figure), approx. 8 d SILT, Lea endum not consid Lev No Positi	n CLAY and S ering liquefiab ee Toe	AND le soils in our : Exit Gra Toe of	dient Berm	Fie	ld S	Seepage	Height (ft)
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10.65 PROJECT REACH O1, STATION 825+86

			R]	EAC	H O1	- STA	825	+86			
		on, this read g the 200-ye		e ULDC Cri	iteria. An Ope	rations and Ma	aintenance pl	lan should be	implement	ed for seisi	nic
Seepage Eva	luation Su	<u>ımmary</u>				Slope Stabilit	v Evaluation	Summary			
20	00-Year DV	WSEL, Und	er Seepage:	Meets	Criteria	Steady	State Seepag	e 200-Year D	WSEL, LS:	Meets	Criteria
200-	Year DWS	SEL, Throug	h Seepage:	Meets	Criteria		Steady St	ate Seepage	HTOL, LS:	Meets	Criteria
	1	HTOL, Und	er Seepage:	Meets	Criteria			Rapid Draw	down, WS:	Meets	Criteria
						•	Seis	mic Slope Sta	bility, WS:	Fails	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
Reach Desc	ription							Reach Over	view		
			Sta	tion Limits:	825+00	to	835+00		-	12+00	
	Fe	ature(s) at U	Jpstream St	ation Limit:	Residential L	ots and Street				A	K
	Featu	re(s) at Dov	wns tream St	ation Limit:	Begin LSRP F	2 Berm				2 Those	
App	rox. Crowr	n Elevation	Range (feet	NAVD88):	34	to	35	an 1 10			1-1
	А	pprox. Leve	ee Height R	ange (feet):	14.5	to	16.5	Part Internet			Sec. 10
		pprox. Crov	-	-	32	to	42		-	100	
	Ap	prox. Lands	ide Slope (H	I:V) Range:	3:1	to	3:1		Const.		
	-	rox. Waters	-	-	1.7:1	to	2.3:1			18 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	N
			-	-	Waterside too	e of slope at the	e waterway -		a former a	3	
					no waterside	bench.			- S- C-		
		I	andside Co	nstraint(s):	Seepage Bern	n and Resident	al	189/20	Le T	- 41 - C	KIN STA
	Landsid	le repairs as	sociated wi	th PL84-99:	Berm				TUELO	H. ALEN	
	Impro	vements as:	sociated wit	h LSRP P1:	None			Rob	as and		C CONTRACT
	Impro	vements as	sociated wit	h LSRP P2:	Drained Seep	age Berm		10 340	411		And Street
Propo	sed Impro	vements as:	sociated wit	h LSRP P3:	None			a lad		2. M	
Generalized	lSubsurfa	ce Conditio	ns								
	Levee	Prism Soils:	Clayey SA	ND to SILT							
La	ndside Sui	rface Layer:		r, approx. 20) feet thick at l	evee toe, Appr	ox. 4 feet of s	Silty SAND a	Berm toe		
		-	Lean CLA			evee toe, Appr 12 feet of Lean		Silty SAND a	Berm toe		
	s below su	irface layer:	Lean CLA					Silty SAND a	Berm toe		
Soils Historic Per	s below su rformance	urface layer:	Lean CLA Approx 40	feet of silty	SAND, over	12 feet of Lean	CLAY	-		were repoi	ted in ULE's
Soils Historic Per Seepage, lan	s below su rformance ndside boil	urface layer:	Lean CLA Approx 40	feet of silty	SAND, over		CLAY	-		were report	ted in ULE's
Soils listoric Per Seepage, lan	s below su rformance ndside boil	urface layer:	Lean CLA Approx 40	feet of silty	SAND, over	12 feet of Lean	CLAY	-		were repor	ted in ULE's
Soils Historic Per Seepage, lan 2014 SGDR 4	s below su rformance ndside boil Addendun	urface layer:	Lean CLA Approx 40	feet of silty	SAND, over	12 feet of Lean	CLAY	-		were repor	ted in ULE's
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10.66 PROJECT REACH O2A, STATION 844+81

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Resed on a	our evaluati	on, this read				- ~ -					
	valuation St	· · · · · · · · · · · · · · · · · · ·	in meets th	e olde en		Slope Stabilit	v Evaluation 9	Summary			
		WSEL, Unde	er Seenage.	Meets	Criteria	r –		e 200-Year DW	VSEL IS	Meets	Criteria
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Reach Des	scription							Reach Overvi			
			Sta	tion Limits:	835+00	to	849+65			Charles T	-
	Fe	ature(s) at U	Jpstream St	ation Limit:	End of LSRP	P2 berm, Start	of LSRP P3		青月 一	1 +10	R. W. Link
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		prox. Lands				to	3:1		Store Mill	11	THE REAL PROPERTY
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		L	andside Co	onstraint(s):	Graded reside	ential lots and s	streets	1 Stan	Re II	7 66 - C	
	Landsic	le repairs as	sociated wi	th PL84-99:	None				TODELIG ET	AL	
	Impro	vements ass	sociated wit	h LSRP P1:	None			State 1			
	Impro	vements ass	sociated wit	h LSRP P2:	Drained Seep	age Berm w/ch	imney drain		11/10		
Pror	oosed Impro	vomonte occ									
110	oosee mpro	venients ass	sociated wit	h LSRP P3:	None						
-	-	ce Conditio		h LSRP P3:	None						and the second
-	ed Subsurfa		ns								
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Generaliz L So Historic P Seepage, E Addendur Liquefiabl Based on o Seepage A	ed Subsurfa Levee andside Su bils below su erformance andside boi n <u>e Soils</u> our liquefact malysis Res Station <u>844+81</u> *Vertical di Through see <u>pility Analys</u> Station	tee Conditio Prism Soils: rface Layer: urface layer: s, and water s, and water surface 200-Year HTOL stance from th page under F sis Results Case Analyzed SS - 200yr SS - HTOL	ns Clayey SA FAT CLAN Poorly Grad rside wavew ment, we are Figure E-65-B E-65-C he toe of the ITOL condit Water Surface (ft) 29.7 32.7	ND and Lea A, approx. 10 ded SAND vash erosion not consid Lev No Posit levee (ground ions are not p Figure E-65-D E-65-E	n CLAY) to 15 feet thic n at Station 84 ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 	5+00 to 846+00 le soils in our Exit Gra Toe of No Positiv No Positiv vere the phreatic uation. of Safety cular) Landside 2.1 2.1	slope stability dient Berm e Gradient e Gradient surface is calcu Factor o (Non-C Waterside n/a n/a	y analyses. Field ulated to day lig f Safety Sircular) Lands ide n/a n/a	,	Through Seepage No n/a	Breakout Height (ft)* n/a



10.67 PROJECT REACH O2B, STATION 850+50

			RE	ACI	H O2H	B - ST	A 850	0+50			
Basedon	our evaluati	on, this read									
	Evaluation St		ii iikeus uit			Slope Stabilit	v Evaluation S	Summarv			
Seepage		WSEL, Unde	er Seenage	Meets	Criteria	T -	-	e 200-Year DV	VSEL LS	Meets	Criteria
20	00-Year DWS				Criteria	Steady		ate Seepage I			Criteria
		HTOL, Unde	10		Criteria		Steady St	Rapid Drawd			Criteria
			i seepage.			I	Seisi	mic Slope Stal			Criteria
								smic Slope Sta	-		Criteria
Reach Des	scription						Bei	Reach Overv	÷	Meets	Crittia
<u>Reach Des</u>	scription		Sta	tion Limits:	849+65	to	853+50	Reactioner	iew	Sal of the	
	Fe	eature(s) at I				for S. Williams				0+00-	
						improvement		Can			C.C.
									6 1 10		
AI	pprox. Crowi		-			to	35	10 · · · · · · · · · · · · · · · · · · ·		1100	
		Approx. Leve	-	.		to	16	A PLANNE	Fille	AL	Co parts
		Approx. Crov		.		to	12	Section 1	Je Lan	Side	States and
	-	prox. Lands	- ·			to	3:1			1	
	Арр	orox. Waters	- ·			to	2:1	1.9-16-		A AL	N
		W	aterside Co	nstraint(s):		nch/docks/pip	e		entrol a a		
		т	andeida Ca	netraint(a).	penetration	idental lots, re	toining11		1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
	Landala					idental lots, re	taining walls	100000	The last	- (a-	State State
		le repairs as						-			
	-	vements ass						State 1			State in the
	-	vements ass				D (1		100 340	1112		
Prop	posed Impro	vements ass	sociated wit	h LSRP P3:	Drained Seep	age Berm w/ch	imney drain				
I				D, SAND an	d SILT						
So Historic P		urface layer:	Lean CLAY Approx. 40	(and SILT, feet of SAN	approx. 10-13 ND, over 15 fee	feet thick at to et of Lean CLA					
So Historic P	oils below su Performance ge or slope s	urface layer:	Lean CLAY Approx. 40	(and SILT, feet of SAN	approx. 10-13 ND, over 15 fee						
Sc <u>Historic P</u> No seepag Liquefiabl	oils below su Performance ge or slope s le Soils	tabilty perfo	Lean CLAY Approx. 40 ormance issu	and SILT, feet of SAN	approx. 10-13 ND, over 15 fee d.		Y	y analyses.			
So Historic P No seepag Liquefiabl Based on	oils below su Performance ge or slope s le Soils	tabilty perfo	Lean CLAY Approx. 40 ormance issu	and SILT, feet of SAN	approx. 10-13 ND, over 15 fee d.	et of Lean CLA	Y	y analyses.			
So Historic P No seepag Liquefiabl Based on	oils below su Performance ge or slope s le <u>Soils</u> our liquefact Analysis Res	tabilty perfo	Lean CLAN Approx. 40 prmance issu	and SILT, feet of SAN	approx. 10-13 ND, over 15 fee d.	et of Lean CLA	Y slope stability	y analyses.		Fhrough	Breakout
So Historic P No seepag Liquefiabl Based on	oils below su Performance ge or slope s le Soils our liquefact	tabilty perfo	Lean CLAY Approx. 40 ormance issu	i and SILT, feet of SAN les reported not consid	approx. 10-13 ND, over 15 fee d.	et of Lean CLA	Y slope stability dient	y analyses. Fiel		Fhrough Seepage	
So Historic P No seepag Liquefiabl Based on	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station	tabilty performance layer: tabilty performance tion assessment sults Water	Lean CLAN Approx. 40 prmance issu	i and SILT, feet of SAN ues reported not consid	approx. 10-13 ND, over 15 fea 1. ering liquefiab	et of Lean CLA de soils in our Exit Gra	SY slope stability dient Berm	-		Ũ	
So Historic P No seepag Liquefiabl Based on	oils below su Performance ge or slope s le <u>Soils</u> our liquefact Analysis Res	tabilty perfo tabilty perfo tion assess wats Water Surface	Lean CLAY Approx. 40 ormance issu nent, we are Figure	and SILT, feet of SAN ues reported not consid Lev No Posit	approx. 10-13 ND, over 15 fea d. ering liquefiab ee Toe	et of Lean CLA le soils in our Exit Gra Toe of	slope stability dient Berm	Fiel		Seepage	Height (ft)
Sc Historic P No seepag Liquefiabl Based on	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station 850+50 *Vertical di	tabilty performance tabilty performance tion assessment sults Water Surface 200-Year HTOL stance from th	Lean CLAY Approx. 40 ormance issue nent, we are Figure E-66-B E-66-C ne toe of the	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (ground	approx. 10-13 ND, over 15 fee 1. ering liquefiab ee Toe ive Gradient ive Gradient	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.3 ere the phreatic	Slope stability dient Berm 19 36	Fiel 	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station <u>850+50</u> *Vertical dia Through see	tabilty performance tabilty performance tion assessm sults Water Surface 200-Year HTOL stance from the page under F	Lean CLAY Approx. 40 ormance issue nent, we are Figure E-66-B E-66-C ne toe of the	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (ground	approx. 10-13 ND, over 15 fea d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.3 ere the phreatic	Slope stability dient Berm 19 36	Fiel 	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station 850+50 *Vertical di	tabilty performance tabilty performance tion assessm sults Water Surface 200-Year HTOL stance from the page under F	Lean CLAN Approx. 40 ormance issu- ment, we are Figure E-66-B E-66-C he toe of the ITOL condit	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (ground	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.2 ere the phreatic uation.	slope stability dient Berm 19 36 surface is calcu	Fiel ulated to day lig	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bills below su Performance ge or slope s le Soils our liquefact Analysis Res Station <u>850+50</u> *Vertical dir Through sec billity Analys	tabilty performance tabilty performance tion assessment sults Water Surface 200-Year HTOL stance from the page under F sis Results Case	Lean CLAN Approx. 40 ormance issu- ment, we are Figure E-66-B E-66-C he toe of the ITOL condit	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (ground ions are not p	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.3 ere the phreatic	slope stability dient Berm 9 36 surface is calcu Factor o	Fiel ulated to day lig	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station 850+50 *Vertical dia Through see	tabilty performance tabilty performance tion assessment sults Water Surface 200-Year HTOL stance from the spage under F sis Results	Lean CLAN Approx. 40 ormance issu- ment, we are Figure E-66-B E-66-C he toe of the ITOL condit Water Surface	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (ground	approx. 10-13 ND, over 15 fea d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ	et of Lean CLA de soils in our Exit Gra Toe of 0,1 0,2 ere the phreatic uation.	slope stability dient Berm 9 36 surface is calcu Factor o (Non-C	Fiel ulated to day lig f Safety Sircular)	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bills below su Performance ge or slope s le Soils our liquefact Analysis Res Station <u>850+50</u> *Vertical dir Through sec billity Analys	tabilty performance tabilty performance tion assessministry water Surface 200-Year HTOL stance from the case Analyzed	Lean CLAN Approx. 40 ormance issu- ment, we are Figure E-66-B E-66-C ne toe of the ITOL condit Water Surface (ft)	and SILT, feet of SAN res reported not consid Lev No Posit No Posit levee (groundions are not p Figure	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside	et of Lean CLA de soils in our Exit Gra Toe of 0,1 0,2 ere the phreatic uation. of Safety cular) Landside	slope stability dient Berm 9 36 surface is calcu Factor o (Non-C Waterside	Fiel ulated to day lig f Safety Sircular) Lands ide	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bills below su Performance ge or slope s le Soils our liquefact Analysis Res Station <u>850+50</u> *Vertical dir Through sec billity Analys	tabilty performance tabilty performance tion assessministry water Surface 200-Year HTOL stance from the case Analyzed SS - 200yr	Lean CLAN Approx. 40 ormance is sum nent, we are Figure E-66-B E-66-C he toe of the ITOL condit Water Surface (ft) 29.8	and SILT, feet of SAN ues reported not consid Lev No Posit No Posit levee (ground ions are not p Figure E-66-D	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor o (Circ Waterside 	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.2 tere the phreatic uation. of Safety cular) Landside 2.4	slope stability dient Berm 19 36 surface is calco (Non-C Waterside n/a	Fiel ulated to day lig f Safety Sircular) Lands ide n/a	d S	Seepage No n/a	Height (ft)* n/a
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So Historic F No seepag Liquefiabl Based on o Seepage A	bills below su Performance ge or slope s le Soils our liquefact Analysis Res Station <u>850+50</u> *Vertical dir Through sec billity Analys	tabilty performance tabilty performance tabilty performance tion assessment sults Water Surface 200-Year HTOL stance from the page under F sis Results Case Analyzed SS - 200yr SS - HTOL RDD	Lean CLAY Approx. 40 ormance issue nent, we are Figure E-66-B E-66-C ne toe of the ITOL condit Water Surface (ft) 29.8 32.8 18.9	and SILT, feet of SAN les reported not consid Lev No Posit No Posit levee (ground ions are not p Figure E-66-D E-66-E E-66-D	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 1.7	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.3 ere the phreatic uation. of Safety ular) Landside 2.4 2.4 	slope stability dient PBerm 19 36 surface is calcu Factor o (Non-C Waterside n/a n/a n/a	Fiel ulated to day lig of Safety Ercular) Lands ide n/a n/a n/a	d S	Seepage No n/a	Height (ft)* n/a
So Historic F No seepag Liquefiabl Based on o Seepage A	bils below su Performance ge or slope s le Soils our liquefact Analysis Res Station *Vertical dia Through sec bility Analys Station	tabilty performance tabilty performance tion assessment water Surface 200-Year HTOL stance from the page under F sis Results Case Analyzed SS - 200yr SS - HTOL	Lean CLAM Approx. 40 ormance is sum nent, we are Figure E-66-B E-66-C ne toe of the ITOL condit Water Surface (ft) 29.8 32.8	and SILT, feet of SAN ues reported not consid Lev No Posit No Posit levee (groun ions are not p Figure E-66-D E-66-E	approx. 10-13 ND, over 15 fee d. ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh part of this eval Factor of (Circ Waterside 	et of Lean CLA de soils in our Exit Gra Toe of 0.1 0.2 ere the phreatic uation. of Safety ular) Landside 2.4 2.4	slope stability dient Berm 9 36 surface is calcu Factor o (Non-C Waterside n/a n/a	Fiel ulated to day lig of Safety Circular) Lands ide n/a n/a	d S	Seepage No n/a	Height (ft)* n/a



10.68 PROJECT REACH O2B, STATION 851+20

			RE	ACE	I O2B	- ST	'A 85	1+20			
Based on o	ur evaluatio	on, this read									
	aluation Su					Slope Stabilit	v Evaluation	Summary			
		WSEL, Unde	er Seepage:	Meets	Criteria	[e 200-Year D	WSEL, LS:	Meets	Criteria
		SEL, Throug			Criteria			ate Seepage l			Criteria
		HTOL, Unde		Meets	Criteria			Rapid Draw		Meets	Criteria
						L	Seis	mic Slope Sta	bility, WS:	Meets	Criteria
							Sei	smic Slope St	ability, LS:	Meets	Criteria
Reach Desc	cription							Reach Over	view		
			Sta	tion Limits:	849+65	to	853+50	I LEGH	10-1-		Land at a lot
	Fe	ature(s) at U	Jpstream St	ation Limit:	South Willian	nson Road			E H	ALE	KA
	Featu	re(s) at Dov	vnstream St	ation Limit:	End of LSRP	Phase 2 / Start	of Phase 3			THIS.	
App	prox. Crowi	n Elevation 1	Range (feet,	NAVD88):	34	to	35			and store	
	A	Approx. Leve	ee Height R	ange (feet):	13.5	to	16	State State		-125	Barris -
	А	approx. Crov	vn Width R	ange (feet):	12	to	12		Tel Min	16.00	
	-	prox. Lands	-	-	3:1	to	3:1		Contraction of the second	Sta I	
	App	rox. Waters	• ·	, 0	2:1	to	2:1	Jan In		8	N
		W	aterside Co	nstraint(s):		nch/docks/pip	e		anna) a a	5	
		т	andside Co	nstraint(s).	penetration Trees and res	idental lots, re	taining walls	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	5		
				nstraint(s).		Shore lake 40	-	Store .	C In	- <u>18-</u>	
	Landsic	le repairs as	sociated wi	th PL84-99:	None			P C	TOUGHT STA		
	Impro	vements as	sociated wit	h LSRP P1:	None			Mar N		1 1	
	Impro	vements as	sociated wit	h LSRP P2:	None				18 11		ALL STA
					rione				121		State of Lot of
Propo	osed Impro	vements as				age Berm w/ch	imney drain	-			
-		vements ass ce Conditio	sociated wit			age Berm w/ch	imney drain				
-	dSubsurfa		sociated wit <u>ns</u>	h LSRP P3:	Drained Seep	age Berm w/ch	imney drain				
Generalize	d Subsurfa Levee	ce Conditio Prism Soils:	sociated wit <u>ns</u> Silty SANE	h LSRP P3: D, SAND an	Drained Seep d SILT	age Berm w/ch feet thick at to					
Generalize	d Subsurfa Levee andside Sur	ce Conditio Prism Soils : rface Layer:	sociated wit <u>ns</u> Silty SANE Lean CLAY	h LSRP P3: D, SAND an í and SILT,	Drained Seep d SILT approx. 10-13		e of levee				
Generalize La Soi	d Subsurfa Levee andside Sur	ce Conditio Prism Soils : rface Layer: ırface layer:	sociated wit <u>ns</u> Silty SANE Lean CLAY	h LSRP P3: D, SAND an í and SILT,	Drained Seep d SILT approx. 10-13	feet thick at to	e of levee				
Generalize La Soi Historic Pe	d Subsurfa Levee andside Sur ls below su erformance	ce Conditio Prism Soils : rface Layer: ırface layer:	sociated wit n <u>s</u> Silty SANE Lean CLAN Approx. 40	h LSRP P3: D, SAND an Y and SILT, feet of SAN	Drained Seep d SILT approx. 10-13 ND, over 15 fee	feet thick at to	e of levee				
Generalize La Soi Historic Pe	d Subsurfa Levee andside Sur ls below su erformance	rtace Conditio Prism Soils: rface Layer: urface layer: 2	sociated wit n <u>s</u> Silty SANE Lean CLAN Approx. 40	h LSRP P3: D, SAND an Y and SILT, feet of SAN	Drained Seep d SILT approx. 10-13 ND, over 15 fee	feet thick at to	e of levee				
Generalize La Soi Historic Pe No seepage	d Subsurfa Levee andside Sun Is below su erformance e or slope s	rtace Conditio Prism Soils: rface Layer: urface layer: 2	sociated wit n <u>s</u> Silty SANE Lean CLAN Approx. 40	h LSRP P3: D, SAND an Y and SILT, feet of SAN	Drained Seep d SILT approx. 10-13 ND, over 15 fee	feet thick at to	e of levee				
Generalize La Soi fistoric Pe No seepage .iquefiable	d Subsurfa Levee andside Sun Is below su erformance e or slope s Soils	tee Conditio Prism Soils: rface Layer: urface layer: 2 tabilty perfo	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issu	h LSRP P3: D, SAND an Y and SILT, feet of SAN ues reported	Drained Seep d SILT approx. 10-13 ND, over 15 fee l.	feet thick at to	e of levee Y				
Generalize La Soi Historic Pe No seepage Liquefiable Based on o	d Subsurfa Levee andside Sur Is below su erformance e or slope s Soils ur liquefact	ce Conditio Prism Soils: rface Layer: urface layer: tabilty perfo	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issu	h LSRP P3: D, SAND an Y and SILT, feet of SAN ues reported	Drained Seep d SILT approx. 10-13 ND, over 15 fee l.	feet thick at to	e of levee Y	y analyses.			
Generalize La Soi Historic Pe No seepage Liquefiable Based on o	d Subsurfa Levee andside Sun Is below su erformance e or slope s Soils	ce Conditio Prism Soils: rface Layer: urface layer: tabilty perfo tabilty perfo	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issu	h LSRP P3: D, SAND an Y and SILT, feet of SAN ues reported	Drained Seep d SILT approx. 10-13 ND, over 15 fee l.	feet thick at to et of Lean CLA le soils in our	e of levee Y slope stabilit	y analyses.			
Generalize La Soi Historic Pe No seepage Liquefiable Based on o	d Subsurfa Levee andside Sur Is below su erformance e or slope s Soils ur liquefact	ce Conditio Prism Soils: fface Layer: urface layer: tabilty perfo tabilty perfo tion assessi sults Water	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issu	h LSRP P3: D, SAND an I and SILT, feet of SAN les reported not consid	Drained Seep d SILT approx. 10-13 ND, over 15 fea 1. ering liquefiab	feet thick at to et of Lean CLA le soils in our Exit Gra	e of levee Y slope stabilit	1		Through	Breakout
Generalize La Soi Historic Pe No seepage Liquefiable Based on o	d Subsurfa Levee andside Sur Is below su erformance e or slope s Soils ur liquefact nalysis Res	tee Conditio Prism Soils: rface Layer: rface layer: tabilty perfo tabilty perfo tion assessi sults Water Surface	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issue ment, we are Figure	h LSRP P3: D, SAND an I and SILT, feet of SAN ues reported not consid Lev	Drained Seep d SILT approx. 10-13 ND, over 15 fea l. ering liquefiab ee Toe	feet thick at to et of Lean CLA le soils in our Exit Gra Toe of	e of levee .Y slope stabilit dient Berm	y analyses.		Seepage	Height (ft)
La Soi fistoric Pe Jo seepage Liquefiable Based on o	d Subsurfa Levee andside Sur Is below su erformance e or slope s Soils ur liquefact nalysis Res	tee Condition Prism Soils: rface Layer: rface layer: tabilty perfo tabilty perfo uts water Surface 200-Year	sociated wit ns Silty SANE Lean CLAN Approx. 40 prmance issue ment, we area Figure E-67-B	h LSRP P3: D, SAND an and SILT, feet of SAN les reported not consid Lev No Positi	Drained Seep d SILT approx. 10-13 ND, over 15 fee 1. ering liquefiab ee Toe ive Gradient	feet thick at to et of Lean CLA le soils in our Exit Gra Toe of No Positiv	e of levee Y slope stabilit dient Berm e Gradient	Fie	ld S	Seepage No	Height (ft) n/a
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10.69 PROJECT REACH P1, STATION 866+50

