RECLAMATION DISTRICT NO. 1601
TWITCHELL ISLAND
BOARD OF TRUSTEES MEETING
TUESDAY, SEPTEMBER 17, 2024
9:00 AM
ENGINEER'S REPORT

I. DWR SYSTEMWIDE MULTI-BENEFIT PROJECT FUNDING SCOPE OF WORK

A. Report on progress of project for activities aimed at addressing erosion-induced damages to the levee waterside slopes and levee roadways along Sevenmile Slough between levee stations 166+50 and 170+50 on Twitchell during the 2023 high water event that DWR is considering funding as part of an Emergency.

B. The Project will qualify for a CEQA Categorical Exemption (CE) and the District will file an Notice of Exemption (NOE) which has a 35 day posting time. Due to biological habitat on site, the District will need to apply for a California Department of Fish & Wildlife (CDFW) Lake and Strem Bed Alteration Agreement (LSAA) permit, which typically takes 4-6 months to acquire. The Project qualifies for a U.S. Army Corps of Engineers (USACE) Section 404 Maintenance Exemption and therefore no permit or schedule is required for that.

II. PROJECT FUNDING AGREEMENT TW – 24 - 1.0 SP – PHASE I – SETBACK LEVEE SAN JOAQUIN RIVER

A. Review the general status of Project KSN Inc has prepared Scope of Work and is still working on onboarding GEI - Environmental Consultant to assist KSN Inc.

EXHIBIT A: 2023 Project Solicitations Package For Multi-Benefits Projects. Scope of Work – Reclamation District No. 1601 – Twitchell Island San Joaquin River Setback Levee – Reach 6 dated August 27, 2024

B. DWR announced last week at the Delta Levees and Habitat Committee Meeting (DLHAC) that advances for this round of Special Project Grants were going to be 3-4 months out.

III. DELTA LEVEE SUBVENTIONS PROGRAM AB 360

A. Review status of future Delta Levee Subvention Funding.

IV. DISTRICT PUMP STATION SOLAR ARRAY

A. Review and consider award to the lowest responsive, responsible bidder of the District's Solar Array Plans.

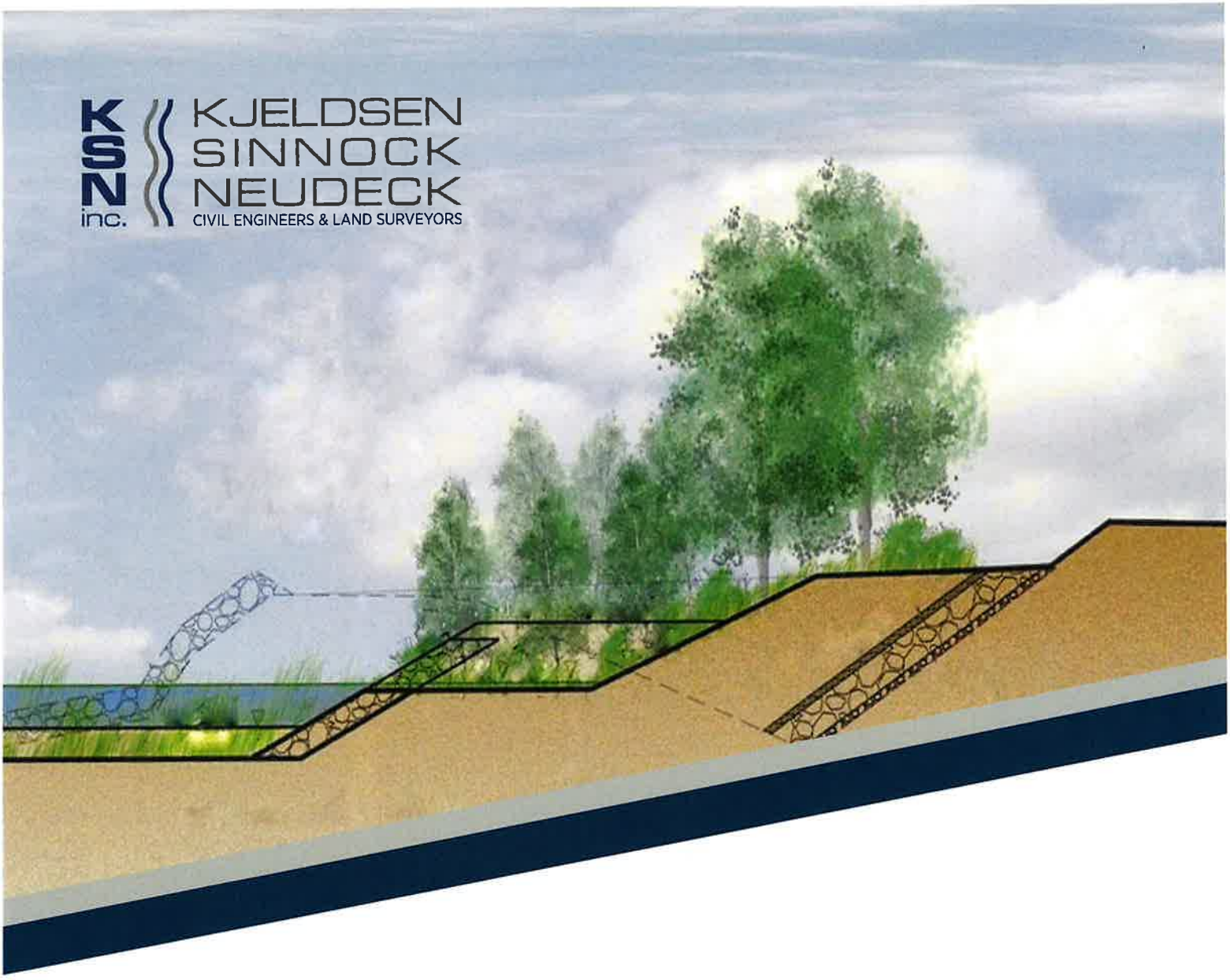
EXHIBIT B: Letter of recommendation of the lowest responsive responsible bidder from KSN Inc. (UNDER SEPARATE COVER)

B. Review status of release ("not hold the County responsible for damages to the panels and its appurtenances due to flooding") to Sacramento County regarding Panels in Flood Plain.

C. Review requirement to design PG&E transformer pad above Base Flood Elevation (Change Order will be required with Selected Contractor).

EXHIBIT A

KJELDSEN SINNOCK NEUDECK
CIVIL ENGINEERS & LAND SURVEYORS



2023 Projects Solicitation Package for
Multi-Benefit Projects

Scope of Work

Reclamation District No. 1601 – Twitchell Island San Joaquin River Setback Levee – Reach 6

August 27, 2024

Prepared For

State of California
Department of Water Resources
715 P Street, 6th Floor
Sacramento, CA 95814

Prepared By

Kjeldsen, Sinnock & Neudeck, Inc.
711 N. Pershing Avenue
Stockton, 95203

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APPENDICES

Appendix A. 90 Percent Improvement Plans for Phase 1 of Reach 6

Appendix B. 10 Percent Improvement Plans for Phase 2 of the Overall Project

Appendix C. Memorandum and 60 Percent Plans for Phase 3 of the Overall Project

Appendix D. Project Cost Estimate Breakdown

Appendix E. Project Schedule

1 INTRODUCTION

Reclamation District No. 1601 – Twitchell Island (District) is responsible for maintaining the levee system and drainage facilities that provide flood protection for primarily agricultural land and infrastructure on Twitchell Island. The District was formed in 1869 and encompasses an area of approximately 3,560 acres within the Delta Primary Zone, surrounded by 11.8 miles of levee. All lands are located within Sacramento County.

The District is located near State Highway Routes 12 and 160 and is bordered by Sevenmile Slough to the north and east, Threemile Slough to the west, and San Joaquin River to the south. Emergency ingress and egress routes are via Sacramento County roads along Sevenmile Slough that provides emergency evacuation to the north via Brannan-Andrus Island and State Highway 12 or to the west via State Highway 160. A vicinity map showing the location of the District is shown in **Figure 1-1**.

1.1 BACKGROUND & PROJECT NEED

The Twitchell Island levee system, and particularly the San Joaquin River levee reach, has a history of levee stability complications including settlement, subsidence, seepage, and slope failure. Deep organic soils and sands in conjunction with adjacent deep waterways and high winds common in the western Delta cause the San Joaquin River levee reach to be extremely vulnerable to erosion and failure, particularly when high winds coincide with high water events which direct significant wave energy and runup at the levees.

The District's overall San Joaquin River Setback Levee Project consists of rehabilitating over four miles of the District's levee along the San Joaquin River in a manner that will increase the levee's resistance to erosion, provide better overall levee stability, and provide additional freeboard to protect against overtopping due to wind generated waves. Furthermore, the project will provide much needed channel margin habitat along this stretch of the San Joaquin River.

The overall San Joaquin River Setback Levee Project is currently divided into ten reaches. Each reach is approximately ½ mile long and is further divided into three phases. The specific work described within this Scope of Work (SOW) is for Reach 6 of the District's overall San Joaquin River Setback Levee Project which is from Station 482+00 to Station 508+80. Reach 6 has been identified as the District's highest priority and the reach with the greatest risk.

1.2 STATE FUNDING HISTORY

This SOW has been prepared in accordance with Project Funding Agreement (PFA) No. TW-24-1.0-SP which was executed on June 19, 2024, between the Department of Water Resources (DWR) and the District. Prior PFAs have authorized funding to the District for engineering, field surveys, environmental evaluation, and permitting of the levee improvements and rehabilitation activities associated with the San Joaquin River levee reach on Twitchell Island. As a result of these prior efforts, the environmental documentation in accordance with the California Environmental Quality Act (CEQA), permitting, and preliminary engineering were finalized for the overall San Joaquin River Setback Levee Project back in 2019.

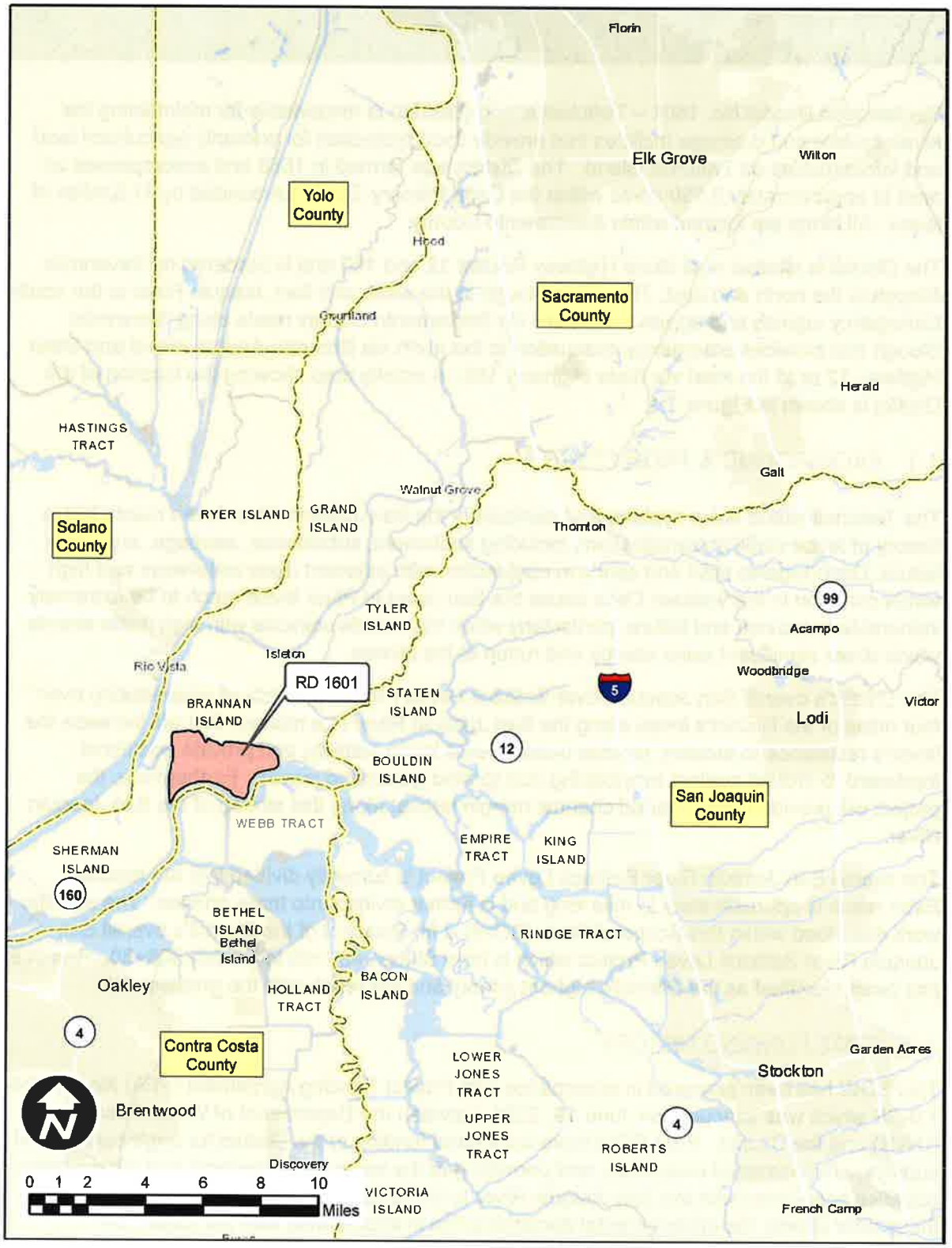

Figure 1-1 - Vicinity Map

1.3 DISTRICT PERSONNEL

District personnel, including consultants involved with the Project, are summarized below in **Table 1-1**.

Table 1-1 - District Personnel

Title	Name	Company
Board of Trustees		
President	Barry Sgarella	RD No. 1601 – Twitchell Island
Trustee	David Huston	RD No. 1601 – Twitchell Island
Trustee	Jasbir Gill	RD No. 1601 – Twitchell Island
District Staff		
Attorney	Jesse Barton	Gallery & Barton
District Engineer	Christopher H. Neudeck	Kjeldsen, Sinnock & Neudeck, Inc.
Secretary	Linda Carter	RD No. 1601 – Twitchell Island
Superintendent	Rick Carter, Jr.	RD No. 1601 – Twitchell Island
Project Consultants		
Project Manager	Erik Almaas	Kjeldsen, Sinnock & Neudeck, Inc.
Construction Manager	David Carr	Kjeldsen, Sinnock & Neudeck, Inc.
Environmental Compliance	Nick Tomera	GEI Consultants

2 PROJECT DESCRIPTION

The overall San Joaquin River Setback Levee Project is anticipated to be constructed in multiple stages over the course of many years as funding becomes available. The environmental, permitting, and preliminary engineering components of the overall project have been completed.

2.1 PROJECT OBJECTIVES

The District is currently in the advantageous position of having a shovel-ready, multi-benefit project that will provide for the following primary objectives:

- to accomplish landside levee improvements that increase the levee's resistance to erosion, provide better overall levee stability, and provide additional freeboard (increased levee height) for an estimated wave run-up of 4.7 feet above the 100-year event water surface elevation.
- to provide channel margin habitat along this stretch of the San Joaquin River.

2.2 PROJECT CONSTRUCTION PHASING

The overall San Joaquin River Setback Levee Project is currently divided into ten reaches. Each reach is approximately ½ mile long, and most reaches, including Reach 6, are further divided into three phases. The three phases consist of:

- Phase 1: Foundation Toe Berm
- Phase 2: Setback Levee
- Phase 3: Channel Margin Habitat

The specific work described within this SOW is for the District's first priority of the overall San Joaquin River Setback Levee Project which consists of Reach 6 from Station 482+00 to Station 508+80, as shown in **Figure 2-1**. The three phases of Reach 6 are summarized in **Figure 2-2** and discussed in further detail below.

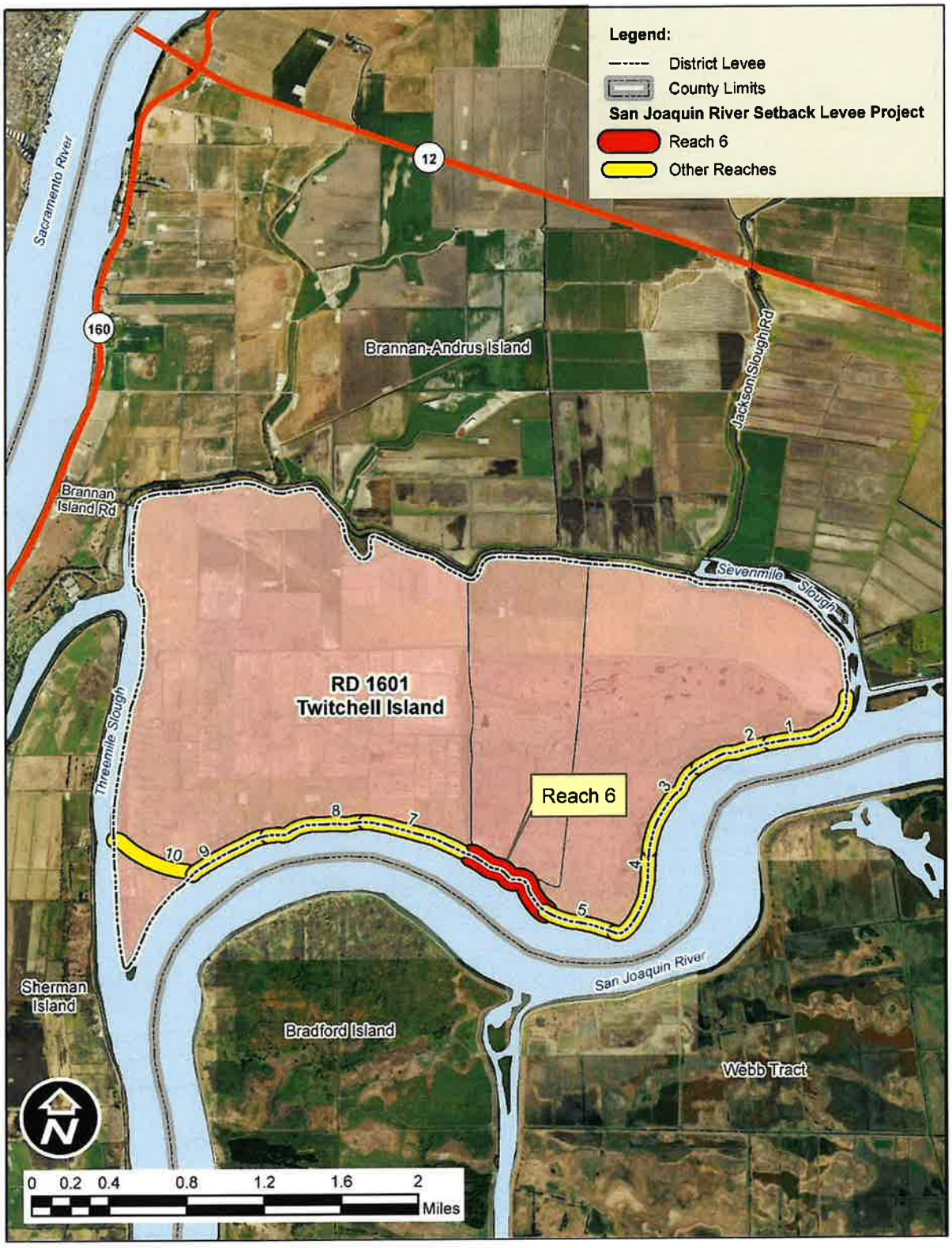

Figure 2-1 - Project Site Map

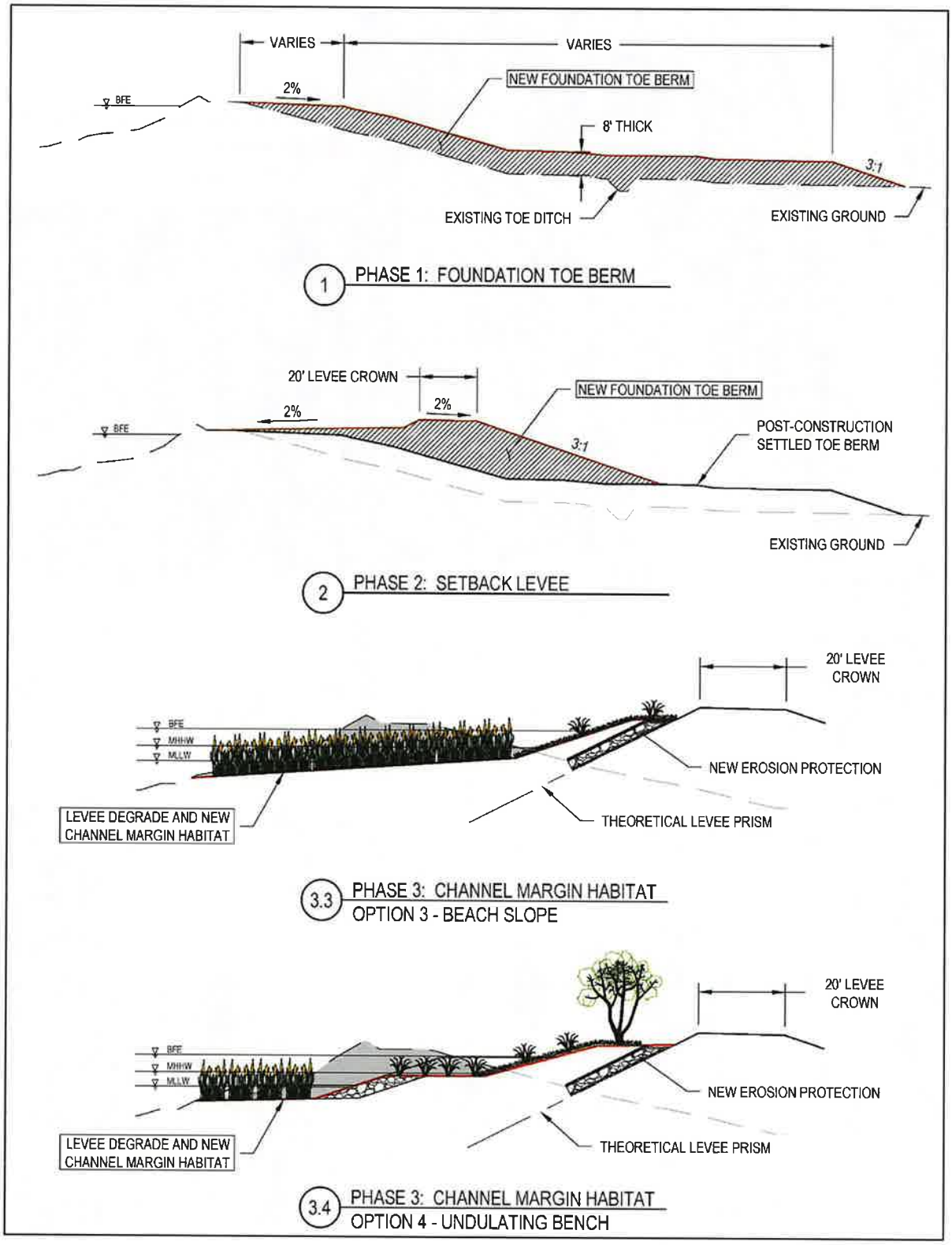

Figure 2-2 - Project Phases

2.2.1 FLOOD PROTECTION

Phase 1 – Foundation Toe Berm

Phase 1 consists of a substantial toe berm placed on the landside of the existing levee that will consolidate and increase the peat foundation strength and provide stability for new levee embankment construction to allow landside crown widening and raising to be safely performed.

Construction activities will commence with clearing and grubbing operations along with any necessary demolition work. Existing irrigation ditches and toe drains will be "mucked out" and free of highly organic matter prior to the placement of toe berm fill material. The ditches will be relocated to a new alignment outside of the berm footprint. Fill material will be placed in horizontal lifts against vertical faces keyed into existing levee material. Fill placement will be staged in maximum 3-foot lifts, and placement rates and settlement will be field monitored. Subsequent stages of fill placement will not be placed within three weeks of the previous stage or until the settlement rates under the initial filling show a distinct reduction consistent with substantial completion of consolidation.

A set of 90-percent improvement plans for Phase 1 for Reach 6 is included as **Appendix A**. As part of the Project, an updated topographic survey will be conducted. The plans for Phase 1 will be revised and refined as necessary, and a final biddable set of plans will be prepared for formal bid solicitation.

Phase 2 – Setback Levee

Phase 2 consists of the new setback levee. It will be constructed on top of the foundation toe berm immediately behind the existing levee with a levee crown elevation equal to the 100-year base flood elevation plus 4.7 feet of estimated wave run-up plus 0.5 foot for future consolidation and settlement.

Fill material will be placed in horizontal lifts against vertical faces keyed into existing levee material. Existing irrigation siphons will be reconstructed to follow the lines and grades of the new levee. All-weather patrol roads will be constructed with 3/4-inch Class 2 aggregate base at the levee crown and toe. Rock slope protection consisting of quarry stone riprap will be constructed on the waterside of the theoretical levee prism and buried.

A set of 10-percent conceptual design plans for Phase 2 of the overall San Joaquin River Setback Levee Project are included as **Appendix B**. Prior to construction of Phase 2, a limited topographic survey will be performed in order to incorporate the new toe berm into the Phase 2 design. Using the 10-percent conceptual design and the new survey data, a final biddable set of plans for Phase 2 will be prepared for formal bid solicitation.

2.2.2 HABITAT DEVELOPMENT

Phase 3 – Channel Margin Habitat

Phase 3 consists of the proposed waterside habitat design. The primary design objective is the creation of a diverse range of channel margin habitat structures and shaded riverine aquatic habitats, and their associated ecological functions and target species benefits. A secondary objective is the creation of a continuous corridor of riparian and upland scrub habitats having a diversity of botanical species and canopy structure.

To achieve these objectives, another essential objective is to design structures and habitats that can withstand the erosive forces of chronic ship/boat wakes and wind waves, and the occasional high energy storm waves, with minimal loss of substrate, soil and vegetation and the ability to recover from infrequent storm-related damage. The waterside of the existing levee along the San Joaquin River will be modified based on up to five design options to create a mosaic of three different habitat types (tule marsh and mudflat; riparian forest and scrub; and upland scrub and grassland).

The remnant levee will be degraded and/or regraded as necessary to provide the lines and grades to support planting. Planting will occur and be maintained for one year during the Habitat Establishment Period.

A memorandum and set of 60 percent plans for Phase 3 of the overall project are included in **Appendix C**. Using the final Phase 2 design, a final biddable set of plans for Phase 3 will be prepared for formal bid solicitation.

3 CEQA / PERMITTING / MITIGATION

All environmental compliance and permitting work for the overall San Joaquin River Setback Levee Project were completed under a prior PFA.

3.1 ENVIRONMENTAL COMPLIANCE

An Environmental Impact Report (EIR) was completed, and a Notice of Determination (NOD) was filed in 2015.

The EIR identifies potential jurisdictional waters of the United States and waters of the State occurring on the project site, including freshwater emergent wetland, willow scrub wetland, and irrigation/drainage ditches. Project construction will result in the permanent removal (because of the direct filling) of potential USACE-jurisdictional waters of the United States, waters of the State, and riparian habitat (i.e., willow scrub wetland). Also, construction of the proposed project will result in the permanent removal of existing vegetation and cover types that are suitable for special-status plants.

3.2 PERMITTING

Permitting has also been completed. A summary of the permitting effort is as follows:

- U.S. Army Corps of Engineers, Section 404 1ndividual Permit and River and Harbors Section 10 Permit
- Endangered Species Act Section 7 Compliance
  - U.S. Fish and Wildlife Service Biological Opinion
  - National Marine Fisheries Service Biological Opinion
- Central Valley Regional Water Quality Control Board, Section 401 Water Quality Certification
- California Department of Fish and Wildlife (CDFW), Section 1602 Lake and Streambed Alteration Agreement (LSAA)
- Section 106 of the National Historic Preservation Act Compliance

The District had previously been granted a five-year extension for its LSAA, and it is currently set to expire on December 31, 2024. CDFW recently informed the District that an additional extension will not be allowed beyond this date. As such, the District will be applying for a new LSAA as part of this SOW.

3.3 HABITAT IMPACTS

California Water Code §12314 specifies that no net loss of habitat shall occur. Any long-term and/or short-term and construction-related impacts resulting from the project have been mitigated.

The District developed a wetland mitigation and monitoring plan to compensate for the loss of jurisdictional wetlands, including appropriate wetland replacement ratios to replace the loss of aquatic functions. The U.S. Army Corps of Engineers (USACE) determined that the overall San Joaquin River Setback Levee impacted freshwater emergent wetland and willow scrub wetland.

The U.S. Fish and Wildlife Service (USFWS) determined that suitable giant garter snake (GGS) habitat was impacted by the overall project.

Compensatory mitigation credits will be purchased by the District prior to construction of Reach 6. Pursuant to the USACE Section 404 permit, the District will purchase 0.9 acre of floodplain mosaic re-establishment credits from the Cosumnes Floodplain Mitigation Bank at a ratio of 1:1 to compensate for the loss of freshwater emergent wetland. Pursuant to the USFWS Biological Opinion, the District will purchase 2.7 acres of credits at a USFWS-approved GGS habitat conservation bank and/or at a DWR-specific compensatory mitigation site on the east side of Twitchell Island at a ratio of 3:1 to compensate for the permanent effects to GGS aquatic habitat (i.e., freshwater emergent marsh).

3.4 HABITAT BENEFITS

California Water Code §12314 also specifies the need for net long-term habitat improvement. The current 60 percent Phase 3 design for Reach 6 includes the creation of 9.1 acres of new habitat consisting of tule marsh, dense willow scrub, upland scrub, and mixed riparian. The current 60 percent Phase 3 design also includes approximately 300 linear feet of Shaded Riverine Aquatic (SRA) habitat. However, given that DWR and CDFW have expressed interest in the development of programmatic SRA habitat, the District expects to add up to 2,380 linear feet of additional SRA in the final 100 percent design. All habitat that is developed will qualify as a net long-term habitat improvement.

4 SUMMARY OF TASKS

The work generally consists of project and grant management, final engineering and design, construction of the three phases of work, environmental compliance, and construction management. Expected tasks include, but are not limited to, the following:

- Project management
  - Execute agreement(s) with subconsultants.
  - Apply for a new CDFW LSAA for the overall project.
  - Develop and certify Delta Stewardship Council (DSC) consistency determination.
  - Negotiate and purchase compensatory mitigation credits.
  - Explore cost sharing opportunities.
  - Apply for and execute agreement with Pacific Gas and Electric for the relocation of existing utility poles.
- Grant management
  - Prepare and submit this SOW.
  - Prepare and submit funding advance requests.
  - Prepare and submit progress invoicing.
  - Prepare and submit final construction completion report.
- Engineering / bidding (for each phase)
  - Perform topographic survey.
  - Prepare plans, specifications, and cost estimate.
  - Advertise in a public newspaper, solicit bids from prospective bidders, and issue addenda if necessary.
  - Receive bids and host public bid opening.
  - Review bids for completeness and award the construction contract to the responsible bidder with the lowest responsive bid.
- Construction and environmental compliance (for each phase)
  - Issue Notice to Proceed to contractor.
  - Review and approve submittals from the contractor and respond to RFIs.
  - Provide construction observations and Quality Assurance testing to ensure that construction is performed in general accordance with the plans and specifications.
  - Review and approve the contractor's progress payment invoices.
  - Provide biological monitoring as necessary to ensure compliance with environmental and permitting requirements.

5 BUDGET

The estimated project cost for Reach 6 is $15,784,000. Except as noted otherwise, all environmental, permitting, and preliminary engineering for the overall project have already been completed as part of a prior PFA. The project cost for Reach 6 includes construction of all three phases as well as soft costs consisting of project management, final engineering, bidding and contract award, and construction management and inspection. The project cost also includes compensatory mitigation for permanent impacts to freshwater emergent marsh on the landside of the District's levee. The estimated project cost for Reach 6 is summarized below in **Table 5-1**. A detailed breakdown of the estimated project costs is included in **Appendix D**.

Table 5-1 – Estimated Project Costs

Description	Total Project Cost	State Cost Share (95%)	Local Cost Share (5%)
Construction – Phase 1	$6,914,000	$6,568,000	$346,000
Construction – Phase 2	$3,547,000	$3,370,000	$177,000
Construction – Phase 3	$1,032,000	$980,000	$52,000
Management / Environmental / Engineering	$1,542,000	$1,465,000	$77,000
Compensatory Mitigation	$689,000	$655,000	$34,000
15% Contingency	$2,059,000	$1,956,000	$103,000
Totals:	**$15,783,000**	**$14,994,000**	**$789,000**

6 SCHEDULE

Upon approval of this SOW, work on final permitting for the project, including a new CDFW LSAA and a DSC Consistency Determination, will commence. At that time, the surveying and final engineering for Phase 1 will kick off as well. The project is expected to be constructed over the course of three consecutive construction seasons beginning in May 2025 and ending in July 2027. The estimated project schedule is summarized below in **Table 6-1** and **Figure 6-1**. A detailed breakdown of the estimated project schedule is included in **Appendix E**.

Table 6-1 - Estimated Project Schedule

Task	Start Date	End Date
Execution of Project Funding Agreement	April 2024	June 2024
Prepare Scope of Work	July 2024	October 2024
Final Permitting	October 2024	April 2025
Surveying & Final Engineering – Phase 1	October 2024	February 2025
Bidding & Contracting – Phase 1	February 2025	April 2025
Construction – Phase 1	May 2025	September 2025
Surveying & Final Engineering – Phase 2	October 2025	January 2026
Bidding & Contracting – Phase 2	January 2026	March 2026
Construction – Phase 2	May 2026	August 2026
Surveying & Final Engineering – Phase 3	August 2026	December 2026
Bidding & Contracting – Phase 3	December 2026	February 2027
Construction – Phase 3	May 2027	July 2027
Establishment Period	August 2027	July 2028
Prepare Project Completion Report	May 2028	September 2028
Performance Period[(1)]	August 2028	July 2031

Notes:

(1) The three-year Performance Period will be funded through a separate PFA and will begin immediately after the Establishment Period.

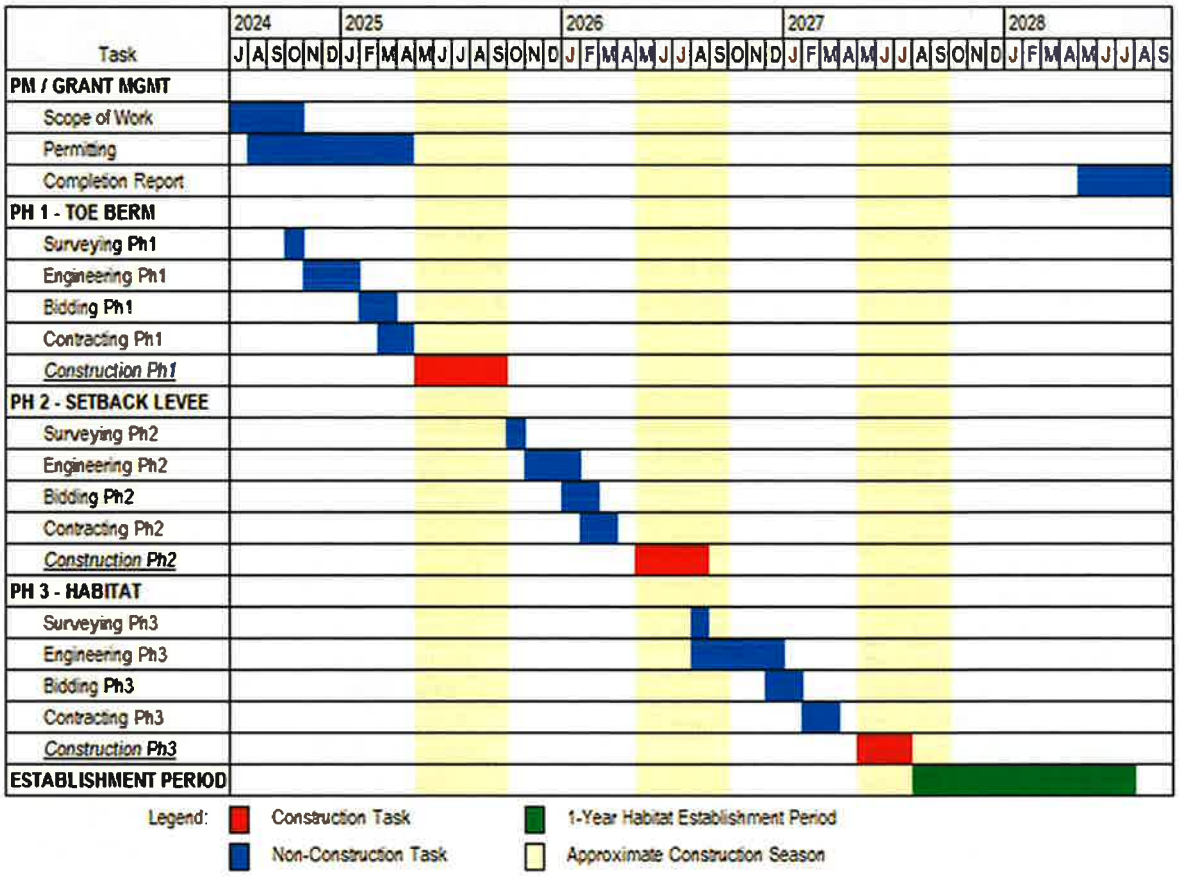

Figure 6-1 - Estimated Project Schedule

7 SUMMARY

On behalf of the District, we hereby submit this SOW to DWR and CDFW. In accordance with Paragraph 7 of PFA No. TW-24-1.0-SP, this SOW includes "*a complete project description and costs of all activities along with schedules and completion dates.*" We look forward to collaborating with DWR and CDFW in implementing this much needed project. Please don't hesitate to contact me with any questions.

