BEL MARIN KEYS WETLAND RESTORATION – PHASE 1 PROJECT

Supplemental Information Document for Joint Aquatic Resource Permit Application

Prepared for
California State Coastal Conservancy

October 2016



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TABLE OF CONTENTS

Bel Marin Keys Wetland Restoration – Phase 1 Project, Supplemental Information Document for Joint Aquatic Resource Permit Application

Page

JARPA Application Form iii

Chapter 1, Introduction 1-1
1.1 Purpose of this Supplemental Information Document 1-1
1.2 Project Compliance with the Terms and Conditions of Nationwide Permit 27 1-1
1.3 Regulatory Overview 1-2
1.4 Project Applicant (Boxes 1 and 2) 1-3

Chapter 2, Project Context 2-1
2.1 Project Location (Box 4) 2-1
2.2 Site History and Setting 2-1

Chapter 3, Project Description (Box 7) 3-1
3.1 Project Purpose and Objectives 3-1
3.2 Project Overview 3-2
3.3 Basis of Design 3-6
3.4 Project Elements 3-6
3.5 Construction Methodology (Box 6) 3-13
3.6 Project Monitoring and Adaptive Management 3-26

Chapter 4, Existing Conditions (Box 5) 4-1
4.1 Existing Land Use 4-1
4.2 Topography and Hydrology 4-1
4.3 Vegetation 4-2

Chapter 5, Waters of the United States in the Project Area (Box 8A) 5-1
5.1 Jurisdictional Analysis 5-1
5.2 Summary of Potentially Jurisdictional Waters and Wetlands 5-1
5.3 Non-Jurisdictional Features 5-2

Chapter 6, Impacts and Benefits to Waters of the United States (Boxes 8B and 9) .. 6-1
6.1 Project Impacts to Waters of the United States 6-1
6.2 Project Benefits to Waters of the United States 6-3

Chapter 7, Special-Status Species and Habitats in the Project Area 7-1
7.1 Special-Status Species Impacts 7-1
7.2 Project Benefits to Special-Status Species 7-5

Page

Chapter 8, Mitigation (Box 12) **8-1**

Chapter 9, Cultural Resources in the Project Area **9-1**

Chapter 10, CEQA/NEPA Compliance (Boxes 14 and FG14) **10-1**

Chapter 11, Supplemental Information for BCDC (Box 18) **11-1**
11.1 Project Information within BCDC Jurisdiction 11-1
11.2 Shoreline Band 11-3
11.3 Environmental Impact Documentation 11-3
11.4 Public Access 11-3

Chapter 12, References **12-1**

Appendices

A. Wetland Delineation Report A-1
B. Biological Assessment B-1
C. BMKV Supplemental EIR/EIS Applicable Mitigation Measures C-1
D. Addresses of Adjoining Property Owners (JARPA Box 15) D-1
E. Cultural Resources Inventory and Evaluation Report E-1
F. Corps Pre-Construction Notification Form F-1
G. Draft Geotechnical Investigation Report G-1

List of Tables

3-1 Summary of Project Elements 3-5
3-2 New Bayfront Levee Cross-Section Geometry 3-16
5-1 Potentially Jurisdictional Wetlands and Other Waters of the U.S. and of the State in the Project Area 5-2
6-1 Summary of Pre- versus Post-Project Conditions and Jurisdictional Waters 6-2
8-1 Summary of Net Change in Jurisdictional Waters 8-1

List of Figures

2-1 Regional Area 2-2
2-2 Project Location 2-3
3-1 Proposed Project 3-3
3-2 Proposed Site Cross-Section 3-8
3-3 South Levee Tie-In & Future NSD Outfall 3-11
3-4 Proposed Site Drainage Modifications 3-12
3-5 North Levee Tie-In 3-15
3-6 Levee Cross Sections 3-17
3-7 Levee Crest Settlement Profile 3-18
3-8 Seasonal Wetland Design and Construction Elements 3-23
3-9 Conceptual Seasonal Wetland Cross Sections 3-24
4-1 Study Area Elevations 4-3
5-1 Potentially Jurisdictional Waters of the U.S. 5-5
11-1 BCDC 100-Foot Shoreline Band 11-2

SAN FRANCISCO BAY AREA
JOINT AQUATIC RESOURCE PERMIT APPLICATION

This form is for use in San Francisco, Contra Costa, Alameda Counties, Marin County (except Estero San Antonio watershed)**, San Mateo County** (except Gazos Creek Watershed), **and the portions of the following counties that drain to San Francisco Bay: Sonoma, Napa, Solano, Santa Clara**

Please consult JARPA Instructions before completing the form

Copies of this form are being submitted to the following agencies:					
Agency	**Contact**	**Phone**	**Type of Application**	**Application/ Permit #**	**Status**
☒San Francisco Bay Regional Water Quality Control Board (RWQCB)	Xavier Fernandez	510-622-5685 xaviere.fernandez@waterboards.ca.gov	CWA Section 401 Permit and/or Waste Discharge Requirements		Select One
☒ US Army Corps of Engineers (Corps)	Roberta Morganstern	415-503-6782 roberta.a.morganstern@usace.army.mil	404 Nationwide 27	2005-29476N	Select One
☒CA Dept of Fish and Wildlife (DFW)	Scott Wilson	707-944-5500 scott.wilson@wildlife.ca.gov	1602 LSAA		Select One
☐US Environmental Protection Agency (EPA)			CWA 404 Individual		Select One
☐US Fish and Wildlife Service (FWS)			As suggested by US EPA for Sec. 7 consultation		Select One
☐National Marine Fisheries Service (NMFS)			As suggested by US EPA for Sec. 7 consultation		Select One
☐US Coast Guard			Section 9 Bridge		Select One
☒ San Francisco Bay Conservation and Development Commission (BCDC)	Jaime Michaels	415-352-3613 Jaime.michaels@bcdc.ca.gov	Administrative-Minor		Select One
☐CA Lands Commission			Select One		Select One
☐Federal Funding Agency					Select One
☐ Lead Local Agency			CEQA		Select One
☐ Other Local Agency			Local Permit		Select One
☐ Other Local Agency			Local Permit		Select One

SECTION ONE – TO BE COMPLETED BY ALL APPLICANTS

Attach additional sheets, if needed

Box 1 Project Name **Bel Marin Keys Wetland Restoration Project – Phase 1**		**Applicant Name** **California State Coastal Conservancy**	
Business/Agency Jeff Melby, Project Manager California State Coastal Conservancy			
Mailing Address 1330 Broadway, 13th Floor, Oakland, CA 94612-2530			
Work Phone 510-286-4088	Home Phone	Fax #	E-mail Address Jeff.melby@scc.ca.gov
Relationship of applicant to property: ☒Owner ☐ Purchaser ☐Lessee ☐ Other _____			
Application is hereby made for a permit or permits to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. I hereby grant to the agencies to which this application is made, the right to enter the above-described location to inspect the proposed, in-progress or completed work. I agree to start work only after all necessary permits have been received.			
Signature of applicant			Date

Box 2 Authorized Agent/Operator Name and Signature (***If an agent is acting for the applicant during the permit process)***			
Mailing Address			
E-mail Address			
Work Phone	Home Phone	Fax #	Cell Phone #
I hereby designate the above named authorized agent to act as my agent in matters related to this application for permit(s). I understand that I am bound by the actions of my agent and I understand that if a federal or state permit is issued, I, or my agent, must sign the permit.			
Signature of applicant			Date mo/date/year
I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete, and accurate.			
Signature of authorized agent			Date mo/date/year

Box 3 Name of property owner(s), if other than applicant.			
Mailing Address			
E-mail Address			
Work Phone	Home Phone	Fax #	Cell Phone #
I understand I am bound by actions of authorized agent and/or the applicant.			
Signature of property owner (except public entity landowners)			Date mo/date/year

This page must be signed by the applicant, property owner and agent to be considered complete.

Box 4 Location, including street address, city, county, zip code where proposed activity will occur BEL MARIN KEYS BOULEVARD, CITY OF NOVATO, MARIN COUNTY 94949	
Waterbody: Novato Creek, Bel Marin Keys South Lagoon, San Pablo Bay Tributary to: San Pablo Bay	
Latitude & longitude if known: 38.076046, -122.501232	Zoning Designation: Marin County Open Space
Assessors parcel number: 157-172-08, 157-172-38, 157-172-37, and 157-172-07	Section, Township, Range, USGS Quadrangle Map, Latitude/Longitude: Novato Quad: Sections 23 and 26, Township 3N, Range 6W Petaluma Point Quad: Sections 22, 27, and 43, Township 3N, Range 6W Lat/Long: 38° 7'29.47"N, 121°59'15.86" W,

Box 5 Existing site conditions: Describe the existing condition of the site, including wetlands, channels, streams, ponds, seeps and ditches, and other jurisdictional features. Include information on elevations, vegetation, property use, and structures. Use additional pages if necessary. **If any portion of the proposed activity has already been initiated or completed on this property, indicate type of activity and month and year of completion, if applicable:**

See the JARPA Supplement, Chapter 4

Box 6 Proposed project starting date: Spring 2017

Estimated duration of activity: 2 years Estimated completion date: December 2019
Will the project be constructed in stages? ☒ Yes ☐ No
Describe any anticipated activities that will take place during the rainy season (October to April)? See the JARPA Supplement, Chapter 3

Box 7 Description of the proposed project: Use as many pages as necessary to describe the project as completely as possible. Describe the area within the project site that will be used each for development features and open space. Include construction plans pertaining to the project. For additional guidance on what to include, refer to the instructions.

The proposed project would occur on 906 acres of state-owned BMKV property that has been farmed for at least the past 33 years, and has subsided approximately 9-10 feet. The project would involve creation of seasonal wetlands and upland habitat; constructing a new outboard levee (landward of the existing one) using on-site material; and modifying site drainage, site access, and existing utility pipelines and pumps. The project would involve cut and fill (and balance on-site) of approximately 1.8 million cubic yards of native soil. The cut would occur from 434 acres within borrow areas and the fill placed over 95 acres to construct a new outboard levee. Project construction would commence in the spring of 2017, and is expected to take two construction seasons to complete. The project is being designed to include a wetland system that would not require extensive management or intervention, and minimal changes to existing site management practices (e.g., mowing and pump operations). However, until native wetland habitat is established, non-native invasive plant control would be conducted as needed.

See the JARPA Supplement, Chapter 3, for additional information.

Specify the equipment and machinery to be used to complete the project

See the JARPA Supplement, Chapter 3

Will water be present in the waterbody during the proposed work period?
☒ Yes ☐ No

Will the proposed project require work in the wetted portion of the channel?
☐ Yes (enclose a plan to divert water around the worksite) ☒ No

Existing agricultural drainage ditches convey surface runoff in the wet season and pond, but do not convey, groundwater in the dry season. Channels that would be bisected by the new outboard levee during dry season construction would be bermed on the downstream (and possibly upstream) side, and any groundwater seeping into those channels would be allowed to pond. Given the groundwater elevation, gradient, and the channel depths, these ponds would not be expected to approach top of channel bank during the dry season. Water that ponds in the bisected channels during the first year's dry season would be used for soil conditioning during levee construction. Prior to the start of the first construction year's rainy season, a new collector channel would be constructed along the land side (west) of the new outboard levee and would intercept the downstream ends of bisected channels, and would convey any wet season flows.

See the JARPA Supplement, Chapter 3, for additional information.

Purpose of the proposed project:

The purpose of the Bel Marin Keys Wetland Restoration Project – Phase 1 is to enhance and create seasonal wetlands; reestablish habitat for special-status species; and to protect of existing inland development and habitats from increased risk of inundation due to climate change and sea level rise.

See JARPA Supplement, Chapter 3, for additional discussion.

Environmental Documents (non-CEQA): List any environmental studies, surveys, etc. that have been prepared for the project and/or the project site. Provide the date of the document and the name of the individual, firm, or agency that prepared it. Attach additional pages as needed. See instructions.

Wetland Delineation Report (ESA 2016a); Appendix A
Biological Assessment (ESA 2016b); Appendix B
Cultural Ressources Report Addendum (ESA 2016c); Appendix E
Draft Geotechnical Report (Hultgren-Tillus Engineers 2016); Appendix G

See special section of the instructions on drawings, figures and photographs. Attach figures, maps, and directions to the project site. One set of original or good quality reproducible drawings must be attached to applications to each agency**.** Applicants are encouraged to submit photographs of the project site, but these do not substitute for drawings. BCDC, the Corps Of Engineers and Coast Guard require at least one set of drawings on 8-1/2 x 11 inch sheets.

Box 8A Placement of Structures And/Or Fill Material in Waters under Army Corps Jurisdiction

- Will fill be placed below the ordinary high water line for fresh waters? ☒ Yes ☐ No
- Will rock, fill, bulkhead, pilings, structures or other material be placed waterward of the mean high water line for tidal waters? ☐ Yes ☒ No
- Will fill be placed below the high tideline in tidal waters? ☐ Yes ☒ No

If applicable, number of linear feet of impact _____ feet
Amount of **total** fill - _____ cubic yards, _____ square feet, _____ acreage
Amount of fill **below the ordinary high water mark or high tide line** 10,200 cubic yards 3.15 acreage
(2.851 acres permanent fill, 0.304 acre temporary fill [culverts])
Type of fill: native soils and reinforced concrete or high-density polyethylene culverts
Material source: on-site materials excavated from borrow areas shown in the project maps.
See JARPA Supplement, Chapters 3, 5, and 6.

Box 8B Waterway Impacts: Placement of Structures and/or Fill in Waters of the State

Will the project or activity involve work in the bed, bank or channel of a river, stream (including seasonal streams), or lake? ☐ No ☒ Yes

If yes, describe both temporary and permanent impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

Waterway Impacts - See JARPA Supplement, Chapters 5 and 6)

Will the project affect any vegetation? ☐ No ☒ Yes. If yes, complete Box 17-FG11

Box 9 Impacts on Wetlands

- Will the proposed project have temporary or permanent impacts to wetlands, including isolated wetlands, seasonal wetlands, managed wetlands or on tide or submerged lands (i.e. fill, flooding, draining)? ☒ Yes ☐ No

If yes, please describe the wetlands, using additional pages as necessary. Provide one or more photographs of the existing conditions.

Wetlands description - see JARPA Supplement, Chapter 6

- If a wetlands delineation has been completed, please submit it with application. ☒ Yes, Attached ☐ No
- If a geology or soils report has been prepared, please submit with application. ☒ Yes, Attached ☐ No

See JARPA Supplement, Appendices A and G.

Box 10 Potential for Impacts to Threatened and Endangered Species

Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site? ☒ Yes ☐ No ☐ Unknown

If yes, list here:

- Ridgway's rail (*Rallus obsoletus*) (federally-listed as endangered)
- Western snowy plover (*Charadrius alexandrines nivosus*) (federally-listed as threatened)
- Salt marsh harvest mouse (*Reithrodontomys raviventris*) (federally-listed as endangered)
- California black rail (*Laterallus jamaicensis coturniculus*) (state-listed as threatened)

Identify the source(s) of information that supports a "yes" or "no" answer above:

Biological Assessment (ESA 2016b); see JARPA Supplement, Appendix B

Jones & Stokes. 2003. Final supplemental environmental impact report/environmental impact statement (SEIR/EIS) Bel Marin Keys Unit V expansion of the Hamilton Wetland Restoration Project. April. Oakland, CA. Prepared for the California State Coastal Conservancy and U.S. Army Corps of Engineers.

Have surveys, using US Fish and Wildlife Service protocols, for possible listed species been conducted?
☐ Yes, Attached ☒ No

If a federal or state listed species is being impacted, a biological assessment or study may be required to evaluate potential project impacts on biological resources. Has such a study been completed? ☒ Yes, Attached ☐ No

Has a hydrological study been completed for the project or project site? ☐ Yes, Attached ☒ No

Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.

Box 11 Avoidance of Impacts
Provide a full, technically accurate description of the entire activity and associated environmental impacts, including areas outside of jurisdictional waters. (90 percent of applications to the Regional Board require an Alternatives Analysis.) See instructions.

Avoidance of Watercourse Impacts - see JARPA Supplement, Chapters 5 and 6

Box 12 Mitigation
Describe the size, type, location, function, and values of the proposed mitigation and a time line for implementation. Describe success criteria, monitoring, and long-term funding, management, and protection of the mitigation site. Attach A Mitigation Plan, if needed. Attach additional pages as needed. See instructions and contact APPROPRIATE AGENCY staff for additional assistance.

Mitigation - see JARPA Supplement, Chapter 8

Box 13 Excavation And/Or Dredging
For Non-Navigational Dredging Projects (construction, flood control, remediation, etc.) that do not propose disposal or reuse of dredged materials in aquatic environments [Navigational Dredging Projects or Dredging Projects that Propose Aquatic Placement of Dredged Material for which Testing may be Needed should be completed through the Dredged Material Management Office (DMMO)**]**.

Will excavation or dredging be required in water or wetlands? ☐ Yes ☒ No

If dredging or excavation:

- Volume: _____ (cubic yards)/area_____ (acres)/_____ (linear feet of channel)
- Composition of material to be removed:_____
- Disposal location for excavated material:_____
- Method of dredging:_____
- Purpose of the dredging: _____
- Estimated future maintenance dredging required annually: _____ cubic yards
- Additional information to be provided in an attachment ☐ Yes ☒ No

Box 14 Environmental Impact Documentation
Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

X Yes (*Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each*)

☐ No (*Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared*)

☐ Notice of Exemption ☐ Mitigated Negative Declaration X NEPA document (*type*): __SEIR/EIS_____

☐ Initial Study X Environmental Impact Report ☐ CESA document (*type*): _____

☐ Negative Declaration ☐ Notice of Determination *(Enclose)* ☐ ESA document (*type*): _____

☐ THP/ NTMP ☐ Mitigation, Monitoring, Reporting Plan

State Clearinghouse Number: SCH# 1998031053

Has a CEQA lead agency been determined? ☒ Yes ☐ No
If yes, CEQA Lead Agency California State Coastal Conservancy
Contact Person Jeff Melby
Telephone Number 510-286-4088

If the project described is part of a larger project or plan, briefly describe the larger project or plan.

The proposed project is the first of a multi-phase expansion of the Hamilton Wetlands Restoration Project (HWRP). The HWRP restored to tidal wetlands 950 acres of the former Hamilton Army Airfield. The BMKV expansion project envisions restoration of an additional 1,600 acres of tidal and seasonal wetlands on property north of and adjacent to the HWRP site. The proposed project is Phase 1 of a multiphase effort to implement the BMKV expansion project. The Phase 1 Project involves construction of a new outboard levee (inboard of the existing levee) and enhancement and creation of 25 acres of seasonal wetlands. Future phases would involve beneficial reuse of dredge material to address subsidence and elevate the site to a sustainable marsh plain elevation, breaching the existing outboard levee to reestablish tidal connectivity, and additional enhancement and creation of seasonal wetlands on the landside of the new outboard levee.

Box 15 Public Notice Has a federal agency or the applicant provided public notice of this application for water quality certification?

Federal Agency ☐ Yes If yes, date, , and ☒ No

Applicant ☐ Yes If yes, date, , and ☒ No

Other ☐ Yes If yes, date, , and ☒ No

If public notice has not been made, please provide the names, addresses and telephone numbers of adjoining property owners, lessees, etc. *(Note that local governments may require additional notice – consult your local government agency.)*

Name	Address	Phone number
SEE ATTACHMENT		

Box 16 Site Inspection

☐ In the event that public agencies determines that a site inspection is necessary, I hereby authorize public agency representatives to enter the property where the project described in this application will take place at any reasonable time, and hereby certify that I am authorized to grant public agency representatives such entry.

☒ I request agencies first contact (*insert name*) _____Jeff Melby_____ at (510) 286-4088 to schedule a date and time to enter the property where the project described in this application will take place. I understand that this may delay the issuance of project permits.

End of Section One

Section Two – Agency Specific Requirements for Project Permitting

Box 17 Department of Fish and Game – Projects Adjacent to Creeks, Streams, Lakes, and the Bay

☐ **This project does not involve this agency (no additional questions completed)**

FG4. AGREEMENT TERM REQUESTED

☒ Regular (5 Years or less) ☐ Long Term (greater than 5 years)

Project Term		Seasonal Work Period		Number of work days
Beginning (year)	Ending (year)	Start Date (month/day)	End Date (month/day)	
2017	2019	March 2	January 15	400

FG5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment.

A.	☒ Standard *(Most construction projects, excluding the categories listed below)*
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*) *Mine I.D. Number:* _____
C.	☐ Timber Harvesting (*Attachment B*) THP *Number:* _____
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*) *SWRCB Number:* _____
E.	☐ Routine Maintenance (*Attachment D*)
F.	☐ DFG Fisheries Restoration Grant Program (FRGP) *FRGP Contract Number:* _____
G	☐ Master
H.	☐ Master Timber Harvesting

FG6. FEES

	A. Project	B. Project Cost	C. Project Fee
1	Bel Marin Keys Wetland Restoration Project – Phase 1	$14 Million	$4,912.25
2			
3			
4			
5			
		D. Base Fee *(if applicable)*	
		E. TOTAL FEE ENCLOSED	$4,912.25

Box 17 Department of Fish and Game

FG7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☐ Yes (*Provide the information below*) X No

Applicant: _____ Notification Number: _____ Date: _____

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

X No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

FG8. PROJECT LOCATION

Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway

D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts? ☐ Yes X No ☐ Unknown

E. County: Marin

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Novato	3N	6W	23, 26	
Petaluma Point	3N	6W	22, 27, 43	

K. Meridian (*check one*) ☐ Humboldt X Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

157-172-08, 157-172-38, 157-172-37, and 157-172-07

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)*

Latitude/Longitude	*Latitude:* 38° 7'29.47"N	*Longitude:* 121°59'15.86" W
	X Degrees/Minutes/Seconds ☐ Decimal Degrees ☐ Decimal Minutes	
UTM	*Easting:* 38.076046	*Northing:* -122.501232 X Zone 10 ☐ Zone 11
Datum used for Latitude/Longitude or UTM	☐ NAD 27	X NAD 83 or WGS 84

Box 17 Department of Fish and Game

FG9. PROJECT CATEGORY AND WORK TYPE *(Check each box that applies)*

PROJECT CATEGORY	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR/MAINTAIN EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☐	☐
Bank stabilization – rip-rap/retaining wall/gabion	☐	☐	☐
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☐
Culvert	X	☐	☐
Debris basin	☐	☐	☐
Dam	☐	☐	☐
Diversion structure – weir or pump intake	X	☐	☐
Filling of wetland, river, stream, or lake	X	☐	☐
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	X	☐	☐
Levee	X	☐	☐
Low water crossing	☐	☐	☐
Road/trail	X	☐	☐
Sediment removal – pond, stream, or marina	☐	☐	☐
Storm drain outfall structure	☐	☐	☐
Temporary stream crossing	☐	☐	☐
Utility crossing : Horizontal Directional Drilling	☐	☐	☐
Jack/bore	☐	☐	☐
Open trench	☐	☐	☐
Other *(specify)*: See JARPA Supplement, Chapter 3	X	☐	☐

FG11 PROJECT IMPACTS

B. Vegetation Type	Temporary Impact	Permanent Impact
See JARPA Supplement, Chapters 6 and 8	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____
	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____

C. Tree Species	Number of Trees to be Removed	Trunk Diameter (range)
None	0	

X *Continued on additional page(s)*

FG12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

See JARPA Supplement, Chapter 8

FG 13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. __See JARPA Supplement, Chapter 1 _____ ☐ Applied ☐ Issued

B. _____ ☐ Applied ☐ Issued

C. _____ ☐ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

FG 14 ENVIRONMENTAL REVIEW

Has an environmental filing fee (DFG Code section 711.4) been paid?

X Yes (CEQA CDFW Filing Fees were paid when the EIS/EIR was finalized in 2005) ☐ No (Explain why it has not been paid)

FG 16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

X Yes (Please enclose the information via digital media with the completed notification form)

☐ No

FG 17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

_____ _____

Signature of Applicant or Applicant's Authorized Representative Date

_____

Print Name

End of BOX 17

Box 18 Bay Conservation and Development Commission – Projects on the Shore of the San Francisco Bay or Other BCDC Areas of Jurisdiction

☐ **This project does not involve this agency (no additional questions completed)**

Does the project involve development within the primary management area of the Suisun Marsh? ☐Yes ☒ No If "Yes", provide any relevant Duck Club number(s):_____	Does the project involve development within the 100-foot shoreline band around San Francisco Bay? ☒ Yes ☐No San Francisco Bay Plan Shoreline Designation
Length of shoreline on the project site, in feet: 4,625 Length of Phase 1 Project elements/work within the 100-foot shoreline band (1,690 linear feet along the site's northern boundary and 2,935 linear feet along the site's southern boundary).	Length of shoreline of any adjacent property owned by the owner of the project site, in feet: 2,935 Length of property adjacent to Phase 1 Project elements/work within the 100-foot shoreline band along the site's southern boundary.
Area reserved for non-public access uses: 224,933 Sq. Feet Area of development/work proposed within the 100-foot shoreline band.	Area reserved for public access: 0 Sq. Feet
Total size of underwater and tidal areas of the project site: 0 Sq. Feet	ID Number(s) of previous BCDC permit(s) issued for work on this site: M06-18

Total cost of project. (This means the fair market value of the project, including materials, labor, machine rentals, etc.): $ 14 Million Processing Fee: $14,000

Bay Fill Information - Fill means earth or any other substance or material, including pilings or structures placed on pilings, and structures floating at some or all times and moored for extended periods such as houseboats and floating docks.

- Total Volume of solid fill to be placed in water or marsh areas: 0 cubic feet
- Area to be covered with solid fill: 0 square feet
- Area to be covered with floating fill: 0 sq feet
- Area to be covered with pile-supported fill: 0 sq feet
- Area to be covered with cantilevered fill: 0 sq feet
- Salt pond area to be filled: 0 sq feet
- Managed wetland area in the primary management
- Area of the Suisun Marsh to be filled: 0 sq feet
- Area on new fill to be reserved for private, commercial, or other uses: 0 sq feet
- Area on new fill to be reserved for public access: 0 sq feet
- What is the basic purpose of the new fill in the Bay, salt pond, managed wetland, or certain waterway?

See JARPA Supplement, Chapter 3

Information on Fill provided in an attachment

- Please specify the area of fill, in square feet, proposed to be covered in structures; used for roads; used for parking; used for pathways and sidewalks; covered with landscaping; used for piers, docks, and other maritime related purposes; placed for shoreline protection; and used for other purposes (specify uses).
- Please provide dimensions of portions of all structures to be built on new fill, including length, width, area, height and number of stories.
- Please provide one or more photographs of existing shoreline conditions.

The following information to justify the proposed fill is provided in an attachment:

BCDC can approve new fill for only five purposes: (1) accommodating a water-oriented use;(2) improving shoreline appearance; (3) providing new public access to the Bay; (4) accommodating a project that is necessary to the health, safety, or welfare of the public in the entire Bay Area; and (5) accommodating a project that is consistent with either: (1) the Suisun Marsh Preservation Act and the Suisun Marsh Protection Plan; or (2) the Suisun Marsh Local Protection Program. Please explain how the project is consistent with one or more of these purposes.

- If the fill is to be used for improving shoreline appearance or providing new public access to the Bay, please explain why it is physically impossible or economically infeasible to accomplish these goals without filling the Bay.
- Please explain how the fill will result in a stable and permanent shoreline.

BOX 18 (CONTINUED)

Box 18 BCDC

- Please explain the steps that will be taken to assure that the project will provide reasonable protection to persons and property against hazards of unstable geologic or soil conditions or of flood or storm waters.
- Please provide the names, addresses, and telephone numbers of any licensed geologists, engineers, or architects involved in the project design who can provide technical information and certify to the safety of the project.
- Please explain:
  1. What possible effects the proposed fill would have on the Bay Area, such as (1) any impact on the volume of Bay waters, on Bay surface area, or on the circulation of Bay water; (2) any impact on water quality; (3) any impact on the fertility of marshes or fish and wildlife resources; and (4) any impact on other physical conditions that exist within the area which would be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, or objects of historic or aesthetic significance; and
  2. How the nature, location, and extent of the proposed fill would minimize any possible harmful conditions or effects.
- Please explain how the public benefits of the project would exceed the public detriment from the loss of water or marshlands.
- For marina projects, please indicate how many berths, if any, are to be made available for live-aboard boats and explain how these live-aboard boats will contribute to public trust purposes.

Please identify any other specific policies of the McAteer-Petris Act (California Government Code Title 7.2, especially Section 66605), the Suisun Marsh Preservation Act (California Public Resources Code Sections 29000-29612), the San Francisco Bay Plan and the Suisun Marsh Preservation Plan, and BCDC's regulations regarding minor fill for improving public access and shoreline appearance, that are relevant to and offer support for the project and explain how the project is consistent with these policies.

Shoreline Band Information - Shoreline band means the land area lying between the bay shoreline and a line drawn parallel to and 100 feet from the bay shoreline. The bay shoreline is the mean high water line, or five feet above mean sea level in marshlands.

- Types of activities to be undertaken or materials to be placed within the shoreline band
- Will the project be located within a water-oriented priority use area that is designated in the San Francisco Bay Plan? ☐ Yes ☒No If "yes", please attach an explanation of how the project can be approved despite this inconsistency. If no, complete the questions below:
  - Total shoreline band area within project site: 224,933 sq feet (area of development/work within the shoreline band)
  - Area within shoreline band to be reserved for non-public uses: 224,933 sq feet (area of development/work within the shoreline band)
  - Area within shoreline band to be reserved for public access: 0 sq feet
- **Information about the shoreline work provided in an attachment:**
  - Please describe the area, in square feet, to be covered by structures; used for roads; used for parking; used for pathways and sidewalks; covered with landscaping; used for shoreline protection; and used for other purposes (specify uses).
  - Please identify the total number of parking spaces in the project and within the shoreline band.
  - Please provide dimensions of portions of all structures to be built within the shoreline band, including length, width, area, height, and number of stories.

Environmental Impact Documentation

- Is the project statutorily exempt from the need for environmental documentation? ☐ Yes ☒No If "yes", please attach a statement supporting this exemption.
- Is the project categorically exempt from the need for environmental documentation? ☐ Yes ☒No If "yes", please attach a statement supporting this exemption.
- Has a government agency other than the lead agency certified a "negative declaration" on the project? ☐Yes ☒ No If "yes", please attach a copy of the certified negative declaration. If "no", please provide sufficient information to allow agencies to make the necessary findings regarding all applicable policies.

Has a government agency other than the lead agency, certified an environmental impact document on the project? ☒ Yes ☐ No If "yes", please attach copies of the certification and the document. Also, please provide a summary of the document if it is longer than 10 pages. If "no", please provide sufficient information to allow agencies to make the necessary findings regarding all applicable policies. the certified document must be submitted prior to action on the permit.

BOX 18 (CONTINUED)

Box 18 BCDC

Public Access Information

- Does public access to the shoreline or views to the bay presently exist on the site of a property contiguous to the project? ☐ Yes ☒ No

  If "yes", please attach a description of the public access. If "no", explain what is preventing public access to the shoreline.
- Will the project block public views of the bay or adversely impact present or future public access to the shoreline? ☐ Yes ☒ No

Please describe why the project will or will not affect public views or public access to the shoreline. For most large projects, identify: (1) the existing number of people or employees using the site; and (2) the existing number of cars, bicycles, and pedestrians visiting the site and the level of service of all nearby roads leading to the site. Please describe how the project will change these factors. Please describe the impact the project is expected to have on the existing use of the site and on existing public views or physical public access at the site. Please describe the impact the project is expedited to have on the public's use of existing nearby parks, public access, public parking and other recreational areas on the shoreline and the roads leading to the site.

- Do public safety considerations or significant use conflicts make it infeasible to provide new public access to the shoreline on the project site? ☐ Yes ☒ No

If "yes", please attach a description of the public safety considerations or significant use conflicts which make it infeasible to provide public access at the project site and either (1) identify an offsite area where public access to the shoreline is to be provided as part of the project and describe the proposed public access at a specified offsite location, or (2) provide an explanation as to why no offsite public access is proposed as part of the project.

- Summarize the public access to be provided as part of the total project:
- Total amount of public access 0 sq feet
- Length of waterfront public access area 0 feet
- Number of parking spaces for public access area 0
- Area and width reserved for view corridor (s) 0 sq feet

Detailed information about public access to be provided in an attachment: Please describe, in square feet, length and width, when appropriate, the existing and proposed public access areas and improvements, including areas used for decks, piers, pathways, sidewalks, landscaping, parking, and other public features. Please describe how the public access area facilities would be accessible to handicapped persons. Please describe the connections to existing public streets or offsite public pathways. Specify how the public access will be permanently guaranteed (e.g. dedication, deed restriction, etc.).

Disclosure Of Campaign Contributions

The following contributions of $250 or more were made by the applicant or applicant's agent to a BCDC commissioner or commissioner's alternate in the preceding twelve months to support the commissioner's or alternate's campaign for election to a local, state or federal office:

Contribution made to:_____ Contribution made by: _____ Date of contribution: _____

☒ No such contributions have been made

END OF FORM

CHAPTER 1
Introduction

1.1 Purpose of this Supplemental Information Document

This document provides supplemental information to support the Joint Aquatic Resource Permit Application (JARPA) for the Hamilton Wetlands Restoration Project, Bel Marin Keys Unit V (BMKV) Expansion – Phase 1 (Phase 1 Project) sponsored by the State Coastal Conservancy (SCC). **Appendix A** provides the Jurisdictional Delineation Report (ESA, 2016a) that was field-verified by the U.S. Army Corps of Engineers (Corps) on June 6 and 10, 2016 (Box 8A, 8B, and 9). **Appendix B** provides the Biological Assessment prepared for the Phase 1 Project (ESA, 2016b) (Box 10). **Appendix C** presents the applicable mitigation measures identified in the BMKV Supplemental EIR/EIS that are applicable to the Phase 1 Project (Box 11 and Box FG12). **Appendix D** provides a list of adjoining property owner names and addresses (Box 15). **Appendix E** provides the Cultural Resources Inventory and Evaluation Reports prepared for the Phase 1 Project (Jones & Stokes 2004; ESA, 2016c). **Appendix F** includes the completed Corps Pre-Construction Notification (PCN) form. **Appendix G** includes a draft geotechnical engineering report.

1.2 Project Compliance with the Terms and Conditions of Nationwide Permit 27

The Phase 1 Project is expected to meet the terms and conditions for authorization under Nationwide Permit 27 – *Aquatic Habitat Restoration, Establishment, and Enhancement Activities,* as the Phase 1 Project consists of the following:

- A project that will support the restoration and enhancement of tidal wetlands, tidal streams, and tidal open waters, which will result in net increases in aquatic resource functions and services;
- A restoration project which includes the following proposed activities:
  - the backfilling of artificial channels; the removal of existing drainage structures, such as drain tiles, and the filling, blocking, or reshaping of drainage ditches to restore wetland hydrology;
  - the installation of structures or fills necessary to establish or re-establish wetland or stream hydrology;
  - activities needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species;

  - reestablishment of submerged aquatic vegetation in areas where those plant communities previously existed;
  - measures to support reestablishment of tidal wetlands in tidal waters where those wetlands previously existed;
  - mechanized land clearing to remove non-native invasive, exotic, or nuisance vegetation;
  - and other related activities.
- The Phase 1 Project proposes the planting of only native plant species at the site.
- The Phase 1 Project does not propose compensatory mitigation; the project would result in net increases in total area and value of aquatic resource functions and services on the site.

Based on the Terms and Conditions of the 2012 Nationwide Permit 27, and on the elements and activities proposed, the Phase 1 Project qualifies for authorization under Nationwide Permit 27.

1.3 Regulatory Overview

Potentially interested or affected resource agencies, their governing regulations, and the associated authorizations and/or consultation processes that may be required for Project implementation are described in the following table.

Agency	Governing Regulation	Potential Requirement
Federal		
U.S. Fish and Wildlife Service	Endangered Species Act, Fish & Wildlife Coordination Act (FWCA), Migratory Bird Treaty Act (MBTA)	Section 7 Formal Consultation
National Marine Fisheries Service	Endangered Species Act, FWCA, Marine Mammal Protection Act, and Magnuson-Stevens Fishery Conservation and Management Act	No Section 7 Consultation anticipated. The Phase 1 Project would not directly impact protected fish or critical habitat.
State		
Bay Conservation and Development Commission (BCDC)	Coastal Zone Management Act; McAteer-Petris Act, San Francisco Bay Plan	Administrative Permit (minor)
State Water Resources Control Board	Clean Water Act Section 402	NPDES Construction General Permit Notification, SWPPP
San Francisco Bay Regional Water Quality Control Board	Clean Water Act Section 401; Porter-Cologne Water Quality Act	Water Quality Certification/Waste Discharge Requirements
California Department of Fish and Wildlife (CDFW)	Fish and Game Code Section 1600	Lake and Streambed Alteration Agreement
State Historic Preservation Office (SHPO)	National Historic Preservation Act	Section 106 Consultation

1.4 Project Applicant (Boxes 1 and 2)

Project Applicant

California State Coastal Conservancy
Jeff Melby, Project Manager
1330 Broadway, 13th Floor, Oakland, CA 94612-2530
Telephone: (510) 286-4088
Email: jeff.melby@scc.ca.gov

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CHAPTER 2
Project Context

2.1 Project Location (Box 4)

The Project site is located near the City of Novato, in Marin County, east of U.S. Highway 101 and south of CA Highway 37 (**Figure 2-1**). The Phase 1 Project would occur entirely on the Bel Marin Keys Unit V (BMKV) property owned by the SCC (**Figure 2-2**). The Project site is located southwest of the City of Novato at the eastern terminus of Bel Marin Keys Boulevard.

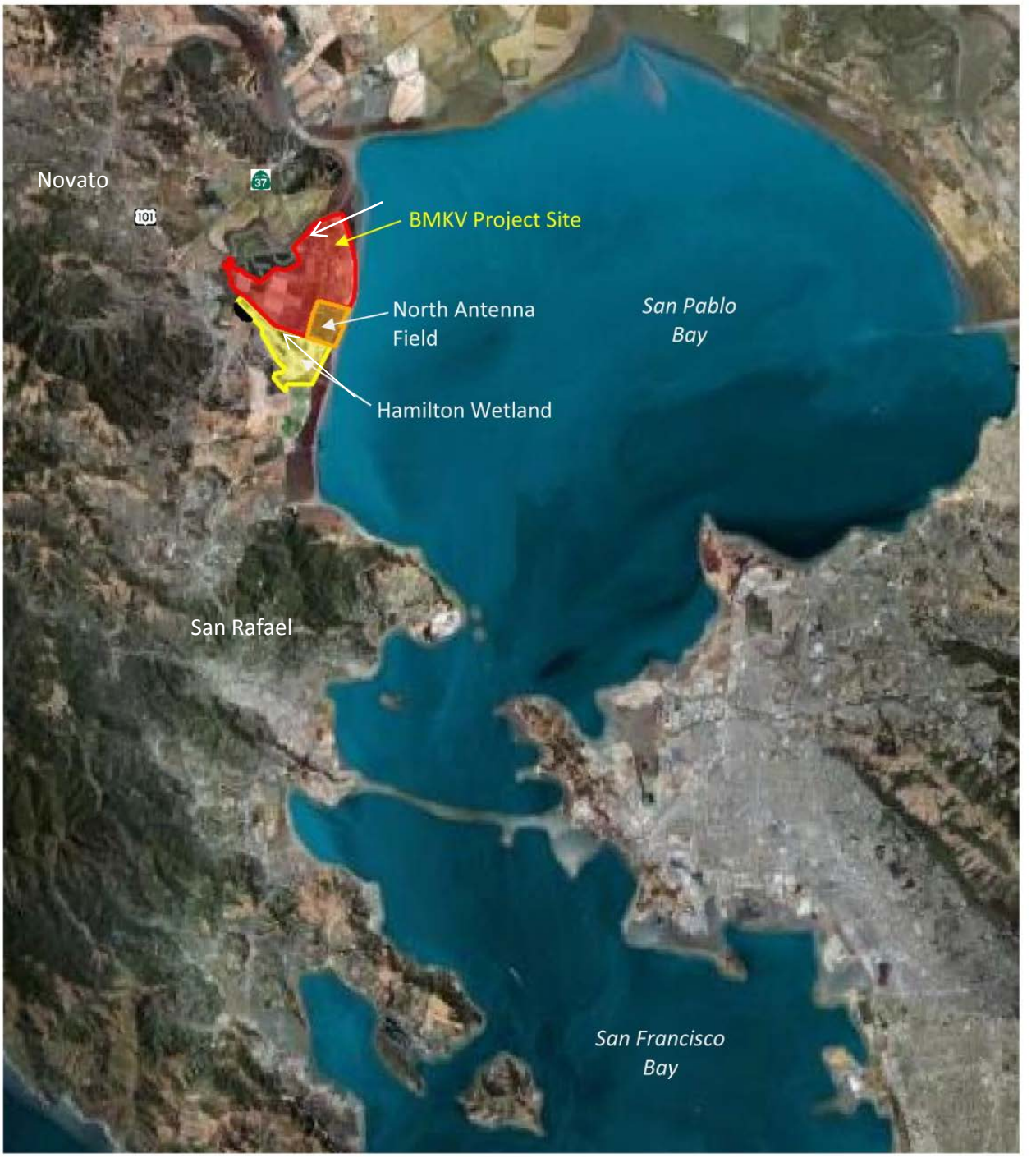
The Phase 1 Project site encompasses approximately 60 percent of the BMKV property. Beginning at the north end of the site and proceeding counter-clockwise, the Phase 1 site is bordered by Novato Creek to the north, the Bel Marin Keys South Lagoon and agricultural land to the west, the restored former Army Airfield of the Hamilton Wetland Restoration Project (HWRP) to the south, a parcel owned by the State Lands Commission (SLC) to the southeast, and agricultural land and San Pablo Bay to the east (Figure 2-2). The Phase 1 site encompasses 906 acres (39,465,360 sq.ft.).

The project site can be found on the Novato and Petaluma Point USGS Quadrangle maps, and at 38° 7'29.47"N, 121°59'15.86" W, within portions of Sections 22, 23, 26, 27,and 34 of Township 3N, Range 6W. The site is contained within Marin County Assessor Parcel Numbers (APN) 157-172-08, 157-172-38, 157-172-37, and 157-172-07, and within hydrologic unit code (HUC) 180500020801.

A supplemental list of adjoining property owners is provided in **Appendix D**.

2.2 Site History and Setting

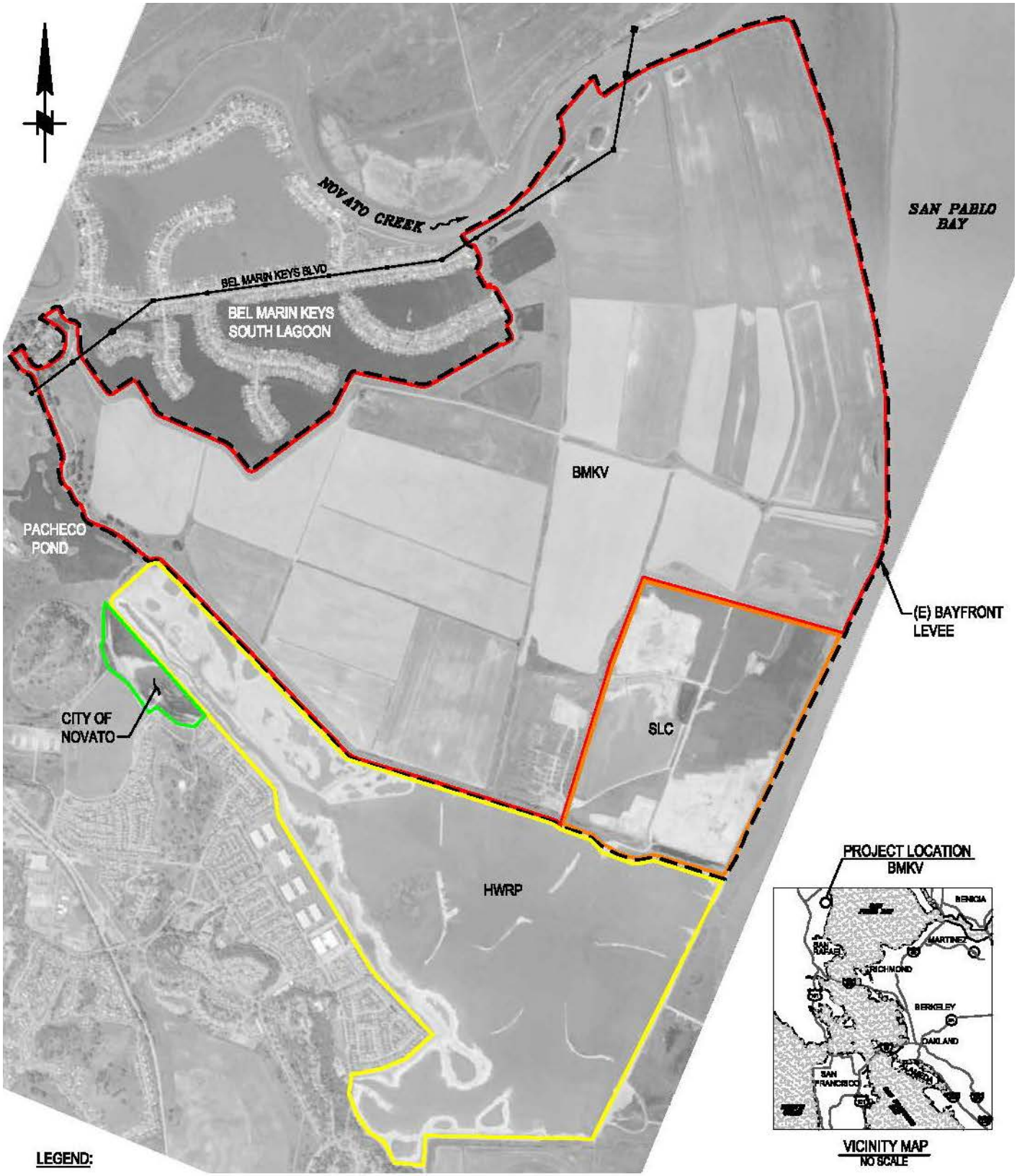
The SCC is leading the effort to restore tidal and seasonal wetlands to a portion of the Novato Creek Baylands ("Baylands"), including the BMKV, in Marin County, California. The Baylands historically spanned several thousand acres along Marin County's San Pablo Bay shoreline in the area of Novato Creek. During the early- to mid-1900s, most of the Baylands' tidal and seasonal wetlands were diked and drained for agriculture and development. Since the mid-1990s, SCC and its agency partners and stakeholders have worked to acquire large tracts of these historic tidal wetlands, and design and implement projects to restore these lands to their approximate pre-reclamation condition.



Bel Marin Keys Wetland Restoration Project – Phase 1 . D150011.00

SOURCE: Moffatt & Nichol 2016, Google Earth 2016

Figure 2-1
Regional Area



SOURCE: Moffatt & Nichol 2016

Bel Marin Keys Wetland Restoration Project – Phase 1 . 150011.00

Figure 2-2

Project Location

In 1998, SCC (as the lead agency for the California Environmental Quality Act (CEQA) process) and the US Army Corps of Engineers (Corps) (as the lead agency for the National Environmental Policy Act (NEPA) process), published an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for wetlands and other habitat restoration on the approximately 950-acre former Hamilton Army Airfield (HAAF) (Jones & Stokes, 2003). The EIR/EIS for the project, commonly referred to as the Hamilton Wetland Restoration Project (HWRP), considered at a programmatic level expansion of the restoration project to include, among other property, the approximately 1,600-acres of diked and farmed Baylands to the north, referred to herein as BMKV property. However, the BMKV expansion was excluded from the selected HWRP alternative due to the BMKV site being in private ownership (Jones & Stokes, 2003). The HWRP was constructed between 2008 and 2013. In April 2014, the bayfront levee was breached, connecting the former HAAF property to San Pablo Bay for the first time in more than 100 years.

In 2001, the SCC purchased the BMKV property. In 2003, SCC (as the lead agency for the CEQA process) and the Corps (as the lead agency for the NEPA process) published a Supplemental EIR/EIS (SEIR/S) for expansion of the HWRP to include the BMKV property (Jones & Stokes, 2003). The SEIR/S considers three action alternatives that involve expansion of the HRWP north into the BMKV parcel and several smaller-scale changes to the authorized HWRP, as well as a no project alternative. Following revisions to address comments received during the Draft SEIR/S public review period, the lead agencies identified Revised Alternative 2 as the preferred alternative (Jones & Stokes, 2003). In July 2004, the Chief of Engineers prepared a report for submittal to Congress ('Chief's Report') recommending the HWRP be modified to include the BMKV expansion (Corps, 2004). The SCC certified the SEIR/S in June 2005. The Corps published its record of decision in December of 2005. The HWRP's BMKV expansion was authorized under the Water Resources Development Act in November of 2007.

At the time of the SEIR/S, the BMKV expansion (i.e., Revised Alternative 2) had not progressed beyond a schematic level of design. In the years since SEIR/S certification, SCC has conducted numerous studies to better understand site conditions and to advance the design of a first implementation phase for the BMKV site restoration (Phase 1 Project). The BMKV Phase 1 Project is the subject of this application.

Phase 1 would disturb approximately 650 acres of the 906-acre Project site within the BMKV property. As described more fully in the following chapters, the Phase 1 Project includes the construction of a new bayfront levee ("New Bayfront Levee") landward of the existing bayfront levee and the creation of seasonal wetlands. Future phases of the BMK Project would include placement of dredged material to raise the site's base elevation, creation of tidal and seasonal wetlands, and breaching the existing bayfront levee to reintroduce tidal waters to the site. Future project phases would be the subject of subsequent permitting efforts, as appropriate.

CHAPTER 3
Project Description (Box 7)

3.1 Project Purpose and Objectives

3.1.1 Basic Project Purpose

The purpose of the Bel Marin Keys Wetland Restoration – Phase 1 Project is to enhance and create seasonal wetlands; reestablish habitat for special-status species; and to protect existing inland development and habitats from increased risk of inundation due to climate change and sea level rise.

3.1.2 Project Purpose and Need

The purpose of the larger HWRP, including the BMKV expansion, is to restore important tidal wetland habitat in San Francisco Bay. Approximately 90 percent of the original (pre-1900) tidal wetlands of San Francisco Bay have been destroyed. This destruction is the result of the diking and filling of the tidal wetlands for purposes of agriculture, urban development, and salt production. This loss of tidal wetlands has greatly reduced the amount of habitat available to many species of fish and wildlife. Several native animal and plant species, including the salt marsh harvest mouse and the Ridgway's rail (formerly California clapper rail), have been listed as in danger of extinction, or endangered, due to reduction in extent and quality of their wetland habitats. Many other species, including migratory birds and numerous fish species, also have been affected by this loss of habitat. The proposed Phase 1 Project would help to counter these trends through site improvements necessary to allow for enhancement and creation of habitat for special-status species.

3.1.3 Project Goals and Objectives

The goal of the HWRP, including the BMKV expansion, is to create a diverse array of wetland and wildlife habitats at the HAAF and BMKV properties that will benefit endangered and other migratory and resident species.

The applicable BMKV expansion project objectives are to:

1. Design and engineer a restoration project that stresses simplicity and minimizes the need for active management.
2. Ensure no net loss of wetland habitat presently occurring at the BMKV site.

3. Create and maintain wetland habitats that sustain viable wildlife populations, with particular emphasis on supporting Bay Area special-status species.

4. Include buffer areas along the upland perimeter of the BMKV expansion area, especially adjacent to residential areas, so wildlife will not be impacted by adjacent land uses.

5. Be compatible with adjacent land uses and wildlife habitats.

6. Provide for public access that is compatible with protection of resource values and with regional and local public access policies.

In addition to those of the BMKV expansion, objectives specific to the Phase 1 Project include:

1. Facilitate achievement of the BMKV expansion project's long-term goals to restore historic tidal wetland habitat at the BMKV site.

2. Create and enhance seasonal wetland habitat resulting in a net gain in wetland acreage, functions, and values.

3. Provide ecosystem functions associated with the combination of seasonal wetlands, and upland interfaces.

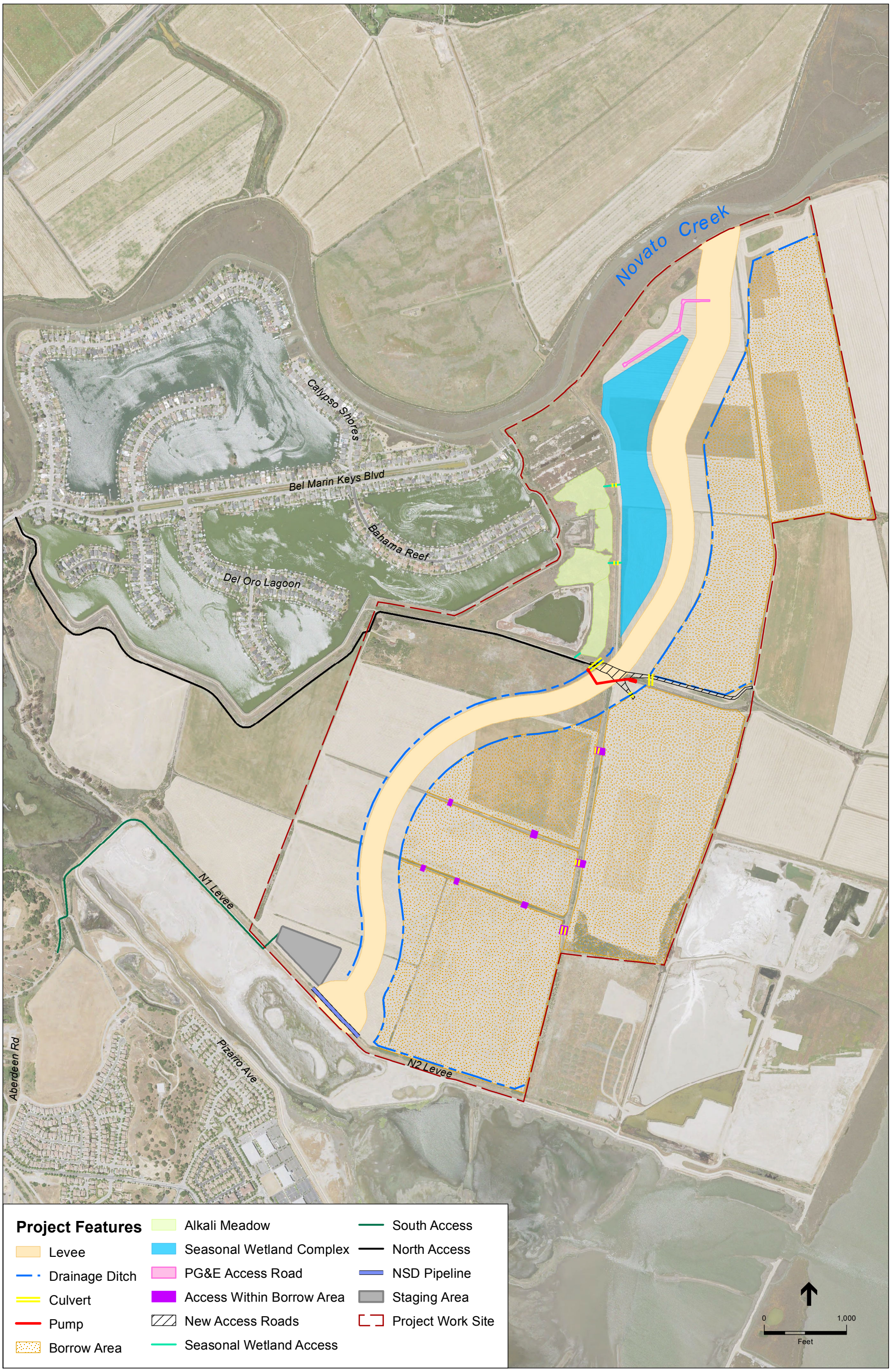
4. Protect existing inland development and habitats from increased risk of inundation due to climate change and sea level rise.

3.2 Project Overview

The Phase 1 Project would occur on 906 acres of state-owned BMKV property that has been farmed for at least the past 33 years, and has subsided approximately 9-10 feet. The Phase 1 Project would involve creation of seasonal wetlands and upland habitat; constructing a new levee using on-site material; and modifying site drainage, site access, and existing utility pipelines and pumps. Each of these elements is described below and summarized in **Table 3-1**. The Phase 1 Project would involve cut and fill (and balance on-site) of approximately 1.8 million cubic yards of native soil. The cut would occur from 434 acres within borrow areas and the fill placed over 95 acres to construct the New Bayfront Levee.

Project construction would commence in the spring of 2017, and is expected to take two construction seasons to complete. The Phase 1 Project is being designed to include a wetland system that would not require extensive management or intervention, and minimal changes to existing site management practices (e.g., mowing and pump operations). However, until native wetland habitat is established, non-native invasive plant control would be conducted as needed.

Project elements are illustrated in **Figure 3-1** and summarized in **Table 3-1**. These elements are described in detail below, based on the conceptual designs. Final project design will be finalized in January 2017, and likely will result in refinement of Project elements. Long-term management and monitoring of the site is discussed in Section 3.5 below.



SOURCE: USDA, 2014; ESA, 2016

Figure 3-1
Proposed Project

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TABLE 3-1
SUMMARY OF PROJECT ELEMENTS

Project Element	Acres	Square feet	Element Purpose and Additional Detail
Total Project Area	906	39,465,360	
New Bayfront Levee	85.95 –Total footprint	3,702,600	The levee would extend for 11,800 linear feet. The access road on the levee crest would be 18 ft. wide.
Borrow Areas	146 – North Borrow Area 288 – South Borrow Area	6,372,000 12,557,000	Excavation of material to create the New Bayfront Levee.
Seasonal Wetland Complex Creation	16	696,960	Creation of seasonal ponds and upland habitat within existing farmland. Up to 0.60 acres of drainage channel would be temporarily impacted during construction in order to ensure proper drainage for the seasonal wetland complex.
Alkali Meadow Creation	9	392,040	Creation of alkali meadow would be adjacent to saline emergent wetland. Up to 0.61 acre of saline emergent wetland would be temporarily impacted during construction of the alkali meadow.
Novato Sanitary District Effluent Pipeline	0.10 – new HDPE pipe 0.003 – new outfall connection	4,250 120	850 feet of new 63” diameter (nominal) HDPE pipe Concrete junction box (10’x 12’)
Site Drainage Modifications	0.53 – new drainage ditch west of new levee 1.43 – new drainage ditches east of new levee 0.05 – new levee pump station and pipe connection 0.001 – culvert at PG&E Access Road 0.02 – culvert at Borrow Area Access, mid-levee	23,160 62,400 2,000 50 800	New drainage ditch would be 5,700 linear feet New drainage ditches would be 15,600 linear feet Pump station outfall to the existing drainage channel (2,000 sqft of hardened bank/bed) PG&E culvert would be 30 feet long Culvert under main access road would be approximately 200 feet long with a diameter between 36-in and 48-in.
Access Roads	0.75 – PG&E Access Road (permanent) 0.59– total area of fill for access crossings within Borrow Areas (8-16 temporary or permanent ditch crossings) 0.04 – total area of fill for access crossings to alkali meadow creation area (2 temporary or permanent ditch crossings)	32,500 27,450	1500-ft long, 20-ft to 40-ft wide, aggregate base 6” to 12” thick Culverts installed in the drainage ditch crossings between borrow areas would range from 50 to 200 feet long with a diameter of 30 or 48 inches. There would be a maximum of 8 temporary and 8 permanent ditch crossings with each being a maximum of 200 feet long and 8 feet wide. There would also be a maximum of two permanent ditch crossings (up to 100 feet long and 8 feet wide) for access to the alkali meadow area. These crossings may be temporary, but are assumed to be permanent for impact calculations.

3.3 Basis of Design

A Preliminary Design Report was prepared in February 2016 by SCC's consulting team (Moffat & Nichol et al, 2016). The report outlines the basis of Phase 1 refinements to the restoration concept evaluated in the 2003 SEIR/S. Since completion of the Preliminary Design Report, the Phase 1 Project has been further refined into that which is presented herein.

3.4 Project Elements

3.4.1 New Bayfront Levee

Under the Phase 1 Project, SCC would construct a New Bayfront Levee. The New Bayfront Levee would be approximately 11,800 linear feet in length, extending in a north-south alignment from the existing levee along Novato Creek's southwestern bank in the north to the existing levees separating the HWRP parcel and BMKV parcel in the south (N1/N2 levees) (Figure 3-1). The new levee alignment would be located approximately 5,000 feet landward or west of the existing bayfront levee (2,300 feet minimum, 6,700 feet maximum distance from the existing bayfront levee). The levee footprint would encompass 95 acres within the BMKV property. While the New Bayfront Levee would not immediately be used for flood protection, it has been designed to meet flood protection standards governed by the Corps and the Federal Emergency Management Agency (FEMA). Accordingly, the levee has been designed for a minimum crest elevation of +12 feet NAVD[1]. The levee crest would be equipped with an 18-foot-wide access road for maintenance vehicles.

The New Bayfront Levee would have a "core" slope of 3H:1V on both sides. Wide, flat stability berms would flank the levee core to provide overall stability. The bayside stability berm would have a 10H:1V slope from elevation +11' down to +1'; the landside (westside) stability berm would have a 10H:1V slope from elevation +8' down to +1'. The purpose of the stability berms is to provide counter balancing weight beyond the toe of the levee's main core. Excavated Bay Mud would be stockpiled on the westside stability berm for later use as fill to adjust the height of the levee crest as the levee settles over time. Additional detail on the levee is provided in Section 3.5.5, *Earthwork*.

3.4.2 Borrow Areas for New Bayfront Levee

Material for the New Bayfront Levee would be sourced from the project site; no fill material would be imported. The volume of material required to construct the levee is estimated at 1.4 million cubic yards (compacted), which would require excavation of approximately 1.8 million cubic yards of material. Levee source material would be excavated from borrow areas on the Project site, bayward of the new levee (Figure 3-1). Fill material would be excavated from approximately 434 acres of existing farmland that's currently divided into approximately 8 farm tracts, some of which are separated by drainage ditches. To access the borrow areas, between 8 and 16 ditch crossings would be constructed. The approximate locations of these ditch crossings are shown in Figure 3-1. The

[1] North American Vertical Datum

culverts would range from 50-ft to 200-ft in length and 30-in to 48-in in diameter. Most of these ditch crossings would remain until the future levee breaching phase to provide the farmer access to the farm tracts for continued agricultural operations post-construction. Levee fill material would be excavated from the borrow areas to a depth of approximately 2 to 3 feet, as illustrated in the cross-sections shown in **Figure 3-2**. Beyond the levee footprint, the configurations of the farm tracts and drainage ditches would not change substantially as a result of project construction; land management practices and site drainage would continue in a manner similar to those of pre-project conditions. Additional detail on the borrow areas is provided in Section 3.5.5, *Earthwork*.

3.4.3 Seasonal Wetland Restoration

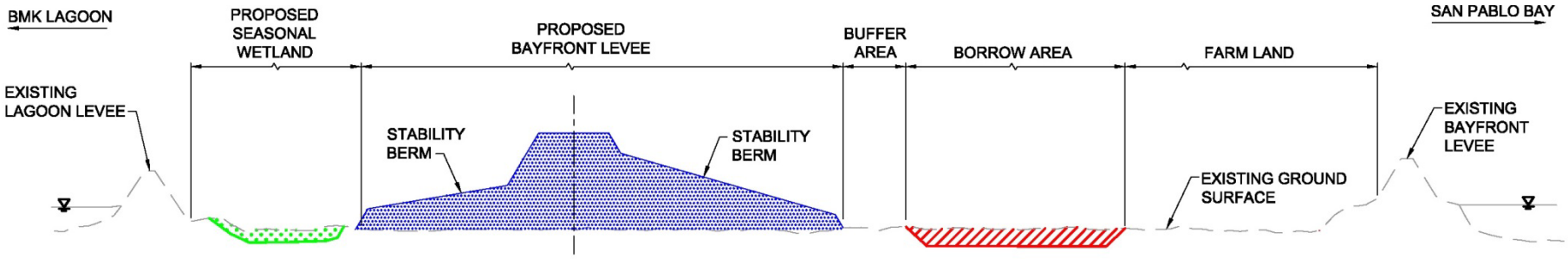
In addition to the New Bayfront Levee, SCC would create or enhance approximately 25 acres of seasonal wetlands on the Project site. Wetland restoration efforts in Phase 1would focus on creation of shallow seasonal depressional wetlands and enhancement of alkali meadow wetlands. The wetland creation areas would occur along the northern portion of the site, between the proposed New Bayfront Levee and the existing Bel Marin Keys South Lagoon Levee (Figure 3-1). The alkali meadow wetlands would be located in proximity to and complement existing wetlands that occur within shallow borrow pits adjacent to the Bel Marin Keys South Lagoon Levee that were created from past levee maintenance and repair activities.

Seasonal Wetland Complex Creation

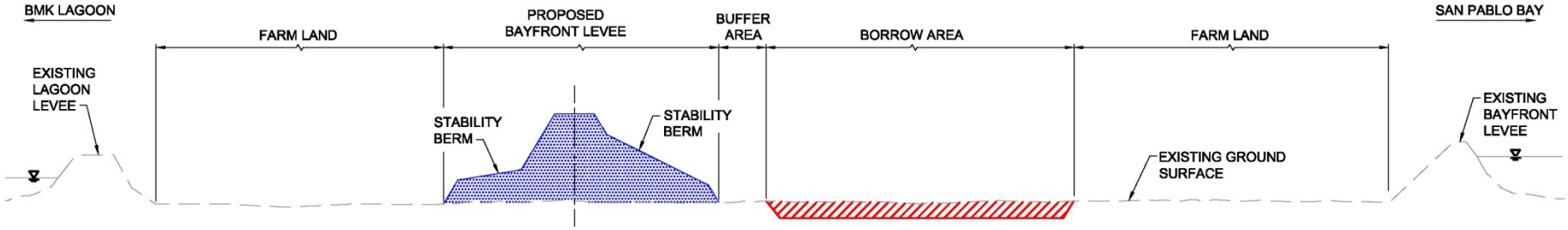
The Phase 1 Project would create shallow depressions (seasonal ponds) and associated high ground to provide a seasonal wetland complex in the northwest portion of the Project site, west of the New Bayfront Levee. Approximately 16 acres of seasonal ponds would be created over approximately 36 acres (Figure 3-1). The created shallow depressions would be approximately 0.5 to 1 acre in size and the maximum depth in each depression would vary between 1 and 2 feet below the existing ground surface in the northern reach of the complex and down to about 2 to 4 feet below existing grade in the southern portion of the complex. The seasonal ponds and associated vegetation that would establish in these depressions would be fed by groundwater and surface-water runoff from precipitation. Depth to groundwater in these locations varies seasonally, based upon weather and due to pumping. The seasonal ponds may vary between freshwater to saline, depending on the existing soil salinity and rainfall. The seasonal ponds would be designed to pool water only in the winter for most years. Water levels would be managed using hand-operated weirs to allow for water ponding, vector control, and control of non-desirable vegetation.

The seasonal ponds would be vegetated with saltgrass in high salinity soil or field sedge (*Carex praegracilis*) and common spikerush (*Eleocharis macrostachya*) in low-salinity soil. Creeping wildrye may also be used to vegetate the transition areas around the seasonal ponds. The seasonal ponds may also be vegetated by dwarf spikerush (*Eleocharis parvula*) if a local seed source can be obtained. Dwarf spikerush has a limited distribution and has a California Rare Plant Rank of 4.3.

The seasonal ponds would provide foraging habitat for dabbling ducks and high tide roost habitat for shorebirds. The vegetative cover and areas around the ponds would also provide suitable nesting habitat for dabbling ducks or songbirds.



Typical Cross-Section through north portion of the site



Typical Cross-Section through south portion of the site

SOURCE: Moffatt & Nichols 2016

Figure 3-2

Illustrative Site Cross-Sections

Alkali Meadow Creation

The Phase 1 Project would use grading and planting to expand and enhance wildlife habitats within the existing saline wetland/open water area immediately east of the Bel Marin Keys South Lagoon. The creation of alkali meadow would cover approximately 9 acres (Figure 3-1). The new alkali meadow areas would result in gentler slopes along the edges of the three existing ponds to increase the extent of the wetland and transition habitat and sculpt more natural, less linear habitat edges.

Planting and seeding would be implemented to re-establish native vegetation in the alkali meadow areas and all other disturbed areas. Vegetation community types in the expanded alkali meadow area would mostly consist of salt grass meadow but also may include creeping wild rye meadow and nontidal saltmarsh plant species. Vegetation may include creeping wildrye (*Elymus triticoides*), field sedge (*Carex praegracilis*), salt grass (*Distichlis spicata*), fat-hen (*Atriplex prostrata*), alkali heath (*Frankenia salina*), pickleweed (*Salicornia pacifica*), and jaumea (*Jaumea carnosa*).

The alkali meadow areas would provide transitional habitat that is lacking in the project area and larger San Francisco Bay Area. Alkali meadows may provide habitat for a wide variety of insects, small mammals, and reptiles, which in turn are important prey for raptors, other birds, and larger mammals.

Temporary Wetlands in New Borrow Areas

An approximately 434-acre area of existing farmland east of the New Bayfront Levee alignment would be excavated to generate borrow material to create the New Bayfront Levee. Excavation in the proposed borrow areas may result in creation of temporary wetland habitat. These potential wetlands could provide habitat for waterbirds and other wildlife. However, any such wetlands or associated habitat would be temporary construction artifacts; during a subsequent phase, the exiting outboard levee would be breached and areas bayward of the New Bayfront Levee would be restored to tidal wetland habitat.

3.4.4 Novato Sanitary District Effluent Pipeline Modification

The Novato Sanitary District (NSD) discharges secondary-treated effluent to San Pablo Bay via a 54-inch diameter reinforced concrete pipe (RCP) operating under pressure. The water in the pipeline is treated effluent from the NSD Treatment Plant in nearby Novato and is discharged into San Pablo Bay or to spray fields to the north of the Project site. Within the Phase 1 Project limits, the pipeline alignment runs generally parallel to and along the north side of the N1/N2 levees (located on the southern border of the BMKV property) and extends east to a submerged outfall in San Pablo Bay.

The New Bayfront Levee would tie in to the north-facing slope of the N1 levee, passing over the existing NSD pipe. To accommodate the new levee tie-in, SCC would abandon 700 feet of the existing outfall pipe within the levee footprint, and install a new 63-inch High Density Polyethylene (HDPE) bypass pipe to convey NSD effluent up and over the New Bayfront Levee. However, the new bypass pipeline would maintain the alignment of the existing effluent pipeline within the

existing NSD easement. A conceptual plan of the new levee tie-in and the bypass are shown in (**Figure 3-3**).

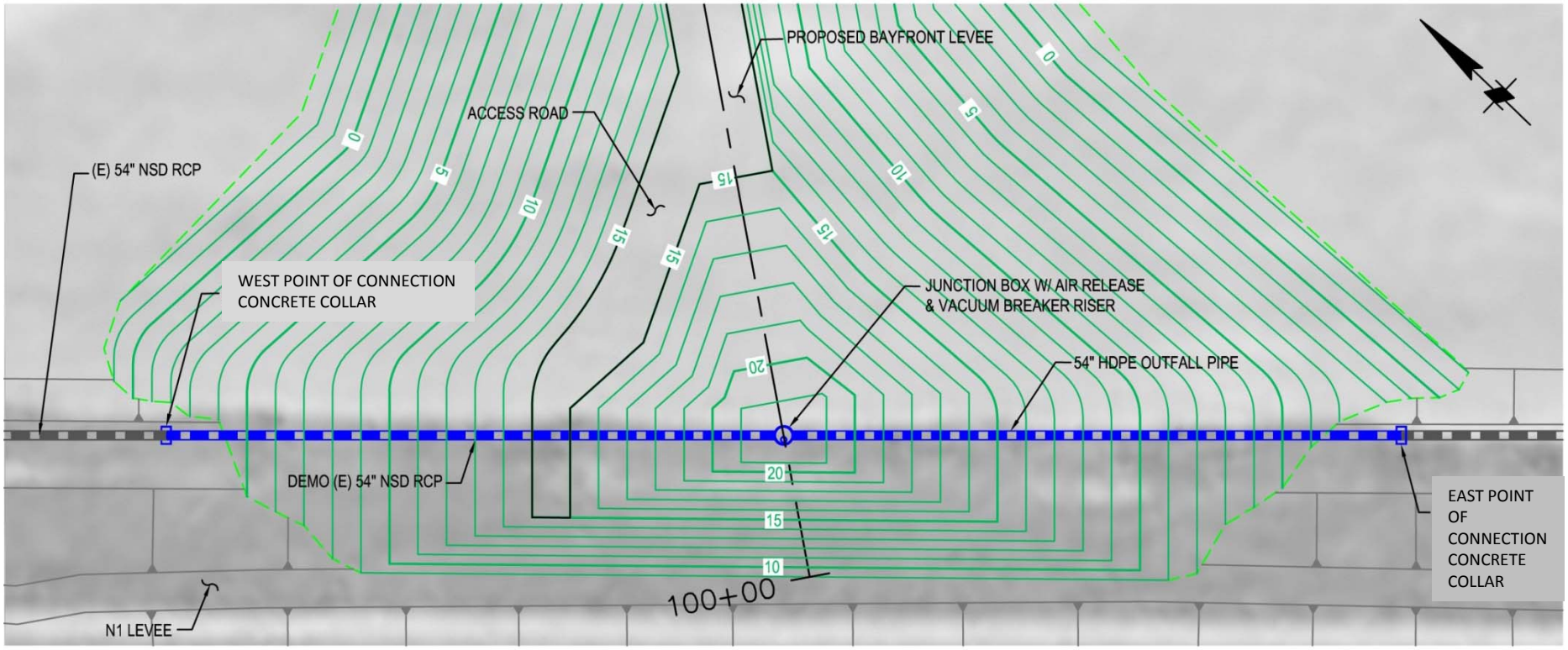
The new HDPE bypass pipe would connect to the existing NSD pipeline with a collar and/or coupling at both ends. The bypass pipe would be equipped with passive air release and anti-vacuum mechanisms connected to a concrete junction box located at the high point of the pipe at the top of the levee tie-in. The new pipeline would pass over the levee crest and not penetrate the levee; additional fill would be placed over the pipe to provide cover and allow maintenance vehicles to pass over the pipe. A lateral service connection, or secondary diversion pipe, would be installed in the NSD pipeline, on the landward side of levee tie-in, to provide water for moisture conditioning of the levee fill, dust control during project construction, and potential use as a source of irrigation water for plant establishment.

3.4.5 Site Drainage Modifications

The Project site is presently drained through a network of agricultural drainage ditches and containment berms. The ditches generally form a grid-like pattern, with channels extending in north-south and east-west orientations. Under current conditions, the drainage ditches route water from the north and south to an east-west collector channel in the center of the site. The collector channel extends east to the existing bayfront levee where an existing pump station conveys runoff over the levee and into San Pablo Bay (**Figure 3-4**).

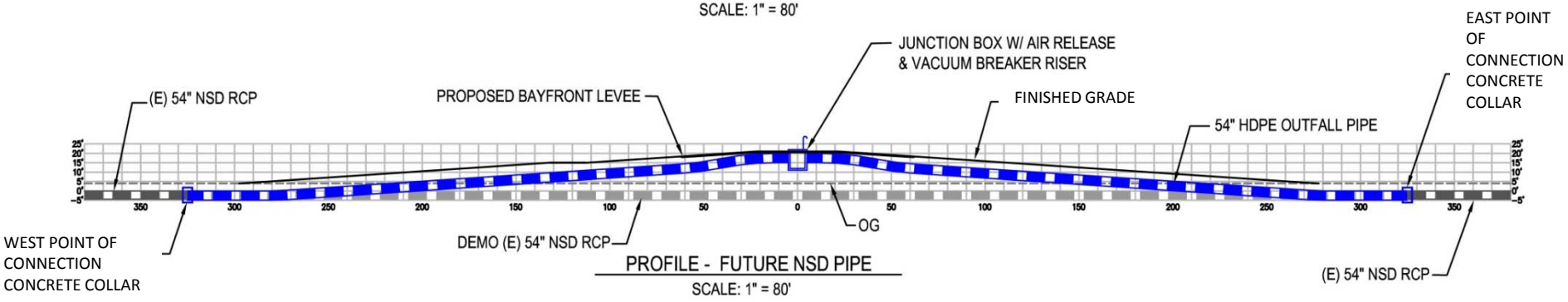
The proposed New Bayfront Levee alignment would bisect several existing agricultural ditches and obstruct flow of surface runoff from the landside of the proposed New Bayfront Levee alignment. To facilitate post-construction drainage, two new drainage ditches would be constructed, one on each side of the New Bayfront Levee. The locations of the ditches are shown in Figure 3-4. Similar to existing conditions, the new drainage ditches would route runoff towards the existing collector channel at the center of the site. North of the pump station, a drainage ditch would not be constructed. Instead, runoff from the New Bayfront Levee would drain to the newly created seasonal wetlands west of the levee.

A new pump station would be installed in the existing collector channel on the west side of the New Bayfront Levee to convey runoff over the levee and into the existing collector channel on the bayside of the New Bayfront Levee (Figure 3-4). The pump would operate by electricity. A new overhead power pole and transformer would be installed at the south side of the existing site access road to connect power to the new pile-supported pump station. The pump would operate automatically with a float-actuated switch or manually. The pump station would connect to two pipes similar to the existing pump station. The pipes would pass over the levee and discharge to the existing main drainage ditch. The pipe outfall in the drainage channel would have an apron of rock on the channel bottom and slopes to prevent scour. The existing pump station at the existing bayfront levee would continue to operate, as needed.



SOUTH TIE-IN & EXISTING NSD PIPE

SCALE: 1" = 80'



PROFILE - FUTURE NSD PIPE

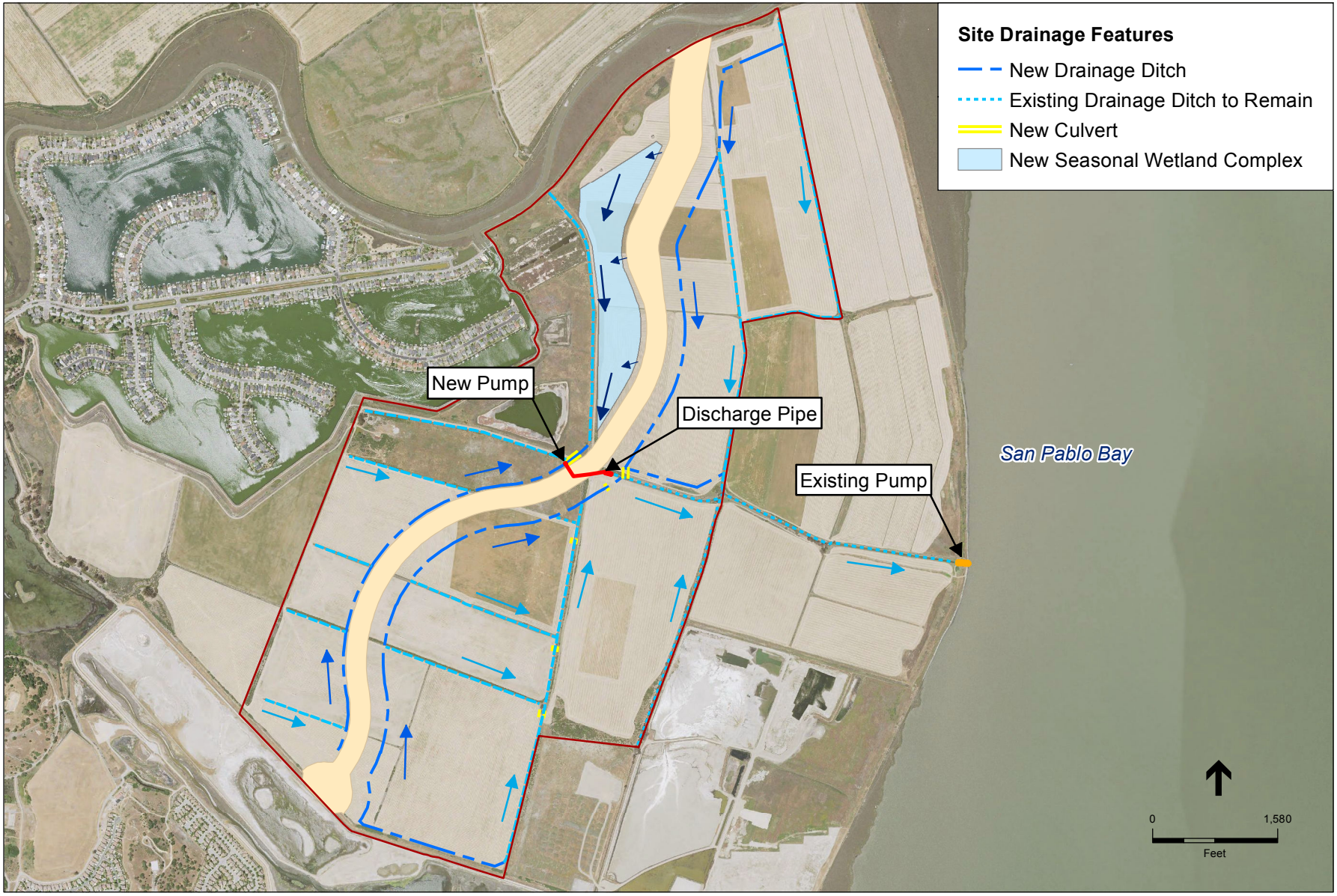
SCALE: 1" = 80'

SOURCE: Moffatt & Nichols 2016

Bel Marin Keys Wetland Restoration Project – Phase 1 . D150011.00

Figure 3-3

South Levee Tie-In & Future NSD Outfall



SOURCE: USDA, 2014; ESA, 2016

Bel Marin Keys Wetland Restoration Project - Phase 1. 150011.00

Figure 3-4

Proposed Site Drainage Modifications

A number of access crossings (as few as 8 and up to 16) would be required within borrow areas over drainage ditches; the minimum number of potential locations have been identified (Figure 3-1) but the actual number and locations of access points would ultimately be determined in the field by the contractor. At all locations a 48-inch (or smaller) diameter culvert would be installed in the drainage ditch and a vehicle crossing constructed. These culverts would be made of reinforced concrete pipe or high-density polyethylene pipe. The culverts would range from 50 to 200 feet long depending on the width of the drainage channel and access road. Most of these ditch crossings would remain to support of continued farming operations until the future levee breaching phase.

Existing ditches on the east side of the New Bayfront Levee would continue to function wherever possible. Existing ditches (or portions of existing ditches) that would no longer be necessary would be filled and areas that need additional drainage would have new drainage ditches excavated. The existing ditches that would be filled include the ditches within the footprint of the New Bayfront Levee and the area east of the levee between the levee and the borrow areas. Some small ditches within the borrow areas would also be filled if they are near a new drainage ditch and the existing ditch would no longer be needed. All ditches would continue to drain toward the existing collector channel in the center of the site.

3.4.6 Pacific Gas & Electric Access Road

To provide continued access to two power transmission towers owned and operated by the Pacific Gas & Electric Company (PG&E), a permanent access road would be constructed within the existing PG&E easement on the northern end of the Project site, west of the New Bayfront Levee and south of Novato Creek. The access road would be 1,500 feet long and approximately 20 to 40 feet wide. The road would have an aggregate base to provide all-weather access to the transmission towers located within the Project site.

A culvert may be located under the new PG&E access road adjacent to the landside (westside) levee toe. The culvert would be 30-ft long and 18-in in diameter. This culvert would divert stormwater north of the PG&E access road and discharge into the newly created seasonal wetland complex.

3.5 Construction Methodology (Box 6)

This section describes the proposed construction phasing and schedule, workforce and equipment required, site preparation steps, construction earthwork, and proposed site restoration methods for the Phase 1 Project. Applicable impact avoidance and minimization measures identified in the BMKV Supplemental EIR/EIS (Jones & Stokes 2003) (**Appendix C**) would be implemented.

3.5.1 Construction Phasing and Schedule

Project construction would be completed over two years. Construction would progress from south to north starting in spring 2017. The Phase 1 project is expected to be complete by December 2019. The levee construction would span two years, with approximately half the final levee height constructed in the first year and the final height achieved in the second year. Subsequent levee height adjustments would be made over the next 20 years to address anticipated settlement of the levee crest.

Year 1

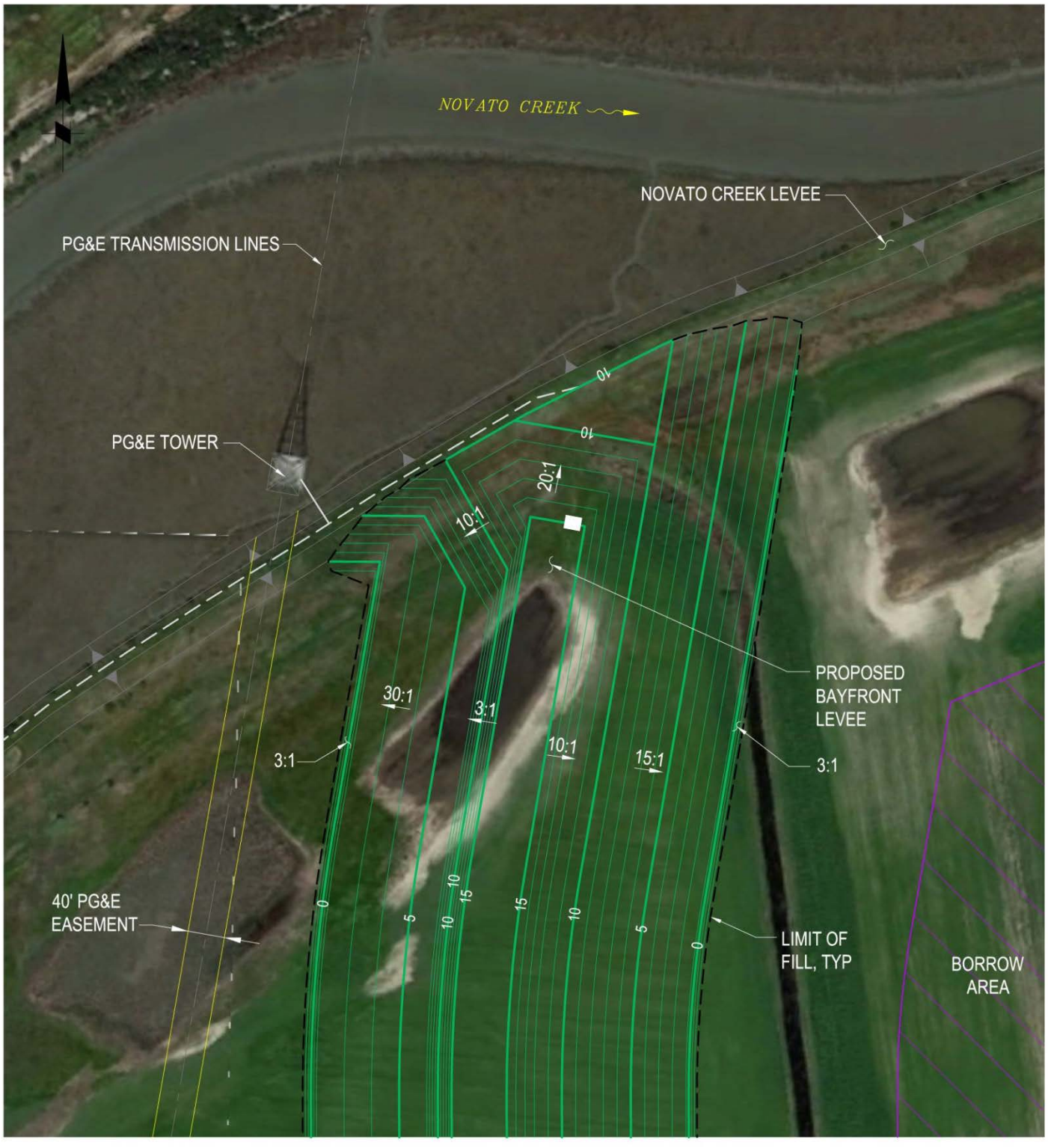
During the first construction year, the New Bayfront Levee would be constructed to an estimated elevation of +8 feet NAVD. The new levee's tie-in to the Novato Creek Levee would also be constructed during the first construction year (see **Figure 3-5**). Concurrent with the progression of levee construction and as existing drainage ditches within the levee alignment are filled, the new drainage ditches would be constructed on the east and west sides of the New Bayfront Levee. Key elements of the first year's construction activities include the following:

- Improve existing access roads (if needed) and prepare contractor staging areas
- Install culverts at drainage ditch crossings for access to borrow areas
- Remove/abandon a portion of the NSD outfall pipeline, and install a new HDPE outfall pipeline and turnout
- Major site grading, including excavation of borrow areas and transport of excavated soils to the New Bayfront Levee site.
- Construct New Bayfront Levee and tie-in to N1 levee. Construction would start at the south and proceed north.
- Construct levee tie-in at Novato Creek levee.
- Excavate new drainage ditches parallel to the New Bayfront Levee and install new pump station at the collector channel on the westside of the New Bayfront Levee.
- Seed and vegetate the westside levee stability berm.
- Install permanent erosion control BMPs and install seasonal BMPs for disturbed areas where construction is not complete.

Year 2

During the second year, the levee would be constructed to an elevation of +15 feet NAVD. To minimize potential for disturbance to seasonal wetlands and species that will be attracted to the wetlands for habitat once constructed, the seasonal wetlands and associated access roads would also be constructed in year two. Key elements of the second year's construction activities include the following:

- Major site grading including excavation of borrow areas and transport of excavated soils to the New Bayfront Levee site; minor grading around wetland creation sites.
- Construct New Bayfront Levee to the final design elevation of +15 feet NAVD (from south to north).
- Plant seasonal wetlands restoration/creation areas.
- Construct permanent aggregate base access road along existing PG&E easement, beneath transmission lines and around two towers at north end of site.
- Erosion control and revegetation of disturbed areas through hydroseeding or other methods where construction is complete.



SOURCE: Moffatt & Nichol 2016

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Figure 3-5

North Levee Tie-In

Post-Construction Levee Height Adjustments

The design approach is to construct the levee to an initial elevation of +15 feet NAVD, which is 3 feet above the minimum crest elevation of +12 feet. The levee would be expected to settle 25 to 40 percent of its fill thickness, depending upon thickness of the underlying compressible Bay Mud. Settlement is expected to occur more rapidly immediately after construction and would slow down over time; settlement is expected to continue for over a century. When the crest settlement approaches the minimum design elevation (anticipated 10-23 years from the initial construction work), additional fill would be placed to raise the crest to the appropriate elevation that would accommodate both settlement and anticipated (or actual) sea level rise. A portion of the fill stored on the stability berm (the westside toe berm) would be used as fill for future levee raising. There would be no new excavation from borrow areas in the Project site. A typical cross-section of the initial levee construction and anticipated future raising events is shown on **Figure 3-6**. The levee crest settlement profile is presented graphically in **Figure 3-7** and the levee crest settlement profile and potential filling schedule is summarized in **Table 3-2**, below.

TABLE 3-2
NEW BAYFRONT LEVEE CROSS-SECTION GEOMETRY

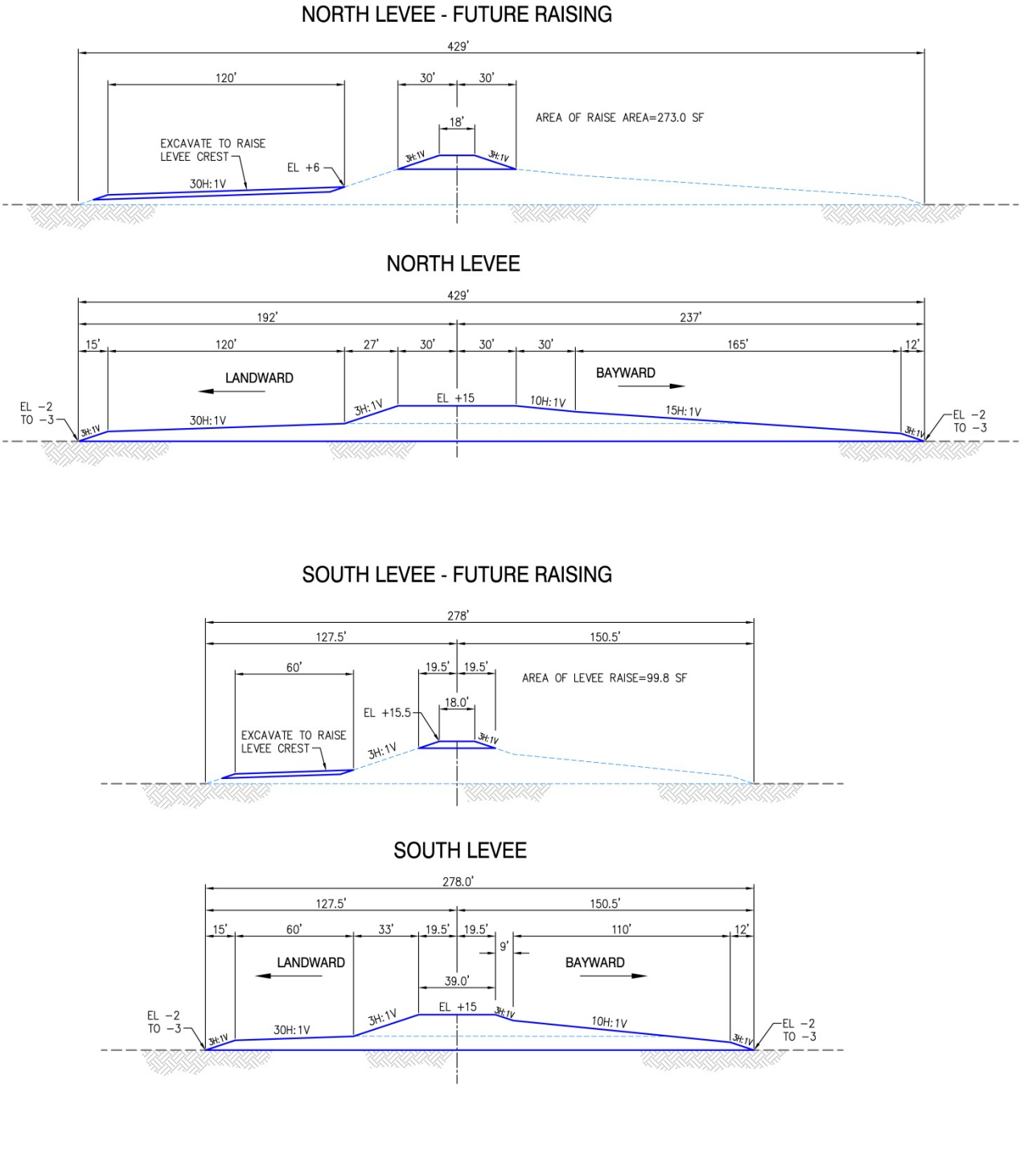
Year	Settlement	Crest/Original Grade elev (NAVD)	Fill Thickness	Crest Finished Grade elev (NAVD)	Crest Finished Grade Width
2017-2019	--	-3.0’	18.0’	+15.0’	39’
2027-2040	3.0’	+12.0’	3.5’	+15.5’	18’
2067	1.5’	+14.0’	--	--	18’

3.5.2 Workforce and Equipment

Temporary construction staffing for the Phase 1 Project would consist of approximately 20 to 56 personnel during construction. All contractors would be properly trained and certified for construction activities, best management practices, and recognizing special-status plants and animals and cultural resources that may be encountered during construction.

Levee construction and seasonal wetland creation would require many different equipment types. Conditions in the field at the time of construction would influence the type of equipment that would be best suited for the work and ultimately would be chosen by the construction contractor. Equipment would be delivered to the Project site by flatbed truck and transported to the work areas via existing access roads.

One or two excavation/hauling crews would be operating at any given time. Up to 23 pieces of equipment would be required during each construction year. The specific mix and number of pieces of equipment used would depend on the activities occurring during the particular construction season and the conditions of the site. The list of equipment and approximate numbers of pieces of equipment for two operating crews anticipated to be used during the Phase 1 Project is anticipated to include:

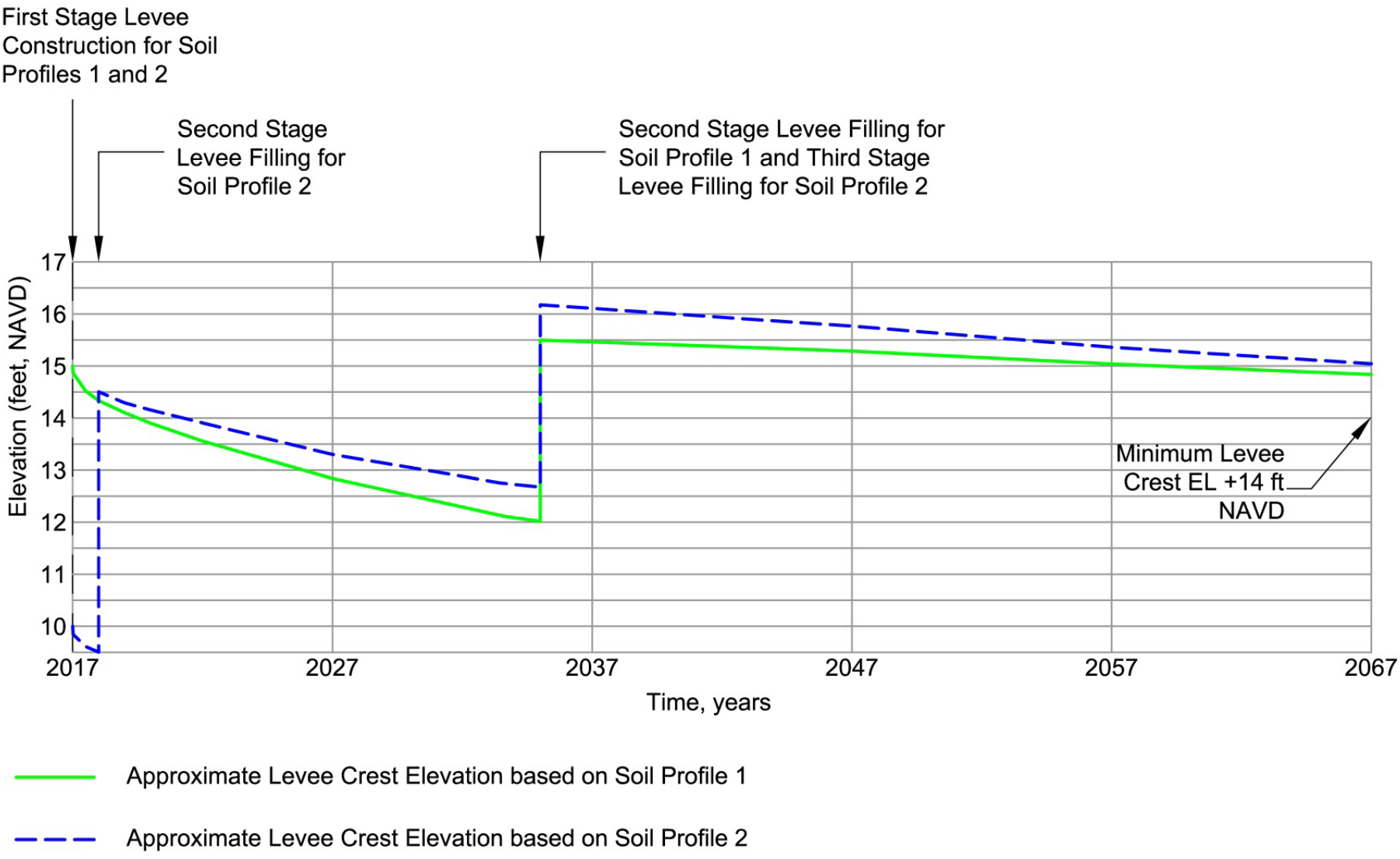


SOURCE: Hultgren & Tillis Engineers 2016

Bel Marin Keys Wetland Restoration Project – Phase 1 . D150011

Figure 3-6

Levee Cross-Sections



SOURCE: Hultgren – Tillis Engineers 2016

Bel Marin Keys Wetland Restoration Project – Phase 1 . D150011.00

Figure 3-7

Levee Crest Settlement Profile

- Tractor with two towed scrapers (9 to 12 pieces of equipment), or self-propelled scrapers (3 to 4 pieces of equipment)
- Sheepsfoot Compactor (1 or 2)
- Disker (2)
- Dozer (4)
- Water pull (3)

3.5.3 Access and Haul Routes

Equipment access and excavated material transport would occur along existing roads, levee tops and across agricultural fields. Existing roads and levees would be utilized to access the construction footprint. Access to the south portion of the Project site would occur from Aberdeen Road (primary access). Access to the north and central portion of the Project site would occur from Bel Marin Keys Boulevard (secondary access). Access roads are shown in Figure 3-1. The existing dirt road along the north access route would be improved by placing a 6-in layer of gravel (or aggregate base) over the existing surface. This would reduce dust and provide a more uniform surface for vehicles. Approximately 4,000 tons of gravel would be placed on 9,500 linear feet of existing access roads, ranging from 12 to 15 feet wide.

Daily worker traffic and small deliveries would occur through the primary access route. Initial equipment delivery and removal would occur through the secondary access route. Main access between the primary access route and the construction areas and borrow sites would be via the N1/N2 levees and through the New Bayfront Levee work area. Main access between the secondary access route and the construction areas and borrow sites would be via existing roads and a new culvert over the existing collection channel (Figure 3-1). The final decision on access and haul routes would be reached through the collaboration of the contractor and design team, in compliance with applicable regulatory permitting requirements prior to construction. Within the site's interior, equipment travel routes and excavated material transport would occur primarily along routes within the Phase 1 Project's cut and fill footprint. Culverts would be installed at drainage crossings, as described in Section 3.4.5, Site Drainage Modifications, above.

3.5.4 Staging Areas

Shown in Figure 3-1, a staging area measuring approximately 7 acres would be established at the southern end of the Project site. Materials, equipment, a fueling station, and a temporary office may be located at the staging area. Large equipment used for earthwork would likely be parked within the active borrow area or other disturbed areas of the site (e.g., access roads) until excavation work is complete. Areas used for staging and site access would be cleared and graded. Heavy equipment such as bulldozers, scrapers, and graders would be used to construct the staging area and any required site-access improvements. A stormwater pollution prevention plan (SWPPP) and safety plan would be developed and implemented to prevent the transport of sediments and/or construction contaminants from the staging area into surrounding areas.

3.5.5 Site Preparation

Vegetation Removal

A qualified botanist would conduct a non-native plant assessment of areas subject to construction activities and would recommend specific measures to control spread of non-native species during project construction. Measures may include the establishment of wash stations for construction vehicles and equipment to clean tires of weed seeds and other propagules before they are moved offsite, and the development of an herbicide spray program to address perennial pepperweed or other invasive weed infestations prior to construction.

Biologists would conduct pre-construction surveys for special-status species before vegetation clearing to ensure no listed species are present. Pickleweed vegetation that may support salt marsh harvest mouse would be hand-removed within the Phase 1 Project footprint. Other vegetation would be cleared and grubbed using standard practices such as using mowers towed behind diesel wheeled tractors, and bulldozer tractors.

The area within the work limits would be cleared of vegetation, except for portions of the existing drainage ditches that would not be filled. The top few inches of soil and vegetation on lands to be graded (excavated or filled) may be stockpiled on site for reuse within the seasonal wetland creation areas.

3.5.6 Levee Construction

Earthwork (grading, excavation, and redistribution of material) is necessary mainly for construction of the New Bayfront Levee, with only minimal grading required for seasonal wetlands. The ground surface within the levee footprint would be excavated to a suitable depth (approximately 2-ft), moisture conditioned, and compacted. Geotextile materials may be used to enhance the stability of the levee foundations.

An estimated 1.8 million cubic yards of material would be excavated for levee construction. Sediment for levee construction would be sourced from borrow areas located on the eastside of the New Bayfront Levee alignment. The predominant on-site borrow material is Bay Mud, which is suitable for levee fill and can be excavated from adjacent agricultural fields. To minimize transport distance and handling, the borrow areas would be sited near the location of final sediment placement. Shown in Figure 3-1, borrow areas would be located entirely within existing farmed tracts. Borrow areas would be excavated to depths of approximately 2 to 3 feet. The material to be excavated and transported has been thoroughly analyzed for its geotechnical properties and has been deemed suitable and stable for the purposes of the Phase 1 Project (Moffatt & Nichol et al., 2016). The area to be excavated would be approximately 434 acres.

Dewatering within the Project site is not expected to be necessary due to the time of year that most construction would occur (April to October). However, if sufficient rainfall occurs during the construction period such that ponded water persists, a portable pump would be used to remove water from work areas and discharge the water to one of the borrow areas.

As described in Section 3.4.1, Project Elements, above, the New Bayfront Levee would have a "core" slope of 3H:1V on both sides, and be flanked by stability berms on either side. See Table 3-2 for the levee cross-section dimension estimates. Sediment placement levee crest would occur in phases, followed by waiting periods to allow for sediment draining and compaction. Bay Mud excavated from nearby farm fields that is too wet to be readily used for the main section (core) of the levee would be placed on the stability berms. Strength and compaction are not critical for stability berms. In the northern portion of the site where the Bay Mud may be weaker, extremely wide, flat slopes would be constructed for the levee. Wide flat slopes are compatible with the future marsh restoration efforts proposed on the bay side (east side) of the levee Slopes would not be built as wide on the west side of the levee since it would not provide habitat benefits.

3.5.7 Seasonal Wetland Construction

The seasonal wetlands would be constructed during the second year of construction. Construction elements and sequencing for each wetland type being created are specified below. Seasonal wetland design and construction elements are shown in **Figures 3-8** and **3-9**.

Seasonal Wetland Complex Creation

Access to the seasonal wetland complex would occur from the New Bayfront Levee to the east and via the existing access road along the west side of the seasonal wetland complex and would not impact existing wetland habitat. Within the site's interior, construction access would generally occur within the New Bayfront Levee footprint and would not traverse existing wetland habitat. Following New Bayfront Levee construction, access to the seasonal wetland complex area would occur via the levee crest and along the existing access road west of the seasonal wetland complex.

The seasonal ponds would be constructed by excavating below existing grade to create a typical ponding depth of 1 to 2 feet. Some ponds may have deeper areas, as much as to 4 feet below existing grade. The ponds would generally drain towards the south towards the new pump (Figure 3-8). A total of approximately 60,000 cubic yards would be excavated to construct the seasonal ponds. Excavated soils would be used in levee construction. Gradual transition areas between the ponds and uplands would be graded around the ponds to create heterogeneous topography within the seasonal wetland complex.

The seasonal wetland ponds would be connected by a series of shallow swales incorporating about six to eight water control structures to control water levels and allow for periodic drainage of the wetland complex, as needed. The water control structures would consist of a combination of concrete twin track weir boxes similar to those used to control water levels in rice fields and irrigation canals, flashboard risers for drainage under the road to the existing ditch, and a screw-operated weir at the south end of the existing ditch. The existing drainage ditch may be temporarily impacted if some excavation is necessary to ensure proper drainage of the seasonal wetland complex. The flashboards would be set at the target water level for the seasonal wetlands and could be adjusted to help manage the wetland habitat. The structures would be operated to

drain the ponds if needed for vector control or for maintenance activities such as disking or mowing. Operations would be provided by the California State Coastal Conservancy or their agent; for example, by the Marin-Sonoma Mosquito and Vector Control District or the farmer lessee.

The areas for the weir boxes would be over excavated to place a foundation of compacted aggregate base rock. The weir boxes would each be about 4 feet square and their foundation areas would each be about 8 feet square. The area around the boxes would be backfilled with native soil and replanted with native upland plants.

Alkali Meadow Creation

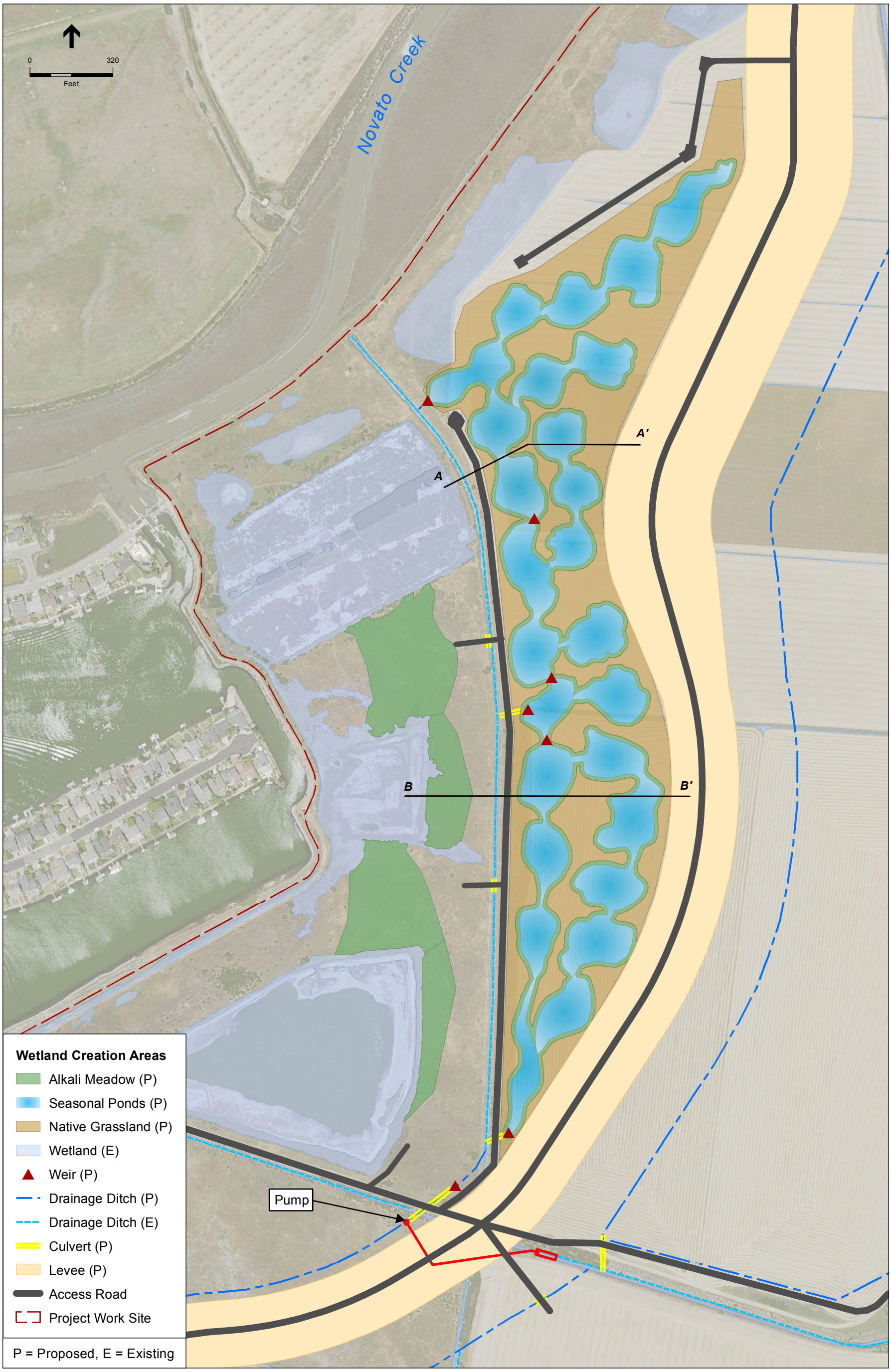
Access to the alkali meadow areas for construction would be primarily from the existing access roads to the south and east of the alkali meadow creation area. Up to two new access roads would be created to serve the alkali meadow creation area. These roads would cross the drainage ditch adjacent to the existing access road separating the seasonal wetland complex from the alkali meadow creation area. At these locations, culverts up to 60 feet long would be installed along the drainage ditch to allow equipment access. A third access route would be from the existing access road south of the alkali meadow creation area. Upon project completion, these access routes could remain or be restored to their approximate pre-construction conditions.

The alkali meadow areas would be constructed by excavating to elevations observed to support alkali meadow vegetation in adjacent areas and thereby restoring similar hydrology. Existing ground elevations within the proposed alkali meadow wetlands area are approximately -2.5 feet NAVD on average, based on the elevation data collected by ESA in July 2016 and review of the 2009-2011 LiDAR. Elevations where saltgrass and alkali heath have been observed to grow in high abundance occur between -4.5 and -2.6 feet NAVD. The alkali meadow areas would gradually slope from existing grades at -2.5 feet down to EL -4.5 feet NAVD to expand the area suitable for salt grass, alkali heath and other wetland/transitional plant species. In order to construct the alkali wetlands an average of about 1 foot of excavation would occur across 9 acres, resulting in up to 20,000 cubic yards of excavated soil which would be placed on the new levee.

Wetland Construction Methods & Equipment

Excavation of the seasonal wetlands complex and alkali meadow areas would likely require four to twelve weeks depending upon the number of crews employed by the construction contractor. The excavation period would occur during the dry season of Year 2 of construction. Revegetation would occur in the fall and depending on the size of the planting crews would require an additional four to eight weeks between mid-October and late December.

Access to the seasonal wetlands complex and alkali meadow areas would occur on existing and proposed access roads. If required to ensure safe access for vehicles and heavy equipment, roads may be upgraded by adding gravel and widening the road as necessary. Upon project completion, these areas could remain or be restored to pre-construction conditions.



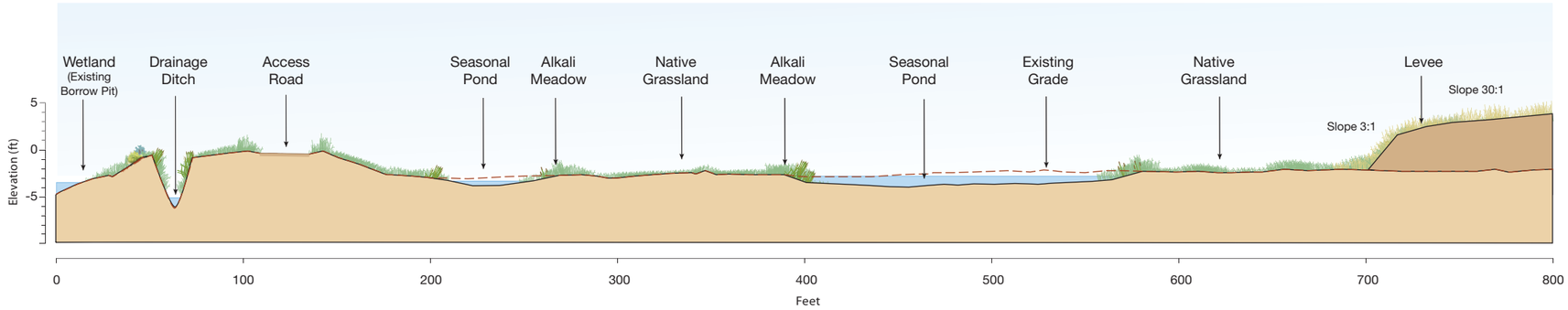
SOURCE: USDA, 2014; ESA, 2016

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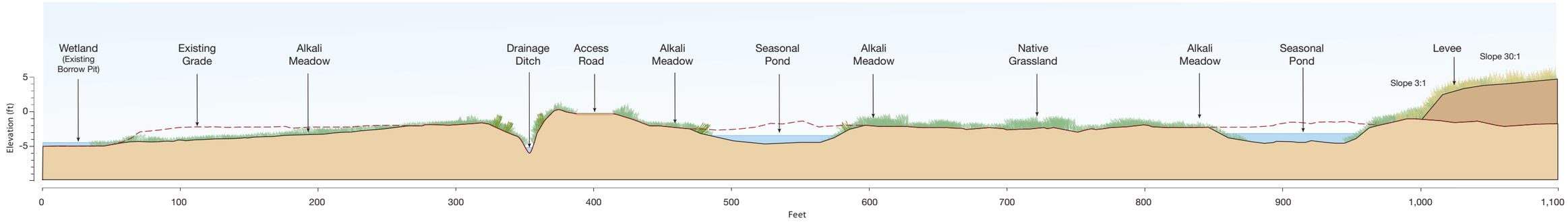
Figure 3-8

Seasonal Wetland Design and Construction Elements

Section A



Section B



Notes:

1. Vertical exaggeration: 5x
2. Locations of cross-sections shown on Figure 3-8.
3. Wet season ponding shown. Little or no surface ponding in the dry season.

SOURCE: ESA 2016

Bel Marin Keys Wetland Restoration Project - Phase 1. 150011.00

Figure 3-9

Conceptual Seasonal Wetland Cross Sections

Construction equipment would include excavators, low ground pressure dozers, low ground pressure dump trucks, graders, and possibly a sheep's foot compactor to compact the base of the seasonal wetlands ponds. Excavated material would be placed in dump trucks and used as top soil on the stability berms along the new Bayfront Levee. Staging for the seasonal wetland creation would be within the common staging area for the larger Phase 1 Project.

Wetlands excavation would occur during the dry season to limit the need for dewatering and/or rerouting of water during construction. Access routes that cross existing ditches would incorporate culverts to convey runoff and groundwater seepage towards the project pump station. Excavation of deeper areas within the seasonal wetlands ponds could occur in stages to help manage groundwater allowing saturated soils to dry via evaporation between excavation stages. Active dewatering is not anticipated with the relatively shallow excavation depths and dry season work.

Erosion is expected to be minimal during and following construction. The seasonal wetland creation areas are comprised of cohesive bay mud that has a low erosion potential. Additionally, the wetland grading includes flat slopes for habitat enhancement. Post construction best management practices for erosion control would include revegetation of native plant species within the seasonal wetland ponds and alkali meadow areas and hydroseeding with a native upland/transitional plant mix within adjacent upland areas. Silt fences would be installed within the existing drainage ditch at the downstream limit of the seasonal wetland complex and alkali meadow area and just upstream of the new pump station to help trap any eroded sediments during the first wet season following construction. The silt fence would be removed from the drainage ditches upon adequate establishment of plants to control site erosion. After the first wet season, it is anticipated that the plantings and seeding would be sufficient to control erosion within the area.

3.5.8 Novato Sanitary District Effluent Pipeline Modification

During the first year of construction, approximately 850 feet of the existing NSD effluent outfall pipeline within the footprint of the New Bayfront Levee would be demolished or abandoned (filled with flowable fill). The existing pipe would be capped at the downstream and upstream ends with blind flanges, or round plates bolted to pipe ends. The new HDPE outfall bypass pipeline section would be installed in the New Bayfront Levee with approximately 4 feet of earthen cover; the portion above elevation +15 ft NAVD would have reduced cover (approximately 1-ft thick). The completed bypass pipeline would be equipped with an anti-vacuum and passive air release mechanism connected to a concrete junction box located at the high point of the pipeline. The new bypass pipeline would be connected to the existing pipeline upstream and downstream of the new bypass (Figure 3-3). The top of the levee at the crest of the pipeline would be paved with concrete to provide year-round access for NSD to maintain the pipeline.

3.5.9 Water Sources for Project Construction

A turnout, or secondary lateral connection to the new NSD bypass pipeline, would be installed to provide water for moisture conditioning of the levee fill, and for dust control during project construction, and for plant establishment irrigation. The supply line would feed an overhead

filling station; water wagons (water pulls) would drive under the filling station for filling. Approximately 300,000 gallons per day are needed for construction purposes, which is a small portion of the NSD's daily discharge. Upon completion of the Phase 1 Project, the overhead filling station would be removed and the water supply line would not be used.

3.5.10 Site Restoration and Revegetation

Staging areas and borrow areas would be restored to their approximate pre-construction conditions to the extent feasible and managed in a similar fashion until subsequent project phases are implemented. As necessary, native plant revegetation, including seeding, tilling rhizomes, planting sod fragments, or planting container stock would occur in areas disturbed by construction including the seasonal wetland creation areas, the levee stability berms, the borrow areas, and the buffer area flanking the bayside of the New Bayfront Levee (Figure 3-2).

The target plant communities for the seasonal wetland complex and alkali meadow would be seasonal wetland, alkali meadow, and native grassland dominated by rhizomatous, spreading (sod-forming) species such as saltgrass (*Distichlis spicata*), creeping wildrye (*Elymus triticoides*), and sedges *(Carex sp.)*. Additional grasses and forbs would also be planted and/or seeded including alkali heath (*Frankenia salina*) and meadow barley (*Hordeum brachyantherum*). Active revegetation efforts at the seasonal wetland complex and alkali meadow (planting, seeding, and intensive weed control maintenance) would be required to establish the target native plant communities due to rapid recruitment and competition of invasive plants. The dominant sod-forming species would be planted at a high density both because many of these species do not readily reproduce from seed and to minimize invasive weed establishment.

Some Phase 1 Project areas – such as the stability berms and the buffer area – may be farmed. The borrow areas are expected to be too saline for farming initially. Standard agricultural management practices would be used to reduce soil salinity in anticipation of farming once suitable soil conditions are achieved. Temporary (less than 5-years) erosion control BMPs would be installed to minimize surface erosion due to stormwater.

3.6 Project Monitoring and Adaptive Management

A range of post-construction activities would occur at the Project site, including management responses triggered if monitoring data indicate a problem or unsatisfactory progress toward objectives and maintenance activities necessary for long-term management of the levee and wetland habitats. These are described further below.

3.6.1 Seasonal Wetlands

The SCC would develop and implement a 5-year monitoring program to measure the habitat establishment rate, quantity, and quality of wetland creation areas. Major elements of the monitoring program would include the following:

- Measure areal extent and locations of established or colonizing marsh vegetation.

- Measure composition and density of established and colonizing plant species.
- Compare predicted and measured site development and function.
- Analyze monitoring data to identify possible reasons for differences between observed and predicted conditions.
- Recommend remedial actions that can be implemented if the restoration is not proceeding as designed.

Per regulatory permits and approvals requirements, monitoring reports would be submitted by the SCC to federal, state, and local agencies each year in which monitoring of the wetland enhancement and creation areas is conducted. If the rate, quality, and quantity of created habitat are not meeting restoration goals at the end of the 5-year period, the SCC would consult with regulatory agency staff and technical experts regarding further monitoring and potential corrective actions.

3.6.2 Non-native / Invasive Plants

After being planted, wetland restoration areas would be monitored for infestation of perennial pepperweed, stinkwort, and other potentially invasive species. All infestations occurring within wetland habitats would be controlled and removed to the extent feasible without jeopardizing the surrounding native vegetation. A long-term monitoring plan would be developed, subject to review and approval by USFWS and CDFW that would remain in effect until wetland habitat is established. It is expected that some ongoing vegetation management would be needed within the created seasonal wetlands. This would likely consist of mowing at least once every other year.

3.6.3 New Bayfront Levee

The New Bayfront Levee would be monitored periodically for several geotechnical performance indicators, including fill thickness, pore pressure, settlement, and lateral deformation. Monitoring would be conducted using instrumentation installed during levee construction and by performing on-site field surveys and/or measurements in accordance with the Draft Final Geotechnical Investigation (Hultgren-Tillis Engineers, March 2016) and construction contract requirements. Levee performance indicators would serve as triggers for determining the need for future adjustments to the levee height.

Levee maintenance would be conducted to maintain vehicle access and repair damage to the levee. Maintenance may include mowing of the levee (crest and slopes), and additional fill placement on the levee crest and slopes, as needed over the 20 years following initial levee construction. This action is described above in Sections 3.4.1, New Bayfront Levee, and 3.5.5, Earthwork.

3.6.4 Phasing and Schedule

Earthwork for levee height adjustments would generally be conducted during the dry season (generally April 15th to October 15th). Revegetation efforts as needed to attain habitat establishment targets would occur between October and May. Ground disturbing activities would

be limited to specific windows to minimize impacts on endangered species. For example, construction in proximity to Ridgway's rail and other ground-nesting bird habitats would be conducted outside of the nesting season.

CHAPTER 4
Existing Conditions (Box 5)

This chapter presents information for on existing site conditions. Additional information on existing conditions at the Project site is provided in technical reports included in Appendix A (Wetland Delineation Report), Appendix B (Biological Assessment), and Appendix E (Cultural Resources Inventory and Evaluation Report).

4.1 Existing Land Use

The Project area consists of former baylands that were diked for agricultural use in the late 19th century. Recently, the majority of the site has been under cultivation for oat hay. The Project area is located within the City-Centered Corridor planning area of Marin County and is designated for agriculture and conservation use. The Project area is zoned within the Bayfront Conservation (BFC) Zone. This zone is intended to preserve, protect, and enhance existing species and habitat diversity in the county. PG&E carries an easement within the Project area to maintain five electric transmission towers.

4.2 Topography and Hydrology

The project area is located within a larger agricultural landscape that is surrounded on all sides by levees. The levees prevent water from the adjacent open water bodies (San Pablo Bay, Bel Marin Keys South, and Novato Creek) and wetland areas (Novato Creek tidal marsh) from entering the project area (although discharges from Bel Marin Keys lagoon into a pond located east of the lagoon occasionally occur during high water events). There is no tidal exchange within the project area, except the above-noted overflow from the Bel Marin Keys lagoon); all surface water comes from rainfall. Surface water drains off of the farm fields into drainage channels which convey the water to a pump station located along the existing bayfront levee. At that point, the water is pumped out of the channel and over the existing bayfront levee into San Pablo Bay. According to the farmer (Jens Kulberg, pers. comm. with C. Rogers), as part of the existing water management regime for ongoing oat hay production, water is pumped off the BMKV property periodically during the winter to keep the farm fields from saturating and to maintain low water levels in the drainage channels.

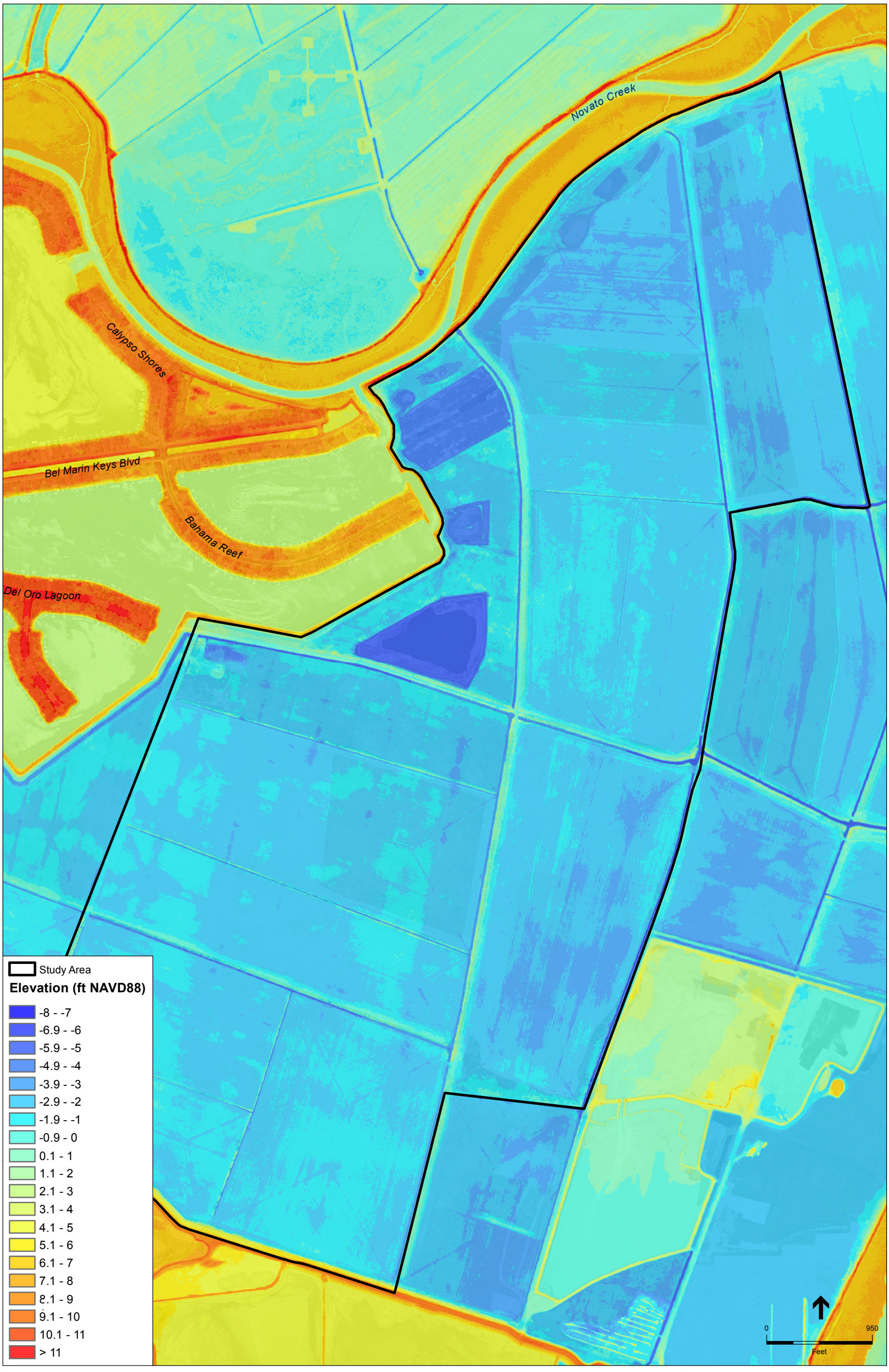
Multiple soil borrow areas, or isolated depressions, are present in the project area. These are locations where soil has been excavated for construction or maintenance of the perimeter levee. The soil borrow areas vary in depth but are in the range of -10 feet (-3 meters) NGVD29 to -6.5 feet (-2 meters) NGVD29, or about 3 to 6 feet (1 to 2 meters) below the surrounding area. The borrow

areas, indicated on the **Figure 4-1** by their darker blue hues, pond water in the winter and most dry out by late summer.

4.3 Vegetation

Vegetation within the project area consists primarily of cultivated oat, Italian rye grass (*Festuca perennis*), vetch, hairy vetch (*Vicia villosa*), and birdsfoot deervetch (*Lotus corniculatus*) in the agricultural fields. Other less frequently observed upland species include cultivated radish (*Raphanus sativus*), ripgut brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), meadow bindweed (*Convolvulus arvensis*), Shamrock clover (*Trifolium dubium*), cutleaf geranium (*Geranium dissectum*), bur clover (*Medicago polymorpha*), prostrate knotweed (*Polygonum aviculare*), rough cocklebur (*Xanthium strumarium*), yellow star thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*) and bull thistle (*Cirsium vulgare*). Mature coyote brush shrubs (*Baccharis pilularis*) border the upland edge of the project area drainage channels and farm tract edges with few mature eucalyptus (*Eucalyptus* sp.) trees at the project area perimeter.

Natural depressions along the existing levees, within roadways, and former borrow areas among the farm tracts contain various annual and perennial wetland vegetation including birdsfoot deervetch, hyssop loostrife (*Lythrum hyssopifolia*), meadow barley (*Hordeum brachyantherum*), common toad rush (*Juncus bufonius*), fat hen (*Atriplex prostrata*), and brass buttons (*Cotula coronopifolia*) with bristly ox-tongue (*Helminthotheca echioides*), curly dock (*Rumex crispus*), Russian thistle (*Salsosa tragus*), and stinkwort (*Dittrichia graveolens*). The steep drainage channels dividing the farm tracts contain vegetation more common to tidally influenced areas including pickleweed (*Salicornia pacifica*), alkali heath (*Frankenia salina*), saltgrass (*Distichlis spicata*), and alkali bulrush (*Bolboschoenus maritimus*), among other wetland plants in lesser abundance. Section 5.2 includes a description of the wetland types located within the project area, including saline emergent wetland, seasonal wetland, and farmed wetland.



SOURCE: 2009-2011 California Coastal Conservancy Lidar; ESA 2016

Figure 4-1
Study Area Elevations

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CHAPTER 5
Waters of the United States in the Project Area (Box 8A)

ESA staff conducted a preliminary jurisdictional delineation (PJD) of all potentially jurisdictional features within the Phase 1Project's delineation study area in March 2016. The field delineation identified and documented all potentially jurisdictional wetlands and other waters of the U.S. within the delineation study area under Corps Section 404 as well as Section 10 jurisdiction. The analysis of jurisdiction is summarized below. Further detail can be found in the Bel Marin Keys Wetland Restoration Project Delineation Report (ESA, 2016a), which was submitted to the Corps on May 24, 2016. Since that submittal, an updated delineation was prepared after field verification with Corps on June 6 and 10, 2016. The updated delineation numbers are presented in **Table 5-1** and summarized in Section 5.2 below.

5.1 Jurisdictional Analysis

San Pablo Bay and Novato Creek are considered traditional navigable waters (TNWs), but are situated outside of the Project area. All waters in the project area are non-tidal. Water in the network of agricultural drainage channels is actively pumped into San Pablo Bay, thereby contributing to the chemical, physical, and biological integrity of the TNW. The drainage channels and ponds within the Project area are considered Relatively Permanent Waters (RPWs), or a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months), based on their surface or subsurface hydrologic connection to San Pablo Bay and/or Novato Creek.

The source of the water in the drainage channels is surface run-off from the agricultural fields along with shallow groundwater. The shallow groundwater table establishes a subsurface hydrological connection to the TNWs. Seasonal and perennial wetlands within the Project area also have plausible groundwater connection to the Bay and Novato Creek. These areas also provide wildlife habitat that is contiguous with the TNWs. Therefore, they are considered wetlands adjacent to TNWs, and are jurisdictional under Sections 404 and 401 of the Clean Water Act.

5.2 Summary of Potentially Jurisdictional Waters and Wetlands

The study concludes that there are 56.51 acres of potentially jurisdictional wetlands and other waters of the U.S. in the Project area. These include:

- 26.12 acres of saline emergent wetland
- 12.29 acres of seasonal wetland
- 0.11 acres of farmed wetland
- 4.98 acres of drainage channel, and
- 13.01 acres of pond.

All of these features are expected to be subject to regulation under Sections 404 and 401 of the CWA.

A summary of potentially jurisdictional wetlands and other waters of the U.S. and of the State within the project area is presented in **Table 5-1** below. **Figure 5-1** shows the location and extent of the potentially jurisdictional features. A detailed delineation map at a scale of 1:3,600 (1 inch equal to 300 ft) is presented in **Appendix A**.

TABLE 5-1
POTENTIALLY JURISDICTIONAL WETLANDS AND OTHER WATERS OF THE U.S. AND OF THE STATE IN THE PROJECT AREA

Feature Type	Cowardin Classification	Extent	
		Linear feet	Area (acres)
Wetlands			
Saline emergent wetland	Palustrine emergent wetlands (mixosaline, semipermanently flooded)		26.12
Seasonal wetland	Palustrine emergent wetlands (seasonally flooded)		12.29
Farmed wetland	Palustrine emergent wetlands (seasonally flooded)		0.11
	Total Wetlands		38.52
Other Waters of the U.S.			
Pond	Lacustrine- limnetic		13.01
Drainage channel	Riverine (seasonally/semipermanently flooded)	37,732.42	4.98
	Total Other Waters	37,732.42	17.99
	Total Area of Wetland and Other Waters Features:	**37,732.42**	**56.51**

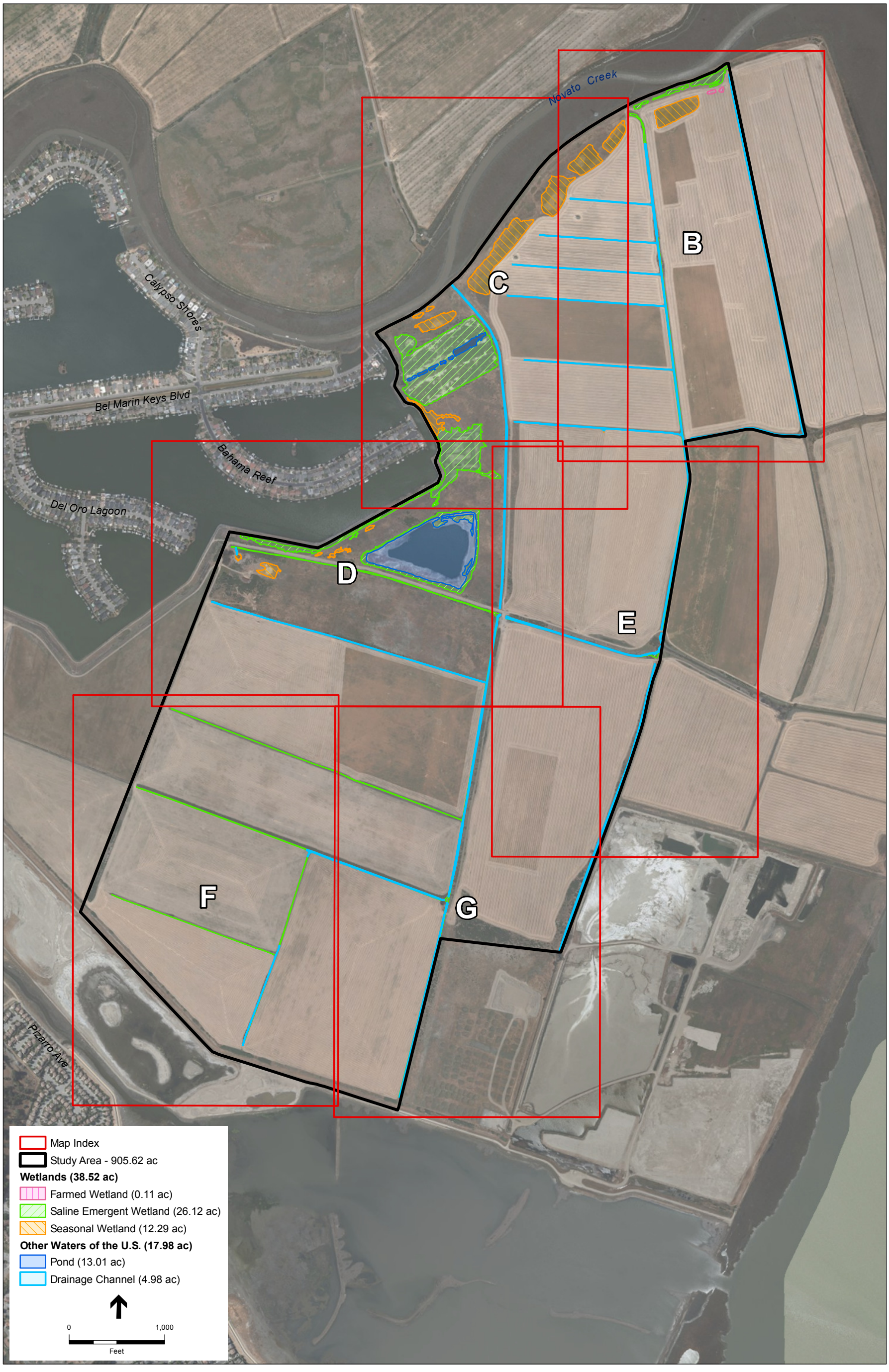
5.3 Non-Jurisdictional Features

The dry farmed fields in the project area do not support potentially jurisdictional wetlands, with two small exceptions (FW-1 and FW-2; see Figure 5-1b). With the exception of FW-1 and FW-2, the farm fields were even, homogeneous stands of oats with some vetch and lacked indicators of wetland hydrology such as ponding or saturation within 12 inches of the soil surface. Cultivated oats and vetch are both considered upland plants and were obviously excluded in areas where soils remain ponded or saturated (FW-1 and FW-2). In addition, fields in the Project area have been graded and leveled for drainage to the perimeter channels that crisscross the Project area to *prevent* ponding and saturated conditions because these conditions are not compatible with agricultural production of oats and vetch. Therefore, based on the lack of indicators of wetland

hydrology and hydrophytic vegetation, the dry farmed fields are not considered potentially jurisdictional (with the exception of FW-1 and FW-2). The Project area has been under continuous agricultural use for many decades, and it is assumed that the conditions observed have prevailed throughout this time and meet the definition of "normal circumstances."

Upland areas throughout the Project area, including access roads and non-cultivated grasslands supporting upland grasses and forbs, also are not considered to be potentially jurisdictional.

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SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1A

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1B

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1C

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Figure 5-1D

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1E

Potentially Jurisdictional Waters of the U.S.