			R	EAC	HP1	- STA	A 866	+50			
Based on o	ur evaluati	on, this read									
	valuation St		in needs th			Slope Stabilit	v Evaluation	Summary			
		WSEL, Unde	er Seenage	Meets	Criteria	-	-	je 200-Year DW		Meets	Criteria
		SEL, Throug			Criteria	Steady		tate Seepage H			Criteria
200		HTOL, Unde			Criteria		Steady 5	Rapid Drawd	· · · · ·		Criteria
		in ol, onu	or beepage.	in ceus	Crittin	1	Seis	mic Slope Stab			Criteria
								ismic Slope Sta	· · •		Criteria
Reach Des	cription							Reach Overvi			
			Sta	tion Limits:	853+50	to	867+00		1000	Turk - T	Saleste and
	Ea	oturo(a) at I	In a tra ana Ct	otion Limit.	A mm row 450 f	act couth of im	riantian ditah		B H		Kr CA
	Fe	ature(s) at C	Jpstream St	ation Limit:	Approx. 4501	eet south of in	rigation ditch			CT CON	
	Featu	re(s) at Dov	vnstream St	ation Limit:	South Williar	nson Road					1-1
Ap	prox. Crowi	n Elevation l	Range (feet,	NAVD88):	34.5	to	35	PAR BOTTOM		-	in a second
		Approx. Leve	-			to	15	AND DE STATE		Hay .	
		pprox. Crov			15	to	20		C. C. MA	886	10 2-03
	-	prox. Lands			2.5:1	to	3.5:1				N
	App	rox. Waters			2.5:1	to	3.5:1		ones of a	5	
		W	aterside Co	nstraint(s):	Dryland levee	9					
		L	andside Co	nstraint(s):	Agricultural l	and		The states		24	
	Landsic	le repairs as	sociated wi	th PL84-99:	None				0		
	Impro	vements ass	sociated wit	h LSRP P1:	None			102	120	-	
	Impro	vements ass	sociated wit	h LSRP P2:	None			-10 200	4400		A
		vements ass		h LSRP P3:	None						Referre
Generalize		ce Conditio	ns								
	Lovoo										
				-	yey SAND an	-					
	andside Su	rface Layer:	SILT with s	and, Sandy	SILT and Lea	an CLAY					
So	andside Su ils below su	rface Layer: urface layer:	SILT with s	and, Sandy	-	an CLAY					
So: Historic Po	andside Sur ils below su e rformance	rface Layer: irface layer: 2	SILT with s Silty SANE	and, Sandy D and Poorly	SILT and Lea	n CLAY D with SILT			. 1052		-20.1
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So Historic Po According high-water	andside Sur ils below su e rformance to the DW event caus	rface Layer: 1rface layer: 2 R Walthall S ed by a brea	SILT with s Silty SANE Glough GER ach of an up	and, Sandy D and Poorly Draft 2, way sstream leve	SILT and Lea Graded SAN ve wash erosic e in 1996-1997	n CLAY D with SILT on was recorde V. Some unders	eepage was o	bserved by K	SN somewh	ere along	0
So: Historic Po According high-water levee durin	andside Sur ils below su erformance to the DW event caus g the same	rface Layer: 1rface layer: 2 R Walthall S ed by a brea	SILT with s Silty SANE Glough GER ach of an up	and, Sandy D and Poorly Draft 2, way sstream leve	SILT and Lea Graded SAN ve wash erosic e in 1996-1997	n CLAY D with SILT on was recorde V. Some unders	eepage was o	•	SN somewh	ere along	0
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So: Historic Pa According high-water levee durin Liquefiable Based on o	andside Su: ils below su erformance to the DW event caus g the same e Soils our liquefact	rface Layer: urface layer: R Walthall S ed by a brea 1996-1997 h tion assessm	SILT with s Silty SANT Clough GER ach of an up igh-water e	and, Sandy O and Poorly Draft 2, way ostream leve vent along t	SILT and Lea Graded SAN ve wash erosid e in 1996-1997 the dryland lev	n CLAY D with SILT on was recorde V. Some unders	eepage was o he locations o	observed by K of underseepag	SN somewh	ere along	0
So: Historic Pa According high-water levee durin Liquefiable Based on o	andside Sur ils below su erformance to the DW event caus og the same e Soils	rface Layer: <u>irface layer:</u> R Walthall S ed by a brea 1996-1997 h tion assessm sults	SILT with s Silty SANT Clough GER ach of an up igh-water e	and, Sandy O and Poorly Draft 2, way ostream leve vent along t	SILT and Lea Graded SAN ve wash erosid e in 1996-1997 the dryland lev	n CLAY D with SILT on was recorde 7. Some unders vee, however t ble soils in our	eepage was o he locations o slope stabilit	observed by K of underseepag	SN somewh ge are unkno	ere along own.	the dryland
So: Historic Pa According high-water levee durin Liquefiable Based on o	andside Su: ils below su erformance to the DW event caus g the same e Soils our liquefact	rface Layer: Inface layer: R Walthall S ed by a brea 1996-1997 h tion assessm sults Water	SILT with s Silty SANT Clough GER ach of an up igh-water e	and, Sandy D and Poorly Draft 2, wav sstream leve vent along t not consid	SILT and Lea 7 Graded SAN 7e wash erosic e in 1996-1997 the dryland lev ering liquefiat	n CLAY D with SILT on was recorde '. Some unders vee, however t ole soils in our Exit Gra	eepage was of he locations of slope stability dient	bserved by Ki of underseepaş y analyses.	SN somewh ge are unkno	ere along own. Through	the dryland Breakout
So: Historic Pa According high-water evee durin Liquefiable Based on o	andside Su: ils below su erformance to the DW! event caus g the same e <u>Soils</u> our liquefact nalysis Res	rface Layer: rrface layer: R Walthall S ed by a brea 1996-1997 h tion assessm sults Water Surface	SILT with s Silty SANI ilough GER uch of an up igh-water e nent, we are Figure	and, Sandy D and Poorly Draft 2, wav sstream leve vent along t not consid	SILT and Lea 7 Graded SAN 7 e wash erosic e in 1996-1997 the dryland lev ering liquefiat ee Toe	n CLAY D with SILT on was recorde 7. Some unders vee, however t ble soils in our	eepage was of he locations of slope stability dient	observed by K of underseepag	SN somewh ge are unkno	ere along own. Through Seepage	the dryland Breakout Height (ft)
So: Historic Pa According high-water levee durin Liquefiable Based on o	andside Su: ils below su erformance to the DW! event caus g the same e <u>Soils</u> our liquefact nalysis Res	rface Layer: rrface layer: R Walthall S ed by a brea 1996-1997 h tion assessm sults Water Surface 200-Year	SILT with s Silty SANI clough GER cch of an up igh-water e nent, we are Figure E-68-B	and, Sandy Dand Poorly Draft 2, wav sstream leve vent along t not consid	SILT and Lea 7 Graded SAN 7 e wash erosic e in 1996-1997 the dryland lev ering liquefiat ee Toe).34	n CLAY D with SILT on was recorde 7. Some unders vee, however t ble soils in our Exit Gra Toe of	eepage was of he locations of slope stability dient FBerm	y analyses.	SN somewh ge are unkno	ere along own. Through Seepage Yes**	Breakout Height (ft) ² 2.5
So: Historic P According high-water levee durin Liquefiable Based on o	andside Sur ils below su erformance to the DW event caus g the same e Soils bur liquefact nalysis Res Station <u>866+50</u>	rface Layer: rrface layer: R Walthall S ed by a brea 1996-1997 h tion assess sults Water Surface 200-Year HTOL	SILT with s Silty SANI clough GER ich of an up igh-water e ment, we are Figure E-68-B E-68-C	and, Sandy Dand Poorly Draft 2, wav sstream leve vent along t not consid	SILT and Lea 7 Graded SAN 7 e wash erosic e in 1996-1997 the dryland lev ering liquefiat ee Toe 0.34 0.44	n CLAY D with SILT on was recorde 7. Some unders vee, however t ole soils in our Exit Gra Toe of 	eepage was c he locations o s lope stabilit dient 	y analyses.	SN somewh ge are unknow	Through Seepage Yes** n/a	the dryland Breakout Height (ft) ³
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So: Historic P According high-water levee durin Liquefiable Based on o Seepage A	andside Sur erformance to the DWI event caus g the same <u>2 Soils</u> our liquefact nalysis Res Station <u>866+50</u> *Vertical dir Through sec **Exits onto illity Analys	rface Layer: Inface layer: R Walthall S ed by a brea 1996-1997 h tion assessm sults Water Surface 200-Year HTOL stance from tl epage under F o fine grained is Results Case Analyzed SS - 200yr SS - HTOL RDD	SILT with s Silty SANE Clough GER the of an up igh-water end nent, we are Figure E-68-B E-68-B E-68-C the toe of the TTOL condit slope, theref Water Surface (ft) 29.9 32.8 19.0	and, Sandy Dand Poorly Draft 2, way stream leve vent along t not consid Leve ((levee (ground ions are not p Figure E-68-D E-68-E E-68-D	SILT and Lea Graded SAN Ve wash erosic e in 1996-1997 the dryland lev ering liquefiat eee Toe 0.34 0.44 d surface) to wh part of this eval t "meets criteri Factor of (Circ Waterside 2.0	n CLAY D with SILT on was recorde . Some unders vee, however t ele soils in our Exit Gra Exit Gra Toe of a'' for through se of Safety cular) Landside 1.8 1.7	eepage was c he locations o slope stabilit Berm 	y analyses. y analyses. Fiek ulated to day light of Safety Circular) Landside n/a n/a n/a	SN somewh ge are unknow	Through Seepage Yes** n/a	Breakout Height (ft) ² 2.5
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10.70 PROJECT REACH P2, STATION 876+00

			R	EAC	H P2	- STA	876 -	+00		
Based on o	our evaluati	on, this read	ch does not :	meet the UI	DC Criteria.					
Seepage E	valuation S	ummary				Slope Stabilit	y Evaluation S	Summary		
	200-Year D	WSEL, Unde	er Seepage:	Meets	Criteria	Steady	State Seepage	e 200-Year DWSEI	L, LS: Meet	s Criteria
20	0-Year DWS	SEL, Throug	h Seepage:	Fails	Criteria		Steady Sta	ate Seepage HTOI	L, LS: Meet	s Criteria
		HTOL, Unde	er Seepage:	Meets	Criteria			Rapid Drawdown	, WS: Meet	s Criteria
							Seisi	mic Slope Stability	, WS: Meet	s Criteria
							Seis	smic Slope Stabilit	y, LS: Meet	s Criteria
Reach Des	scription							Reach Overview		
				tion Limits:	867+00	to	909+00			
					Agriculture re			Company the for		- Ke ST
	Featu	re(s) at Dov	vnstream St	ation Limit:	Approx. 450 f	eet south of irr	igation ditch			- All
Ar		n Elevation I			34	to	37			h -
, 1 P	-	Approx. Leve			9	to	14	an antiquest		See Part
		Approx. Crov	-		16.5	to	42	St. Phyladeland		
		prox. Lands			2.5:1	to	5:1			N
	-	rox. Waters		-	2.5:1	to	5:1		5	
			, ,	, 0		e, agricultural la				a - autor
					Agriculture la	-		The Case		
	Landsid	le repairs as			0					And the second second
	Impro	vements ass	sociated wit	h LSRP P1:	None			510 m -		
	Impro	vements ass	sociated wit	h LSRP P2:	None			Da 25 11		Sel Br
Prop	posed Impro	vements ass	sociated wit	th LSRP P3:	None			-44	6	
Generaliz	ed Subsurf:	ce Conditio	ns							
oener anz										
	Levee) SILT Lea	n CLAY					
I		Prism Soils:	Silty SANI			ovev SAND				
	andside Su	Prism Soils : rface Layer:	Silty SANI Lean Clay,	SILT, Silty	SAND and Cla					
So	andside Su bils below su	Prism Soils: rface Layer: 1rface layer:	Silty SANI Lean Clay,	SILT, Silty						
So Historic P	andside Su oils below su Performance	Prism Soils: rface Layer: 11face layer: 2	Silty SANI Lean Clay, Silty SANI	SILT, Silty Dover Poorl	SAND and Cla y Graded SAN	ID with SILT	ed by KSN so	omewhere along th	ne dryland levee	after an
So Historic P According	Landside Su bils below su erformance g to the DW	Prism Soils: rface Layer: Irface layer: 2 R Walthall S	Silty SANI Lean Clay, Silty SANI Slough ŒR	SILT, Silty Dover Poorl Draft 2, son	SAND and Cla y Graded SAM ne underseepa	ND with SILT	-	omewhere along th e unknown howev	-	after an
So H istoric P According	Landside Su bils below su erformance g to the DW	Prism Soils: rface Layer: Irface layer: 2 R Walthall S	Silty SANI Lean Clay, Silty SANI Slough ŒR	SILT, Silty Dover Poorl Draft 2, son	SAND and Cla y Graded SAM ne underseepa	ND with SILT	-	-	-	after an
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So Historic P According apstream b Liquefiable	Landside Su pils below su Performance g to the DW levee breach e Soils	Prism Soils: rface Layer: nrface layer: 2 R Walthall S aed during th	Silty SANI Lean Clay, Silty SANI Slough GER ne 1996-199	SILT, Silty Dover Poorl Draft 2, son 7 high-wates	SAND and Cla y Graded SAN ne underseepa r event. The lo	ND with SILT	erseepage are	e unknown howev	-	after an
So Historic P According upstream b Liquefiable Based on o	Landside Su pils below su Performance g to the DW levee breach e Soils	Prism Soils: rface Layer: Irface layer: R Walthall S ied during th tion assessm	Silty SANI Lean Clay, Silty SANI Slough GER ne 1996-199	SILT, Silty Dover Poorl Draft 2, son 7 high-wates	SAND and Cla y Graded SAN ne underseepa r event. The lo	ID with SILT ge was observ cations of und	erseepage are	e unknown howev	-	after an
So Historic P According Ipstream I Liquefiable Based on o	andside Su vils below su verformance g to the DW levee breach <u>e Soils</u> our liquefac <u>nalysis Res</u>	Prism Soils: rface Layer: Irface layer: R Walthall S ied during th tion assessm	Silty SANI Lean Clay, Silty SANI Blough GER ne 1996-199 ment, we are	SILT, Silty Dover Poorl Draft 2, son 7 high-wates	SAND and Cla y Graded SAN ne underseepa r event. The lo	ID with SILT ge was observ cations of und	erseepage are	e unknown howev	-	
So Historic P According Ipstream I Liquefiable Based on o	andside Su pils below su <mark>erformance</mark> g to the DW levee breach <u>e Soils</u> our liquefac	Prism Soils: rface Layer: Irface layer: R Walthall S led during th tion assessm sults	Silty SANI Lean Clay, Silty SANI Slough GER ne 1996-199	SILT, Silty i Dover Poorl Draft 2, son 7 high-wates e not consid	SAND and Cla y Graded SAN ne underseepa r event. The lo	ND with SILT ge was observ cations of und le soils in our :	erseepage are slope stability dient	e unknown howev	er.	Breakout
So distoric P According apstream b diquefiable Based on o	andside Su pils below su performance g to the DW levee breach our liquefac analysis Res Station	Prism Soils: rface Layer: Irface layer: R Walthall S ied during th tion assessm sults Water	Silty SANI Lean Clay, Silty SANI Blough GER ne 1996-199 ment, we are	SILT, Silty - D over Poorl Draft 2, son 7 high-wate: e not consid	SAND and Cla y Graded SAN ne underseepa r event. The lo ering liquefiab	ID with SILT ge was observ cations of und le soils in our Exit Gra	erseepage ard slope stability dient Berm	e unknown howev 7 analyses.	er. Through	Breakout
So Historic P According Ipstream I Liquefiable Based on o	andside Su vils below su verformance g to the DW levee breach <u>e Soils</u> our liquefac <u>nalysis Res</u>	Prism Soils: rface Layer: urface layer: R Walthall S led during th tion assessm sults Water Surface	Silty SANI Lean Clay, Silty SANI Blough GER he 1996-199 ment, we are Figure	SILT, Silty 4 D over Poorl Draft 2, son 7 high-wates e not consid Lev No Posit	SAND and Cla y Graded SAN ne underseepa r event. The lo ering liquefiab	ID with SILT ge was observ cations of und le soils in our s Exit Gra Toe of	erseepage ard slope stability dient Berm	e unknown howev 7 analyses. Field	er. Through Seepage	Breakout Height (ft)
So Historic P According upstream b Liquefiable Based on o	andside Su vils below su verformance g to the DW levee breach our liquefac nalysis Res Station <u>876+00</u>	Prism Soils: rface Layer: arface layer: R Walthall S aed during th tion assessm sults Water Surface 200-Year HTOL	Silty SANI Lean Clay, Silty SANI Blough GER ne 1996-199 ment, we are Figure E-69-B E-69-C	SILT, Silty A Dover Poorl Draft 2, son 7 high-wates e not consid Lev No Posit No Posit	SAND and Cla y Graded SAN ne underseepa r event. The lo ering liquefiab ee Toe ive Gradient ive Gradient	ID with SILT ge was observ cations of und le soils in our s Exit Gra Toe of	erseepage ard slope stability dient Berm - -	e unknown howev 7 analyses. Field 0.05	Through Seepage Yes n/a	Breakout Height (ft) 2.6
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So Historic P According upstream b Liquefiable Based on o Seepage A	andside Su vils below su verformance g to the DW levee breach our liquefac nalysis Res Station 876+00 *Vertical di	Prism Soils: rface Layer: urface layer: R Walthall S and during th tion assessm sults Water Surface 200-Year HTOL stance from tl epage under F	Silty SANI Lean Clay, Silty SANI Blough GER ne 1996-199 nent, we are Figure E-69-B E-69-C he toe of the	SILT, Silty 4 Dover Poorl Draft 2, son 7 high-wates e not consid Lev No Posit No Posit levee (ground	SAND and Cla y Graded SAN ne underseepa r event. The lo ering liquefiab ee Toe ive Gradient ive Gradient d surface) to wh	ID with SILT ge was observ cations of und le soils in our s Exit Gra Toe of 	erseepage ard slope stability dient Berm - -	e unknown howev 7 analyses. Field 0.05 0.07	Through Seepage Yes n/a	Breakout Height (ft) 2.6
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So Historic P According Ipstream I Liquefiabl Based on o Seepage A	andside Su pils below su performance g to the DW levee breach e Soils our liquefac malysis Res Station 876+00 *Vertical di Through se	Prism Soils: rface Layer: Irface layer: R Walthall S tion assessm sults Water Surface 200-Year HTOL stance from tl epage under F sis Results Case	Silty SANI Lean Clay, Silty SANI Blough GER ne 1996-1997 nent, we are Figure E-69-B E-69-C he toe of the ITOL condit	SILT, Silty 4 Dover Poorl Draft 2, son 7 high-wates e not consid Lev No Posit No Posit levee (ground	SAND and Cla y Graded SAN ne underseepa r event. The lo ering liquefiab ee Toe ive Gradient d surface) to wh part of this eval Factor of	ID with SILT ge was observ cations of und le soils in our : Exit Gra Toe of 	erseepage ard slope stability dient Berm - - surface is calcu	e unknown howev / analyses. Field 0.05 0.07 Jated to daylight on	Through Seepage Yes n/a	Breakout Height (ft) 2.6
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10.71 PROJECT REACH Q1, STATION 915+50

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Based on (our evaluatio	on this read			DC Criteria.						
	Valuation St		II GOUS HOU	incer the Or		lone Stabilit	y Evaluation S	Summary			
Seepage E		WSEL, Unde	er Seenage.	Meets	Criteria	-	-	e 200-Year DW		Meets	Criteria
20	0-Year DWS				Criteria	Steady		ate Seepage H			Criteria
20		HTOL, Unde			Criteria		Steady St	Rapid Drawd			Criteria
		III OL, Und	n beepage.	THE CLS	Cilitia		Seis	mic Slope Stab			Criteria
								smic Slope Stat	-		Criteria
Reach Des	scription						Ben	Reach Overvi	-	Micus	Ciluita
teach De.	<u>, , , , , , , , , , , , , , , , , , , </u>		Sta	tion Limits:	909+00	to	944+00		- Cal		
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			-		Agriculture roa						
Ar	oprox. Crowi				-	to	35				
		Approx. Leve	-			to	14	P.S.S. Shilling		1115	So permit
		Approx. Crov	-			to	42			6.6	
		prox. Lands				to	7:1		C Te Main	So anna	7/2 2 2 2
	-	rox. Waters		-		to	7:1			3	N
			•	nstraint(s):							
		T	andside Co	nstraint(s):	Agriculture			15 Mar	2 Tes	100	
	Landsic	de repairs as		. ,	6				TODEDO	ALLA	
		vements ass						Store D			
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Pror	posed Impro								1 10-		
	ed Subsurfa									State State State	
	Levee	Prism Soils:	Silty SANI	and Poorly	y Graded SAND	with SII T					
I											
	and side Su	rface Laver:	Silty Sand.	-		with 5111					
		rface Layer: irface layer:	-	approx. 15		with SIL1					
So	oils below su	irface layer:	-	approx. 15							
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So Historic P According	oils below su Performance g to the DW	ırface layer: 2 R Walthall S	SILT and C	approx. 15 TLAY Draft 2, sor	feet thick	e was observ	-			d levee a	fter an
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10.72 PROJECT REACH R1, STATION 955+00