Sincerely,

Erik Almaas, P.E.
Kjeldsen, Sinnock & Neudeck, Inc.
San Joaquin River Setback Levee
Project Manager

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APPENDIX A

90 PERCENT IMPROVEMENT PLANS FOR PHASE 1 OF REACH 6

RECLAMATION DISTRICT NO. 1601

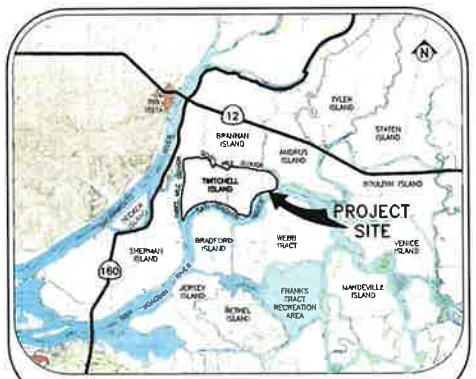
TWITCHELL ISLAND

SACRAMENTO COUNTY, CALIFORNIA

SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1

BETWEEN

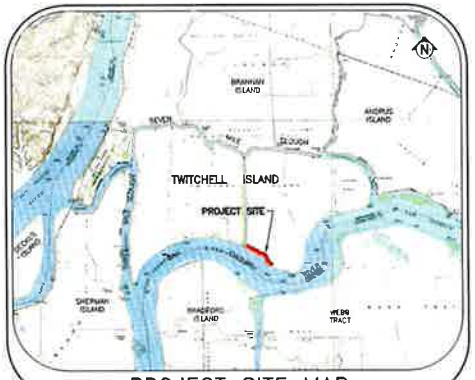
STATION 482+00 to STATION 508+80



VICINITY MAP

DWG NO.	SHEET NO.	DESCRIPTION
G001	1	TITLE SHEET
G002–G003	2–3	NOTES
C101	4	PROJECT CONTROL SHEET
C102	5	BASE MAP
C201–C203	6–8	SITE PLAN
C401–C403	9–11	DETAILS
C501–C510	12–21	CROSS SECTIONS

SHEET INDEX



PROJECT SITE MAP

Submittal	
No.	Date
95	5/23/2017

PROJECT ENGINEER

KSN INC. KJELDSEN SINNOCK NEUDECK
Civil Engineers and Land Surveyors
711 N Pershing Avenue, Stockton, CA 95203, 209-946-0268
1550 Harbor Blvd., Suite 212, West Sacramento, CA 95691, 916-403-5900
www.ksninc.com

RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

TITLE SHEET

Revisions				
No.	Description	Date	By	Approved By

Design EEA
Drawn EEA
Check CHN

Scale N.T.S.
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 1 of 21
Project File No. 1110-0571

G001

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\C4D\Sheets_6.1\SNL_01_Title Sheet.dwg
PLOT DATE: May 25, 2017 - 12:40pm

GENERAL NOTES:

1. PRIOR TO THE COMMENCEMENT OF WORK, A JOINT INSPECTION BETWEEN THE ENGINEER, OR HIS REPRESENTATIVE, AND THE CONTRACTOR, OR HIS REPRESENTATIVE, WILL BE CONDUCTED TO REVIEW THE PRECONSTRUCTION CONDITIONS OF THE EXISTING FACILITIES IN THE VICINITY OF THE PROJECT SITE, (E.G. ROADS, PUMPS, DISCHARGE PIPES, SIPHONS, RAMPS, GATES, SIGNS, ETC.). IF SUCH EXISTING FACILITIES ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR, AT HIS EXPENSE, SHALL REPLACE OR RESTORE THEM TO THE CONDITION THAT EXISTED PRIOR TO THE COMMENCEMENT OF WORK.
2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT (209) 946-0268, A MINIMUM OF 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
3. THE DISTRICT RESERVES THE RIGHT TO SUSPEND CONSTRUCTION AT ANY TIME IN THE EVENT OF EXTREME HIGH OR LOW TIDES, FLOOD EVENTS, OTHER CONDITIONS OR EMERGENCIES THAT MAY JEOPARDIZE THE INTEGRITY OF THE DISTRICT'S LEVEE AND ROAD SYSTEM.
4. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, COUNTY AND LOCAL REQUIREMENTS, AS REQUIRED FOR TRAFFIC CONTROL AND PUBLIC SAFETY DURING PROJECT CONSTRUCTION.
5. THE DISTRICT WILL FURNISH ALL RIGHT-OF-WAYS FOR ALL LEVEE ROADS AND ACCESS ROADS UNDER THE DISTRICT'S JURISDICTION. THE CONTRACTOR WILL SECURE RIGHT-OF-WAYS FOR ALL OTHER AREAS NOT UNDER THE DISTRICT'S JURISDICTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ACCESS FOR LOCAL TRAFFIC ALONG THE DISTRICT LEVEE ROADS AND ACCESS ROADS AT ALL TIMES DURING CONSTRUCTION. ANY DAMAGE TO THE LEVEE ROADS AND ACCESS ROADS SHALL BE IMMEDIATELY REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.
7. IF DELIVERING MATERIAL OR EQUIPMENT BY TRUCK, ALL TRUCK TRAFFIC SHALL BE LIMITED TO THE DISTRICT LEVEE ROADS AND ACCESS ROADS, UNLESS OTHERWISE APPROVED.
8. MAXIMUM SPEED LIMIT ON DISTRICT LEVEE ROADS IS 30 MPH, OR AS POSTED.
9. THE ENGINEER WILL PROVIDE THE LOCATION OF THE DESIGNATED PROJECT REPAIR SITES WITH A START AND STOP POINT, AND WILL PROVIDE TEMPORARY BENCHMARKS IN THE VICINITY OF THE PROJECT SITE TO BE UTILIZED BY THE CONTRACTOR FOR SETTING ELEVATIONS.
10. THE CONTRACTOR IS RESPONSIBLE FOR SETTING ALL CONSTRUCTION STAKING AND SURVEYING, AS MAY BE REQUIRED FOR CONSTRUCTION ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, SETTING ANY ELEVATIONS AS REQUIRED THROUGHOUT THE PROJECT SITE.
11. ANY DEFICIENCIES NOTED DURING INTERIM AND FINAL INSPECTIONS BY THE ENGINEER AND/OR DISTRICT, SHALL BE CORRECTED BY THE CONTRACTOR PRIOR TO FINAL ACCEPTANCE BY THE DISTRICT. ANY ADDITIONAL COSTS AND EXPENSES FOR MOBILIZATION AND/OR DEMOBILIZATION, LABOR, EQUIPMENT AND OTHER ASSOCIATED COSTS REQUIRED TO CORRECT THE DEFICIENCIES NOTED, EXCEPT SPECIFIED MATERIAL(S), SHALL BE BORNE BY THE CONTRACTOR.
12. ALL IMPROVEMENTS TO BE DONE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THESE PLANS AND SPECIFICATIONS.
13. THE INTENT OF THESE PLANS ARE TO SERVE AS A GUIDE AND TO PROVIDE THE CONTRACTOR WITH INFORMATION AND DETAILS NECESSARY TO CONSTRUCT THE PROJECT AND FURNISH THE NECESSARY LABOR, MATERIALS, AND EQUIPMENT TO PERFORM THE WORK IN ACCORDANCE WITH THEIR TRUE INTENT AND PURPOSE. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY REGARDING ANY DISCREPANCIES AND AMBIGUITIES WHICH MAY EXIST IN THE PLANS OR SPECIFICATIONS. IF THE PLANS DESCRIBE PORTION OF THE WORK IN GENERAL TERMS BUT NOT IN COMPLETE DETAIL, IT IS UNDERSTOOD THAT ONLY THE BEST GENERAL PRACTICE IS TO PREVAIL AND THAT ONLY MATERIALS AND WORKMANSHIP OF THE FIRST QUALITY ARE TO BE USED.
14. SHOULD IT APPEAR THAT THE WORK TO BE DONE, OR ANY MATTER RELATIVE THERETO, IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THESE PLANS, THE CONTRACTOR SHALL CONTRACT THE ENGINEER AT (209) 946-0268 FOR SUCH FURTHER EXPLANATIONS AS MAY BE NECESSARY.
15. THE CONTRACTOR SHALL NOTIFY THE ENGINEER WHENEVER IT APPEARS THERE IS A CHANGE IN SITE CONDITIONS OR AN ADJUSTMENT TO BE MADE IN WORK REQUIREMENTS.
16. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY FIELD CHANGES MADE WITHOUT WRITTEN AUTHORIZATION FROM THE ENGINEER.
17. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE OSHA REGULATIONS.
18. THE CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THE CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD THE DISTRICT AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE ENGINEER.
19. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE SECURITY OF HIS PLANT AND EQUIPMENT. THE DISTRICT WILL NOT TAKE ANY RESPONSIBILITY FOR MISSING OR DAMAGED EQUIPMENT, TOOLS, OR PERSONAL BELONGINGS.
20. UNLESS NOTED OTHERWISE, THE CONTRACTOR SHALL NOT CLOSE ANY ROAD, STREET, OR HIGHWAY TO THE PUBLIC EXCEPT WITH THE PERMISSION OF THE ENGINEER AND THE PROPER GOVERNMENTAL AUTHORITY. TEMPORARY PROVISIONS SHALL BE MADE BY THE CONTRACTOR TO ENSURE CONTINUOUS ACCESS TO PUBLIC AND PRIVATE DRIVEWAYS, AND PROPER FUNCTIONING OF DRAINAGE INLETS, GUTTERS, CULVERTS, DRAINAGE AND IRRIGATION DITCHES, AND NATURAL WATER COURSES.
21. CONTRACTOR IS RESPONSIBLE FOR THE PRESERVATION OF SURVEY MONUMENTS LOCATED WITHIN THE AREA OF WORK HEREIN PERMITTED, PRIOR TO THE START OF CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT SURVEY MONUMENTS THAT POTENTIALLY MAY BE DISTURBED SHALL BE LOCATED AND REFERENCED BY A LICENSED LAND SURVEY AND A CORNER RECORD BE FILED WITH THE COUNTY SURVEYOR. ANY SURVEY MONUMENTS DISTURBED DURING THE COURSE OF CONSTRUCTION SHALL BE REESTABLISHED BY A LICENSED LAND AND ANOTHER CORNER RECORD FILED WITH THE COUNTY SURVEYOR. (LAND SURVEYORS' ACT SECTION 8771)

ENVIRONMENTAL NOTES:

1. THE CONTRACTOR SHALL MAINTAIN AIR POLLUTION CONTROLS BY NOT DISCHARGING SMOKE, DUST, OR ANY OTHER AIR CONTAMINANTS INTO THE ATMOSPHERE IN SUCH QUANTITY AS WILL VIOLATE THE REGULATIONS OF ANY LEGALLY CONSTITUTED AUTHORITY. THE CONTRACTOR SHALL ALSO ABATE DUST NUISANCE BY CLEANING, SWEEPING AND SPRINKLING WITH WATER, OR OTHER MEANS AS NECESSARY. THE USE OF WATER IN AN AMOUNT WHICH RESULTS IN MUD ON PUBLIC ROADS IS NOT ACCEPTABLE AS A SUBSTITUTE FOR SWEEPING OR OTHER METHODS.
2. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION AND COMPLY WITH ALL PERMITS TO PROTECT STREAMS, WATERWAYS AND OTHER BODIES OF WATER FROM POLLUTION WITH FUELS, OIL, BITUMEN'S, CALCIUM CHLORIDE, AND OTHER HARMFUL MATERIALS AND SHALL CONDUCT AND SCHEDULE HIS OPERATIONS SO AS TO AVOID OR MINIMIZE MUDDYING AND SILTING OF SAID WATERS. CARE SHALL BE EXERCISED TO PRESERVE ROADSIDE VEGETATION BEYOND THE LIMITS OF CONSTRUCTION.
3. THROUGHOUT ALL PHASES OF CONSTRUCTION, INCLUDING SUSPENSION OF WORK, AND UNTIL FINAL ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL KEEP THE WORK SITE CONDITIONS CLEAN AND FREE FROM RUBBISH AND DEBRIS.

DUST AND MUD CONTROL:

1. DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL KEEP ALL CONSTRUCTION AREAS, EXCAVATION AND LEVEE CROWN FILL AREAS, ACCESS ROADS, OTHER ROADWAYS, AND OTHER USE AREAS WHERE DUST IS GENERATED WELL WATERED; AND DURING WET CONDITIONS, AREAS USED BY LOCAL TRAFFIC, FREE AND CLEAR FROM MUD.
   A. CROP DAMAGE: THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL TO PREVENT CROP DAMAGE AND FOR ANY AREAS IN ADDITION TO THOSE MENTIONED THAT GENERATE DUST AND/OR OTHER CONDITIONS WHICH MIGHT DAMAGE CROPS.
   B. NON-WORK DAYS: THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL IN ANY PROJECT AREAS, ACCESS ROADS OR CROP AREAS WHICH ARE USED BY THE CONTRACTOR, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. THE CONTRACTOR SHALL DEDICATE AT LEASE ONE (1) WATER TRUCK FOR THE ALLEVIATION OR PREVENTION OF DUST NUISANCE FOR, BUT NOT LIMITED TO, THE FOLLOWING AREAS:
   A. PROJECT AREA
   B. LEVEE AND ACCESS ROADS
   C. LEVEE CROWN FILL AREAS
   D. OTHER CONSTRUCTION USE AREAS
   E. CROP DAMAGE PREVENTION
   F. BUILDINGS
3. WATER WILL BE MADE AVAILABLE FOR THE CONSTRUCTION OPERATIONS FROM THE DISTRICT DRAINAGE CANALS OR FROM THE SURROUNDING WATERWAY. THE PUMPING FACILITY SHALL BE LOCATED IN AN AREA THAT WILL NOT CREATE A TRAFFIC OR MUD HAZARD ON THE LEVEE ROADS USED BY THE PUBLIC, LOCAL TRAFFIC, OR CONSTRUCTION ACTIVITIES.

UTILITY NOTES:

1. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND SHALL CONTACT THE RESPECTIVE UTILITY COMPANIES PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION OF ALL SUCH FACILITIES.
2. THE APPROXIMATE LOCATION OF KNOWN UTILITIES, SUBMARINE CABLES SIPHONS, FERRY CABLES, DISCHARGE PIPES, ETC., MAY BE BE SHOWN ON THE PLANS FOR THE INFORMATION OF THE CONTRACTOR. THE DISTRICT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR RELIABILITY OF THIS INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE ACTUAL LOCATION OF ALL UNDERGROUND, SURFACE, OVERHEAD, AND SUBMARINE IMPROVEMENTS, OR FACILITIES WHICH MAY BE SUBJECT TO DAMAGE BY REASON OF HIS OPERATIONS.
3. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING IRRIGATION AND DRAINAGE FACILITIES INCLUDING, BUT NOT LIMITED TO, SIPHONS, DITCHES, CROSSINGS, DISTRIBUTION BOXES, SLIDE GATES, ETC., DURING THE TERM OF THE CONTRACT. THE EXISTING IRRIGATION AND DRAINAGE FACILITIES MUST REMAIN FULLY OPERATIONS DURING THE PERIOD OF CONSTRUCTION.
4. CONTRACTOR SHALL COORDINATE THE RECONSTRUCTION OF EXISTING SIPHON PIPES WITH THE LANDOWNERS' IRRIGATION SCHEDULE.

POWER LINES:

1. THE CONTRACTOR SHALL TAKE NOTE OF POWER LINES WITHIN THE CONSTRUCTION ZONE. EXTREME CAUTION IS ADVISED WHILE WORKING AROUND AND NEAR THESE LIVE LINES.

TRAFFIC CONTROL

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL AND AS DESCRIBED IN THE SPECIFICATIONS.

CLEANUP:

1. THROUGHOUT ALL PHASES OF CONSTRUCTION, INCLUDING SUSPENSION OF WORK, AND UNTIL FINAL ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL KEEP THE PREMISES OCCUPIED BY HIM IN A CLEAN AND ORDERLY CONDITION, DISPOSING OF REFUSE IN A MANNER SATISFACTORY TO THE ENGINEER.
2. THE CONTRACTOR, UPON COMPLETION OF ALL WORK, SHALL RESTORE ALL LEVEE AND ACCESS ROADS, HAUL ROADS, PROJECT SITES, AND ANY OTHER DISTURBED AREAS IN A MANNER SATISFACTORY TO THE ENGINEER, DISTRICT, AND LANDOWNERS.

CONTROL OF EROSION:

1. THE CONTRACTOR SHALL MAINTAIN EARTHWORK SURFACES TRUE AND SMOOTH AND PROTECTED FROM EROSION. WHERE EROSION OCCURS, THE CONTRACTOR SHALL PROVIDE FILL OR SHALL EXCAVATE AS NECESSRY TO RETURN EARTHWORK SURFACES TO THE GRADE AND FINISH SPECIFIED.

ABBREVIATIONS:

AB	AGGREGATE BASE	LF	LINEAR FEET
AC	ASPHALTIC CONCRETE	LP	LOW POINT
BC	BEGINNING OF CURVE	LT	LEFT
BFE	BASE FLOOD ELEVATION	MAX	MAXIMUM
BM	BENCHMARK	MIN	MINIMUM
CC	CENTER TO CENTER	N	NORTH, NORTHING
CL	CENTERLINE	NIC	NOT IN CONTRACT
CY	CUBIC YARD	NO	NUMBER
DIAM	DIAMETER	NTS	NOT TO SCALE
DIM	DIMENSION	OC	ON CENTER
E	EAST, EASTING	OD	OUTSIDE DIAMETER
EA	EACH	PL	PROPERTY LINE
EC	END OF CURVE	PRC	POINT OF REVERSE CURVATURE
EG	EXISTING GROUND	R	RADIUS
ELEV	ELEVATION	RC	RELATIVE COMPACTION
EP	EDGE OF PAVEMENT	ROW	RIGHT-OF-WAY
EW	EACH WAY	RT	RIGHT
EX	EXISTING	SPEC	SPECIFICATION
FG	FINISH GRADE	SF	SQUARE FEET
FL	FLOWLINE	STA	STATION
FT	FOOT, FEET	STD	STANDARD
GB	GRADE BREAK	SY	SQUARE YARD
HORIZ	HORIZONTAL	TEMP	TEMPORARY
HP	HIGH POINT	TYP	TYPICAL
ID	INSIDE DIAMETER	UNO	UNLESS NOTED OTHERWISE
IN	INCH, INCHES	VERT	VERTICAL
INV	INVERT		

CONVENTIONS:

- BENCHMARK – VERTICAL & HORIZONTAL
- BENCHMARK – VERTICAL ONLY
- TEMPORARY CONTROL POINT OR TEMPORARY BENCHMARK
- DETAIL INDICATOR: DETAIL IDENTIFICATION NUMBER (1) / DRAWING NUMBER WHERE DETAIL IS SHOWN (C401)
- SECTION INDICATOR: SECTION IDENTIFICATION NUMBER (2) / DRAWING NUMBER WHERE SECTION IS SHOWN (C402)
- NOTE IDENTIFICATION NUMBER (4)
- REVISION NUMBER (1)

G002

Submittal	
No.	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

NOTES

Revisions				
No.	Description	Date	By	Apvd. By

Design EEA
Drawn EEA
Check CHN

Scale N.T.S.
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 2 of 21
Project File No. 1110-0571

CONSTRUCTION NOTES:

ACCESS ROUTES:

1. THE CONTRACTOR SHALL IMPROVE, MAINTAIN, AND REPAIR/RECONSTRUCT UPON COMPLETION, ALL THE LEVEE ROADS AND ACCESS ROADS AS MAY BE REQUIRED FOR TRANSPORTATION AND HAULING MATERIAL TO THE PROJECT AREAS. ALL DISTURBED LEVEE ROADS AND ACCESS ROADS SHALL BE RESTORED TO PRE-EXISTING CONDITION OR BETTER.

2. THE ACCESS ROUTES FOR THIS PROJECT MAY REQUIRE THE CONTRACTOR TO MODIFY AND REWORK THE GRADING OF THE EXISTING ROADS TO MEET THE CONTRACTOR'S HAULING AND ROAD DRAINAGE REQUIREMENTS.

3. THE CONTRACTOR SHALL REVIEW THE ACCESS ROUTES AND DETERMINE THE LOCATION FOR TURNOUTS, RAMPS, ROAD DRAINAGE, ALIGNMENT, ETC. UPON COMPLETION OF THE PROJECT, SOME PORTIONS OF THE ACCESS ROADS MAY REQUIRE MINOR MODIFICATIONS AND ALTERATIONS. THE ACCESS ROADS WHICH REMAIN SHALL BE LEFT IN GOOD CONDITION FOR THE DISTRICT, FARMERS, AND OTHER LOCAL TRAFFIC.

4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR MAKING ANY NECESSARY IMPROVEMENTS, MODIFICATIONS, AND ALTERATIONS TO MEET HIS REQUIREMENTS AND FOR THE MAINTENANCE AND EXPENSE THEREOF.

5. THE CONTRACTOR'S EQUIPMENT SHALL BE RESTRICTED TO OPERATE ONLY ON THOSE LEVEE ROADS AND ACCESS ROADS AND WITHIN THOSE SPECIFIED WORK AREAS INDICATED ON THE PLANS UNLESS OTHERWISE APPROVED BY THE ENGINEER, DISTRICT, AND LANDOWNERS.

6. THE CONTRACTOR SHALL EXTEND, STRENGTHEN, REPLACE, OR OTHERWISE MODIFY THE EXISTING CROSSINGS (E.G. CULVERTS, SIPHONS, DRAIN PIPES, IRRIGATION PIPES, PUMP DISCHARGE PIPES, WET SPOTS, ETC.) AS NECESSARY TO ACCOMMODATE HIS EQUIPMENT. THE CONTRACTOR SHALL PROVIDE WHATEVER MEASURES ARE NECESSARY TO PRESERVE, PROTECT, AND MAINTAIN THE CROSSINGS SO AS TO ENSURE CONTINUOUS AND UNINTERRUPTED OPERATIONS DURING THE ENTIRE TERM OF THIS CONTRACT.

7. THE ACCESS ROADS MAY REQUIRE TEMPORARY IRRIGATION OR DISCHARGE PIPE EXTENSIONS AND RAMPING DURING CONSTRUCTION OPERATIONS. TEMPORARY EXTENSIONS AND RAMPING WILL BE PROVIDED AND INSTALLED BY THE CONTRACTOR AT HIS EXPENSE, INCLUDING REMOVAL IF REQUIRED, IN A MANNER WHICH MEETS WITH THE APPROVAL OF THE ENGINEER, THE DISTRICT, AND THE LANDOWNERS.

8. NEITHER THE DISTRICT NOR THE ENGINEER MAKE ANY WARRANTY OR GUARANTEE AS TO THE ADEQUACY OF THE EXISTING NATIVE MATERIALS TO SUPPORT THE CONSTRUCTION TRAFFIC ON THE ACCESS ROADS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR MAKING THE NECESSARY IMPROVEMENTS AND PROVIDING THE NECESSARY MEASURES REQUIRED TO ACCOMMODATE HIS ANTICIPATED NEEDS.

9. THE CONTRACTOR SHALL SECURE ALL OTHER ACCESS ROAD EASEMENTS AS MAY BE REQUIRED WITH THE INDIVIDUAL PROPERTY OWNERS FOR ALL NON-DISTRICT AND/OR PUBLIC ACCESS ROADS AND AS DESCRIBED IN THE SPECIFICATIONS.

CLEARING & GRUBBING

1. UNLESS OTHERWISE INDICATED, THE WORK AREAS SHALL BE CLEARED AND GRUBBED WITHIN THE LIMITS OF GRADING.

2. USE CAUTION WHILE CLEARING AND GRUBBING AROUND POWER LINES & BURIED ELECTRICAL CABLES.

3. ALL MATERIAL THAT IS CLEARED AND REMOVED SHALL BECOME THE PROPERTY AND RESPONSIBILITY OF THE CONTRACTOR FOR REMOVAL AND DISPOSAL OFFSITE.

LEVEE CROWN GRADING:

1. ALL SUBGRADE AREAS SHALL BE PREPARED AS NOTED AND SHALL BE FINISHED TO THE DESIGNATED GRADE AND CROSS SECTION. THE FINISHED SURFACE SHALL BE OF UNIFORM TEXTURE, DRESSED AND GRADED TO DRAIN AND PREVENT WATER PONDING.

2. IMMEDIATELY PRIOR TO PLACING IMPORT FILL OR AGGREGATE BASE, ALL SUBGRADE AREAS SHALL CONFORM TO THE HEREIN SPECIFIED COMPACTION REQUIREMENTS AND THE ELEVATION TOLERANCES, SHALL BE FREE OF LOOSE OR EXTRANEOUS MATERIAL, AND SHALL BE CONSTRUCTED WITH A MINIMUM 2% CROSS-SLOPE.

3. THE CONTRACTOR SHALL MAINTAIN, AND RECONSTRUCT AS NECESSARY, ALL EXISTING LANDSIDE LEVEE ACCESS RAMPS AFFECTED BY LEVEE CROWN WORK.

LEVEE IMPORT FILL:

1. LEVEE IMPORT FILL SHALL BE CONSTRUCTED WITH ACCEPTABLE MATERIALS SUFFICIENT TO MEET DESIGN GRADES AND SPECIFICATIONS.

2. ALL SUBGRADE AREAS RECEIVING LEVEE IMPORT FILL SHALL BE PREPARED AS NOTED. THE CONTRACTOR MAY BE REQUIRED TO PERFORM ADDITIONAL SUBGRADE PREPARATION WORK WITHIN THE FILL AREAS PRIOR TO THE ACCEPTANCE OF THE IMPORT FILL MATERIAL.

3. THE CONTRACTOR SHALL DELIVER LEVEE IMPORT FILL MATERIAL TO THE REQUIRED SECTIONS AS UNIFORM MIXTURES. THE MIXTURE SHALL BE DEPOSITED AND SPREAD TO THE REQUIRED COMPACTED THICKNESS. SEGREGATION OF MATERIAL SHALL BE AVOIDED AND EACH LAYER OF MATERIAL, AS SPREAD, SHALL BE FREE FROM POCKETS OF COARSE OR FINE MATERIAL.

   A. IN THE EVENT SEGREGATION OCCURS, THE MATERIAL SHALL BE WORKED UNTIL THE VARIOUS SIZES OF MATERIAL ARE UNIFORMLY AND SATISFACTORILY BLENDED. AFTER BEING SPREAD, THE MATERIAL SHALL BE WATERED AND SHAPED TO THE REQUIRED SECTION AND THEN COMPACTED.

   B. WHERE THE REQUIRED THICKNESS IS 6 INCHES (6") OR LESS, THE MATERIAL MAY BE SPREAD AND COMPACTED IN ONE LAYER. WHERE THE REQUIRED THICKNESS IS MORE THAN 6 INCHES (6"), THE MATERIAL SHALL BE SPREAD AND COMPACTED IN TWO OR MORE LAYERS OF APPROXIMATELY EQUAL THICKNESS, AND THE MAXIMUM COMPACTED THICKNESS OF ANY ONE LAYER SHALL NOT EXCEED 8 INCHES (8"). EACH LAYER SHALL BE SPREAD AND COMPACTED IN A SIMILAR MANNER.

   C. AT THE TIME EMBANKMENT FILL MATERIAL IS SPREAD, IT SHALL HAVE AN OPTIMUM MOISTURE CONTENT SUFFICIENT TO OBTAIN THE REQUIRED COMPACTION. SUCH MOISTURE SHALL BE UNIFORMLY DISTRIBUTED THROUGHOUT THE MATERIAL.

4. THE FINISH SURFACE OF THE TOP LAYER SHALL BE FINISHED TO THE DESIGNATED GRADE AND CROSS SECTION. THE FINISHED SURFACE SHALL BE OF UNIFORM TEXTURE, DRESSED AND GRADED TO DRAIN AND PREVENT WATER PONDING.

AGGREGATE BASE:

1. THE CONTRACTOR SHALL PROVIDE AND PLACE 3/4" MAXIMUM GRADING, CLASS 2 AGGREGATE BASE TO THE LINES AND GRADES INDICATED IN THESE PLANS. THE AGGREGATE BASE SHALL CONFORM TO THE SPECIFICATIONS.

2. AGGREGRATE BASE SHALL BE PLACED AND COMPACTED TO A MIN. RELATIVE DENSITY OF AT LEAST 95 PERCENT, IN ACCORDANCE WITH ASTM D-1557 PROCEDURE.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING THE PROGRESS OF THE MATERIAL PLACEMENT TO ENSURE CONFORMANCE WITH THE SPECIFIED LINES AND GRADES.

4. AGGREGATE BASE SHALL BE UNIFORMLY TAPERED AT THE ENDS OF EACH FILL SITE AND IN AREAS OF EXISTING RAMPS, TO PROVIDE A SMOOTH TRANSITION TO THE EXISTING CROWN ELEVATION.

5. THE CONTRACTOR SHALL RESTORE ALL EXISTING LANDSIDE LEVEE ACCESS RAMPS AFFECTED BY LEVEE CROWN WORK WITH NEW AGGREGATE BASE MATERIAL AS NECESSARY.

6. FINISH LEVEE CROWN GRADE SHALL PROVIDE A MIN. CROSS SLOPE OF 2%.

7. MEASUREMENT FOR PAYMENT WILL BE BASED UPON THE ACTUAL TONNAGE ACCEPTED IN PLACE WITHIN THE SPECIFIED TOLERANCES. THE CONTRACTOR WILL NOT BE COMPENSATED FOR MATERIAL PLACED IN EXCESS OF THE SPECIFIED TOLERANCES.

   A. PAYMENT FOR MATERIAL DELIVERED BY TRUCK WILL BE BASED UPON THE NET MATERIAL TONNAGE DELIVERED, AS SUPPORTED BY CERTIFIED WEIGHMASTER TAGS, OR BASED UPON THE LEGAL HIGHWAY LOAD LIMIT LESS THE TRUCK TARE WEIGHT AS SUPPORTED BY CERTIFIED WEIGHMASTER TAGS, WHICHEVER IS LESS.

   B. THE CONTRACTOR WILL NOT BE COMPENSATED FOR TRUCKED TONNAGE WHICH EXCEEDS THE LEGAL POSTED LOAD LIMITS.

8. ALL CONSTRUCTION GRADER BERMS AND ROADWAY SHOULDERS SHALL BE BLADED DOWN PRIOR TO COMPLETION OF PROJECT AS TO NOT INTERFERE WITH THE ROADWAY DRAINAGE.

COMPACTION EQUIPMENT:

1. COMPACTION EQUIPMENT SHALL BE NON-VIBRATORY TYPE, 2 AXLE TANDEM ROLLER COMPACTOR EQUIPMENT, SHEEPSFOOT ROLLERS, PNEUMATIC-TIRED ROLLERS, DRUM ROLLERS OR OTHER MECHANICAL MEANS ACCEPTABLE TO THE ENGINEER, TO SUCH EXTENT AS WILL PRODUCE THE SPECIFIED RELAVTIVE COMPACTION. VIBRATORY EQUIPMENT WILL NOT BE PERMITTED ON DISTRICT LEVEES AND FILLS.

TESTING:

1. THE DISTRICT WILL RETAIN THE SERVICES OF AN INDEPENDENT SOILS CONSULTANT AND TESTING LABORATORY TO PERFORM SOIL ANALYSIS, FIELD COMPACTION, AND DENSITY TESTS AND CHECK COMPLIANCE WITH THESE SPECIFICATIONS. THE CONTRACTOR SHALL BE REQUIRED TO REMOVE SURFACE MATERIALS AT LOCATIONS DESIGNATED BY THE TESTING ENGINEER AND TO PROVIDE ASSISTANCE AS NECESSARY FOR TESTING. THE INDEPENDENT TESTING LABORATORY WILL SAMPLE AND PERFORM ALL REQUIRED TESTS SUCH AS MOISTURE CONTENT, GRADATION AND MOISTURE DENSITY RELATIONSHIPS.

WELDED STEEL PIPE (SIPHON RECONSTRUCTION):

1. WELDED STEEL PIPE SHALL CONFORM TO THE SPECIFICATIONS. ALL NEW PIPE SHALL BE EPOXY-COATED.

2. ALL PIPE JOINTS SHALL BE WELDED. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS.

3. PRIOR TO BACKFILLING AT THE WELDED JOINTS, THE PIPE SHALL BE TESTED AND PLACED UNDER OPERATING HEAD FOR A PERIOD OF 2 HOURS. ANY LEAKS OR OTHER DEFECTS SHALL BE CORRECTED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE ALL TEST EQUIPMENT, GAUGES, PLUGS AND CAPS REQUIRED FOR TESTING.

4. AFTER THE PIPE HAS BEEN PROPERLY ASSEMBLED AND INSTALLED, BACKFILLING SHALL BE PERFORMED AT ALL TIMES IN A MANNER THAT AVOIDS ABRASION OR OTHER PIPE DAMAGE.

5. AFTER THE INITIAL BACKFILLING HAS BEEN MADE AND APPROVED BY THE ENGINEER, THE FINAL BACKFILLING SHALL BE MADE. MATERIAL SHALL BE PLACED IN THE TRENCH CAREFULLY IN ORDER NOT TO DAMAGE THE PIPE AND COMPACTED TO 90% RELATIVE COMPACTION IN ACCORDANCE WITH ASTM D 1557-78 PROCEDURE TO THE PROPER LINES AND GRADES.

G003

Submittal	
#	Date
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PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

NOTES

Revisions				
No.	Description	Date	By	Apvd By

Design EEA
Drawn EEA
Check CHN

Scale N.T.S.
Original Drawing Scale 0 ½" 1"

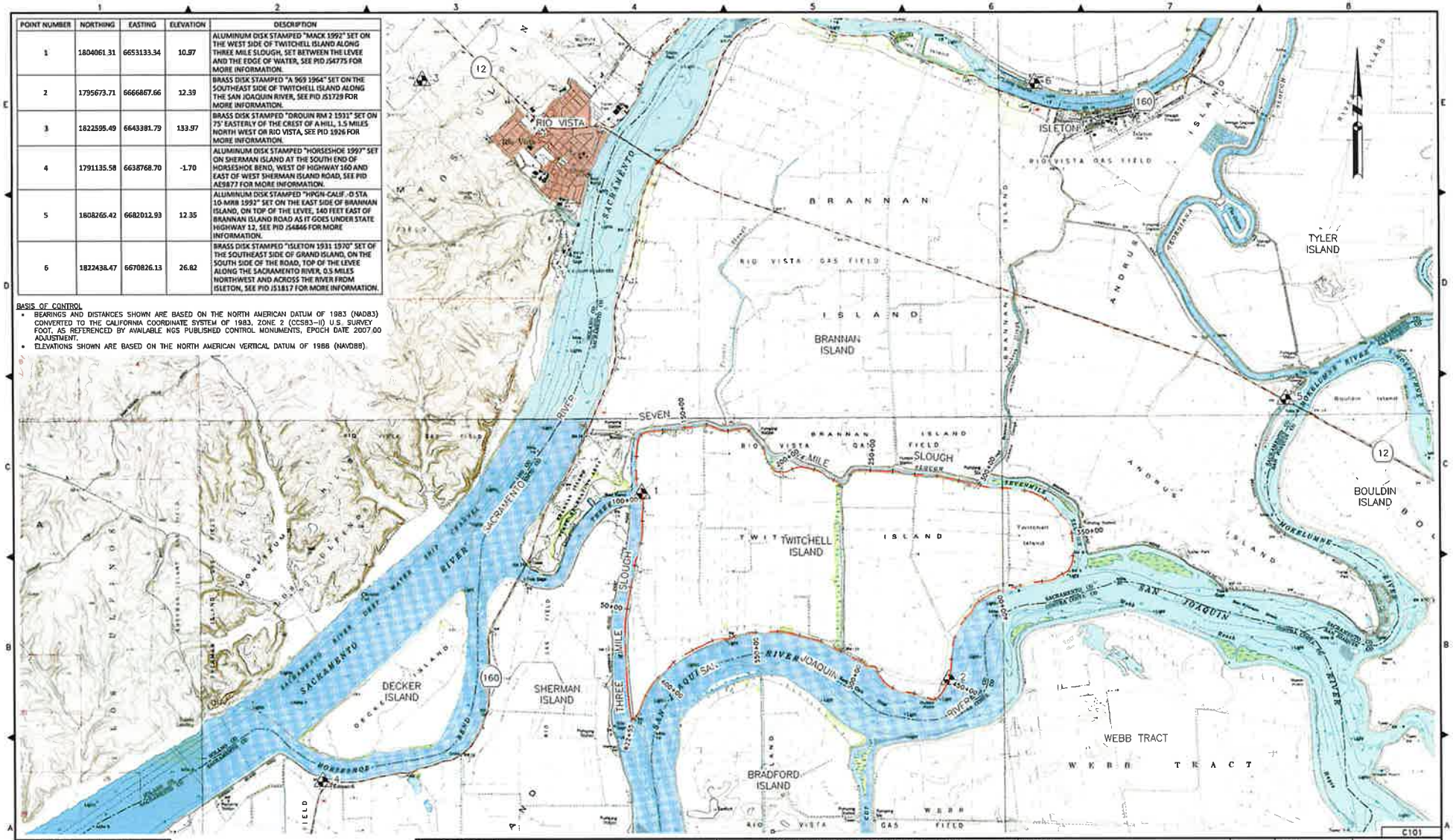
Date MAY 2017
Sheet Number 3 Of 21
Project File No. 1110-0571

FILE SPEC: P:\1110_Tribal_Maps\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_6.1\SHL_02_Notes.dwg
PLOT DATE: May 25, 2017 - 12:40pm

POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	1804061.31	6653133.34	10.97	ALUMINUM DISK STAMPED "MACK 1992" SET ON THE WEST SIDE OF TWITCHELL ISLAND ALONG THREE MILE SLOUGH, SET BETWEEN THE LEVEE AND THE EDGE OF WATER, SEE PID JS4775 FOR MORE INFORMATION.
2	1795673.71	6666867.66	12.39	BRASS DISK STAMPED "A 969 1964" SET ON THE SOUTHEAST SIDE OF TWITCHELL ISLAND ALONG THE SAN JOAQUIN RIVER, SEE PID JS1729 FOR MORE INFORMATION.
3	1822595.49	6643381.79	133.97	BRASS DISK STAMPED "DROUIN RM 2 1931" SET ON 75' EASTERLY OF THE CREST OF A HILL, 1.5 MILES NORTH WEST OR RIO VISTA, SEE PID 1926 FOR MORE INFORMATION.
4	1791135.58	6638768.70	-1.70	ALUMINUM DISK STAMPED "HORSESHOE 1997" SET ON SHERMAN ISLAND AT THE SOUTH END OF HORSESHOE BEND, WEST OF HIGHWAY 160 AND EAST OF WEST SHERMAN ISLAND ROAD, SEE PID AE9877 FOR MORE INFORMATION.
5	1808265.42	6682012.93	12.35	ALUMINUM DISK STAMPED "HPGN-CALIF.-0 STA 10-MRB 1992" SET ON THE EAST SIDE OF BRANNAN ISLAND, ON TOP OF THE LEVEE, 140 FEET EAST OF BRANNAN ISLAND ROAD AS IT GOES UNDER STATE HIGHWAY 12, SEE PID JS4866 FOR MORE INFORMATION.
6	1822438.47	6670826.13	26.82	BRASS DISK STAMPED "ISLETON 1931 1970" SET OF THE SOUTHEAST SIDE OF GRAND ISLAND, ON THE SOUTH SIDE OF THE ROAD, TOP OF THE LEVEE ALONG THE SACRAMENTO RIVER, 0.5 MILES NORTHWEST AND ACROSS THE RIVER FROM ISLETON, SEE PID JS1817 FOR MORE INFORMATION.