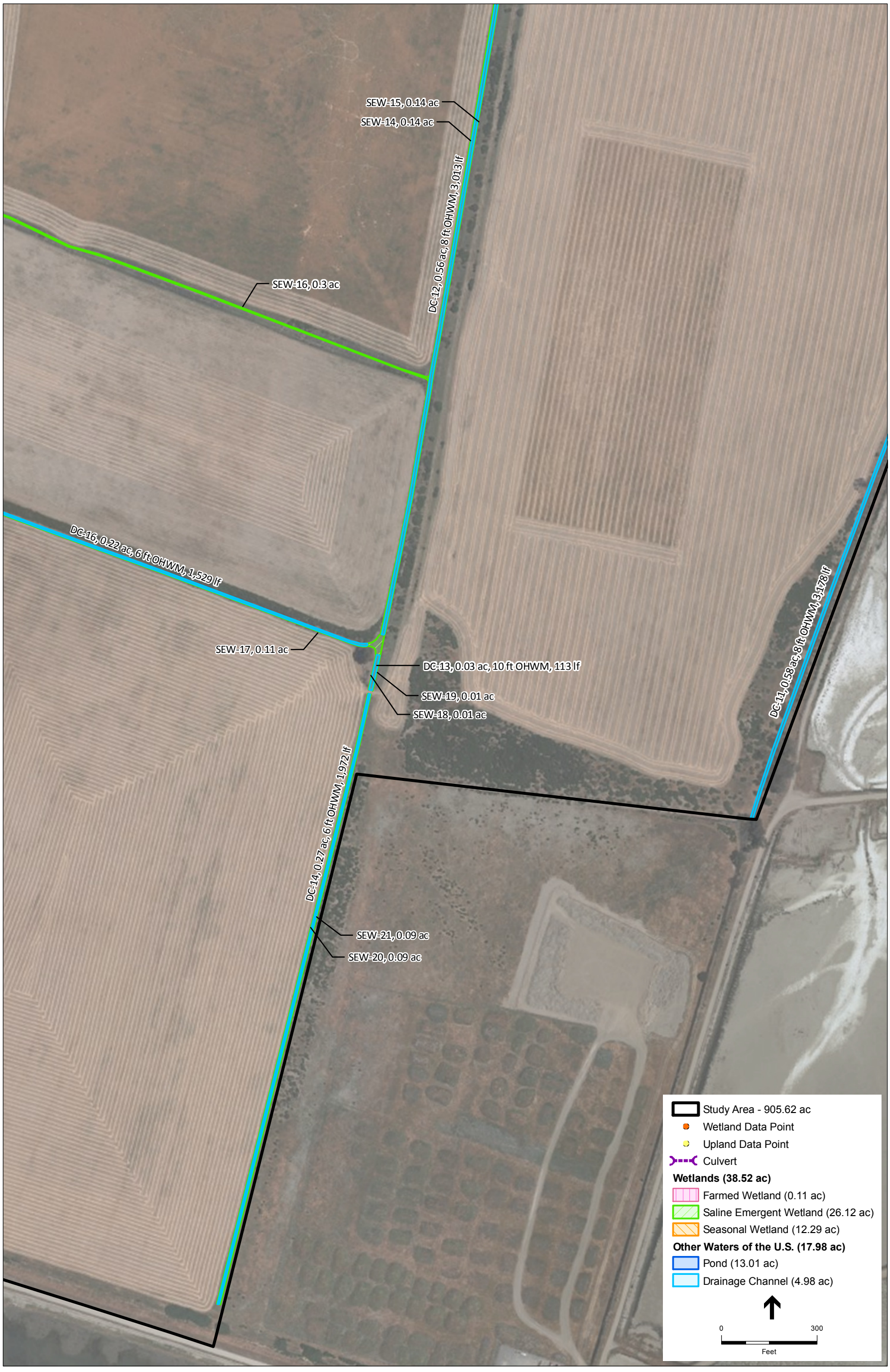


SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1F

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 5-1G

Potentially Jurisdictional Waters of the U.S.

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CHAPTER 6
Impacts and Benefits to Waters of the United States (Boxes 8B and 9)

The following sections summarize the proposed restoration project's anticipated impacts to jurisdictional waters, the pre- and post-project habitat compositions (including jurisdictional waters and wetlands), and the post-project benefits to aquatic resources and special-status species. This assessment is based on preliminary Project design information, and will be refined as needed if Project design details are adjusted in the course of agency coordination and further analysis.

6.1 Project Impacts to Waters of the United States

Construction of the proposed Project would disturb approximately 4.32 acres of jurisdictional waters of the U.S. and State, including 2.30 acres of existing wetlands and 2.02 acres (17,619 linear feet) of other waters. Of this amount 1.47 acres (3,000 linear feet) would be temporary and 2.85 acres (14,419 linear feet) would be permanent.

Permanent impacts would result from the permanent placement of native fill (i.e., excavated and redistributed site soils, totaling approximately 1.8 million cubic yards) across approximately 95 acres to create the New Bayfront Levee and to support site drainage and continued farming. The Phase 1 Project would reduce saline emergent wetland by 0.79 acre. Seasonal wetland habitat would increase by approximately 25 acres and all other jurisdictional features would increase in acreage or would not change. The amount of drainage channel "other waters" in the Project site is expected to increase by 6,771 linear feet or 0.80 acre. These drainage channels are expected to support some saline emergent wetland at the edges of the channels over time, although it is not practical to predict how much saline emergent wetland will establish. The loss of saline emergent wetland in the drainage channels is not considered a significant loss of waters of the U.S. The existing saline emergent wetland habitat within the drainage channels provides marginal fringe wetland habitat. The created seasonal wetlands will provide a much larger contiguous wetland habitat area and provide similar wetland habitat to saline emergent wetlands. See Chapter 8 for further discussion of project impacts and mitigation needs. See **Table 6-1** for additional details on the pre- and post-project effects on waters of the U.S.

TABLE 6-1
SUMMARY OF PRE- VERSUS POST-PROJECT CONDITIONS AND JURISDICTIONAL WATERS

	Existing Condition		Post-Project Conditions		Net Change	
	Extent		Extent		Extent	
Feature Type	**Linear feet**	**Area (acres)**	**Linear feet**	**Area (acres)**	**Linear feet**	**Area (acres)**
Wetlands						
Saline emergent wetland		26.12		25.33		-0.79
Seasonal wetland		12.29		36.39		+24.10
Farmed wetland		0.11		0.11		0
SubTotal		***38.52***		***61.83***		***+23.31***
Other Waters of the U.S.						
Pond		13.01		13.01		0
Drainage channel	37,732	4.98	42,903	5.78	6,771	+0.80
SubTotal	***37,732***	***17.99***	***42,903***	***18.79***	***6,771***	***+0.80***
Non-Jurisdictional Features						
Transitional Habitat/ Uplands/Farmland/ Roads/Minor Built Structures		849.11		825.00		-24.11
SubTotal		***849.11***		***825.00***		***-24.11***
PROJECT TOTALS						
Non-jurisdictional Features		849.11		825.00		-24.11
Wetlands and Other Waters (Jurisdictional) Features		56.51		80.62		+24.11
Total Acreage		**905.62**		**905.62**		**0**

SOURCE: ESA, 2016. Area subtotals subject to rounding.

6.2 Project Benefits to Waters of the United States

The Phase 1 Project would result in a net increase in aquatic functions and services and would benefit aquatic habitat and waters of the U.S. After implementation, the Project site would support approximately 36.39 acres of seasonal wetlands, representing a gain of approximately 25 acres of seasonal wetland habitat compared to existing conditions, this includes 9 acres of alkali meadow habitat and 16 acres of seasonal ponds. An approximate 0.80 acre or 6,771 linear feet increase in drainage channel would result from Phase 1 Project implementation.

In the long-term, the Phase 1 Project would increase aquatic habitat, wetland habitat, and wetland-upland interface, and enhance the broader aquatic food web. Overall effects of the Phase 1 Project combined with future restoration phases (restoration of tidal salt marsh habitat) would contribute to the recovery of threatened and endangered species including salt marsh harvest mouse, Ridgeway's rail, and California black rail. See Chapter 7 below for additional discussion of the Phase 1 Project's biological resource benefits.

Benefit to Diked Baylands of San Francisco Bay

The Phase 1 Project would impact wetlands and waters of the U.S. situated within San Francisco Bay diked baylands. The Phase 1 Project would cause a net increase in area and habitat value of seasonal wetlands occurring within the San Francisco Bay diked baylands. Furthermore, the purpose of the BMKV restoration project is to restore the site to a complex of tidal and seasonal wetlands, some of which would continue to occur in diked baylands.

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CHAPTER 7
Special-Status Species and Habitats in the Project Area

7.1 Special-Status Species Impacts

Three federally-listed wildlife species have the potential to occur within or adjacent to the Project area and may be impacted by the Phase 1 Project:

- Ridgway's rail (*Rallus obsoletus*) (federally-listed as endangered)
- Western snowy plover (*Charadrius alexandrines nivosus*) (federally-listed as endangered)
- Salt marsh harvest mouse (*Reithrodontomys raviventris*) (federally-listed as endangered)

There is no designated critical habitat in the Project area. A detailed discussion of federally-protected species is provided in the Biological Assessment (ESA, 2016b) included in **Appendix B**.

Additionally, the California black rail (*Laterallus jamaicensis coturniculus*) is state-listed as threatened and is a fully protected species under California Fish and Game Code Section 3511. There is no federal listing for this species, and critical habitat has not been established.

Construction activities within 500 feet of tidal marsh habitat adjacent to Novato Creek could temporarily disrupt these protected species, potentially resulting in take of these species.

Impact avoidance and minimization measures will be implemented to reduce potential impacts on special-status species. These measures are listed below.

Special-Status Wildlife Species Protection

- A qualified biologist will provide training to field management and construction personnel on the importance of protecting environmental resources. Communication efforts and training will take place during preconstruction meetings so that construction personnel are aware of their responsibilities and the importance of compliance.

- Construction personnel will be educated on the types of sensitive resources located in the action area and the measures required to avoid impacts on these resources. Materials covered in the training program will include environmental rules and regulations for the specific project and requirements for limiting activities to the construction right-of-way and avoiding demarcated sensitive resource areas. Training seminars will educate construction supervisors and managers on:

  - The need for resource avoidance and protection.
  - Construction drawing format and interpretation.
  - Staking methods to protect resources.
  - The construction process.
  - Roles and responsibilities.
  - Project management structure and contacts.
  - Conservation measures.
  - Emergency procedures.

- If new construction personnel are added to the Phase 1 Project, the contractor will ensure the new personnel receive the mandatory training before starting work. A representative will be appointed during the employee education program to be the contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped individual. The representative's name and telephone number will be provided to the USFWS before the initiation of ground disturbance.

- If individuals of listed wildlife species may be present and subject to potential injury or mortality from construction activities, a qualified biologist will conduct preconstruction surveys. If a listed wildlife species is discovered, construction activities will not begin in the immediate vicinity of the individual until USFWS and/or CDFW is contacted and the individual has been allowed to leave the construction area.

- Minimum qualifications for a qualified biologist will be a four-year college degree in biology or related field and two years of professional experience in the application of standard survey, capture, and handling methods for the species of concern. However, in the case of CDFW fully protected species (i.e., salt marsh harvest mouse), no capture or handling will be done.

- Any special-status species observed during surveys will be reported to the USFWS and CDFW so the observations can be added to the California Natural Diversity Database (CNDDB).

Salt Marsh Harvest Mouse

- Disturbance to wetland vegetation will be avoided to the extent feasible in order to reduce potential impacts on salt marsh harvest mouse. If wetland plants cannot be avoided, it will be removed by hand (and/or by another USFWS and CDFW-approved method). An approved biologist will be on site to monitor all wetland vegetation removal activities.

- Vegetation within salt marsh harvest mouse habitat will be removed to bare ground using hand tools (and/or by another USFWS and CDFW approved method).

- Within salt marsh harvest mouse habitat, vegetation will be removed from all areas prior to ground disturbance (driving roads, action area, or anywhere else that vegetation could be crushed).

- To prevent salt marsh harvest mouse from moving through the Phase 1 Project site during construction, temporary exclusion fencing will be placed around a defined work area adjacent to suitable habitat before construction activities start and immediately after vegetation removal. The fence should be made of a material that does not allow salt marsh harvest mouse to pass through or over, and the bottom should be buried to a depth of at least six inches so that mice cannot crawl under the fence. Any supports for the salt marsh harvest mouse exclusion fencing (e.g., t-posts) will be placed on the inside of the Project area.

- Prior to the start of daily construction activities during initial ground disturbance, the qualified biologist will inspect the salt marsh harvest mouse-proof boundary fence to ensure that it has no holes or rips and the base is still buried. The fenced area also will be inspected to ensure that no mice are trapped in it. Any mice found along and outside the fence will be closely monitored until they move away from the construction area.

- If a salt marsh harvest mouse is discovered, construction activities will cease in the immediate vicinity of the individual until USFWS is contacted and the individual has been allowed to leave the construction area.

- All equipment will be staged on existing roadways, designated staging areas, and away from suitable wetland habitats (i.e., Novato Creek marsh and wetlands adjacent to Bel Marin Keys development) when not in use.

- A qualified biologist will be on site during construction activities occurring in wetlands. The biologist will document compliance with the Phase 1 Project permit conditions and avoidance and conservation measures. The qualified biologist has the authority to stop project activities if any of the requirements associated with these measures is not being fulfilled. If the biologist has requested work stoppage because of take of any of the listed species, the USFWS and CDFW will be notified within one day by email or telephone.

Ridgway's Rail

- To minimize or avoid the loss of individual Ridgway's rails, activities, including vegetation removal, adjacent to tidal marsh areas (within 500 feet or a distance determined in coordination with USFWS) will be avoided during the Ridgway's rail breeding season from February 1 through August 31.

- If areas within or adjacent to Ridgway's rail habitat cannot be avoided during the breeding season, protocol-level surveys shall be conducted to determine Ridgway's rail locations. If no rail territories are detected or their territories can be avoided, then project activities may proceed at that location. If nesting Ridgway's rails are determined to be present, activities will not occur within 500 feet, or a distance determined in coordination with USFWS, of an identified calling center, unless the intervening distance across a major slough channel or across a substantial barrier between the rail calling center and any project activity area is greater than 200 feet, then it may proceed at that location within the breeding season. The surveys will focus on potential habitat that may be disturbed by construction activities during the breeding season to ensure that Ridgway's rails are not nesting in these locations. Survey methods will follow the USFWS survey protocol for Ridgway's rail summarized below (USFWS, 2015).

- For each project site (or marsh), survey stations should be established so that the entire marsh is covered by 100-meter radius circular plots. Listening (passive) and call playback (active) survey stations should be established no more than 200 meters apart along transects in or adjacent to marsh areas. Survey stations should be located on levee crowns or boardwalks to minimize disturbances to marsh areas.
- Surveys should be initiated between January 15 and February 1. For each survey station, four surveys are to be conducted: two (2) passive surveys, followed by two (2) active surveys. Surveys should be spaced at least two (2) weeks apart and should cover the time period from the date of the first survey through the end of March or mid-April. Surveys should proceed until Ridgway's rail(s) are detected. Once a Ridgway's rail is detected, the project site is considered occupied. At this time, all active surveys within the project site shall be terminated. A 10(a)(1)(A) permit is required to conduct active surveys.

California Black Rail

- To minimize or avoid the loss of individual California black rails, activities, including vegetation removal, adjacent to tidal marsh areas (within 500 feet or a distance determined in coordination with CDFW) will be avoided during the California black rail breeding season from February 1 through August 31.

- If areas within or adjacent to black rail habitat cannot be avoided during the breeding season, focused surveys shall be conducted to determine black rail locations. If no rail territories are detected or their territories can be avoided, then project activities may proceed at that location. If nesting California black rails are determined to be present, activities will not occur within 500 feet, or a distance determined in coordination with CDFW, of an identified calling center, unless the intervening distance across a major slough channel or across a substantial barrier between the rail calling center and any project activity area is greater than 200 feet, then it may proceed at that location within the breeding season. The surveys will focus on potential habitat that may be disturbed by construction activities during the breeding season to ensure that black rails are not nesting in these locations. Survey methods are adapted from Point Reyes Bird Observatory Black Rail Survey Protocol and USFWS clapper rail survey methods summarized below (PRBO, 2016; USFWS, 2015).

    - For each project site (or marsh), survey stations should be established so that the entire marsh is covered by 100-meter radius circular plots. Listening (passive) and call playback (active) survey stations should be established no more than 200 meters apart along transects in or adjacent to marsh areas. Survey stations should be located on levee crowns or boardwalks to minimize disturbances to marsh areas.
    - Surveys should be initiated between March 15 and May 31. For each survey station, four surveys will be conducted with at least 10 days between surveys: (2) passive surveys, followed by two (2) active surveys. Passive surveys involve listening at survey stations for five minutes. Active surveys will passively listen for one minute then broadcast recorded black rail vocalizations: one minute of "grr" calls followed by 0.5 minute of "ki-ki-krr" calls then listening for additional 3.5 minutes for response. Surveys should proceed until California black rail(s) are detected. Once a black rail is detected, the location and direction will be documented and the project site is considered occupied. At this time, all active

surveys within the project site shall be terminated. A 10(a)(1)(A) permit is required to conduct active surveys.

In addition to the measures listed above, the following avoidance and minimization measures identified in the BMKV Supplemental EIR/EIS (Jones & Stokes 2003) will be implemented. The full text of these measures is provided in **Appendix C**.

- Mitigation Measure BIO-1: Conduct Surveys to Locate Northern Harrier, White-Tailed Kite, Golden Eagle, Cooper's Hawk, Sharp-shinned Hawk, Short-Eared Owl, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow Nest Sites Before Construction Is Initiated and Avoid Breeding Sites

- Mitigation Measure BIO-2: Remove Salt Marsh Harvest Mouse Habitat and Place Barrier Fencing in the Immediate Vicinity of Operating Equipment.

- Mitigation Measure BIO-3: Avoid Operation of Equipment within 250 feet of the Outboard Tidal Coastal Marsh During the Breeding Period of the California Clapper Rail and California Black Rail

- Mitigation Measure BIO-4: Conduct Surveys to Locate San Pablo Song Sparrow Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction

- Mitigation Measure BIO-5: Conduct Surveys to Locate Burrowing Owl Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction

- Mitigation Measure BIO-7: Develop and Implement a Restoration Monitoring and Adaptive Management Program Designed to Minimize Potential Impacts on Special-Status Species

- Mitigation Measure BIO-9: Monitor Development of Brackish Open Water, Emergent Marsh, and/or Seasonal Wetlands

- Mitigation Measure BIO-10a: Prevent Spread of Perennial Pepperweed and Other Invasive Weeds to Uninfested Areas

- Mitigation Measure BIO-10b: Monitor Restoration Sites and Control for Infestation by Invasive Nonnative Plants

7.2 Project Benefits to Special-Status Species

In the long-term, the Phase 1 Project would result in an increase in aquatic habitat, wetland habitat, and wetland-upland interface, as well as an overall enhancement of the aquatic food web. Overall effects of the Phase 1 Project combined with future restoration phases (restoration of tidal salt marsh habitat) would contribute to the recovery of salt marsh harvest mouse, Ridgeway's rail, and California black rail. Additionally, restoration of seasonal wetlands adjacent to pickleweed habitat would likely provide refugia habitat for salt marsh harvest mouse.

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CHAPTER 8
Mitigation (Box 12)

Construction of the proposed project would impact 2.30 acres of existing wetland habitat and 2.02 acres (17,619 linear feet) of other waters of the U.S., totaling 4.32 acres of jurisdictional waters of the U.S. and the State. Of this amount 1.47 acres (3,000 linear feet) would be temporary and 2.85 acres (14,619 linear feet) would be permanent.

TABLE 8-1
SUMMARY OF NET CHANGE IN JURISDICTIONAL WATERS

	Temporarily Impacted		Permanently Impacted		Created		Net Change	
	Linear Feet	Area (Acres)	Linear feet	Area (acres)	Linear feet	Area (acres)	Linear feet	Area (acres)
Wetlands								
Saline emergent wetland		0.61		0.79		0		-0.79
Seasonal wetland		0		0.90		25.00		24.10
Farmed wetland		0		0		0		0
SubTotal		***0.61***		***1.69***		***25.00***		***23.31***
Other Waters of the U.S.								
Pond		0		0		0		0
Drainage channel	3,000	0.86	14,619	1.16	21,390	1.96	6,771	0.80
SubTotal	***3,000***	***0.86***	***14,619***	***1.16***	***21,390***	***1.96***	***6,771***	***0.80***
Total		**1.47**		**2.85**		**26.96**		**24.11**

The Phase 1 Project would create approximately 25 acres of seasonal wetland habitat and enhance 20 acres of upland habitat. Although the Phase 1 Project would result in loss of 0.79 acre of saline emergent marsh habitat, it would also create 25 acres of seasonal wetland habitat.

Upon project completion, the Project site would be monitored for 5 years and necessary actions would be taken to ensure project restoration goals are achieved.

Because the Phase 1 Project would result in creation of a substantially larger habitat area than exists at the site currently, and then would be impacted by project construction, the proposed Phase 1 Project would not require compensatory mitigation. If an impact to mitigation ratio were applied to account for project impacts, the Phase 1 Project would result in a mitigation to benefit ratio of 7.5:1, which is above and beyond the standard compensatory mitigation ratios applied to project impacts.

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CHAPTER 9
Cultural Resources in the Project Area

A Cultural Resources Inventory and Evaluation Report was completed by Jones & Stokes in 2004 (Jones & Stokes, 2004) and is included as **Appendix E**. An Addendum to this report completed by Environmental Science Associates (ESA) in 2016 (ESA, 2016c), is also included in **Appendix E**. During the 2004 study, Jones & Stokes did not identify any prehistoric archaeological sites in the BMKV expansion project area (including the Phase 1 Project area). Jones & Stokes did identify two historic-era archaeological resources and evaluated both resources according to National Register of Historic Places (National Register) and the California Register of Historical Resources (California Register) criteria. Due to a lack of association and integrity, neither was recommended as eligible for listing.

ESA conducted a field visit of the Phase 1 Project APE on April 9, 2016 to substantiate the 2004 cultural resources identification and analysis. Three cultural resources were identified and evaluated including an overflow structure, farm complex, and levee and ditch system.

Archival research and field investigations completed in 2004 and 2016 indicate that implementation of the BMKV expansion project (including the Phase 1 Project) would not impact any known significant architectural or archaeological resources. Additionally, the BMKV expansion project (including the Phase 1 Project) has a low potential for the inadvertent discovery of unknown archaeological resources or human remains. Based on the 2004 findings and the 2016 analysis, ESA recommends a finding of No Historic Properties for the Phase 1 Project.

The following mitigation measures identified in the BMKV SEIR/S (Jones & Stokes 2003) would be implemented in the unlikely event that archaeological resources or human remains were identified during ground disturbing activities. The full text of these measures is included in Appendix C.

- Mitigation Measure CR-1: Stop Work if Buried Cultural Deposits Are Encountered during Construction Activities.
- Mitigation Measure CR-2: Stop Work if Human Remains are Encountered during Construction Activities.

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CHAPTER 10
CEQA/NEPA Compliance (Boxes 14 and FG14)

A summary of the CEQA/NEPA compliance history for the HWRP, including the BMKV expansion, is included in Section 2.2, Site History and Setting. As noted in that section, SCC and Corps completed CEQA/NEPA compliance documentation requirements for the BMKV expansion between 2003 and 2005. In the ensuing period, the SCC has worked with its partner agencies and consultant team to secure match funding, conduct additional technical investigations of the site, and to develop the BMKV Phase 1 Project for implementation. The Phase 1 Project does not involve substantial revisions, changed circumstances, or new information that would result in new significant effects or substantially increase the severity of significant effects identified in the BMKV SEIR/S. Therefore, as provided for under 14 CCR Section 15164, SCC is preparing an addendum to the SEIR/S to satisfy CEQA compliance obligations for the Phase 1 Project. The addendum will be provided under separate cover. The Corps' NEPA guidance (40 CFR 1500-1508 and Department of the Army Engineer Regulation 200-2-2) is silent on the requirement for additional NEPA compliance documentation for minor project changes that do not involve significant new circumstances or information. In such cases Corps staff may prepare a memo to file documenting its reasoning for concluding no further NEPA compliance documentation is warranted, or it may choose to take no further action.

10.1 Project Impacts on Adjacent Properties and Cumulative Impacts

A summary of the 2003 BMKV SEIR/S analysis is provided to address the Corps San Francisco District's General Regional Condition for Nationwide Permit 27.[2] The SEIR/S contains a thorough analysis of potential impacts of the BMKV expansion, including effects on adjacent properties, residences, and cumulative impacts. The Phase 1 Project has been designed to be compatible with adjacent residential uses and open space. The restoration concept design was based on a thorough evaluation of alternatives, and the selected alternative protects adjacent residential views and consistent with local planning efforts for development and public access. The Phase 1 Project has been designed to be the most compatible with adjacent residential uses.

[2] The complete SEIR/S is available for review online: http://www.scc.ca.gov/webmaster/project_sites/belmarin/documents.html

Mitigation measures were identified in the SEIR/S and would be implemented for the Phase 1 Project, as applicable. The applicable mitigation measures for the Phase 1 Project are presented in Appendix C.

Chapter 5 of the SEIR/S contains a cumulative impact analysis.[3] The analysis concluded that the BMKV expansion project would result in irretrievable commitment of fossil fuels and other energy sources. However, the project would not considerably contribute to significant cumulative impacts on aesthetics, air quality, cultural resources, geology/soils, hazardous substances, land use, noise, transportation, public utilities, public health, water quality, or hydrology/hydraulics. Overall the analysis determined the BMKV expansion project would considerably contribute to beneficial cumulative impacts on biological resources.

[3] The SEIR/S Chapter 5 Cumulative Impact Analysis is available at: http://www.scc.ca.gov/webmaster/project_sites/belmarin/final/text/FEIR/Chapter-5.pdf).

CHAPTER 11
Supplemental Information for BCDC (Box 18)

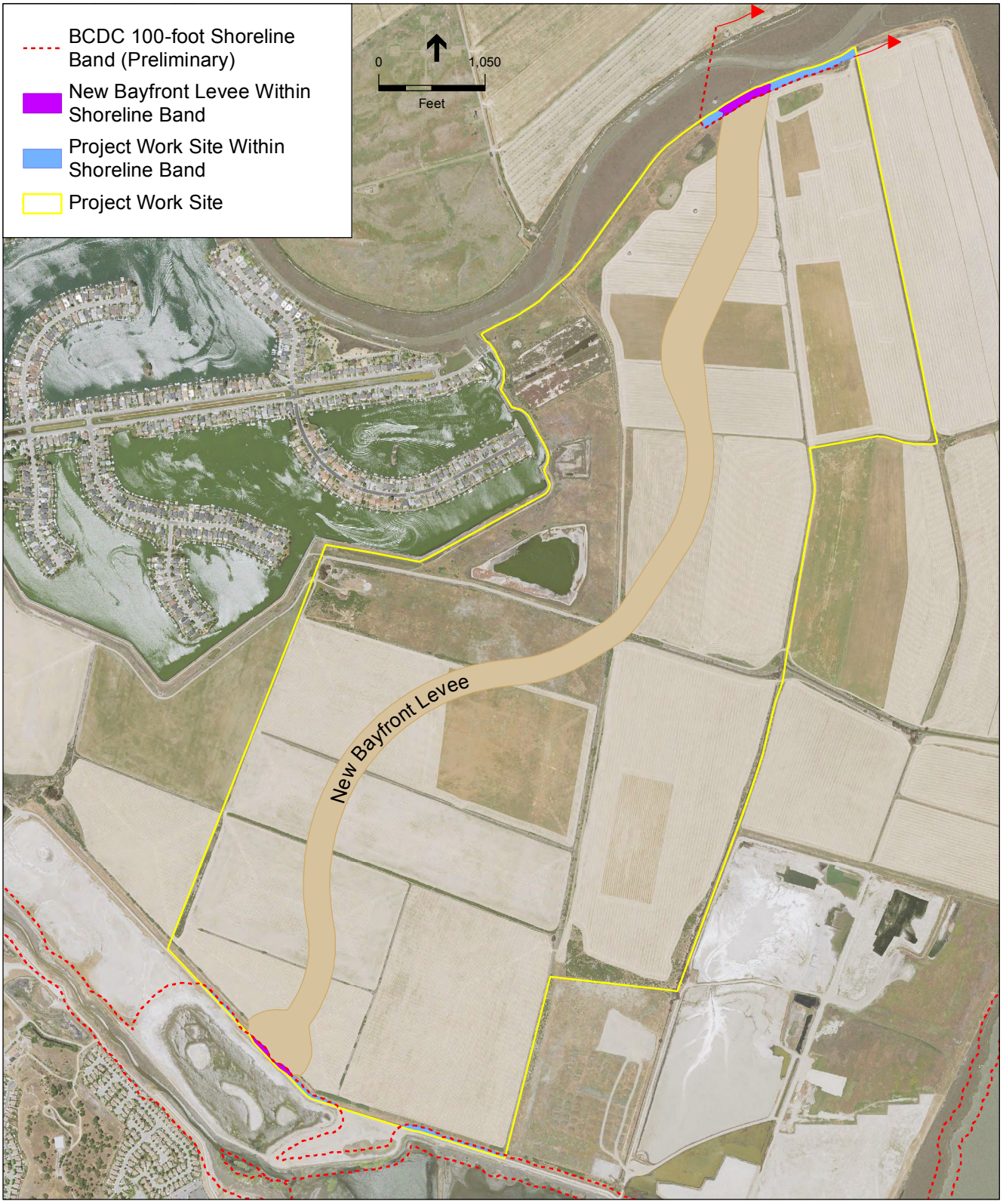
11.1 Project Information within BCDC Jurisdiction

Does the project involve development within the 100-foot shoreline band around San Francisco Bay?

☒ Yes ☐No

San Francisco Bay Plan Shoreline Designation: At the north end of the Project site the bay shoreline was drawn by using the MHW (5.45 ft NAVD88 from the NOAA tidal gauge in Richmond) along the open water of Novato Creek and 5 ft above MSL (MSL is 3.26 ft and 5 ft above MSL is 8.26 ft NAVD88) along the marsh. Topographic lines along the northern boundary along Novato Creek were extrapolated from lidar based digital elevation map. At the south end of the project the bay shoreline was drawn by using the MHW (since its only open water and not marsh). The surveyed topographic map from the HWRP was used to generate the 5.45 ft NAVD88 contour line along the southern boundary. The BCDC shoreline band extends 100 feet inland from the bay shoreline. See Figure 11-1 for representation of the preliminary bay shoreline band and the Project site and area of new fill within the shoreline band.

Length of shoreline on the Project site, in feet:4,625	Length of shoreline of any adjacent property owned by the owner of the Project site, in feet: 2,935
Area reserved for non-public access uses: 224,933 Sq. Feet	Area reserved for public access: 0 Sq. Feet
Total size of underwater and tidal areas of the Project site: 0 Sq. Feet	Total shoreline band area within the Project site: 224,933 Sq. Feet
Total volume of solid fill to be placed in water or marsh areas: No bay fill. Within shoreline band, one seasonal wetland would be filled including 15.5 feet of fill over 4,316 Sq. Feet (66,898 Cubic Feet)	Area to be covered with solid fill: No bay fill. Within shoreline band, levee would cover 67,873 Sq. Feet
Area on new fill to be reserved for private, commercial, or other uses: No bay fill. Within shoreline band, levee would cover 67,873 Sq. Feet	Area on new fill to be reserved for public access: 0 Sq. Feet
Area within the shoreline band to be reserved for non-public uses: 224,933 Sq. Feet	Area within shoreline band to be reserved for public access: 0 Sq. Feet
Total cost of project. (This means the fair market value of the project, including materials, labor, machine rentals, etc.) $ 14 Million	



SOURCE: ESA 2016, USDA 2014

Bel Marin Keys Wetland Restoration Project - Phase 1. 150011.00

Figure 11-1

BCDC 100-Foot Shoreline Band

11.2 Shoreline Band

- *What is the basic purpose of the new fill in the Bay, salt pond, managed wetland, or certain waterway*?
  - The goal of the HWRP, including the BMKV expansion and Phase 1 Project, is to create a diverse array of wetland and wildlife habitats at the BMKV site that will benefit endangered species and other migratory and resident species.
- *Please specify the area of fill, in square feet, proposed to be covered in structures*.
  - The Phase 1 Project would not construct structures, such as paved roads, parking, sidewalks, landscaping, or shoreline protection within the shoreline band. The Phase 1 Project would construct a levee within the shoreline band of Novato Creek for the purposes of habitat and flood protection. The levee would fill approximately 67,873 sq.ft. within the shoreline band.
- *Please identify the total number of parking spaces in the project and within the shoreline band*.
  - Upon project completion there would be no public parking spaces within the site boundary or within the shoreline band.
- *Please provide dimensions of portions of all structures to be built within the shoreline band, including length, width, area, height, and number of stories*.
  - The New Bayfront Levee would be built within a portion of the shoreline band. The New Bayfront Levee includes 1,200 linear feet with an average width of 57 feet within the shoreline band. The levee would be built to an elevation of +15 feet over an area of 67,873 square feet within the shoreline band. Within the portion of the levee footprint occurring within the shoreline band, approximately 4,316 square feet of existing seasonal wetland would be filled.

11.3 Environmental Impact Documentation

See Chapter 10, above.

11.4 Public Access

- *Please describe why the project will not affect public views or public access to the shoreline. For most large projects, identify: (1) the existing number of people or employees using the site; and (2) the existing number of cars, bicycles, and pedestrians visiting the site and the level of service of all nearby roads leading to the site. Please describe how the project will change these factors*.
  - SCC purchased the BMKV property from a private owner for purposes of wetland restoration. As part of its interim management of the site prior to restoration, SCC has allowed a farmer to use the property for oat hay and a bee keeper to use the property for bee hives. SCC has also allowed the general public to walk and bicycle on the property although SCC has not provided any trails or other formal public access. During periods of construction of the Phase 1 Project, access to certain areas of the site will be closed to everyone but construction personnel as necessary to

insure public safety. Upon completion of construction of the Phase 1 Project, SCC will resume managing the site in a similar manner as it had before: the farmer and bee keeper will be allowed to resume their activities and SCC will allow people to walk and bicycle on the site. In a future phase of the HWRP-BMKV Expansion project, SCC intends to provide formal public access on the BMKV property through extension of the Bay Trail along a portion of the property.

- There are no public San Francisco Bay shoreline viewing opportunities that would be obstructed by the Phase 1 Project. The New Bayfront Levee would be the most prominent vertical element of the Phase 1 Project. The New Bayfront Levee would be visible from public roads (cul de sacs) within the Bel Marin Keys community. These roads currently allow for views of the BMK site, but not the Bay shoreline which is located approximately 1 mile to the east. There are no public parks or recreation areas within the BMK community that offer views to the Bay shoreline. And so while the levee would be visible from public vantage points within the BMK community (i.e., roads) it would be in keeping with the existing visual character of the site (surrounded by levees) and would not obstruct or impair Bay or Bay shoreline views.

- *Please describe the impact the project is expected to have on the existing use of the site and on existing public views or physical public access at the site.*

  - See previous response. Upon completion of construction, the site would be managed in a manner similar to that occurring under pre-Project conditions (i.e., dry farming for grains). The BMKV property is bounded by and traversed by existing levees and berms. The addition of the new levee and seasonal wetlands will be in keeping with the site's existing visual character.

- *Please describe the impact the project is expected to have on the public's use of existing nearby parks, public access, public parking and other recreational areas on the shoreline and the roads leading to the site.*

  - With the exception of limited construction-period equipment and vehicle transportation and access along primary and secondary access roads (see Section 3.5.3, above) which may be used by the public to access regional recreational resources, the Phase 1 Project would have no impact on the public's use of existing nearby parks, public access, public parking, or other recreational areas. An approximately 1,000 foot of Bay Trail between Pacheco Pond and Hamilton Wetlands Restoration Project would be used for vehicle and equipment transport during construction. Temporary access restrictions of approximately 5 minutes may occur a few times per day during vehicle ingress/egress. The trail would otherwise remain open to the public.

- *Summarize the public access to be provided as part of the total project:*

  - One of the specific objectives for the BMKV expansion is to provide for public access that is compatible with protection of resource values and with regional and local public access policies. The BMKV site does not currently provide formal public access due to safety issues (ongoing agricultural operations across much of the site). And no formal access is proposed during the construction phases of the BMKV restoration. However, the SCC is exploring options to provide connections to the nearby Bay Trail, either as part of the future phases of the restoration work at the BMKV site or as an independent project.

CHAPTER 12
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APPENDIX A

Wetland Delineation Report

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Draft

BEL MARIN KEYS WETLAND RESTORATION PROJECT PHASE I RESTORATION ACTION

Wetland Delineation Report

Prepared for
California State Coastal Conservancy

May 2016



Draft

BEL MARIN KEYS WETLAND RESTORATION PROJECT PHASE I RESTORATION ACTION

Wetland Delineation Report

Prepared for
California State Coastal Conservancy

May 2016

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TABLE OF CONTENTS

Bel Marin Keys Wetland Restoration Project Phase I Restoration Action – Draft Wetland Delineation Report

Page

1. Introduction **1**
- 1.1 Responsible Parties 1
- 1.2 Study Area Location 1
- 1.3 Purpose of Assessment 4

2. Environmental Setting **5**
- 2.1 Wetland Delineation Study Area 5
- 2.2 Soils 5
- 2.3 Hydrology 6
- 2.4 Vegetation 6

3. Methodology **11**
- 3.1 Regulatory Setting 11
- 3.2 Pre-field Review 14
- 3.3 Field Survey Methods 14
- 3.4 Mapping and Acreage Calculations 18

4. Results **19**
- 4.1 Results 19
- 4.2 Jurisdictional Analysis 30
- 4.3 Conclusions 32

5. References **33**

Appendices

A. NRCS Soils Report
B. Wetland Determination Data Forms
C. Data Table for all Features Evaluated
D. Photo Appendix

Page

Figures

Figure 1-1	Regional Location	2
Figure 1-2	Topographic Map	3
Figure 2-1	Study Area Elevations	7
Figure 2-2	Soils	8
Figure 3-1	NWI Map for Bel Marin Keys Study Area	15
Figure 3-2	NWI Map – Northwest Section	16
Figure 3-3	Novato Creek Historical Ecology GIS Data	17
Figure 4-1A	Potentially Jurisdictional Waters of the U.S.	21
Figure 4-1B	Potentially Jurisdictional Waters of the U.S.	22
Figure 4-1C	Potentially Jurisdictional Waters of the U.S.	23
Figure 4-1D	Potentially Jurisdictional Waters of the U.S.	24
Figure 4-1E	Potentially Jurisdictional Waters of the U.S.	25
Figure 4-1F	Potentially Jurisdictional Waters of the U.S.	26
Figure 4-1G	Potentially Jurisdictional Waters of the U.S.	27

Tables

Table 4-1	Potentially Jurisdictional Wetlands and Other Waters of the U.S. and of the State in the Study Area	19

CHAPTER 1
Introduction

This report has been prepared to document the results and conclusions of a wetland delineation field survey conducted in March 2016 at the Bel Marin Keys Wetland Restoration Project (project) study area. The study area includes approximately 906 acres of the Bel Marin Keys Unit V (BMKV) property, which is owned by the California State Coastal Conservancy (SCC). The study area consists primarily of agricultural land that borders the southern and eastern boundary of the Bel Marin Keys community (Figure 1-1). On behalf of the SCC, Environmental Science Associates (ESA) investigated the extent of potentially jurisdictional wetlands and other waters of the U.S. subject to regulation under the Clean Water Act (CWA). The study concludes that there are 58 acres of potentially jurisdictional wetlands and other waters of the U.S. in the study area. These include:

- 24.29 acres of saline emergent wetland
- 15.24 acres of seasonal wetland
- 0.11 acres of farmed wetland
- 4.98 acres of drainage channel, and
- 13.01 acres of pond.

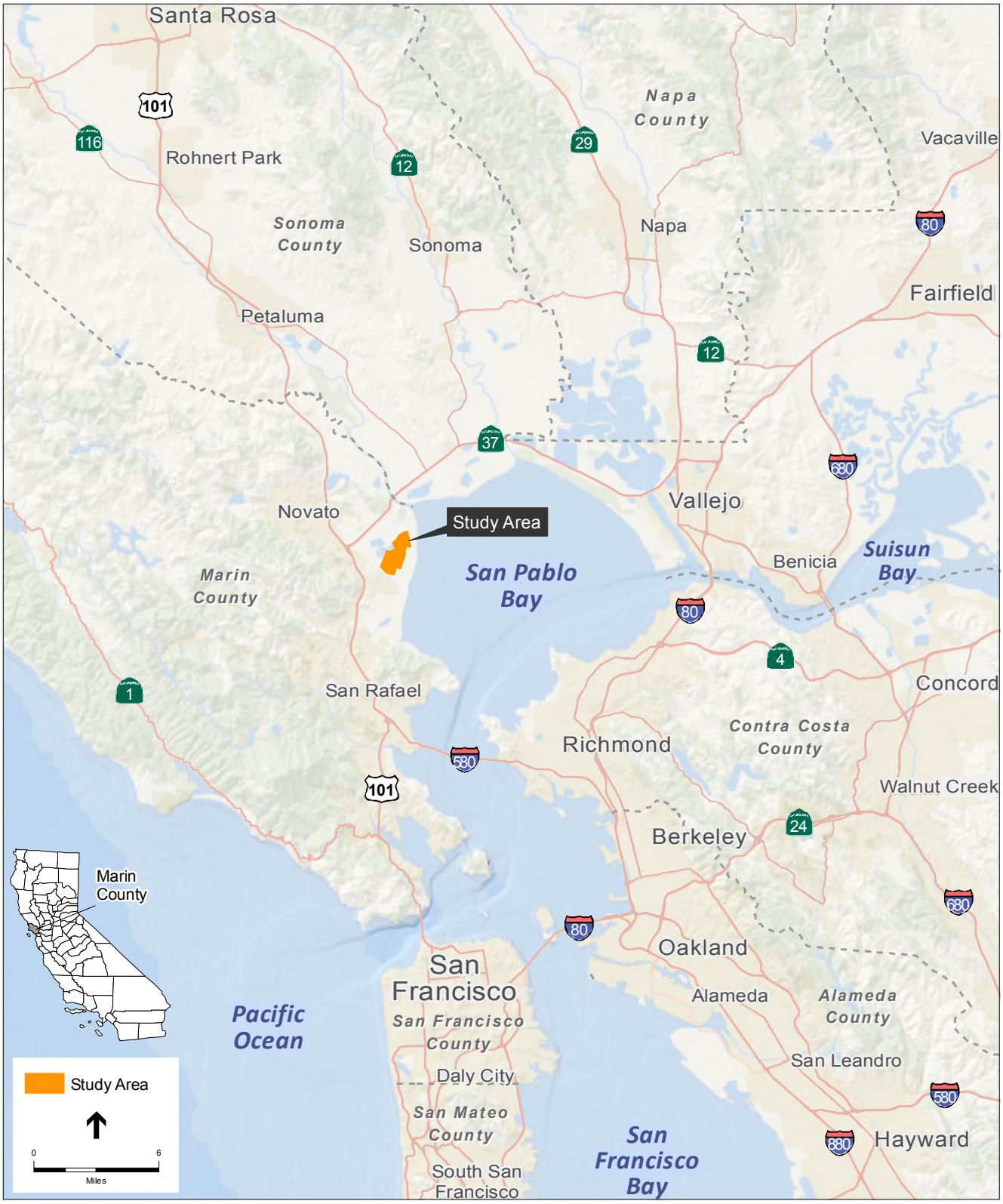
1.1 Responsible Parties

The responsible party and point of contact for regulatory permitting is:

Jeff Melby
Project Manager,
State Coastal Conservancy
1330 Broadway, 13th Floor
Oakland, CA 94612-2530
510.286.4088, jeff.melby@scc.ca.gov

1.2 Study Area Location

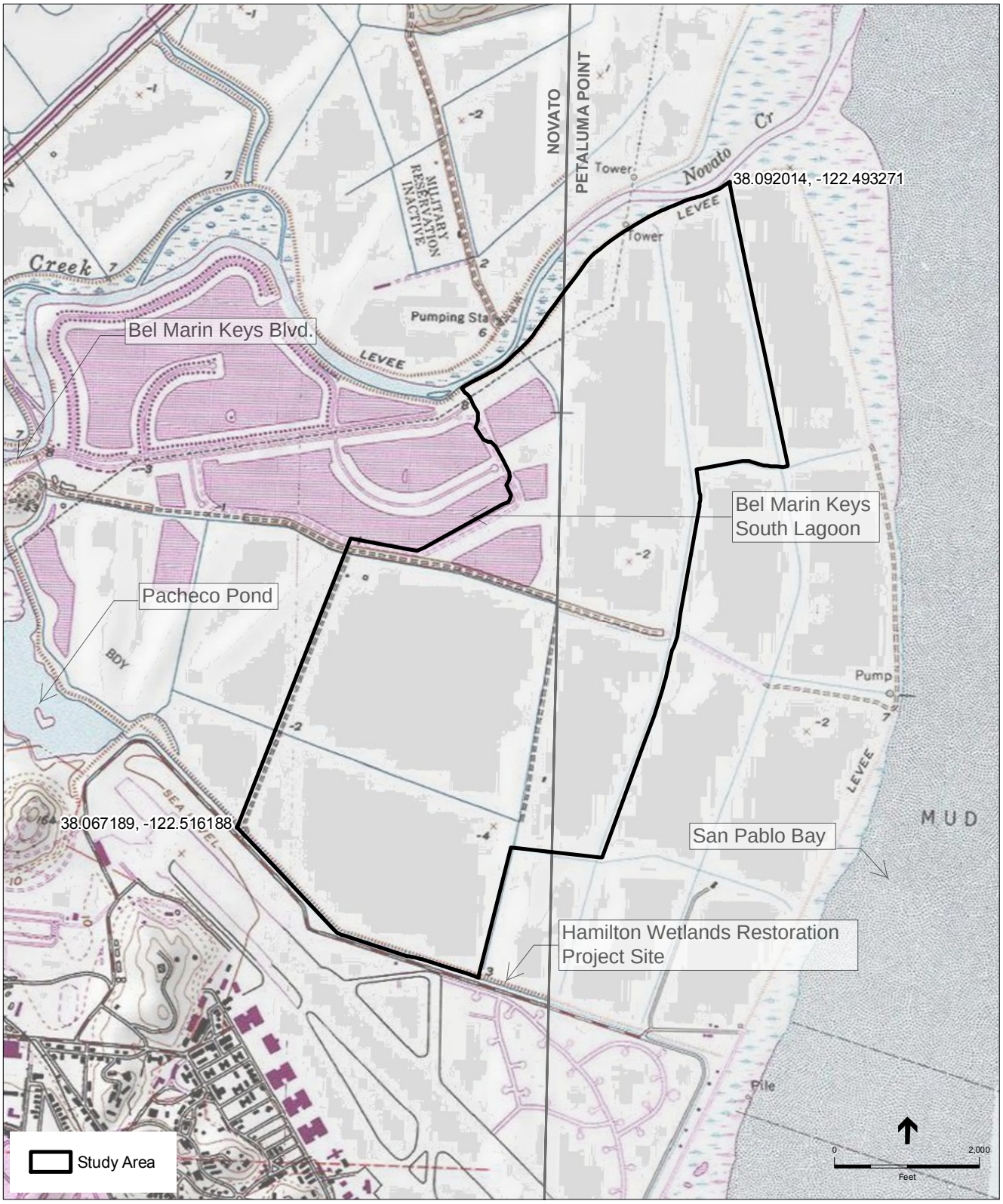
The study area is located in Novato in Marin County, east of U.S. Highway 101 and south of CA Highway 37 (Figure 1-1). The BMKV property is effectively bordered by waterbodies on all sides, separated by levees. Beginning at Bel Marin Keys Boulevard at the northwest end and proceeding counter-clockwise, the adjacent waterbodies are Pacheco Pond to the south and west, Hamilton Wetland to the south and west, San Pablo Bay to the east, Novato Creek to the north, and the Bel Marin Keys South Lagoon to the north (**Figure 1-2**). A small portion of the BMKV property abuts the privately owned and operated Anubhuti Meditation and Retreat Center to the northwest; no waterbody abuts the BMKV property at this location.



SOURCE: ESRI, 2012; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 1-1
Regional Location



SOURCE: USGS 7.5' Topo Quad (Novato, 1985; Petaluma Point, 1985); ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 1-2

Topographic Map

The study area is covered in two U.S. Geological Survey 7.5 minute quadrangle maps: Novato and Petaluma Point (Figure 1-2). Coordinates for the study area are: 38.092014, -122.493271 for the northeast corner and 38.067189, -122.51688 for the southwest corner.

1.3 Purpose of Assessment

The purpose of this investigation is to describe and delineate all wetlands and waters of the U.S. and State within the project study area that may be subject to Sections 404 and 401 of the Clean Water Act, and the Porter-Cologne Water Quality Control Act. Information from this report may be used in preparing permit applications for future actions proposed in the study area. This report is intended to be reviewed by the U.S. Army Corps of Engineers (USACE) so that a preliminary jurisdictional determination (PJD) of wetlands and other waters of the U.S. in the study area can be made; this report is also intended to support the Regional Water Quality Control Board's (RWQCB) assessment of their regulatory jurisdiction.

CHAPTER 2
Environmental Setting

2.1 Wetland Delineation Study Area

The study area is located in the ecologically diverse California Coastal Steppe Section, Mount St. Helena Flows and Valleys subsection of the Ecological Subregions of California (Miles and Goudey, 1997). This subsection contains the northwest trending Sonoma, Mayacamas, and Howell Ranges and the valleys of the Napa River and Sonoma Creek. Natural plant communities typical of the region and surrounding the study area include grassland, oak woodland, Douglas fir in moist canyons and chamise chaparral on exposed slopes with shallow soils. Areas around San Pablo Bay support tidal and non-tidal wetlands. The climate is temperate with mean annual precipitation of 35.59 inches and mean annual temperatures ranging from a high of 70.0 to a low of 47.9 degrees Fahrenheit (Western Regional Climate Center, 2016).

The study area within BMKV is located along the west side of San Pablo Bay that has exterior levees on the north, west, and south boundaries. The levees prevent water exchange with San Pablo Bay; wetlands and waters within the study area do not have a tidal exchange. The majority of the study area is dry farmed with upland crops consisting of oats (*Avena sativa*) and vetch (*Vicia sativa*) that are harvested annually in the spring or early summer and used as hay. The crop plants are generally direct seeded in late fall or early winter. The fields have been used for dry farmed crops for the past several decades. There is no evidence in the study area or in historic aerial photos (Google Earth, 2016) of irrigation infrastructure. Therefore, it is unlikely that irrigated crops have been grown in the study area in the past several decades, if ever.

Multiple soil borrow areas, or isolated depressions, are present in the study area. These are locations where soil has been excavated for construction or maintenance of the perimeter levee. The soil borrow areas vary in depth but are in the range of -3 meters NGVD29 to -2meters NGVD29, or about 1 to 2 meters below the surrounding area (**Figure 2-1**). The borrow areas, indicated on the figure by their pinkish hues, pond water in the winter and most dry out by late summer.

2.2 Soils

The *Custom Soil Resource Report for Marin County, California* (NRCS, 2016 – **Appendix A**) and the study area soils map (**Figure 2-2**) show nine soil series within the report area of interest. Of these nine, only two soil series occur within the study area. Both of these soil series are

considered hydric by the Natural Resources Conservation Service (NRCS) (NRCS, 2015). The following is a brief description of mapped soils within the study area:

- **Reyes clay,** a Sulfic Fluvaquent, is a somewhat poorly drained soil that rarely floods and does not pond with a water table depth at ground level. The soil is strongly saline as Reyes clay is found in tidal marshes. The clay substrate is alluvium derived from igneous, metamorphic and sedimentary rock. Reyes clay is the dominant soil type within the study area.

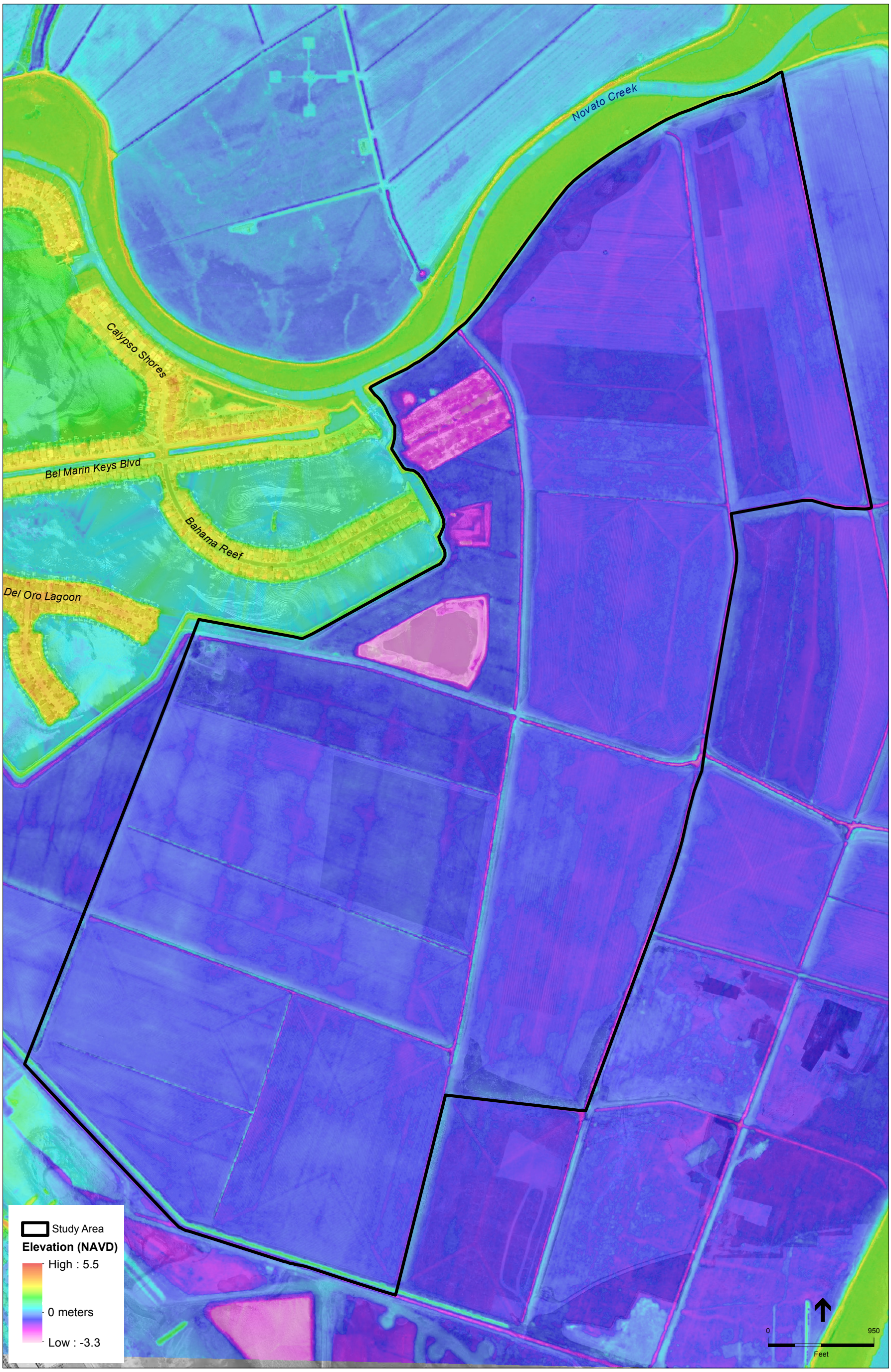
- **Novato clay,** a Typic Sulfaquent, is a very poorly drained soil that frequently floods but does not pond, with a water table depth at ground level. The soil is strongly saline and found in tidal marshes. The profile is consistent clay from 0 to 60 inches. Within the study area, Novato clay is located along the north and northeast BMKV property boundary associated with the Novato Creek levee, and along the bay shore east of the existing Bayfront levee.

2.3 Hydrology

The study area is located within a larger agricultural landscape that is surrounded on all sides by levees. The levees prevent water from the adjacent open water bodies (San Pablo Bay, Bel Marin Keys South Lagoon, and Novato Creek) and wetland areas (Novato Creek tidal marsh) from entering the study area (although discharges from Bel Marin Keys lagoon into a pond located east of the lagoon occasionally occur during high water events). There is no tidal exchange within the study area; all surface water comes from rainfall. Surface water drains off of the farm fields into drainage channels which convey the water to a pump station located along the eastern levee (Figure 1-2) and the water is pumped out of the channel into the bay. According to the farmer (Jens Kulberg, pers. comm. with C. Rogers), water is pumped off the BMKV property periodically during the winter to keep the farm fields from saturating and to maintain low water levels in the drainage channels.

2.4 Vegetation

Vegetation within the study area consists of primarily of cultivated oat, Italian rye grass (*Festuca perennis*), vetch, hairy vetch (*Vicia villosa*), and birdsfoot deervetch (*Lotus corniculatus*) in the agricultural fields. Other less frequently observed upland species include cultivated radish (*Raphanus sativus*), ripgut brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), meadow bindweed (*Convolvulus arvensis*), Shamrock clover (*Trifolium dubium*), cutleaf geranium (*Geranium dissectum*), bur clover (*Medicago polymorpha*), prostrate knotweed (*Polygonum aviculare*), rough cocklebur (*Xanthium strumarium*), yellow star thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*) and bull thistle (*Cirsium vulgare*). Mature coyote brush shrubs (*Baccharis pilularis*) border the upland edge of the study area drainage channels and farm tract edges with few mature eucalyptus (*Eucalyptus* sp.) trees at the study area perimeter.

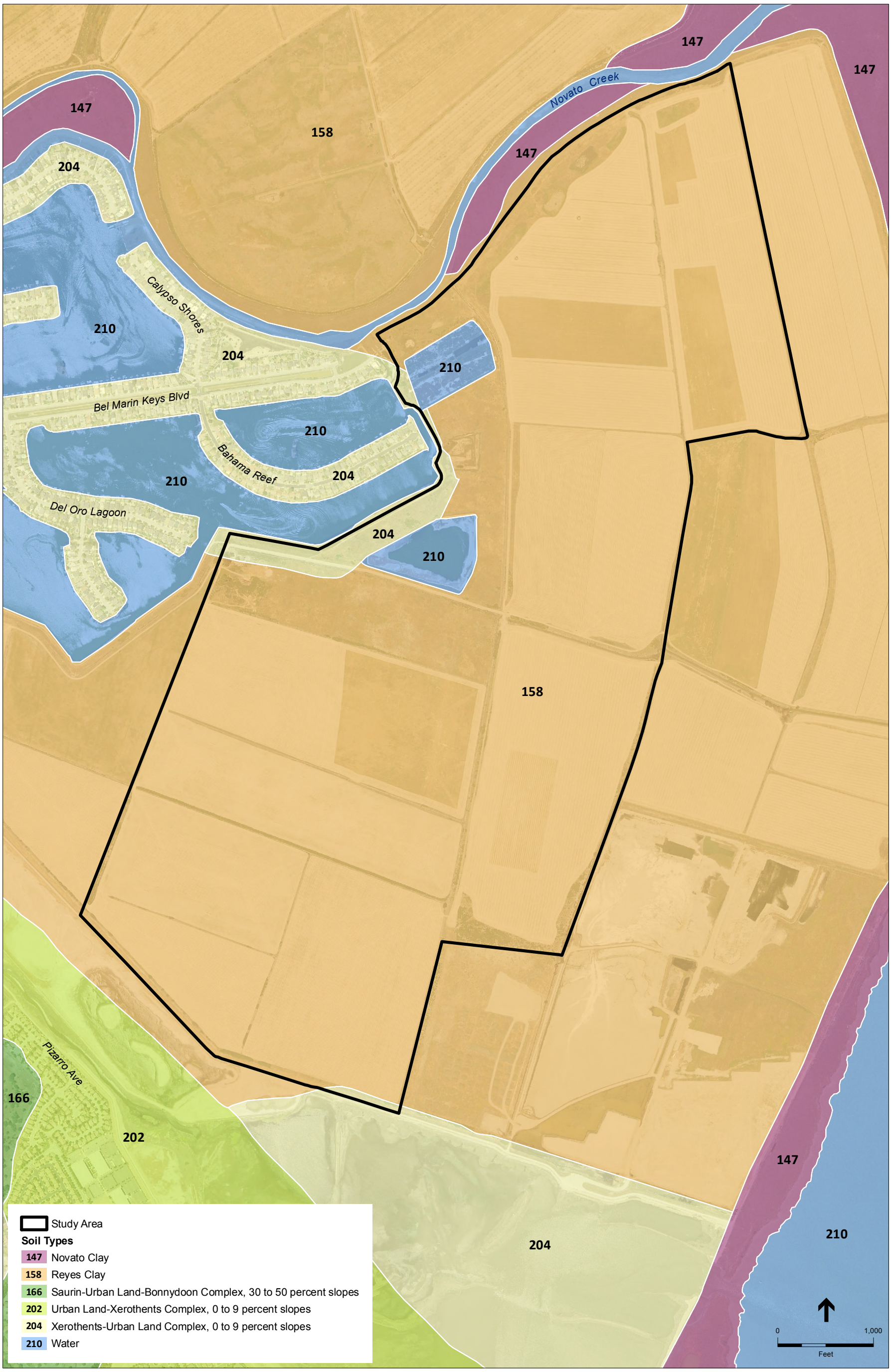


SOURCE: USDA, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 2-1

Study Area Elevations



SOURCE: USDA, 2014; NRCS, 2007; ESA, 2016

Figure 2-2
Soils

Natural depressions along the existing levees, within roadways, and former borrow areas among the farm tracts contain various annual and perennial wetland vegetation including birdsfoot deervetch, hyssop loostrife (*Lythrum hyssopifolia*), meadow barley (*Hordeum brachyantherum*), common toad rush (*Juncus bufonius*), fat hen (*Atriplex prostrata*), and brass buttons (*Cotula coronopifolia*) with bristly ox-tongue (*Helminthotheca echioides*), curly dock (*Rumex crispus*), Russian thistle (*Salsosa tragus*), and stinkwort (*Dittrichia graveolens*). The steep drainage channels dividing the farm tracts contain vegetation more common to tidally influenced areas including pickleweed (*Salicornia pacifica*), alkali heath (*Frankenia salina*), saltgrass (*Distichlis spicata*), and alkali bulrush (*Bolboschoenus maritimus*), among other wetland plants in lesser abundance. Section 4.1 includes a detailed description of the wetland types located within the study area, including saline emergent wetland, seasonal wetland, and farmed wetland.

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CHAPTER 3
Methodology

3.1 Regulatory Setting

3.1.1 Federal

The federal government defines "Waters of the United States" in 33 CFR 328.3 as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

2. All interstate waters including interstate wetlands;

3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:

    a. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or

    b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

    c. Which are used or could be used for industrial purpose by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of the United States under the definition;

5. Tributaries of the above waters;

6. The territorial seas;

7. Wetlands adjacent to the above waters (other than waters that are themselves wetlands). Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.

8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the EPA.

The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Under normal circumstances, the definition of wetlands requires three wetland identification parameters be present: wetland hydrology, hydric soils, and hydrophytic vegetation. Examples of wetlands may include freshwater marsh, seasonal wetlands, and vernal pool complexes that are adjacent to perennial waters of the U.S.

"Other waters of the U.S." refers to those hydric features that are regulated by the CWA but are not wetlands (33 CFR 328.4). To be considered jurisdictional, these features must exhibit a defined bed and bank and an ordinary high water mark. The term "ordinary high water mark" refers to that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. Examples of other waters of the U.S. may include rivers, creeks, ponds, and lakes.

In January 2001, the U.S. Supreme Court issued a decision in the case of the *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* that altered the Corps' regulatory authority over wetlands that are isolated from navigable waters.[1] On June 5, 2007, the EPA and the USACE released guidance on the definitions of jurisdictional waters of the U.S. in response to *Rapanos v. United States* and *Carabell v. United States*. According to this guidance the USACE and the EPA will take jurisdiction over the following waters:

1. Traditional navigable waters, which is defined as all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

2. Wetlands adjacent to traditional navigable waters; including adjacent wetlands that do not have a continuous surface connection to traditional navigable waters;

3. Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months);

4. Wetlands adjacent to non-navigable tributaries as defined above that have a continuous surface connection to such tributaries (e.g. they are not separated by uplands, a berm, dike, or similar feature).

[1] Since the SWANCC decision, waters covered solely by this definition by virtue of their use as habitat by migratory birds are no longer considered "waters of the United States." The Supreme Court's opinion did not specifically address what other connections with interstate commerce might support the assertion of CWA jurisdiction over "nonnavigable, isolated, intrastate waters" under this definition, and the Corps is recommending case by case consideration. A factor that may be relevant to this consideration includes, but is not limited to, the following: Jurisdiction of isolated, intrastate, and nonnavigable waters may be possible if their use, degradation, or destruction could affect other "waters of the United States," thus establishing a significant nexus between the water in question and other "waters of the United States" (Corps, undated memorandum).

The EPA and the USACE decide jurisdiction over the following waters, based on a fact-specific analysis to determine if there is a significant nexus, as defined below, to a traditional navigable water (TNW):

1. Non-navigable tributaries that are not relatively permanent;

2. Wetlands adjacent to non-navigable tributaries that are not relatively permanent;

3. Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary.

The EPA and the USACE generally do not assert jurisdiction over the following features:

1. Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow);

2. Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

The EPA and the USACE have defined the significant nexus standard as follows:

1. A significant nexus analysis assesses the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters;

2. Significant nexus includes consideration of hydrologic and ecologic factors including:

    a. Volume, duration, and frequency of flow, including consideration of certain physical characteristics of the tributary,

    b. Proximity to the traditional navigable water,

    c. Size of the watershed,

    d. Average annual rainfall,

    e. Average annual winter snow pack,

    f. Potential of tributaries to carry pollutants and flood waters to traditional navigable waters,

    g. Provision of aquatic habitat that supports a traditional navigable water,

    h. Potential of wetlands to trap and filter pollutants or store flood waters, and

    i. Maintenance of water quality in traditional navigable waters.

3.2 Pre-field Review

Prior to conducting the field investigation, the following background materials were reviewed:

- Petaluma Point and Novato, CA USGS 7.5-minute topographic quadrangle maps;
- Color aerial photography for vegetative, topographic, and hydrologic signatures (Google Earth, 2016);
- The Custom Soil Resource Report for Marin County, California (NRCS, 2016), for information about soils and geomorphology;
- The National Hydric Soils List for California, Marin County (NRCS, 2015) to determine if any soils mapped within the study area are considered hydric at the level of soil series;
- The National Wetlands Inventory (U.S. Department of the Interior, 2015) (**Figures 3-1** and **3-2**);
- Novato Creek Historical Ecology GIS Data (SFEI, 2015) (**Figure 3-3**);
- LiDAR data for the study area (U.S. Department of Commerce, et. al. 2009-2011);
- *Final Supplemental Environmental Impact Report/Environmental Impact Statement (SEIR/EIS), Bel Marin Keys Unit V Expansion of the Hamilton Wetland Restoration Project.* Calif. Coastal Conservancy and U.S. Army Corps of Engineers, 2003.

3.3 Field Survey Methods

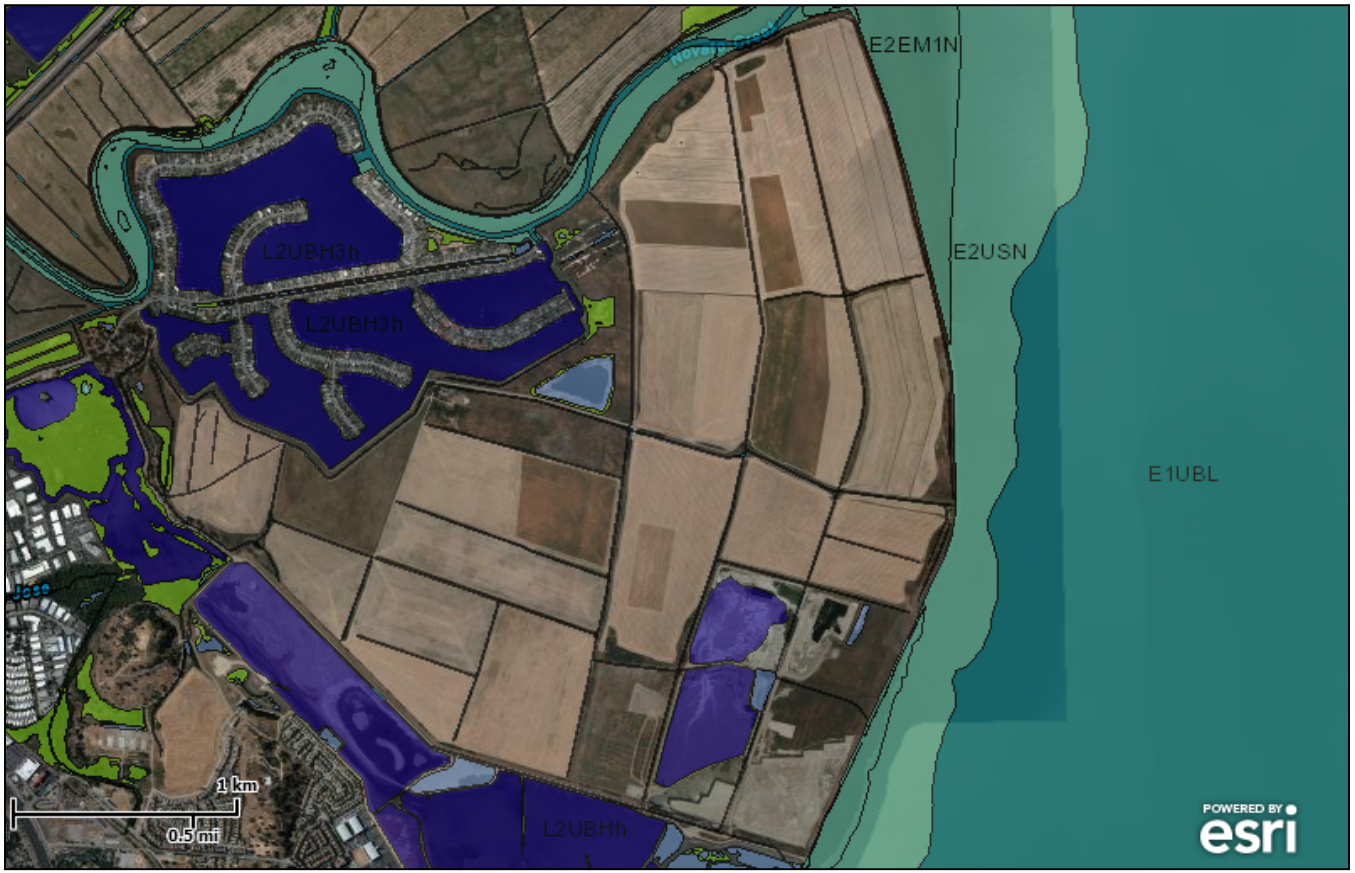
The wetland delineation was conducted within the study area by ESA biologists Rachel Brownsey, Chris Rogers, Rachel Danielson, and Rebecca Acosta on March 3, 17, and 31, 2016. The survey on March 17 occurred five days after a large precipitation event and the other two surveys did not correspond with precipitation events.

The delineation used the "Routine Determination Method" as described in the *1987 Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987), hereafter called the "1987 Manual." The 1987 Manual was used in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (Corps, 2008), hereafter called the "Arid West Supplement." For areas where the 1987 Manual and the Arid West Supplement differ, the Arid West Supplement was followed. Wetlands and waters were classified using commonly accepted habitat types; however, the Cowardin classification (Cowardin et al., 1979) of each feature type is noted in the discussion in Section 4.

Three positive wetland parameters must normally be present for an area to be considered a wetland: 1) a dominance of wetland vegetation, 2) presence of hydric soils, and 3) presence of wetland hydrology. Presence or absence of positive indicators for wetland vegetation, soils and hydrology was assessed per the 1987 Manual and Arid West Supplement guidelines. Data points were taken within suspected wetlands and a paired point was taken (where applicable) in nearby uplands. Data points were recorded on Arid West wetland determination data forms. Data forms are provided in **Appendix B**.

U.S. Fish and Wildlife Service

National Wetlands Inventory



NWI Map for Bel Marin Keys Study Area

Apr 14, 2016

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

User Remarks: Categories not necessarily representative of wetland types on the ground.

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Figure 3-1

U.S. Fish and Wildlife Service

National Wetlands Inventory

NWI Map-
Northwest Section

Apr 14, 2016



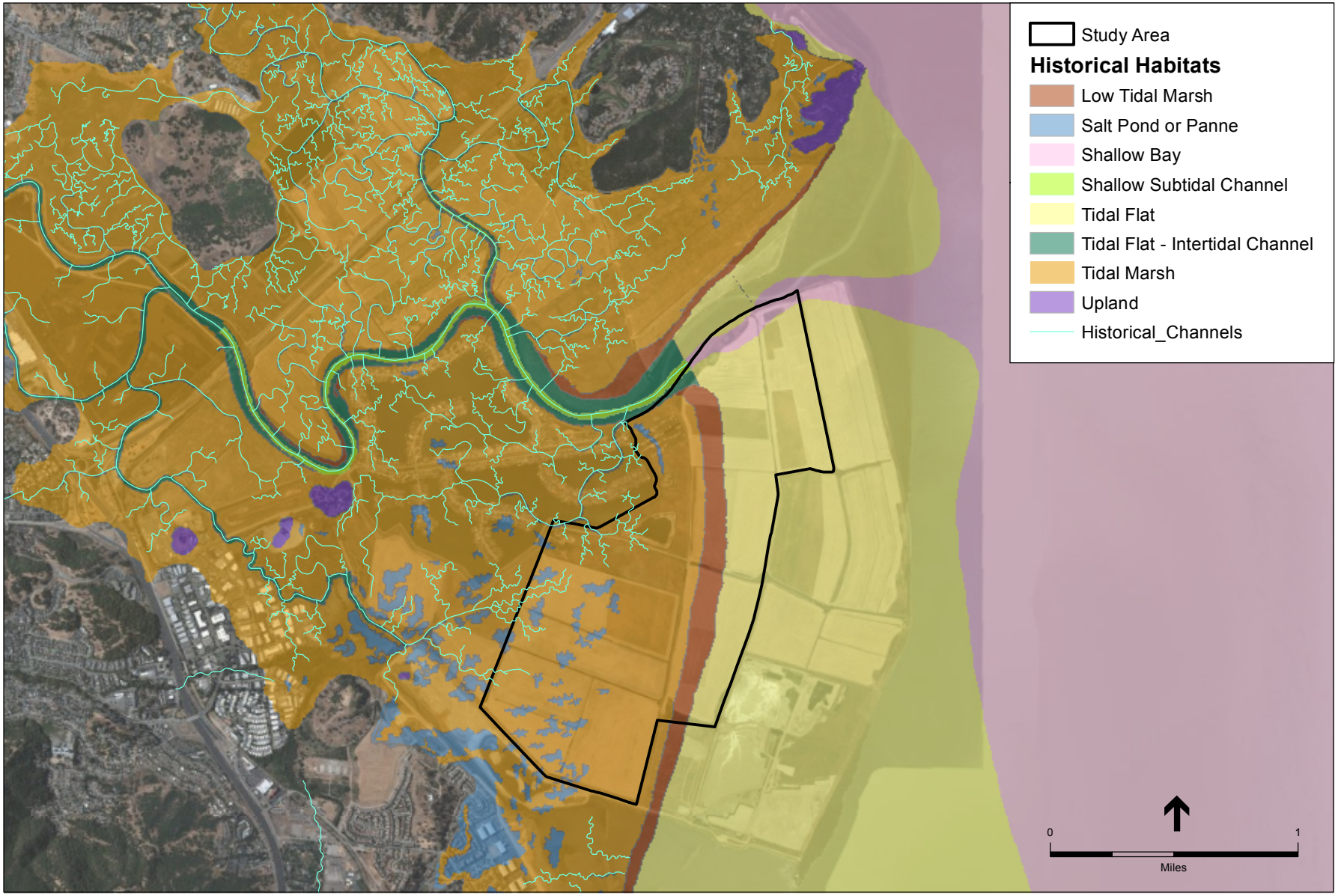
Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
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- Freshwater Pond
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- Other

User Remarks: Categories not necessarily representiative of wetland types on the ground.

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Figure 3-2



SOURCE: SFEI, 2016; ESA, 2016

Bel Marin Keys Wetland Restoration Bayfront Levee Project. 150011

Figure 3-3

Novato Creek Historical Ecology GIS Data

At each data point, a visual assessment of the dominant plant species within a 6-foot radius was made. Dominant species were assessed using the recommended "50/20" rule per the Arid West Supplement. Plants were identified to species using the *The Jepson manual: Vascular plants of California, second edition* (Baldwin et al., 2012). The *Arid West 2014 Final Regional Wetland Plant List* (Lichvar et al., 2014) was used to determine the wetland indicator status of all plants. Soils at each data point were characterized by color, texture, organic matter accumulation, and the presence or absence of hydric soil indicators. Color was described using Munsell soil color charts (Kollmorgen Instruments Corporation, 1990). Presence of wetland hydrology was determined at each data point by presence of one or more of the primary and/or secondary indicators, per guidance of the Arid West Supplement.

For "other waters of the U.S." to be considered jurisdictional, these features must exhibit a defined bed and bank and an ordinary high water mark (OHWM). Channels with obvious bed and banks and OHWM were characterized by noting vegetation, geomorphology (e.g., incision) and hydrologic characteristics, and by measuring representative channel bank cross-sections to obtain average width at the ordinary high water mark.

3.4 Mapping and Acreage Calculations

All features, including data points, wetland boundaries, and channels were recorded using a Global Positioning System (GPS) unit (Trimble GeoXT) with real-time differential correction and an instrument-rated mapping accuracy of +/- 1 meter, or were delineated on aerial photography using Geographic Information System (GIS) software (ArcGIS 10.1) and site-specific topographic data and aerial imagery.

In the office, data from data points and wetland boundaries were downloaded from the GPS unit and mapped using GIS software on an overlay of both LiDAR and geo-referenced aerial photography. GPS-determined wetland boundaries and data points were visually confirmed. Acreage of wetland and waters of the U.S. polygons, and the length of linear features were determined using ArcGIS.

CHAPTER 4
Results

4.1 Results

This wetland delineation identified 57.63 acres of potentially jurisdictional features within the study area. Potentially jurisdictional features include 39.63 acres of wetlands and 17.98 acres of other waters of the U.S. Potentially jurisdictional features within the study area include saline emergent wetlands, freshwater emergent wetlands, seasonal wetlands, ponds, and drainage channels. **Table 4-1** provides the total extent of potentially jurisdictional wetlands and other waters of the U.S. within the study area and **Appendix C** contains a table with the individual attributes of each mapped feature, according to the USACE ORM Aquatic Resources format. Potentially jurisdictional features are depicted in detailed maps provided in **Figures 4-1A** through **4-1G**. Each type of wetland and other waters is described in greater detail in Section 4.1.1. Data sheets and representative site photographs are included in Appendices B and D, respectively.

TABLE 4-1
POTENTIALLY JURISDICTIONAL WETLANDS AND
OTHER WATERS OF THE U.S. AND OF THE STATE IN THE STUDY AREA

Feature Type	Cowardin Classification	Extent	
		Linear feet	Area (acres)
Wetlands			
Saline emergent wetland	Palustrine emergent wetlands (mixosaline, semipermanently flooded)		24.29
Seasonal wetland	Palustrine emergent wetlands (seasonally flooded)		15.24
Farmed wetland	Palustrine emergent wetlands (seasonally flooded)		0.11
	Total Wetlands		39.64
Other Waters of the U.S.			
Pond	Lacustrine- limnetic		13.01
Drainage channel	Riverine (seasonally/semipermanently flooded)	37,732.42	4.98
	Total Other Waters	37,732.42	17.99
	Total Area of Wetland and Other Waters Features:	**37,732.42**	**57.63**

4.1.1 Potentially Jurisdictional Wetlands

Following is a discussion of those areas identified to be potentially jurisdictional wetlands, based upon observations or inferences of wetland hydrology, soils, and vegetation.

Saline Emergent Wetland

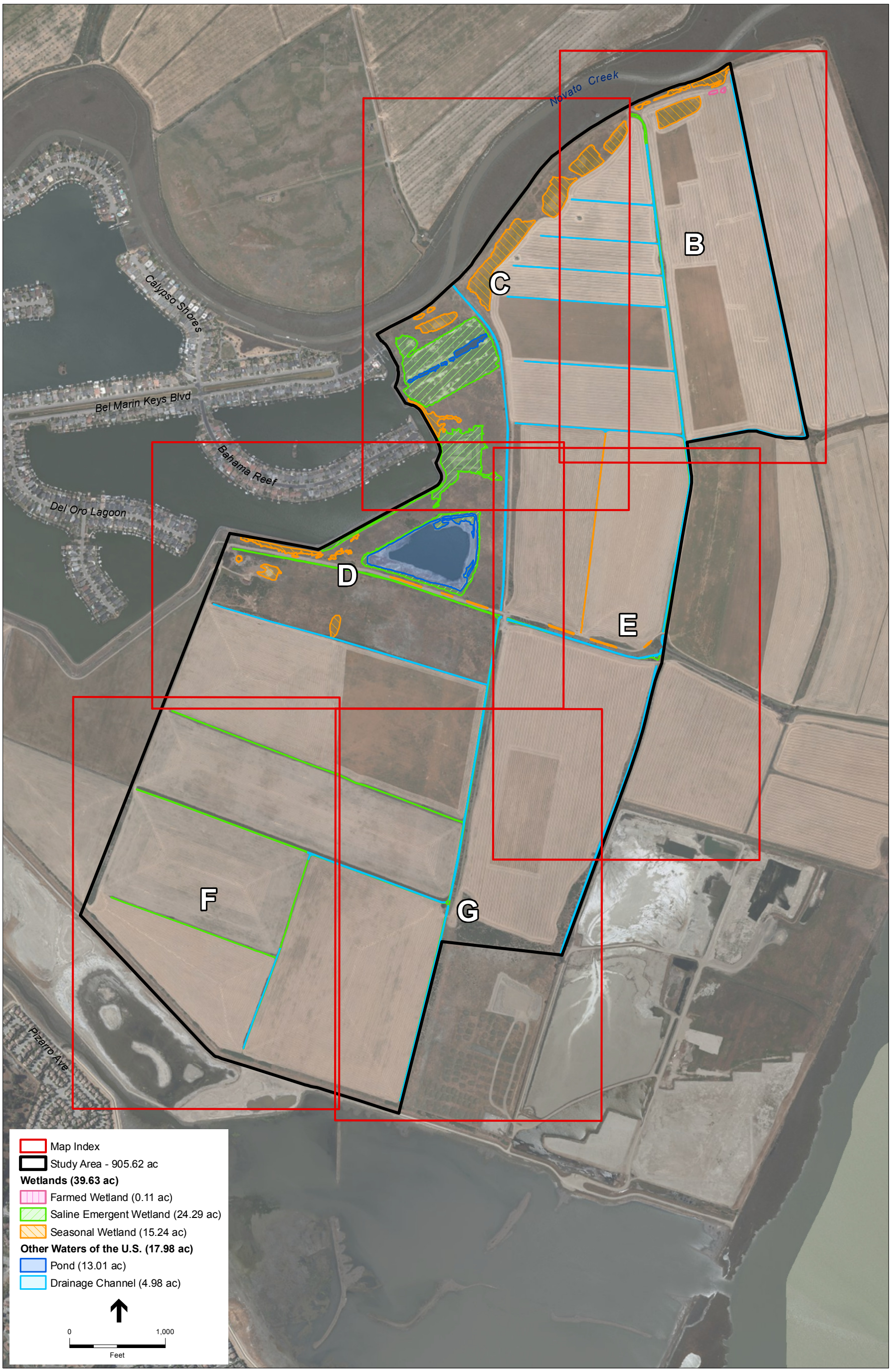
Areas along the interior levee toe, within the excavated channels, and within the borrow areas are classified as saline emergent wetland. This feature type is identified as *Palustrine Emergent Wetland - Mixosaline, Semi-permanently Flooded* according to the Cowardin classification system (Cowardin et al., 1979). The total area of saline emergent wetland within the study area is 24.29 acres. The majority of wetlands in the study area are saline emergent wetlands. This is likely due to the saline properties of the soil, combined with an elevated groundwater table near the interior slope of the levee. Both Reyes Clay and Novato Clay are considered saline soil types.

Saline emergent wetland was characterized by moderate to dense cover of pickleweed (*Salicornia pacifica*, OBL) and in some areas included cover of brass buttons (*Cotula coronopifolia*, OBL), salt grass (*Distichlis spicata*, FACW), alkali heath (*Frankenia salina*, FACW), alkali bulrush (*Bolboschoenus maritimus*), and a number of other minor associates. Areas within the drainage channels that supported moderate to dense cover of pickleweed (greater than about 20 percent total cover of pickleweed) were mapped as saline emergent wetland. Data points that correspond with saline emergent wetland are 6, 8, 27. Corresponding upland points are 7, 9, 28. Soils have a depleted matrix with redoximorphic concentrations in the matrix, meeting hydric soil indicator F3. Hydric soil indicators were observed at both wetland and upland points. Indicators of wetland hydrology in saline emergent wetland varied by location but included high water table (A2), saturation (A3), and oxidized rhizospheres along living roots (C3). Wetland hydrology indicators were absent from upland areas.

Seasonal Wetland

Seasonal wetlands are classified as *Palustrine Emergent Wetlands (Seasonally Flooded)* according to the Cowardin classification system (Cowardin et al., 1979). These are areas that become inundated during the winter, dry out by summer, support facultative (or wetter) annual plants, and are located in shallow depressions. Similar to the saline emergent wetlands, many seasonal wetlands are located near levees where the groundwater table may be high due to open water outside the levee (SW-8 and SW-11 are a good example of this). Data points that correspond with seasonal wetland are 101, 23, 32. Corresponding upland points are 102, 24, 33.

Seasonal wetlands were overwhelmingly dominated by Italian rye grass (FAC) and often supported minor cover of curly dock (FAC), hyssop loostrife (*Lythrum hyssopifolia*, OBL), and fat hen (FACW). The transitional areas between seasonal wetland and uplands were dominated by bristly ox tongue (FAC), birdsfoot deervetch (FACU) and stinkwort (NI). Consistent with most of the study area, soils within seasonal wetlands exhibited a depleted matrix (indicator F3) with a high percentage (15 to 50 percent) of redoximorphic concentrations. Indicators of wetland hydrology included high water table (A2), saturation (A3), and oxidized rhizospheres along living roots (C3).



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1A

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1B

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1C

Potentially Jurisdictional Waters of the U.S.

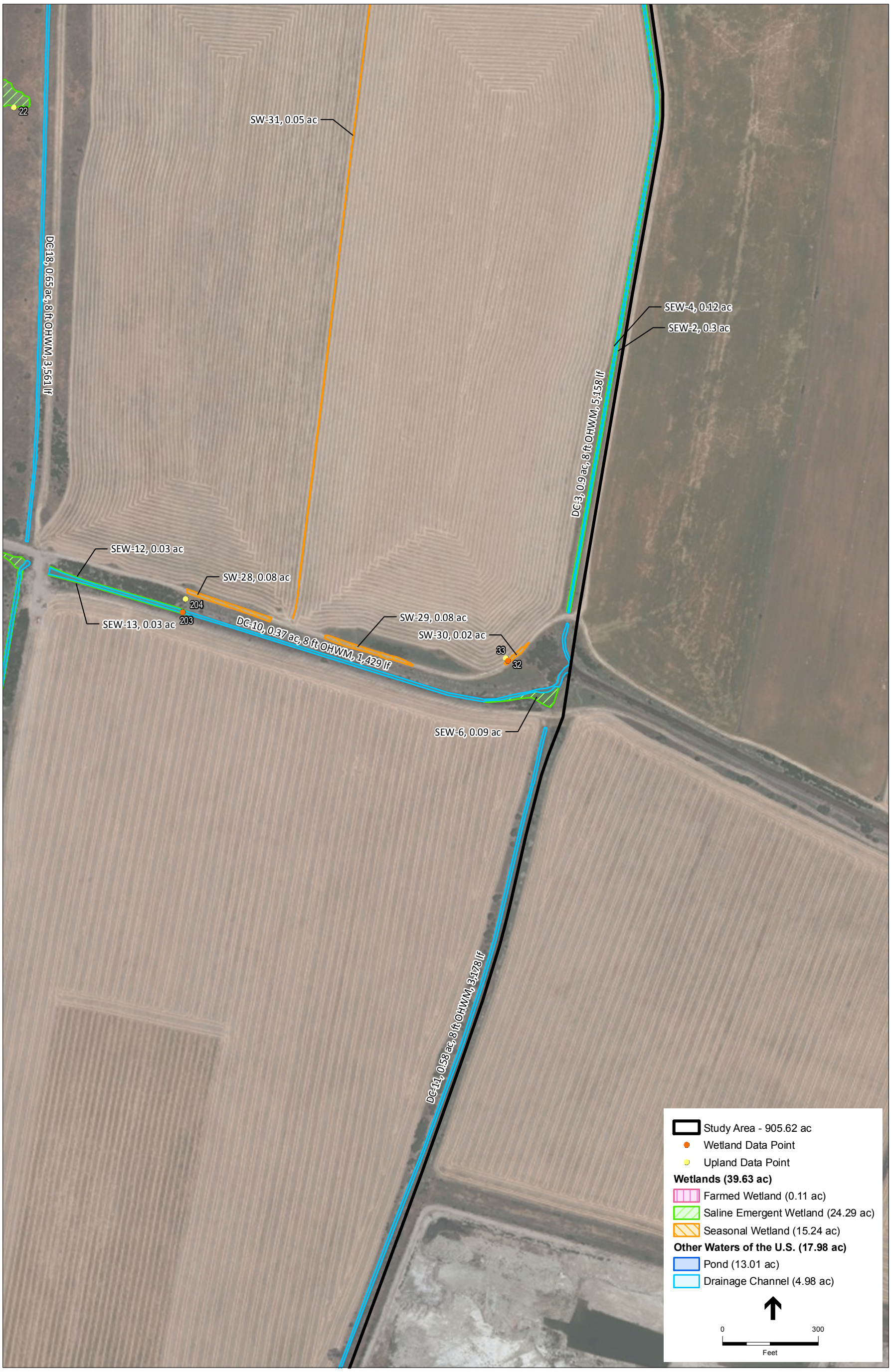


SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1D

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1E

Potentially Jurisdictional Waters of the U.S.

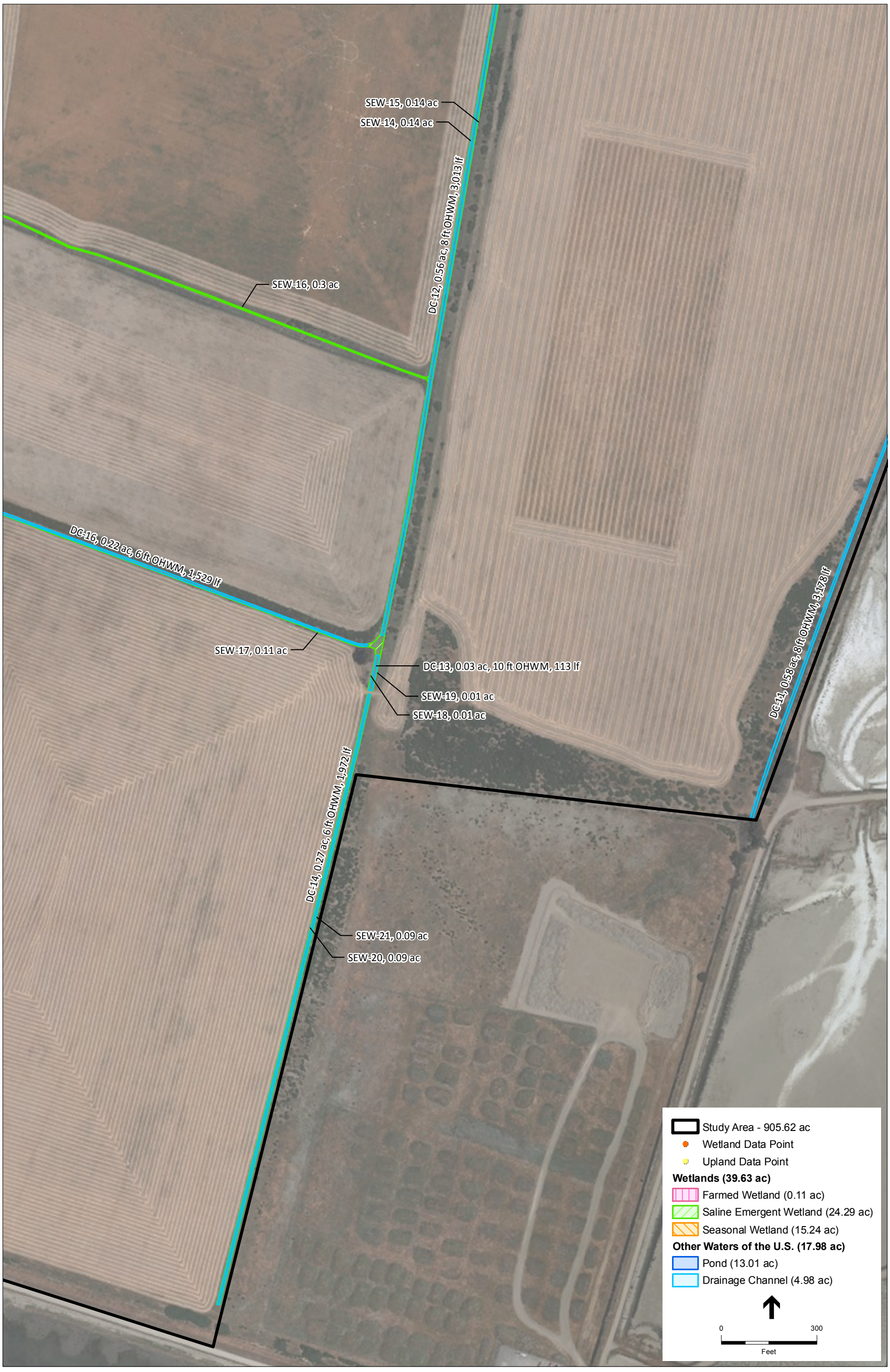


SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1F

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1G

Potentially Jurisdictional Waters of the U.S.

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Several seasonal wetlands were mapped within existing access roads (SW-28, SW-29, SW-30). These areas are small depressions with compacted soil that were likely created by vehicles driving on the roads during wet conditions. Water ponds in these features during the winter, particularly following rain events, and as they dry out the soil surface cracks. Hydrophytic vegetation is present with very sparse cover, as noted at data point 32.

Farmed Wetland

Farmed wetlands are small, seasonal wetlands located in depressions within the farmed fields. This wetland type is characterized as *Palustrine Emergent Wetland (Seasonally Flooded)* according to the Cowardin classification system (Cowardin et al., 1979). Two farmed wetlands were mapped in the northeast corner of the study area (FW-1 and FW-2). Farmed wetlands are characterized by data point 12, and the corresponding upland point is 13.

The two areas mapped as farmed wetlands were distinguished from the surrounding upland farm fields based on topography, species composition, surface soil cracking, and, soil moisture. Farmed wetlands were located in depressions within the farm fields where the dominant plant was Italian rye grass and the upland cultivated species (oats, vetch) were excluded, presumably because they cannot tolerate the period of inundation. There was a very obvious shift in species composition between the wetland and upland areas. The farmed wetlands also had less vegetation cover overall, and dramatic surface soil cracking in heavy clay soil that was still moist (while surrounding upland soils were dry). Soils with a depleted matrix (F3) were observed at both wetland and upland points.

ESA surveyed farm fields throughout the study area, targeting areas that displayed unique signatures[2] on aerial photos, or that appeared to be depressions or low points based on LiDAR data. These areas varied slightly in the amount of oat cover, but did not exhibit a shift in dominance to Italian ryegrass or other facultative wetland species. Therefore, no additional farmed wetlands were observed.

4.1.2 Potentially Jurisdictional 'Other Waters'

Following is a discussion of those areas which did not exhibit wetland features, and therefore were identified to be non-wetland "other waters of the U.S."

Drainage Channel

Drainage channels are present throughout the study area as a network of excavated linear features that convey drainage water and shallow groundwater from the farm fields to the lowest point in the area adjacent to the levee on the east boundary. Water is pumped from this location to the adjacent San Pablo Bay as determined by the farmer, and according to a schedule that maximizes oat hay

[2] Photographic signatures are a combination of photo characteristics including color, pattern, contrast, texture, size, and shape that distinguish unique features from their surrounding area.

production. The drainage patterns and pumping schedule of the drainage system allow water to shallowly pond in the drainage channels during the winter and spring, and typically for the entire year, resulting in conditions that support emergent wetland vegetation or other waters (unvegetated open waters). This feature type is identified as *Riverine – seasonally/semipermanently flooded* according to the Cowardin classification system (Cowardin et al., 1979). Some of the shallower, minor drainage channels support flow only seasonally while the main channels support surface water or saturation for the majority of the year.

Most of the drainage channels exhibit a defined ordinary high water mark based on the absence of vegetation in the bed, and a scour line low on the channel bank. Standing or slowly flowing water was observed in most of these channels at the time of the delineation field investigation.

Some drainage channels do not exhibit an OHWM and are sparsely to densely vegetated with pickleweed, alkali bulrush, saltgrass, alkali heath, and other wetland plants; these areas are mapped as wetlands (saline emergent wetland) rather than as other waters (drainage channel).

Pond

Ponds in the study area are *Lacustrine - Limnetic* according to the Cowardin classification system (Cowardin et al., 1979). These are areas where open water persists throughout the year or at least continuously between fall and mid-summer. The period of inundation and water depth exclude emergent vegetation. Ponds are present in the study area because of past soil borrow activities that provided fill material for levee construction and maintenance. These activities left large, deep depressions that capture runoff from adjacent areas or intercept shallow groundwater. Open water features adjacent to the study area including San Pablo Bay, Novato Creek, and the Bel Marin Keys lagoon likely contribute to elevated groundwater that prevents infiltration and promotes inundation in the study area ponds.

4.2 Jurisdictional Analysis

4.2.1 Potentially Jurisdictional Features

The USACE and Environmental Protection Agency (EPA) issued guidance related to the Rapanos decision on June 5, 2007. The *Rapanos-Carabell* consolidated decisions addressed several issues, including the question of jurisdiction in relation to waters that are relatively permanent (RPW) or are not relatively permanent (non-RPW). It was concluded that non-RPWs that have a “significant ecological nexus” with a TNW, including non-navigable tributaries that do not typically flow year-round or have continuous flow at least seasonally; wetlands adjacent to such tributaries, and wetlands adjacent to but that do not directly abut permanent, non-navigable tributary, may be considered waters of the U.S. A significant nexus can be determined to be present if the tributary, in combination with any adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical, and biological integrity of a TNW. Key considerations when evaluating a significant nexus include volume, duration, and frequency of the flow of water in the tributary

and the proximity of the tributary to the TNW, plus hydrologic, ecologic, and other functions related to the tributary and all of its adjacent wetlands.

San Pablo Bay and Novato Creek are considered TNWs, but are situated outside of the study area. All waters in the study area are non-tidal. Water in the network of agricultural drainage channels is actively pumped into San Pablo Bay, thereby contributing to the chemical, physical, and biological integrity of the TNW. The drainage channels and ponds within the study area are considered RPWs based on their surface or subsurface hydrologic connection to San Pablo Bay and/or Novato Creek. The source of the water in the drainage channels is surface run-off from the agricultural fields along with shallow groundwater. The shallow groundwater table establishes a subsurface hydrological connection to the TNWs. Seasonal and perennial wetlands within the study area also have plausible groundwater connection to the Bay and Novato Creek. These areas also provide wildlife habitat that is contiguous with the TNWs. Therefore, they are considered wetlands adjacent to TNWs, and are jurisdictional under Sections 404 and 401 of the Clean Water Act.

4.2.2 Non-Jurisdictional Features

As described briefly in the Farmed Wetlands section (4.1.1), the dry farmed fields in the study area do not support potentially jurisdictional wetlands, with two small exceptions (FW-1 and FW-2). Prior to the field survey, ESA conducted a thorough review of aerial photographs from the past two decades based on aerial photos available in Google Earth (Google Earth, 2016). Areas with distinctive signatures such as lighter colors in the early part of the growing season (perhaps indicating delayed plant growth due to saturated soils) or darker colors in the late part of the growing season (possibly indicating areas that dry out later in the season) were investigated carefully along with the surrounding farm fields. With the exception of FW-1 and FW-2 the farm fields were even, homogeneous stands of oats with some vetch and lacked indicators of wetland hydrology such as ponding or saturation within 12 inches of the soil surface. Cultivated oats and vetch are both considered upland plants and were obviously excluded in areas where soils remain ponded or saturated (FW-1 and FW-2). In addition, fields in the study area have been graded and leveled for drainage to the perimeter channels that crisscross the study area to *prevent* ponding and saturated conditions because these conditions are not compatible with agricultural production of oats and vetch. Therefore, based on the lack of indicators of wetland hydrology and hydrophytic vegetation, the dry farmed fields are not considered potentially jurisdictional (with the exception of FW-1 and FW-2). The study area has been under continuous agricultural use for many decades, and it is assumed that the conditions observed have prevailed throughout this time and meet the definition of “normal circumstances.”

Upland areas throughout the study area including access roads and non-cultivated grasslands supporting upland grasses and forbs also are not considered to be potentially jurisdictional.

4.3 Conclusions

A total of 57.63 acres of potentially jurisdictional wetlands and waters of the U.S. and State occur within the 905.62 acre study area, consisting of 39.64 acres of wetlands and 17.99 acres of other waters.

This report documents the wetland boundary delineation and best professional judgment of ESA investigators. All conclusions presented should be considered preliminary and subject to change pending official review and preliminary jurisdictional determination in writing by the USACE.

CHAPTER 5
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Appendix A
NRCS Soils Report

ESA

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Marin County, California



March 11, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map.....8
Legend.....9
Map Unit Legend.....10
Map Unit Descriptions.....10
Marin County, California.....12
114—Cortina gravelly sandy loam, 0 to 5 percent slopes.....12
147—Novato clay.....13
158—Reyes clay.....14
161—Saurin-Bonnydoon complex, 2 to 15 percent slopes.....15
162—Saurin-Bonnydoon complex, 15 to 30 percent slopes.....17
166—Saurin-Urban land-Bonnydoon complex, 30 to 50 percent slopes.…19
202—Urban land-Xerorthents complex, 0 to 9 percent slopes.....21
203—Xerorthents, fill.....22
204—Xerorthents-Urban land complex, 0 to 9 percent slopes.....23
210—Water.....24
References.....25

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

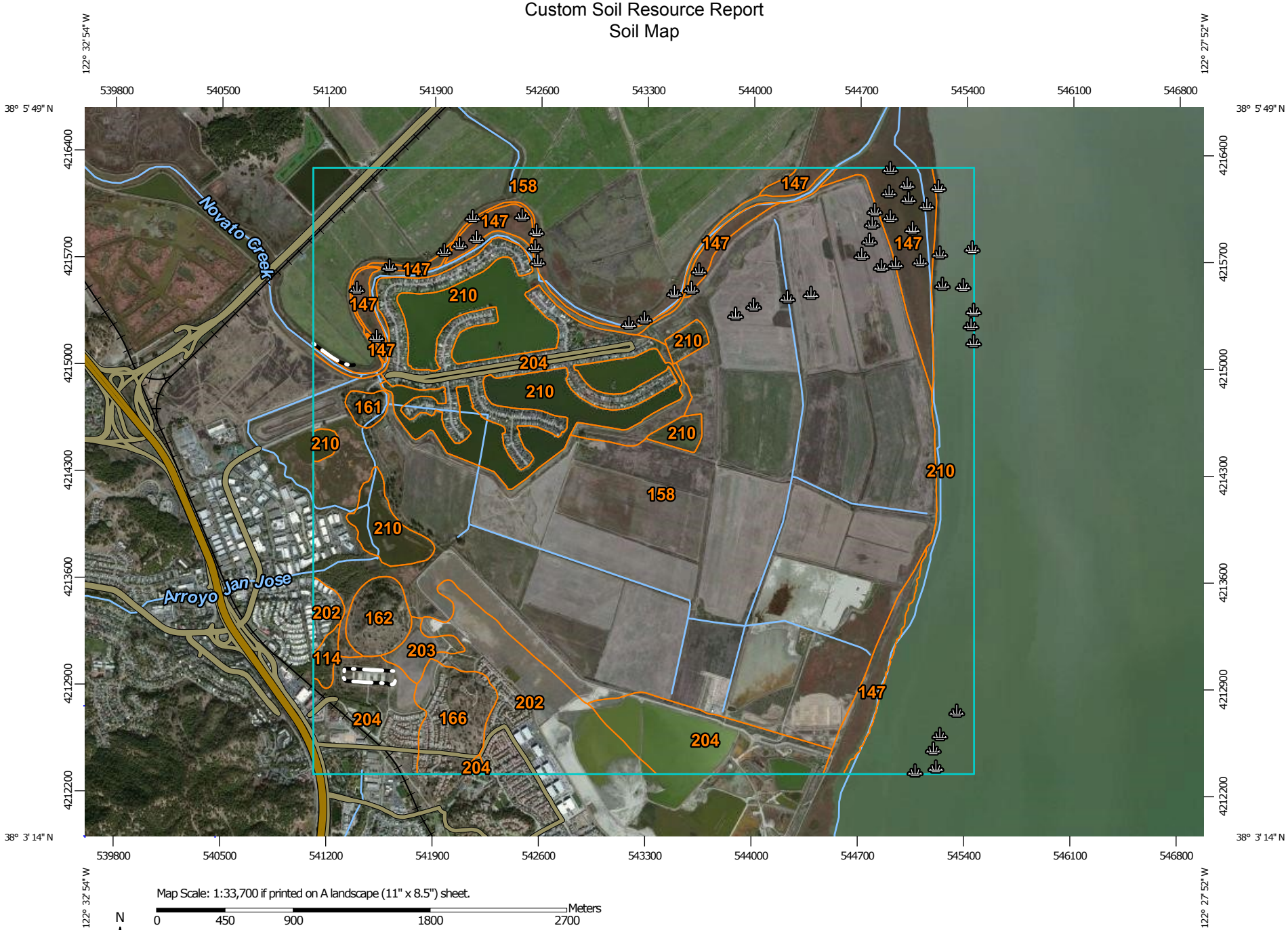
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:33,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 450 900 1800 2700

Feet
0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marin County, California
Survey Area Data: Version 9, Sep 25, 2014

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

Date(s) aerial images were photographed: Nov 2, 2010—Feb 17, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Marin County, California (CA041)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
114	Cortina gravelly sandy loam, 0 to 5 percent slopes	11.0	0.3%
147	Novato clay	204.9	4.8%
158	Reyes clay	2,484.4	57.9%
161	Saurin-Bonnydoon complex, 2 to 15 percent slopes	12.9	0.3%
162	Saurin-Bonnydoon complex, 15 to 30 percent slopes	43.1	1.0%
166	Saurin-Urban land-Bonnydoon complex, 30 to 50 percent slopes	74.7	1.7%
202	Urban land-Xerorthents complex, 0 to 9 percent slopes	199.9	4.7%
203	Xerorthents, fill	22.2	0.5%
204	Xerorthents-Urban land complex, 0 to 9 percent slopes	480.3	11.2%
210	Water	755.2	17.6%
Totals for Area of Interest		**4,288.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally

are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Marin County, California

114—Cortina gravelly sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hf1k
Elevation: 30 to 300 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 300 to 325 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cortina and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting

Landform: Interior valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly sandy loam
H2 - 10 to 44 inches: stratified very gravelly loamy sand to very gravelly loam
H3 - 44 to 60 inches: stratified very gravelly sand to very gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: GRAVELLY SANDY LOAM (R015XC033CA)

Minor Components

Unnamed

Percent of map unit: 7 percent

Ballard

Percent of map unit: 5 percent

Clear lake

Percent of map unit: 2 percent
Landform: Depressions
Landform position (two-dimensional): Backslope

Unnamed

Percent of map unit: 1 percent

147—Novato clay

Map Unit Setting

National map unit symbol: hf2m
Elevation: 0 to 10 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 270 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Novato and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Novato

Setting

Landform: Tidal marshes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 15 inches: clay
H2 - 15 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Salinity, maximum in profile: Strongly saline (16.0 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 8w
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: C/D

Minor Components

Unnamed, strongly acid soils

Percent of map unit: 5 percent

Unnamed, overwash

Percent of map unit: 5 percent

158—Reyes clay

Map Unit Setting

National map unit symbol: hf2z
Elevation: 0 to 10 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 280 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Reyes and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reyes

Setting

Landform: Tidal marshes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 14 inches: clay
H2 - 14 to 63 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Rare

Frequency of ponding: None
Salinity, maximum in profile: Strongly saline (16.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: ACID SUBIRRIGATED (1980) Tidal Marshes - Reclaimed tide (R014XC007CA)

Minor Components

Ballard

Percent of map unit: 3 percent

Blucher

Percent of map unit: 3 percent
Landform: Drainageways
Landform position (two-dimensional): Backslope

Cole

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

161—Saurin-Bonnydoon complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: hf32
Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 270 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Saurin and similar soils: 50 percent
Bonnydoon and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saurin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 10 inches: clay loam
H2 - 10 to 33 inches: clay loam
H3 - 33 to 37 inches: weathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: LOAMY (R015XC034CA)

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 19 inches: weathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: SHALLOW GRAVELLY LOAM (R015XC037CA)

Minor Components

Unnamed, deep
Percent of map unit: 5 percent

Tocaloma
Percent of map unit: 5 percent

Los osos
Percent of map unit: 5 percent

Unnamed, shallow
Percent of map unit: 5 percent

162—Saurin-Bonnydoon complex, 15 to 30 percent slopes

Map Unit Setting
National map unit symbol: hf33
Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 270 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition
Saurin and similar soils: 40 percent
Bonnydoon and similar soils: 30 percent
Minor components: 24 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saurin

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile
H1 - 0 to 10 inches: clay loam
H2 - 10 to 33 inches: clay loam
H3 - 33 to 37 inches: weathered bedrock

Properties and qualities
Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: LOAMY (R015XC034CA)

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 19 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: SHALLOW GRAVELLY LOAM (R015XC037CA)

Minor Components

Tocaloma

Percent of map unit: 8 percent

Los osos

Percent of map unit: 8 percent

Unnamed, dark surface

Percent of map unit: 8 percent

166—Saurin-Urban land-Bonnydoon complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hf37
Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 270 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Saurin and similar soils: 30 percent
Urban land: 25 percent
Bonnydoon and similar soils: 20 percent
Minor components: 21 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saurin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 10 inches: clay loam
H2 - 10 to 33 inches: clay loam
H3 - 33 to 37 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 11 inches: gravelly loam
H2 - 11 to 15 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D

Minor Components

Xerorthents

Percent of map unit: 5 percent

Tocaloma

Percent of map unit: 5 percent

Unnamed, shallow

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 2 percent

Los osos
Percent of map unit: 2 percent

Slumps
Percent of map unit: 2 percent

202—Urban land-Xerorthents complex, 0 to 9 percent slopes

Map Unit Setting
National map unit symbol: hf4d
Elevation: 0 to 500 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 70 percent
Xerorthents and similar soils: 20 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform: Valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups
Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8

Description of Xerorthents

Setting
Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Earth spread deposits derived from igneous, metamorphic and sedimentary rock

Properties and qualities
Slope: 0 to 9 percent

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): 8s
Land capability classification (nonirrigated): 8s

Minor Components

Hydraquents

Percent of map unit: 2 percent
Landform: Tidal flats
Landform position (two-dimensional): Backslope

Reyes

Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

Blucher

Percent of map unit: 1 percent

Novato

Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

Ballard

Percent of map unit: 1 percent

Cole

Percent of map unit: 1 percent

Slopes more than 9 percent

Percent of map unit: 1 percent

Unnamed, briefly flooded soils

Percent of map unit: 1 percent

203—Xerorthents, fill

Map Unit Composition

Xerorthents and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerorthents

Setting

Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Earth spread deposits derived from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): 8s
Land capability classification (nonirrigated): 8s

204—Xerorthents-Urban land complex, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hf4g
Elevation: 0 to 500 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerorthents and similar soils: 45 percent
Urban land: 40 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerorthents

Setting

Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Earth spread deposits

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): 8s
Land capability classification (nonirrigated): 8s

Description of Urban Land

Setting
Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope

Interpretive groups
Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8

Minor Components

Slopes more than 9 percent
Percent of map unit: 2 percent

Hydraquents
Percent of map unit: 2 percent
Landform: Tidal flats
Landform position (two-dimensional): Backslope

Unnamed, briefly flooded soils
Percent of map unit: 2 percent

Ballard
Percent of map unit: 2 percent

Blucher
Percent of map unit: 2 percent

Cole
Percent of map unit: 2 percent

Novato
Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

Reyes
Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

210—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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Appendix B
Wetland Determination Data Forms

ESA

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: Novato, Marin Sampling Date: 2/03/16

Applicant/Owner: CA SCC State: CA Sampling Point: SP01

Investigator(s): CR, RB, RA, RD Section, Township, Range: Novato, T3N R6W,

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): NONE Slope (%): 1

Subregion (LRR): C - Mediterranean C Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes Y No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes + No

Hydric Soil Present? Yes + No

Wetland Hydrology Present? Yes + No

Is the Sampled Area within a Wetland? Yes + No

Remarks: AREA INVESTIGATED DUE TO LANDSCAPE POSITION (LOW POINT) BUT AREA IS CONSISTENTLY AVOIDED BY FARMING PRACTICES. THIS AREA MAY BE SUBJECT TO UNDERSEEPAGE FROM NOVATO CREEK ASK ENGINEER FOR HYDROLOGY DATA FROM NEARBY PIEZOMETER

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. CIRSIUM VULGARE	2		FACU
2. HEMINTHOTHECA ECHIOIDES	10	Y	FACU
3. RUMEX CRISPUS	3		FAC
4. LOTUS CORNICULATUS	8	Y	FAC
5. GERANIUM MOLLE	5		UPL
6. BROMUS SP (NIF)	2		UPL
7.			
8.			
	30 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust —

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes Y No

Remarks: VEGETATION IS STILL YOUNG, EXPECT HIGHER COVER IN A MONTH OR 2.

SOIL

Sampling Point: 01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 3/2	98	10YR 7/6	2	C	M	CLAY LOAM	
8-16	2.5Y 3/2	70	10YR 5/8	30	C	M	CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: TEXTURE IS FAIRLY CONSISTENT THROUGHOUT PROFILE.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- + Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO STANDING WATER OR SATURATED SOILS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: Novato, Marin Sampling Date: ~~02~~3/03/16

Applicant/Owner: CA SCC State: CA Sampling Point: SP02

Investigator(s): CR, RB, RARD Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: THIS IS THE PAIRED UPLAND Pt w/ SP01. LOCATED

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 6 FT.)			
1. BROMUS SP (NIF).	50	Y	UPL
2. VICIA SATIVA	10	Y	UPL
3. HELMINTHOTHECA ECHIOIDES	10	Y	FACU
4. RUMEX CRISPUS	2	N	FAC
5. CENTAUREA SOLSTITIALIS	1	N	UPL
6. GERANIUM DISSECTUM	2	N	UPL
7. SONCHUS ASPER	1	N	FACU
8. LACTUCA SERRIOLA	1	N	FAC
FESTUCA PERENNIS	20	Y	FAC
	70 = Total Cover		
~~Woody Vine Stratum (Plot size:)~~			
1. AVENA SATIVA UPL	5	TOTAL COVER = 70	
2.			
	70 = Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	23	x 3 =	69
FACU species	11	x 4 =	44
UPL species	63	x 5 =	315
Column Totals:	97 (A)		428 (B)

Prevalence Index = B/A = 4.4

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1	100						
4-18	2.5Y 3/2	90	5YR 5/8	10	C	M		REDOX FEATURES
			2.5Y 2/0	<1			Mg	CONCRETION

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks: SOIL IS VERY HEAVY CLAY BELOW 4 INCHES, 0-4 INCHES HAS MORE ORGANIC MATTER.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: VERY FEW OXIDIZED RHIZOSPHERES, BELOW 4"

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 3/3/16

Applicant/Owner: CA SCC State: CA Sampling Point: 03

Investigator(s): CDR; KNB; RA, RRD Section, Township, Range:

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): concave Slope (%):

Subregion (LRR): C- Mediterranean CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
All hydric indicators present

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 2M)			
1. Atriplex triangularis - FACW	26	Y ✓	FACW
2. Rumex crispus - FAC	1	N	FAC
3. Helminthotheca echioides - FAC	1	N	FACW
4. Salsola tragus - FACU	2		
5.			
6.			
7.			
8.			
	30% = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2	60	7.5YR 4/6	40	C	M	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ✓ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

- colors consistent/uniform 0-16"; below 16" soil is much wetter but not saturated
- Saturation @ 18"-20"+

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): >18"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 03/03/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 04

Investigator(s): CR, RA, RB, RD Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): C-Med. CA Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: Reyes Clay NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes + No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes + No _____	
Wetland Hydrology Present?	Yes + No _____	

Remarks: THIS POINT IS RIGHT ON THE BORDER OF WETLAND.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. FESTUCA PERENNIS	50	Y	FAC
2. HELMINTHOTHECA ECHIOIDES	1	N	FAC
3. LOTUS CORNICULATUS	30	Y	FAC
4. RUMEX CRISPUS	1	N	UPL
5. BROMUS SP (NIF	1	N	UPL
6. LACTUCA SERRIOLA	1	N	UPL
7.			
8.	84	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 16 % Cover of Biotic Crust —

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	~~21~~ 81	x 3 =	~~153~~ 243
FACU species	300	x 4 =	1200
UPL species	3	x 5 =	15
Column Totals:	84	(A)	~~288~~ 258 (B)

258/84 = Prevalence Index = B/A = 3.0 ~~288/84 = 3.43~~

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	90	10.5 YR 5/6	10	C	M	CLAY LOAM	
6-16	10YR 4/2	80	10.5 YR 5/6	20	C	M	CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes Y No _____

Remarks: SOIL IS EXTREMELY DRY, HEAVY CLAY TEXTURE BECOMES HEAVIER CLAY BELOW 6" WHICH CORRESPONDS WITH THE BOTTOM OF THE ROOT ZONE.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes Y No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: OBVIOUS OXIDIZED RHIZOSPHERES ALONG LIVING ROOTS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: ~~05~~ 3/3/16

Applicant/Owner: CA SCC State: CA Sampling Point: 05

Investigator(s): RNB; RRT Section, Township, Range:

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ____ No ✓	

Remarks: 3RD POINT IN TRANSECT FROM WETLAND EDGE TO UPLAND.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 2M)			
1. Festuca perennis	45	Y	FAC
2. Avena barbata	1	N	UPL
3. Vicia sativa	15	N	UPL
4. Rumex crispis	1	N	FAC
5. Lotus corniculatus	10	N	FAC
6. Helminthotheca echioides	1	N	FACU
7.			
8.			
	73 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 27 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12"	7.5YR 3/2	98	7.5YR 4/6	2	C	M	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

upland terrace

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (Includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/4/16

Applicant/Owner: SCC State: CA Sampling Point: 06

Investigator(s): RAcosta/CRogers Section, Township, Range:

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): ~1

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Drainage ditch – ^wetland throughout. OHWM = 8' emergent

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Baccharis pilularis	5		UPL
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Typha latifolia	2		OBL
2. Bolboschoenus robustus	50		OBL
3. Rumex crispus	1		FAC
4. Helminthotheca echioides	1		FACU
5. Cyperus eragrostis	2		FACW
6. Azolla	2		OBL
7. Vicia villosa	1		UPL
8.			
	59 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	64 = Total Cover		

% Bare Ground in Herb Stratum 36% % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Hydrophytic species in drainage ditch; upland species on slope.

SOIL

Sampling Point: 06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16+	7.5YR 4/0	75	7.5YR 5/8	25	C	M	Clay	Very wet, nearly gley

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: Gray-blue soil, nearly gley, w/ redox, throughout profile.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- X Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): 3"

Water Table Present? Yes X No _____ Depth (inches): 6"

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Drainage ditch

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: B Ea Marin Keys City/County: Novato, Marin Sampling Date: ~~07~~ 3/3/16

Applicant/Owner: CA SCC State: CA Sampling Point: 07

Investigator(s): RB, RD Section, Township, Range:

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): —

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No ____	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:
paired upland point w/ point 8. Terrace above drainage.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 2m)			
1. Baccharis pilularis	20	Y	UPL
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 2m)			
1. Vicia sativa	7	N	UPL
2. Avena barbata	15	Y	UPL
3. Rumex crispus	1	N	FAC
4. Hirschfeldia	30	Y	UPL
5. Helminthotheca echioides	1	N	FACU
6. Italian thistle (Carduus pycnocephalus)	1	N	UPL
7.			
8.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	55 = Total Cover		

% Bare Ground in Herb Stratum 45 % Cover of Biotic Crust —

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2	95	10YR 5/4	5	C	M	loamy/clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/3/16

Applicant/Owner: SCC State: CA Sampling Point: 08

Investigator(s): Rebecca Acosta / Chris Rogers Section, Township, Range: _____

Landform (hillslope, terrace, etc.): plain Local relief (concave, convex, none): ~~none~~ slightly concave Slope (%): 1

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: Reyes clay NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: Small patch of pickleweed, likely result of underseepage from Novato Creek

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Salicornia pacifica	70	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	70 = Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16+	2.5Y 3/2	75	5YR 5/8	25	C	M	Clay	Moist throughout

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: Prominent Redox throughout profile

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Very wet, redoxomorphic soil

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKU City/County: Marin Sampling Date: 3/3/16

Applicant/Owner: SOC State: CA Sampling Point: 09

Investigator(s): R. Acosta / C. Rogers Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%): <1%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 2M Ø)			
1. Salicornia pacifica	1	N	OBL
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Festuca perennis	40	Y	FAC
2. Avena fatua	10	Y	UPL
3. Helminthotheca echioides	2	N	FAC
4. Lotus corniculatus	5	N	FACU
5. Medicago polymorpha	5	N	FACU
6. Vicia villosa	1	N	UPL
7. Vicia sativa	1	N	UPL
8.			
	64 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	65 = Total Cover		

% Bare Ground in Herb Stratum 35 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50. (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1	x 1 =	1
FACW species	0	x 2 =	0
FAC species	42	x 3 =	126
FACU species	10	x 4 =	40
UPL species	12	x 5 =	60
Column Totals:	65 (A)		227 (B)

Prevalence Index = B/A = 3.49

Hydrophytic Vegetation Indicators:

NO Dominance Test is >50%

NO Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: 09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/3	95	5YR 5/8	5	C	M	CL	
3-16+	10YR 3/3	85	5YR 5/8	15	C	M	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks: Distinct from adjacent pickleweed wetland. (08)
No indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No indicators.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: Novato, Marin Sampling Date: 03/03/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 10

Investigator(s): RB, RD Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks: THIS PT LOCATED ALONG THE BOUNDARY OF THE BORROW + FACW FIELD AREA, THE MAJORITY OF THE BORROW AREA IS DOMINATED BY ATRIPLEX PATULA WITH RUMEX CRISPUS, XANTHIUM STRUMARIUM, CIRSIUM VULGARE,

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		

Herb Stratum

~~Sapling/Shrub Stratum~~ (Plot size:)

1. HEMICYCLOPUS & ECHIOIDES	55	Y	FACU
2. VICIA VILLOSA	5	N	UPL
3. LOTUS CORNICULATUS	20	Y	FAC
4. ATRIPLEX PATULA	15	Y	FACW
5. AVENA SATIVA	5	N	UPL
= Total Cover			

Herb Stratum (Plot size:)

1. RUMEX CRISPUS	2	N	FAC
2. DITRICHIA GRAVEOLENS	1	N	FACW
3. CIRSIUM VULGARE	1	N	FAC
4.			
5.			
6.			
7.			
8.			
104 = Total Cover			

Woody Vine Stratum (Plot size:)

1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: PLANTS ARE STILL VERY YOUNG, EXPECT HIGHER COVER LATER IN THE SEASON, WITH APPROXIMATELY EQUIVALENT COMPOSITION + DOMINANCE

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5Y 3/2	60	2.5YR 4/8	40	C	M	CLAY LOAM	
10-18	5Y 4/1	50	2.5YR 3/6	15				DARKER REDOX ALONG PORE LININGS
			2.5YR 4/8	35	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: THIS PT LOCATED AT THE EDGE OF A TILED FIELD. SOIL AT THIS PT MAY HAVE BEEN SIGNIFICANTLY DISTURBED.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: PLENTY OF OX RHIZOSPHERES ALONG LIVING ROOTS.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 3/3/16

Applicant/Owner: CA SCC State: CA Sampling Point: 11

Investigator(s): CR, RA Section, Township, Range:

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No ✓

Hydric Soil Present? Yes ✓ No ____

Wetland Hydrology Present? Yes ____ No ____

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks:

disturbed/tilled soils produced soil surface cracks, hydric soil ~~still~~ indicators observed, veg is non-wetland. Farmed area.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Avena sativa	30	Y	UPL
2. Vicia sativa	5	N	UPL
3. Vicia villosa	9	N	UPL
4. Helminthotheca echioides	2	N	FACU
5. Lotus corniculatus	50	Y	FAC
6. Raphanus	2	N	UPL
7.			
8.			
	94 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	
FACW species 0	x 2 =	
FAC species 1	x 3 =	3
FACU species 1	x 4 =	4
UPL species 4	x 5 =	20
Column Totals: 6 (A)		27 (B)

Prevalence Index = B/A = 4.5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR3/2	99	7.5YR5/6	1	C	M	loamy clay	(root zone)
4-8	2.5Y 4/2	80	7.5YR5/6	20	C	M	clay	
8-16	2.5Y 4/2	70	7.5YR 4/4	30	C	M	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

tilled soils - significantly disturbed

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

uniform surface soil cracks throughout tilled field

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 03/03/16

Applicant/Owner: CA SCC State: CA Sampling Point: 12

Investigator(s): RB, RD Section, Township, Range:

Landform (hillslope, terrace, etc.): DEPRESSION Local relief (concave, convex, none): CONCAVE Slope (%): —

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: THIS SMALL AREA IS A DEPRESSION THAT IS OBVIOUSLY DIFFERENT FROM SURROUNDING FIELD: 1.) HEAVY CLAY SOIL STILL SATURATED/MOIST 2.) SPP COMP = FESTUCA PERENNIS, 3.) SURFACE SOIL CRACKS VERY DRAMATIC.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. FESTUCA PERENNIS	40	Y	FAC
2. RUMEX CRISPUS	<1	N	FAC
3. AVENA SATIVA	10	N	(NL)
4. VICIA VILLOSA	5	N	NL
5. VICIA SATIVA	5	N	UPL
6.			
7.			
8.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	95	7.5YR 5/8	5	C	M	CLAY LOAM	
6-14	10YR 4/2	50	7.5YR 5/8	50	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SURFACE SOIL CRACKS ARE DIFFERENT FROM SURROUNDING FIELD. = VERY DRAMATIC. NO OXIDIZED RHIZOSPHERES

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 3/3/16

Applicant/Owner: CA SCC State: CA Sampling Point: 13

Investigator(s): RA, RB Section, Township, Range:

Landform (hillslope, terrace, etc.): hill slope Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:
Cracking present, not as dramatic as paired point 12. Upon investigation, there were no veg or hydrology present.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Festuca perennis	30	Y	FAC
2. ~~Rumex crispus~~			
3. Avena sativa	30	Y	NPL
4. Vicia villosa	10	Y	NL
5. Vicia sativa	10	Y	FACU
6. Spergula sp	1	N	NL
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	30	x 3 =	90
FACU species	10	x 4 =	40
UPL species	3	x 5 =	15
Column Totals:	43 (A)		145 (B)

Prevalence Index = B/A = 3.4

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	99	10YR 4/4	<1				
4-12	10YR 4/2	80	7.5YR 4/6	20				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ☑ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil cracking is found on rest of farm field + not as dramatic as the previous point.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/3/16

Applicant/Owner: SCC State: CA Sampling Point: Ø X

Investigator(s): C Rogers, Rachel Donielson Section, Township, Range:

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%): Ø

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: Area of lower veg cover, occasionally not cultivated in past years. Already seen w/ oats up to edge of drainage ditch.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 2M r)			
1. Avena fatua	25	Y	UPL
2. Vicia sativa	10	N	FACU
3. Lotus corniculatus	3	N	FAC
4. Raphanus sativus	2	N	UPL
5.			
6.			
7.			
8.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	40 = Total Cover		

% Bare Ground in Herb Stratum 60 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: Cultivated field (this year and most years). Occasionally avoided, apparently too wet some years

SOIL

Sampling Point: ØX

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 3/2	99	7.5YR 5/8	1	C	M	CL	within till depth
6-12+	2.5Y 3/2	80	7.5YR 4/6	20	C	M	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks: Retains residual qualities of Reyes clay, which is hydric.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface cracks evident in all cultivated areas, not necessarily hydrology indicator; no other indicators.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: Novato, Marin Sampling Date: 3/17/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 15

Investigator(s): ANB RBD Section, Township, Range:

Landform (hillslope, terrace, etc.): DEPRESSION Local relief (concave, convex, none): CONCAVE Slope (%):

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No

Hydric Soil Present? Yes X No

Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No

Remarks: SATURATED/PONDED DEPRESSION SUPPORTING FACULTATIVE PLANTS. RECENT PRECIPITATION (5 DAYS PRIOR) MAY HAVE CAUSED ABOVE AVERAGE WET CONDITIONS.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 6FT)			
1. FESTUCA PERENNIS	60	Y	FAC
2. RUMEX CRISPUS	3	N	FAC
3. VICIA SATIVA	8	N	UPL
4. HELMINTHOTHECA ECHIOIDES	2	N	FACU
5. BROMUS SP.	2	N	UPL
6. LOTUS CORNICULATUS			FAC
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	100						ORGANIC LAYER
2-17	7.5YR 4/6	60	5YR 4/3	40	RM		CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: THICK ORGANIC LAYER AT SOIL SURFACE

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): 2"

Water Table Present? Yes X No _____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin City/County: Novato, Marin Sampling Date: 3/17/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 16

Investigator(s): RNB RBS Section, Township, Range:

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 1%

Subregion (LRR): C – Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X

Hydric Soil Present? Yes X No ____

Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: PAIRED UPLAND POINT w/ SP 15, INDICATOR OF WTLD HYDROLOGY MAY BE A RESULT OF RECENT (5 DAYS PRIOR) SIGNIFICANT RAIN EVENT

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. VICIA VILLOSA	15	Y	UPL
2. FESTUCA PERENNIS	40	Y	FAC-
3. BROMUS SP.	30	Y	UPL
4. RUMEX CRISPUS	1	N	FAC+
5. HELMINTHOTHECA ECHIOIDES	1	N	FACU
6.			
7.			
8.			
	117 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 30 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	41	x 3 =	123
FACU species	1	x 4 =	4
UPL species	75	x 5 =	375
Column Totals:	117 (A)		502 (B)

Prevalence Index = B/A = 502/117 = 4.3

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 4/1	60	10YR 4/3	40			CLAY LOAM	
8-20	2.5Y 4/1	60	10YR 4/3	39			CLAY LOAM	
	→		2.5Y 2.5/1	1				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes + No _____

Remarks: SOIL MATRIX COLORS AND % ARE THE SAME ABOVE AND BELOW 8" SOIL FROM 0-8 INCHES SOIL IS LESS COMPACTED. BELOW 8" THERE ARE MANGANESE CONCENTRATIONS

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No + Depth (inches): 20"

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 2"

Wetland Hydrology Present? Yes + No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SATURATION NEAR THE SURFACE IS LIKELY DUE TO RECENT (10 DAYS PRIOR) SIGNIFICANT RAIN EVENT.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Novato, Marin Sampling Date: 3/17/16

Applicant/Owner: CA SCC State: CA Sampling Point: 017

Investigator(s): ZNB; RRD Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): depression Slope (%): 0

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
paired wetland point to sp18. Point located in depression

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 3m)			
1. Rumex crispus	20	Y	FAC
2. Festuca perennis	40	Y	FAC
3. Cardus pycnocephalus	1	N	UPL
4. Hemizonia fasciculata	2	N	FACU
5.			
6.			
7.			
8.			
	63 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 4/1	85	7.5YR 5/4	12	C	M	CLAY LOAM	ROOT ZONE SOIL
			2.5Y 2.5/1	3	D	M		
8-18	2.5Y 4/1	60	7.5YR 5/4	40	C	M	CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 12"

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: Novato, Marin Sampling Date: 3/17/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 18

Investigator(s): DNB RBD Section, Township, Range:

Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): NONE Slope (%): 2%

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes + No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes + No ____	
Wetland Hydrology Present?	Yes ____ No +	

Remarks: PAIRED UPLAND PT TO SP17, LOCATED ON THE SLOPE ABOVE THE DEPRESSION. VEGETATION SHIFTS AT THIS POINT TO BROMUS DIANDRUS UPSLOPE, FESTUCA PERENNIS DOWNSLOPE. NO WETLAND HYDROLOGY.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 6 FT)			
1. RUMEX CRISPUS	5	N	FAC
2. BROMUS DIANDRUS	40	Y	NL
3. HELMINTHOTHECA ECHIOIDES	5	N	FACU
4. FOENICULUM VULGARE	2	N	NL
5. FESTUCA PERENNIS	40	Y	FAC
6.			
7.			
8.	92	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ____ Prevalence Index is ≤3.0[1]
- ____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 1B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR4/1	95	7.5YR5/6	5	C	M	CLAY LOAM	(ROOT ZONE)
8-18	10YR4/1	80	7.5YR5/6	20	C	M	CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: ROOT ZONE SOIL (0-8 INCHES) HAS A LOAMIER TEXTURE THAN BELOW WHICH IS MORE CLAY.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SOIL IS MOIST BUT NOT SATURATED, NO GROUNDWATER OR SATURATION WITHIN 18" (DEPTH OF SOIL PIT).

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN City/County: Novato, Marin Sampling Date: 3/17/2016
Applicant/Owner: CA SCC State: CA Sampling Point: 19
Investigator(s): ENB RRD Section, Township, Range:
Landform (hillslope, terrace, etc.): REMNANT DRAINAGE Local relief (concave, convex, none): CONCAVE Slope (%): ——
Subregion (LRR): C-Med. CA Lat: Long: Datum:
Soil Map Unit Name: Reyes Clay NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: THIS AREA APPEARS TO BE A REMNANT DRAINAGE, MATURE PICKLEWEED LOOKS VERY DRIED OUT AND OLD (DECADENT), COYOTE BRUSH AND UPLAND WEEDS MOVING INTO THIS AREA (COYOTE BRUSH SEEDLINGS 2-3 yrs OLD)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. SALICORNIA VIRGINICA	15	Y	OBL
2. RUMEX CRISPUS	13	Y	FAC
3. CARDUUS PYCNOCEPHALUS	10	N	UPL
4. FESTUCA PERENNIS	5	N	FAC
5. RAPHANUS SATIVUS	8	N	UPL
6. GERANIUM DISSECTUM	3	N	NL
7. FESTUCA BROMOIDES	1	N	FAC
8. AVENA BARBATA	5	N	NL
LACTUCA SERRIOLA	3	N	FACU
	63 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 37 % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: ALTHOUGH DOMINANT, SALICORNIA IS DECADENT AND LIKELY DYING OUT. REMNANT CHANNEL HAS BEEN COLONIZED BY RAPHANUS SATIVUS, CARDUUS PYCNOCEPHALUS.

SOIL

Sampling Point: 19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 4/6	20 →			C	M	CLAY LOAM	
	10YR 4/2	79	2.5Y 7.5/1	1	C	M		
12-18	5Y 4/1	60	10YR 4/6	40	C	M	LOAMY CLAY	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SOIL IS BARELY MOIST. NO INDICATORS OF WETLAND HYDROLOGY.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: 3Cs MARIN KENS City/County: Novato, Marin Sampling Date: 3/17/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 20

Investigator(s): RNB RRD Section, Township, Range:

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): NONE Slope (%): 0

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✗ No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✗
Hydric Soil Present?	Yes ✗ No ____	
Wetland Hydrology Present?	Yes ____ No ✗	

Remarks: THIS AREA NOT CONSIDERED WETLAND DUE TO LACK OF HYDROLOGY INDICATOR. ALTHOUGH SATURATION (MINIMAL) WAS OBSERVED BETWEEN 8-10 INCHES, IT IS LIKELY DUE TO RECENT PRECIP AND HEAVY CLAY SOILS.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. FESTUCA PERENNIS	55	Y	FAC
2. HELMINTHOTHECA ECHIOIDES	5	N	FACU
3. FESTUCA BROMOIDES	10	N	FAC
4. GERANIUM DISSECTUM	20	Y	NL
5. RUMEX CRISPUS	3	N	FAC
6.			
7.			
8.	93		
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 7 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✗ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✗ No ____

Remarks:

SOIL

Sampling Point: 20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	5Y 5/1	100					CLAY	
8-14	5Y 4/1	90	10YR 4/6	10	C	M	CLAY	
14-18	5Y 4/1	85	10YR 4/6	14	C	M	CLAY	
			5Y 2.5/1	1	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: SOIL TEXTURE IS VERY HEAVY CLAY

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 8"

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SATURATION ONLY BETWEEN 8" AND 10". NO WATER FLOWING INTO SOIL PIT. SATURATION IS LIKELY A RESULT OF WATER HOLDING CAPACITY OF SOIL WHICH IS HEAVY CLAY. COMBINED W/ RECENT PRECIP EVENT (5 DAYS PRIOR).

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: Novato, Marin Sampling Date: 3/17/16

Applicant/Owner: CA SCC State: CA Sampling Point: 21

Investigator(s): RNB RRD Section, Township, Range:

Landform (hillslope, terrace, etc.): DEPRESSION Local relief (concave, convex, none): Depression Slope (%):

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No

Hydric Soil Present? Yes X No

Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No

Remarks: THIS FEATURE APPEARS TO BE A REMNANT CHANNEL OR SWALE LEADING TO THE BORROW PIT.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Lythrum sp.	30	Y	OBL
2. Festuca perennis	20	Y	FAC
3. Hemizonella echioides	1	N	FACU
4. Lactuca serriola	1	N	UPL
5. Atriplex triangularis	2	N	FACW
6.			
7.			
8.			
	54 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 46 % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ✓ Yes No

Remarks:

SOIL

Sampling Point: 21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 4/1	93					clay	
			7.5YR 4/6	5	C	PL		
			7.5YR 5/6	2	C	M		
6-	2.5Y 4/1	90	7.5YR 4/6	40	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Depression w/ bare soil; veg turned down; soil moist but not saturated

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: Novato, Marin Sampling Date: 3/17/16

Applicant/Owner: CA SCC State: CA Sampling Point: 22

Investigator(s): RNB, RRJ Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No	**Is the Sampled Area within a Wetland?** Yes No ✓
Hydric Soil Present?	Yes ✓ No	
Wetland Hydrology Present?	Yes No ✓	

Remarks:
paved pt to 21; berm/plateau above depression & Δ in vegetation

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Festuca perennis	60	Y	FAC
2. Salsola tragus	10	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks:

SOIL

Sampling Point: 22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 4/1	95	10YR 4/6	5	C	M	Clay loam	
4-18	2.5Y 4/1	80	10YR 5/6	20				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ✓ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✗ Depth (inches): ___

Water Table Present? Yes ___ No ✗ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✗ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

no oxidized rhizospheres, no wetland hydrology

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BCL MARIN City/County: NOVATO/MARIN Sampling Date: 3/31/2016

CASCC Applicant/Owner: R. ACOSTA R. BROWNSEY State: CA Sampling Point: 23

Investigator(s): Section, Township, Range:

Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): NONE Slope (%): 1

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: POINT LOCATED ALONG SLOPE LEADING DOWN TO A CLOSED DEPRESSION W/ STANDING WATER, DEPTH = 1 FT AT DEEPEST POINT. THIS IS A SEASONAL FEATURE, BASED ON EVIDENCE FROM AERIAL PHOTOS AND NO PERENNIAL

VEGETATION – Use scientific names of plants. EMERGENT VEG

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. LYTHRUM HYSSOPIFOLIA	25	Y	OBL
2. HELMINTHOTHECA ECHIOIDES	10	N	FAC
3. FESTUCA PERENNIS	40	Y	FAC
4. CALYSTEGIA AUBURN	5	N	FACW
5. UNK GRASS	10	N	FAC/FACW
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: UNKNOWN GRASS - THIS SPP. STANDS AT ABOUT THE EDGE OF THE WETLAND DOWN INTO THE VEGETATED AREA.

* BOUNDARY OF WETLAND MAPPED BASED ON VEGETATION TYPOLOGY RAPHANUS, HELMINTHOTHECA, CIRSIUS PYNOCEPHALUS, VICIA SATIVA GRO DOWN TO THE BOUNDARY OF THE WETLAND.