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ased on o	ur evaluati	on. this read			DC Criteria.						
	aluation S					Slope Stabilit	y Evaluation S	Summary			
		WSEL, Unde	er Seepage:	Meets	Criteria	r –	-	e 200-Year DW	SEL, LS:	Meets	Criteria
		SEL, Throug			Criteria			ate Seepage H	_	Meets	Criteria
		HTOL, Unde			Criteria			Rapid Drawdo	-	Meets	Criteria
							Seis	mic Slope Stab	ility, WS:	Meets	Criteria
							Sei	smic Slope Stal	bility, LS:	Meets	Criteria
Reach Des	<u>cription</u>							Reach Overvi	ew		
			Sta	tion Limits:	944+00	to	959+00		1000	Nuclei III	- that we want
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App	-	n Elevation l			32 9	to	35	I I I I I I I I I I I I I I I I I I I		BAL	Roy Martin
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	•	prox. Lanus prox. Waters	• •		2.3.1	to	5:1				N
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	Landsid	le repairs as			-	iturar land		200	TOULEN	四月1日	
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	-	vements as						The start	18 11 1		AL 37
	mpro	veniento doi	source m	in Bord 12.	rione				9 - A 3 5		Sugar and - 1 70 .
Prope	osed Impro	vements as	sociated wit	h LSRP P3	None				A 600		State of the local division of the local div
-	-	vements ass		th LSRP P3:	None				10	AC.	
-	d Subsurfa	nce Conditio	ns		None			- 11			
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Generalize	d Subsurfa Levee andside Su	ice Conditio Prism Soils : rface Layer:	<u>ns</u> Silty SANI Silty Sand,) approx. 4.5	feet thick	nd Silty SAND					
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10.73 PROJECT REACH S1, STATION 965+00

			R	EAC	HS1	- STA	965-	+00			
Recod on	our oplusti	on this root			DC Criteria.						
	Evaluation S		in uoes not	meet the OI	DC CHICHA	Slope Stabili	ty Evaluation S	Summory			
Seepager		WSEL, Unde	er Seenage.	Meets	Criteria	T	State Seepage		VSEI IS.	Meets	Criteria
20	00-Year DWS				Criteria	Steady		ate Seepage I			Criteria
20		HTOL, Unde			Criteria		Steady St	Rapid Drawo	-		Criteria
		iii OL, enu	n beepuge.	THE CLS	Cilitin	1	Seist	mic Slope Sta	· · · · ·		Criteria
								smic Slope Sta	-		Criteria
Reach De	scription							Reach Overy			
<u>ittuen De</u>	<u>seripton</u>		Sta	tion Limits:	959+00	to	972+00	Reach O lef		MARCE -	
	Fe	ature(s) at U			90 degree bei		2100		E/E		KTA
					90 degree bei						
А	pprox. Crow				e	to	35				1-1
		Approx. Leve				to	11	Contraction of the local division of the loc	Star Con		Carlos 1
		approx. Crov	-			to	14	And an and		495	and halt
		prox. Lands				to	4.5:1			1	
	-	rox. Waters:		-		to	3.0:1			T -1	N
				-		ditch at waters			a stand in a	5	A STATE
					34 feet wide,	3 to 4 feet deep	2				
		L	andside Co	onstraint(s):	None - agricu	ltural land		1000 -	700400		
	Landsid	le repairs as	sociated wi	th PL84-99:	None				5	S ET	
	Impro	vements ass	sociated wit	h LSRP P1:	None				1 and		
	Impro	vements ass	sociated wit	h LSRP P2:	None				16 C -		
Pro	nosed Impro										
				h LSRP P3:	None			-	AD	2 C	
	zed Subsurfa			h LSRP P3:	None			7			
	zed Subsurfa		ns		None						
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11.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical findings related to Reclamation District No. 17 Urban Levee Design Criteria. If changes occur in the conditions, layout, or scope of the levee system, we should be allowed to review this report and provide additional conclusions, if any. It is the responsibility of the owner to transmit the information of this report to the appropriate organizations or people involved in evaluation of the project. The conclusions contained in this report are solely professional opinions and are valid for a period of no more than 20 years from the date of applicable findings.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building with earth materials. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. Our services did not include excavation sloping or shoring, soil volume change factors, or a complete geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials.

For explorations performed by ENGEO, we determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.



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13.0 ACRONYMS AND ABBREVIATIONS

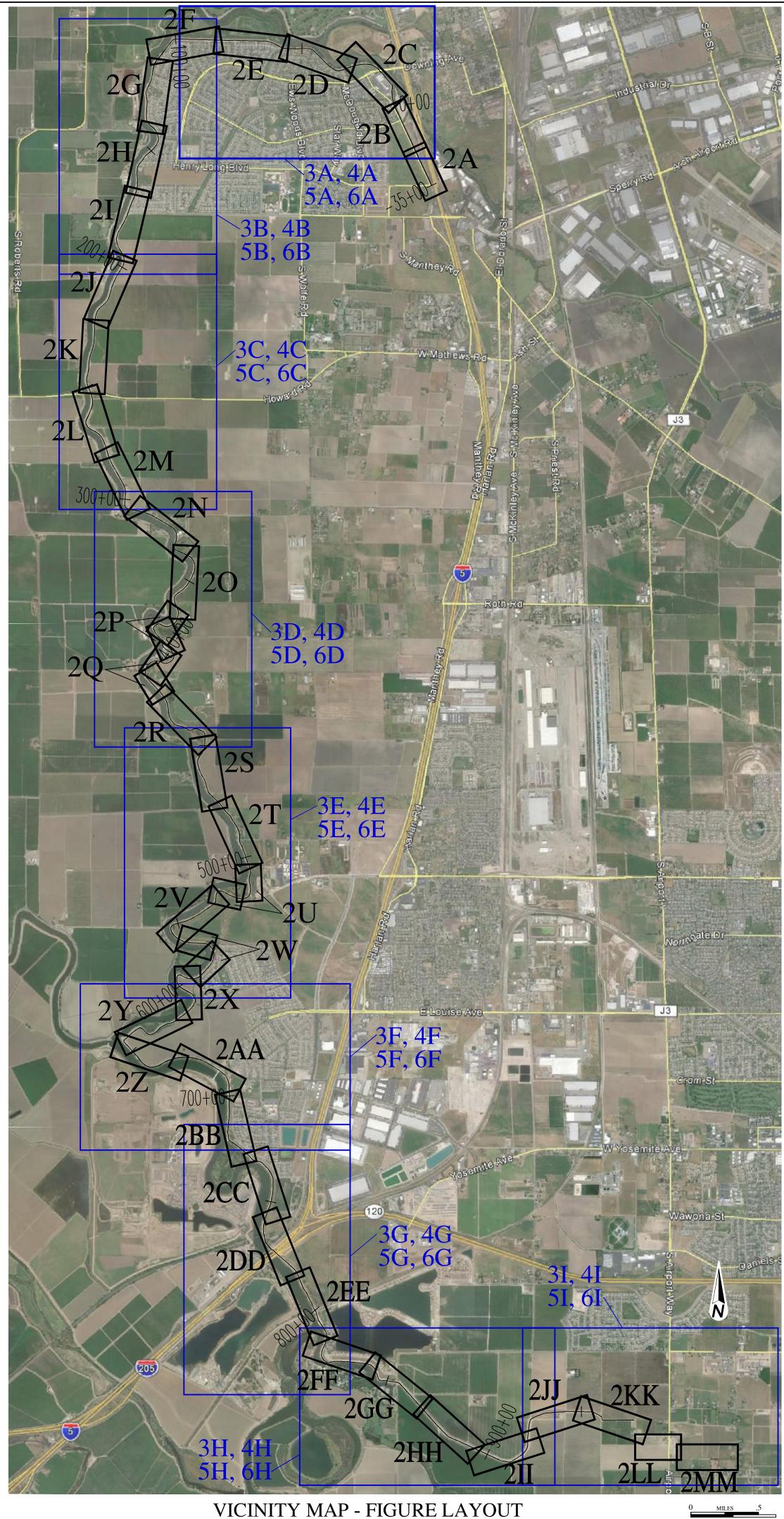
BOSC	Board of Senior Consultants
CVFPB	Central Valley Flood Protection Board
DWR	California Department of Water Resources
DWSE	Design Water Surface Elevation
FIRM	Flood Insurance Rate Map
GER	Geotechnical Evaluation Report
HTOL	Hydraulic Top of Levee
IEPR	Independent External Peer Review
LSRP	Levee Seepage Repair Program
LSRTP	Lower San Joaquin River and Tributaries Project
P1GDR	Phase 1 Geotechnical Data Report
P1GER	Phase 1 Geotechnical Evaluation Report
Post-EQ	Post Earthquake
PS	Pseudo Static
QA/QC	Quality Assurance / Quality Control
RD 17	Reclamation District 17
RDD	Rapid Drawdown
SAR	Safety Assurance Review
SGDR	Supplemental Geotechnical Data Report
SHANSEP	Stress History and Normalized Soil Engineering Properties
SS	Steady State
STA	Stations
ULDC	Urban Levee Design Criteria
ULE	Urban Levee Evaluation
ULOP	Urban Level of Flood Protection Criteria
USACE	U.S. Army Corps of Engineers



FIGURES

Figure 1 – Vicinity Map and Explanation Figures 2A - 2MM – Plan and Profile Figures 3A - 3I – Under Seepage Evaluation Summary Figures 4A - 4I – Through Seepage Evaluation Summary Figures 5A - 5I – Slope Stability Evaluation Summary Figures 6A - 6I – Seismic Evaluation Summary Figures 7A - 7G – Water Surface Profiles





) KILOMETERS

ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

EXPLANATION ALL LOCATIONS ARE APPROXIMATE

ALL LUCATIONS ARE A	PPROXIMATE		
WR0017_177B	BORING (ULE, 2006-2013)	CPT-5	CONE PENETRATION TEST (LUCKEY & MCKEE PROPERTY, KLEINFELDER, 2003)
B-5	SOIL BORING (VALLENTYNE PROPERTY, KLEINFELDER, 2003)	WR0017_023M	MONITORING WELL (ULE, 2006-2013)
К-В-103	BORING (TRAILS OF MANTECA, TERRASEARCH, 2002)	MW-54	MONITORING WELL (SOUTH LATHROP SPECIFIC PLAN, ENGEO, 2004)
5-B-14	BORING (RD17, KLEINFELDER, 1986-1989)	MW-10	MONITORING WELL (CENTRAL LATHROP SPECIFIC PLAN, ENGEO, 2004)
1-B8	SOIL BORING (RD17, ENGEO, 2010)	MW-8	MONITORING WELL (TERRY PROPERTY, KLEINFELDER, 2003)
4- B -6	SOIL BORING (MARKETPLACE AT WESTON RANCH, ENGEO, 2009)	MW-6	MONITORING WELL (MCKEE PROPERTY, KLEINFELDER, 2003)
3-B-105	SOIL BORING (RD17, ENGEO, 2009)	MW-3	MONITORING WELL (TRAILS OF MANTECA, TERRA SEARCH, 2002)
CS2-B3	SOIL BORING (RD17, ENGEO, 2008-2009)	1-CPT2	TEST PIT (CERRI PROPERTY, 2013)
2-B-16	SOIL BORING (RD17, ENGEO, 2007)	WR0017_TP-15	TEST PIT (ULE, 2006-2013)
B-3	SOIL BORING (RIVER RUN LEVEE EVALUATION, ENGEO, 2006)	TP-4	TEST PIT (CENTRAL LATHROP SPECIFIC PLAN, ENGEO, 2004)
1-B-15	SOIL BORING (LAND PARK WATER TANK, ENGEO, 2006)	TP-6	TEST PIT (TERRY PROPERTY, KLEINFELDER, 2003)
B-4	SOIL BORING (RIVER RUN DEVELOPMENT, ENGEO, 2005)	REACH A	REACH DESIGNATION
B-10	SOIL BORING (SOUTH LATHROP SPECIFIC PLAN, ENGEO, 2004)	A 🔳 B	REACH END AND START POINT, LEFT (END) RIGHT (BEGIN)
B-33	SOIL BORING (CENTRAL LATHROP SPECIFIC PLAN, ENGEO, 2004)	164+60	CROSS SECTION LOCATION
B-8 ⊕	SOIL BORING (TERRY & HARRIS PROPERTY, KLEINFELDER, 2003)	15+00	LEVEE ALIGNMENT AND STATIONING
B-7	SOIL BORING (LUCKEY & MCKEE PROPERTY, KLEINFELDER, 2003)		UNDER SEEPAGE WITHIN REACH - MEETS CRITERIA
₿-4	SOIL BORING (MCKEE PROPERTY, KLEINFELDER, 2003)		UNDER SEEPAGE WITHIN REACH - DOES NOT MEET CRITERIA
B-5 ⊕	SOIL BORING (LATHROP ASSOCIATES, KLEINFELDER, 2003)		UNDER SEEPAGE WITHIN REACH - NOT CALCULATED
^{₩R0017_004H} 	HAND AUGER BORING (ULE, 2006-2013)		PHASE 1 IMPROVEMENT PROJECT
CPT-107	CONE PENETRATION TEST (TERRY & HARRIS PROPERTY, KLEINFELDER, 2003)		PHASE 3 IMPROVEMENT PROJECT
1-B3	CONE PENETRATION TEST (CERRI PROPERTY, 2013)	<mark>SP, SM-SP, SC-SP</mark>	POORLY GRADED SAND TO SILTY OR CLAYEY SAND
WR0017_097C	CONE PENETRATION TEST (ULE, 2006-2013)	SM	SILTY SAND
5-CPT-31 🜘	CONE PENETRATION TEST (RD17, ENGEO, 2010)	SC-SM	SILTY SAND TO CLAYEY SAND
4-CPT-31 🔘	CONE PENETRATION TEST (RD17, ENGEO, 2009)	SM-ML	SILTY SAND TO SILT
3-CPT-118 🔘	CONE PENETRATION TEST (RD17, ENGEO, 2008-2009)	ML	SILT, CLAYEY SILT, AND SANDY SILT
2-CPT-40 🛞	CONE PENETRATION TEST (RIVER RUN LEVEE EVALUATION, ENGEO, 2006)	CL-ML	SILTY CLAY TO CLAYEY SILT WITH LOW PLASTICITY
105C	CONE PENETRATION TEST (DWR/ULE, FUGRO, 2006-2007)	CL	SILTY TO SANDY CLAY WITH LOW TO HIGH PLASTICITY
1-CPT-82	CONE PENETRATION TEST (RIVER RUN DEVELOPMENT, ENGEO, 2005)	СН	SILTY TO SANDY CLAY WITH HIGH PLASTICITY

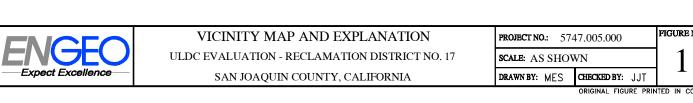
	FIGURE INDEX							
FIGURE NUMBER	TITLE							
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2A-2MM	PLAN AND PROFILE							
3A-3I	UNDER SEEPAGE EVALUATION PLAN							
4A-4I	THROUGH SEEPAGE EVALUATION PLAN							
5A-5I	SLOPE STABILITY EVALUATION PLAN							
6A-6I	SEISMIC EVALUATION PLAN							
7A-7G	WATER SURFACE PROFILES							

KEY TO BORING LOGS

	MAJOI	R TYPES				DESCRIPTIO	N	
HAN 200	GRAVELS			GW - Well g	raded	gravels or gravel-sa	and mixtures	
⊢¥ Ч~	MORE THAN HALF COARSE FRACTION		N 5% FINES	GP - Poorly	grade	d gravels or gravel-s	and mixtures	\$
S M O H H H	IS LARGER THAN NO. 4 SIEVE SIZE	GRAVELS	WITH OVER	GM - Silty g	ravels	, gravel-sand and sil	t mixtures	
COARSE-GRAINED SOLS MORE THAN HALE OF MATL LARGER THAN #200 SIEVE I			% FINES	GC - Clayey	/ grave	ols, gravel-sand and	clay mixtures	5
C L L L L L L L L L L L L L L L L L L L	SANDS MORE THAN HALF	CLEAN S	SANDS WITH	SVV - Weig	raded	sands, or gravelly s	and mixtures	
-CRA F MA	COARSE FRACTION		AN 5% FINES	SP - Poorly	grade	d sands or gravelly s	and mixtures	ŝ
ARSE ALF O	NO. 4 SIEVE SIZE	SANDS V		SM - Silty s	and, sa	and-silt mixtures		
ĞŦ			% FINES	💈 SC - Clayey	r sanc.	sanc-clay mixtures		
LER				ML - Inorga	nic silt	with low to medium	p asticity	
FINF-GRAINFID SOILS MORF THAN HALF OF MATL SWALLER THAN #200 S EVE	SILTS AND CLAYS LIQ	UID LIMIT 50 %	OR LESS	CL Inorgai	nic cla	y with low to medium	r plastic ty	
SOLS PLCS JSEV				OL - Low pl	asticity	organic silts and cla	ays	
NFD OF M U#201				MH - Flastic	silt w	ith high plasticity		
GRAI HALF THAN	SILTS AND CLAYS FIQUE	LIMIT GREAT	FR THAN 50 %	CH Fatcla	y with	high plasticity		
HANH				OH - Highly	plasti	c organic silts and cl	ays	
F -	HIGHLY CR	GANIC SOIL	3	PT - Peat a	nd oth	er highly organic soil	8	
	graine: ⇒ its with 15 t⇒ 29% retains -grained soil with ≻30% retained on			-			ne.	
	U.S. STANDARD 200 40			RAIN SIZES	CI 3/4	LEAR SQUARE SIEN	E OPENING	
SILTS AND	•							
CLAYS		SAND	1		GRA	VEL	CORRIES	
		SAND MEDIUM	COARSE	FINE	GRA	COARSE	COBBLES	BOULDERS
	\$ FINE		COARSE	FINE		COARSE CONSIST	ENCY	
	\$ FINE	<mark>MEDIUM</mark> VE DENSI	COARSE TY BLOWS/FOOT	FINE		COARSE CONSIST SILTS AND CLAYS	ENCY SIRENGIHT	
	S FINE RELATI SANDS AND GRAVEL VERY LOOSE	<mark>MEDIUM</mark> VE DENSI	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4	FINE		COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT	ENCY <u>SIRENGIH*</u> 0-1/4 1/4-1/2	
	S FINE RELATI SANDS AND GRAVEL VERY LOOST LCOSE MEDIUM DENSE	<mark>MEDIUM</mark> VE DENSI	COARSE TY BLOWS:FOOT <u>(S.P.T.)</u> 0-4 4-10 10-30	FINE		COARSE CONSIST SILTS AND CLAYS VERY SOFT	ENCY <u>STRENGTHT</u> 0-1/4	
	S FINE RELATI SANDS AND GRAVEL VERY LOOST LOOSE	<mark>MEDIUM</mark> VE DENSI	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4 4-10	FINE		COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF	ENCY <u>SIRENGIH*</u> 0-1/4 1/4-1/2 1/2 1	
	S FINE RELATI SANDS AND GRAVEL VERY LOOST LCOSE MEDIUM DENSE DENSE	<mark>MEDIUM</mark> VE DENSI	COARSE TY BLOWS/FOOT (S.P.T.) 0-4 4-10 10-30 30-50			COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	ENCY <u>SIRENCIH*</u> 0-1/4 1/4-1/2 1/2 1/2 1-2 2-4	
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	S FINE RELATI SANDS AND GRAVEL VERY LOOSI LOOSI MEDIUM DENSE DENSE VERY DENSE SAMPLER Modified Ca California (2	MEDIUM VE DENSI [®] <u>3</u> E SYMBOLS	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4 4-10 10-30 30-50 OVER 50 OVER 50	MOIST DRY MO ST	URE C Damı Visib	COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD CONDITION Dusty, dry to touch b but no visible water le freewater	ENCY <u>SIRENCIH*</u> 0-1/4 1/4-1/2 1/2 1/2 1-2 2-4	
	S FINE RELATI SANDS AND GRAVEL VERY LOOSI LOOSI MEDIUM DENSE DENSE VERY DENSE SAMPLER Modified Ca California (2	MEDIUM VE DENSI [®] <u>S</u> ^E SYMBOLS Ilifornia (3° O. 2.5° O.D.) sam	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4 4-10 10-30 30-50 OVER 50 OVER 50	MOIST DRY MO ST WET	URE C Damı Visib	COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD CONDITION Dusty, dry to touch but no visible water le freewater id - Layer Break	ENCY <u>SIRENCIH</u> 0-1/4 1/4-1/2 1/2 1/2 1/2 1/2 1/2 1-2 2-4 OVFR 4	BOULDERS
	S FINE RELATI SANDS AND GRAVEL VERY LOOSE LEOSE MEDIUM DENSE DENSE VERY DENSE SAMPLER Modified Ca California (2 S.P.T S	MEDIUM VE DENSI [®] <u>3</u> SYMBOLS diformiz (3° O. 55 [°] O.D.) sam split spoon sam	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4 4-10 10-30 30-50 OVER 50 OVER 50	MOIST DRY MO ST WET	URE C Damı Visib	COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD CONDITION Dusty, dry to touch b but no visible water le freewater	ENCY <u>SIRENCIH</u> 0-1/4 1/4-1/2 1/2 1/2 1/2 1/2 1/2 1-2 2-4 OVFR 4	BOULDERS
	S FINE RELATI SANDS AND GRAVEL VERY LOOSE LCOSE MEDIUM DENSE DENSE VERY DENSE SAMPLER Modified Ca California (2 S.P.T S Shelby Tube	MEDIUM VE DENSI <u>S</u> E SYMBOLS difornia (3° O. 55 O.E.) sam split spoon sar s Dore	COARSE TY BLOWS/FOOT <u>(S.P.T.)</u> 0-4 4-10 10-30 30-50 OVER 50 OVER 50	MOIST DRY MO ST WET	URE C Dam Visib Sel Ea	COARSE CONSIST SILTS AND CLAYS VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD CONDITION Dusty, dry to touch b but no visible water le freewater id - Layer Break shed - Gradational or eg	ENCY <u>SIRENCIH</u> 0-1/4 1/4-1/2 1/2 1/2 1/2 1/2 1/2 1-2 2-4 OVFR 4	BOULDERS

Stabilized groundwater let

CONSISTENCY OF COHESIVE SOILS Pocket Penetrometer Descriptor Torvane (tsf) Field Approximation Very Soft < 0.25 Easily penetrated several inches by fist < 0.12 Soft 0.25 - 0.50 0.12 - 0.25 Easily penetrated several inches by thumb Medium Stiff 0.50 - 1.0 0.25 - 0.50 Can be penetrated several inches by thumb with moderate effort Stiff 1.0 - 2.0 0.50 - 1.0 Readily indented by thumb but penetrated only with great effort Very Stiff 2.0 - 4.0 1.0 - 2.0 Readily indented by thumbnail Indented by thumbnail with difficulty > 4.0 > 2.0 Hard APPARENT DENSITY OF COHESIONLESS SOILS MOISTURE Descriptor SPT N(60) - Value (blows / foot) Descriptor Criteria Very Loose 0 - 4 Absence of moisture, dusty, dry to the touch Dry Loose 5 - 10 Moist Damp but no visible water Medium Dense 11 - 30 Dense 31 - 50 Wet Visible free water, usually soil is below > 50 water table Very Dense PERCENT OR PROPORTION OF SOILS SOIL PARTICLE SIZE Criteria Descriptor Descriptor Size > 12 inches Boulder Particles are present but estimated to be less than 5% Trace 3 to 12 inches Cobble Coarse 3/4 inch to 3 inches 5 to 10% Few Gravel No. 4 Sieve to 3/4 inch Little 15 to 25% No. 10 Sieve to No. 4 Sieve Coarse No. 40 Sieve to No. 10 Sieve Sand Medium Some 30 to 45% No. 200 Sieve to No. 40 Sieve Mostly 50 to 100% Passing No. 200 Sieve Silt and Clay PLASTICITY OF FINE-GRAINED SOILS Descriptor Criteria A 1/8-inch thread cannot be rolled at any water content. Nonplastic The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit. Low The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after Medium reaching the plastic limit. The lump crumbles when drier than the plastic limit. It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. High DRY STRENGTH OF FINE-GRAINED SOILS DILANTANCY OF FINE-GRAINED SOILS Descriptor Criteria Descriptor Criteria No visible change in the specimen. None Dry specimen crumbles into powder with mere pressure of handling. None Water appears slowly on the surface of the specimen during shaking and does not disappear, or disappears Low Dry specimen crumbles into powder with some finger pressure. Slow Medium Dry specimen breaks into pieces or crumbles with considerable finger pressure. slowly, upon squeezing High Dry specimen cannot be broken with finger pressure; will break into Water appears quickly on the surface Rapid pieces between thumb and a hard surface. of the specimen during shaking and disappears quickly upon squeezing. Very High Dry specimen cannot be broken between thumb and a hard surface. TOUGHNESS OF FINE-GRAINED SOILS CEMENTATION Descriptor Criteria Descriptor Criteria Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft. Crumbles or breaks with handling or Low Weak little finger pressure. Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness. Crumbles or breaks with considerable finger pressure Medium Moderate Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness. High Will not crumble or break with finger Strong pressure.