BASIS OF CONTROL

- BEARINGS AND DISTANCES SHOWN ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83) CONVERTED TO THE CALIFORNIA COORDINATE SYSTEM OF 1983, ZONE 2 (CCS83--II) U.S. SURVEY FOOT, AS REFERENCED BY AVAILABLE NGS PUBLISHED CONTROL MONUMENTS, EPOCH DATE 2007.00 ADJUSTMENT.
- ELEVATIONS SHOWN ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



C101

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

PROJECT CONTROL SHEET

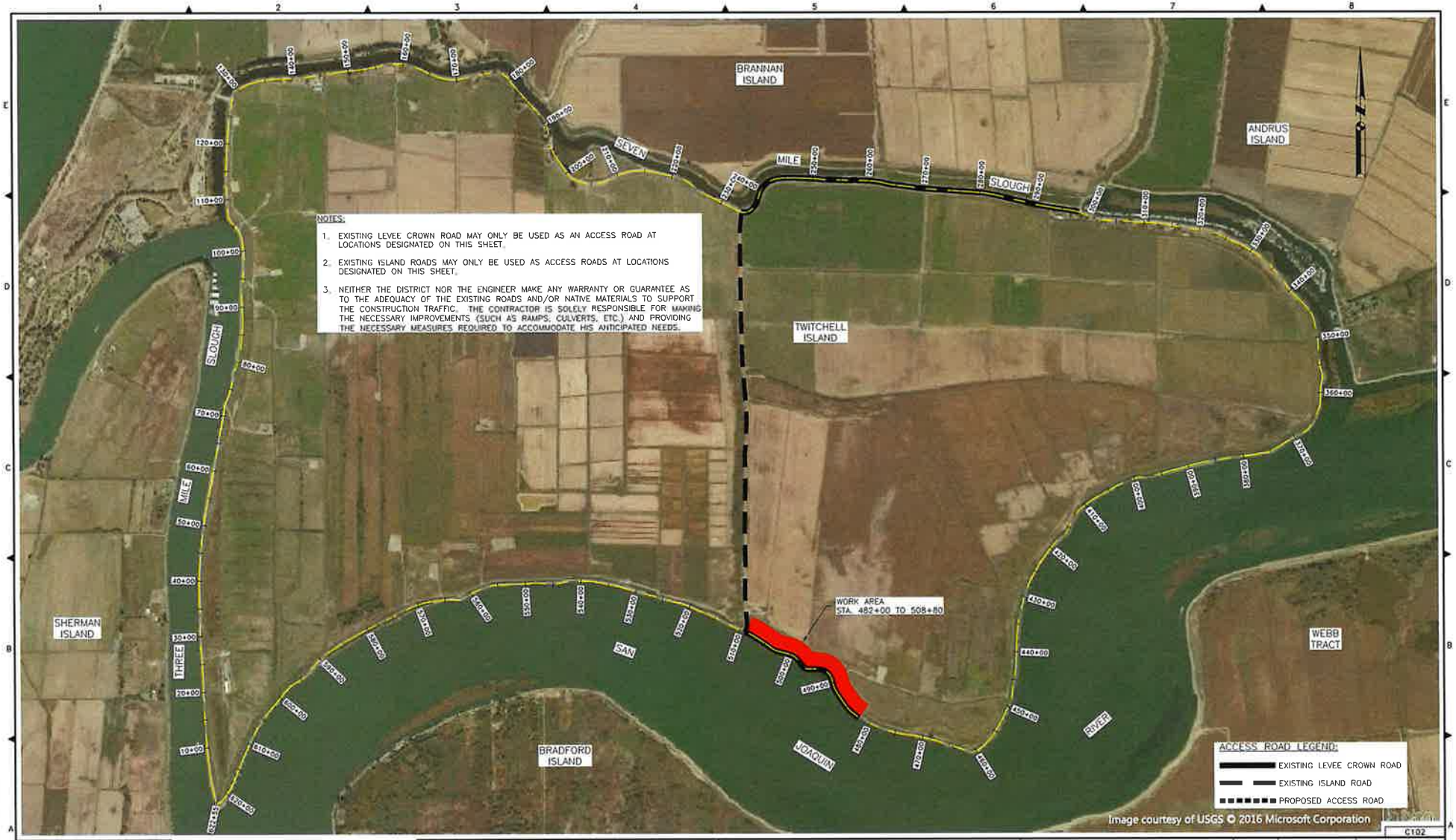
Revisions				
No.	Description	Date	By	Appvd. By

Design LGB
Drawn EEA
Check KFN

Scale 1" = 2000'
Original Drawing Scale 0 1/4" 1"

Date MAY 2017
Sheet Number 4 of 21
Project File No. 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_6-1\SHL_04_Control Sheet.dwg
PLOT DATE: May 25, 2017 - 12:43pm



C102

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

BASE MAP

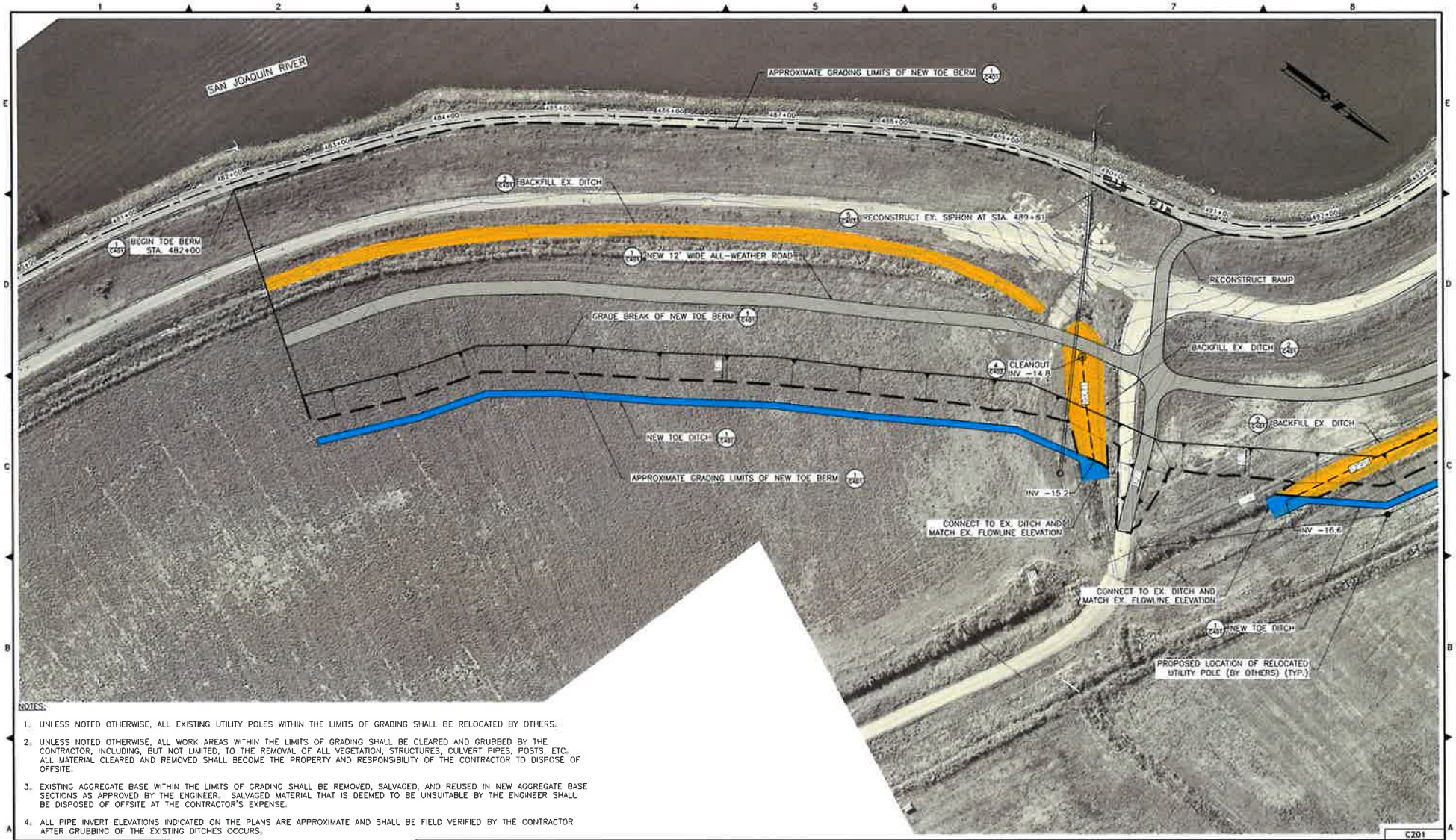
Revisions				
No.	Description	Date	By	Appvd. by

Design EEA
Drawn EEA
Check CHN

Scale 1" = 800'
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 5 of 21
Project File No. 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CADD\Sheets_6.1\Sht_05_Base Map.dwg
PLOT DATE: May 25, 2017 - 12:44pm



NOTES:

1. UNLESS NOTED OTHERWISE, ALL EXISTING UTILITY POLES WITHIN THE LIMITS OF GRADING SHALL BE RELOCATED BY OTHERS.
2. UNLESS NOTED OTHERWISE, ALL WORK AREAS WITHIN THE LIMITS OF GRADING SHALL BE CLEARED AND GRUBBED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED, TO THE REMOVAL OF ALL VEGETATION, STRUCTURES, CULVERT PIPES, POSTS, ETC. ALL MATERIAL CLEARED AND REMOVED SHALL BECOME THE PROPERTY AND RESPONSIBILITY OF THE CONTRACTOR TO DISPOSE OF OFFSITE.
3. EXISTING AGGREGATE BASE WITHIN THE LIMITS OF GRADING SHALL BE REMOVED, SALVAGED, AND REUSED IN NEW AGGREGATE BASE SECTIONS AS APPROVED BY THE ENGINEER. SALVAGED MATERIAL THAT IS DEEMED TO BE UNSUITABLE BY THE ENGINEER SHALL BE DISPOSED OF OFFSITE AT THE CONTRACTOR'S EXPENSE.
4. ALL PIPE INVERT ELEVATIONS INDICATED ON THE PLANS ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR AFTER GRUBBING OF THE EXISTING DITCHES OCCURS.

PIPE LEGEND:

12" ϕ SOLID-WALL DRAIN PIPE

12" ϕ PERFORATED DRAIN PIPE

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
Civil Engineers and Land Surveyors
711 N Pershing Avenue, Stockton, CA 95203, 209-946-0268
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SITE PLAN
STA. 482+00 TO 492+00

Revisions				
No.	Description	Date	By	Aprvd. By

Design EEA
Drawn EEA
Check CHN

Scale 1" = 40'
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 6 of 21
Project File No. 1110-0571

C201

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CAD\Sheets_6.1\SH_06_Plan.dwg
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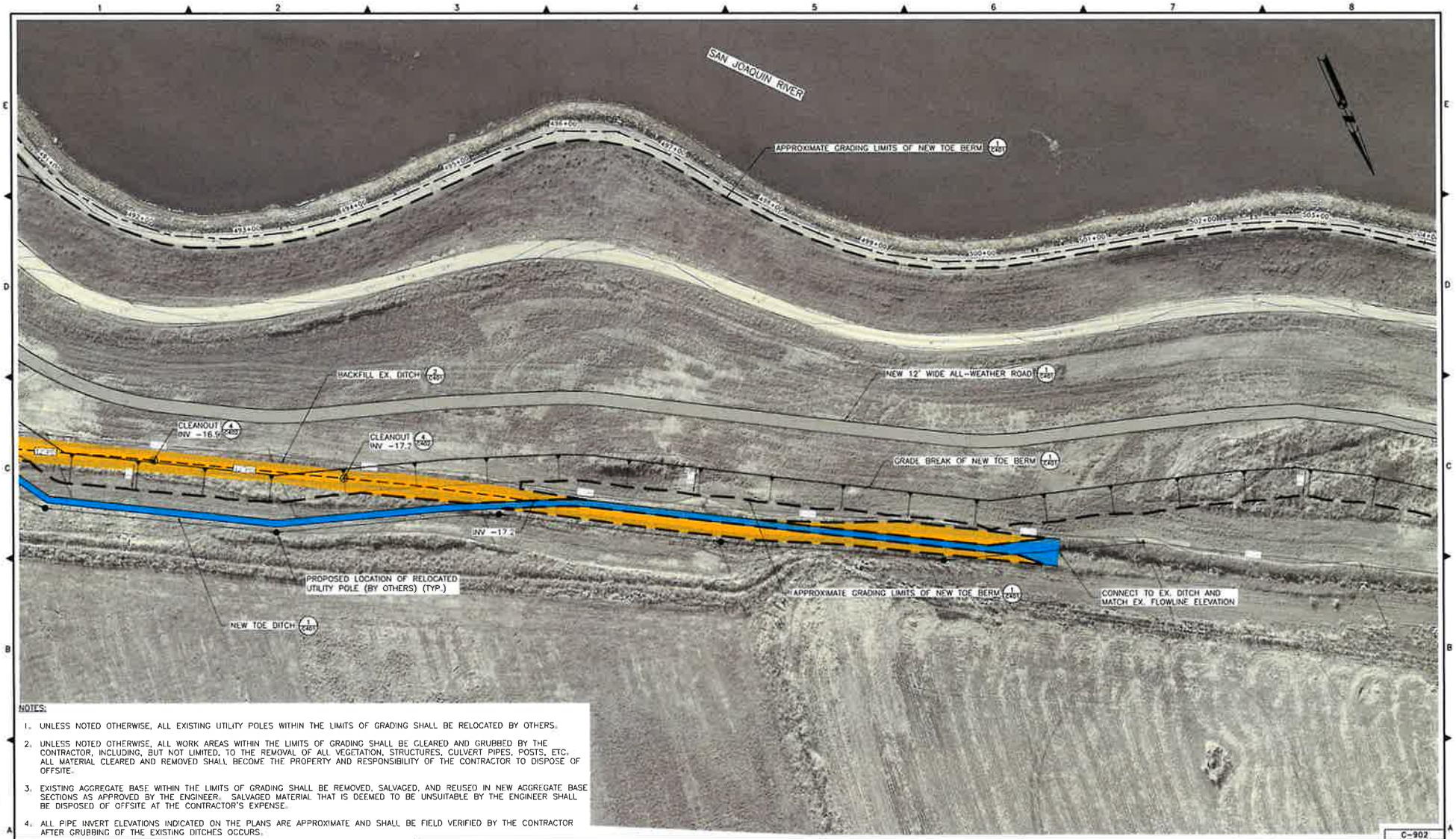

NOTES:

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Submittal	
#	Date
95	5/23/2017

PIPE LEGEND:

- SOLID-WALL DRAIN PIPE
- PERFORATED DRAIN PIPE

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SITE PLAN
STA. 492+00 TO 503+00

Revisions				
No.	Description	Date	By	Apprvd. By

Design EEA
Drawn EEA
Check CHN

Scale 1" = 40'
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 7 of 21
Project File No. 1110-0571

C-902

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\05_Civil\CAD\Sheets_6.1\Sht_06_Plan.dwg
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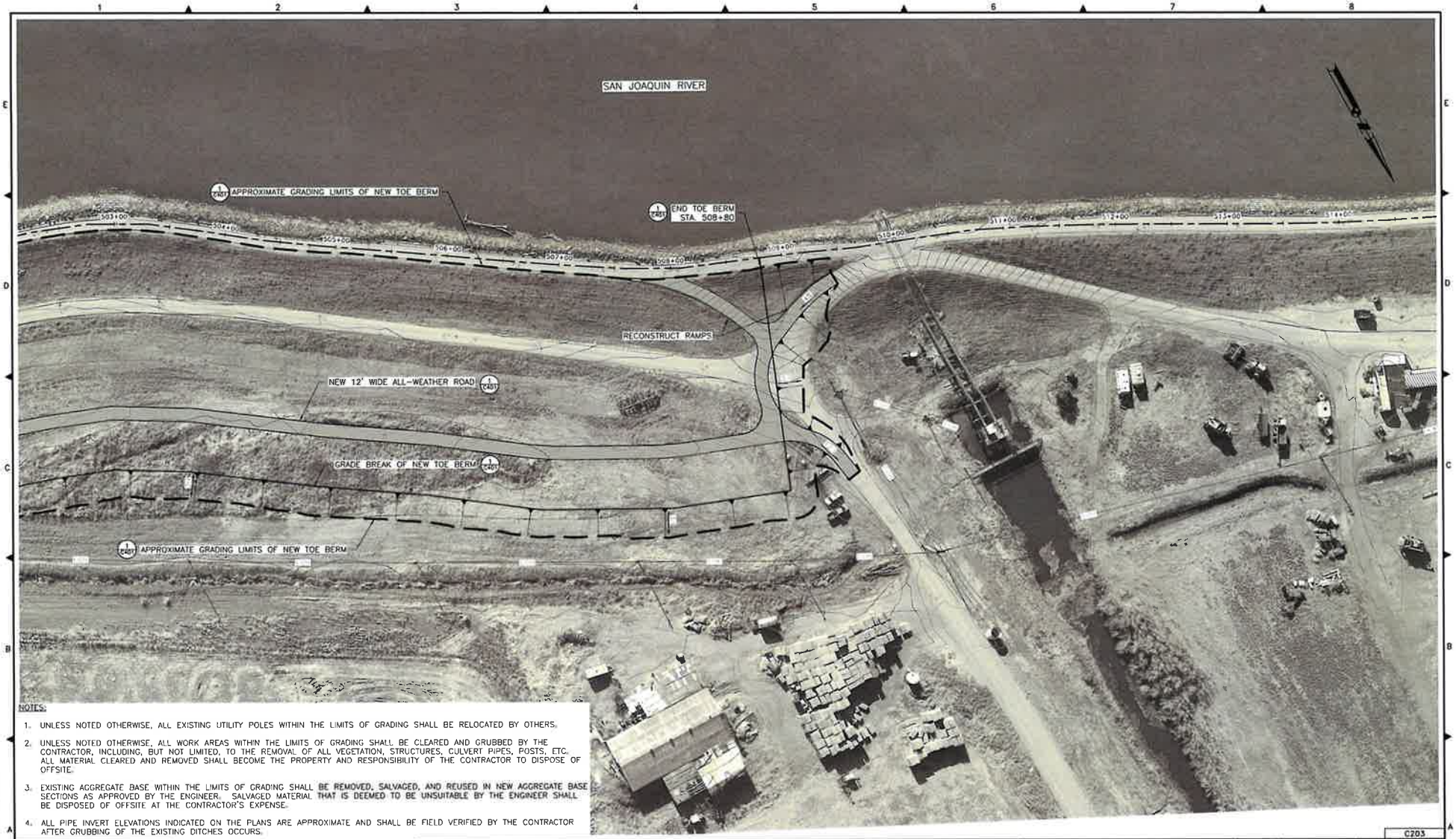

NOTES:

1. UNLESS NOTED OTHERWISE, ALL EXISTING UTILITY POLES WITHIN THE LIMITS OF GRADING SHALL BE RELOCATED BY OTHERS.
2. UNLESS NOTED OTHERWISE, ALL WORK AREAS WITHIN THE LIMITS OF GRADING SHALL BE CLEARED AND GRUBBED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED, TO THE REMOVAL OF ALL VEGETATION, STRUCTURES, CULVERT PIPES, POSTS, ETC. ALL MATERIAL CLEARED AND REMOVED SHALL BECOME THE PROPERTY AND RESPONSIBILITY OF THE CONTRACTOR TO DISPOSE OF OFFSITE.
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4. ALL PIPE INVERT ELEVATIONS INDICATED ON THE PLANS ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR AFTER GRUBBING OF THE EXISTING DITCHES OCCURS.

C203

Submittal	
#	Date
95	5/23/2017

PIPE LEGEND:

SOLID-WALL DRAIN PIPE

PERFORATED DRAIN PIPE

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SITE PLAN
STA. 503+00 TO 508+80

Revisions				
No.	Description	Date	By	Apprvd. By

Design EEA
Drawn EEA
Check CHN

Scale 1" = 40'

Original Drawing Scale 0 ½" 1"

Date MAY 2017

Sheet Number 8 Of 21

Project File No. 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\05_Civil\CAD\Sheets_6.1\Sht_06_Plan.dwg
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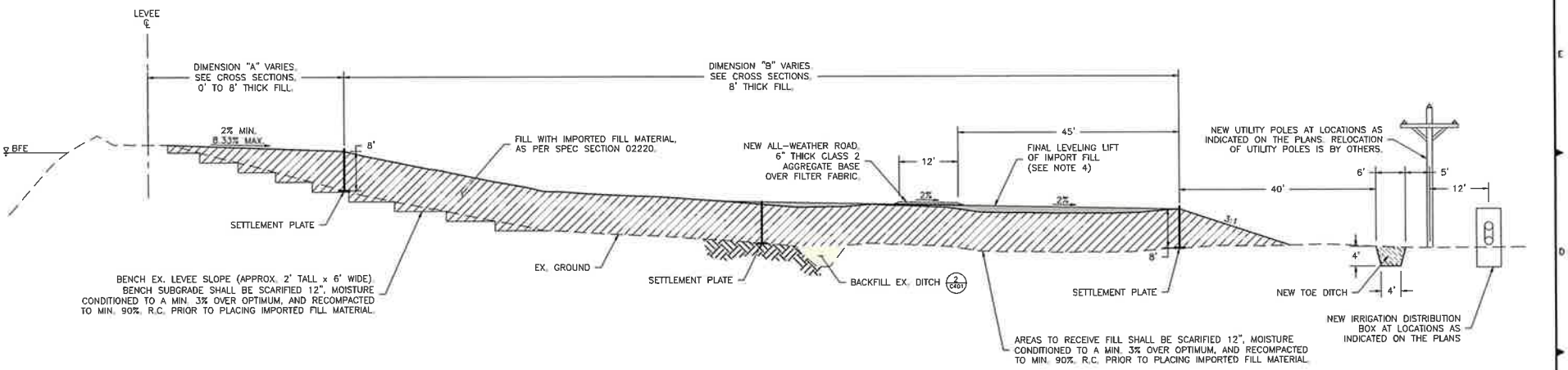
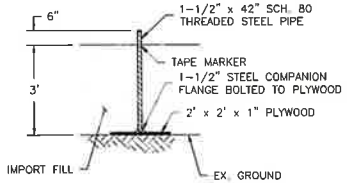


NOTES:

1. FILL PLACEMENT SHALL BE STAGED IN MAXIMUM 3' LIFTS. CONTRACTOR SHALL ALLOW A MINIMUM OF 3 WEEKS BETWEEN STAGES.
2. FILL PLACEMENT RATES AND SETTLEMENT TO BE FIELD MONITORED. FILL PLACEMENT RATES MAY BE ADJUSTED DEPENDING ON SITE CONDITIONS.
3. SETTLEMENT PLATES SHALL BE INSTALLED AT LOCATIONS SHOWN EVERY 150' ALONG THE LEVEE. A 1-1/2" x 36" THREADED STEEL PIPE EXTENSION SHALL BE ADDED PRIOR TO THE PLACEMENT OF EACH SUBSEQUENT FILL LAYER.
4. AFTER 8' THICKNESS OF FILL HAS BEEN PLACED AND HAS SETTLED, CONTRACTOR SHALL PLACE AND COMPACT A FINAL LEVELING LIFT OF IMPORT FILL IN ORDER TO PROVIDE 2% MIN. DRAINAGE AWAY FROM THE LEVEE.

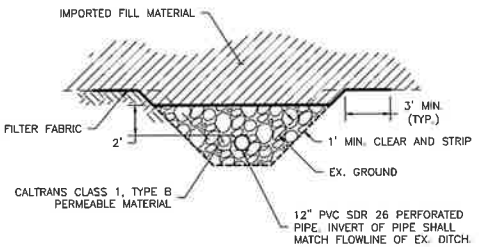


SETTLEMENT PLATE DETAIL

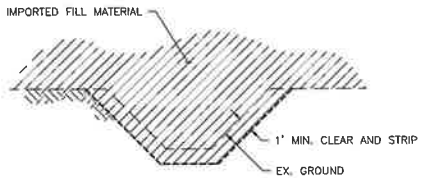
1 TOE BERM – TYPICAL SECTION

STA. 360+00 TO 508+80
STA. 512+00 TO 567+00

SCALE: N.T.S.



WITH PERFORATED PIPE DRAIN



WITHOUT PERFORATED PIPE DRAIN

2 EXISTING DITCH BACKFILL

SCALE: N.T.S.

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

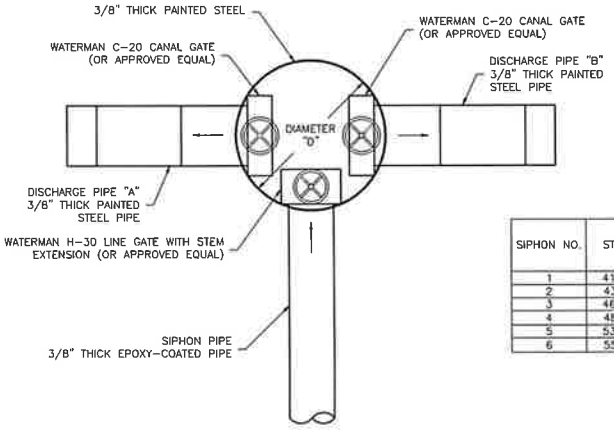
DETAILS

Revisions				
No.	Description	Date	By	Appvd. By

Design	EEA
Drawn	EEA
Check	CHN
Scale	AS SHOWN
Original Drawing Scale	0 ½" 1"
Date	MAY 2017
Sheet Number	9 of 21
Project File No.	1110-0571

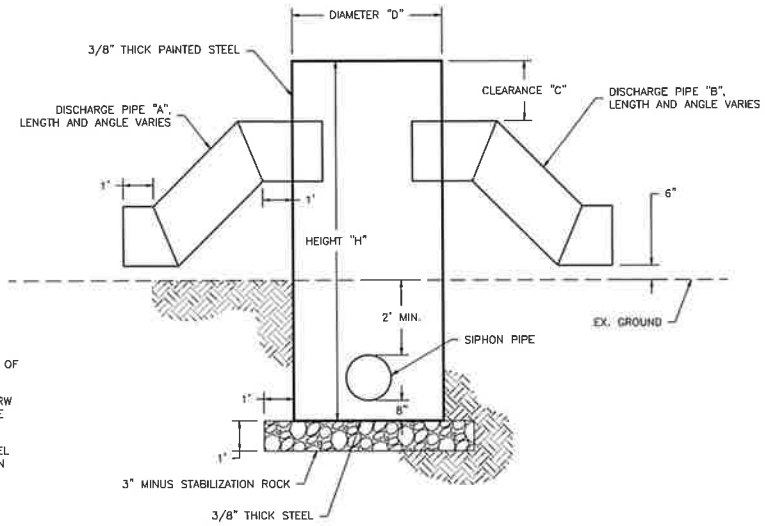
C401

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_8.1\Sht_09_Details.dwg
PLOT DATE: May 25, 2017 - 12:53pm



PLAN VIEW

SIPHON NO.	STATION	SIPHON PIPE DIAMETER	DISCHARGE PIPE "A" DIAMETER	DISCHARGE PIPE "B" DIAMETER	DISTRIBUTION BOX		
					DIAMETER "D"	HEIGHT "H"	CLEARANCE "C"
1	411+43	18"	24"	24"	5'	12.0'	2.0'
2	434+61	14"	18"	18"	5'	11.0'	2.0'
3	466+88	16"	20"	20"	5'	11.0'	1.5'
4	489+81	24"	N/A	30"	6'	13.5'	2.5'
5	537+87	16"	20"	20"	5'	12.5'	3.0'
6	556+21	16"	20"	N/A	5'	12.0'	2.5'



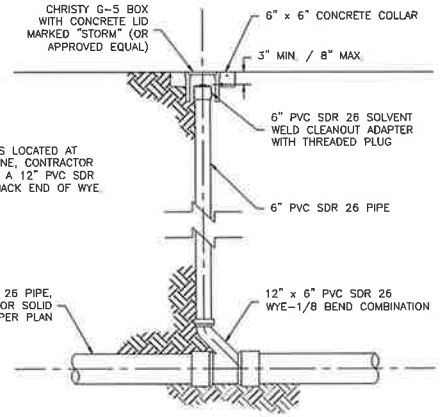
SECTION VIEW

NOTES:

1. VALVE AND CANAL GATE STEMS TO EXTEND ABOVE TOP OF BOX. INSTALL STEM EXTENSIONS AS NEEDED.
2. ALL SIPHON PIPE SHALL BE 3/8" MIN. THICK STEEL ERW STRAIGHT SEAM, GRADE B PIPE, EPOXY COATED ON THE EXTERIOR. ALL PIPE JOINTS SHALL BE WELDED.
3. ALL DISCHARGE PIPES SHALL BE 3/8" MIN. THICK STEEL ERW STRAIGHT SEAM, GRADE B PIPE, PAINTED WHITE ON THE EXTERIOR. ALL PIPE JOINTS SHALL BE WELDED.

(3) DISTRIBUTION BOX

SCALE: N.T.S.



NOTES:

1. IF CLEANOUT IS LOCATED AT END OF PIPELINE, CONTRACTOR SHALL INSTALL A 12" PVC SDR 26 PLUG AT BACK END OF WYE.

(4) CLEANOUT

SCALE: N.T.S.

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KSN INC. KJELDSEN SINNOCK NEUDECK
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

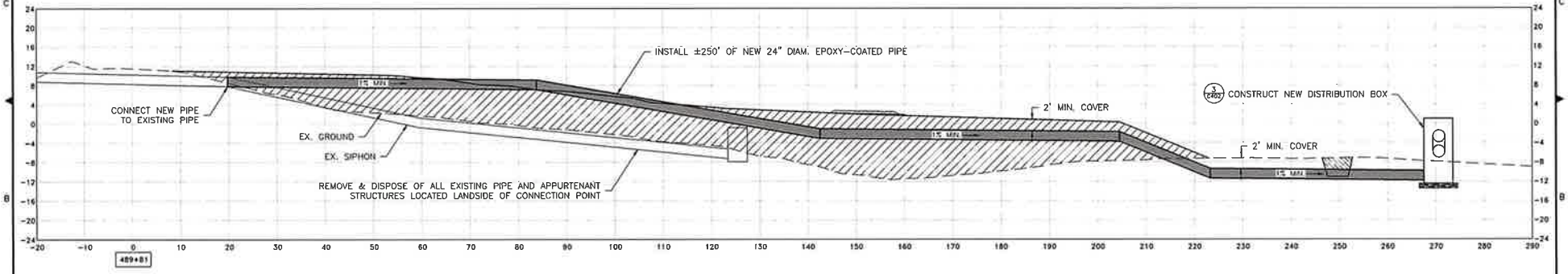
DETAILS

Revisions				
No.	Description	Date	By	Appvd By

Design	EEA
Drawn	EEA
Check	CHN
Scale	AS SHOWN
Original Drawing Scale	0 ½" 1"
Date	MAY 2017
Sheet Number	10 of 21
Project File No.	1110-0571

C402

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CAD\Sheets_8.1\SnL_09_Details.dwg
PLOT DATE: May 25, 2017 - 12:54pm



NOTES:

1. ALL SIPHON PIPE SHALL BE 3/8" MIN. THICK STEEL ERW STRAIGHT SEAM, GRADE B PIPE, EPOXY COATED ON THE EXTERIOR. ALL PIPE JOINTS SHALL BE WELDED.