SOIL

Sampling Point: 23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2	70	5YR 5/8	30			CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 8

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BCL MARIN KEYS City/County: Novato, Marin Sampling Date: 3/31/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 24

Investigator(s): R. ACOSTA, R. BROWNSEY Section, Township, Range:

Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): NONE Slope (%): 5%

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: PAIRED UPLAND POINT TO SP 23

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. RAPHANUS SATIVA	10	N	UPL
2. BROMUS DIANDRUS	30	Y	UPL
3. VICIA SATIVA	2	N	UPL
4. HELMINTHOTHECA ECHIOIDES	15	N	FAC
5. AVENA FATUA	2	N	UPL
6. FESTUCA PERENNIS	30	Y	FAC
7.			
8.			
	89 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 11 % Cover of Biotic Crust —

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 45	x 3 =	135
FACU species	x 4 =	
UPL species 44	x 5 =	220
Column Totals: 89 (A)		355 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	2.5Y 3/2	90	7.5YR 5/8	10	C	M	SANDY CLAY LOAM	
7-16	2.5Y 3/2	70	7.5YR 5/8	29	C	M	"	"
7-16			7.5YR 2.5/1	1	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO INDICATORS OF WTLD HYDROLOGY.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: NOVATO / MARIN Sampling Date: 3/31/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 25

Investigator(s): R. BROWNSEY, R. ACOSTA Section, Township, Range: _____

Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): NONE Slope (%): 1.5%

Subregion (LRR): C-Med. CA Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: Reyes Clay NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: PT LOCATED JUST OUTSIDE OF AN INUNDATED AREA, WETLAND HAS SOME AREAS OF OPEN WATER W/ RUMEX CRISPUS. THIS AS WELL AS 1 ADJACENT WETLANDS ARE DEPRESSIONS, LIKELY SUPPORTED BY ELEVATED GROUNDWATER TABLE.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. FESTUCA PERENNIS	60	Y	FAC
2. HELMINTHOTHECA ECHIOIDES	5	N	UPL
3. RUMEX CRISPUS	2	N	UPL
4.			
5.			
6.			
7.			
8.			
	67 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 33 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: AREA CLEARLY DOMINATED BY FESTUCA PERENNIS WETLAND BOUNDARY MAPPED BY GPS BASED ON VEGETATION & TOPOGRAPHY.

SOIL

Sampling Point: 25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	2.5Y 4/1	60	10YR 3/6	39	C	M	CLAY LOAM	
			10YR 2/1	1	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: WATER SEEPING INTO SOIL PIT AT 10"

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: Novato, Marin Sampling Date: 3/31/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 26

Investigator(s): RA, RB Section, Township, Range:

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): NONE Slope (%):

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: PAIRED UPLAND PT TO SP 25

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Bromus diandrus	30	Y	UPL
2. Curly dock (Rumex crispus)	5	N	FAC
3. Vicia sativa	5	N	UPL
4. Helminthotheca echioides	2	N	FAC
5. Festuca perennis	20	Y	FAC
6.			
7.			
8.			
	62 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 38 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species 27	x 3 =	81
FACU species ____	x 4 =	____
UPL species 35	x 5 =	175
Column Totals: 62 (A)		256 (B)

Prevalence Index = B/A = 4.13

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: D6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	2.5Y 4/1	74	5YR 5/8	25	C	M	LOAMY CLAY	
0-18			2.5YR 2.5/1	1	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: SOIL MATRIX + REDOX CONSISTENT THROUGHOUT THE PROFILE

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SOIL IS MOIST BUT NOT SATURATED, NO WATER TABLE WITHIN 18". NO INDICATORS OF WTLD HYDROLOGY.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BML City/County: Novato, Marin Sampling Date: 3/31
Applicant/Owner: CA SCC State: CA Sampling Point: 27 Wet
Investigator(s): RA, RB Section, Township, Range:
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Convex Slope (%): 1
Subregion (LRR): C-Med. CA Lat: Long: Datum:
Soil Map Unit Name: Reyes Clay NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes + No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes + No

Remarks: Point was taken at edge of emergent veg surrounding pond, veg is characteristic of pond margin

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Distichalus spicata	90	Y	FACW
2. Salicornia pacifica	3	N	OBL
3. Helminthotheca echioides	1	N	FAC
4.			
5.			
6.			
7.			
8.			
	94 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	94 = Total Cover		

% Bare Ground in Herb Stratum 6 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR4/1	78	7.5YR4/6	20	C	M	sandy clay loam	dominant oxidation & rhizospheres
"	"	"	2.5Y6/6	2	C	M	"	lighter oxidation

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Depleted matrix

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

bright oxidized rhizospheres observed (photo taken)

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BML City/County: Novato, Marin Sampling Date: 3/31/16
Applicant/Owner: CA SCC State: CA Sampling Point: 28 UPL
Investigator(s): RA, KB Section, Township, Range:
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): convex Slope (%): 2
Subregion (LRR): C - Med. CA Lat: Long: Datum:
Soil Map Unit Name: Reyes Clay NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks:
Point above ~~one~~ edge of emergent veg / wetland veg boundary with upland features

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Lophanus sativa	15	UPL	4
2. Foeniculum vulgare	1	UPL	NI
3. Helminthotheca echioides	1	FAC	NI
4. Bacchanis pilularis	1	UPL	NI
5. Bromus hordeaceus	10	UPL	NI
6. Bromus diandrus	35	UPL	4
7. Trifolium dubium	1	UPL	NI
8. Rumex crispus	1	FAC	NI
Festuca perennis	5	FAC	NI
	70 % = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 7	x 3 =	21
FACU species	x 4 =	
UPL species 64	x 5 =	320
Column Totals: 71 (A)		341 (B)

Prevalence Index = B/A = 4.80

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Area dominated by upland sp.

SOIL

Sampling Point: 28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR4/1	85	7.5YR4/6	15	C	M	Sandy clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators present in soil

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN KEYS City/County: NOVATO / MARIN Sampling Date: 3/31/2016

Applicant/Owner: CA SCC State: CA Sampling Point: 29

Investigator(s): R. ACOSTA, R. BROWNSEY Section, Township, Range:

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): NONE Slope (%): 0

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No ____
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: RAISED UPLAND POINT AT SP 30, THIS POINT LOCATED IN A RAISED AREA, SURROUNDED BY LOWER AREAS THAT SUPPORT FAC AND FACW PLANTS. THIS AREA DOMINATED BY UPL BROMUS DIANDRUS

VEGETATION – Use scientific names of plants. W/ SOME RAPHANUS SATIVUS.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. BROMUS DIANDRUS	50	Y	UPL
2. FESTUCA PERENNIS	40	Y	FAC
3. RAPHANUS SATIVUS	5	N	UPL
4.			
5.			
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 = ____	
FACW species ____	x 2 = ____	
FAC species 40	x 3 = 120	
FACU species ____	x 4 = ____	
UPL species 55	x 5 = 275	
Column Totals: 95 (A)	395 (B)	

Prevalence Index = B/A = 4.2

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: VERY LOW COVER OF ANNUAL GRASSES, JUST BEGINNING TO FLOWER

SOIL

Sampling Point: 29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5Y 3/2	85	5YR 5/8	15			SANDY CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks: SOIL COLOR + TEXTURE CONSISTENT THROUGH PROFILE

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO OXIDIZED RHIZOSPHERES, NO INDICATORS OF WTD. HYDROLOGY

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMV City/County: Novato, Marin Sampling Date: 3/31/16

Applicant/Owner: CA SCC State: CA Sampling Point: 30

Investigator(s): R. Acosta, R. Brownsey Section, Township, Range:

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): convex Slope (%): 1%

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: THIS AREA DOMINATED BY FESTUCA PERENNIS W/ OCCASIONAL PATCHES OF COTULA CORONOPIFOLIA, FRANKENIA SALINA, AND CHENOPODIUM ALBUM. BACCHARIS SPECIES HAVE DIED, PERHAPS DUE TO INUNDATION. THIS MAY BE A DEVELOPING WETLAND.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Festuca perennis	90	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: VEGETATION IS EXTREMELY UNIFORM IN THIS AREA.

SOIL

Sampling Point: 30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10YR 4/2	89	7.5YR 4/4	10	C	M	SANDY CLAY LOAM	
"		"	2.5Y 6/6	1	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: OXIDIZED RHIZOSPHERES IN SURFACE 0-3 INCHES. VERY DISTINCT.

2.5YR 4/2

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: Novato, Marin Sampling Date: 3/31/16

Applicant/Owner: CA SCC State: CA Sampling Point: 31

Investigator(s): R. Acosta, R. Brownsey Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): NONE Slope (%):

Subregion (LRR): C - Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:
Third point taken in vicinity to locate wetland in area
Area has varying topography.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Bromus diandrus	5	N	UPL
2. Festuca perennis	20	Y	FAC
3. Frankenia salina	1	N	FACW
4.			
5.			
6.			
7.			
8.			
	26 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 74 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5Y 4/2	84	5YR 5/8	15	C	M	sandy clay loam	
11	"	"	2.5Y 2.5/1	1	C	M	"	Manganese

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Manganese, redox concentrations, and oxidized rhizospheres present

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water marks / water-stained leaves refer to matted down plant material as a signature of water present long term

oxidized rhizospheres present

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/31.

Applicant/Owner: SCC State: CA Sampling Point: 032

Investigator(s): CDR; RRD Section, Township, Range:

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): depression Slope (%): Ø

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No	**Is the Sampled Area within a Wetland?** ✓ **Yes** **No**
Hydric Soil Present?	Yes ✓ No	
Wetland Hydrology Present?	Yes ✓ No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 1m)			
1. Hordeum brachyantherum	5	Y	FACW
2. Lolium hyssopifolium	2		OBL
3. Festuca perennis	1		FAC
4. Ranunculus muricatus	1		FACW
5. Poa annua	1		FACU
6. Juncus bufonius	1		FACW
7. Callitriche marginata	1		OBL
8.			
	12 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ✓ **Yes** **No**

Remarks:

SOIL

Sampling Point: 032

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 4/2	95	5YR 5/6	5	C	M	clay	
6-	2.5Y 4/2	80	5YR 4/6	20	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

- redox concentrations apparent in layers of surface soil cracks

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

- Depressional seasonal wetland - maintained via roadtracks/ use as a road.
- deep surface soil cracks

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BEL MARIN City/County: Novato, Marin Sampling Date: 3/31/2016

CA SCC Applicant/Owner: R. ACOSTA R. BROWNSEY State: CA Sampling Point: 33

Investigator(s): Section, Township, Range:

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): NONE Slope (%): 0

Subregion (LRR): C-Med. CA Lat: Long: Datum:

Soil Map Unit Name: Reyes Clay NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: PARCEL UPLAND PT TO SP 32. POINT LOCATED ALONG EDGE OF FARM FIELD.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. VICIA SATIVA	20	Y	UPL
2. RAPHANUS SATIVA	5	N	UPL
3. AVENA SATIVA	15	Y	UPL
4. CONTANREA SOLSTITIALIS	5	N	UPL
5. BRIZA MINOR	1	N	UPL
6. LOTUS CORNICULATUS	2	N	FAC
7.			
8.			
	48 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 52 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	—	x 1 =	
FACW species	—	x 2 =	
FAC species	2	x 3 =	6
FACU species		x 4 =	
UPL species	46	x 5 =	220
Column Totals:	48 (A)		226 (B)

Prevalence Index = B/A = 4.8

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 4/2	99	7.5YR 5/8	<1	C	M	CLAY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO INDICATORS OF WETLAND HYDROLOGY.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV Tract 8 City/County: Marin Sampling Date: 3/17/16
Applicant/Owner: SCC State: CA Sampling Point: 101
Investigator(s): CR / RA Section, Township, Range:
Landform (hillslope, terrace, etc.): plain Local relief (concave, convex, none): concave (slight) Slope (%): <1%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: Reyes clay NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No
Is the Sampled Area within a Wetland? Yes X No

Remarks: Small closed depression

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size:)			
1. Baccharis pilularis	5	N	UPL
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size:)			
1. Bolboschoenus maritimus	35	Y	OBL
2. Cotula coronopifolia	20	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
55 = Total Cover			
Woody Vine Stratum (Plot size:)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: Edge of dense alkali bulrush stand,

SOIL

Sampling Point: 101

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 4/0	60	5YR 3/4	40	C	M	C	Dense, blocky, moist
8-16+	2.5Y 4/0	90	5YR 4/6	10	C	M	C	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Good indicators of depleted matrix

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 1-2"

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 8"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Small enclosed basin.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/17/16
Applicant/Owner: SCC State: CA Sampling Point: 102
Investigator(s): CR, RA Section, Township, Range:
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): None Slope (%): <1%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes No X
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes No X
Is the Sampled Area within a Wetland? Yes No X

Remarks: Grassland surrounding wetland depression (point 101)

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Festuca perennis	80	Y	FAC
2. Hordeum brachyantherum	1	N	FACW
3. Lotus corniculatus	5	N	FAC
4. Brassica nigra	3	N	UPL
5.			
6.			
7.			
8.			
	89 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	1	x 2 =	2
FAC species	85	x 3 =	255
FACU species	0	x 4 =	0
UPL species	3	x 5 =	15
Column Totals:	89 (A)		272 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
N Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: Weak indic., doesn't pass prev. index

SOIL

Sampling Point: 102

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	2.5Y 4/2	80	10YR 4/6	20	C	M	CL	Majority of root zone
5-16	2.5Y 4/2	90	7.5YR 5/8	10	C	M	C	Dense, blocky, below roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Marginally meets depleted matrix

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Margin of basin, outside normal inund/sat.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: _____ Sampling Date: 3/17/16

Applicant/Owner: _____ State: _____ Sampling Point: 103

Investigator(s): CR, RA Section, Township, Range: _____

Landform (hillslope, terrace, etc.): plain Local relief (concave, convex, none): concave Slope (%): 3

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: At the edge of seasonally inundated pond.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Polygonum aviculare	3	N	FACW
2. Lythrum hyssopifolium	3	N	OBL
3. Extriplex triangularis	5	N	FACW
4. Cotula coronopifolia	3	N	OBL
5. Juncus bufonius	1	N	FACW
6. Festuca perennis	34	Y	FAC
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: At the margins of a seasonal ponded area.

SOIL

Sampling Point: 103

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 3/2	98	10YR 4/6	2	C	M	CL	root zone
4-16+	2.5Y 4/2	75	5YR 4/6	25	C	M	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): _____

Water Table Present? Yes X No ____ Depth (inches): 3 inches

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): _____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bel Marin Keys City/County: Marin Sampling Date: 3/17/16

Applicant/Owner: State: CA Sampling Point: 24 104

Investigator(s): CR, RA Section, Township, Range:

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes No X	

Remarks:
right at wetland, upland boundary

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Festuca perennis	84	Y	FAC
2. Lotus corniculatus	5	N	FAC
3. Helminthotheca echioides	1	N	FACU
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: ~~103~~ 104

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	5Y 4/1	90	2.5YR 4/8	10	C	M	CL	mat zone, min conditions
6-14+	5Y 3/2	80	2.5YR 3/6	20			C	blocky

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 14"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 12"

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/31/16

Applicant/Owner: SCC State: CA Sampling Point: 201

Investigator(s): CR, RD Section, Township, Range:

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No

Hydric Soil Present? Yes X No

Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No

Remarks: Drainage cross ditch in agric. field, seasonally wet from precip, ψ high water table.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 2MR)			
1. Avena sativa	10	N	UPL
2. Festuca perennis	45	Y	FAC
3.			
4. Raphanus sativus	5	N	UPL
5. Cotula coronopifolia	1	N	OBL
6. Atriplex triangularis	15	Y	FACW
7.			
8.			
	76 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 24 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: Marginal wetland vegetation, seasonal.

SOIL

Sampling Point: 201

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 3/2	80-98	5YR 4/4	2-20	C	M	CL	
6+	2.5 3/2	>99	5YR 4/4	<1	C	M	CL	Saturated, GW below 6"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

water @ 6" into hole

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/31/16

Applicant/Owner: SCC State: CA Sampling Point: 202

Investigator(s): CR, RD Section, Township, Range:

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%):

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes	No X	

Remarks: Edge of cultivated field, drained by ditch in 202. Hydric soil remains below plow line, no other indicators.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Avena sativa	60	Y	UPL
2. Raphanus sativus	5	N	UPL
3. Festuca perennis	5	N	FAC
4. Vicia sativa	5	N	UPL
5.			
6.			
7.			
8.			
	75 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 25 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: Edge of cultivated field, drained by ditch in pt. 202

SOIL

Sampling Point: 202

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	92	7.5YR 4/6	5	C	M	CL	
	10YR 7/6	3						
6-12	5Y 4/1	85-90	7.5YR 4/6	10-15	C	M	CL	below plow line

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Hydric below pl

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No indicators

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/31/16

Applicant/Owner: SCC State: _____ Sampling Point: 203

Investigator(s): CR, RD Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): concave Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: Narrow margin adjacent to drainage channel, seasonal high water during/after precip; pumping maintains lower typical water level.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Distichlis spicata	65	Y	FAC
2. Cordylanthus pygmaeus	5	N	UPL
3. Frankenia salina	10	N	FACW
4.			
5.			
6.			
7.			
8.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	65	x 3 =	195
FACU species	0	x 4 =	0
UPL species	5	x 5 =	25
Column Totals:	85 (A)		240 (B)

Prevalence Index = B/A = < 3

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 203

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 3/2	98	5YR 5/8	2	C	M	c (loose	diffuse redox
8-12	2.5Y 3/2	90-95	5YR 4/6	5-10	C	M	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Marginal hydric soil adjacent to drainage channel.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- X Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: On bank, 2' vertical and 3' lateral from standing water in drainage channel; Seasonal high water likely, and pumping maintains lower.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: Marin Sampling Date: 3/31/16
Applicant/Owner: SCC State: CA Sampling Point: 204
Investigator(s): CR, RD Section, Township, Range:
Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Convex Slope (%): 5
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes No X
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes No X
Is the Sampled Area within a Wetland? Yes No X

Remarks: Remnant hydric soil, but no other indicators. Top of bank

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Baccharis pilularis	20	Y	UPL
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size:)			
1. Raphanus sativus	40	Y	UPL
2. Centaurea solstitialis	20	Y	UPL
3. Frankenia salina	10	N	FACW
4. Rumex crispus	1	N	FACW
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	90 = Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust 9

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 0 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: Distinct upland, top of bank.

SOIL

Sampling Point: 204

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	5Y 4/1	95	5YR 4/6	5	C	M	SC	Dense blocky peds
12-18	2.5Y 4/2	85	7.5YR 4/6	15	C	M	SC	" " "

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Evidence of soil deposited from dredging drainage channel. Not orig. land surface

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No indicators, top of bank.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMKV City/County: _____ Sampling Date: 3/31/16

Applicant/Owner: SCC State: CA Sampling Point: 205

Investigator(s): CR, RD Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: Small ag drainage ditch, w/ standing water and in-channel wetl.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Xanthium strumarium	20	Y	FAC
2. Festuca peremnis	30	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	50	x 3 =	150
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	50 (A)		150 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: Sparse, marginal wetland veg. at edge of channel, and later in season, likely in-channel).

SOIL

Sampling Point: 205

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 3/2	95	10YR 5/8	5	C	M	C	Saturated
6-	2.5Y 3/2	99	10YR 5/8	<1	C	M	C	Saturated, inund.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Saturated, inundated

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- X Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 10

Water Table Present? Yes X No ___ Depth (inches): 6

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 6

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Small drainage ditch, narrow, w/ standing water

Appendix C

Data Table for all Features Evaluated



Water_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude
DC-1	California	R	Riverine	AREA	0.71	ACRE	Drainage Channel	38.08652	-122.49174
DC-2	California	R	Riverine	AREA	0.22	ACRE	Drainage Channel	38.08137	-122.49229
DC-3	California	R	Riverine	AREA	0.90	ACRE	Drainage Channel	38.08337	-122.49526
DC-4	California	R	Riverine	AREA	0.02	ACRE	Drainage Channel	38.08796	-122.49743
DC-5	California	R	Riverine	AREA	0.03	ACRE	Drainage Channel	38.08687	-122.49789
DC-6	California	R	Riverine	AREA	0.04	ACRE	Drainage Channel	38.08599	-122.49829
DC-7	California	R	Riverine	AREA	0.04	ACRE	Drainage Channel	38.08508	-122.49828
DC-8	California	R	Riverine	AREA	0.04	ACRE	Drainage Channel	38.08325	-122.49778
DC-9	California	R	Riverine	AREA	0.13	ACRE	Drainage Channel	38.08144	-122.4976
DC-10	California	R	Riverine	AREA	0.37	ACRE	Drainage Channel	38.07536	-122.49789
DC-11	California	R	Riverine	AREA	0.58	ACRE	Drainage Channel	38.07049	-122.49701
DC-12	California	R	Riverine	AREA	0.56	ACRE	Drainage Channel	38.07196	-122.50198
DC-13	California	R	Riverine	AREA	0.03	ACRE	Drainage Channel	38.06753	-122.50288
DC-14	California	R	Riverine	AREA	0.27	ACRE	Drainage Channel	38.06471	-122.50368
DC-15	California	R	Riverine	AREA	0.14	ACRE	Drainage Channel	38.07513	-122.50662
DC-16	California	R	Riverine	AREA	0.22	ACRE	Drainage Channel	38.06847	-122.50563
DC-17	California	R	Riverine	AREA	0.05	ACRE	Drainage Channel	38.06491	-122.50955
DC-18	California	R	Riverine	AREA	0.65	ACRE	Drainage Channel	38.08107	-122.50138
FW1	California	P	Palustrine	AREA	0.06	ACRE	Farmed Wetland	38.09117	-122.49386
FW2	California	P	Palustrine	AREA	0.04	ACRE	Farmed Wetland	38.09124	-122.4935
P-1	California	L	Lacustrine	AREA	0.52	ACRE	Pond	38.08375	-122.5025
P-2	California	L	Lacustrine	AREA	0.03	ACRE	Pond	38.08336	-122.50313
P-3	California	L	Lacustrine	AREA	0.04	ACRE	Pond	38.08323	-122.50342
P-4	California	L	Lacustrine	AREA	0.07	ACRE	Pond	38.08308	-122.50376
P-5	California	L	Lacustrine	AREA	0.07	ACRE	Pond	38.08292	-122.50416
P-6	California	L	Lacustrine	AREA	0.05	ACRE	Pond	38.08275	-122.50454
P-7	California	L	Lacustrine	AREA	12.22	ACRE	Pond	38.07779	-122.50366
SEW-1	California	P	Palustrine	AREA	0.15	ACRE	Emergent Wetland	38.09013	-122.49643

Water_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude
SEW-2	California	P	Palustrine	AREA	0.30	ACRE	Emergent Wetland	38.08265	-122.49516
SEW-3	California	P	Palustrine	AREA	0.18	ACRE	Emergent Wetland	38.08546	-122.49547
SEW-4	California	P	Palustrine	AREA	0.12	ACRE	Emergent Wetland	38.07849	-122.49477
SEW-6	California	P	Palustrine	AREA	0.09	ACRE	Emergent Wetland	38.07494	-122.49558
SEW-7	California	P	Palustrine	AREA	12.73	ACRE	Emergent Wetland	38.08326	-122.50333
SEW-8	California	P	Palustrine	AREA	5.21	ACRE	Emergent Wetland	38.08059	-122.50272
SEW-9	California	P	Palustrine	AREA	0.78	ACRE	Emergent Wetland	38.07869	-122.50571
SEW-10	California	P	Palustrine	AREA	2.82	ACRE	Emergent Wetland	38.07788	-122.50344
SEW-11	California	P	Palustrine	AREA	0.53	ACRE	Emergent Wetland	38.07693	-122.50548
SEW-12	California	P	Palustrine	AREA	0.03	ACRE	Emergent Wetland	38.07579	-122.50018
SEW-13	California	P	Palustrine	AREA	0.03	ACRE	Emergent Wetland	38.07575	-122.50018
SEW-14	California	P	Palustrine	AREA	0.14	ACRE	Emergent Wetland	38.0719	-122.50201
SEW-15	California	P	Palustrine	AREA	0.14	ACRE	Emergent Wetland	38.07195	-122.50196
SEW-16	California	P	Palustrine	AREA	0.30	ACRE	Emergent Wetland	38.07157	-122.50766
SEW-17	California	P	Palustrine	AREA	0.11	ACRE	Emergent Wetland	38.0682	-122.50457
SEW-18	California	P	Palustrine	AREA	0.01	ACRE	Emergent Wetland	38.06754	-122.5029
SEW-19	California	P	Palustrine	AREA	0.01	ACRE	Emergent Wetland	38.06753	-122.50286
SEW-20	California	P	Palustrine	AREA	0.09	ACRE	Emergent Wetland	38.06471	-122.50369
SEW-21	California	P	Palustrine	AREA	0.09	ACRE	Emergent Wetland	38.0647	-122.50367
SEW-22	California	P	Palustrine	AREA	0.26	ACRE	Emergent Wetland	38.06998	-122.51112
SEW-23	California	P	Palustrine	AREA	0.05	ACRE	Emergent Wetland	38.06751	-122.50849
SEW-24	California	P	Palustrine	AREA	0.05	ACRE	Emergent Wetland	38.06491	-122.50954
SEW-25	California	P	Palustrine	AREA	0.08	ACRE	Emergent Wetland	38.06689	-122.51206
SW-1	California	P	Palustrine	AREA	0.71	ACRE	Seasonal Wetland	38.0916	-122.49377
SW-2	California	P	Palustrine	AREA	0.23	ACRE	Seasonal Wetland	38.09116	-122.49527
SW-3	California	P	Palustrine	AREA	0.10	ACRE	Seasonal Wetland	38.09075	-122.49645
SW-4	California	P	Palustrine	AREA	1.83	ACRE	Seasonal Wetland	38.0906	-122.49515
SW-5	California	P	Palustrine	AREA	0.86	ACRE	Seasonal Wetland	38.0898	-122.49734

Water_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude
SW-6	California	P	Palustrine	AREA	1.41	ACRE	Seasonal Wetland	38.08911	-122.4984
SW-7	California	P	Palustrine	AREA	1.96	ACRE	Seasonal Wetland	38.08812	-122.49947
SW-8	California	P	Palustrine	AREA	3.94	ACRE	Seasonal Wetland	38.08622	-122.50156
SW-9	California	P	Palustrine	AREA	0.06	ACRE	Seasonal Wetland	38.08477	-122.50395
SW-10	California	P	Palustrine	AREA	0.08	ACRE	Seasonal Wetland	38.08456	-122.50435
SW-11	California	P	Palustrine	AREA	0.97	ACRE	Seasonal Wetland	38.0844	-122.50369
SW-12	California	P	Palustrine	AREA	0.73	ACRE	Seasonal Wetland	38.0816	-122.50364
SW-13	California	P	Palustrine	AREA	0.04	ACRE	Seasonal Wetland	38.07822	-122.50648
SW-14	California	P	Palustrine	AREA	0.00	ACRE	Seasonal Wetland	38.07814	-122.50658
SW-15	California	P	Palustrine	AREA	0.00	ACRE	Seasonal Wetland	38.0781	-122.50665
SW-16	California	P	Palustrine	AREA	0.03	ACRE	Seasonal Wetland	38.07777	-122.50673
SW-17	California	P	Palustrine	AREA	0.06	ACRE	Seasonal Wetland	38.07775	-122.50706
SW-18	California	P	Palustrine	AREA	0.03	ACRE	Seasonal Wetland	38.07763	-122.50779
SW-19	California	P	Palustrine	AREA	0.68	ACRE	Seasonal Wetland	38.07783	-122.50906
SW-20	California	P	Palustrine	AREA	0.06	ACRE	Seasonal Wetland	38.07807	-122.51051
SW-21	California	P	Palustrine	AREA	0.02	ACRE	Seasonal Wetland	38.07761	-122.50869
SW-22	California	P	Palustrine	AREA	0.06	ACRE	Seasonal Wetland	38.0775	-122.51071
SW-23	California	P	Palustrine	AREA	0.52	ACRE	Seasonal Wetland	38.07714	-122.50958
SW-24	California	P	Palustrine	AREA	0.41	ACRE	Seasonal Wetland	38.07564	-122.50717
SW-25	California	P	Palustrine	AREA	0.07	ACRE	Seasonal Wetland	38.07694	-122.50462
SW-26	California	P	Palustrine	AREA	0.02	ACRE	Seasonal Wetland	38.0766	-122.50313
SW-27	California	P	Palustrine	AREA	0.06	ACRE	Seasonal Wetland	38.07634	-122.50203
SW-28	California	P	Palustrine	AREA	0.08	ACRE	Seasonal Wetland	38.07567	-122.49894
SW-29	California	P	Palustrine	AREA	0.08	ACRE	Seasonal Wetland	38.07531	-122.49746
SW-30	California	P	Palustrine	AREA	0.02	ACRE	Seasonal Wetland	38.0753	-122.49582
SW-31	California	P	Palustrine	AREA	0.05	ACRE	Seasonal Wetland	38.0785	-122.49787
SW-32	California	P	Palustrine	AREA	0.05	ACRE	Seasonal Wetland	38.0776	-122.5073

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Appendix D
Photo Appendix

ESA



Bel Marin Keys Wetland Delineation . 150011

Photo 1
Saline emergent wetland (sp-01). March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 2
Sp-02 upland paired point with Sp-01. March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 3
Saline emergent wetland (sp-03). March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 4
Sp-04 upland paired point to Sp-03. March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 5
Saline emergent wetlands. March 17, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 6
Seasonal wetland at Bel Marin Keys. March 17, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 7
Seasonal wetland (Sp-101). March 17, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 8
Corresponding upland point (Sp-102). March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 9
Farmed wetland (sp-12). March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 10
Corresponding upland point (Sp-13). March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 11
Seasonal wetland (Sp-32). March 31, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 12
Corresponding upland point (Sp-33). March 31, 2015



Bel Marin Keys Wetland Delineation . 150011

Photo 13

Borrow ponds at Bel Marin Keys (saline emergent wetland and pond). March 31, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 14

Drainage channel at Bel Marin Keys. March 31, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 15
Dry farmed field at Bel Marin Keys. March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 15
Cracked tilled soil within dry farmed field. March 3, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 15
Borrow pit (pond) at Bel Marin Keys. March 31, 2016



Bel Marin Keys Wetland Delineation . 150011

Photo 15
Brass buttons patches east of the Bel Marin Keyes levee (seasonal wetland). March 3, 2016

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ESA Biological Resources

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memorandum

date June 23, 2016

to Roberta Morganstern

from Chris Rogers

subject Bel Marin Keys Unit V
Revised Wetland Delineation
Corps File No. 2005-29476N

Roberta,
Following our site visits on June 6 and 10, 2016, I have revised the wetland delineation figures that were included in the draft delineation report to reflect the revisions that we agreed on in the field. These figures 4-1A through 4-1G replace the same numbered figures that were included in the delineation report. New data sheets #206, #207, and #208 are included here, in support of the revision of one wetland feature and the addition of another; both changes are summarized below.

I also have recalculated the acreages of all the jurisdictional features present within the study area, which are summarized in the attached Table 4-1. This table replaces the same table included in the delineation report.

It is my understanding that these maps and area calculations accurately represent the Corps jurisdiction. With these revisions, I am requesting an Approved Jurisdictional Determination. For the purposes of our permitting schedule, you agreed that we should proceed with using these maps as the basis for calculating impacts for the permit application, which we are now preparing.

Following is a summary of the map revisions:

Map 4-1A: Index map, no changes.

Map 4-1B:

- Change seasonal wetlands SW-1, SW-2 and SW-3 to saline emergent wetlands based on dominant vegetation; these features are now labeled as SEW-26, SEW-27, and SEW-28.

Map 4-1C

- SW-8 boundary was remapped, eliminating from jurisdiction the southwestern portion. New data point #206 confirms the remainder of the feature is a jurisdictional wetland (data sheet attached). On further review, data point #1 is changed to an upland point because it failed to meet all three criteria.
- SW-31 delete all but northern-most 15 feet of small drainage, connected to DC-9.
- Show outfall on BMK lagoon levee.

Map 4-1D

- Add new seasonal wetland SW-32; new paired data points #207 and #208 define its boundary (data sheets attached).
- Change seasonal wetlands SW-13, 14, 15, 19 and 20 to saline emergent wetland based on dominant vegetation (pickleweed); these features are now labeled SEW-29, 30, 31, 32, and 33.
- Delete seasonal wetlands in the road: SW-21, SW-25, SW-26, SW-27, and SW-28.
- Delete SW-24 (marginal wetland in fallow field)
- Add narrow channel connecting SW-22 to SEW-11, 3 feet wide.
- add culvert south of SEW-11 to boundary.

Map 4-1E

- delete seasonal wetlands in the road: SW-28, SW-29, and SW-30.
- delete SW-31 as appears on this map; small part of it stays on map 4-1C (see note above)

Map 4-1F: no changes.

Map 4-1G: no changes.

TABLE 4-1
POTENTIALLY JURISDICTIONAL WETLANDS AND
OTHER WATERS OF THE U.S. AND OF THE STATE IN THE STUDY AREA

Feature Type	Cowardin Classification	Extent	
		Linear feet	Area (acres)
Wetlands			
Saline emergent wetland	Palustrine emergent wetlands (mixosaline, semipermanently flooded)		26.12
Seasonal wetland	Palustrine emergent wetlands (seasonally flooded)		12.29
Farmed wetland	Palustrine emergent wetlands (seasonally flooded)		0.11
	Total Wetlands		38.52
Other Waters of the U.S.			
Pond	Lacustrine- limnetic		13.01
Drainage channel	Riverine (seasonally/semipermanently flooded)	37,732.42	4.98
	Total Other Waters	37,732.42	17.99
	Total Area of Wetland and Other Waters Features:	**37,732.42**	**56.51**

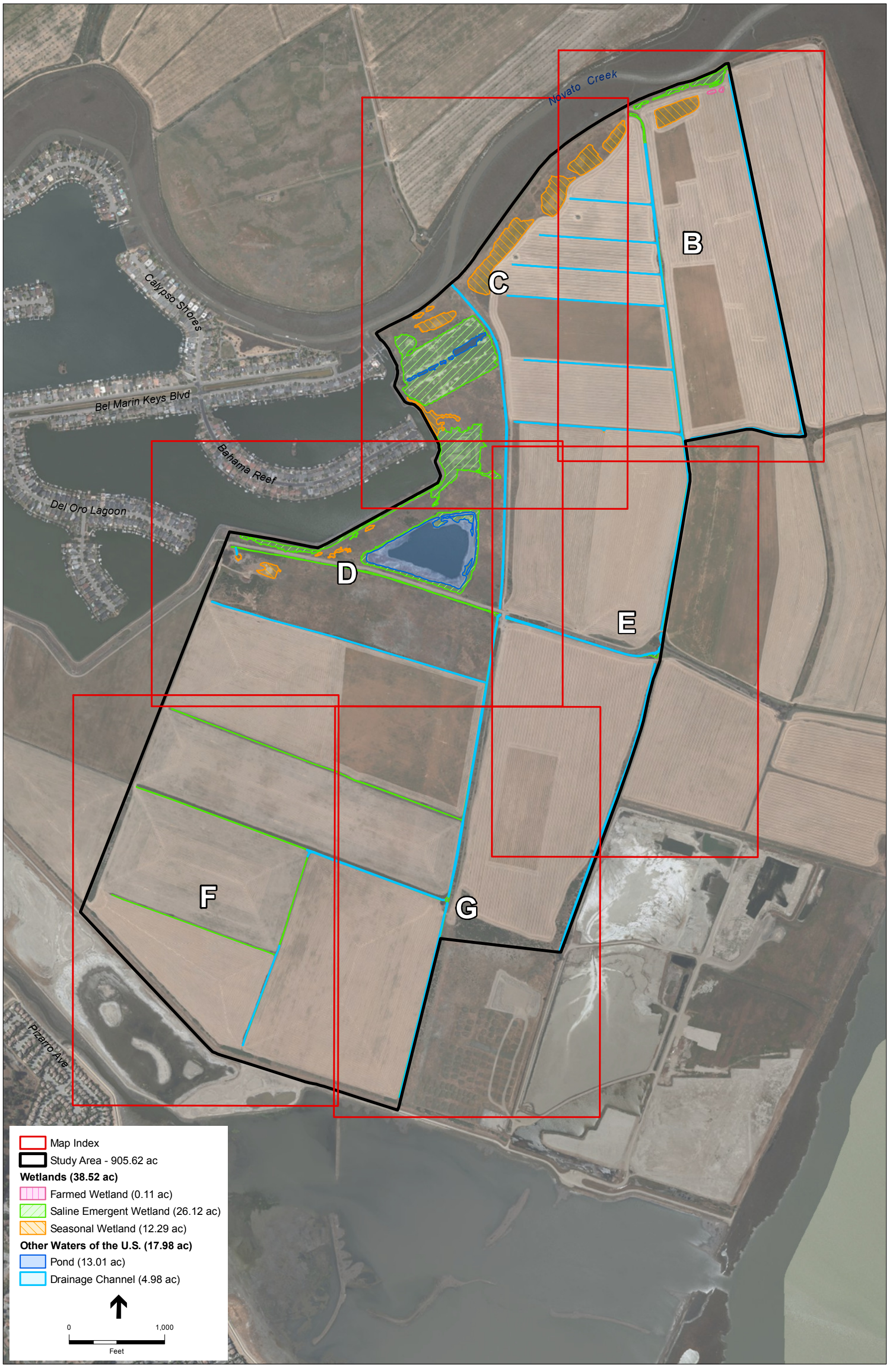
If you have any questions, please call me at 510-740-1721.

Sincerely,



Chris Rogers
ESA, Botany and Wetlands Program Manager

cc: Jeff Melby, State Coastal Conservancy



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1A

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1B

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1C

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1D

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1E

Potentially Jurisdictional Waters of the U.S.

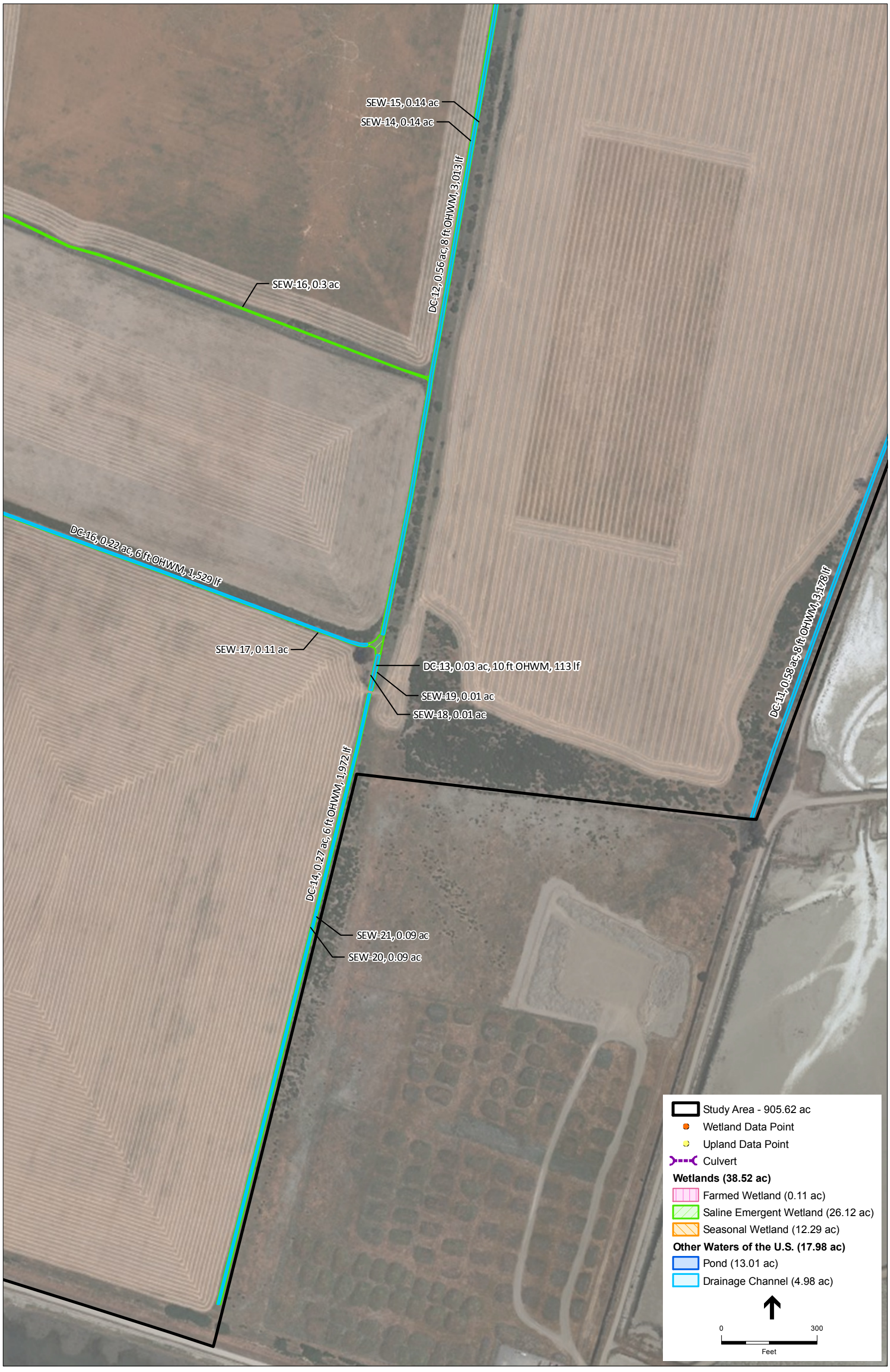


SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1F

Potentially Jurisdictional Waters of the U.S.



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

Bel Marin Keys Restoration Project . 150011

Figure 4-1G

Potentially Jurisdictional Waters of the U.S.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: MARIN Sampling Date: 6/6/2016

Applicant/Owner: CA COASTAL CONSERVANCY State: CA Sampling Point: 206

Investigator(s): SITE VISIT W/ USACE Section, Township, Range:

Landform (hillslope, terrace, etc.): DEPRESSION Local relief (concave, convex, none): CONCAVE Slope (%): 0

Subregion (LRR): C Lat: Long: Datum:

Soil Map Unit Name: REYES CLAY NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: THIS POINT IS LOCATED JUST WITHIN THE WETLAND BOUNDARY, IT REPLACES SP 1 AS THE WETLAND POINT.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 6FT)			
1. XANTHIUM STRUMARIUM	45		FAC
2. RUMEX CRISPUS	10		FAC
3. HELMINTHOTHECA ECHIOIDES	20		FACU
4. LACTUCA SERRIOLA	2		UPL
5. RAPHANUS SATIVUS	2		UPL
6. UNKNOWN COMPOSITE	3		FACU
7. ATRIPLEX PROSTRATA	5		FAC
8. SONCHUS ASPER	2		FAC
TYPHA ANGUSTIFOLIA <1	84		= Total Cover
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
ANTHEMIS COTULA			= Total Cover

% Bare Ground in Herb Stratum 16 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 206

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	90	7.5YR 5/8				CLAY LOAM	- ROOT ZONE
4-10	2.5Y 3/2	97	2.5YR 4/6	5	C	M	CLAY LOAM	
4-10	2.5Y 4/3	98						2nd MATRIX
10-16	10YR 3/1	60	7.5YR 4/6	2	C	M	CLAY	
10-16	2.5Y 4/3	38						2nd MATRIX

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks: TEXTURE CHANGE BELOW 10", AND SOIL IS MOIST BELOW 10"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- X Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: SEDIMENT DEPOSITS ON THATCH.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: MARIN Sampling Date: 6/6/2016

Applicant/Owner: CA COASTAL CONSERVANCY State: CA Sampling Point: 207

Investigator(s): SITE VISIT W/ USACE Section, Township, Range:

Landform (hillslope, terrace, etc.): DEPRESSION Local relief (concave, convex, none): CONCAVE Slope (%):

Subregion (LRR): C Lat: Long: Datum:

Soil Map Unit Name: REMES CLAY NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No

Hydric Soil Present? Yes ✓ No

Wetland Hydrology Present? Yes ✓ No

Is the Sampled Area within a Wetland? Yes X No

Remarks: AREA INVESTIGATED BASED ON LANDSCAPE POSITION, AREAS THAT APPEAR TO SUPPORT PONDING, AND FACULTATIVE VEGETATION. LANDSCAPE POSITION, VEGETATION COMPOSITION & PHENOLOGY VERY SIMILAR TO NEARBY SEASONAL WETLANDS.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 6 FT)			
1. FESTUCA PERENNIS	75	Y	FAC
2. RUMEX CRISPUS	3	N	FAC
3. HORDEUM MARINUM	5	N	FAC
4. LOTUS CORNICULATUS	10	N	FAC
5.			
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes Y No

Remarks:

SOIL

Sampling Point: 207

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	2.5Y 3/1	95	7.5YR 5/8	5	C	M	CLAY LOAM	
2-8	2.5Y 3/2	98	7.5YR 5/8	2	C	M	CLAY	
8-16	2.5Y 4/1	60	2.5YR 4/8	20	C	M	CLAY	
8-16	2.5Y 4/3	20						2nd MATRIX

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

LAYER 2-8 INCHES IS HEAVY, DENSE CLAY, LOWER LAYER IS MORE BLOCKY.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WATER STAINED LEAVES AT THE LOWEST POINT OF DEPRESSION, INDICATIVE OF PONDING / SATURATED SOILS.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: BMK City/County: MARIN Sampling Date: 6/6/16

Applicant/Owner: CA COASTAL CONSERVANCY State: CA Sampling Point: 208

Investigator(s): USACE SITE VISIT Section, Township, Range:

Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): Slope (%):

Subregion (LRR): C Lat: Long: Datum:

Soil Map Unit Name: REMES CLAY NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No

Hydric Soil Present? Yes X No

Wetland Hydrology Present? Yes No X

Is the Sampled Area within a Wetland? Yes No X

Remarks: PAIRED UPLAND POINT W/ 207. LOCATED ON A SLOPE, SIMILAR VEG TO 207, BUT LACKS HYDROLOGY INDICATORS,

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 FT)			
1. FESTUCA PERENNIS	78		
2. RUMEX CRISPUS	10		
3. LOTUS CORNICULATUS	2		
4. BROMUS DIANDRUS	21		
5. HELMINTHOTHECA ECHIOIDES	5		
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 106

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 3/2	95	10YR 3/6	5	C	M	CLAY LOAM	
4-10	2.5Y 3/2	99	5YR 5/8	1	C	M	CLAY	
10-12+	2.5Y 3/2	39	5YR 5/8	1	C	M	CLAY	
	2.5Y 4/3	60					CLAY	2nd MATRIX

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO INDICATORS OF WETLAND HYDROLOGY

APPENDIX B
Biological Assessment

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BEL MARIN KEYS WETLAND RESTORATION PROJECT PHASE 1

Biological Assessment

Prepared on behalf of:
California State Coastal Conservancy

October 2016

Prepared for submittal to:
U.S. Army Corps of Engineers

ESA



BEL MARIN KEYS WETLAND RESTORATION PROJECT PHASE 1

Biological Assessment

Prepared on behalf of:
California State Coastal Conservancy

October 2016

Prepared for submittal to:
U.S. Army Corps of Engineers

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TABLE OF CONTENTS

Bel Marin Keys Wetland Restoration Project Phase 1, Biological Assessment

Page

Chapter 1, Background and History 1-1
- 1.1 Background 1-1
- 1.2 Consultation to Date 1-2
- 1.3 Species Considered in this Biological Assessment 1-2
- 1.4 Critical Habitat 1-3
- 1.5 Project Site and Action Area 1-3

Chapter 2, Description of the Proposed Action 2-1
- 2.1 Summary 2-1
- 2.2 Project Elements 2-1
- 2.3 Construction Methodology 2-10
- 2.4 Monitoring 2-18
- 2.5 Adaptive Management Responses and Maintenance Activities 2-20
- 2.6 Avoidance and Minimization Measures 2-20

Chapter 3, Listed Species in the Action Area 3-1
- 3.1 Salt Marsh Harvest Mouse 3-1
- 3.2 Ridgway's (California Clapper) Rail 3-5
- 3.3 Western Snowy Plover 3-7

Chapter 4, Environmental Baseline Conditions 4-1
- 4.1 Land Use 4-1
- 4.2 Vegetation 4-1
- 4.3 Jurisdictional Wetlands and Other Waters of the United States 4-1

Chapter 5, Effects of the Proposed Action 5-1
- 5.1 Direct and Indirect Effects 5-1
- 5.2 Effects of Interrelated and Interdependent Actions 5-5

Chapter 6, Cumulative Effects and Determination 6-1
- 6.1 Salt Marsh Harvest Mouse 6-2
- 6.2 Ridgway's (California Clapper) Rail 6-2
- 6.3 Western Snowy Plover 6-3
- 6.4 Conclusion 6-3

Chapter 7, References 7-1

Page

Appendices

A. California Black Rail Analysis....A-1

List of Tables

1-1 Special-Status Species Considered for Bel Marin Keys Wetland Restoration Project – Phase 1....1-2
4-1 Potentially Jurisdictional Wetlands and Other Waters of the U.S. and of the State in the Study Area....4-2

List of Figures

1-1 Action Area....1-4
2-1 Proposed Project Features....2-3
2-2 Proposed Site Cross-Sections....2-5
2-3 Proposed Site Drainage Modifications....2-9
2-4 Seasonal Wetland Design and Construction Elements
2-5 Ridgway's Rail Habitat and 500 Foot Rail Buffer....2-25
3-1 CNDDB Occurrences of Listed Species....3-4
4-1 Potentially Jurisdictional Waters....4-3

CHAPTER 1
Background and History

The purpose of this Biological Assessment (BA) is to address the effect of the Bel Marin Keys Wetland Restoration Project – Phase 1 (project, proposed project, or proposed action) on species listed as endangered or threatened under the Endangered Species Act (ESA), or their designated critical habitat. The California State California Conservancy (SCC) is planning to begin the Bel Marin Keys Wetland Restoration Project by initiating a multi-phased tidal restoration project. The first phase includes the construction of a new bayfront levee ("New Bayfront Levee") landward of the existing bayfront levee and the creation of a minimum of 25 acres of seasonal wetlands; future phases will include dredged material placement for creation of tidal and seasonal wetlands, and breaching of the existing bayfront levee to reintroduce tidal waters to the site. Future phases and levee breaching is estimated to range from 10 to15 years after completion of New Bayfront Levee. The proposed action evaluated for this BA is the first phase of this multi-phase restoration project. The U.S. Army Corps of Engineers (USACE) is the lead federal action agency permitting the project under 404 of the Clean Water Act.

1.1 Background

The California State Coastal Conservancy (SCC) is leading the effort to restore the Bel Marin Keys Unit V (BMKV) site to tidal and seasonal wetlands. The Bel Marin Keys Wetland Restoration Project seeks to create a mosaic of tidal, seasonal, and transitional habitat on the site by constructing flood control features, placing dredged material to elevate the subsided baylands, and reintroducing tidal waters to the area. Due to long-term subsidence within the site's interior, ground surface elevations are below tidal marsh elevations; this condition is similar to the conditions at the Hamilton Wetlands Restoration Project (HWRP) to the south. As was proposed for the HWRP, the plan is to address the subsidence by placing fill material to raise grades within the restoration property to create tidal and seasonal marsh habitat.

In 2003, The USACE analyzed the BMKV site as a possible expansion of the HWRP. In partnership with the SCC and the Bay Conservation and Development Commission, the USACE prepared a Supplemental Environmental Impact Report/Environmental Impact Statement (SEIR/EIS)(Jones and Stokes, 2003) and a General Reevaluation Report (GRR) (USACE, 2003). The overall objective of the GRR was to evaluate the physical, environmental, and economical considerations of expanding the HWRP to include BMKV. The BMKV project site and the HWRP site are shown in the Area Map on **Figure 1-1**. Since the 240-acre State Lands Commission (SLC) Parcel was part of the HWRP, the SEIR/S and GRR analyzed the possibility of expanding the HWRP by including the BMKV project site. The areas added to the larger HWRP included the approximately 1,600-acre BMKV property. The HWRP restoration is now

complete, and the remaining portions of the original project include the SLC Parcel and the BMKV property. The GRR evaluated numerous alternatives for restoration of the BMKV site, ultimately selecting the alternative that provided a mix of tidal and non-tidal wetland habitat while anticipating a combination of dredged material reuse and natural sedimentation to raise grade within the site.

The proposed action, creation of a New Bayfront Levee and seasonal wetlands, is being developed to ensure that future work in subsequent phases remain feasible. The site is also actively farmed for oat hay by a private party under a contract with SCC. Site management by the SCC will continue until the levees are breached, which has been estimated to range from 10 to 15 years after completion of the New Bayfront Levee.

1.2 Consultation to Date

This BA, prepared by Environmental Science Associates (ESA) on behalf of California State Coastal Conservancy, addresses the proposed action in compliance with Section 7 of the ESA. Section 7 assures that, through consultation with the National Marine Fisheries Service (NMFS) and/or U.S. Fish and Wildlife Service (USFWS), federal actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of critical habitat.

1.3 Species Considered in this Biological Assessment

A list of special-status species considered for evaluation in this BA was compiled through species lists from USFWS and the California Department of Fish and Wildlife (CDFW), (lists generated online April 11, 2016 [CDFW, 2016; USFWS, 2016]). **Table 1-1** lists special-status species considered for evaluation within the action area.

TABLE 1-1
SPECIAL-STATUS SPECIES CONSIDERED FOR BEL MARIN KEYS WETLAND RESTORATION PROJECT – PHASE 1

Common Name (Scientific Name)	Status	Project Determination
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	endangered	*may affect, and is likely to adversely affect*
Ridgway's (California clapper) rail (*Rallus obsoletus*)	endangered	*may affect, and is likely to adversely affect*
western snowy plover (*Charadrius alexandrinus nivosus*)	endangered	*may affect, but is not likely to adversely affect*

Project activities are described in detail in Section 2 and project-specific effects on listed species are discussed in Section 5.

Project activities *may affect, and are likely to adversely affect* two federally listed species:

- Salt marsh harvest mouse
- Ridgway's (California clapper) rail

Western snowy plover have low potential to occur within the action area due to lack of suitable habitat. However, there is a new occurrence of breeding western snowy plovers at the adjacent HWRP site less than a mile to the south. Western snowy plovers may utilize the agricultural fields for foraging, which may be temporarily disrupted by construction activities; however, nesting sites do not occur in the action area. The low likelihood of occurrence within the action area and the design of levee construction and restoration activities project effects *may affect, but are not likely to adversely affect* this species.

Other listed species, including California red-legged frog, California least tern, northern spotted owl, California freshwater shrimp, delta smelt, longfin smelt, steelhead, tidewater goby, San Bruno elfin butterfly, and Marin western flax are absent from the action area due to lack of suitable habitat or the action area is outside the known range of these species. Therefore the project will have *no impact* and these species and they are not considered further in this analysis.

1.4 Critical Habitat

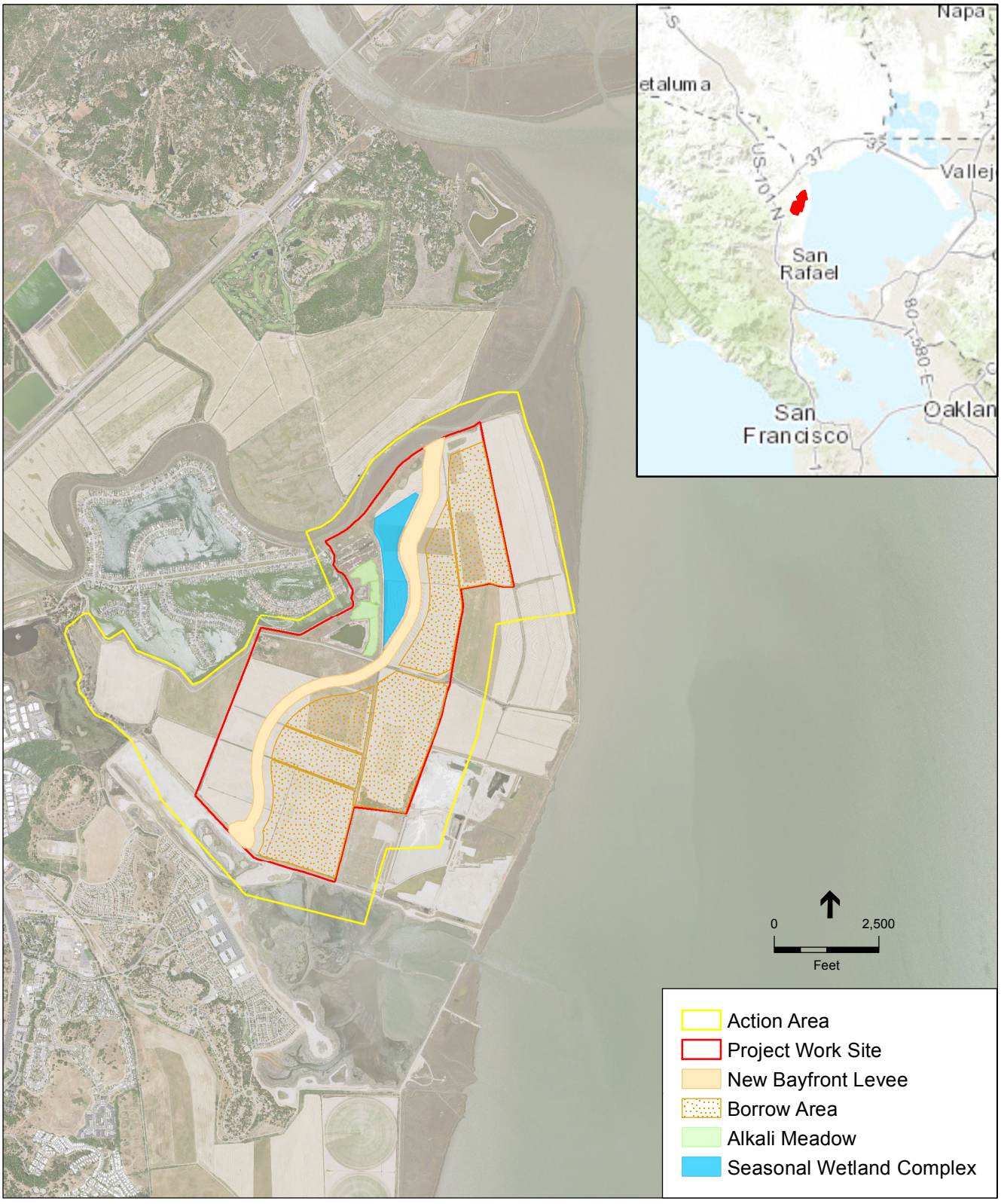
Critical habitat is defined in Section 3(5)A of the ESA as the specific areas within the geographical area occupied by the species on which are found physical or biological features essential to the conservation of the species and that may require special management considerations or protection. There is no designated critical habitat within the action area.

1.5 Project Site and Action Area

The proposed action is located on the Bel Marin Keys Unit V property between the existing Bel Marin Keys residential development and San Pablo Bay in Marin County, California. (**Figure 1-1**).

The project site consists of approximately 906 acres within the 1,600-acre BMKV property owned by the SCC. The project site is covered on two U.S. Geological Survey 7.5-minute quadrangle maps: Petaluma Point and Novato. The coordinates for the center of the site are Latitude 38° 04'23.27" North, Longitude 122° 30'0.25" West.

The action area is defined as all areas that would be directly or indirectly affected by the proposed action. The entire construction activity footprint of the project design, including buffers required for equipment travel, staging areas, is approximately 650 acres of temporary disturbance within the 906-acre BMKV site (Figure 1-1).



SOURCE: ESA 2016, Moffatt and Nichol 2016

Bel Marin Keys Wetland Restoration Project - Phase 1 . 150011.00

Figure 1-1
Action Area

CHAPTER 2
Description of the Proposed Action

2.1 Summary

The purpose of the Bel Marin Keys Wetland Restoration Project is to restore important tidal wetland habitat in San Francisco Bay. Approximately 90 percent of the original tidal wetlands of San Francisco Bay have been destroyed as a result of the diking and filling of the tidal wetlands for purposes of agriculture, urban development, and salt production. This loss of tidal wetlands has greatly reduced the amount of habitat available to many species of fish and wildlife. Several local animal and plant species, including the salt marsh harvest mouse and the Ridgway's rail, have been listed as in danger of extinction as a direct result of the reduction in extent and quality of their wetland habitats. Many other species, including migratory birds and numerous fish species, also have been affected by this loss of habitat. The proposed Phase 1 project includes site improvements necessary to allow for: 1) reestablishment of tidal wetlands in tidal waters where those wetlands previously existed; 2) creation of seasonal wetlands; 3) reestablishment of habitat for special-status species; and 4) protection of existing inland development and habitats from increased risk of inundation due to climate change and sea level rise.

The Phase 1 project includes the construction of a New Bayfront Levee landward of the existing bayfront levee, the creation of a 25 acres of seasonal wetlands, and modification to existing site drainages and utility pipelines and pumps to accommodate the project. Future phases will include placement of dredged material for creation of tidal wetlands, and breaching of the existing bayfront levee to reintroduce tidal waters to the site.

The Phase 1 Project would involve cut and fill (and balance on-site) of approximately 1.8 million cubic yards of native soil. The cut would occur from 434 acres within borrow areas and the fill placed over 95 acres to construct the New Bayfront Levee. The proposed action would commence in the summer of 2017, and is expected to take two construction seasons to complete. The proposed action is part of a long-term restoration effort to restore 906 acres of current agricultural lands to tidal marsh.

2.2 Project Elements

The proposed action would consist of the following primary features, as illustrated in the figure entitled Proposed Project (**Figure 2-1)**.

2.2.1 New Bayfront Levee

Under the Phase 1 Project, SCC would construct a New Bayfront Levee. The New Bayfront Levee would be approximately 11,800 linear feet in length, extending in a north-south alignment from the existing levee along Novato Creek's southwestern bank in the north to the existing levees separating the HWRP parcel and BMKV parcel in the south (N1/N2 levees) (Figure 2-1). The new levee alignment would be located approximately 5,000 feet landward or west of the existing bayfront levee (2,300 feet minimum, 6,700 feet maximum distance from the existing bayfront levee). The levee footprint would encompass 95 acres within the BMKV property. While the New Bayfront Levee would not immediately be used for flood protection, it has been designed to meet flood protection standards governed by the Corps and the Federal Emergency Management Agency (FEMA). Accordingly, the levee has been designed for a minimum crest elevation of +12 feet NAVD[1]. The levee crest would be equipped with an 18-foot-wide access road for maintenance vehicles.

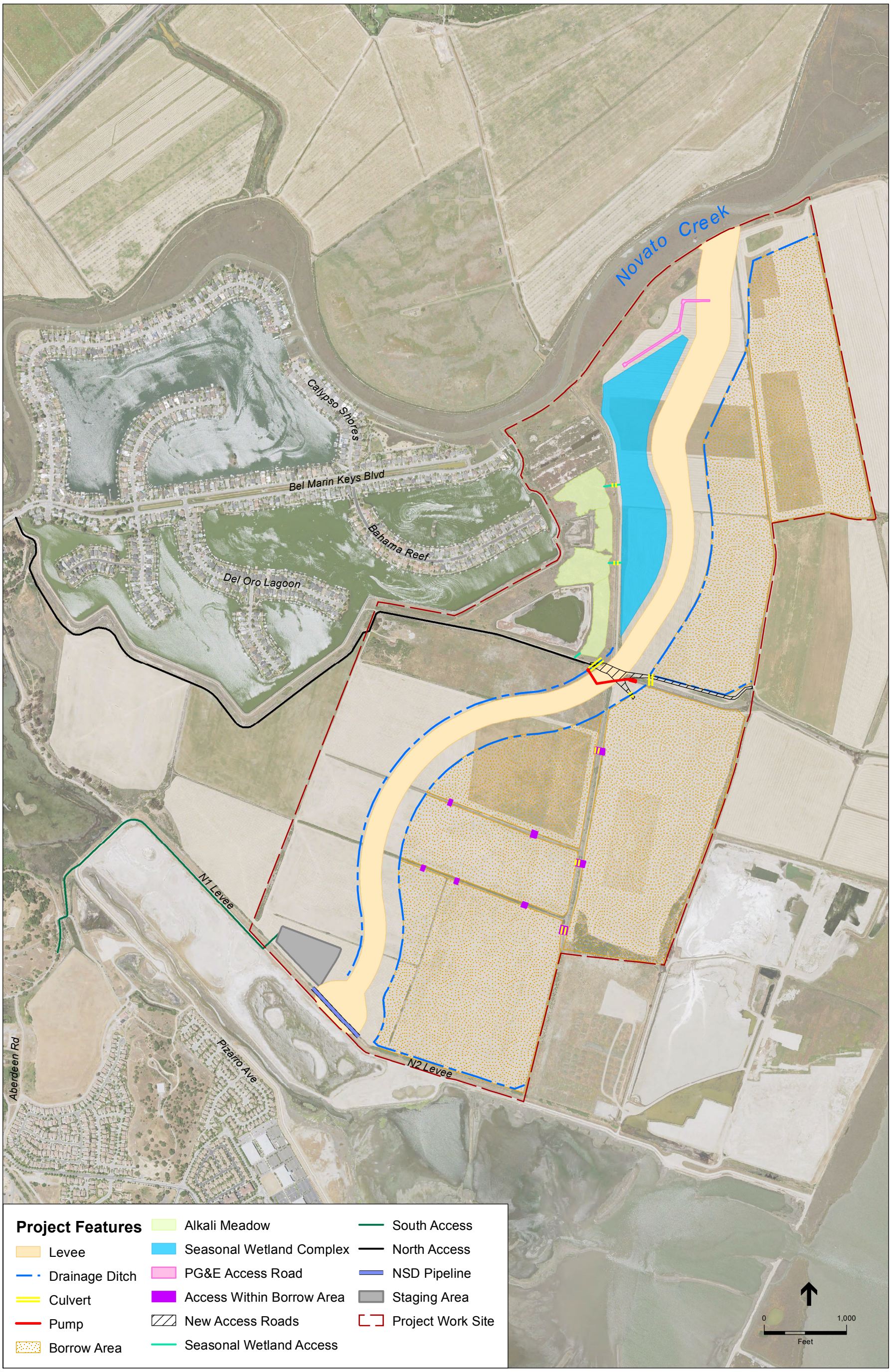
2.2.2 Borrow Areas for New Bayfront Levee

Material for the New Bayfront Levee would be sourced from the project site; no fill material would be imported. The volume of material required to construct the levee is estimated at 1.4 million cubic yards (compacted), which would require excavation of approximately 1.8 million cubic yards of material. Levee source material would be excavated from borrow areas on the Project site, bayward of the new levee (Figure 2-1). Fill material would be excavated from approximately 434 acres of existing farmland that's currently divided into approximately 8 farm tracts, some of which are separated by drainage ditches. To access the borrow areas, between 8 and 16 ditch crossings would be constructed. The approximate locations of these ditch crossings are shown in Figure 2-1. The culverts would range from 50-ft to 200-ft in length and 30-in to 48-in in diameter. Most of these ditch crossings would remain until the future levee breaching phase to provide the farmer access to the farm tracts for continued agricultural operations post-construction. Levee fill material would be excavated from the borrow areas to a depth of approximately 2 to 3 feet, as illustrated in the cross-sections shown in **Figure 2-2**. Beyond the levee footprint, the configurations of the farm tracts and drainage ditches would not change substantially as a result of project construction; land management practices and site drainage would continue in a manner similar to those of pre-project conditions. Additional detail on the borrow areas is provided in Section 2.3.6, Levee Construction.

2.2.3 Seasonal Wetland Restoration

In addition to the New Bayfront Levee, SCC would create or enhance approximately 25 acres of seasonal wetlands on the Project site. Wetland restoration efforts in Phase 1would focus on creation of shallow seasonal depressional wetlands and enhancement of alkali meadow wetlands. The wetland creation areas would occur along the northern portion of the site, between the

[1] North American Vertical Datum



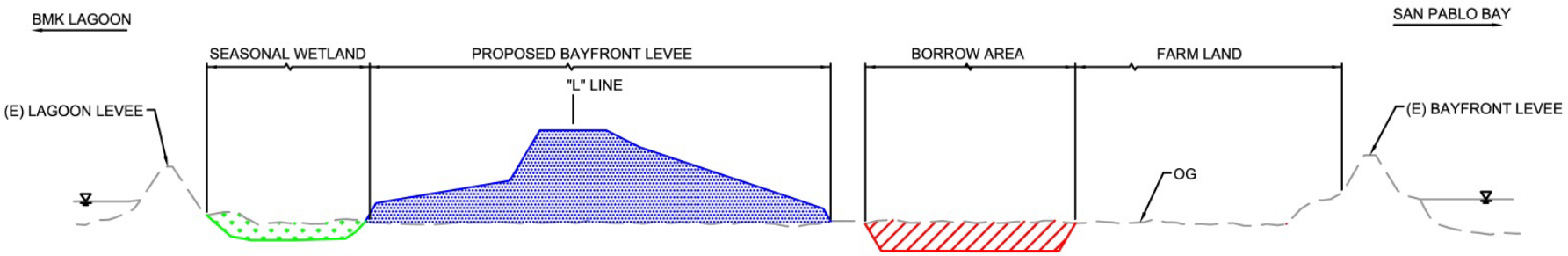
SOURCE: USDA, 2014; ESA, 2016

Bel Marin Keys Wetland Restoration Project - Phase 1 . 150011.00

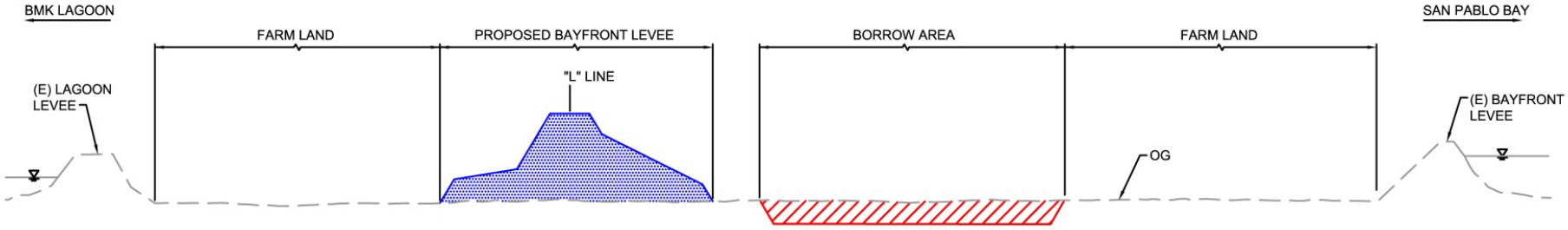
Figure 2-1

Proposed Project

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Typical Cross-Section through north portion of the site



Typical Cross-Section through south portion of the site

SOURCE: Moffatt & Nichols 2016

Bel Marin Keys Wetland Restoration Project – Phase 1 . D150011.00

Figure 2-2

Proposed Site Cross-Sections

proposed New Bayfront Levee and the existing Bel Marin Keys South Lagoon Levee (Figure 2-1). The alkali meadow wetlands would be located in proximity to and complement existing wetlands that occur within shallow borrow pits adjacent to the Bel Marin Keys South Lagoon Levee that were created from past levee maintenance and repair activities.

Seasonal Wetland Complex Creation

The Phase 1 Project would create shallow depressions (seasonal ponds) and associated high ground to provide a seasonal wetland complex in the northwest portion of the Project site, west of the New Bayfront Levee. Approximately 16 acres of seasonal ponds would be created over approximately 36 acres (Figure 2-1). The created shallow depressions would be approximately 0.5 to 1 acre in size and the maximum depth in each depression would vary between 1 and 2 feet below the existing ground surface in the northern reach of the complex and down to about 2 to 4 feet below existing grade in the southern portion of the complex. The seasonal ponds and associated vegetation that would establish in these depressions would be fed by groundwater and surface-water runoff from precipitation. Depth to groundwater in these locations varies seasonally, based upon weather and due to pumping. The seasonal ponds may vary between freshwater to saline, depending on the existing soil salinity and rainfall. The seasonal ponds would be designed to pool water only in the winter for most years. Water levels would be managed using hand-operated weirs to allow for water ponding, vector control, and control of non-desirable vegetation.

The seasonal ponds would be vegetated with saltgrass in high salinity soil or field sedge (*Carex praegracilis*) and common spikerush (*Eleocharis macrostachya*) in low-salinity soil. Creeping wildrye may also be used to vegetate the transition areas around the seasonal ponds. The seasonal ponds may also be vegetated by dwarf spikerush (*Eleocharis parvula*) if a local seed source can be obtained. Dwarf spikerush has a limited distribution and has a California Rare Plant Rank of 4.3.

The seasonal ponds would provide foraging habitat for dabbling ducks and high tide roost habitat for shorebirds. The vegetative cover and areas around the ponds would also provide suitable nesting habitat for dabbling ducks or songbirds.

Alkali Meadow Creation

The Phase 1 Project would use grading and planting to expand and enhance wildlife habitats within the existing saline wetland/open water area immediately east of the Bel Marin Keys South Lagoon. The creation of alkali meadow would cover approximately 9 acres (Figure 2-1). The new alkali meadow areas would result in gentler slopes along the edges of the three existing ponds to increase the extent of the wetland and transition habitat and sculpt more natural, less linear habitat edges.

Planting and seeding would be implemented to re-establish native vegetation in the alkali meadow areas and all other disturbed areas. Vegetation community types in the expanded alkali meadow area would mostly consist of salt grass meadow but also may include creeping wild rye meadow and nontidal saltmarsh plant species. Vegetation may include creeping wildrye (*Elymus triticoides*), field sedge (*Carex praegracilis*), salt grass (*Distichlis spicata*), fat-hen (*Atriplex prostrata*), alkali heath (*Frankenia salina*), pickleweed (*Salicornia pacifica*), and jaumea (*Jaumea carnosa*).

The alkali meadow areas would provide transitional habitat that is lacking in the project area and larger San Francisco Bay Area. Alkali meadows may provide habitat for a wide variety of insects, small mammals, and reptiles, which in turn are important prey for raptors, other birds, and larger mammals.

Temporary Wetlands in New Borrow Areas

An approximately 434-acre area of existing farmland east of the New Bayfront Levee alignment would be excavated to generate borrow material to create the New Bayfront Levee. Excavation in the proposed borrow areas may result in creation of temporary wetland habitat. These potential wetlands could provide habitat for waterbirds and other wildlife. However, any such wetlands or associated habitat would be temporary construction artifacts; during a subsequent phase, the exiting outboard levee would be breached and areas bayward of the New Bayfront Levee would be restored to tidal wetland habitat.

2.2.4 Novato Sanitary District Effluent Pipeline

The Novato Sanitary District (NSD) discharges secondary-treated effluent to San Pablo Bay via a 54-inch diameter reinforced concrete pipe (RCP) operating under pressure. The water in the pipeline is treated effluent from the NSD Treatment Plant in nearby Novato and is discharged into San Pablo Bay or to spray fields to the north of the Project site. Within the Phase 1 Project limits, the pipeline alignment runs generally parallel to and along the north side of the N1/N2 levees (located on the southern border of the BMKV property) and extends east to a submerged outfall in San Pablo Bay.

The New Bayfront Levee would tie in to the north-facing slope of the N1 levee, passing over the existing NSD pipe. To accommodate the new levee tie-in, SCC would abandon 700 feet of the existing outfall pipe within the levee footprint, and install a new 63-inch High Density Polyethylene (HDPE) bypass pipe to convey NSD effluent up and over the New Bayfront Levee. However, the new bypass pipeline would maintain the alignment of the existing effluent pipeline within the existing NSD easement.

The new HDPE bypass pipe would connect to the existing NSD pipeline with a collar and/or coupling at both ends. The bypass pipe would be equipped with passive air release and anti-vacuum mechanisms connected to a concrete junction box located at the high point of the pipe at the top of the levee tie-in. The new pipeline would pass over the levee crest and not penetrate the levee; additional fill would be placed over the pipe to provide cover and allow maintenance vehicles to pass over the pipe. A lateral service connection, or secondary diversion pipe, would be installed in the NSD pipeline, on the landward side of levee tie-in, to provide water for moisture conditioning of the levee fill, dust control during project construction, and potential use as a source of irrigation water for plant establishment.

2.2.5 Site Drainage Modifications

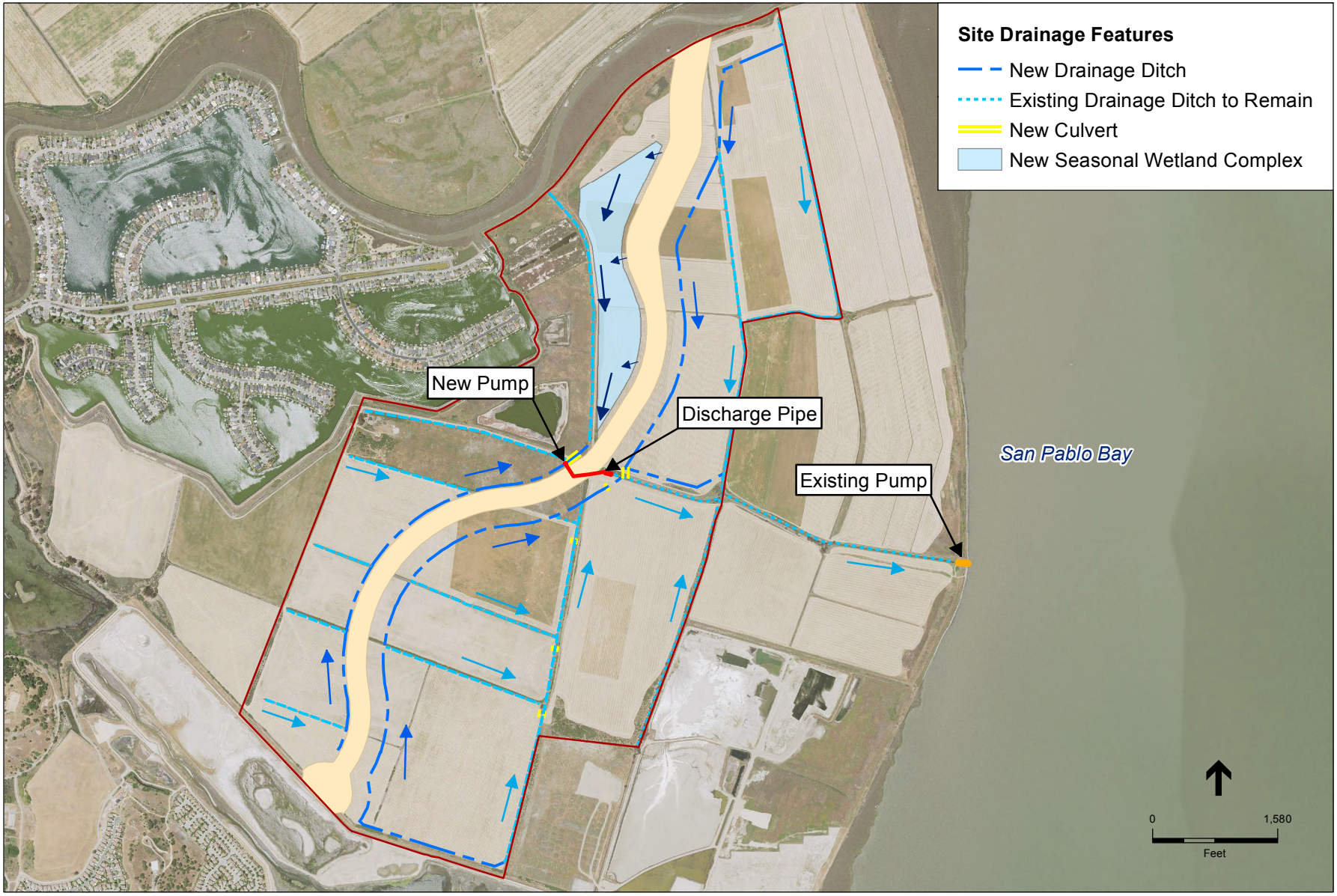
The Project site is presently drained through a network of agricultural drainage ditches and containment berms. The ditches generally form a grid-like pattern, with channels extending in north-south and east-west orientations. Under current conditions, the drainage ditches route water from the north and south to an east-west collector channel in the center of the site. The collector channel extends east to the existing bayfront levee where an existing pump station conveys runoff over the levee and into San Pablo Bay (**Figure 2-3**).

The proposed New Bayfront Levee alignment would bisect several existing agricultural ditches and obstruct flow of surface runoff from the landside of the proposed New Bayfront Levee alignment. To facilitate post-construction drainage, two new drainage ditches would be constructed, one on each side of the New Bayfront Levee. The locations of the ditches are shown in Figure 2-3. Similar to existing conditions, the new drainage ditches would route runoff towards the existing collector channel at the center of the site. North of the pump station, a drainage ditch would not be constructed. Instead, runoff from the New Bayfront Levee would drain to the newly created seasonal wetlands west of the levee.

A new pump station would be installed in the existing collector channel on the west side of the New Bayfront Levee to convey runoff over the levee and into the existing collector channel on the bayside of the New Bayfront Levee (Figure 2-3). The pump would operate by electricity. A new overhead power pole and transformer would be installed at the south side of the existing site access road to connect power to the new pile-supported pump station. The pump would operate automatically with a float-actuated switch or manually. The pump station would connect to two pipes similar to the existing pump station. The pipes would pass over the levee and discharge to the existing main drainage ditch. The pipe outfall in the drainage channel would have an apron of rock on the channel bottom and slopes to prevent scour. The existing pump station at the existing bayfront levee would continue to operate, as needed.

A number of access crossings (as few as 8 and up to 16) would be required within borrow areas over drainage ditches; the minimum number of potential locations have been identified (Figure 2-3) but the actual number and locations of access points would ultimately be determined in the field by the contractor. At all locations a 48-inch (or smaller) diameter culvert would be installed in the drainage ditch and a vehicle crossing constructed. These culverts would be made of reinforced concrete pipe or high-density polyethylene pipe. The culverts would range from 50 to 200 feet long depending on the width of the drainage channel and access road. Most of these ditch crossings would remain to support of continued farming operations until the future levee breaching phase.

Existing ditches on the east side of the New Bayfront Levee would continue to function wherever possible. Existing ditches (or portions of existing ditches) that would no longer be necessary would be filled and areas that need additional drainage would have new drainage ditches excavated. The existing ditches that would be filled include the ditches within the footprint of the New Bayfront Levee and the area east of the levee between the levee and the borrow areas. Some small ditches within the borrow areas would also be filled if they are near a new drainage ditch and the existing ditch would no longer be needed. All ditches would continue to drain toward the existing collector channel in the center of the site.



SOURCE: USDA 2014, ESA 2016

Bel Marin Keys Wetland Restoration Project - Phase 1. 150011.00

Figure 2-3

Proposed Site Drainage Modifications

2.2.6 Pacific Gas & Electric Access Road

To provide continued access to two power transmission towers owned and operated by the Pacific Gas & Electric Company (PG&E), a permanent access road would be constructed within the existing PG&E easement on the northern end of the Project site, west of the New Bayfront Levee and south of Novato Creek. The access road would be 1,500 feet long and approximately 20 to 40 feet wide. The road would have an aggregate base to provide all-weather access to the transmission towers located within the Project site.

A culvert may be located under the new PG&E access road adjacent to the landside (westside) levee toe. The culvert would be 30-ft long and 18-in in diameter. This culvert would divert stormwater north of the PG&E access road and discharge into the newly created seasonal wetland complex.

2.3 Construction Methodology

This section describes the proposed construction phasing and schedule, workforce and equipment required, site preparation steps, construction earthwork, and proposed site restoration methods for the Phase 1 Project.

2.3.1 Construction Sequencing

Project construction would be completed over two years. Construction would progress from south to north starting in spring 2017. The Phase 1 project is expected to be complete by December 2019. The levee construction would span two years, with approximately half the final levee height constructed in the first year and the final height achieved in the second year. Subsequent levee height adjustments would be made over the next 20 years to address anticipated settlement of the levee crest.

Year 1:

- Improve existing access roads (if needed) and prepare contractor staging areas
- Install culverts at drainage ditch crossings for access to borrow areas
- Remove/abandon a portion of the NSD outfall pipeline, and install a new HDPE outfall pipeline and turnout
- Major site grading, including excavation of borrow areas and transport of excavated soils to the New Bayfront Levee site.
- Construct New Bayfront Levee and tie-in to N1 levee. Construction would start at the south and proceed north.
- Construct levee tie-in at Novato Creek levee.
- Excavate new drainage ditches parallel to the New Bayfront Levee and install new pump station at the collector channel on the westside of the New Bayfront Levee.
- Seed and vegetate the westside levee stability berm.

- Install permanent erosion control BMPs and install seasonal BMPs for disturbed areas where construction is not complete.

Year 2:

During the second year, the levee would be constructed to an elevation of +15 feet NAVD. To minimize potential for disturbance to seasonal wetlands and species that will be attracted to the wetlands for habitat once constructed, the seasonal wetlands and associated access roads would also be constructed in year two. Key elements of the second year's construction activities include the following:

- Major site grading including excavation of borrow areas and transport of excavated soils to the New Bayfront Levee site; minor grading around wetland creation sites.
- Construct New Bayfront Levee to the final design elevation of +15 feet NAVD (from south to north).
- Plant seasonal wetlands restoration/creation areas.
- Construct permanent aggregate base access road along existing PG&E easement, beneath transmission lines and around two towers at north end of site.
- Erosion control and revegetation of disturbed areas through hydroseeding or other methods where construction is complete.

Post-Construction Levee Height Adjustments

The design approach is to construct the levee to an initial elevation of +15 feet NAVD, which is 3 feet above the minimum crest elevation of +12 feet. The levee would be expected to settle 25 to 40 percent of its fill thickness, depending upon thickness of the underlying compressible Bay Mud. Settlement is expected to occur more rapidly immediately after construction and would slow down over time; settlement is expected to continue for over a century. When the crest settlement approaches the minimum design elevation (anticipated 10-23 years from the initial construction work), additional fill would be placed to raise the crest to the appropriate elevation that would accommodate both settlement and anticipated (or actual) sea level rise. A portion of the fill stored on the stability berm (the westside toe berm) would be used as fill for future levee raising. There would be no new excavation from borrow areas in the Project site.

2.3.2 Workforce and Equipment

Temporary construction staffing for the Phase 1 Project would consist of approximately 20 to 56 personnel during construction. All contractors would be properly trained and certified for construction activities, best management practices, and recognizing special-status plants and animals and cultural resources that may be encountered during construction.

Levee construction and seasonal wetland creation would require many different equipment types. Conditions in the field at the time of construction would influence the type of equipment that would be best suited for the work and ultimately would be chosen by the construction contractor.

Equipment would be delivered to the Project site by flatbed truck and transported to the work areas via existing access roads.

One or two excavation/hauling crews would be operating at any given time. Up to 23 pieces of equipment would be required during each construction year. The specific mix and number of pieces of equipment used would depend on the activities occurring during the particular construction season and the conditions of the site. The list of equipment and approximate numbers of pieces of equipment for two operating crews anticipated to be used during the Phase 1 Project is anticipated to include:

- Tractor with two towed scrapers (9 to 12 pieces of equipment), or self-propelled scrapers (3 to 4 pieces of equipment)
- Sheepsfoot Compactor (1 or 2)
- Disker (2)
- Dozer (4)
- Water pull (3)

2.3.3 Access and Haul Routes

Equipment access and excavated material transport would occur along existing roads, levee tops and across agricultural fields. Existing roads and levees would be utilized to access the construction footprint. Access to the south portion of the Project site would occur from Aberdeen Road (primary access). Access to the north and central portion of the Project site would occur from Bel Marin Keys Boulevard (secondary access). Access roads are shown in Figure 2-1. The existing dirt road along the north access route would be improved by placing a 6-in layer of gravel (or aggregate base) over the existing surface. This would reduce dust and provide a more uniform surface for vehicles. Approximately 4,000 tons of gravel would be placed on 9,500 linear feet of existing access roads, ranging from 12 to 15 feet wide.

Daily worker traffic and small deliveries would occur through the primary access route. Initial equipment delivery and removal would occur through the secondary access route. Main access between the primary access route and the construction areas and borrow sites would be via the N1/N2 levees and through the New Bayfront Levee work area. Main access between the secondary access route and the construction areas and borrow sites would be via existing roads and a new culvert over the existing collection channel (Figure 2-1). The final decision on access and haul routes would be reached through the collaboration of the contractor and design team, in compliance with applicable regulatory permitting requirements prior to construction. Within the site's interior, equipment travel routes and excavated material transport would occur primarily along routes within the Phase 1 Project's cut and fill footprint. Culverts would be installed at drainage crossings, as described in Section 2.2.5, Site Drainage Modifications, above.

2.3.4 Staging Area

Shown in Figure 2-1, a staging area measuring approximately 7 acres would be established at the southern end of the Project site. Materials, equipment, a fueling station, and a temporary office may be located at the staging area. Large equipment used for earthwork would likely be parked within the active borrow area or other disturbed areas of the site (e.g., access roads) until excavation work is complete. Areas used for staging and site access would be cleared and graded. Heavy equipment such as bulldozers, scrapers, and graders would be used to construct the staging area and any required site-access improvements. A stormwater pollution prevention plan (SWPPP) and safety plan would be developed and implemented to prevent the transport of sediments and/or construction contaminants from the staging area into surrounding areas.

2.3.5 Vegetation Removal

A qualified botanist would conduct a non-native plant assessment of areas subject to construction activities and would recommend specific measures to control spread of non-native species during project construction. Measures may include the establishment of wash stations for construction vehicles and equipment to clean tires of weed seeds and other propagules before they are moved offsite, and the development of an herbicide spray program to address perennial pepperweed or other invasive weed infestations prior to construction.

Biologists would conduct pre-construction surveys for special-status species before vegetation clearing to ensure no listed species are present. Pickleweed vegetation that may support salt marsh harvest mouse would be hand-removed within the Phase 1 Project footprint. Other vegetation would be cleared and grubbed using standard practices such as using mowers towed behind diesel wheeled tractors, and bulldozer tractors.

The area within the work limits would be cleared of vegetation, except for portions of the existing drainage ditches that would not be filled. The top few inches of soil and vegetation on lands to be graded (excavated or filled) may be stockpiled on site for reuse within the seasonal wetland creation areas.

2.3.6 Levee Construction

Earthwork (grading, excavation, and redistribution of material) is necessary mainly for construction of the New Bayfront Levee, with only minimal grading required for seasonal wetlands. The ground surface within the levee footprint would be excavated to a suitable depth (approximately 2-ft), moisture conditioned, and compacted. Geotextile materials may be used to enhance the stability of the levee foundations.

An estimated 1.8 million cubic yards of material would be excavated for levee construction. Sediment for levee construction would be sourced from borrow areas located on the eastside of the New Bayfront Levee alignment. The predominant on-site borrow material is Bay Mud, which is suitable for levee fill and can be excavated from adjacent agricultural fields. To minimize

transport distance and handling, the borrow areas would be sited near the location of final sediment placement. Shown in Figure 2-1, borrow areas would be located entirely within existing farmed tracts. Borrow areas would be excavated to depths of approximately 2 to 3 feet. The material to be excavated and transported has been thoroughly analyzed for its geotechnical properties and has been deemed suitable and stable for the purposes of the Phase 1 Project (Moffatt & Nichol et al., 2016). The area to be excavated would be approximately 434 acres.

Dewatering within the Project site is not expected to be necessary due to the time of year that most construction would occur (April to October). However, if sufficient rainfall occurs during the construction period such that ponded water persists, a portable pump would be used to remove water from work areas and discharge the water to one of the borrow areas.

The New Bayfront Levee would have a "core" slope of 3H:1V on both sides, and be flanked by stability berms on either side. Sediment placement levee crest would occur in phases, followed by waiting periods to allow for sediment draining and compaction. Bay Mud excavated from nearby farm fields that is too wet to be readily used for the main section (core) of the levee would be placed on the stability berms. Strength and compaction are not critical for stability berms. In the northern portion of the site where the Bay Mud may be weaker, extremely wide, flat slopes would be constructed for the levee. Wide flat slopes are compatible with the future marsh restoration efforts proposed on the bay side (east side) of the levee Slopes would not be built as wide on the west side of the levee since it would not provide habitat benefits.

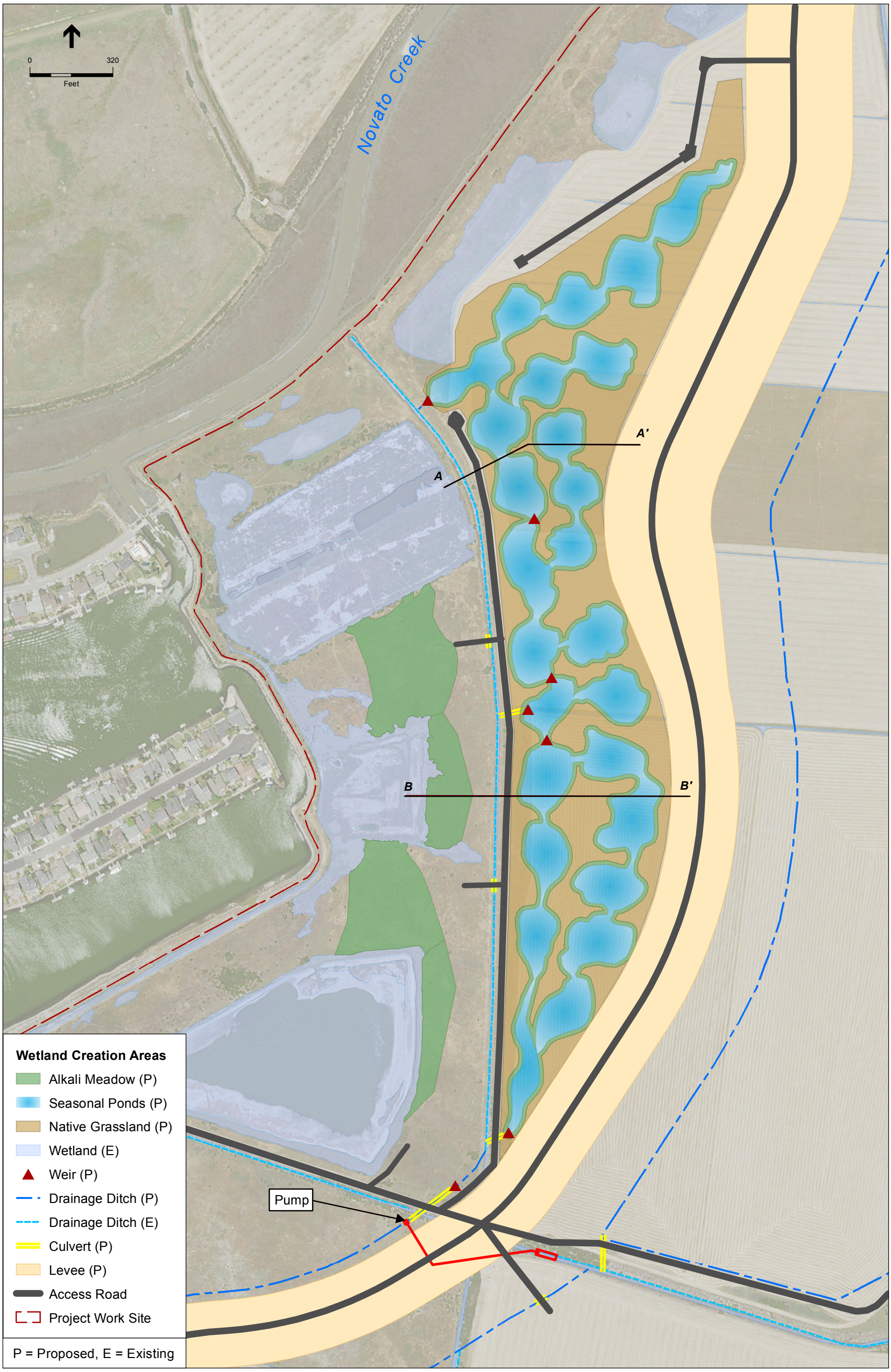
2.3.7 Seasonal Wetlands Construction

The seasonal wetlands would be constructed during the second year of construction. Construction elements and sequencing for each wetland type being created are specified below. Seasonal wetland design and construction elements are shown in **Figure 2-4.**

Seasonal Wetland Complex Creation

Access to the seasonal wetland complex would occur from the New Bayfront Levee to the east and via the existing access road along the west side of the seasonal wetland complex and would not impact existing wetland habitat. Within the site's interior, construction access would generally occur within the New Bayfront Levee footprint and would not traverse existing wetland habitat. Following New Bayfront Levee construction, access to the seasonal wetland complex area would occur via the levee crest and along the existing access road west of the seasonal wetland complex.

The seasonal ponds would be constructed by excavating below existing grade to create a typical ponding depth of 1 to 2 feet. Some ponds may have deeper areas, as much as to 4 feet below existing grade. The ponds would generally drain towards the south towards the new pump (Figure 2-4). A total of approximately 60,000 cubic yards would be excavated to construct the seasonal ponds. Excavated soils would be used in levee construction. Gradual transition areas between the ponds and uplands would be graded around the ponds to create heterogeneous topography within the seasonal wetland complex.



SOURCE: USDA, 2014; ESA, 2016

Bel Marin Keys Wetland Restoration Project - Phase 1.
150011.00 **Figure 2-4**
Seasonal Wetland Design and Construction Elements

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The seasonal wetland ponds would be connected by a series of shallow swales incorporating about six to eight water control structures to control water levels and allow for periodic drainage of the wetland complex, as needed. The water control structures would consist of a combination of concrete twin track weir boxes similar to those used to control water levels in rice fields and irrigation canals, flashboard risers for drainage under the road to the existing ditch, and a screw-operated weir at the south end of the existing ditch. The existing drainage ditch may be temporarily impacted if some excavation is necessary to ensure proper drainage of the seasonal wetland complex. The flashboards would be set at the target water level for the seasonal wetlands and could be adjusted to help manage the wetland habitat. The structures would be operated to drain the ponds if needed for vector control or for maintenance activities such as disking or mowing. Operations would be provided by the California State Coastal Conservancy or their agent; for example, by the Marin-Sonoma Mosquito and Vector Control District or the farmer lessee.

The areas for the weir boxes would be over excavated to place a foundation of compacted aggregate base rock. The weir boxes would each be about 4 feet square and their foundation areas would each be about 8 feet square. The area around the boxes would be backfilled with native soil and replanted with native upland plants.

Alkali Meadow Creation

Access to the alkali meadow areas for construction would be primarily from the existing access roads to the south and east of the alkali meadow creation area. Up to two new access roads would be created to serve the alkali meadow creation area. These roads would cross the drainage ditch adjacent to the existing access road separating the seasonal wetland complex from the alkali meadow creation area. At these locations, culverts up to 60 feet long would be installed along the drainage ditch to allow equipment access. A third access route would be from the existing access road south of the alkali meadow creation area. Upon project completion, these access routes could remain or be restored to their approximate pre-construction conditions.

The alkali meadow areas would be constructed by excavating to elevations observed to support alkali meadow vegetation in adjacent areas and thereby restoring similar hydrology. Existing ground elevations within the proposed alkali meadow wetlands area are approximately -2.5 feet NAVD on average, based on the elevation data collected by ESA in July 2016 and review of the 2009-2011 LiDAR. Elevations where saltgrass and alkali heath have been observed to grow in high abundance occur between -4.5 and -2.6 feet NAVD. The alkali meadow areas would gradually slope from existing grades at -2.5 feet down to EL -4.5 feet NAVD to expand the area suitable for salt grass, alkali heath and other wetland/transitional plant species. In order to construct the alkali wetlands an average of about 1 foot of excavation would occur across 9 acres, resulting in up to 20,000 cubic yards of excavated soil which would be placed on the new levee.

2.3.8 Napa Sanitary District Effluent Pipeline Modification

During the first year of construction, approximately 850 feet of the existing NSD effluent outfall pipeline within the footprint of the New Bayfront Levee would be demolished or abandoned (filled with flowable fill). The existing pipe would be capped at the downstream and upstream ends with blind flanges, or round plates bolted to pipe ends. The new HDPE outfall bypass pipeline section would be installed in the New Bayfront Levee with approximately 4 feet of earthen cover; the portion above elevation +15 ft NAVD would have reduced cover (approximately 1-ft thick). The completed bypass pipeline would be equipped with an anti-vacuum and passive air release mechanism connected to a concrete junction box located at the high point of the pipeline. The new bypass pipeline would be connected to the existing pipeline upstream and downstream of the new bypass. The top of the levee at the crest of the pipeline would be paved with concrete to provide year-round access for NSD to maintain the pipeline.

2.3.9 Site Restoration and Revegetation

Staging areas and borrow areas would be restored to their approximate pre-construction conditions to the extent feasible and managed in a similar fashion until subsequent project phases are implemented. As necessary, native plant revegetation, including seeding, tilling rhizomes, planting sod fragments, or planting container stock would occur in areas disturbed by construction including the seasonal wetland creation areas, the levee stability berms, the borrow areas, and the buffer area flanking the bayside of the New Bayfront Levee.

The target plant communities for the seasonal wetland complex and alkali meadow would be seasonal wetland, alkali meadow, and native grassland dominated by rhizomatous, spreading (sod-forming) species such as saltgrass (*Distichlis spicata*), creeping wildrye (*Elymus triticoides*), and sedges *(Carex sp.)*. Additional grasses and forbs would also be planted and/or seeded including alkali heath (*Frankenia salina*) and meadow barley (*Hordeum brachyantherum*). Active revegetation efforts at the seasonal wetland complex and alkali meadow (planting, seeding, and intensive weed control maintenance) would be required to establish the target native plant communities due to rapid recruitment and competition of invasive plants. The dominant sod-forming species would be planted at a high density both because many of these species do not readily reproduce from seed and to minimize invasive weed establishment.

Some Phase 1 Project areas – such as the stability berms and the buffer area – may be farmed. The borrow areas are expected to be too saline for farming initially. Standard agricultural management practices would be used to reduce soil salinity in anticipation of farming once suitable soil conditions are achieved. Temporary (less than 5-years) erosion control BMPs would be installed to minimize surface erosion due to stormwater.

2.4 Monitoring

2.4.1 Seasonal Wetlands

The SCC would develop and implement a 5-year monitoring program to measure the habitat establishment rate, quantity, and quality of seasonal wetland enhancement and creation areas. Major elements of the monitoring program would include the following.

- Measure areal extent and locations of established or colonizing marsh vegetation.
- Measure composition and density of established and colonizing plant species.
- Compare predicted and measured site development and function.
- Analyze monitoring data to identify possible reasons for differences between observed and predicted conditions.
- Recommend remedial actions that can be implemented if the restoration is not proceeding as designed.

Per regulatory permits and approvals, monitoring reports would be submitted by the SCC to federal, state, and local agencies each year in which monitoring of the wetland enhancement and creation areas is conducted. If the rate, quality, and quantity of created habitat are not meeting restoration goals at the end of the 5-year period, the sponsoring agencies would consult with regulatory agency staff and technical experts regarding further monitoring and potential corrective actions.

2.4.2 Levee Performance

The New Bayfront Levee would be monitored periodically for several geotechnical performance indicators, including fill thickness, pore pressure, settlement, and lateral deformation. Monitoring would be conducted using instrumentation installed during levee construction and by performing on-site field surveys and/or measurements in accordance with the Draft Final Geotechnical Investigation (Hultgren-Tillis Engineers, March 2016) and construction contract requirements. Levee performance indicators would serve as triggers for determining the need for future adjustments to the levee height.

2.4.3 Monitoring and Adaptive Management Approach

The project would use an adaptive management approach with objective-driven monitoring for the restored wetland areas. Indicators of functional outcomes from project construction and operation (metrics) would be measured to evaluate wetland functionality and to inform corrective measures if habitats become degraded. Seasonal wetland monitoring metrics would address physical habitat, hydrological regime and water quality, and revegetation success.

2.5 Adaptive Management Responses and Maintenance Activities

A range of post-construction activities could occur at the project. Some activities are potential management responses that could be triggered if monitoring data indicate a problem or unsatisfactory progress toward objectives. Others are maintenance activities that may be necessary for long-term management of the levee and wetland habitats.

2.5.1 Manage Non-native Invasive Plants

After being planted, wetland restoration areas would be monitored for infestation of perennial pepperweed, stinkwort, and other potentially invasive species. All infestations occurring within wetland habitats would be controlled and removed to the extent feasible without jeopardizing the surrounding native vegetation. A long-term monitoring plan would be developed, subject to review and approval by USFWS and CDFW that would remain in effect until wetland habitat is established. It is expected that some ongoing vegetation management would be needed within the created seasonal wetlands. This would likely consist of mowing at least once every other year.

2.5.2 Maintenance of Levee

Levee maintenance would be conducted to maintain vehicle access and repair damage to the levee. Maintenance may include mowing of the levee (crest and slopes), and additional fill placement on the levee crest and slopes, as needed over the 20 years following initial levee construction. This action is described above in Sections 2.2.1, New Bayfront Levee, and 2.3.6, Levee Construction.

2.5.3 Phasing and Schedule

Earthwork for levee height adjustments would generally be conducted during the dry season (generally April 15th to October 15th). Revegetation efforts as needed to attain habitat establishment targets would occur between October and May. Ground disturbing activities would be limited to specific windows to minimize impacts on endangered species. For example, tree and shrub removal would generally occur between September and February to limit disturbance to nesting birds. Similarly, construction in proximity to Ridgway's rail and other ground-nesting bird habitats would be limited to this period.

2.6 Avoidance and Minimization Measures

In order to avoid and minimize effects of the proposed action during construction and to provide compensation for temporary habitat loss effects that will occur; a number of avoidance and minimization measures are being included as part of the proposed action.

In addition to the measures listed below, the following avoidance and minimization measures identified in the BMKV Supplemental EIR/EIS (Jones & Stokes 2003) will be implemented. The full text of these measures is available online at: http://hamiltonwetlands.scc.ca.gov/library/final-general-reevaluation-report-and-final-supplemental-environmental-impact-report-environmental-impact-statement/

- Mitigation Measure BIO-1: Conduct Surveys to Locate Northern Harrier, White-Tailed Kite, Golden Eagle, Cooper's Hawk, Sharp-shinned Hawk, Short-Eared Owl, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow Nest Sites Before Construction Is Initiated and Avoid Breeding Sites
- Mitigation Measure BIO-2: Remove Salt Marsh Harvest Mouse Habitat and Place Barrier Fencing in the Immediate Vicinity of Operating Equipment.
- Mitigation Measure BIO-3: Avoid Operation of Equipment within 250 feet of the Outboard Tidal Coastal Marsh During the Breeding Period of the California Clapper Rail and California Black Rail
- Mitigation Measure BIO-4: Conduct Surveys to Locate San Pablo Song Sparrow Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction
- Mitigation Measure BIO-5: Conduct Surveys to Locate Burrowing Owl Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction
- Mitigation Measure BIO-7: Develop and Implement a Restoration Monitoring and Adaptive Management Program Designed to Minimize Potential Impacts on Special-Status Species
- Mitigation Measure BIO-9: Monitor Development of Brackish Open Water, Emergent Marsh, and/or Seasonal Wetlands
- Mitigation Measure BIO-10a: Prevent Spread of Perennial Pepperweed and Other Invasive Weeds to Uninfested Areas
- Mitigation Measure BIO-10b: Monitor Restoration Sites and Control for Infestation by Invasive nonnative plants

2.6.1 Special-Status Wildlife Species Protection

- A qualified biologist will provide training to field management and construction personnel on the importance of protecting environmental resources. Communication efforts and training will take place during preconstruction meetings so that construction personnel are aware of their responsibilities and the importance of compliance.
- Construction personnel will be educated on the types of sensitive resources located in the action area and the measures required to avoid impacts on these resources. Materials covered in the training program will include environmental rules and regulations for the specific project and requirements for limiting activities to the construction right-of-way and avoiding demarcated sensitive resource areas. Training seminars will educate construction supervisors and managers on:
    - The need for resource avoidance and protection.

  - Construction drawing format and interpretation.
  - Staking methods to protect resources.
  - The construction process.
  - Roles and responsibilities.
  - Project management structure and contacts.
  - Conservation measures.
  - Emergency procedures.

- If new construction personnel are added to the project, the contractor will ensure the new personnel receive the mandatory training before starting work. A representative will be appointed during the employee education program to be the contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped individual. The representative's name and telephone number will be provided to the USFWS before the initiation of ground disturbance.
- If individuals of listed wildlife species may be present and subject to potential injury or mortality from construction activities, a qualified biologist will conduct preconstruction surveys. If a listed wildlife species is discovered, construction activities will not begin in the immediate vicinity of the individual until USFWS and/or CDFW is contacted and the individual has been allowed to leave the construction area.
- Minimum qualifications for a qualified biologist will be a four-year college degree in biology or related field and two years of professional experience in the application of standard survey, capture, and handling methods for the species of concern. However, in the case of CDFW fully protected species (i.e., salt marsh harvest mouse), no capture or handling will be done.
- Any special-status species observed during surveys will be reported to the USFWS and CDFW so the observations can be added to the CNDDB.

2.6.2 Salt Marsh Harvest Mouse

- Disturbance to wetland vegetation will be avoided to the extent feasible in order to reduce potential impacts on salt marsh harvest mouse. If wetland plants cannot be avoided, it will be removed by hand (and/or by another USFWS and CDFW-approved method). An approved biologist will be on site to monitor all wetland vegetation removal activities.
- Vegetation within salt marsh harvest mouse habitat will be removed to bare ground using hand tools (and/or by another USFWS and CDFW approved method).
- Within salt marsh harvest mouse habitat, vegetation will be removed from all areas prior to ground disturbance (driving roads, action area, or anywhere else that vegetation could be crushed).
- To prevent salt marsh harvest mouse from moving through the project site during construction, temporary exclusion fencing will be placed around a defined work area adjacent to suitable habitat before construction activities start and immediately after vegetation removal. The fence should be made of a material that does not allow salt marsh harvest mouse to pass through or over, and the bottom should be buried to a depth of at

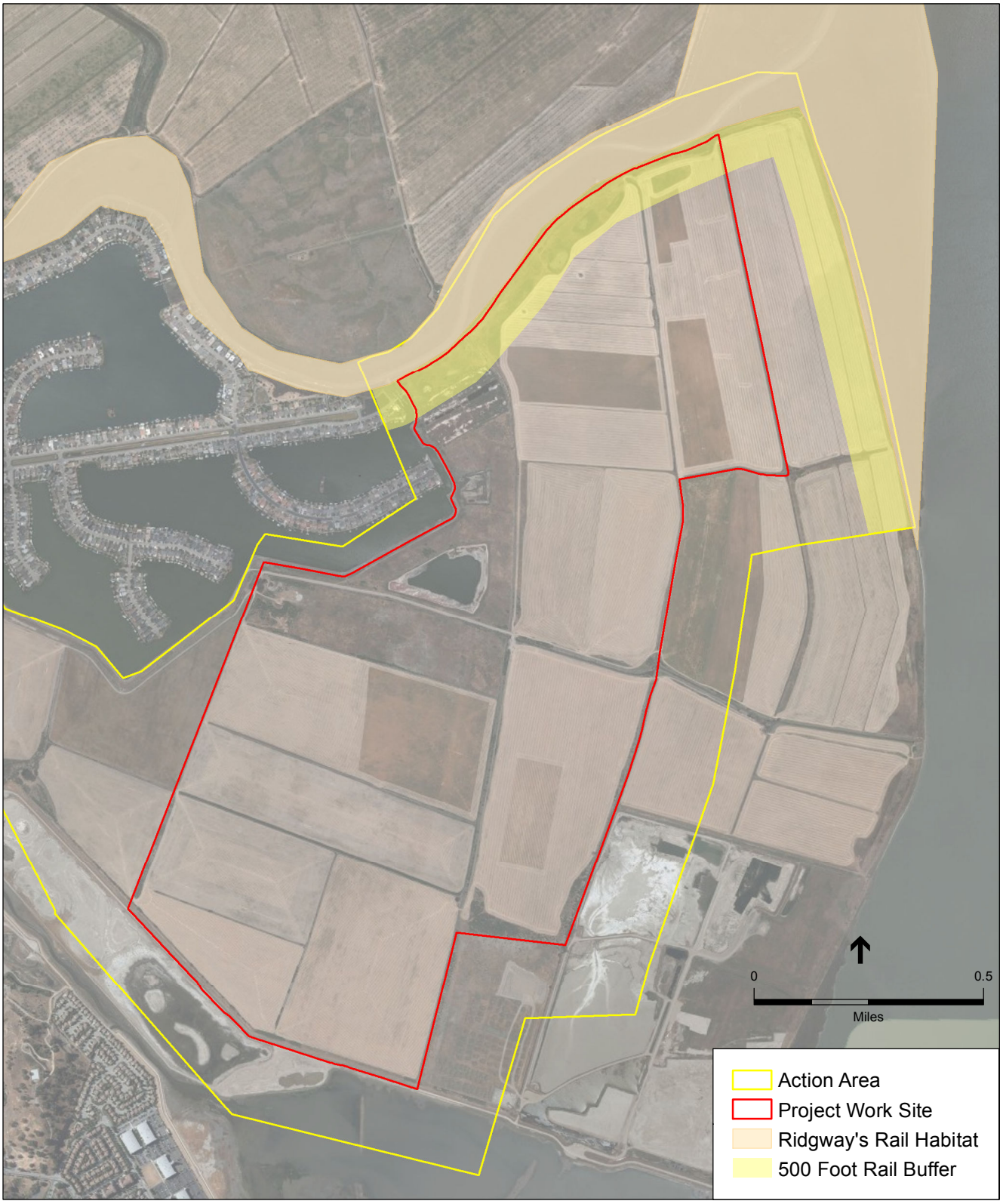
least six inches so that mice cannot crawl under the fence. Any supports for the salt marsh harvest mouse exclusion fencing (e.g., t-posts) will be placed on the inside of the project area.

- Prior to the start of daily construction activities during initial ground disturbance, the qualified biologist will inspect the salt marsh harvest mouse-proof boundary fence to ensure that it has no holes or rips and the base is still buried. The fenced area also will be inspected to ensure that no mice are trapped in it. Any mice found along and outside the fence will be closely monitored until they move away from the construction area.
- If a salt marsh harvest mouse is discovered, construction activities will cease in the immediate vicinity of the individual until USFWS is contacted and the individual has been allowed to leave the construction area.
- All equipment will be staged on existing roadways and away from suitable wetland habitats (i.e., Novato Creek marsh and wetlands adjacent to Bel Marin Keys development) when not in use.
- A qualified biologist will be on site during construction activities occurring in wetlands. The biologist will document compliance with the project permit conditions and avoidance and conservation measures. The qualified biologist has the authority to stop project activities if any of the requirements associated with these measures is not being fulfilled. If the biologist has requested work stoppage because of take of any of the listed species, the USFWS and CDFW will be notified within one day by email or telephone.

2.6.3 Ridgway's (California Clapper) Rail

- To minimize or avoid the loss of individual Ridgway's rails, activities, including vegetation removal, adjacent to tidal marsh areas (within 500 feet or a distance determined in coordination with USFWS) will be avoided during the Ridgway's rail breeding season from February 1 through August 31 (**Figure 2-5**).
- If areas within or adjacent to Ridgway's rail habitat cannot be avoided during the breeding season, protocol-level surveys shall be conducted to determine Ridgway's rail locations. If no rail territories are detected or their territories can be avoided, then project activities may proceed at that location. If nesting Ridgway's rails are determined to be present, activities will not occur within 500 feet, or a distance determined in coordination with USFWS, of an identified calling center, unless the intervening distance across a major slough channel or across a substantial barrier between the rail calling center and any project activity area is greater than 200 feet, then it may proceed at that location within the breeding season. The surveys will focus on potential habitat that may be disturbed by construction activities during the breeding season to ensure that Ridgway's rails are not nesting in these locations. Survey methods will follow the USFWS survey protocol for Ridgway's rail summarized below (USFWS, 2015).
    - For each project site (or marsh), survey stations should be established so that the entire marsh is covered by 100-meter radius circular plots. Listening (passive) and call playback (active) survey stations should be established no more than 200 meters apart along transects in or adjacent to marsh areas. Survey stations should be located on levee crowns or boardwalks to minimize disturbances to marsh areas.

- Surveys should be initiated between January 15 and February 1. For each survey station, four surveys are to be conducted: two (2) passive surveys, followed by two (2) active surveys. Surveys should be spaced at least two (2) weeks apart and should cover the time period from the date of the first survey through the end of March or mid-April. Surveys should proceed until Ridgway's rail(s) are detected. Once a Ridgway's rail is detected, the project site is considered occupied. At this time, all active surveys within the project site shall be terminated. A 10(a)(1)(A) permit is required to conduct active surveys.



SOURCE: CDFW 2016, ESA 2016

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Figure 2-5

Ridgway's Rail Habitat and 500 Foot Buffer

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CHAPTER 3
Listed Species in the Action Area

3.1 Salt Marsh Harvest Mouse

Salt marsh harvest mouse is federally and state-listed as endangered (FR 35:16047; October 13, 1970) and is fully protected under Fish and Game Code. The Recovery Plan for this species, along with four other endangered species, was finalized in August, 2013, in the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Recovery Plan) (USFWS, 2013a). Supplemental information is provided in the USFWS February 2010 five-year review for the salt marsh harvest mouse (USFWS, 2010a). The five-year review recommended the salt marsh harvest mouse remain listed as endangered due to the continuation of threats from habitat loss due to filling, diking, subsidence, changes in water salinity, non-native species invasions, sea level rise associated with global climate change, and contamination. Habitat suitability of many marshes is further limited by small size, fragmentation, and lack of other vital features such as sufficient refugia habitat. The Recovery Plan states that the basic strategy for recovery of the salt marsh harvest mouse is the protection, enhancement, and restoration of extensive, well-distributed habitat suitable for the species.

3.1.1 Overview

This section reviews the status of the salt marsh harvest mouse and information about its biology, ecology, distribution, and current threats, as summarized from the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Recovery Plan) (USFWS, 2013a).

Description and Taxonomy

The salt marsh harvest mouse is a small rodent in the family Muridae, morphologically similar to the more widespread western harvest mouse (*Reithrodontomys megalotis*). There are two subspecies of salt marsh harvest mouse. There are two subspecies: the northern salt marsh harvest mouse (*Reithrodontomys raviventris halicoetes*) lives in the marshes of the San Pablo and Suisun bays, and the southern salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) is found in the marshes of Corte Madera, Richmond, and South San Francisco Bay.

Population Status (Northern Subspecies)

As described in the Recovery Plan (USFWS 2013a, pp130-131), the fringing tidal marshes along northern San Pablo Bay (Petaluma River to Mare Island Strait) support the largest population of the northern subspecies of salt marsh harvest mice in San Pablo Bay. Patchy and unstable, though

sometimes sizable populations of salt marsh harvest mouse occupy tidal marshes of Suisun Marsh. In the diked marshes of Suisun Marsh, especially those that are designated and managed as Mouse Conservation Areas, there are relatively stable populations of fairly high densities.

Life History and Ecology

Salt marsh harvest mice are generally sexually active from May through November for the northern subspecies. The breeding season of the Mare Island population (northern subspecies) extends from August through November. Nests are minimal and constructed of loose grass and vegetative matter that is placed on the ground or over old bird nests (USFWS, 2013a).

Predation related to flooding has been viewed as an important factor. Protection from predators depends on the dense vegetation cover of typical salt marsh harvest mouse habitat. Other than predation of exposed mice during marsh flooding events, predation is presumably greatest in habitats with incomplete or sparse cover, such as diked baylands with patchy vegetation and high proportions of annual grasses.

Habitat

Salt marsh harvest mice are typically associated with tall, dense, continuous stands of pickleweed (*Salicornia pacifica* [= *Salicornia virginica*]) in saline soil. These stands remain mostly unsubmerged during periods of flooding, or are mixed with other unsubmerged sources of cover, such as taller vegetation. However, there is significant variation in vegetation types used by salt marsh harvest mice. Saline to subsaline marsh that lacks pickleweed, or supports it as a minor component, may be used as habitat by significant numbers of salt marsh harvest mice. Though it was originally thought that Pacific cordgrass (*Spartina foliosa*), some bulrush species (*Schoenoplectus* spp.) species, and cattail (*Typha* spp.) vegetation provided only marginal and incidental habitat for the salt marsh harvest mouse, recent studies (2000-2005) in the Grizzly Island and Hill Slough areas within the Suisun Marsh indicate a much greater use of various bulrush species, especially threesquare bulrush (*Schoenoplectus americanus*), than found in other portions of the range.

Salt marsh harvest mice commonly occur in the upper portions of tidal marshes where terrestrial grasses are absent or remote, while western harvest mice tend to be dependent on proximity to terrestrial grass vegetation. However, salt marsh harvest mice frequently utilize terrestrial grassland habitats adjacent to tidal marsh and grass-pickleweed ecotones, and this use is highest in the late spring and early summer. Salt marsh harvest mice in eastern San Pablo Bay and Suisun Marsh (northern subspecies) appear to be widespread in terrestrial grasslands and grassland-brackish marsh ecotones.

Flooding, as a factor in habitat quality for salt marsh harvest mice, is closely related to vegetation and marsh structure. Flooding that submerges vegetation of the middle marsh plain may occur from very high tides near the summer and winter solstices, storm surges, and extreme river outflows into the estuary. Prolonged flooding exposes salt marsh harvest mice to predators, and increases the risk of mortality due to exposure or drowning. Mice move locally from flooded tidal

marsh to emergent high ground or vegetation. Salt marsh harvest mice likely remain in their home ranges during high tide immersion of marsh vegetation, and swim or cling to taller emergent portions of vegetation or floating debris.

The relative importance of landward marsh edges as flood refugia for salt marsh harvest mice probably differs between narrow and deep tidal marshes. Flood refugia at landward marsh edges appear more important in narrow marshes where mice are concentrated during high tide and slightly less important in deeper marshes, given their intramarsh refugia. Even in deep marsh plains, the only available refugia are gumplant (*Grindelia* spp.) vegetation, natural berms and levees, and trapped floating woody debris along marsh edges at creek banks.

Threats

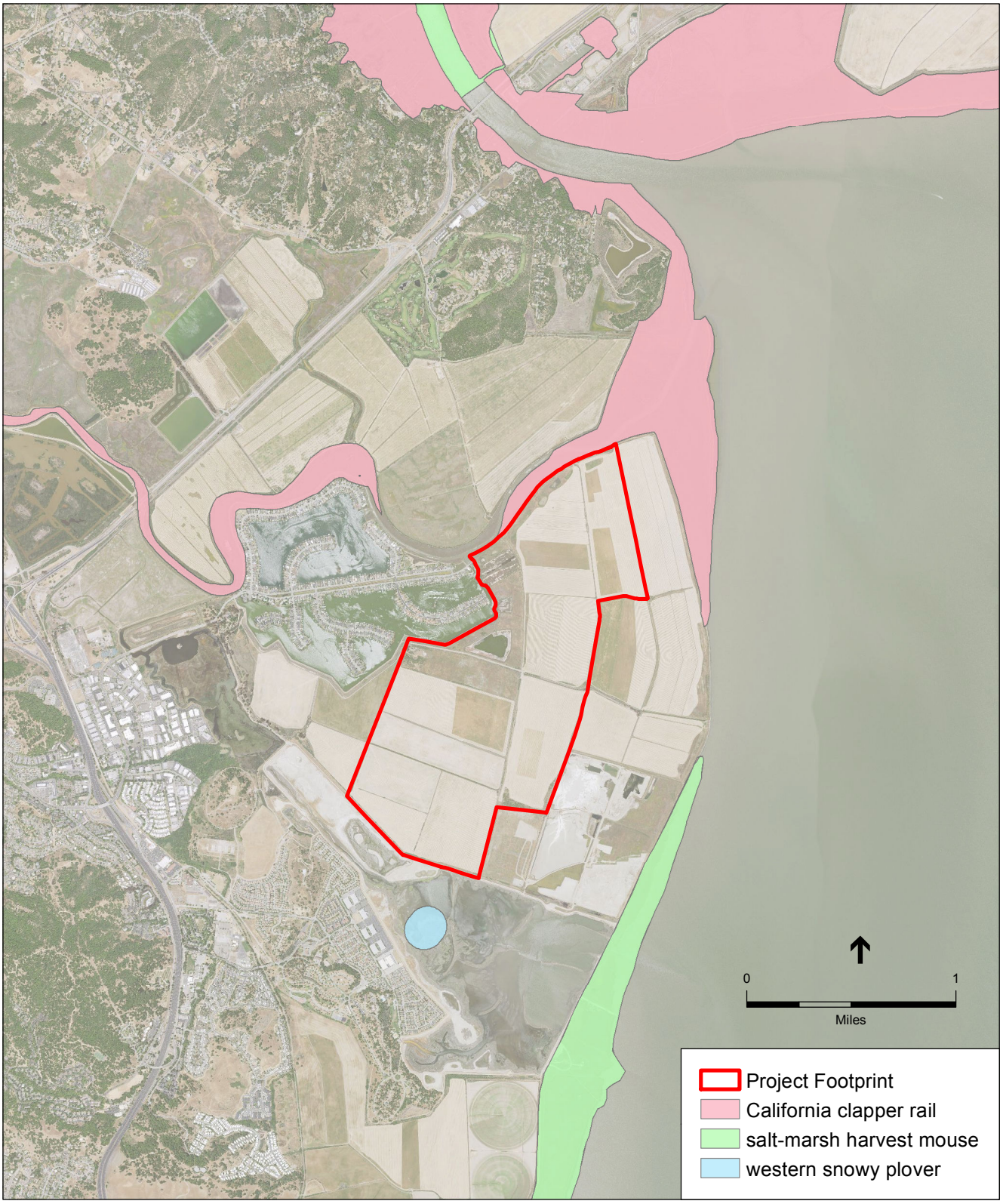
The most fundamental reason for the decline of the salt marsh harvest mouse is loss of habitat through filling (i.e., destruction), subsidence, and vegetation change. The high and middle, or pickleweed zones, of tidal marshes have been the most affected. Extirpated populations may fail to re-establish despite regeneration of suitable habitat conditions, possibly because of constraints on dispersal from source populations. Narrow strip-like marshes are unlikely to be functional corridors between existing larger marshes. Very narrow marshes with no or poor quality upper marsh habitat may disappear with sea level rise and could be barriers to movement.

Flooding of salt marsh harvest mouse habitat in diked baylands is influenced by (1) the degree of subsidence below sea level, (2) the efficiency of tidegate drains and drainage ditches operating at low tide, and (3) the magnitude of flooding. Routine flooding and draining associated with conventional methods of waterfowl marsh management in Suisun Marsh also causes widespread, prolonged submergence of salt marsh harvest mouse habitat. Salt marsh harvest mice may suffer excessive death rates due to predation and drowning.

Specifically within the action area, the proximity of the Bel Marin Keys development and public access increases the presence of domestic animals, most notably cats, which may prey upon salt marsh harvest mice. The installation of power lines and towers through the action area and within Novato Creek marsh habitats to the north provides perching for raptors and increases their potential to prey on native marsh species.

3.1.2 Occurrence in Action Area

Salt marsh harvest mouse is known locally from three occurrences outside of the Action Area. The first occurrence (Occ. # 30) was documented at the mouth of Las Gallinas Creek in San Rafael in 1986 (**Figure 3-1**). More recent occurrences, 2002 and 2005, are demarked at Lower Tubbs Island in the north San Pablo Bay (Occ. #16) and on the west bank of Petaluma River within Petaluma Marsh two miles south of Petaluma (Occ. #18) (CDFW, 2016). Suitable habitat occurs along San Pablo Bay east of the action area and within Novato Creek marsh area north of the action area.



SOURCE: CDFW 2016, ESA 2016

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Figure 3-1

CNDDB Occurrences of Listed Species

Within the levee construction footprint area there are sparse patches of pickleweed where salt water seepage has occurred along the north levee and within some of the straight drainage channels in the agricultural fields. Within the wetland enhancement areas, between Bel Marin Keys development and the New Bayfront Levee, pickleweed is associated with the inundated historic borrow pits and engineered channel along the east. Both these areas have limited habitat value for salt marsh harvest mouse due to sparse and isolated patches of pickleweed, separation from high quality habitats, presence of predators, and ongoing disturbances (i.e., agricultural operations). Still, due to the proximity of quality habitat and nearby occurrences there is potential for individual salt marsh harvest mice to occur within the action area.

3.1.3 Critical Habitat in Action Area

Critical habitat has not been designated or proposed for this species.

3.2 Ridgway's (California Clapper) Rail

Ridgway's rail, formerly known as California clapper rail, was recognized as endangered by the Federal government and added to the List of Endangered Species on October 13, 1970 and added to the California endangered species list on June 27, 1971. The first recovery plan for the species was published November 16, 1984 but an updated recovery plan was finalized in August, 2013 for this species, along with four other endangered species, in the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Recovery Plan) (USFWS, 2013a).

3.2.1 Overview

This section reviews the status of the Ridgway's rail and information about its biology, ecology, distribution, and current threats, as summarized from the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (Recovery Plan) (USFWS, 2013a).

Description and Taxonomy

Ridgway's rail belongs to the order Gruiformes, in the family Rallidae, which includes rails, gallinules, and coots. The genus *Rallus* consists primarily of marsh-dwelling birds with short rounded wings, large feet, and long toes. Ridgway's rail is one of the largest species of genus *Rallus*, measuring 32-47 centimeters (13-19 inches) from bill to tail and has a hen-like appearance, with a long orange bill, a rufous breast, black and white barred flanks, and white undertail feathers (USFWS, 2013a).

Population Status

Ridgway's rails were historically abundant in all tidal and brackish marshes in the San Francisco Bay vicinity, as well as in all of the larger tidal estuaries from Marin to San Luis Obispo counties. The tidal marshes of south San Francisco Bay, including portions of San Mateo, Santa Clara, and Alameda counties, supported the largest populations of Ridgway's rails (USFWS, 2013a).

Life History and Ecology

In general, Ridgway's rails are secretive birds and difficult to observe in dense marsh vegetation; they prefer to run and hide rather than fly from threats. This non-migratory bird maintains home ranges in tidal and brackish marshes of about 11 acres and has high site fidelity. Ridgway's rail is an omnivore, feeding on a variety of marsh crabs, mussels, clams, and amphipods (USFWS, 2013). The breeding season of Ridgway's rails begins by February with nesting starting in mid-March and extending into August. The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs laid during renesting attempts have hatched and young are mobile.

Habitat

Ridgway's rails occur within a range of tidal and brackish marshes. The quality of a marsh strongly influences the density of rail population it can support. Physical habitat characteristics critical to Ridgway's rails include marsh size, location relative to other marshes, existence of functional high tide refugia, presence of buffers or transitional zones between marshes and upland areas, marsh elevation, and hydrology. Currently, there are fewer than 15 such patches in the San Francisco Bay Estuary (USFWS, 2013a).

Threats

Threats facing Ridgway's rail are habitat loss/degradation, predation by native and non-native predators, climate change, and contaminants from efforts to remove non-native *Spartina* in the San Francisco Bay. Conversion of tidal marsh on a large scale began in the late 1800s. In the South Bay, tidal marsh was diked and drained primarily for urban and industrial development. In the North Bay (San Pablo and Suisun included), reclaimed land was used for grazing, agriculture, and duck clubs.

Native predators known to prey on Ridgway's rails and their eggs include; the native gopher, great blue heron, red-tailed hawk, peregrine falcon, northern harrier, barn owl, great horned owl, short-eared owl, common raven, raccoon, and California ground squirrel. Non-native predators that pose a threat to Ridgway's rail are; the Norway rat, red fox, domestic cat, and feral pigs (USFWS, 2013a).

As described under salt marsh harvest mouse above, the presence of housing development nearby and perching structures for raptors increases predation risk to rails within the action area.

3.2.2 Occurrence in the Action Area

Ridgway's rails have been documented along San Pablo Bay near Petaluma River and within Novato Creek marsh habitats (**Figure 3-1**) (CDFW, 2016). Occurrence #65 documents Ridgway's rails at the mouths of Petaluma River and Novato Creek in 2011. In 2004 breeding Ridgway's rails were detected during surveys just south of Novato Creek south to China Camp (Occ. #62). These areas provide high quality habitat with dense stands of pickleweed and a

complex channel network affording ample cover protection. Ridgway's rails are expected to occur within Novato Creek marsh habitats north of the action area.

There are no records of Ridgway's rails within the project disturbance areas. The areas interior of the levees along Novato Creek and San Pablo Bay do not provide suitable habitat for Ridgway's rail. The straight steep-sloped channels and lack of dense continuous cover does not afford this secretive marsh bird protection for escape from predators. Much of the action area is actively farmed for hay production, and the landward side of bayfront levees generally support dense non-native vegetation stands. However, due to proximity of suitable habitat and known occurrences within the Novato Creek area individual Ridgway's rail may temporarily occur in the action area.

3.2.3 Critical Habitat in the Action Area

Critical habitat has not been designated or proposed for this species.

3.3 Western Snowy Plover

The Pacific coast population of the western snowy plover was listed as threatened by USFWS on March 5, 1993 (USFWS, 1993). The recovery plan for this species was published in August 2007 (USFWS, 2007).

3.3.1 Overview

This section reviews the status of western snowy plover and information about its biology, ecology, distribution, and current threats, as summarized from the *Recovery Plan for Pacific Coast Population of Western Snowy Plover* (USWFS, 2007).

Description and Taxonomy

The western snowy plover belongs to the family Charadriidae. This small shorebird is pale gray-brown above and white below, with a white hindneck collar and dark lateral breast patches, forehead bar, and eye patches. The bill and legs are blackish. In breeding plumage, males usually have black markings on the head and breast; in females, usually one or more of these markings are dark brown. There are two subspecies of snowy plover in North America; the western snowy plover and the Cuban snowy plover. The Pacific coast population breeds on the Pacifica coast from southern Washington to Baja California. Breeding data indicates the Pacific population is distinct from western snowy plovers breeding in the interior U.S. (USFWS, 2012).

Population Status

Western snowy plovers concentrate in suitable habitat, with the number of adults at coastal breeding locations ranging from 1 to 315, depending in part, on the size of the area. Western snowy plover populations in California have fluctuated between roughly one thousand and two thousand birds over the past 30 years. In California, there has been a significant decline in

breeding locations, especially in southern California. By the late 1970s, nesting western snowy plovers were absent from 33 of 53 locations with breeding records prior to 1970. Subsequent coast-wide surveys in 1989 and 1991 indicated a further decline in numbers of breeding adult western snowy plovers during the decade after the 1977 to 1980 survey. Western snowy plover populations had declined by about 44 percent in San Francisco Bay.

Life History and Ecology

Nesting western snowy plovers at coastal locations consist of both year-round residents and migrants. Migrants begin arriving at breeding areas in central California as early as January, although the main arrival is from early March to late April. Some individuals nest at multiple locations during the same year so birds may continue arriving through June. In California, pre-nesting bonds and courtship activities are observed as early as mid-February and mated birds from previous breeding seasons frequently reunite. The nesting season extends from early March through late September. Both parents incubate eggs and double brooding is common in coastal California.

Habitat

The Pacific coast population of the western snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries are the main coastal habitats for nesting. Nests typically occur in flat, open areas with sandy or saline substrates with sparse or absent vegetation.

Western snowy plover foraging habitat consists of intertidal zones, dry sand areas above the high tide, salt pans, spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. They sometimes probe for prey in the sand and pick insects from low-growing plants. Opportunities for foraging are directly dependent on salinity levels. Specifically, salt ponds of medium salinity seem to provide the best quality foraging habitat (USFWS, 2012).

Threats

Overall, western snowy plover numbers have declined on the Pacific coast over the past century. The subspecies faces multiple threats throughout its range. The reasons for decline and degree of threats vary by geographic location; however, the primary threat is habitat destruction and degradation. Habitat loss and degradation can be primarily attributed to human disturbance, urban development, introduced beachgrass (*Ammophila* spp.), and expanding predator populations.

3.3.2 Occurrence in the Action Area

Western snowy plover is known from one CNDDB occurrence (Occ. #143) in the project vicinity within the newly restored Hamilton Wetlands (**Figure 3-1**). The record describes the location generally to the western portion of the approximate 150 acre restoration pond (CDFW, 2016). Four adults and a juvenile were detected in early and late July 2013 indicating breeding occurred

at the site. Hamilton wetland restoration included the placement of approximately six million cubic yards of dredged material on the previous airfield to raise the land surface and then opened to tidal influence in April 2014. The bare, soft earth created suitable conditions for western snowy plover breeding to occur and it is expected the habitat will continue to improve and support a breeding population.

The action area does not have any records of western snowy plovers interior of the levees and does not contain suitable breeding or foraging habitat to support this species. The construction footprint areas do not contain sandy or gravel soils for suitable for breeding sites and the lack of tidal influence at the site limits suitable invertebrate prey for snowy plovers. Western snowy plovers are not expected to occur within the action area; however, the project may inadvertently create habitat for this species following site restoration, resulting in a long-term beneficial effect to this species.

3.3.3 Critical Habitat in the Action Area

Critical habitat was designated for this specie son June 19, 2012 along the coasts of California, Oregon, and Washington. There is not critical habitat within the action area. The closest critical habitat polygon for western snowy plover is over 10 miles to the northeast near Napa River (USFWS, 2012).

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CHAPTER 4
Environmental Baseline Conditions

4.1 Land Use

The action area consists of former baylands that were diked for agricultural use in the late 19th century. Recently, the majority of the site has been under cultivation for oat hay. As part of oat hay production drainage ditches between farm fields are pumped into San Pablo Bay in the winter to reduce saturation and ponding in the farm fields. The action area is located within the City-Centered Corridor planning area of Marin County and is designated for agriculture and conservation use. The action area is zoned within the Bayfront Conservation (BFC) Zone. This zone is intended to preserve, protect, and enhance existing species and habitat diversity in the county. PG&E also carry an easement within the action area to maintain five electric transmission towers. An overflow pump occurs from the South Bel Marin Keys Lagoon and the action area also provides some flood relief for the neighboring housing development.

4.2 Vegetation

Vegetation within the action area consists of primarily of cultivated oat, Italian rye grass (*Festuca perennis*), vetch, hairy vetch (*Vicia villosa*), and birdsfoot deervetch (*Lotus corniculatus*) in the agricultural fields. Other less frequently observed upland species include cultivated radish (*Raphanus sativus*), ripgut brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), meadow bindweed (*Convolvulus arvensis*), Shamrock clover (*Trifolium dubium*), cutleaf geranium (*Geranium dissectum*), bur clover (*Medicago polymorpha*), prostrate knotweed (*Polygonum aviculare*), rough cocklebur (*Xanthium strumarium*), yellow star thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*) and bull thistle (*Cirsium vulgare*). Mature coyote brush shrubs (*Baccharis pilularis*) border the upland edge of the study area drainage channels and farm tract edges with few mature eucalyptus (*Eucalyptus* sp.) trees at the study area perimeter.

4.3 Jurisdictional Wetlands and Other Waters of the United States

A wetland delineation survey for waters under USACE jurisdiction under the Clean Water Act (CWA) and Rivers and Harbors Act (RHA) was conducted for the project site (ESA, 2016). The delineation identified 56.51 acres as Waters of the United States (including wetlands) (**Figure 4-1**).