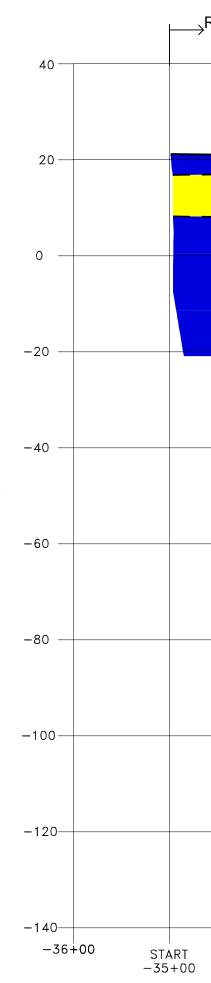
SAND

NR No Recovery

(S.P.T.) Number of blows of 146 lb, hammer failing 30° to orive a 2- nch \oplus D. (1-3/8 lnch i.D.) sampler * Unconfined compressive strength in tons/so, ftl, asterisk on log means determined by pocket penetrometer -

2A ' 300+00-2N 2AA 2Z 700+00 2BB 2FF 2GG 2HH 2LL 2MM





211 FIGURE LAYOUT NO SCALE

2G

2H 2I 30,00 2J 2K

2L

₹\2M

2P 2Q

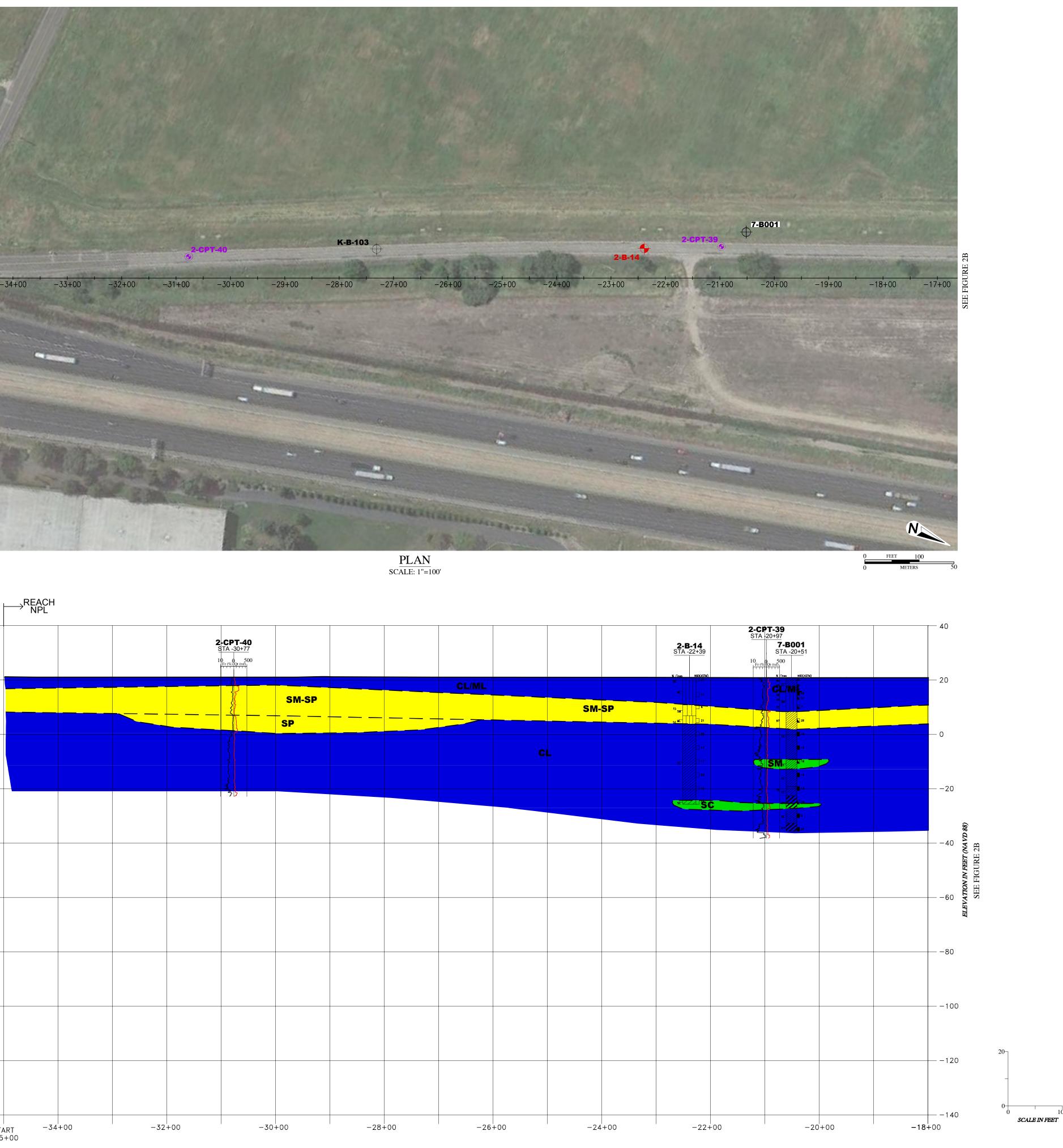
2R

2Y martin

1/20

2V/

2CC



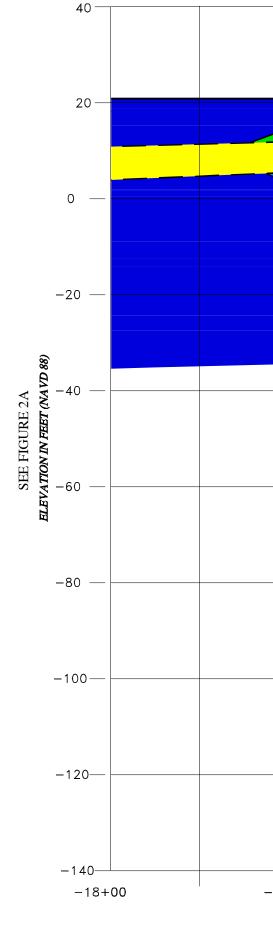
				-CPT-40 STA -30+77 0 0 500							2-B-14 STA -22+39	
							CL/ML				X Fines N60(ASTM)	
					SM-SP						MC 11	
									SM-	SP	15 SHT 2 21	
					SP						51 ML 21	
								CL				
				35								
											SC SC	;
-34	+00	-32	+00	-30-	+00	-28-	-00 -26-	+00	-24	+00	-22+	0(
							PROFILE					

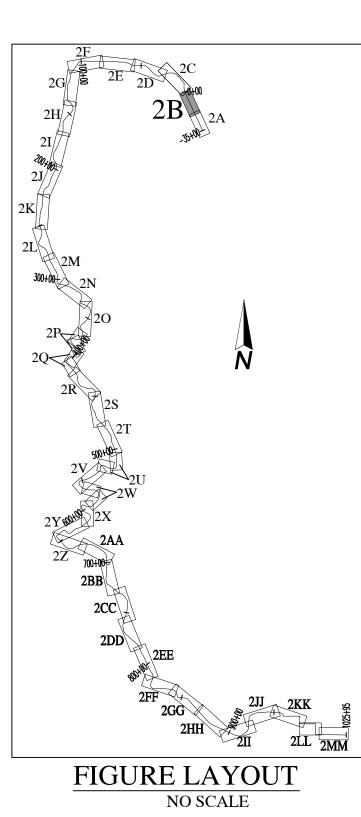
PROFILE SCALE: H:1"=100', V:1"=20'

PLAN AND PROFILE - STATION -36+00 TO -18+00 ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

100

PROJECT NO.: 5747.005.000 SCALE: AS SHOWN DRAWN BY: MES CHECKED BY: JJT ORIGINAL FIGURE PRINTED IN COLOR



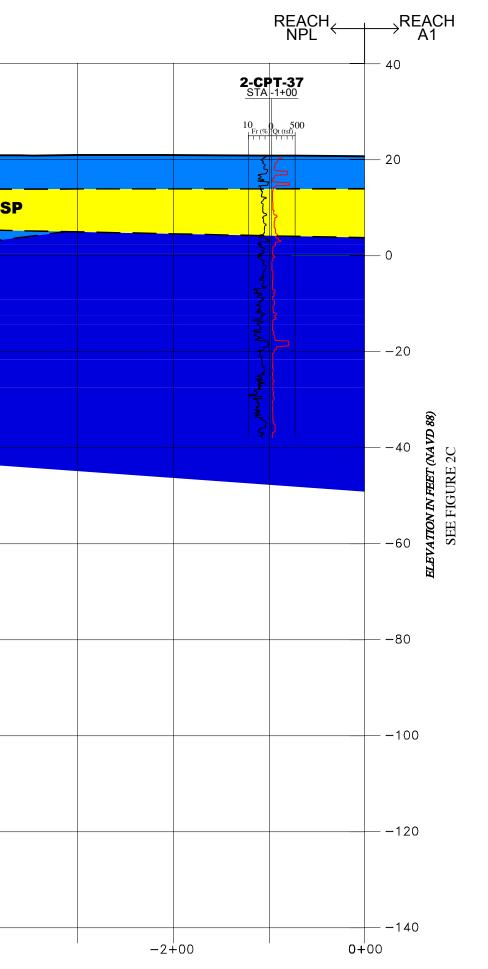




PLAN SCALE: 1"=100'

			7-B002 STA -12+90	2-CPT-3 STA -11+9 10 0 2 Fr (%) Qt (tsf)								
		4	SC-SW 55		SM				2			ML
		5	3 ML 26							<u> </u>		
		7	0 SM 2 32 7 3 6 ME 24									SM-SI
			0 //// 23									
			SM SM									
			CL 62	~ ~ ~							CL	
		4	19									
			s₽ N ¹⁵									
		6 5	3 1 CL 17 SUT 10 1 28									
			SU <u> </u> 28									
-16+00	-14	+00		-12+00)	-10	0+00	-8+	-00	-6	+00	-4+00
	· •			00	-		PROFIL			Ŭ		
						SC	$\frac{PROFIL}{ALE \cdot H \cdot 1'' = 100'}$					

SCALE: H:1"=100', V:1"=20'



100 SCALE IN FEET



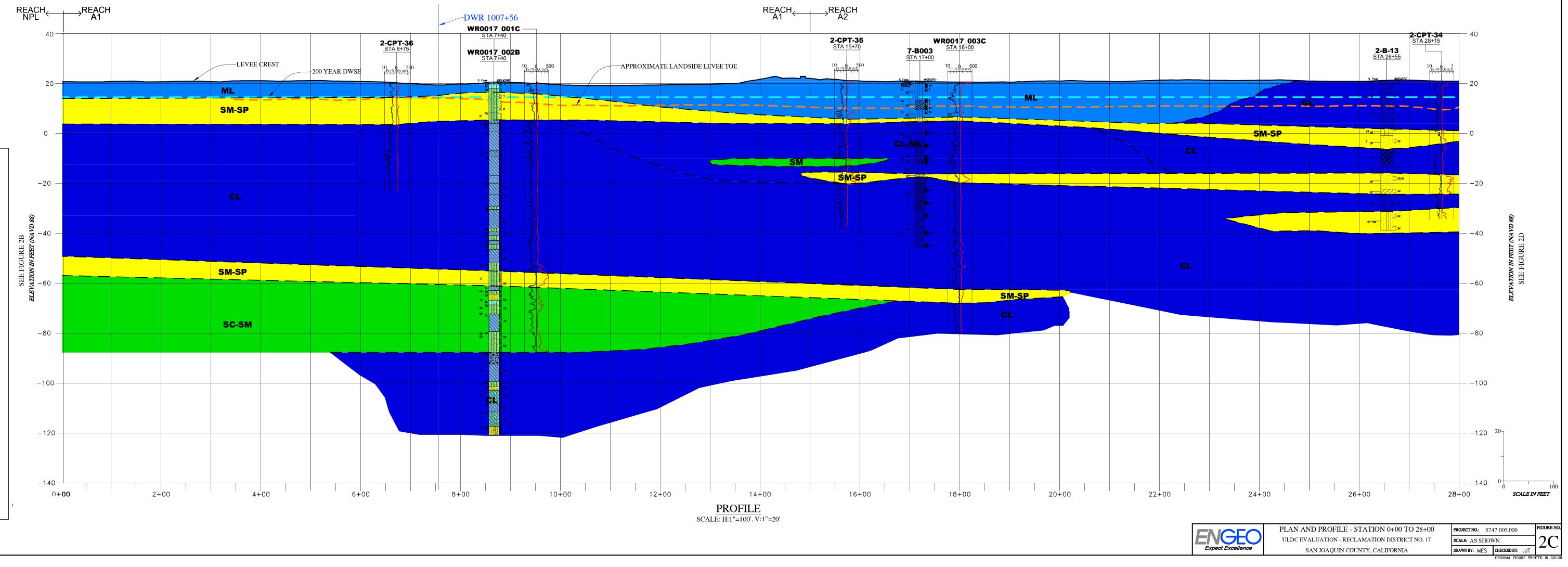
PLAN AND PROFILE - STATION -18+00 TO 0+00 ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

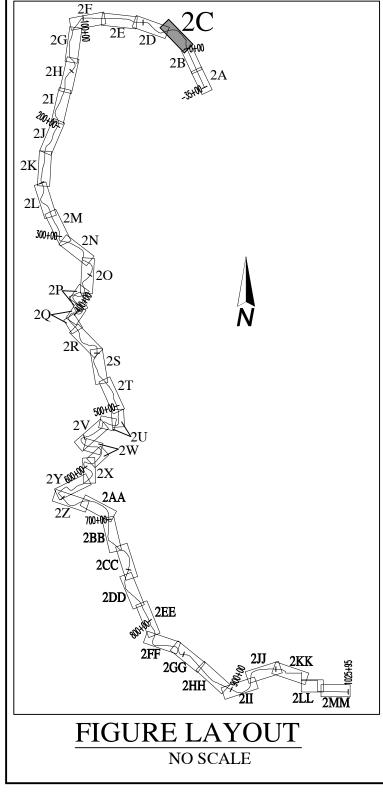
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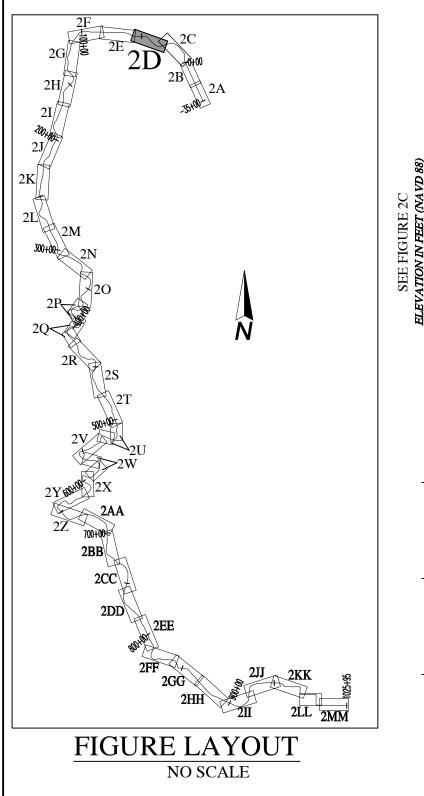


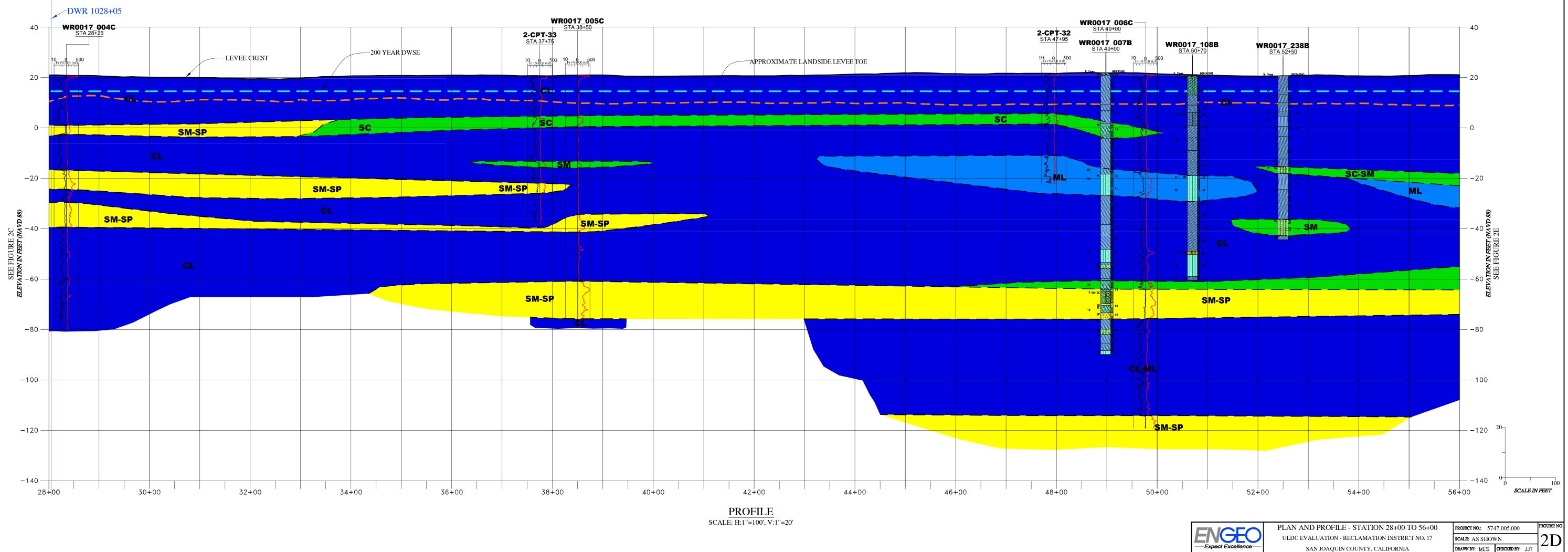


PLAN SCALE: 1"=100'





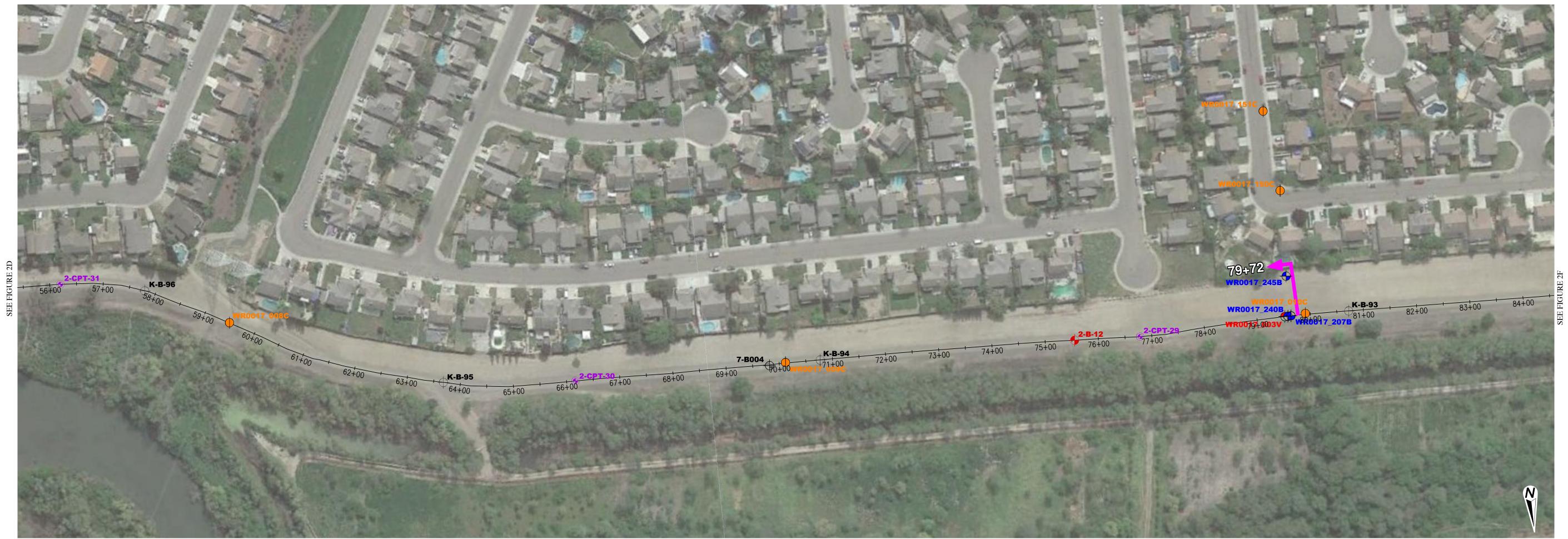


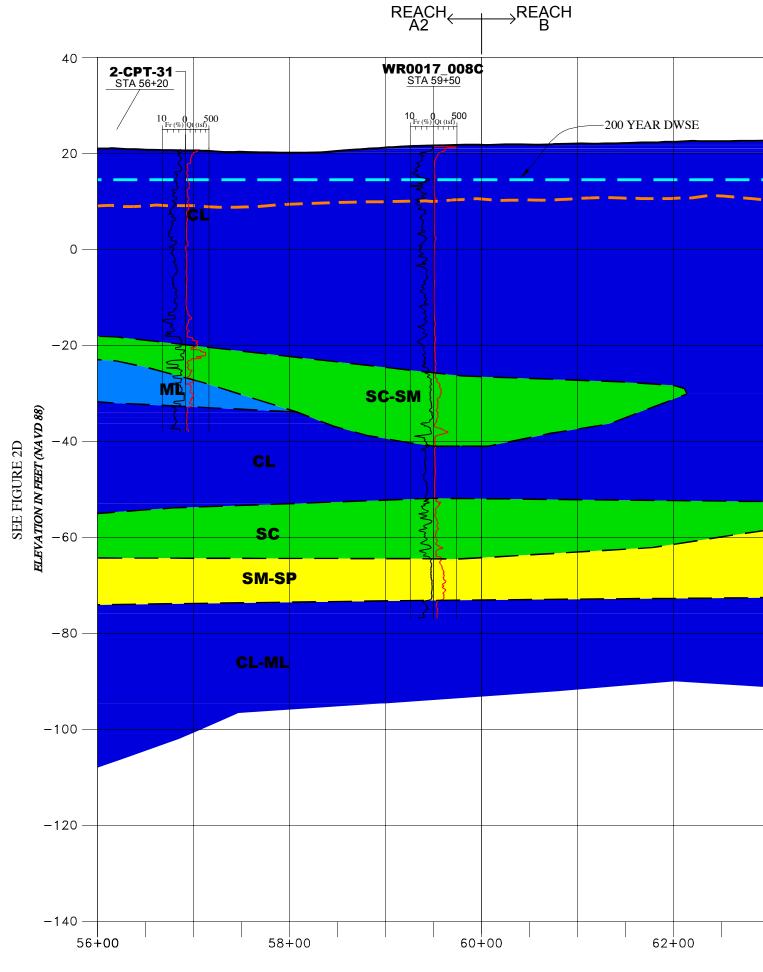


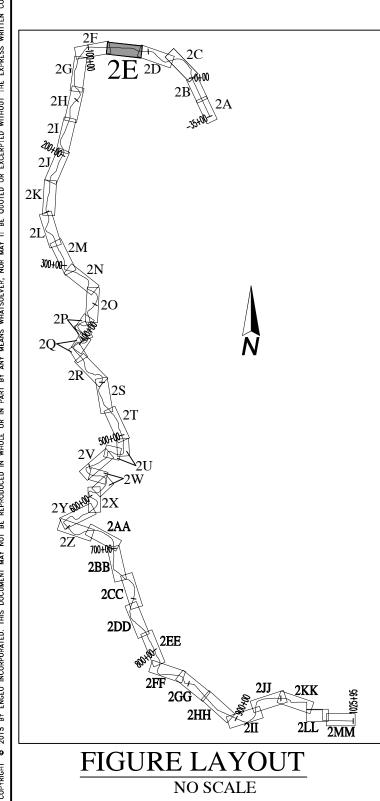
PLAN SCALE: 1"=100'