5 RECONSTRUCT EX. SIPHON AT STA. 489+81

SCALE: 1" = 10'

C403

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
Civil Engineers and Land Surveyors
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www.ksninc.com

RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

DETAILS

Revisions				
No.	Description	Date	By	Approved By

Design EEA
Drawn EEA
Check CHN

Scale AS SHOWN
Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 11 OF 21
Project File No. 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CAD\Sheets_5 1\Sh1_09_Details.dwg
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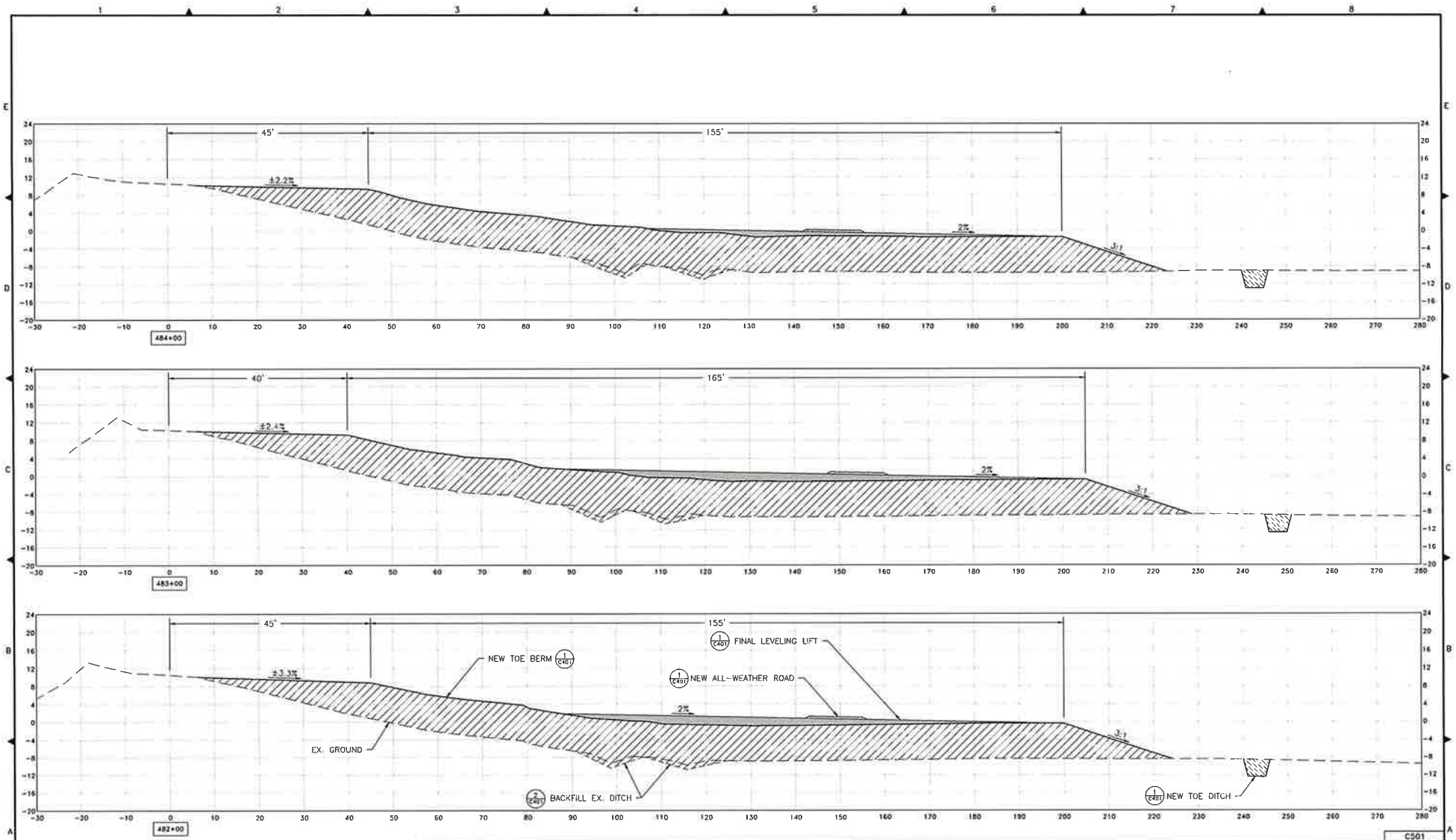

C501

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KSN INC. KJELDSEN SINNOCK NEUDECK
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 482+00 TO 484+00

Revisions				
No.	Description	Date	By	Approved By

Design	EEA
Drawn	EEA
Check	CHN

Scale: 1" = 10'
Original Drawing Scale: 0 ½" 1"

Date: MAY 2017
Sheet Number: 12 of 21
Project File No.: 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CAD\Sheets_6:1\Sht_12_Sections.dwg
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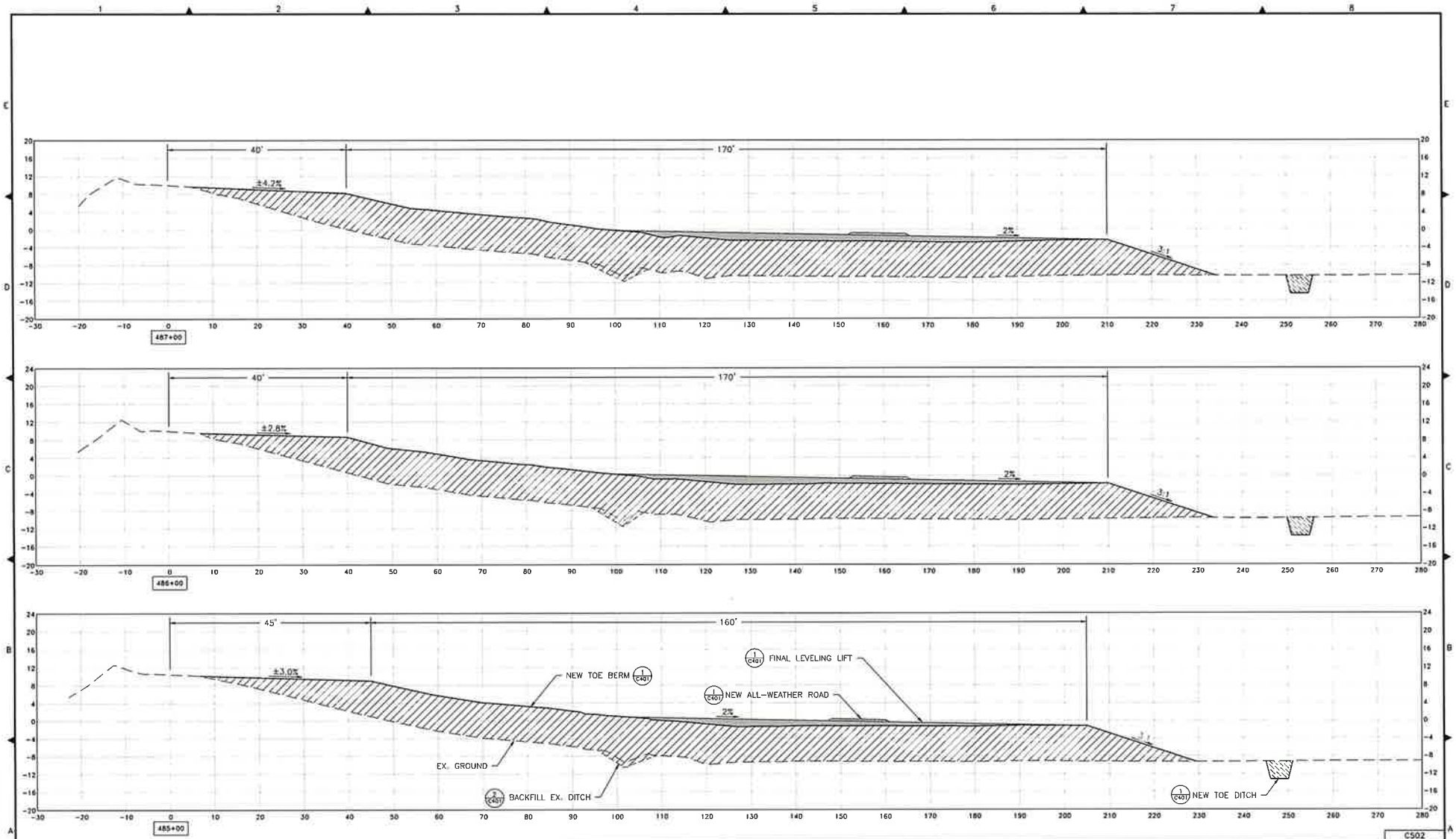

C502

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 485+00 TO 487+00

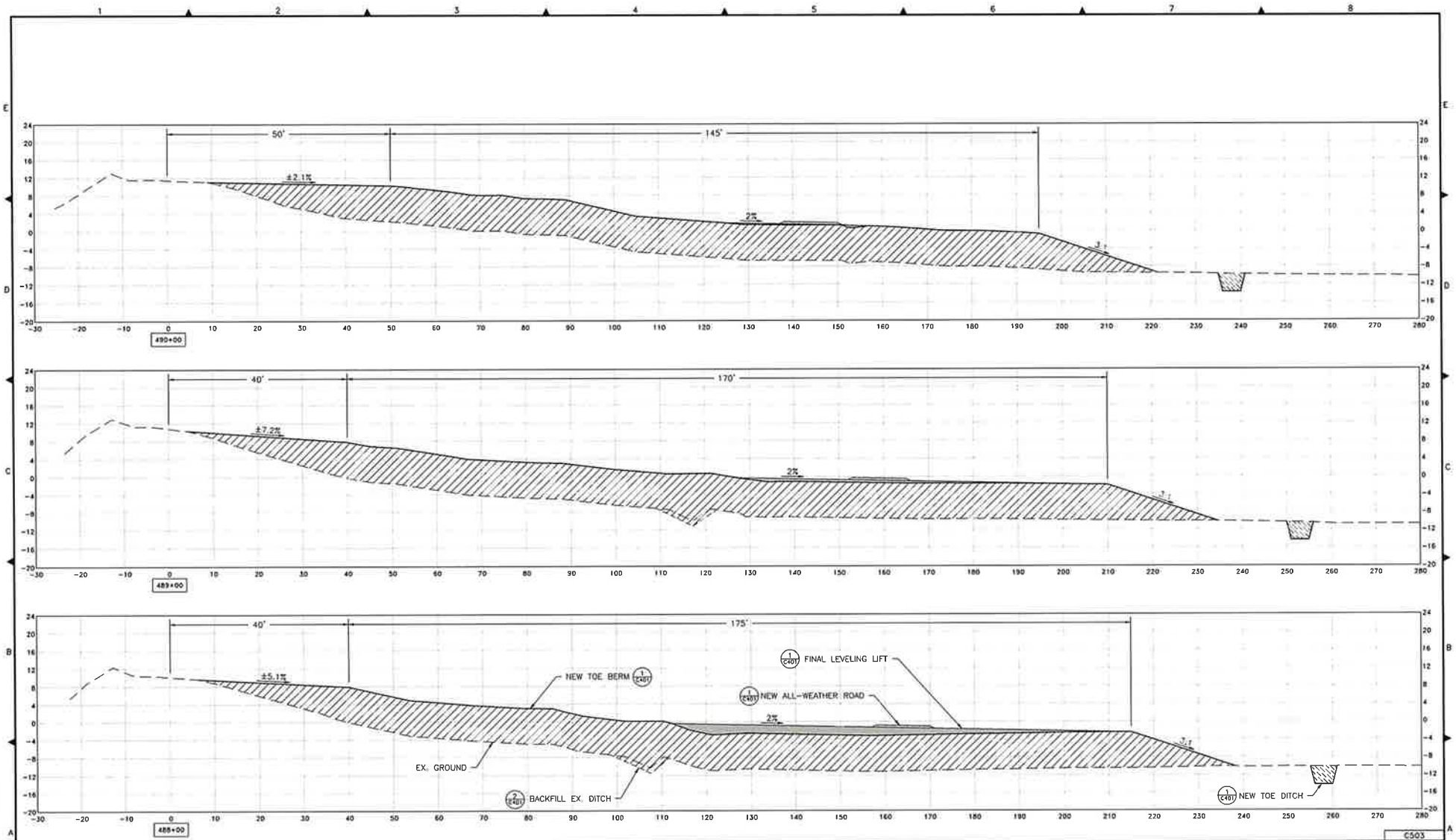
Revisions				
No.	Description	Date	By	Approved By

Design	EEA
Drawn	EEA
Check	CHN

Scale: 1" = 10'
Original Drawing Scale: 0 ½" 1"

Date: MAY 2017
Sheet Number: 13 of 21
Project File No.: 1110-0571

FILE SPEC: P:\1110_Mitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_6-1\Sht_12_Sections.dwg
PLOT DATE: May 25, 2017 - 12:57pm



C503

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
Civil Engineers and Land Surveyors
711 N Pershing Avenue, Stockton, CA 95203, 209-946-0268
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www.ksninc.com

RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 488+00 TO 490+00

Revisions				
No.	Description	Date	By	Appvd By

Design	EEA
Drawn	EEA
Check	CHN
Scale	1" = 10'
Original Drawing Scale	0 ½" 1"
Date	MAY 2017
Sheet Number	14 of 21
Project File No.	1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_6.1\Sht_12_Sections.dwg
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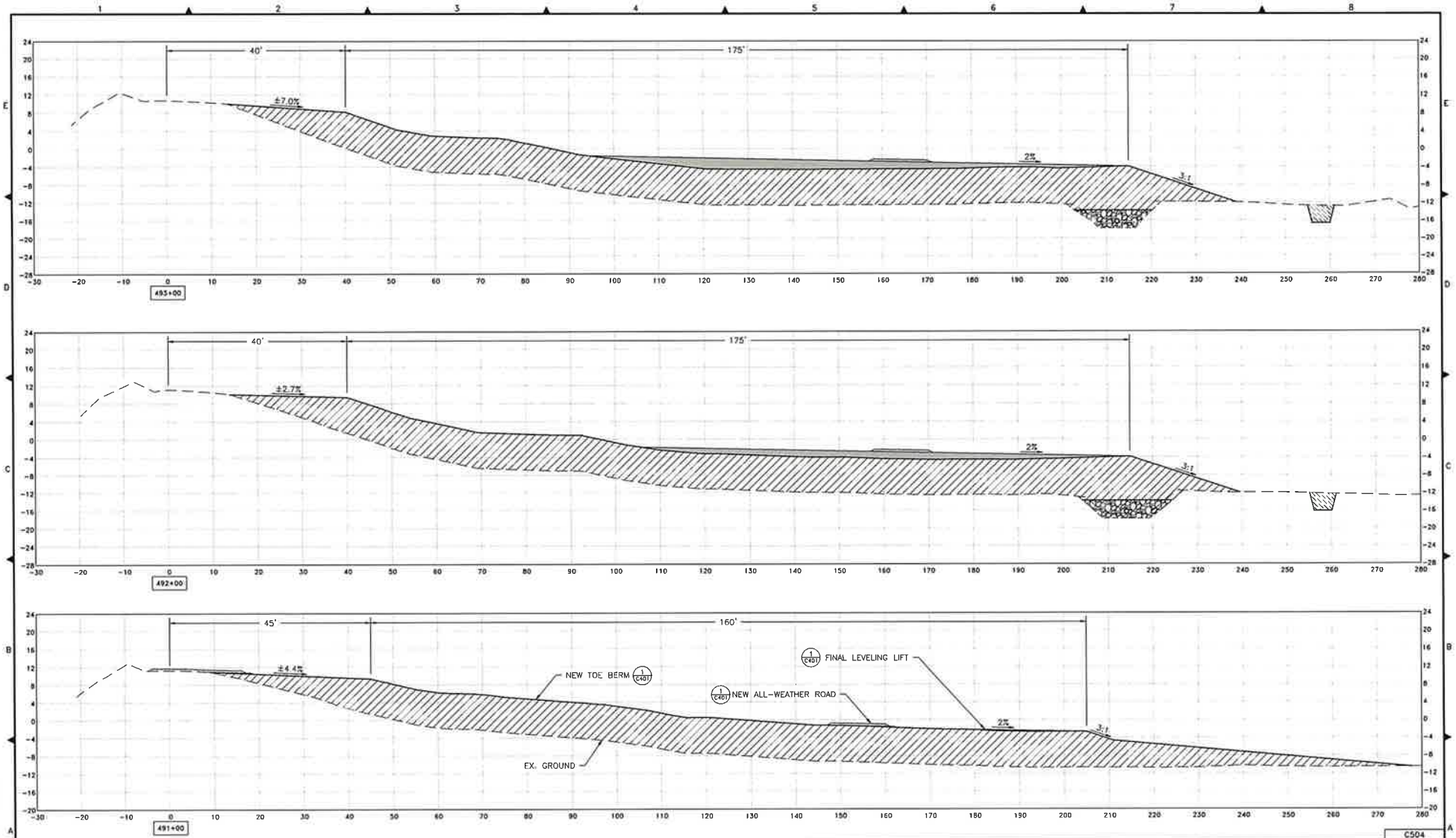

C504

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KSN INC. KJELDSEN SINNOCK NEUDECK
Civil Engineers and Land Surveyors
711 N Pershing Avenue, Stockton, CA 95203, 209-946-0268
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 491+00 TO 493+00

Revisions				
No.	Description	Date	By	Approved By

Design	EEA
Drawn	EEA
Check	CHN
Scale	1" = 10'
Original Drawing Scale	0 ½" 1"
Date	MAY 2017
Sheet Number	15 of 21
Project File No.	1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-I_Berm_Improvements\05_Civil\CAD\Sheets_6.1\Sht_12_Sections.dwg
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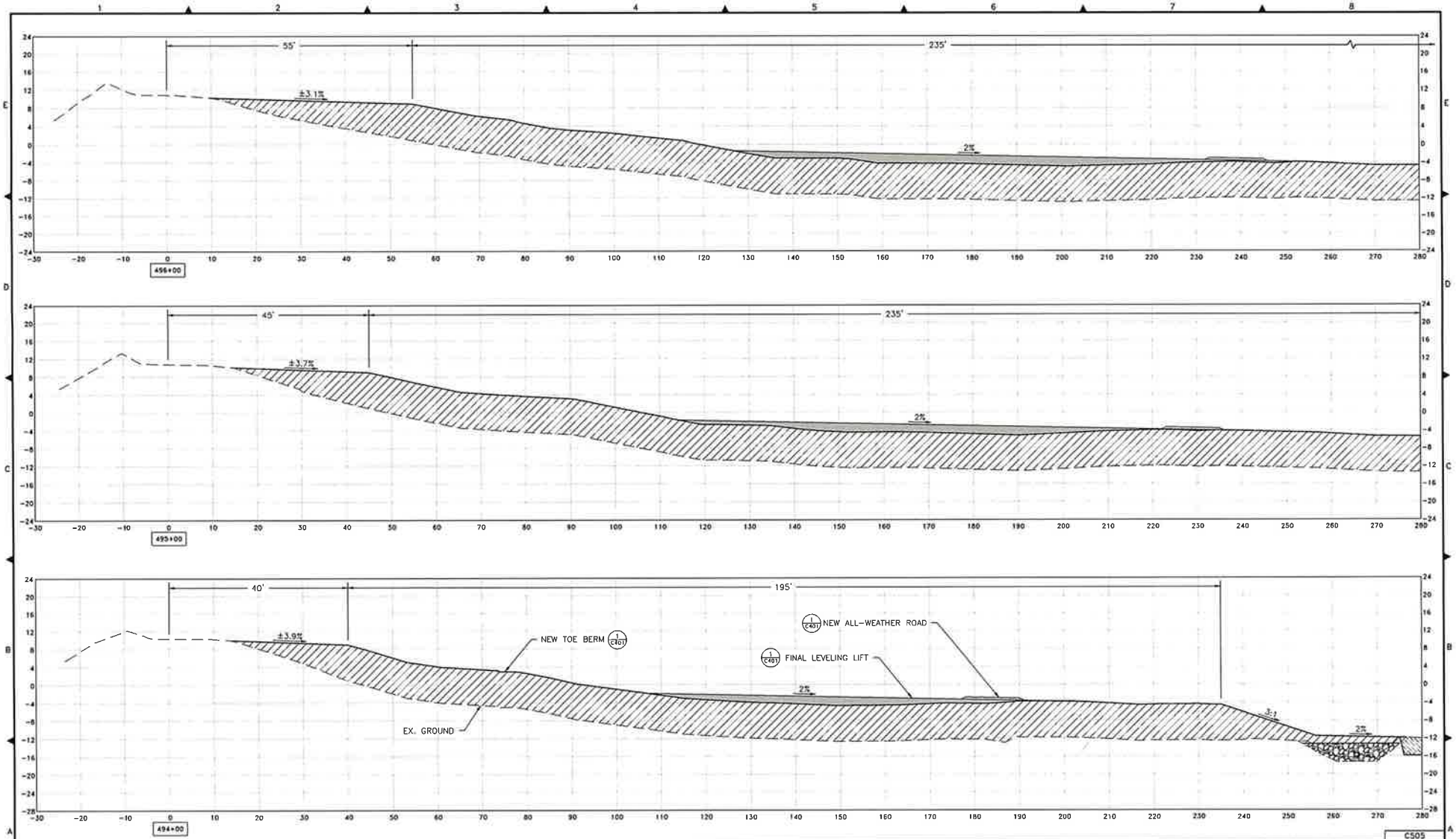

C505

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 494+00 TO 498+00

Revisions				
No.	Description	Date	By	Apprvd. By

Design	EEA
Drawn	EEA
Check	CHN

Scale: 1" = 10'

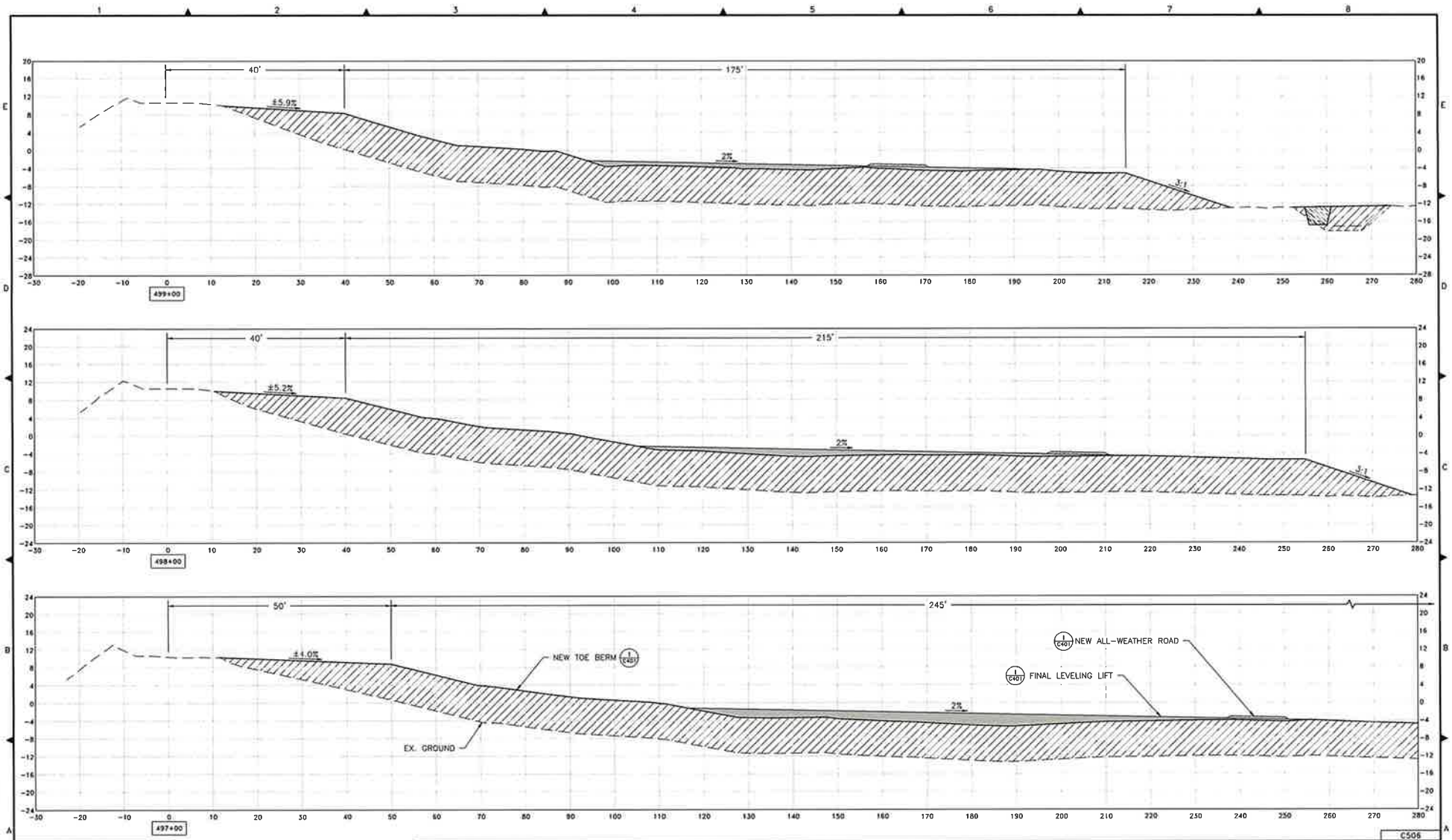
Original Drawing Scale: 0 ½" 1"

Date: MAY 2017

Sheet Number: 16 of 21

Project File No.: 1110-0571

FILE SPEC: P:\1110_Twitchell_Island\0571_SJR_Levee_Improvements\0010_Phase-1_Berm_Improvements\05_Civil\CAD\Sheets_61\Sht_12_Sections.dwg
PLOT DATE: May 25, 2017 - 12:58pm



C506

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

KJELDSEN SINNOCK NEUDECK INC.
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 497+00 TO 499+00

Revisions				
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Date: MAY 2017
Sheet Number: 17 of 21
Project File No.: 1110-0571

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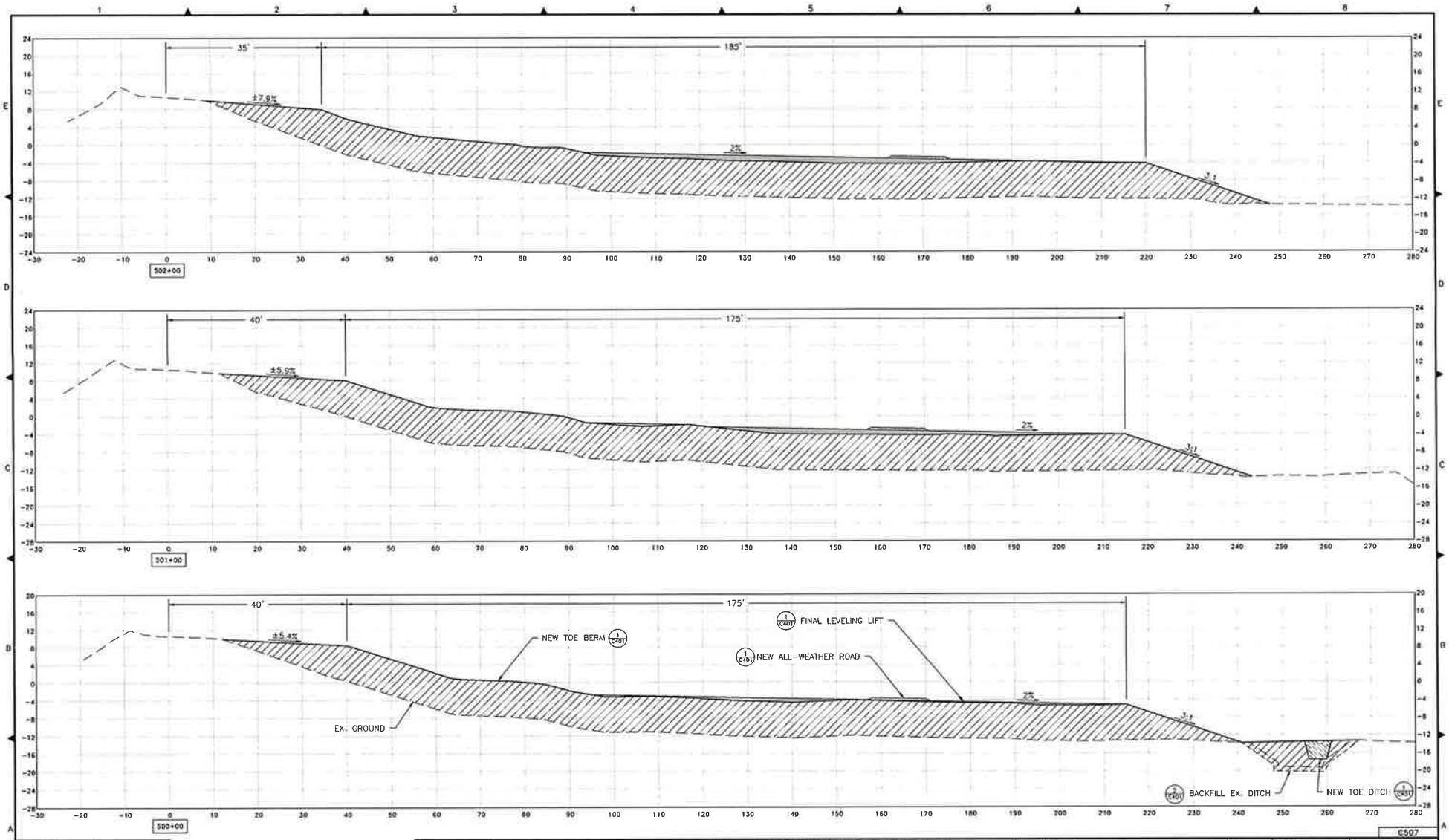

C507

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 500+00 TO 502+00

Revisions				
No.	Description	Date	By	Approved By

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Drawn EEA
Check CHN

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Date MAY 2017
Sheet Number 18 Of 21
Project File No. 1110-0571

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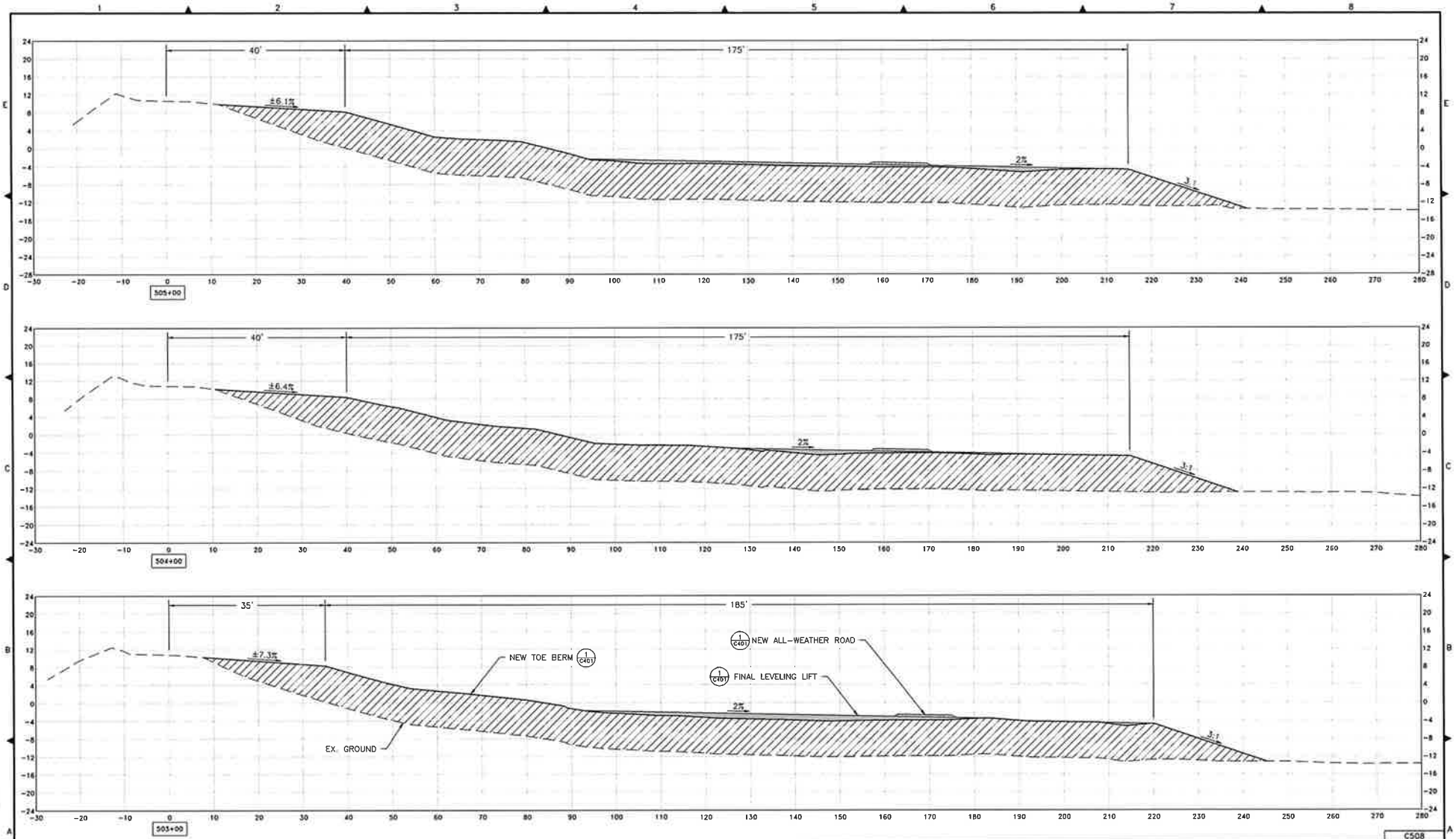

C508

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 503+00 TO 505+00

Revisions				
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Date	MAY 2017
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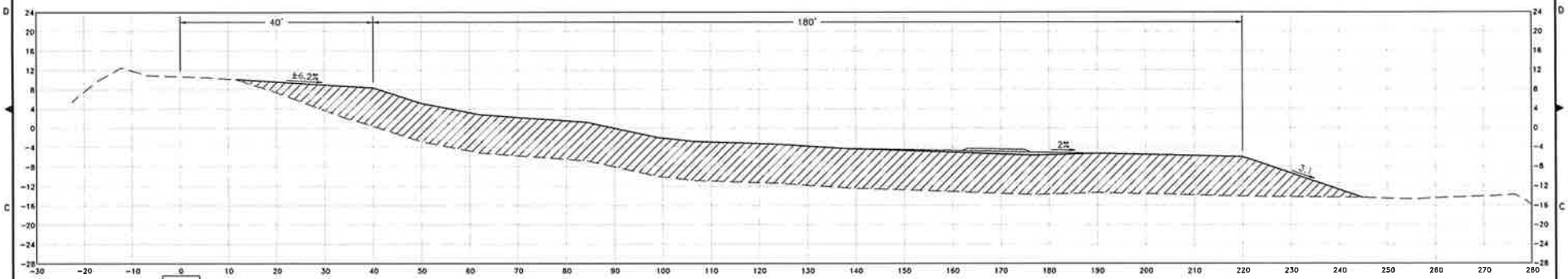

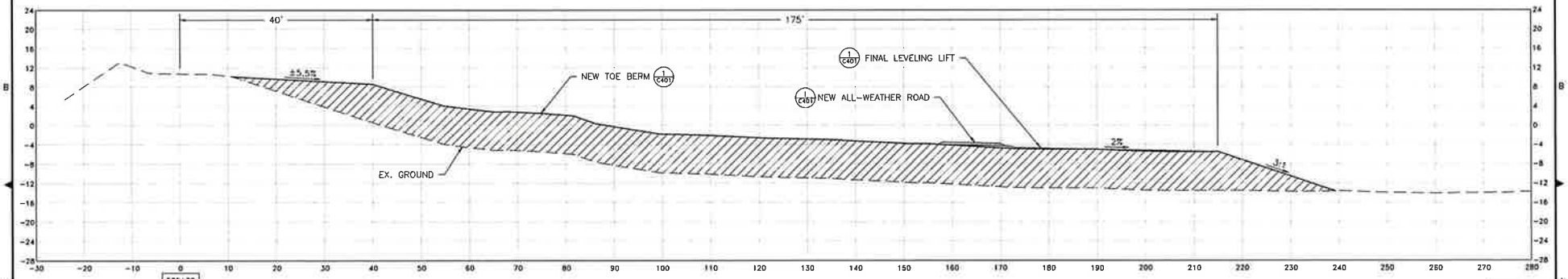

C509

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 508+00 TO 507+00

Revisions				
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Check CHN

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Original Drawing Scale 0 ½" 1"

Date MAY 2017
Sheet Number 20 Of 21
Project File No. 1110-0571

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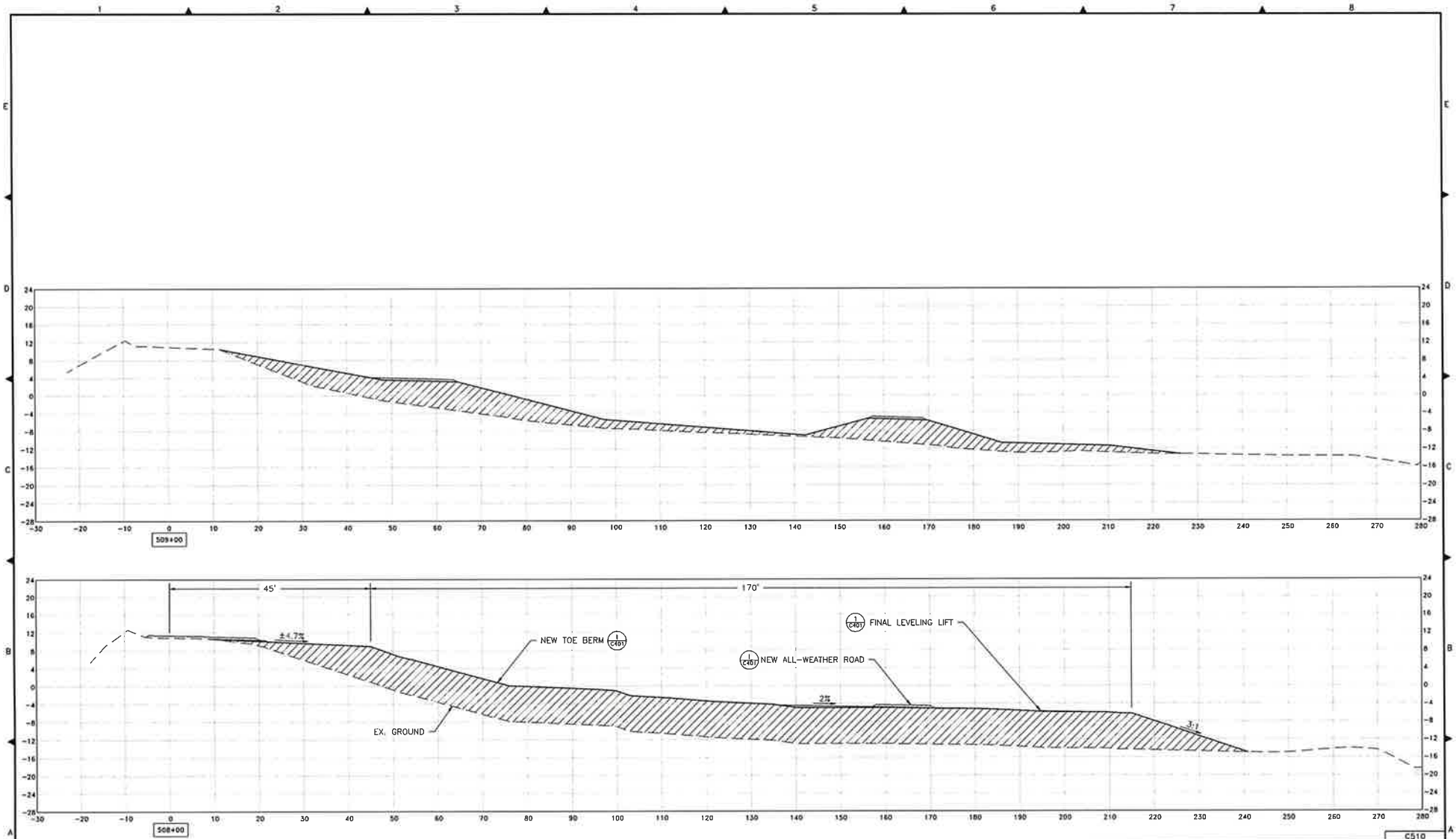

C510

Submittal	
#	Date
95	5/23/2017

PROJECT ENGINEER

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, REACH 6.1
SACRAMENTO COUNTY, CALIFORNIA