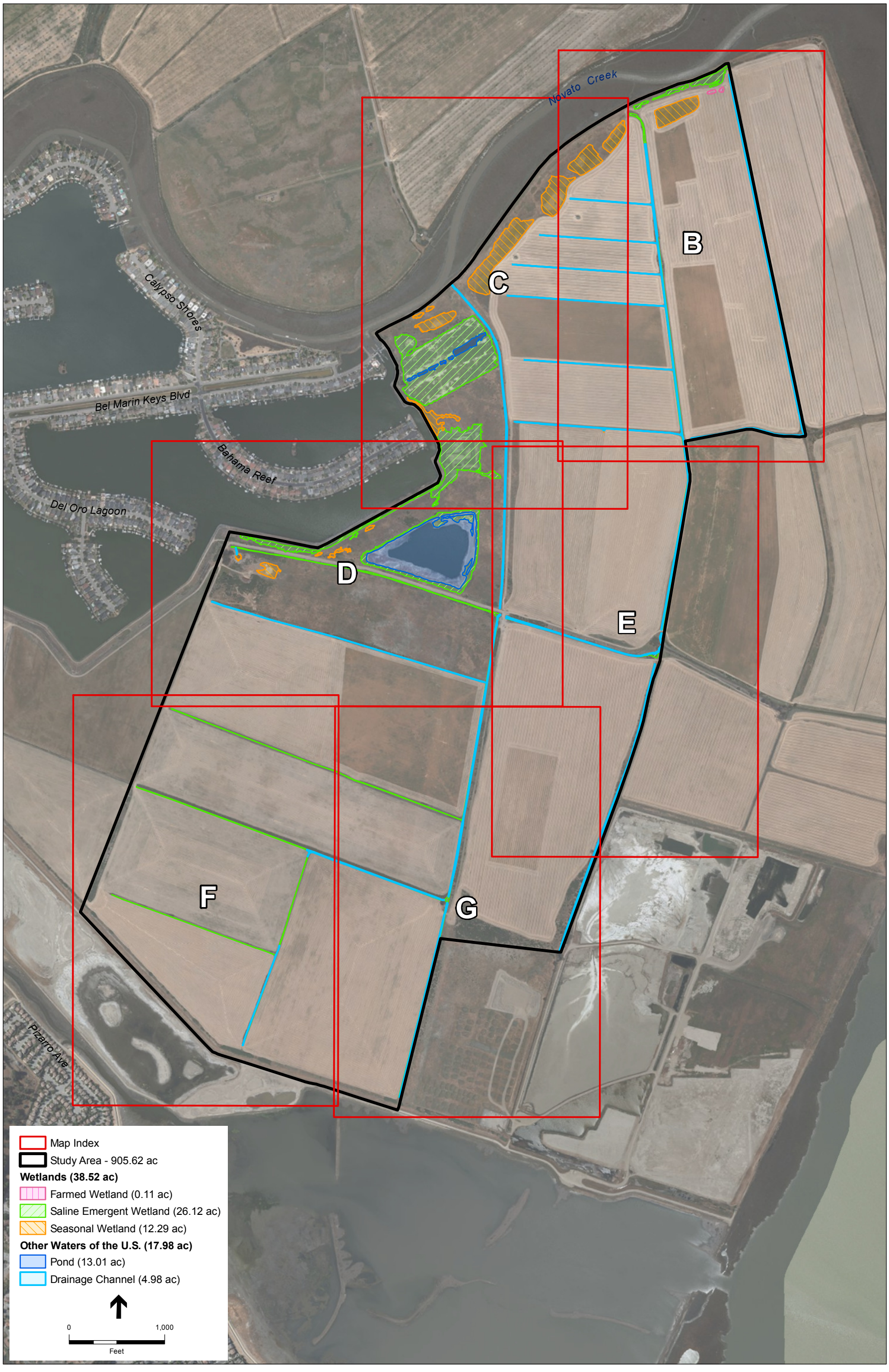
Potentially jurisdictional features include 38.52 acres of wetlands and 17.99 acres of other waters of the U.S. (**Table 4-1**), which are expected to be subject to regulation under Sections 404 and

401 of the CWA, Section 10 of the RHA, and the Porter-Cologne Water Quality Control Act. Potentially jurisdictional features within the action area include saline emergent wetlands, seasonal wetlands, farmed wetlands, ponds, and drainage channels.

Permanent effects would result from the permanent placement of native fill (i.e., excavated and redistributed site soils) across approximately 1.6 acres. Part of the proposed action is creation or expansion of a minimum of 25 acres of seasonal wetland habitats.

TABLE 4-1
POTENTIALLY JURISDICTIONAL WETLANDS AND OTHER WATERS OF THE U.S. AND OF THE STATE IN THE STUDY AREA

Feature Type	Cowardin Classification	Extent	
		Linear feet	Area (acres)
Wetlands			
Saline emergent wetland	Palustrine emergent wetlands (mixosaline, semipermanently flooded)		26.12
Seasonal wetland	Palustrine emergent wetlands (seasonally flooded)		12.29
Farmed wetland	Palustrine emergent wetlands (seasonally flooded)		0.11
	Total Wetlands		38.52
Other Waters of the U.S.			
Pond	Lacustrine- limnetic		13.01
Drainage channel	Riverine (seasonally/semipermanently flooded)	37,732.42	4.98
	Total Other Waters	37,732.42	17.99
	Total Area of Wetland and Other Waters Features:	**37,732.42**	**56.51**



SOURCE: SFEI & Quantum Spatial, 2014; ESA, 2016

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Figure 4-1

Potentially Jurisdictional Waters of the U.S.

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CHAPTER 5
Effects of the Proposed Action

This chapter analyzes the potential direct and indirect effects of the proposed action and interrelated and interdependent actions to those species identified in Chapter 1.

5.1 Direct and Indirect Effects

Direct effects are those effects generated directly from the proposed action. Examples of direct effects to listed species include incidental take during construction, elimination of suitable habitat due to project construction, and degradation of habitats due to construction-related activities (50 CFR 402.02). Indirect effects are those effects that are caused by the proposed action and are later in time. Examples of these types of effects to biological resources include the discharge of effluent or other material that adversely affect water quality and aquatic habitat downstream of the project site (50 CFR 402.02).

5.1.1 Salt Marsh Harvest Mouse

Effects of New Bayfront Levee Construction

Construction activities may result in the harassment, harm, injury, or death of salt marsh harvest mice through habitat degradation, crushing by equipment and vehicles, noise and vibrations, and introduction or spread of invasive noxious weed species. Vegetation removal would be the primary cause of habitat loss or degradation. The proposed action would have temporary effects to low quality patches and fringes of pickleweed habitat within the New Bayfront Levee alignment that may be used by salt marsh harvest mice. Construction activities adjacent to Novato Creek marsh habitats to the north and the seasonal wetlands between the proposed levee alignment and Bel Marin Keys development may temporarily disturb or displace salt marsh harvest mice in these areas of higher quality marsh habitat; the proposed action will not directly affect these areas. Removal of pickleweed vegetation within the levee alignment, borrow pits, and staging areas for levee construction would result in a temporary reduction in potential habitat. Short term effects are the temporary loss of salt marsh harvest mouse habitat as vegetation is removed for construction until reestablishment in the restored and created wetland habitats. Temporary losses of suitable habitat would be compensated for by the creation of wetlands and transitional habitat through the restoration design for the proposed action.

If salt marsh harvest mice stay in the area after vegetation clearing individual mice may be harassed by noise and vibrations resulting in disruption of forging, sheltering, and/or breeding activities. Disturbed salt marsh harvest mice may flush from their territories and be exposed to higher predation, increased competition for resources, or, from March to November, failed reproduction attempts through abandonment of a current litter. During construction activities there is potential for individual salt marsh harvest mice to get crushed by project equipment and vehicles. These effects will be minimized through implementation of project avoidance and minimization measures, such as removal of suitable habitat, worker awareness training, and exclusionary fencing.

Construction activities could result in the introduction or spread of noxious weed species, which could displace native species, thereby changing the diversity of species or number of any species of plants. Weed species, such as perennial pepperweed, establishes poor above-ground cover and provides little cover during high winter tides. Without suitable upland refugia cover, salt marsh harvest mice are vulnerable to predation during high tide events. Spreading rhizomatously and by seed, perennial pepperweed may also displace pickleweed and other native salt marsh vegetation essential to the salt marsh harvest mouse. Several measures and Best Management Practices will be implemented to control the spread of noxious weed species.

Effects of Wetland Creation Activities

Restoration activities include the creation of new seasonal wetlands and transitional upland habitats. Wetland restoration is designed to avoid disturbance to existing wetlands and sensitive habitats minimizing impacts to wetland vegetation and associated wetland species, including the salt marsh harvest mouse. However, connecting created wetlands to existing wetlands may result in the harassment, harm, injury, or death of salt marsh harvest mice through similar effects as described in New Bayfront Levee construction above. Overall the creation of wetlands and upland transitional habitats will provide potential refugia habitat for salt marsh harvest mouse and provide resistance to sea-level rise effects in the future.

Effects of Take

The majority of the action area is low quality salt marsh harvest mouse habitat comprised of agricultural fields with patches and fringes of pickleweed along drainages and in saltwater seepage areas at the base of the outer levee. Overall the proposed action is part of a long-term restoration effort that would support the recovery of salt marsh harvest mouse, but harassment of individual salt marsh harvest mice may occur. The proposed action *may affect, and is likely to adversely affect* salt marsh harvest mouse through temporary disturbance of habitat, displacement of individual salt marsh harvest mouse, and harassment due to construction noise and vibrations. However, restoration of wetlands and transitional habitats would provide long-term recovery of salt marsh harvest mouse through wetland habitat creation. Furthermore, implementation of avoidance and minimizations measures would reduce adverse effects to salt marsh harvest mouse during project construction and implementation and the proposed action is not anticipated to jeopardize the recovery of this species.

5.1.2 Ridgway's (California Clapper) Rail

Effects of New Bayfront Levee Construction

Ridgway's rails inhabit suitable tidal wetlands and tidal sloughs in the action area. Rails require an intricate network of sloughs to provide abundant invertebrate populations and escape routes from predators, particularly for vulnerable flightless young (USFWS, 2013). Within the action area only the marshes associated with Novato Creek provide suitable nesting and foraging habitat for Ridgway's rail and these marshes are outside the New Bayfront Levee construction footprint. The interior channels within the action area are straight and narrow with steep banks and limited vegetation cover. These channels do not provide a network of escape sloughs and the surrounding agricultural fields do not provide suitable cover for flushing Ridgway's rail. Similarly the wetlands between the New Bayfront Levee and Bel Marin Keys development are not connected to the marsh habitat of Novato Creek and do not contain a network of sloughs or channels required for this secretive rail.

Construction activities adjacent to suitable marsh habitat of Novato Creek may result in the harassment, harm, injury, or death of Ridgway's rails through crushing by equipment and machinery, loss of breeding activity, nest abandonment, or increased risk of predation or competition. Activities that involve the movement of large equipment, and/or soil, could inadvertently crush and kill individual Rideway's rails, nests, or young. However, it is unlikely that individual adult Ridgway's rails, nests, or young will be directly lost due to the proposed project. Nests, eggs, and young are unlikely to be present in areas where activities will occur and adult Ridgway's rail would easily escape equipment if they occurred within the construction footprint. Individual Ridgway's rails may be harassed by noise and vibrations associated with levee creation, and other construction activities adjacent to salt marsh habitat resulting in the disruption of feeding, sheltering, or breeding activities. Ridgway's rails that are harassed may be flushed from protective cover or their territories exposing the rails to predators. The level of harassment would be increased in severity if construction activities occurred during the rail's breeding season (February 1 to August 31) resulting in the loss of breeding activity or if the work occurred during an extreme high tide when the Ridgway's rails are most likely to escape the adjacent flooded marsh plain to seek upland refugia cover along the levee.

Breeding would not be disturbed during construction, and impacts on breeding habitat would be minimal with implementation of the conservation measures. Construction activities, including vegetation clearing, would be limited to months outside the breeding season within 500 feet, or a distance determined in coordination with USFWS, from tidal marsh habitat adjacent to Novato Creek. If it is necessary for construction activities to occur during the breeding season, then protocol-level surveys of suitable nesting habitat adjacent to construction areas would be performed to identify the general location of Ridgway's rail nest sites in the action area. If Ridgway's rail nesting sites are identified then no construction activities will occur within 500 feet of these locations or within 200 feet with a substantial barrier separation, or a distance determined in coordination with USFWS, from disturbance activities during the nesting season.

Effects of Wetland Creation Activities

Breeding Ridgway's rails are not expected to occur within the wetland creation areas due to lack of suitable breeding habitat. It is unlikely that individual adult Ridgway's rails, nests, or young will be directly lost due to wetland restoration activities. Additionally, wetland restoration is designed to reduce impacts to wetlands and wetland vegetation further reducing the potential to affect individual rails that may incidentally occur in the work areas. Similar to levee construction activities, restoration activities adjacent to (within 500 feet or a distance determined in coordination with USFWS) Novato Creek may result in the harassment, harm, injury, or death of Ridgway's rails through construction disturbance, but these impacts would be reduced through implementation of conservation measures.

Effects of Take

The proposed action *may affect, and is likely to adversely affect* Ridgway's rail although loss of Ridgway's rail is unlikely. Temporary disturbance to individual Ridgway's rails could occur in suitable salt marsh habitats near Novato Creek. The proposed action would not jeopardize the continued existence of this species and over the long-term, in conjunction with future restoration, the project will benefit the recovery of this endangered marsh bird.

5.1.3 Western Snowy Plover

Effects of Construction Activities

Construction activities could disturb foraging or roosting western snowy plovers within or near the action area as a result of noise, visual disturbance, and vibrations. The agricultural fields in the action area provide potential foraging habitat and plovers in the area may occasionally use the action area for roosting. There is ample foraging and roosting habitat in the region and the proposed action would not substantially degrade plover foraging or roosting habitats. The action area does not support breeding habitat for western snowy plovers. This highly mobile bird can easily move away from construction disturbance to adjacent foraging or roosting habitat without detriment to its survival.

Effects of Wetland Creation Activities

Similar to construction activities, disturbance from wetland creation and enhancement activities could temporarily disturb western snowy plovers foraging or roosting in the action area, but disturbance would be minimal and not jeopardize the survivorship of this mobile species. Disturbances as a result of the proposed action would be temporary in nature and creation of wetland habitats could provide future breeding habitat as evident from the adjacent restored Hamilton wetlands.

Effects of Take

The action area does not contain any sandy soils or salt ponds that provide breeding habitat for western snowy plovers and therefore would not affect nesting western snowy plovers. As described above, construction activities can disturb individual foraging or roosting plovers, but due to the mobility of this species and the availability of foraging and roosting in the area project-related activities are unlikely to sustainably disturb or result in the jeopardy of this species. There is an unlikely potential for the harm or death of western snowy plovers if an individual bird collides or is run over by project equipment or vehicles. Due to the mobility of this species, the lack of breeding habitat, and the conservation measures in place, harm and mortality of western snowy plovers is not anticipated. The project *may affect but is not likely to adversely affect* western snowy plovers.

5.2 Effects of Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no significant independent utility apart from the action that is under consideration (50 CFR 402.02). Interrelated and interdependent actions are activities that would not occur "but for" the proposed action (50 CFR 402.02). There are no interrelated or interdependent actions associated with the proposed action.

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CHAPTER 6
Cumulative Effects and Determination

6.1 Cumulative Effects

Cumulative effects include those of future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration (50 CFR 402.02). The ESA requires USFWS to evaluate the cumulative effects of the Proposed Action on listed species and designated critical habitat, and to consider cumulative effects in formulating biological opinions (USFWS, 1998). The ESA defines cumulative effects as "those effects of future State or private actions, not involving Federal activities that are reasonably certain to occur within the "action area" of the proposed action subject to consultation (USFWS, 1998).

As described in Section 2.1 above, the purpose of the proposed action (or project) is to construct a New Bayfront Levee to allow for later reestablishment of tidal wetlands in tidal waters where those wetlands previously existed; enhancement and creation of a minimum of 25 acres of seasonal wetlands; and protection of existing inland development and habitats from increased risk of inundation due to climate change and sea level rise. Future phases will include placement of dredged material for creation of tidal and seasonal wetlands, and breaching of the existing bayfront levee to reintroduce tidal waters to the site.

The proposed action would cut and fill (and redistribute) approximately 1.8 million cubic yards of native soil across approximately 650 acres. The proposed action would commence in the summer of 2017, and is expected to take two construction seasons to complete. The proposed action is part of a long-term restoration effort to restore 906 acres of current agricultural lands to tidal marsh.

6.2 Determination

6.2.1 Definitions of Determinations

The USFWS has defined the different determination statements that can be reached through consultation under the Federal Endangered Species Act. To assess the magnitude of the potential effect, the anticipated change that could occur is compared against the evaluation criteria to ascertain whether the proposed action would result in a determination of "*no effect*," "*may affect, but is not likely to adversely affect*," or "*may affect, and is likely to adversely affect.*" In most instances, where a potential adverse effect may occur, conservation measures are available to

reduce the magnitude of the effect. The determination statements for potential effects are defined below (USFWS and NMFS, 1998).

> **"*No effect*"** is the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat.
>
> "***May affect, but is not likely to adversely affect***" is the appropriate conclusion when effects on listed species or critical habitat are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.
>
> **"*May affect, and is likely to adversely affect*"** is the appropriate conclusion if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made.

6.2.2 Determination of Effects on Listed Species

Salt Marsh Harvest Mouse

As discussed in Section 5.1.1, the proposed action *may affect, and is likely to adversely affect* salt marsh harvest mouse through habitat degradation, displacement, and temporary harassment due to construction activities. However, vegetation removal and construction-related effects to salt marsh harvest mice and their habitat would be minimized through implementation of Avoidance and Minimization Measures. In the long-term the proposed action is part of a multi-phased effort to restore approximately 906 acres of the BMKV property to tidal marsh with transitional upland habitat that would result in a net increase in year-round salt marsh harvest mouse habitat and provide refugia for during high water events and sea-rise effects. Overall effects of the proposed action would contribute to the recovery of salt marsh harvest mouse within San Pablo Bay marshes.

Ridgway's (California Clapper) Rail

As discussed in Section 5.1.2, the proposed action *may affect and is likely to adversely affect* Ridgway's rail. Levee construction and restoration activities adjacent to the occupied marsh habitats associate with Novato Creek may harass or displace Ridgway's rail. However, project-related effects to Ridgway's rail would be minimized through implementation of Avoidance and Minimization Measures. In the long-term the second phase of the proposed project would restore approximately 906 acres of tidal salt marsh habitat that would contribute to the recovery of Ridgway's rail.

Western Snowy Plover

As discussed in Section 5.1.3, the proposed action *may affect, but is not likely to adversely affect* western snowy plovers. The action area lacks suitable nesting habitat for this species and the proposed action will not harass, harm, or kill breeding plovers or their eggs or young. Construction activities, restoration activities, and adaptive management actions may cause a temporary disturbance to foraging plovers within the action area. However, disturbances would be considered minimal since plovers can readily leave the area for a plethora of nearby roosting and foraging habitat. Harm or mortality of western snowy plovers is not expected.

6.3 Conclusion

In conclusion, after reviewing the current status of species, the environmental baseline for the action area, and the effects of the proposed action, the Phase 1 Bel Marin Keys Restoration Project *may affect but is not likely to adversely affect* western snowy plovers; and *may affect, and is likely to adversely affect* salt marsh harvest mouse, and Ridgway's rail. However, the proposed action, with avoidance and minimization measures would substantially avoid and/or minimize adverse effects and would not jeopardize the continued existence or preclude recovery of these species. Restoration activities, as a component of the proposed action, would result in increased of wetland habitat that will support the recovery of special-status species and would benefit the larger San Pablo Bay ecosystem.

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CHAPTER 7
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APPENDIX A
California Black Rail Analysis

Introduction

The California black rail is not a federally listed species and is not addressed within the USFWS Biological Assessment. However, the California black rail is a California threatened and fully protected species and is addressed in this Appendix for consideration by CDFW. The following describes the biology, status, habitat, threats, and potential to occur of California black rails. Project effects, conservation measures, and determination for this species are also presented for consideration.

Project effects on this species would be similar as for the Ridgway's rail. Construction activities within 500 feet of Novato Creek associated tidal marsh habitats could temporarily disrupt California black rails inhabiting these areas and could result in the take of this species. However, with implementation of conservation measures proposed for Ridgway's rail and the **Conservation Measure** below, potential take is not likely to occur or jeopardize the recovery of this species. Restoration of wetlands proposed as part of the associated longer-term restoration efforts will potentially provide breeding and foraging habitat for California black rail and aid in the survivorship of this marsh bird.

Overview

California black rail (*Laterallus jamaicensis coturniculus*) is state-listed as threatened and is also a fully protected species under Fish and Game Code Section 3511. There is no federal listing for this species, and critical habitat has not been designated. California black rails are small birds, approximately the size of a sparrow, and are year-round residents of tidal marshes in San Pablo Bay California black rails occur along tidal sloughs, brackish marsh, and tidal wetlands and typically occur in marshes dominated by pickleweed or low growing forms of bulrush. California black rails are associated with habitat features representative of mature, well-developed marshes. California black rails most often are found in larger marshes and close to other large marshes. California black rails require high marshes with moist soil and shallow water. Other factors that affect California black rail use of tidal wetlands are inundation regime and marsh geomorphology, stable water levels that seldom flood, dense stands of low growing vegetation, and access to high-ground refugia. Diked marshes do not appear to provide suitable breeding habitat, possibly because they have lower food resource levels than tidal wetlands. California black rail nests are located in the high marsh zone and occasionally the upper limits of the middle marsh zone above

the limits of tidal inundation. Nests are constructed of loosely placed vegetation concealed in dense marsh vegetation. California black rails feed primarily on invertebrates.

Information of the historical range of the California black rail is scarce. Limited numbers are known to have bred along the coast from Tomales Bay to northern Baja California in Mexico. The bird also bred inland at freshwaters marshes including Sacramento-San Joaquin River Delta. Today California black rails are found in San Francisco Bay, in Bodega Bay in Sonoma County, in Tomales Bay and Bolinas Lagoon in Marin County, and in Morro Bay in San Luis Obispo County. The California black rail no longer breeds in coastal southern California. Population numbers have continued to decline since the 1970's due mostly to habitat conversion. More than 80 percent of California black rails are estimated to be concentrated in the marshes of San Francisco Bay.

A major cause of decline and principal barrier to recovery for black rails and other ground nesting marsh birds is the loss and degradation of wetland habitat in northern and southern California. This includes coastal and estuarine salt marshes, inland freshwater marshes, and Colorado River marshlands. Critical concern is the loss of high marsh habitat that provides refuge areas from high tides. Lack of refuge areas have left rails exposed to predation by domestic, introduced, and native predators.

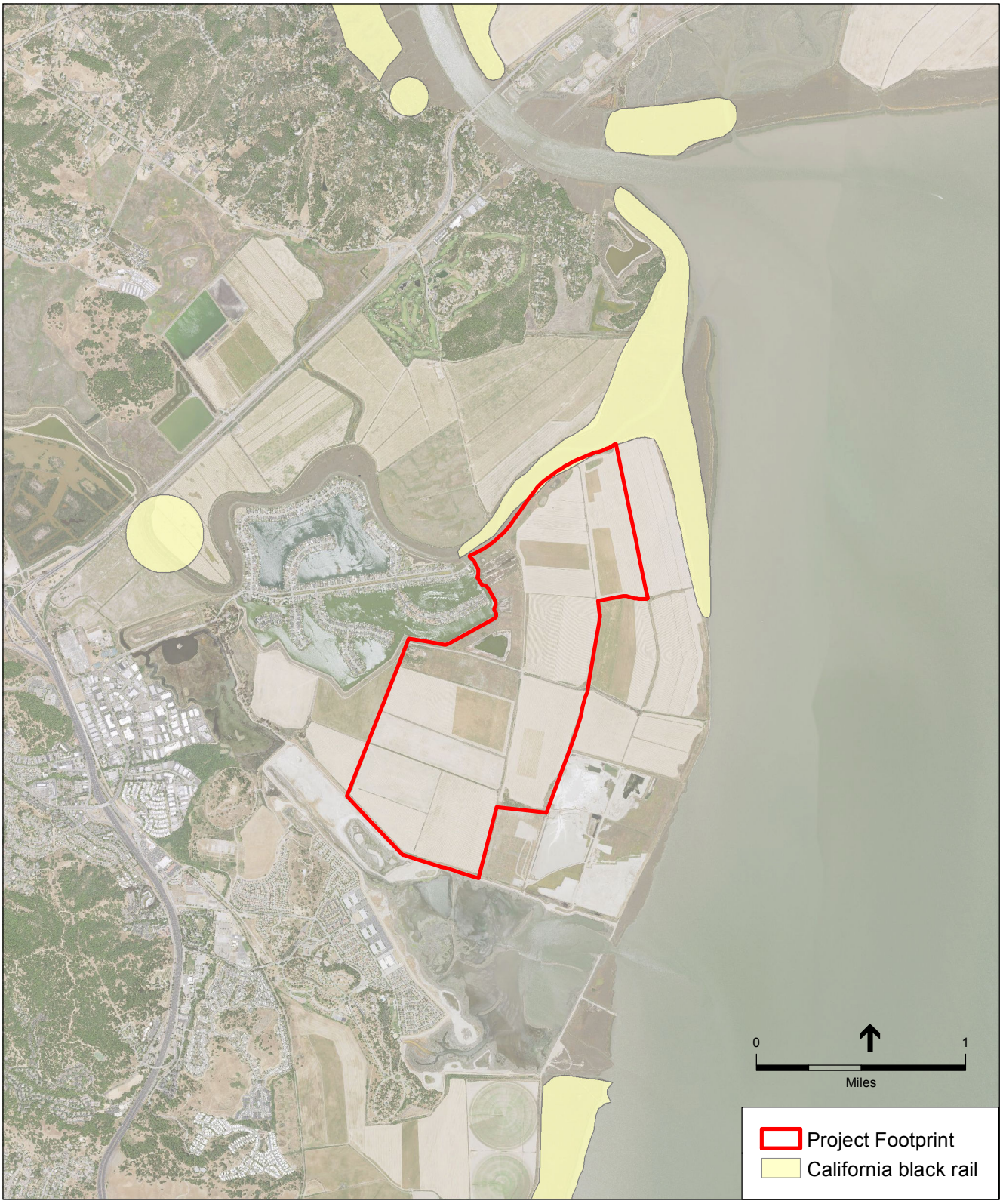
Occurrence in the Action Area

There are seven documented CNDDB occurrences of California black rail in the project area vicinity (CDFW, 2016) (Figure A-1). The vegetation communities associated with these occurrences are tidal brackish marsh dominated by pickleweed, bulrush, and other halophytes. The nearest occurrence (Occ #79) is from 2001 within the tidal marsh habitat immediately to the north of the project area. The next nearest occurrence (Occ. #105) is located over 1.5 miles to the west separated from the project area by the Bel Marin Keys residential development (CDFW, 2016).

Conservation Measure

California Black Rail

- To minimize or avoid the loss of individual California black rails, activities, including vegetation removal, adjacent to tidal marsh areas (within 500 feet or a distance determined in coordination with CDFW) will be avoided during the California black rail breeding season from February 1 through August 31 (**Figure 2-4 in Biological Assessment**).
- If areas within or adjacent to California black rail habitat cannot be avoided during the breeding season, protocol-level surveys shall be conducted to determine black rail locations. If no rail territories are detected or their territories can be avoided, then project activities may proceed at that location. If nesting California black rails are determined to be present, activities will not occur within 500 feet, or a distance determined in coordination with CDFW, of an identified calling center, unless the intervening distance across a major slough channel or across a substantial barrier between the rail calling center and any project activity area is greater than 200 feet, then it may proceed at that location within the breeding season. The surveys will focus on potential habitat that



SOURCE: CDFW 2016, ESA 2016

Bel Marin Keys Wetland Restoration Project - Phase 1 . 150011.00

Figure A-1

CNDDB Occurrences of California Black Rail

may be disturbed by construction activities during the breeding season to ensure that black rails are not nesting in these locations. Survey methods are adapted from Point Reyes Bird Observatory Black Rail Survey Protocol and USFWS Ridgway's rail survey methods summarized below (PRBO, 2016; USFWS, 2015).

- For each project site (or marsh), survey stations should be established so that the entire marsh is covered by 100-meter radius circular plots. Listening (passive) and call playback (active) survey stations should be established no more than 200 meters apart along transects in or adjacent to marsh areas. Survey stations should be located on levee crowns or boardwalks to minimize disturbances to marsh areas.
- Surveys should be initiated between March 15 and May 31. For each survey station, four surveys will be conducted with at least 10 days between surveys: (2) passive surveys, followed by two (2) active surveys. Passive surveys involve listening at survey stations for five minutes. Active surveys will passively listen for one minute then broadcast recorded black rail vocalizations: one minute of "grr" calls followed by 0.5 minute of "ki-ki-krr" calls then listening for additional 3.5 minutes for response. Surveys should proceed until California black rail(s) are detected. Once a black rail is detected, the location and direction will be documented and the project site is considered occupied. At this time, all active surveys within the project site shall be terminated. A 10(a)(1)(A) permit is required to conduct active surveys.

Effects of the Proposed Action

Similar to effects on Ridgway's rail, the proposed action is not anticipated to result in the harm or mortality of California black rails, but may temporarily disrupt individual California black rails in suitable marsh habitat of Novato Creek.

Effects of Bayfront Levee Construction

California black rails inhabit tidal wetland and marshes similar to Ridgway's rail but can also extend into freshwater marshes. Within the action area only the marshes associated with Novato Creek provide suitable nesting and foraging habitat for rails and these marshes are outside the proposed Bayfront levee construction footprint. Similarly the wetlands between the proposed Bayfront levee and Bel Marin Keys development are not connected to the marsh habitat of Novato Creek and do not contain sufficient vegetative cover or complexity in marsh structure to be suitable for California black rails.

Construction activities adjacent to suitable marsh habitat of Novato Creek may result in the harassment, harm, injury, or death of California black rails through crushing by equipment and machinery, loss of breeding activity, nest abandonment, or increased risk of predation or competition. During extreme high tides black rails may inadvertently seek refuge on the high levees and occasional move into the inland areas. However, the levees support non-native vegetation with sparse coverage providing little protection from predators and therefore, reducing the potential black rails would venture up and over the northern levee. It is unlikely that individual adult rails, nests, or young will be directly lost due to the proposed project because of a

lack of suitable breeding habitat within the active construction areas and implementation of conservation measures.

Breeding would not be disturbed during construction, and impacts on breeding habitat would be minimal with implementation of the conservation measures. Construction activities, including vegetation clearing, would be limited to months outside the breeding season within 500 feet, or a distance determined in coordination with CDFW, from tidal marsh habitat adjacent to Novato Creek. If it is necessary for construction activites to occur during the breeding seasion, then focused surveys of suitable nesting habitat adjacent to construction areas would be performed to identify the general location of California black rail nest sites in the action area. If black rail nesting sites are identified then no construction activities will occur within 500 feet of these locations or within 200 feet with a substantial barrier separation, or a distance determined in coordination with CDFW, from disturbance activities during the nesting season.

Effects of Wetland Creation Activities

Similar to Ridgway's rail, California black rails are not expected to occur within the wetland creation areas due to lack of suitable breeding habitat. Wetland creation and restoration is designed to reduce impacts to wetlands and wetland vegetation further reducing the potential to affect individual rails that may incidentally occur in the work areas. Similar to levee construction activities, restoration activities adjacent to (within 500 feet or a distance determined in coordination with CDFW) Novato Creek may result in the harassment, harm, injury, or death of marsh rails through construction disturbance, but these impacts would be reduce through implementation of conservation measures.

Effects of Take

The proposed action may affect California black rail although loss of California black rail is unlikely. Temporary disturbance to individual California black rails could occur in suitable salt marsh habitats near Novato Creek. The proposed action would not jeopardize the continued existence of this species and over the long-term, in conjunction with future tidal wetland restoration in the second phase of the project, the project will benefit the recovery of this threatened marsh bird. Because breeding season impacts will be avoided, either seasonally or identifying nest locations through surveys, and disturbance are minimal and temporary in nature, this impact is considered less than significant.

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APPENDIX C
BMKV Supplemental EIR/EIS Applicable Mitigation Measures

C.1 Applicable BMKV Supplemental EIR/EIS Mitigation Measures

Note the text below is exactly as appears in the SEIR/EIS, except where agency or species names have changed since the SEIR/EIS was published (e.g., California Department of Fish and Wildlife and Ridgway's rail). Only mitigation measures applicable to the BMKV Phase 1 Project are shown below.

- **Mitigation Measure A-1: Control PM10 Emissions in Accordance with BAAQMD Standards**

  The following controls should be implemented at all construction sites.

  - Water all active construction areas at least twice daily.
  - Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard.
  - Pave, apply water 3 times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
  - Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
  - Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

  Enhanced Control Measures – the following measures should be implemented at construction sites greater than 4 acres in area.

  - Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
  - Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
  - Limit traffic speeds on unpaved roads to 15 mph.
  - Install sandbags or other erosion control measures to prevent silt runoff to public roadways.

- Replant vegetation in disturbed areas as quickly as possible.

Optional Control Measures – the following control measures will be considered for use at construction sites that are large in area, located near sensitive receptors, or which may warrant additional emissions reductions for any other reason.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

- **Mitigation Measure BIO-1: Conduct Surveys to Locate Northern Harrier, White-Tailed Kite, Golden Eagle, Cooper's Hawk, Sharp-shinned Hawk, Short-Eared Owl, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow Nest Sites Before Construction Is Initiated and Avoid Breeding Sites**

  The Conservancy, Corps, or successors in interest will conduct surveys to locate nest sites of the above-mentioned species in suitable breeding habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by CDFW. Survey results will be submitted to CDFW before construction is initiated. If nests or young of these species are not located, construction may proceed. If nest sites or young are located, the Conservancy, Corps, or successors in interest will consult with CDFW to determine what mitigation measures could be implemented to avoid or reduce potential disturbance-related impacts on these species (e.g., establishing buffers around active nest sites or sequencing construction activities to avoid activities near nesting habitats during the breeding season).

- **Mitigation Measure BIO-2: Remove Salt Marsh Harvest Mouse Habitat and Place Barrier Fencing in the Immediate Vicinity of Operating Equipment.**

  The potential for construction-related mortality of salt marsh harvest mice could be reduced or eliminated by hand-removal of pickleweed habitat (pickleweed in tidal marshes is habitat for salt marsh harvest mice) and subsequent placement of a barrier fence 20 feet from the boundaries of construction areas in and adjacent to coastal salt marsh habitat. As the salt marsh harvest mouse is a fully protected and listed state species and a listed federal species, the Conservancy, Corps, or successors in interest will consult with USFS and CDFW to evaluate these and any other appropriate methods for avoiding construction-related mortality of salt marsh harvest mice.

- **Mitigation Measure BIO-3: Avoid Operation of Equipment within 250 feet of the Outboard Tidal Coastal Marsh During the Breeding Period of the California Clapper Rail and California Black Rail**

  The Conservancy, Corps, or successors in interest will avoid operating construction equipment in the outboard tidal marsh from February 1 to July 31. A 250-foot buffer has been previously recommended in the LTMS Biological Opinion for activities that have

occurred as a result of restoration activities under the HWRP. This buffer is also recommended for the BMKV expansion. If construction equipment must operate in the marsh during this period, surveys will be conducted by a qualified biologist using survey methods approved by USFWS and CDFW before construction is initiated to locate Ridgway's rail and black rails. If rails are located, the Conservancy, Corps, or successors in interest will consult with USFWS and CDFW to determine what, if any, additional mitigation measures may be required to allow construction to proceed.

- **Mitigation Measure BIO-4: Conduct Surveys to Locate San Pablo Song Sparrow Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction**

  The Conservancy, Corps, or successors in interest will conduct surveys to locate San Pablo song sparrow breeding territories in suitable marsh habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by CDFW. Survey results will be submitted to CDFW before construction is initiated. If active breeding territories are not located, construction may proceed. If breeding territories are located, the Conservancy, Corps, or successors in interest will consult with CDFW to determine what mitigation measures could be implemented to avoid or reduce potential mortality of this species (e.g., establishing buffers around active nest sites or breeding territories, or sequencing construction activities to avoid potential impacts on the species during the breeding season).

- **Mitigation Measure BIO-5: Conduct Surveys to Locate Burrowing Owl Nest Sites before Construction Is Initiated and Avoid Breeding Sites during Construction**

  The Conservancy, Corps, or successors in interest will conduct surveys to locate burrowing owl nest sites in suitable grassland habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by CDFW. Survey results will be submitted to CDFW before construction is initiated. If active nests are not located, construction may proceed, but the Conservancy, Corps, or successors in interest will consult with CDFW to determine what mitigation measures could be implemented to reduce potential mortality of this species (e.g., establishing buffers around active nest sites or sequencing construction activities to avoid potential impacts on the species during the breeding season).

- **Mitigation Measure BIO-7: Develop and Implement a Restoration Monitoring and Adaptive Management Program Designed to Minimize Potential Impacts on Special-Status Species**

  The Conservancy, Corps, or successors in interest will develop a restoration monitoring and adaptive management program, in coordination with USFWS, NMFS< and CDFW, within 1 year after the completion of construction. Important elements of the program will be scheduling intrusive activities to avoid periods when special-status species are sensitive to disturbance and implementing management practices that have minimal effects on special-status species, to the greatest extent feasible.

- **Mitigation Measure BIO-9: Monitor Development of Brackish Open Water, Emergent Marsh, and/or Seasonal Wetlands.**

  The Corps, in conjunction with the Conservancy, or its successors in interest, will develop and implement a 5-year monitoring program to measure the establishment rate, quantity, and quality of brackish open water, emergent marsh, and/or seasonal wetlands.

- Major elements of the monitoring program will include the following:
- Measure areal extent and locations of established or colonizing marsh vegetation.
- Measure composition and density of established and colonizing plant species.
- Analyze monitoring data to identify possible reasons for differences between observed and predicted conditions.
- Recommend remedial actions that can be implemented if the restoration is not proceeding as designed.

Monitoring reports will be submitted by the Corps, Conservancy, or its successors in interest, to CDFW, USFWS, NMFS, and BCDC for each year in which monitoring of the development of seasonal wetland and emergent marsh is conducted. If the rate, quality, and quantity of created habitat are not meeting restoration goals at the end of the 5-year period, the sponsoring agencies will consult with CDFW, USFWS, NMFS, and technical experts regarding further monitoring and potential corrective actions.

- **Mitigation Measure BIO-10a: Prevent Spread of Perennial Pepperweed and Other Invasive Weeds to Uninfested Areas**

  A qualified botanist will conduct a non-native plant assessment of areas subject to construction activities and will recommend specific measures to control spread of non-native species. Measures may include the establishment of wash stations for construction vehicles and equipment to clean tires of weed seeds and other propagules before they are moved offsite, and the development of an herbicide spray program to destroy perennial perpperweed or other invasive weed infestations prior to construction.

- **Mitigation Measure BIO-10b: Monitor Restoration Sites and Control for Infestation by Invasive nonnative plants**

  After being planted, restoration areas will be monitored for infestation of non-native cordgrasses, perennial pepperweed, stinkword, and other potentially invasive species. All infestations occurring within wetland habitats will be controlled and removed to the extent feasible without jeopardizing the establishment of surrounding native vegetation. A long-term monitoring plan will be developed, subject to review and approval by USFWS and CDFW, that will remain in effect until marsh habitat is established.

- **Mitigation Measure CR-1: Stop Work if Buried Cultural Deposits Are Encountered during Construction Activities**

  If buried cultural resources, such as chipped stone or groundstone, historic debris, building foundations, or human bone, are inadvertently discovered during ground-disturbing activities, work will stop in that area and within a 100-foot radius of the find until a qualified archaeologist can assess the significance of the find.

- **Mitigation Measure CR-2: Stop Work if Human Remains are Encountered during Construction Activities**

  If human skeletal remains are encountered, the county coroner will be contacted immediately. If the county coroner determines that the remains are Native American, the coroner will then be required to contact the Native American Heritage Commission

(NAHC) (pursuant to Section 7050.5 (c) of the California Health and Safety Code) and the County Coordinator of Indian Affairs. A qualified archaeologist will also be contacted immediately.

If any human remains are discovered in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- The county coroner has been informed and has determined that no investigation of the cause of death is required; and
- If the remains are of Native American origin,
  - The descendants from the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98; or
  - The NAHC was unable to identify a descendent or the descendent failed to make a recommendation within 24 hours after being notified by the Commission.

- **Mitigation Measure N-1: Employ Noise-Reducing Construction Practices**

  To reduce noise levels to the maximum extent practicable, the wetland construction contractor will employ the following noise-reducing construction practices.

  - During construction phases, the contractor will ensure that construction is performed in accordance with applicable City and County noise standards. No noise generating construction or repair work within 1,000 feet of residences will be performed between the hours of 10:00 p.m. and 7:00 a.m. on any weekday, Sunday, or legal holiday.
  - During construction phases, earthmoving within 300 feet of an occupied residence will only be performed during normal daylight hours (8:00 a.m. to 5:00 p.m.), Monday through Saturday, wherever feasible.
  - Mufflers should be kept operable and effective on all construction equipment, generators, and vehicles. All internal combustion engines must be operated within exhaust and intake silencers. Wherever possible, noise-generating construction equipment should be shielded from nearby residences by noise-attenuating buffers such as structures or truck trailers.
  - Prior to construction within 1,000 feet of residences, written notice should be provided to potentially affected residences identifying the type, duration, and frequency of construction activities. Notification materials will also identify a mechanism for residents to register complaints if construction noise levels are overly intrusive or construction occurs outside the required hours.
  - Construction staging areas(s) and stockpile areas will be located at least 1,000 feet from occupied residences, or contractors will be required to provide appropriate noise-reducing engine-housing enclosures. Equipment warm-up areas, water tanks,

and storage areas should be located in the established staging area or in other portions of the expansion site more than 1,000 feet from existing residences as feasible.

- Throughout the construction period, the contractor will implement appropriate additional noise mitigation measures, including, but not limited to, changing the location of stationary construction equipment, shutting off idling equipment, rescheduling construction activity, or installing temporary barriers around stationary construction noise sources at the request of the City or County.

APPENDIX D

Addresses of Adjoining Property Owners (JARPA Box 15)

The following list of Addresses of Adjoining Property Owners represent properties adjacent to the BMKV property.

Names and Addresses of Adjacent Property Owners		
Marin County Flood Control & Water Conservation District 3501 Civic Center Drive San Rafael, CA 94903 APN: 157-172-22, 157-160-18	State of California APN: 157-570-09, 157-172-41, 157-180-01, 157-180-25, 157-180-66, 157-172-06, 157-190-01	Bel Marin Keys Community Service District 4 Montego Key Novato, CA 94949 APN: 157-570-03, 157-570-04, 157-570-05, 157-570-08, 157-570-11, 157-560-17, 157-550-13,
Megan Costello and Robyn Raschke 165 Bahama Reef Novato, CA 94949 APN: 157-392-01	Megan Costello 168 Bahama Reef Novato, CA 94949 APN: 157-391-23	Martyn and Kimberley Dodd 1196 Bel Marin Keys Blvd Novato, CA 94949 APN: 157-381-32
Brahma Kumari World Spiritual Organization 820 Bel Marin Keys Blvd Novato, CA 94949 APN: 157-172-40		

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APPENDIX E

Cultural Resources Inventory and Evaluation Report

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ESA

1425 N. McDowell Boulevard
Suite 200
Petaluma, CA 94954
707.795.0900 phone
707.795.0902 fax

www.esassoc.com

memorandum

date June 16, 2016

to Jeff Melby, California State Coastal Conservancy

from Heidi Koenig M.A., RPA

subject Addendum - Cultural Resources Inventory and Evaluation Report for Bel Marin Keys Unit V Expansion of the Hamilton Wetlands Restoration Project, Marin County, California

Introduction

This memorandum provides an analysis of potential impacts to cultural resources for the Bel Marin Keys Unit V Expansion (BMKV Project) of the Hamilton Wetlands Restoration Project (HWRP) in Marin County, California. **Figure 1** shows the BMKV Project area. The State Coastal Conservancy (SCC) and U.S. Army Corps of Engineers (Corps), in collaboration with the San Francisco Bay Conservation and Development Commission (BCDC), is preparing an Addendum Environmental Impact Report (EIR) to address proposed changes to the approved BMKV Project of the HWRP Supplemental EIR/Environmental Impact Statement (EIS). The Addendum EIR is intended to satisfy requirements under the California Environmental Quality Act (CEQA), and to provide project-specific environmental documentation for the project elements proposed under a Clean Water State Revolving Fund (CWSRF) Program Application, required for review by the State Water Resources Control Board (SWRCB).

The process of finalizing the design has resulted in minor changes to the approved BMKV Project including the following:

- Modifications to the length and alignment of the new outboard levee ("New Bayfront Levee") extending from the existing levee separating the Hamilton Army Airfield (HAAF) and BMKV parcel in the south (N1 and N2 levee) to the existing levee along Novato Creek's southwestern bank in the north

- Construction of seasonal wetlands

This memorandum is an addendum to the *Cultural Resources Inventory and Evaluation Report prepared for Bel Marin Keys Unit V Expansion of the Hamilton Wetlands Restoration Project* (Jones & Stokes, 2004). The 2004 report, which was the supporting document for the cultural resources analysis of the SEIR/EIS, included efforts to identify historic properties in the proposed 2004 BMKV Project area. The 2004 cultural resources study included a summary of information from previous cultural resources investigations, as well as additional archival

research, consultation with Native Americans and other interested parties, archaeological and architectural field surveys, and the evaluation of identified cultural resources.

During the 2004 study, Jones & Stokes did not identify any prehistoric archaeological sites in the BMKV Project area. Jones & Stokes did identify two historic-era archaeological resources and evaluated both resources according to National Register of Historic Places (National Register) and the California Register of Historical Resources (California Register) criteria. Due to a lack of association and integrity, neither was recommended as eligible for listing.

Jones & Stokes also identified 10 architectural resources composed of 21 individual components (buildings, structures, linear features, and landscape features). With the exception of the Ammunition Bunkers, which was outside of the 2004 BMKV Project area, Jones & Stokes' architectural historian recommended the architectural resources as not eligible for listing in the National Register or California Register. **Table 1** provides details on the 2004 cultural resources inventory and evaluation.

TABLE 1. CULTURAL RESOURCES PREVIOUSLY RECORDED IN THE BMKV PROJECT AREA

Primary #	Type	Eligibility Recommendation	In 2004 BMKV Project Area	In current APE
Archaeological Resources				
P-21-002579	Historic-era artifact deposit	Not eligible - no associations, lack of integrity	Yes	No
P-21-002580	House remnants (1940s) – concrete patio, ornamental pond, timber-lined pit	Not eligible - no associations, lack of integrity	Yes	No
Architectural Resources				
P-21-002581	Overflow structure (1930s or 1940s)	Not eligible - no associations, no unique construction methods	Yes	Yes
P-21-002582	Tidal gate (late 1950s–early 1960s)	Not eligible - no associations, no unique construction methods	Yes	No
P-21-002583	Farm complex (1930s) – house, barn, and shed in eucalyptus trees	Not eligible - no associations, lack of historical significance	Yes	Yes
P-21-002584	Barn (1940s) and eucalyptus trees	Not eligible – moved from original construction location, no associations, lack of historical significance	Yes	No
P-21-002585	Ammunition bunkers	Eligible for listing in the National Register as a contributor to the Hamilton Air Force Base Historic District	No	No
P-21-002586	Levee and ditch system (Phased construction)	Not eligible - no direct associations, historical changes cause lack of integrity	Yes	Yes
P-21-002587	Pump house (1910–1914)	Not eligible - no associations, lack of historical significance	Yes	No
P-21-002588	Air Force antenna complex (1958–1959)	Modern construction	Yes	No
P-21-002589	Air Force rifle range (late 1950s–early 1980s)	Modern construction	Yes	No
P-21-002590	New pump house (1990s)	Modern construction	Yes	No

2016 BMKV Project Area of Potential Effects

The Area of Potential Effects (APE) for the 2016 Addendum includes approximately 325.5 acres as shown on **Figure 2**. The APE is defined as the area, both surface and subsurface, that could experience disturbance as a result of proposed BMKV Project activities, including the proposed levee (103.8 acres), the potential borrow areas (approximately 160 acres), the potential seasonal wetlands (north -31.5 acres and south – 30.2 acres), and the possible access routes. Ground disturbance would include excavation or borrow areas; the vertical APE extends 6 feet below the existing surface.

2016 BMKV Project Cultural Resources Identification and Evaluation

Environmental Science Associates (ESA) conducted a field visit of the 2016 BMKV Project APE on April 9, 2016 to substantiate the 2004 cultural resources identification and analysis. **Table 2** lists the cultural resources in the 2016 BMKV Project APE.

TABLE 2. CULTURAL RESOURCES IN THE 2016 BMKV PROJECT APE

Primary #	Type	2004 Eligibility Recommendation	In 2016 BMKV Project APE	2016 Eligibility Recommendation
P-21-002581	Overflow structure (1930s or 1940s)	Not eligible - no associations, no unique construction methods	Yes	Not eligible
P-21-002583	Farm complex (1930s) – house, barn, and shed in eucalyptus trees	Not eligible - no associations, lack of historical significance	Yes	House and shed removed; barn not eligible
P-21-002586	Levee and ditch system (Phased construction)	Not eligible - no direct associations, historical changes cause lack of integrity	Yes	Not eligible

The overflow structure (P-21-002581) is in the BMKV Project APE at the proposed northern seasonal wetland. As described in the 2004, the 4 by 5-foot-wide structure is constructed of concrete and steel rebar, and was likely installed in the 1930s or 1940s as part of local reclamation efforts. With no specific associations or unique construction type, Jones & Stokes recommended the overflow structure as not eligible for listing in the National or California registers. ESA concurs with this recommendation.

The farm complex (P-21-002583) is in the BMKV Project APE at the proposed southern seasonal wetland. In 2004, the complex consisted of a house, barn, and shed in a grove of eucalyptus trees. The buildings were likely constructed in the 1930s. With no clear association and lack of historical significance, as well as diminished integrity of materials and workmanship, Jones & Stokes recommended the farm complex as not eligible for listing in the National or California registers. By the 2016 ESA site visit, the house and shed had been removed and the barn was significantly more dilapidated than observed in 2004. ESA concurs with the recommendation that the extant barn is not eligible for listing in the National or California registers.

Portions of the levee and ditch system (P-21-002586) are in the BMKV Project APE in the vicinity of the proposed levee. Reclamation efforts in the area began as early as 1876; the current system was in place by 1935. With no direct associations to a particular time period or a specific individual, the system lacks historical significance. Repeated alterations including demolishing parts of the levees for adjacent development lessen the integrity of workmanship and materials. Jones & Stokes recommended the levee and ditch system as not eligible for listing in the National or California registers. ESA concurs with this recommendation.

Finding of Effect

Based on the 2004 findings and the 2016 analysis, ESA recommends a finding of **No Historic Properties** for the BMKV Project.

Recommendations

Archival research and field investigations completed in 2004 and 2016 indicate that implementation of the BMKV Project would not impact any known significant architectural or archaeological resources. Additionally, the BMKV Project has a low potential for the inadvertent discovery of unknown archaeological resources or human remains.

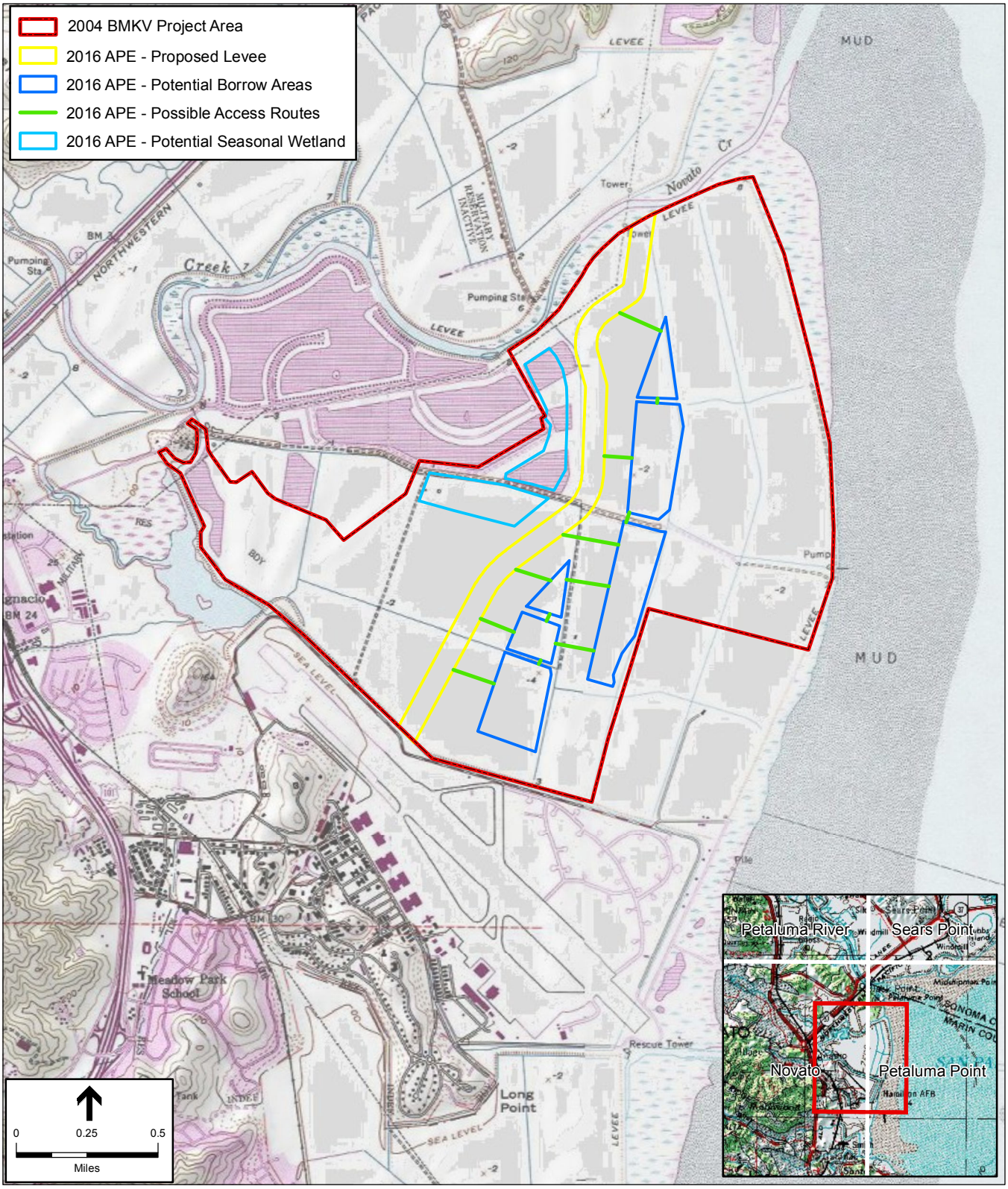
Mitigation measures identified in the *Supplemental Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Bel Marin Keys Unit V Expansion of the Hamilton Wetland Restoration Project* (Jones & Stokes, 2003) would apply in the unlikely event that archaeological resources or human remains are identified during ground disturbing activities:

Mitigation Measure CR-1: Stop Work if Buried Cultural Deposits Are Encountered during Construction Activities. If buried cultural resources, such as chipped stone or groundstone, historic debris, building foundations, or human bone, are inadvertently discovered during ground-disturbing activities, work will stop in that area and within a 100-foot radius of the find until a qualified archaeologist can assess the significance of the find.

Mitigation Measure CR-2: Stop Work if Human Remains are Encountered during Construction Activities. If human skeletal remains are encountered, the county coroner will be contacted immediately. If the county coroner determines that the remains are Native American, the coroner will then be required to contact the NAHC (pursuant to Section7050.5 (c) of the California Health and Safety Code) and the County Coordinator of Indian Affairs. A qualified ~~Jones & Stokes~~ archaeologist will also be contacted immediately. If any human remains are discovered in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- the county coroner has been informed and has determined that no investigation of the cause of death is required; and
- if the remains are of Native American origin,
  - the descendants from the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98; or
  - the NAHC was unable to identify a descendent or the descendent failed to make a recommendation within 24 hours after being notified by the commission.

According to the California Health and Safety Code, 6 or more human burials at 1 location constitute a cemetery (Section 8100), and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC.



SOURCE: USGS Novato and Petaluma Point

Bel Marin Keys Unit V Project . 150011

Figure 1

Project Location



Figure 2

Area of Potential Effects showing Cultural Resources

S-28131

Cultural Resources Inventory and Evaluation Report for Bel Marin Keys Unit V Expansion of the Hamilton Wetland Restoration Project, Marin County, California

Prepared for:

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415/977-8669

Prepared by:

Jones & Stokes
268 Grand Avenue
Oakland, CA 94610
Contact: Barbra Siskin or Madeline Lanz
510/433-8962

March 2004

Jones & Stokes. 2004. Cultural Resources Inventory and Evaluation Report for Bel Marin Keys Unit V Wetland Restoration Project, Marin County, California. March 2004. (J&S 02-296.) Oakland, CA. Prepared for U.S. Army Corps of Engineers, San Francisco District, San Francisco, CA.

Contents

Page

INTRODUCTION 1

PROJECT LOCATION 1

PROJECT DESCRIPTION 1

REGULATORY SETTING 2
- Section 106 of the National Historic Preservation Act 2
- California Environmental Quality Act 4

ENVIRONMENTAL SETTINGS 6
- Previous Archaeological Research in San Francisco Bay Area 6
- Ethnographic Setting 8
- Historic Setting 10

METHODS 13
- Prefield Research 13
- Native American Consultation 13
- Historical Research 14
- Field Survey 14
- Results 15

CONCLUSIONS AND RECOMMENDATIONS 21
- Archaeological Resources 21
- Architectural Resources 21

REFERENCES CITED 23

Appendix A. Native American Correspondence

Appendix B. Department of Parks and Recreation 523 Forms

List of Figures

Figure		Follows Page
1	Project Vicinity	2
2	Project Location	2
3	Project Area of Potential Effects	2

INTRODUCTION

This inventory and evaluation report documents Jones & Stokes' efforts to identify historic properties in the proposed Bel Marin Keys Unit V Expansion (BMKV) project area in Marin County, California. This report provides a summary of information from previous cultural resources investigations and supplements the cultural resources work done for a proposed development documented in a previous environmental impact report (EIR) for the Bel Marin Keys Unit V site (Shannon 1992). This investigation was conducted to comply with Section 106 of the National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA). The U.S. Army Corps of Engineers (Corps) and the California State Coastal Conservancy (Conservancy) are partners in the federally authorized wetlands restoration study. As the lead federal agency for the BMKV project, the Corps is responsible for compliance with Section 106 of NHPA. The Conservancy is the lead agency under CEQA.

The tasks completed to accomplish the inventory and evaluation comprised prefield research, consultation with Native Americans and other interested parties, archival research, archaeological and architectural field surveys, supplementary research to evaluate identified cultural resources, and preparation of this report. Twenty-three cultural resources were identified and evaluated for significance using the criteria established for the California Register of Historical Resources (CRHR) and the National Register of Historic Places (NRHP).

PROJECT LOCATION

The BMKV project area includes the BMKV parcel, an adjacent parcel owned by the California State Lands Commission (SLC), and small portions of the former Hamilton Army Air Field (HAAF).

The BMKV parcel is located in Marin County in the northern San Francisco Bay Area (Figures 1 and 2). The eastern boundary of the BMKV property is adjacent to the waters of San Pablo Bay. The northern boundary of the BMKV property consists of Novato Creek on the east, the Bel Marin Keys south lagoon levee in the center, and Novato Creek on the west. The western boundary of the BMKV property follows the base of Headquarters Hill and the western toe of the levee separating Pacheco Pond from the property. The southern boundary of the BMKV property is the northern property line of the HAAF property and the western and northern property line of the SLC parcel. Most of the BMKV property is south of Bel Marin Keys Boulevard; an 8-acre portion of the property is located north of Bel Marin Keys Boulevard between the boulevard and Novato Creek.

The SLC parcel is located just south and east of the BMKV parcel and north of the HAAF property. This parcel is included in the project area because the BMKV expansion

proposed several changes to the previously proposed wetland restoration design on the SLC parcel.

The third part of the project area consists of two small portions of the HAAF parcel. It is proposed to extend the Bay Trail north and south from the City of Novato levee through these portions of HAAF, and other parties propose to later construct an interpretive center on these portions. Except for these portions related to the proposed trail extensions and interpretive center, the BMKV project area does not include the rest of the main HAAF parcel.

Figures 1 and 2 show the BMKV project area and boundaries.

PROJECT DESCRIPTION

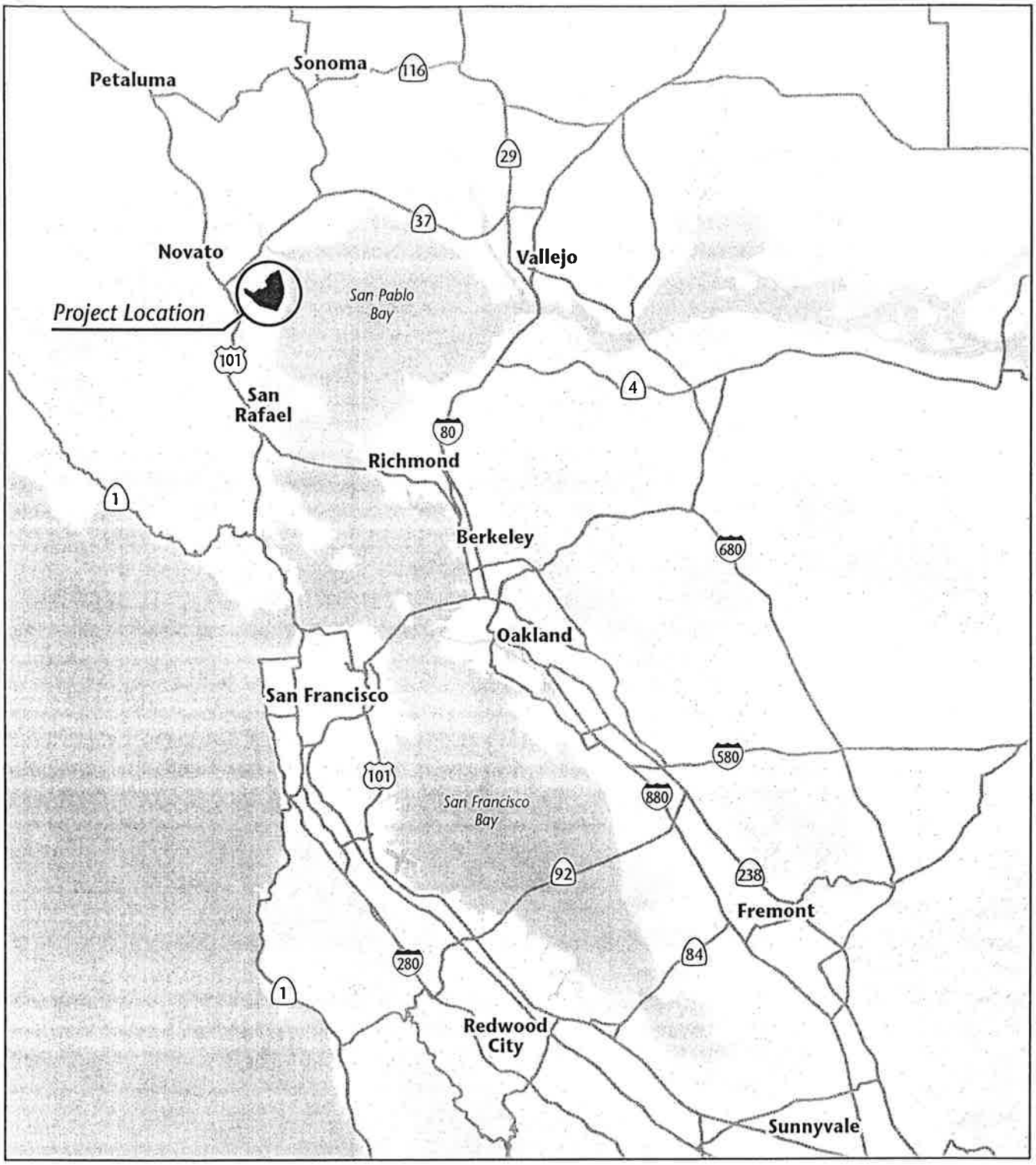
The Conservancy and the Corps are proposing to restore wetlands at the BMKV project area as an addition to the Hamilton Wetland Restoration Project (HWRP), which was authorized by Congress in 1999 on the adjacent HAAF and SLC parcels. Approximately 90% of the original tidal wetlands of San Francisco Bay have been diked and/or filled and converted to agricultural, urban, industrial, salt production, and other land uses. This loss of tidal wetlands has greatly reduced the amount of habitat available to many species of fish and wildlife.

In 1998, a conceptual design for the HWRP was developed for a portion of the HAAF property and the adjacent SLC property (often referred to as the North Antenna Field), and an environmental impact report/statement (EIR/EIS) was completed (U.S. Army Corps of Engineers and California State Coastal Conservancy 1998). The HWRP was authorized by Congress in the Water Resources Development Act (WRDA) of 1999. In 2001, the Conservancy purchased the property known as the BMKV parcel with the intention of proposing restoration on the property as an expansion of the authorized HWRP. The Corps and the Conservancy are presently proposing to add the BMKV expansion to the HWRP. A conceptual design for the expansion has been developed, and a final supplemental EIR/EIS for the BMKV expansion was released in April 2003 (U.S. Army Corps of Engineers and California State Coastal Conservancy 2003).

The goal of the proposed BMKV expansion is to create a diverse array of wetland and wildlife habitats at the BMKV site that benefits endangered species as well as other migratory and resident species. This project goal is derived from the authorized HWRP. The BMKV project's objectives are the same as those for the HWRP and are discussed in the final EIR/EIS.

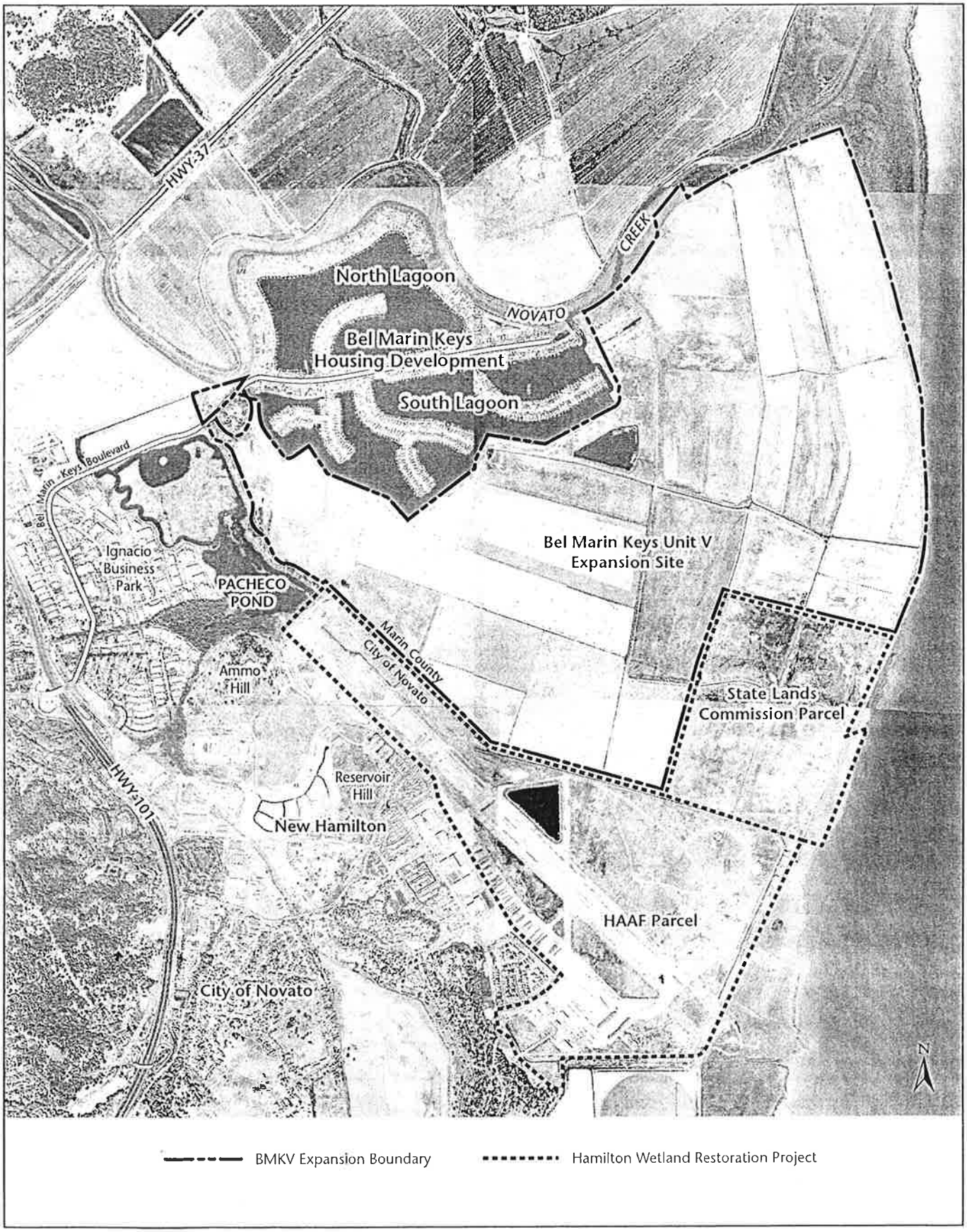
As described in the supplemental EIR/EIS, the Corps and Conservancy have selected Revised Alternative 2 as the preferred alternative. The following construction-related activities associated with implementation of the BMKV expansion preferred alternative are relevant to this report.

- Creation of a staging area on the BMKV parcel to provide storage of topsoil, heavy equipment, fuel, and supplies.



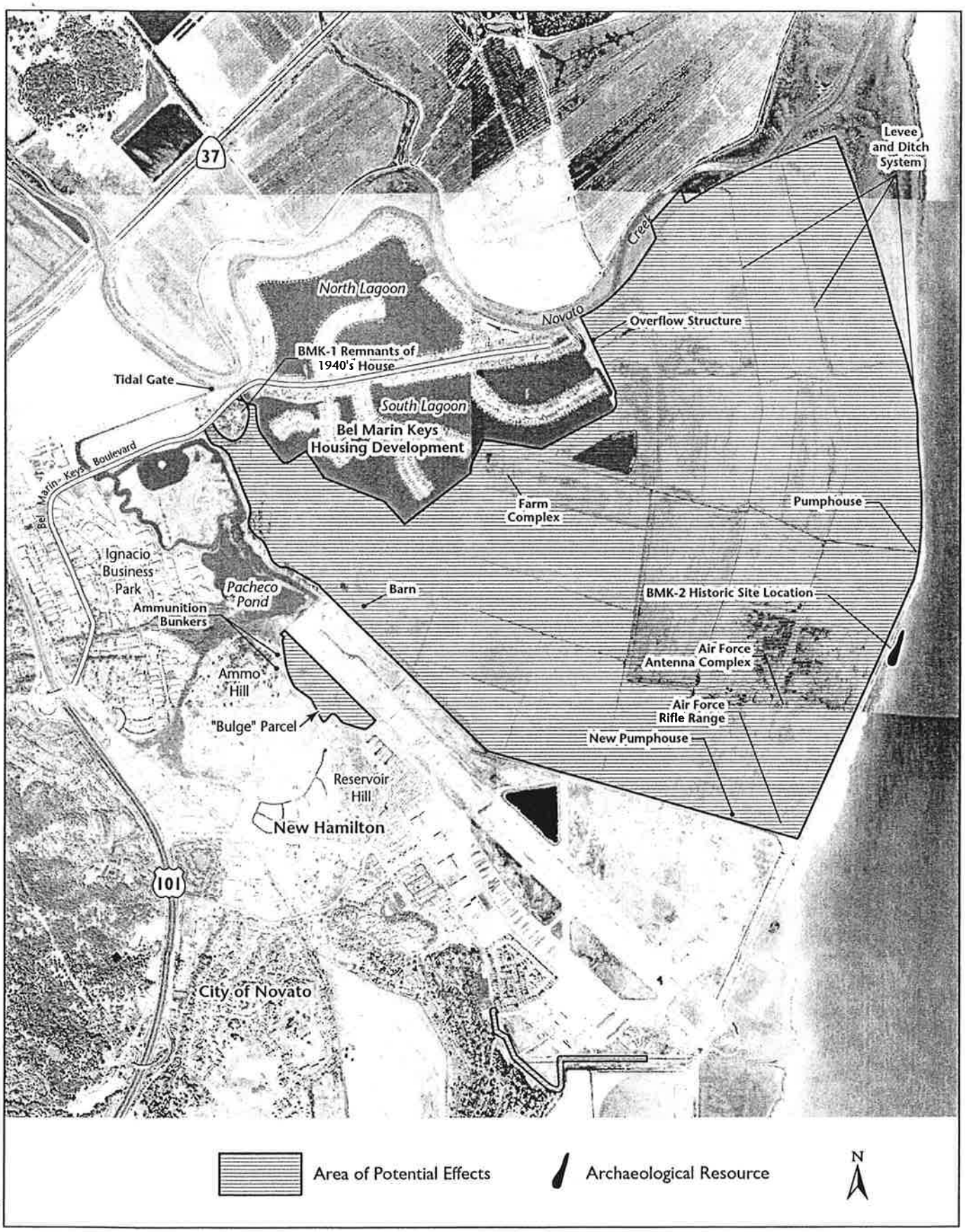
02296.02-009

Figure 1
Location of the Bel Marin Keys Unit V Expansion Site



02996.02

Figure 2
Bel Marin Keys Unit V Expansion Site



02296.02-008 3-22-04

Figure 3
Area of Potential Effects

- Site preparation activities at the BMKV parcel, including modification and removal of existing infrastructure including certain levees and all structures onsite; excavation and salvage of topsoil; construction of levees, berms, internal peninsulas, water quality detention ponds, and trails; removal of trees; and placement of the distribution pipelines for dredged material.

- Modification of existing power towers on the BMKV parcel by jacketing them in asphalt and concrete.

- Placement of dredged material for restoration of wetland and upland habitat areas on the BMKV parcel.

- Installation of drainage and other water-control infrastructure on the BMKV parcel.

- Excavation of connecting channels and breaching of perimeter levees on the BMKV parcel.

The BMKV expansion also includes two actions on areas outside the BMKV parcel.

- Placement of additional dredged material on a 90-acre area on the southeast corner of the SLC parcel to create high transitional habitat.

- Trail construction of the northward and southward extension of the Bay Trail from the City of Novato levee on the HAAF parcel.

REGULATORY SETTING

Section 106 of the National Historic Preservation Act

The BMKV project is a Civil Works study by the Corps and represents a federal undertaking. As such, the lead federal agency (the Corps) must comply with Section 106 of the NHPA. Section 106 of the NHPA requires that, before beginning any undertaking, a federal agency must take into account the effects of the undertaking on historic properties and offer the Advisory Council on Historic Preservation (ACHP) and other interested parties an opportunity to comment on these actions. Specific regulations regarding compliance with Section 106 state that, although the tasks necessary to comply with Section 106 may be delegated to others, the federal agency is ultimately responsible for ensuring that the Section 106 process is completed.

The Section 106 review process involves a five-step procedure.

1. Initiate the Section 106 process (assess the ability of the undertaking to affect historic properties, identify consulting parties, and plan to involve interested parties).

2. Identify historic properties in the area of potential effects (APE).

3. Assess adverse effects.

4. Resolve adverse effects.

5. Implement the project according to the memorandum of agreement (MOA), or implement project without an MOA if no agreement is necessary.

Section 106 requires federal agencies or those they fund or permit to consider the effects of their actions on properties that are determined eligible for listing or are listed in the NRHP. To determine whether an undertaking could affect NRHP-eligible properties, cultural resources (including archaeological, historical, architectural, and traditional cultural properties) must be inventoried and evaluated for the NRHP. To be listed in the NRHP, a property must be at least 50 years old (or be of exceptional historic significance if less than 50 years old) and meet one or more of the NRHP criteria. To qualify for listing, a historic property must represent a significant theme or pattern in history, architecture, archaeology, engineering, or culture at the local, state, or national level. It must meet one or more of the four criteria listed below and have sufficient integrity to convey its historic significance. The criteria for evaluation of the eligibility of a historic property for listing in the NRHP are defined in Title 36, Code of Federal Regulations (CFR), Section 60.4 as follows.

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that
>
> - are associated with events that have made a significant contribution to the broad patterns of our history;
>
> - are associated with the lives of persons significant in our past;
>
> - embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> - have yielded or may be likely to yield information important in prehistory or history.

In addition to meeting the significance criteria, a significant historic property must possess "integrity" to be considered eligible for listing in the NRHP. *Integrity* refers to a property's ability to convey its historic significance (U.S. Department of Interior 1991). Integrity is a quality that applies to historical resources in seven specific ways: location, design, setting, materials, workmanship, feeling, and association. To be considered a significant historic property, a resource must possess two, and usually has more, of these kinds of integrity, depending on the context and the reasons why the property is significant.

The NHRP criteria also limit the consideration of moved properties because significance is embodied in locations and settings. Under NRHP Criteria B, moving a building destroys the integrity of location and setting. A moved property can be eligible for listing if it is significant primarily for architectural value or if it is the surviving property most importantly associated with a historic person or event (U.S. Department of Interior 1991).

California Environmental Quality Act

CEQA requires that public or private projects financed or approved by public agencies assess the effects of the project on historical resources. *Historical resources* are defined as buildings, sites, structures, objects, or districts, each of which may have historical, architectural, archaeological, cultural, or scientific significance. CEQA requires that, if the project would result in an effect that may cause a substantial adverse change in the significance of a historical resource, alternative plans or measures to mitigate the effect must be considered; however, only significant historical resources need to be addressed. Therefore, the significance of cultural resources must be determined. The following steps are normally taken in a cultural resources investigation for CEQA compliance.

1. Identify cultural resources.

2. Evaluate the significance of the resources.

3. Evaluate the effects of the project on significant resources.

4. Develop and implement measures to mitigate the effects of the project on significant resources.

The CEQA guidelines define three ways that a property may qualify as a significant historical resource for the purposes of CEQA review.

- The resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR).

- The resource is included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code (PRC), or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

- The lead agency determines the resource to be significant as supported by substantial evidence in light of the whole record (California Code of Regulations [CCR], Title 14, Division 6, Chapter 3, Section 15064.5[a]).

Each of these ways of qualifying as a significant historical resource for the purposes of CEQA is related to the eligibility criteria for inclusion in the CRHR (PRC 5020.1[k], 5024.1, 5024.1[g]). A historical resource may be eligible for inclusion in the CRHR if it

1. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2. is associated with the lives of persons important in our past;

3. embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values; or

4. has yielded, or may be likely to yield, information important in prehistory or history.

Properties that are listed in or eligible for listing in the NRHP are considered eligible for listing in the CRHR, and thus are significant historical resources for the purpose of CEQA (PRC Section 5024.1[d][1]).

Area of Potential Effects

The area of potential effect (APE) for this report includes:

- the 1,600-acre BMKV parcel wherein project activities are proposed;
- the 250-acre SLC parcel wherein several modifications of the HWRP design are proposed; and
- two portions of the HAAF site where additions to the Bay Trail and an interpretive center are proposed.

Vertically, the depth of APE necessary to excavate existing site soils for the reuse in habitat restoration and earthworks will generally not exceed 3 feet in the SLC and BMKV parcels. . Deeper excavation will result from the excavation of pilot channels on the BMKV parcel to a maximum depth of between 10 and 16 feet below ground surface.

The APE is shown in Figure 2.

ENVIRONMENTAL SETTINGS

Previous Archaeological Research in San Francisco Bay Area

Archaeological investigations in the San Francisco Bay Area were initiated under the auspices of the University of California, Berkeley, Anthropology Department in 1902, when Max Uhle began the first excavation at the Emeryville Shellmound in Alameda County. This site was the largest at that time and remains one of the most significant sites in the Bay Area. Uhle's most important finding at the Emeryville Shellmound was the discovery of ten distinct strata within the mound, which he identified as evidence for cultural change (Uhle 1907:21). Through his investigations of burial customs and relative artifact types in conjunction with the change in proportions of oyster and clamshells throughout the midden, Uhle was able to distinguish two major cultural phases (Uhle 1907:17). Uhle performed extensive excavations on eight additional sites between 1906 and 1915. Uhle's approach to the archaeological research of shellmounds and his theories on evolutionary cultural change dominated the field for many years (Beardsley 1954:4).

Nels C. Nelson was the first archaeologist to survey the coastline of San Francisco Bay, including the Marin County coast. Nelson conducted a survey of the Bay Area between 1906 and 1908 during which he documented 425 shellmounds along the coast from the Russian River in Sonoma County to Half Moon Bay in San Mateo County (Nelson 1909). There are numerous Nelson shellmounds located within a short distance of the proposed project area, to the north and south. Nelson's primary concerns were the distribution, condition, number, and constituents of the shellmounds, which might infer the age of the site and the number of inhabitants who used them (Nelson 1909; Moratto 1984:63). Nelson recognized the intensive use of shellfish throughout the coastal middens as evidence for a distinct economic base of marine resources in the region (Moratto 1984:227). Nelson also performed the first investigations at three shellmounds in eastern Marin County in 1909 and 1910. However, archaeology in Marin County and the Bay Area as a whole remained largely unexplored until the 1940s and later.

Excavations of shell middens in Alameda and Contra Costa Counties began around the time Nelson was surveying the Bay Area. By 1916, 11 sites identified by Nelson had been excavated. By the 1940s, enough information had been gathered to permit the development of a tentative regional prehistory. In 1948, the Central California Taxonomic System (CCTS), which had been developed for the Central Valley, was expanded to correlate the Bay Area sequence with those of the Sacramento-San Joaquin Delta (Delta). However, as more work was conducted, it became obvious that this and other systems lacked refinement.

Advances were made in archaeological dating methods and researchers applied these new techniques to distinguish temporally and culturally discrete assemblages of shell beads and ornaments. More recently, new techniques were developed for determining obsidian sources and exchange routes among different Native American groups throughout California and beyond. In addition, obsidian hydration and radiocarbon dating have been instrumental in establishing dates of occupation for many of the sites within the San Francisco Bay Area. Information on human

occupation prior to 5000 B.P. is almost nonexistent, due, in part, to the depositional environment and dramatic environmental changes that took place at this time.

Results from previous archaeological investigations within the project area and the surrounding region have shown that the San Francisco Bay Area was inhabited by mobile hunter-gatherers. Over time, their foraging strategies became more focused on the locally obtainable resources and their lives became increasingly more sedentary. Fredrickson and Bennyhoff developed a taxonomic sequence that defined three basic cultural patterns—the Windmiller Pattern, the Berkeley Pattern, and the Augustine Pattern—throughout the San Francisco Bay Area and interior Delta for the period between 2500 B.C. and A.D. 1500 (Bennyhoff and Fredrickson 1994).

The Windmiller Pattern (2500 B.C. to 1000 B.C.) is thought to be a mixed economy of game procurement and the use of wild plant foods. The archaeological record contains numerous projectile points with a wide range of faunal remains. Hunting was not limited to terrestrial animals. The tools included in the Windmiller Pattern are fishing hooks and spears made of crafted fish bone (Moratto 1984: 201). Plant resources were also used, as indicated by the presence of stone tools such as milling slabs and handstones. The Windmiller Pattern reflects a seasonal adaptation in which habitation sites in the valley were occupied during the winter months, and camps in the foothills were occupied in the summer (Bennyhoff and Fredrickson 1994).

The Windmiller Pattern shifted to a more specialized adaptation called the Berkeley Pattern, which spanned approximately 1,000 years, from about 1500 B.C. to 500 B.C. A decrease in the presence of milling slabs and handstones and a shift to mortar and pestle technology is evident in the archaeological record, and indicates an increased dependence on acorns. Large shell mounds are found near water sources, and the presence of projectile points and atlatls suggests that hunting was still an important part of subsistence (Fredrickson 1973: 125a-126). Within the southern Bay Area, the Berkeley Pattern is illustrated by a heavy reliance on the bayshore environment.

The Augustine Pattern followed the Berkeley Pattern around 500 A.D. This adaptation was adopted by the ethnographically known people of the historic period. The Augustine Pattern exhibits an increase in ceremonialism, social organization, and stratification. Trade was an important element of this adaptation and can be seen in the different types of obsidian from other regions and shells beads. The presence of shaped Gunther Barbed series indicate the use of the bow and arrow. The increase in ceremonialism can be found in the presentation of flexed burials with the association of artifacts, including shellbeads, mortars and pestles, and projectile points.

Prehistoric Research Issues

Beginning in the late 1940s and into the mid to late 1960s, American archaeologists were moving away from the presentation of simple culture histories based on sequences of diagnostic artifacts. This change to a cultural/theoretical approach came to be known as "New

Archaeology." The "new archaeologists" now wanted to know more than when people were doing what in prehistoric times; they now also wanted to know how and why people chose to organize, develop, modify, or discard certain modes of adaptation. According to Hayes (2004), research themes shifted focus, bringing different issues, including the following, to the forefront.

- Food procurement (e.g., hunting vs. collecting).
- Exchange/trade of ideas, stylistic items, raw materials, etc. (e.g., production specialization, shell beads, obsidian).
- Interaction across cultural boundaries (e.g., alliances for economic/defensive purposes).
- Environmental knowledge (e.g., utility of particular gathering locations).

In response to the desire to address confusing and sometimes conflicting classificatory terms and the burgeoning new directions for research, Fredrickson took on the obvious need to rework the Central California classification system and to synthesize the state of current knowledge in Central California archaeology. He produced a dissertation proposing two sets of related terms and drew North Coast Ranges archaeology into a clear relationship with Central California and San Francisco Bay (Hayes 2004).

Artifacts recovered from sites and eventually larger spatial units (e.g., localities and districts) are used to define prehistoric peoples adaptive mode or "pattern." As more data become available, we should be able to define subsets (i.e., phases and aspects) of the pattern, thereby enhancing our understanding of the variety of a given pattern across space. In Fredrickson's scheme, time is deliberately pushed to the background. Control of the temporal factor remains as crucial as ever in order to define components and assemblages or determine which precedes or follows the other. By making adaptation in all its various forms the prime objective with considerations of the temporal framework kept in perspective, we work toward a clearer picture of human behavior (Hayes 2004).

Ethnographic Setting

Ethnography of the Coast Miwok

The project area was inhabited by the Coast Miwok Indians in the prehistoric past and at the time of contact. The Coast Miwok language, a member of the Miwokan subfamily of the Utian family, is divided into two dialect groups: Western (Bodega) and Southern (Kelly 1978:414; Shipley 1978:84). The Coast Miwok territory extended from Duncan's Point on the Sonoma County coast to the end of the Marin County peninsula (Kroeber 1925) and as far east as far as midway between the Sonoma and Napa Rivers (Kelly 1978). These boundaries are based on common linguistic associations rather than a common sociopolitical organization. Kroeber

(1925:831) defined the largest unit of political organization as a tribelet, which encompassed the village community.

The main tribelet in the project area was the Omiomi group, which inhabited the valley of Novato Creek on the northwest side of San Pablo Bay (Milliken 1995:250). Other nearby tribelets included Alaguali, Olompali, Petaluma, Tamal, and several others included within Coast Miwok territory. The Alaguali tribelet was located on the marshland borders of the northern shores of San Pablo Bay, to the northeast of the Omiomi (Milliken 1995:250), while the Olompali tribelet was located to the northwest of the Omiomi in an inland valley. The distinction between tribelet territories is sometimes difficult to ascertain.

Coast Miwok sociopolitical organization did not extend beyond the village. Larger villages had a chief, whose position was nonhereditary. The chief's responsibilities included advising and caring for the villagers and overseeing activities in the dance house. Incipient chiefs were tutored by the current chief and four elderly women (Kelly 1978:419). Other important leaders included the woman chief and the *máien*. The woman chief appears to have been primarily a ceremonial leader who was involved in the Bird Cult and coordinated the Acorn Dance and the Sünwele Dance. The *máien* was the head of the female ceremonial house, directed the construction of new dance houses, had wood hauled for festivals, supervised the preparation of foods for special events, sent invitations to dances, and sometimes selected dance performers (Kelly 1978:19). Dances were important to the Coast Miwok and were held frequently. According to a Bodega Coast Miwok man, dances were held because "they wanted to have a good time. If someone was sick, they danced to cure them. If nobody was sick, they danced anyway" (Kelly 1978:422). The Acorn Dance was associated with first-fruits ceremony, and the Sünwele Dance was a religious ceremony that focused on spirit impersonation (Kelly 1978:422).

Coast Miwok villages were usually located near major inland watercourses or, in some cases, along the coast. The villages were composed of several structure types, including dwelling houses, a sweathouse (in larger villages), and dance houses (in larger villages). Dwelling houses were built on conical frames of willow or driftwood poles with bunches of grass, tule, or brush covering the structure. Housing from six to ten persons, each dwelling had a central stone-lined hearth and a smokehole in the roof. Coast Miwok built sweathouses as circular structures that were dug 4 to 5 feet below the ground surface. Coast Miwok men frequently used the sweathouse for socializing and work. Dance houses were constructed in a manner similar to the sweathouse. There were two types of dance houses: one for males and females and the other strictly for females. The mixed-gender dance house was excavated at a depth of 2 feet and was about 15 feet in diameter. The female dance house was not earth-covered but roofed in tule or grass and was smaller than the mixed-gender dance house (Kelly 1978:417).

The Coast Miwok subsistence strategy focused on the coast and the adjacent inland for much of the year, where salmon and other fish, deer, crab, kelp, seeds, mudhens, geese, mussels, and clams were available. During summer, the focus of hunting and plant-gathering activities shifted to the hills, where rabbit, bear, elk, deer, squirrels, gophers, seeds, greens, and acorns were plentiful. Acorns were pounded into meal, leached, and boiled with hot stones to make

mush (tanbark acorns were preferred). Adult males smoked tobacco, which was gathered along Healdsburg and Santa Rosa Creeks (Kelly 1978:415–417; Heizer and Elsasser 1980).

Fishing was performed in a variety of ways; bay fish were caught in a seine strung between two rafts, and surf fish were captured with circular dip nets. During the winter steelhead and salmon runs, Coast Miwok constructed small weirs to trap the fish. Weirs were constructed with posts and willow sticks driven into the river bottom, forming a line of gates and pens. Salmon were also harvested with spears and dip nets. Eel was netted or poisoned in pools with the root of *Marah fabaceus*, more commonly known as manroot.

Coast Miwok technology comprised items fashioned from wood, stone, shell, and animal materials. Wood artifacts are few, seemingly limited to the double-bladed balsa paddle, mush stirrers, bows, spear shafts, and hollowed log foot drums. Stone manufactures were well developed; beachside boulders were used as mortars, and portable stone mortar and pestles were used to grind herbs, pigments, and crystal dust. The Coast Miwok polished stone, and sometimes perforated it, for use as hunting and fishing charms. Hunters used long obsidian blades as charms when hunting bear. Obsidian was obtained from the Wappo for manufacturing butchering knives and arrow points. Coast Miwok traded clamshell disk beads to the Wappo in exchange for unworked obsidian. General utility knives were made from green chalcedony. Men made nets from lupine (*Lupinus chamissonis*) root cordage. Women made basketry and men made willow containers for hunting implements and made burden baskets and mortar hoppers. The Coast Miwok made coiled and twined basketry, which were ornamented with red woodpecker and white duck feathers, quail tips, and shell pendants. Basket types included mush bowls, cooking baskets, parching trays, meal sifters, seed beaters, and cradles (Kelly 1978:417–418).

Contact between the Coast Miwok and Europeans first occurred on the Marin County coast as early as 1579, when Sir Francis Drake spent 5 weeks on the coast to repair his damaged ship (Kroeber 1925). Spanish explorers made contact with the Coast Miwok in the late 1700s. The mission of the Spanish colonists was to turn the Native American population into Spaniards, in religion, in language, and gradually, through the intermixing of blood (Bean and Rawls1993:17). By 1776, the Franciscan fathers of the San Francisco mission began forced conversions of Native Americans to Christianity and brought Coast Miwok to mission lands, causing a partial abandonment of native settlements. Subsequent ranching and settlement by Mexicans and Americans further displaced Coast Miwok from their homes and subjected the group to homicide and epidemic diseases (Kelley 1978).

Many of the Coast Miwok were taken to the San Francisco Mission Dolores, established in 1776, Mission San Jose de Guadalupe, established in 1797, and Mission San Rafael Archangel, established in 1817, to be converted. Large groups were taken, ranging in numbers from approximately 40 to 150 tribal members at a time (Milliken 1995). Their numbers decreased rapidly, as did the Native American populations throughout the Bay Area and California.

Among the first known members of the Omiomi tribe to be baptized at Mission San Francisco was Nobato Gayac, on February 1802. Milliken also reports that very few Omiomi

were taken until 1811, when 142 were taken to San Francisco. Omiomi tribal members were regularly taken to San Francisco until 1817 (Milliken 1995:250).

During the early years of U.S. dominance of California, some Coast Miwok took work in sawmills and as field hands (Kelly 1978:414). Although the Coast Miwok population declined dramatically, the National Park Service, the Miwok Archaeological Preserve, and individuals of at least partial Coast Miwok descent began recreating the village of Kule Loklo (Bear Valley) on the Point Reyes National Seashore. Dances and local festivals reflecting Coast Miwok traditions are now held at Kule Loklo (Eargle 1986:67, 84–85).

Historic Setting

Early History

Marin County was one of the original 27 counties created when California became a state in 1850. It is dotted with numerous dairy farms as well as poultry and stock ranches. The Golden Gate National Recreational Area also makes up a sizeable portion of the county (Hart 1978: 259).

As early as the 1500s, Europeans such as Frances Drake and Sebastian Rodriguez Cermeno explored the region. By the early nineteenth century, missionization of the area was underway when Spain established Mission San Rafael Archangel in present-day San Rafael. After 1822, Mexico gained independence from Spain and began allowing its citizens land grants throughout Alta California. In 1848, the United States defeated Mexico in the Mexican-American War, and Mexico surrendered its Alta California land in the Treaty of Guadalupe Hidalgo. Livestock grazing in addition to agricultural and dairy farming comprised the principal industries during this period (Kyle 1990: 172-174; Mason 1975: 156).

Once California became a state, the state assumed ownership of much of the land within its borders, including lands under navigable streams, lakes, or harbors; land acquired through purchase, condemnation, or gift; and land that was obtained through *rancho* land title disputes. In addition, through the Swampland Act of September 28, 1850 (also known as the Arkansas Act), the federal government granted California public land throughout the state (amounting to over 2 million acres) that was subject to overflow and therefore unprofitable for agricultural use unless reclamation work was undertaken (Robinson, 1948:191-192). With federal assistance, the swamp and overflow land was identified, surveyed, certified, and then patented to the state. The state, in turn, issued a state patent to future swampland purchasers.

History of the Project Area

The project area, a historic marshland, was part of this swamp and overflow acreage. California issued patents for land within the project area in 1863 to Henry Hansen and in 1876 to

L.C. McAfee (Marin County Recorder's Office 1868:187-189; 1876b:565). E.B. Perrin eventually assumed ownership of Hansen and McAfee's property. During this period, a complex of buildings was constructed (present-day Headquarters Hill located in the northwestern corner of the BMKV parcel). The complex, which included a two-story brick house, stables, and outbuildings served as headquarters for the succeeding property owners as the land was gradually developed and used for farming (Shannon 1992).

By 1878, Perrin sold his property (located in the northwestern part of the BMKV parcel) to John W. Ferris (Shannon 1992). In 1892, Ferris, a civil engineer and swampland developer from the Central Valley, increased his Marin County land holdings by purchasing over 500 additional acres of swampland (including the project area) along San Pablo Bay. The state issued a patent to Ferris for his land in 1893 (Marin County Recorder's Office 1893:189; Dodge 1892).

Although Ferris owned vast amounts of acreage in the area, there is no evidence that he actually resided in Marin County. He most likely rented his property to sharecroppers who farmed the land for agricultural purposes. In 1906, Ferris married Emma Watson, daughter of Claus Spreckels (a sugar tycoon) and moved to England (San Francisco Chronicle 1920). Ferris retained ownership of his Marin County property, including the study area, until 1912 when he sold it through an agent in the states to Louis Friedlander and F. K. Houston of San Francisco (Marin County Recorder's Office 1912:356).

It is unclear when measures were initially undertaken to reclaim the land in the project area from the bay, although early records indicate some reclamation efforts were in place in the northwestern part of the study area by 1876 (Marin County Recorder's Office 1876a: 473). By 1898, levees, ditches, and several outbuildings were located throughout the project area (Dickens 1898). Between 1910 and 1914, a pump house was constructed in the eastern part of the project area along San Pablo Bay (U.S. Geological Survey 1914, 1916). Although Ferris most likely undertook many of these drainage improvements, it is uncertain whether Ferris or Friedlander and Houston were directly connected to the later changes, which include the construction of the pump house. Ferris is the least likely candidate for these changes as he was living abroad at that time. Upon purchasing the property, it is probable that Friedlander and Houston, like Ferris, rented the reclaimed land to sharecroppers who used it to grow oats and barley (Shannon 1992).

California Packing Corporation

In 1916, California Fruit Canners received title to the property (known as Marin Meadow) and transferred it to California Packing Corporation (Calpak) (now Del Monte) (Marin County Recorder's Office 1917:458–476). Calpak was a large fruit-processing company formed in 1916 from a handful of canners and marketers, including California Fruit Canners Association, Central California Canneries, Griffin & Skelley Co., J. K. Armsby Co., and a major interest in Alaska Packers Association. Upon its merger, Calpak increased its product line and expanded its ranch holdings, including acquiring land such as the study area (Fortnight: the News Magazine of the West 1950:21). By the 1920s, the company operated hundreds of plants and production facilities around the world.

To increase production, Calpak vastly improved irrigation and drainage in the study area to meets its large-scale operating needs. The company constructed additional levees, ditches, and onsite wells; built or improved roads; and put in place a handful of structures, including barns and residences. Over the next 30 years Calpak used the property to grow sugar beets, peas, and other crops as well as to breed stallions that were used in the farm operations. (Shannon 1992.)

By 1948, Calpak had sold the property to H. Ward Dawson. Within the next 20 years, the southern part of the SLC parcel (Figure 2) was reclaimed and used by Hamilton Air Force Base for an antenna field and firing range. Over time, additional owners included McAlester Construction Finance and Bel Marin Keys Development Association. In 2002, the State of California purchased the land within the project area (Marin County Assessor's Office 2002). Agricultural use of the property still occurs but is limited to dry farming of oat hay (Shannon 1992).

Hamilton Army Air Field

The HAAF parcel (in addition to land just south of Pacheco Pond) was originally part of Hamilton Field, which the U.S. military constructed between 1931 and 1935 as a bombardment base (i.e., for the training of bomber crews). As one of three such bases in the United States at the time, the airfield played a vital role in the development of air defense mechanisms on the West Coast in the 1930s and in the training and processing of units during the early 1940s. From 1947 through 1960, the Air Force used the facility (including portions of the SLC parcel) to conduct defense and training operations and renamed Hamilton Field to Hamilton Air Force Base. By the early 1970s, the U. S. Navy and Coast Guard, in addition to the Air Force, occupied the base. In 1984, the base was conveyed to the Army and renamed Hamilton Army Air Field. Shortly thereafter the facility was decommissioned and the land was transferred to private-sector ownership, with some land transferring to the Coastal Conservancy (PAR Environmental Services, Inc. 1993).

METHODS

The effort to identify cultural resources in the proposed study area included a record search and a review of the archaeological, ethnographic, and historical literature; consultation with the Native American Heritage Commission (NAHC) and Native American representatives; examination of historic maps; historical research; and field surveys. Information gathered as a result of these activities permitted identification of cultural resources in the study area and shaped the pedestrian survey strategy. Each of these methods and their results are outlined below.

Prefield Research

Records Search

The record search conducted in December 2001 at the Northwest Information Center of the California Historical Resources Information System revealed several previous archaeological investigations within and adjacent to the project area. In addition, several prehistoric archaeological sites have been recorded near the project area; however, none have been identified directly within the project area. Previous archaeological investigations conducted within the project area boundaries include Shannon 1992, Flynn 1978, and Jackson 1979. These studies did not result in the identification of prehistoric resources.

Native American Correspondence

A letter was sent to the NAHC requesting that it consult its sacred lands file and send a list of individuals and organizations that may have knowledge of properties of cultural or religious importance to Native Americans in the expansion area (Appendix A). The search of the sacred lands file revealed no Native American cultural properties within the expansion area. A letter was sent to each individual and organization identified on the NAHC list, and a follow-up phone call was placed to each person. To date, no responses have been received.

Historical Research

In an effort to identify important historic people, events, and architectural trends that may have been associated with the project area, a Jones & Stokes' historian conducted archival research at the County of Marin Assessor's Office, the County of Marin Recorder's Office, the California State Library in Sacramento, the Division of Mines and Geology Library in Sacramento, the California State Lands Commission, the Marin County Civic Center Library, and the Novato History Museum. In addition, previous studies, including Shannon 1992 and PAR Environmental Services 1993, were consulted.

Field Surveys

Barbra Siskin, a Jones & Stokes archaeologist visited the proposed BMKV expansion area on January 17 and 18, 2002, on February 25, 2002, and again on August 1 and 2, 2002 (see Figure 3 for a survey coverage map). Ms. Siskin conducted the field survey in a manner that would allow a view of all portions of the proposed expansion area. The levees were walked in a linear circumference of the property. Areas around historic structures and suspected historic activity were investigated in intensive transects spaced no farther than 33 feet apart. The proposed Bay Trail alignment was surveyed on August 1 and 2.

The majority of the land in the project area is surrounded by dikes and levees and is approximately 3 feet below mean sea level. For much of the year, the former agricultural fields are submerged, making a comprehensive survey of the area of little use because it is unlikely that the area is sensitive for the presence of archaeological resources or that any would be evident during a surface survey. As much of the land encompassed by the BMKV expansion project was once tidal marsh, it is highly unlikely that prehistoric resources would be located in this area. The many previously recorded prehistoric sites close to the project area were all found on the lower terraces and at an elevation slightly above sea level. In 1909, Nelson reported several sites north of the project area and numerous sites to the south; these sites are primarily shell middens (Nelson 1909).

Madeline Lanz, a Jones & Stokes architectural historian, visited the project site on January 9, 2002, and August 1, 2002. As part of the survey and inventory process, Ms. Lanz photographed and took notes of the individual architectural resources.

Results

Prehistoric Archaeology

No prehistoric archaeological sites were identified during this investigation. For the purposes and scope of the proposed BMKV expansion, the issue of deeply buried early prehistoric sites (5,000 years old and older) was not pursued because the proposed BMKV expansion area is not expected to require deep excavation into the Bay mud layer, and therefore it is unlikely to reach horizons where prehistoric resources may be found. The thickness of the Bay mud deposits located below the project site ranges from 98 feet near San Pablo Bay to 23 feet near Pacheco Pond (ESA 1993). Bay mud deposits are not expected to contain prehistoric archaeological resources.

Historical Archaeology

The field survey for this project resulted in the identification of two historic archaeological resources. The resources identified were one historic trash deposit and the remnants of a 1940s house.

Historic Trash Deposit

The historic trash deposit site includes a large concentration of historic debris and household items. There is no evidence of a foundation or remnants of a structure at the site location. The historic trash deposit is located on the outboard side of the man-made levee along the western boundary of the project area on the shores of San Pablo Bay. A concentration of materials is scattered between the outboard side of the modern levee and the high-tide line on San Pablo Bay, several hundred yards south of the Pump House. It appears that the historic

dump is an intrusive secondary deposit, and the site is completely submerged at high tide. At the time of the first field visit, portions of the historic debris scatter were extending well beyond the low-tide mark. Upon a subsequent visit to the site, the tide was high and the deposit was located under a minimum of 10 to 12 feet of water, well below the mean high-tide mark.

Numerous types of household items were observed during the survey, and the historic trash deposit appears to be a secondary deposit. The deposit includes clear, brown, green, cobalt, opaque green, and aqua glass fragments; white porcelain, ceramic, and terra cotta fragments; white porcelain wire insulator, several spoons and other utensils, portions of a broken white porcelain toilet bowl and portions of a pedestal sink; medicine bottles; numerous pieces of white ceramic dishware; terra-cotta pipe fragments; large deposits of rusted, melted, burned metal with various glass and metal household items fused into the metal.

The historic deposit lacks integrity because of the location of the materials below the mean high-tide mark. No association with a particular household could be made at this time and therefore it would be difficult to yield important information regarding the history of California without provenience or association. The historic deposit lacks integrity and does not appear to meet the criteria for listing in the NRHP or the CRHR. (See Appendix B for the primary record for this resource.)

Remnants of 1940s House

The remnants of the 1940s house are located on the north side of Bel Marin Keys Road, on the opposite side of the road from Headquarters Hill. According to historic maps and personal communication with a local landowner (Webster pers. comm.), a house was built at this site in the 1940s and was torn down in the early 1990s.

The site consists of a former concrete patio and driveway area (feature 1), an ornamental pond (feature 2), and a fairly modern timber-lined pit (feature 3) that appears to have been constructed considerably later than the original house. This resource does not appear to meet any of the criteria for listing in the NRHP or in the CRHR. (See Appendix B for the primary record for this resource.)

Architecture

A total of ten architectural properties comprising 21 individual resources (buildings, structures, linear and landscape features) were surveyed and evaluated as part of this study. (See Figure 3 for location of architectural properties). Nine of the ten architectural properties are located in the project area and do not appear to meet the criteria for listing in the NRHP or the CRHR. The remaining architectural property (two ammunition bunkers) is located close to the project area (the proposed Bay Trail runs adjacent to the bunkers), and the bunkers were therefore assessed as part of this project. In 1993, PAR Environmental Services recommended the ammunition bunkers as eligible for the NRHP because they are contributors to the Hamilton Air Field Historic District (PAR Environmental Services 1993). As part of this study, Jones & Stokes revisited the two bunkers to assess their integrity and to determine whether the 1993

evaluations were still valid. This report finds that NRHP eligibility findings still pertain. In addition, the resources appear to meet the CRHR criteria.

Twentieth Century Reclamation Efforts

As early as 1876, reclamation efforts were underway in the project area. Between 1898 and 1914, additional levees and ditches were constructed. By 1935, the current system was in place (Dickens 1898; USGS 1914, 1916; Messner 1935). An overflow structure is located in the northern part of the BMKV parcel near Bel Marin Keys. The structure is nestled in an earthen slope and consists of board-formed concrete and steel rebar. There is also a tidal gate located in a wide canal directly north of Bel Marin Keys Boulevard. It is composed of board-formed concrete with a series of six steel check gates. It measures approximately 4 feet wide by 5 feet deep.

A system of levees and ditches is located throughout the project area. The levees are earthen features, and the ditches are earthen and concrete lined. The levees measure approximately 25 to 40 feet in width and line the perimeter of much of the project area. The ditches are approximately 22 feet wide and orient north-south and east-west throughout the project area. In addition to the levees and ditches, an approximately 100-foot canal was constructed as part of the system directly north of Bel Marin Keys Boulevard.

The levee and ditch system does not appear to meet the criteria for listing in the NRHP or the CRHR. The system was constructed in phases over the past 100 years and therefore is not directly associated with a particular time period or with any one particular persons or events that may have been important to the area or Northern California overall. In addition, the numerous changes to the system compromised the system's integrity. The levee and ditch system was initially constructed in the northern corner of the project area and gradually extended southeast until it was completed in the 1930s. Historic maps indicate that over the years, levees and ditches were newly constructed, filled in, or destroyed (Dickens 1898; USGS 1914, 1916, 1980; Messner 1935). The major destructive element to the system was the construction of the Bel Marin Keys development in the 1960s. The entire northern part of the system was destroyed by this development, and a new levee was constructed around the perimeter of the community. Because of a loss of integrity, the levee and ditch system does not appear to meet the NRHP or CRHR criteria. (See Appendix B for more information about this resource.)

Based on building methods and materials used, the Calpak overflow structure appears to have been constructed in the mid-twentieth century. It is located in the northern part of the BMKV parcel near Bel Marin Keys. The structure is nestled in an earthen slope and consists of board-formed concrete and steel rebar. Calpak most likely constructed the structure as part of its property improvement efforts in the 1930s and 1940s.

Although the overflow resource played an important role in local reclamation efforts, it is not known to be directly associated with significant people or events in the area or Northern California overall, and therefore does not appear to meet Criterion A or B of the NRHP or Criterion 1 or 2 of the CRHR. In addition, the structure as a water control feature is of simple design and does not display unique or distinct construction methods. As such, it does not appear

to meet NRHP Criterion C or CRHR Criterion 3. In summary, the Calpak overflow structure does not appear to meet the criteria for listing in the NRHP or the CRHR. (See Appendix B for more information about this resource.)

A tidal gate is located in a wide canal directly north of Bel Marin Keys Boulevard. It is composed of board-formed concrete with a series of six steel check gates. The structure does not appear on historic maps, and, based on construction methods and materials, it most likely was constructed in the late 1950s or early 1960s to assist in the drainage of area creeks (Webster pers. comm.). Although the structure performs an important function for area reclamation efforts, the tidal gate does not appear to be directly associated with important events or people in the area and therefore does not appear to meet Criterion A or B of the NRHP or Criterion 1 or 2 of the CRHR. Under Criterion C of the NRHP and Criterion 3 of the CRHR, the structure does not display unique construction methods. Under consideration of all criteria, the twentieth-century tidal gate does not appear to meet the NRHP or CRHR criteria. (See Appendix B for more information about this resource.)

Farm Complex

A house, barn, and shed sheltered by a eucalyptus grove are located in the north central part the BMKV parcel in the vicinity of Bel Marin Keys.

The house is a wood-frame building with gabled roof with wide eaves and horizontal plank-board siding. The barn is a long rectangular building with a gable roof with a moderate eave. The wood-frame structure features vertical plank-board siding. Corrugated metal sheets cover the walls and the roof. The shed is located between the house and the barn. It is a wood-frame building with a steep shed roof.

Based on historic maps and building materials used, the house and barn were mostly likely constructed in the 1930s by Calpak as part of its agricultural operation (Messner 1935; U.S. Geological Survey 1942). The shed appears to have been built within the past 50 years.

The house and barn do not appear to meet the criteria for listing in the NRHP or the CRHR. Although the complex played a useful role in Calpak's agricultural endeavors on the property as shelter and storage facilities, the two buildings are not known to be directly associated with events that have made a significant contribution to the history of the region overall; therefore, they do not appear to meet Criterion A of the NRHP or Criterion 1 of the CRHR. The residence and barn are not known to be associated with persons important to the community or Marin County overall; therefore, they do not meet Criterion B of the NRHP or Criterion 2 of the CRHR. The structures do not display distinctive characteristics of a type, period, or method of construction and therefore do not appear to meet Criterion C of the NRHP or Criterion 3 of the CRHR. In addition, both the house and barn are heavily deteriorated, with much of the siding, doors, windows, etc., missing. The shed also does not appear to be eligible for the NRHP or the CRHR because it does not meet the exceptional-significance criteria established for recently constructed properties. Under consideration of all criteria, as well as integrity, the barn/house/shed complex does not appear to meet the criteria for listing in the NRHP or the CRHR.

The eucalyptus trees located by the complex were most likely planted as a windbreak when the buildings were initially constructed. Eucalyptus trees were commonly planted for this purpose throughout California as early as the 1850s. As historic landscape features associated with a property that lacks significance, the trees lack historical significance and therefore do not appear to meet the criteria for listing in the NRHP or the CRHR (See Appendix B for more information about these resources).

Old Pump House

A pump house is located along the eastern boundary of the project area near a levee by San Pablo Bay. The pump house is a wood-frame structure sitting on a wood platform that is supported by a timber frame. The building is sided with corrugated metal sheets. Two long steel pipes travel from the pump house to the levee and out to the bay.

The pump house was constructed between 1910 and 1914 as part of early reclamation efforts (U.S. Geological Survey 1914). Although John Ferris undertook many drainage improvements on his property in the late 1800s and early 1900s, it is unlikely that he is responsible for the pump house since he was residing in England by the turn of the twentieth century. It is more probable that Louis Friedlander and F.K. Houston, who bought the property in 1912, built the structure (Shannon 1992).

The pump house is part of the property's reclamation system that was constructed in phases over time, and therefore is not directly associated with a particular period or with a particular time period or with any one particular person or events who may have been important to the area or Northern California overall. For this reason the pump house does not appear to meet Criterion A of the NRHP or Criterion 1 of the CRHR. The pump house does not appear to have a direct association with any person or persons significant to area history and therefore does not appear to meet Criterion B of the NRHP or Criterion 2 of the CRHR. Under Criterion C of the NRHP and Criterion 3 of the CRHR, the pump house is a common example of its type constructed in the early twentieth century throughout the area, and notably the North Bay region. In summary, the pump house does not appear to meet the criteria for listing in the NRHP or the CRHR. (See Appendix B for more information about this resource.)

Barn

A large wood-frame rectangular barn is located in a eucalyptus grove directly northeast of Pacheco Pond. The barn measures approximately 46 by 100 feet and is sided with horizontal plank boards covered with corrugated metal sheets. A large sliding double door is located on the front elevation. The rear elevation is heavily damaged. Numerous eucalyptus trees, both historic and recent growth, grow in close proximity to the barn.

According to long-time resident Ron Webster, the barn was constructed in the 1940s and was originally part of a grain storage complex located just east of Headquarters Hill. Calpak most likely constructed the complex (comprising barns and silos) as part of its agricultural operations. In the early 1960s, the complex, with the exception of the barn, was demolished to make room for the Bel Marin Keys housing development. During this period, the barn was

moved to its present location and continues to function as a hay storage facility (Webster pers. comm.).

As a moved structure, the barn does not appear to meet the criteria for the NRHP. Although the barn played an important role in the agricultural development of the property as a hay storage facility, it does not appear to have played a significant role in the development of the Marin area or Northern California overall, and therefore does not appear to meet Criterion 1 of the CRHR. The barn has no direct association with an important person or persons in Northern California and therefore does not meet Criterion 2 of the CRHR. The barn is a typical, wood-frame structure that does not display unique construction methods and as such does not meet Criterion 3 of the CRHR. In summary, because it is a moved structure and because it does not appear to meet Criterion 1, 2, or 3 of the CRHR, the barn does not appear to be eligible for NRHP or CRHR listing.

The eucalyptus trees located near the barn most likely were planted as a windbreak. Eucalyptus trees were commonly planted for this purpose throughout California as early as the 1850s. These trees were likely planted in the early to mid-twentieth century when buildings were first constructed or located in the vicinity. As historic landscape features associated with a structure that lacks significance, the trees lack historical significance and therefore do not appear to meet the criteria for listing in the NRHP or the CRHR. (See Appendix B for more information about these resources.)

Air Force Antenna Complex

The remnants of an Air Force antenna field are located northwest of the rifle range. The site is accessed by a paved road and includes an operations building, a generator building, and seven 50-foot tall poles topped by antennas.

Hamilton Air Force Base constructed the antenna complex between 1958 and 1959 (U.S. Geological Survey 1958, 1959). The buildings comprising the antenna complex do not appear to meet the criteria for NRHP or CRHR eligibility because they are less than 50 years old and do not meet the exceptional-significance criteria established for recently constructed properties. (See Appendix B for more information about this resource.)

Air Force Rifle Range

A former rifle range (originally part of Hamilton Air Force Base) is located in the southeast corner of the project area near San Pablo Bay. The range consists of a target range, ammunition building, administration building, shed, and a target practice field.

According to historic maps, the range was built in increments starting in the late 1950s through the early 1980s (U.S. Geological Survey 1958, 1959, 1968, 1980). The rifle range does not appear to be eligible for listing in the NRHP or CRHR because it is less than 50 years old and does not meet the exceptional-significance criteria established for recently constructed properties. (See Appendix B for more information about these resources.)

New Pump House

A concrete pump house is located west of the firing range. The building does not appear on a 1980 map and most likely was constructed within the last 10 years (U.S. Geological Survey 1980). It does not appear to be eligible for listing in the NRHP or the CRHR because it does not meet the criteria of exceptional significance for recently constructed buildings. (See Appendix B for more information about this resource.)

Ammunition Bunkers

Two concrete ammunition bunkers are located immediately southwest of Perimeter Road in the HAAF parcel and near a portion of the proposed Bay Trail extension. Each bunker is buried in the base of a partially human-made hill known as Reservoir Hill or Ammo Hill. Hamilton Air Force Base constructed the two bunkers (in addition to several others) as ammunition magazines during World War II (PAR Environmental Services 1993). Neither of these bunkers is within the APE.

In 1993, PAR Environmental Services evaluated the resources at Hamilton Air Force Base for NRHP eligibility. As part of its study, PAR Environmental Services defined the Hamilton Air Force Base Historic District. The two ammunition bunkers were considered contributors to the Hamilton Air Force Base Historic District (PAR Environmental Service 1993). As part of this study, Jones & Stokes revisited the bunkers to assess their integrity and to determine whether the 1993 evaluations were still valid. This report finds that NRHP eligibility findings still pertain. In addition, the bunkers appear to meet the CRHR criteria. However, since the bunkers are not within nor immediately adjacent to the APE for the proposed project, they would not be affected.

CONCLUSIONS AND RECOMMENDATIONS

Archaeological Resources

The historic archaeological resources, including the historic deposit on San Pablo Bay and the historic remnants of the demolished 1940s house documented within this report, do not meet the criteria for listing in the NRHP or the CRHR. According to the results of the archaeological and architectural investigation and the project as currently proposed, it does not appear that the project will result in an adverse affects on any archaeological resources; therefore, no further investigation is necessary.

The Department of Parks and Recreation (DPR) 523 primary record forms for all historic archaeological resources are provided in Appendix B.

Following concurrence from the State Historic Preservation Office (SHPO) that no NRHP-eligible properties exist within the APE, the Corps may proceed with the project and is not required to take any further actions regarding the cultural resources under Section 106.

Architectural Resources

Of the ten architectural properties documented in this report, it appears that one property meets the criteria for listing in the NRHP or the CRHR, but this property is not within the proposed APE. Based on the current project description, the proposed project would not result in adverse effects or significant impacts on any architectural property; therefore, no further investigation is recommended. Also, no further treatment of ineligible cultural resources is recommended.

DPR 523 forms for all architectural properties are provided in Appendix B.

Following SHPO concurrence that no NRHP-eligible properties exist within the APE, the Corps may proceed with the project and is not required to take any further actions regarding the cultural resources under Section 106.

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Appendix A. Native American Correspondence

FAXED 12/20/01

☐ Mail ☒ Fax ☐ Overnight ☐ Courier

To: Debbie Pilas-Treadway
Native American Heritage Commission
915 Capitol Mall, #364
Sacramento, CA 95814
(916) 657-5390

Date: December 20, 2001
Client: California Coastal Commission/Army Corps or Engineers
Project: Bel Marin Keys
Project #:

Subject: Cultural resources studies for Bel Marin Keys Wetlands Restoration Project, Marin County, CA

☒ 1 Enclosure(s) ☐ Per your request ☒ For your review ☒ For your information/use
☐ Other

2 Total pages faxed Original will follow by mail ☐ yes ☐ no

Message:

Jones & Stokes is conducting cultural resources studies for a project in Novato, Marin County, CA. The proposed project location is indicated on the enclosed Novato and Petaluma Point 7.5' USGS quadrangle.

A record search was conducted at the Northwest Information Center at Sonoma State University on December 19, 2001. The project area will be surveyed by an archaeologist within the next month. Based on both the archival records, several cultural resources have been identified near the project area but no prehistoric sites have been located within the project area. This project is a wetlands restoration project, all of the land within the proposed project area will ultimately be completely flooded.

We are seeking comments from Native American representatives and would greatly appreciate your sending us a list of Native American representatives that might be interested in activities in this area. Also, please consult you inventory of sacred lands.

Thank you for your cooperation in this matter. Please call me if you have any questions.510.433.5968

From: Barbra Siskin cc:

268 Grand Avenue • Oakland, CA 94610-4724 • tel. 510/433-8962 • fax 510/433-8961
www.jonesandstokes.com

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390
Web Site www.nahc.ca.gov

December 28, 2001

Ms. Barbra Siskin
Jones and Stokes
268 Grand Avenue
Oakland, California 94610-4724

RE: Proposed Bel Marin Keys Wetlands Restoration Project, Marin County.

Sent by Fax: (510) 433-8961
Pages Sent: 2

Dear Ms. Siskin:

A record search of the sacred lands file has failed to indicate the presence of Native American cultural resources in the immediate project area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Enclosed is a list of Native Americans individuals/organizations who may have knowledge of cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

NATIVE AMERICAN CONTACTS
Marin County
December 28, 2001

MARIN COUNTY NA LIST

:ant Smith
4309 Chico Ave
Santa Rosa, CA 95401
(707) 528 -2584
Coast Miwok
Pomo

Kathleen Smith
1778 Sunnyvale Avenue
Walnut Creek, CA 94596
(925) 938-6323
Pomo
Coast Miwok

The Federated Indians of Graton Rancheria
Gene Buvelot
1025 Susan Way
Novato, CA 94947
(415) 883-9215 Home
coastmiwok@aol.com - email
Coast Miwok

Ya-Ka-Ama
6215 Eastside Road
Forestville, CA 95436
(707) 887-1541
Pomo
Miwok
Wappo

The Federated Indians of Graton Rancheria
Greg Sarris, Chairperson
P.O. Box 481
Novato, CA 94948
(707) 763-6143
coastmiwok@aol.com - email
Coast Miwok

COPY

The Federated Indians of Graton Rancheria
Tim Campbell, Cultural Resources Officer
PO Box 481
Novato, CA 94948
(707) 763-6143 Office
coastmiwok@aol.com - email
Coast Miwok

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regards to the cultural assessment for the proposed Bel Marin Keys Wetlands Restoration project, Marin County.

Jones & Stokes

January 3, 2002

COPY

Grant Smith
4309 Chico Avenue
Santa Rosa, Ca 95401

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Grant:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

A records search for this property was conducted at the Central California Information Center of the California Historical Resources Information System in September, 2001, which indicates that there are several known archaeological resources near the project area, but none are located directly within the project area boundaries. Jones & Stokes archaeologists will conduct a survey of the area that is not already underwater. Jones & Stokes has also submitted a query to the Native American Heritage Commission's sacred lands database.

We would also like to be notified of any information you have regarding cultural resources that may exist on or near this area. If you have any information regarding cultural resources on or near this parcel, please contact me at 510.433.5968.

Sincerely,

Barbra Siskin

Barbra Siskin
Archaeologist

Attachment

268 Grand Avenue · Oakland, CA 94610 · tel. 510 433.8962 · fax 510 433.8961
www.jonesandstokes.com

Jones & Stokes

COPY

January 3, 2002

Kathleen Smith
1778 Sunnyvale Avenue
Walnut Creek, Ca 94596

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Kathleen:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

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Sincerely,

Barbra Siskin

Barbra Siskin
Archaeologist

Attachment

268 Grand Avenue · Oakland, CA 94610 · tel. 510 433.8962 · fax 510 433.8961
www.jonesandstokes.com

Jones & Stokes

January 3, 2002

COPY

Gene Buvelot
The Federated Indians of Graton Rancheria
1025 Susan Way
Novato, Ca 94947

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Gene:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

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Sincerely,

Barbra Siskin

Barbra Siskin
Archaeologist

Attachment

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Jones & Stokes

COPY

January 3, 2002

Ya-Ka- Ama
6215 Eastside Raod
Forestville, Ca 95436

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Ya-Ka-:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

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Sincerely,

Barbra Siskin
Archaeologist

Attachment

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Jones & Stokes

COPY

January 3, 2002

Ya-Ka- Ama
6215 Eastside Raod
Forestville, Ca 95436

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Ya-Ka-:

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Sincerely,

Barbra Siskin
Archaeologist

Attachment

268 Grand Avenue · Oakland, CA 94610 · tel. 510 433.8962 · fax 510 433.8961
www.jonesandstokes.com

Jones & Stokes

COPY

January 3, 2002

Greg Sarris
Chairperson
The Federated Indians of Graton Rancheria
P.O. Box 481
Novato, Ca 94948

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Greg:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

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Sincerely,

Barbra Siskin
Archaeologist

Attachment

268 Grand Avenue · Oakland, CA 94610 · tel. 510 433.8962 · fax 510 433.8961
www.jonesandstokes.com

Jones & Stokes

January 3, 2002

COPY

Tim Campbell
Cultural Resources Officer
The Federated Indians of Graton Rancheria
P.O. Box 481
Novato, Ca 94948

Subject: Cultural Resources Investigation for Bel Marin Keys Wetlands Restoration Project, City of Novato, Marin County

Dear Tim:

Jones & Stokes is conducting a cultural resources investigation for a 1600 acre parcel in Novato, Marin County. The project area is slated for wetlands restoration and will ultimately be inundated. The area encompassed within the project area is indicated on the enclosed copy of the Petaluma Point and Novato 7.5' USGS quadrangles.

A records search for this property was conducted at the Central California Information Center of the California Historical Resources Information System in September, 2001, which indicates that there are several known archaeological resources near the project area, but none are located directly within the project area boundaries. Jones & Stokes archaeologists will conduct a survey of the area that is not already underwater. Jones & Stokes has also submitted a query to the Native American Heritage Commission's sacred lands database.

We would also like to be notified of any information you have regarding cultural resources that may exist on or near this area. If you have any information regarding cultural resources on or near this parcel, please contact me at 510.433.5968.

Sincerely,

Barbra Siskin
Archaeologist

Attachment

268 Grand Avenue · Oakland, CA 94610 · tel. 510 433.8962 · fax 510 433.8961
www.jonesandstokes.com

Appendix B. DPR 523 Forms

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code
Other
Review Code | Reviewer | Date

Page 1 of 2 | *Resource Name or #: (Assigned by Recorder) Historic Trash Dump P-21-2579

P1. Other Identifier:

*P2. Location: x Not for Publication ☐ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ ¼ of Sec ; DMA B.M

c. San Jose (Pacheco) Land Grant City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone 10 ; 10545226 mE/ 4213484 mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

The historic trash deposit is located approximately 300 yards south of the pump house, on the outboard side of a manmade levee and riprap. The site is located below the mean high tide line and is covered partially by water of San Pablo Bay even at very low tide. At high tide the site is covered completely by approximately 10-12 feet of water.

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The historic trash deposit is clearly a secondary deposit as it is comprised of numerous types of household items and the site location is located below the mean high tide, on the outboard side of a manmade levee.

The deposits includes: clear, brown, green, cobalt, opaque green, and aqua glass fragments; white porcelain, ceramic, and terra cotta fragments; white porcelain wire insulator, several spoons and other utensils, portions of a broken white porcelain toilet bow and portions of a pedastal sink; medicine bottles; numerous pieces of white ceramic dishware; terra cotta pipe fragments; large deposits of rusted, melted, burned metal with various glass and metal household items fused into the metal.

*P3b. Resource Attributes: (List attributes and AH4- historic dump/trash scatter

*P4. Resources present: ☐ Building ☐ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects)

P5b. Description of Photo: (View, date, accession #) None

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
Approximately 1920's-1940's

*P7. Owner and Address:
California State Coastal
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and
Barbra Siskin
Jones & Stokes
268 Grand Ave. Oakland, CA 94610

*P9. Date Recorded:

*P10. Survey Type: (Describe)
Pedestrian survey

*P11. Report Citation: (Cite survey report and other sources, or enter "none.")
Jones & Stokes 2002. Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, California.

*Attachments: NONE ☒ Location Map ☐ Sketch Map ☐ Continuation Sheet ☐ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

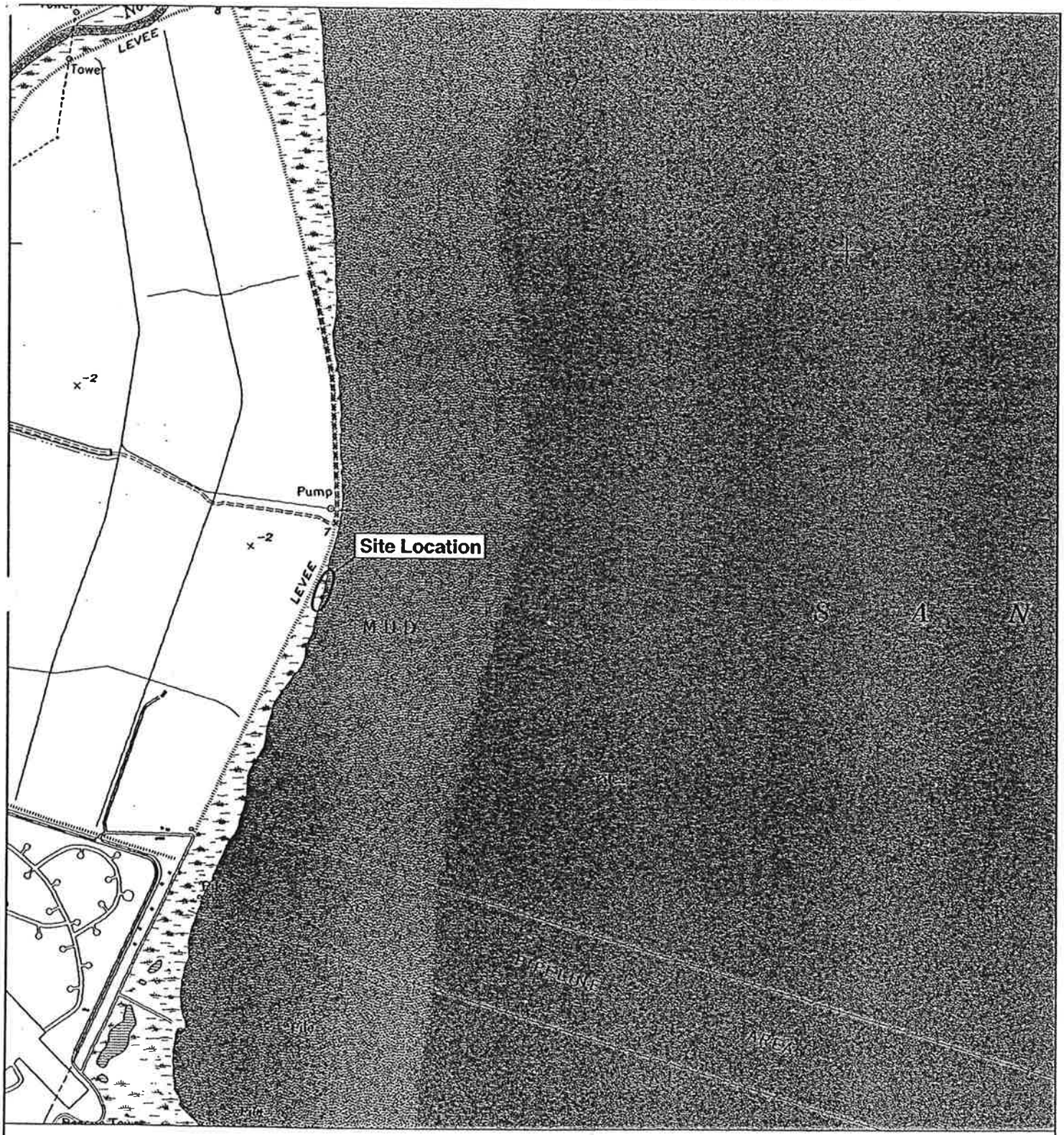
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI #
Trinomial

Page 2 of 2 *Resource Name or #: Historic Trash Deposit

*Map Name: Petaluma Point, California *Scale: 1:24,000 (1"=2,000') *Date of Map: PR 1980





0 1,000 2,000 3,000 4,000 5,000

feet

Scale = 1:24,000

Base map: USGS 7.5'-series Petaluma Point, California, quadrangle (1959, Photorevised 1980)



DPR 523J (1/95)

*Required Information

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code
Other
Review Code | Reviewer | Date

Page 1 of 5 | *Resource Name or #: (Assigned by Recorder) J&S BMK-1 P-21-2580

P1. Other Identifier:

*P2. Location: x Not for Publication ☐ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ ¼ of Sec ; DMA B.M

c. San Jose (Pacheco) Land Grant City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone 10 ; mE/ mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

The remnants of a 1940s home are located on top of Headquarters Hill, on the north side of Bel Marin Keys Road. The elevation is approximately 40 feet. Headquarters Hill is a small but fairly prominent hill surrounded but flat agricultural lands, which sits below sea level. The area surrounding the site is heavily vegetated but easily accessible and close to Bel Marin Keys Road.

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

According to historic maps (1942 Petaluma 15' USGS Quagrangle) and personal communication with a local landowner (personal communication with Ron Webster August 2002) a house was built at this site in the 1940s and was torn down in the early 1990s. Apparently the concrete pad (feature 1) was a patio and driveway area, the pond was part of the ornamental landscaping (feature 3) and the timber lined pit is considerably more recent that the original construction of the house and is in fact fairly modern (feature 2).

*P3b. Resource Attributes: (List attributes and codes) AH3- Landscaping Features and AH1- unknown (timber lined pit)

*P4. Resources present: ☐ Building ☐ Structure ☒ Object ☒ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects)

P5b. Description of Photo: (View, date, accession #) See photo page - Attached

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
Approximately 1940's

*P7. Owner and Address:
California State Coastal
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and
Shahira Ashkar
Jones & Stokes
268 Grand Ave. Oakland, CA 94610

*P9. Date Recorded:

*P10. Survey Type: (Describe)
Pedestrian survey

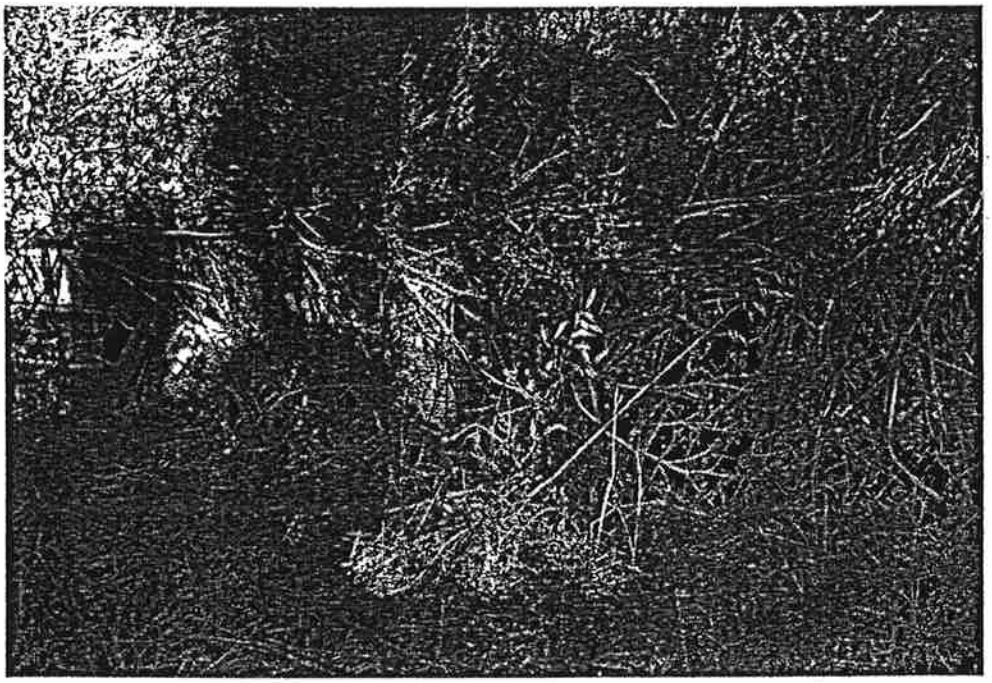
*P11. Report Citation: (Cite survey report and other sources, or enter "none.")
Jones & Stokes 2002.Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, California.

*Attachments: NONE ☒ Location Map ☒ Sketch Map ☐ Continuation Sheet ☐ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List): Photo page

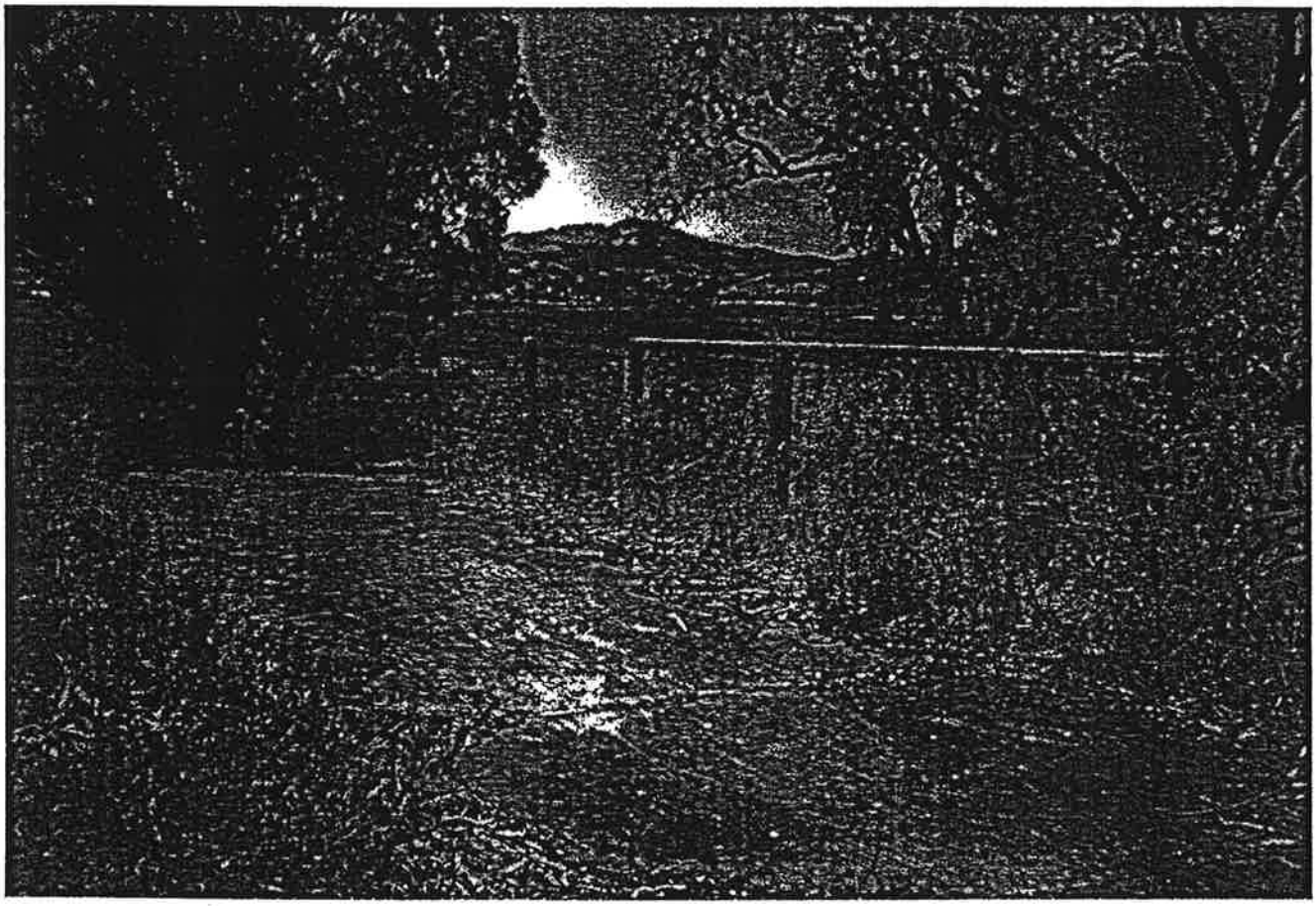
DPR 523A (1/95) *Required Information



J&S-BMK-1, Feature 1
Concrete patio, facing northwest



J&S-BMK-1, Feature 2
Timber-lined pit, facing north



J&S-BMK-1, Feature 3
Concrete pond, facing west

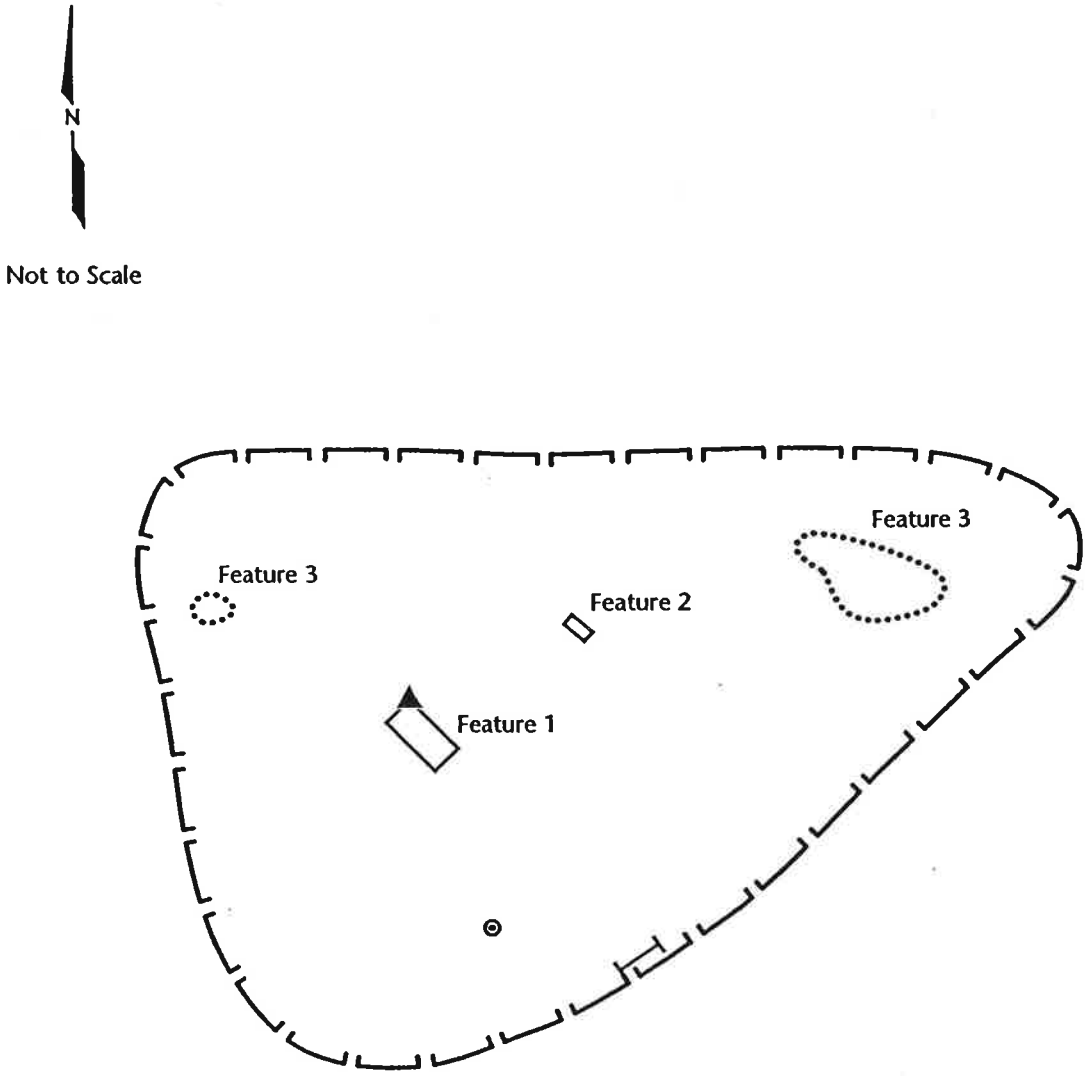
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary #
HRI #
Trinomial

Page 4 of 5 *Resource Name or #: (assigned by recorder) J&S-BMK-1

Drawn By: S. Ashkar *Scale: (see bar scale below) *Date of Map: July 2002



NOTE: Include bar scale and north arrow.