DRAWN BY: MES CHECKED BY: JJT ORIGINAL FIGURE PRINTED IN COLOR

SAN JOAQUIN COUNTY, CALIFORNIA



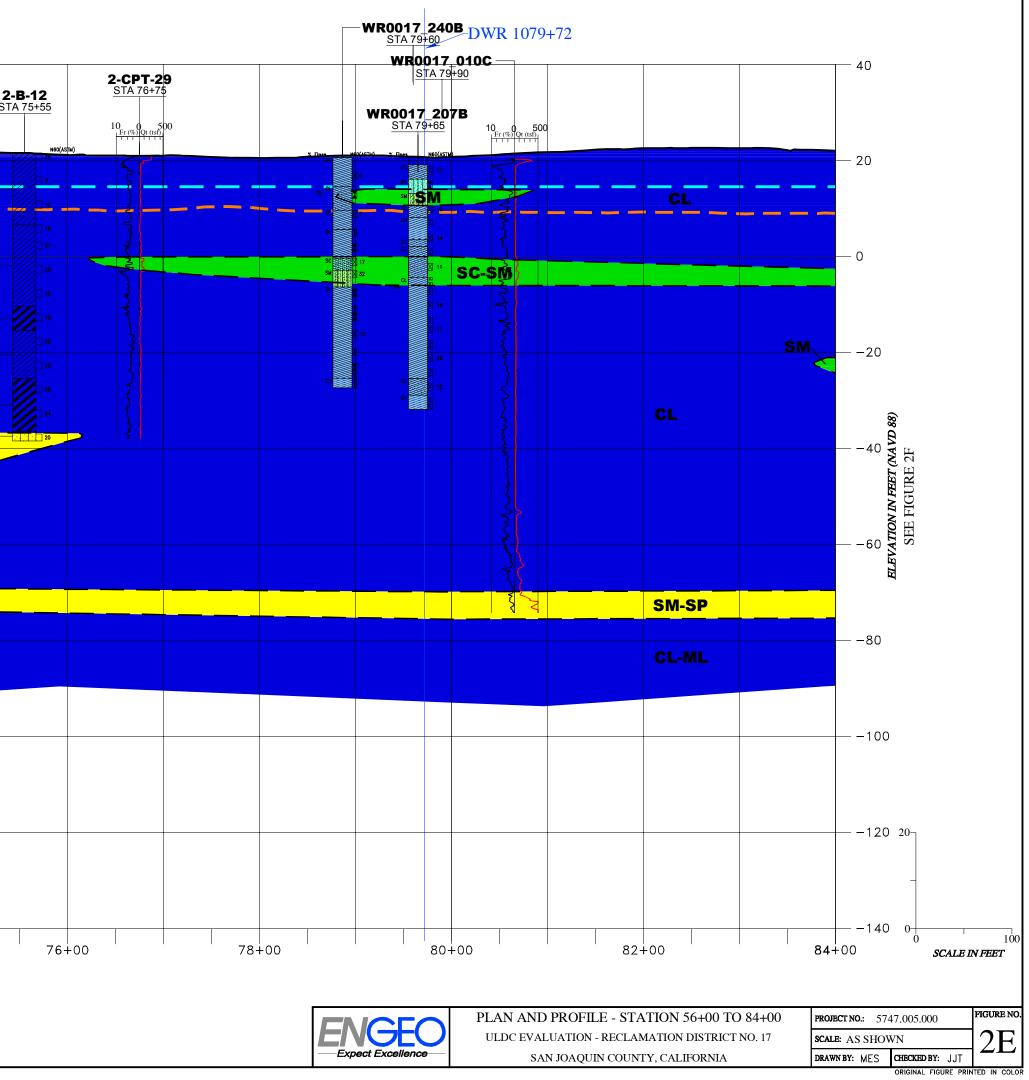


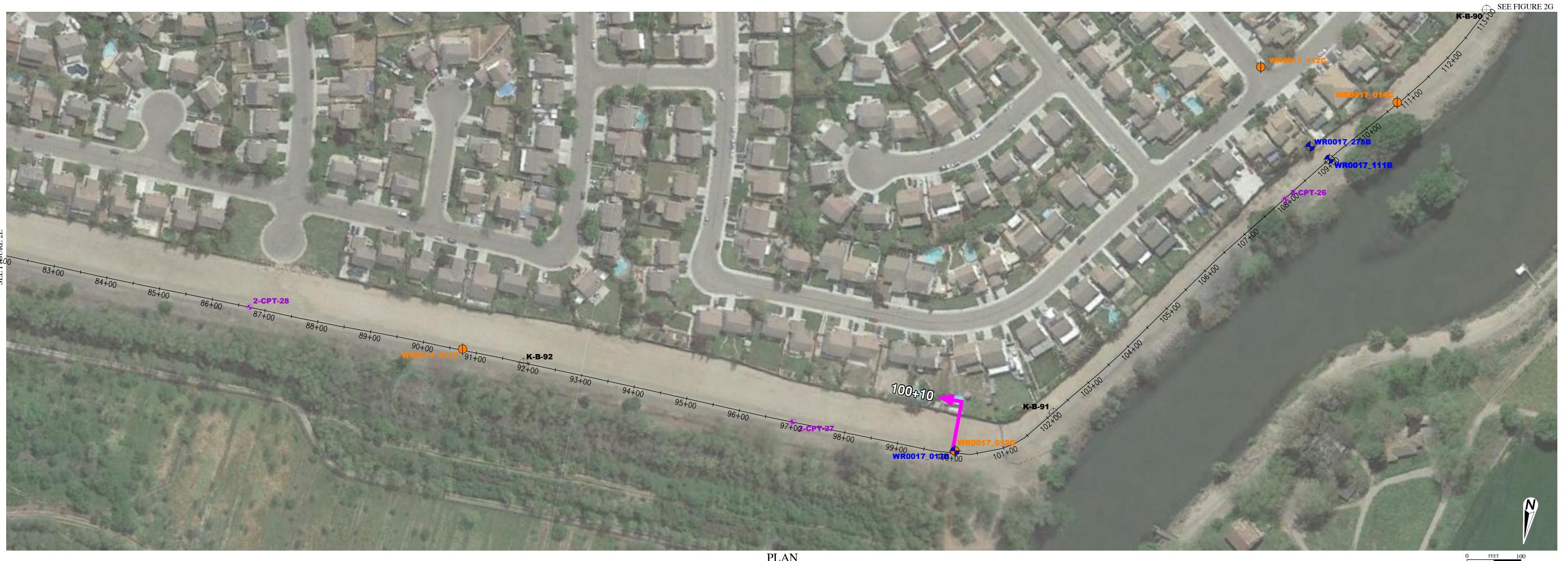


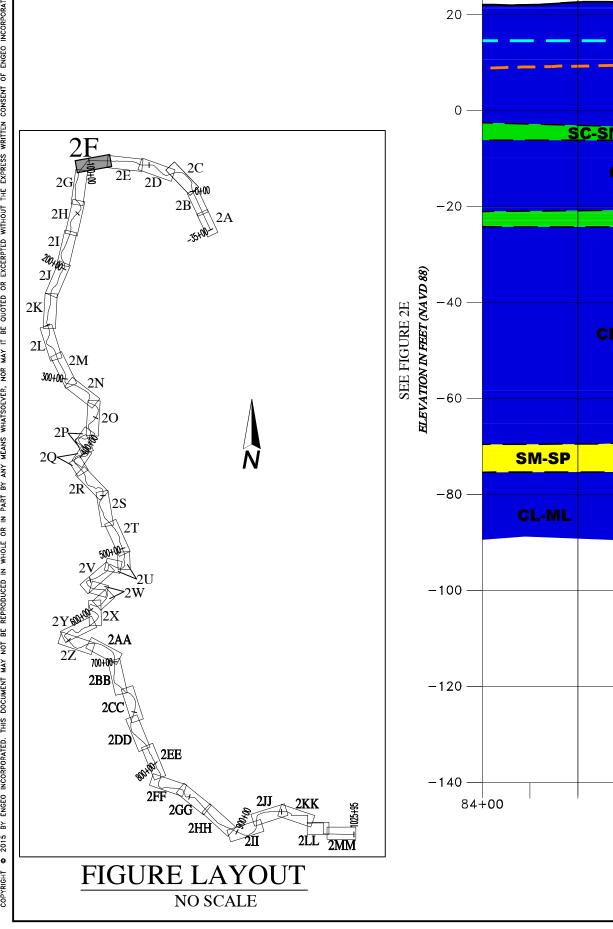
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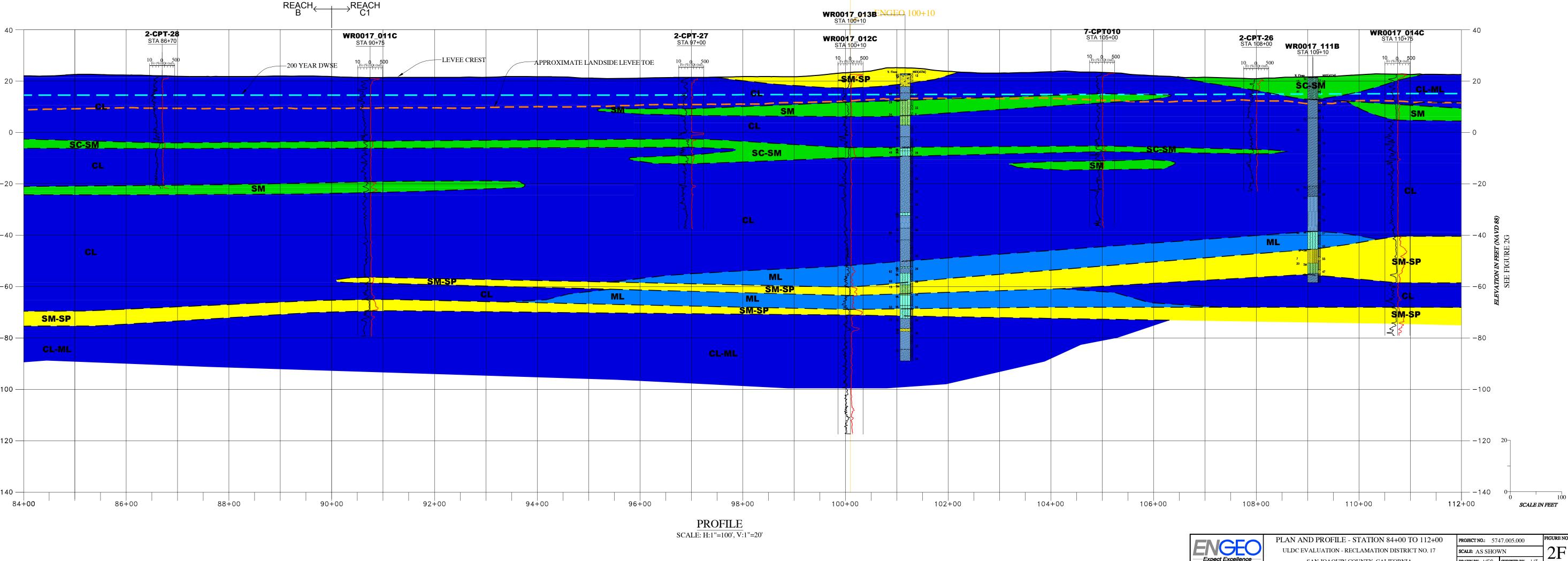
				WR0017_009C			
	LEVEE CREST	2-CPT-30 <u>STA 66+15</u> 10. 00. 500 <u>Fr(%) 02. ((sf))</u>		7-B004 STA 70+00	500 APPROXI	MATE LANDSIDE LEVEE TOE	2-B STAT
			CL	65 58 5 59 c 6 6			α
		SM S	CL				
			SC	53 CC 24 19 39 SM SM 24 24 39 41			CH CL
			CL	CH ME 44 64 ME 29	M-SP		CH SM
			CL SM-SP				
			CL		3		
				CL-ML			
64	+00	66+00	68+00	70+00	72+00	74+00	
04	τυυ	00+00	00+00	PROFILE	/2+00	/4+00	

PROFILE SCALE: H:1"=100', V:1"=20'









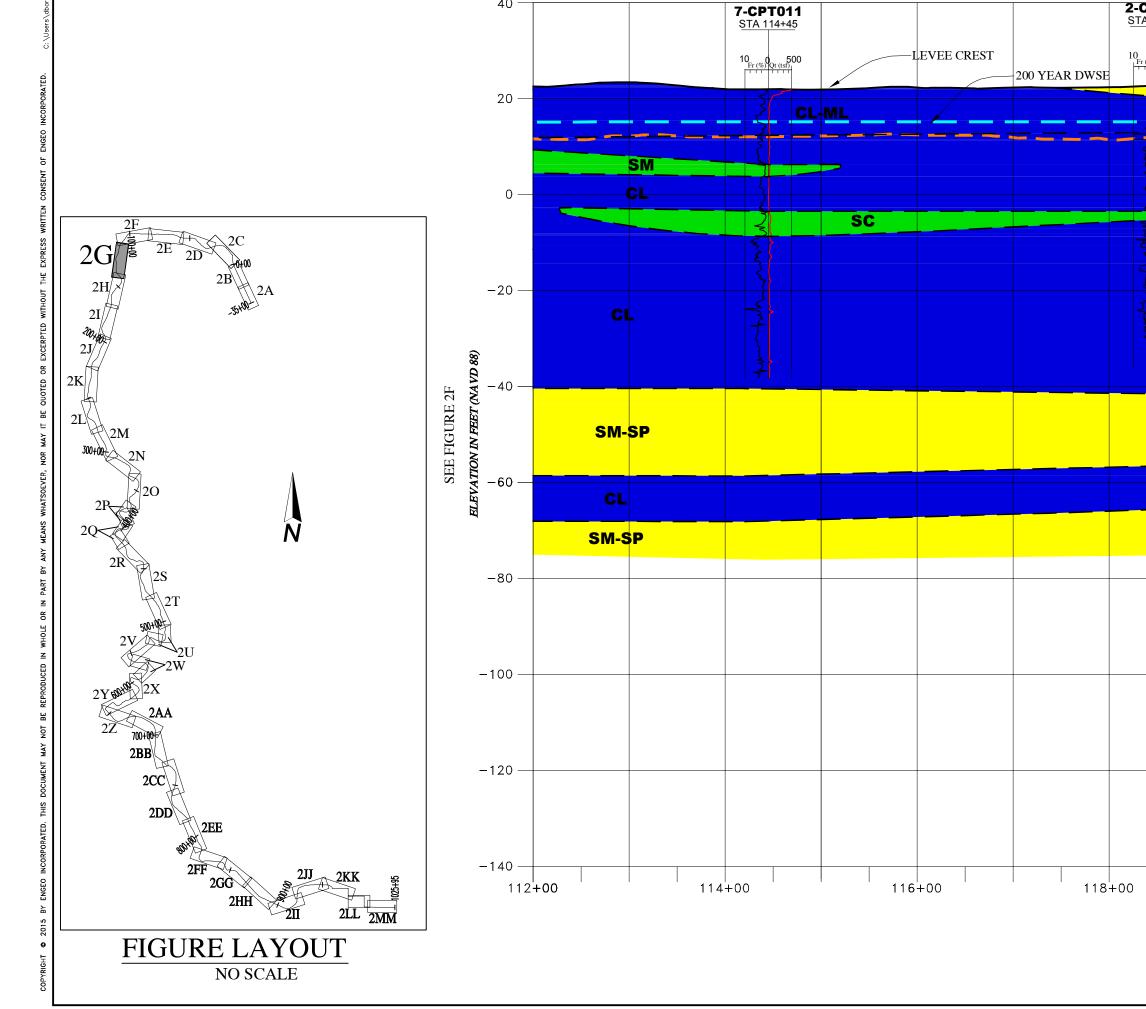
PLAN SCALE: 1"=100'

ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

SCALE: AS SHOWN SCALE: AS SHUTT







40 -

2K

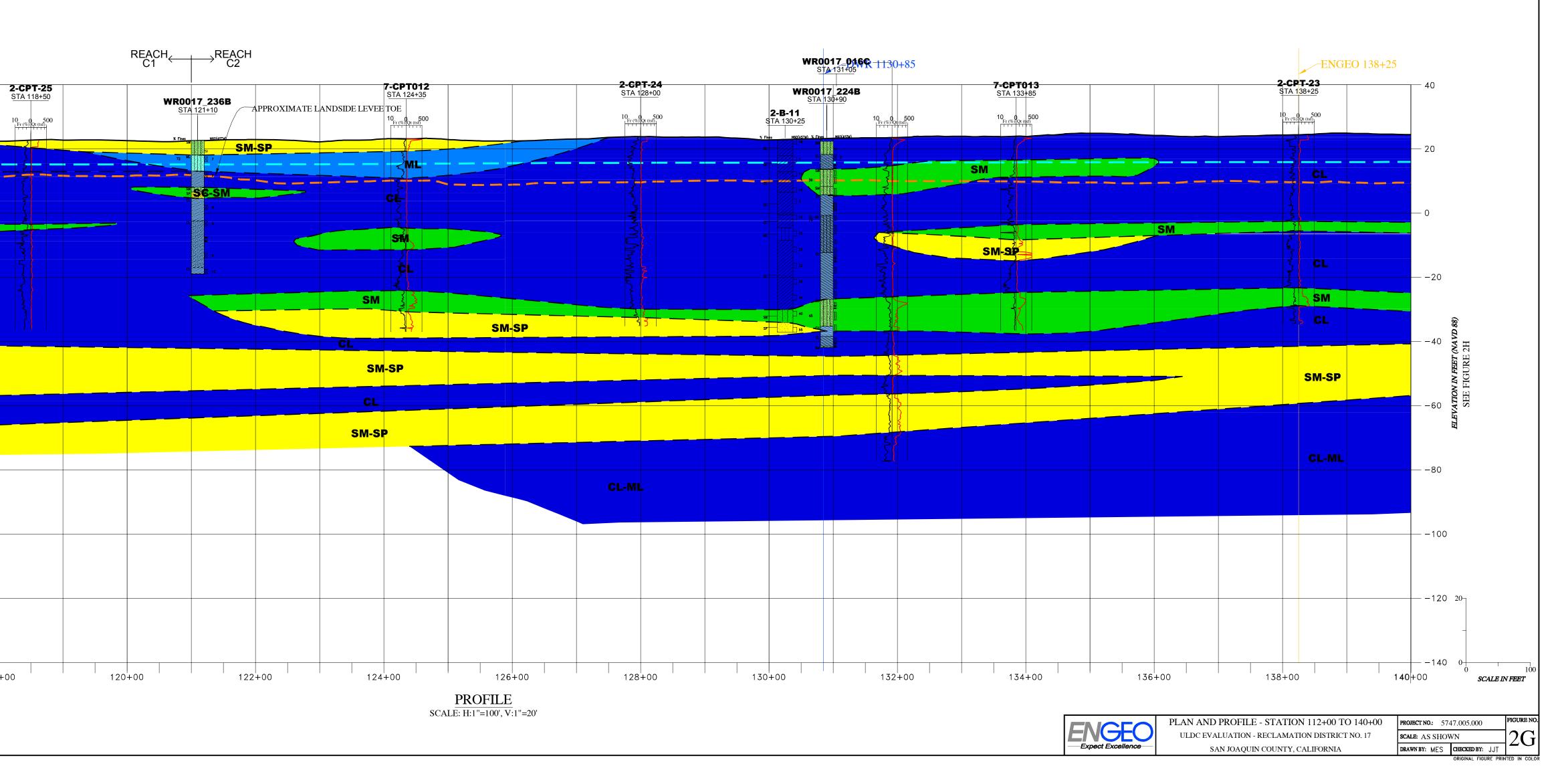
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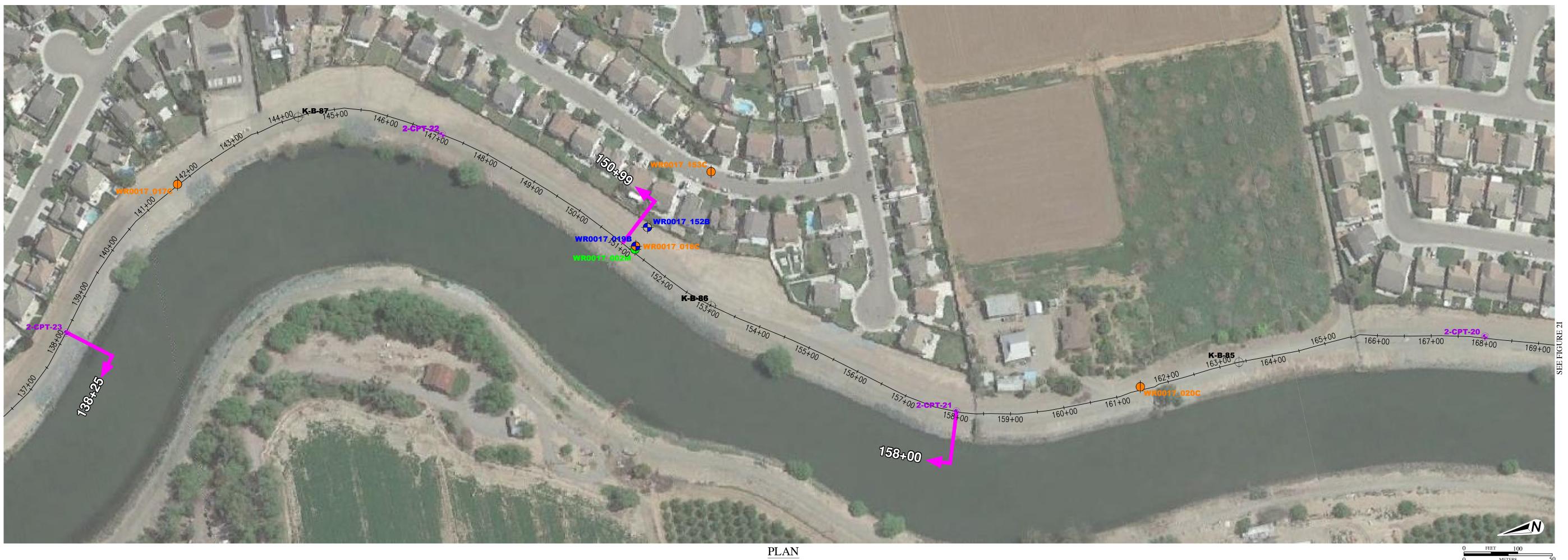
2R 2S