SECTIONS
STA. 508+00 TO 509+00

Revisions				
No.	Description	Date	By	Aprvd. By

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Original Drawing Scale	0 ½" 1"
Date	MAY 2017
Sheet Number	21 Of 21
Project File No.	1110-0571

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PLOT DATE: May 25, 2017 - 1:01pm

APPENDIX B

10 PERCENT IMPROVEMENT PLANS FOR PHASE 2 OF THE OVERALL PROJECT

RECLAMATION DISTRICT NO. 1601

TWITCHELL ISLAND

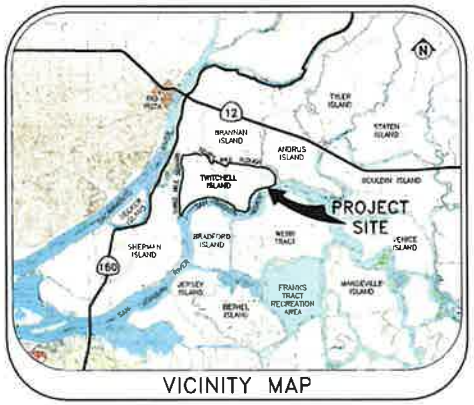
SACRAMENTO COUNTY, CALIFORNIA

SAN JOAQUIN RIVER SETBACK LEVEE, PHASE 2

VARIOUS LOCATIONS BETWEEN

STATION 360+00 to 590+00

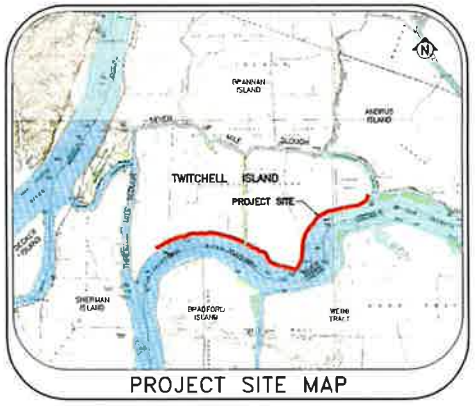
DWR PROJECT FUNDING AGREEMENT NO. TW-XX-XX



VICINITY MAP

DWG NO.	SHEET NO.	DESCRIPTION
G001	1	TITLE SHEET
C101	2	BASE MAP
C401	3	DETAILS

SHEET INDEX



PROJECT SITE MAP

Submittal	
#	Date
10	9/4/2014

PRINCIPAL ENGINEER — NOT FOR CONSTRUCTION

PROJECT ENGINEER — NOT FOR CONSTRUCTION

KSN INC. KJELDSEN SINNOCK NEUDECK
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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, PHASE 2
SACRAMENTO COUNTY, CALIFORNIA

TITLE SHEET

Revisions				
No.	Description	Date	By	Aprvd. By

Design EEA
Drawn EEA
Check CHN

Scale N.T.S.
Original Drawing Scale 0 ½" 1"

Date SEPTEMBER 2014
Sheet Number 1 of 3
Project File No. 1110-0571

G001

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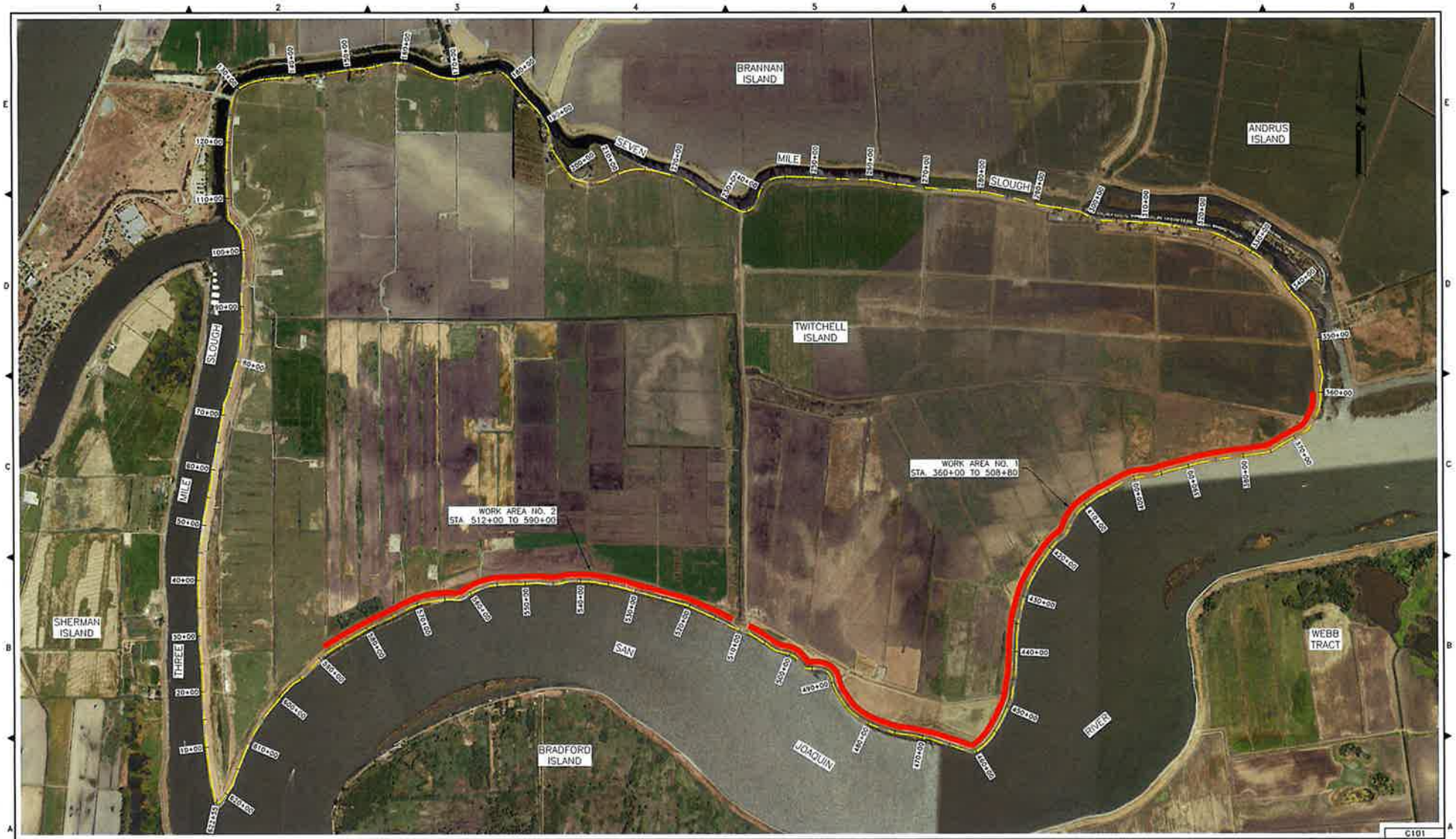

Submittal	
#	Date
10	9/4/2014

PRINCIPAL ENGINEER — NOT FOR CONSTRUCTION

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, PHASE 2
SACRAMENTO COUNTY, CALIFORNIA

BASE MAP

Revisions				
No.	Description	Date	By	Apvd. By

Design EEA
Drawn EEA
Check CHN

Scale 1" = 800'
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Date SEPTEMBER 2014
Sheet Number 2 Of 3
Project File No. 1110-0571

C101

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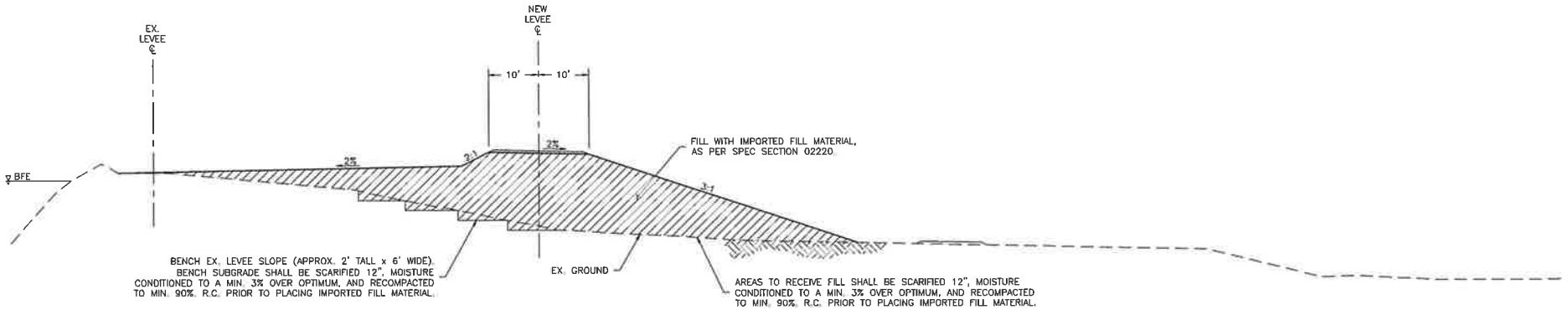

1 SETBACK LEVEE – TYPICAL SECTION
STA. 360+00 TO 508+80, 512+00 TO 590+00

SCALE: N.T.S.

C401

Submittal	
#	Date
10	9/4/2014

PRINCIPAL ENGINEER — NOT FOR CONSTRUCTION

PROJECT ENGINEER — NOT FOR CONSTRUCTION

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RECLAMATION DISTRICT NO. 1601
SAN JOAQUIN RIVER SETBACK LEVEE, PHASE 2
SACRAMENTO COUNTY, CALIFORNIA

DETAILS

Revisions				
No.	Description	Date	By	Approved By

Design EEA
Drawn EEA
Check CHN

Scale AS SHOWN
Original Drawing Scale 0 ½" 1"

Date SEPTEMBER 2014
Sheet Number 3 Of 3
Project File No. 1110-0571

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PLOT DATE: Sep 04, 2014 - 5:20pm

APPENDIX C

MEMORANDUM AND 60 PERCENT PLANS FOR PHASE 3 OF THE OVERALL PROJECT

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Sacramento, CA 95811
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916.414.5800 tel
916.414.5850 fax

Memorandum

To: Erik Almaas, KSN Engineers

From: Steve Chainey and Andrea Shephard, AECOM

CC: DWR – Bryan Brock
AECOM – Francine Dunn, Cori Resha, Kesha Chapman, and Stephen Ramirez

Date: February 12, 2014

Subject: RD 1601 Twitchell Island Setback Levee Project Waterside Habitat Design Technical Memorandum

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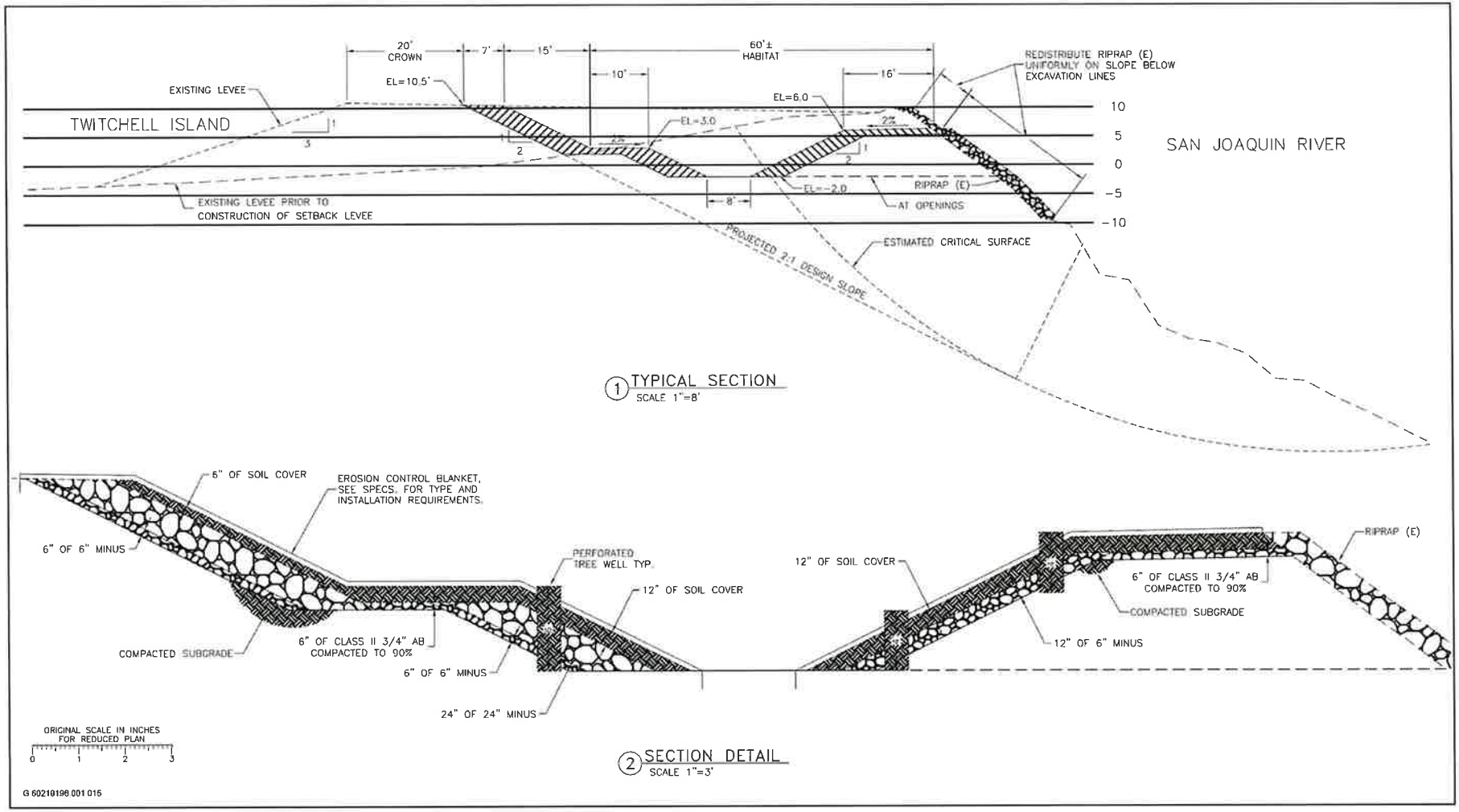
BACKGROUND

1999/2000 Setback Levee Habitat Enhancement Project

In 1999, DWR's Delta Levees Program and Environmental Compliance and Ecosystem Enhancement Branch, in concert with RD 1601, constructed the *Twitchell Island Setback Levee Habitat Enhancement Project* on 3,000 lineal feet (LF) of the north side (right bank) of the San Joaquin River (SJR), just upstream of the mouth of Threemile Slough. The south levee of Twitchell Island had a steep, unstable waterside slope and high energy wind wave erosion. The site was identified as both a threat to levee integrity and an opportunity to combine Delta ecosystem enhancement with a levee protection project. The goal of the 1999 enhancement project was to build a more stable setback levee and create emergent marsh and Shaded Riverine Aquatic (SRA) habitats.

A predominant feature of the project design was creation of a tidal back channel located between a low bench along the constructed setback levee and a portion of the original levee that was retained as a waterside berm in the form of a series of "barrier islands" (Exhibit 1). Several water entrance points between the channel and the San Joaquin River were designed at angles to maintain circulation and keep water from stagnating in the back channel. The low bench and the waterside berm/islands were planted in 2000 to establish dense riparian vegetation and create SRA habitat along SJR and the tidal back channel. Total setback levee project cost was approximately $3 million in 2000, and included creation of 2,200 LF of river island and tidal "slough" habitat. The project has been very successful in creating riparian and SRA habitat along the berm/islands and waterside low bench. Retention of the original riverside rocked bank and the addition of rock in other erosion-prone locations has successfully prevented the loss of habitat that would otherwise be subjected to persistent wind wave and wake erosion. Establishment of emergent marsh occurred in some portions of the tidal back channel, but has been less successful in other portions. Tules (*Scirpus* spp.) planted along the channel margins and other volunteer marsh species have become established at many locations. However, water hyacinth (*Eichornia crassipes*) has invaded portions of the channel (Exhibit 2). Water hyacinth can have negative effects on aquatic habitats and water quality in the Delta. Once ensconced in calm waters, monotypic, floating mats of hyacinth harbor non-native predatory fish that prey on and compete for food resources with native Delta species. Therefore, the success of the project in creating beneficial aquatic habitat for native Delta plant and animal species has been diminished by the invasion of the water hyacinth.



Source: KSN, Inc. 1999; Adapted by AECOM 2014

Exhibit 1

Typical Cross Section of 1999 Project Design by KSN Engineers for RD 1601's Twitchell Island Setback Levee Habitat Restoration Project

Source: DWR, 2008

Exhibit 2 **SRA Habitat, Tules and Water Hyacinth (*Eichornia crassipes*) in Tidal Back Channel at 1999 Twitchell Island Setback Levee Habitat Project Site.**

BDCP, Delta Levees Program and "Fish Friendly" Levees

The Bay Delta Conservation Plan (BDCP) has identified Channel Margin Habitat (CMH) as a mitigation and restoration priority for ecosystem enhancement in the Delta. Towards that end, DWR-DEE sponsored a *Channel Margin Habitat Workshop* on November 6, 2013, held at the Delta Conservancy Offices in West Sacramento, CA. The workshop brought together 30 participants from agency and university staff and consultants with a broad range of expertise in aquatic ecology and Delta ecosystems to refine a Delta-focused working definition of CMH, including physical and biological characteristics, enhancement objectives, and implementation priorities. Workshop results are intended to guide DWR's Delta Ecosystem Enhancement staff in appropriate design of CMH in association with state-sponsored levee projects in the Delta.

The Delta Levees Program defines levees that include waterside habitat and are designed to benefit native fish species as "Fish Friendly Levees." In this context, Fish Friendly Levees (FFL) are primarily meant to provide Delta-specific rearing and outmigration habitat for juvenile salmonids, while decreasing habitat for predators of native fishes. The following excerpt is from a summary of the CMH workshop proceedings:

Fish Friendly Levees are the complex of aquatic, wetland, and riparian habitats at the edges of watercourses in association with rip-rapped levees. FFL provides sandy or muddy substrate at a range of elevations that include tidally submerged or shallow benches to seasonally-inundated riparian habitat (i.e. shaded riverine aquatic). FFL has high diversity in structure, topography, vegetation, and hydrology, with shallower depths and slower velocities than in the adjacent channel. The intention of FFL creation is to include a mosaic of ecologically valuable water-to-upland habitats on river reaches within the Delta that provides the food and shelter necessary for the successful rearing of native fish species.

The principal ecological functions of this habitat include the following:

- Provide food production and foraging opportunities for salmonids during their outmigration as well as other native fish species.
- Provide refuge from predation for salmonids during their outmigration through overhead cover and finely branched woody debris.
- Reduce predators' use in channel and created salmonid habitat (e.g., add smaller rock to exposed riprap to decease predator hiding areas).
- Allows for variable inundation of benches with tide stage and seasonal flow.

HABITAT DESIGN OBJECTIVES

Primary Objective: Channel Margin Habitat

The proposed new waterside habitat design for four miles of SJR-Twitchell Island levee is consistent with and takes direction from the guidance provided by the CMH Workshop results and DWR's Delta Levees Program emphasis on creating fish friendly levees. The primary design objective is the creation of a diverse range of channel margin habitat structures and SRA habitats, and their associated ecological functions and target species benefits. A secondary objective is creation of a continuous corridor of riparian and upland scrub habitats having a diversity of botanical species and canopy structure. To achieve these objectives, another essential objective is to design structures and habitats that can withstand the erosive forces of chronic ship/boat wakes and wind waves, and the occasional high energy storm waves, with minimal loss of substrate, soil and vegetation and the ability to recover from infrequent storm-related damage.

Specific Design Criteria

To achieve the primary and secondary project objectives, five design options have been developed with these nine specific design criteria in mind:

- On the riverside, create wave-resistant banks using a combination of dense tule and willow thickets and low gradient beach slopes to attenuate wave energy, and hardpoint wave breaks and rock or biotechnical bank slope protection.
- On leeward and landside surfaces, minimize the use of rock and maximize natural soil surfaces. Wherever feasible, remove or lower existing rocked banks.

- Sculpt flat benches or beach slope surfaces at elevations within the locally appropriate tidal range that can support emergent marsh (tule) vegetation.

- Create tidal "sloughs" in the form of protected back channels that are submerged during high tides, but fully drain to an exposed bottom at mean lower low tide (MLLW). Complete drainage at MLLW is intended to discourage colonization by water hyacinth, and provide small areas of intertidal mudflat habitat.

- Provide sufficient soil depth and volume under tree-planting surfaces so that larger riparian tree species can grow to mature heights with a vigorous canopy, thereby optimizing canopy width and SRA habitat at water's edge.

- For riparian areas, shape variable height planting surfaces in relation to water levels, including low elevation benches that are partially inundated by higher tides.

- On soil surface slopes, slopes must be stable to prevent surface erosion, in a range from 2.5:1 to 4:1 slope gradients depending on exposure to wind wave energy.

- Minimize or protect trees from exposure to damage from beaver populations.

- In general, minimize linear shorelines and landform uniformity, and maximize vertical and horizontal variability in relation to tidal range and soil depth to shallow groundwater.

DESIGN CONSTRAINTS AND OTHER CONSIDERATIONS

Design options must be feasible within the constraints of site specific conditions and the engineering design requirements and safety thresholds for the adjacent setback levee project. Some of the more limiting constraints and other design frameworks are discussed below.

Bank Steepness and Wave Erosion

San Joaquin River channel depths near Twitchell Island vary from 25 to 50 feet below MLLW. In some locations, submerged, low gradient banks or shelves extending 30 to 60 feet out from the shoreline may be present at depths ranging from 0 to 6 feet below mean higher high water (MHHW). In other locations, the submerged banks are very steep and unstable below the shoreline. The entire bankline at the project site is rock-armored from the top of bank down to depths well below MLLW, and is devoid of woody riparian or marsh vegetation except for a few small tule patches. Boat and ship wakes (Exhibit 3), ship prop wash, and severe wind wave erosion (Exhibit 4) acting against the steep banks is a major factor affecting bank stability. In the absence of rock armor or other stabilizing conditions, exposed soil surfaces on unprotected banks would likely erode within a short time frame. Depending on the direction of high winds in relation to river alignment, wind wave fetch along Twitchell Island can be up to three miles long across the 2,000'-3,000' wide expanse of the SJR. RD 1601 reported wind wave height during severe storms breaking over the top of the rocked levee, 5-6 feet above MHHW (Exhibit 4).

Limits of Excavation

The proposed setback levee will have buried rock armor over the projected 2:1 levee slope (see Section 2.5) The rock over 2:1 slope projection will be the inland limit of potential excavation of the existing levee to create landforms that support the intended vegetation and habitat features. There will be approximately 50-60 horizontal feet of existing levee within which habitat forms can be created, primarily by excavation and lowering of the existing levee soil mass, and removal of some portion of the existing

Source: Google Earth, July 2011

Exhibit 3 **Wave Fetch and Boat Wakes on San Joaquin River, Twitchell Island**

Source: RD 1601, February 7, 1998

Exhibit 4 **Wind-driven storm waves and debris on San Joaquin River, breaking over the top of levee (el. 10-11 ft) on south side of Twitchell Island**

rocked banks. In some cases, rock can be salvaged and relocated to stabilize banks on the windward side of created habitat landforms.

Tidal Range

The intertidal zone is an essential component of CMH in the Delta. Tidal and topographic/bathymetric data from several sources and tide stations in the vicinity of Twitchell Island were reviewed to develop an accurate accounting of the range of tidal elevations for design applications. The nearest, most complete record of tides was found to be Tide Station No. 9415193, named 'Three-Mile Slough at SJR, Chevron Point, Twitchell Island' on NOAA's online website *Tides & Currents*: http://tidesandcurrents.noaa.gov/. The Zero (0.0') reference elevations in tide station data is typically represented in relation to MLLW or to some other 0.0' base level that is unique to each tide station. In **Table 1** below, tide station elevations have been converted to actual elevations based on a standard vertical geodetic datum NAVD88 (North American Vertical Datum 1988). In this document, NAVD88 datum is used to represent existing and project design bathymetry and topography for plan view and cross section drawings (see Attachment A for cross section and plan view drawings, specifications, plant lists, and planting details, Sheets L1 to L13). Data shown in the NAVD88 column is taken from NOAA/National Geodetic Survey's (NGS) online conversion table for this tide station and PID number (web source: http://www.ngs.noaa.gov/Tidal_Elevation/index.jsp).

Table 1	**Tide Elevations at Three-Mile Slough Entrance at San Joaquin River in Relation to NAVD88 and MLLW Vertical Datums**	
Location:	**Three-Mile Slough at San Joaquin River, Chevron Point, Twitchell Island**	
Tide Sta.:	**9415193**	
PID #:	JS1716 (VM #: 11884)	
		(converted values below)
	MLLW Datum Elevations	**NAVD88 Actual Elevation:**
MHHW	3.42 Ft. *[14.78 sta. tide]*	5.43
MHW	2.95 Ft.	4.96
MSL	1.76 Ft.	3.77
MLW	0.52 Ft.	2.53
MLLW	**0.0 Ft.** *[11.36 sta. tide]*	**2.01**
Notes: MHHW = mean higher high water; MHW = mean high water; MLLW = mean lower low water; MLW = mean low water; MSL = mean sea level; NAVD88 = North American Vertical Datum of 1988 (replaced NGVD29 as standard) For NAVD88 datum conversion: add 2.01 ft to MLLW datum elevations		

Tule Growth Depth Thresholds

Records of the vertical range of tule growth in the Delta are variable and not consistent between sites where bathymetric measurements have been recorded, nor is it always clear which reference elevation datum was used (NAVD29, NGVD88, MLLW, Mean Sea Level, etc.). Other variable factors can affect where tules establish and persist, including different species of tules, water salinity gradients, tidal range, substrate depth and texture and erosive conditions. Existing tule marsh depths were measured along the perimeter of Twitchell Island to develop a more reliable picture of tule growth potential, in particular the maximum water depth threshold for the occurrence of tules patches. The outermost (deepest) limit of tule stands at numerous locations was measured with a telescoping staff gage from a jet-powered boat along San Joaquin River between Threemile Slough and Sevenmile Slough. The boat

survey was conducted by AECOM, DWR, and CDFG personnel on October 16, 2013. Average tule depth threshold results at the three largest tule patches are summarized in **Table 2**.

Table 2 Tule Depth Threshold Elevations along San Joaquin River at Twitchell Island

Time of Day on October 16, 2013	Avg. depth to limit of tule patch	Average Height above/below MLLW	Actual Elev. (NAVD88)	Max. water depth of tules at MHHW (5.43 ft. elev.)
9:42 AM, Low Tide	n/a	+0.10 ft.	2.11 ft. elev.	
12:00 PM	n/a	+1.35 ft.	3.36 ft. elev.	
3:25 PM, High Tide	n/a	+3.43 ft.	5.44 ft. elev.	
Observed high tide debris line, 10:00 AM	appx. 3+ ft. above wsel	+3.15 ft.	+5.16 ft. elev.	
Boat Survey Data				
9:35 AM, 1st tule patch 7-Mile Slough	3.5'	*-3.40 ft.*	*-1.39 ft. elev.*	6.82' deep
10:00 AM 2nd, #37 Nav. Buoy-Green	4.5'	*-4.35 ft.*	*-2.34 ft. elev.*	7.77' deep
10:30 AM 3rd patch	4.7'	*-4.50 ft.*	*-2.49 ft. elev.*	7.92' deep
Great Diurnal Range = 3.42 feet from MLLW to MHHW				
Mean Range of Tide = 2.42 feet from MLW to MHW				

Notes: elev. = elevation; ft. = feet; MHHW = mean higher high water; MHW = mean high water; MLLW = mean lower low water; MLW = mean low water; NAVD88 = North American Vertical Datum of 1988 (replaced NGVD29 as standard); wsel = water surface elevation

Negative values below reference datum 0.0' are shown in *italic* font.

Herbivory Damage

Beaver populations are present throughout the Delta and surrounding Twitchell Island. At the existing levee setback habitat site, considerable beaver harvesting of trees and many downed or girdled trees and tree stumps were observed during site visits. In some locations there was substantial loss of riparian vegetation, especially near the shoreline of the river and back channels. At least one active beaver lodge was found on the bank of a back channel. There is a paucity of existing riparian vegetation to provide food and structure for beaver populations within several miles of the project site. Therefore, it is prudent to assume that riparian plantings will require some degree of protection to limit the likely occurrence of beaver damage. The most cost effective, temporary measure is to run a low fenceline 2'-3' high along the top of bank on the riverside of planted areas.

DESIGN OPTIONS AND APPLICATIONS

Design Options 1 and 2 are intended for locations with steep riverbanks. Both options retain all or most of the existing bank rock to resist erosion and scour from wind waves and boat/ship wakes. Design Options 3, 4, and 5 are intended for locations with less steep banks and existing submerged shelves on which creation of low gradient beach slopes and wide bands of tule marsh have greater potential to attenuate wave energy. Option 5 also relies on rock-faced hardpoints, separating deep bays of tules, to break the path of wind waves that would otherwise collide with full force on the soil-surfaced bank. (See Attachment A, 60% Design Plans & Specifications, Sheets L1 to L13.)

Option 1- Barrier Islands and Tidal Back Channel

Option 1 (Sheets L5 and L10) is similar to the existing levee setback habitat site, with a series of barrier islands separated from land by a continuous back channel that fills and partially drains with the tides,

and widely spaced inlets between the river and back channel. The primary differences between the existing design and Option 1 include,

- No rock placed on banks or bottom of back channel. (Erosion has not occurred in this area of the existing habitat site.) This greatly reduces the needed rock volume and cost to construct the barrier islands. Rock on the existing windward slope will remain to protect the island and back channel habitat.

- Island is topped with a layer of cobble /soil mix, and the top elevation is 1.5' higher to provide more aerobic soil rooting volume above the saturated zone, especially for larger tree species.

- Back channel and inlet bottoms are sloped to completely drain to the river during low tides. The back channel has a bottom width of 8-14 feet, and a 25' wide water surface at MHHW.

- Two feet of topsoil, instead of 6 inches, is placed over the buried rock on the projected levee slope of the proposed setback levee. More topsoil will promote better growth rates and size of woody plants on the lower backslope.

Option 2- Wide Islands with Discontinuous Back Channels

Option 2 (Sheets L6 and L10) is similar to Option 1 in that it has a series of barrier islands, topped with soil/cobble mix, and separated from land by tidal back channels that drain completely at low tide. Option 2 is different from Option 1 in these features,

- Barrier islands are 32 feet wide instead of 15 feet wide (Option 1) to provide more riparian habitat isolated from the "mainland", with denser riparian and SRA habitat protected by the "moat" of the back channel.

- Both the tops of islands and the intervening peninsulas slope downward towards the river, from elevation 13.0' at the top of the peninsula slope, to elevation 10.0' at back side of top of island, to elevation 8.0' at river's edge which is 2.6' above MHHW. This provides a greater soil rooting volume at the upper end of slope for large trees to thrive, and a closer proximity to shallow groundwater at the lower end to support water-thirsty alders, buttonbush, and willows with canopy overhanging the river's water surface. To accomplish this, the upper four feet of existing rocked bank will be removed and reused elsewhere. The top slope also assures that breaking wave runup from major storms will drain back to the river instead of downcutting into the soil on the backside of the island.

Option 3- Stable 15:1 Beach Slope and 75'-Wide Tule Band

Unlike Options 1 and 2, Option 3 (Sheets L7 and L11) removes the waterside rocked bank and existing levee fill down to elevation -2.0'. To compensate for the loss of rock-armored bank protection below the waterline, Option 3 solves the need to dissipate wave energy by,

- creating a stable 15:1 beach slope within, and 4 feet below, the intertidal range where wind waves occur most frequently.

- adding a second line of wave attenuation created by a continuous 75'-wide band of tule marsh. Tule marsh occupying most of the beach slope width will have a variable bottom elevation from -2.0' to 4.0' elevation, with a narrow band of mudflat expected to occupy the upper zone where tule growth may not establish well.

- protecting the backslope during the post-construction years required for establishment of mature, dense tule growth by adding bio-technical bank protection above elevation 4.0' (from 2 feet below MHHW to elevation 10.0' or 12.0'). The bio-technical bank protection will have a layer of cobble/soil mix, interplanted with densely spaced willow cuttings. Alternatively, the slope can be covered with a blanket of inter-locking, soil-filled geo-cells, and then planted with willow cuttings.

Option 4- Undulating Bench with Scalloped Bankline

Option 4 (Sheets L8 and L11) creates optimal variability in water depth, inundation duration and frequency, and a non-linear shoreline that varies sinuously with tide levels. Option 4 is similar to Option 3 in that it includes a continuous band of tule marsh, 35-feet wide (though not as wide as Option 3), with armored bank protection on the lower backslope, and removal of the existing rocked bank and levee fill down to elevation 1.0'.

Features unique to Option 4 include,

- variable height middle bench, 20' wide, sculpted in a wave form between elevation 9.0' down to elevation 5.0' (0.4 feet below MHHW). Upper levels of the middle bench would support mixed riparian forest and tall shade trees, while the lower dips would be a combination of shallow mudflat and alder/willow scrub close to the water surface.

- variable height lower bench from elevation 3.0' to elevation 1.5' (0.5 feet below MLLW). The lower bench supports the 35-feet wide band of tule marsh.

- sinuous shoreline with pronounced in-and-out variation as tide levels intersect the variable height of the middle and lower benches.

Option 5- Deep Back Bays Between Rock Hardpoints: Option 5 (Sheets L9 and L12) solves the need to break long-fetch wind waves by creating rock hardpoints that extend outward 50 feet beyond the excavated backslope (or 10 feet beyond the existing bank line), with deep bays of relatively protected water and marsh in between. Option 5 has the greatest variation in non-linear shoreline. In addition to the hardpoints, features unique to Option 5 include,

- tule marsh at a uniform water depth (at elevation 0.0') occupying the 50-foot deep bays between hardpoints.

- complete removal of the existing rocked bank to provide a ready source of rock to create the hardpoints that will at times be subjected to intense wave energy.

- planted soil banks between hardpoints with riparian canopy overhanging the marsh perimeter, and on the unrocked portion of hardpoint projections (similar to the peninsulas in Option 2).

Summary of Habitats, All Options Combined

Table 3 and Sheet L3 of Attachment A show the locations, levee stationing, and linear extents for where each habitat design option will be applied to the existing four miles of the project's waterside length. Table 4 is a compilation of the created acreage of all habitats and vegetation types for each option, and for all options combined.

Table 3 Design Option Stationing, Bank Lengths, and Acres

	Option	From Station	To Station	Length LF	Acres
4	Undulating Bench	360+00	373+00	1,300	2.98
2	Barrier Islands	373+00	393+00	2,000	4.59
4	Undulating Bench	393+00	398+00	500	1.14
3	Beach Slope	398+00	410+00	1,200	2.75
5	Deep Back Bays	410+00	423+00	1,300	2.98
4	Undulating Bench	423+00	428+00	500	1.14
2	Barrier Islands	428+00	453+00	2,500	5.73
4	Undulating Bench	453+00	462+00	900	2.06
3	Beach Slope	462+00	478+00	1,600	3.67
4	Undulating Bench	478+00	485+00	700	1.60
3	Beach Slope	485+00	508+80	2,380	5.46
--	[Pump outfall]	508+80	512+00	--	--
4	Undulating Bench	512+00	530+00	1,800	4.13
1	Continuous Channel	530+00	545+00	1,500	3.44
4	Undulating Bench	545+00	555+00	1,000	2.29
2	Barrier Islands	555+00	567+00	1,200	2.75
	Total length/ac:	360+00	567+00	20,380 LF	46.78 ac

Table 4 Vegetation/Habitat Types (acres) for Design Options 1 thru 5

Design Option	Shallow shoreline width varies	Tidal back channel	Tule marsh[1]	Dense willow scrub	Alder willow scrub	Mixed riparian	Tall trees (riparian)	Upland scrub
Option 1-	n/a	0.38	0.00	0.00	0.66	0.00	0.19	0.34
Option 2-	n/a	1.04	1.03	0.00	1.82	1.98	0.62	1.93
Option 3-	9.51	0.00	9.51	2.37	0.00	0.00	0.00	1.18
Option 4-	6.92	0.00	5.49	0.00	0.00	2.35	0.00	4.63
Option 5-	1.04	0.00	1.12	0.19	0.00	0.00	0.00	0.57
All Options Combined	17.47	1.42	17.15	2.56	2.48	4.33	0.81	8.65

Notes:

Does not include shoreline of back channels in Options 1 and 2. Shallow shoreline width assumes average water depth from 0.0 to 3.5 feet during all or most of the tidal range on the river side of habitat options 3, 4, and 5.

[1] Acreages listed for tule marsh include projected clonal growth below and beyond planting limit at 1.0' elev. (i.e. one foot below MLLW), based on extents of existing tule patches.

HABITAT CREATION AND CONSTRUCTION SEQUENCE

Excavation and Grading

RD 1601 estimates that a minimum of 10 construction seasons would be required to complete the proposed project (Almaas, pers. comm., 2011, 2012a). It is expected that improvements along one to two levee reaches, each approximately 2,100 to 3,500 feet in length, could be completed each construction season. This would include construction of landside levee improvements and creation of waterside habitat in those reaches. RD 1601 proposes to begin constructing the proposed project beginning in calendar year 2015 and continuing as funding cycles allow additional construction.