*Required Information

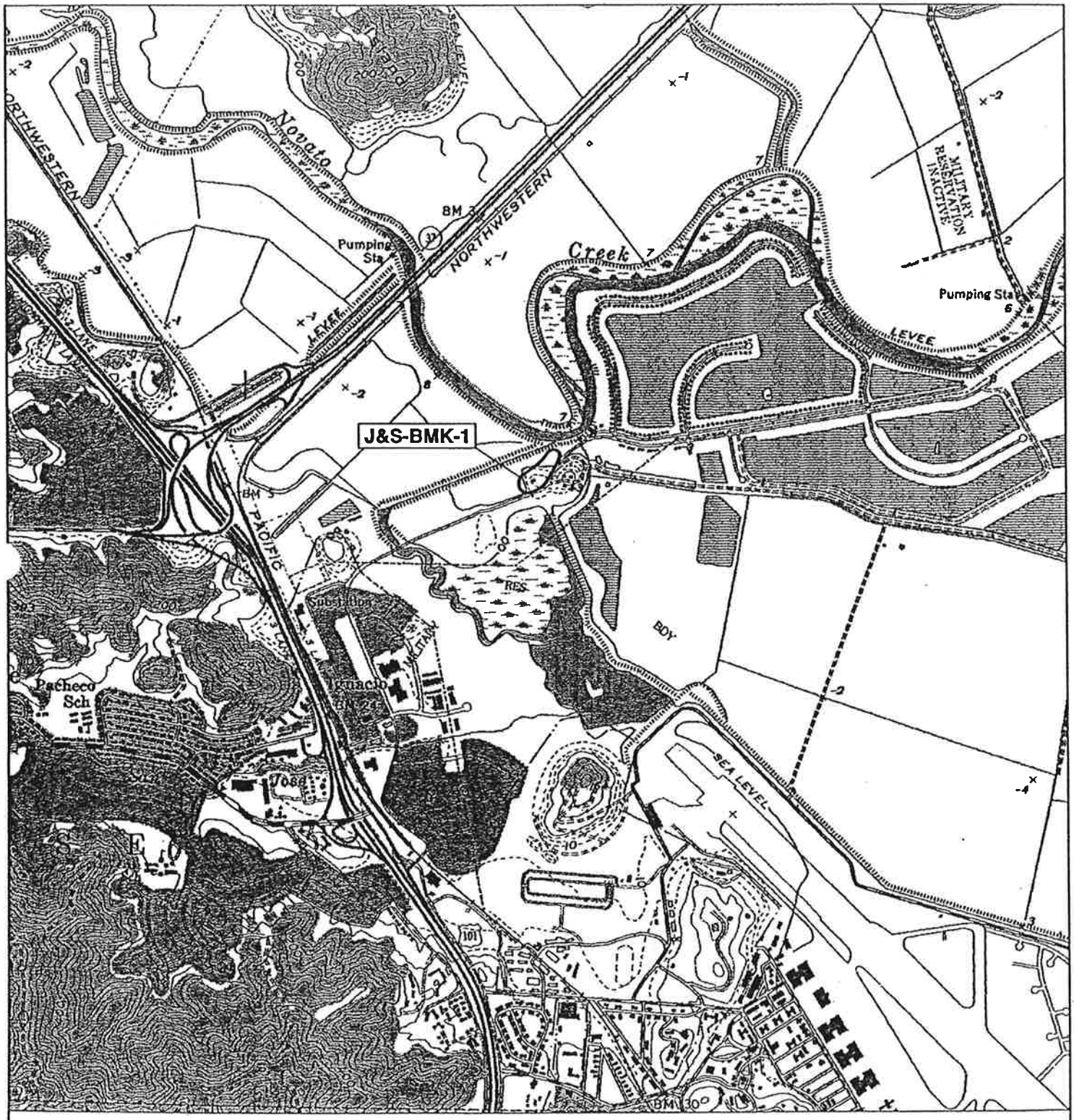
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI #
Trinomial

Resource Name or #: J&S-BMK-1

Map Name: Novato, California *Scale: 1:24,000 (1"=2,000') *Date of Map: PR 1980



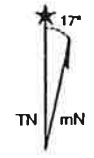


0 1,000 2,000 3,000 4,000 5,000

feet

Scale = 1:24,000

Base map: USGS 7.5-Minute Series Novato, California, Quadrangle (1954, Photorevised 1980)



*Required Information

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 6 *Resource Name or #: (Assigned by Recorder) Levee and Ditch System P-21-2586

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato and Petaluma Point Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: ; mE/ mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

UTM: 10 541721E 4214586N; 10544815E 4216019N; 10544652E 4212270N

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A system of levees and ditches is located throughout the project area. The levees are earthen features, the ditches are earthen, and concrete lined. The levees measure approximately twenty-five to forty feet in width and line the perimeter of much of the project area. The ditches are approximately twenty-five feet wide and orient north-south and east-west throughout the project area. In addition to the levees and ditches, an approximately 100-foot canal was constructed as part of the system directly north of Bel Marin Keys Boulevard.

*P3b. Resource Attributes: (List attributes and codes) HP20 Canal/Aqueduct

*P4. Resources present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)

5a. Photograph or Drawing (Photograph required for buildings, structures, and objects)

P5b. Description of Photo: (View, date, accession #)
See linear feature form
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca 1876 - 1935

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☒ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☒ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

*Resource Name or # (Assigned by recorder) Levee and Ditch System

B1. Historic Name:

B2. Common Name:

B3. Original Use: Reclamation B4. Present Use: Reclamation

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
Ca 1876 to 1935. Substantially altered in 1960s with construction of Bel Marin Keys development.

*B7. Moved? [X] No [ ] Yes [x] Unknown Date: Original Location:

*B8. Related Features:
canal

B9a. Architect: N/A b. Builder: N/A

*B10. Significance: Theme: Water Reclamation Area: Marin County, California

Period of Significance: 1935 Property Type: Drainage Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

As early as 1876 reclamation efforts were underway in the project area. Between 1898 and 1914 additional levees and ditches were constructed. By 1935, the current system was in place (Dickens 1898; USGS 1914, 1916; Messner 1935).

The levee and ditch system does not appear to meet the criteria for listing in the NRHP or the CRHR. The system was constructed in phases over the past one hundred years and therefore is not directly associated with a particular time period or with any one particular persons or events that may have been important to the area or Northern California overall. In addition, the numerous changes to the system compromised the system's integrity. The levee and ditch system was initially constructed in the northern corner of the project area and gradually extended southeast until it was completed in the 1930s. Historic maps indicate that over the years levees and ditches were newly constructed, filled in, or destroyed (Dickens 1898: USGS 1914, 1916; Messner 1935: USGS 1980). The major destructive element to the system was the construction of the Bel Marin Keys development in the 1960s. Through this development the entire northern part of the system was destroyed and a new levee was constructed around the perimeter of the community. Because of a loss of integrity, the levee and ditch system does not appear to meet the NRHP or CRHR criteria.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes 2002. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:

*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

DEPARTMENT OF PARKS AND RECREATION — HRI #
LINEAR FEATURE RECORD — Trinomial

Page 3 of 6 *Resource Name or #: (Assigned by Recorder) Levee and Ditch System

L1. Historic And/or Common Name:

L2a. Portion Described: ☐ Entire Resource ☐ Segment ☒ Point Observation Designation: P1

L2b. Location of point or segment: (Provide UTM coordinates, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map)
10545003E 4213819N

L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

The levees are earthen features, the ditches are both earthen, and concrete lined. The levees measure approximately twenty-five to forty feet in width and line the perimeter of much of the project area. The ditches are approximately twenty-five feet wide and orient north-south and east-west throughout the project area. In addition to the levees and ditches, an approximately 100-foot canal

L4. Dimensions: (In feet for historic features and meters for prehistoric features)
a. Top Width 25 feet
b. Bottom Width 20 feet
c. Height or Depth 10 feet
d. Length of Segment

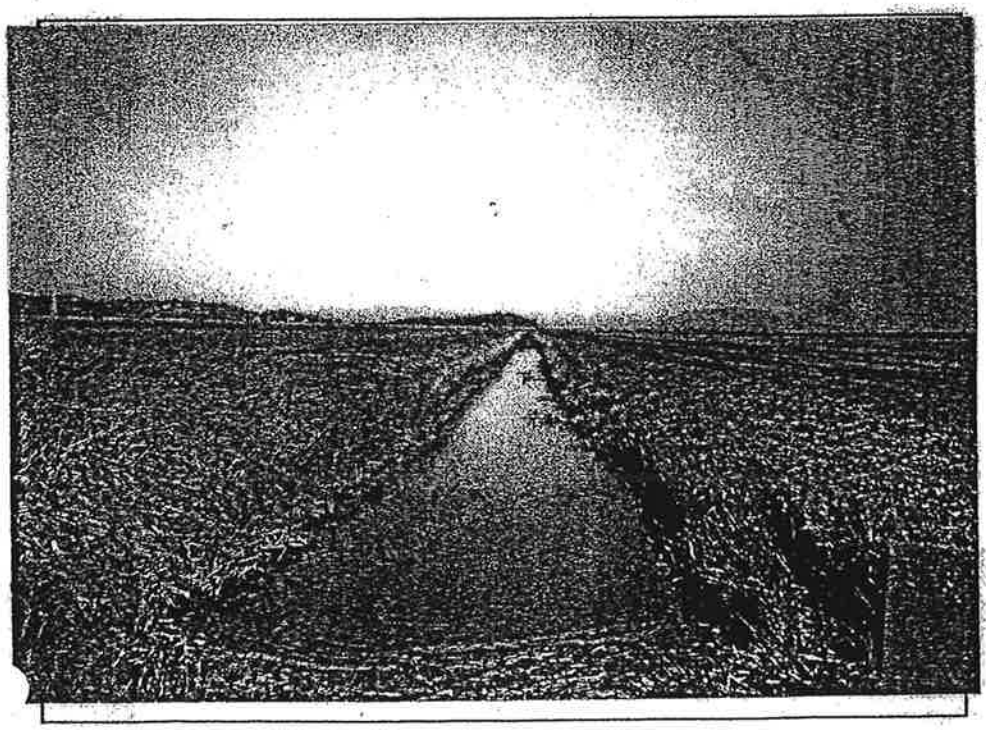
L4e. Sketch of Cross-Section (include scale) Facing: Northeast



L5. Associated Resources:
None

L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)
Seasonal grasses, brambles, ice plant, oat/hay farming in vicinity

L7. Integrity Considerations:
See Significance Statement on Building, Structure, and Object Record



L8b. Description of Photo, Map, or Drawing (View, scale, etc.)
Facing Northeast

L9. Remarks:

L10. Form Prepared by: (Name, affiliation, and address)
Madeline Lanz
Jones & Stokes
2600 V Street
Sacramento, CA 95816

L11. Date: 8/14/02

DPR 523E (1/95)

DEPARTMENT OF PARKS AND RECREATION
LINEAR FEATURE RECORD

HRI #
Trinomial

Page 4 of 6 *Resource Name or #: (Assigned by Recorder) Levee and Ditch System

L1. Historic And/or Common Name:

L2a. Portion Described: ☐ Entire Resource ☐ Segment ☒ Point Observation Designation: P2

. Location of point or segment: (Provide UTM coordinates, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map)
10543519E 4212580N

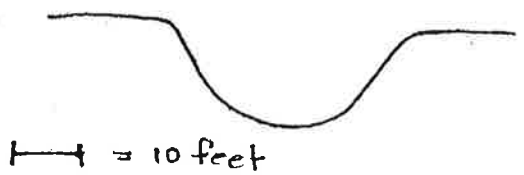
L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

The levees are earthen features, the ditches are both earthen, and concrete lined. The levees measure approximately twenty-five to forty feet in width and line the perimeter of much of the project area. The ditches are approximately twenty-five feet wide and orient north-south and east-west throughout the project area. In addition to the levees and ditches, an approximately 100-foot canal

L4. Dimensions: (In feet for historic features and meters for prehistoric features)
a. Top Width 20 feet
b. Bottom Width 15-20 feet
c. Height or Depth 10 feet
d. Length of Segment

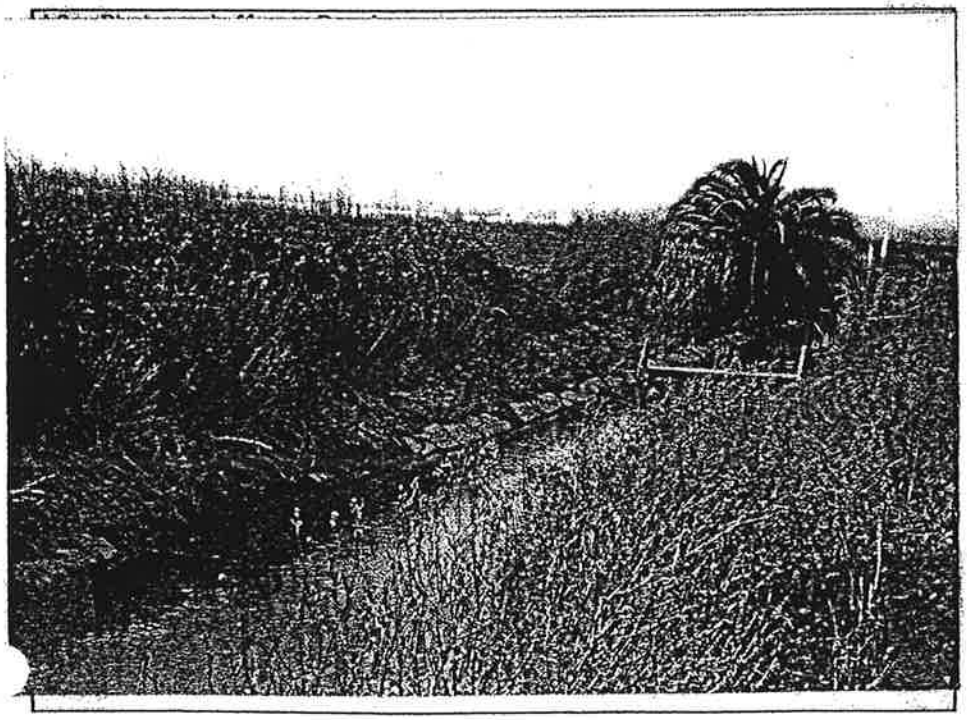
L5. Associated Resources:
None

L4e. Sketch of Cross-Section (include scale) Facing: Northwest



L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)
Seasonal grasses, brambles, ice plant, oat/hay farming in vicinity

L7. Integrity Considerations:
See Significance Statement on Building, Structure, and Object Record



L8b. Description of Photo, Map, or Drawing (View, scale, etc.)
Facing Northwest

L9. Remarks:

L10. Form Prepared by: (Name, affiliation, and address)
Madeline Lanz
Jones & Stokes
2600 V Street
Sacramento, CA 95816

L11. Date: 8/14/02

DPR 523E (1/95)

DEPARTMENT OF PARKS AND RECREATION HRI #
LINEAR FEATURE RECORD Trinomial

Page 5 of 6 *Resource Name or #: (Assigned by Recorder) Levee and Ditch System

L1. Historic And/or Common Name:

L2a. Portion Described: ☐ Entire Resource ☐ Segment ☒ Point Observation Designation: P3

. Location of point or segment: (Provide UTM coordinates, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map)
10541284E 4214510N

L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

The levees are earthen features, the ditches are both earthen, and concrete lined. The levees measure approximately twenty-five to forty feet in width and line the perimeter of much of the project area. The ditches are approximately twenty-five feet wide and orient north-south and east-west throughout the project area. In addition to the levees and ditches, an approximately 100-foot canal

L4. Dimensions: (In feet for historic features and meters for prehistoric features)
a. Top Width 100 feet
b. Bottom Width 100 feet
c. Height or Depth 35 feet
d. Length of Segment

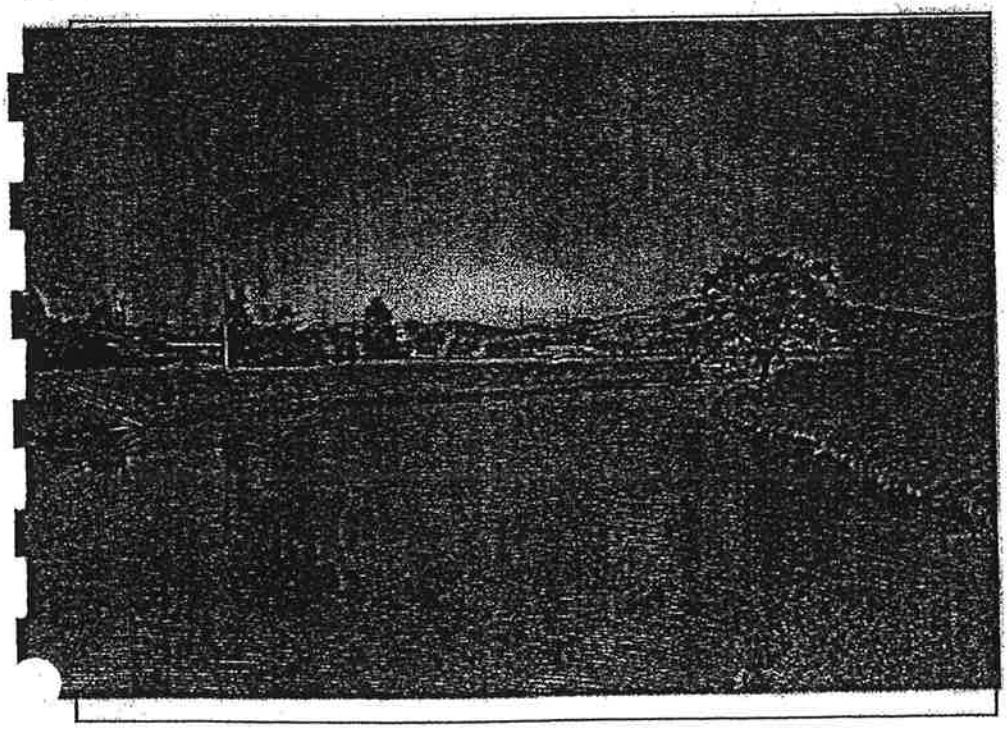
L5. Associated Resources:
None

L4e. Sketch of Cross-Section (include scale) Facing: Northeast



L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)
Seasonal grasses, brambles, ice plant, oat/hay farming in vicinity

L7. Integrity Considerations:
See Significance Statement on Building, Structure, and Object Record



L8b. Description of Photo, Map, or Drawing (View, scale, etc.)
Facing Northeast

L9. Remarks:

L10. Form Prepared by: (Name, affiliation, and address)
Madeline Lanz
Jones & Stokes
2600 V Street
Sacramento, CA 95816

L11. Date: 8/14/02

DPR 523E (1/95)

DEPARTMENT OF PARKS AND RECREATION

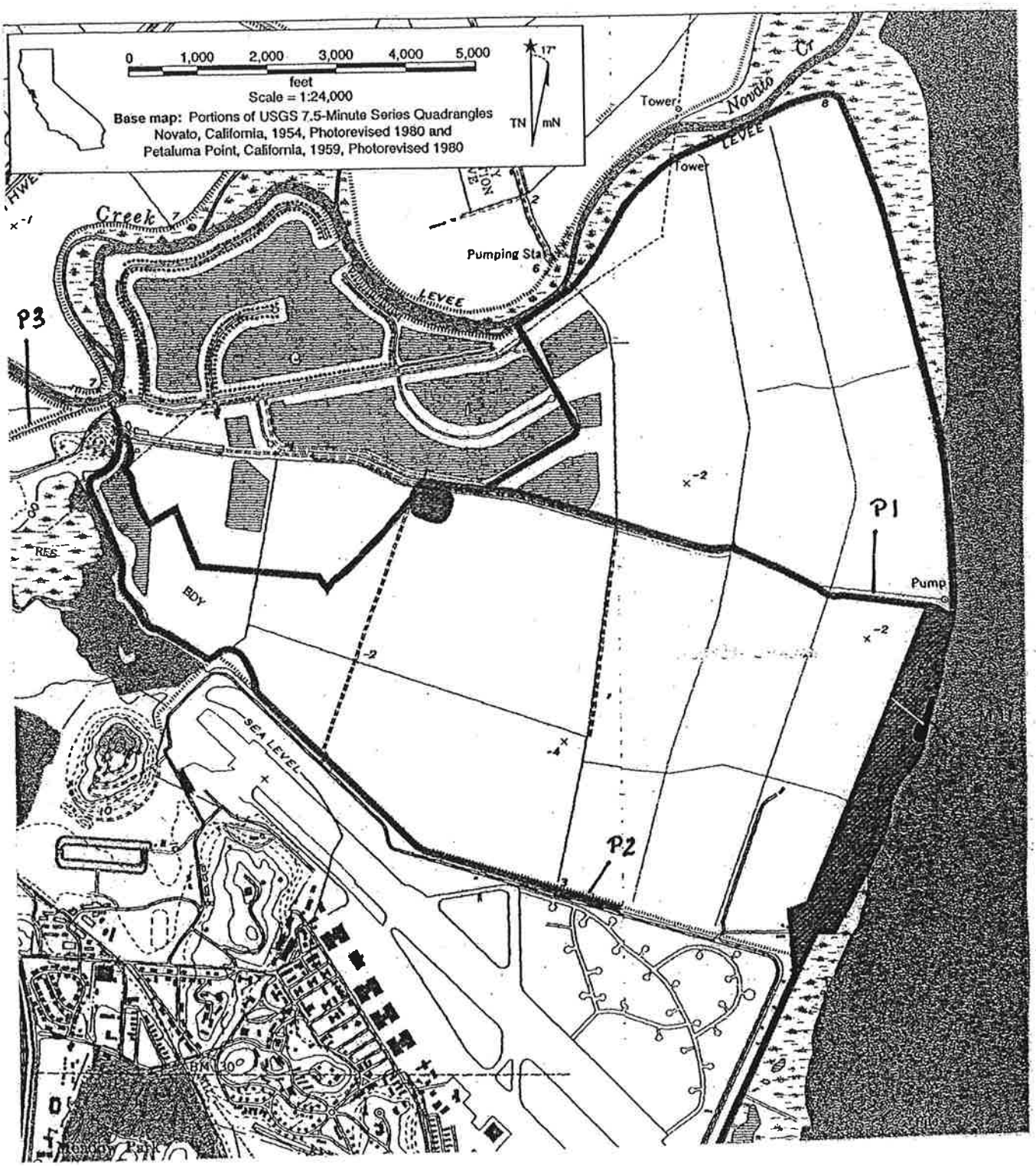
LOCATION MAP

HRI #

Trinomial

Page 6 of 6 *Resource Name or #: (Assigned by Recorder) Levee and Ditch System

*Map Name: Novato and Petaluma Point, USGS topo *Scale: 1:24 *Date of Map: 1980



*R 523J (1/95)

*Required Information

DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

HRI #

Trinomial

NRHP Status Code 6

Other Listings

Review Code Reviewer Date

*Resource Name or #: (Assigned by Recorder) Overflow Structure P-21-2581

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 543494 mE/ 4214957 mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

An overflow structure is located in the northern part of the BMKV parcel near Bel Marin Keys. The structure is nestled in an earthen slope and is comprised of board-formed concrete and steel rebar. It measures approximately four feet wide and five feet deep.

*P3b. Resource Attributes: (List attributes and codes) HP20 Canal/Aqueduct

*P4. Resources present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects)

P5b. Description of Photo: (View, date, accession #) No Photograph Available

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both ca 1930s-40s

*P7. Owner and Address: California State Coastal Conservancy 1330 Broadway Suite 1100 Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address) Madeline R. Lanz, Jones & Stokes 2600 V Street Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe) Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record

☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record

☐ Artifact Record ☐ Photograph Record ☐ Other (List):

*Required Information

DEPARTMENT OF PARKS AND RECREATION — HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Overflow Structure

B1. Historic Name:

B2. Common Name:

B3. Original Use: Water overflow B4. Present Use: Water overflow

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
Built during 1930s - 1940s

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: N/A b. Builder: N/A

*B10. Significance: Theme: Water Reclamation Area: Marin County, California

Period of Significance: 1930-1950 Property Type: Drainage Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

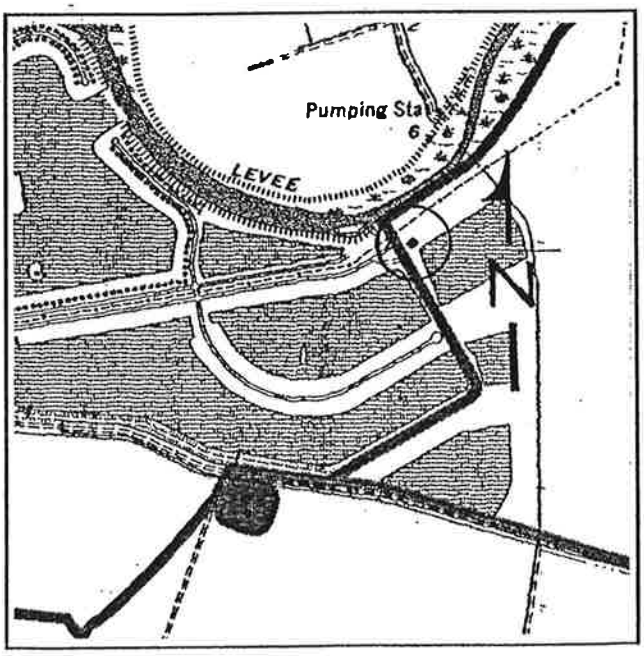
Based on building methods and materials used, the overflow structure appears to have been constructed in the mid-twentieth century. Calpak most likely constructed the structure as part of its property improvement efforts in the 1930s and 1940s.

Although the resource played an important role in local reclamation efforts, it is not known to be directly associated with significant people or events in the area or Northern California overall, and therefore, does not appear to meet Criterion A or B of the NRHP or Criterion 1 or 2 of the CRHR. In addition, the structure as a water control feature, is of simple design and does not display unique or distinct construction methods. As such, it does not appear to meet NRHP Criterion C or CRHR Criterion 3. In summary, the overflow structure does not appear to meet the criteria for listing in the NRHP or the CRHR.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

B13. Remarks:



*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

*Required Information

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 2 *Resource Name or #: (Assigned by Recorder) Tidal Gate P-21-2582

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 541431 mE/ 4214688 mN

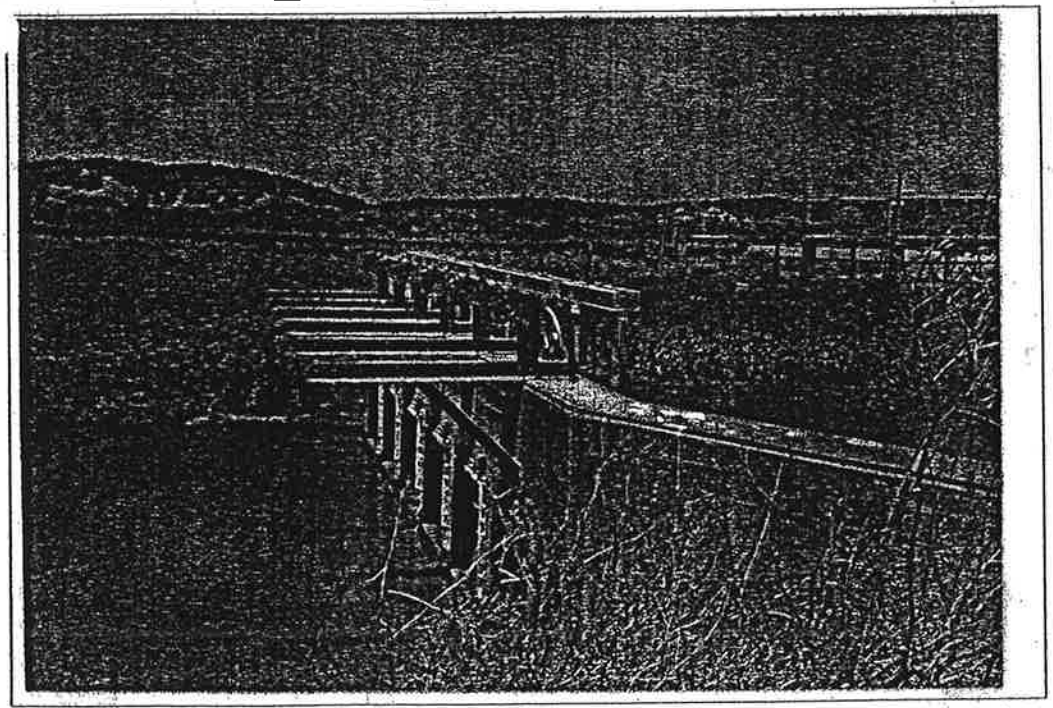
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A tidal gate is located in a wide canal directly north of Bel Marin Keys Boulevard. It is comprised of board-formed concrete with a series of six steel check-gates.

*P3b. Resource Attributes: (List attributes and codes) HP21 Dam

*P4. Resources present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Looking north
August 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca. 1950s-1960s

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION — HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Tidal Gate

B1. Historic Name:

B2. Common Name:

B3. Original Use: Ttidal gate B4. Present Use: Tidal gate

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
constructed in the late 1950s to early 1960s

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: N/A b. Builder: N/A

*B10. Significance: Theme: Water Reclamation Area: Marin County, California

Period of Significance: 1955-1965 Property Type: Drainage Property Applicable Criteria: N/A

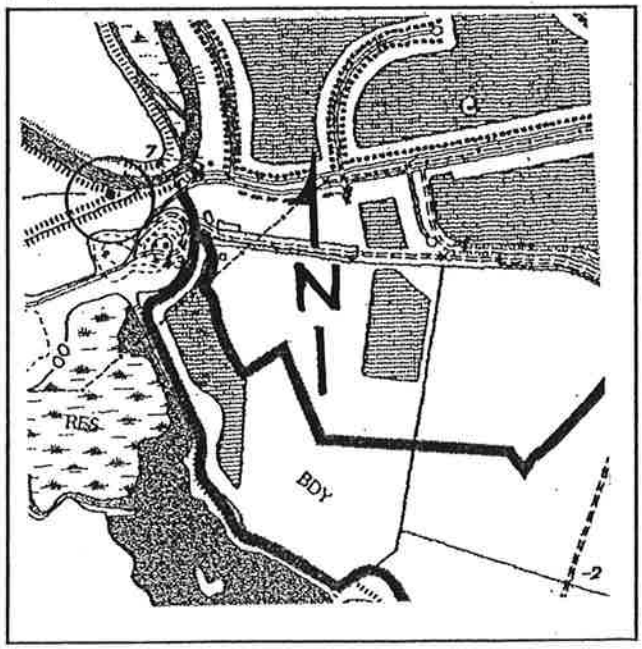
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The structure does not appear on historic maps and based on construction methods and materials, it most likely was constructed in the late 1950s or early 1960s to assist in the drainage of area creeks (Webster pers comm). Although the structure performs an important function for area reclamation efforts, the tidal gate does not appear to be directly associated with important events or people in the area and therefore does not appear to meet Criteria A or B of the NRHP or Criteria 1 or 2 of the CRHR. Under Criterion C of the NRHP and Criterion 3 of the CRHR, the structure does not display unique construction methods. Under consideration of all criteria, the tidal gate does not appear to meet the NRHP or CRHR criteria.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

B13. Remarks:



*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

 *Required Information

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 4 *Resource Name or #: (Assigned by Recorder) Farm Complex P-21-2583

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 543061 mE/ 4214271 mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

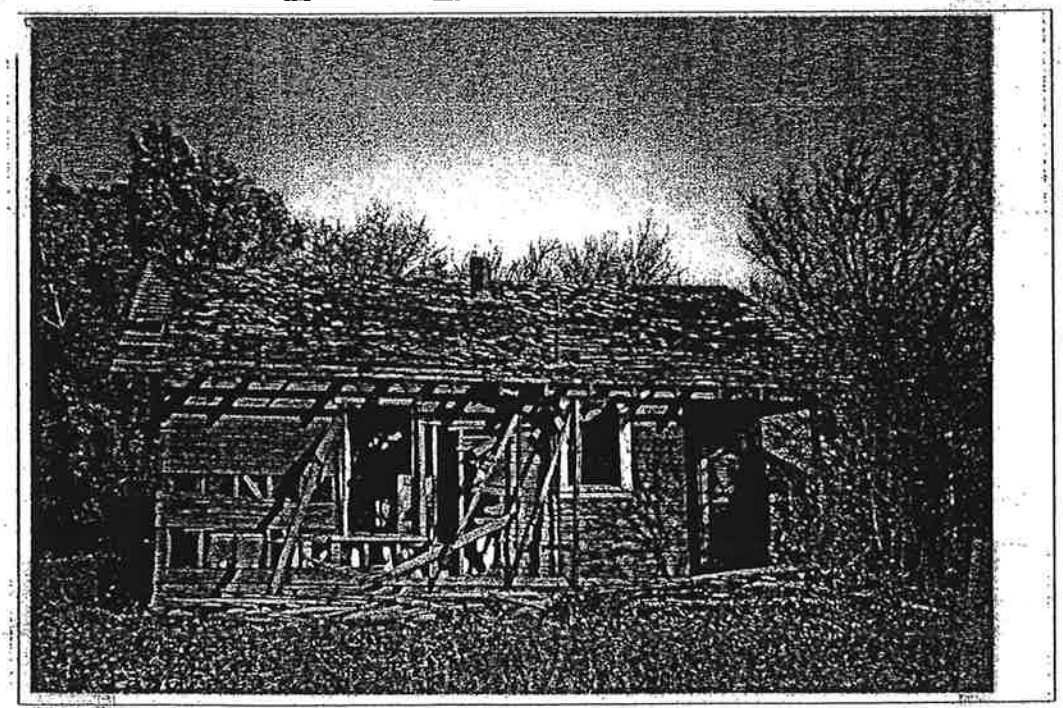
*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A house, barn, and shed sheltered by a Eucalyptus grove are located in the north central part the BMKV parcel in the vicinity of Bel Marin Keys.

The house is a wood-frame building with gabled roof with wide eaves and horizontal plank-board siding. The barn (**Photograph** 2) is a long rectangular building with a gable roof with a moderate eave. The wood-frame structure features vertical plank-board siding. Corrugated metal sheets cover the walls and the roof. The shed (**Photograph** 3) is located between the house and the barn. It is a wood-frame building with a steep shed roof.

*P3b. Resource Attributes: (List attributes and codes) HP33 Farm/Ranch

*P4. Resources present: ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
House, south elevation
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca. 1930s

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Sokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Farm Complex

B1. Historic Name:

2. Common Name:

B3. Original Use: Residence and barn B4. Present Use: Residence and barn

*B5. Architectural Style: Vernacular

*B6. Construction History: (Construction date, alterations, and date of alterations)
Ca 1930s

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:
Historic Eucalyptus

B9a. Architect: Unknown b. Builder: Unknown

*B10. Significance: Theme: Agricultural Development Area: Marin County, California

Period of Significance: 1930-1939 Property Type: Rural Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Based on historic maps and building materials used, the house and barn were mostly likely constructed in the 1930s by Calpak as part of its agricultural operation (Messner 1935; USGS 1942). The shed appears to have been built within the past 50 years.

The house and barn do not appear to meet the criteria for listing in the NRHP or the CRHR. Although the complex played a useful role in Calpak's agricultural endeavors on the property as shelter and storage facilities, the two buildings are not known to be directly associated with events that have made a significant contribution to the history of the region overall; therefore, they does not appear to meet Criterion A of the NRHP or Criterion 1 of the CRHR. The residence and barn are not known to be associated with persons important to the community or Marin County overall; therefore, they do not meet Criterion B of the NRHP or Criterion 2 of the CRHR. The structures do not display distinctive characteristics of a type, period, or method of construction and therefore do not appear to meet Criterion C of the NRHP or Criterion 3 of the CRHR. In addition, both the house and barn are heavily deteriorated with much of the siding, doors, windows etc. missing. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

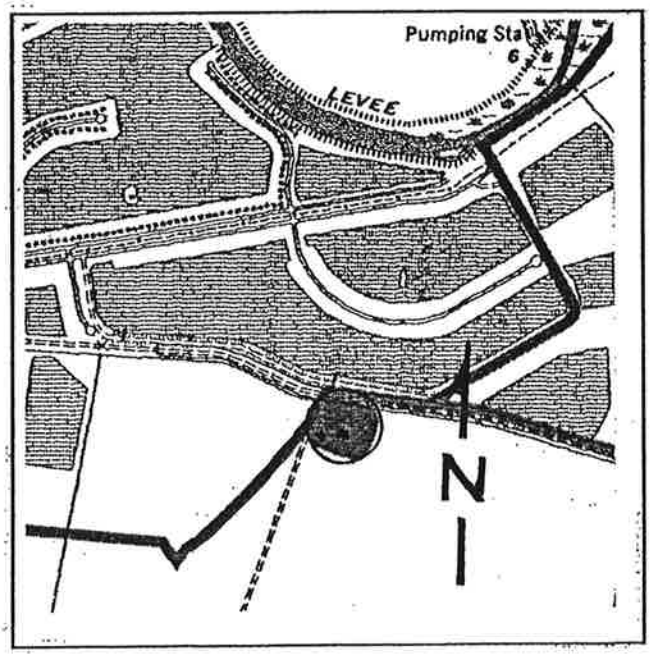
see Jones & Stokes. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:

*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)



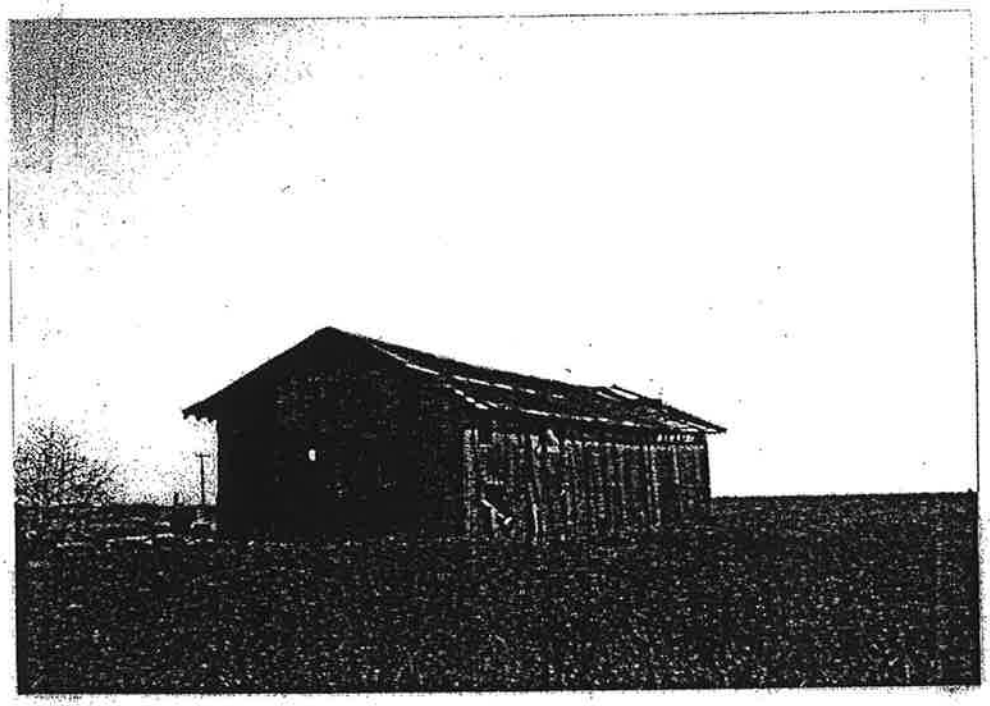
*Required Information

Significance (Continued)

The shed also does not appear to be eligible for the NRHP or the CRHR because it does not meet the exceptional significance criteria established for recently constructed properties. Under consideration of all criteria, as well as integrity, the barn/house/shed complex does not appear to meet the criteria for listing in the NRHP or the CRHR.

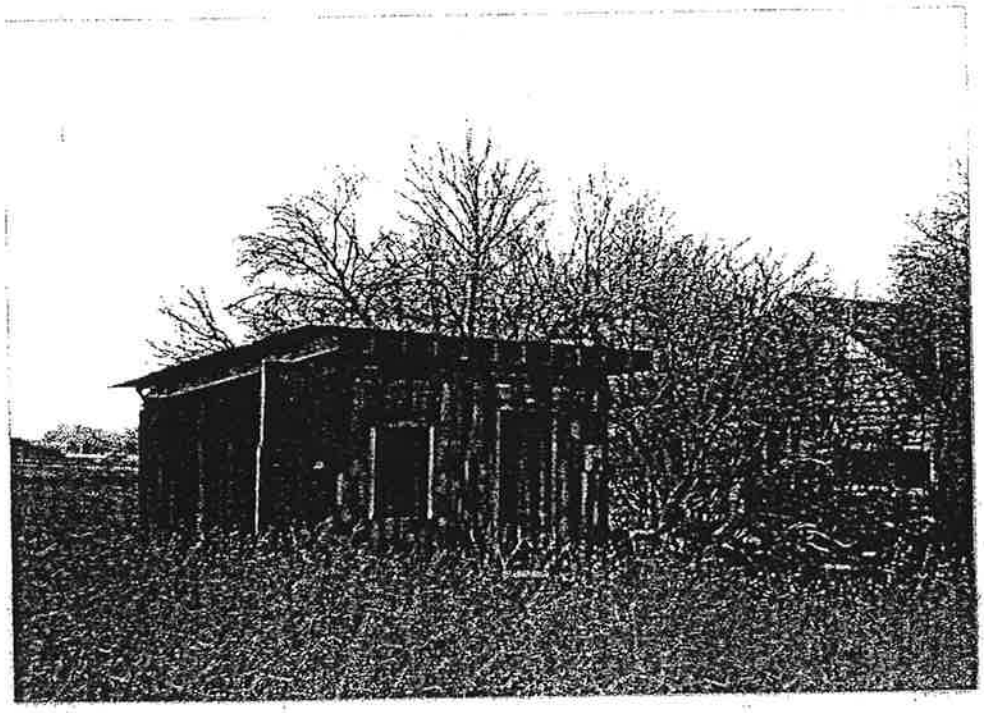
The Eucalyptus trees located by the complex most likely planted as a windbreak when the buildings were initially constructed. Eucalyptus trees were commonly planted for this purpose throughout California as early as the 1850s. As historic landscape features associated with a property that lacks significance, the trees lack historical significance and therefore do not appear to meet the criteria for listing in the NRHP or the CRHR.

Photographs (Continued)



Photograph 2. Barn

Photographs (Continued)



Photograph 3. Shed

DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code
Other Listings
Review Code Reviewer Date

Page 1 of 2 *Resource Name or #: (Assigned by Recorder) Old Pumphouse P-21-2587

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Petaluma Point Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 545292 mE/ 4213830 mN

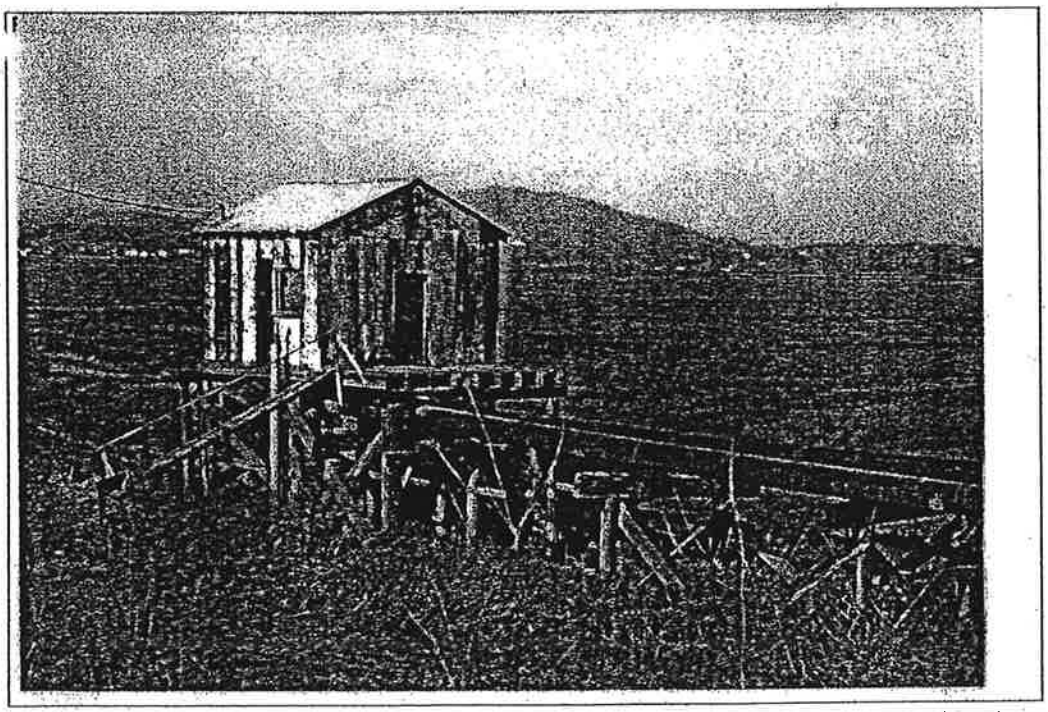
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A pumphouse is located along the eastern boundary of the project area in a levee by San Pablo Bay. The pumphouse is a wood-frame structure sitting on a wood platform that is supported by a timber frame. The building features a gabled roof and is sided with corrugated metal sheets. Two long steel pipes travel from the pumphouse to the levee and out to the bay.

*P3b. Resource Attributes: (List attributes and codes) HP11 Engineering Structure

*P4. Resources present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Facing northwest
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca. 1912 -1914

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Old Pumphouse

B1. Historic Name:

B2. Common Name:

B3. Original Use: Pumphouse B4. Present Use: Pumphouse

*B5. Architectural Style: Industrial

*B6. Construction History: (Construction date, alterations, and date of alterations)
Ca 1912 - 1914

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: N/A b. Builder: Unknown

*B10. Significance: Theme: Water Reclamation Area: Marin County, California

Period of Significance: 1912-1914 Property Type: Drainage Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The pumphouse was constructed between 1910 and 1914 as part of early reclamation efforts (U.S. Geological Survey, 1914). Although John Ferris undertook many drainage improvements on his property in the late 1800s and early 1900s, it is unlikely that he is responsible for the pumphouse since he was residing in England by the turn of the 20th century. It is more probable that Louis Friedlander and F.K. Houston who bought the property in 1912 built the structure (Shannon 1992).

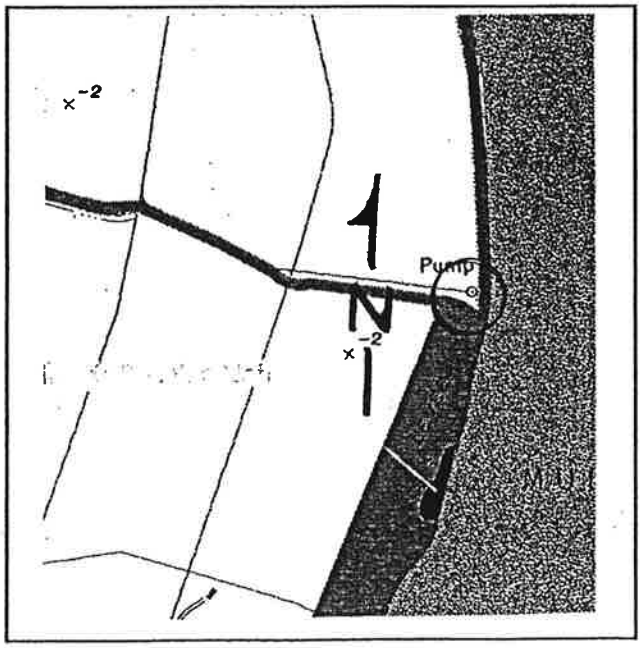
The pumphouse is part of the property's reclamation system that was constructed in phases over time and therefore is not directly associated with a particular period or with a particular time period or with any one particular person or events who may have been important to the area or Northern California overall. For this reason the pumphouse does not appear to meet Criterion A of the NRHP or Criterion 1 of the CRHR. The pumphouse does not appear to have a direct association with any person or persons significant to area history and therefore does not appear to meet Criterion B of the NRHP or Criterion 2 of the CRHR. Under Criterion C of the NRHP and Criterion 3 of the CRHR, the pumphouse is a common example of its type constructed in the early 20th century throughout the area, and notably the North Bay region. In summary, the pumphouse does not appear to meet the criteria for listing in the NRHP or the CRHR.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes 2002. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:



*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 3 *Resource Name or #: (Assigned by Recorder) Barn P-21-2584

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 542270 mE/ 4213550 mN

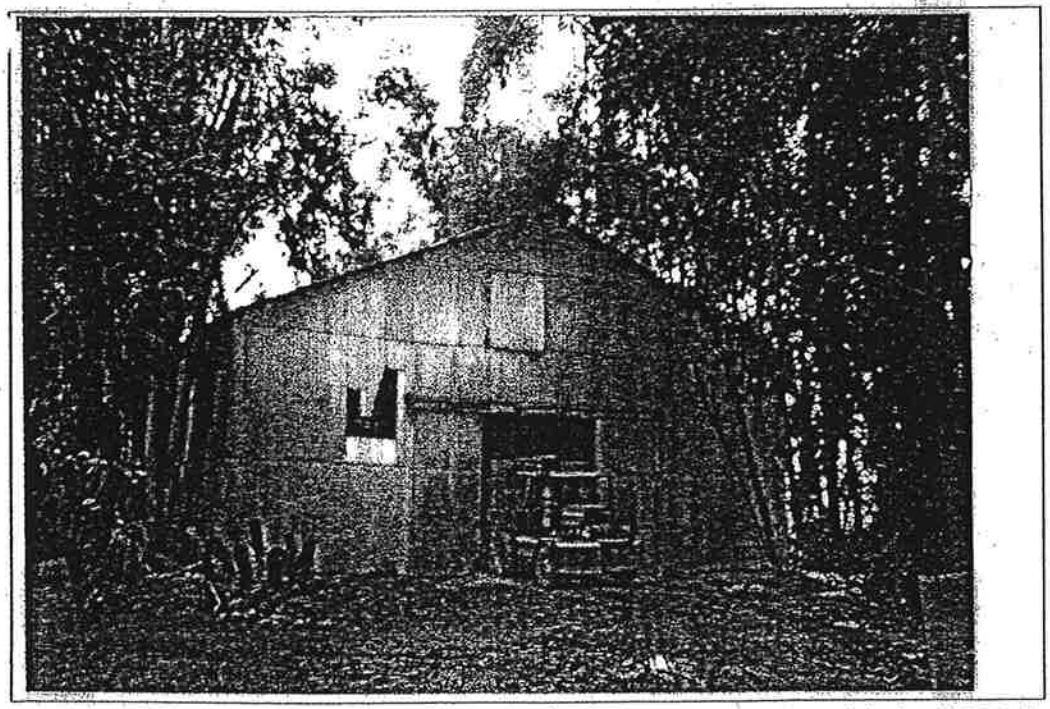
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A large, wood-frame rectangular barn is located in a Eucalyptus grove directly northeast of Pacheco Pond. The barn measures approximately 46 x 100 feet and is sided with horizontal plank-boards covered with corrugated metal sheets. A large sliding double door is located on the front elevation. The rear elevation is heavily damaged. Numerous Eucalyptus trees, both historic and recent growth, grow in close proximity to the barn.

*P3b. Resource Attributes: (List attributes and codes) HP33 Farm/Ranch

*P4. Resources present: ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Northwest elevation
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca. 1940s

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Barn

B1. Historic Name:

2. Common Name:

B3. Original Use: Barn B4. Present Use: Barn

*B5. Architectural Style: Vernacular

*B6. Construction History: (Construction date, alterations, and date of alterations)

Ca. 1940s

*B7. Moved? ☐ No ☒ Yes ☐ Unknown Date: ca early 1960s Original Location: east of Headquarters Hill

*B8. Related Features:

Historic and recent growth Eucalyptus trees

B9a. Architect: Unknown b. Builder: Unknown

*B10. Significance: Theme: Agricultural Development Area: Marin County, California

Period of Significance: 1940-1949 Property Type: Rural Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

According to long-time resident Ron Webster, the barn was constructed in the 1940s and was originally part of a grain storage complex located just east of Headquarters Hill. Calpak most likely constructed the complex (comprised of barns and silos) as part of its agricultural operations. In the early 1960s, the complex, with the exception of the barn, was demolished to make room for the Bel Marin Keys housing development. During this period, the barn was moved to its present location and continues to function as a hay storage facility (Ron Webster pers comm August 2002).

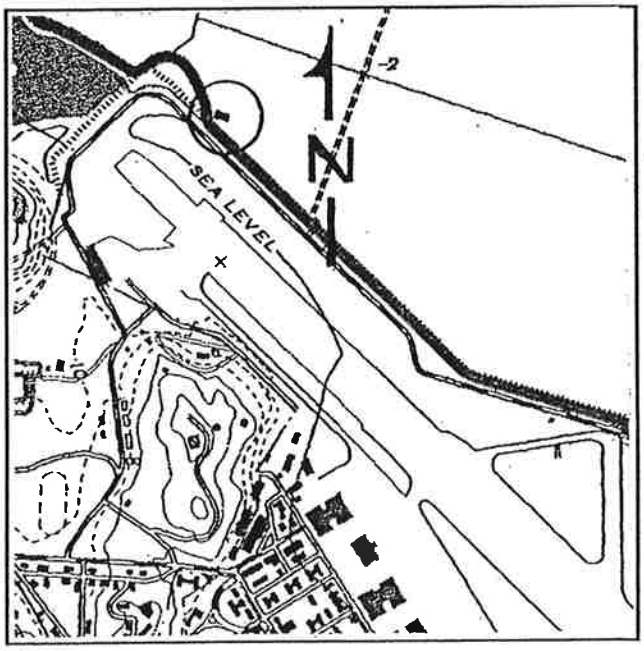
As a moved structure that is not historically or architecturally significant, the barn does not appear to meet the criteria for the NRHP. Although the barn played an important role in the agricultural development of the property as a hay storage facility, it does not appear to have played a significant role in the development of the Marin area or Northern California, overall and therefore does not appear to meet Criterion 1 of the CRHR. Under Criterion 2 of the CRHR, the barn has no direct association with an important person or persons in Northern California and therefore does not meet that criterion. The barn is a typical, wood-frame structure that does not display unique construction methods and as such does not meet Criterion 3 of the CRHR. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes. *Cultural Resources Inventory and Evaluation for Bel Marine Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:



*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

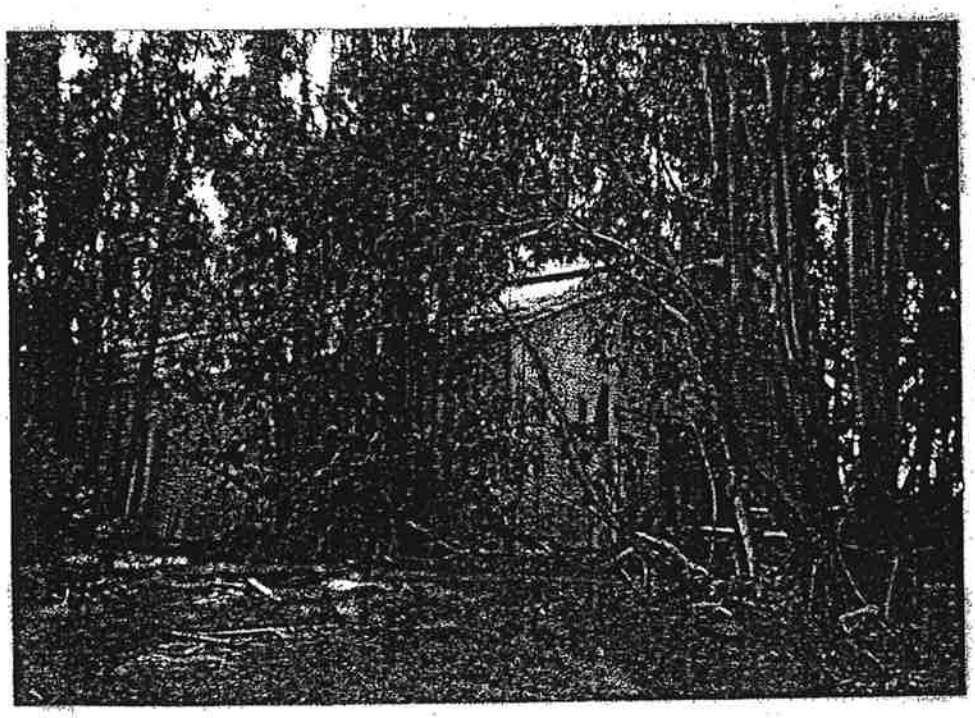
 *Required Information

Significance (Continued)

In summary, because it is a moved structure and because it does not appear to meet Criteria 1, 2, or 3 of the CRHR, the barn does not appear to be eligible for NRHP or CRHR listing.

The Eucalyptus trees located by the barn most likely were planted as a windbreak. Eucalyptus trees were commonly planted for this purpose throughout California as early as the 1850s. These trees were likely planted in the early to mid-twentieth century when buildings were first constructed or located in the vicinity. As historic landscape features associated with a structure that lacks significance, the trees lack historical significance and therefore do not appear to meet the criteria for listing in the NRHP or the CRHR.

Photographs (Continued)



Photograph 2. Side elevation with Eucalyptus

DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

HRI #

Trinomial

NRHP Status Code 6

Other Listings

Review Code Reviewer Date

*Resource Name or #: (Assigned by Recorder) Air Force Antenna Complex P-21-2588

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Petaluma Point Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 544561 mE/ 4212991 mN

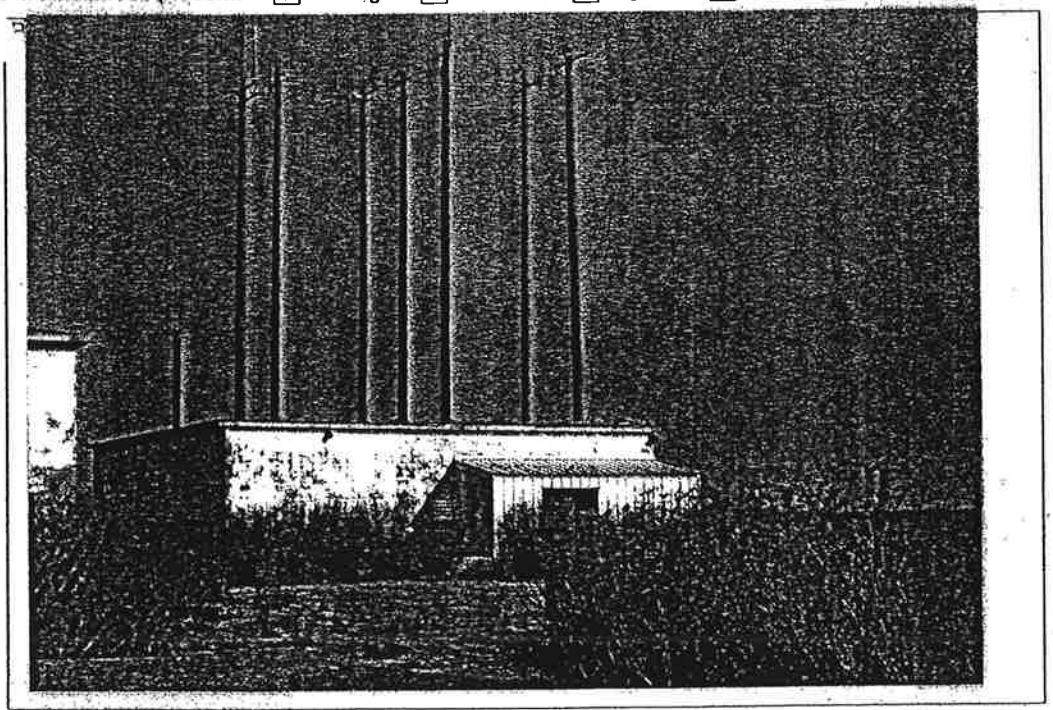
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The remnants of an Air Force antenna field are located northwest of the rifle range. The site is accessed by a paved road and includes an operations building, a generator building (see **Photograph 2**), and seven 50-foot tall poles topped by antennas.

*P3b. Resource Attributes: (List attributes and codes) HP34 Military Property

*P4. Resources present: ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Operations Buildings, SW Elevation
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
1958-1959

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record

☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record

☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95)

*Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Air Force Antenna Complex

B1. Historic Name:

B2. Common Name:

B3. Original Use: Radio/Antenna facility B4. Present Use: Vacant

*B5. Architectural Style: Industrial

*B6. Construction History: (Construction date, alterations, and date of alterations)
1958-1959

*B7. Moved? [X] No [ ] Yes [x] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: Unknown b. Builder: Unknown

*B10. Significance: Theme: Military Development Area: Marin County, California

Period of Significance: 1958-1959 Property Type: Military Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

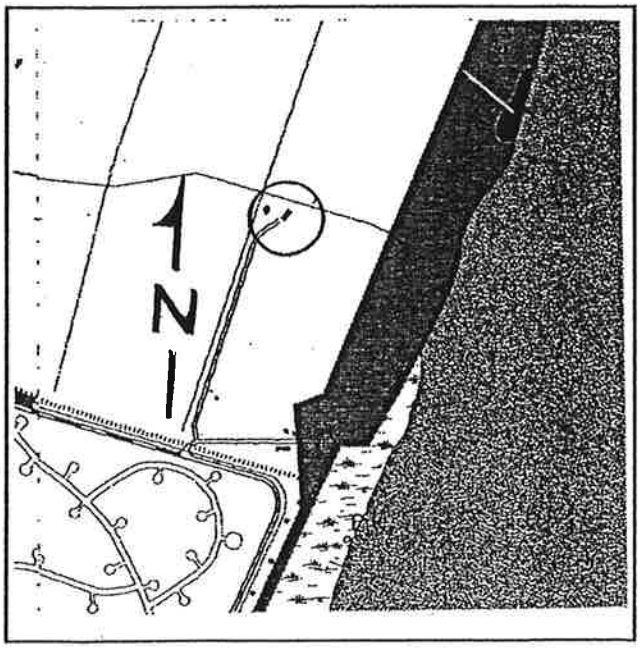
Hamilton Air Force Base constructed the antenna complex between 1958 and 1959 (USGS 1958; USGS 1959). The buildings comprising the antenna complex do not appear to meet the criteria for NRHP or CRHR eligibility because they are less than 50 years old and do not meet the exceptional significance criteria established for recently constructed properties.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:

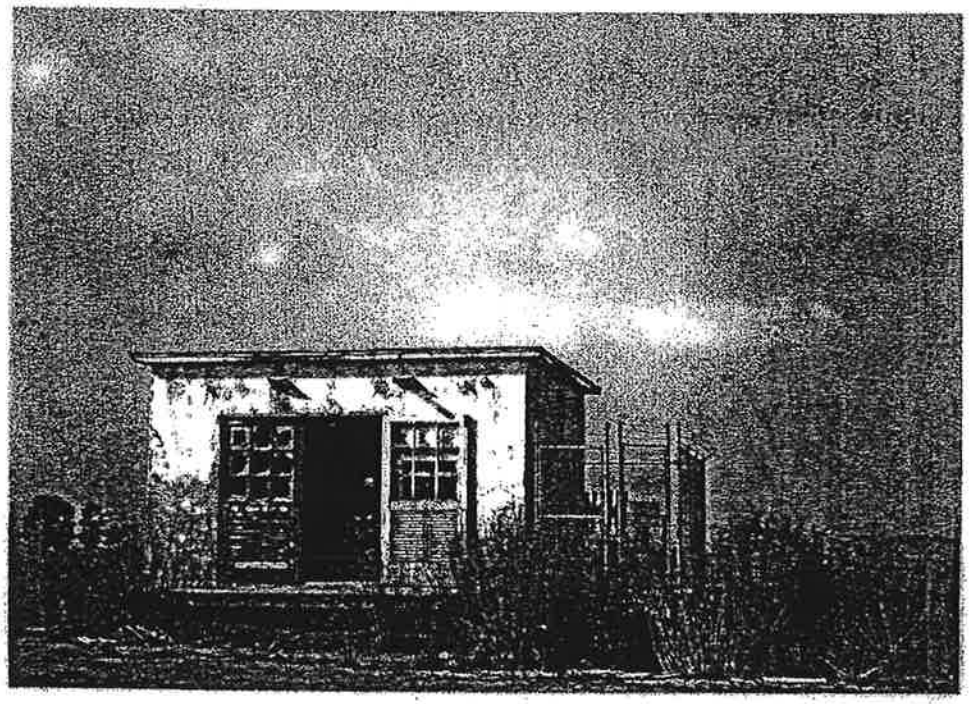


*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

Photographs (Continued)



Photograph 2. Generator Building

PRIMARY RECORD

HRI #
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 3 *Resource Name or #: (Assigned by Recorder) Air Force Rifle Range P-21-2589

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Petaluma Point Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 544606 mE/ 4212392 mN

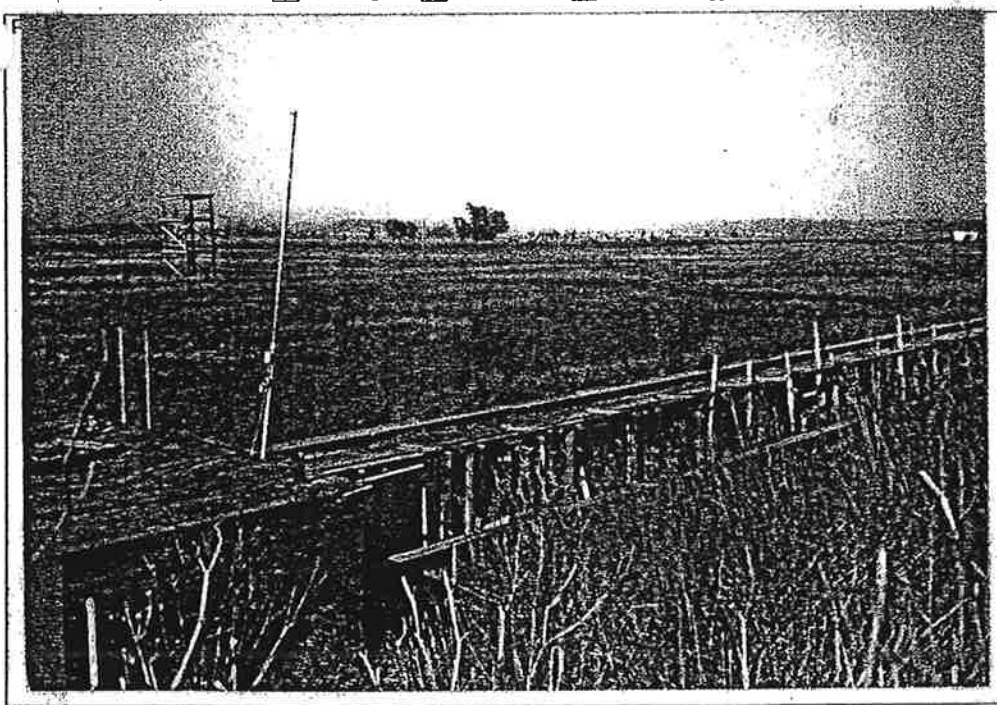
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A former rifle range, (originally part of Hamilton Air Force Base) is located in the southeast corner of the project area near San Pablo Bay. The range consists of a target range, ammunition building, administration building, shed (see **Photograph 2**), and a target practice field (see **Photograph 3**).

*P3b. Resource Attributes: (List attributes and codes) HP34 Military Property

*P4. Resources present: ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Target range, Northwest Elevation
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
1958-1980

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) Air Force Rifle Range

B1. Historic Name:

B2. Common Name:

B3. Original Use: Rifle range B4. Present Use: Rifle range

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
The range was built in increments between 1958 and 1980

*B7. Moved? [X] No [ ] Yes [x] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: N/A b. Builder: Unknown

*B10. Significance: Theme: Military Development Area: Marin County, California

Period of Significance: 1958-1980 Property Type: Military Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

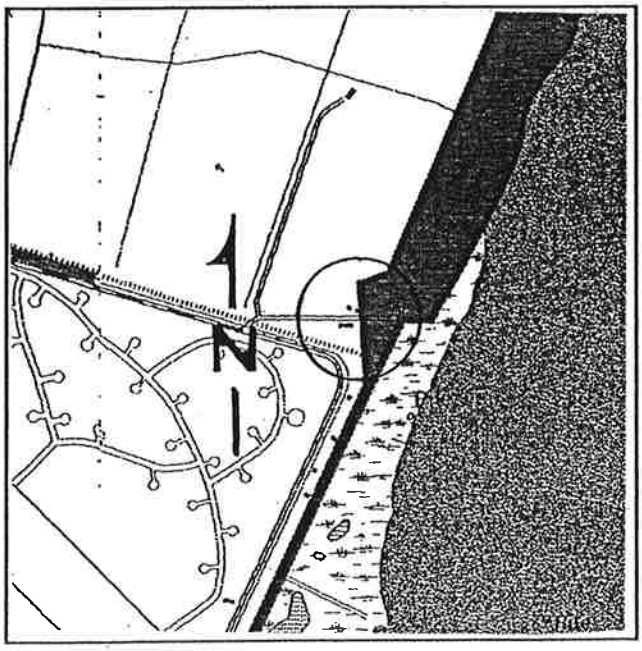
According to historic maps, the range was built in increments starting in the late 1950s until the early 1980s. (USGS 1958; 1959; 1968; 1980). The rifle range does not appear to be eligible for listing in the NRHP or CRHR because it is less than 50 years old and does not meet the exceptional significance criteria established for recently constructed properties.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes 2002. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:

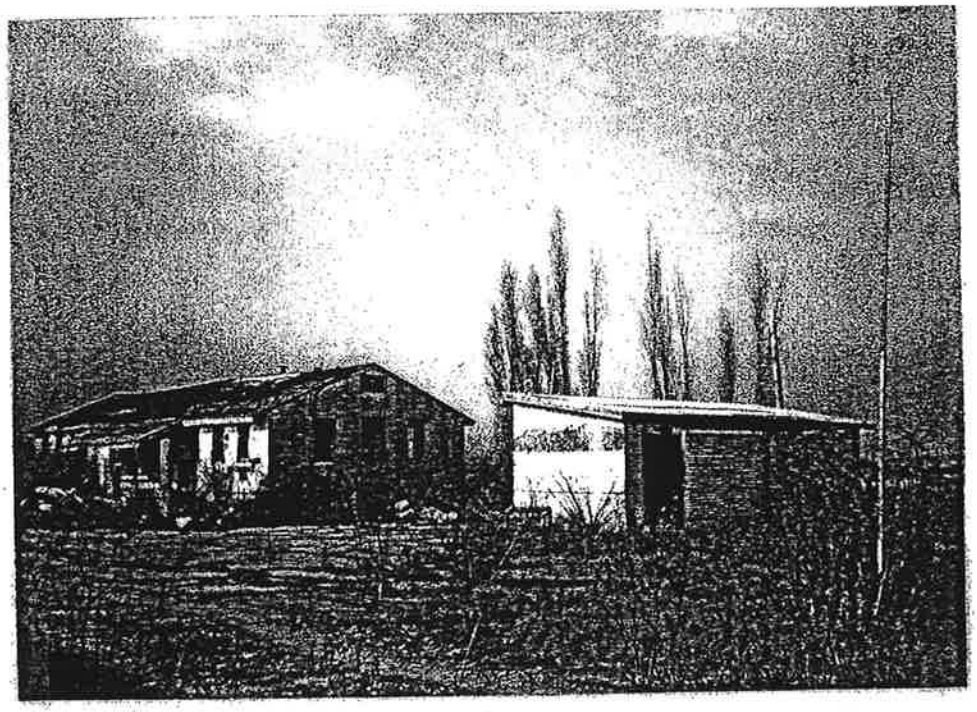


*B14.Evaluator: Madeline R. Lanz

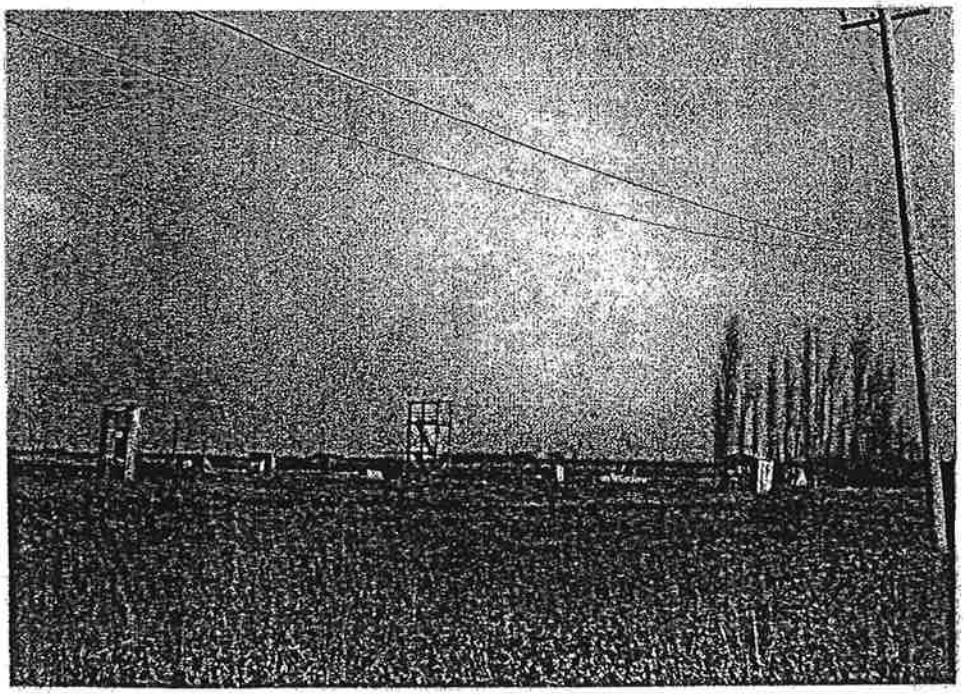
*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

hotographs (Continued)



Photograph 2. Administration Building and Shed



Photograph 3. Target Practice Field

PRIMARY RECORD

HRI#
Trinomial
NRHP Status Code 6
Other Listings
Review Code Reviewer Date

Page 1 of 2 *Resource Name or #: (Assigned by Recorder) New Pumphouse P-21-2590

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Petaluma Point Date 1980 T____; R____; ____ ¼ of ____ ¼ of Sec____; ____B.M.

c. Address ____ City Novato Zip____

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 544271 mE/ 4212372 mN

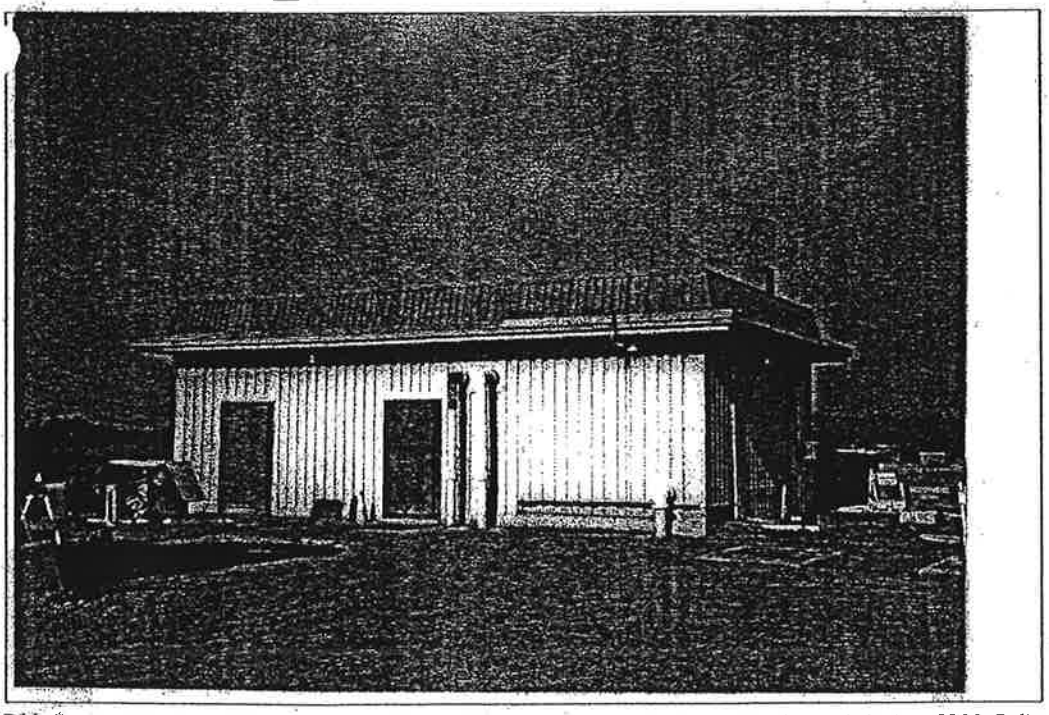
e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

A one-story concrete pumphouse is located west of the firing range.

*P3b. Resource Attributes: (List attributes and codes) HP11 Engineering Structure

*P4. Resources present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Southeast Elevation
January 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca 1990s

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DPR 523A (1/95) *Required Information

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 6

*Resource Name or # (Assigned by recorder) New Pumphouse

B1. Historic Name:

B2. Common Name:

B3. Original Use: Pumphouse B4. Present Use: Pumphouse

*B5. Architectural Style: Modern

*B6. Construction History: (Construction date, alterations, and date of alterations)
Ca 1990s

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: Unknown b. Builder: Unknown

*B10. Significance: Theme: Water Reclamation Area: Marin County, California

Period of Significance: 1990 Property Type: Drainage Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

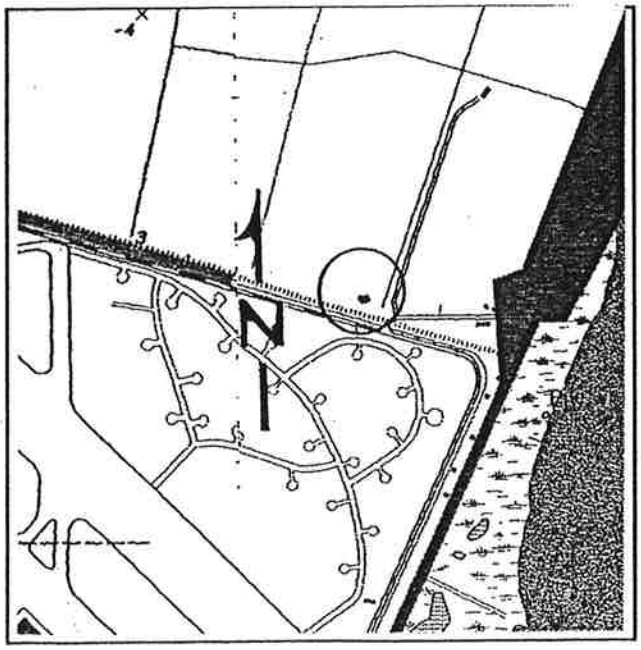
The building does not appear on a 1981 map and most likely was constructed within the last ten years (U.S. Geological Survey 1981). It does not appear to be eligible for listing in the NRHP or the CRHR because it does not meet the criteria of exceptional significance for recently constructed buildings.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

see Jones & Stokes 2002. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:



*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

*Required Information

PRIMARY RECORD

Trinomial
NRHP Status Code 3D
Other Listings
Review Code Reviewer Date

Page 1 of 3 *Resource Name or #: (Assigned by Recorder) Ammunition Bunkers P-21-2585

1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Marin

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Novato Date 1980 T ; R ; ¼ of ¼ of Sec ; B.M.

c. Address City Novato Zip

d. UTM: (Give more than one for large and/or linear resources) Zone: 10 ; 541823 mE/ 4213235 mN

e. Other Locational Data: (e.g. parcel #, directions to resource, elevation, etc., as appropriate)

*P3a. Description (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Two concrete ammunition bunkers (bunker no. 751 and bunker no. 752) are located immediately southwest of Perimeter Road in the HAAF Parcel. Each bunker is buried in the base of a partially man-made hill known as Reservoir or Ammo Hill. Bunker no. 751 is located northwest of bunker no. 752.

*P3b. Resource Attributes: (List attributes and codes) HP34 Military Property

*P4. Resources present: ☐ Building ☐ Structure ☐ Object ☐ Site ☐ District ☒ Element of District ☐ Other (isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Bunker no. 751, looking south
August 9, 2002

*P6. Date Constructed/Age and Sources: ☒ Historic ☐ Prehistoric ☐ Both
ca 1941-1945

*P7. Owner and Address:
California State Coastal Conservancy
1330 Broadway Suite 1100
Oakland, CA 94612

*P8. Recorded by: (Name, affiliation, and address)
Madeline R. Lanz, Jones & Stokes
2600 V Street
Sacramento CA, 95818

*P9. Date Recorded: 1/9/02

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Jones & Stokes 2002 *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA*

*Attachments: NONE ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record
☐ Artifact Record ☐ Photograph Record ☐ Other (List):

DEPARTMENT OF PARKS AND RECREATION HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

 *NRHP Status Code 3D

*Resource Name or # (Assigned by recorder) Ammunition Bunkers

B1. Historic Name:

B2. Common Name:

B3. Original Use: Ammunition bunkers B4. Present Use: Ammunition bunkers

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
Constructed during World War II

*B7. Moved? [X] No [ ] Yes [ ] Unknown Date: Original Location:

*B8. Related Features:

B9a. Architect: N/A b. Builder: US Military

*B10. Significance: Theme: Military Development Area: Marin County, California

Period of Significance: World War II Property Type: Military Property Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Hamilton Air Force Base constructed the two bunkers (in addition to several others) as ammunition magazines during World War II. (Par Environmental Services 1993).

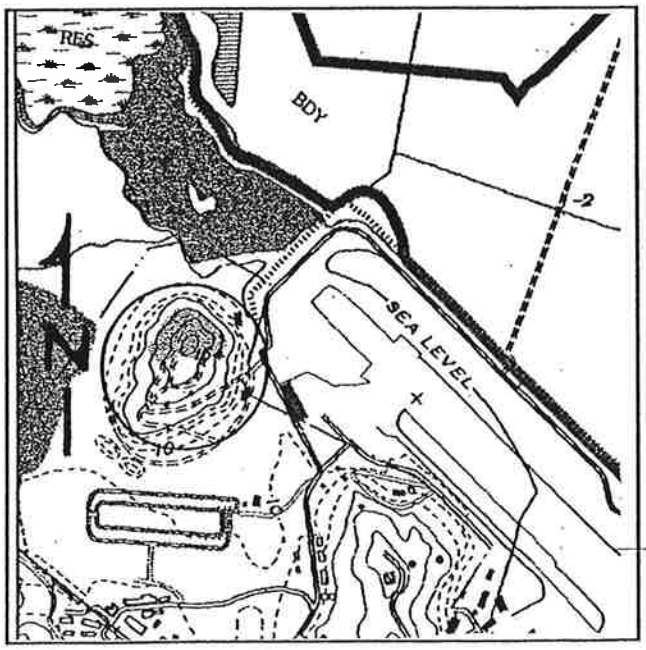
In 1993, Par Environmental Services (Par) evaluated the resources at Hamilton Air Force Base for NRHP eligibility. As part of its study, Par defined the Hamilton Air Force Base Historic District. The two ammunition bunkers were considered contributors to the Hamilton AFB Historic District (Par Environmental Services 1993). As part of this study, Jones & Stokes revisited the bunkers to assess their integrity and to determine whether the 1993 evaluations were still valid. This report finds that NRHP eligibility findings still pertain. In addition, the resources appear to meet the CRHR criteria.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:

See Jones & Stokes 2002. *Cultural Resources Inventory and Evaluation for Bel Marin Keys Unit V Wetlands Restoration Project, Marin County, CA.*

B13. Remarks:



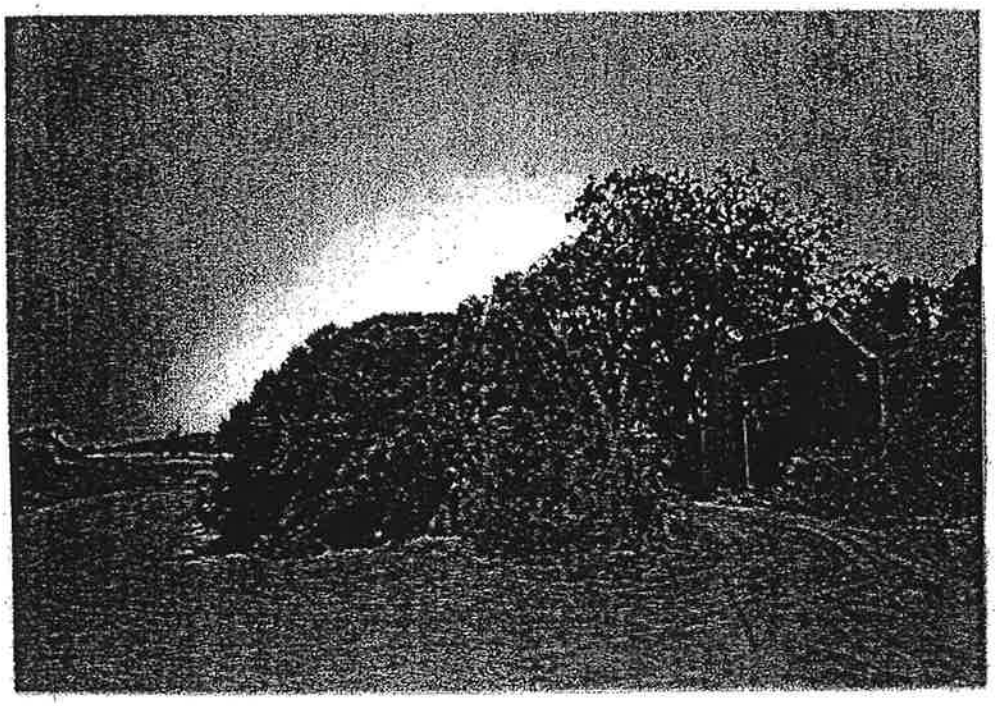
*B14.Evaluator: Madeline R. Lanz

*Date of Evaluation: August 14, 2002

(This space reserved for official comments.)

*Required Information

Photographs (Continued)



Photograph 2. Bunker no. 752

APPENDIX F

Corps Pre-Construction Notification (PCN) Form

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U.S. Army Corps of Engineers

South Pacific Division

Nationwide Permit Pre-Construction Notification (PCN) Form

This form integrates requirements of the U.S. Army Corps of Engineers Nationwide Permit Program within the South Pacific Division (SPD), including General and Regional Conditions. You MUST fill out all boxes related to the work being done. Fillable boxes in this form expand if additional space is needed.

Box 1 Project Name Bel Marin Keys Wetland Restoration Project – Phase 1			
Applicant Name Jeff Melby		**Applicant Title** Project Manager	
Applicant Company, Agency, etc. California State Coastal Conservancy		Applicant's internal tracking number (if any)	
Mailing Address 1330 Broadway, 13th Floor, Oakland, CA 94612-2530			
Work Phone with area code 510-286-4088	Mobile Phone with area code	Home Phone with area code	Fax # with area code
E-mail Address Jeff.melby@scc.ca.gov	Relationship of applicant to property: ☑ Owner ☐ Purchaser ☐ Lessee ☐ Other:		
Application is hereby made for verification that subject regulated activities associated with subject project qualify for authorization under a U.S. Army Corps of Engineers Nationwide Permit or Permits as described herein. I certify that I am familiar with the information contained in this application and, that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. I hereby grant to the agency to which this application is made the right to enter the above-described location to inspect the proposed, in-progress or completed work. I agree to start work only after all necessary permits have been received and to comply with all terms and conditions of the authorization.			
Signature of applicant			Date (mm/dd/yyyy)

If anyone other than the person named as the Applicant will be in contact with the U.S. Army Corps of Engineers representing the Applicant regarding this project during the permit process, Box 2 MUST be filled out.

Box 2 Authorized Agent/Operator Name		**Agent/Operator Title**	
Agent/Operator Company, Agency, etc.		E-mail Address	
Mailing Address			
Work Phone with area code	Mobile Phone with area code	Home Phone with area code	Fax # with area code
I hereby authorize the above named authorized agent to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application. I understand that I am bound by the actions of my agent and I understand that if a federal or state permit is issued, I, or my agent, must sign the permit.			
Signature of applicant			Date (mm/dd/yyyy)
I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete, and accurate.			
Signature of authorized agent			Date (mm/dd/yyyy)

Revised April 12, 2012. For the most recent version of this form, visit your Corps District's Regulatory website.

Box 3 Name of Property Owner(s), if other than Applicant:		
Owner Title	**Owner Company, Agency, etc.**	
Mailing Address		
Work Phone with area code	Mobile Phone with area code	Home Phone with area code

Box 4 Name of Contractor(s) (if known):		
Contractor Title	**Contractor Company, Agency, etc.**	
Mailing Address		
Work Phone with area code	Mobile Phone with area code	Home Phone with area code

Box 5 Site Number __ of __. Project location(s), including street address, city, county, state, zip code where proposed activity will occur: BEL MARIN KEYS BOULEVARD, CITY OF NOVATO, MARIN COUNTY 94949	
Name of Waterbody(ies) (if known, otherwise enter "an unnamed tributary to"): Novato Creek, Bel Marin Keys South Lagoon Tributary to what named, downstream waterbody: San Pablo Bay	
Latitude & Longitude (D/M/S, DD, or UTM with Zone):	Section, Township, Range:
County Assessor Parcel Number (Include County name):	USGS Quadrangle map name:
Watershed (HUC and watershed name[1]): [1]http://water.usgs.gov/GIS/regions.html	Size of permit area or project boundary: acres linear feet
Directions to the project location and other location descriptions, if known:	
Access limitations or restrictions (if any): Gate key required to access the site	

Box 6 Nature of Activity (Description of the project, include all features):
Grade and recontour a portion of the BMKV site to create a new levee, create new and enhance existing seasonal wetlands, modify site drainage and access, and modify an existing utility pipeline.

Project Purpose (Description of the reason or purpose of the project):
The purpose of the Phase 1 Project is enhancement and creation of seasonal wetlands; reestablishment of tidal wetlands; reestablishment of habitat for special-status species; and protection of existing inland development and habitats from increased risk of inundation due to climate change and sea level rise.

Reason(s) for Discharge into Waters of the United States (Description of why dredged and/or fill material needs to be placed in Waters of the United States):
Fill of waters of the U.S. is required to achieve the project goals for habitat restoration.

Proposed discharge of dredge and/or fill material. Indicate total surface area in **acres** and **linear feet** (where appropriate) of the proposed impacts to Waters of the United States, indicate water body type (tidal wetland, non-tidal wetland, vernal pool, riparian wetland, ephemeral stream/river, intermittent stream/river, perennial stream/river, pond/lake, vegetated shallows, bay/harbor, lagoon, ocean, etc.), and identify the impact(s) as permanent and/or temporary for each requested Nationwide Permit[1]:

[1] Enter the intended permit number(s). See Nationwide Permit regulations for permit numbers and qualification information: http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/NationwidePermits.aspx

Water Body Type	Requested NWP Number: 27				Requested NWP Number:				Requested NWP Number:			
	Permanent		Temporary		Permanent		Temporary		Permanent		Temporary	
	Area	Length	Area	Length	Area	Length	Area	Length	Area	Length	Area	Length
Other Waters	1.16	14,619	0.86	3,000								
Wetland	1.69		0.61									
Total:	2.85		1.47									

Total volume (in cubic yards) and type(s) of material proposed to be dredged from or discharged into Waters of the United States:

Material Type	Total Volume Dredged	Total Volume Discharged
Rock Slope Protection (RSP)		
Clean spawning gravel		
River rock		
Soil/Dirt/Silt/Sand/Mud		8,160 cy
Concrete		
Structure		
Stumps/Root wads		
Other:		2,040 cy
Total:		10,200 cy

Activity requires a written waiver to exceed specified limits of the Nationwide Permit? ☐ Yes ☑ No
If yes, provide Nationwide Permit number and name, limit to be exceeded, and rationale for each requested waiver:

Activity will result in the loss of greater than ½-acre of Waters of the United States? ☐ Yes ☑ No
If yes, provide an electronic copy (compact disc) or multiple hard copies (7) of the complete PCN for appropriate Federal and State Pre-discharge Notification (See General Condition #31, Pre-construction Notification, Agency Coordination, Section 2 and 4):

Describe direct and indirect effects caused by the activity (General Condition #31, District Engineer's Decision:
See the supplement to the JARPA. Also see the BMKV Supplemental EIR/EIS (Jones & Stokes 2003)

Potential cumulative impacts of proposed activity(if any): Beneficial cumulative effects due to habitat enhancements.

Drawings and figures (see each U.S. Army Corps of Engineers District's Minimum Standards Guidance):
Vicinity map: ☑ Attached (or mail copy separately if applying electronically)
To-scale Plan view drawing(s): ☑ Attached (or mail copy separately if applying electronically)
To-scale elevation and/or Cross Section drawing(s): ☑ Attached (or mail copy separately if applying electronically)
Numbered and dated pre-project color photographs: ☑ Attached (or mail copy separately if applying electronically)
Sketch drawing(s) or map(s): ☑ Attached (or mail copy separately if applying electronically)

Has a wetlands/waters of the U.S. delineation been completed?
☑ Yes, Attached[2] (or mail copy separately if applying electronically) ☐ No
If a delineation has been completed, has it been verified in writing by the Corps?
☑ Yes, Date of preliminary or approved jurisdictional determination (mm/dd/yyyy): 6/10/2016 Corps file number: 2005-29476N ☐ No
[2]If available, provide ESRI shapefiles (NAD83) for delineated waters

For proposed discharges of dredged material resulting from navigation dredging into inland or near-shore waters of the U.S. (including beach nourishment), please attach[3] a proposed Sampling and Analysis Plan (SAP) prepared according to Inland Testing Manual (ITM) guidelines (including Tier I information, if available), or if disposed offshore, a proposed SAP prepared according to the Ocean Disposal Manual.
[3]Or mail copy separately if applying electronically

Is any portion of the work already complete? ☐ YES ☑ NO
If yes, describe the work:

Box 7 Authority:
Is Section 10 of the Rivers and Harbors Act applicable?: ☐ YES ☑ NO
Is Section 404 of the Clean Water Act applicable?: ☑ YES ☐ NO

Is the project located on U.S. Army Corps of Engineers property or easement?: ☐ YES ☑ NO
If yes, has Section 408 process been initiated?: ☐ YES ☐ NO
Would the project affect a U.S. Army Corps of Engineers structure?: ☐ YES ☑ NO
If yes, has Section 408 process been initiated?: ☐ YES ☐ NO

Is the project located on other Federal Lands (USFS, BLM, etc.)?: ☐ YES ☑ NO
Is the project located on Tribal Lands?: ☐ YES ☑ NO

Box 8 Is the discharge of fill or dredged material for which Section 10/404 authorization is sought part of a larger plan of development?: ☑ YES ☐ NO

If discharge of fill or dredged material is part of development, name and proposed schedule for that larger development (start-up, duration, and completion dates):
The BMK Wetland Restoration Project will be implemented in 2 phases. The timing of Phase 2 implementation is yet to be determined.

Location of larger development (if discharge of fill or dredged material is part of a plan of development, a map of suitable quality and detail of the entire project site should be included):
Phase 2 would occur on the BMKV property, adjacent to, east of the Phase 1 project. See Figure 1-1.

Box 9 Measures taken to avoid and minimize impacts to waters of the United States:
See Appendix D

Box 10 Proposed Compensatory Mitigation related to fill/excavation and dredge activities. Indicate in **acres** and **linear feet** (where appropriate) the total quantity of Waters of the United States proposed to be created, restored, enhanced and/or preserved for purposes of providing compensatory mitigation. Indicate water body type (tidal wetland, non-tidal wetland, vernal pool, riparian wetland, ephemeral stream/river, intermittent stream/river, perennial stream/river, pond/lake, vegetated shallows, bay/harbor, lagoon, ocean, etc.) or non-jurisdictional (uplands[1]). Indicate mitigation type (permittee-responsible on-site/off-site, mitigation bank, or in-lieu fee program). If the mitigation is purchase of credits from a mitigation bank, indicate the bank to be used, if known:

[1] For uplands, please indicate if designed as an upland buffer.

Site Number	Water Body Type	Created		Restored		Enhanced		Preserved		Mitigation Type
		Area	Length	Area	Length	Area	Length	Area	Length	
	Other Waters	1.96	21,390							
	Wetlands	25								
Total:		26.96								

If no mitigation is proposed, provide detailed explanation of why no mitigation would be necessary:

This is a restoration project. Impacts to jurisdictional waters would be addressed onsite by creation and enhancement of a substantially larger area of habitat.

If permittee-responsible mitigation is proposed, provide justification for not utilizing a Corps-approved mitigation bank or in-lieu fee program:

Use of mitigation banks or in-lieu fee programs are not necessary for this project.

Has a draft/conceptual mitigation plan been prepared in accordance with the April 10, 2008, Final Mitigation Rule[2] and District Guidelines[3,4,5]?

[2]http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/mitig_info.aspx

[3]**Sacramento and San Francisco Districts**-http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/pdf/Mitigation_Monitoring_Guidelines.pdf

[4]**Los Angeles District**-http://www.spl.usace.army.mil/regulatory/mmg_2004.pdf

[5]**Albuquerque District**-http://www.spa.usace.army.mil/reg/mitigation/SPA%20Final%20Mitigation%20Guidelines_OLD.pdf

☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No

If no, a mitigation plan must be prepared and submitted, if applicable.

Mitigation site(s) Latitude & Longitude (D/M/S, DD, or UTM with Zone):	USGS Quadrangle map name(s):
Assessor Parcel Number(s):	Section(s), Township(s), Range(s):

Other location descriptions, if known:

Directions to the mitigation location(s):

Box 11 Threatened or Endangered Species and Essential Fish Habitat

Please list any federally-listed (or proposed) threatened or endangered species or critical habitat (or proposed critical habitat) within the project area (include scientific names (e.g., Genus species), if known):

a. Ridgway's rail (Rallus obsoletus)
b. Western snowy plover (Charadrius alexandrines nivosus)
c. Salt marsh harvest mouse (Reithrodontomys raviventris)
d.
e.
f.

Have surveys, using U.S. Fish and Wildlife Service/NOAA Fisheries protocols, been conducted?
☐ Yes, Report attached (or mail copy separately if applying electronically) ☑ No

Has a biological assessment or evaluation been completed for the proposed project?
☑ Yes, Report attached (or mail copy separately if applying electronically) ☐ Not attached

Has Section 7 consultation been initiated by another federal agency?
☐ Yes, Initiation letter attached (or mail copy separately if applying electronically) ☑ No

Has Section 10 consultation been initiated for the proposed project?
☐ Yes, Initiation letter attached (or mail copy separately if applying electronically) ☑ No

Has the USFWS/NOAA Fisheries issued a Biological Opinion?
☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No
If yes, list date Opinion was issued (m/d/yyyy):

Is the project located within Essential Fish Habitat[1] (EFH)? ☐ Yes ☑ No

[1] http://swr.nmfs.noaa.gov/hcd/HCD_webContent/EFH/index_EFH.htm

Box 12 Historic Properties and Cultural Resources:

Are any cultural resources of any type known to exist on-site? ☐ Yes ■ No

Please list any known historic properties listed, or eligible for listing, on the National Register of Historic Places:

a.
b.
c.
d.
e.
f.

Has a cultural resource records search been conducted?
☑ Yes, Report attached (or mail copy separately if applying electronically) ☐ No

Has a cultural resource pedestrian survey been conducted for the site?
☑ Yes, Report attached (or mail copy separately if applying electronically) ☐ No

Has another federal agency been designated the lead federal agency for Section 106 consultation?
☐ Yes, Designation letter/email attached (or mail copy separately if applying electronically) ☑ No

Has Section 106 consultation been initiated by another federal agency?
☐ Yes, Initiation letter attached (or mail copy separately if applying electronically) ☑ No

Has a Section 106 MOA or PA been signed by another federal agency and the SHPO?
☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No
If yes, list date MOA or PA was signed (m/d/yyyy):

Box 13 Section 401 Water Quality Certification:
Applying for certification? ☑ Yes, Attached (or mail copy separately if applying electronically) ☐ No
☐ Not applicable (projects proposed for authorization under RHA Section 10 only)

Certification issued (including Programmatically)?
☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No
Certification waived? ☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No
Certification denied? ☐ Yes, Attached (or mail copy separately if applying electronically) ☑ No

Exempted activity? ☐ Yes ☑ No
Agency concurrence? ☐ Yes, Attached ☑ No
If exempt, state why:

Box 14 Coastal Zone Management Act:
Is the project located within the Coastal Zone? ☐ Yes ☑ No (If no, proceed to Box 15)

If yes, applying for a coastal commission-approved Coastal Development Permit?
☐ Yes, Attached (or mail copy separately if applying electronically) ☐ No
If no, applying for separate CZMA-consistency certification?
☐ Yes, Attached (or mail copy separately if applying electronically) ☐ No

Permit/Consistency issued? ☐ Yes, Attached (or mail copy separately if applying electronically) ☐ No

Exempt? ☐ Yes ☐ No
Agency concurrence? ☐ Yes, Attached ☐ No
If exempt, state why:

Box 15 List of other certifications or approvals/denials received from other federal, state, or local agencies for work described in this application:

Agency	Type of Approval[4]	Identification Number	Date Applied	Date Approved	Date Denied

[4] Would include but is not restricted to zoning, building, and flood plain permits

Nationwide Permit General Conditions (GC) checklist:

(http://www.gpo.gov/fdsys/pkg/FR-2012-02-21/pdf/2012-3687.pdf)

Check	General Condition	Rationale for compliance with General Condition
☑	1. Navigation	Project would not involve work in a navigable water.
☑	2. Aquatic Life Movements	Project would enhance aquatic habitat.
☑	3. Spawning Areas	Project would not involve work in fish spawning areas.
☑	4. Migratory Bird Breeding Areas	Seasonal avoidance and preconstruction surveys will avoid breeding migratory birds.
☑	5. Shellfish Beds	Project would not involve shellfish beds.
☑	6. Suitable Material	Onsite materials have been tested and confirmed suitable for use as fill in the levee.
☑	7. Water Supply Intakes	Project would not involve water supply intakes.
☑	8. Adverse Effects from Impoundments	Drainage ditches and overflow structures would be designed to avoid adverse impacts.
☑	9. Management of Water Flows	Onsite drainage management includes a pump to manage high-flow events. The levee will prevent flooding.
☑	10. Fills Within 100-Year Floodplains	The levee is designed according to FEMA standards.
☑	11. Equipment	Heavy equipment will operate using standard procedures to minimize soil disturbance.
☑	12. Soil Erosion and Sediment Controls	A SWPPP will be implemented to minimize soil erosion and sedimentation during construction.
☑	13. Removal of Temporary Fills	The site will be revegetated and stabilized upon completion of construction.
☑	14. Proper Maintenance	The Project will be monitored and maintained according to the Monitoring and Adaptive Management Plan.
☑	15. Single and Complete Project	The Phase 1 Project is a single and complete project.
☑	16. Wild and Scenic Rivers	Project is not located on a designated Wild and Scenic River.
☑	17. Tribal Rights	The Project would not impair tribal rights.
☑	18. Endangered Species	See Box 11 above.
☑	19. Migratory Bird and Bald and Golden Eagle Permits	Preconstruction surveys will be implemented to avoid and protect migratory birds.
☑	20. Historic Properties	See Box 12 above.
☑	21. Discovery of Previously Unknown Remains and Artifacts	Mitigation Measures CR-1 and CR-2 would be implemented if remains or artifacts are discovered during construction.
☑	22. Designated Critical Resource Waters	Project is not located in a designated critical resource water.
☑	23. Mitigation	See Box 10 above.
☑	24. Safety of Impoundment Structures	The project has been designed by certified engineers using standard engineering design protocols.
☑	25. Water Quality	See Box 13 above.
☑	26. Coastal Zone Management	See Box 14 above.
☑	27. Regional and Case-by-Case Conditions	The Project complies with San Francisco District Regional Conditions.
☑	28. Use of Multiple Nationwide Permits	Project would only use NWP 27
☑	29. Transfer of Nationwide Permit Verifications	The Corps' transfer protocols are understood.
☑	30. Compliance Certification	Upon project completion, the Conservancy will provide a compliance certification document to the Corps.
☑	31. Pre-Construction Notification	This is the PCN.

San Francisco District (SPN) in California:

A. General Regional Conditions that apply to all NWPs in the Sacramento, San Francisco, and Los Angeles Districts:

1. Is pre-construction notification (PCN) required? ☑ Yes ☐ No

   If yes, then in accordance with General Condition 31, the appropriate U.S. Army Corps of Engineers (Corps) District shall be notified using either the South Pacific Division PCN Checklist or a signed application form (ENG Form 4345) with an attachment providing information on compliance with all of the General and Regional Conditions. The PCN Checklist and application form are available at: http://www.spn.usace.army.mil/regulatory/index.html. In addition, the PCN shall include:

   a. A written statement describing how the activity has been designed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States; and

   b. Drawings, including plan and cross-section views, clearly depicting the location, size and dimensions of the proposed activity as well as the location of delineated waters of the U.S. on the site. The drawings shall contain a title block, legend and scale, amount (in cubic yards) and area (in acres) of fill in Corps jurisdiction, including both permanent and temporary fills/structures. The ordinary high water mark or, if tidal waters, the mean high water mark and high tide line, should be shown (in feet), based on National Geodetic Vertical Datum (NGVD) or other appropriate referenced elevation. All drawings for projects located within the boundaries of the Los Angeles District shall comply with the most current version of the *Map and Drawing Standards for the Los Angeles District Regulatory Division* (available on the Los Angeles District Regulatory Division website at: www.spl.usace.army.mil/regulatory/); and

   c. Numbered and dated pre-project color photographs showing a representative sample of waters proposed to be impacted on the project site, and all waters proposed to be avoided on and immediately adjacent to the project site. The compass angle and position of each photograph shall be documented on the plan-view drawing required in subpart b of this regional condition.

   If yes, is the PCN attached? ☑ Yes ☐ No ☐ Not Applicable

2. Is the activity located in an area designated as Essential Fish Habitat (EFH) by the Pacific Fishery Management Council (i.e., all tidally influenced areas - Federal Register dated March 12, 2007 (72 FR 11092)).
   ☐ Yes ☑ No

   If yes, notification pursuant to General Condition 31 is required. The PCN shall include an EFH assessment and extent of proposed impacts to EFH. Examples of EFH habitat assessments can be found at: http://www.swr.noaa.gov/efh.htm.

3. Are any other Federal agencies involved? ☑ Yes ☐ No

   If yes, for activities in which the Corps designates another Federal agency as the lead for compliance with Section 7 of the Endangered Species Act (ESA) of 1973 as amended (50 CFR Part 402.07), Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act (EFH) (50 CFR 600.920(b)) and/or Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (36 CFR 800.2(a)(2)), the lead Federal agency shall provide all relevant documentation to the appropriate Corps demonstrating any previous consultation efforts, as it pertains to the Corps Regulatory permit area (for Section 7 and EFH compliance) and the Corps Regulatory area of potential effect (APE) (for Section 106 compliance). For activities requiring a PCN, this information shall be submitted with the PCN. If the Corps does not designate another Federal agency as the lead for ESA, EFH and/or NHPA, the Corps will initiate consultation for compliance, as appropriate.

4. Is the project located within a waterbody supporting any federally-listed threatened or endangered fish species?
☐ Yes ☑ No
If yes, unless determined to be impracticable by the Corps, the permittee shall design all road crossings to ensure that the passage and/or spawning of fish is not hindered. In these areas, the permittee shall employ bridge designs that span the stream or river, including pier- or pile-supported spans, or designs that use a bottomless arch culvert with a natural streambed.

5. Will the permittee complete the construction of any compensatory mitigation required by special condition(s) of the NWP verification before or concurrent with commencement of construction of the authorized activity?
☐ Yes ☑ No

If no, then the proposed activity may not be in compliance with Regional Condition 10, unless construction of compensatory mitigation prior to or concurrent with commencement of construction of the authorized activity is specifically determined impracticable by the Corps.

Will the mitigation involve use of a mitigation bank or in-lieu fee program? ☐ Yes ☑ No

If yes, then the permittee shall submit proof to the Corps of payment prior to commencement of construction of the authorized activity.

6. Will the activity result in the loss of greater than 300 linear feet of intermittent and/or ephemeral streams for NWPs 29, 39, 40, 42, 43, 44, 51, and 52 or result in the loss of greater than 500 linear feet along the bank for NWP 13? ☐ Yes ☑ No

If yes, is the applicant requesting a waiver of the linear foot limit? ☐ Yes ☐ No ☐ Not Applicable

If yes, then the request shall include the following:

a. A narrative description of the stream. This should include known information on: volume and duration of flow; the approximate length, width, and depth of the water body and characters observed associated with an Ordinary High Water Mark (e.g. bed and bank, wrack line, or scour marks); a description of the adjacent vegetation community and a statement regarding the wetland status of the associated vegetation community (i.e. wetland, non-wetland); surrounding land use; water quality; issues related to cumulative impacts in the watershed, and; any other relevant information; and

b. An analysis of the proposed impacts to the waterbody in accordance with General Condition 31 and Regional Condition 3; and

c. Measures taken to avoid and minimize losses, including other methods of constructing the proposed project; and

d. A compensatory mitigation plan describing how the unavoidable losses are proposed to be compensated, in accordance with 33 CFR Part 332.

B. SPN Regional Conditions to be applied across **the entire San Francisco District:**

1. Is the project located within the **San Francisco Bay diked baylands** (undeveloped areas currently behind levees that are within the historic margin of the Bay)? Diked historic baylands are those areas on the Nichols and Wright map below the 5-foot contour line, National Geodetic Vertical Datum (NGVD) (see Nichols, D.R., and N. A. Wright. 1971. Preliminary map of historic margins of marshland, San Francisco Bay, California. U.S. Geological Survey Open File Map, Figure 1 on the Public Notice for Federal Register Notice Announcing the Reissuance of the Nationwide Permits and the San Francisco District Regional Conditions: http://www.spn.usace.army.mil/regulatory/nwp/2012/final%20NWPs.pdf)? ☑ Yes ☐ No

If yes, notification pursuant to General Condition 31 is required. The PCN must include an explanation of how avoidance and minimization of losses of waters or wetlands are taken into consideration to the maximum extent practicable (see General Condition 23(a)).

2. Is the project located within the **Santa Rosa Plain** (http://www.spn.usace.army.mil/regulatory/srp/srpmap.pdf)?
☐ Yes ☑ No

   If yes, notification pursuant to General Condition 31 is required. The PCN must include an explanation of how avoidance and minimization of losses of waters or wetlands are taken into consideration to the maximum extent practicable (see General Condition 23(a)).

3. Will the proposed project impact **Eelgrass Beds**? ☐ Yes ☑ No

   If yes, notification pursuant to General Condition 31 is required. The PCN must include a compensatory mitigation plan, habitat assessment, and extent of proposed-project impacts to Eelgrass Beds.

C. SPN Regional Conditions to be applied to specific Nationwide Permits (NWP):

NWP 3:

Will excavation equipment operate from an upland site? ☐ Yes ☐ No
If no, an explanation as to need to place equipment in waters of the U.S. must be included in the PCN.

Will work occur within a special aquatic site? ☐ Yes ☐ No
If yes, an explanation why the special aquatic site cannot be avoided, as well as impact minimization measures, must be included in the PCN.

NWP 11:

Are temporary structures proposed in wetlands or vegetated shallow water areas? ☐ Yes ☐ No
If yes, notification pursuant to General Condition 31 is required. The PCN shall include the type of habitat and aerial extent affected by the structure(s).

NWP 12:

Will excess material removed from any trenching that is not used for backfilling of the trench be disposed of at an upland site? ☐ Yes ☐ No

Does the proposed project include construction of substation facilities? ☐ Yes ☐ No
If yes, NWP 12 cannot be used to authorize this project.

NWP 13:

Will more than 300 linear feet of bank be stabilized? ☐ Yes ☐ No
If yes, notification pursuant to General Condition 31 is required. The PCN shall address the effect of the bank stabilization on the stability of the opposite side of the waterway's bank, and on the adjacent property upstream and downstream of the activity.

Will wetland vegetation or submerged, rooted, aquatic plants be removed from an area greater than 0.1 acre or 300 linear feet? ☐ Yes ☐ No
If yes, notification pursuant to General Condition 31 is required and shall include vegetation type and extent of removal.

Will excess material excavated from a toe trench be disposed of in an upland location? ☐ Yes ☐ No
If yes, the PCN shall include the location of the disposal site.

Will additional fill extend beyond the original shoreline in excess of one cubic yard per running foot?
☐ Yes ☐ No

Will bank stabilization incorporate structures or modifications beneficial to fish and wildlife? ☐ Yes ☐ No
If no, the applicant shall demonstrate why the structures or modifications were not considered practicable.

NWP 14:

Will the proposed project fill greater than 300 linear feet of a jurisdictional waterway? ☐ Yes ☐ No
If yes, notification pursuant to General Condition 31 is required. The PCN shall address the effect of the activity on the stability of the opposite side of the waterway's bank, and on the adjacent property upstream and downstream of the activity.

Is the proposed project to construct taxiways or runways? ☐ Yes ☐ No
If yes, NWP 14 cannot be used to authorize this project.

Has this NWP been used to authorize previous project segments within the same linear transportation project?
☐ Yes ☐ No
If yes, justification must be provided demonstrating that the cumulative impacts of the proposed and previously authorized project segments do not result in more than minimal impacts to the aquatic system.

Has any new or additional bank stabilization required for the crossing incorporated structures or modifications beneficial to fish and wildlife? ☐ Yes ☐ No
If no, the applicant shall demonstrate why they were not considered practicable. Bottomless and embedded culverts are encouraged over traditional culvert stream crossings.

NWP 23:

Use of this NWP requires notification pursuant to General Condition 31. Please refer to Regional Conditions for additional information on PCN requirements.

NWP 27:

The PCN shall include documentation of a review of the project's impacts to demonstrate that at the conclusion of work the project would result in a net increase of aquatic function. The documentation must also include a review of the project's impacts on adjacent properties or structures and must also discuss cumulative impacts associated with the project.

NWP 29:

Will the activity result in the replacement of wetlands or waters of the U.S. with impervious surfaces?
☐ Yes ☐ No
If yes, the residential development shall incorporate low impact development concepts to the extent practicable, and a description of those concepts proposed shall be included with the PCN. Additional information on concepts and definitions are available at the following website: http://www.epa.gov/owow/NPS/lid

Is the proposed project located within the San Francisco Bay diked baylands (Figure 1 on the Public Notice for Federal Register Notice Announcing the Reissuance of the Nationwide Permits and the San Francisco District Regional Conditions: http://www.spn.usace.army.mil/regulatory/nwp/2012/final%20NWPs.pdf)?
☐ Yes ☐ No
If yes, NWP 29 cannot be used to authorize this project.

NWP 33:

Are access roads designed to be the minimum width necessary? ☐ Yes ☐ No ☐ Not Applicable (N/A)

Are access roads designed to minimize changes to the hydraulic flow characteristics of waterways and degradation of water quality for project implementation? ☐ Yes ☐ No ☐ N/A

Will the road(s) be properly stabilized and maintained during and after construction? ☐ Yes ☐ No ☐ N/A

Will fill be placed to minimize encroachment of equipment within waters of the U.S? ☐ Yes ☐ No ☐ N/A

Will vegetative disturbance be minimized? ☐ Yes ☐ No ☐ N/A

Will borrow material be taken from an upland source, where feasible? ☐ Yes ☐ No ☐ N/A

If no to any of the above, NWP 33 cannot be used to authorize the project.

Will the proposed project result in stream channelization? ☐ Yes ☐ No ☐ N/A
If yes, NWP 33 cannot be used to authorize the project.

NWP 35:

Use of this NWP requires notification pursuant to General Condition 31. Please refer to Regional Conditions for additional information on PCN requirements.

NWP 39

Will the activity result in the replacement of wetlands or waters of the U.S. with impervious surfaces?
☐ Yes ☐ No
If yes, the commercial or institutional development shall incorporate low impact development concepts to the extent practicable, and a description of those concepts proposed shall be included with the PCN. Additional information on concepts and definitions are available at the following website: http://www.epa.gov/owow/NPS/lid

Is the proposed project located within the San Francisco Bay diked baylands (Figure 1 on the Public Notice for Federal Register Notice Announcing the Reissuance of the Nationwide Permits and the San Francisco District Regional Conditions: http://www.spn.usace.army.mil/regulatory/nwp/2012/final%20NWPs.pdf)?
☐ Yes ☐ No
If yes, NWP 39 cannot be used to authorize the project.

NWP 40:

Will work impede flows during high volume events of a perennial or intermittent watercourse? ☐ Yes ☐ No
If yes, NWP 40 can not be used to authorize the project.

NWP 41:

If the Corps determines that there will be a detrimental impact to aquatic habitat, compensatory mitigation may be required.

Will fill material be re-deposited, re-graded, and/or discharged, or will channel lining be installed?
☐ Yes ☐ No
If yes, notification pursuant to General Condition 31 is required. The PCN shall include a statement demonstrating the need for the project and an explanation of the project's benefit to water quality.

NWP 42:

Are buildings proposed in waters of the U.S.? ☐ Yes ☐ No
If yes, the applicant must demonstrate that there is no on-site practicable alternative less environmentally damaging as defined by the Section 404(b)(1) guidelines.

APPENDIX G

Draft Geotechnical Investigation Report

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DRAFT
FINAL GEOTECHNICAL INVESTIGATION

BEL MARIN KEYS UNIT V WETLAND RESTORATION
NEW BAYFRONT LEVEE
MARIN COUNTY, CALIFORNIA

Project No. 831.01
March 14, 2016

Prepared by

Hultgren – Tillis Engineers

A California Corporation
Specializing in Geotechnical Engineering

Hultgren-Tillis Engineers

March 14, 2016
Project No. 831.01

Moffatt & Nichol
2185 N. California Blvd., Suite 500
Walnut Creek, California 94596

Attention: Mr. Neil Nichols

Draft
Final Geotechnical Investigation
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Dear Mr. Nichols:

We performed a final geotechnical investigation for the proposed new Bayfront Levee for the Bel Marin Keys Unit V (BMKV) Wetland Restoration project in Marin County, California. The geotechnical investigation was performed in accordance with the Subconsultant Agreement dated June 26, 2015. The results of our investigation are presented in the attached report.

It was a pleasure working with you on the final design of the Bayfront Levee portion of the wetland restoration project. We look forward to working with you on the project during implementation. If you have any questions, please call.

Sincerely,

Hultgren – Tillis Engineers

DRAFT

Callan J. Yu
Civil Engineer

DRAFT

Edwin M. Hultgren
Geotechnical Engineer

CJY:EMH:lm:la

cc: Mr. Jeff Melby, State Coastal Conservancy (via email)

Filename: 83101R01 draft.docx

TABLE OF CONTENTS

		Page
I.	**INTRODUCTION**	**1**
II.	**FIELD EXPLORATION AND LABORATORY TESTING**	**2**
	A. BMKV Residential Subdivision	2
	B. Hamilton North Levee	2
	C. Preliminary Bayfront Levee Alignment	2
	D. Bayfront Levee	2
	E. Select Laboratory Data Summaries	4
	F. Survey Reference	4
III.	**SITE CONDITIONS**	**5**
	A. General Regional Geology	5
	B. Regional Seismicity and Geologic Hazards	6
	C. Surface Conditions	6
	D. Subsurface Conditions	8
	E. Groundwater	9
IV.	**DISCUSSION AND CONCLUSIONS**	**10**
	A. General	10
	B. Settlement	10
	C. Static Slope Stability	14
	D. Seismic Analyses	21
	E. Design Configurations	24
	F. On-Site Borrow Material	26
	G. Levee Foundations	27
	H. Impacts on PG&E Towers and Setback Distance	28
	I. Novato Sanitary District Outfall	28
	J. Seepage Considerations	29
V.	**RECOMMENDATIONS**	**30**
	A. Levee Geometry	30
	B. Earthwork	30
	C. Performance Verification	33
	D. Surface Drainage and Maintenance	34
	E. Weaker Bay Mud Delineation and Exploration	35
	F. Sheetpiles and Pipe Trench	35
	G. Services During Construction	36

SELECTED REFERENCES

PLATES

Plate 1 Vicinity Map

Plate 2 Site Plan

Plate 3 Geologic Map

Plate 4 1854 U.S. Coast Survey

Plate 5 Idealized Soil Profile

Plate 6 Vane Shear Results on Potential Borrow Materials

Plate 7 Atterberg Limits on Potential Borrow Materials

Plate 8 Compaction Curves on Potential Borrow Materials

Plate 9 Moisture Content vs Depth on Potential Borrow Materials

Plate 10 Levee Crest Settlement Profile

Plate 11 TxUU Shear Strength Data in Bay Mud

Plate 12 Typical Design Configuration 1, Immediately-After-First-Stage Construction

Plate 13 Typical Design Configuration 1, Immediately-After-Second-Stage Construction

Plate 14 Typical Design Configuration 2, Immediately-After-First-Stage Construction

Plate 15 Typical Design Configuration 2, Immediately-After-Second-Stage Construction

Plate 16 Typical Design Configuration 2, Immediately-After-Third-Stage Construction

APPENDIX A Recent Logs of Borings

Plates A-1 through A-10 Logs of Borings 1 through 5

Plates A-11 through A-18 Logs of Test Pits 1 through 8

Plate A-19 Soil Classification

APPENDIX B Laboratory Test Results

Plates B-1 and B-2 Atterberg Limits

Plate B-3 Sieve Analysis Test Results

Plates B-4 through B-8 Unconsolidated-Undrained Triaxial Strength (TxUU) Test Results

Plates B-9 through B-10 Consolidated-Undrained Triaxial Strength (TxCU) Test Results

Plates B-11 through B-46 Consolidation and Time-Rate Test Results

Plates B-47 through B-49 Compaction Curves

Plates B-50 through B-52 Corrosivity Analysis

APPENDIX C Geotechnical Instrumentation

Plates C-1 and C-2 Inclinometers Installation

Plates C-3 and C-4 Piezometer Installation

Plates C-5 and C-6 Piezometer Data

APPENDIX D Slope Stability Results

Plates D-1 through D-14 Slope Stability Results for Design Profile 1

Plates D-15 through D-32 Slope Stability Results for Design Profile 2

I. INTRODUCTION

This report presents the results of our final geotechnical investigation for the proposed new Bayfront Levee for the Bel Marin Keys Unit V (BMKV) Wetland Restoration project in Marin County, California. The project includes construction of a new approximate 2.2-mile-long levee to allow restoration of tidal marshes and potentially beneficial reuse of dredged sediments. The new Bayfront Levee will be offset inland of the existing bayfront levee and traverse the BMKV site in the north-south direction.

The site is located east of Highway 101 and south of State Highway 37, approximately four miles southeast of downtown Novato, California. The site is bordered by the Bel Marin Keys (BMK) residential community and Novato Creek to the north, San Pablo Bay to the east, Hamilton Wetland Restoration to the south, and Pacheco Pond to the west. The site is bounded by existing perimeter levees with the exception of a small area of high ground at the far west end of the site. Portions of the existing perimeter levee fronting San Pablo Bay will be breached to restore tidal inundation. The new levee is to protect both the BMK residential community and properties to the west from tidal inundation once the existing bayfront levee is breached. The site location is shown on the Vicinity Map, Plate 1. The preliminary new bayfront levee as envisioned in the 2010 Conceptual Design Report and the currently proposed new Bayfront Levee are presented on the Site Plan, Plate 2. The proposed new Bayfront Levee alignment and levee stationing (Stations 100+00 to 213+95) are provided by Moffatt & Nichol. Unless otherwise specifically noted, all elevations in this report refer to the North American Vertical Datum of 1988 (NAVD).

Our scope of services was outlined in the Subconsultant Agreement dated June 26, 2015. Our services included site investigation, subsurface exploration, laboratory testing, and developing conclusions and recommendations regarding geotechnical aspects of the levee. These geotechnical aspects include subsurface conditions, stability, settlement, borrow materials, staged filling, and placement and compaction of new levee embankment. The results of our geotechnical investigation are presented in this report.

II. FIELD EXPLORATION AND LABORATORY TESTING

Several geotechnical explorations were performed in the BMKV project vicinity for previous site development proposals and for the design of new bayfront levee alignments. These field explorations are described in chronological order below. Selected references are listed at the end of this report. Selected locations of subsurface exploration in the vicinity of the new Bayfront Levee alignment are shown on the Site Plan, Plate 2. [Note to Draft Final Report – These exploration locations are also summarized in Table __, below.]

A. BMKV Residential Subdivision

Geotechnical investigations were performed within BMKV as part of the development of residential properties within Unit V of the BMK area. Herzog Associates performed 8 exploratory borings and 20 cone penetration test (CPT) soundings in 1991. In 1995, Miller Pacific Engineering Group performed 44 borings, 6 CPTs, 13 test pits, and installed 5 piezometric monitoring wells.

B. Hamilton North Levee

The North Levee separates Hamilton Wetland Restoration from BMKV. The North Levee consists of two subsegments. The western approximate 4,000 feet long segment is referred to as North-1 Levee (N-1). The second segment is approximately 5,200 feet long and is referred to as North-2 Levee (N-2). As part of the Hamilton Wetland Restoration project, URS performed geotechnical investigations for the N-1 and N-2 Levee in 2004 and 2005, respectively. The geotechnical exploration for the N-1 Levee included 10 borings and 6 vane shear tests and the N-2 Levee include 16 borings and 6 vane shear tests.

C. Preliminary Bayfront Levee Alignment

A preliminary geotechnical investigation and design for a new bayfront levee alignment was performed by ENGEO in 2010. The field investigation included drilling 2 exploratory borings, pushing 13 CPT soundings, and performing 2 vane shear test profiles.

D. Bayfront Levee

We explored subsurface conditions on August 3 through August 6, 2015 by drilling 5 borings along the proposed levee alignment to depths of 60 to 80 feet below existing grade. The borings were labeled as Borings 1 through 5. Inclinometer casings were installed

and grouted into place at Borings 1 and 4. Piezometers were installed and grouted into place with a cement bentonite mix at Borings 2 and 5. Boring 5 was drilled approximately 175 feet offset from Boring 4. The upper 60 feet of Boring 5 was not logged or sampled. The intent of Boring 5 was to characterize the depth of the Bay Mud and to install and grout piezometers in-place. The inclinometer and peizometer installation diagram and collected piezometers data are presented in Appendix C.

Our subcontractor drilled the borings with truck-mounted rotary-wash drilling equipment. We collected samples with a 2.5-inch outside diameter (OD), 1.9-inch inside diameter (ID) split barrel sampler or a Shelby sampler with 3-inch outside diameter, thin-walled tube. The 2.5-inch OD samplers were driven with an automatic 140-pound hammer dropping approximately 30-inches for a penetration depth of up to 18-inches. The Shelby tubes were pushed to either 24- or 30-inches.

Our engineer logged the borings and recorded blow counts from driving the samplers. We recovered samples from the borings for further visual classification and for selection of materials for laboratory testing. Our engineer used a pocket penetrometer to evaluate unconfined compressive strength or a torvane to evaluate the soil shear strength. The borings were backfilled with grout. We converted the field penetration resistance obtained while driving the 2.5-inch sampler to equivalent Standard Penetration Test (SPT) N-values by multiplying by 0.8 to account for sampler size.

We also performed additional shallow subsurface exploration to evaluate potential on-site borrow areas for the new levee fill by excavating 8 test pits on October 8, 2015 to depths of 8 to 8.5 feet below existing grade. Vane shear tests were performed using a Geonor H-60 hand held vane.

Laboratory tests were performed on selected samples from the borings and test pits. The tests include moisture content, dry density, organic content, Atterberg limits, sieve analyses, unconsolidated-undrained triaxial strength (TxUU) tests, consolidated-undrained triaxial strength (TxCU) tests, consolidation tests, compaction curves, resistivity tests, pH tests and corrosion potential tests.

Soil descriptions, equivalent SPT N-values, pocket penetrometer, torvane, and hand vane shear tests and the selected laboratory test data are shown on the Logs of Borings, Plates A-1 through A-10 and the Logs of Test Pits, Plates A-11 through A-18 in Appendix A.

The soil descriptions on the logs of boring and test pits are presented in general accordance with the Soil Classification System presented on Plate A-19 with laboratory test results presented in the manner described by the Key to Test Data.

The laboratory testing results are presented in Appendix B. Atterberg limits are presented on Plates B-1 and B-2. Sieve results are presented on Plate B-3. Triaxial unconsolidated undrained test results are presented on Plates B-4 to B-8. Triaxial consolidated undrained test results are presented on Plates B-9 and B-10. Consolidation test results together with time-rated data are presented on Plates B-11 through B-46. Compaction test results are presented on Plates B-47 through B-49. Corrosivity analysis results are presented on Plates B-50 through B-52.

E. Select Laboratory Data Summaries

Laboratory testing of potential borrow materials were performed on samples from our test pits. A summary of the Atterberg limits on potential borrow material is presented on Plate 7. Our compaction curves together with compaction curves from previous investigations are summarized on Plate 8. Summaries of moisture content versus depth for samples from both our recent test pits and those from previous test pits (Miller Pacific 1995) are presented on Plate 9.

F. Survey Reference

A LIDAR survey of BMKV was performed in 2000. A topographic survey of the existing levees along Novato Creek and the existing bayfront levee was performed in 2009. The elevations shown in this report are referenced to NAVD. The exploratory borings and test pit locations were measured by using a hand-held GPS instrument. The GPS instrument has a horizontal precision ranging from 10 to 25 feet.

III. SITE CONDITIONS

A. General Regional Geology

BMKV is located within the Coastal Range geomorphic province of California. The Costal Range lies between the Pacific Ocean and the Great Valley province (Sacramento and San Joaquin Valleys). The Coastal Range province is characterized by northwest trending mountain ranges and valleys.

The sea level rose following the last ice age, flooding the valleys. Eroded fine-grained silt and clay particles were carried down streams to the bay, where they met the salty and relatively quiet bay waters. There they settled to form the highly plastic clay and silt estuary deposit known as San Francisco Bay Mud (Bay Mud). The accretion of Bay Mud formed mudflats and marshlands. The marshlands at BMKV were diked to accommodate farming. The entire BMKV property is underlain by Bay Mud ranging in thickness from a few feet near the Meditation Center to over 90 feet at the northern boundary along Novato Creek. Bay Mud is typically normally-consolidated to slightly over-consolidated, weak and highly compressible soil and typically exhibits low permeability and low shear strength. Bay Mud is typically underlain by stronger and less compressible alluvial soils.

Blake, Graymer, Jones, and Soule published a geologic map for parts of Marin County in 2000. Selected portions of their geologic map and the descriptions of map units are presented on Plate 3. The geology map indicates artificial fill over marine and marsh deposits (Qmf) within the study area boundaries. The study area is mapped as artificial fill because it has been diked and farmed. Most of the site has received little to no fill.

The 1854 shoreline of San Pablo Bay and the approximate study area boundaries are presented on Plate 4. The shoreline was extended to its current location along the mouth of Novato Creek and extending into San Pablo Bay. Levees were constructed along Novato Creek and San Pablo Bay, and the land was reclaimed for agricultural use. The levees were likely constructed by excavating Bay Mud from the adjacent marsh. From the time levees were built in the late 1800s to early 1900s, the property was used for grazing and agriculture. The study area was drained by a system of drainage ditches and pumps. As a result of diking, drainage, and cultivation, the ground surface subsided to its present elevations several feet below sea level, creating a surficial crust of desiccated Bay Mud.

B. Regional Seismicity and Geologic Hazards

The predominate seismic hazard for the BMKV area is strong groundshaking and the resulting potential for deformation of the new levee. The intensity of groundshaking will depend on several factors including characteristic of fault, distance to fault and earthquake hypocenter, earthquake magnitude and duration, and site-specific geologic conditions. Ground motions may be amplified and have longer periods at soft Bay Mud deposit sites than at bedrock sites.

No known active faults pass through BMKV, and the risk of fault rupture is low. The major active faults near BMK are listed in the following table.

Table 1: Active Faults

Fault	Distance	Direction From Fault
Rogers Creek	6 miles	Northeast
Hayward	6.5 miles	East
San Andreas	13.5 miles	West
West Napa	14 miles	Northeast
San Gregorio	14.5 miles	Southwest
Concord – Green Valley	20 miles	East

C. Surface Conditions

The new Bayfront Levee alignment crosses several local landforms: the existing levees which will abut the ends of the new Bayfront Levee, hay fields which make up most of the site area, drainage ditches, depressions at past levee borrow areas and unpaved access roads.

1. <u>Perimeter Levees</u>

The BMKV site was reclaimed from tidal marshlands adjacent to Novato Creek and San Pablo Bay. These existing perimeter levees are generally 10 to 15 feet above existing interior grade. The original reclaimed marsh was much higher in elevation than current interior grades. The initial perimeter levees may have only been 5 to 6 feet high relative to the

original marsh elevation. The levees were most likely constructed from adjacent borrow ditches. Over time, the relative height of the levee increased as the farm fields lowered due to oxidation and desiccation. Several episodes of levee filling likely occurred as the levees settled and eroded areas needed repair, and as the landowners sought increased protection from extreme tides and wind driven waves. Several repairs to the existing levees were made in the last decade including the Novato Creek levee and the existing bayfront levee. The Novato Creek and existing bayfront levees were repaired in late 2006 to early 2007. The existing bayfront levee was also repaired in 2015. The N-1 and N-2 Levees were constructed and completed by the late 2000s. Most of the levee crests are unpaved with the exception of N-1 and N-2 Levees, which have a gravel surface.

Crest elevations along Novato Creek ranged from Elevation 8 feet to Elevation 11 feet. Along the existing bayfront levee where a fringing marsh remains on the bayside, the top of levee crest generally ranged from Elevation 8 feet to Elevation 10 feet. The top of crest is up to Elevation 13 feet along those sections of the existing bayfront levee without the fringing marsh. We judge the elevations of the N-1 and N-2 Levees range between Elevation 8 feet and Elevation 10 feet.

2. BMKV Site Interior

The ground surface at the BMKV site along and immediately adjacent to the planned new Bayfront Levee alignment is covered predominately by oat hay fields. The hay fields are separated by drainage ditches. Brush and occasional trees exist along the main drainage ditch traversing the center of the site from west to east. Overhead utilities also run parallel to the main drainage ditch to the pump station located at the existing bayfront levee. Several unpaved access farm roads traverse the site. The main farm road runs parallel to the main drainage ditch to the pump station.

LIDAR data indicated that most of the BMKV site along the planned new Bayfront Levee alignment ranged from Elevation -2 feet to Elevation -3 feet. Several previous borrow pits exist adjacent to the Novato Creek levee and near or beneath the northern end of the planned new levee alignment. The depth of the borrow pits was not surveyed. We judge the borrow pits to be shallower than 5 feet. During our summer and fall 2015 site visits, the borrow pits were observed to be dry. These depressions are likely shallow ponds during and following winter rains.

D. Subsurface Conditions

We subdivided the subsurface conditions generally into three strata based on their engineering properties: Bay Mud Crust, Young Bay Mud, and alluvium. These layers are described further below. An idealized soil profile for the Bayfront Levee alignment is presented on Plate 5. [Note on final Draft – Plate 5 will be inserted once the final alignment is set.]

1. Bay Mud Crust

The BMKV site is blanketed with a surficial layer of Bay Mud Crust. The crust is approximately 6 to 8 feet thick and has dried due to farming activities. The crust has a stiff to very stiff consistency. The drying has created shrinkage cracks up to 2-inches wide and extending 2 feet below existing grade. The shrinkage cracks were observed throughout the site. The Bay Mud Crust overlies Young Bay Mud and the transition between the two units is gradational.

Potential borrow areas are located in the fields adjacent to the planned levee alignment. Similar to the subsurface material along the planned levee alignment, potential borrow areas are predominately Bay Mud Crust. The moisture content typically increases with depth, as shown on the summary plot presented on Plate 9.

2. Young Bay Mud

The Young Bay Mud, commonly referred to as Bay Mud in this report, is normally-consolidated to slightly over-consolidated, weak and highly compressible fat clay (CH) and elastic silt (MH). The Bay Mud layer is quite thick. The base of the Bay Mud extends to depths of 45 to 55 feet below grade along the majority of the preliminary levee alignment. The depths correspond to Elevation -45 feet to Elevation -60 feet. The base of the Bay Mud becomes deeper toward the northern approximate 1,500 feet of the levee alignment near Novato Creek, to a maximum depth of 90 feet or about Elevation -95 feet. The Bay Mud typically ranges from soft to medium stiff and the consistency increases with depth.

With the exception of our northernmost boring (Boring 4), the strength of the Bay Mud was reasonably consistent in our borings, and it was also fairly consistent with most previous explorations by others. The strength profile developed from this data was used to analyze the stability of the southern ¾ of the planned new Bayfront Levee. Our northernmost

boring (Boring 4) encountered weaker Bay Mud. At least one other boring (ENGEO 2010) also found a weaker Bay Mud profile in the northern portion of the site. This data was used to develop a second strength profile to assess the stability in the northern portion of the levee alignment.

3. Alluvium

Alluvium underlies Young Bay Mud. The alluvial soils generally consist of stiff to very stiff sandy silts and clays. The alluvium extends to the bottom of the deepest exploration in the site vicinity, approximately 100 feet.

E. Groundwater

The site is several feet below sea level, and the groundwater levels within the site are primarily controlled by evapo-transpiration and to a lesser degree by drainage ditches and pumping. During exploration, we commonly encountered water at 6 to 8 feet below ground surface. These depths correspond to about Elevation -9 feet to Elevation -11 feet.

Vibrating wire (VW) piezometers were installed in Boring 2 and Boring 5 to measure in-situ pore water pressures within the Bay Mud. Initial piezometer measurements indicate that the hydraulic head at/near the base of the Bay Mud is about 1 to 1.5 feet above the ground surface. The shallowest piezometers points show a lowering trend through the dry autumn months until the beginning of the winter rains. The piezometer measurements are presented in Appendix C.

The above descriptions of soil conditions summarize observations at the time of the investigations. Conditions are expected to vary across the site, with time, and depend on several factors including changes in moisture content resulting from seasonal precipitation, irrigation practices, pumping operations, and tides.

IV. DISCUSSION AND CONCLUSIONS

A. General

The most significant geotechnical issue for this project is the presence of Bay Mud. Bay Mud is weak and highly compressible and blankets the entire length of the levee alignment.

Considerable settlement will occur under the loading of the new levee embankment fill, and settlement will continue into the next century. The design levee elevations can be maintained by placing additional fill on the levee crest as the levee settles. We refer to this as stage filling. The settlement due to loading of the new levee embankment is described further in the Settlement section.

To avoid overstressing the underlying Bay Mud, we conclude that the new levee will need to have moderately flat overall levee slopes or a combination of steeper slopes on the main levee embankment core and very flat wide stability berms. Important attributes of either a flat slope or stability berm are its mass and width. The function of a flat slope or a stability berm is to apply a counter-balancing mass on the weak foundation materials beyond the main levee embankment core.

The transition between the more consistent Bay Mud profile along the southern ¾ of the Bayfront Levee alignment to weaker Bay Mud to the north is not well defined. The location of Boring 4 exhibiting weaker Bay Mud shear strength data is near Station 189+00. There is no geotechnical data within the planned Bayfront Levee alignment north of Station 189+00. Additional geotechnical exploration is needed to estimate the limits of weaker Bay Mud. The nearest exploration point to the south is E-09-C10 at approximate Station 184+00. We judge that the weaker Bay Mud may transition at or north of Station 184+00.