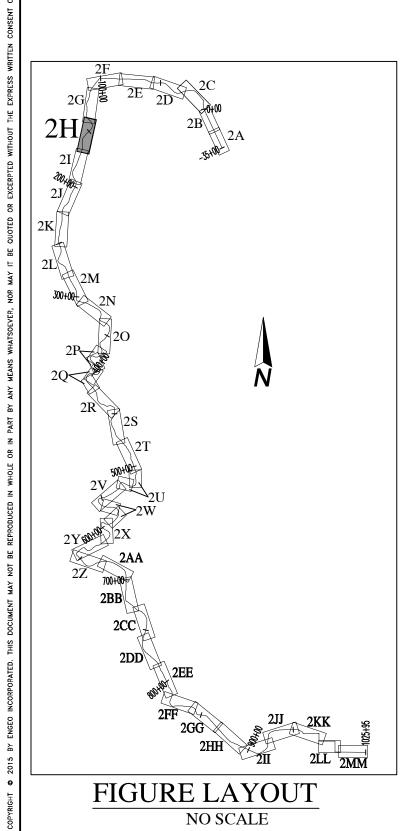
2T

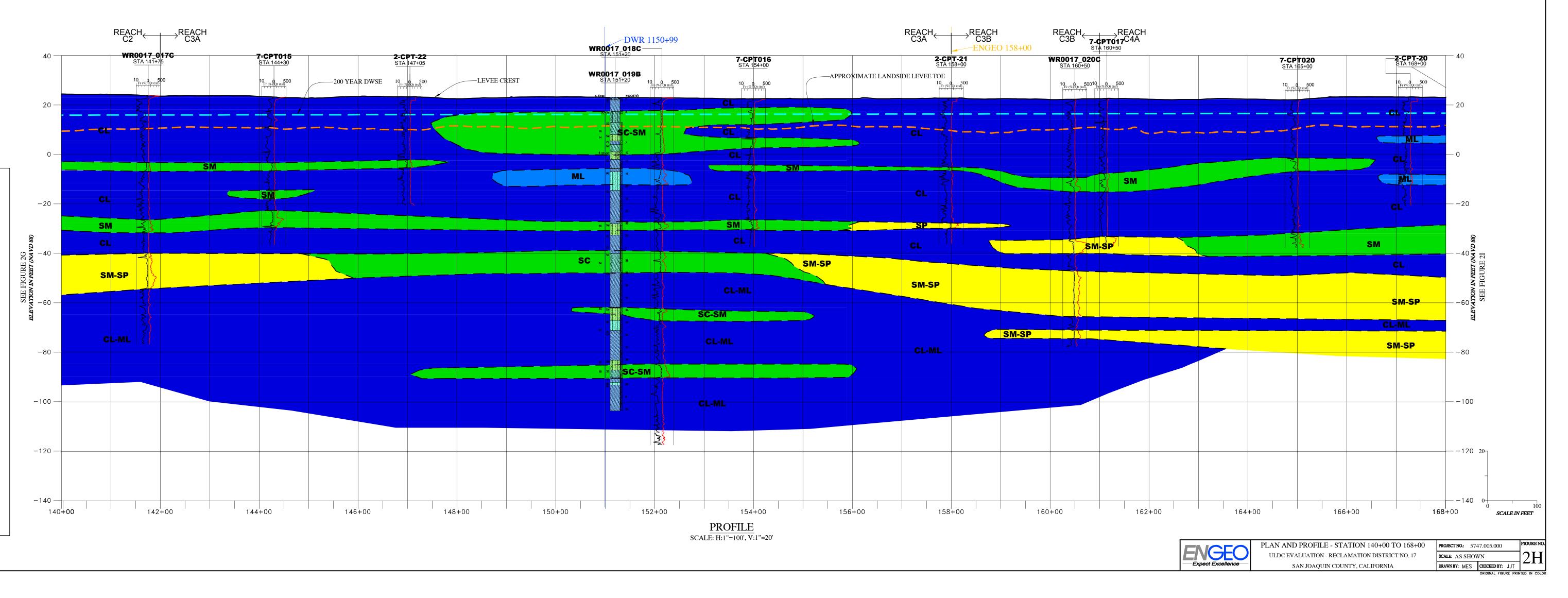
2P 2Q

PLAN SCALE: 1"=100'

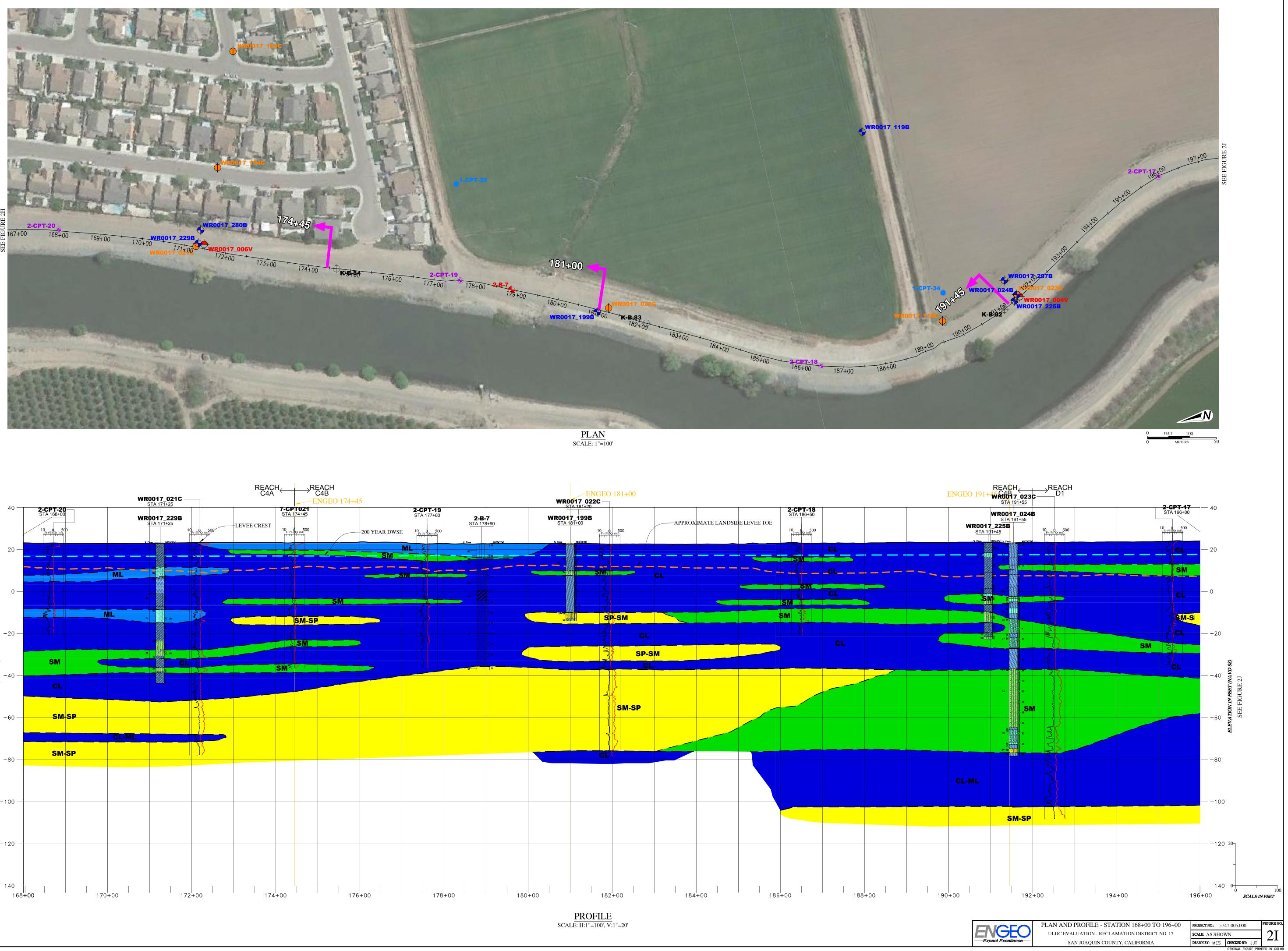


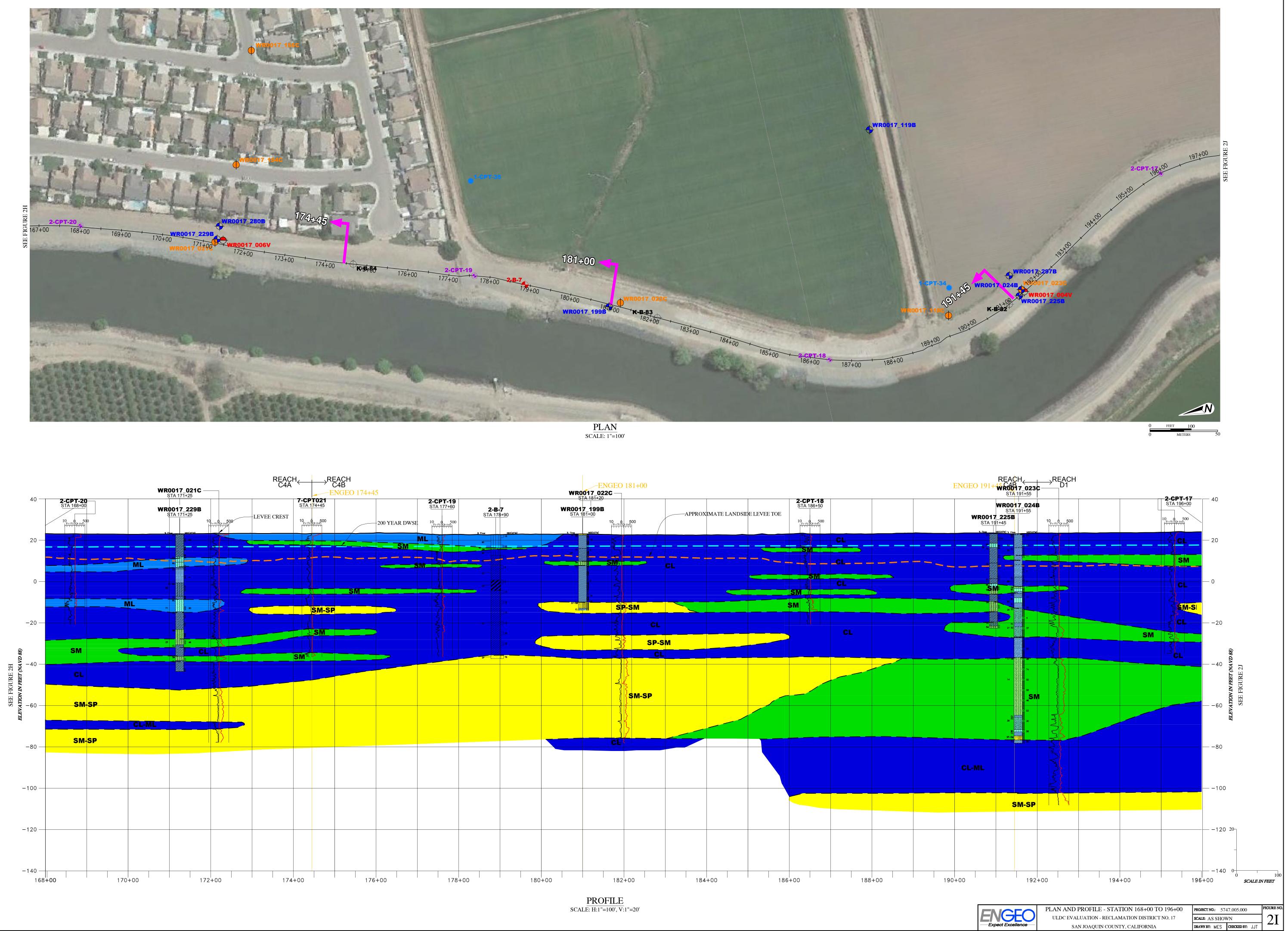


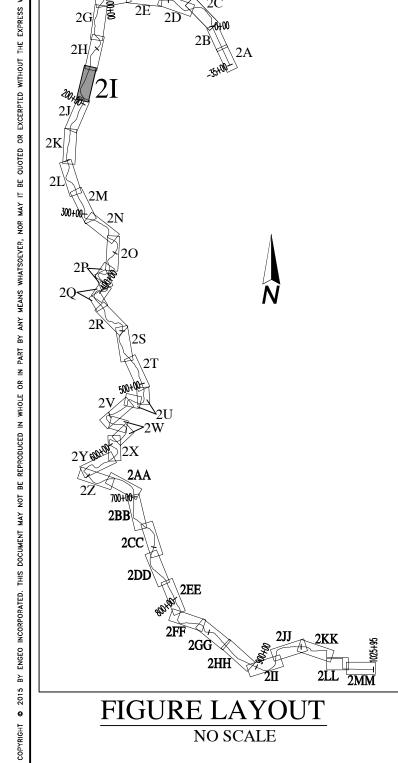




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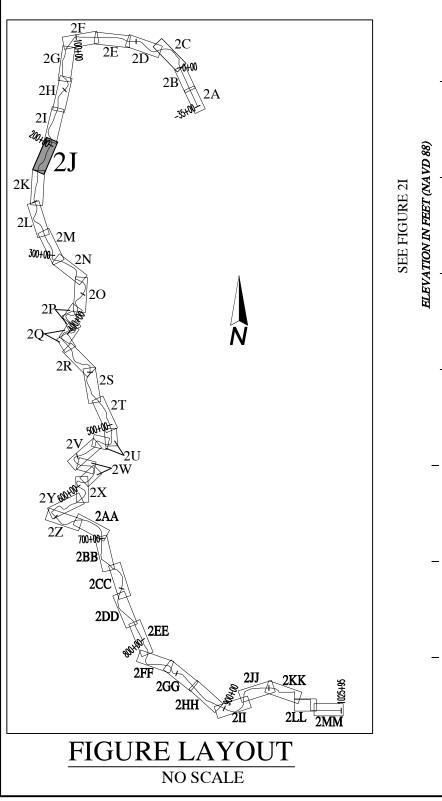


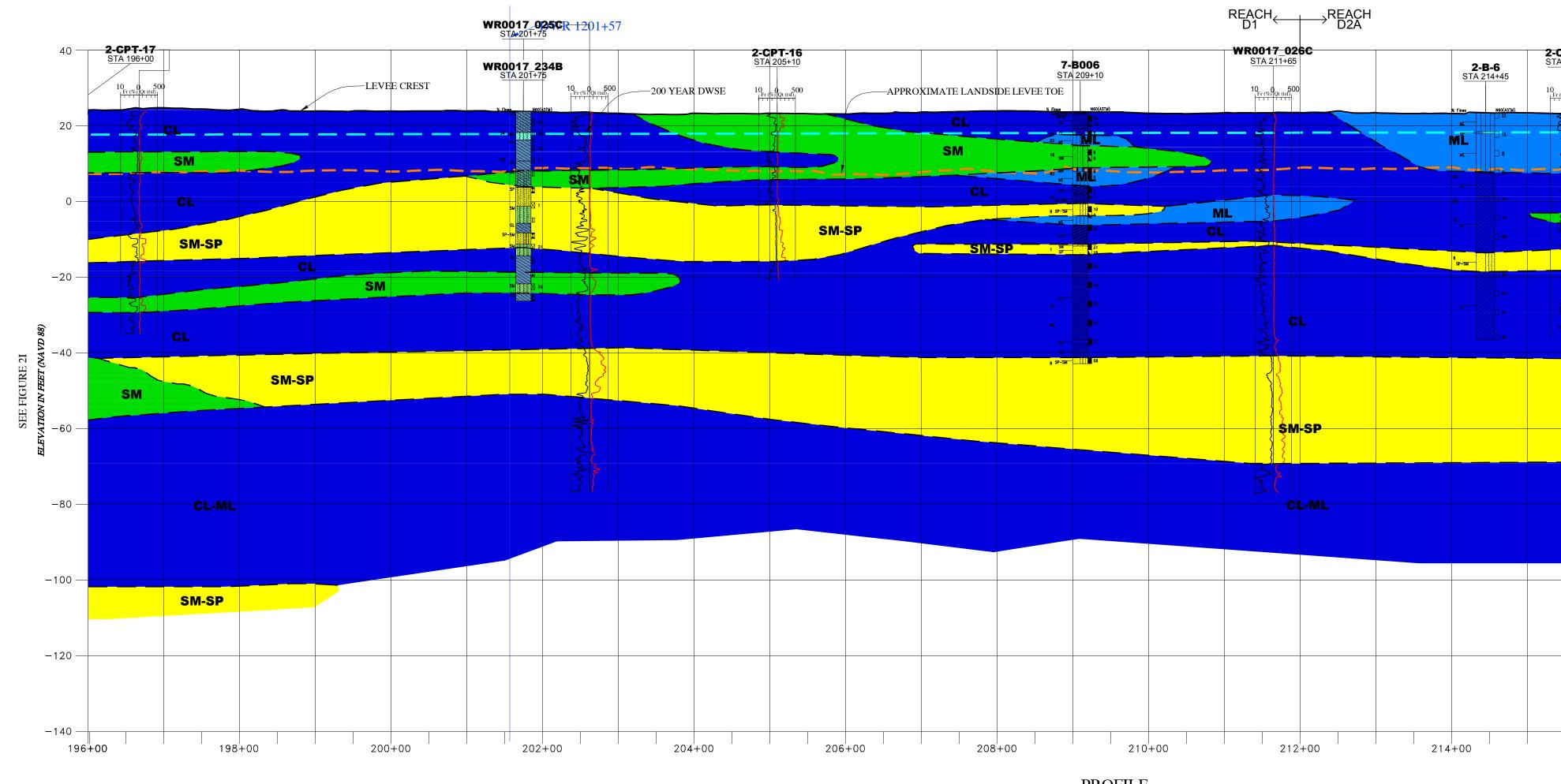












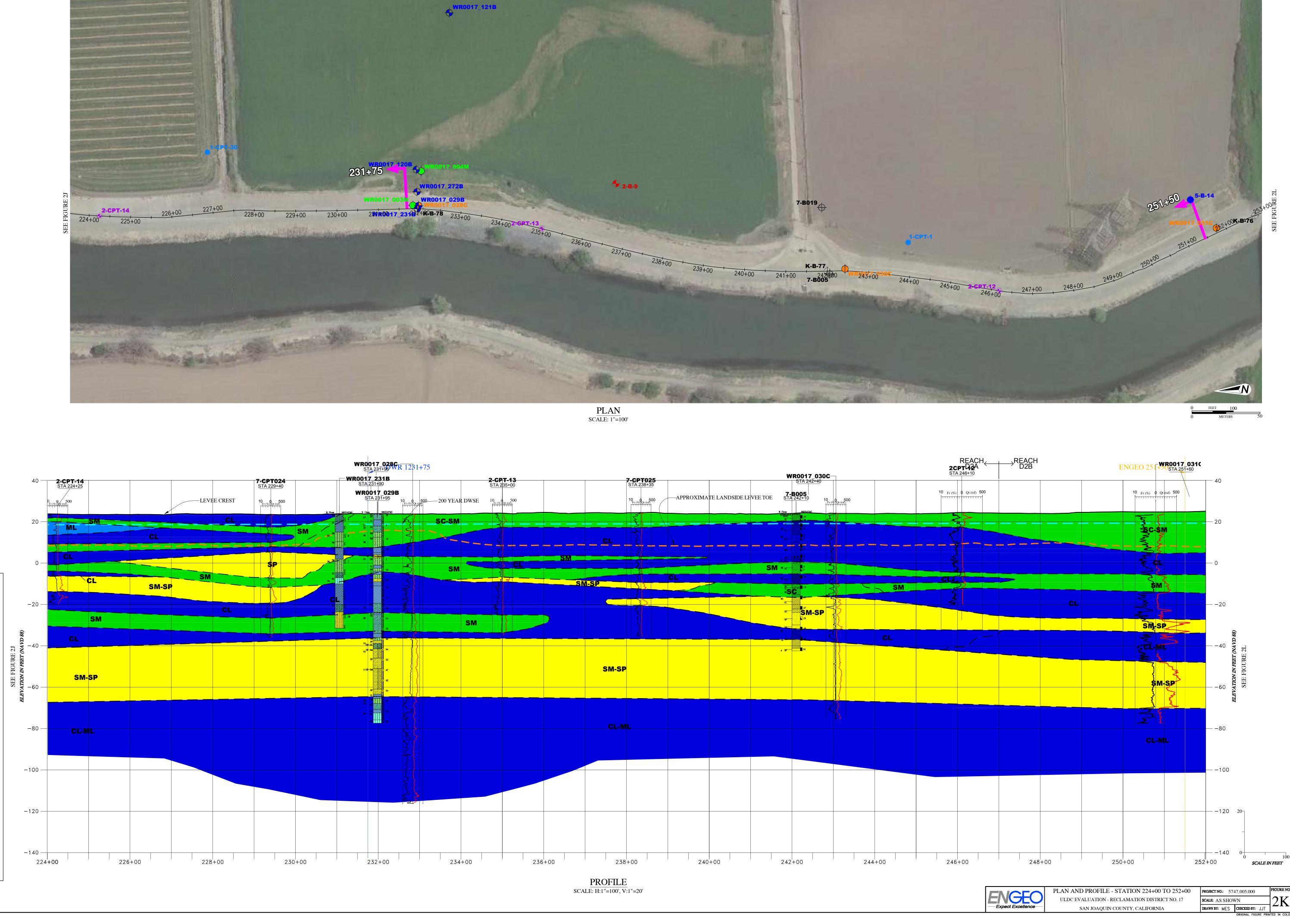
PLAN SCALE: 1"=100'

PROFILE SCALE: H:1"=100', V:1"=20'

2-CPT15 STA 215+55 WR0017_223B STA 221+45 10 0 500 20 SM-SP SM-SP 9 SP-SM - - 20 SM -40 SM-SP -60 5 CL-ML — — 100 -120 ²⁰ -140 218+00 220+00 216+00 224+00 222+00 SCALE IN FEET FIGURE NO PLAN AND PROFILE - STATION 196+00 TO 224+00 **PROJECT NO.:** 5747.005.000 2J