Creating habitat on the waterside of the existing levee would involve excavation and grading, followed by planting and seeding activities. Construction of waterside habitat would occur following completion and stabilization of the new setback levee and toe berm in that reach. Excavation and grading of "landside" elements of the waterside habitat would be accomplished during dry conditions or by pumping out groundwater before breaching the separation wall between the modified riverbank and excavation pit. "Dry" excavation and grading would be accomplished with scrapers, dozers, hydraulic excavators, and haul trucks. The excavated material would be stockpiled onsite for use in creating features associated with the proposed habitat design or as setback levee or toe berm fill material for other phases. Stockpiles would be located on the landside of the levee within the footprint of the proposed setback levee and toe berm. Waterside excavation of the existing levee fill below MHHW would be conducted with long-arm excavators or clam-shell dredges operated from the landside, or similar equipment operated on the waterside from stationary barges anchored by spud piles in the San Joaquin River adjacent to the work area.

Planting and Seeding

Planting and seeding will commence after completion of finish grading and, where required, during placement of rock on exposed windward banks.

Seeding for erosion control and upland habitat will typically occur in November or December, after the first wetting rain. Seed of native grasses and forbs will be applied using a combination of native grass seed drills (e.g., Truax Grass Drill) on relatively flat sites (less than 3:1 slope), or by broadcast equipment on steeper and less accessible sites. All soil surface areas of riparian and upland habitats, except for Dense Willow Scrub, will be seeded one growing season before plants are installed to stabilize the soil and allow time for weed management. Proposed seed mix species are listed on Sheet L4 of Attachment A.

Tule Marsh will be planted from nursery-grown container stock or from root divisions harvested from within existing tule stands on or near Twitchell Island. Tule stock will typically be planted 4'-6' on center. Because tules must be planted within the intertidal zone, on saturated mudflats or in shallow water, it is not feasible to plant at depths greater than one feet below MLW. Potential tule marsh expansion below elevation 1.0' to a maximum depth threshold will occur naturally and gradually by vegetative colonization (i.e., extension of tule root rhizomes).

Riparian and Upland Scrub vegetation will be planted with a combination of nursery-grown container stock and live cuttings of willow and cottonwood stems from harvest sites in the project vicinity. Where thickets of willow scrub will provide important wind wave energy dissipation, cuttings will be densely planted 2'-3' on center in parallel rows. In other locations less subject to potential bank erosion, Tall Trees (large, fast-growing tree species) will be planted 15'-20' on center, and smaller trees and shrubs will be planted 5'-15' on center. Upland Scrub will include patches of unplanted (but seeded) open grassland. Sheet L4 of Attachment A lists proposed marsh, riparian and upland species to be included in the planting palette, and their associated vegetation types as labeled on the design drawing cross sections (Sheets L5-L9). Planting details are on Sheet L13, and landscape notes and specifications are on Sheet L2.

HABITAT ESTABLISHMENT AND MAINTENANCE

Maintenance activities needed to establish new habitat on the waterside of the existing levee would include plant irrigation, weed control (mowing, and herbicide application), debris removal, and corrective measures such as replanting, and reseeding. Maintenance needs would be evaluated during the

establishment efforts and may vary in timing or frequency in accordance with conditions on the ground. The intent of habitat establishment and maintenance operations would be to promote habitat that would be healthy, vigorous, and create persistent ecosystems that would thrive and reproduce without supplemental intervention after 3-5 years.

Watering operations during the establishment of plants would be supported by temporary irrigation systems connected to existing RD 1601 pumps that draw water from the San Joaquin River. Application of water would be done in a manner that is sufficient to wet the soil and saturate the root zone of installed plants without causing erosion, damage to plants, or excessive runoff. The watering regime would be designed to establish healthy and vigorous plants and would include a "weaning off" period designed so that established plants would not be irrigation-dependent.

Weed control would be conducted to reduce invasive weed establishment. Weed control would involve the use of mechanical and/or chemical techniques to support establishment of native and/or desirable installed vegetation, and reduction or suppression of non-native and/or undesirable vegetation (i.e., noxious weeds). Weeds would be controlled during the first 3-5 years so that they do not compete with installed plants or seeded native species. Created habitat areas would be mowed or wicked or sprayed with herbicide (depending on field conditions and season). These areas would be treated before broadleaf weeds and non-native grasses grow high enough to shade out native species and before non-native grass seed matures and shatters. Use of both mechanical equipment and selected systemic herbicides would be applied in accordance with required methods to protect waterways and nearby sensitive habitat. Grazing with small-hooved animals (goats and sheep) is another weed control option that could be used in upland grassland seeded areas after 2-3 years of growth by woody plants.

Debris removal would occur during weed control operations or as scheduled by RD 1601. Debris blown into or placed in the project area, such as any human-made debris would be removed. Debris removal would be performed using hand-clearing or low-impact methods and the debris would be hauled offsite in accordance with State and local regulations.

During the habitat and maintenance establishment period, the waterside-installed habitat would be monitored for any needed replacement of dead or severely stressed plants or areas requiring re-seeding Remediation seeding and planting would occur during the first 3-5 years. The health, vigor, and survivorship of all plant materials would be maintained and monitored by RD 1601. Periodic inspections would be conducted by RD 1601 to examine plant condition and seeded areas that may be under-performing. Replacement plants or seed would be obtained from the same source used for the initial installation or from similar local sources.

ATTACHMENT A

60% Design Plans & Specifications

RECLAMATION DISTRICT NO. 1601
LEVEE IMPROVEMENT & CHANNEL MARGIN HABITAT
SAN JOAQUIN RIVER PROJECT & CHEVRON POINT PROJECTS
SACRAMENTO COUNTY, CALIFORNIA

PROJECT OVERVIEW

Twitchell Island Reclamation District (RD) 1601 is approximately 35 miles south-southwest of Sacramento in the western Sacramento-San Joaquin Delta (Delta). This reclaimed island is approximately 3,500 acres and is bounded by the San Joaquin River to the south, Threemile Slough to the west, and Sevenmile Slough to the north and east. The proposed project includes the San Joaquin River reach of the Twitchell Island levee system, an approximately 5-mile stretch of levee that extends from Chevron Point (at the confluence of the San Joaquin River and Threemile Slough) to just north of the confluence of the San Joaquin River and Sevenmile Slough on the south side of the island.

The objective of the Proposed Project for the San Joaquin River reach is to create Intertidal Channel Margin Habitat, including freshwater marsh (tules), riparian and upland habitats integrated with a new setback levee projectto be constructed by RD 1601 adjacent to the land side of the existing levee. The waterside of the existing levee along the San Joaquin River will be modified to create a mosaic of three different habitat configurations (Design Options),. The constructed channel margin habitat planting area will be from setback levee Station 360+00 to Station 567+00, comprised of 20,700 linear feet and 19 acres of native trees and shrubs,17 acres of planted tule marsh, and up to 125 acres native perennial grass seeding.

The channel margin habitat project is adjacent to and east of a similar setback levee and habitat project site constructed and planted in 1999 and 2002 on 3,000 lineal feet of Twitchell Island levee along the right bank of SJR. Average tidal range at the project site is from elevation 5.4-ft (NGVD88 datum) at MHHW to elevation 2.0-ft at MLLW (source: NOAA/National Geodetic Survey's Tide Station 9415193, *'Three-Mile Slough at SJR, Chevron Point, Twitchell Island'*.)

60% Draft
February 7, 2014

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9	L9	Planting Plan Option 5 - Deep Back Bays Between Rock Hardpoints
10	L10	Typical Section - Options 1 & 2
11	L11	Typical Section - Options 3 & 4
12	L12	Typical Section - Option 5
13	L13	Planting Details

PREPARED FOR:

RECLAMATION DISTRICT 1601
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(916) ( )( )
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PREPARED BY:

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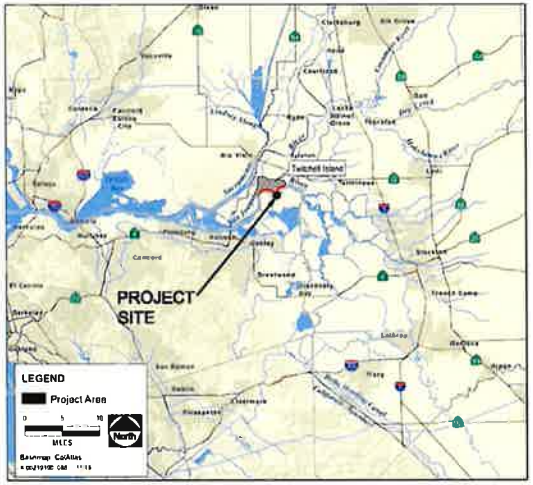
VICINITY MAP

LOCATION MAP



Accepted By:_____ Date: _____

Accepted By:_____ Date: _____

Contract Number: C####

Approved On: ##-##-#### By:

Resolution No: 2014-### Clerk of the Board

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

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CXXXX

COVER

60% DRAFT

scale:	1"=60'
job no.:	60110058.04
drawn by:	KC
checked by:	KC, SC

sheet no.: L1

sheet 1 of 13
date: 02/07/2014

LANDSCAPE SYMBOLS

GENERAL LANDSCAPE NOTES

1. ALL WORK TO BE PERFORMED BY A LICENSED CONTRACTOR AND EXPERIENCED WORKERS. THE CONTRACTOR SHALL CONFORM TO ALL FEDERAL, STATE, AND LOCAL CODES AND OBTAIN ALL PERMITS NECESSARY TO COMPLETE WORK.
2. THE CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF THE PROJECT INCLUDING SAFETY OF ALL PERSONS AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING CONSTRUCTION EQUIPMENT AND MATERIALS FROM THEFT AND VANDALISM DURING THE CONSTRUCTION PERIOD.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE PROJECT SITE TO VERIFY SITE CONDITIONS AND COMPLETELY UNDERSTAND THE REQUIRED SCOPE OF WORK SHOWN ON THESE DRAWINGS.
4. ALL AREAS OF SEEDING AND PLANTING ARE SUBJECT TO IN-FIELD DESIGN VERIFICATION AND ADJUSTMENTS AS DIRECTED BY RD1601.
5. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES BEFORE THE START OF ANY CONSTRUCTION OPERATIONS, INCLUDING AND NOT LIMITED TO EXCAVATION OR TRENCHING. THE CONTRACTOR SHALL CALL UNDERGROUND SERVICE ALERT (U.S.A.) AT 811/1-800-227-2600. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 48 HOURS ADVANCE NOTICE FOR LOCATING UTILITIES.
6. THE CONTRACTOR SHALL CONTACT RD1601 IMMEDIATELY UPON FINDING ANY FIELD CONDITIONS THAT WOULD CONFLICT WITH THE INFORMATION INDICATED ON THESE DRAWINGS OR THE PROJECT SPECIFICATIONS. ALL FIELD ADJUSTMENTS MUST BE APPROVED BY RD1601 BEFORE CONSTRUCTION OF SAID ADJUSTMENTS; FAILURE TO DO SO SHALL RESULT IN THE CONTRACTOR ASSUMING FULL RESPONSIBILITY FOR ANY REQUIRED REVISIONS OR FIELD MODIFICATIONS, AS DIRECTED BY RD1601, AT NO ADDITIONAL COST.
7. ALL STORAGE AND EQUIPMENT OF MATERIALS SHALL OCCUR WITHIN THE STAGING AREA AS PRESCRIBED ON THESE DRAWINGS AND AS DIRECTED BY RD1601. ALL LUBRICATION, REFUELING OR MAINTENANCE OF CONSTRUCTION VEHICLES SHALL BE CONDUCTED WITHIN APPROVED CONSTRUCTION STAGING AREAS.
8. TEMPORARY FENCING SHALL BE INSTALLED AND MAINTAINED BY THE CONTRACTOR AROUND THE PERIMETER OF THE PROJECT AREA AND OTHER LOCATIONS DEEMED NECESSARY BY THE CONTRACTOR. NO WORK OUTSIDE OF THE DESIGNATED WORK AREA WILL BE PERMITTED WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER.
9. CONFORM TO EXISTING GRADES AND CONDITIONS WHENEVER POSSIBLE. ANY ADJACENT OR OFFSITE AREAS DISTURBED BY THE CONTRACTOR'S OPERATION MUST BE RESTORED BY THE CONTRACTOR TO THE PREDISTURBANCE CONDITION TO THE SATISFACTION OF RD1601.
10. IF ARTIFACTS, FOREIGN OBJECTS, BONE, OR UNKNOWN MATERIALS ARE ENCOUNTERED WHILE DIGGING OR EXCAVATING ON SITE, THE CONTRACTOR SHALL SUSPEND WORK WITHIN 50 FEET OF THE LOCATION UNTIL A QUALIFIED ARCHAEOLOGIST IS ABLE TO ASSESS THE SITE AND FINDINGS TO DETERMINE SIGNIFICANCE.
11. THE CONTRACTOR IS RESPONSIBLE FOR SOIL EROSION CONTROL MEASURES THAT MAY BE REQUIRED THROUGH THE DURATION OF THE CONTRACT PERIOD. SHOULD SOIL EROSION CONDITIONS EXIST WHEN THE CONTRACTOR INITIALLY ACCEPTS THE SITE, THE CONTRACTING OFFICER SHALL BE CONTACTED. FAILURE OF THE CONTRACTOR TO NOTIFY THE CONTRACTING OFFICER IMPLIES ACCEPTANCE OF THE SITE BY THE CONTRACTOR IN ITS EXISTING CONDITION. ALL COSTS NECESSARY TO MITIGATE EXISTING EROSION CONTROL PROBLEMS SHALL BE AT THE CONTRACTOR'S EXPENSE AND AT NO ADDITIONAL COST TO THE OWNER OR INCREASE IN ORIGINAL BID PRICE SHALL BE PERMITTED.
12. THE PROJECT SITE IS LOCATED WITHIN THE SAN JOAQUIN RIVER FLOODPLAIN AND, THEREFORE, SUBJECT TO INUNDATION. THE CONTRACTOR IS HEREBY NOTICED TO KEEP APPRISED OF LOCAL WEATHER AND RIVER FLOW CONDITIONS TO ENSURE PEOPLE, EQUIPMENT, AND SUPPLIES ARE MOVED TO HIGHER GROUND IN CASE OF A FLOOD EVENT.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE PROJECT SITE IN A NEAT AND ORDERLY CONDITION, FREE OF RUBBISH AND DEBRIS, AT ALL TIMES; REFER TO THE PROJECT SPECIFICATIONS FOR ADDITIONAL SITE CLEANUP REQUIREMENTS.
14. AT ANY TIME, THE CONTRACTOR'S OPERATIONS AND CONSTRUCTION SHALL BE SUBJECT TO OBSERVATION BY RD1601.
15. ALL WRITTEN DIMENSION SUPERCEDE SCALED DIMENSIONS.
16. REFER TO THESE PROJECT NOTES AND THE DETAILS ON THE DRAWINGS FOR ADDITIONAL INFORMATION.

CONSTRUCTION ACCESS

1. ALL HAUL AND ACCESS ROUTES SHALL BE EXISTING ROADS AS DIRECTED FOR SUCH USE BY RD1601. MOVEMENT OF HEAVY EQUIPMENT TO AND FROM THE PROJECT SITE SHALL BE RESTRICTED TO ESTABLISHED ROADWAYS. THE CONTRACTOR'S CONSTRUCTION ACCESS POINTS SHALL BE LIMITED TO THOSE SHOWN ON THE DRAWINGS OR DEFINED IN THE SPECIFICATIONS, AS DIRECTED IN THE FIELD BY RD1601. PAVED AREAS AT THESE CONTROLLED ACCESS POINTS SHALL BE SWEPT, AS NECESSARY, BY THE CONTRACTOR TO CONTROL DUST AND CLEANUP MATERIAL TRACKED OR SPILLED ON SAID PAVED AREAS. THE CONTRACTOR SHALL CONFORM TO ALL GOVERNING CODES, LAWS AND ORDINANCES.
2. EXCEPT AS SPECIFIED HEREIN, OR AS SHOWN ON THE DRAWINGS, EXISTING STRUCTURES OR OTHER IMPROVEMENTS IN THE AREA ADJACENT TO THE WORK AREA SHALL NOT BE DISTURBED, DAMAGED, OR UNDERMINED BY THE CONTRACTOR, EXCEPT WHERE IN THE OPINION OF RD1601 IT IS ESSENTIAL TO RELOCATE SUCH IMPROVEMENTS. IF RELOCATION OF ANY FACILITY IS REQUIRED, THE CONTRACTOR SHALL RELOCATE THE IMPROVEMENTS SO AS TO BE AT LEAST EQUAL IN CONDITION AND UTILITY TO THE ORIGINAL. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT ANY DAMAGE TO EXISTING FACILITIES. SHOULD DAMAGE OR INJURY OCCUR AS A RESULT OF THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR SHALL REPAIR OR REPLACE SUCH DAMAGED FACILITIES TO RD1601'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.
3. THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED TO EXISTING INFRASTRUCTURE, IRRIGATION OR PUMPING FACILITIES, STORM DRAIN PIPES, PAVEMENT, PUBLIC STREETS, OR OTHER UTILITIES AND IMPROVEMENTS RESULTING FROM THE CONTRACTOR'S OPERATIONS.
4. SEE THE GENERAL LANDSCAPE NOTES AND SHEET L3 FOR ADDITIONAL INFORMATION.

PRESERVATION FENCING

1. AT NO TIME SHALL CONSTRUCTION OPERATIONS, VEHICLE OR EQUIPMENT PARKING, PLACEMENT OF STRUCTURES, OR ANY OTHER ACTIVITY OCCUR WITHIN AREAS TO BE PRESERVED OR CONTAINED BY PRESERVATION FENCING UNLESS OTHERWISE NOTED ON THE DRAWINGS AND AS DIRECTED AND OR APPROVED BY RD1601. ALL AREAS SHOWN ON THE DRAWINGS AS PRESERVATION AREAS SHALL HAVE RESTRICTED ACCESS AND SHALL BE PROTECTED WITH PRESERVATION FENCING ACCORDING TO THE RD 1601 STANDARD SPECIFICATIONS. WITHIN THE PROJECT AREAS TO BE PRESERVED, NO EXCAVATIONS SHALL BE MADE, NO MATERIALS OR EQUIPMENT SHALL BE STORED, AND NO HEAVY EQUIPMENT OR VEHICLES SHALL BE OPERATED OR PARKED.

BEAVER DETERRENT METHODS

1. RIPARIAN PLANTINGS WILL REQUIRE PROTECTION TO LIMIT BEAVER DAMAGE. THE CONTRACTOR WILL INSTALL A LOW FENCELINE 3' HIGH ALONG THE TOP OF BANK ON THE RIVERSIDE OF PLANTED AREAS.
2. THE FENCE SHALL BE INSTALLED THE ENTIRE LENGTH OF THE PROJECT SITE, EXCEPT AT IDENTIFIED EXISTING TWITCHELL ISLAND FERRY ROAD.
3. PLACE FENCE DIRECTLY ON SOIL, NOT KEYED.
4. SECURE FENCE TO POST AT TOP, BOTTOM, AND THIRD POINTS (4 PLACES TOTAL) WITH REBAR TIE-WIRE.
5. FENCE WILL BE WELDED WIRE (STEEL) FILED FENCE 14 GAUGE WIRE WITH 2"X2" MESH OPENINGS.
6. POST WILL BE #4 REBAR WITH THE END BENT AND WELDED AS AN "EYE" (LOOP) SPOT WELDED CLOSE.
7. FENCE WILL HAVE HINGED OPENING EVERY 200' FOR MAINTENANCE.

IRRIGATION NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUBMITTAL OF A TEMPORARY IRRIGATION DESIGN. THE SUBMITTAL MUST BE APPROVED BY RD1601 FOR INSTALLATION PRIOR TO INSTALLATION. A COMPLETE AND FULLY OPERATIONAL IRRIGATION SYSTEM WILL BE USE TO SUPPORT MEETING THE PERFORMANCE STANDARDS FOR PLANT SURVIVORSHIP AS DETERMINED BY RD 1601.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARITY WITH EXISTING AND PROPOSED GRADE CONDITIONS, FENCE LOCATIONS, AND EXISTING VEGETATION TO BE PRESERVED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF SITE CONDITIONS AND RD 1601 REQUIREMENTS BEFORE LAYOUT OF IRRIGATION SYSTEM.
3. THE CONTRACTOR SHALL COORDINATE THEIR OPERATIONS WITH OTHER CONTRACTORS FOR THE PLACEMENT OF PIPING AND OTHER IRRIGATION EQUIPMENT, WHEN REQUIRED. ADDITIONALLY, THE CONTRACTOR SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES AND OTHER CONTRACTORS ON OR ADJACENT TO THE PROJECT SITE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE PLACEMENT OF IRRIGATION EQUIPMENT AND MATERIALS WITH INDIVIDUAL PLANT LOCATIONS AND EXISTING SITE CONDITIONS.
5. THE ESTABLISHMENT OF PLANTS WILL BE SUPPORTED BY TEMPORARY IRRIGATION SYSTEMS CONNECTED TO EXISTING RD1601 PUMPS OR FROM RD1601 APPROVED WATER SOURCES. MAIN LINE AS DESCRIBED HEREIN IRRIGATION AND WATERING APPLICATIONS SHALL BE CONDUCTED TO ESTABLISH HEALTHY AND VIGOROUS PLANTS THAT ARE NOT IRRIGATION-DEPENDENT AT THE END OF THE MAINTENANCE PERIOD. WATER SHALL BE APPLIED IN A WAY THAT WILL ALLOW FOR THE "WEANING OFF" OF PLANTS.
6. BEFORE THE INSTALLATION OF THE IRRIGATION SYSTEMS OR WHEN IRRIGATION SYSTEMS ARE NOT OPERATIONAL, SUCH AS IN DRY WINTER PERIODS AFTER INSTALLATION OF THE IRRIGATION SYSTEMS, AND WHEN DIRECTED BY RD 1601, THE CONTRACTOR SHALL BE RESPONSIBLE FOR WATERING INSTALLED PLANTS USING HAND WATERING TECHNIQUES. HAND WATERING SHALL OCCUR FOR REPLANTS OR LATE-PLANTED PLANTS OR CERTAIN SPECIES OR INDIVIDUAL PLANTS THAT REQUIRE IRRIGATION AFTER MOST OTHER PLANTS ARE WEANED. HAND WATERING SHALL CONSIST OF THE APPLICATION OF WATER IN A MANNER THAT IS SUFFICIENT TO WET THE SOIL AND SATURATE THE ROOT ZONE AS PRESCRIBED ABOVE, WITHOUT DAMAGING THE PLANT, THE SURROUNDING GRADE, OR THE PLANTING BERM. WATER PRESSURE SHALL BE REGULATED TO A LEVEL THAT APPLIES SUFFICIENT WATER WITHOUT CAUSING DAMAGE TO PLANTS OR EROSION TO THE PLANT BERM. SHOULD WATERING BE REQUIRED IN DRY WINTER PERIODS, IT SHALL BE CONDUCTED AS DIRECTED BY RD 1601 AS PART OF THE MAINTENANCE PERIOD
7. THE CONTRACTOR SHALL OPERATE THE IRRIGATION SYSTEM FOR TEST APPROVAL BY RD 1601. THE CONTRACTOR SHALL NOTIFY RD 1601 48 HOURS IN ADVANCE OF TESTING. THE IRRIGATION SYSTEM SHALL BE FULLY OPERATIONAL AT THE TIME OF PLANTING AND BEFORE THE START OF THE MAINTENANCE PERIOD. THE CONTRACTOR SHALL PERFORM TESTS AS SPECIFIED AND REPAIR ALL FAULTY JOINTS OR SYSTEM PROBLEMS. THE CONTRACTOR SHALL PROVIDE A FORCE PUMP AND ALL OTHER REQUIRED TEST EQUIPMENT. USE OF CEMENT OR CAULKING TO SEAL LEAKS WILL NOT BE PERMITTED AT ANY TIME. BEFORE TESTING, THE LINES SHALL BE FLUSHED TO REMOVE DIRT AND OTHER DEBRIS THAT MAY HAVE ACCUMULATED IN THE PIPE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE IRRIGATION SYSTEM AND PREPARING AS-BUILT DRAWINGS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF IRRIGATION SYSTEM FROM THEFT AND VANDALISM, FROM DAMAGE BY WILDLIFE, AND PROMPT REPLACEMENT OF DAMAGED OR MISSING PARTS AND EQUIPMENT.
10. THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS TO MEET DESIGN INTENT PRIOR TO SYSTEM INSTALLATION.
11. SEE THE GENERAL LANDSCAPE NOTES FOR ADDITIONAL INFORMATION.

PLANTING NOTES

1. PLANT QUANTITIES SHOWN IN THE PROJECT PLANT LEGEND AND PLANTING PLAN CALLOUTS ARE FOR INFORMATION ONLY. THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS AND PROVIDE THE ACTUAL PLANT QUANTITIES NEEDED TO IMPLEMENT THE PLANTING SCHEME AS SHOWN IN THESE DRAWING AND THE PROJECT SPECIFICATIONS.
2. TULE MARSH WILL BE PLANTED FROM NURSERY-GROWN CONTAINER STOCK OR FROM ROOT DIVISIONS HARVESTED FROM WITHIN EXISTING TULE STANDS ON OR NEAR TWITCHELL ISLAND IN ONE GALLON CONTAINERS.
3. ONCE TULE STOCK HAS ESTABLISHED TO RD 1601 APPROVAL: ONE GALLON CONTAINERS OF SCIRPUS ACUTUS AND SCIRPUS CALIFORNICUS SHALL BE DIVIDED INTO THREE EQUAL PARTS WITH USE OF A STRAIGHT DUAL EDGED SHOVEL OR EQUAL AND AS APPROVED BY THE RD1601 BEFORE INSTALLED. THEN INSTALLED IN LOCATIONS AS SHOWN ON THE DRAWINGS
4. PLANTS AND SEEDED AREAS SHALL BE LOCATED BY THE CONTRACTOR ACCORDING TO THE LAYOUT SHOWN ON THE DRAWINGS. PLANTS SHALL BE PLACED IN A RANDOM DISTRIBUTION TO MIMIC A NATURAL LAYOUT; REFER TO SHEET L13 FOR PLANT LAYOUT DETAILS.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING POSITIVE DRAINAGE IN ALL PLANTING AREAS AND AT INDIVIDUAL PLANT LOCATIONS. THE CONTRACTOR SHALL RECEIVE APPROVAL FOR ALL METHODS TO BE USED TO CORRECT DRAINAGE PROBLEMS BEFORE IMPLEMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A 2% MINIMUM CROSS-SLOPE AROUND EACH PLANT TO ENSURE POSITIVE DRAINAGE.
6. PLANTING AND SEEDING WILL COMMENCE AFTER COMPLETION OF FINISH GRADING AND, WHERE REQUIRED, DURING PLACEMENT OF ROCK ON EXPOSED WINDWARD BANKS.
7. SEED OF NATIVE GRASSES WILL BE APPLIED USING A COMBINATION OF NATIVE GRASS SEED DRILLS (E.G., TRIJAX GRASS DRILL) ON RELATIVELY FLAT SITES (LESS THAN 3:1 SLOPE), OR BY BROADCAST EQUIPMENT ON STEEPER AND LESS ACCESSIBLE SITES.
8. ALL SOIL SURFACE AREAS OF RIPARIAN AND UPLAND HABITATS, EXCEPT FOR DENSE WILLOW SCRUB, WILL BE SEEDED ONE GROWING SEASON BEFORE PLANTS ARE INSTALLED TO STABILIZE THE SOIL AND ALLOW TIME FOR WEED MANAGEMENT.

MAINTENANCE NOTES

1. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS DURING THE MAINTENANCE PERIOD WHICH SHALL BEGIN UPON THE ACCEPTANCE OF THE CONTRACTOR'S INSTALLATION OPERATIONS. REPAIRS DUE TO NATURAL DISASTERS, SUCH AS SEVERE FLOODING, SHALL NOT BE A MAINTENANCE RESPONSIBILITY OF THE CONTRACTOR. ALL MAINTENANCE ACTIVITIES SHALL BE COORDINATED WITH RD1601. THE MAINTENANCE OPERATIONS SHALL INCLUDE, BUT NOT BE LIMITED TO
   - MAINTAINING PLANTING SITES AND IRRIGATION SYSTEMS (IF REQUIRED), AND CONDUCTING WEED CONTROL, WATERING, AND DEBRIS REMOVAL FOR THE DURATION OF THE CONTRACT PERIOD;
   - REPLACING ALL DEAD OR SEVERELY STRESSED PLANTS AND OTHER MATERIALS, AS REQUIRED;
   - MAINTAINING ALL WATERING BASINS TO BE WEED FREE AND REMOVING ALL NOXIOUS WEEDS AND ALL OTHER UNDESIRED, NON-NATIVE PLANTS FROM PROJECT SITE AS DIRECTED BY RD1601;
   - OPERATING THE IRRIGATION SYSTEM ON A REGULAR BASIS THROUGHOUT THE IRRIGATION SEASON AND MAINTAINING THE IRRIGATION SYSTEM IN A FULLY OPERATIONAL CONDITION FOR THE DURATION OF THE MAINTENANCE PERIOD, AND UP TO THE FINAL ACCEPTANCE OF THE PROJECT; AND
   - KEEPING UP-TO-DATE "AS-BUILT" DRAWINGS DURING THE MAINTENANCE PERIOD.
2. SEE THE GENERAL NOTES AND THESE DRAWINGS FOR ADDITIONAL INFORMATION

ABBREVIATIONS

(E)	EXISTING
(N)	NEW
&	AND
A	
AB	AGGREGATE BASE
ADJ	ADJACENT
AGGR.	AGGREGATE
APPROX.	APPROXIMATE
ARCH.	ARCHITECT
ASPH.	ASPHALT
AVG	AVERAGE
B	
BITUM.	BITUMINOUS
BLDG.	BUILDING
BOT.	BOTTOM
C	
CJ.	CONTROL JOINT
CLR.	CLEAR(ANCE)
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONARY UNIT
CONC.	CONCRETE
CONSTR.	CONSTRUCTION
CONTR.	CONTRACTOR
CONT.	CONTINUE
COT	COTTONWOOD
CRK.	COUNTER SUNK
CTR.	CENTER
D	
(D)	DECIDUOUS
DBL.	DOUBLE
DEPT.	DEPARTMENT
DF.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIAG.	DIAGONOL
DIM.	DIMENSION
DIP	DUCTILE IRON PIPE
DN.	DOWN
DET.	DETAIL
DWG.	DRAWING
E	
E.	EAST
EA.	EACH
EJ.	EXPANSION JOINT
EL.	ELEVATION
ELEC.	ELECTRIC
ELEV.	ELEVATION
ENCL.	ENCLOSURE
EQ.	EQUAL
EQUIP.	EQUIPMENT
EW	EACH WAY
EX	EXISTING
EXT.	EXTERIOR
F	
FIN.	FINISH
F.C.B.	FACE OF BLOCK
FOC.	FACE OF CONCRETE
FOF.	FACE OF FINISH
FOC.	FACE OF CURB
FOM.	FACE OF MASONRY
FOS.	FACE OF STUD
FOW.	FACE OF WALL
FT.	FOOT OR FEET
FTG.	FOOTING
FWM.	FRESH WATER MARSH
G	
GA.	GAUGE
GALV.	GALVANIZED
G.	GROUND
GPM.	GALLONS PER MINUTE
GRD.	GRADE
H	
HB.	HOSE BIB
HP.	HORSE POWER
HT.	HEIGHT
H/ HORIZ.	HORIZONTAL
HR.	HOUR
I	
ID.	INSIDE DIAMETER (DIM)
IE	INVERT ELEVATION
INT.	INTERIOR
INV	INVERT
IWM	INSTREAM WOODY MATERIAL
J	
JT.	JOINT
L	
LB.	POUND
L.O.W.	LIMIT OF WORK
M	
MAX.	MAXIMUM
MED.	MEDIUM
MFR.	MANUFACTURER
MIN.	MINIMUM
MISC.	MISCELLANEOUS
N	
N.	NORTH
NCMWC.	NATOMAS CENTRAL MUTUAL WATER COMPANY
NIC.	NOT IN CONTRACT
NO.	NUMBER
NOM.	NOMINAL
NPDES.	NATIONAL POLLUTION DISCHARGE EMINATION SYSTEM
NTS	NOT TO SCALE
O	
OC.	ON CENTER
OD.	OUTSIDE DIAMETER (DIM.)
P	
PT.	POINT
PVC.	POLYVINYL CHLORIDE
Q	
QT.	QUART
R	
R.	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF.	REFERENCE
REINF.	REINFORCE
REQ.	REQUIRE
RWD.	REDWOOD
RIP.	ROCK SLOPE PROTECTION
S	
S.	SOUTH
SCH	SCHEDULE
SECT.	SECTION
SF	SQUARE FEET
SH.	SHEET
SIF.	SIMILAR
SQ.	SQUARE
SST.	STAINLESS STEEL
STD.	STANDARD
STL.	STEEL
STRUCT.	STRUCTURAL
SW	SEASONAL WETLAND
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
SYMM	SYMMETRICAL
T	
TO	TOP OF
THK.	THICK(NESS)
TS.	TUBE STEEL
TYP.	TYPICAL
U	
UNFIN.	UNFINISH
UNK	UNKNOWN
UNO.	UNLESS NOTED OTHERWISE
V	
VRFY.	VERIFY
V / VERT.	VERTICAL
W	
W.	WEST OR WIDE
W	WITH
WSEL.	WATER SURFACE ELEVATION
WWF.	WELDED WIRE FABRIC

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

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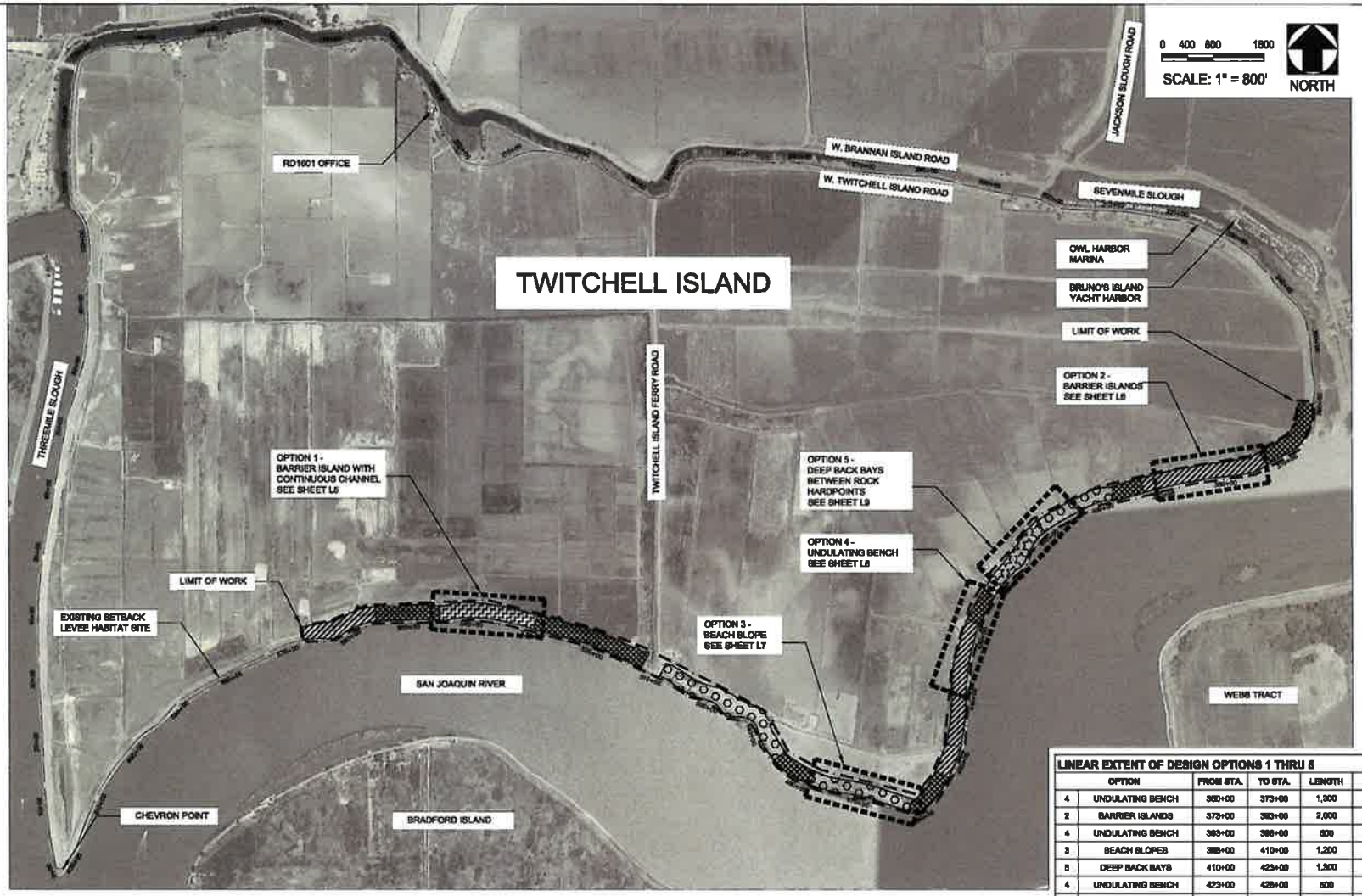
NOTES AND SYMBOLS

60% DRAFT

scale: 1"=50'
job no.: 08110058.04
drawn by: KC
checked by: KC, SC

sheet no.: L2

sheet 2 of 13
date: 02/07/2014



LEVEE OPTIONS LEGEND		
SYMBOL	DESIGN OPTION	TOTAL BANK LENGTH
	OPTION 1 - BARRIER ISLANDS WITH CONTINUOUS CHANNEL	1,500 LF
	OPTION 2 - BARRIER ISLANDS	5,700 LF
	OPTION 3 - BEACH SLOPE	5,180 LF
	OPTION 4 - UNDULATING BENCH	6,700 LF
	OPTION 5 - DEEP BACK BAYS BETWEEN HARD POINTS	1,300 LF
	TOTAL	20,380 LF

NOTES:
1. DATE OF AERIAL MAP IS 2010 AND MAY NOT REFLECT THE MOST CURRENT SITE CONDITIONS..
2. SEE SHEETS L5 - L8 FOR PLANTING SHEETS.
3. INGRESS/EGRESS ROUTES TO BE DETERMINED.
4. THE TOTAL ACRES ARE BASED ON AVERAGE HABITAT DESIGN WIDTH OF 100'; ACTUAL WIDTHS VARIES WITH SITE CONDITIONS.