B. Settlement

Minimum levee crest design elevations were provided by Moffatt & Nichol. The levee is to maintain an initial minimum levee crest above Elevation +12 feet (NAVD). To allow for 2 feet of sea level rise, a minimum levee crest of Elevation +14 feet was selected for 50 years from present. The minimum levee crest width is 16 feet. The levee is to maintain a 16 foot wide levee crest above Elevation +14 feet after stage filling and subsequent ultimate consolidation settlement. The design limit levee crest geometry is presented in Table 2.

Table 2: Design Levee Crest Geometry

Minimum Levee Crest Elevation Before Sea Level Rise	+12 feet
Minimum Crest Width	16 feet
Allowance for Sea Level Rise	2 feet
Minimum Levee Crest Elevation After Future Stage Filling and Subsequent Ultimate Consolidation Settlement	+14 feet

The levee will settle during and after construction. To estimate the magnitude and time rate of settlement, we used the parameters in Table 3, below.

Table 3: Soil Properties Used for Settlement Analyses

Fill Unit Weight	110 pcf*
Bay Mud Unit Weight	92 pcf
Bay Mud Void Ratio, e_0	2.45
Bay Mud Virgin Compression Index, Cc	1.20
Bay Mud Rebound Compression Index, Cr	0.13
Bay Mud Cc / (1+ e_0)	0.35
Bay Mud Cr / (1+ e_0)	0.04
Bay Mud Coefficient of consolidation c_v	12 ft^2/year
Groundwater Elevation	0 feet

*pcf: pounds per square inch

The settlement analysis was performed using the computer program CONSOL 3.0. To characterize the stress distribution beneath the levee, we modeled the levee embankment load as a series of superimposed infinite strip fills to account for varying embankment widths.

We assumed that the ground surface is at Elevation -3 feet and since the time for levee breach is unknown, we assumed a groundwater level at Elevation 0 feet. Pre-

consolidation pressures of the underlying Bay Mud were based on laboratory test results.

Neither the clay levee embankment at the surface nor the sandy clay to clayey sand alluvium layer beneath the Bay Mud are free draining layers. We judge that the upper bound of the time rate of settlement can be reasonably characterized by assuming single drainage for the Bay Mud thicknesses. In reality, drainage path is between single and double drainage. In subsequent paragraphs, we computed time rates of single drainage together with our judgment on the expected rate of settlement. We believe efforts to more precisely estimate the time rate of settlement along the levee alignment are not warranted. The decision as to when to place additional fill will be based on future levee crest elevation surveys. The results of our analysis are presented below.

1. <u>Soil Profile 1</u>

Soil Profile 1 is intended to represent soil conditions beneath the new Bayfront Levee from Stations 100+00 to 184+00, which is approximately the southern ¾ of the levee alignment. In this area, the Bay Mud thickness varies from 45 to 60 feet thick and averages about 50 feet thick. For this area, we analyzed a Bay Mud thickness of 50 feet and an initial levee embankment fill placed to Elevation +15 feet. This initial crest elevation allows for 3 feet of settlement before additional fill needs to be placed. We estimate that one increment of future filling will be needed to maintain the minimum levee crest elevation. We estimate that the levee will settle to Elevation +12 feet in about 17 years after completion of First Stage construction. (We computed that it would take 25 years to settle 3 feet in our upper bound single drainage model.) Once the levee in the southern 3/4's of the alignment has settled to Elevation +12 feet, 3.5 feet of additional fill to Elevation +15.5 feet will be needed to account for the balance of the long-term settlement. This will allow for 1.5 feet of settlement to maintain the final, long-term design crest elevation of +14 feet. The estimated levee crest settlement within 50 years for Soil Profile 1 is presented on Plate 10.

Settlement will occur beyond the toe of the stability berms. For a 5 feet thick stability berm with a 3H:1V slope, we estimate about 0.8-inch of settlement will occur at a point 25 feet beyond the toe of the slope and that 0.3-inch will occur at 50 feet beyond the toe.

2. Soil Profile 2

Soil Profile 2 is intended to represent soil conditions beneath the new Bayfront Levee from Stations 184+00 to 213+95. In this northern 1/4 of the levee alignment the Bay Mud thickness varies from 60 to 95 feet thick. For this area, we analyzed a Bay Mud thickness of 80 feet. For a long-term crest elevation of +14 feet, the total fill thickness will be on the order of 25 feet and about 8 feet of settlement is expected.

The Bay Mud is very weak in this area. As discussed in a later section, very wide stability berms would be needed to maintain static stability. Limiting seismic deformation will be difficult without some form of soil improvement. We conclude that wick drains should be used beneath the landside portion of the levee and its landside stability berm to accelerate consolidation and improve the soil strength. Wick drains are prefabricated vertical drains typically installed to provide a shortened drainage path to relieve excess pore water pressure within soft, consolidating soils. The shortened drainage path allows for the acceleration of consolidation and a corresponding increase in the strength of the Bay Mud.

The rate of accelerated consolidation of Bay Mud will depend on the spacing of the wick drains. For wick drain spacing of 6 feet in a triangular pattern, we estimate that 50 percent consolidation occurs within 4.5 months, 75 percent in 9 months, and 90 percent in 15 months. Other than in transition zones, the wick drains would penetrate the full thickness of the Bay Mud. In some areas, fill in excess of that needed to achieve final grade after settlement would be placed as a surcharge load over the wick drains. The added consolidation under the weight surcharge loads can provide further strength in the Bay Mud.

For this approach, we anticipate multiple stages of filling. The First Stage of construction will consist of installing wick drains beneath the levee landside toe berm and placing 8 to 13 feet of fill. One or two increments of filling may occur to surcharge the stability berm area and to achieve a 3 feet overbuild to Elevation +15 feet in the crest area. We anticipate these initial stages occurring over a two year period.

In the future, when the levee has settled to near Elevation +12 feet, another increment of levee fill will need to be placed to avoid having the crest below its minimum design elevation. We estimate that the levee will settle to Elevation +12 feet in about

17 years after completion of Second Stage construction. We conclude that the levee crest needs to be filled back to Elevation +15.5 feet.

The estimated levee crest settlement for the Soil Profile 2 condition within 50 years is presented on Plate 10. The crest settlement time rate assumes that it is not accelerated by the nearby wick drains beneath the landside stability berm.

For a 10 feet thick stability berm with a 3H:1V slope, we estimate about 1.6-inches of settlement will occur at a point 25 feet beyond the toe of the slope. We estimate 0.7-, 0.5- and 0.3-inches of settlement will occur at 50, 75 and 100 feet beyond the toe of the stability berm.

3. Transition Between Wicks and No Wicks

Differential settlement will occur due to unequal rate of consolidation between areas with and without wick drains. A transition in wick drain depths over a select levee length should be designed so the differential settlement is not sharp.

4. Transition Between Existing and New Levees

Where the new Bayfront Levee abuts the existing levees, the existing levees will have already settled under the weight of the existing levee fill. The new levee section will be settling as new fill loads are placed. Differential settlement will occur due to unequal consolidation of Bay Mud in the abutment areas. Differential settlement can cause cracks within the compressing layer and the fill above. To provide protection against settlement-induced cracking and the associated seepage risk, flatter levee embankment slopes with wider buttress/stability berms can be used in these transition areas.

C. Static Slope Stability

1. Soil Profile 1

The two most critical conditions for slope stability will occur (1) during or immediately after placement of embankment fill and (2) during a large magnitude earthquake. This section addresses various static slope stability conditions. The slope stability results are presented in Appendix D. Seismic conditions will be addressed in the Seismic Analyses section.

Soil Profile 1 is intended to represent soil conditions beneath the new Bayfront Levee from Stations 100+00 to 184+00. For the immediately-after-first-stage construction, the Bay Mud Crust was modeled as an 8 foot thick layer. We selected a shear strength of 1,000 pounds per square feet (psf) from the existing ground surface down to a depth of 5 feet. Below 5 feet, we characterized the strength as 1,000 psf decreasing 217 psf for each additional foot of depth to 350 psf at 8 feet deep. Below a depth of 8 feet, we selected a constant shear strength of 350 psf to a depth of 27 feet. At a depth of 27 feet below existing ground surface, we characterized the strength as 350 psf increasing 8 psf for each additional foot of depth. In our stability analysis, the ground surface was assumed to be at Elevation -3 feet. The bottom of the Bay Mud was modeled at Elevation -63 feet. The TxUU shear strength data within the Bay Mud and our selected design profiles is presented on Plate 11.

The levee embankment materials will be compacted considerably stronger than the Bay Mud foundation materials. Using the higher cohesive strength of the embankment materials in our stability analyses resulted in tension zones in the embankment. We judge that the tension cannot be relied upon. Our method to discount tension within the embankment is to assume that a vertical tension crack develops in the embankment fill. Because we “crack” the fill in our immediately-after-first-stage construction stability analysis, the shear strength values in these materials are not directly used in the analysis. We checked an alternate approach, which is to assume that cohesion is lost along the length of the trial stability circle passing through the embankment. The developed strength in this segment of the trial stability circle is limited to an assumed frictional component of 30 degrees. The differences between the factor of safety of the two approaches were minimal. The shear strength parameters that we selected for use in the immediately-after-first-stage construction stability analyses are presented in Table 4. The slope stability analysis was performed using Spencer’s method in the computer program SLOPE/W.

Table 4: Material Properties Used for Soil Profile 1 in Immediately-After-First-Stage Construction Stability Analyses

	Total Unit Weight	Cohesion	Angle of Internal Friction
1. Embankment fill	110 pcf	1,000 psf	0°
2. Stability berm fill	105 pcf	1,000 psf	0°
3. Bay Mud Crust for upper 5 feet	95 pcf	1,000 psf	0°
4. Bay Mud Crust between 5 and 8 feet	95 pcf	1,000 psf - 217 psf/ft	0°
5. Bay Mud deeper than 8 feet	95 pcf	350 psf	0°
6. Bay Mud deeper than 27 feet	95 pcf	350 psf + 8 psf/ft	0°
7. Alluvium	120 pcf	1,500 psf	0°

With time, the Bay Mud will gain strength as it consolidates. The undrained margin of safety after the underlying Bay Mud is partially or fully consolidated under the loading of the levee embankment was computed assuming the consolidated undrained strength was equal to 0.3 times the vertical effective stress ($S_u/p = 0.3$).

Long-term (effective stress) loading conditions were computed using effective strength parameters shown in Table 5.

Table 5: Material Properties Used for Soil Profile 1 in Long-Term Stability Analyses

	Total Unit Weight	Cohesion	Angle of Internal Friction
1. Embankment fill	110 pcf	100 psf	32°
2. Stability berm fill	105 pcf	100 psf	32°
3. Bay Mud	95 pcf	0	32°
4. Alluvium	120 pcf	0	32°

The thicknesses of landside stability berms were adjusted to develop a safe, efficient configuration and achieve a factor of safety of at least 1.5 for immediately after constructing both the First and Second Stages. A 3H:1V (horizontal to vertical) levee slope and

a 60 foot wide stability berm with a thickness ranging from 5 to 7 feet thick resulted in a computed factor of safety immediately-after construction of 1.5.

For the Second Stage of construction, we accounted for the strength gain in the Bay Mud that would occur during the time to cause the levee crest to settle to near its minimum crest elevation. We assumed that the material to raise the crest would be created by excavating 2 feet uniformly off of the original stability berm. With the crest raised to account for the predicted total settlement and the toe berm height reduced by both settlement and cutting two feet, we checked the new immediately-after-second-stage construction stability. The computed factor of safety is 1.6. Once this underlying Bay Mud is fully consolidated under the new loading from the fill, the fully consolidated undrained factor of safety for the landside levee embankment is 1.8. The long-term effective stress factor of safety is 2.6.

On the waterside, a flat and wide 10H:1V uniform slope is planned for restoration of marsh habitats and erosion resistance of the slope. This configuration maintains a waterside computed factor of safety of 1.6 for the immediately-after-first-stage construction condition. The factor of safety for the immediately-after-second-stage construction condition is 1.7. Once the underlying Bay Mud is fully consolidated, the consolidated undrained factor of safety for the waterside levee embankment is 1.9. The long-term effective stress factor of safety is 3.8.

The slope stability results for Soil Profile 1 are presented in Table 6, below. The typical design configurations for Soil Profile 1 are presented on Plates 12 and 13.

Table 6: Slope Stability Results for Soil Profile 1

	Landside Factor of Safety	**Waterside Factor of Safety**
Immediately-After-First-Stage Construction	1.5	1.6
Immediately-After-Second-Stage Construction	1.6	1.7
Long-Term, Undrained Strength	1.8	1.9
Long-Term, Effective Stress	2.6	3.8

The results indicate that the factors of safety increases with time for the landside and waterside slopes. As the Bay Mud consolidates and gains strength, the factors of safety increase.

2. Soil Profile 2

Soil Profile 2 is intended to represent soil conditions beneath the new Bayfront Levee from Stations 184+00 to 213+95. For the immediately-after-first-stage construction, the Bay Mud Crust was modeled as an 8 foot thick layer. We selected a shear strength of 1,000 psf at the existing ground surface to a depth of 5 feet. Below 5 feet, we characterized the strength as 1,000 psf decreasing 250 psf for each additional foot of depth.

We chose a design shear strength profile of Bay Mud for use in immediately-after construction slope stability analysis that accounted for constant shear strength to a depth of 43 feet and then increasing below that depth. Below a depth of 8 feet, we selected a shear strength of 250 psf. At a depth of 43 feet below existing ground surface, we characterized the strength as 250 psf increasing 8 psf for each additional foot of depth. In our stability analysis, the ground surface was assumed to be at Elevation -3 feet. The bottom of Bay Mud was modeled at Elevation -83 feet. The TxUU shear strength data and our selected design profile is presented on Plate 11.

The shear strength parameters that we selected for use in the immediately-after construction stability analyses are presented in Table 7.

Table 7: Material Properties used for Soil Profile 2 in Immediately-After-First-Stage Construction Stability Analyses

	Total Unit Weight	Cohesion	Angle of Internal Friction
1. Embankment fill	110 pcf	1,000 psf	0°
2. Stability berm fill	105 pcf	1,000 psf	0°
3. Bay Mud Crust for upper 5 feet	95 pcf	1,000 psf	0°
4. Bay Mud Crust between 5 and 8 feet	95 pcf	1,000 psf - 250 psf/ft	0°
5. Bay Mud deeper than 8 feet	95 pcf	250 psf	0°
6. Bay Mud deeper than 43 feet	95 pcf	250 psf + 8 psf/ft	0°
7. Alluvium	120 pcf	1,500 psf	0°

The results of the slope stability using Soil Profile 2 are much lower than the results for Soil Profile 1. Much wider and flatter stability berms on both the landside and waterside to buttress the levee embankment would be necessary to provide an acceptable level of safety. The alternate wick drain approach will accelerate the consolidation and strength gain of Bay Mud.

A combination of landside stability berm widths and thicknesses with the use of wick drains were analyzed to develop a safe, efficient configuration. A 3H:1V levee slope and a 90 foot wide stability berm with a thickness ranging from 7 to 9 feet thick and 90 foot wide zone of wick drains were analyzed. The computed factor of safety immediately-after-first-stage construction is 1.6.

Using a S_u/p ratio of 0.3, we estimate that a Second Stage filling consisting of two feet thick on the landside toe berm and 5 feet thick on the levee crest can be placed one year after the completion of the First Stage filling. The computed factor of safety immediately-after-second-stage construction is 1.5.

We estimate that a third stage filling consisting of a fill thickness of 3.5 feet will be required at approximately 17 years after Second Stage construction. The computed factor of safety immediately-after-third-stage construction is 1.7. Once this underlying Bay Mud

is consolidated to Elevation +14 feet under the new loading from the fill, the consolidated undrained factor of safety for the landside levee embankment is 2.0.

Long-term effective stress loading conditions were computed using effective strength parameters shown in Table 8. The long-term effective stress factor of safety is 2.5.

Table 8: Material Properties used for Soil Profile 2 in Long-Term Stability Analyses

	Total Unit Weight	Cohesion	Angle of Internal Friction
1. Embankment fill	110 pcf	100 psf	32°
2. Stability berm fill	105 pcf	100 psf	32°
3. Bay Mud	95 pcf	0	32°
4. Wicked Bay Mud	95 pcf	0	32°
5. Alluvium	120 pcf	0	32°

On the waterside, a flat and wide 20H:1V uniform slope is planned for restoration of marsh habitats and erosion resistance of the slope. This configuration maintains a waterside computed factor of safety of 1.8 for the immediately-after-first-stage construction condition. The factor of safety for the immediately-after-second-stage construction condition is 1.5. The factor of safety for the immediately-after-third-stage construction condition is 2.3. Once the underlying Bay Mud is fully consolidated, the consolidated undrained factor of safety for the waterside levee embankment is 2.8. The long-term effective stress factor of safety is 5.6.

The slope stability results for Soil Profile 2 are presented in Table 9, below. The varying design configurations for Soil Profile 2 are presented on Plates 14 through 16.

Table 9: Slope Stability Results for Soil Profile 2

	Landside Factor of Safety	Waterside Factor of Safety
Immediately-After-First-Stage Construction	1.6	1.8
Immediately-After-Second-Stage Construction	1.5	1.5
Immediately-After-Third-Stage Construction	1.7	2.3
Long-Term, Undrained Strength	2.0	2.8
Long-Term, Effective Stress	2.5	5.6

D. Seismic Analyses

Several seismic sources are close by, most notably the Rogers Creek, Hayward, and San Andreas faults. It remains prudent to do an inspection of the levee following a large earthquake. Soil liquefaction is a phenomenon in which a loose to medium dense saturated granular soil undergoes reduction of internal strength as a result of increased pore water pressure generated by shear strains within the soil mass. This behavior is most commonly induced by strong groundshaking associated with earthquakes. Soil conditions at the site consist predominately of clay. We judge that the risk of liquefaction is low.

The Bay Mud has low to moderate sensitivity, that is, its shear strength upon remolding is moderately lower than its undisturbed peak strength. Fine-grained sensitive clays are susceptible to the reduction of shear strength due to strong groundshaking. Lateral deformation and/or settlement (slumping) may occur if foundation soils lose strength. Lateral deformation may lead to cracking at the levee embankment, which could in turn lead to increased seepage, internal erosion, and piping failure.

1. <u>Pseudo-Static Slope Stability</u>

We analyzed the potential for embankment instability due to seismic loads on the embankment for the immediately-after construction and long-term consolidation configurations for the landside and waterside slopes. The pseudo-static analysis applies a horizontal force at the center of gravity of the slip area mass to model an earthquake force. The

yield coefficient (K_y) is the value of this force resulting in a factor of safety of 1.0. The pseudo-static slope stability results for Soil Profiles 1 and 2 are presented below in Table 10 and in Appendix D.

Table 10: Pseudo-Static Slope Stability Results

	Soil Profile 1		Soil Profile 2	
	Landside Yield Coefficient	**Waterside Yield Coefficient**	**Landside Yield Coefficient**	**Waterside Yield Coefficient**
Immediately-After-First-Stage Construction	0.07	0.07	0.04	0.04
Immediately-After-Second-Stage Construction	0.09	0.08	0.06	0.03
Immediately-After-Third-Stage Construction	N/A	N/A	0.07	0.08
Long-Term, Undrained Strength	0.10	0.10	0.10	0.10

2. Seismic Deformation

We analyzed seismic deformations using the procedure developed by Bray and Travasarou (2007). The procedure provides an estimate of the median value of displacement in the direction of the sliding mass. Shear wave velocity was correlated from undrained shear strengths used in Soil Profiles 1 and 2.

The seismic loading was estimated for a 50 percent probability of occurrence within 100 years (144-year return period) and a 10 percent probability of occurrence within 50 years (475-year return period). The results of the seismic deformation analysis are presented in Tables 11 and 12.

Table 11: Seismic Displacements for 144-Year Return Period

	Soil Profile 1		Soil Profile 2	
	Landside Displacement (ft)	**Waterside Displacement (ft)**	**Landside Displacement (ft)**	**Waterside Displacement (ft)**
Immediately-After-First-Stage Construction	1.7	1.7	3.3	3.3
Immediately-After-Second-Stage Construction	1.2	1.4	2.1	4.3
Immediately-After-Third-Stage Construction	N/A	N/A	1.2	1.4
Long-Term, Undrained Strength	1.0	1.0	1.0	1.0

Table 12: Seismic Displacements for 475-Year Return Period

	Soil Profile 1		Soil Profile 2	
	Landside Displacement (ft)	**Waterside Displacement (ft)**	**Landside Displacement (ft)**	**Waterside Displacement (ft)**
Immediately-After-First-Stage Construction	3.6	3.6	6.6	6.6
Immediately-After-Second-Stage Construction	2.9	3.2	4.7	7.7
Immediately-After-Third-Stage Construction	N/A	N/A	2.8	3.4
Long-Term, Undrained Strength	2.4	2.5	2.5	2.6

The direction of seismic displacements is estimated along the failure plane, which is mostly horizontal. To estimate vertical displacements, reduce these values by 0.7.

The results indicate that large deformations of the levee may occur during a large seismic loading. The acceptable level of seismic displacements may be determined by evaluating the remaining post-seismic freeboard for a 10-year flood elevation. The new Bayfront Levee will not be loaded tidally until after the immediately-after-second-stage construction case.

For Soil Profile 1, the amount of displacement relative to the levee height is low. The post-seismic levee elevation remains above the base flood elevation of +9 feet for both the 144- and 475-year return periods. For Soil Profile 2, the post-seismic levee elevation remains above the base flood for the 144-year return period. For the 475-year return period, the levee embankment on Soil Profile 2 is vulnerable to a large earthquake loading for the immediately-after-second-stage construction case. As the Bay Mud gains strength, the estimated seismic displacements will decrease. Once the Third Stage of construction is completed, the post-seismic levee elevation will remain above the base flood for the 475-year return period.

E. Design Configurations

We developed two soil profiles of Bay Mud to evaluate settlement and slope stability of the levee embankment. Soil Profile 1 was developed for the new Bayfront Levee alignment from Stations 100+00 to 184+00. The second, weaker and deeper Soil Profile 2 was developed for the northern portion of the levee between Stations 184+00 to 213+95. Based on the two soil profiles, we developed two levee design configurations. Design Configuration 1 applies between Stations 110+00 to 184+00. Design Configuration 2 applies between Stations 184+00 to 213+95.

1. <u>Design Configuration 1</u>

Toward the waterside of the levee embankment, the design calls for a 3H:1V slope between the top of the levee crest to Elevation +11 feet. Below Elevation +11 feet, the waterside slope is 10H:1V. The waterside levee slope is designed for habitat enhancement and erosion resistance and exceeds the minimum requirements for geotechnical slope stability.

We propose that the levee embankment fill be placed in two stages. During the First Stage, the levee embankment would be filled to Elevation +15 feet, three feet above the minimum design crest elevation. The three feet overbuild is a partial allowance for

the expected settlement. When the levee settles to near the minimum crest elevation, the levee crest can be raised (the second stage of the Two-Stage Construction). To accommodate the future raising for Stage 2, fill will be stockpiled during Stage 1 at the landside toe. This stockpile will be the upper portion of the stability berm, and will be aiding the initial stability of the levee while it consolidates and the foundation soils gain strength. During the Stage 2 filling, the levee crest will be raised to a height such that, when consolidation is complete, the crest will be at or above Elevation +14 feet. This will allow the levee crest to remain above the selected allowance for sea level rise. We estimate the future Stage 2 filling may need to occur in approximately 17 years.

The Two-Stage Construction approach is more efficient with respect to material used. As the weak, compressible Bay Mud consolidates under the weight of the levee fill, the Bay Mud will gain strength. With stronger foundation soils, less material is needed in the stability berms for the Two-Stage Construction approach than if the entire embankment were constructed in a single stage.

It is not necessary to excavate the Stage 2 fill from the stability berm if other fill sources are available. The timeframe for existing bayfront levee breach is unknown. If the new Bayfront Levee needs to be raised before the existing bayfront levee is breached, additional fill may be excavated from the area between the new and existing bayfront levees. Other potential sources include borrowing from the future upland and seasonal wetland habitat areas west of the new Bayfront Levee. One could also consider allowing a portion of the site to accept fills from approved offsite excavations and using this material to raise the levee.

For Two-Stage Construction, the First Stage levee embankment will need to be constructed sufficiently wide to accommodate the future Second Stage Fill. About 3.5 feet of additional fill is planned for Second Stage. We have performed our calculation assuming an 18 foot final Second Stage levee crest width, two feet wider than the design minimum. To maintain 3H:1V slopes on both sides of the levee, the First Stage levee crest will need to be at least a 39 foot wide crest at Elevation +15 feet. The First Stage landside stability berm needs to be 7 feet thick at the landside toe of the levee embankment and 5 feet thick at the far end of the toe berm. The stability berm needs to be at least 60 feet wide. Typical design cross-sections for Design Configuration 1 for First and Second Stages are presented on Plates 12 and 13, respectively.

2. Design Configuration 2

In the northern portion of the site where the Bay Mud may be weaker, very wide, flat slopes or very wide stability berms will be needed. Wide flat slopes are compatible with the future marsh restoration on the bay side of the levee. Very wide flat slopes or stability berms are less desirable on the west side of the levee. In addition, these weak soils may exist near PG&E's electrical transmission corridor. The risk of levee foundation and embankment deformation under both static and seismic conditions potentially causing lateral displacement at an adjacent transmission tower needs to be considered. The strength of the Bay Mud can be improved by accelerating consolidation by the use of wick drains. Wick drains would only be used beneath the landside of the levee to avoid creating a seepage path beneath the levee. Design Configuration 2 would need to be constructed in several stages. The First Stage of construction will occur during the first year of construction. The Second Stage of construction will occur after a minimum waiting period of one year after completion of the First Stage. We estimate that a period of 18 to 24 months will be needed to accomplish the three stages of filling. The Third Stage of construction will occur once the levee crest settles to the minimum levee crest elevation of +12 feet, estimated in 17 years. After full consolidation, the levee will have settled to near the initial design elevation of +12 feet. Additional fill can be placed as the sea level rise occurs and the design crest elevation increases. Typical design cross-sections for Design Configuration 2 are presented on Plates 14 through 16.

F. On-Site Borrow Material

Embankments are usually less costly if they can be constructed with on-site materials rather than imported materials. The predominate on-site borrow material is Bay Mud, which can be excavated from the adjacent fields and proposed pilot channels. The results of the moisture content tests from test pit samples are summarized in a plot of moisture content versus depth in Plate 9. The moisture content results from our test pit exploration in 2015 are consistently drier than the moisture contents from the Miller Pacific exploration in 1995. This is most likely due to seasonal precipitation during the different times of exploration. Our exploration occurred toward the end of summer in 2015 after several years of drought.

The shaded zone in Plate 9 suggests an approximate range of moisture contents that may be more suitable for compaction than those outside the shaded zone. Some scarifying and moisture conditioning will be needed, especially in the wetter materials. Deeper than about 3 to 4 feet below the ground surface, the Bay Mud has moisture contents that will require

considerable drying to become suitable for use as embankment fill. The handling needed to dry Bay Mud for use in the main levee embankment from deeper than 3 to 4 feet would increase the cost of using the material. For embankment fill, we conclude that the depth of borrow from nearby fields will be most efficient if limited to the upper 3 to 4 feet.

Strength and compaction are not critical for stability berms. The stability berm mainly functions as a counter-balance mass for the new loading of embankment fill on the weak foundations. The practical criteria for material to be placed within the stability berms include the ability to place the material and the capability of the material to support common construction equipment that would be used to shape the stability berms or traffic across the berms. The landside stability berm will also need to support maintenance equipment. Bay Mud excavated from nearby fields that is too wet to be readily used as levee embankment fill may be considered for use in the stability berms provided it serves the function described above.

Atterberg limits and laboratory compaction tests were performed on bulk samples from the test pits. The results of the Atterberg limits are presented on Plate 7. The results of the laboratory compaction tests are summarized on Plate 8. We highlighted the moisture content range between 24 to 32 percent to allow the reader to quickly compare a likely range of compaction moisture contents with the plots of moisture content versus depth measured in the borrow area test pits presented on Plate 9.

G. Levee Foundations

We found shrinkage cracks to a depth of 2 feet in our test pits. Shrinkage cracks may extend deeper in some areas. These cracks could be a path for seepage beneath the levee embankment. The presence and depth of shrinkage cracks in the levee foundation can be checked by excavating an inspection trench.

Subgrade preparation commonly includes excavating the existing subgrade to the depth of the shrinkage cracks and then scarifying, moisture conditioning and recompacting the exposed subgrade. The procedure would be appropriate for this site.

The proposed levee will be constructed across several existing ditches. Water and soft sediments in the ditches need to be removed beneath the footprint of the planned levee embankment prior to placing fill. The bottom of the ditches is likely to expose soft to medium

stiff Bay Mud. Ditch backfill will need to be placed such that it does not create a potential seepage path beneath the levee.

Gravel roads, drainage pipes, buried utility lines, leach fields, and other similar linear features could create seepage paths beneath the levee. Existing and past land uses can suggest the possible presence of such features. Removing these features needs to be included in the site preparation.

H. Impacts on PG&E Towers and Setback Distance

In general, the further away the new levee embankment, the less settlement impact will occur on the existing PG&E towers. Our estimates of settlement versus distance from the stability berm toe are presented in the Settlement section above. As currently planned, the toe of the Bayfront Levee landside stability berm will be slightly over 100 feet from the PG&E right-of-way. At that distance, we estimate that the levee embankment will cause 0.1-inch total settlement beneath the existing PG&E towers. We judge that the existing PG&E towers will not be adversely affected by settlement from the Bayfront Levee. Surveys of the PG&E tower foundations and points between the tower and the stability berm toe can be made during construction to check horizontal or vertical movement during and after placing fill.

Seismic deformation of the levee embankment will likely reach well beyond the toe of the stability berm. Other than for short periods of time while the wick drains relieve excess power water pressure following a fill increment, seismic displacement from a 475-year return period earthquake is estimated to be on the order of 3 feet. We believe this is in the same range of deformations that may be expected along many portions of the existing transmission alignment where the towers are near levees and other embankments over Bay Mud.

I. Novato Sanitary District Outfall

An existing 54-inch diameter pipeline owned and operated by Novato Sanitary District (NSD) extends parallel along the northern side of the N-1 and N-2 Levee within the BMKV site. The pipeline discharges secondary-treated effluent to an outfall located approximately 950 feet beyond the existing bayfront levee to the east. The footprint of the new levee embankment would cross the existing pipeline and cause significant settlement to the pipeline. As a minimum a pipeline bypass will be needed during construction of the new levee

embankment. We met with NSD, and they prefer that the bypass become the permanent alignment.

The bypass will be rerouted from beneath the planned footprint of the levee embankment to within the N-1 Levee. To both protect the pipe and to cutoff potential seepage through the N-1 Levee, the pipe can be placed in a trench shored on each side by interlocking sheetpile walls. The sheetpiles will need to be well-braced to control lateral deflection.

Typically, a buried pipe not associated with a water retention structure would be supported by a bedding layer consisting of crushed aggregate or similar materials. A permeable bedding layer would be a potential seepage path and is not desirable. To control seepage, most of the bypass pipe within the N-1 Levee will be supported on and backfilled with low permeability, self-compacting materials such as controlled low strength material (CLSM). CLSM is a cement-based material that will be stiffer than the surrounding soil. Where the bypass pipe transitions from the N-1 Levee to the BMKV site, a graded filter can be used to collect seepage that may be seeping along contacts between the CLSM and the underlying materials.

J. Seepage Considerations

The levee embankment will be constructed using on-site borrow materials consisting of fine-grained, low-permeability elastic silt and clay. The levee foundation consists of similar materials. Seepage through these materials will be very small. Cracking from either drying or from differential movement is being addressed. An inspection trench will be excavated along the full length of the levee alignment. The existing subgrade soils with shallow shrinkage cracks will be excavated and replaced with fill compacted to a moisture content several percentage points above optimum. Where differential settlement is a concern, the areas will be treated in a manner that will spread the potential differential settlement over wide zones, reducing the risk of cracking. When coupled with placing and compacting the levee fill wet of optimum and having a wide, flat waterside ecotone slope, we judge that the risk of through-seepage and under-seepage is very low and not expected to be a concern. The new Bayfront Levee operation and maintenance procedures will include periodic inspection, embankment mowing and rodent control protocols.

V. RECOMMENDATIONS

A. Levee Geometry

The levee should consist of the main *levee embankment* (the water retention structure) flanked by *stability berms*. The waterside minimum limits of the levee embankment should be defined by a minimum 3H:1V slope extending from the levee crest to the prepared subgrade. This 3H:1V slope will be buried beneath the waterside habitat and erosion berm. The landside minimum limits of the levee embankment should be defined by a minimum 3H:1V slope extending down from the levee crest to the prepared subgrade. The lower portion of the 3H:1V landside slope will be buried beneath the landside stability berm. The levee embankment should be designed to have a final crest width of at least 16 feet. The levee crest should be maintained at or above the minimum design elevation (Elevation +14 feet) after completion of settlement. We recommend that the levee geometry conform to the details and cross-sections presented on Plates 12 through 16.

B. Earthwork

1. Site Preparation

The site should be cleared and grubbed of surface and subsurface deleterious matter including trees, brush, other vegetation and debris designated for removal. Tree roots greater than 1-inch in diameter should be removed. The grass along the levee alignment should be close-mowed and the hay should be harvested.

Beneath the embankment fill along the entire levee alignment, the subgrade should be excavated to a depth of at least 2 feet. The excavated subgrade beneath the levee embankment and the subgrade beneath the stability berms along the entire levee alignment (except the areas specified below), should be scarified to a depth of at least 1 foot.

Ditches within the footprint of the levee embankment should be excavated to a depth of at least two feet below the invert with 10H:1V or flatter side slopes.

The scarified subgrades should be moisture conditioned and compacted in accordance with the recommendations presented in the Compaction section of this report.

2. Inspection/Cut-Off Trench

An inspection/cut-off trench should be excavated along the entire alignment of the waterside levee core. The trench should be excavated nominally two feet below the prepared subgrade. The geotechnical engineer should inspect the trench for shrinkage cracking. The geotechnical engineer may allow the trench to be shallower in some areas and may request a deeper trench in others. The base of the trench should extend at least 4 feet wide with 1H:1V or flatter side slopes. The trench should be backfilled with on-site fat clay (CH) and/or elastic silt (MH). Rather than attempt to achieve a high degree of relative compaction, the soil should be moisture conditioned to a plastic condition (wet of Plastic Limit) to achieve a compacted undrained shear strength of between 600 to 2,000 psf. The backfill should be placed in lifts of 8-inches thick or less and compacted by kneading with a sheepsfoot compactor. The undrained shear strength of the compacted trench backfill should be checked as the lifts are compacted using a Geonor H-60 hand-held vane shear device

3. Fill Materials

Fill for the levee embankment portion of the new levee should consist of a Uniform Soil Classification of fat clay (CH) and/or elastic silt (MH) per ASTM D-2487 and be derived from shallow excavations in the adjacent fields. Prior to borrowing, the borrow areas should be close-mowed and the hay harvested. The site surface should then be thoroughly disced. Fill for the levee embankment should be moisture conditioned to within 3 to 8 percent above the optimum moisture content. Deep discing may aid in achieving a more uniform moisture content. The fill should be moisture conditioned in the borrow area to a moisture content suitable for compaction prior to hauling and placing the fill on the levee embankment.

If materials other than fat clay (CH) or elastic silt (MH) are encountered in the borrow areas, the geotechnical engineer should be consulted to assess how to best use the materials. Soils consisting of sand and peat are not acceptable as fill for embankment fill.

Fill derived from on-site excavations that are too wet to be readily used as compacted fill for the levee embankment should be used in the stability berm areas. Stability berm fill should be dried back to a moisture content suitable for achieving a moderate degree of compaction and developing a fill that will support construction equipment.

Imported fill may be used for the main section of the levee. Imported fill should be free of deleterious matter and have no rock fragments greater than 2-inches in maximum dimension or lumps of soil greater than 4-inches in maximum dimension. Not more than 40 percent by weight should be retained on a No. 200 sieve. The plasticity index should be at least 12 but not greater than 30. In addition, imported fill should have a Uniform Soil Classification of Lean Clay (CL) per ASTM D-2487. Imported fill with a permeability lower than on-site materials should be placed toward the waterside of the levee embankment. If the permeability is higher than the on-site levee embankment material, the imported fill should be placed on the landside portion of the embankment fill.

At least seven calendar days prior to importing fill, the contractor should submit samples of import fill to the geotechnical engineer's office together with the results of laboratory test data verifying the suitability of the material. The source of the import borrow area should be identified and the geotechnical engineer should be given unrestricted access to visit the import borrow area prior to and during importing operations.

Aggregate base, if any, should meet the requirements for Caltrans ¾-inch maximum Class 2 Aggregate Base. CLSM, if any, should conform to Caltrans specifications.

4. **Compaction**

Surfaces in areas to be filled should be scarified to a depth of at least 12-inches. The scarified soil should be moisture conditioned and compacted to meet the requirements as described below.

The scarified subgrade beneath the embankment fill should be moisture conditioned to between 3 to 8 percent over optimum moisture content and compacted with a sheepsfoot compactor to at least 90 percent relative compaction. The subgrade beneath the balance of the stability berms should be moisture conditioned to at least 3 percent over optimum moisture content and compacted with a sheepsfoot compactor to at least 80 percent relative compaction. ASTM test D-1557 should be used to establish the reference values for computing optimum moisture content and relative compaction.

After being conditioned in the borrow areas to a moisture content suitable for compaction, but not less than 3 percent over optimum, embankment fill should be placed in

lifts 8-inches or less in loose thickness and methodically compacted to at least 90 percent relative compaction. A sheepsfoot compactor or equivalent kneading compaction equipment should be used. Material that fails to meet the moisture or compaction criteria should be loosened by ripping or scarifying, moisture conditioned, and then recompacted. After compaction, fills should not be allowed to dry out. This may require periodic sprinkling. Compacted fill that has dried should be scarified, remoisture conditioned and recompacted prior to receiving additional fill.

The lower lifts of fill may deflect (pump) under equipment loads. Mild pumping will be accepted provided the recommended compaction is achieved. If the fill surface is pumping more than 4-inches, alternative methods should be employed to place and compact fill until a more stable site surface is achieved. Such methods may include scarifying and reducing the moisture content of the soil, keeping rubber tired equipment off the affected area, and using thinner lifts and lighter equipment.

Embankment fill should be placed parallel to the longitudinal axis of the levee, without haul roads across the levee. Material haulers and other construction traffic crossing the levee embankment should be routed at angles less than 30 degrees to the levee axis and should be disbursed to avoid overly compacted zones (hard spots) within the levee embankment.

In pavement areas, such as a patrol road or trail on top of the levee, the upper 6-inches of subgrade should be compacted to at least 95 percent relative compaction and rolled to provide a smooth, non-yielding surface. Soft or pumping areas should be aerated or excavated and recompacted.

Aggregate base should be placed in thin lifts no greater than 6-inches in loose thickness and in a manner that avoids segregation, moisture conditioned as necessary, and compacted to at least 95 percent relative compaction. A smooth drum roller compactor or equivalent compaction equipment should be used to compact aggregate base.

C. Performance Verification

To monitor the performance of the levee, fill thickness, pore pressure, settlement, and lateral deformation measurements should be made. Fill thickness markers should be

installed beneath the levee crest embankment and the mid-points of the waterside slope and landside toe berms at 1,000 foot intervals. Settlement should be checked by level survey or gps equipment having a precision of plus or minus 0.01 foot. Elevations at the levee crest should be surveyed after the first construction season, at the beginning of the second construction season, and after completion of the levee embankment. This should be followed by elevation measurements at six months, one year, annually through four years after construction, biannually to year ten, and at five-year intervals thereafter.

VW piezometers and data loggers should be installed prior to the beginning of the construction season to measure excess pore pressures within the Bay Mud. Piezometers and data logger should be installed at two locations within the levee core embankment.

A survey of the PG&E towers should be made prior to construction and again following completion of construction. The precision of the survey should be plus or minus 0.01 feet.

Lateral deformation should be monitored by slope inclinometers. Inclinometers should be installed prior to the beginning of the first construction season. Inclinometers should be placed on the landside stability berm at five locations along the levee alignment. Locations of the inclinometers should be selected by the geotechnical engineer. The inclinometer casing should extend at least 10 feet below the bottom of Bay Mud.

Inclinometers should be read twice immediately after installation to establish a baseline. During the first construction season, inclinometers should then be measured bi-weekly during fill placement. During the second construction season, inclinometers should be measured before placing fill, when the additional fill reaches half of its height, and immediately after completion of filling. Subsequent readings should be at 6 months, 1 and 2 years after completion. After two years, the need for additional readings should be assessed.

D. Surface Drainage and Maintenance

Drainage should be by sheetflow. Ground surfaces should slope away from the levee crest and stability berms. Irregularities that may tend to concentrate drainage should be corrected to re-establish sheetflow. Ponding of surface water should not be allowed on the levee crest or landside stability berm.

Settlement will continue to occur after completion of the levee and should be measured for conformance of design elevations. Settlement measurements will provide better estimates of the rate of settlement along the levee alignment. Settlement hubs should be installed in a maximum interval of 500 feet along the waterside crest of the levee alignment after completion of the second construction season. The settlement hubs should be surveyed immediately after installation, 6 months later, then annually.

The zone beginning 30 feet waterside of the levee crest and extending across to the toe of the landside stability berm should be maintained free of trees and brush. This width of the levee should be mowed periodically to allow for maintenance and annual inspection. The owner should have a rodent control plan in place. Rodent holes or burrows should be filled. The levee should be patrolled during and after high water and storm events.

E. Weaker Bay Mud Delineation and Exploration

The extent of weaker Bay Mud and transition to weaker Bay Mud within the levee alignment should be explored. Original plans had the levee alignment crossing between the PG&E towers and beneath the PG&E transmission lines. The revised levee alignment is rerouted around the PG&E infrastructure. There is limited geotechnical data within the footprint of the revised levee alignment. Additional borings and laboratory testing should be performed to characterize the shear strength, compressibility, and depth of Bay Mud.

F. Sheetpiles and Pipe Trench

Sheetpiles should be installed along the entire extent on both sides of the NSD bypass pipeline. Sheetpiles should be continuous and interlocking extending to at least Elevation -20 feet. Stability of sheetpiles for excavation support should be evaluated by the contractor's engineer. The contractor should be responsible for providing stable excavations. Temporary struts should be used where needed to support sheetpile walls. Sheetpiles should be left permanently in place.

If groundwater is encountered within the bottom of the trench excavation, the groundwater should be removed prior to placing CLSM. The pipeline bedding and backfill should consist of CLSM.

G. Services During Construction

Prior to construction, we should review project grading plans and specifications for conformance with the intent of our recommendations. During construction we should observe and/or test subgrade preparation and observe the inspection/cut-off trench. We should observe and test placement and compaction of fill. If conditions are encountered during construction that are not consistent with those described herein, we should be contacted to review our recommendations and provide alternatives, if appropriate.

SELECTED REFERENCES

SELECTED REFERENCES

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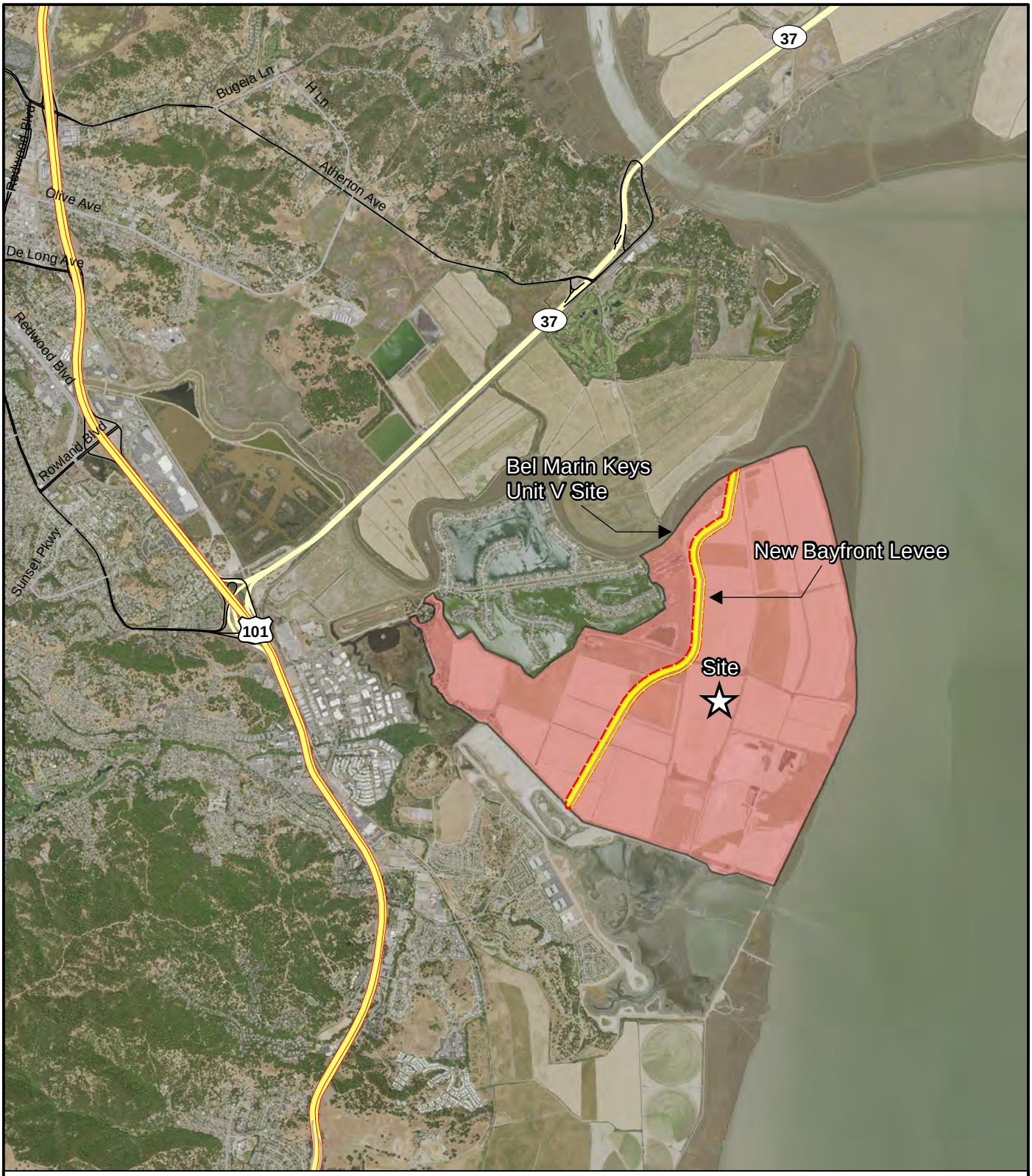
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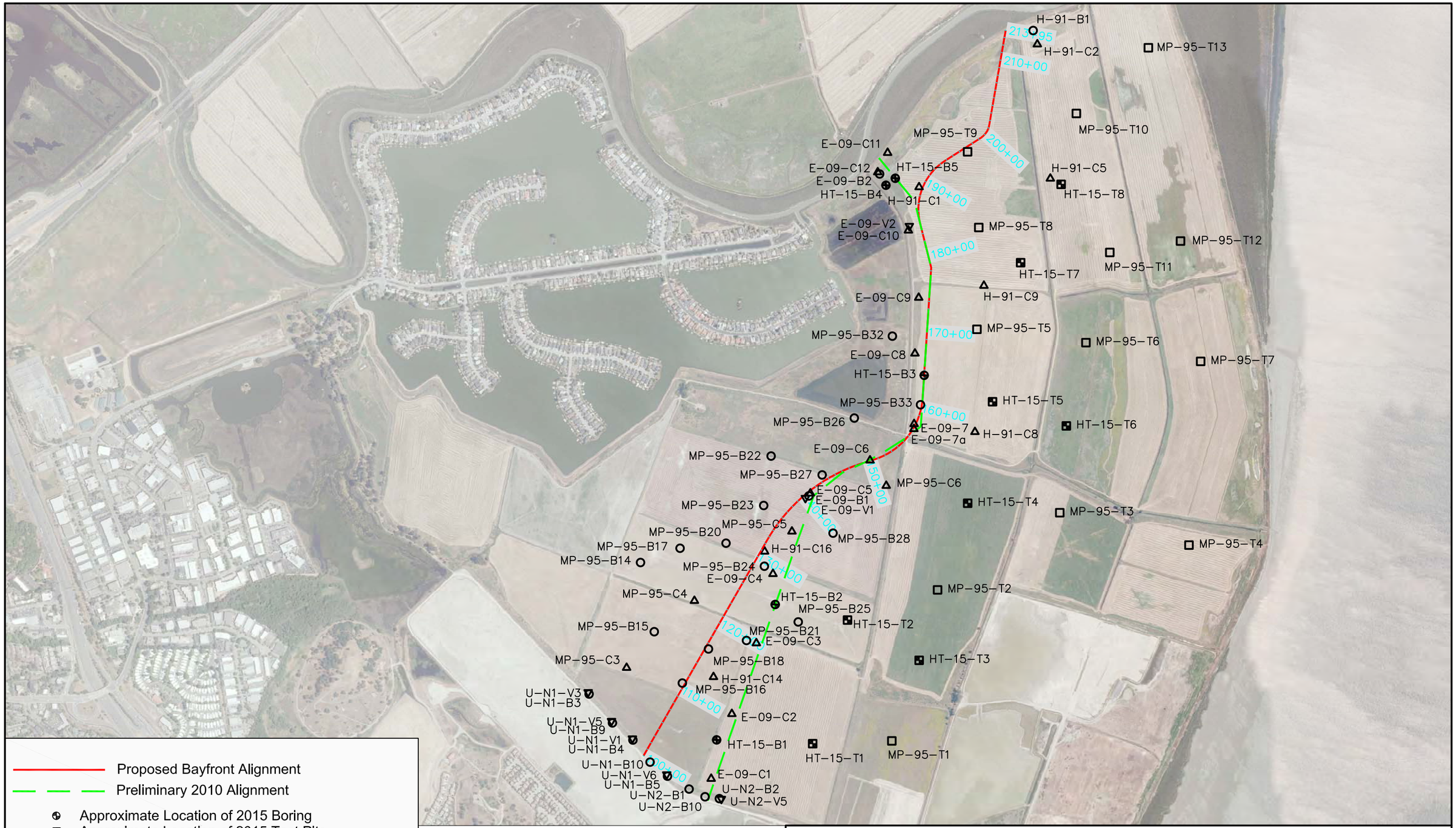
PLATES



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Vicinity Map

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 1



Proposed Bayfront Alignment

Preliminary 2010 Alignment

- Approximate Location of 2015 Boring
- Approximate Location of 2015 Test Pits
- Approximate Location of Boring by Others
- Approximate Location of CPT by Others
- Approximate Location of Vane Shear by Others
- Approximate Location of Test Pits by Others

N

SCALE

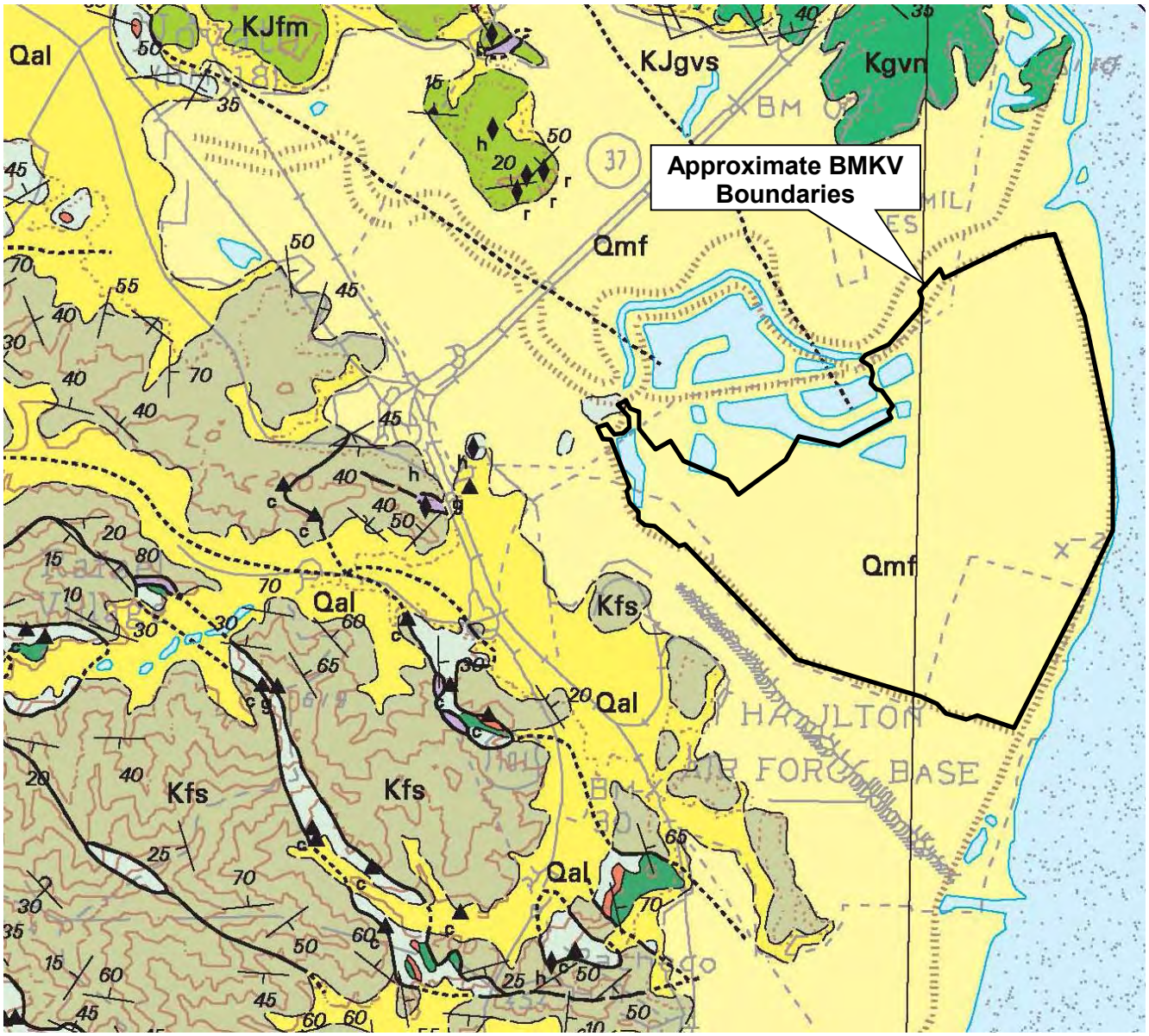
0 1,200 feet

1 inch = 1,200 feet

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Site Plan

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 2



Legend

SCALE

1" = 4000'

N

Qmf	Artificial fill over marine and marsh deposits (Quaternary)
Qal	Alluvium (Quaternary)
Kfs	Sandstone and shale (Cretaceous)
KJfm	Metamorphic rocks (Cretaceous and Jurassic)
Kgvn	Novato Conglomerate (Cretaceous)
KJgvs	Sandstone and claystone (Cretaceous and/or Jurassic)

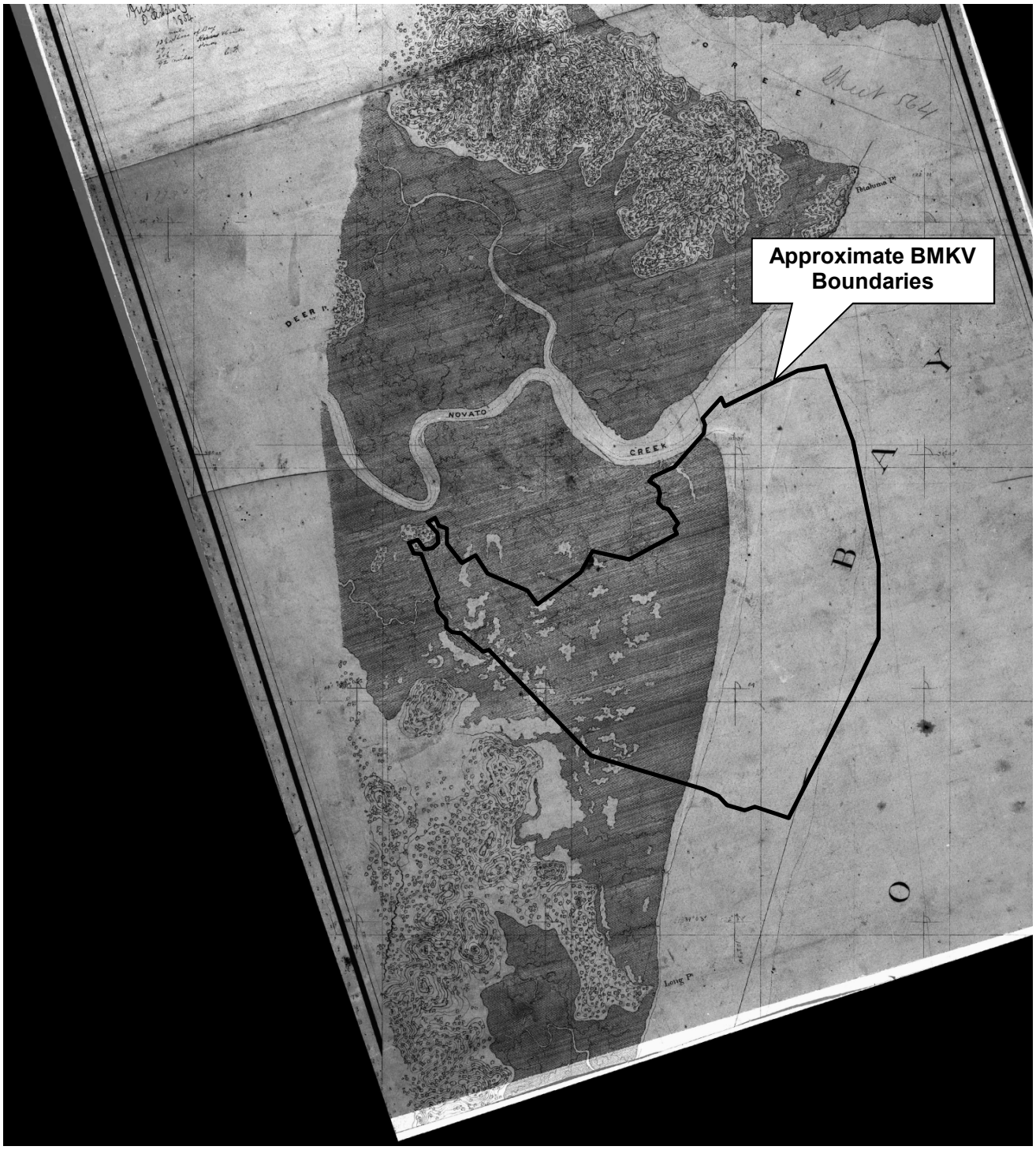
Fault - Dashed where approximately located, small dashed where inferred, dotted where concealed, queried where location is uncertain, inferred, dotted where concealed

Source: Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California, by M.C. Blake Jr., R.W. Graymer, D.L. Jones, and A. Soule, 2000

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Geologic Map

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 3



Not to Scale

N

Source: U.S. Coast Survey 1854, San Francisco Bay, California, Plane Table Sheet.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

1854 U.S. Coast Survey

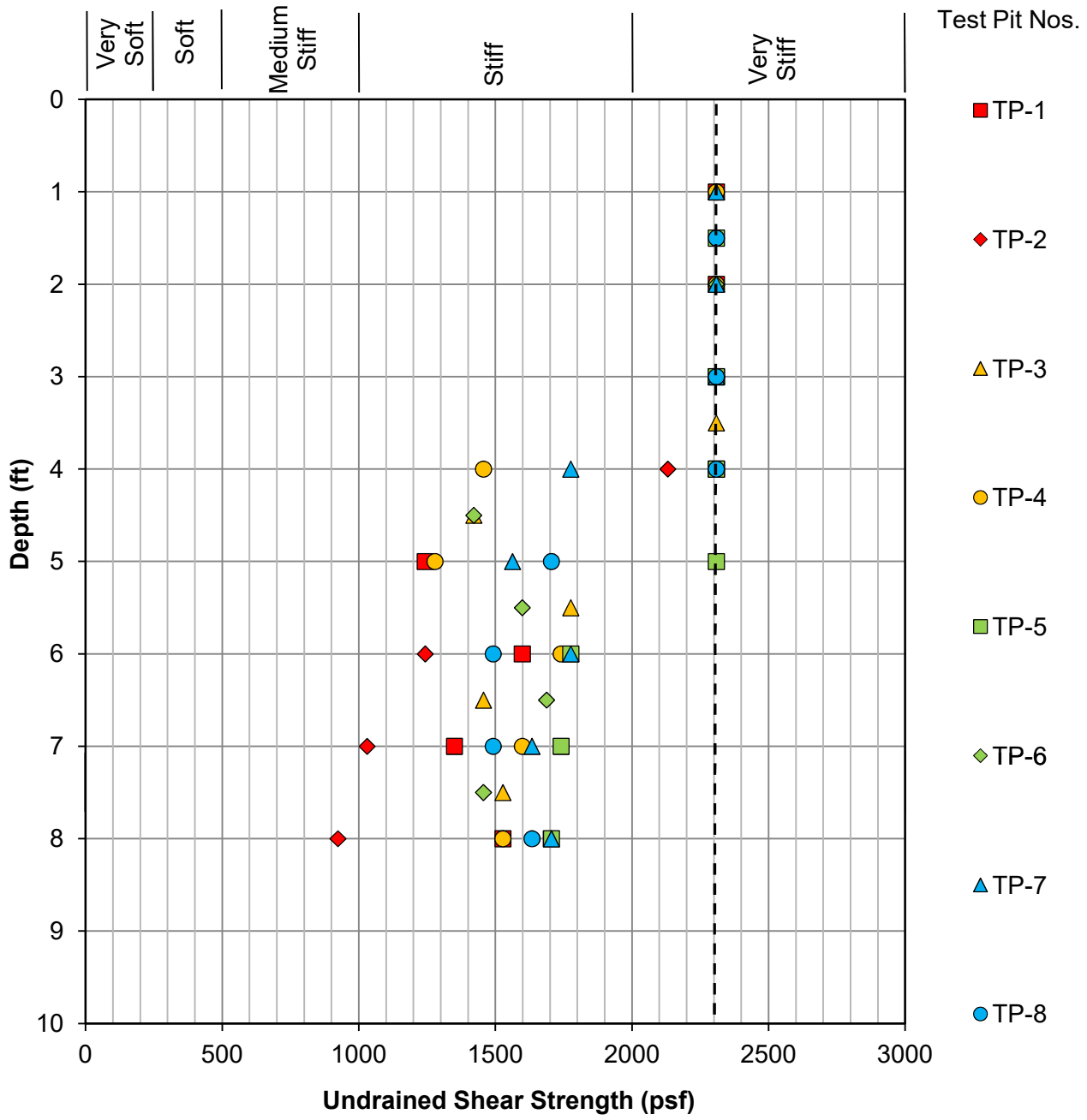
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 4

Placeholder for Final Report
Plate 5 will be inserted once the final alignment is set

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Idealized Subsurface Profile

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 5



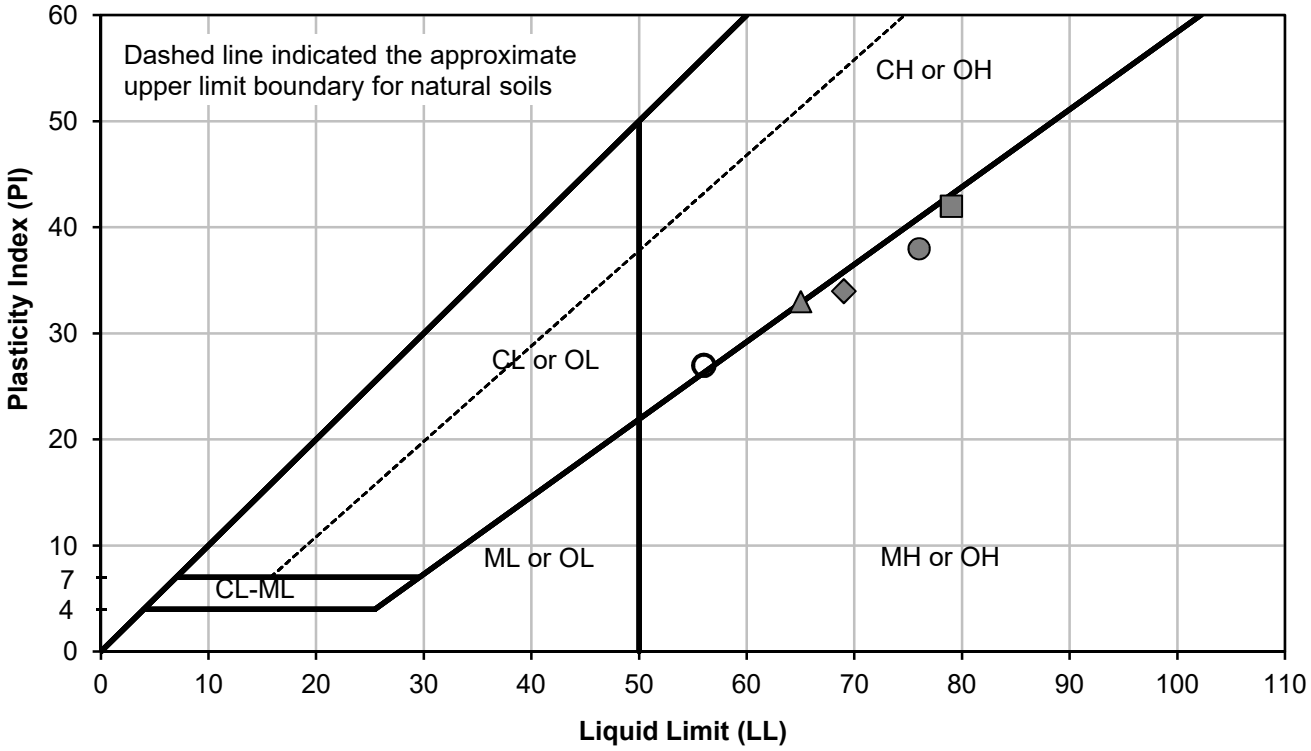
Notes:

1. Undrained shear strength was measured using hand held vane shear device (Model: Geonor H-60) manufactured by Geonor, Inc.
2. Undrained shear strength data shown in the plot above were modified by using a Bjerrum's field vane correction factor (μ) of 0.85.
3. Data points falling on the vertical dashed gridline indicate the soil had an undrained shear strength exceeding 2300 psf (130 kPa x 0.85), the maximum value for the vane used.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Vane Shear Results on Potential Borrow Materials

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 6



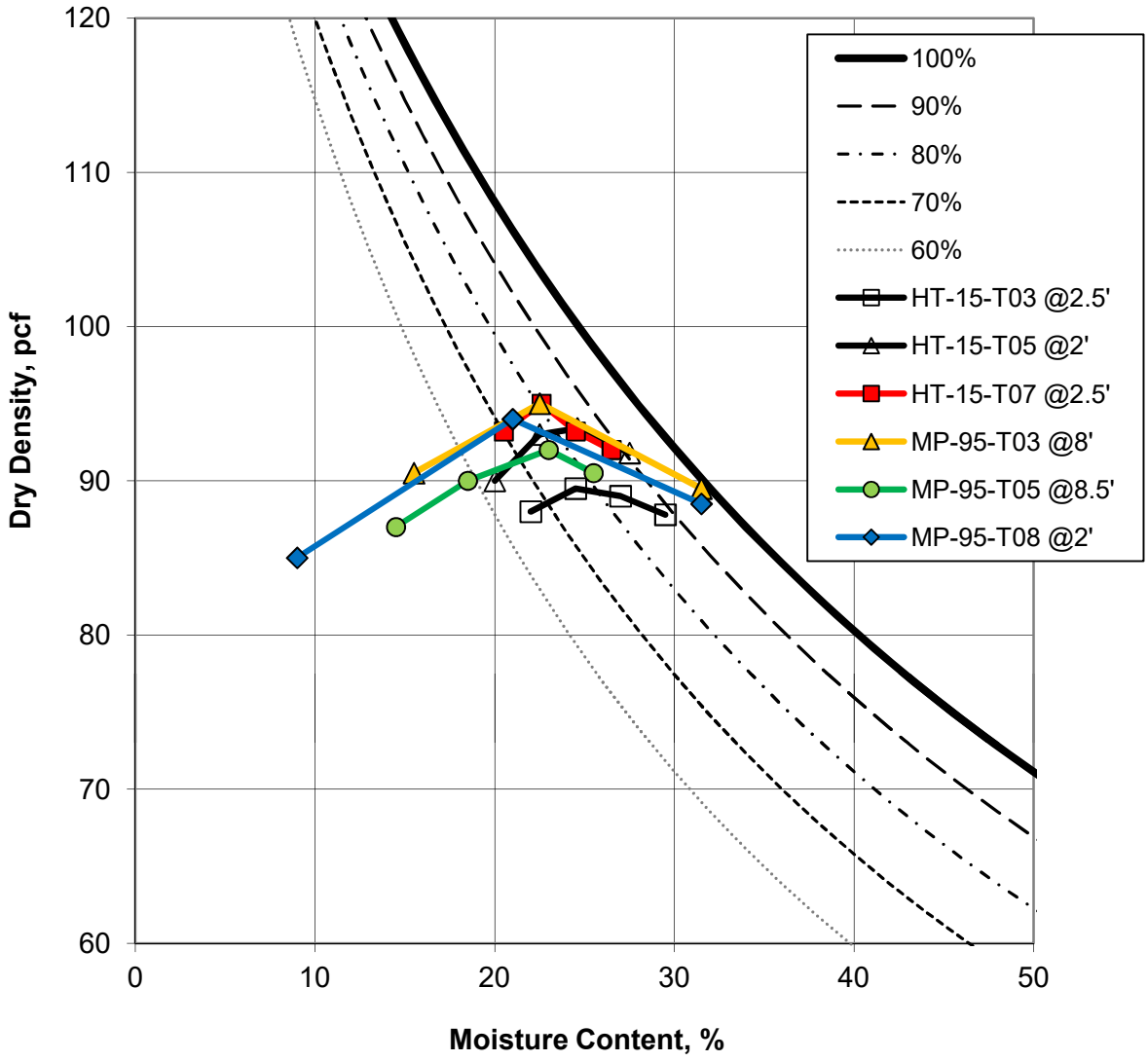
Symbol	Number	Depth (feet)	Soil Description	LL (%)	PL (%)	PI (%)	Moisture Content (%)
●	B-2	1.25-1.75	Gray Elastic SILT	76	38	38	43
▲	B-4	4.25-4.75	Olive Fat CLAY w/ Sand	65	31	33	42
■	TP-2	5.5	Dark Gray Brown Elastic SILT	79	37	42	23
◆	TP-3	4	Dark Gray Brown Elastic SILT	69	35	34	40
○	TP-7	2.5	Dark Gray Brown Fat CLAY	56	29	27	25

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Atterberg Limits on Potential Borrow Materials

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 7

Compaction Test Results
(Saturation Curves Assume Specific Gravity = 2.65)

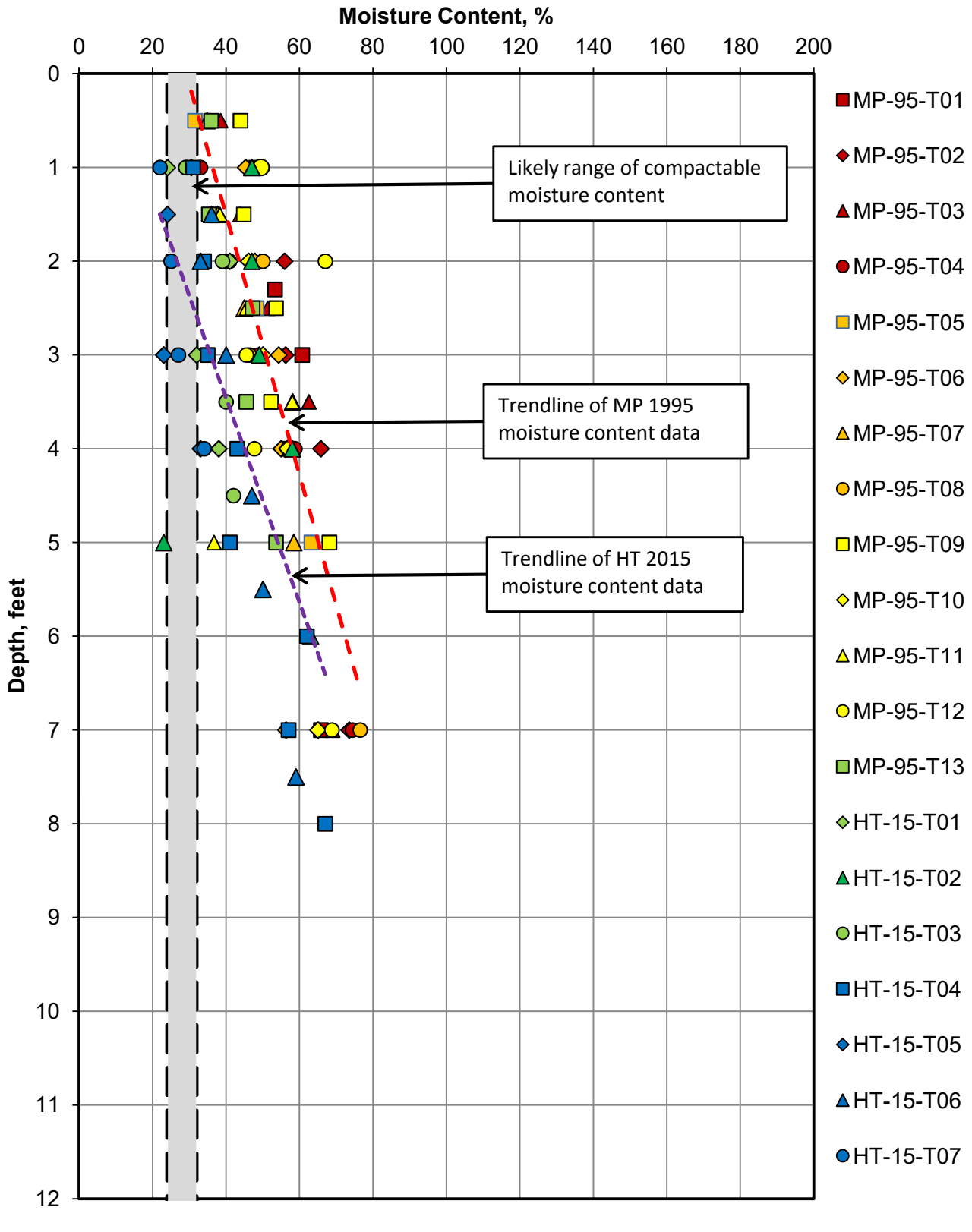


Note: Test method based on ASTM Test D1557

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Compaction Curves on Potential Borrow Materials

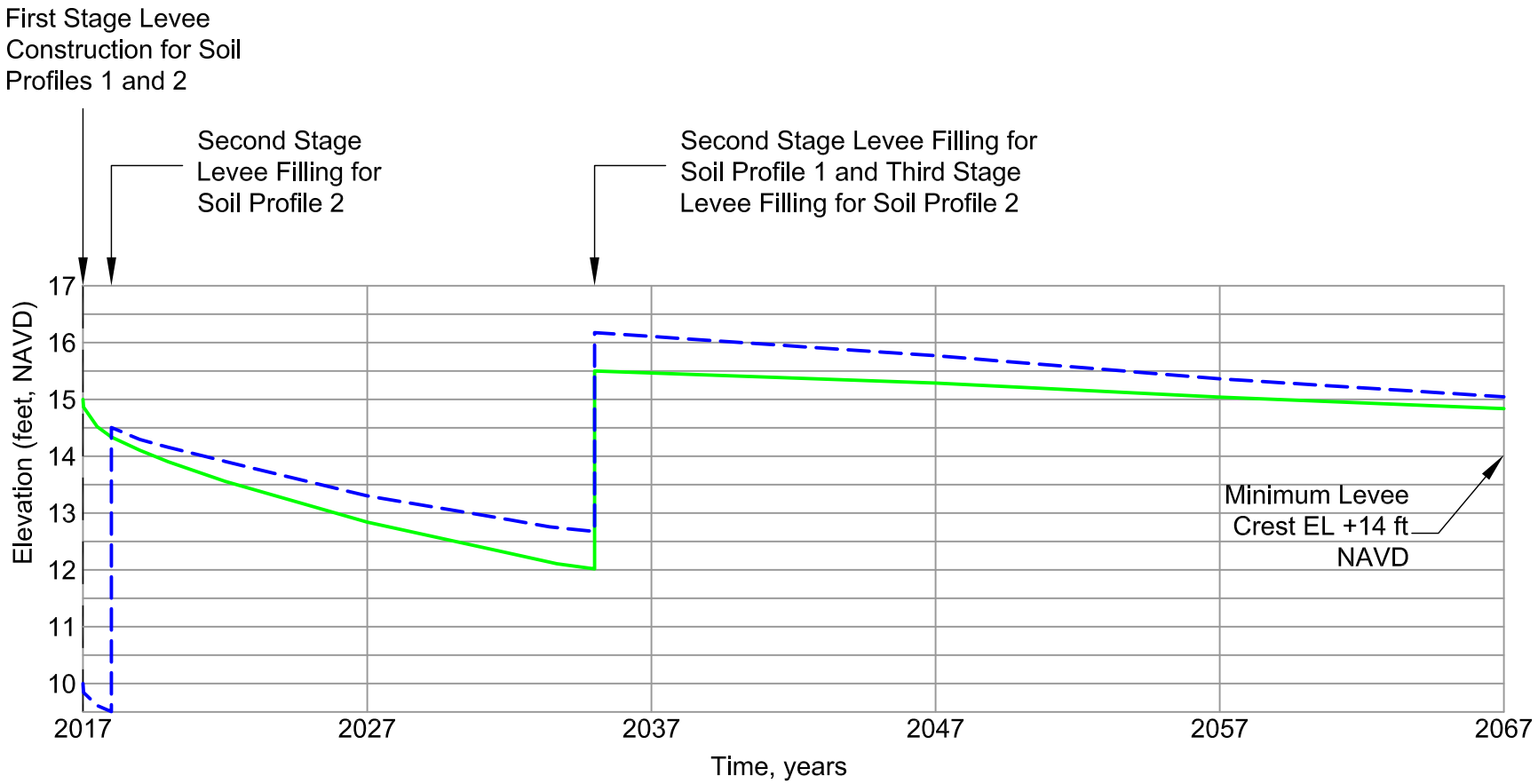
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 8



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Moisture Content vs Depth on Potential Borrow Materials

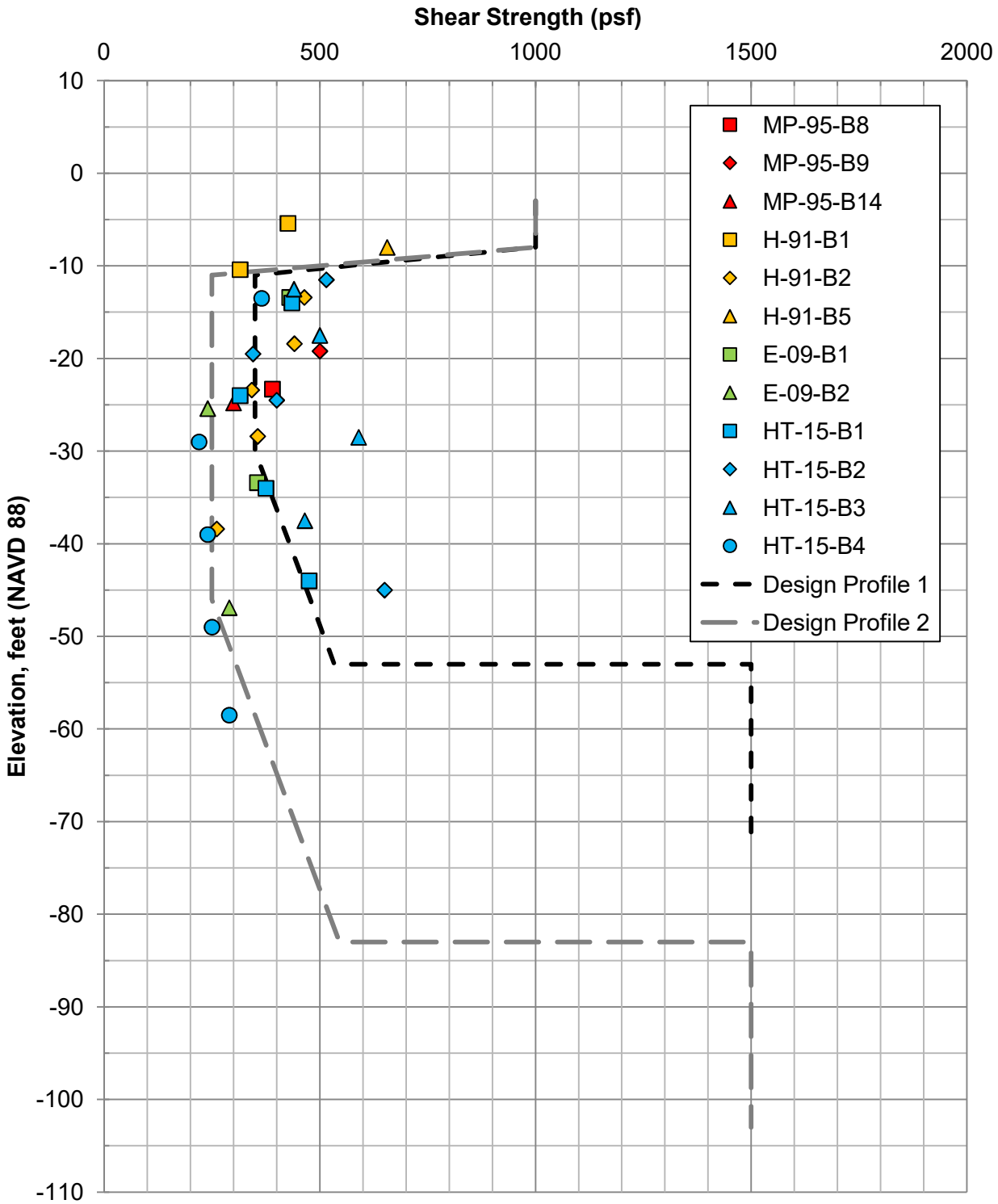
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 9



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Levee Crest Settlement Profile

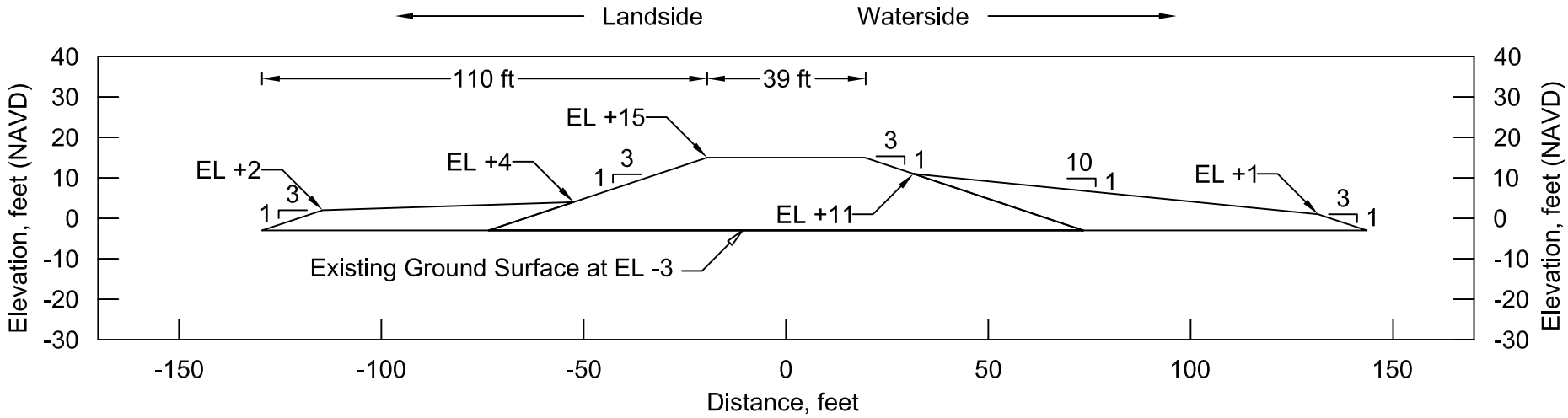
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 10



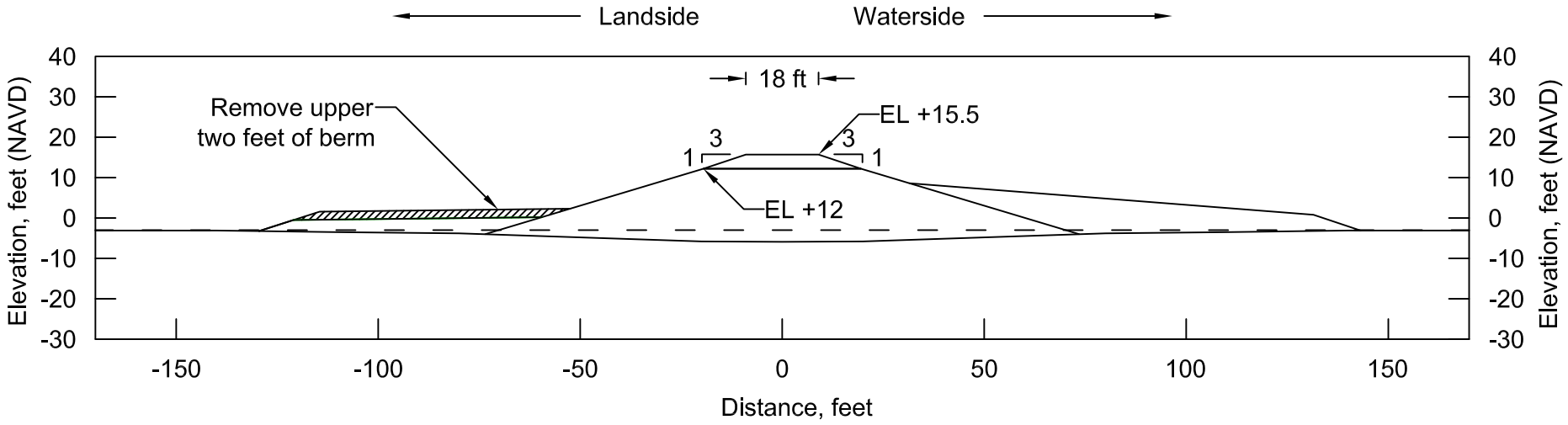
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

TxUU Data in Bay Mud

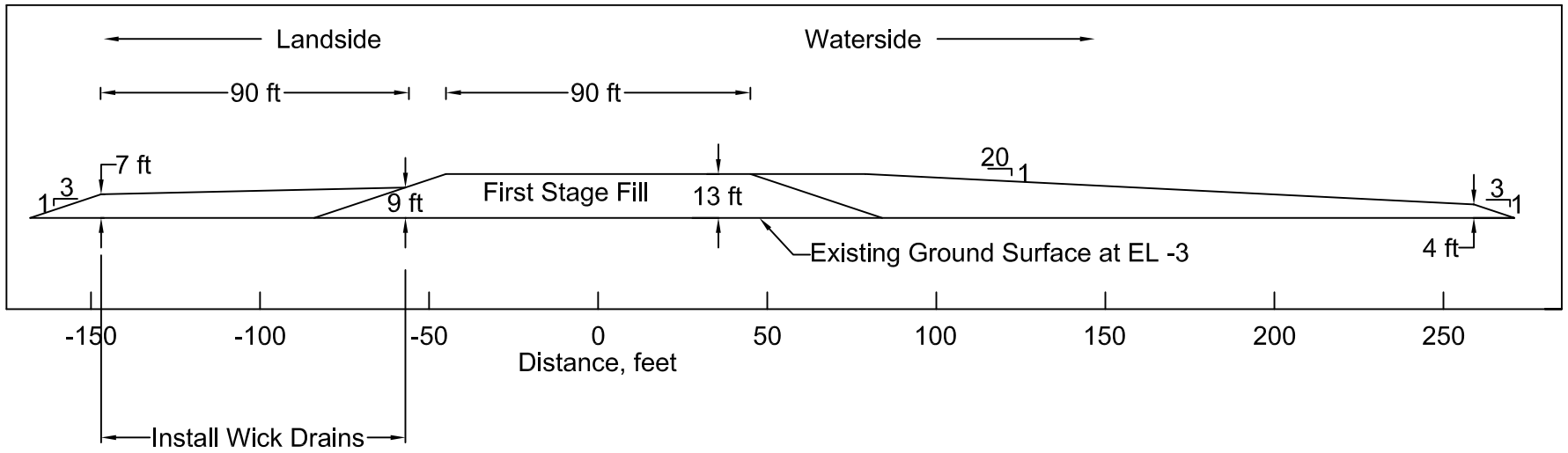
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 11



SCALE 0 40 feet 1 inch = 40 feet	Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Typical Design Configuration 1** **Immediately-After-First-Stage Construction**	
	Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 12



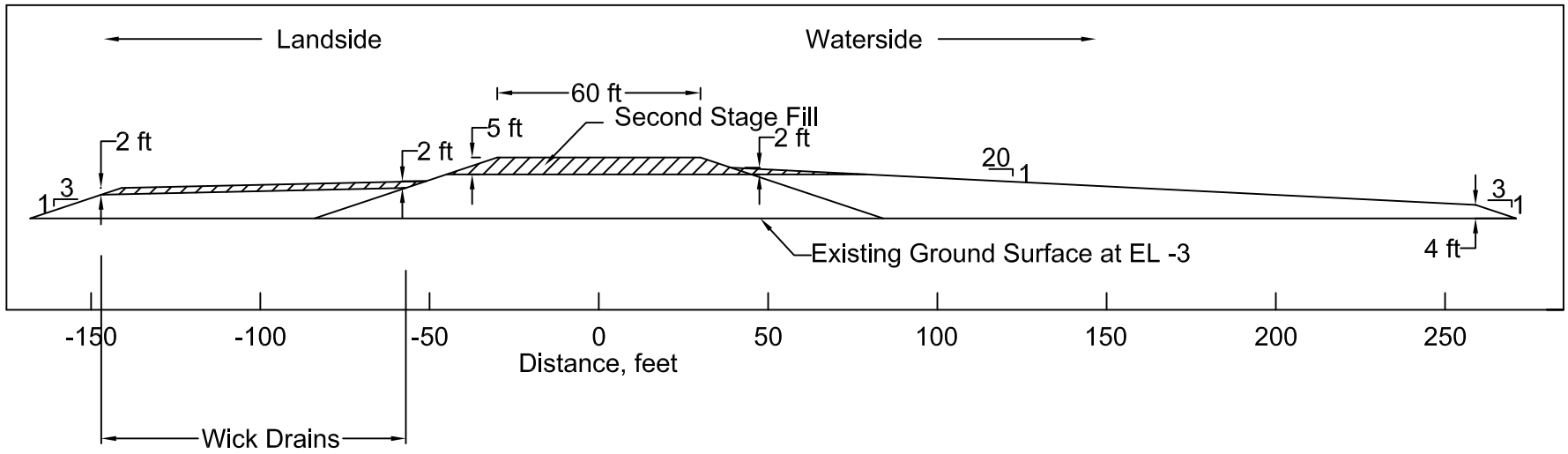
SCALE 0 40 feet 1 inch = 40 feet	Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Typical Design Configuration 1** **Immediately-After-Second-Stage Construction**	
	Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 13



Notes:

(1) Wick drains should be spaced 6 feet apart in triangular pattern and penetrate full thickness of Bay Mud.
(2) Place Phase 1 fill up to 13-foot thickness maximum.
(3) Landside toe berm extends 168 feet from centerline.
(4) Waterside toe berm extends 271 feet from centerline.
(5) Place Second Stage fill after 1 year minimum waiting period after completion of First Stage fill.

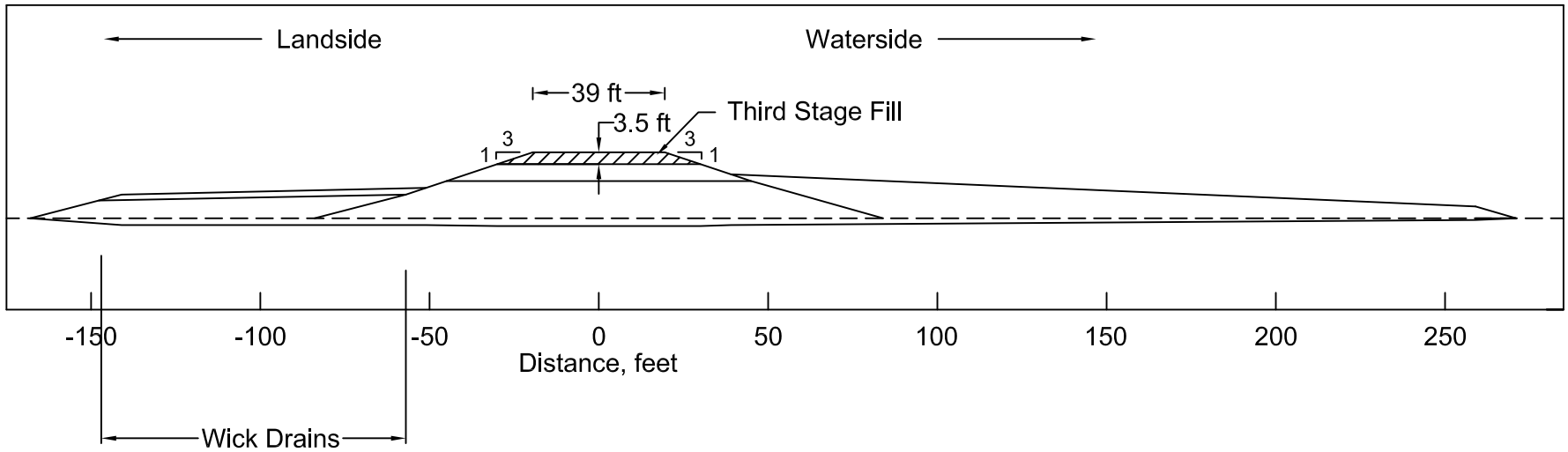
SCALE 0 50 feet 1 inch = 50 feet	Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Typical Design Configuration 2** **Immediately-After-First-Stage-Construction**	
	Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 14



Notes:

(1) Add Second Stage fill after 1 year minimum waiting period after completion of First Stage fill.
(2) Add 2 feet fill thickness on toe berm.
(3) Add 5 feet fill thickness on crest.
(4) Add up to 2 feet thick on waterside slope.
(5) Cross Section is conceptual and does not show consolidation settlement estimates.

SCALE 0 50 feet 1 inch = 50 feet	Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Typical Design Configuration 2** **Immediately-After-Second-Stage Construction**	
	Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 15



Notes:

(1) When levee crest settles to near Minimum Levee Crest Elevation +12 feet, place Third Stage fill.
(2) Add 3.5 feet fill thickness on crest.
(3) Levee crest width allows for an additional 3.5 feet furture levee raising.

SCALE 0 50 feet 1 inch = 50 feet	Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Typical Design Configuration 2** **Immediately-After-Third-Stage Construction**	
	Hultgren - Tillis Engineers	Project No. 831.01	Plate No. 16

APPENDIX A

Date : 8/3/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.06504
Longitude : -122.50941

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	6		CH		Fat Clay (CH), gray with orange mottling, moist, stiff, with organics		1.3	28	68	Organic Content=5%
5	M	3				Soft, wet	0.3		42	67	Organic Content=5%
					▽	8/3/2015					
	M	3				Fat Clay (CH), dark gray, saturated, very soft to soft, (Bay Mud)	0.18	0.5	83	52	
10	T	P					0.2		89	48	TxUU=435
15	T	P				Light brownish gray	0.1		79 80 80 85	53 53 53 51	TxCU Consol
20	T	P				Gray	0.1		73	56	TxUU=315
25	M	P		CH			0.11		77	55	
30	T	P							86 82	50 52	LL=67 PI=35 TxUU=375 Consol
35	M	P					0.15		64	62	
40	T	P				Trace peat	0.1		91	48	TxUU=475

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 1
(Page 1 of 2)

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. A-1

Date : 8/3/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.06504
Longitude : -122.50941

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	6		CL		Medium stiff to stiff Sandy Lean Clay (CL), very dark gray, saturated, medium stiff to stiff	0.5	1.3			Sieve
50	M	24		CL		Lean Clay (CL), bluish gray, saturated, very stiff		4.5+ 3.5			
55	M	12		CL		Lean Clay (CL), olive brown, saturated, very stiff		2.3 3.5			
60	M	11		CH		Fat Clay (CH), light brown, saturated, medium stiff to stiff		0.5 1.0	47	74	

Bottom of boring at 61.5 feet
Groundwater encountered at 7 feet during drilling

Date : 8/4/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -3.5 (NAVD88)
Latitude : 38.07001
Longitude : -122.50690

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	12		MH		Elastic Silt (MH), gray with orange mottling, moist, very stiff, trace organics		3.8	43	70	LL=76 PI=38 Organic Content =5%
5	M	5				Stiff, with organics		1.8 1.5	64	61	Organic Content=5%
	T	P				Elastic Silt (MH), very dark gray, saturated, very soft to soft, (Bay Mud)	0.1		88 97	50 46	TxUU=515 Consol
10											
15	T	P					0.1		96	46	TxUU=345
20	T	P					0.1		96 94	46 47	LL=85 PI=45 TxUU=400 Consol
25	M	P		MH			0.12		86	51	
30	T	P					0.2		99 97 97	45 45 46	TxCU
35	M	P					0.16	0.5	87	50	
40	T	P					0.2		94 100	47 45	TxUU=650 Consol

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 2
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-3

Date : 8/4/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -3.5 (NAVD88)
Latitude : 38.07001
Longitude : -122.50690

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	P		MH			0.22		95	47	
50	T	P		CL		Lean Clay (CL), bluish gray, saturated, very stiff Sandy		2.3			
55	M	9				Lean Clay (CL), light brown with orange mottling, saturated, stiff to very stiff		1.5 2.3 2.0	42	78	
60	M	20		CL							
65	M	12						2.2			

Bottom of boring at 66.5 feet
Groundwater obscured due to rotary wash drilling

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 2
(Page 2 of 2)

Date : 8/5/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -1.5 (NAVD88)
Latitude : 38.07830
Longitude : -122.50034

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	12		CH		Fat Clay (CH), brown, dry to moist, hard, trace organics		4.5	33	74	Organic Content=5%
5	M	2			▽	Trace sand 8/5/2015	0.25	0.8 1.0	62	59	Organic Content=5%
	M	2				Fat Clay (CH), dark gray, saturated, very soft to soft, (Bay Mud)	0.26		77	53	
10	T	P					0.2		88 95	50 47	LL=79 PI=44 TxUU=440 Consol
15	T	P							109	42	TxUU=500
20	M	P				Trace peat	0.19		113	39	
25	T	P		CH		Increasing peat	0.2	0.5	150	32	TxUU=590
30	M	P					0.09 0.14	0.5	88	46	
35	T	P					0.1	0.5	76 80	55 53	TxUU=465 Consol
40	M	P					0.15	0.5	76	53	
				SC		Clayey Sand (SC), bluish gray, saturated, dense					

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 3
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-5

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Date : 8/5/2015 Drilling Method : Rotary Wash Elevation (Feet) : -1.5 (NAVD88) Latitude : 38.07830 Longitude : -122.50034					
	T	P		SC				4.5+			LL=33 PI=18 Sieve
50	M	25		CL		Lean Clay with Sand (CL), olive gray, saturated, very stiff		4.5+ 3.5	19	108	
55	M	21		CL		Lean Clay (CL), light brown, saturated, very stiff		3.5 3.0			
60	M	11				Stiff		2.5 1.5			

Bottom of boring at 61.5 feet
Groundwater encountered at 6 feet during drilling

Date : 8/5/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -2.5 (NAVD88)
Latitude : 38.08506
Longitude : -122.50229

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	10		CH		Fat Clay (CH), gray with orange mottling, moist, hard, trace organics		4.5+	42	70	Organic Content=5%
	M	9						1.5	42	73	LL=65 PI=34
5						Dark brown, stiff					Organic Content=5%
	M	2				Fat Clay (CH), dark gray, wet, very soft to soft, (Bay Mud)	0.26		78	52	
10	T	P					0.2		87	50	TxUU=365
15	M	P					0.15		93	47	
20	M	P					0.13		91	47	
25	T	P		CH			0.3		88 91	49 47	TxUU=220 Consol
30	M	P					0.11		86	50	
35	T	P					0.1		80	51	TxUU=240
40	M	P					0.12		79	52	

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 4
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-7

Date : 8/5/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -2.5 (NAVD88)
Latitude : 38.08506
Longitude : -122.50229

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	T	P					0.1		81 73	51 54	LL=64 PI=33 TxUU=250 Consol
50	M	P		CH			0.14				
55	T	P					0.1		76	54	TxUU=290
60	M	18				Lean Clay (CL), bluish gray, saturated, stiff to very stiff		1.5 2.3			
65	M	15		CL				2.0	37	85	
70	M	10				Lean Clay (CL), light brown with orange mottling, saturated, stiff to very stiff		1.8			
75	M	11		CL				1.0			
80	M	10				Medium stiff, light gray		0.8	58	65	

Bottom of boring at 81.5 feet
Groundwater obscured due to rotary wash drilling

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 4
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-8

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Date : 8/6/2015 Drilling Method : Rotary Wash Elevation (Feet) : -3.5 (NAVD88) Latitude : 38.08535 Longitude : -122.50182					
						Boring drilled to 60 feet prior to first sample					
5											
10											
15											
20											
25											
30											
35											
40											

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 5
(Page 1 of 2)

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. A-9

Date : 8/6/2015
Drilling Method : Rotary Wash
Elevation (Feet) : -3.5 (NAVD88)
Latitude : 38.08535
Longitude : -122.50182

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
50											
55											
60	M	P		CH		Fat Clay (CH), dark gray, saturated, very soft to soft, (Bay Mud)	0.14		74	56	
65	T	P		CL		Lean Clay (CL), bluish gray, saturated, stiff	0.4	1.7			
70	M	14									
75	M	13		CL		Lean Clay (CL), light brown with gray mottling, saturated, very stiff		2.5 3.0			

Bottom of boring at 76.5 feet
Groundwater obscured due to rotary wash drilling

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Boring 5
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-10

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.06498
Longitude : -122.50505

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	B			CH		Fat Clay (CH), light brown, dry, very stiff, vegetation roots, (Bay Mud Crust)	4.5+	1.15+	24	72	
	B					Fat Clay (CH), brown, moist, very stiff, roots to 3 feet, (Bay Mud Crust)	4.5+	1.15+	41	63	Organic Content=6%
	B						4.5+	1.15+	32	69	
	B			CH			4.5	1.15+	38	62	
5	B							0.62			
	B					Fat Clay (CH), gray, wet, stiff, (Bay Mud Crust)		0.80			
	B			CH				0.67			
	B							0.76			

Bottom of test pit at 8.5 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.
The dry density and moisture content shown was measured by using a nuclear probe.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 1
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-11

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -2 (NAVD88)
Latitude : 38.06944
Longitude : -122.50359

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, with vegetation, (Bay Mud Crust)					
	B					Elastic Silt (MH), brown, dry, very stiff, (Bay Mud Crust)	4.5+	1.15+	47	59	
	B						4.5	1.15+	47	65	
	B						4.5	1.15+	49	64	
	B			MH				1.07	58	62	
5	B					Wet		0.85	23		LL=79 PI=42
	B					Medium stiff		0.62	63		
	B					Elastic Silt (MH), blue gray, wet, medium stiff, (Bay Mud)		0.51			
	B			MH				0.46			

Bottom of test pit at 8.5 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 2
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-12

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.06805
Longitude : -122.50030

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, with vegetation roots, (Bay Mud Crust)					
	B					Elastic Silt (MH), brown, moist, very stiff, (Bay Mud Crust)	4.5+	1.15+	29	71	
	B						4.5+	1.15+	39	64	
	B			MH			4.5+	1.15+	40	67	LL=69 PI=34
	B					Wet		0.71	42	61	
5	B							0.89			Organic Content=2%
	B					Elastic Silt (MH), gray, wet, stiff, (Bay Mud Crust)		0.73			
	B			MH	▽	10/8/2015		0.76			

Bottom of test pit at 8 feet
Groundwater encountered at 7.5 feet during test pit.
The vane shear shown was computed using a Bjerrum's field vane correction factor of 0.85.
The dry density and moisture content shown were measured using a nuclear probe.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 3
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-13

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.07372
Longitude : -122.49825

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, with vegetation roots, (Bay Mud Crust)					
	B					Fat Clay (CH), brown, moist, very stiff, trace vegetation roots, (Bay Mud Crust)	4.5	1.15+	31	75	
	B						4.5	1.15+	34	70	
	B						4.5	1.15+	35	66	
	B			CH				0.73	43	72	
5	B							0.64	41		
	B					Wet		0.87	62		
	B					Fat Clay (CH), gray, saturated, stiff, (Bay Mud Crust)		0.80	57		
	B			CH	▽	10/8/2015		0.76	67		

Bottom of test pit at 8.5 feet
Groundwater encountered at 8 during test pit.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 4
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-14

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.07738
Longitude : -122.49722

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	B			CH		Fat Clay (CH), light brown, dry, very stiff, with vegetation roots, (Bay Mud Crust)	4.5	1.15+	24	64	
	B					Fat Clay (CH), brown, moist, very stiff, shrinkage cracks extend to 2.5 feet, (Bay Mud Crust)	4.5	1.15+	23	65	Organic Content=4%
	B			CH			4.5	1.15+	33	60	
5	B						4.5	1.15+			
	B							0.89			
	B					Fat Clay (CH), gray brown, wet, stiff, (Bay Mud Crust)		0.87			
	B			CH				0.85			

Bottom of test pit at 8.5 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.
The dry density and moisture content shown was measured using a nuclear probe.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 5
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-15

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.07657
Longitude : -122.49385

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, with vegetation roots, (Bay Mud Crust)					
	B					Fat Clay (CH), brown, moist, very stiff, (Bay Mud Crust)	4.5	1.15+	36	73	Organic Content=4%
	B						4.5	1.15+	33	76	
	B			CH			4.5	1.15+	40	68	
	B					Fat Clay (CH), brown, wet, stiff, (Bay Mud Crust)		0.71	47		
5	B							0.80	50		
	B			CH				0.84			
	B							0.73	59		

Bottom of test pit at 8 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 6
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-16

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.08239
Longitude : -122.49608

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, (Bay Mud Crust)					
	B					Fat Clay (CH), brown, moist, very stiff, shrinkage cracks extend to 2 feet, (Bay Mud Crust)	4.5	1.15+	22	68	Organic Content=5%
	B			CH			4.5	1.15+	25	62	LL=56 PI=27
	B						4.5	1.15+	27	63	
	B					Fat Clay (CH), brown, wet, very stiff, (Bay Mud Crust)		0.89	34	63	
5	B			CH				0.78			
	B					Fat Clay (CH), gray, wet, stiff, (Bay Mud Crust)		0.89			
	B			CH				0.82			
	B							0.85			

Bottom of test pit at 8.5 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.
The dry density and moisture content shown was measured by using a nuclear probe.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 7
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-17

Date : 10/8/2015
Drilling Method : Test Pit
Elevation (Feet) : -3 (NAVD88)
Latitude : 38.08323
Longitude : -122.49432

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Static Cone Penetration Test (tsf)	Vane Shear (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), light brown, dry, very stiff, (Bay Mud Crust)					
	B					Fat Clay (CH), brown, moist, very stiff, (Bay Mud Crust)	4.5	1.15+			
	B						4.5	1.15+			
	B			CH		Wet	4.5	1.15+			
5	B							0.85			
	B							0.75			
	B					Fat Clay (CH), gray, wet, stiff, (Bay Mud Crust)		0.75			
	B			CH				0.82			

Bottom of test pit at 8.5 feet
No groundwater encountered.
The vane shear shown was computed by using a Bjerrum's field vane correction factor of 0.85.

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Log of Test Pit 8
(Page 1 of 1)

Hultgren - Tillis Engineers | Project No. 831.01 | Plate No. A-18

MAJOR DIVISIONS				GROUP NAMES
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS MORE THAN 50% OF COARSE FRACTION IS RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS 50% OR MORE OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SANDS WITH LESS THAN 5% FINES	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		SANDS WITH OVER 12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS 50% OR MORE PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	SILT
			CL	LEAN CLAY
			OL	ORGANIC CLAY, ORGANIC SILT
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE		MH	ELASTIC SILT
			CH	FAT CLAY
			OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT

UNIFIED SOIL CLASSIFICATION SYSTEM- ASTM D 2487

S - SPT

M - 2.5 inch

C - 3.0 inch

T - Shelby Tube

B - Bag

- Water Level at Time of Drilling
- Water Level after Drilling (with date measured)

Consol - Consolidation

Gs - Specific Gravity

LL - Liquid Limit (%)

PI - Plasticity Index (%)

TxUU - Shear Strength (psf) - Unconsolidated Undrained Triaxial Shear

TxCU - Shear Strength (psf) - Consolidated Undrained Triaxial Shear

UC - Compressive Strength (psf) - Unconfined Compression

P - Push

Perm - Permeability

Sieve - Particle Size Analysis

VS - Laboratory Vane Shear (psf)

-200 - % Passing No. 200 Sieve

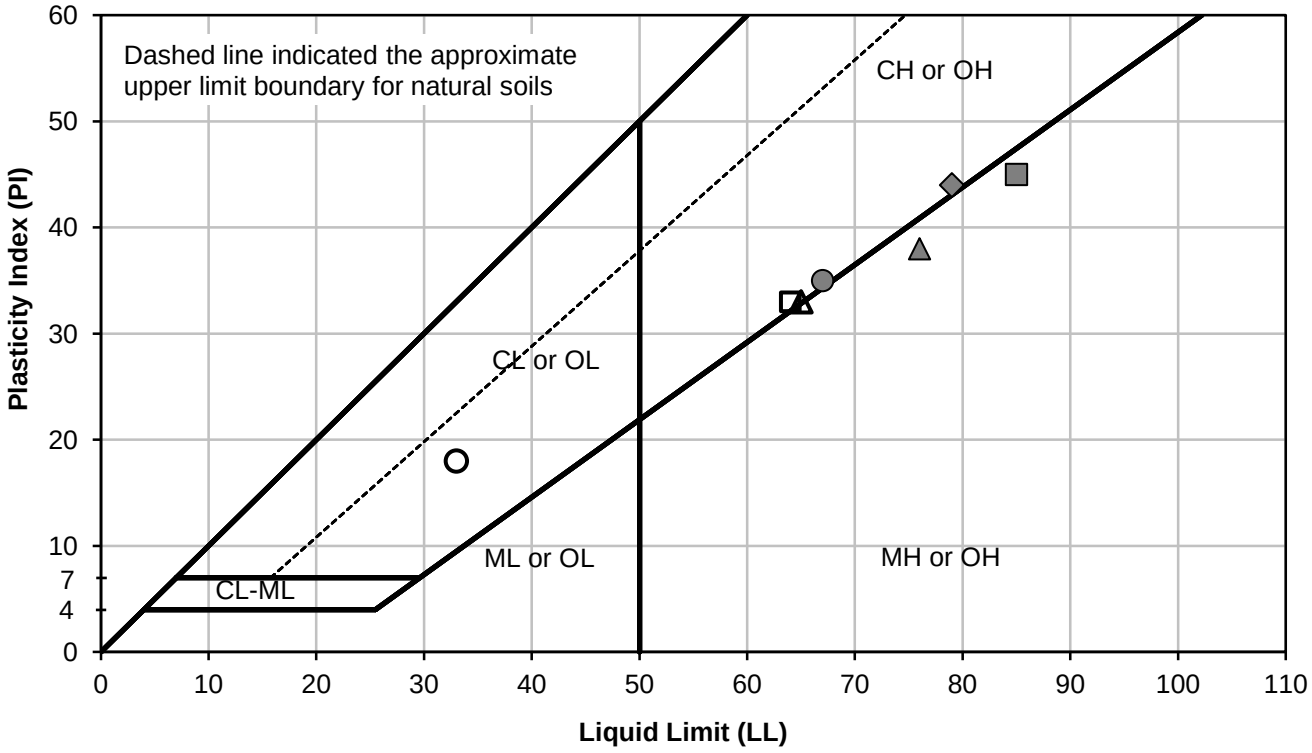
KEY TO TEST DATA

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Soil Classification Chart

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. A-19

APPENDIX B



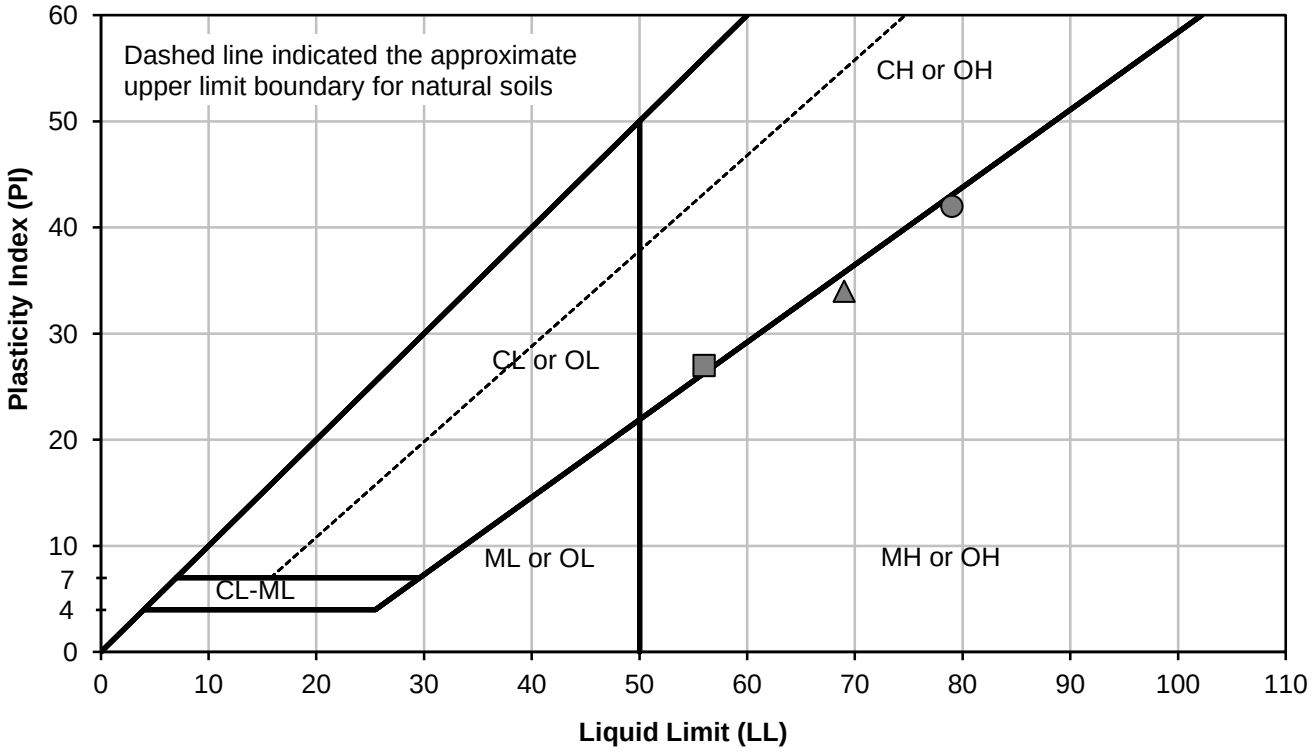
Symbol	Boring Number	Depth (feet)	Soil Description	LL (%)	PL (%)	PI (%)	Moisture Content (%)
●	1	30-32	Greenish Gray Fat Clay (Bay Mud)	67	32	35	86
▲	2	1.25-1.75	Gray Elastic SILT	76	38	38	43
■	2	20-22	Greenish Gray Elastic SILT (Bay Mud)	85	40	45	96
◆	3	10-12	Greenish Gray Fat CLAY (Bay Mud)	79	35	44	88
○	3	45-46	Dark Greenish Gray Lean Clayey SAND	33	15	18	N/A
△	4	4.25-4.75	Olive Fat CLAY w/ Sand	65	31	33	42
□	4	45-47	Greenish Gray Fat Clay (Bay Mud)	64	31	33	81

Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Atterberg Limits

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-1



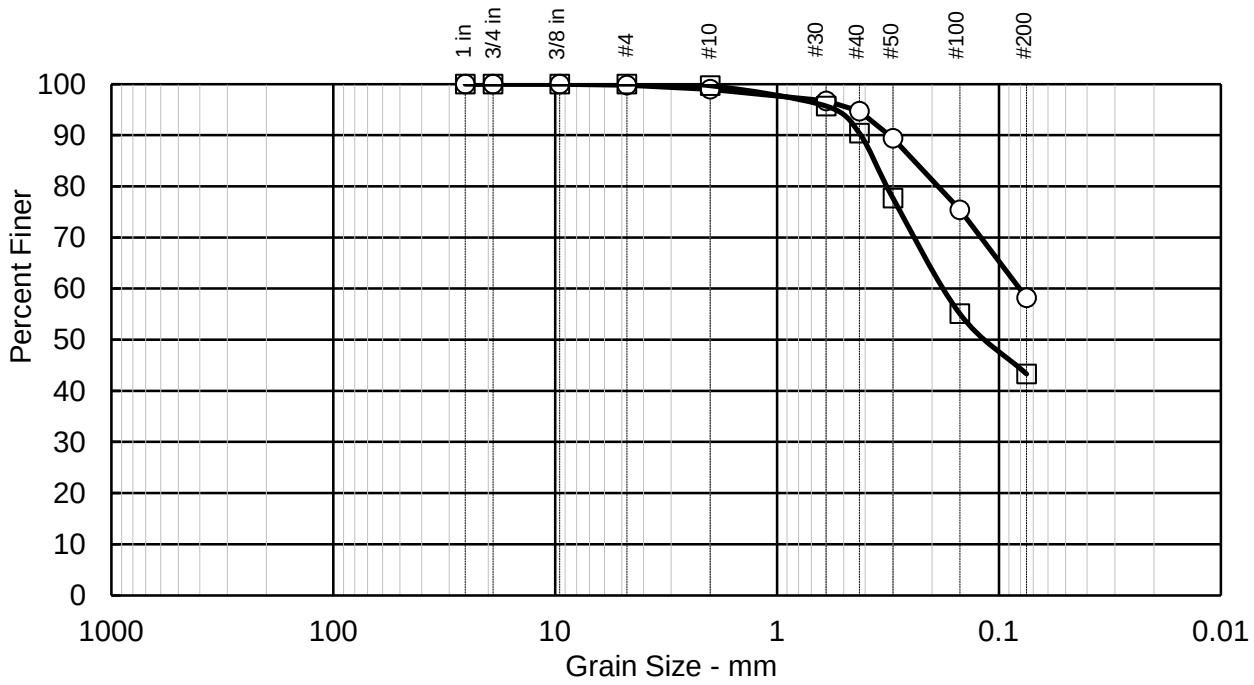
Symbol	Test Pit Number	Depth (feet)	Soil Description	LL (%)	PL (%)	PI (%)	Moisture Content (%)
●	2	5-5.5	Dark Gray Brown Elastic SILT	79	37	42	23
▲	3	3.5-4	Dark Gray Brown Elastic SILT	69	35	34	40
■	7	2-2.5	Dark Gray Brown Fat CLAY	56	29	27	25

Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Atterberg Limits

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-2



Sieve Size	○	□	
	Percent Finer		
1 in	100.0	100.0	
3/4 in	100.0	100.0	
3/8 in	100.0	100.0	
#4	99.8	100.0	
#10	99.0	99.7	
#30	96.7	95.7	
#40	94.7	90.4	
#50	89.4	77.7	
#100	75.4	55.1	
#200	58.2	43.3	
	Grain Size		
D60	0.080	0.180	-
D30	-	-	-
D10	-	-	-
	Coefficients		
Cc	-	-	-
Cu	-	-	-

Soil Description	
○	Gray Sandy CLAY
□	Dark Greenish Gray Lean Clayey SAND

Sample Key	
○	Boring 1 @ 46-46.5'
□	Boring 3 @ 45-46'

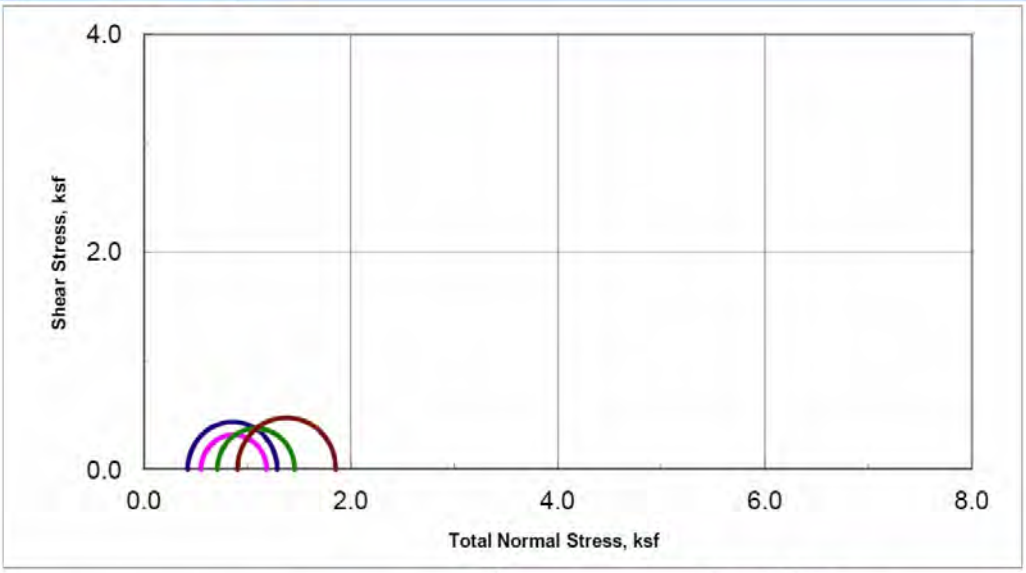
Testing performed by
Cooper Testing Laboratory

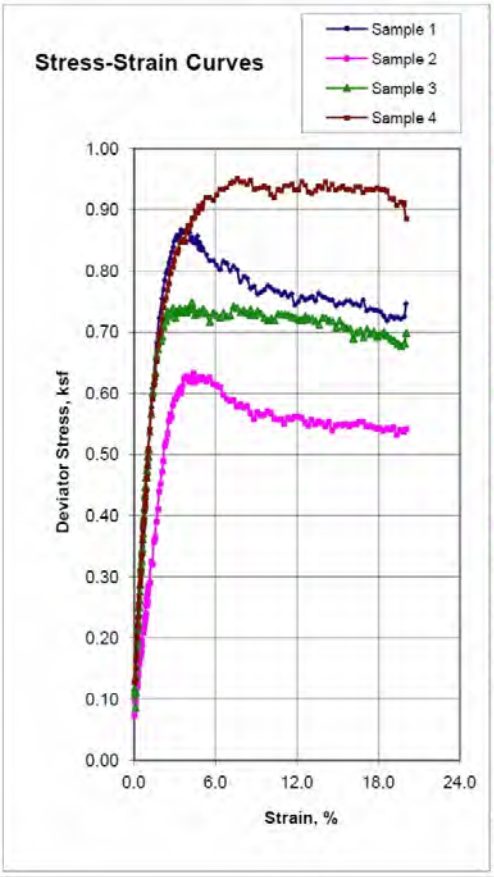
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Sieve Analysis Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-3

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	88.7	72.9	85.6	90.7
Dry Den,pcf	48.2	55.9	50.2	47.7
Void Ratio	2.495	2.018	2.356	2.535
Saturation %	96.0	97.5	98.1	96.6
Height in	6.00	6.00	5.98	5.97
Diameter in	2.88	2.85	2.86	2.87
Cell psi	2.9	3.8	4.9	6.3
Strain %	3.44	4.34	4.24	7.55
Deviator, ksf	0.868	0.633	0.749	0.951
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.060	0.060	0.060
Job No.:	212-133a			
Client:	Hultgren-Tillis Engineers			
Project:	Bel Marin Keys - 831.01			
Boring:	1	1	1	1
Sample:				
Depth ft:	10-12	20-22	30-32	40-42

Visual Soil Description	
Sample #	
1	Greenish Gray Fat CLAY (Bay Mud)
2	Greenish Gray CLAY (Silty) (Bay Mud)
3	Greenish Gray CLAY (Bay Mud)
4	Greenish Gray CLAY (Bay Mud)

Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

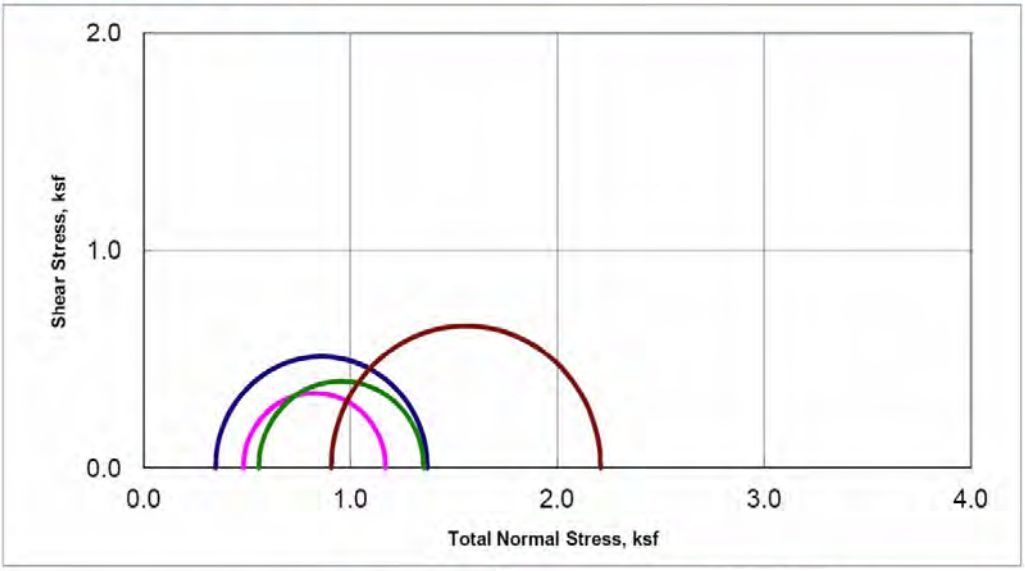
Testing performed by Cooper Testing Laboratory

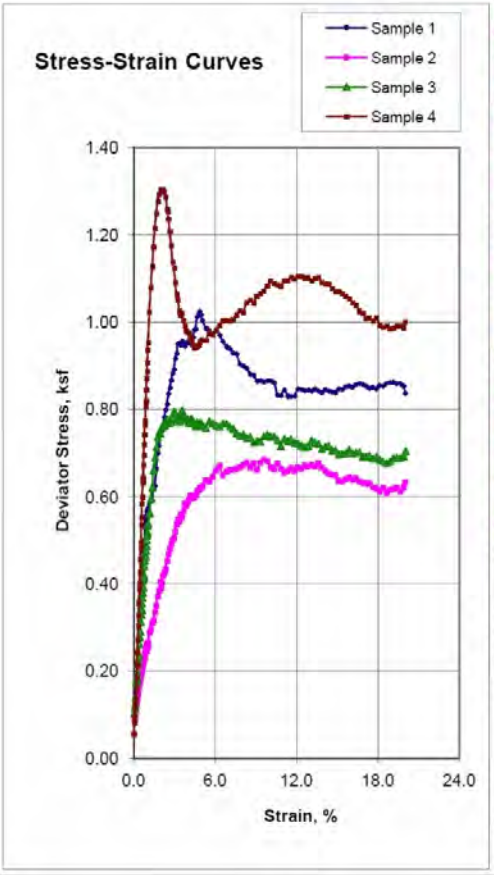
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (UU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-4

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	87.6	95.5	95.7	94.2
Dry Den,pcf	49.9	46.4	46.2	47.0
Void Ratio	2.375	2.632	2.648	2.585
Saturation %	99.6	98.0	97.5	98.4
Height in	6.06	6.04	6.01	6.01
Diameter in	2.83	2.84	2.85	2.86
Cell psi	2.4	3.4	3.9	6.3
Strain %	4.85	9.56	3.54	2.04
Deviator, ksf	1.025	0.686	0.798	1.304
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.060	0.060	0.060
Job No.:	212-133b			
Client:	Hultgren-Tillis Engineers			
Project:	Bel Marin Keys - 831.01			
Boring:	2	2	2	2
Sample:				
Depth ft:	7-9(Tip-11")	15-17	20-22	40-42(Tip-5")

Visual Soil Description	
Sample #	
1	Greenish Gray CLAY (Bay Mud)
2	Dark Bluish Gray CLAY (Bay Mud)
3	Greenish Gray Elastic SILT (Bay Mud)
4	Greenish Gray CLAY (Bay Mud)

Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

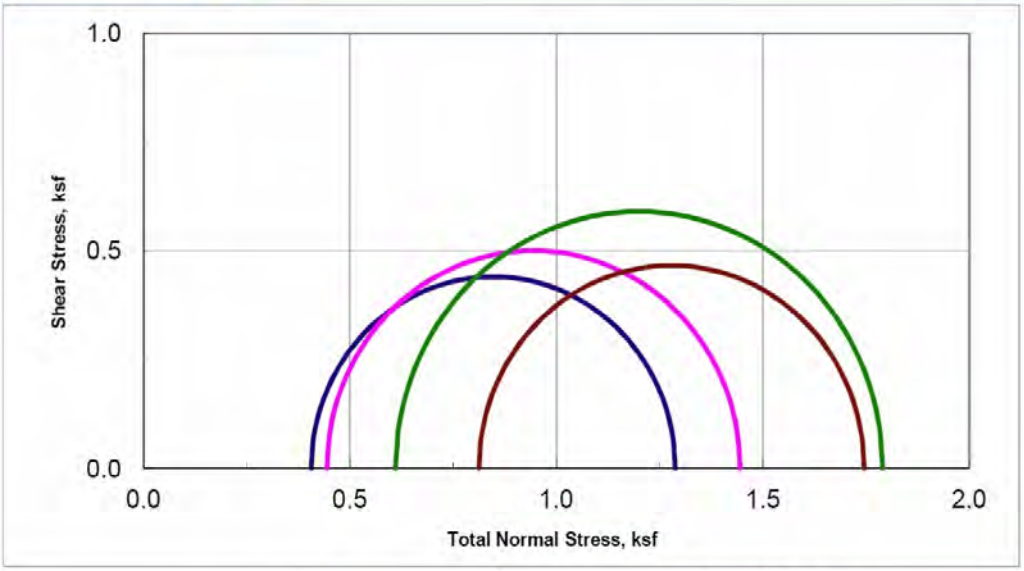
Testing performed by Cooper Testing Laboratory

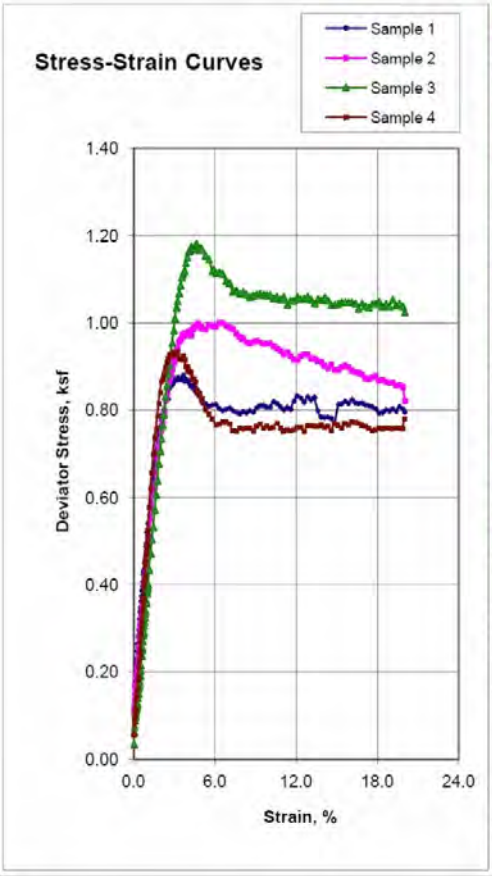
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (UU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-5

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	87.5	108.5	150.4	76.0
Dry Den,pcf	49.7	42.2	31.8	55.1
Void Ratio	2.394	2.990	4.309	2.061
Saturation %	98.6	97.9	94.3	99.5
Height in	6.05	6.03	6.01	6.01
Diameter in	2.84	2.86	2.86	2.87
Cell psi	2.8	3.1	4.2	5.6
Strain %	3.63	6.54	4.63	3.23
Deviator, ksf	0.881	1.001	1.181	0.933
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.060	0.060	0.060
Job No.:	212-133c			
Client:	Hultgreen-Tillis Engineers			
Project:	Bel Marin Keys - 831.01			
Boring:	3	3	3	3
Sample:				
Depth ft:	10-12(Tip-11")	15-16.5	25-27(Tip-1")	35-37

Visual Soil Description	
Sample #	
1	Greenish Gray Fat CLAY (Bay Mud)
2	Very Dark Bluish Gray CLAY (Bay Mud)
3	Very Dark Bluish Gray CLAY w/ organics
4	Very Dark Bluish Gray CLAY (Bay Mud)

Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

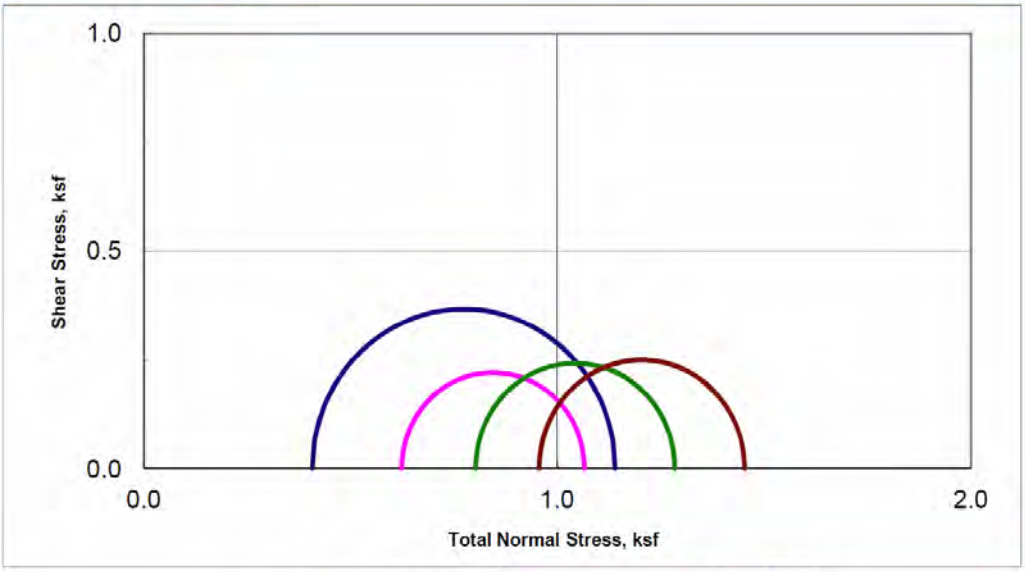
Testing performed by Cooper Testing Laboratory

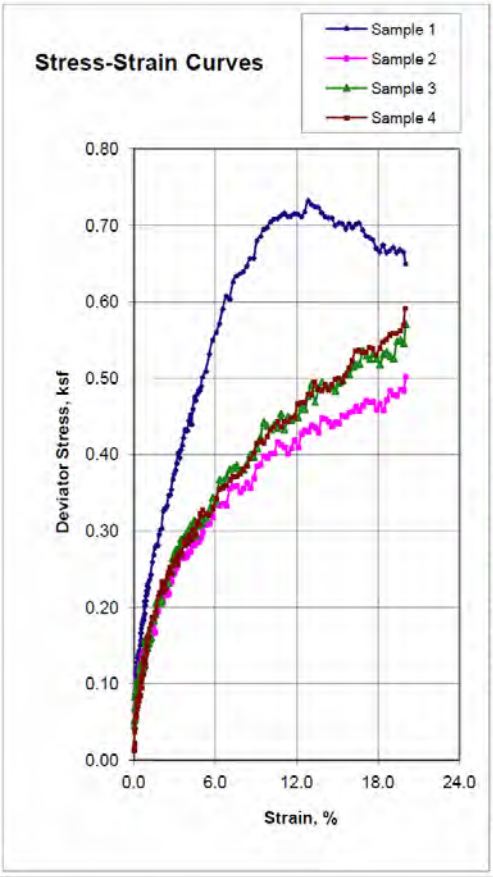
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (UU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-6

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	86.7	87.9	80.0	81.3
Dry Den,pcf	49.9	49.0	51.4	50.8
Void Ratio	2.377	2.439	2.278	2.319
Saturation %	98.5	97.3	94.8	94.6
Height in	6.02	6.07	5.94	6.05
Diameter in	2.86	2.88	2.87	2.90
Cell psi	2.8	4.3	5.6	6.6
Strain %	12.82	15.00	15.00	15.00
Deviator, ksf	0.732	0.442	0.483	0.498
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.061	0.059	0.061
Job No.:	212-133d			
Client:	Hultgren-Tillis Engineers			
Project:	Bel Marin Keys - 831.01			
Boring:	4	4	4	4
Sample:				
Depth ft:	10-12	25-27(Tip-5")	35-37(Tip-7")	45-47(Tip-5")

Visual Soil Description	
Sample #	
1	Very Dark Bluish Gray CLAY (Bay Mud)
2	Greenish Gray CLAY
3	Very Dark Bluish Gray CLAY (Bay Mud)
4	Greenish Gray CLAY (Bay Mud)

Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

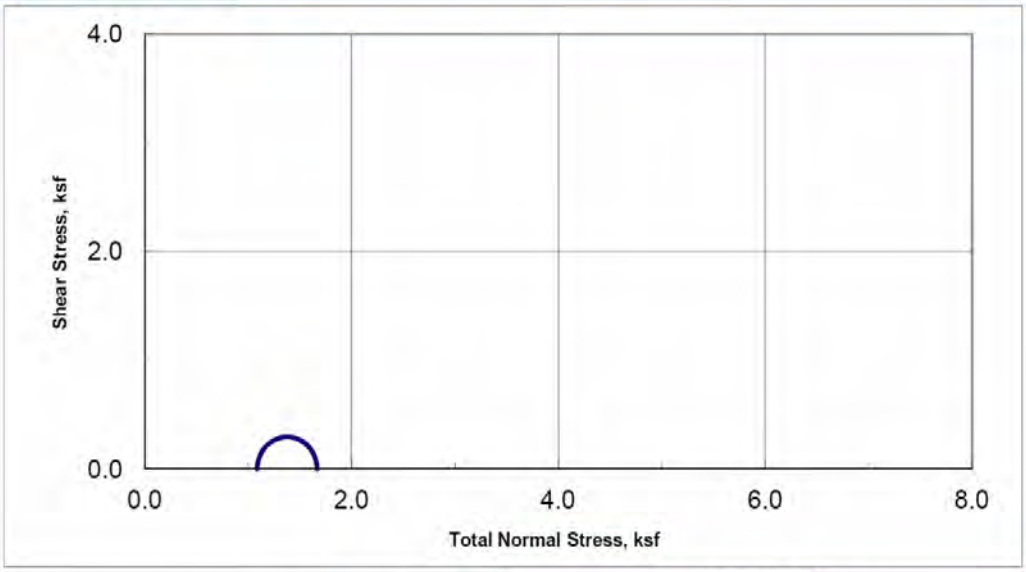
Testing performed by Cooper Testing Laboratory

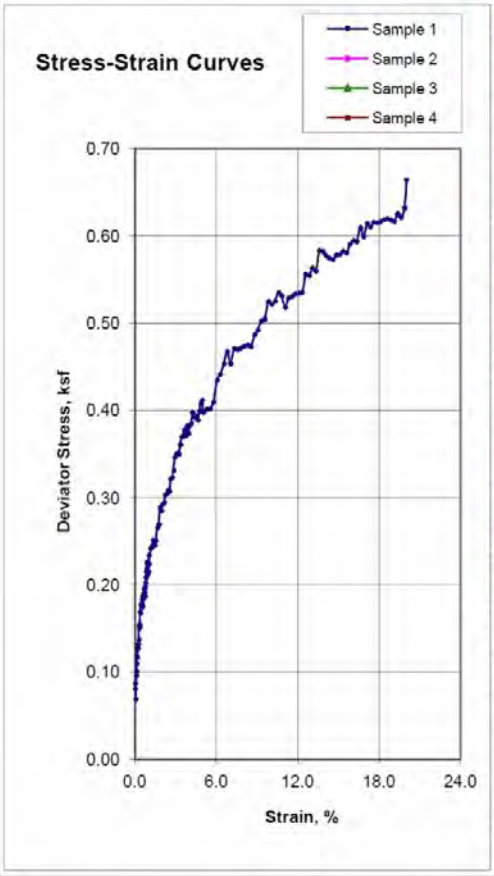
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (UU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-7