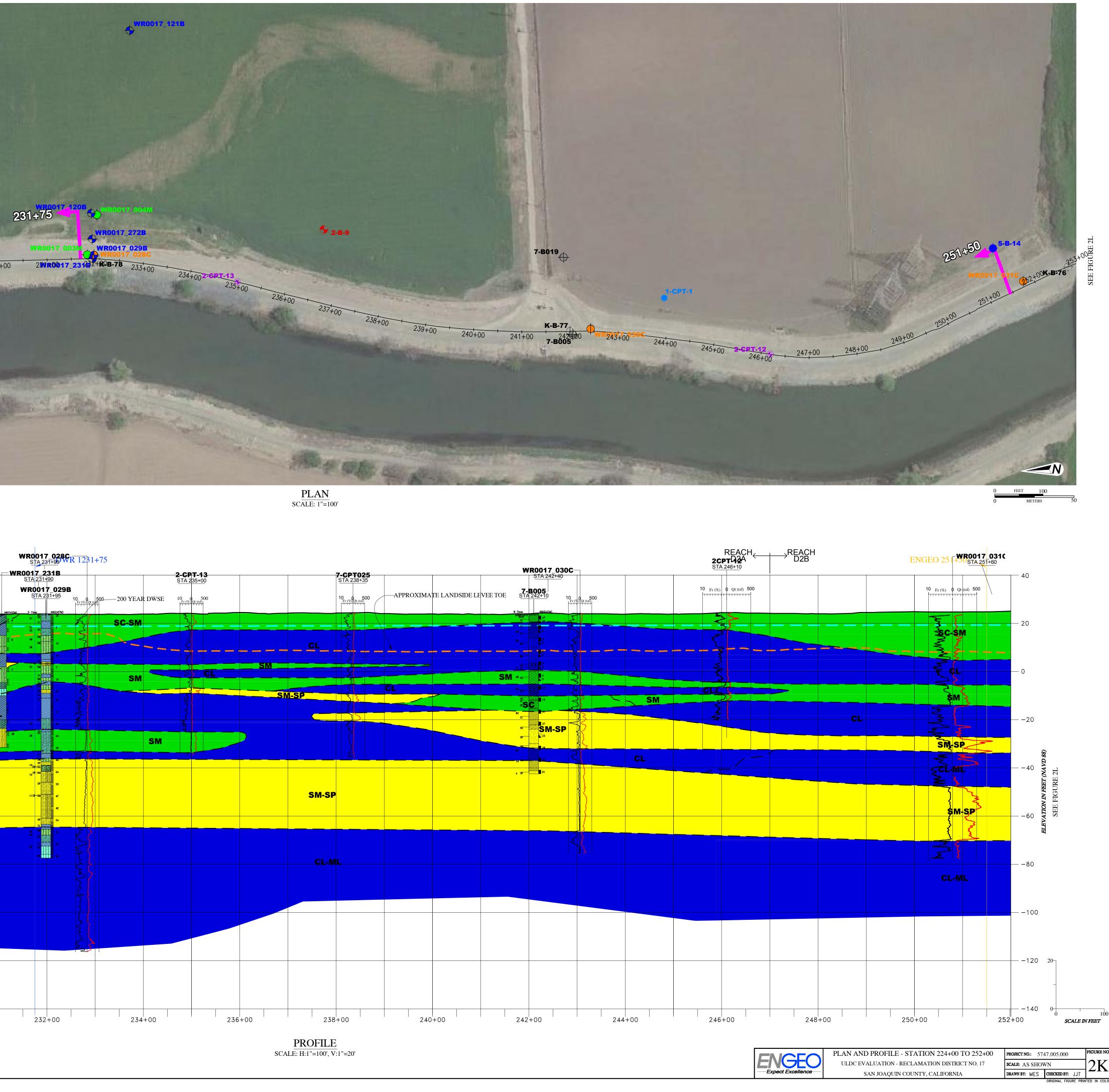
SCALE: AS SHOWN ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 DRAWN BY: MES CHECKED BY: JJT ORIGINAL FIGURE PRINTED IN COLOR SAN JOAQUIN COUNTY, CALIFORNIA





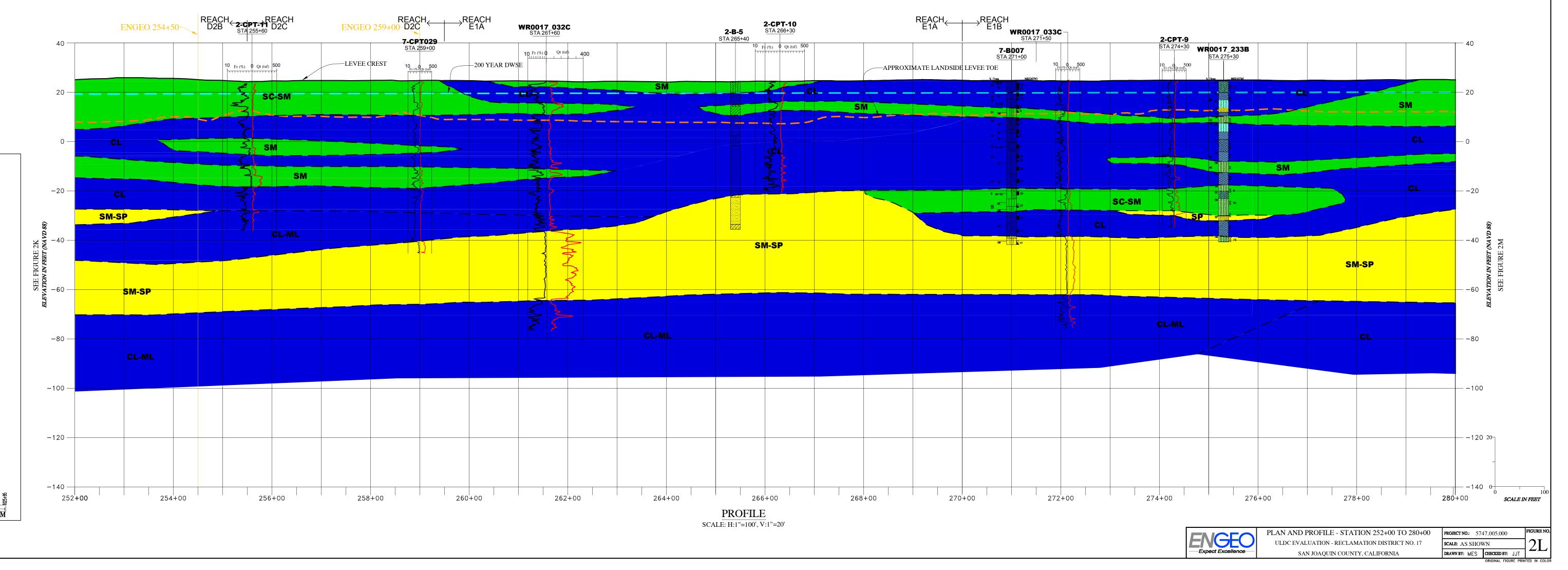
28 2A 2J/ **2**K 2L ₩\2M 300+00 2N 1/20 2P 2Q 2R 2S 41/21 2V 2V 2W 2Y SUM 2X 2AA 2Z 700+00 2BB 2CC 2DD 2FF 2GG 2HH 2JJ 2KK 2LL 2MM FIGURE LAYOUT NO SCALE

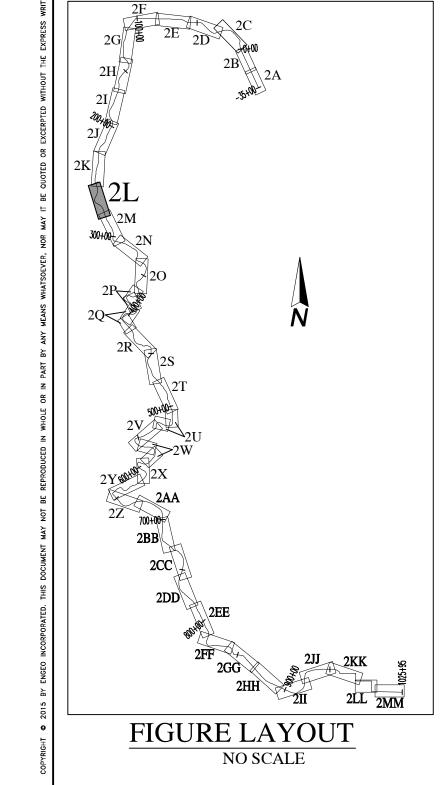
2E 2D 2C





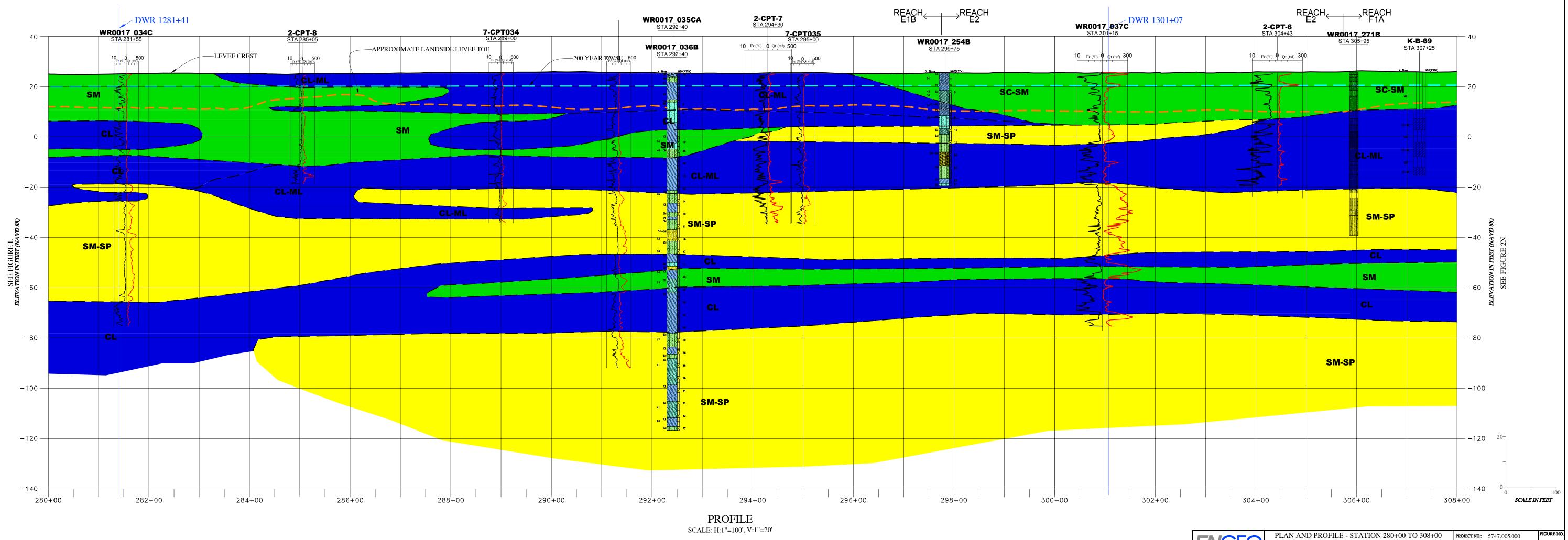


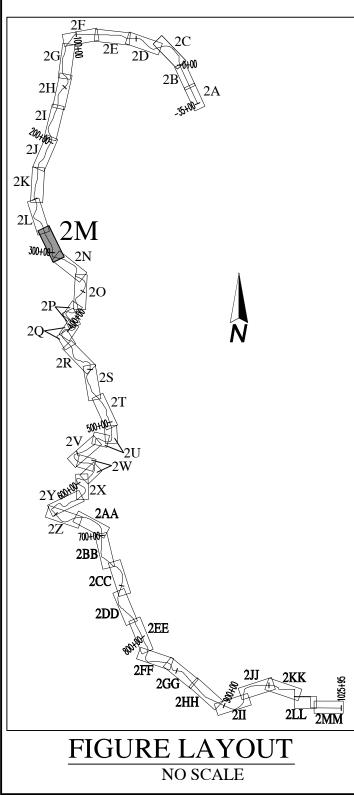




PLAN SCALE: 1"=100'





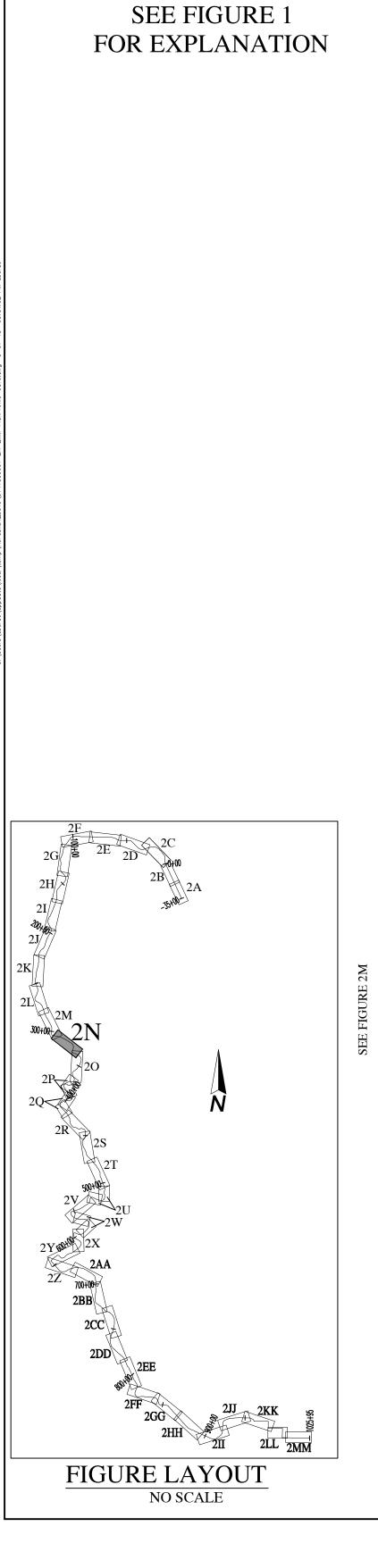


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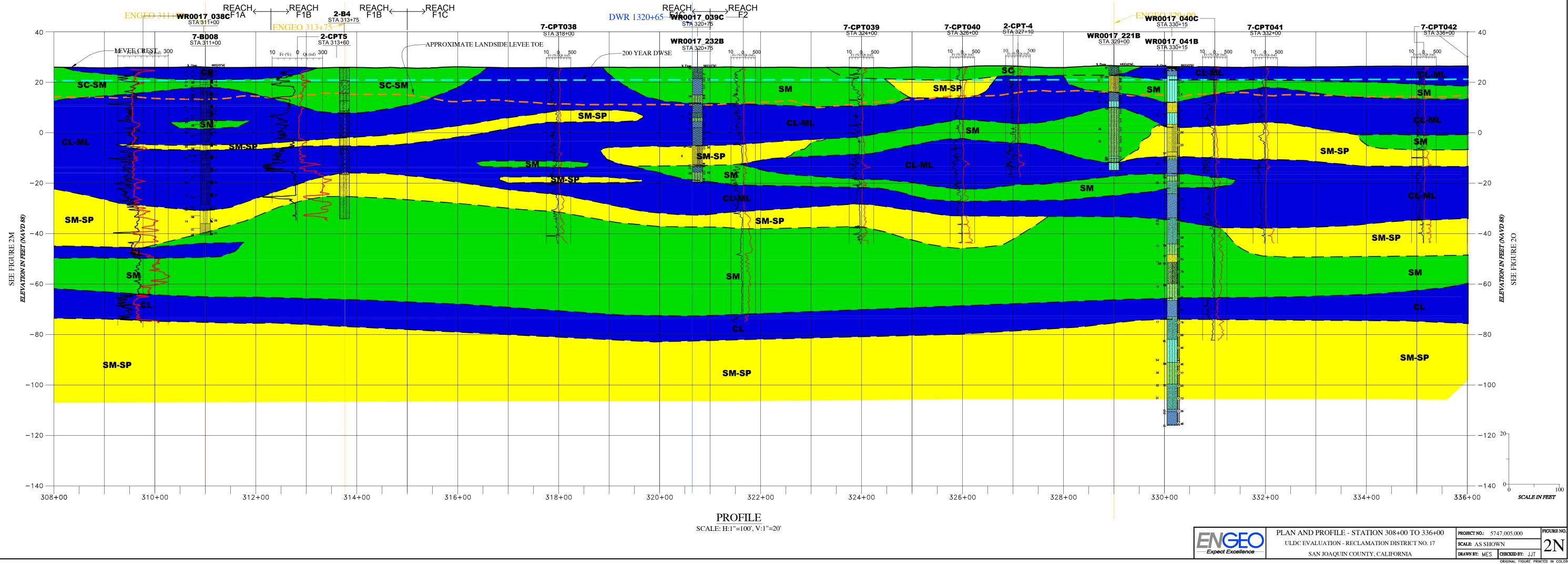


ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

SCALE: AS SHOWN DRAWN BY: MES CHECKED BY: JJT ORIGINAL FIGURE PRINTED IN COLOR



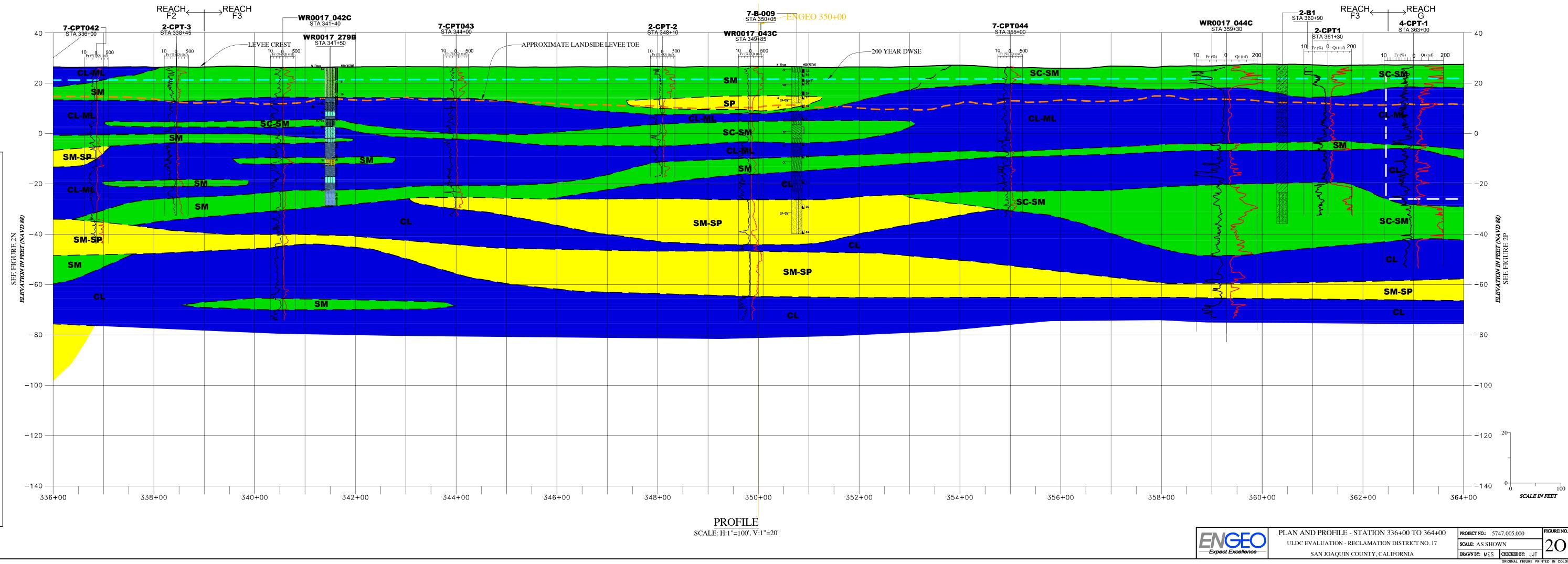




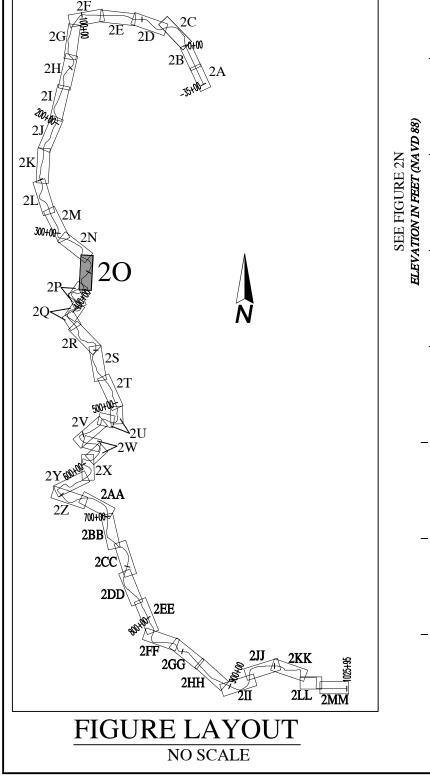
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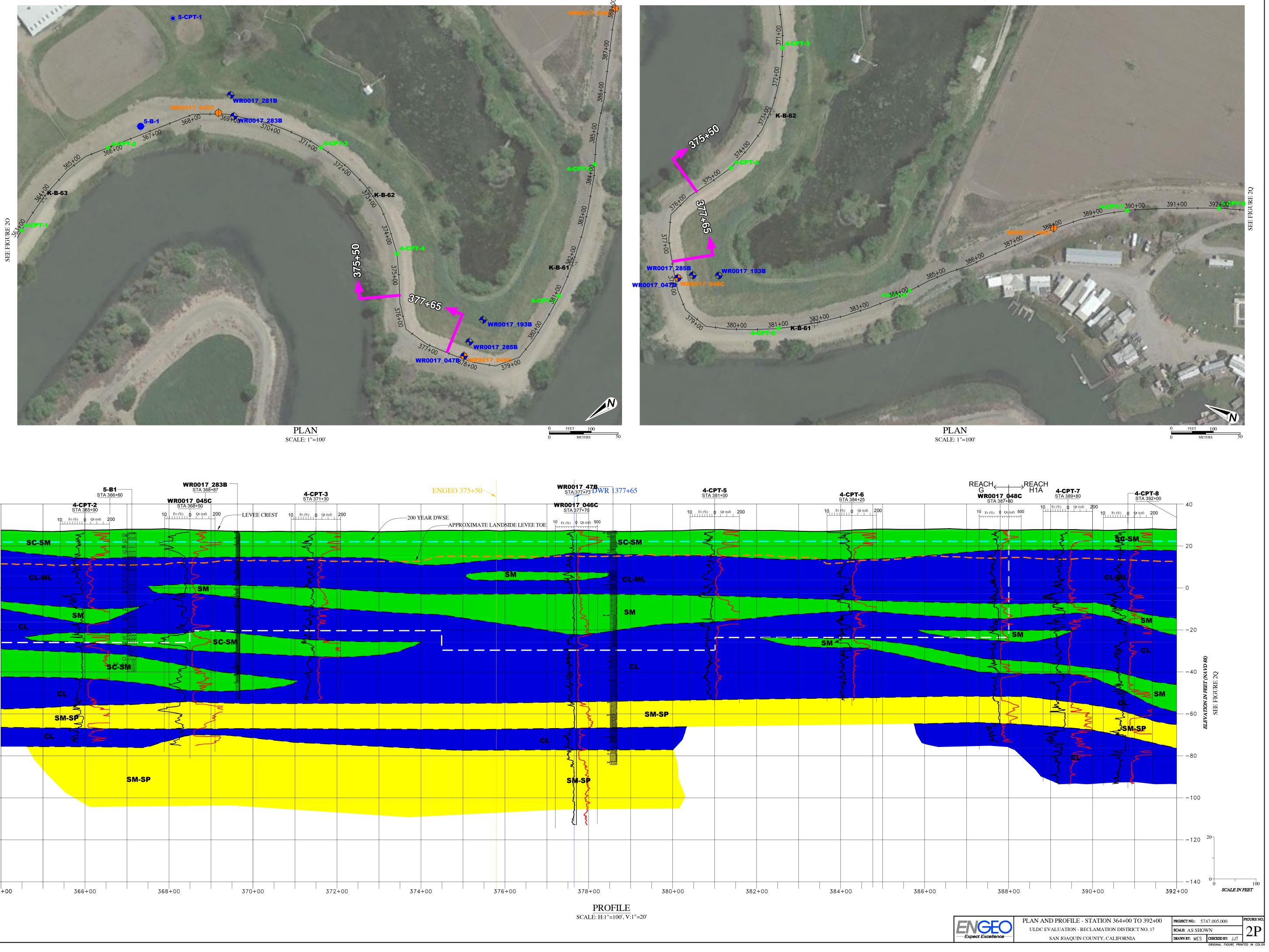