LINEAR EXTENT OF DESIGN OPTIONS 1 THRU 5					
	OPTION	FROM STA.	TO STA.	LENGTH	ACRES
4	UNDULATING BENCH	360+00	373+00	1,300	2.98
2	BARRIER ISLANDS	373+00	393+00	2,000	4.59
4	UNDULATING BENCH	393+00	399+00	600	1.14
3	BEACH SLOPES	399+00	419+00	1,200	2.75
5	DEEP BACK BAYS	419+00	423+00	1,300	2.98
4	UNDULATING BENCH	423+00	428+00	500	1.14
2	BARRIER ISLANDS	428+00	453+00	2,500	5.73
4	UNDULATING BENCH	453+00	462+00	900	2.06
3	BEACH SLOPES	462+00	478+00	1,600	3.67
4	UNDULATING BENCH	478+00	485+00	700	1.60
3	BEACH SLOPES	485+00	508+80	2,380	5.46
-	PUMP OUTFALL	508+80	512+00	-	-
4	UNDULATING BENCH	512+00	530+00	1,800	4.13
1	BARRIER ISLANDS WITH CONTINUOUS CHANNEL	530+00	545+00	1,500	3.44
4	UNDULATING BENCH	545+00	555+00	1,000	2.29
2	BARRIER ISLANDS	555+00	567+00	1,200	2.75

RD1601
LEVEE IMPROVEMENT &
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KEY MAP

60% DRAFT

scale: 1"=800'
job no.: 60110056.04
drawn by: SR
checked by: KC, SC

sheet no.: L3

sheet 3 of 13
date: 02/07/2014

PLANTING SYMBOL	HABITAT TYPE	PLANT INSTALLATION DETAILS	KEY	PLANTS			QUANTITIES		PLANT SPACING
				BOTANICAL NAME	COMMON NAME	PLANT SIZE	# TOTAL PLANTS	% TOTAL AREA	
	MIXED RIPARIAN	1 L13, 2 L13	AC NE	ACER NEGUNDO	BOX ELDER	TREEPOT4	121	10%	12.5' O.C. THROUGHOUT
			AL RH	ALNUS RHOMBIFOLIA	WHITE ALDER	TREEPOT4	60	5%	12.5' O.C. THROUGHOUT
			FR LA	FRAXINUS LATIFOLIA	OREGON ASH	TREEPOT4	121	10%	12.5' O.C. THROUGHOUT
			PL RA	PLATANUS RACEMOSA	CALIFORNIA SYCAMORE	TREEPOT4	60	5%	12.5' O.C. THROUGHOUT
			PO FR	POPULUS FREMONTII	FREMONT COTTONWOOD	TREEPOT4	341	30%	12.5' O.C. THROUGHOUT
			QU LO	QUERCUS LOBATA	VALLEY OAK	TREEPOT4	121	10%	12.5' O.C. THROUGHOUT
			RH CA	RHAMNUS CALIFORNICA TOMENTELLA	COFFEEBERRY	TREEPOT4	36	3%	12.5' O.C. THROUGHOUT
			RO CA	ROSA CALIFORNICA	CALIFORNIA WILD ROSE	TREEPOT4	24	2%	12.5' O.C. THROUGHOUT
			SA GO	SALIX GOODDINGII	GOODING'S BLACK WILLOW	TREEPOT4	121	10%	12.5 O.C. THROUGHOUT
			SA LAE	SALIX LAEVIGATA	RED WILLOW	TREEPOT4	121	10%	12.5' O.C. THROUGHOUT
			SA LAS	SALIX LASIOLEPIS	ARROYO WILLOW	TREEPOT4	121	10%	12.5' O.C. THROUGHOUT
			SA ME	SAMBUCUS MEDICANA	ELDERBERRY	TREEPOT4	36	3%	12.5' O.C. THROUGHOUT
			VI CA	VITIS CALIFORNICA	WILD GRAPE	TREEPOT4	24	2%	12.5' O.C. THROUGHOUT
						TOTALS:	1,207		
	DENSE WILLOW SCRUB	1 L13, 2 L13, 3 L13, 4 L13	AL RH	ALNUS RHOMBIFOLIA	WHITE ALDER	TREEPOT4	143	20%	12.5' O.C. THROUGHOUT
			CE OC	CEPHALANTHUS OCCIDENTALIS	BUTTON BUSH	TREEPOT4	214	30%	12.5' O.C. THROUGHOUT
			SA EX	SALIX EXIGUA	NARROW-LEAVED WILLOW	CUTTINGS/TREEPOT4	1,785	10%	2.5' O.C. THROUGHOUT
			SA LAE	SALIX LAEVIGATA	RED WILLOW	CUTTINGS/TREEPOT4	2,678	15%	2.5' O.C. THROUGHOUT
			SA LAS	SALIX LASIOLEPIS	ARROYO WILLOW	CUTTINGS/TREEPOT4	2,678	15%	2.5' O.C. THROUGHOUT
			SA LUC	SALIX LUCIDA SPP. LASIANDRA	PACIFIC WILLOW	CUTTINGS/TREEPOT4	1,785	10%	2.5' O.C. THROUGHOUT
						TOTALS:	9,283		
	ALDER WILLOW SCRUB	1 L13, 2 L13, 3 L13, 4 L13	AC NE	ACER NEGUNDO	BOX ELDER	TREEPOT4	69	10%	12.5' O.C. THROUGHOUT
			AL RH	ALNUS RHOMBIFOLIA	WHITE ALDER	TREEPOT4	138	20%	12.5' O.C. THROUGHOUT
			CE OC	CEPHALANTHUS OCCIDENTALIS	BUTTON BUSH	TREEPOT4	69	10%	12.5' O.C. THROUGHOUT
			FR LA	FRAXINUS LATIFOLIA	OREGON ASH	TREEPOT4	35	5%	12.5' O.C. THROUGHOUT
			PO FR	POPULUS FREMONTII	FREMONT COTTONWOOD	TREEPOT4	35	5%	12.5' O.C. THROUGHOUT
			RO CA	ROSA CALIFORNICA	CALIFORNIA WILD ROSE	TREEPOT4	35	5%	12.5' O.C. THROUGHOUT
			SA EX	SALIX EXIGUA	NARROW-LEAVED WILLOW	CUTTINGS/TREEPOT4	104	15%	12.5' O.C. THROUGHOUT
			SA LAE	SALIX LAEVIGATA	RED WILLOW	CUTTINGS/TREEPOT4	104	15%	12.5' O.C. THROUGHOUT
			SA LAS	SALIX LASIOLEPIS	ARROYO WILLOW	CUTTINGS/TREEPOT4	104	15%	12.5' O.C. THROUGHOUT
						TOTALS:	693		
	UPLAND SCRUB	1 L13, 2 L13	AC NE	ACER NEGUNDO	BOX ELDER	TREEPOT4	141	15%	20' O.C. THROUGHOUT
			AE CU	AESCULUS CALIFORNICA	CALIFORNIA BUCKEYE	TREEPOT4	141	15%	20' O.C. THROUGHOUT
			AR DO	ARTEMISIA DOUGLASIANA	MUGWORT	TREE BAND	141	15%	20' O.C. THROUGHOUT
			BA SA	BACCHARIS SALICIFOLIA	MULEFAT	TREEPOT4	188	20%	20' O.C. THROUGHOUT
			QU LO	QUERCUS LOBATA	VALLEY OAK	TREEPOT4	141	15%	20' O.C. THROUGHOUT
			RH CA	RHAMNUS CALIFORNICA TOMENTELLA	COFFEEBERRY	TREEPOT4	188	20%	20' O.C. THROUGHOUT
						TOTALS:	940		
	TALL TREES (RIPARIAN)	1 L13, 2 L13	CA BA	CAREX BARBARAE	SANTA BARBARA SEDGE	TREE BAND	12 (Set)	5%	IN CLUSTERS OF 3 AROUND SELECTED TALL TREES
						TOTALS:	12		
			PL RA	PLATANUS RACEMOSA	CALIFORNIA SYCAMORE	TREEPOT4	18	20%	20' O.C. THROUGHOUT
			PO FR	POPULUS FREMONTII	FREMONT COTTONWOOD	TREEPOT4	31	35%	20' O.C. THROUGHOUT
			QU LO	QUERCUS LOBATA	VALLEY OAK	TREEPOT4	13	15%	20' O.C. THROUGHOUT
			SA GO	SALIX GOODDINGII	GOODING'S BLACK WILLOW	TREEPOT4	26	30%	20' O.C. THROUGHOUT
						TOTALS:	88		
	TULE MARSH	5 L13	SC AC	SCIRPUS ACUTUS	COMMON TULE	CONTAINER	14,841	50%	5' O.C. WITH ALTERNATING ROWS
			SC CA	SCIRPUS CALIFORNICUS	CALIFORNIA BULRUSH	CONTAINER	14,841	50%	5' O.C. WITH ALTERNATING ROWS
						TOTALS:	29,682		

PLANTING SYMBOL	HABITAT TYPE	SEED MIX FOR HABITAT AREA		APPLICATION RATE (PLS* LBS/AC)
		BOTANICAL NAME	COMMON NAME	
	NATIVE GRASS SEED MIX	ELYMUS GLAUCUS	BLUE WILDRYE	3.0
		ELYMUS TRACHYCAULUS	SLENDER WHEATGRASS	3.0
		HORDEUM BRACHYANTHERUM SPP.	MEADOW BARLEY	3.0
		LEYMUS TRITICOIDES	CREEPING WILD RYE	4.0
		MELICA CALIFORNICA	CALIFORNIA MELIC	1.0
		NASSELLA PULCHRA	PURPLE NEEDLEGRASS	7.0
		POA SECUNDA SPP SECUNDA	PINE BLUEGRASS	1.0
			TOTALS:	22.0

NOTES:

- PLS = PURE LIVE SEED WHICH IS THE PERCENT OF VIABLE SEED GERMINATION IN A BULK POUND OF SEED. CERTIFIED PLS RATINGS ARE PROVIDED BY THE SEED SUPPLIER OR SEED GROWER.

1. SEED MIXES SHALL BE INSTALLED IN AREAS AS SHOWN ON DRAWINGS AND AS DIRECTED BY RD1601.

NOTES:

1. SEE SHEET L3 FOR PROJECT AREA LOCATION.
2. SEE SHEET L5 TO L9 FOR PLANTING LAYOUT.
3. NO ELDERBERRY CONTAINER PLANTS WILL BE INSTALLED WITHIN THE LAST 150 FEET FROM THE TERMINATING EDGE OF ANY LEVEE HABITAT OPTIONS.
4. TOTAL AREA QUANTITIES ARE SHOWN ON SHEET L3.
5. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
6. SEE SHEET L-2 FOR GENERAL NOTES.

RD1601
LEVEE IMPROVEMENT &
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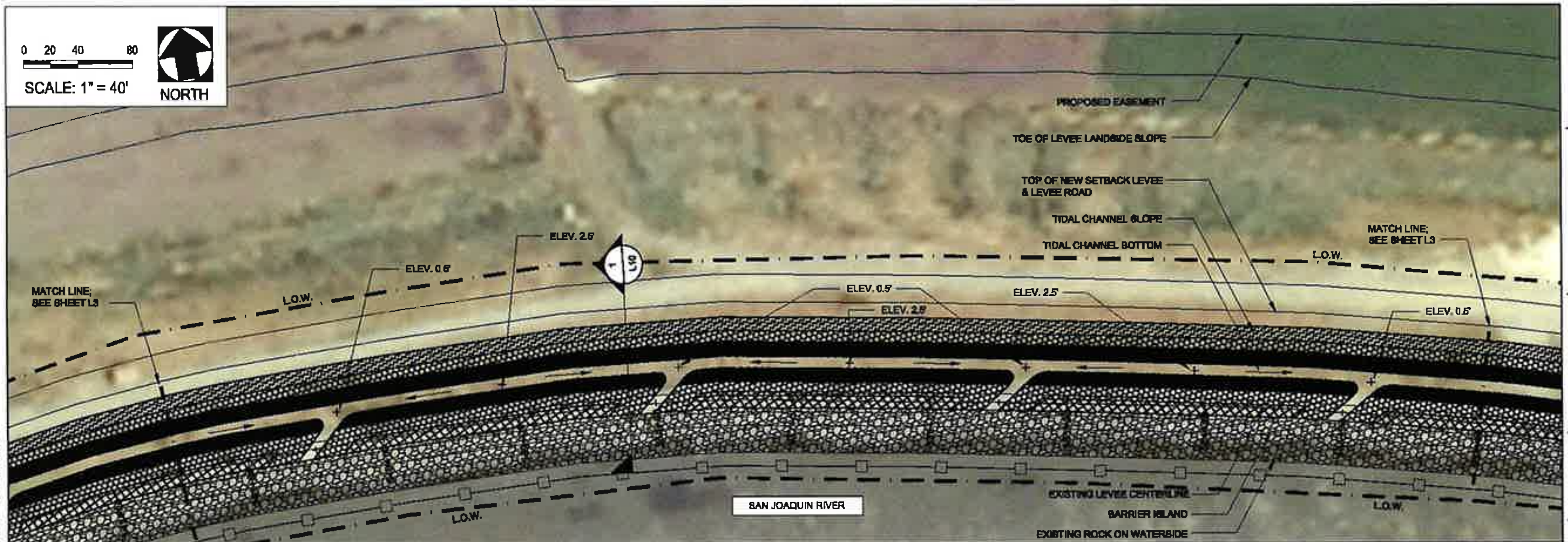
PLANT LEGEND

60% DRAFT

scale: 1"=50'
job no.: 60110058.04
drawn by: KC
checked by: KC, SC

sheet no.: L4

sheet 4 of 13
date: 02/07/2014



LEGEND

(dashed line symbol)	L.O.W.
000	STATION NUMBER
(section symbol 1/L10)	TYPICAL CROSS-SECTION (SEE SHEETS L10, L11 & L12)
(hatch)	TALL TREES
(hatch)	ALDER & WILLOW SCRUB
(hatch)	UPLAND SCRUB
(solid)	TULE MARSH
(pattern)	ROCK SLOPE PROTECTION
(line symbol)	SHALLOW SHORELINE (AVERAGE 10' WIDTH AND LESS THAN 3'-5' BELOW MLLW)

NOTES:

1. THIS DRAWING IS DIAGRAMMATIC AND SHOULD BE USED AS A GRAPHICAL REPRESENTATION.
2. SEE SHEET L2 FOR PLANTING NOTES.
3. SEE SHEET L3 FOR PROJECT AREA LOCATION.
4. SEE SHEET L4 FOR PLANTING LEGEND AND QUANTITIES.
5. SEE SHEET L10 FOR TYPICAL CROSS SECTION OF OPTION 1.
6. DATE OF AERIAL MAP IS 2010 & DOES NOT REFLECT THE MOST CURRENT SITE CONDITIONS.
7. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
8. NO RIPPING OR DISCING IN SENSITIVE RESOURCE AREAS.

KEY MAP

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

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PLANTING PLAN
OPTION 1 - BARRIER ISLANDS
WITH CONTINUOUS CHANNEL

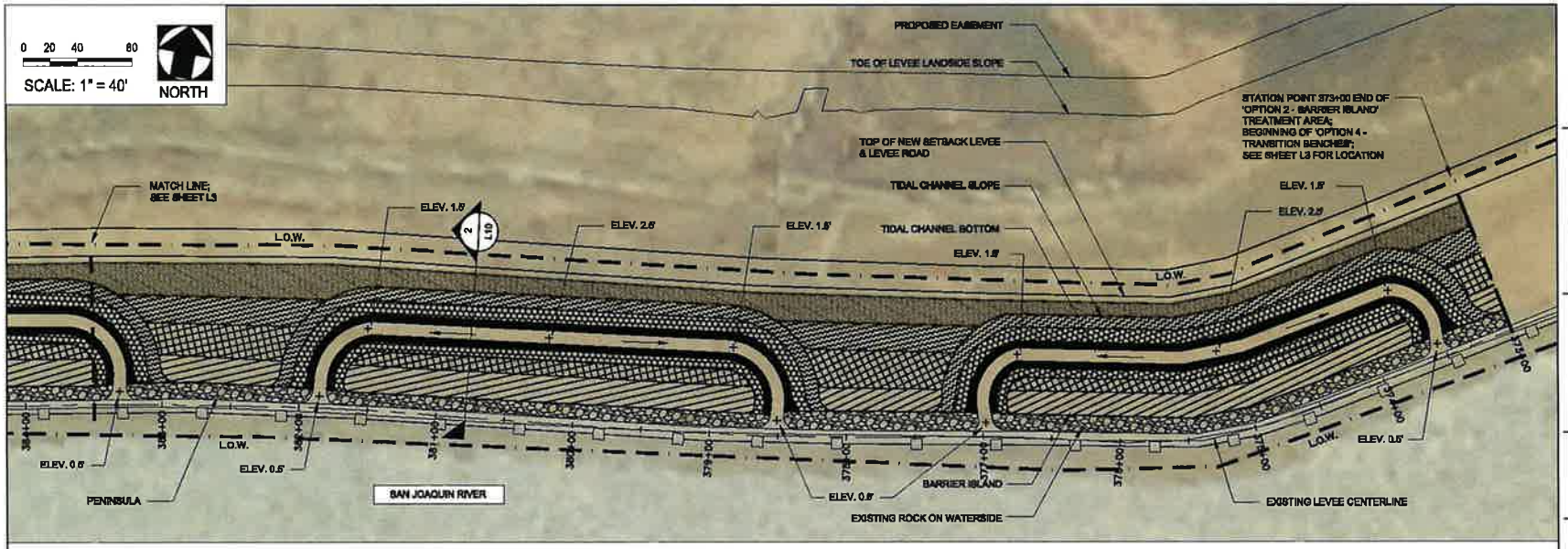
60% DRAFT

scale:	1"=40'
job no.:	06110058.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L5

sheet 5 of 13

date: 02/07/2014



LEGEND

- LIMIT OF WORK (L.O.W.)
- 400+00 STATION NUMBER
- TYPICAL CROSS-SECTION (SEE SHEETS L10, L11 & L12)
- NATIVE GRASS SEED MIX
- UPLAND SCRUB
- TALL TREES
- ALDER & WILLOW SCRUB
- MIXED RIPARIAN
- TULE MARSH
- EXISTING ROCK ON WATERSIDE
- SHALLOW SHORELINE (AVERAGE 10' WIDTH AND LESS THAN 3'-5' BELOW MLLW)

NOTES:
1. THIS DRAWING IS DIAGRAMMATIC AND SHOULD BE USED AS A GRAPHICAL REPRESENTATION.
2. SEE SHEET L2 FOR PLANTING NOTES.
3. SEE SHEET L3 FOR PROJECT AREA LOCATION.
4. SEE SHEET L4 FOR PLANTING LEGEND AND QUANTITIES.
5. SEE SHEET L10 FOR TYPICAL CROSS SECTION OF OPTION 2.
6. DATE OF AERIAL MAP IS 2010 & DOES NOT REFLECT THE MOST CURRENT SITE CONDITIONS.
7. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
8. NO RIPPING OR DISCING IN SENSITIVE RESOURCE AREAS.

KEY MAP

RD1601
LEVEE IMPROVEMENT & CHANNEL MARGIN HABITAT

AECOM
2020 L Street, Suite 400
Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5890

CXXXX

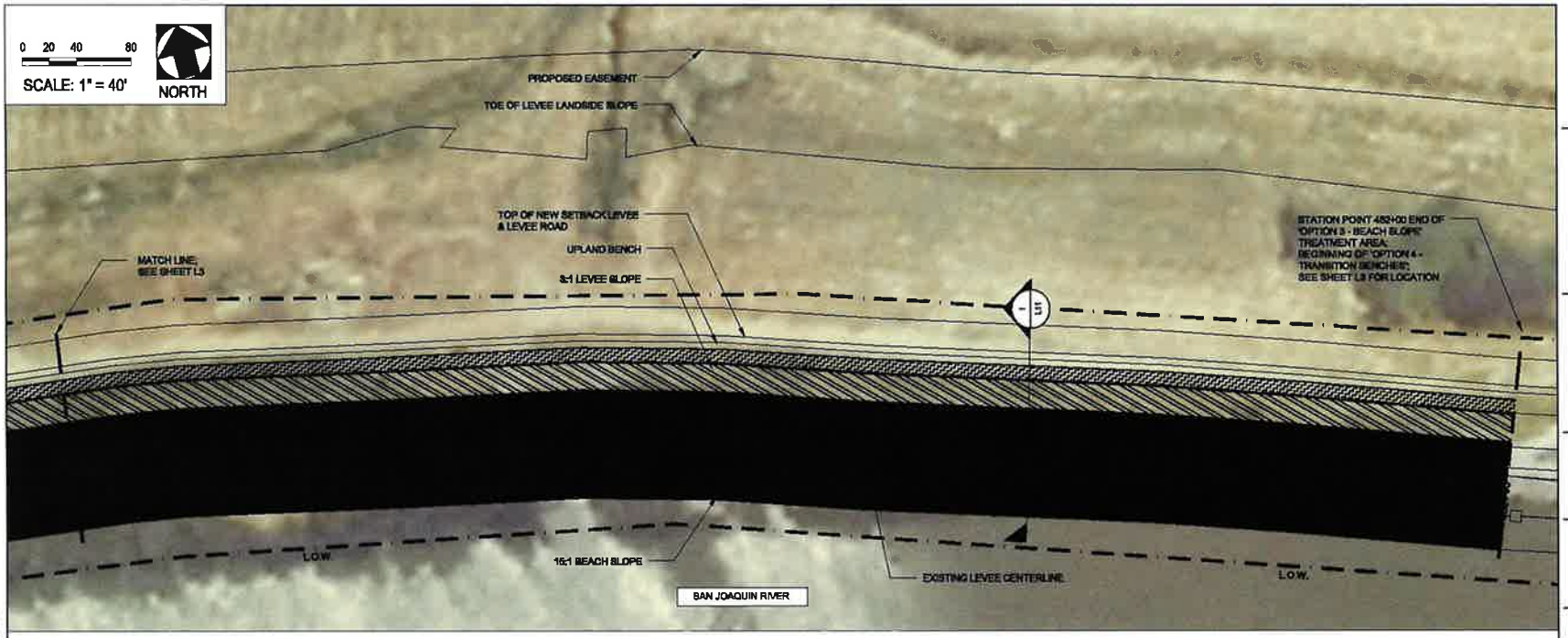
PLANTING PLAN
OPTION 2 - BARRIER ISLANDS

60% DRAFT

scale:	1"=40'
job no.:	60110058.04
drawn by:	SR
checked by:	KC, BC

sheet no.: L6

sheet 9 of 13
date: 02/07/2014



LEGEND

- LIMIT OF WORK (L.O.W.)
- 400+00 STATION NUMBER
- TYPICAL CROSS-SECTION (SEE SHEETS L10, L11 & L12)
- UPLAND SCRUB
- DENSE WILLOW SCRUB
- TULE MARSH
- SHALLOW SHORELINE (AVERAGE 10' WIDTH AND LESS THAN 3'-5' BELOW MLLW)

NOTES:

1. THIS DRAWING IS DIAGRAMMATIC AND SHOULD BE USED AS A GRAPHICAL REPRESENTATION.
2. SEE SHEET L2 FOR PLANTING NOTES.
3. SEE SHEET L3 FOR PROJECT AREA LOCATION.
4. SEE SHEET L4 FOR PLANTING LEGEND AND QUANTITIES.
5. SEE SHEET L11 FOR TYPICAL CROSS SECTION OF OPTION 3.
6. DATE OF AERIAL MAP IS 2010 & DOES NOT REFLECT THE MOST CURRENT SITE CONDITIONS.
7. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
8. NO RIPPING OR DISCING IN SENSITIVE RESOURCE AREAS.

KEY MAP

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

AECOM
2020 L Street, Suite 400
Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5850

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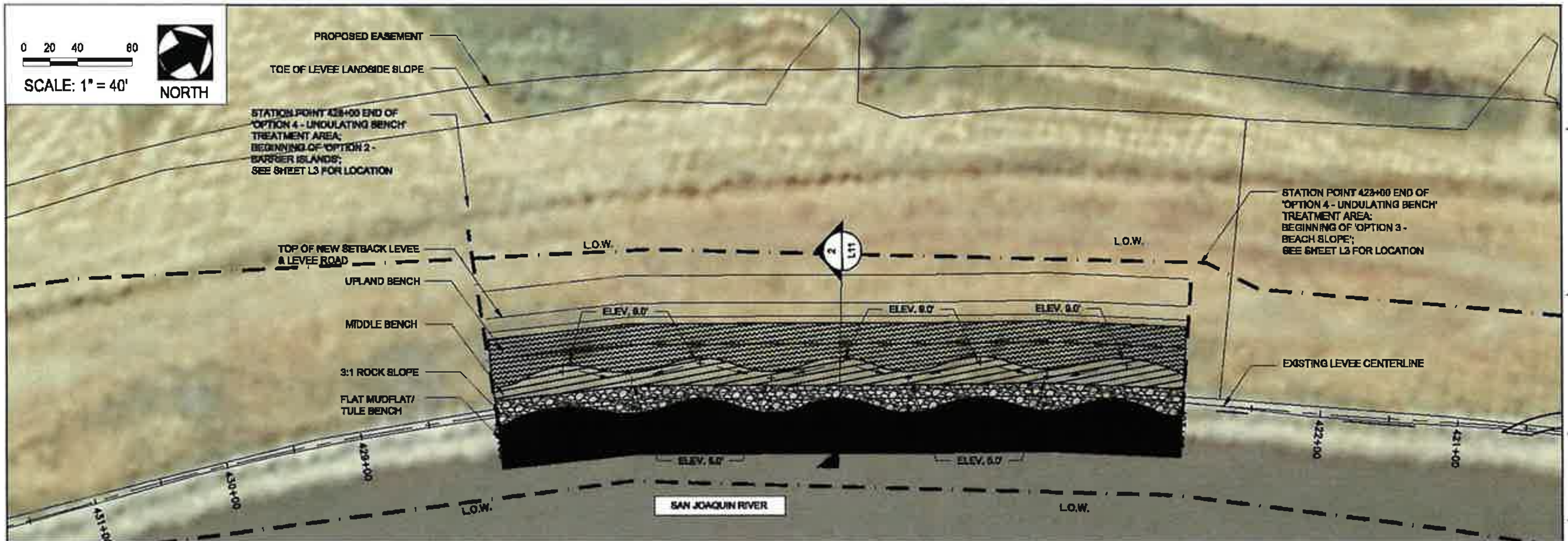
PLANTING PLAN
OPTION 3 - BEACH SLOPE

60% DRAFT

scale:	1"=40'
job no.:	06110058.04
drawn by:	BR
checked by:	KC, BC

sheet no.: L7

sheet 7 of 13
date: 02/07/2014



LEGEND

	LIMIT OF WORK (L.O.W.)
400+00	STATION NUMBER
	TYPICAL CROSS-SECTION (SEE SHEETS L10, L11 & L12)
	UPLAND SCRUB
	MIXED RIPARIAN
	TULE MARSH
	ROCK SLOPE PROTECTION
	SHALLOW SHORELINE (AVERAGE 10' WIDTH AND LESS THAN 3'-5' BELOW MLLW)

NOTES:
1. THIS DRAWING IS DIAGRAMMATIC AND SHOULD BE USED AS A GRAPHICAL REPRESENTATION.
2. SEE SHEET L2 FOR PLANTING NOTES.
3. SEE SHEET L3 FOR PROJECT AREA LOCATION.
4. SEE SHEET L4 FOR PLANTING LEGEND AND QUANTITIES.
5. SEE SHEET L11 FOR TYPICAL CROSS SECTION OF OPTION 4.
6. DATE OF AERIAL MAP IS 2010 & DOES NOT REFLECT THE MOST CURRENT SITE CONDITIONS.
7. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
8. NO RIPPING OR DISCING IN SENSITIVE RESOURCE AREAS.

KEY MAP

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

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2020 L Street, Suite 400
Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5850

CXXXX

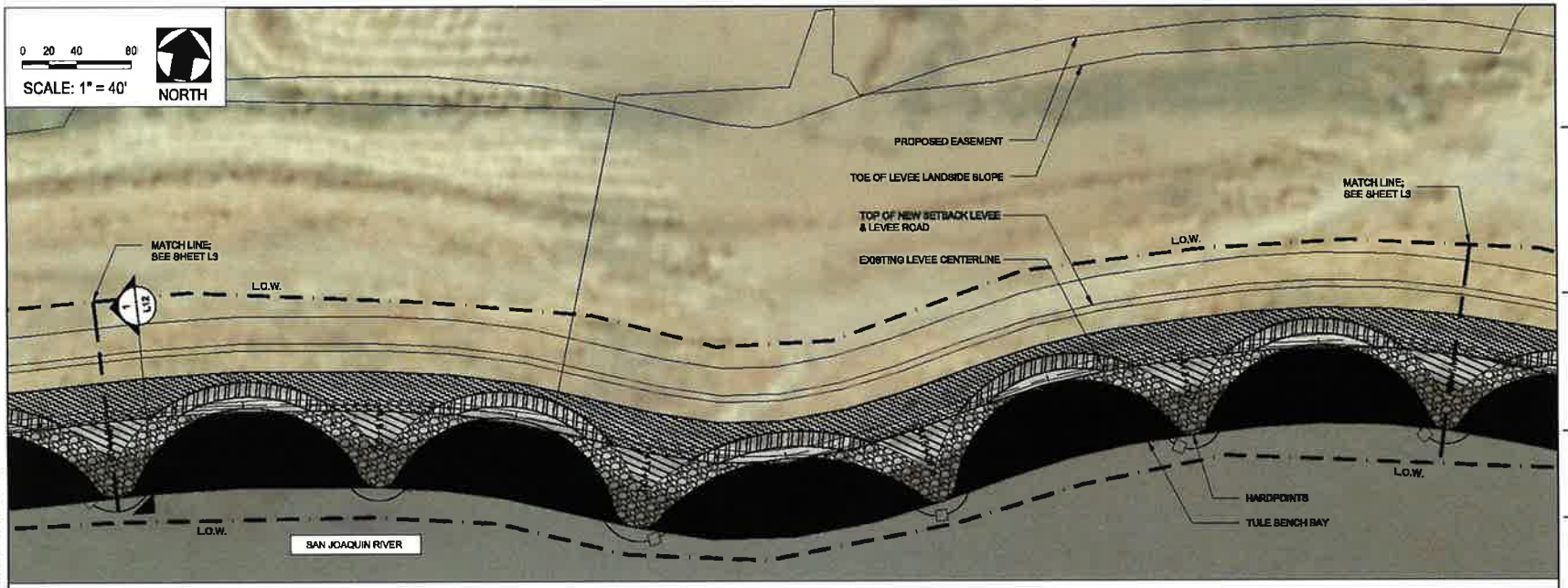
PLANTING PLAN
OPTION 4 -
UNDULATING BENCH

60% DRAFT

scale:	1"=30'
job no.:	06110058.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L8

sheet 8 of 13
date: 02/07/2014



LEGEND

- LIMIT OF WORK (L.O.W.)
- 400+00 STATION NUMBER
- TYPICAL CROSS-SECTION (SEE SHEETS L10, L11 & L12)
- UPLAND SCRUB
- MIXED RIPARIAN
- DENSE WILLOW SCRUB
- TULE MARSH
- ROCK ON WATERSIDE
- SHALLOW SHORELINE (AVERAGE 10' WIDTH AND LESS THAN 3'-5' BELOW MLLW)

NOTES:

1. THIS DRAWING IS DIAGRAMMATIC AND SHOULD BE USED AS A GRAPHICAL REPRESENTATION.
2. SEE SHEET L2 FOR PLANTING NOTES.
3. SEE SHEET L3 FOR PROJECT AREA LOCATION.
4. SEE SHEET L4 FOR PLANTING LEGEND AND QUANTITIES.
5. SEE SHEET L12 FOR TYPICAL CROSS SECTION OF OPTION 5.
6. DATE OF AERIAL MAP IS 2010 & DOES NOT REFLECT THE MOST CURRENT SITE CONDITIONS.
7. LEVEE IMPROVEMENTS CONSTRUCTED UNDER SEPARATE CONTRACTS.
8. NO RIPPING OR DISCING IN SENSITIVE RESOURCE AREAS.

KEY MAP

RD1601
LEVEE IMPROVEMENT & CHANNEL MARGIN HABITAT

AECOM
2020 L Street, Suite 400
Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5850

CXXXX

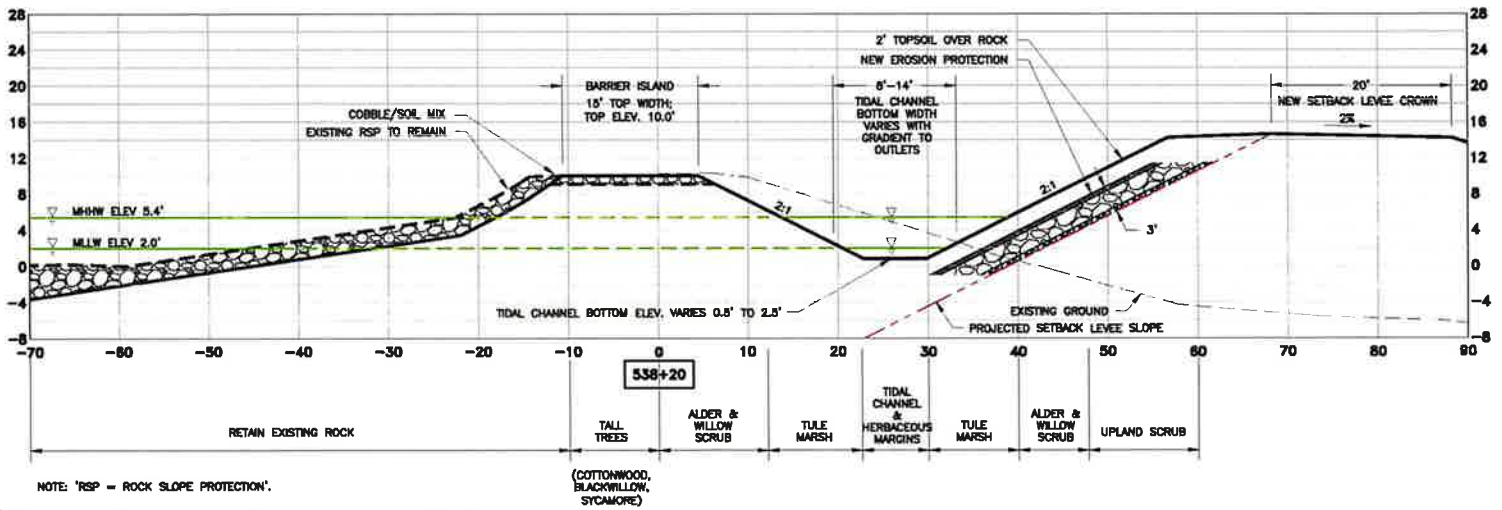
PLANTING PLAN
OPTION 5 - DEEP BACK BAYS BETWEEN ROCK HARDPOINTS

60% DRAFT

scale:	1"=40'
job no.:	06110058.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L9

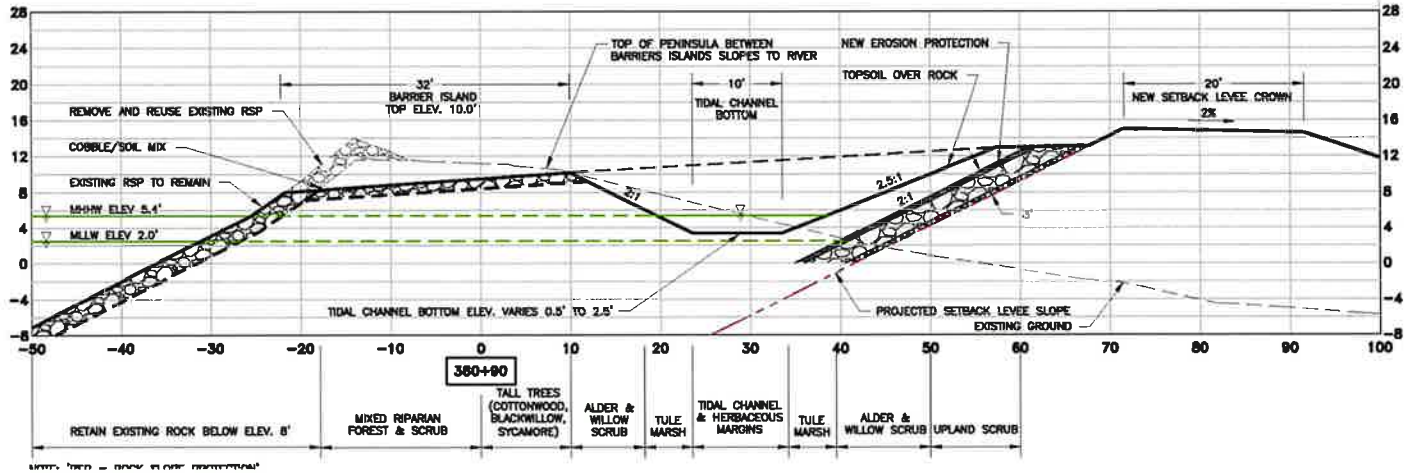
sheet 9 of 13
date: 02/07/2014



1 / L10 OPTION 1 - BARRIER ISLAND WITH CONTINUOUS BACK CHANNEL TYPICAL CROSS SECTION

NOT TO SCALE

SECTION



2 / L10 OPTION 2 - BARRIER ISLAND TYPICAL CROSS SECTION

NOT TO SCALE

SECTION

NOTES:
1. CROSS SECTION INFORMATION PROVIDED BY ENGINEERS.
2. SEE SHEET L3 FOR KEY MAP INFORMATION.
3. SEE SHEET L4 FOR PLANTING MATRIX INFORMATION.
4. SEE SHEET L13 FOR PLANTING DETAIL INFORMATION.