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	76.3			
Dry Den,pcf	53.5			
Void Ratio	2.149			
Saturation %	95.8			
Height in	5.86			
Diameter in	2.87			
Cell psi	7.5			
Strain %	15.00			
Deviator, ksf	0.578			
Rate %/min	1.00			
in/min	0.058			
Job No.:	212-133e			
Client:	Hultgreen-Tillis Engineers			
Project:	Bel Marin Keys - 831.01			
Boring:	4			
Sample:				
Depth ft:	55-57			

Visual Soil Description	
Sample #	
1	Very Dark Bluish Gray CLAY (Bay Mud)
2	
3	
4	
Remarks:	

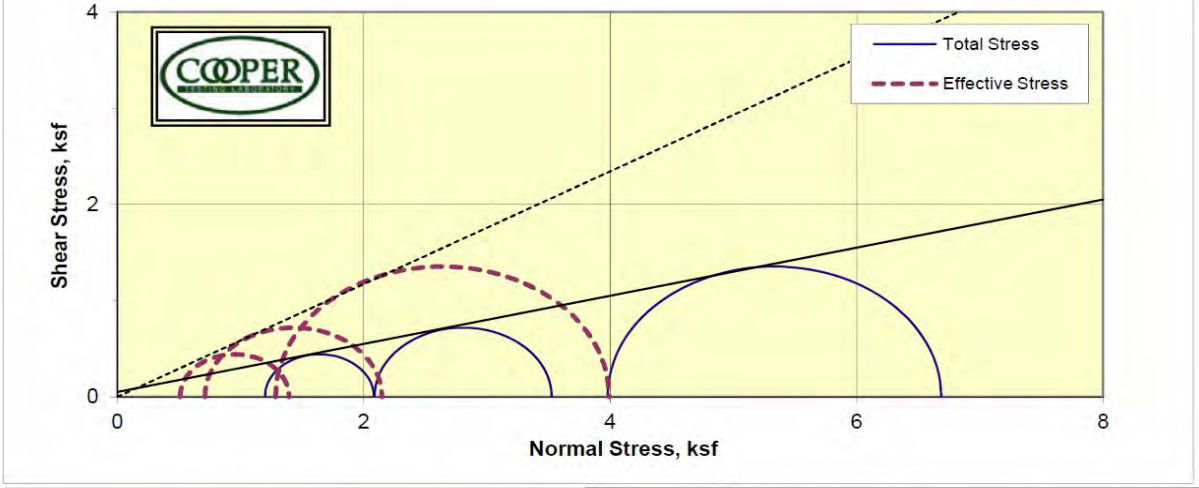
Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

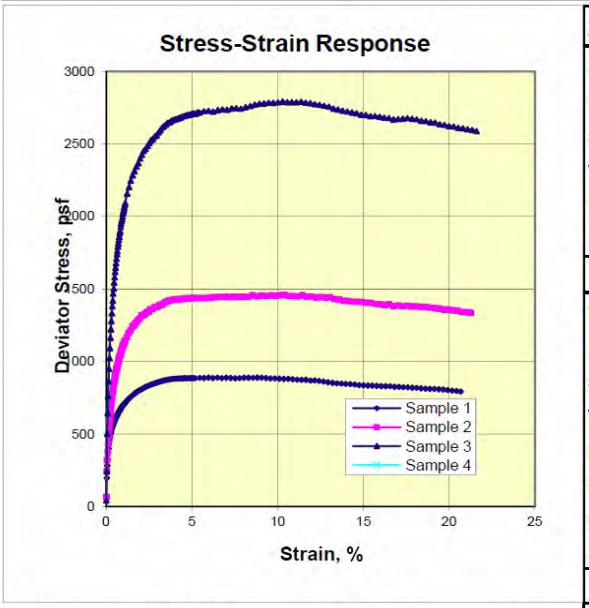
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (UU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-8





Sample:	**1**	**2**	**3**	**4**
MC, %	79.2	79.7	80.1	
DD, pcf	52.5	52.5	52.8	
Sat. %	96.7	97.3	98.7	
Void Ratio	2.212	2.211	2.190	
Diameter in	2.87	2.87	2.87	
Height, in	5.85	5.86	5.88	
	Final			
MC, %	67.6	60.1	52.1	
DD, pcf	59.6	64.2	70.0	
Sat. %	100.0	100.0	100.0	
Void Ratio	1.826	1.623	1.407	
Diameter, in	2.74	2.67	2.59	
Height, in	5.67	5.52	5.45	
Cell, psi	68.1	74.2	87.3	
BP, psi	59.8	59.7	59.7	
	Effective Stresses At:			
Strain, %	5.0	5.0	5.0	
Deviator ksf	0.885	1.438	2.709	
Excess PP	0.688	1.376	2.694	
Sigma 1	1.394	2.149	3.993	
Sigma 3	0.509	0.710	1.283	
P, ksf	0.952	1.429	2.638	
Q, ksf	0.442	0.719	1.355	
Stress Ratio	2.737	3.025	3.111	
Rate in/min	0.0003	0.0003	0.0003	

Job No.:	212-133	**Date:** 9/1/2015
Client:	Hultgren-Tillis Engineers	BY:DC
Project:	Bel Marin Keys - 831.01	
Sample 1)	1 @ 15-17(Tip-17.5")	Greenish Gray CLAY (Bay Mud)
Sample 2)	1 @ 15-17(Tip-11")	Greenish Gray CLAY (Bay Mud)
Sample 3)	1 @ 15-17(Tip-5")	Greenish Gray CLAY (Bay Mud)
Sample 4)		

Total C	**0.0**	**ksf**
Total phi	**14.0**	**degrees**
Eff. C	**0.0**	**ksf**
Eff. Phi	**30.4**	**degrees**

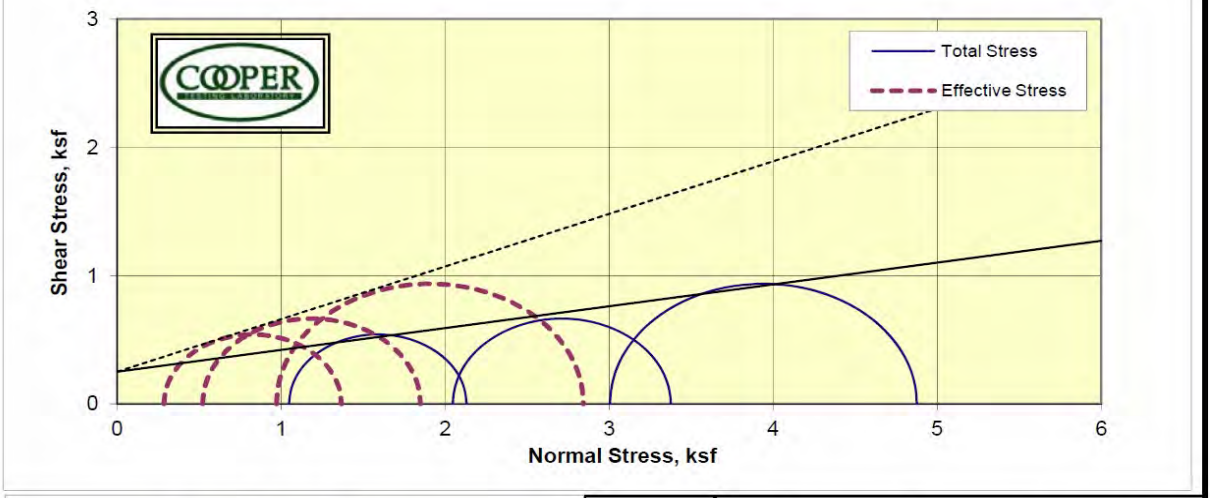
©

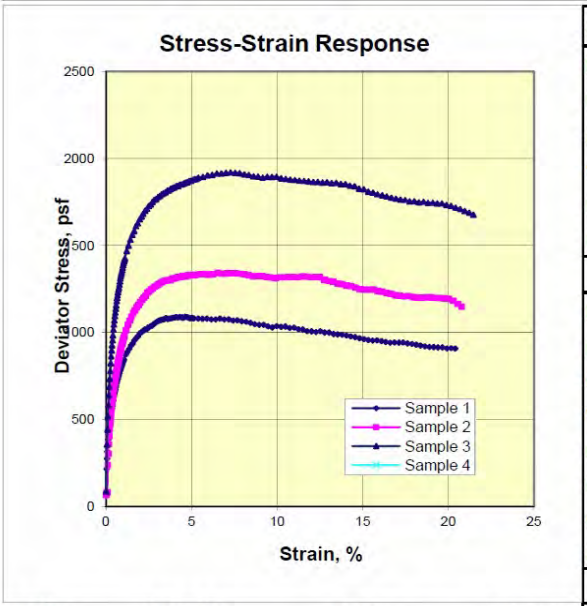
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Triaxial (CU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-9





Job No.:	212-133	**Date:**	9/10/2015
Client:	Hultgren-Tillis Engineers		BY:DC
Project:	Bel Marin Keys - 831.01		
Sample 1)	2 @ 30-32(Tip-16")	Greenish Gray CLAY (Bay Mud)	
Sample 2)	2 @ 30-32(Tip-9")	Greenish Gray CLAY (Bay Mud)	
Sample 3)	2 @ 30-32(Tip-3")	Greenish Gray CLAY (Bay Mud)	
Sample 4)			

Sample:	**1**	**2**	**3**	**4**
MC, %	98.5	96.5	96.6	
DD, pcf	45.3	45.4	45.9	
Sat. %	97.7	96.2	97.7	
Void Ratio	2.723	2.708	2.669	
Diameter in	2.87	2.87	2.87	
Height, in	6.09	5.86	5.86	
	Final			
MC, %	90.1	79.7	72.2	
DD, pcf	49.1	53.5	57.1	
Sat. %	100.0	100.0	100.0	
Void Ratio	2.433	2.152	1.950	
Diameter, in	2.78	2.70	2.66	
Height, in	5.97	5.65	5.47	
Cell, psi	66.8	73.7	80.1	
BP, psi	59.5	59.5	59.2	
	Effective Stresses At:			
Strain, %	5.0	5.0	5.0	
Deviator ksf	1.081	1.329	1.872	
Excess PP	0.763	1.525	2.032	
Sigma 1	1.367	1.850	2.844	
Sigma 3	0.286	0.521	0.972	
P, ksf	0.827	1.186	1.908	
Q, ksf	0.541	0.664	0.936	
Stress Ratio	4.781	3.548	2.926	
Rate in/min	0.0003	0.0003	0.0003	

Total C	**0.3**	**ksf**
Total phi	**9.6**	**degrees**
Eff. C	**0.3**	**ksf**
Eff. Phi	**22.3**	**degrees**

©

Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

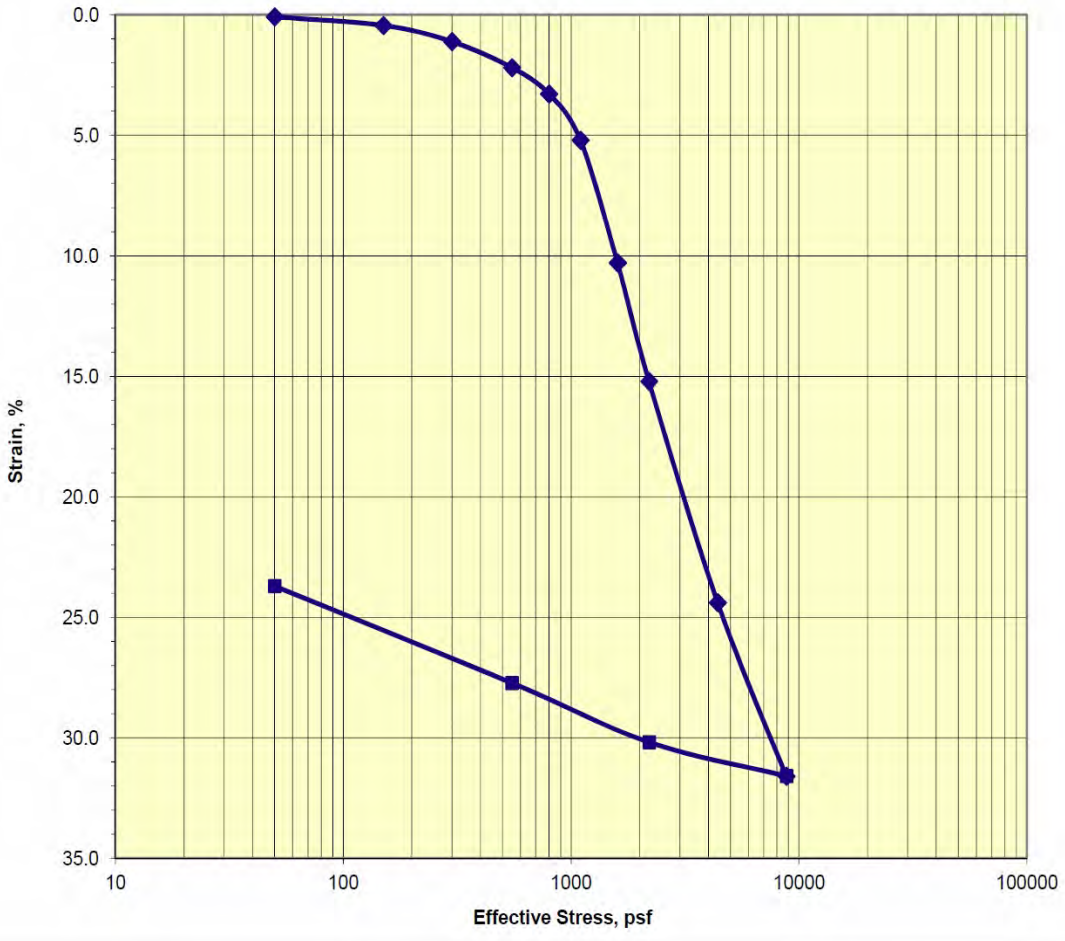
Triaxial (CU) Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-10

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	1	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	15-17(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY			**Date:**	9/2/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	84.6	56.3
Dry Density, pcf:	50.9	66.9
Void Ratio:	2.309	1.519
% Saturation:	98.9	100.0

Remarks:

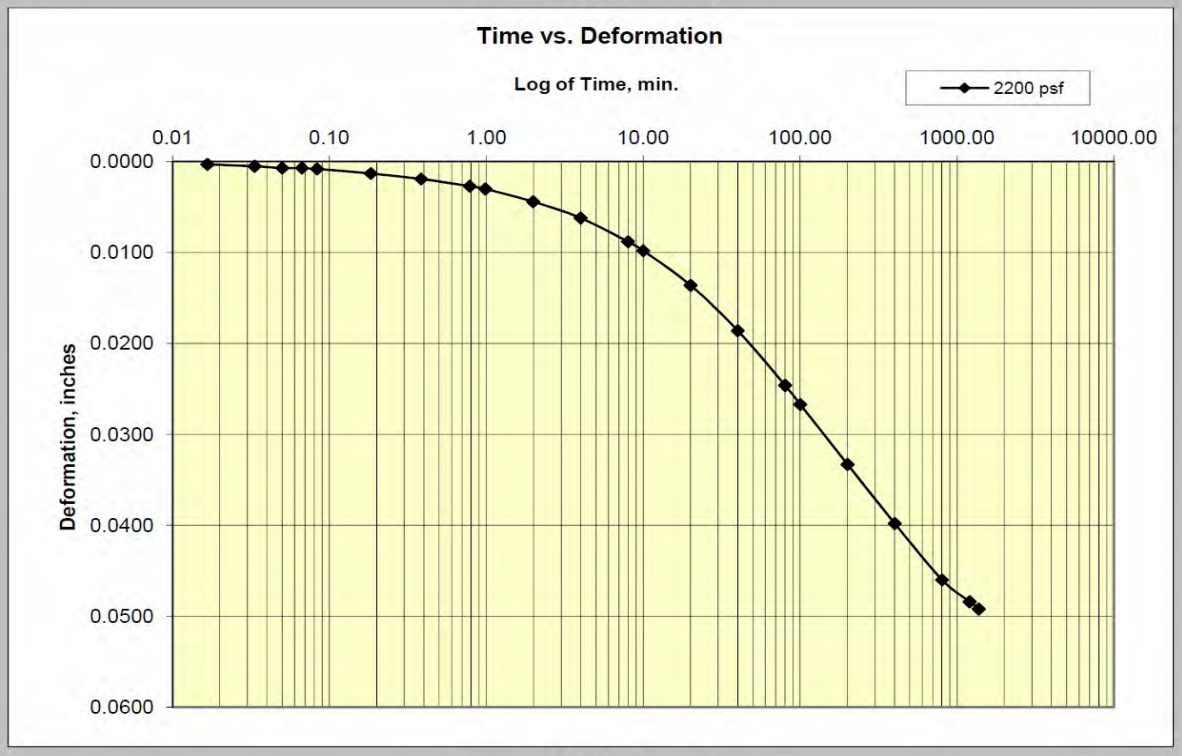
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

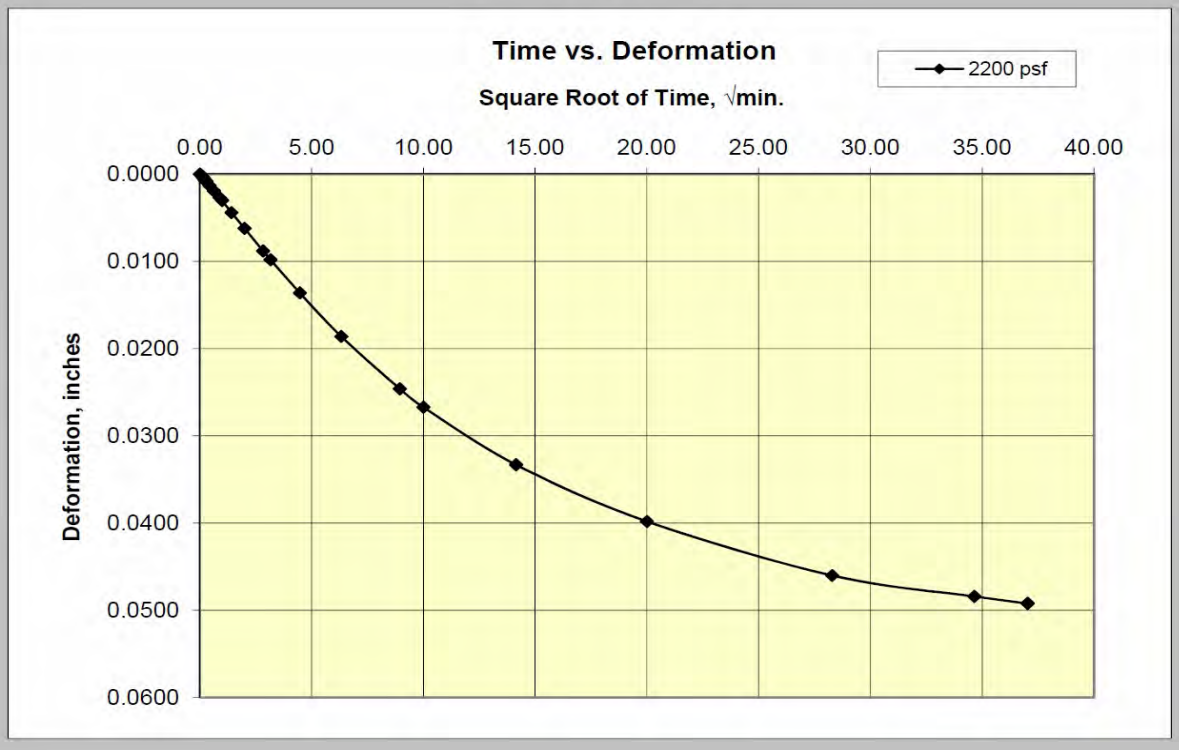
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-11

Load 8 | 2200 psf



2200 psf



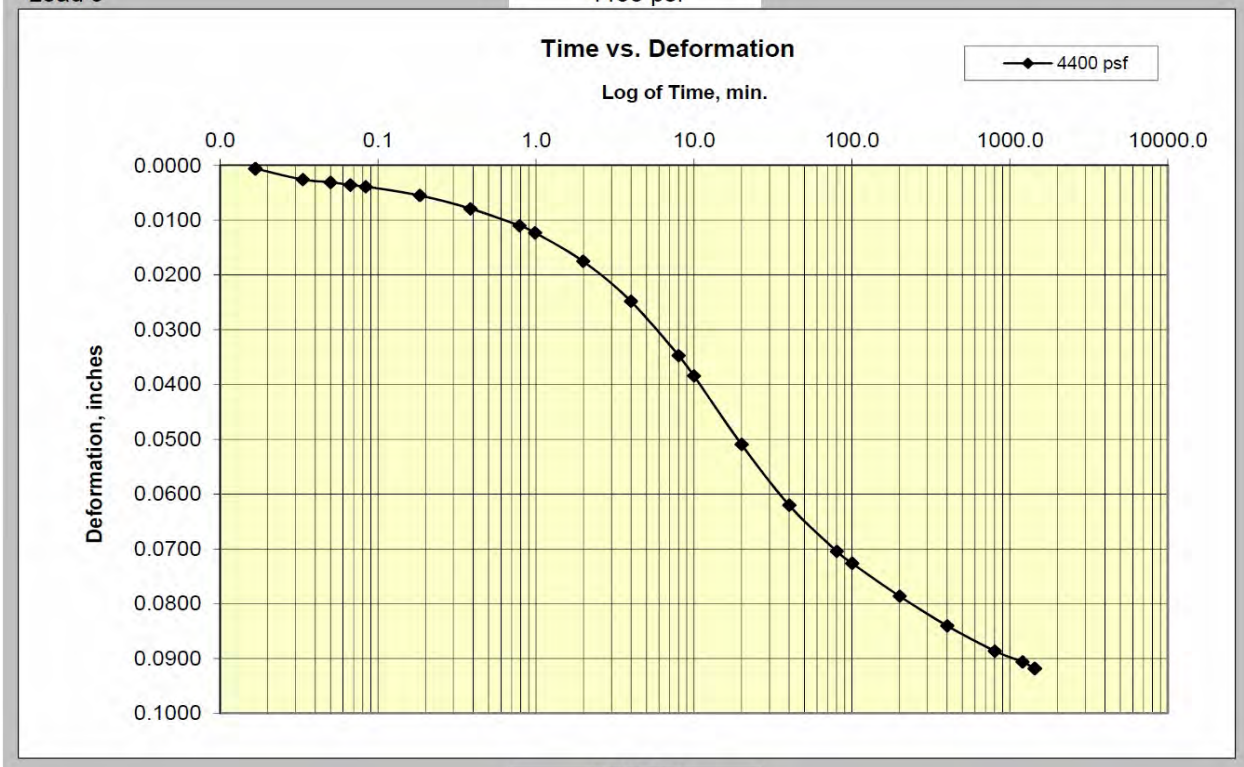
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

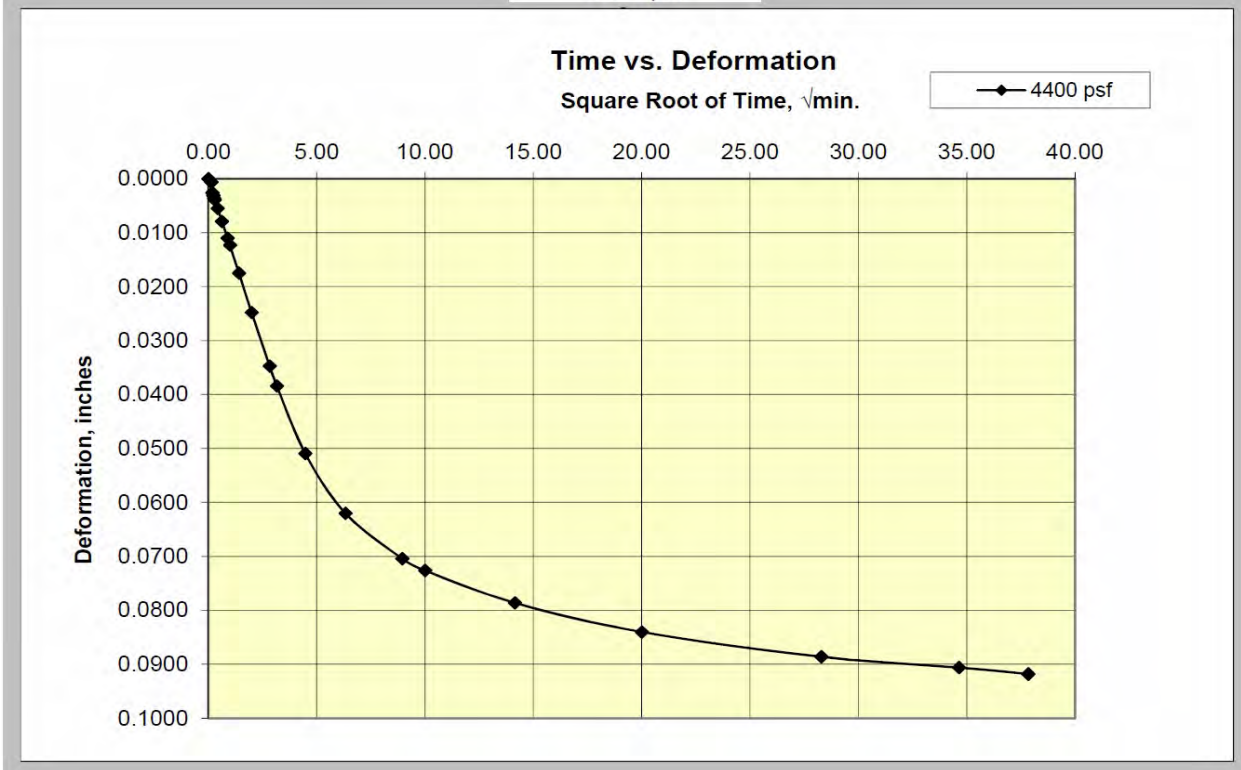
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-12

Load 9 4400 psf



4400 psf



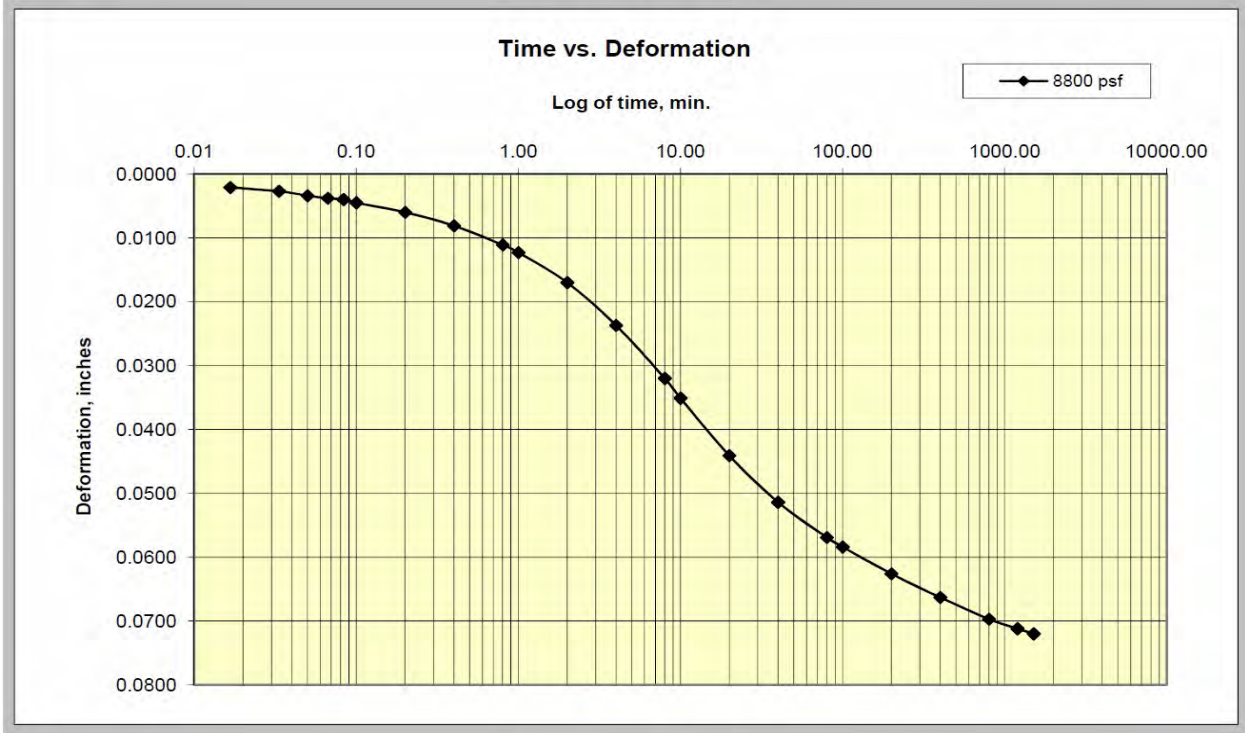
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

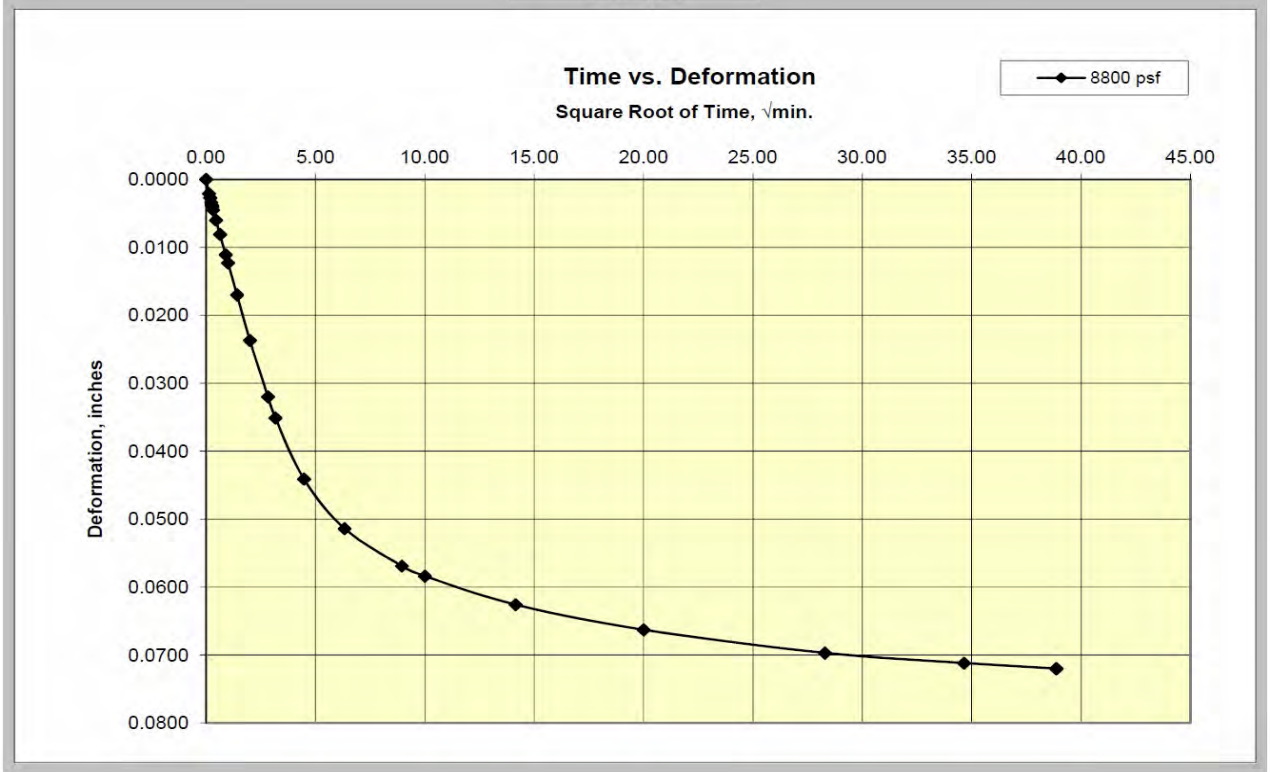
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-13

Load 10 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

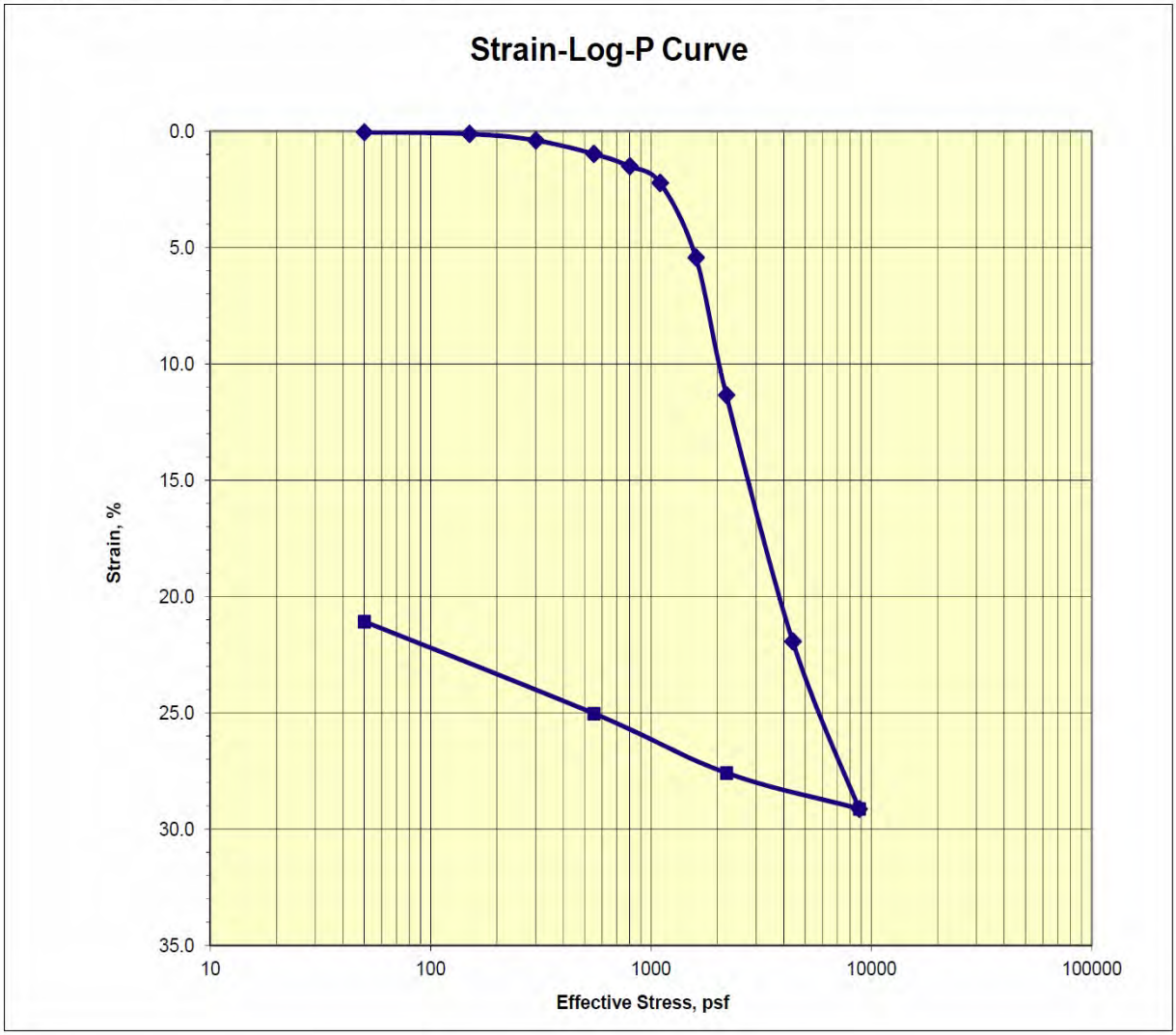
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-14

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	1	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	30-32(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray Fat CLAY (Bay Mud)			**Date:**	9/2/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	82.1	57.9
Dry Density, pcf:	51.9	65.8
Void Ratio:	2.246	1.563
% Saturation:	98.8	100.0

Remarks:

Testing performed by Cooper Testing Laboratory

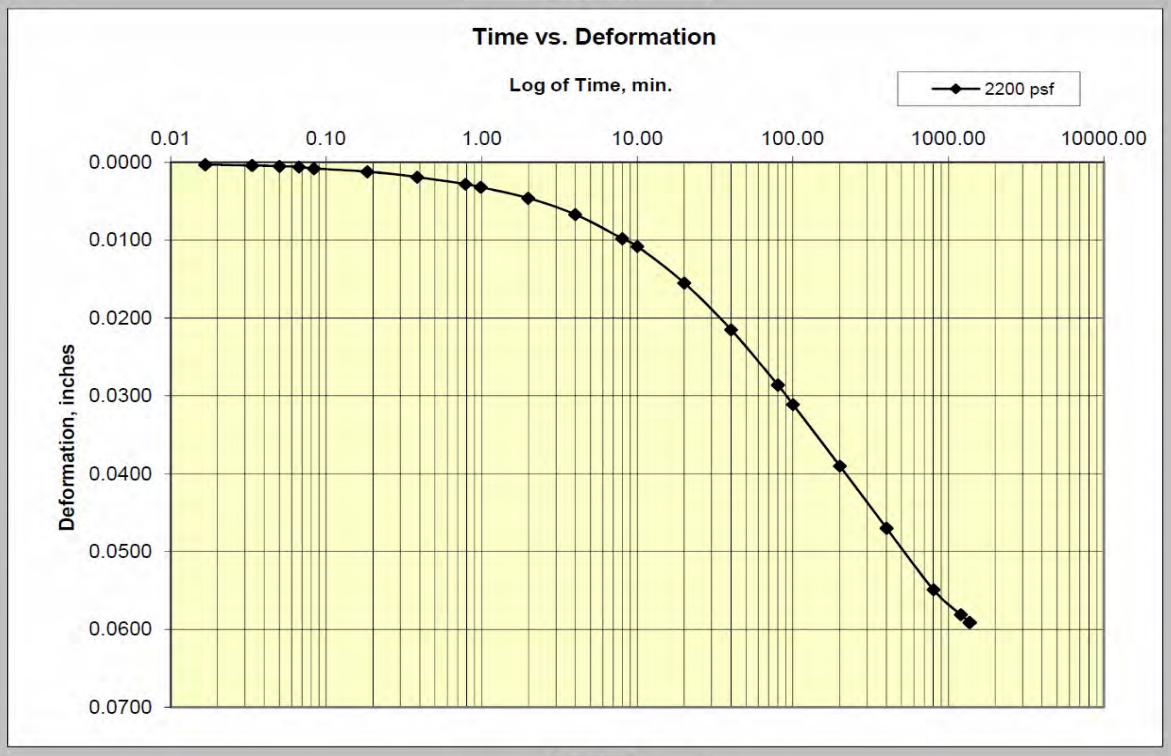
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Consolidation Test Results

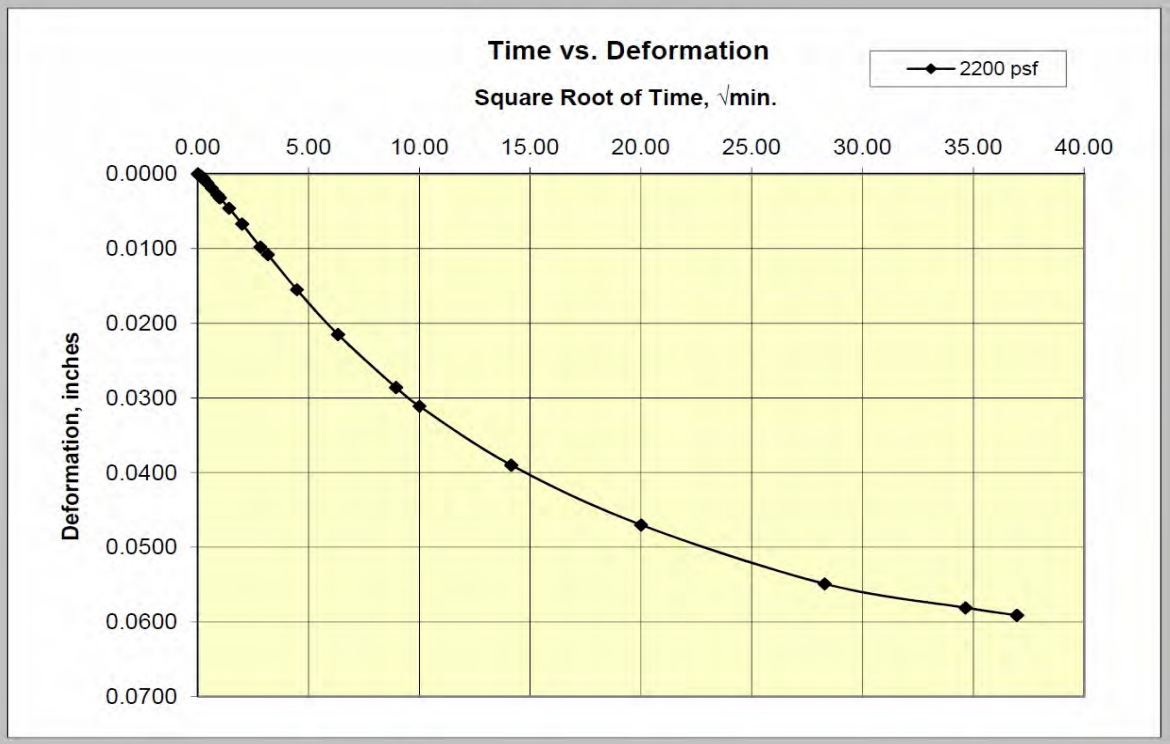
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-15

Load 8

2200 psf



2200 psf



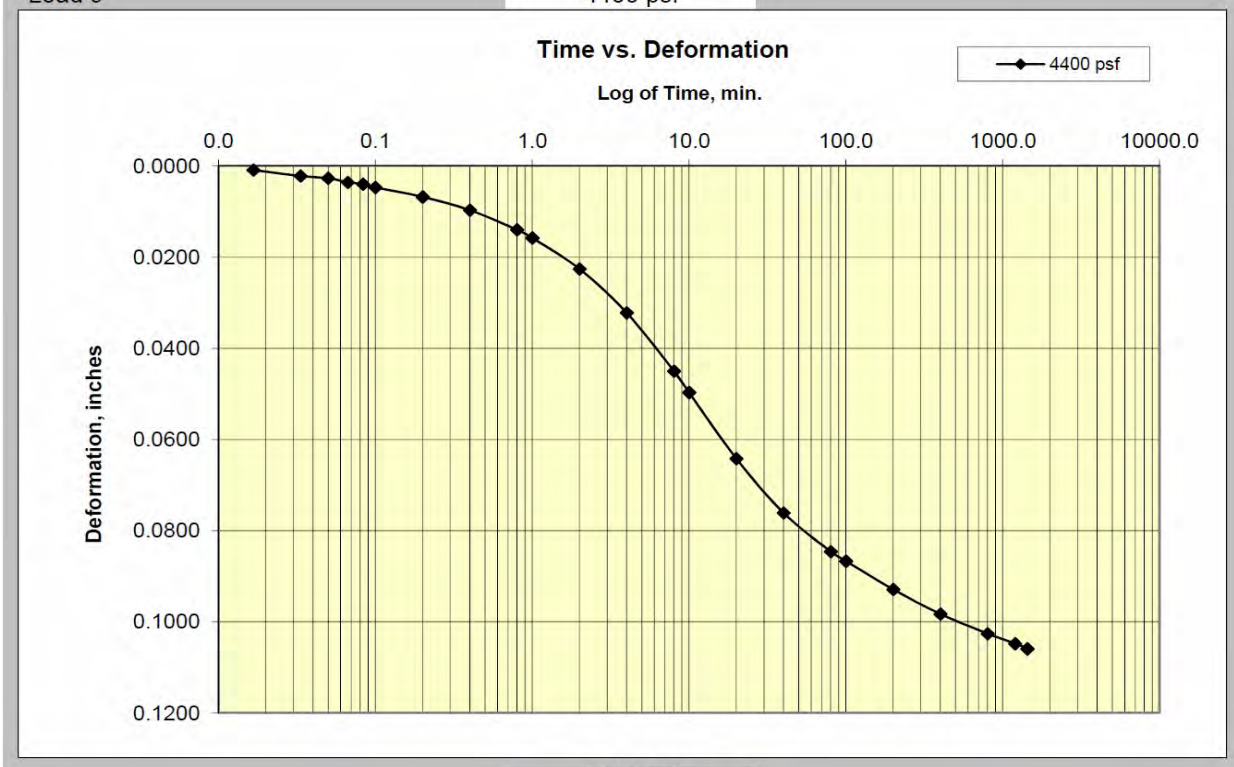
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

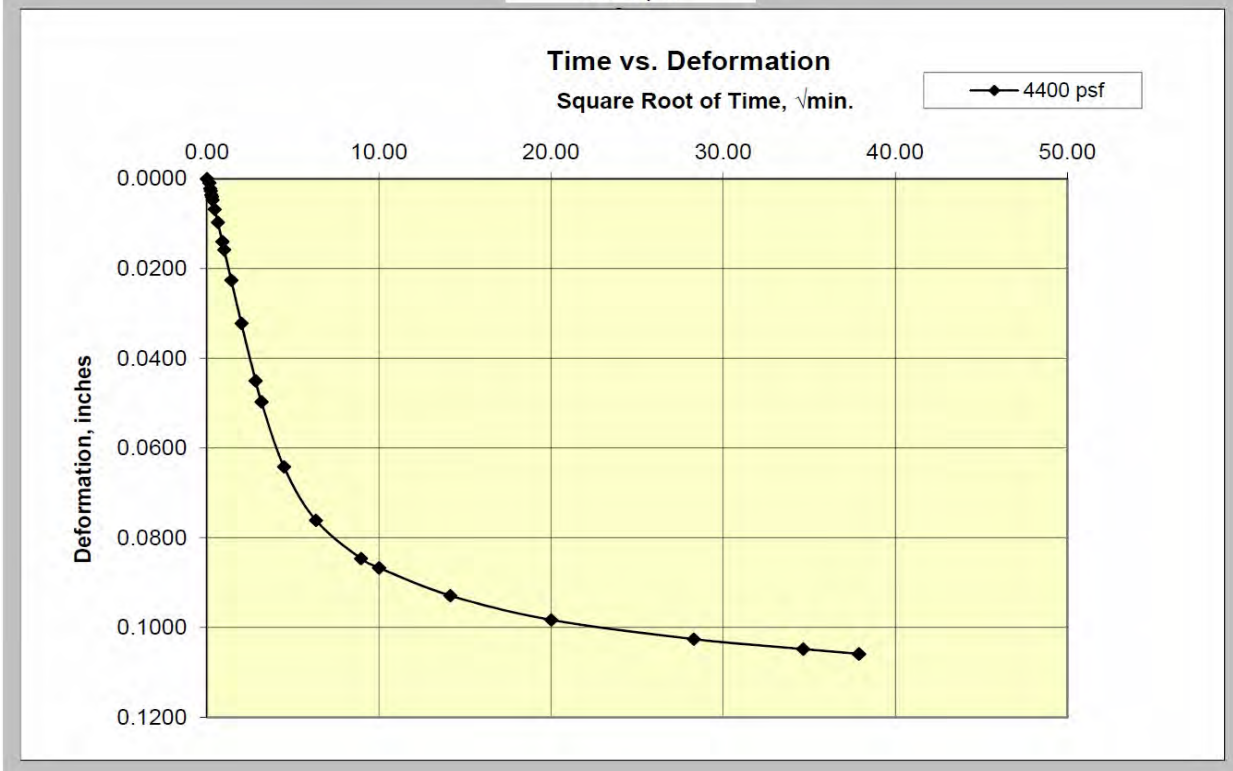
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-16

Load 9 | 4400 psf



4400 psf



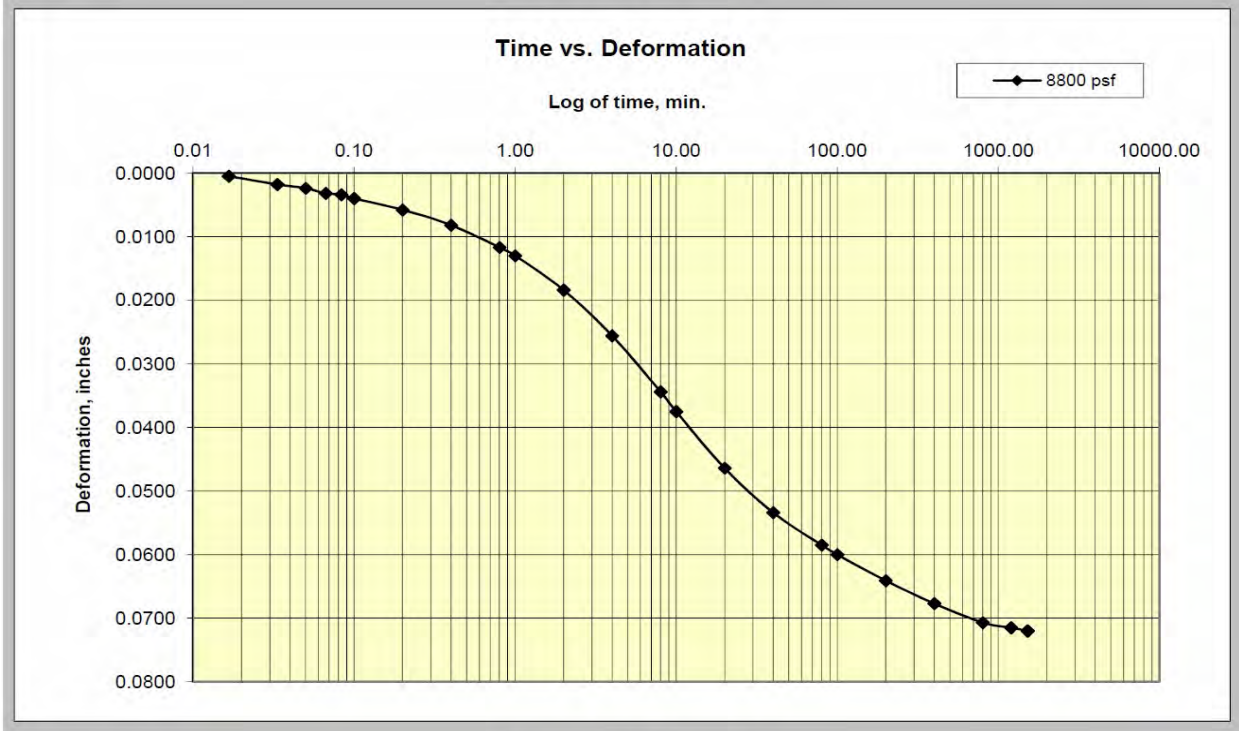
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

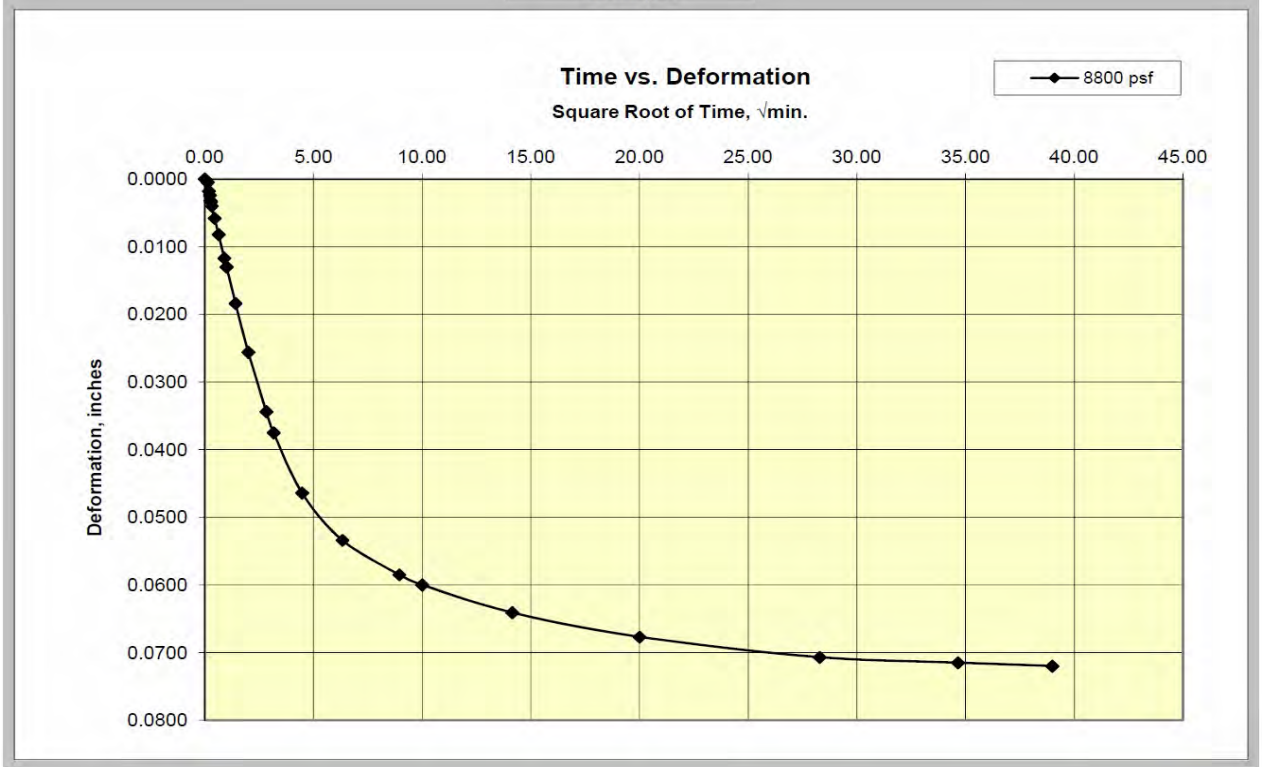
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-17

Load 10 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

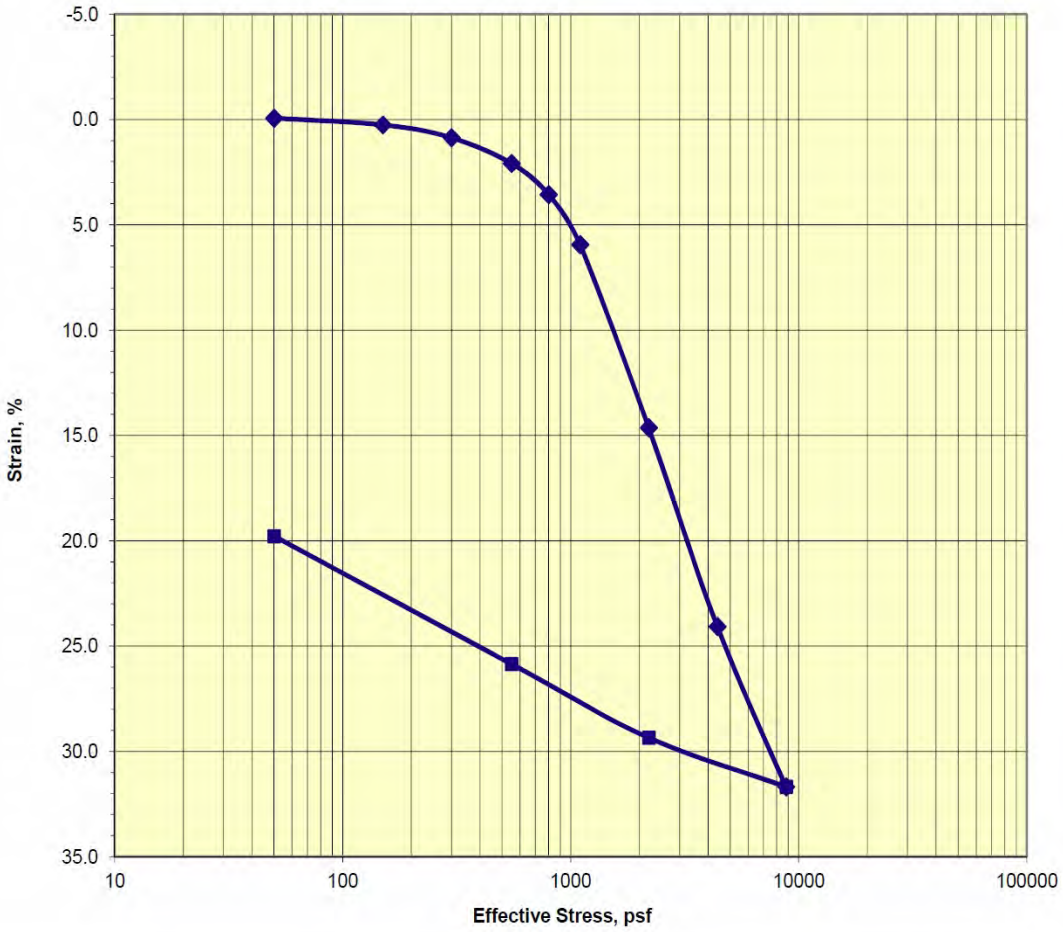
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-18

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	2	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	7-9(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY (Bay Mud)			**Date:**	9/2/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	97.2	70.9
Dry Density, pcf:	45.7	57.9
Void Ratio:	2.691	1.913
% Saturation:	97.5	100.0

Remarks:

Testing performed by Cooper Testing Laboratory

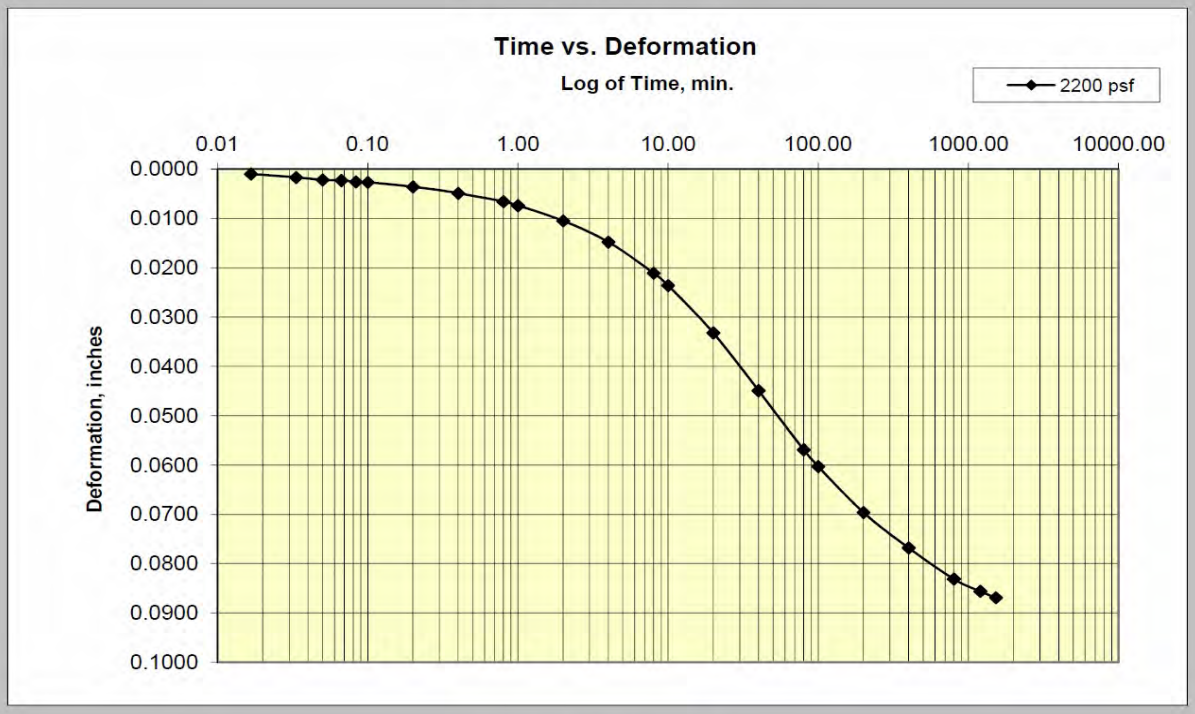
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Consolidation Test Results

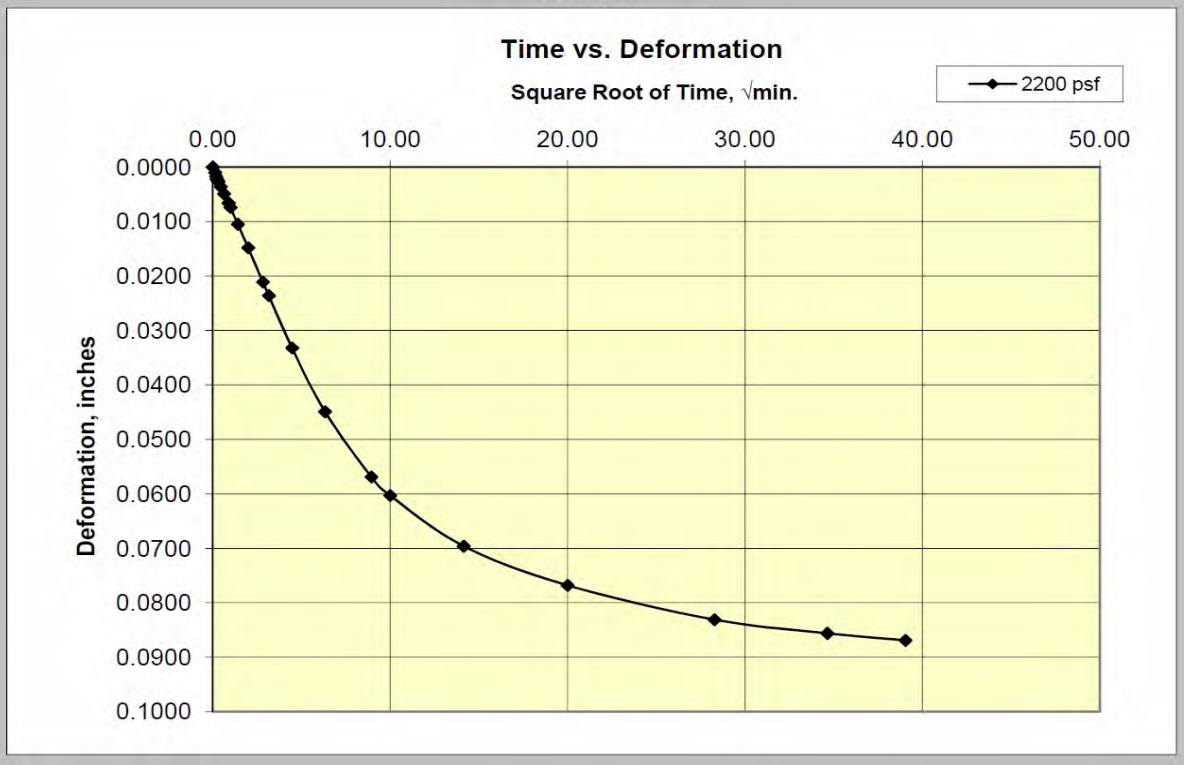
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-19

Load 7

2200 psf



2200 psf



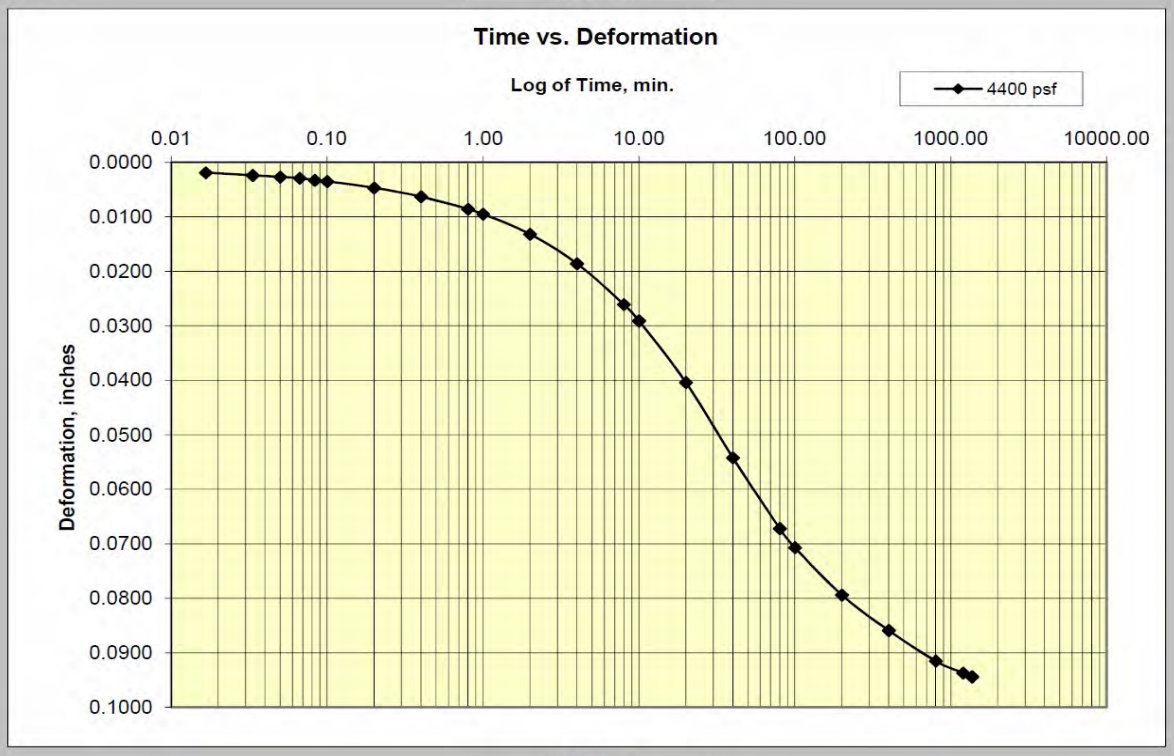
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

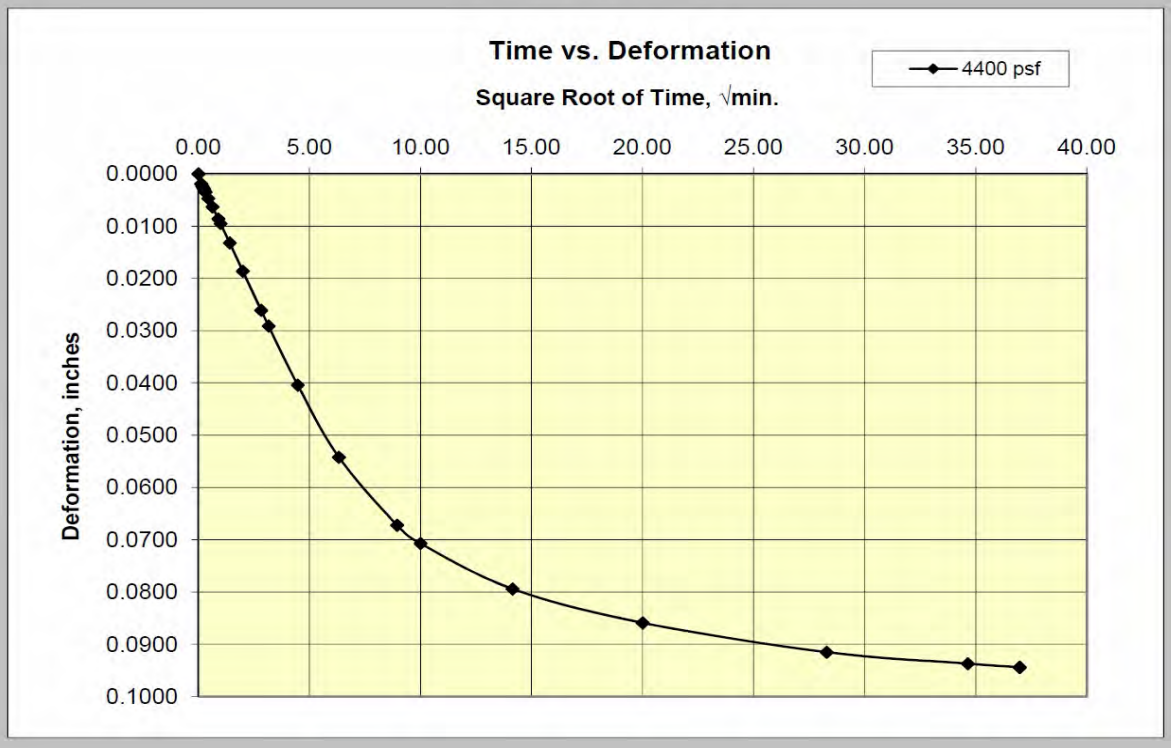
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-20

Load 8 | 4400 psf



4400 psf



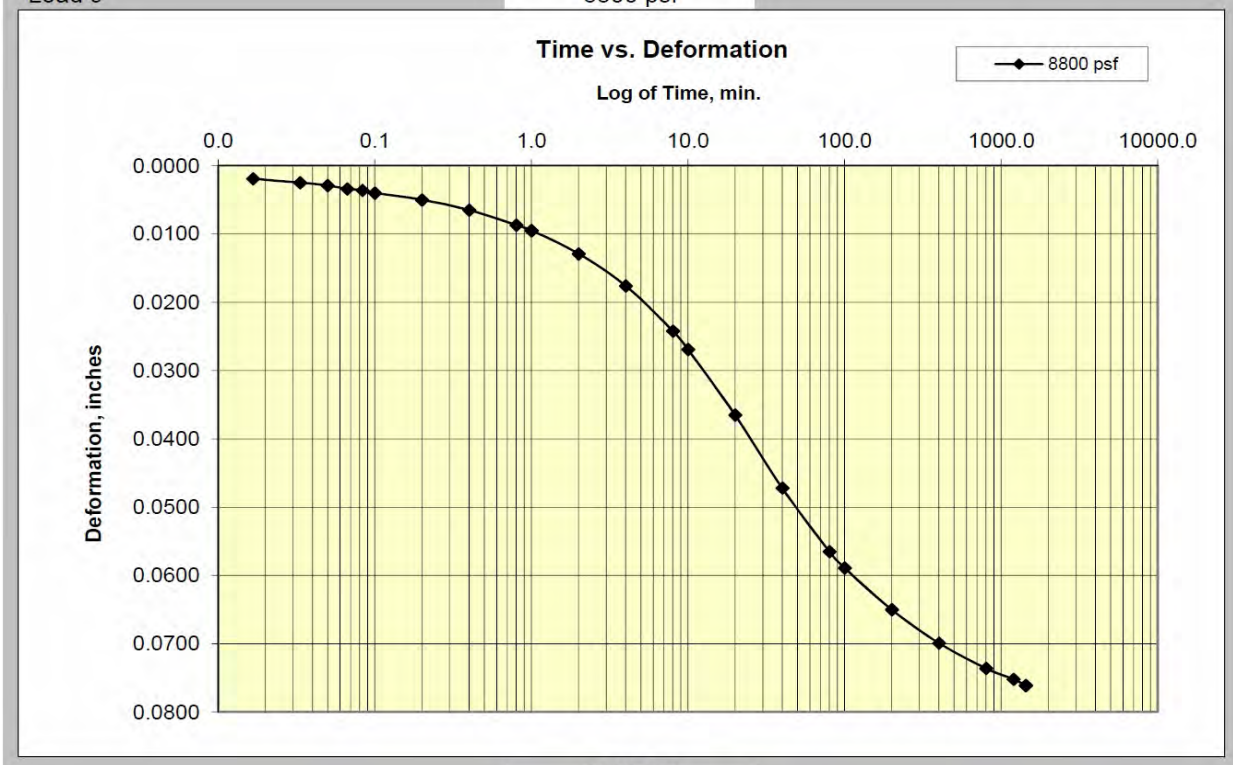
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

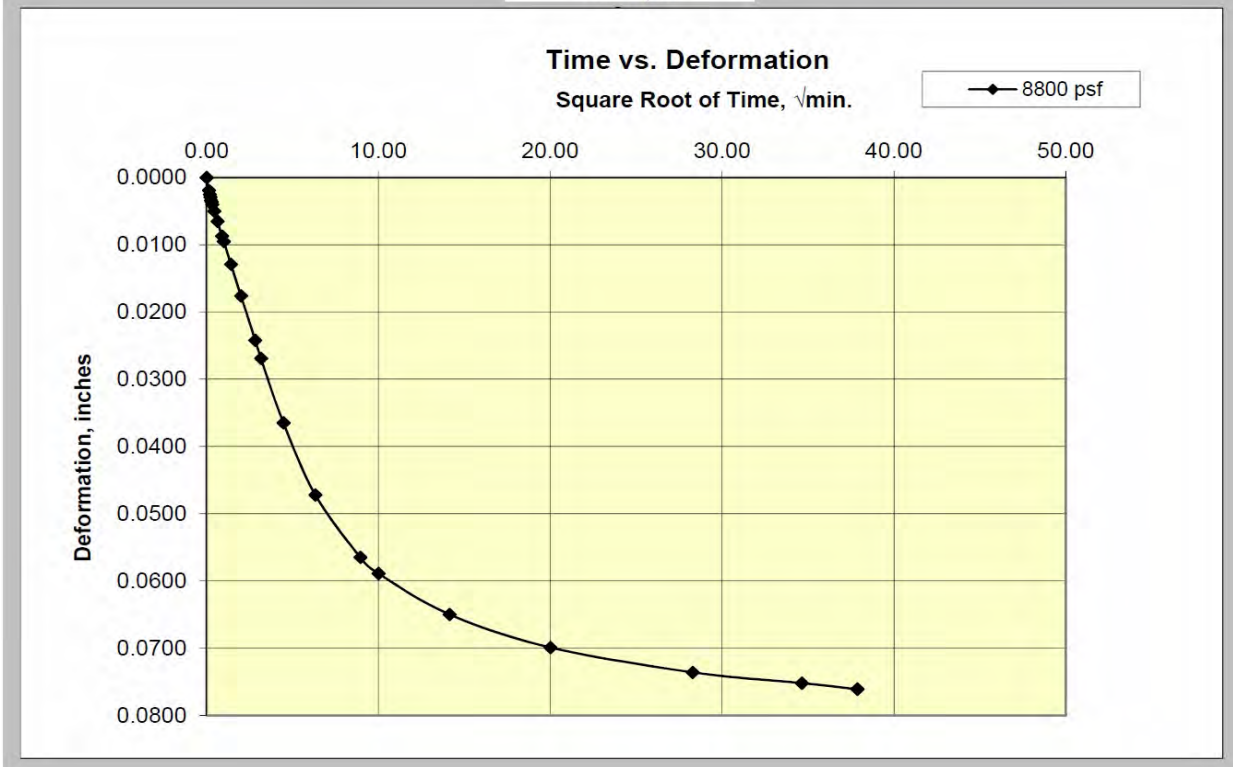
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-21

Load 9 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

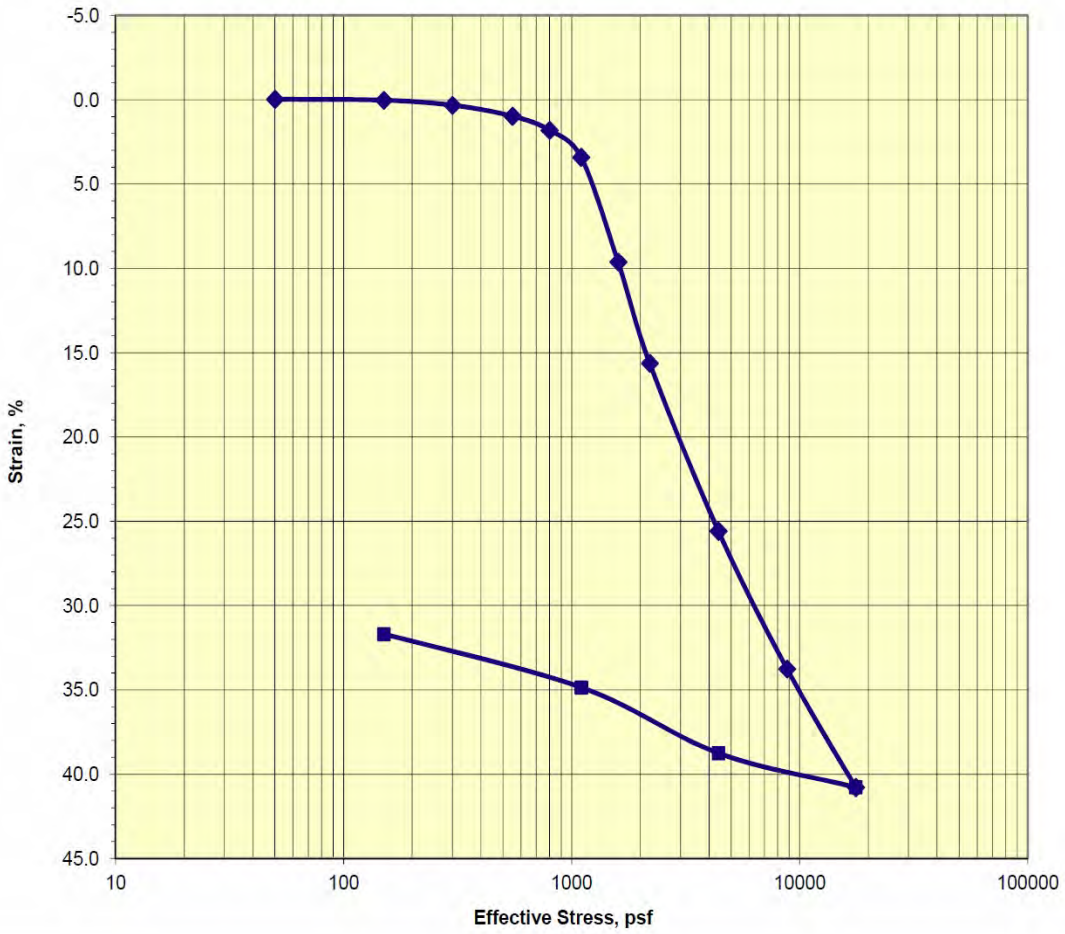
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-22

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	2	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	20-22(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray Elastic SILT (Bay Mud)			**Date:**	9/4/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	94.4	56.4
Dry Density, pcf:	46.8	66.8
Void Ratio:	2.600	1.522
% Saturation:	98.0	100.0

Remarks:

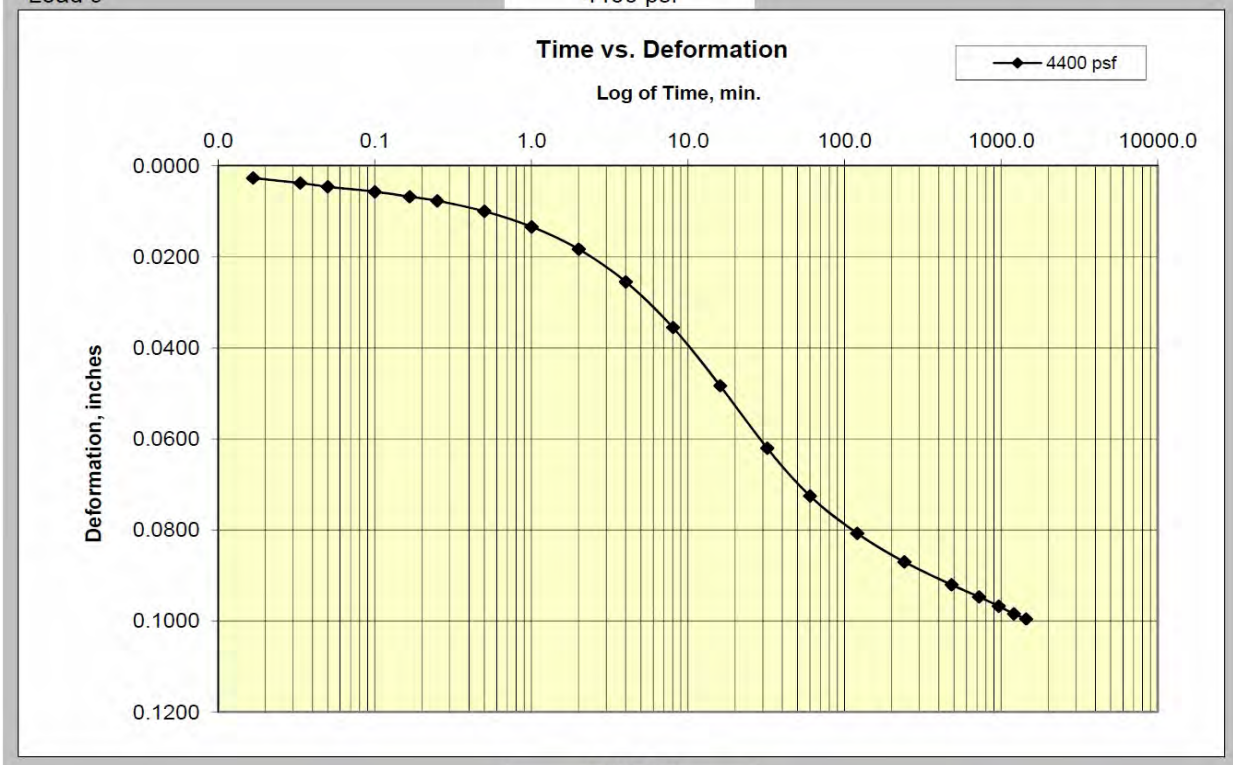
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

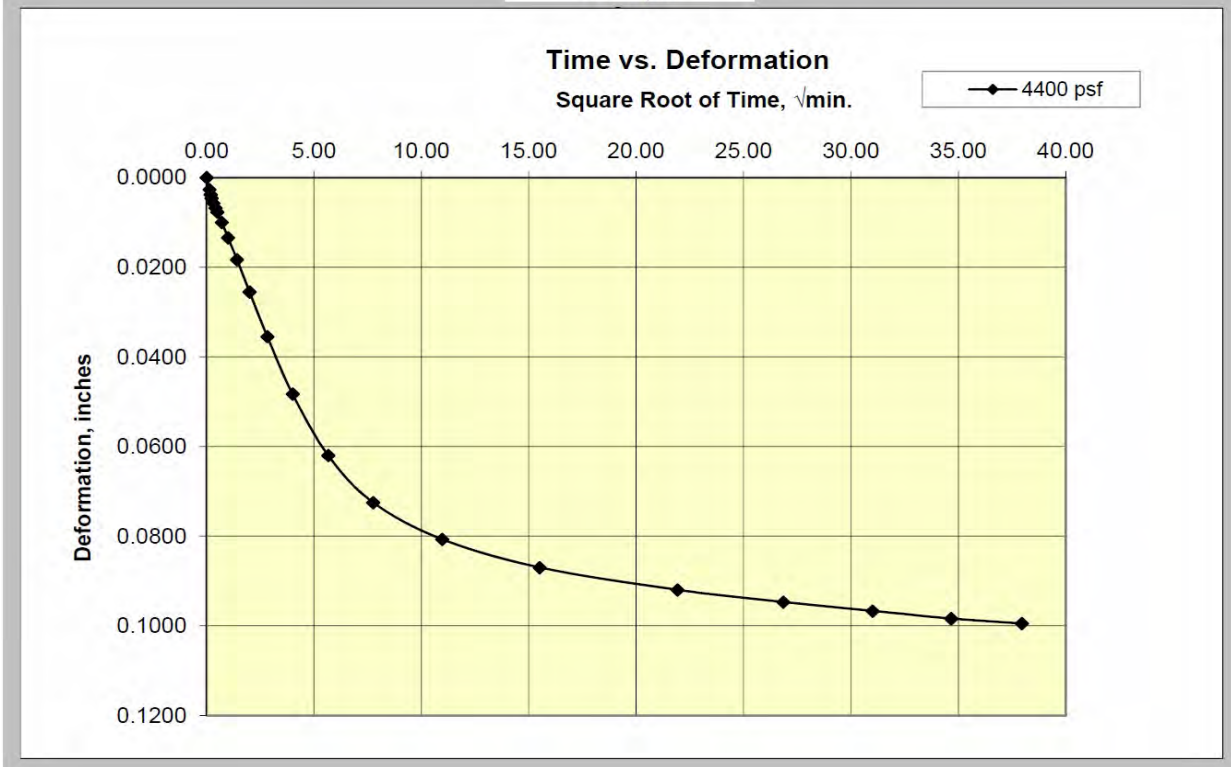
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-23

Load 9 | 4400 psf



4400 psf



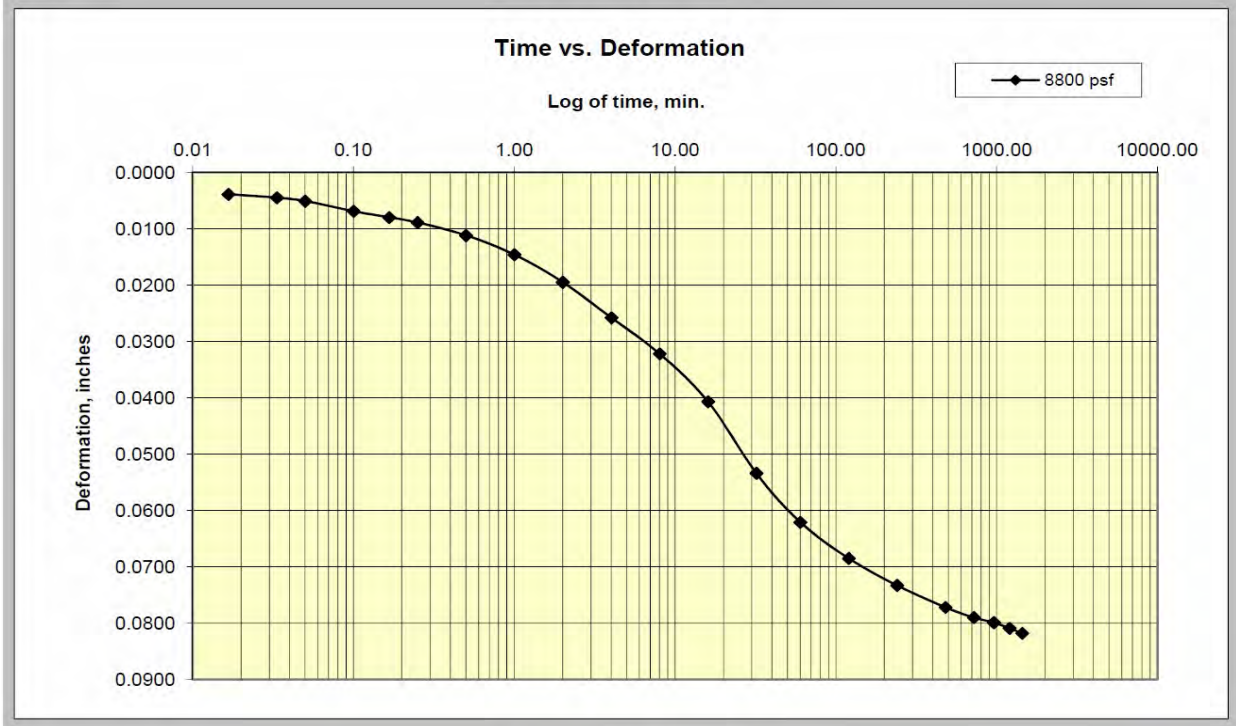
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

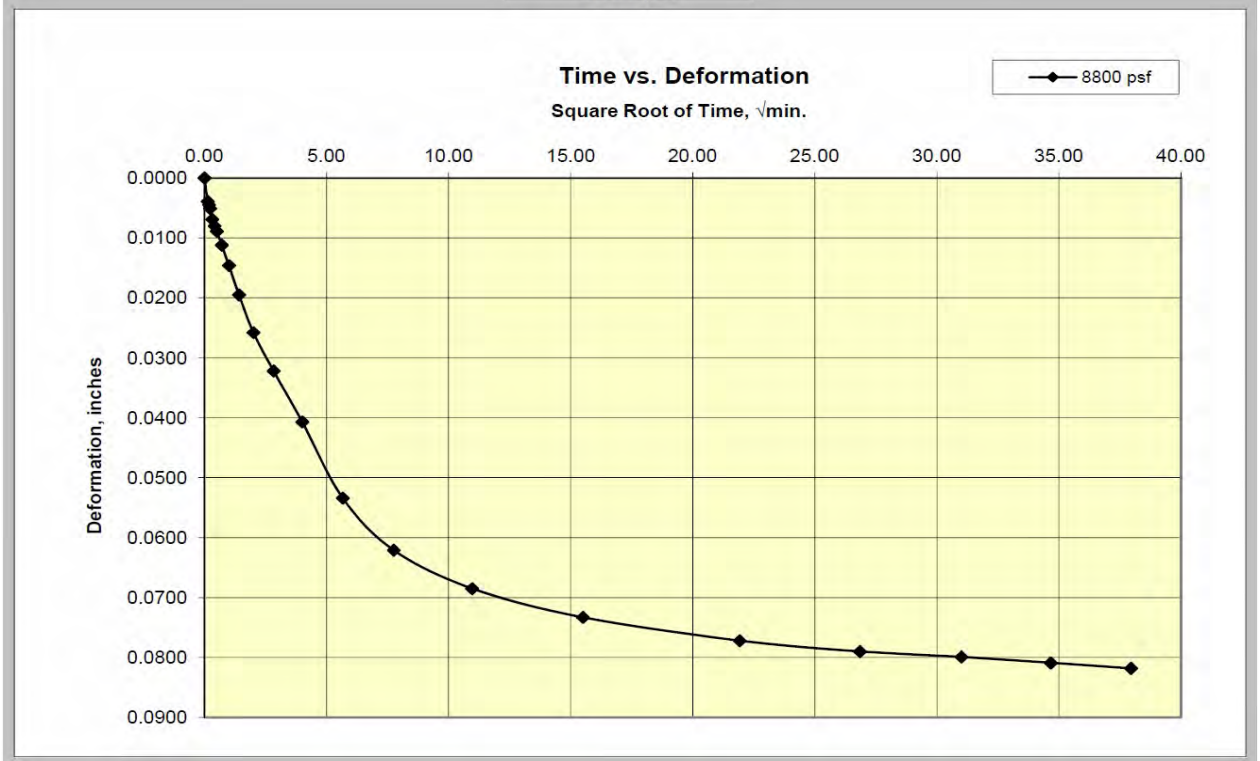
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-24

Load 10 | 8800 psf



8800 psf



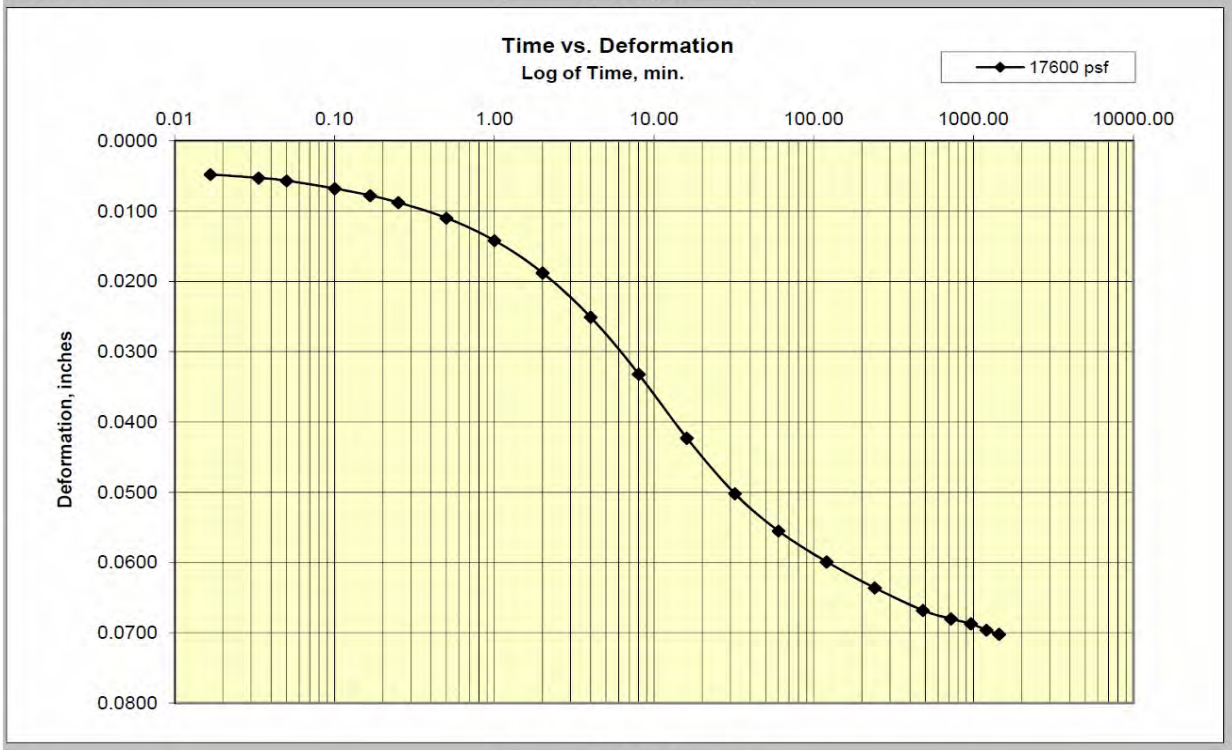
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

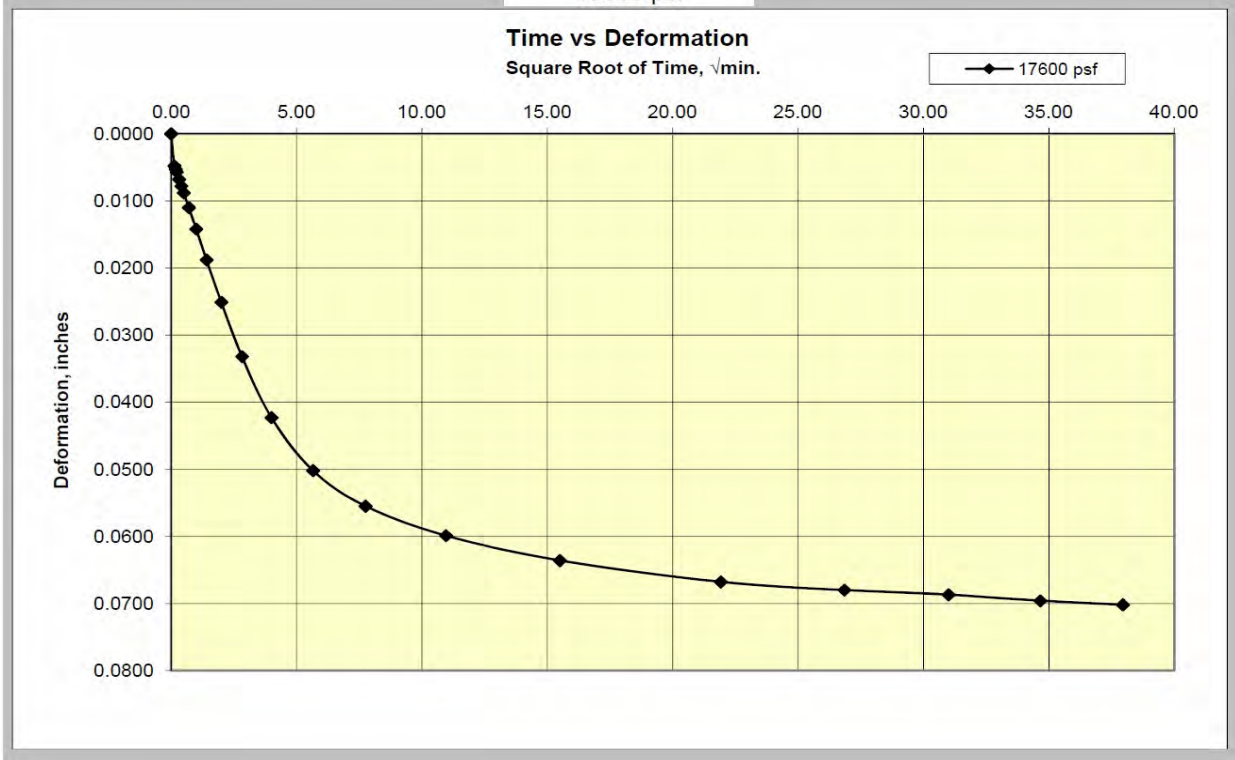
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-25

Load 11 | 17600 psf



17600 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

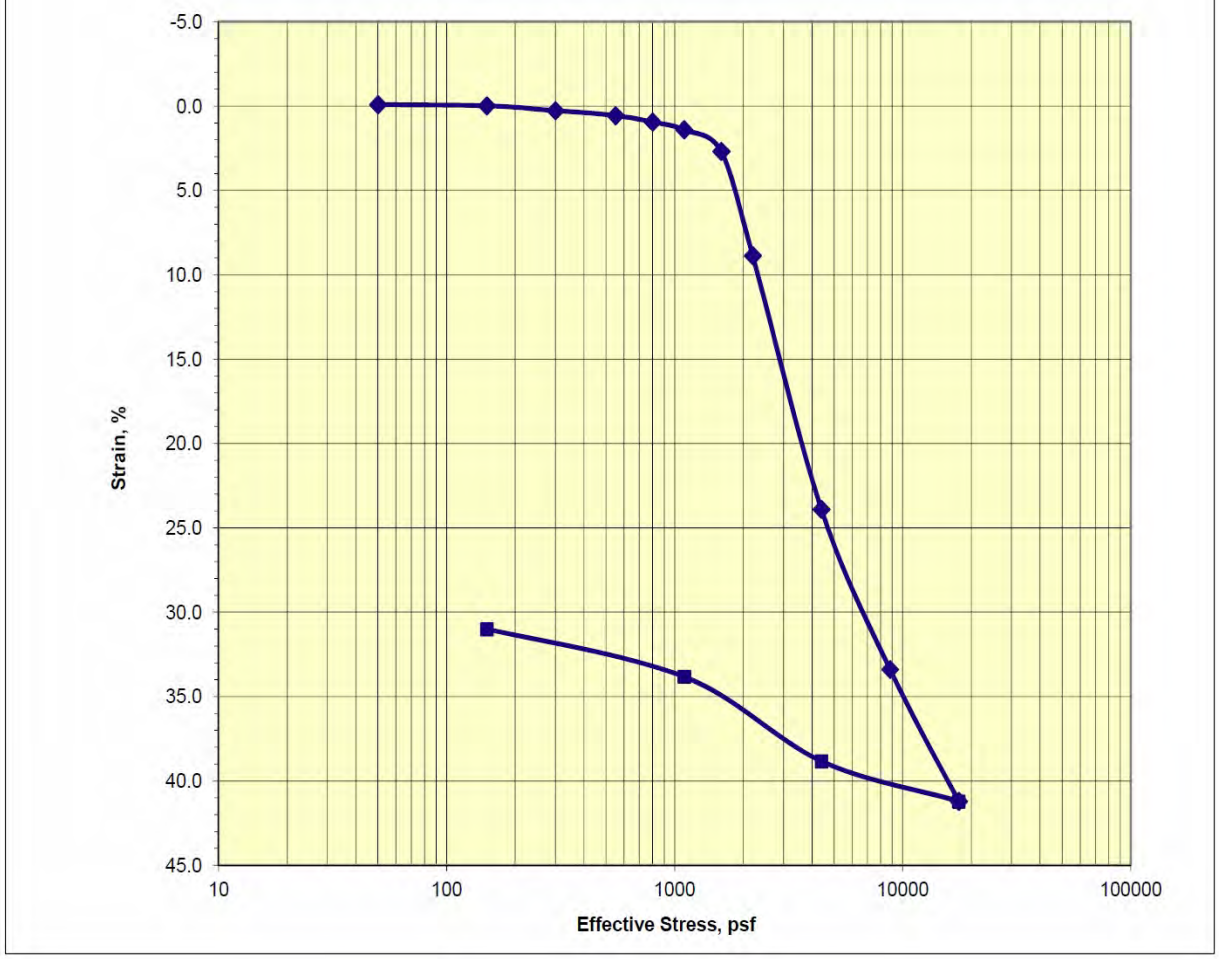
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-26

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	2	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	40-42(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY (Bay Mud)			**Date:**	9/3/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	99.5	60.1
Dry Density, pcf:	45.2	64.3
Void Ratio:	2.727	1.622
% Saturation:	98.5	100.0

Remarks:

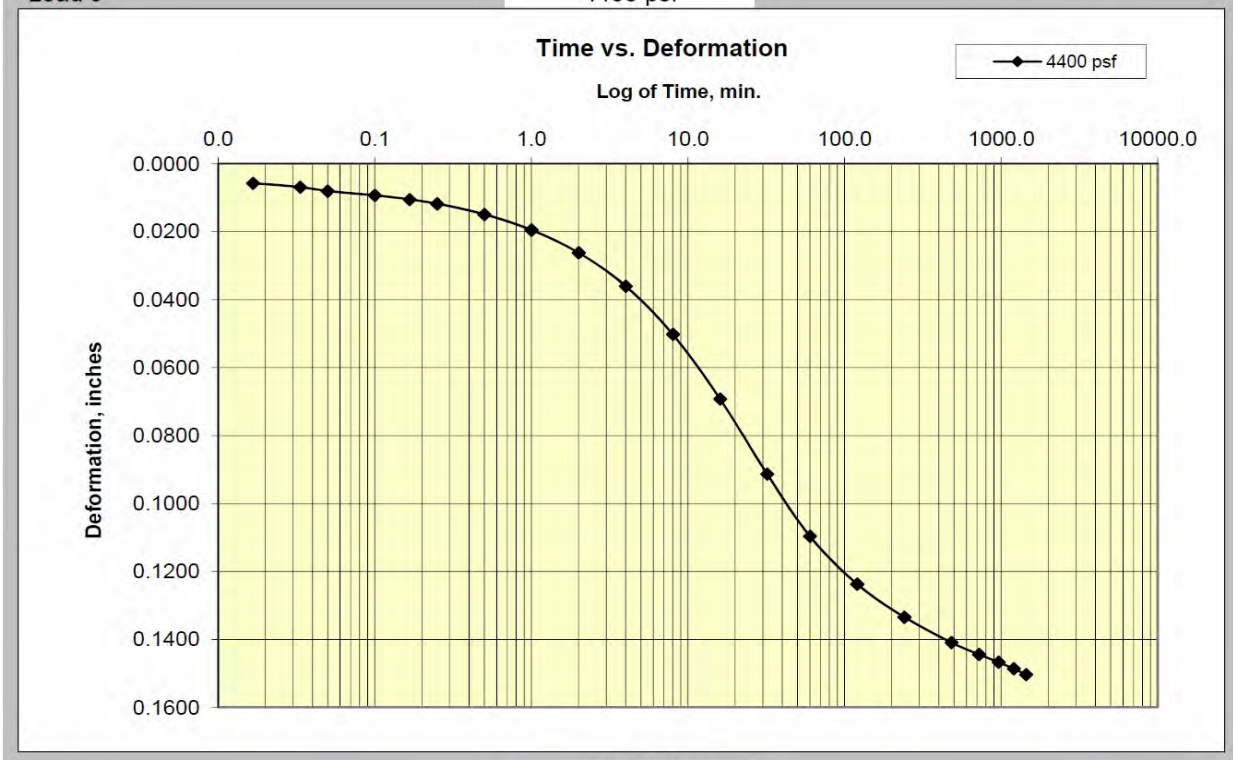
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

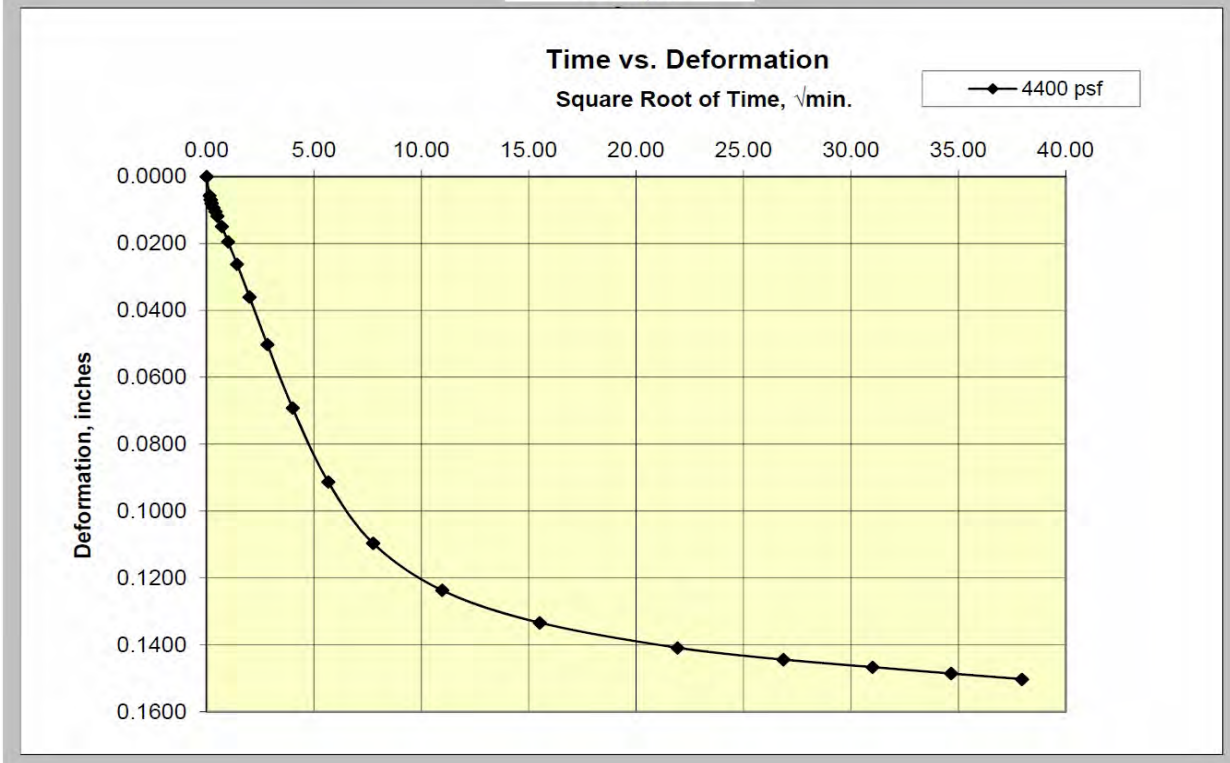
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-27

Load 9 4400 psf



4400 psf



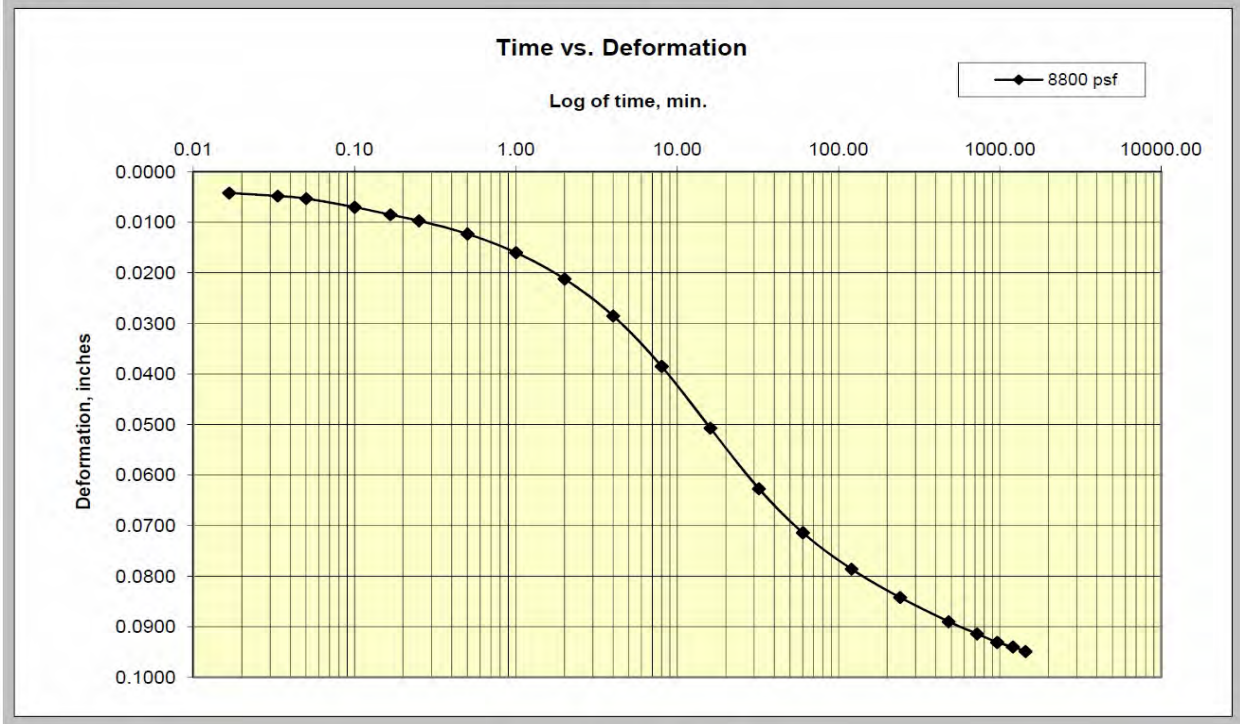
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

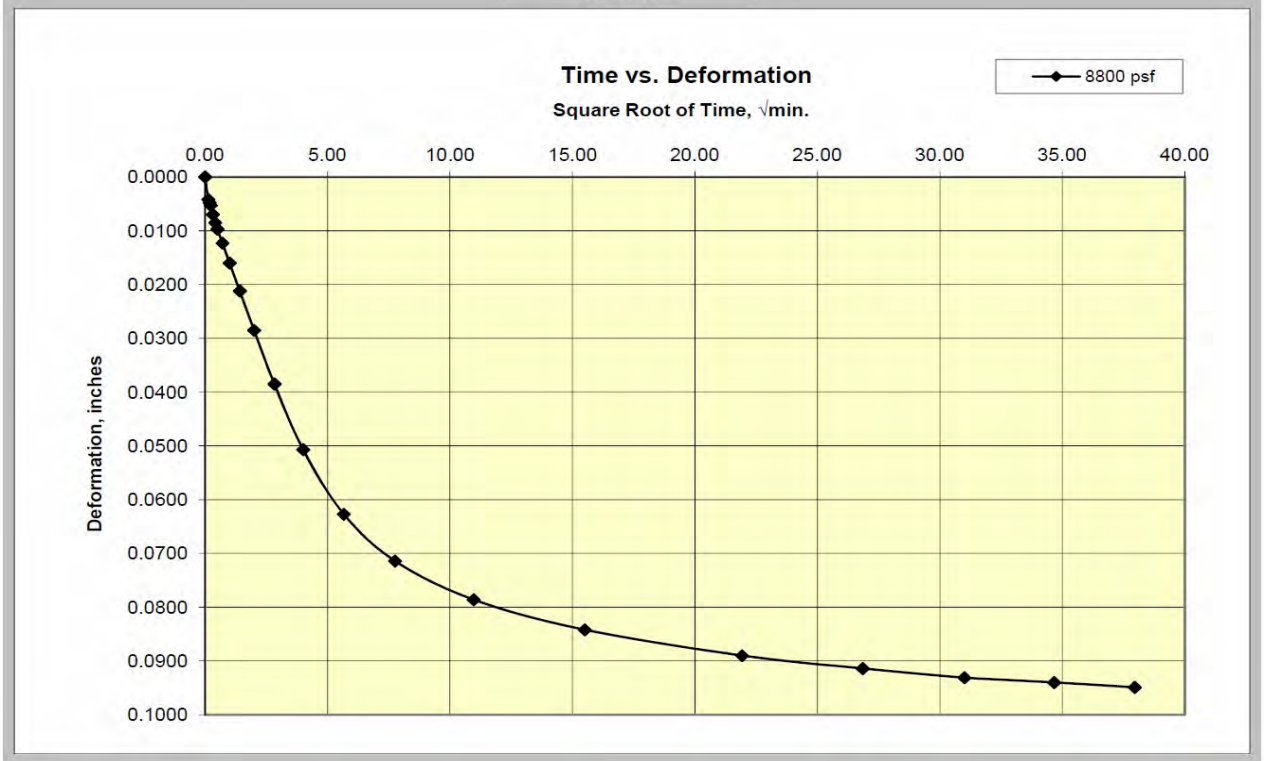
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-28

Load 10 | 8800 psf



8800 psf



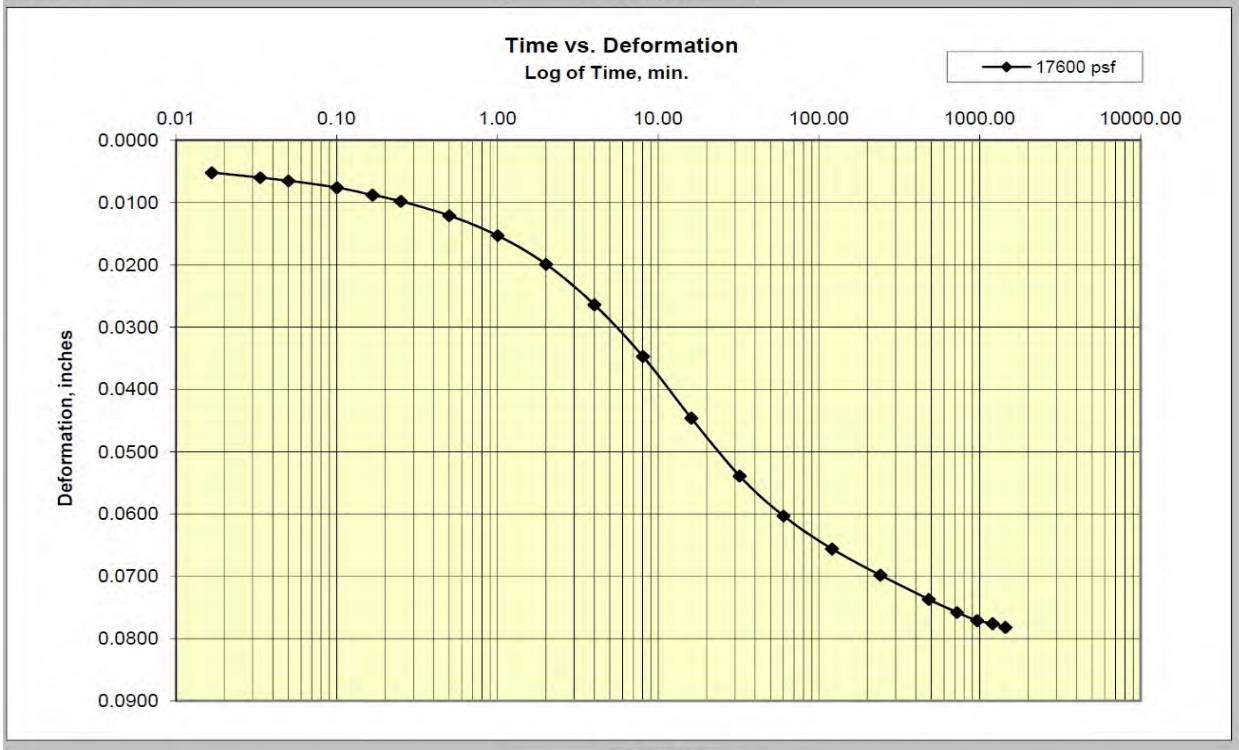
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

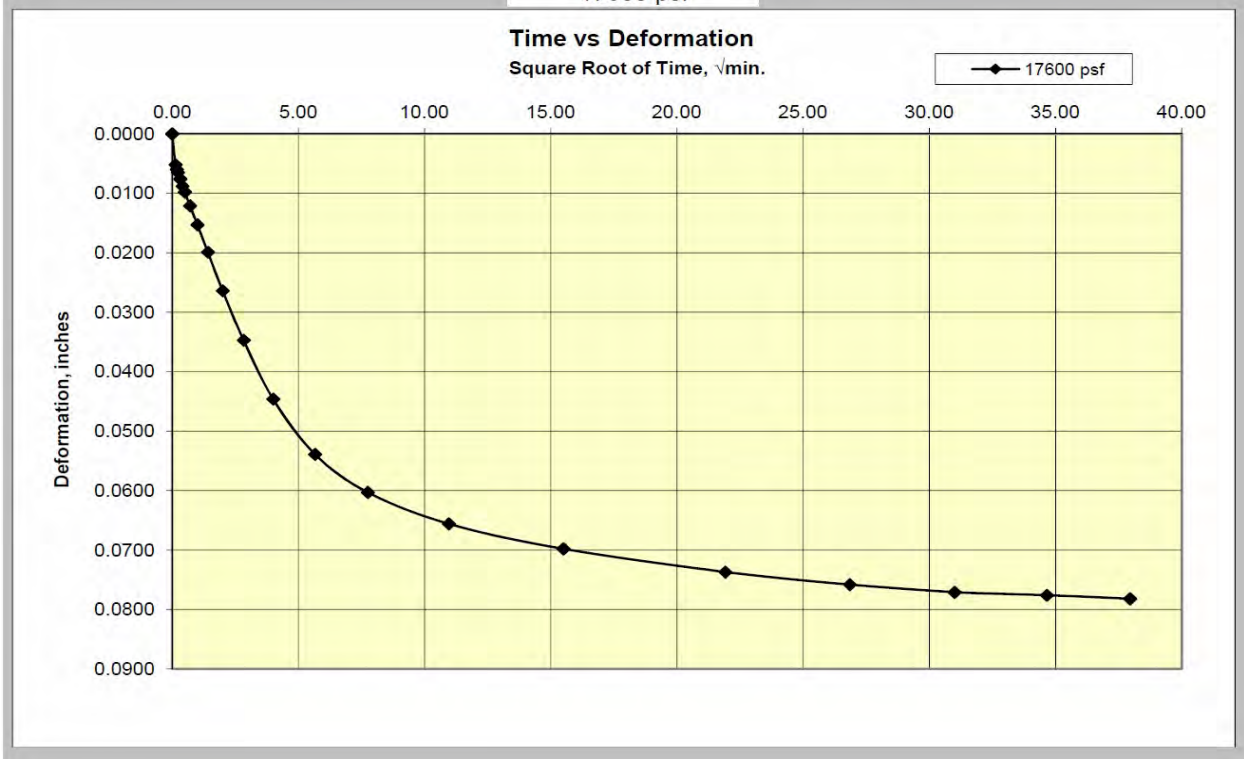
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-29

Load 11 | 17600 psf



17600 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

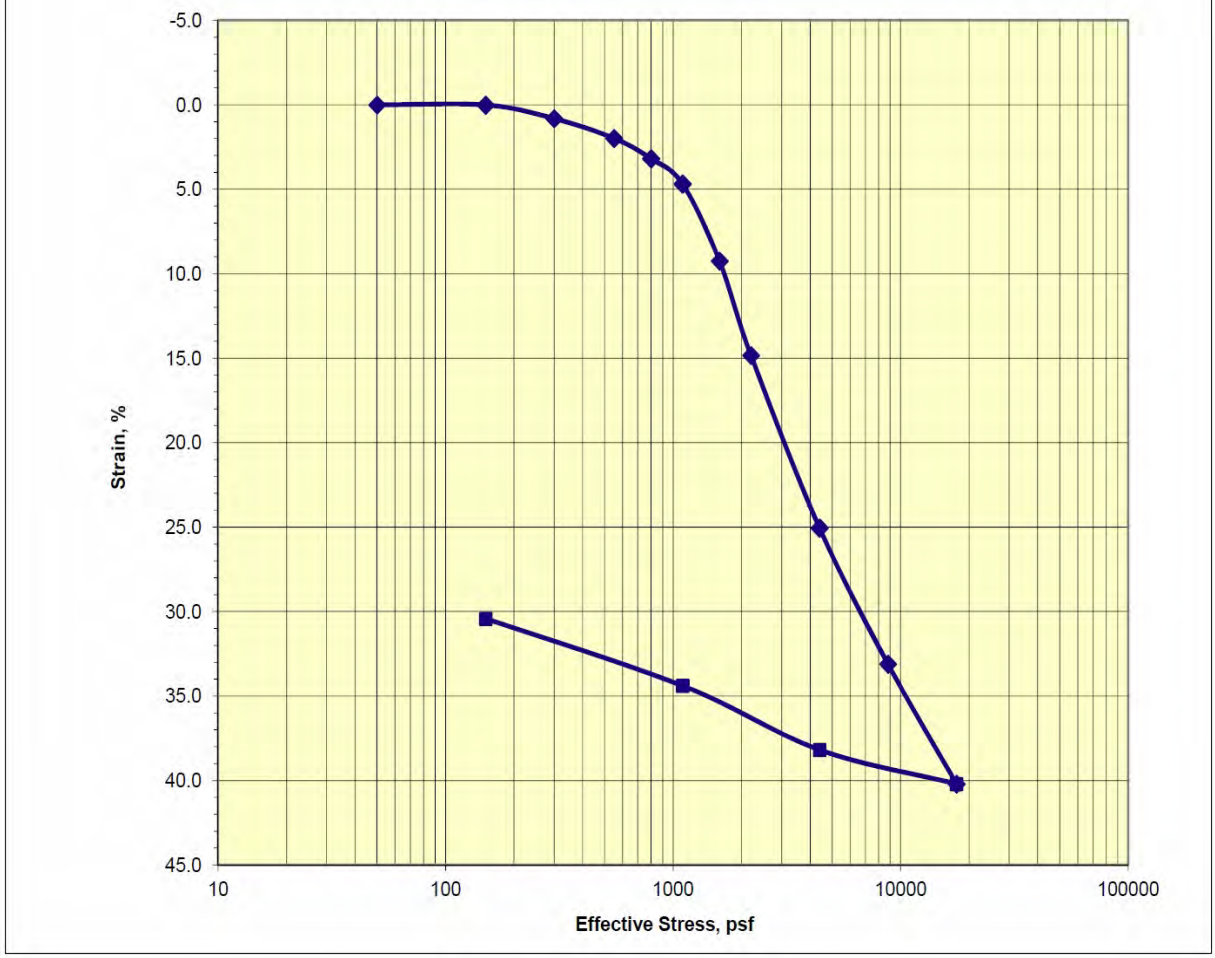
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-30

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	3	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	10--12(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray Fat CLAY (Bay Mud)			**Date:**	9/3/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	94.5	56.9
Dry Density, pcf:	46.9	66.5
Void Ratio:	2.596	1.536
% Saturation:	98.3	100.0

Remarks:

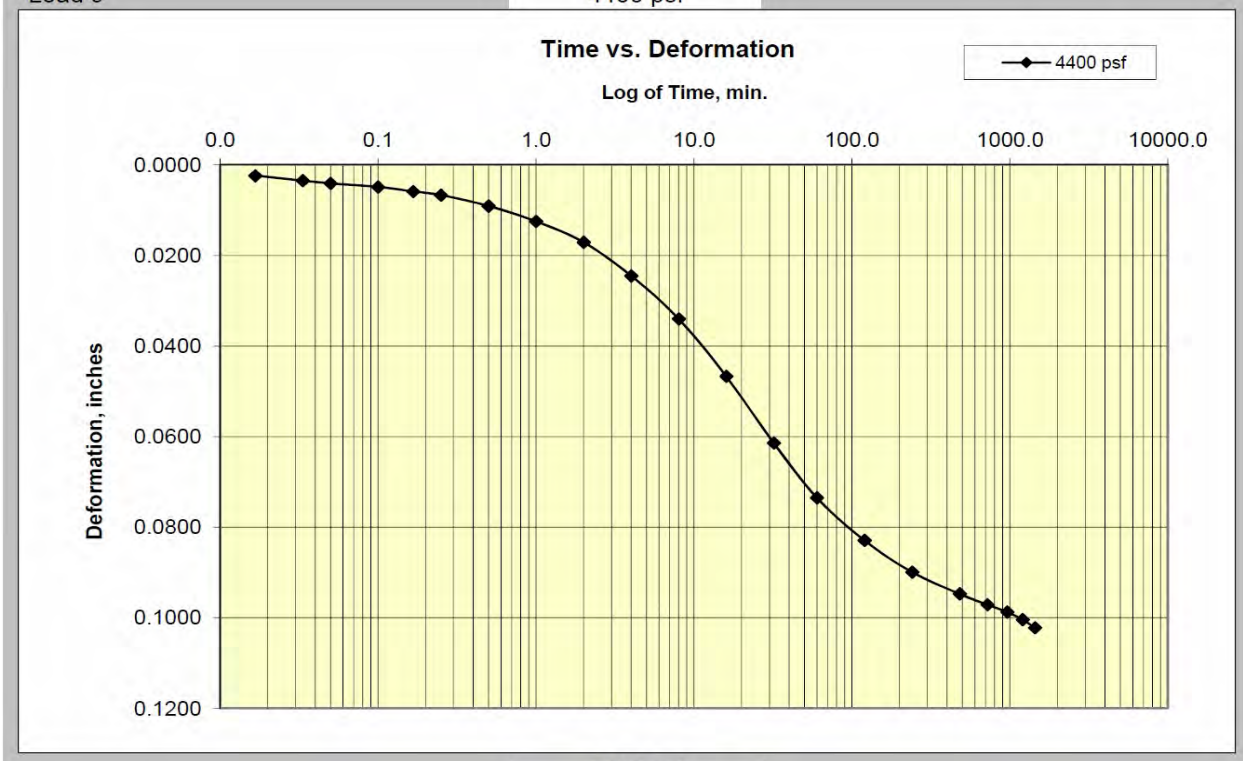
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

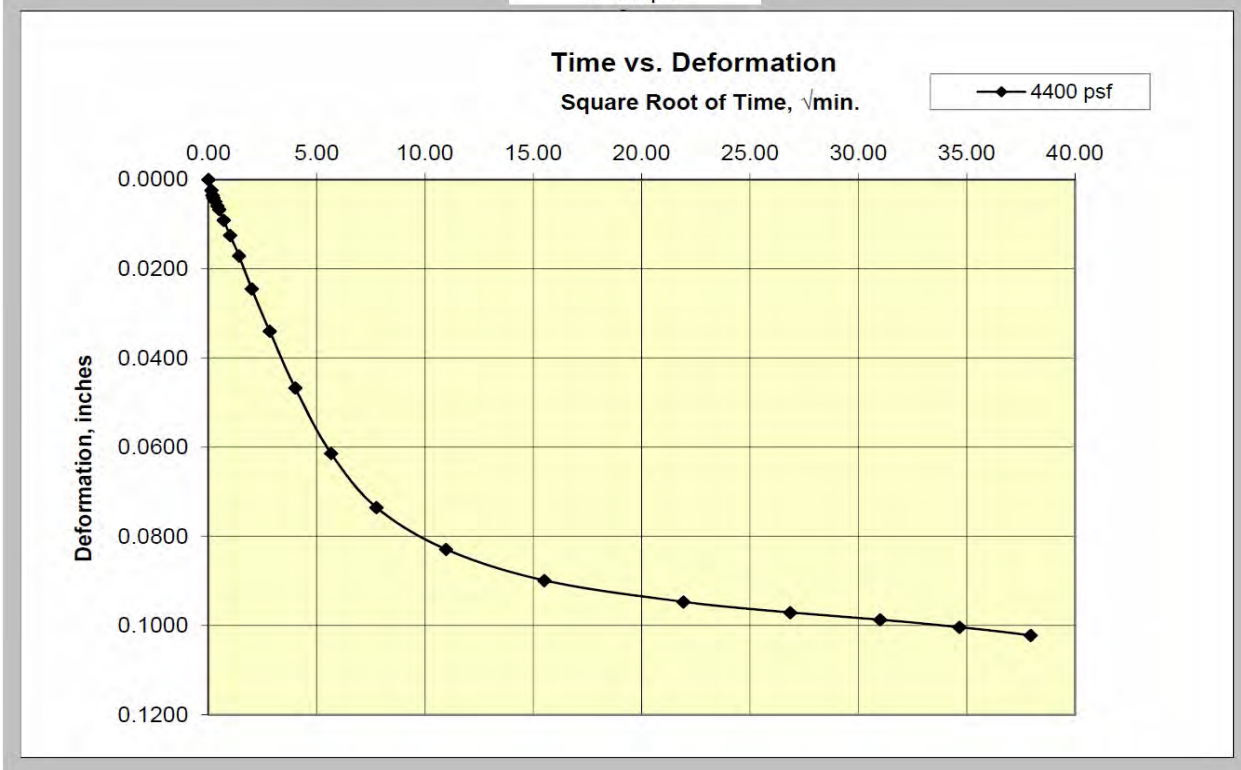
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-31

Load 9 | 4400 psf



4400 psf



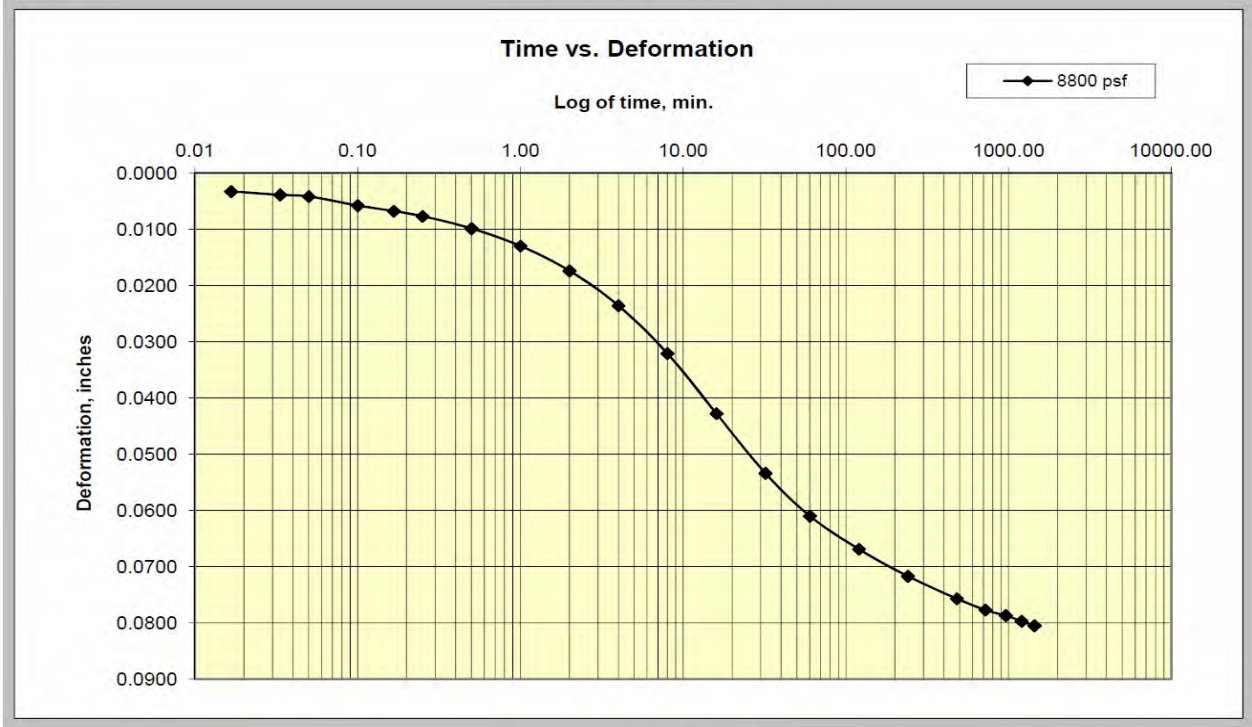
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

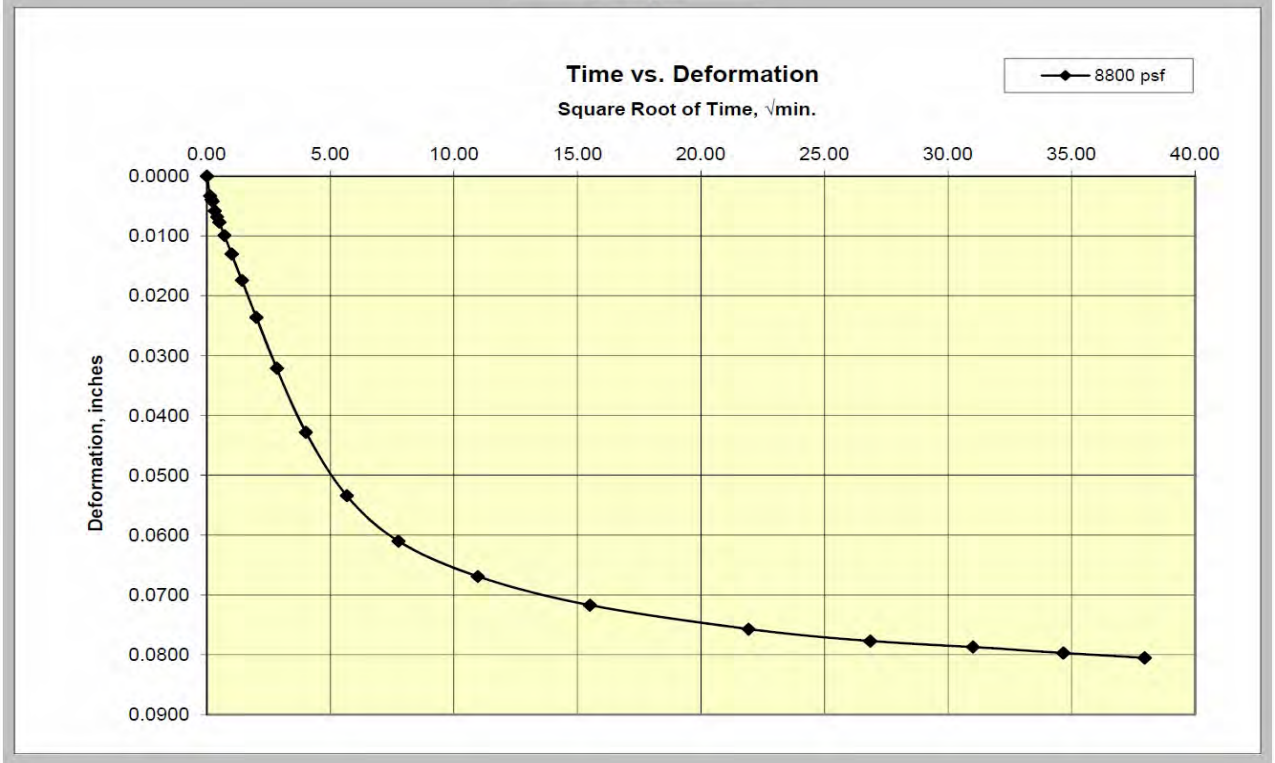
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-32

Load 10 | 8800 psf



8800 psf



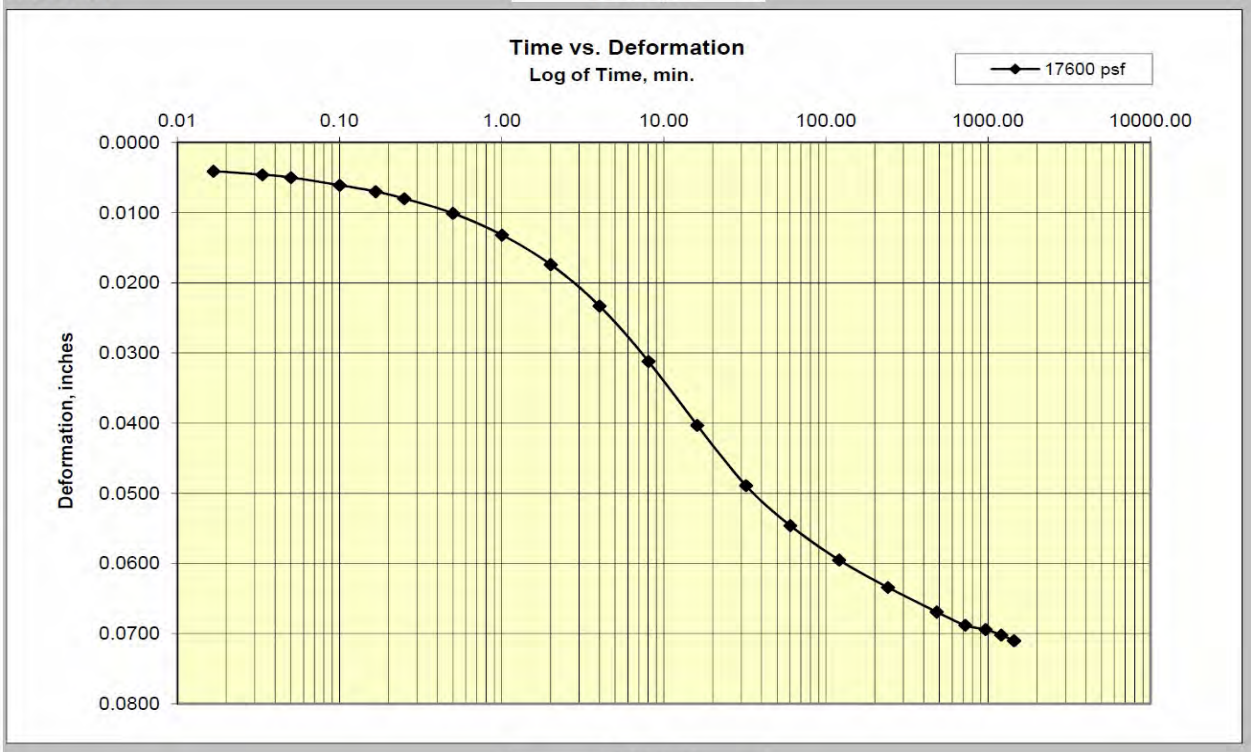
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

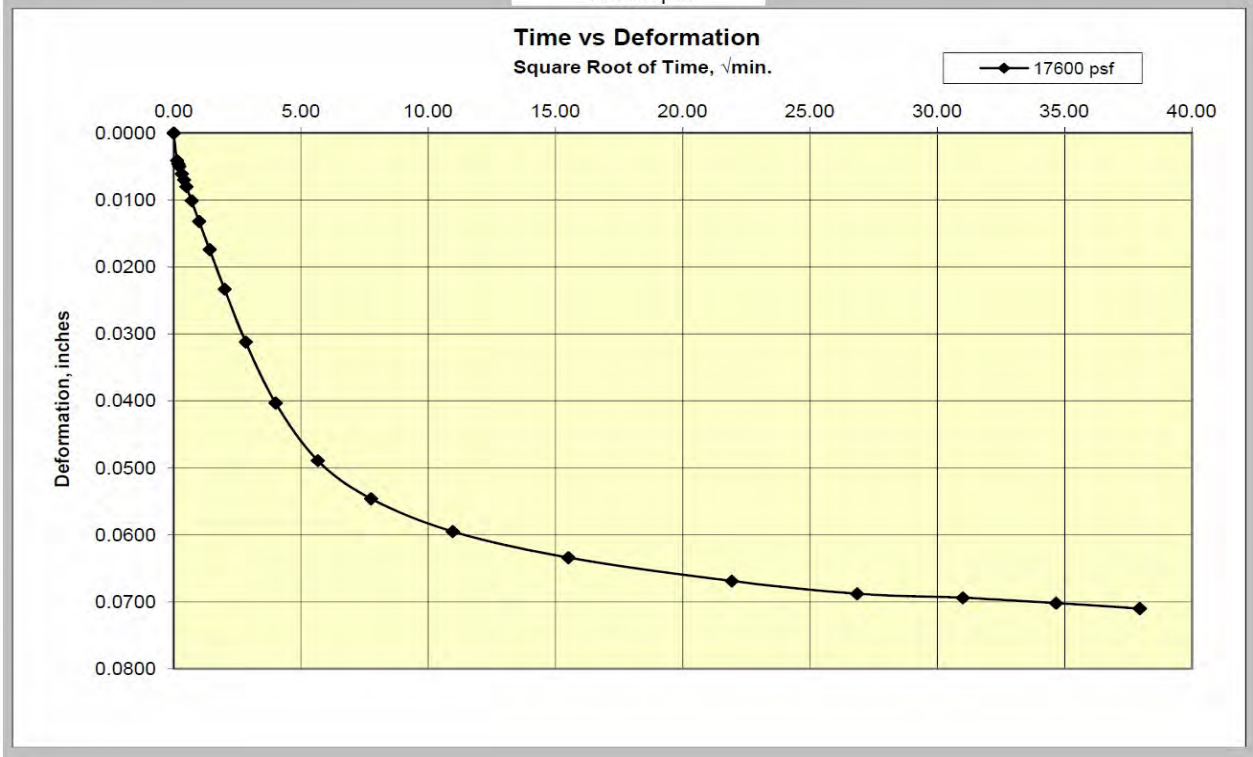
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-33