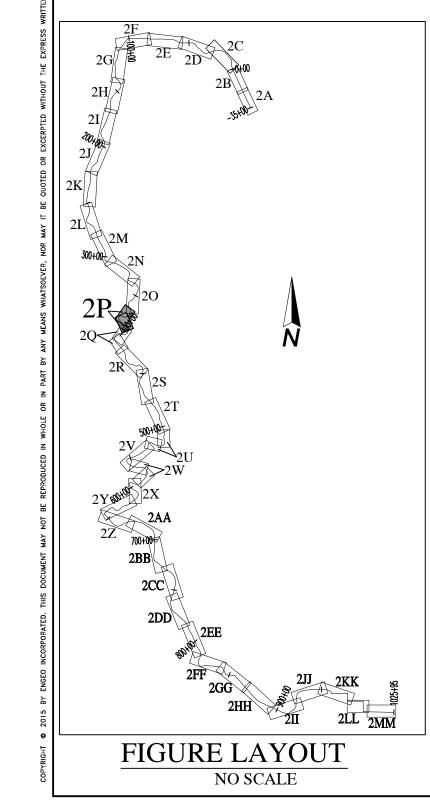


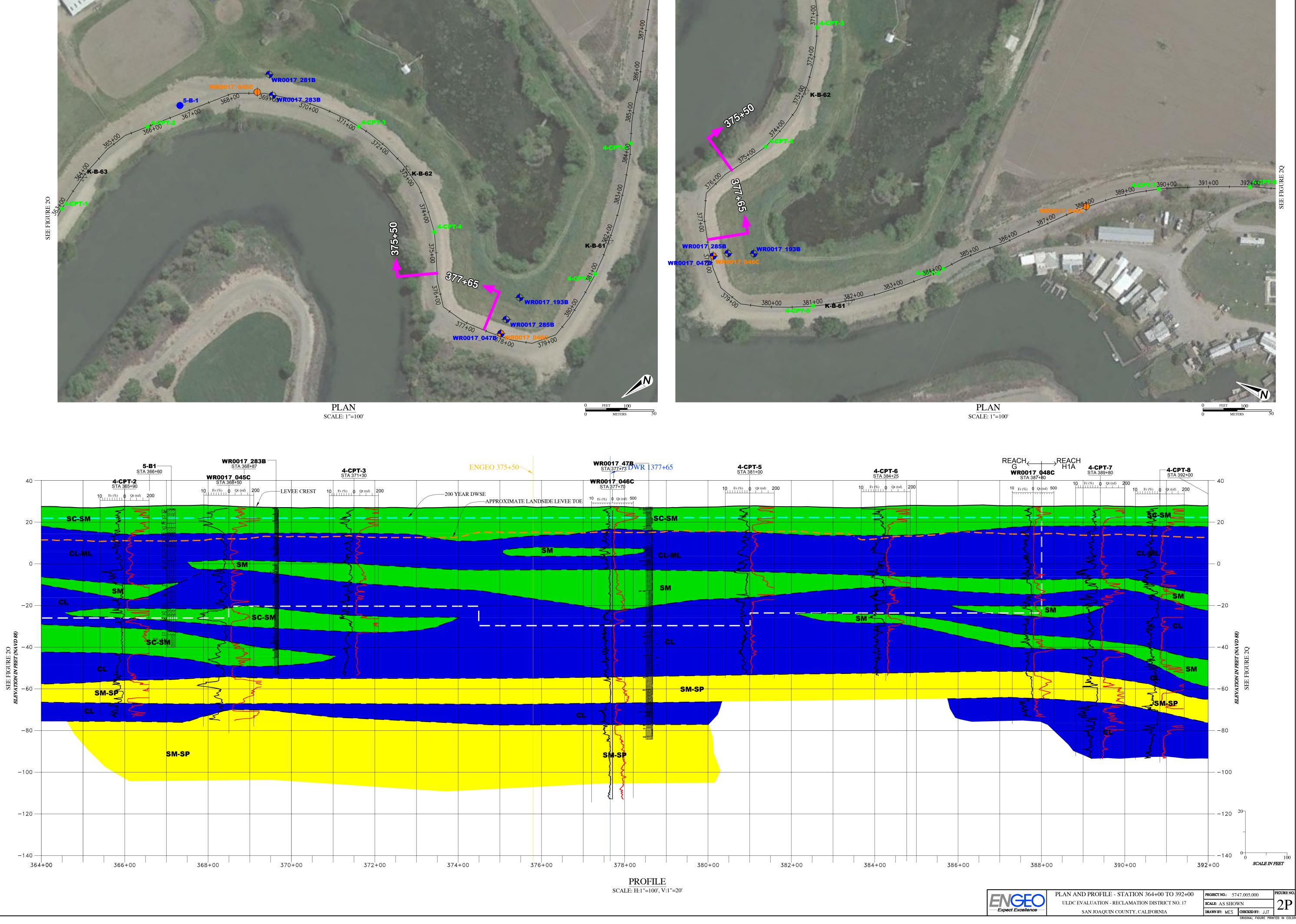
SAN JOAQUIN COUNTY, CALIFORNIA

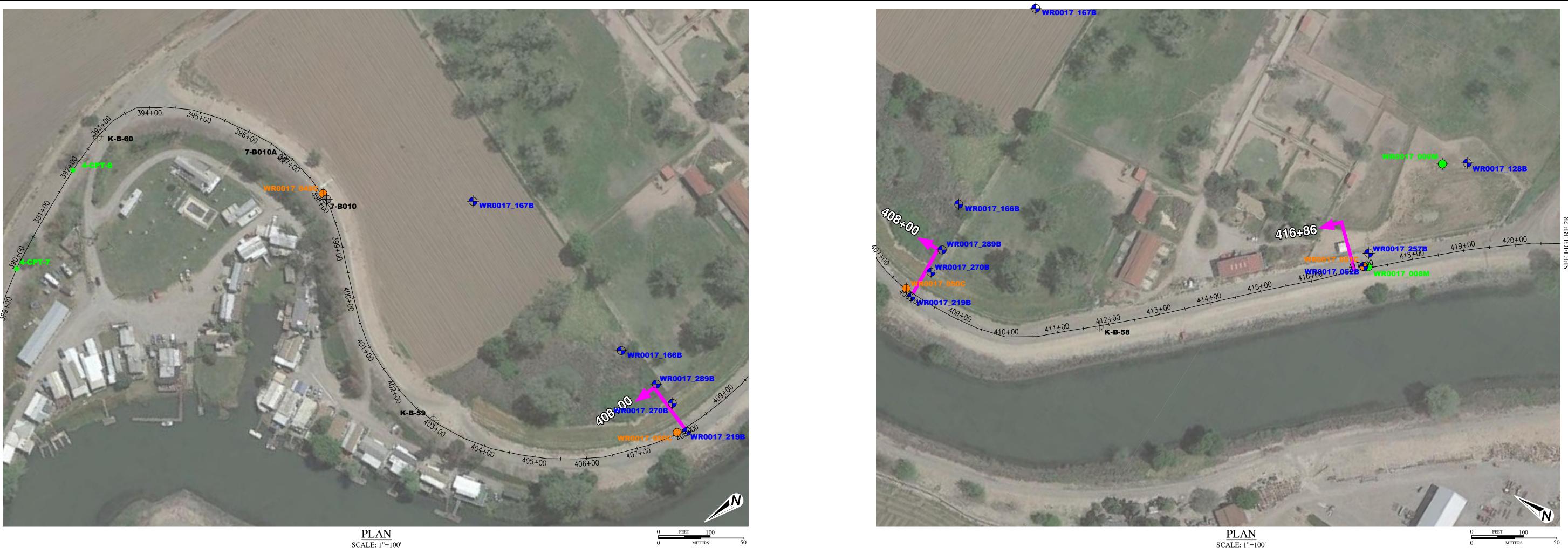


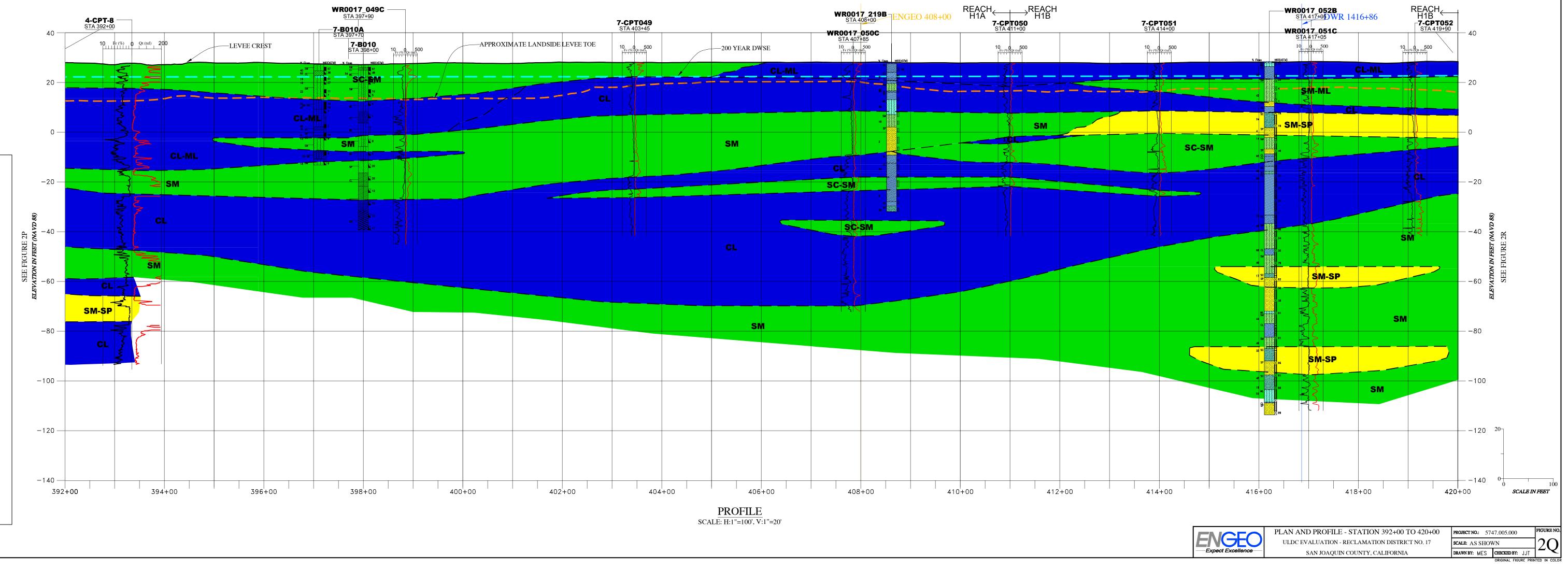
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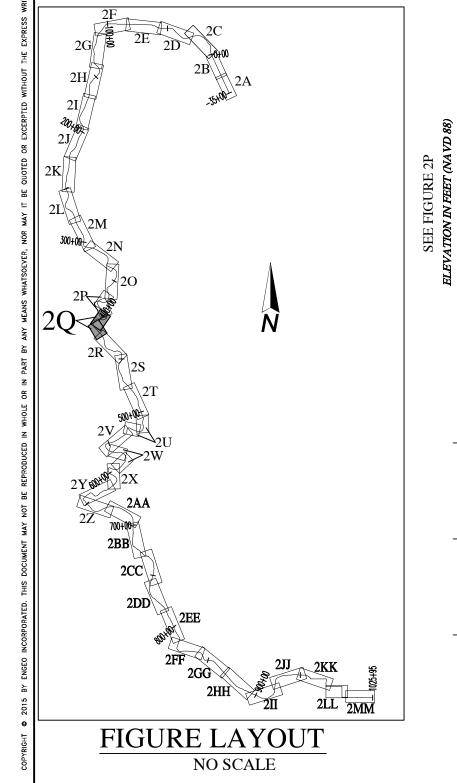


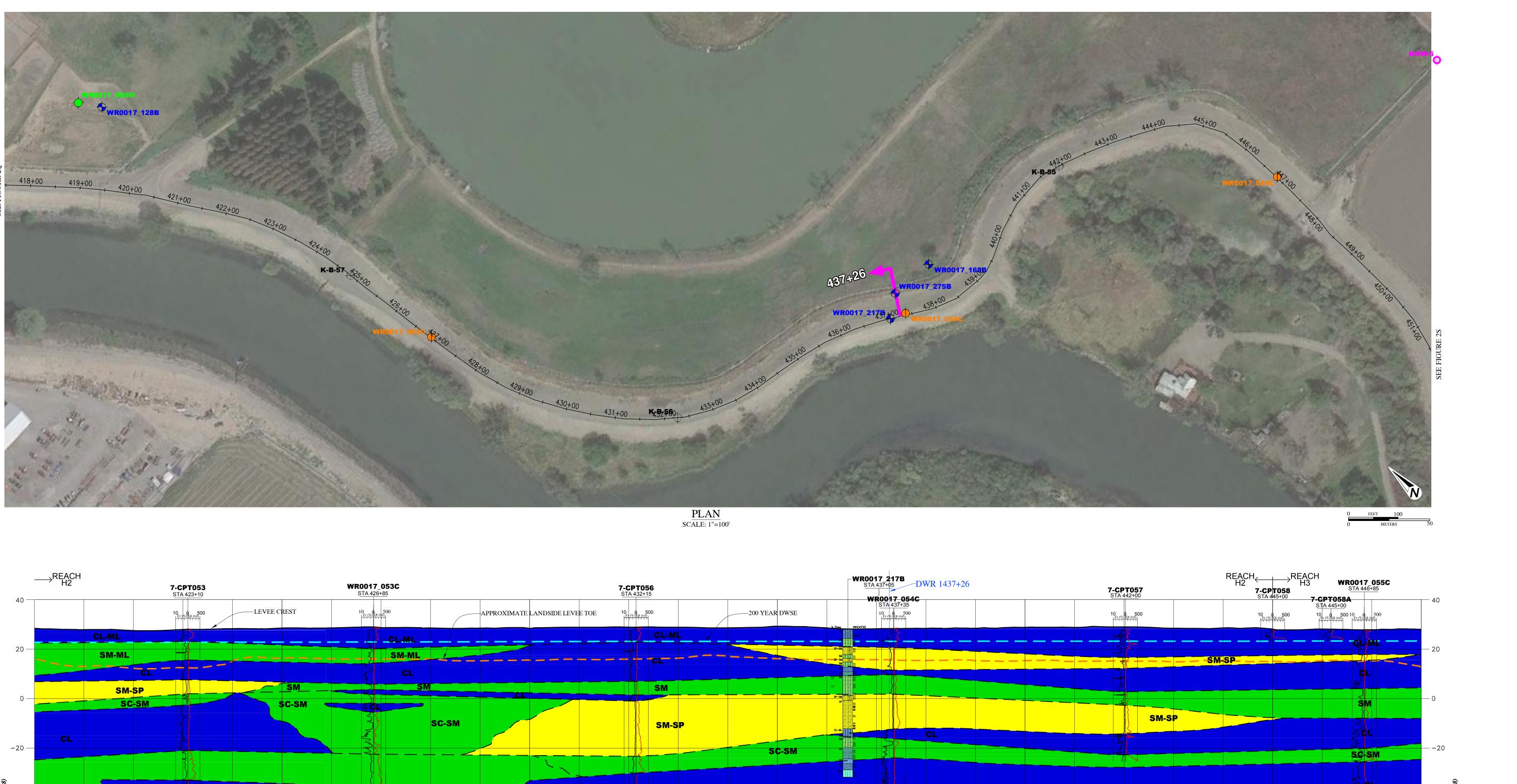


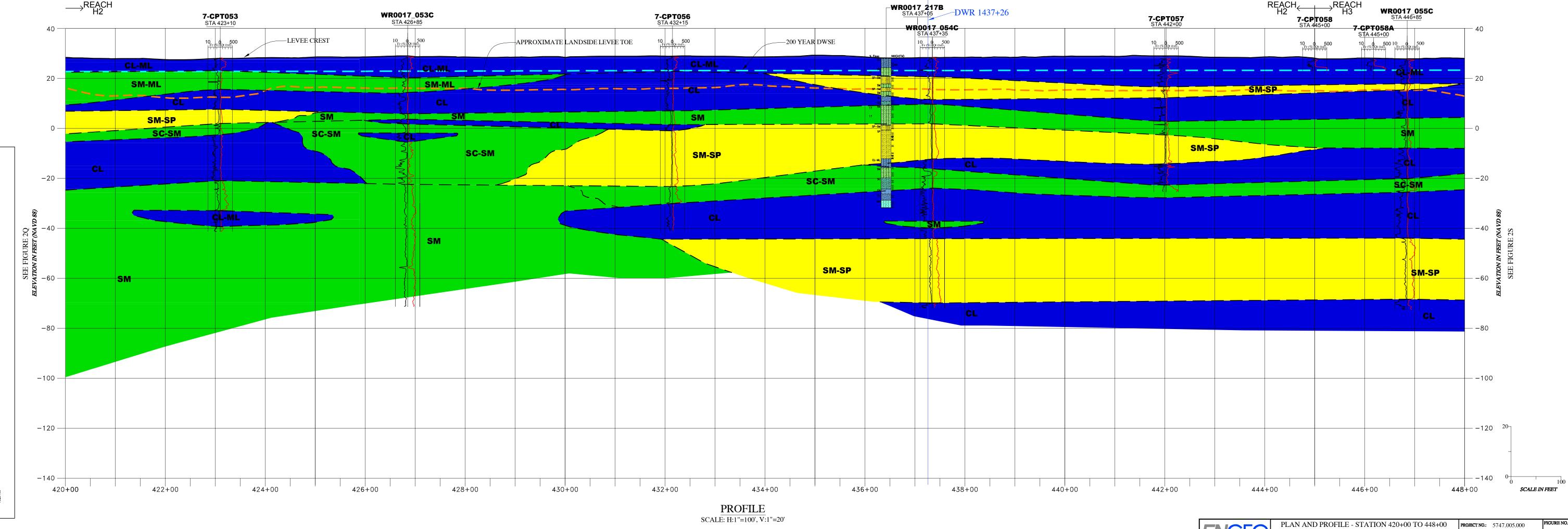


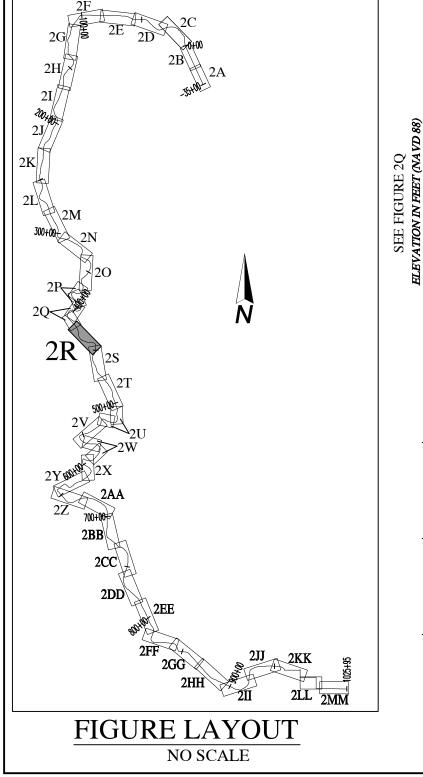












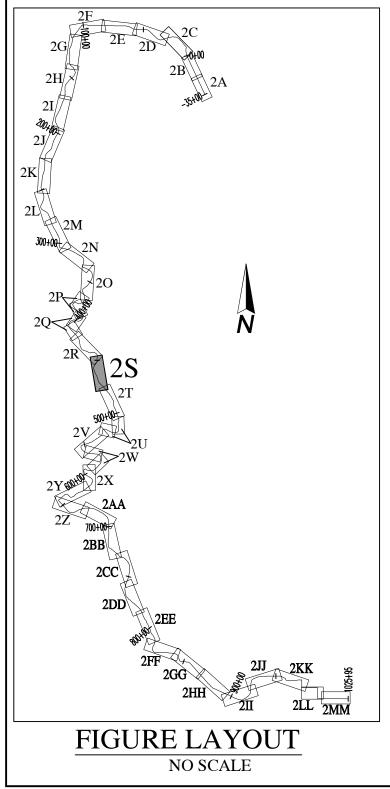
PLAN AND PROFILE - STATION 420+00 TO 448+00 ULDC EVALUATION - RECLAMATION DISTRICT NO. 17 SAN JOAQUIN COUNTY, CALIFORNIA

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SCALE: AS SHOWN

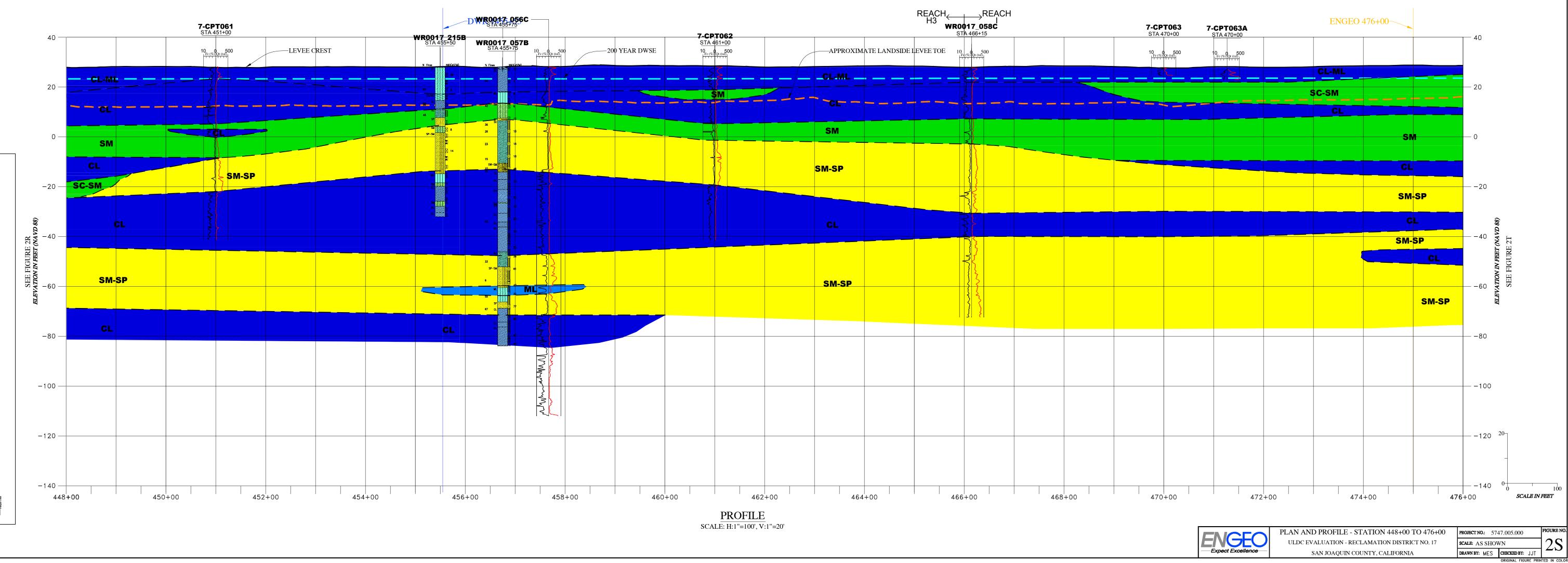
SCALE: AS SHOWN DRAWN BY: MES CHECKED BY: JJT ORIGINAL FIGURE PRINTED IN COLOP





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PLAN SCALE: 1"=100'