RD1601
LEVEE IMPROVEMENT & CHANNEL MARGIN HABITAT

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Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5850

CXXXX

CROSS SECTION - OPTIONS 1 & 2

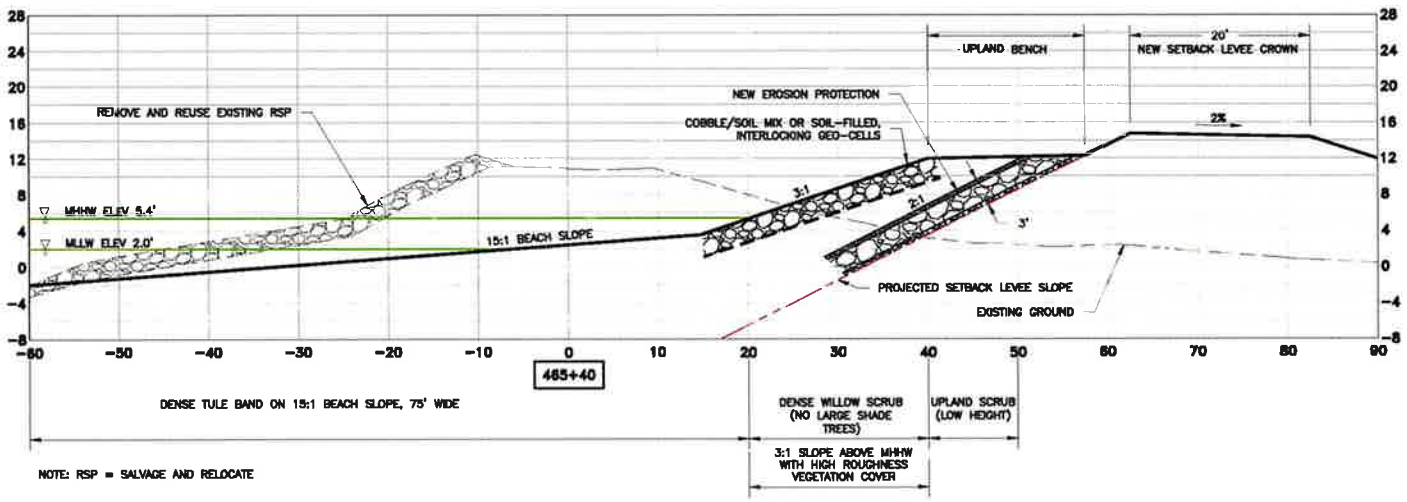
60% DRAFT

scale:	NTS
job no.:	06110058.04
drawn by:	SR
checked by:	KC, BC

sheet no.: L10

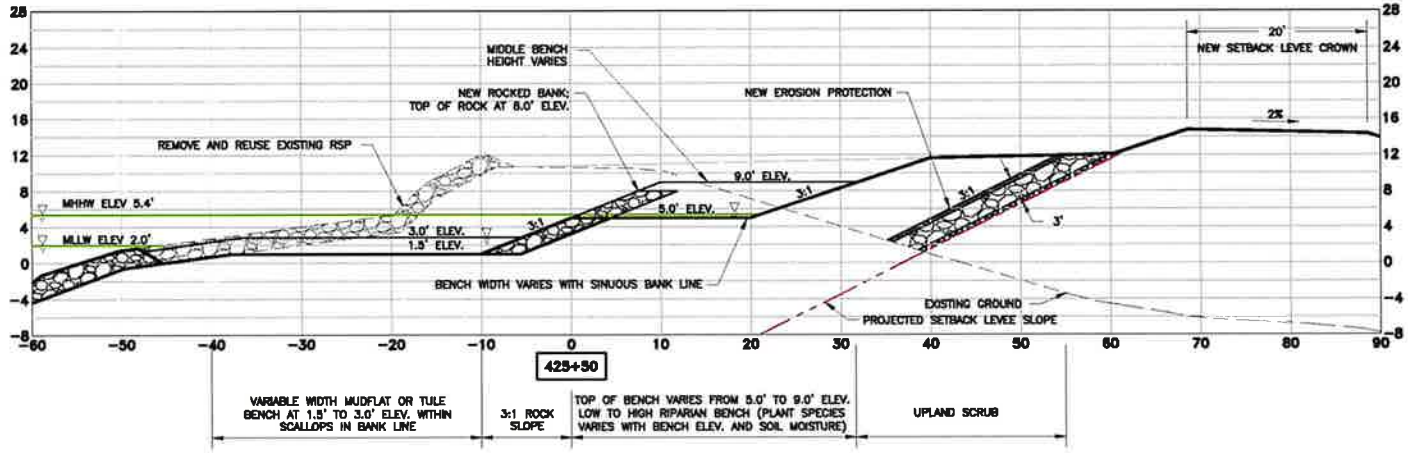
sheet 10 of 13

date: 02/07/2014



1 / L11 OPTION 3 - BEACH SLOPE TYPICAL CROSS SECTION

NOT TO SCALE SECTION



2 / L11 OPTION 4 - UNDULATING BENCH TYPICAL CROSS SECTION

NOT TO SCALE SECTION

NOTES:
1. CROSS SECTION INFORMATION PROVIDED BY ENGINEERS.
2. SEE SHEET L3 FOR KEY MAP INFORMATION.
3. SEE SHEET L4 FOR PLANTING MATRIX INFORMATION.
4. SEE SHEET L13 FOR PLANTING DETAIL INFORMATION.

RD1601
LEVEE IMPROVEMENT & CHANNEL MARGIN HABITAT

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Fax: (916) 414-5850

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CROSS SECTION - OPTIONS 3 & 4

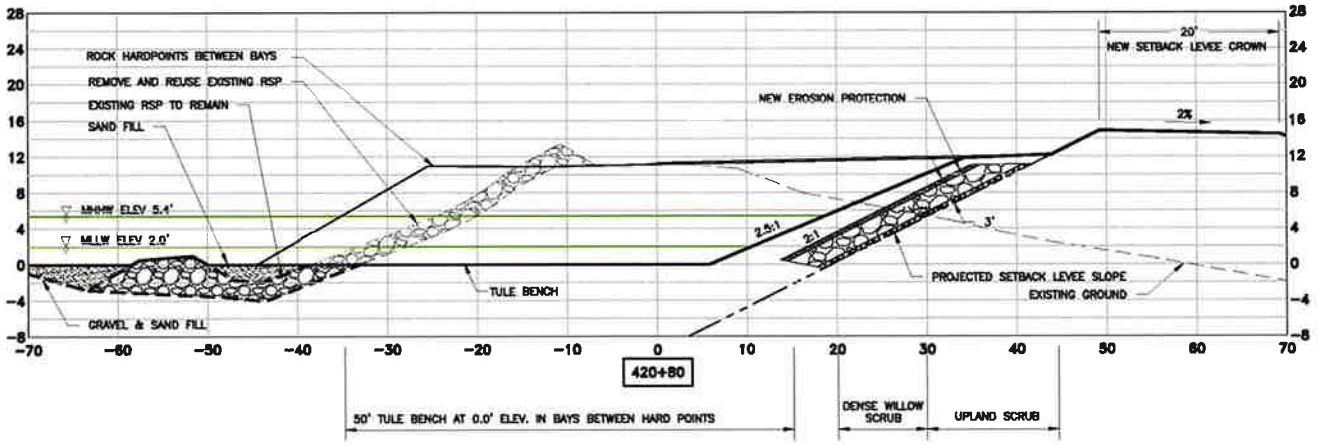
60% DRAFT

scale:	NTS
job no.:	05110056.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L11

sheet 11 of 13

date: 02/07/2014



NOTE: 'RSP = ROCK SLOPE PROTECTION'.
REMOVE RSP ON EXISTING BANKS BETWEEN HARDPOINTS.

1 / L12 OPTION 5 - DEEP BACK BAYS BETWEEN ROCK HARDPOINTS TYPICAL CROSS SECTION

NOT TO SCALE

SECTION

NOTES:
1. CROSS SECTION INFORMATION PROVIDED BY ENGINEERS.
2. SEE SHEET L3 FOR KEY MAP INFORMATION.
3. SEE SHEET L4 FOR PLANTING MATRIX INFORMATION.
4. SEE SHEET L13 FOR PLANTING DETAIL INFORMATION.

RD1601
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CHANNEL MARGIN HABITAT

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Sacramento CA 95811
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Fax: (916) 414-5850

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CROSS SECTION -
OPTION 5

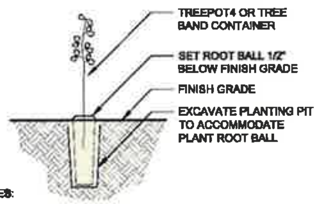
60% DRAFT

scale:	NTS
job no.:	60110056.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L12

sheet 12 of 13

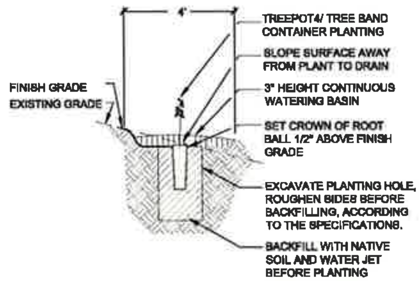
date: 02/07/2014



NOTES:

1. INSTALL PLANTS AS SHOWN.
2. PROVIDE WEED FREE ZONE AROUND PLANTING SITE.
3. SEE SHEET L4 FOR ADDITIONAL INFORMATION.
4. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

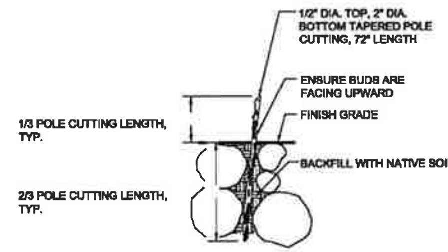
1 / L13 TREEPOT4/TREE BAND CONTAINER
NOT TO SCALE SECTION



NOTES:

1. SEE SHEET L4 FOR PLANT SPECIES AND ADDITIONAL INFORMATION.
2. SLOPE MAY VARY FOR INSTALLATION OF TREEPOT4 AND TREE BAND.
3. REFER TO THE SHEET L2 FOR ADDITIONAL INFORMATION.
4. SEE SHEET L4 FOR LAYOUT PLAN.

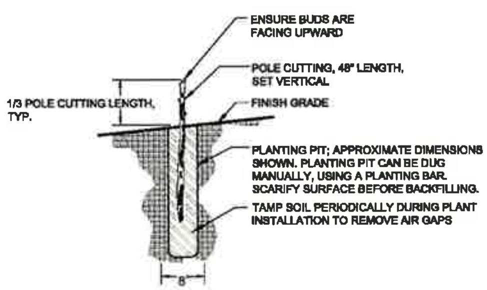
2 / L13 TREEPOT4/TREE BAND ON SLOPE
NOT TO SCALE SECTION



NOTES:

1. REFER TO PLANT SCHEDULE ON SHEET L4 FOR PLANT SPECIES.

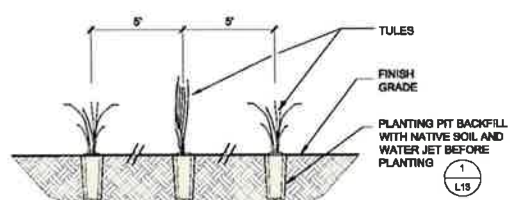
3 / L13 CUTTING ON GRADE OR IN ROCK
NOT TO SCALE SECTION



NOTES:

1. REFER TO THE PROJECT DRAWINGS AND SHEET L4 FOR ADDITIONAL INFORMATION.

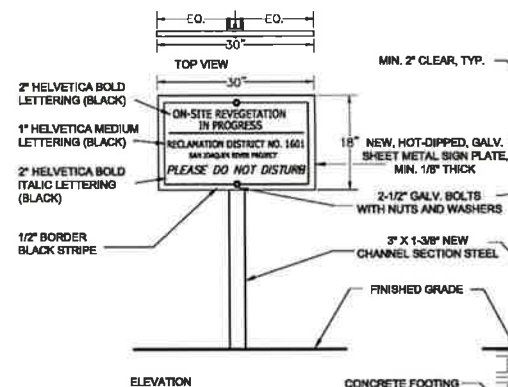
4 / L13 CUTTING ON SLOPE
NOT TO SCALE SECTION

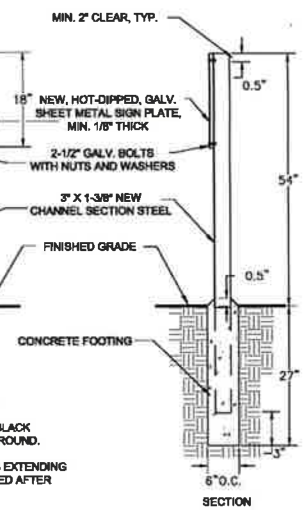


NOTES:

1. INSTALL TULES IN ALTERNATING ROWS.
2. REFER TO THE PROJECT DRAWINGS AND SHEET L4 FOR ADDITIONAL INFORMATION.

5 / L13 TULE LAYOUT
NOT TO SCALE SECTION





NOTES:

1. PAINT WILL BE ENAMEL BASE.
2. SIGN WILL BE PAINTED WITH BLACK LETTERING ON WHITE BACKGROUND.
3. ALL EXPOSED BOLT THREADS EXTENDING BEYOND NUT WILL BE STRIPPED AFTER INSTALLATION.

6 / L13 REVEGETATION SIGN
NOT TO SCALE SECTION

RD1601
LEVEE IMPROVEMENT &
CHANNEL MARGIN HABITAT

AECOM
2020 L Street, Suite 400
Sacramento CA 95811
Tel: (916) 414-5800
Fax: (916) 414-5850

CXXXX

PLANTING DETAILS

60% DRAFT

scale:	NTS
job no.:	60110058.04
drawn by:	SR
checked by:	KC, SC

sheet no.: L13

date: 02/07/2014

APPENDIX D

PROJECT COST ESTIMATE BREAKDOWN

RECLAMATION DISTRICT NO. 1601
TWITCHELL ISLAND
SAN JOAQUIN RIVER SETBACK LEVEE PROJECT
REACH 6 - PRIORITY 1 - STA. 482+00 TO STA. 508+80
SACRAMENTO COUNTY, CALIFORNIA

OPINION OF PROBABLE COSTS

Item	Description	Qty	Unit	Unit Cost	Total Cost
Construction					
Phase 1: Foundation Toe Berm					
1.	Mobilization			5%	$314,300
2.	Erosion Control			5%	$314,300
3.	Clearing and Grubbing	16	AC	$4,000	$64,000
4.	12" Pipe	230	LF	$25	$5,800
5.	12" Perforated Pipe	1,540	LF	$25	$38,500
6.	Cleanout	10	EA	$1,000	$10,000
7.	Drain Rock	6,200	TN	$40	$248,000
8.	Relocate Existing Utility Pole	5	EA	$15,000	$75,000
9.	Import Fill	291,000	TN	$20	$5,820,000
10.	Toe Ditch	2,400	LF	$10	$24,000
				Subtotal:	*$6,913,900*
Phase 2: Setback Levee					
1.	Mobilization			5%	$161,300
2.	Erosion Control			5%	$161,300
3.	Import Fill	122,000	TN	$20	$2,440,000
4.	Reconstruct Existing Siphon	1	EA	$33,000	$33,000
5.	Rock Slope Protection	11,500	TN	$55	$632,500
6.	All-Weather Road Patrol Roads	3,400	TN	$35	$119,000
				Subtotal:	*$3,547,100*
Phase 3: Channel Margin Habitat					
1.	Mobilization			5%	$46,900
2.	Erosion Control			5%	$46,900
3.	Earthwork	2,680	LF	$200	$536,000
4.	Planting	2,680	LF	$150	$402,000
5.	Habitat Establishment (1 year)		*(included in Planting item)*		
				Subtotal:	*$1,031,800*
				Construction Subtotal:	***$11,492,800***

RECLAMATION DISTRICT NO. 1601
TWITCHELL ISLAND
SAN JOAQUIN RIVER SETBACK LEVEE PROJECT
REACH 6 - PRIORITY 1 - STA. 482+00 TO STA. 508+80
SACRAMENTO COUNTY, CALIFORNIA

OPINION OF PROBABLE COSTS

Item	Description	Qty	Unit	Unit Cost	Total Cost
Management / Environmental / Engineering					
1.	Project Management			2.0%	$229,900
2.	Environmental and Permitting			0.5%	$57,500
3.	Final Engineering - Phase 1			1.0%	$69,200
4.	Final Engineering - Phase 2			5.0%	$177,400
5.	Final Engineering - Phase 3			3.0%	$31,000
6.	Bidding and Contract Award			0.5%	$57,500
7.	Construction Mangement, Inspection & Environmental Compliance			8.0%	$919,500
8.	Mitigation			6.0%	$689,600
	Management / Environmental / Engineering Subtotal:				***$2,231,600***

PROJECT SUBTOTAL:	$13,724,400
CONTINGENCY (15%):	$2,058,700
PROJECT TOTAL:	**$15,783,000**

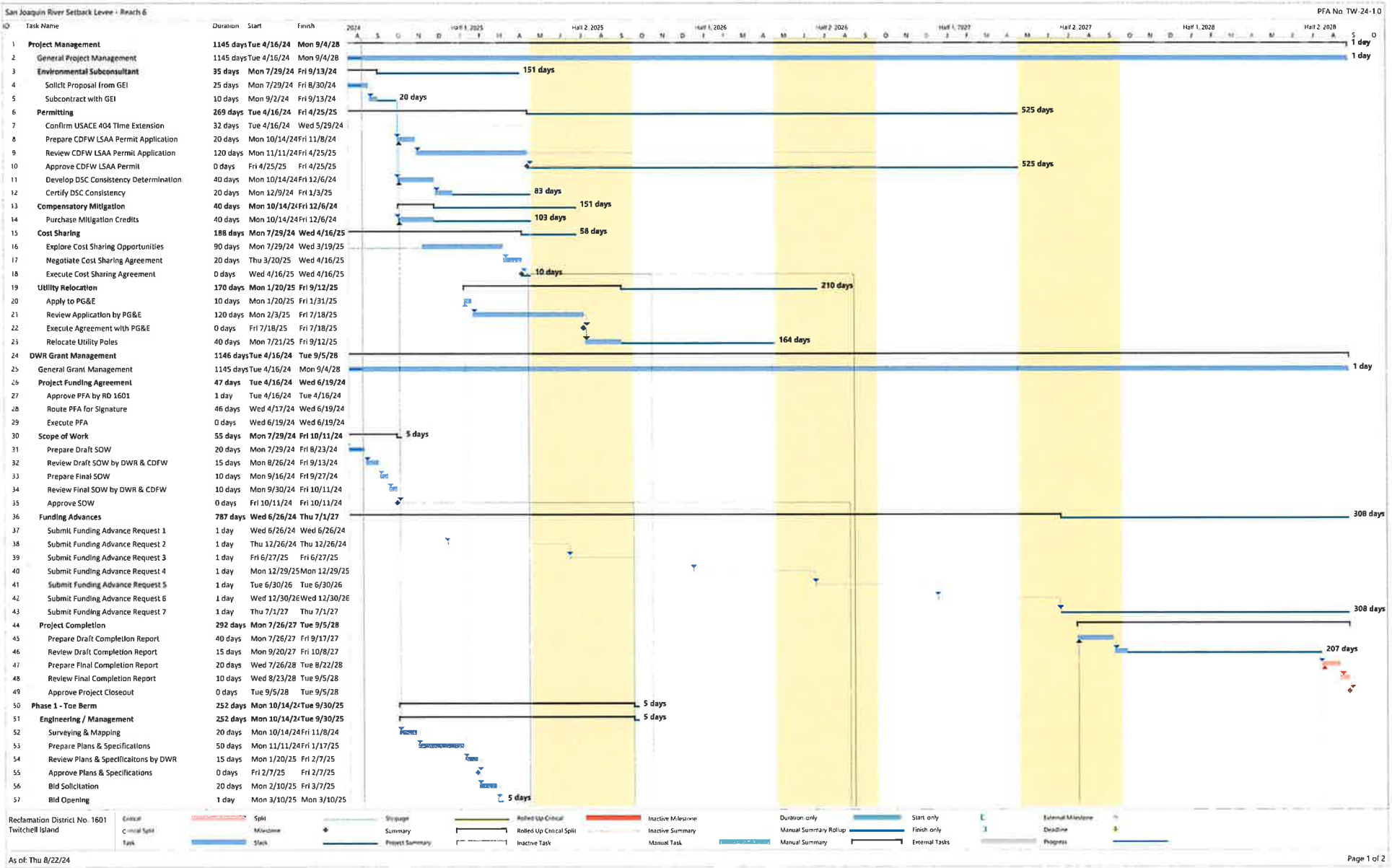
Notes:

1. All environmental, permitting, and preliminary engineering for the overall project will have been completed as part of DWR PFA No. TW-09-1.0. A new CDFW LSAA will need to be secured.

2. Soft Costs include project management, final engineering, bidding and contract award, and construction management and inspection.

3. Mitigation costs are based on purchasing mitigation credits at an approved mitigation bank at a rate of ±$150k per acre based on impacts to waters of the U.S. at a mitigation ratio of 1:1 and impacts to GGS habitat at a mitigation ratio of 3:1

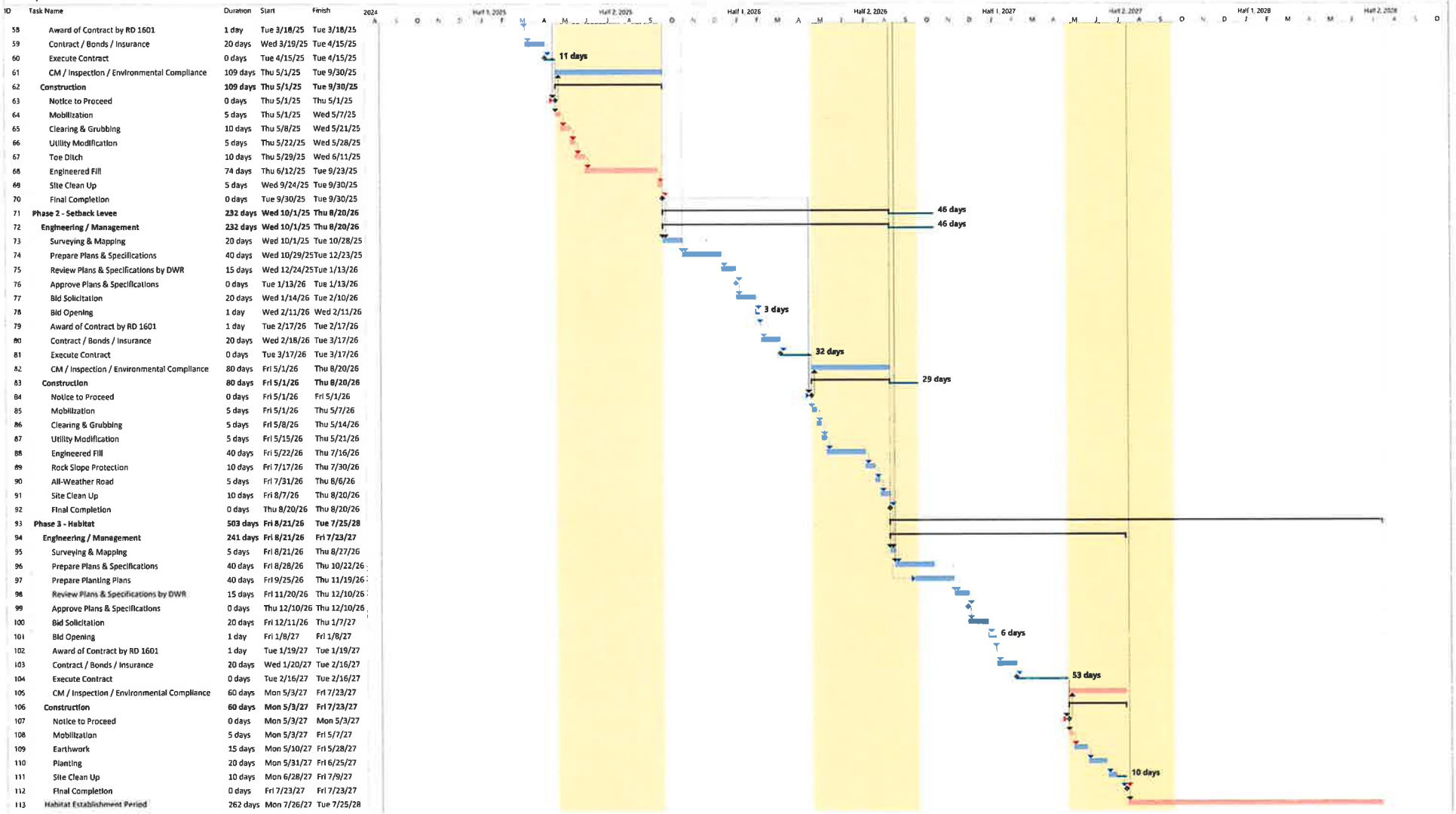
4. Habitat establishment costs are based on the 1-year establishment period that begins immediately following the end of planting. A 3-year performance period will follow through a separate PFA.


San Joaquin River Setback Levee - Reach 6
PFA No. TW-24-1.0
ID Task Name Duration Start Finish
1 Project Management 1145 days Tue 4/16/24 Mon 9/4/28
2 General Project Management 1145 days Tue 4/16/24 Mon 9/4/28
3 Environmental Subconsultant 35 days Mon 7/29/24 Fri 9/13/24
4 Solicit Proposal from GEI 25 days Mon 7/29/24 Fri 8/30/24
5 Subcontract with GEI 10 days Mon 9/2/24 Fri 9/13/24
6 Permitting 269 days Tue 4/16/24 Fri 4/25/25
7 Confirm USACE 404 Time Extension 32 days Tue 4/16/24 Wed 5/29/24
8 Prepare CDFW LSAA Permit Application 20 days Mon 10/14/24 Fri 11/8/24
9 Review CDFW LSAA Permit Application 120 days Mon 11/11/24 Fri 4/25/25
10 Approve CDFW LSAA Permit 0 days Fri 4/25/25 Fri 4/25/25
11 Develop DSC Consistency Determination 40 days Mon 10/14/24 Fri 12/6/24
12 Certify DSC Consistency 20 days Mon 12/9/24 Fri 1/3/25
13 Compensatory Mitigation 40 days Mon 10/14/24 Fri 12/6/24
14 Purchase Mitigation Credits 40 days Mon 10/14/24 Fri 12/6/24
15 Cost Sharing 188 days Mon 7/29/24 Wed 4/16/25
16 Explore Cost Sharing Opportunities 90 days Mon 7/29/24 Wed 3/19/25
17 Negotiate Cost Sharing Agreement 20 days Thu 3/20/25 Wed 4/16/25
18 Execute Cost Sharing Agreement 0 days Wed 4/16/25 Wed 4/16/25
19 Utility Relocation 170 days Mon 1/20/25 Fri 9/12/25
20 Apply to PG&E 10 days Mon 1/20/25 Fri 1/31/25
21 Review Application by PG&E 120 days Mon 2/3/25 Fri 7/18/25
22 Execute Agreement with PG&E 0 days Fri 7/18/25 Fri 7/18/25
23 Relocate Utility Poles 40 days Mon 7/21/25 Fri 9/12/25
24 DWR Grant Management 1146 days Tue 4/16/24 Tue 9/5/28
25 General Grant Management 1145 days Tue 4/16/24 Mon 9/4/28
26 Project Funding Agreement 47 days Tue 4/16/24 Wed 6/19/24
27 Approve PFA by RD 1601 1 day Tue 4/16/24 Tue 4/16/24
28 Route PFA for Signature 46 days Wed 4/17/24 Wed 6/19/24
29 Execute PFA 0 days Wed 6/19/24 Wed 6/19/24
30 Scope of Work 55 days Mon 7/29/24 Fri 10/11/24
31 Prepare Draft SOW 20 days Mon 7/29/24 Fri 8/23/24
32 Review Draft SOW by DWR & CDFW 15 days Mon 8/26/24 Fri 9/13/24
33 Prepare Final SOW 10 days Mon 9/16/24 Fri 9/27/24
34 Review Final SOW by DWR & CDFW 10 days Mon 9/30/24 Fri 10/11/24
35 Approve SOW 0 days Fri 10/11/24 Fri 10/11/24
36 Funding Advances 787 days Wed 6/26/24 Thu 7/1/27
37 Submit Funding Advance Request 1 1 day Wed 6/26/24 Wed 6/26/24
38 Submit Funding Advance Request 2 1 day Thu 12/26/24 Thu 12/26/24
39 Submit Funding Advance Request 3 1 day Fri 6/27/25 Fri 6/27/25
40 Submit Funding Advance Request 4 1 day Mon 12/29/25 Mon 12/29/25
41 Submit Funding Advance Request 5 1 day Tue 6/30/26 Tue 6/30/26
42 Submit Funding Advance Request 6 1 day Wed 12/30/26 Wed 12/30/26
43 Submit Funding Advance Request 7 1 day Thu 7/1/27 Thu 7/1/27
44 Project Completion 292 days Mon 7/26/27 Tue 9/5/28
45 Prepare Draft Completion Report 40 days Mon 7/26/27 Fri 9/17/27
46 Review Draft Completion Report 15 days Mon 9/20/27 Fri 10/8/27
47 Prepare Final Completion Report 20 days Wed 7/26/28 Tue 8/22/28
48 Review Final Completion Report 10 days Wed 8/23/28 Tue 9/5/28
49 Approve Project Closeout 0 days Tue 9/5/28 Tue 9/5/28
50 Phase 1 - Toe Berm 252 days Mon 10/14/24 Tue 9/30/25
51 Engineering / Management 252 days Mon 10/14/24 Tue 9/30/25
52 Surveying & Mapping 20 days Mon 10/14/24 Fri 11/8/24
53 Prepare Plans & Specifications 50 days Mon 11/11/24 Fri 1/17/25
54 Review Plans & Specificaitons by DWR 15 days Mon 1/20/25 Fri 2/7/25
55 Approve Plans & Specifications 0 days Fri 2/7/25 Fri 2/7/25
56 Bid Solicitation 20 days Mon 2/10/25 Fri 3/7/25
57 Bid Opening 1 day Mon 3/10/25 Mon 3/10/25
1 day
1 day
151 days
20 days
525 days
525 days
83 days
151 days
103 days
58 days
10 days
210 days
164 days
1 day
5 days
308 days
308 days
207 days
5 days
5 days
5 days
Reclamation District No. 1601
Twitchell Island
As of: Thu 8/22/24
Page 1 of 2

San Joaquin River Setback Levee - Reach 6

PFA No TW-24-1 0

ID	Task Name	Duration	Start	Finish
58	Award of Contract by RD 1601	1 day	Tue 3/18/25	Tue 3/18/25
59	Contract / Bonds / Insurance	20 days	Wed 3/19/25	Tue 4/15/25
60	Execute Contract	0 days	Tue 4/15/25	Tue 4/15/25
61	CM / Inspection / Environmental Compliance	109 days	Thu 5/1/25	Tue 9/30/25
62	**Construction**	**109 days**	**Thu 5/1/25**	**Tue 9/30/25**
63	Notice to Proceed	0 days	Thu 5/1/25	Thu 5/1/25
64	Mobilization	5 days	Thu 5/1/25	Wed 5/7/25
65	Clearing & Grubbing	10 days	Thu 5/8/25	Wed 5/21/25
66	Utility Modification	5 days	Thu 5/22/25	Wed 5/28/25
67	Toe Ditch	10 days	Thu 5/29/25	Wed 6/11/25
68	Engineered Fill	74 days	Thu 6/12/25	Tue 9/23/25
69	Site Clean Up	5 days	Wed 9/24/25	Tue 9/30/25
70	Final Completion	0 days	Tue 9/30/25	Tue 9/30/25
71	**Phase 2 - Setback Levee**	**232 days**	**Wed 10/1/25**	**Thu 8/20/26**
72	**Engineering / Management**	**232 days**	**Wed 10/1/25**	**Thu 8/20/26**
73	Surveying & Mapping	20 days	Wed 10/1/25	Tue 10/28/25
74	Prepare Plans & Specifications	40 days	Wed 10/29/25	Tue 12/23/25
75	Review Plans & Specifications by DWR	15 days	Wed 12/24/25	Tue 1/13/26
76	Approve Plans & Specifications	0 days	Tue 1/13/26	Tue 1/13/26
77	Bid Solicitation	20 days	Wed 1/14/26	Tue 2/10/26
78	Bid Opening	1 day	Wed 2/11/26	Wed 2/11/26
79	Award of Contract by RD 1601	1 day	Tue 2/17/26	Tue 2/17/26
80	Contract / Bonds / Insurance	20 days	Wed 2/18/26	Tue 3/17/26
81	Execute Contract	0 days	Tue 3/17/26	Tue 3/17/26
82	CM / Inspection / Environmental Compliance	80 days	Fri 5/1/26	Thu 8/20/26
83	**Construction**	**80 days**	**Fri 5/1/26**	**Thu 8/20/26**
84	Notice to Proceed	0 days	Fri 5/1/26	Fri 5/1/26
85	Mobilization	5 days	Fri 5/1/26	Thu 5/7/26
86	Clearing & Grubbing	5 days	Fri 5/8/26	Thu 5/14/26
87	Utility Modification	5 days	Fri 5/15/26	Thu 5/21/26
88	Engineered Fill	40 days	Fri 5/22/26	Thu 7/16/26
89	Rock Slope Protection	10 days	Fri 7/17/26	Thu 7/30/26
90	All-Weather Road	5 days	Fri 7/31/26	Thu 8/6/26
91	Site Clean Up	10 days	Fri 8/7/26	Thu 8/20/26
92	Final Completion	0 days	Thu 8/20/26	Thu 8/20/26
93	**Phase 3 - Habitat**	**503 days**	**Fri 8/21/26**	**Tue 7/25/28**
94	**Engineering / Management**	**241 days**	**Fri 8/21/26**	**Fri 7/23/27**
95	Surveying & Mapping	5 days	Fri 8/21/26	Thu 8/27/26
96	Prepare Plans & Specifications	40 days	Fri 8/28/26	Thu 10/22/26
97	Prepare Planting Plans	40 days	Fri 9/25/26	Thu 11/19/26
98	Review Plans & Specifications by DWR	15 days	Fri 11/20/26	Thu 12/10/26
99	Approve Plans & Specifications	0 days	Thu 12/10/26	Thu 12/10/26
100	Bid Solicitation	20 days	Fri 12/11/26	Thu 1/7/27
101	Bid Opening	1 day	Fri 1/8/27	Fri 1/8/27
102	Award of Contract by RD 1601	1 day	Tue 1/19/27	Tue 1/19/27
103	Contract / Bonds / Insurance	20 days	Wed 1/20/27	Tue 2/16/27
104	Execute Contract	0 days	Tue 2/16/27	Tue 2/16/27
105	CM / Inspection / Environmental Compliance	60 days	Mon 5/3/27	Fri 7/23/27
106	**Construction**	**60 days**	**Mon 5/3/27**	**Fri 7/23/27**
107	Notice to Proceed	0 days	Mon 5/3/27	Mon 5/3/27
108	Mobilization	5 days	Mon 5/3/27	Fri 5/7/27
109	Earthwork	15 days	Mon 5/10/27	Fri 5/28/27
110	Planting	20 days	Mon 5/31/27	Fri 6/25/27
111	Site Clean Up	10 days	Mon 6/28/27	Fri 7/9/27
112	Final Completion	0 days	Fri 7/23/27	Fri 7/23/27
113	Habitat Establishment Period	262 days	Mon 7/26/27	Tue 7/25/28



Reclamation District No. 1601
Twitchell Island

Critical
Critical Split
Task
Split
Milestone
Slack
Slippage
Summary
Project Summary
Rolled Up Critical
Rolled Up Critical Split
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress

As of: Thu 8/22/24

(Letter of Recommendation Under Separate Cover)

EXHIBIT B