Load 11 | 17600 psf



17600 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

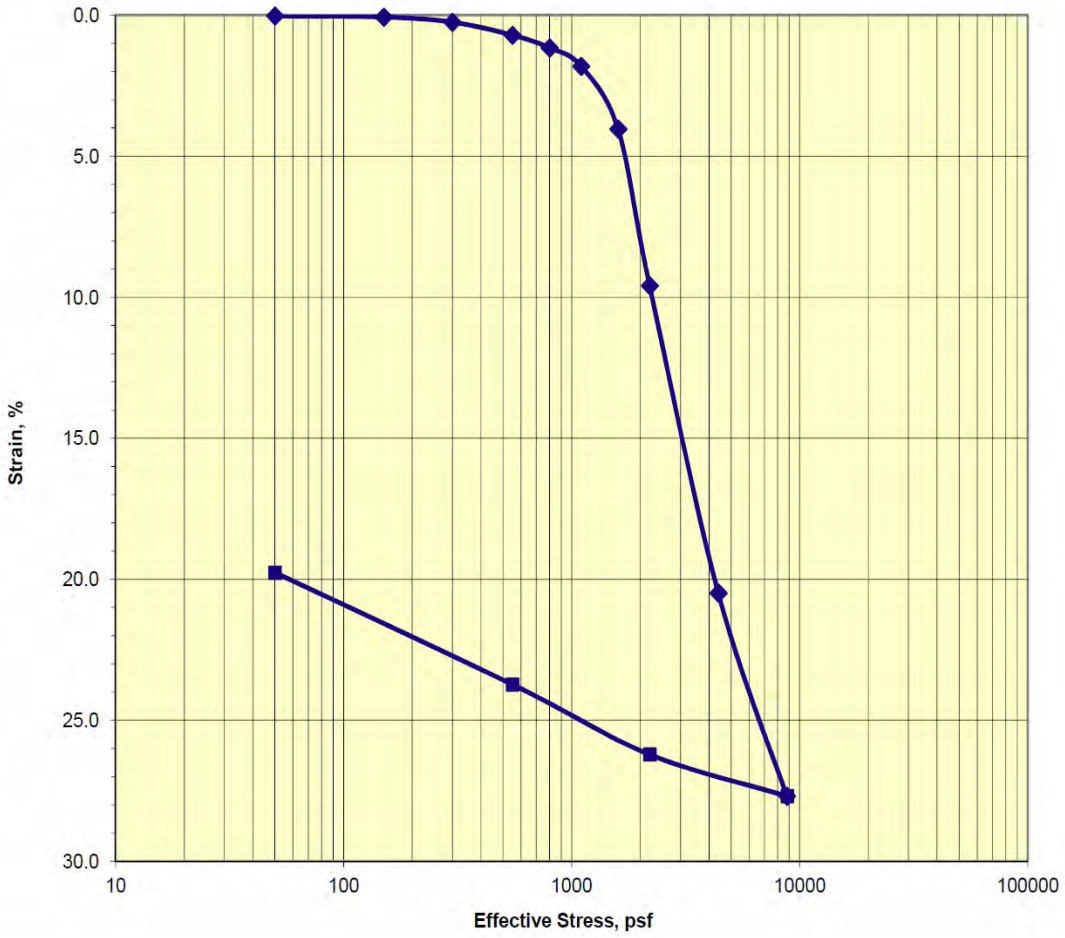
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-34

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	3	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	35-37(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY (Bay Mud)			**Date:**	9/3/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	80.0	57.5
Dry Density, pcf:	53.0	66.0
Void Ratio:	2.180	1.553
% Saturation:	99.1	100.0

Remarks:

Testing performed by Cooper Testing Laboratory

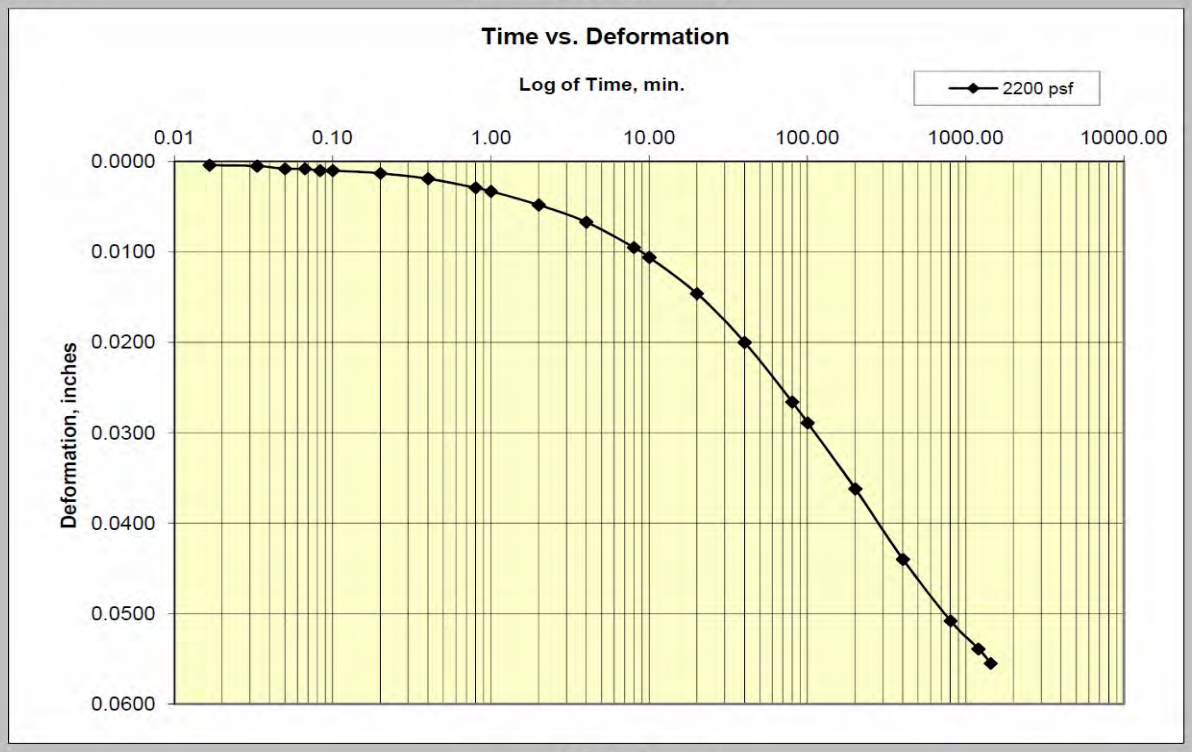
Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Consolidation Test Results

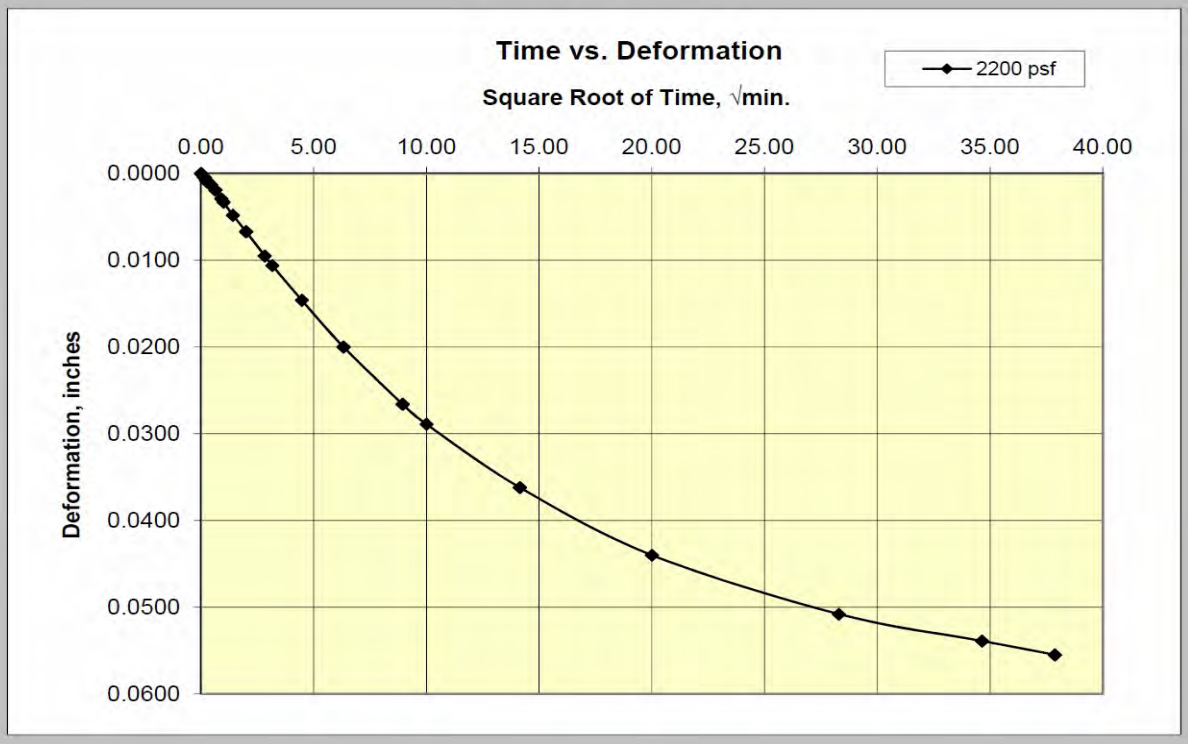
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-35

Load 8

2200 psf



2200 psf



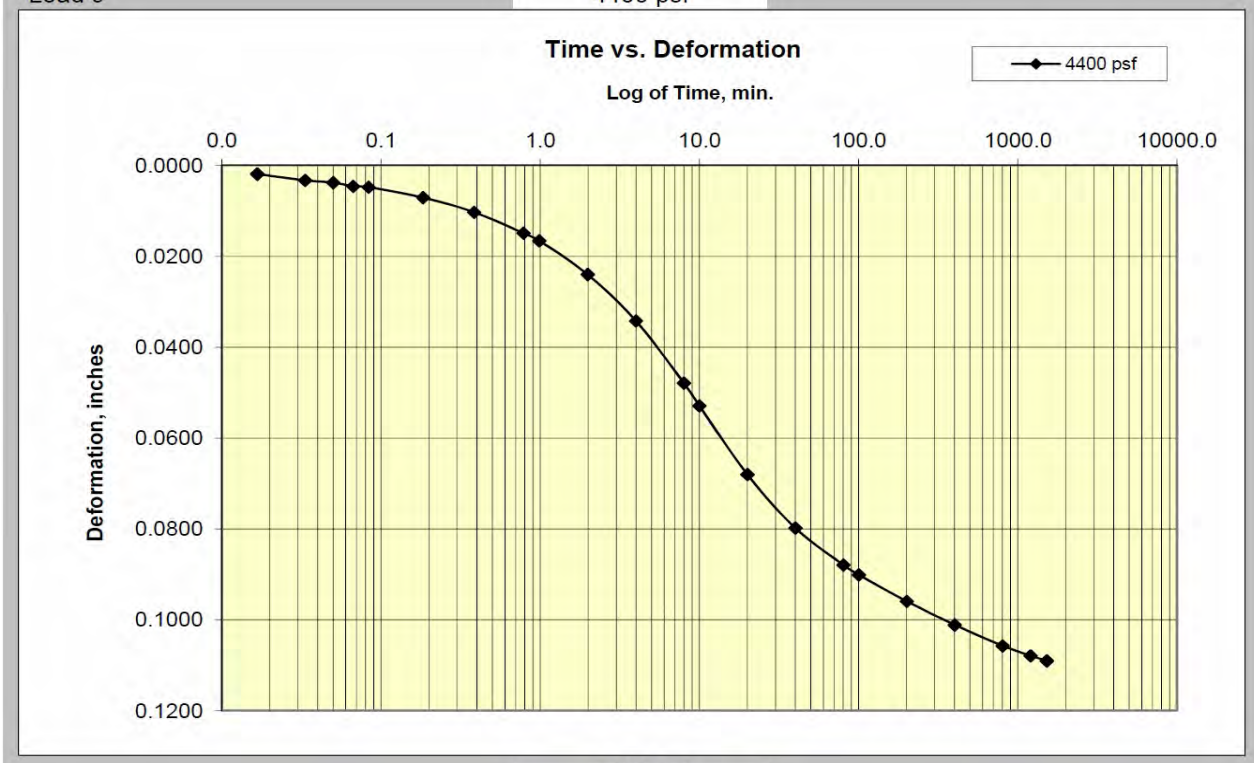
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

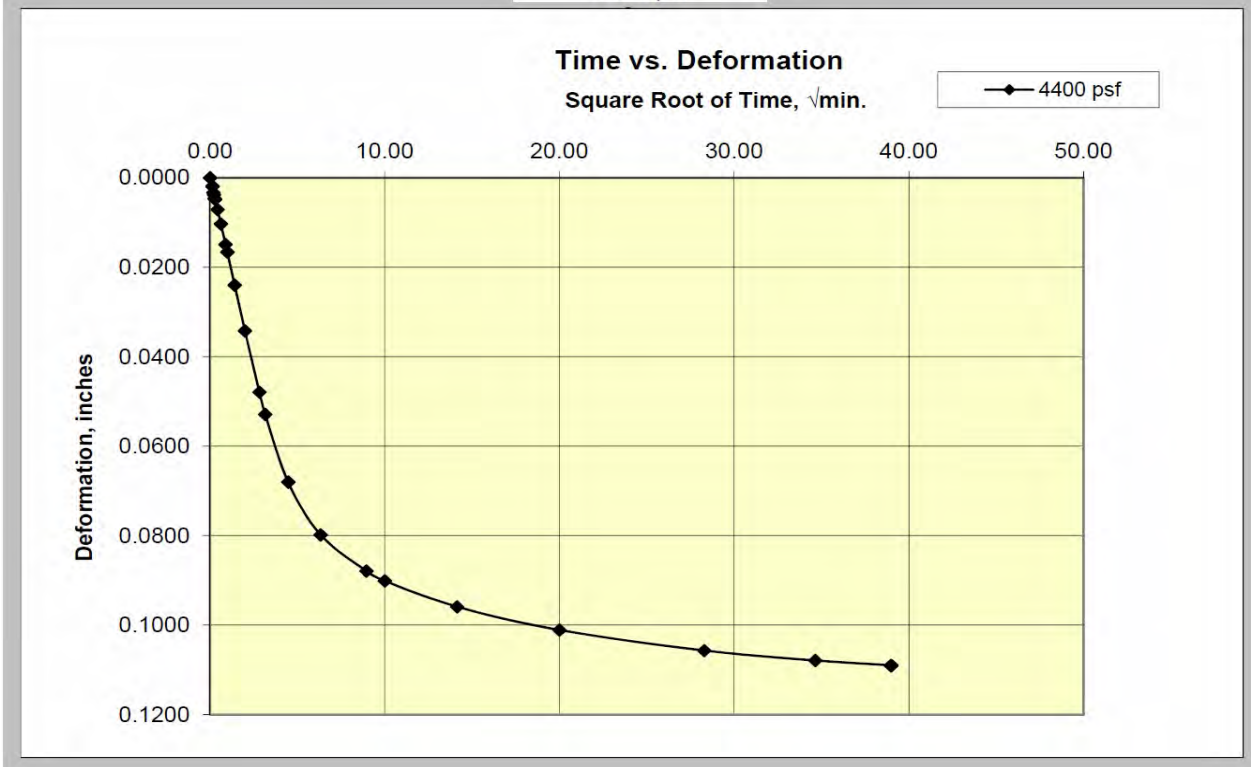
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-36

Load 9 | 4400 psf



4400 psf



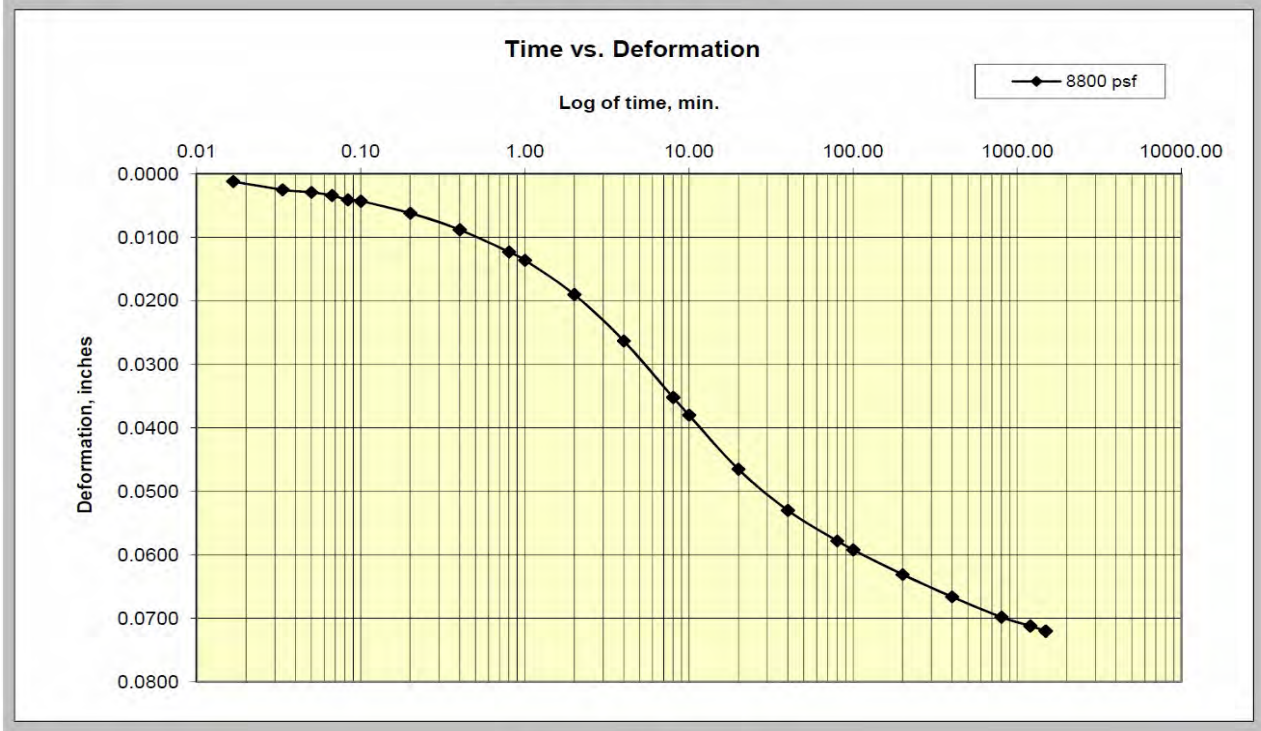
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

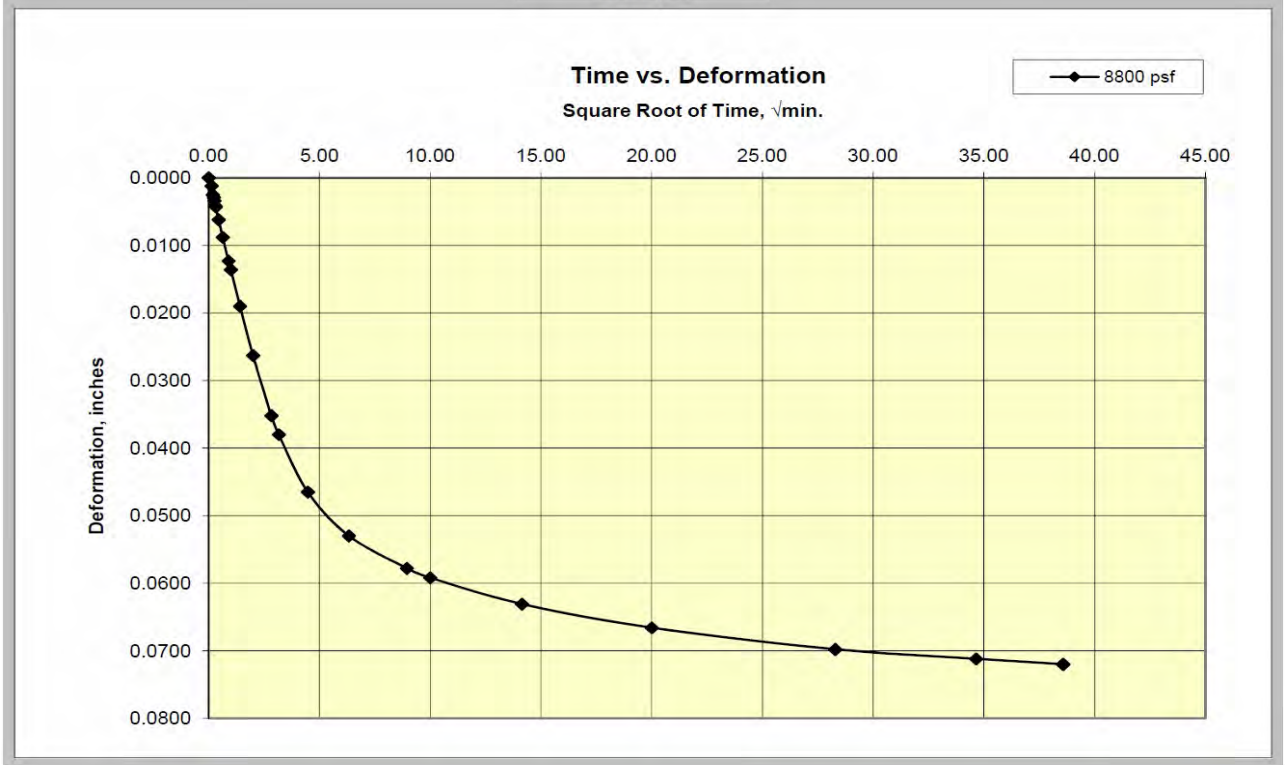
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-37

Load 10 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

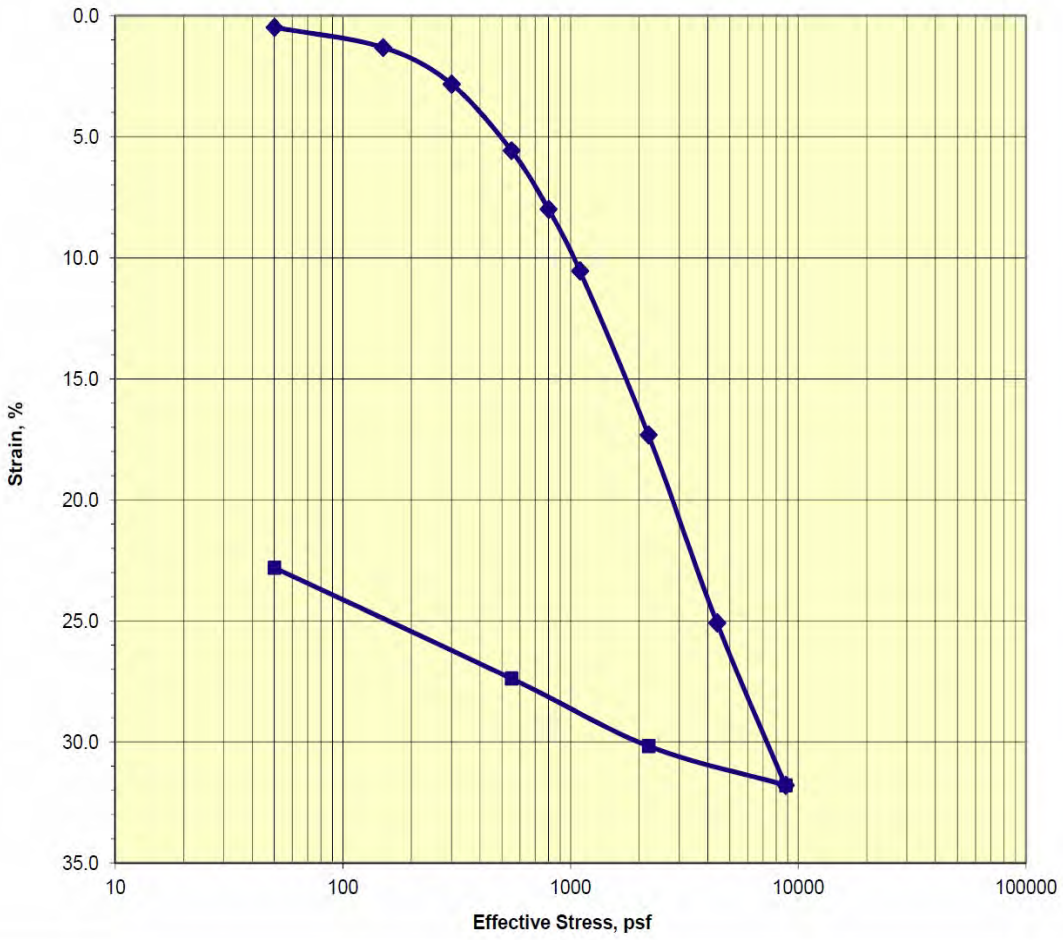
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-38

Consolidation Test
ASTM D2435

Job No.:	212-133	**Boring:**	4	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	25-27(Tip-4")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray CLAY (Bay Mud)			**Date:**	9/9/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	90.7	63.9
Dry Density, pcf:	47.3	61.9
Void Ratio:	2.567	1.725
% Saturation:	95.4	100.0

Remarks:

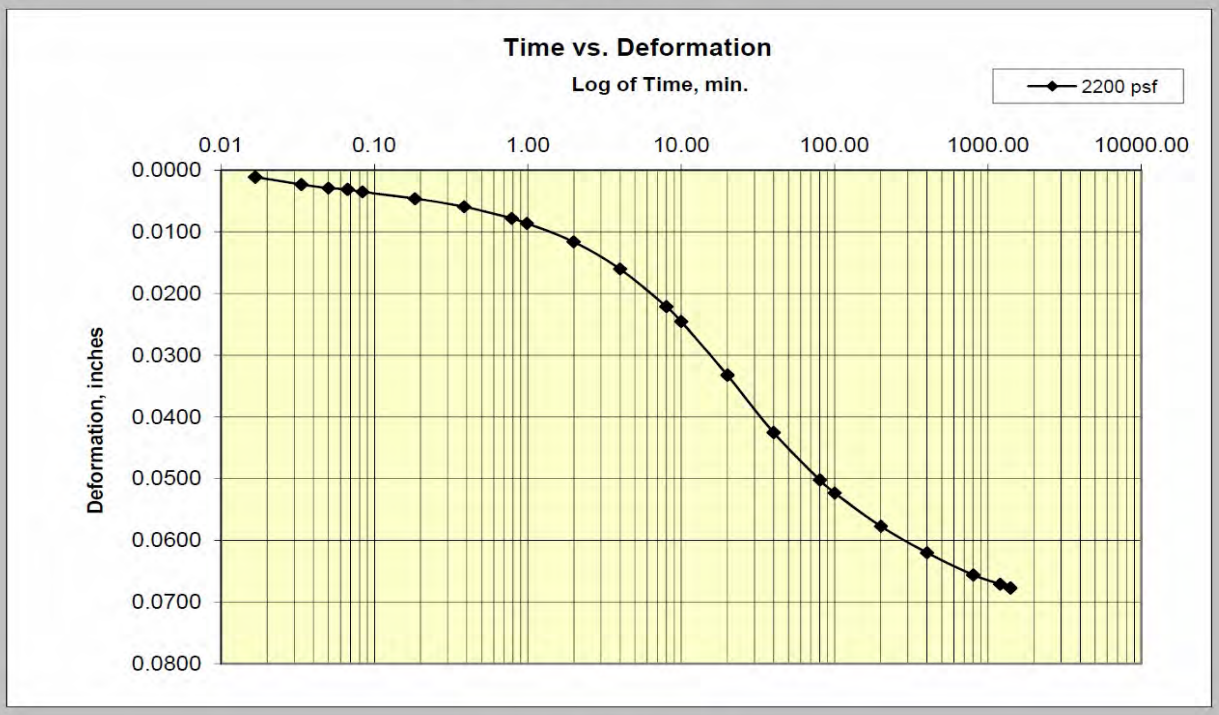
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

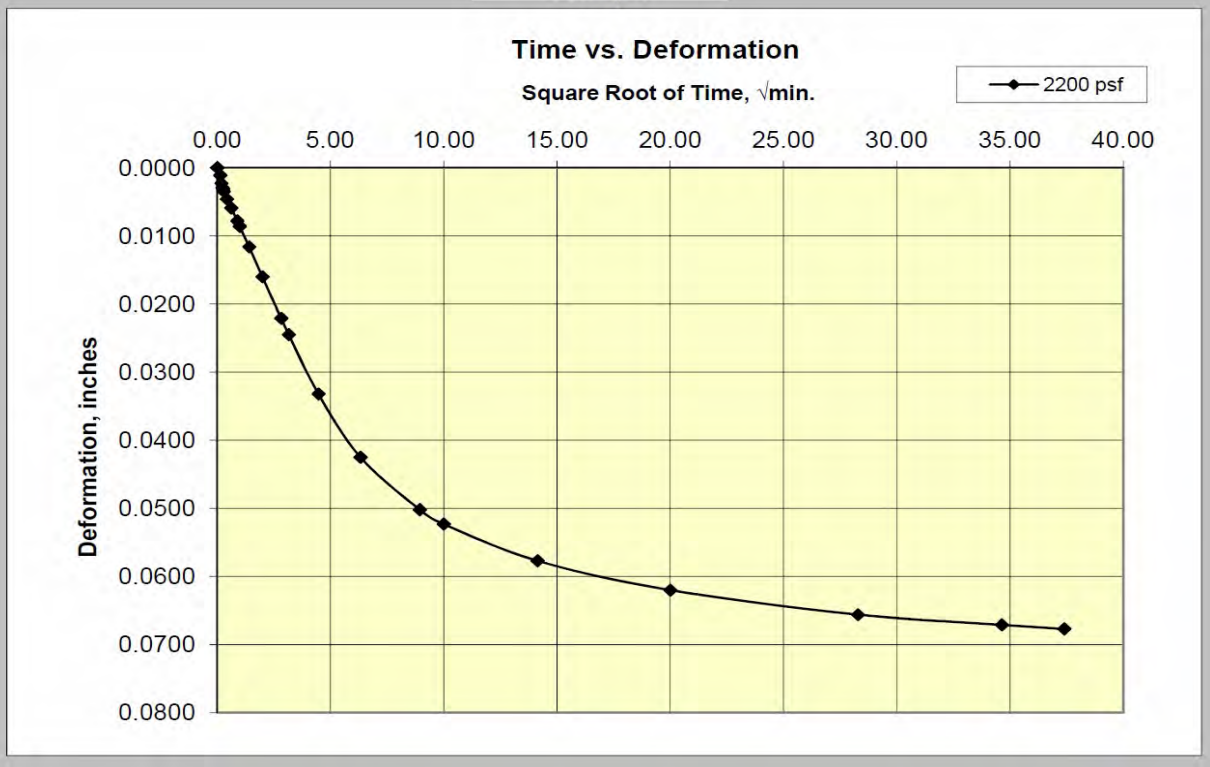
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-39

Load 7 | 2200 psf



2200 psf



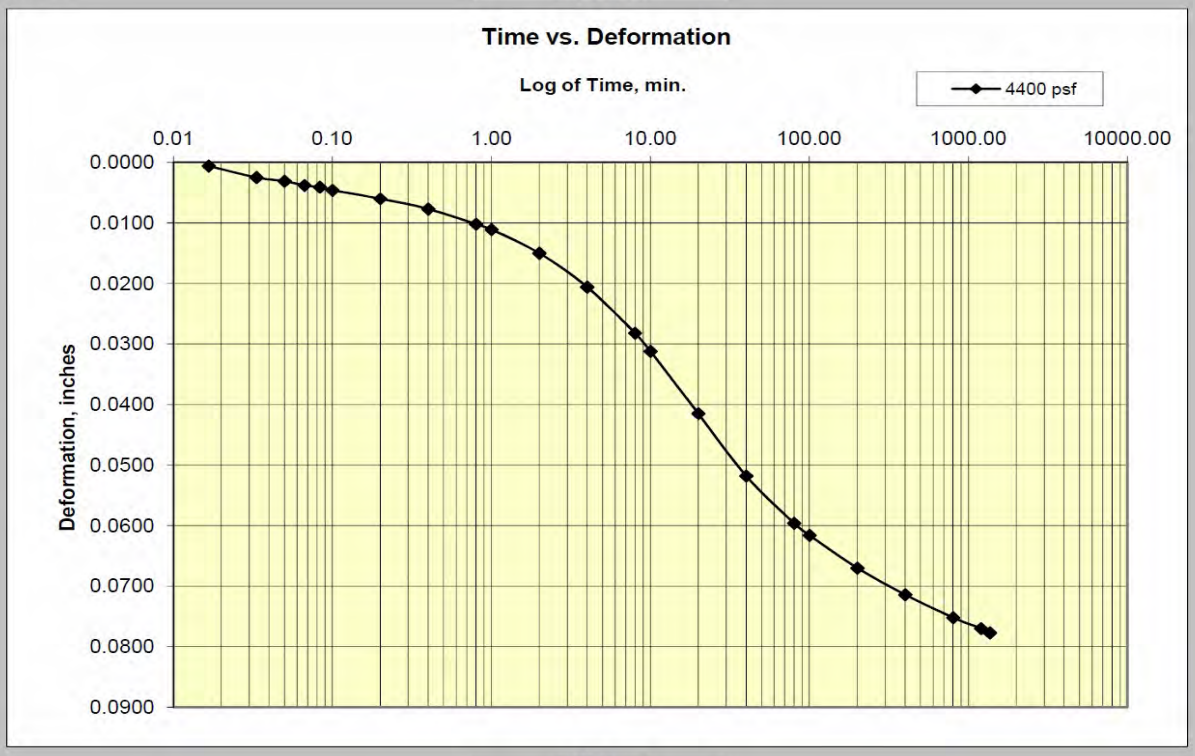
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

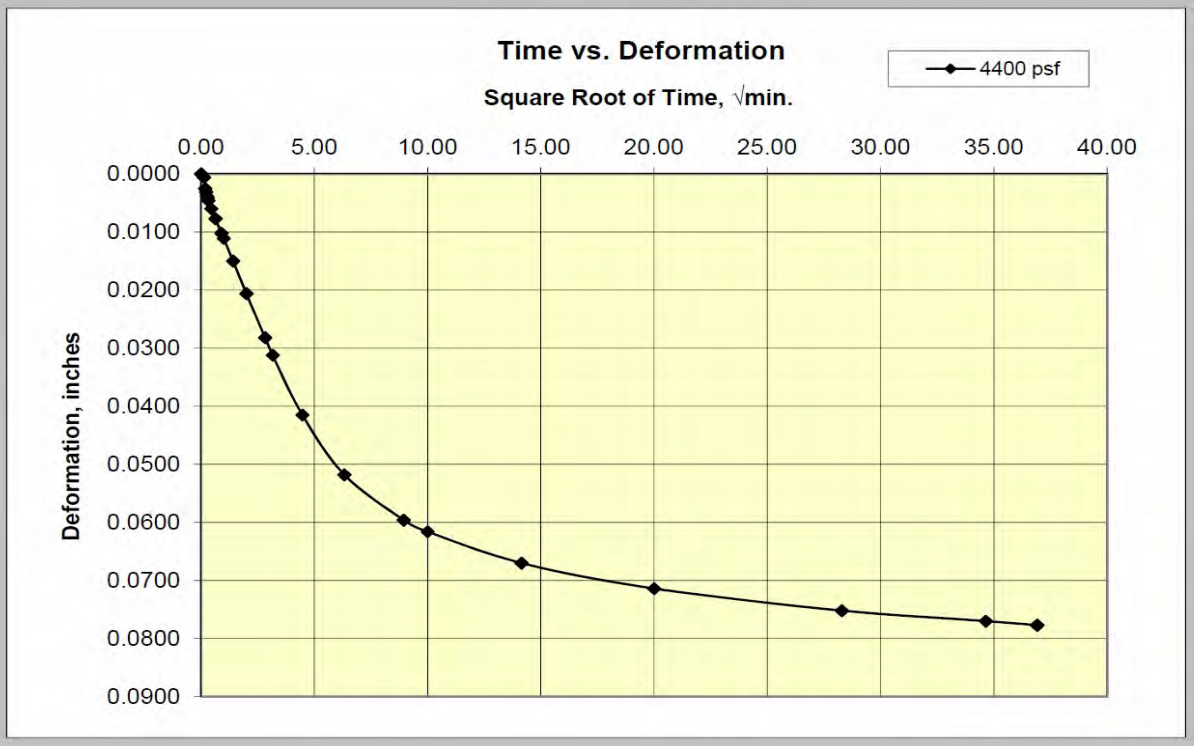
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-40

Load 8 4400 psf



4400 psf



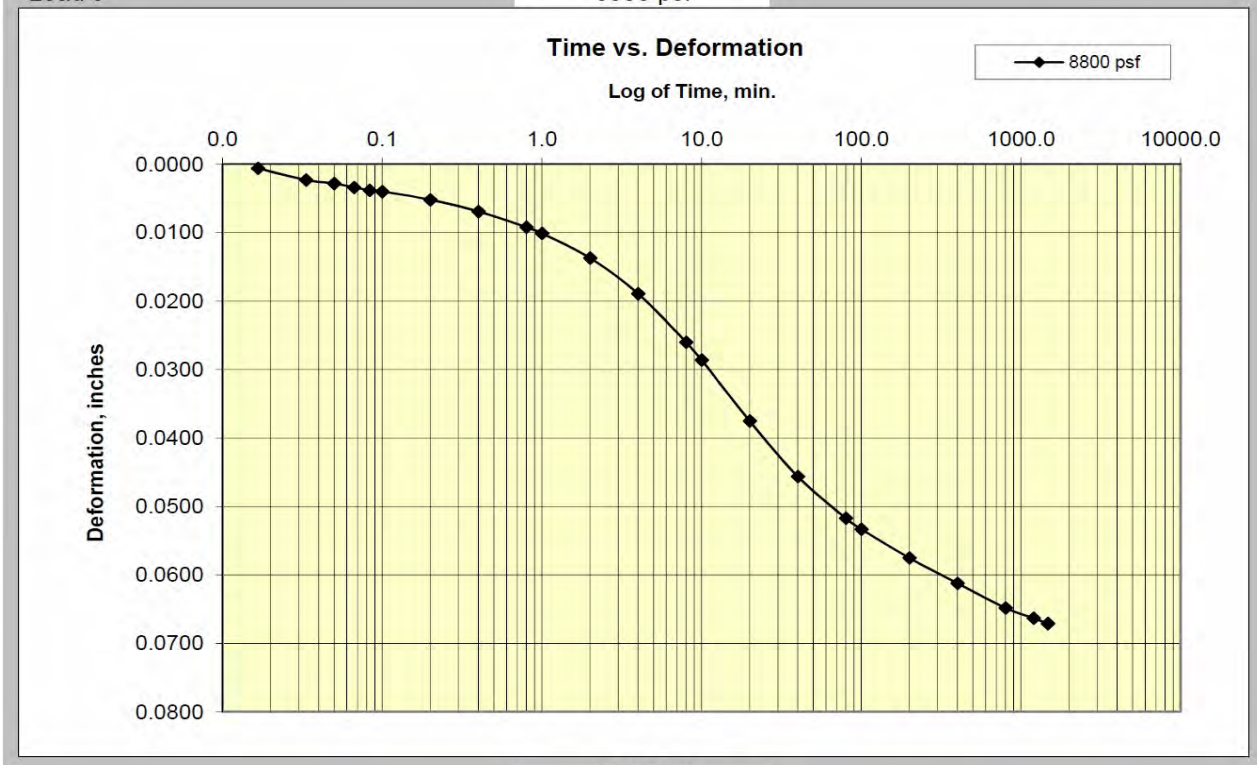
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

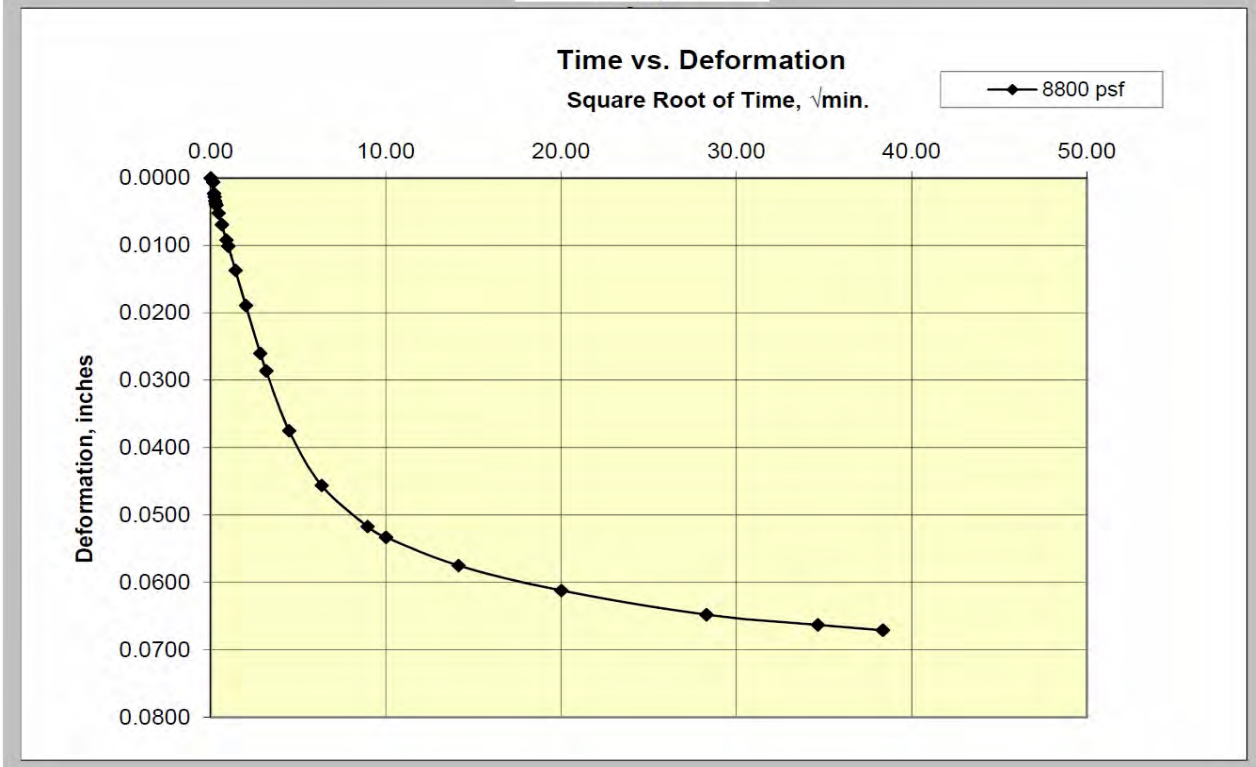
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-41

Load 9 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

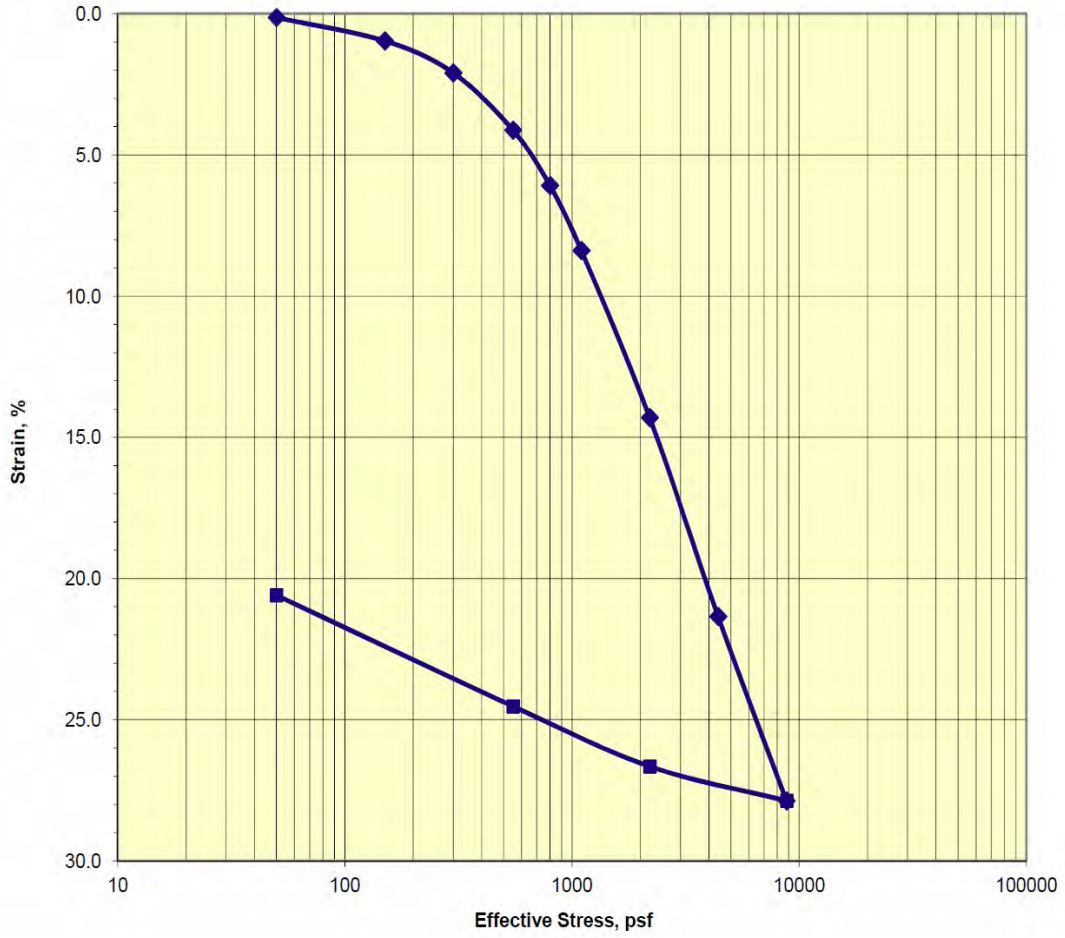
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-42

Consolidation Test
ASTM D2435

Job No.:		**Boring:**	4	**Run By:**	MD
Client:	Hultgren-Tillis Engineers	**Sample:**		**Reduced:**	PJ
Project:	Bel Marin Keys - 831.01	**Depth, ft.:**	45-47(Tip-7")	**Checked:**	PJ/DC
Soil Type:	Greenish Gray Fat CLAY (Bay Mud)			**Date:**	9/9/2015

Strain-Log-P Curve



Assumed Gs 2.7	Initial	Final
Moisture %:	72.8	53.8
Dry Density, pcf:	54.2	68.7
Void Ratio:	2.112	1.453
% Saturation:	93.1	100.0

Remarks:

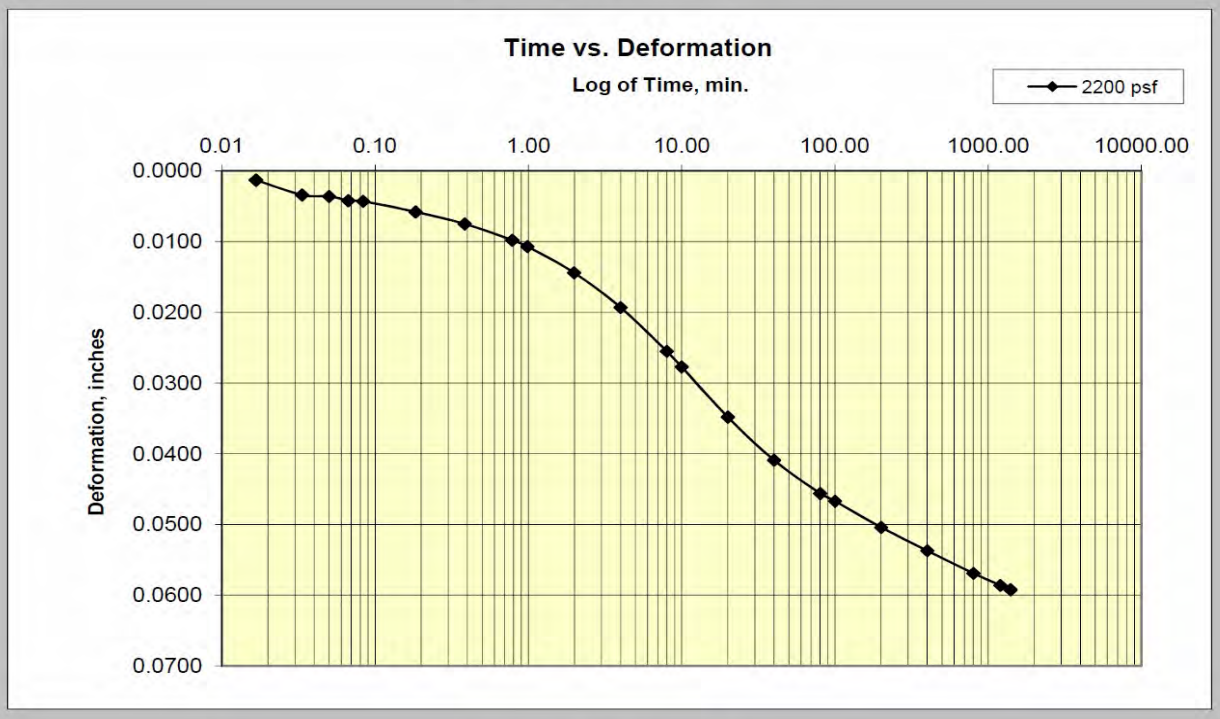
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

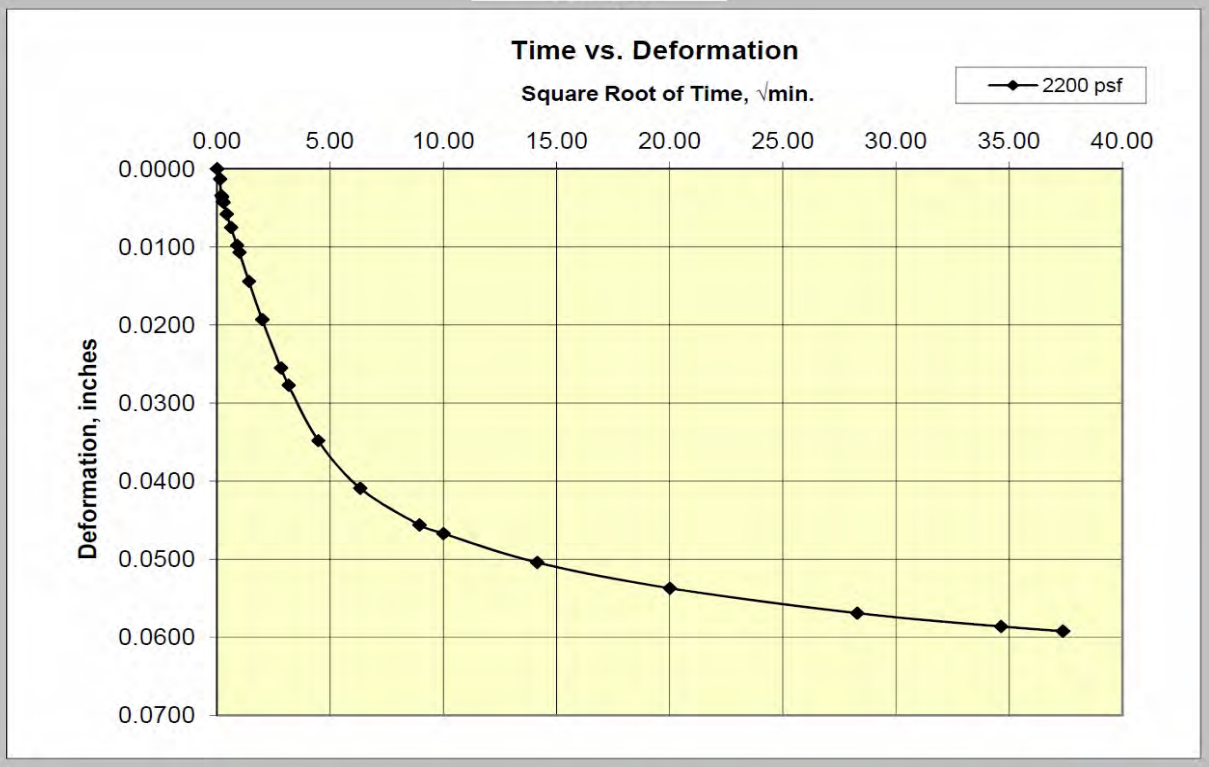
Consolidation Test Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-43

Load 7 | 2200 psf



2200 psf



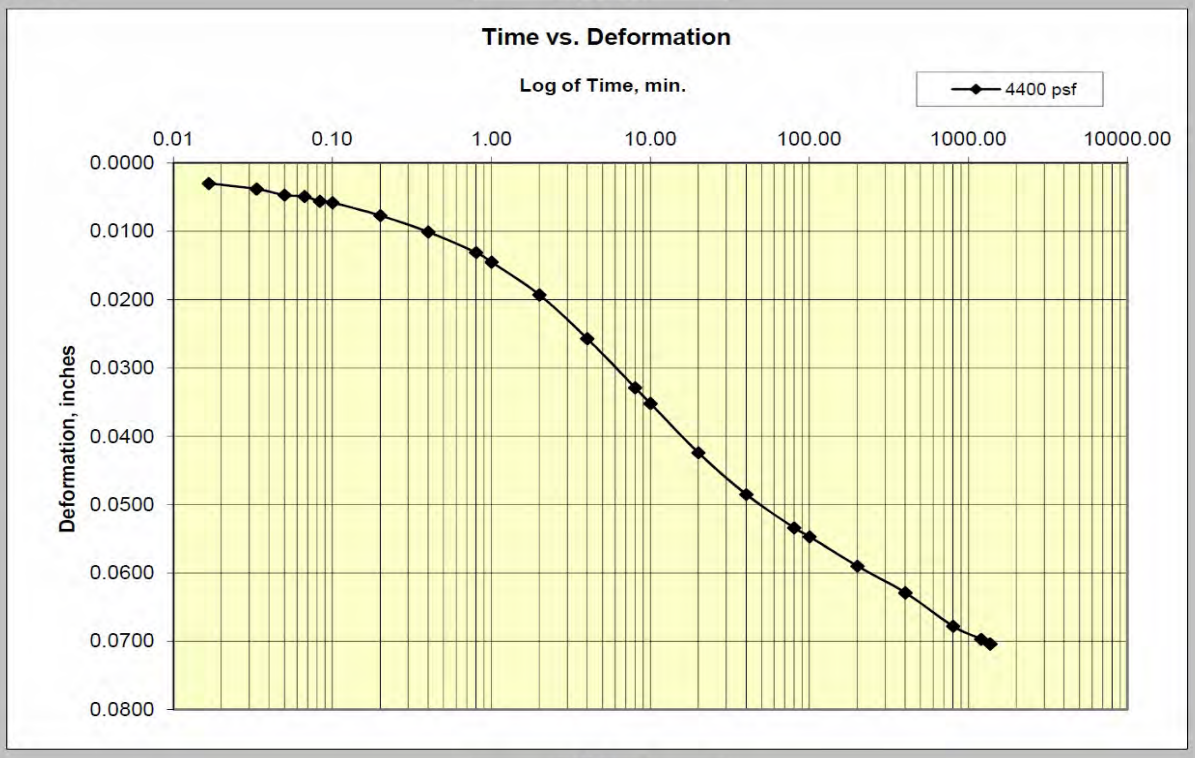
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

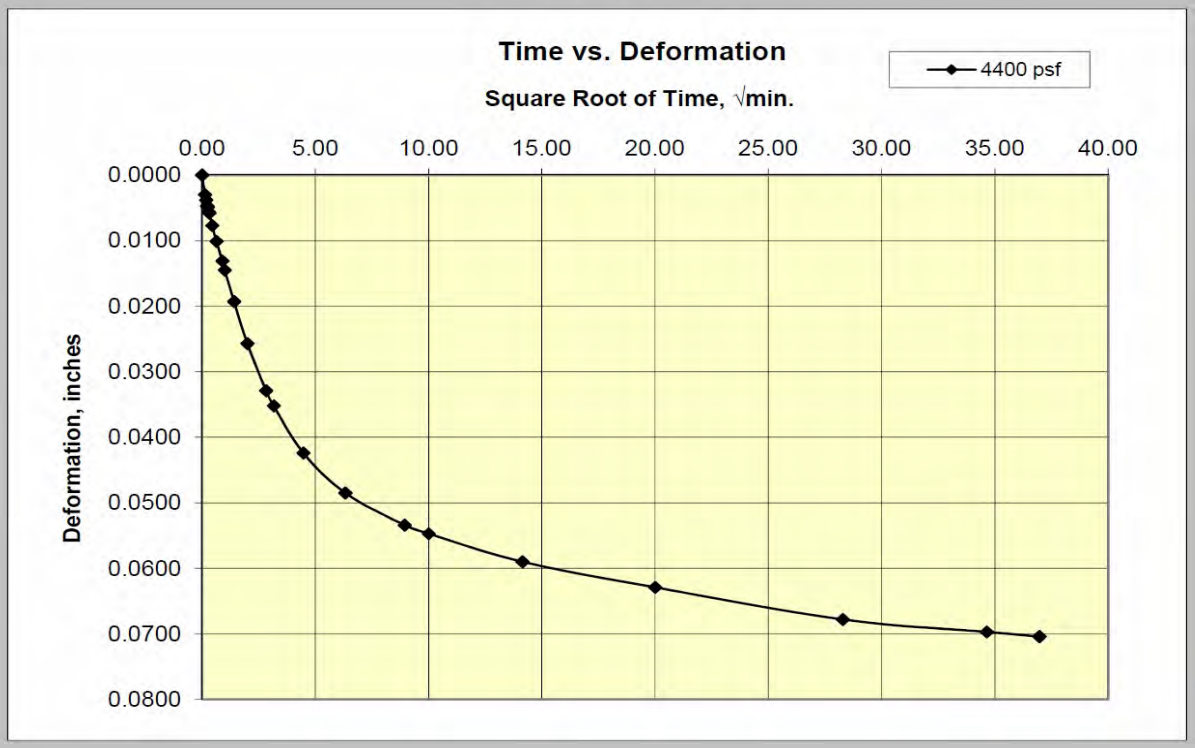
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-44

Load 8 4400 psf



4400 psf



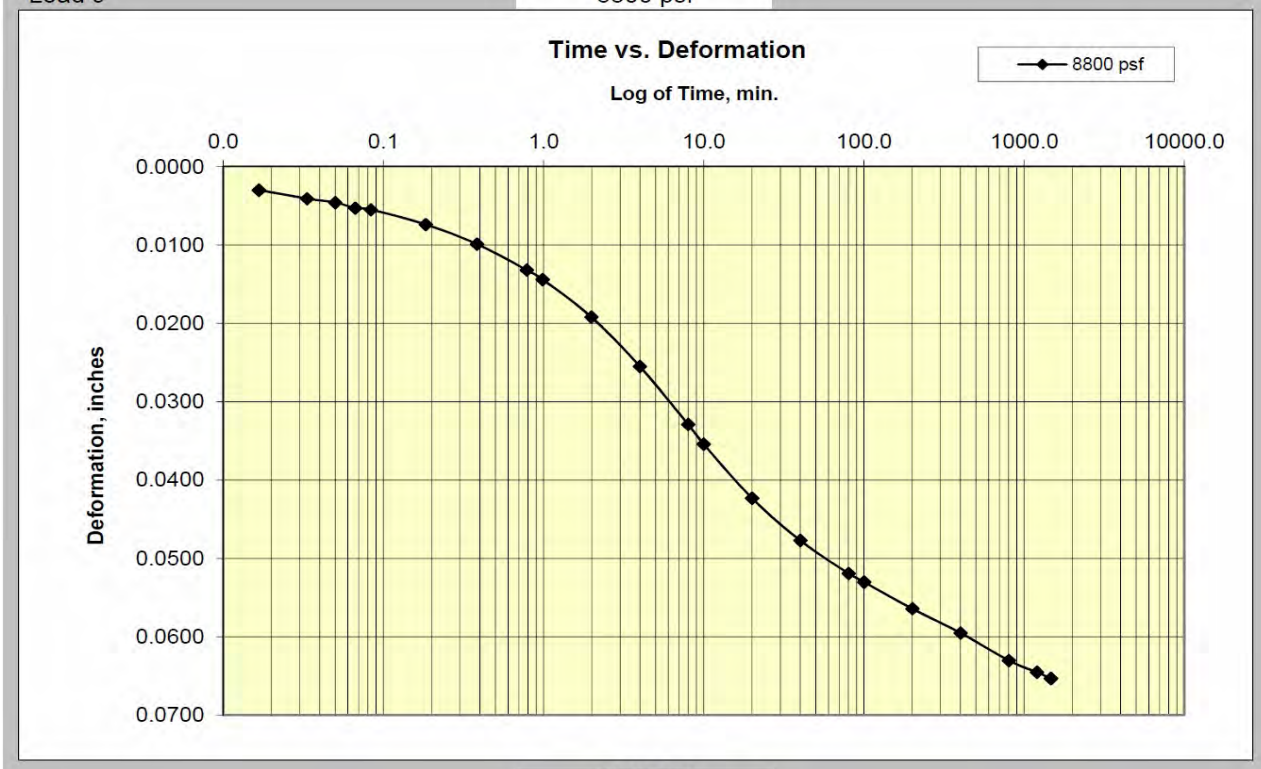
Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

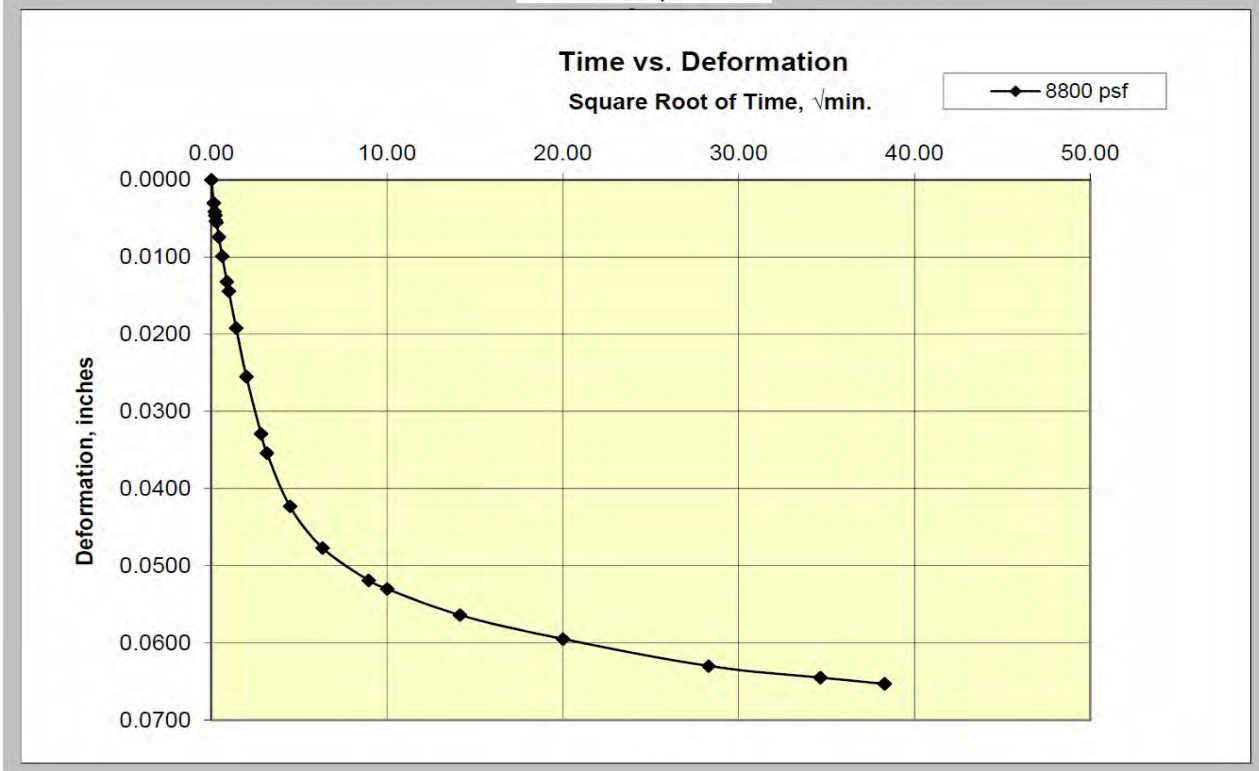
Consolidation Time-Rate Plots

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-45

Load 9 | 8800 psf



8800 psf



Testing performed by Cooper Testing Laboratory

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Consolidation Time-Rate Plots

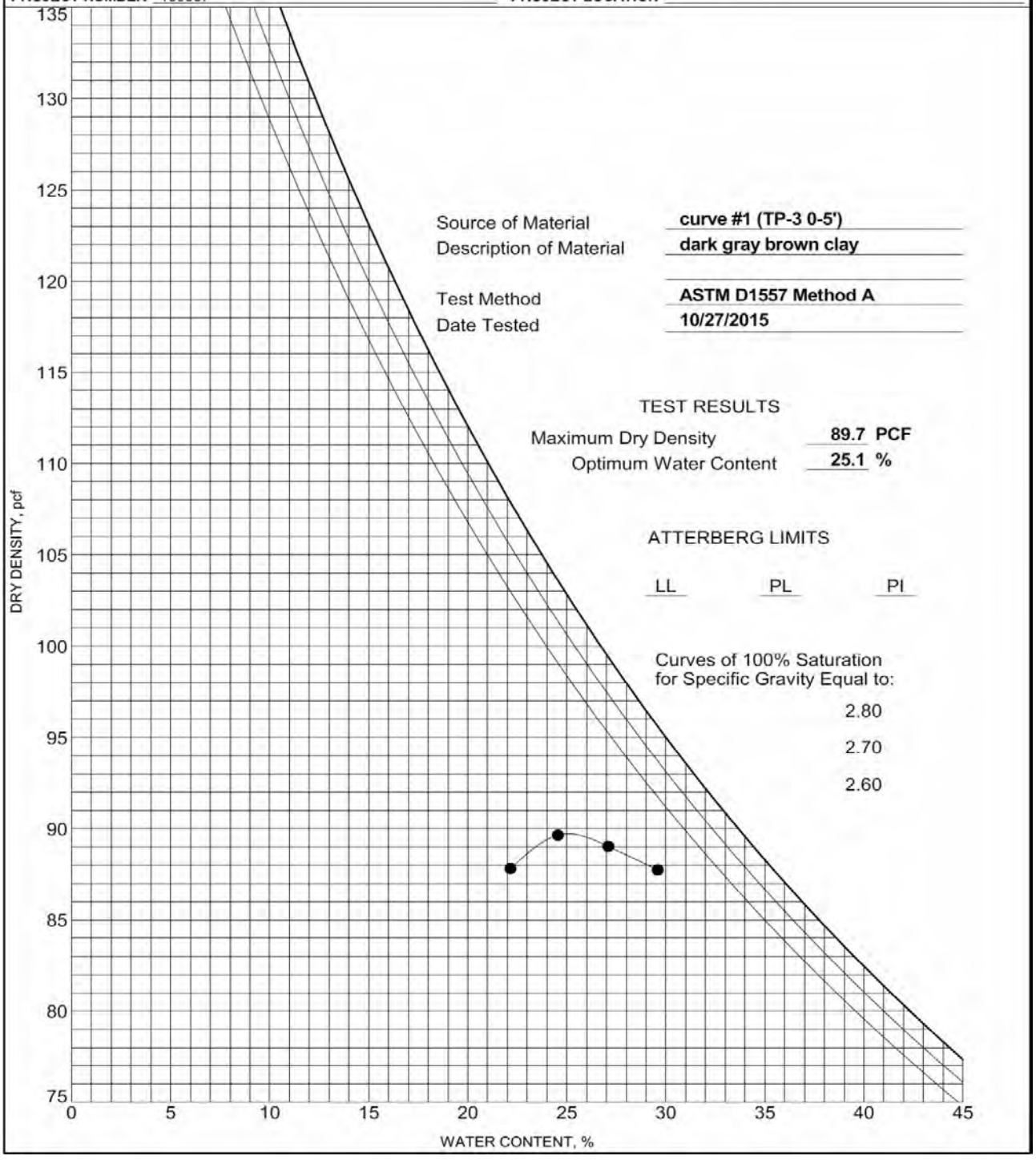
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-46

CE&G
CAL ENGINEERING & GEOLOGY

MOISTURE-DENSITY RELATIONSHIP

CLIENT Hultgren - Tillis Engineers # 831.01 **PROJECT NAME** Bel Marin Keys Borrow

PROJECT NUMBER 150887 **PROJECT LOCATION**



Testing performed by CEG

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Compaction Curve Results

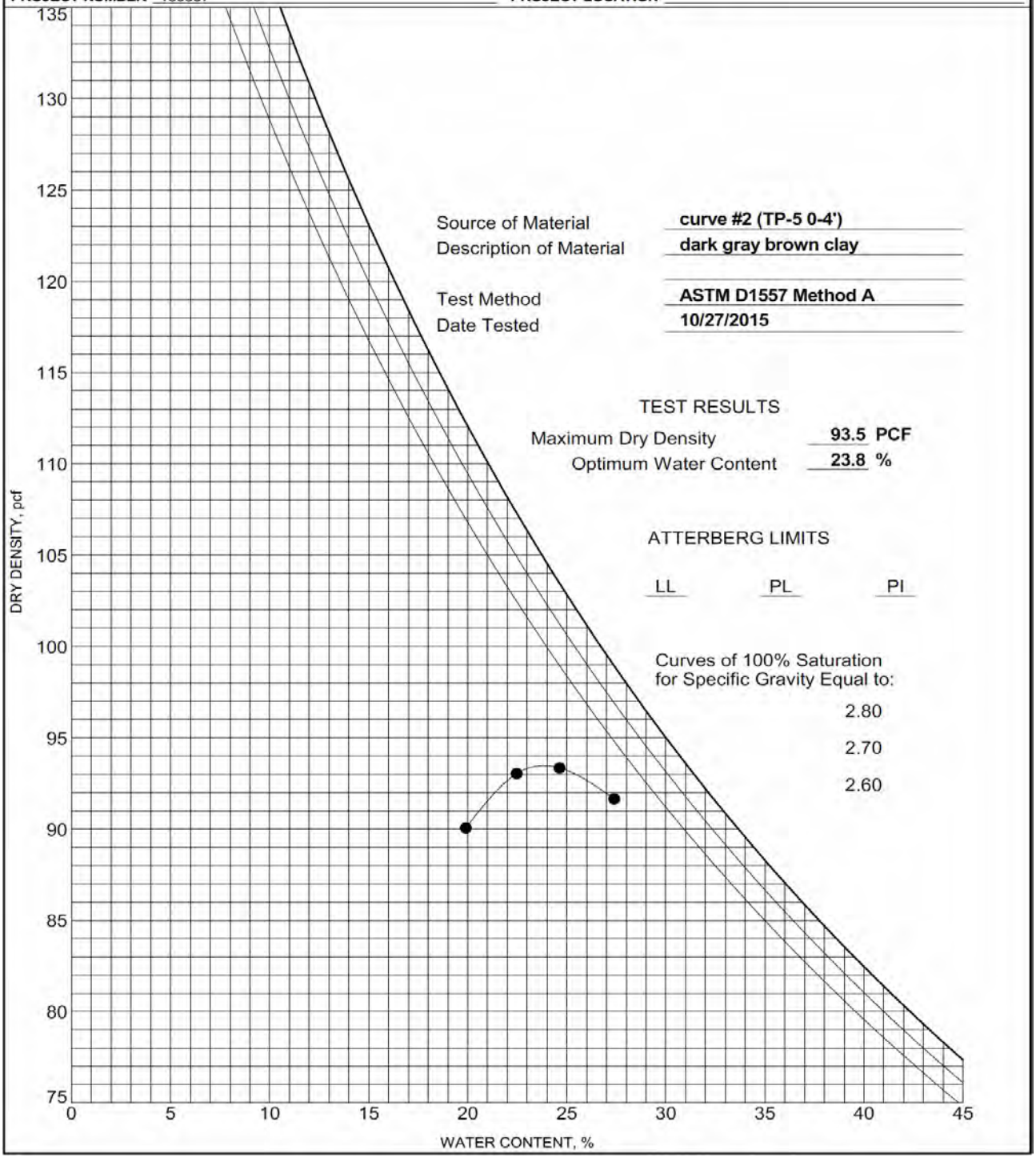
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-47

CE&G
CAL ENGINEERING & GEOLOGY

MOISTURE-DENSITY RELATIONSHIP

CLIENT Hultgren - Tillis Engineers # 831.01 PROJECT NAME Bel Marin Keys Borrow

PROJECT NUMBER 150887 PROJECT LOCATION



Testing performed by CEG

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Compaction Curve Results

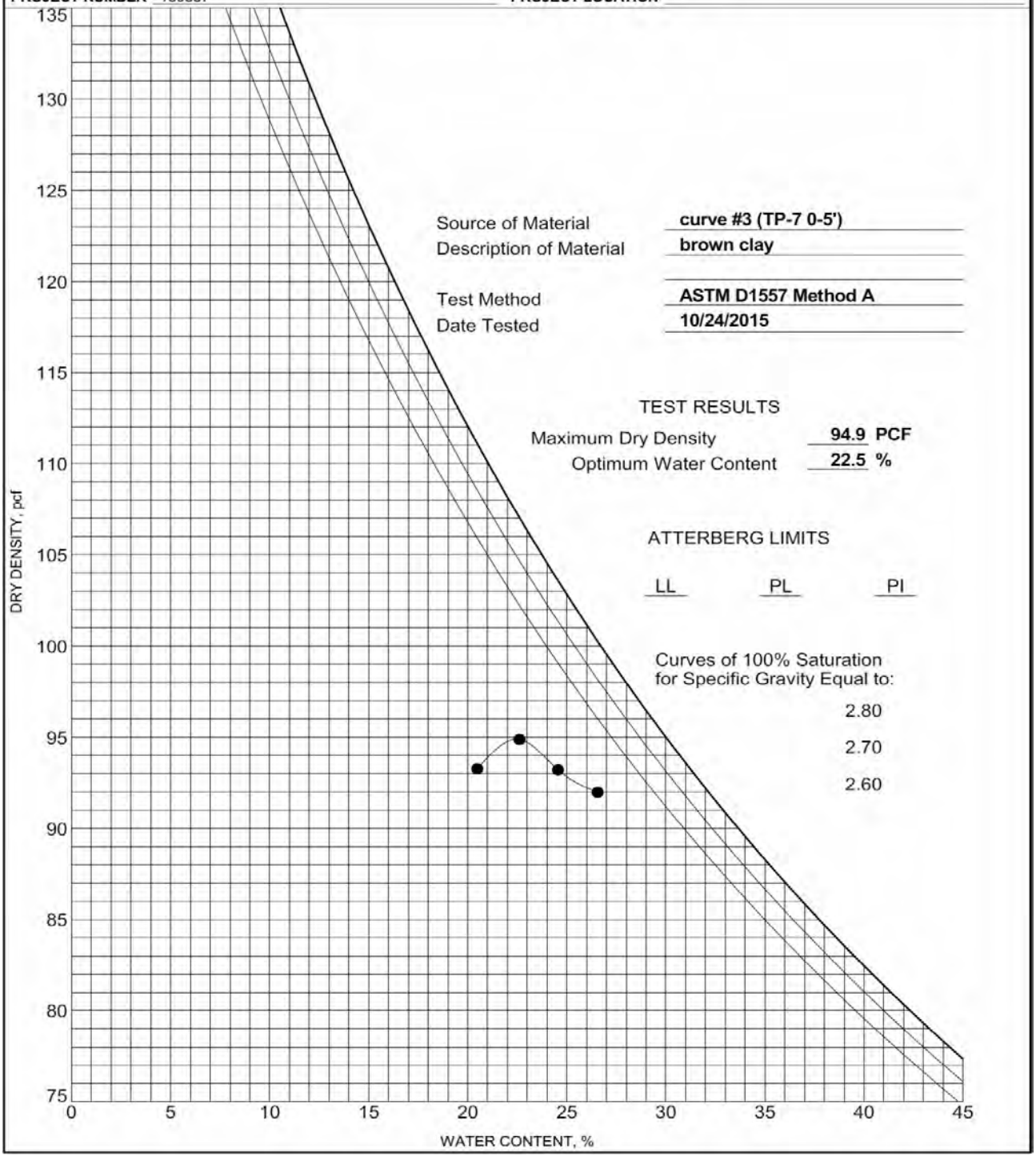
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-48

CE&G
CAL ENGINEERING & GEOLOGY

MOISTURE-DENSITY RELATIONSHIP

CLIENT Hultgren - Tillis Engineers # 831.01 **PROJECT NAME** Bel Marin Keys Borrow

PROJECT NUMBER 150887 **PROJECT LOCATION**



Testing performed by CEG

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Compaction Curve Results

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. B-49

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

24 August, 2015

Job No. 1508125
Cust. No.11451

Mr. Callan Yu
Hultgren-Tillis Engineers
4085 Nelson Avenue, Suite A
Concord, CA 94520-1257

Subject: Project No.: 831.01
Project Name: Bel Marin Keys, Novato
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Yu:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on August 19, 2015. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Sample No.001 is classified as "severely corrosive" and Sample No.002 is classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from 120 to 760 mg/kg are determined to be sufficient to attack steel embedded in a concrete mortar coating. Chloride ion concentrations greater than 300 mg/kg are considered corrosive to embedded reinforcing steel; and, as such, the concrete mix design shall be adjusted accordingly by a qualified corrosion engineer.

The sulfate ion concentrations ranged from 40 to 1,100 mg/kg and are determined to be sufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, in accordance with the California Building Code requirements with a maximum water-to-cement ratio of 0.50.

The pH of the soils are 3.92 and 5.29, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Any soils with a pH of <6.0 is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials were 470-mV & 490-mV, which are indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630*.

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl

Enclosures

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Project No. 831.01

Plate No. B-52

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client:	Hultgren-Tillis Engineers
Client's Project No.:	831.01
Client's Project Name:	Bel Marin Keys, Novato
Date Sampled:	19-Aug-15
Date Received:	19-Aug-15
Matrix:	Soil
Authorization:	Signed Chain of Custody

Date of Report: 24-Aug-2015

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1508125-001	B1 @ 4.25 - 4.75'	470	3.92	-	200	-	760	1,100
1508125-002	B4 @ 1.25 - 1.75'	490	5.29	-	950	-	120	40

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	150	15
Date Analyzed:	20-Aug-2015	20-Aug-2015	-	19-Aug-2015	-	20-Aug-2015	20-Aug-2015

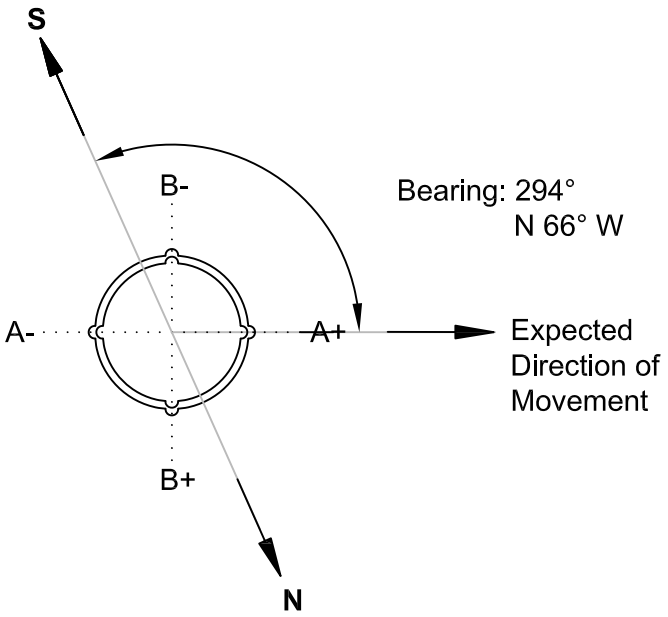
* Results Reported on "As Received" Basis

Cheryl McMillen
Laboratory Director

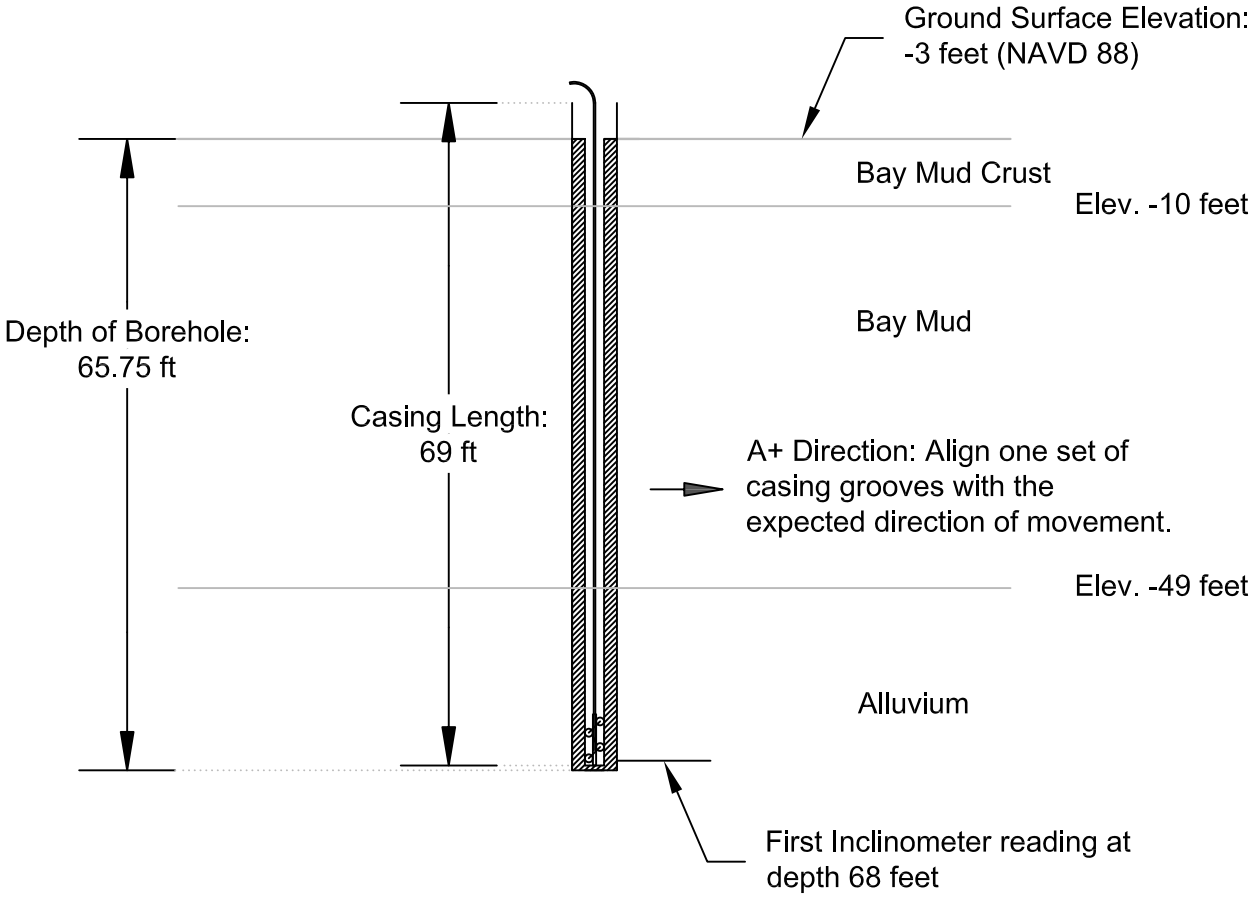
Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX C

Plan View



Profile

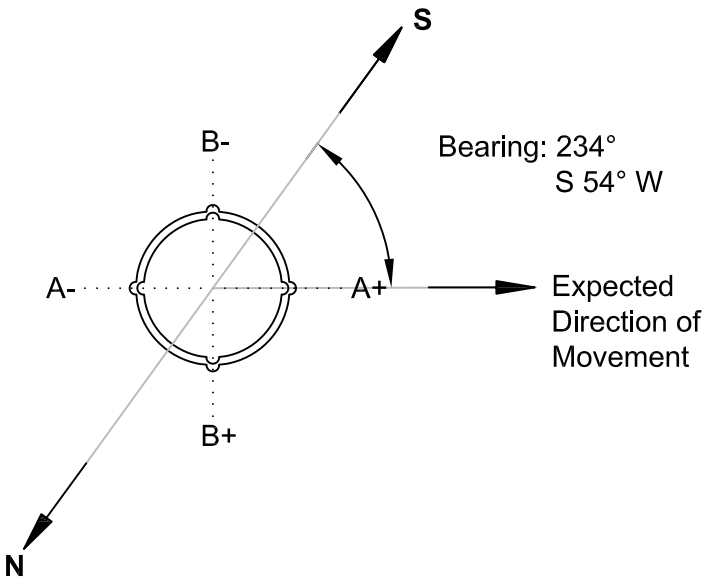


Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

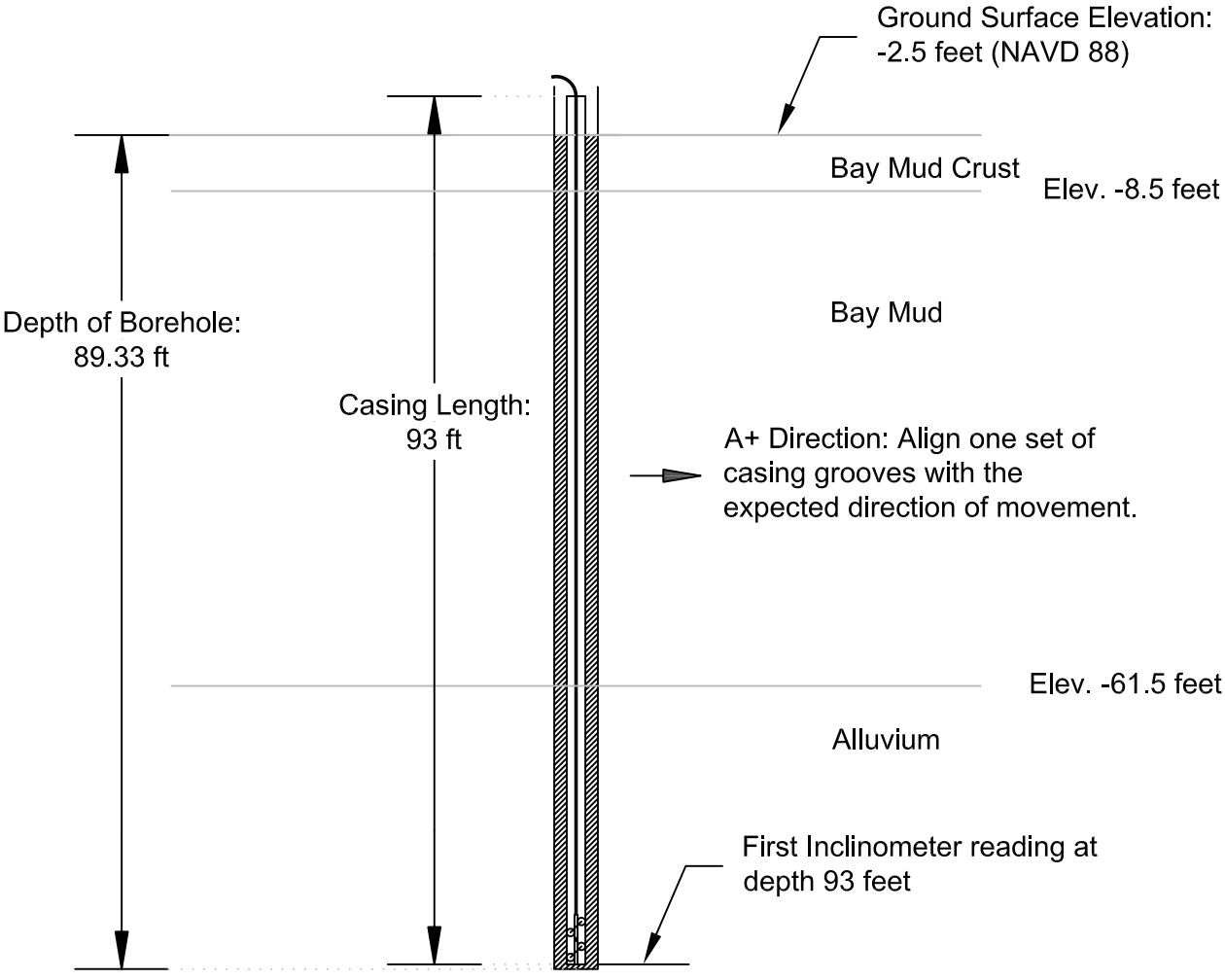
Inclinometer Completion Diagram at Boring 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-1

Plan View



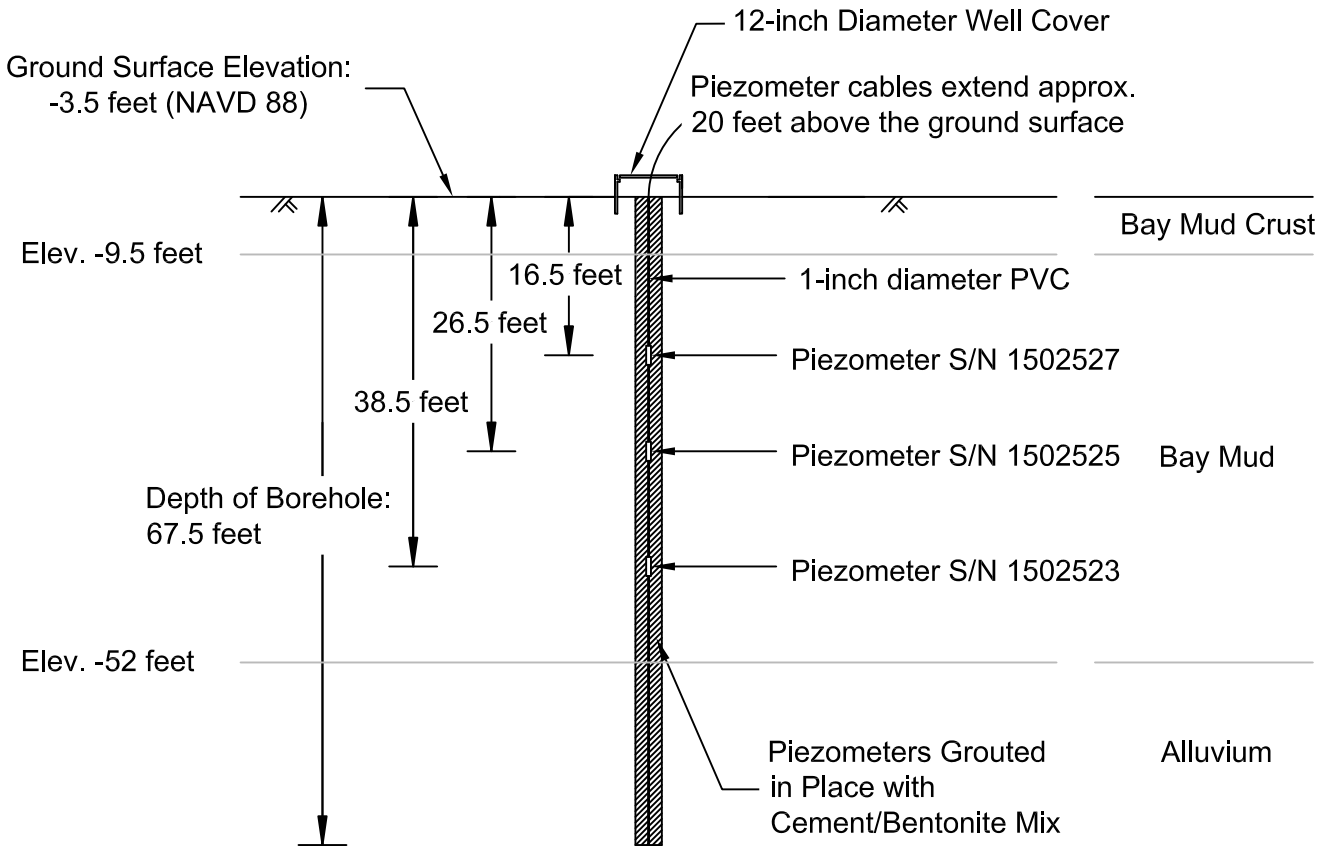
Profile



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Inclinometer Completion Diagram at Boring 4

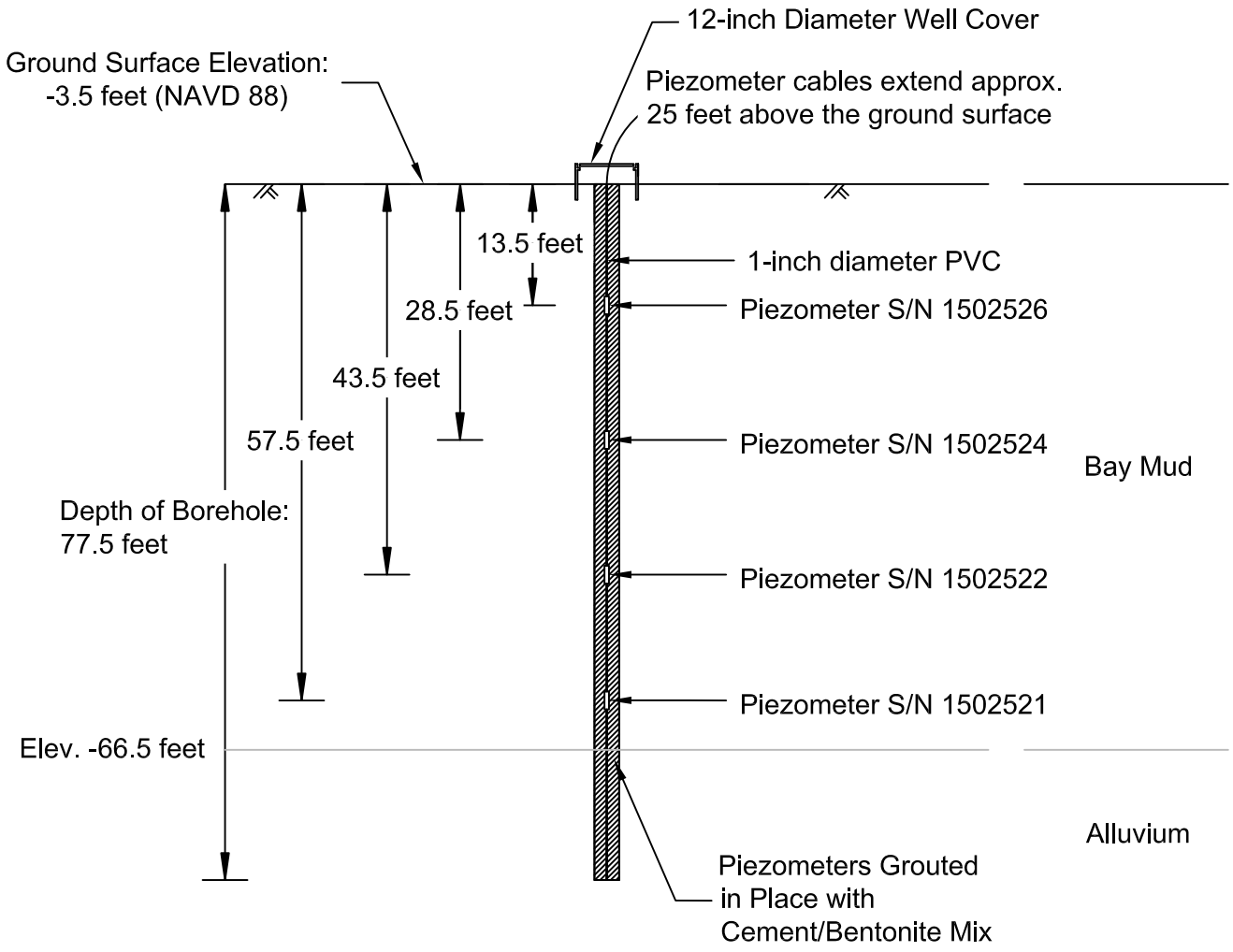
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-2



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Piezometer Installation at Boring 2

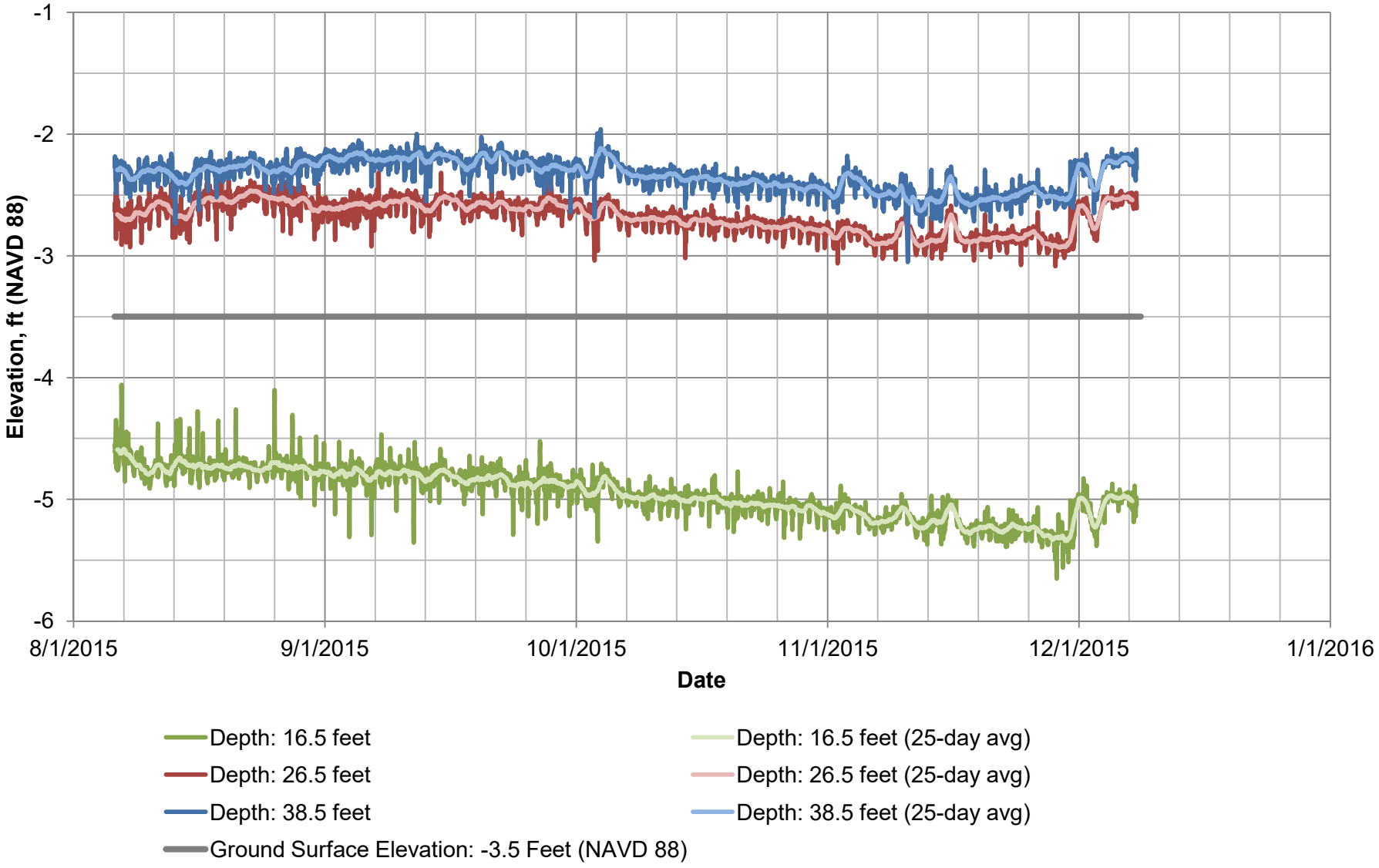
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-3



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Piezometer Installation at Boring 5

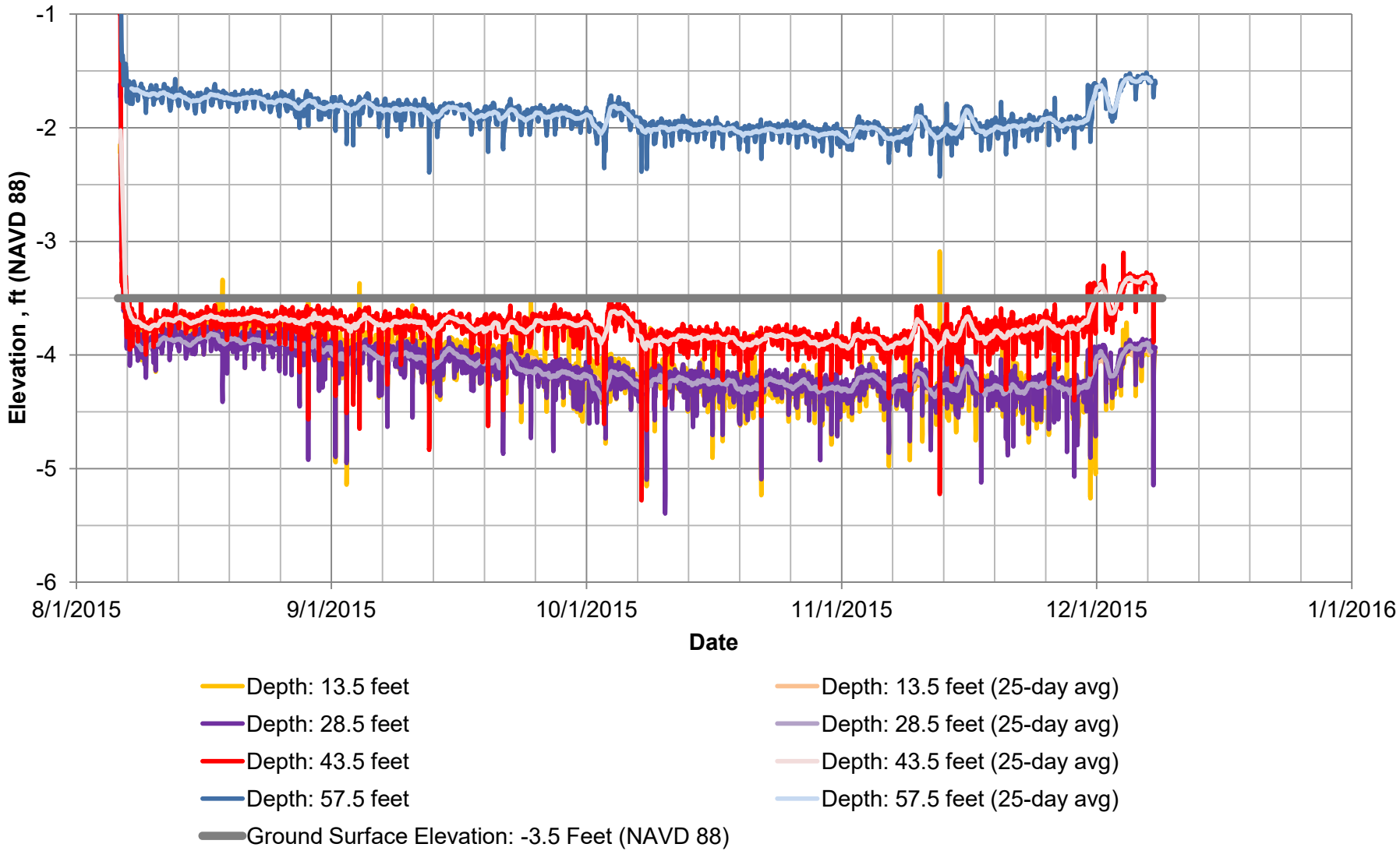
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-4



Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Piezometer Data
Boring 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-5

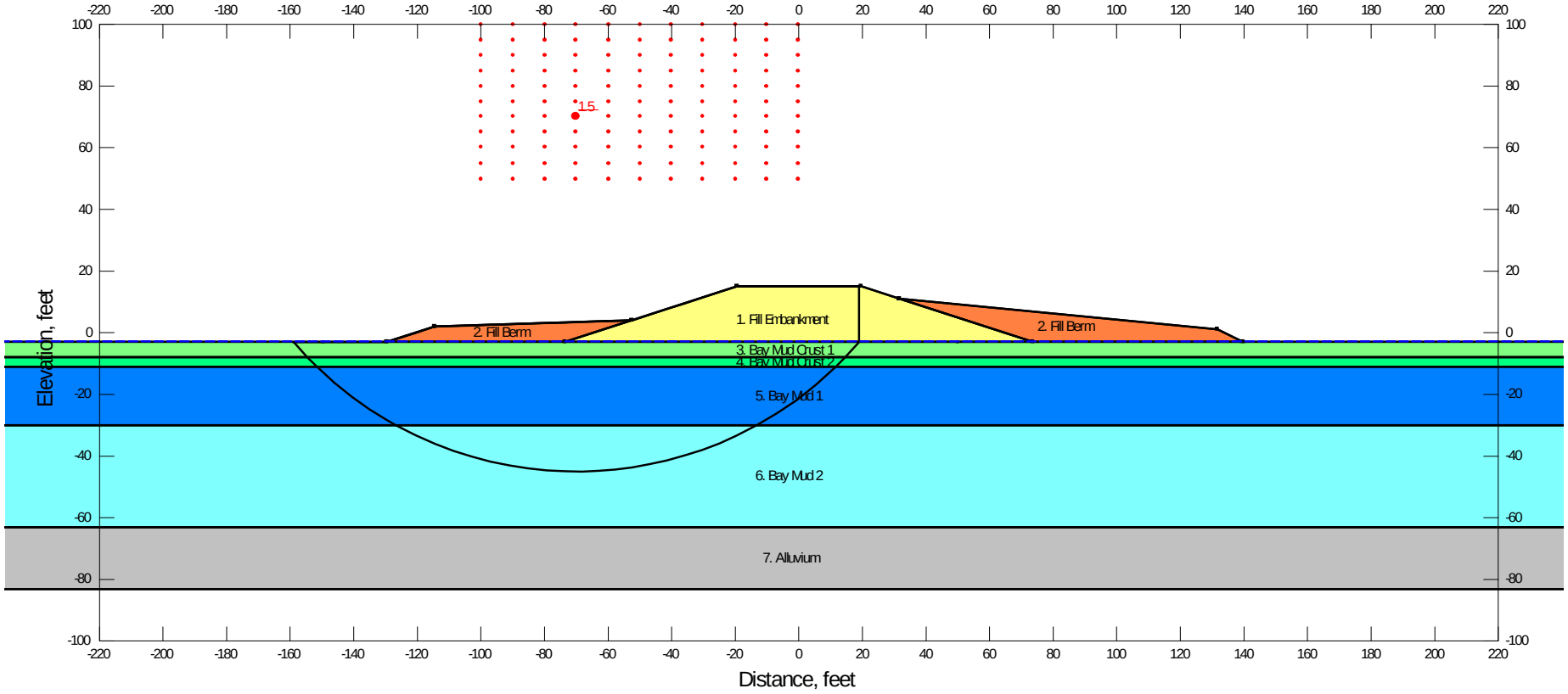


Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Piezometer Data
Boring 5

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. C-6

APPENDIX D

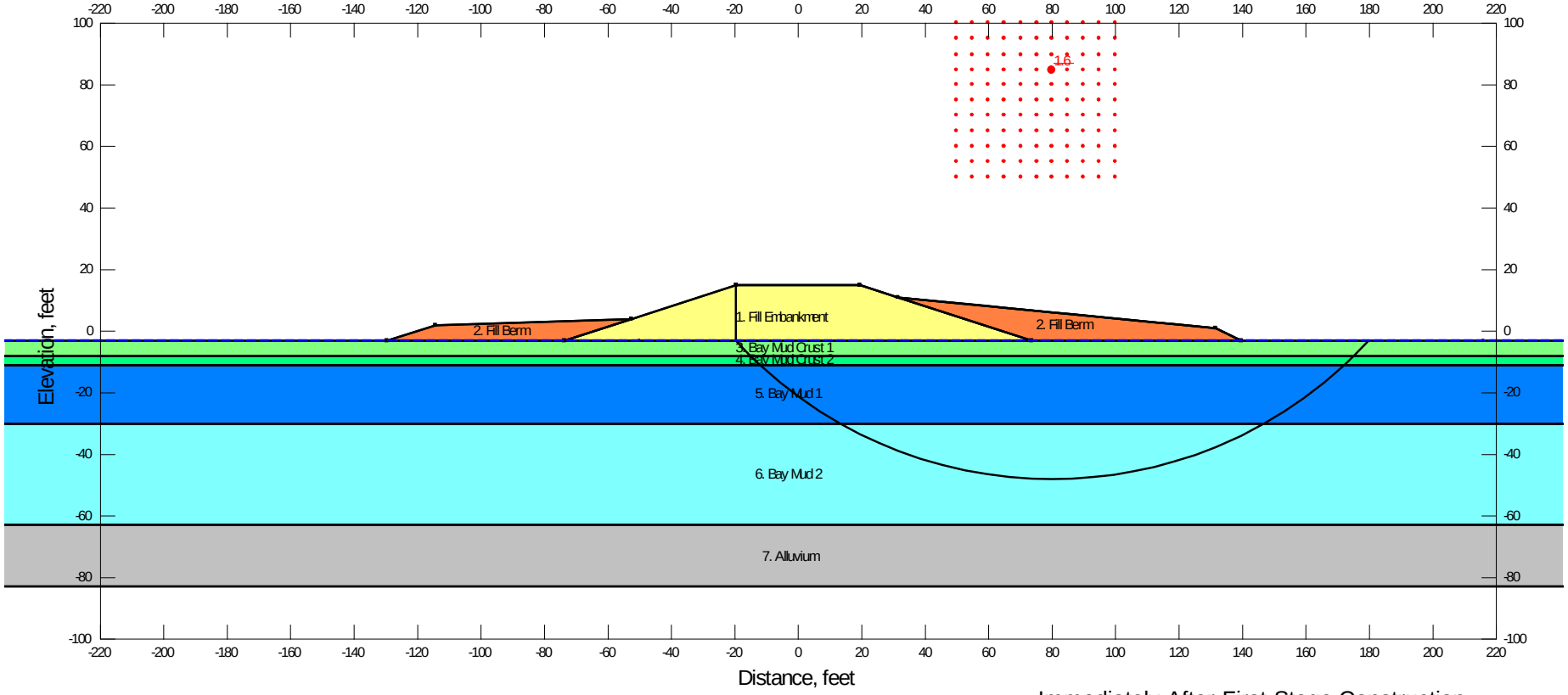


Immediately-After-First-Stage Construction
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-1

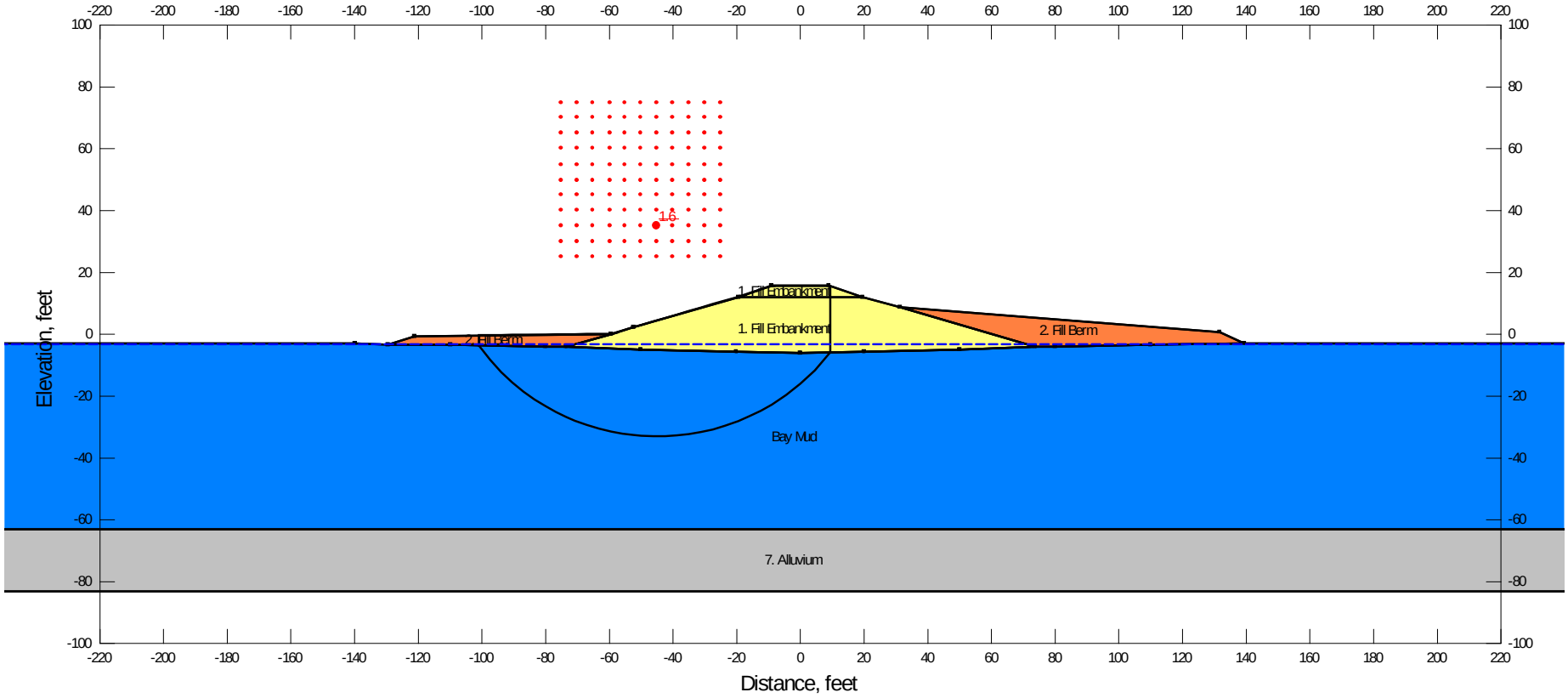


Immediately-After-First-Stage Construction
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

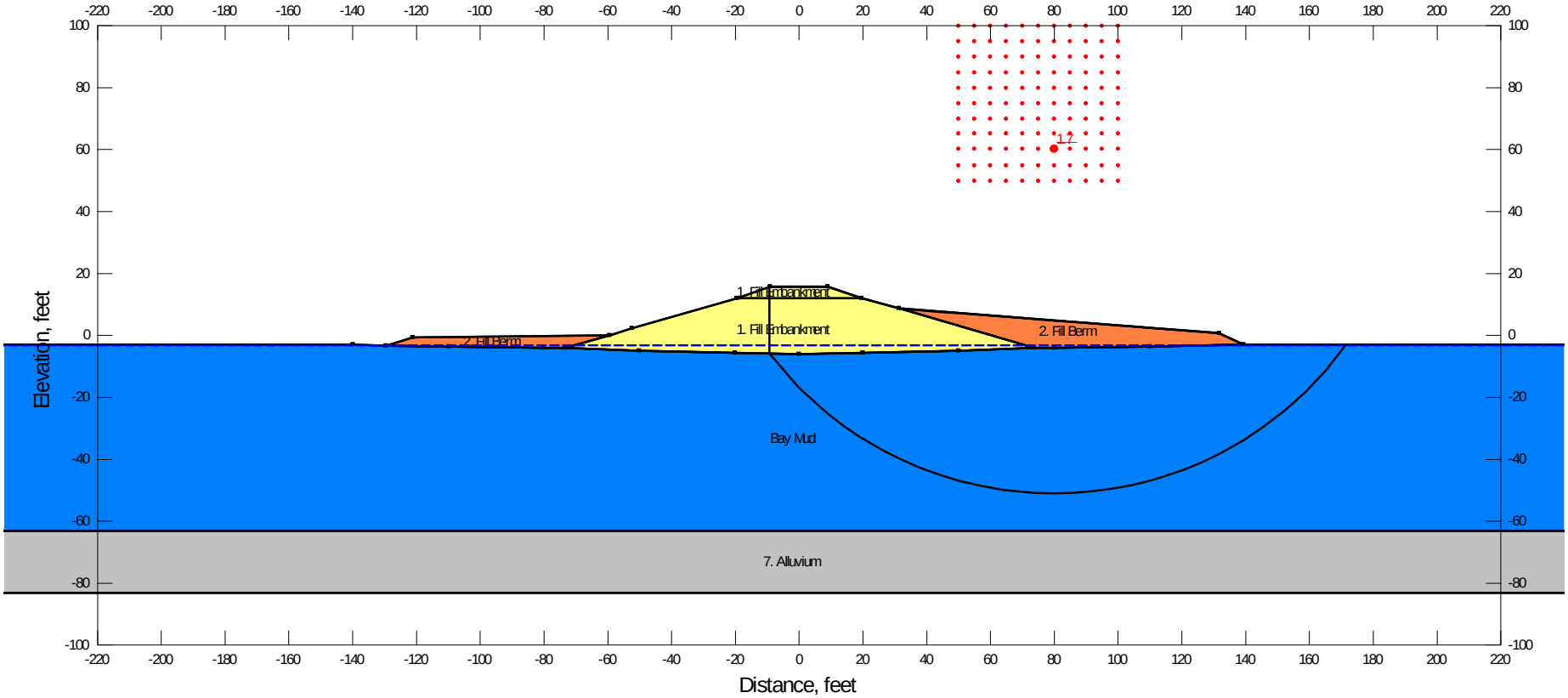
Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-2



Immediately-After-Second-Stage Construction
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration New Bayfront Levee Marin County, California	**Slope Stability Results** **Soil Profile 1**	
Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-3

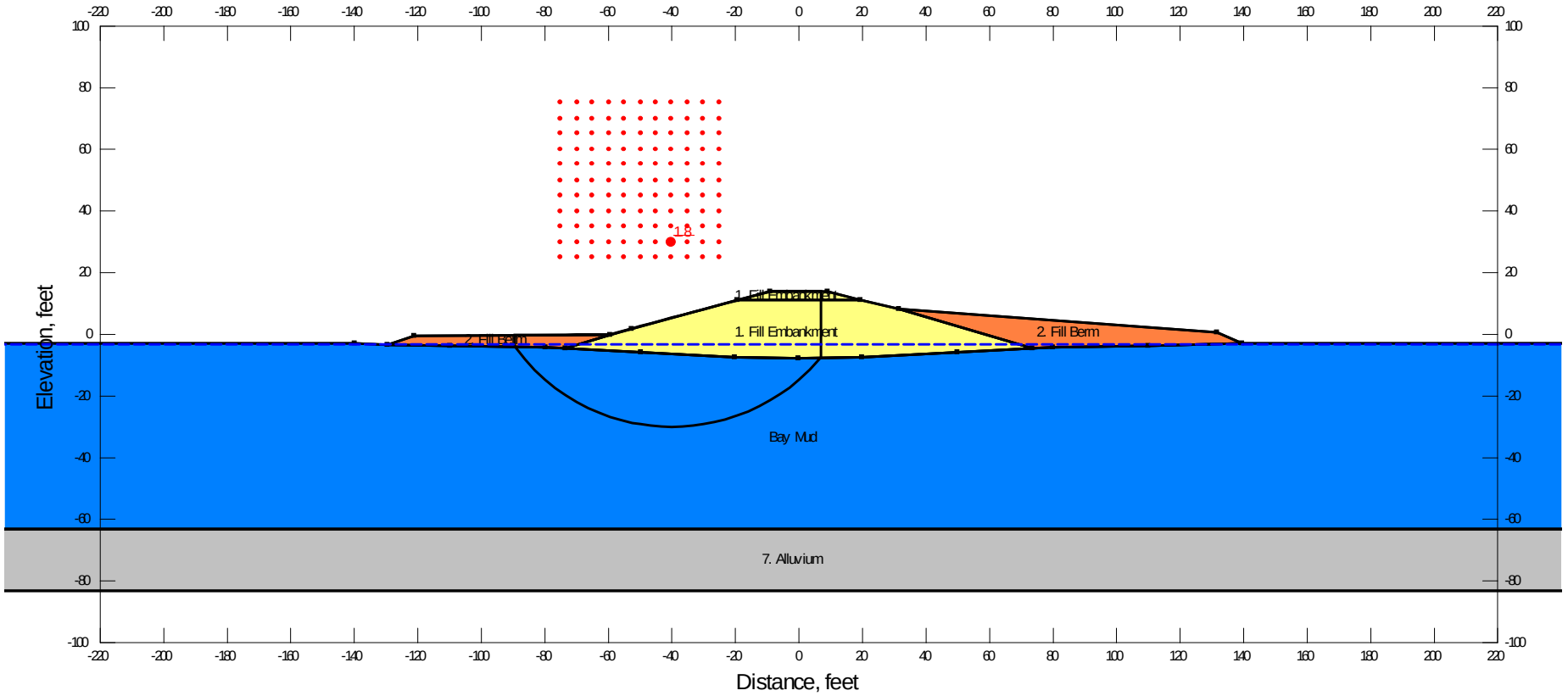


Immediately-After-Second-Stage Construction
Waterside Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-4

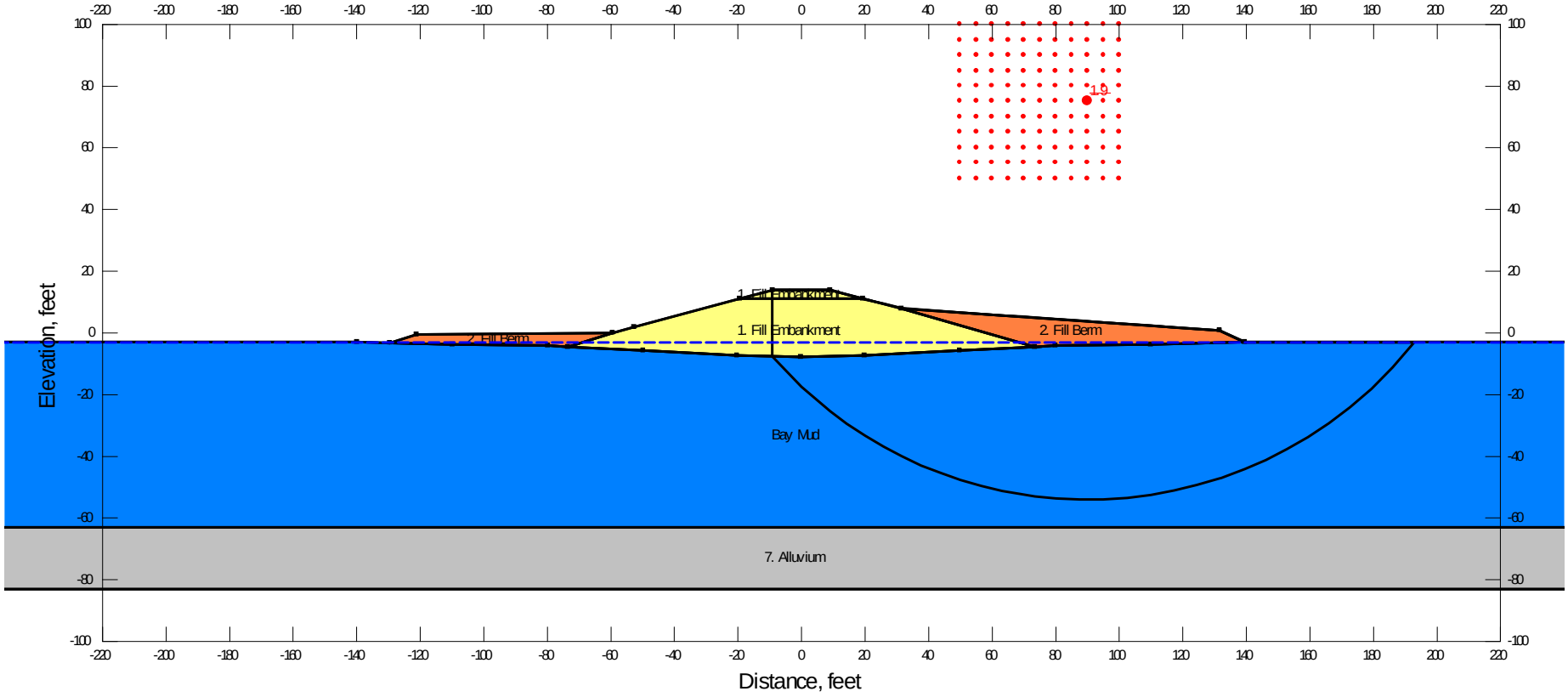


Long-Term
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-5

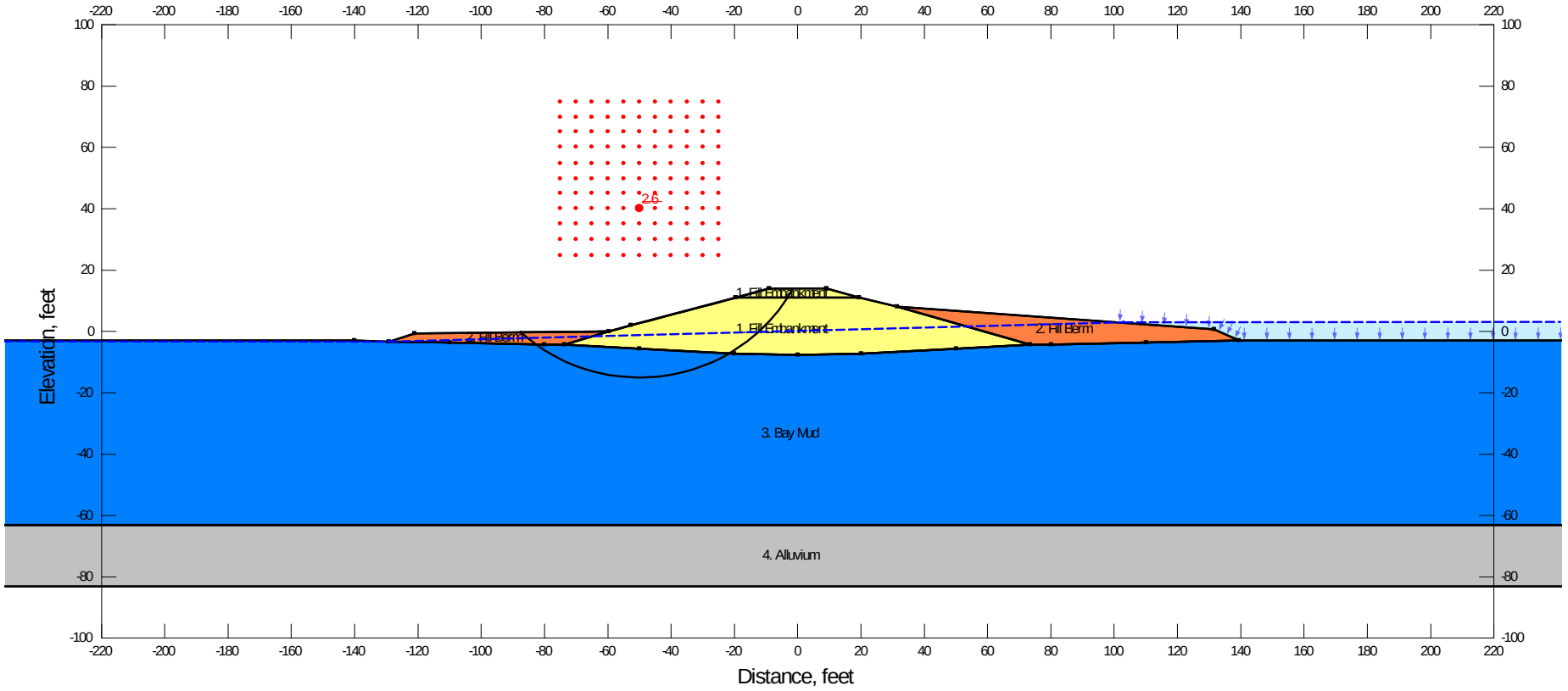


Long-Term
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-6

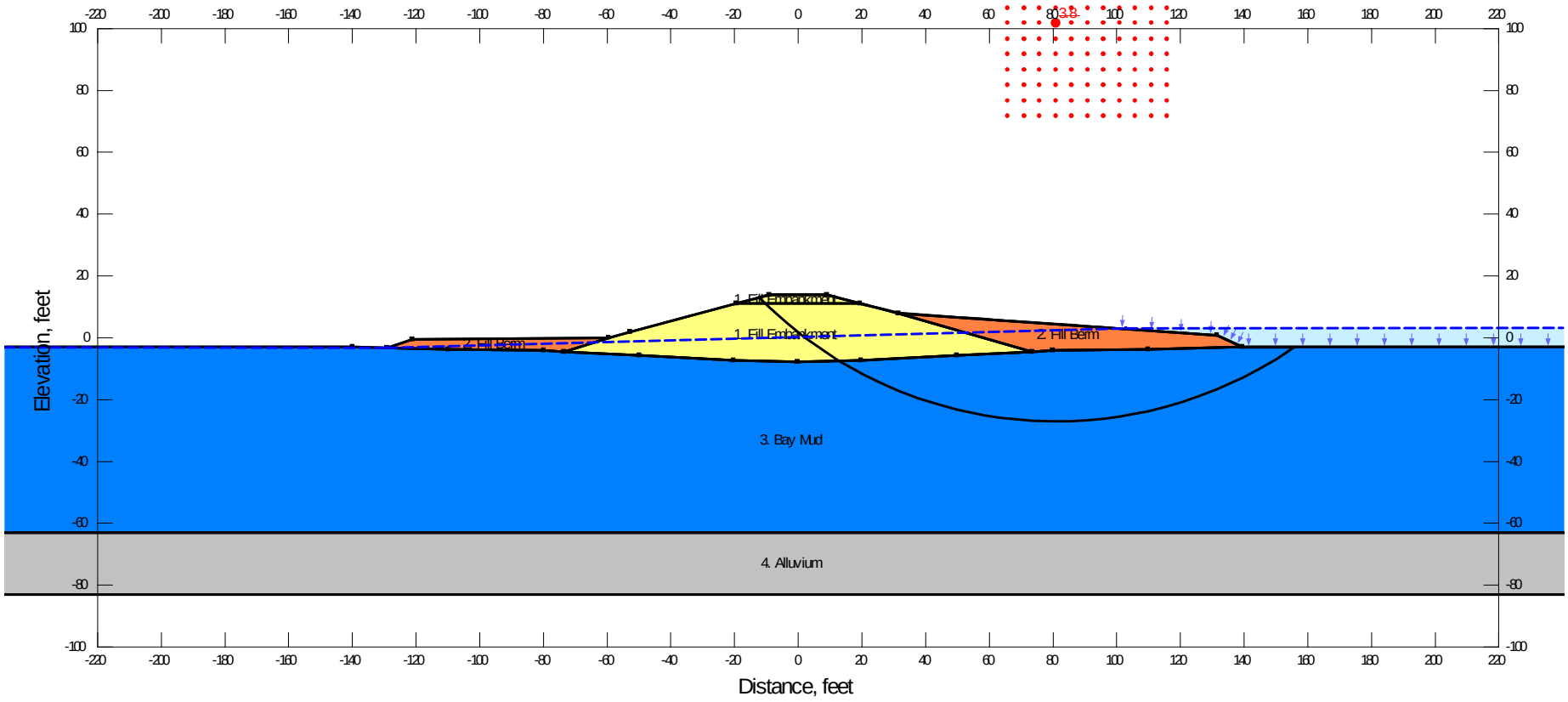


Long-Term
Landside, Effective Stress Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-7

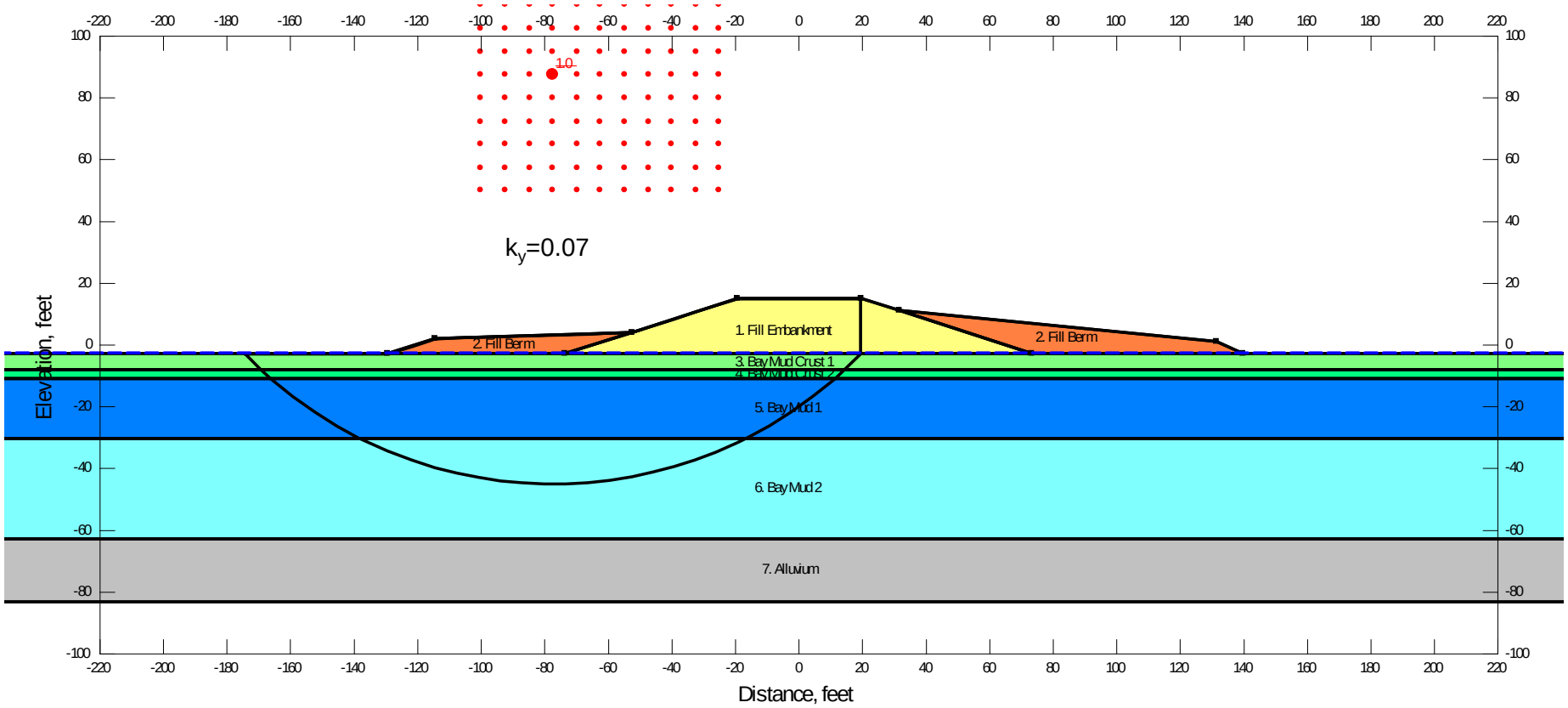


Long-Term
Waterside, Effective Stress Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-8

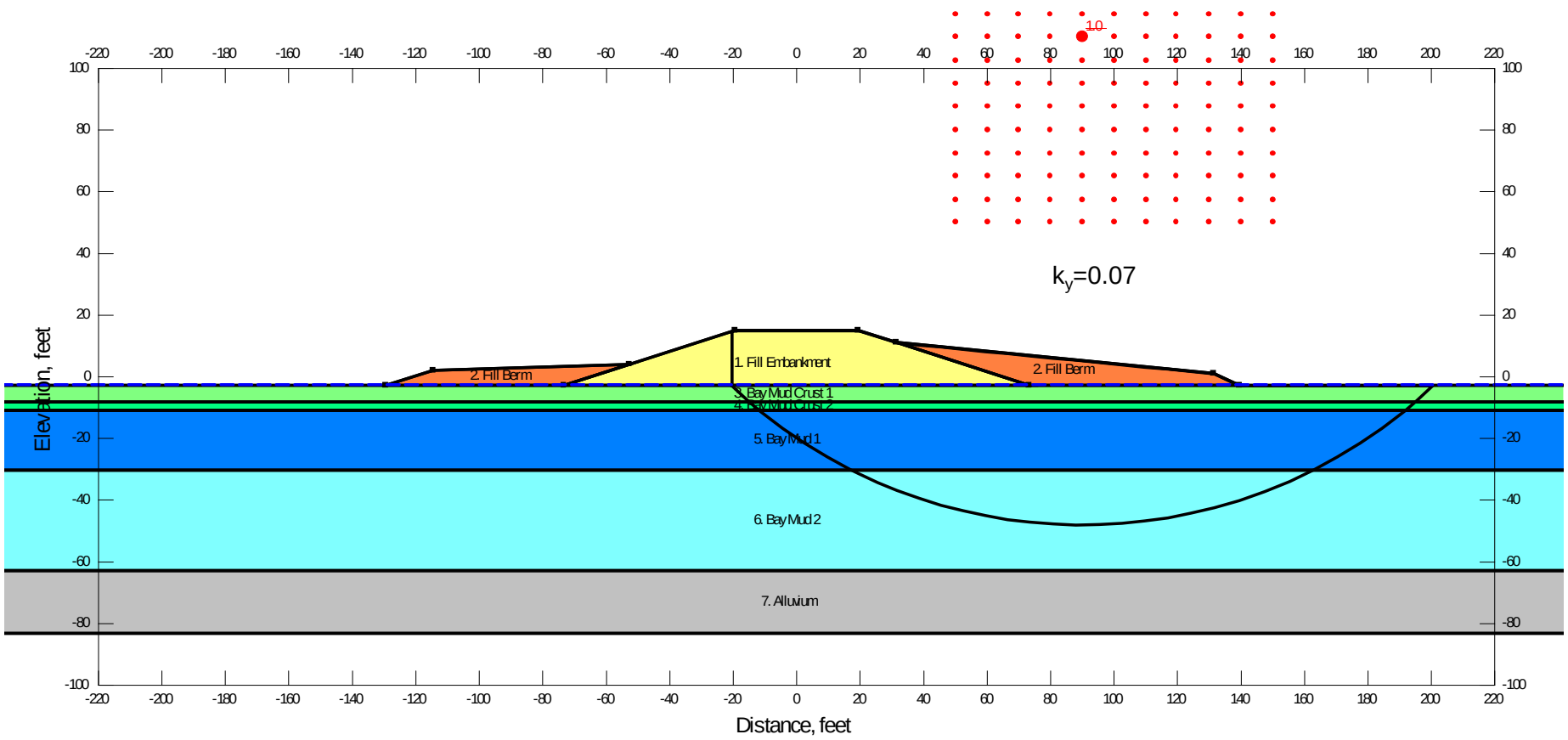


Immediately-After-First-Stage Construction
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 818.01	Plate No. D-9

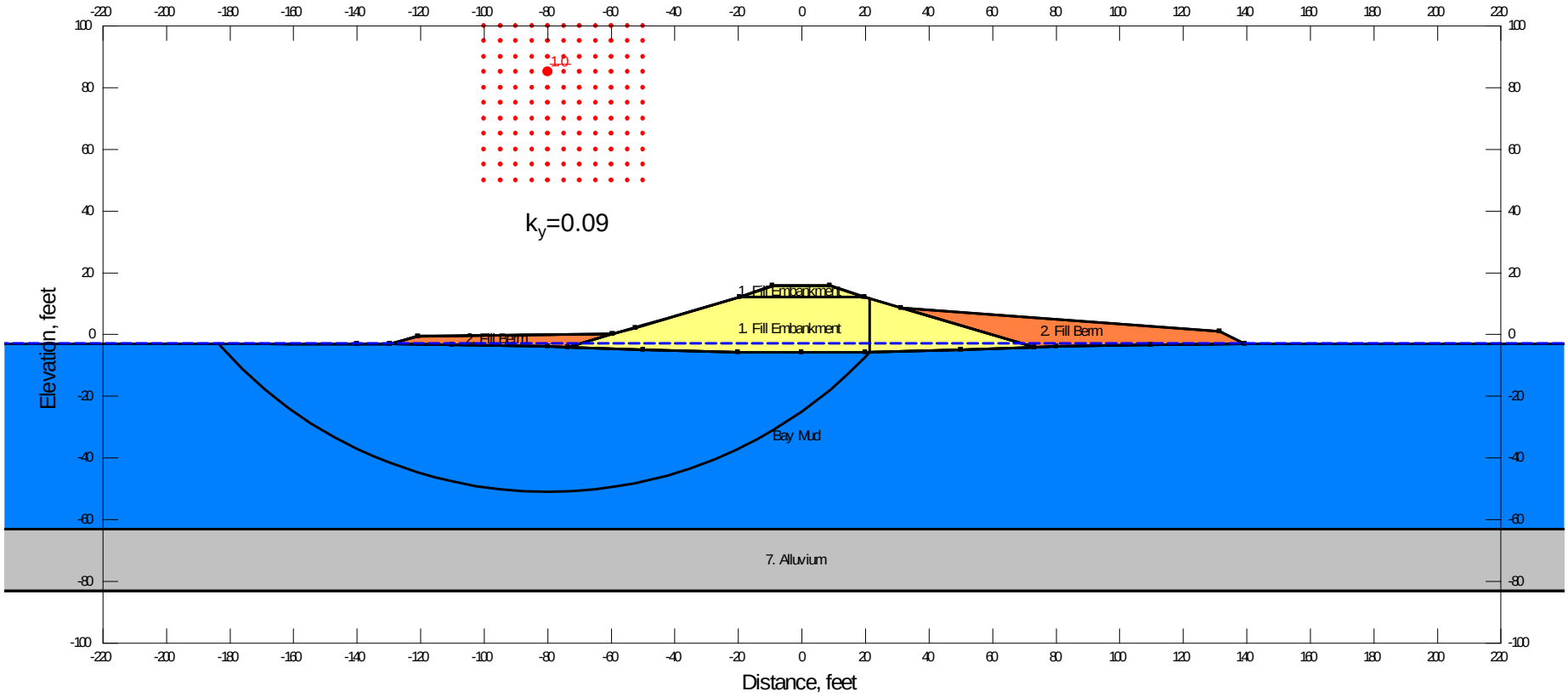


Immediately-After-First-Stage Construction
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-10

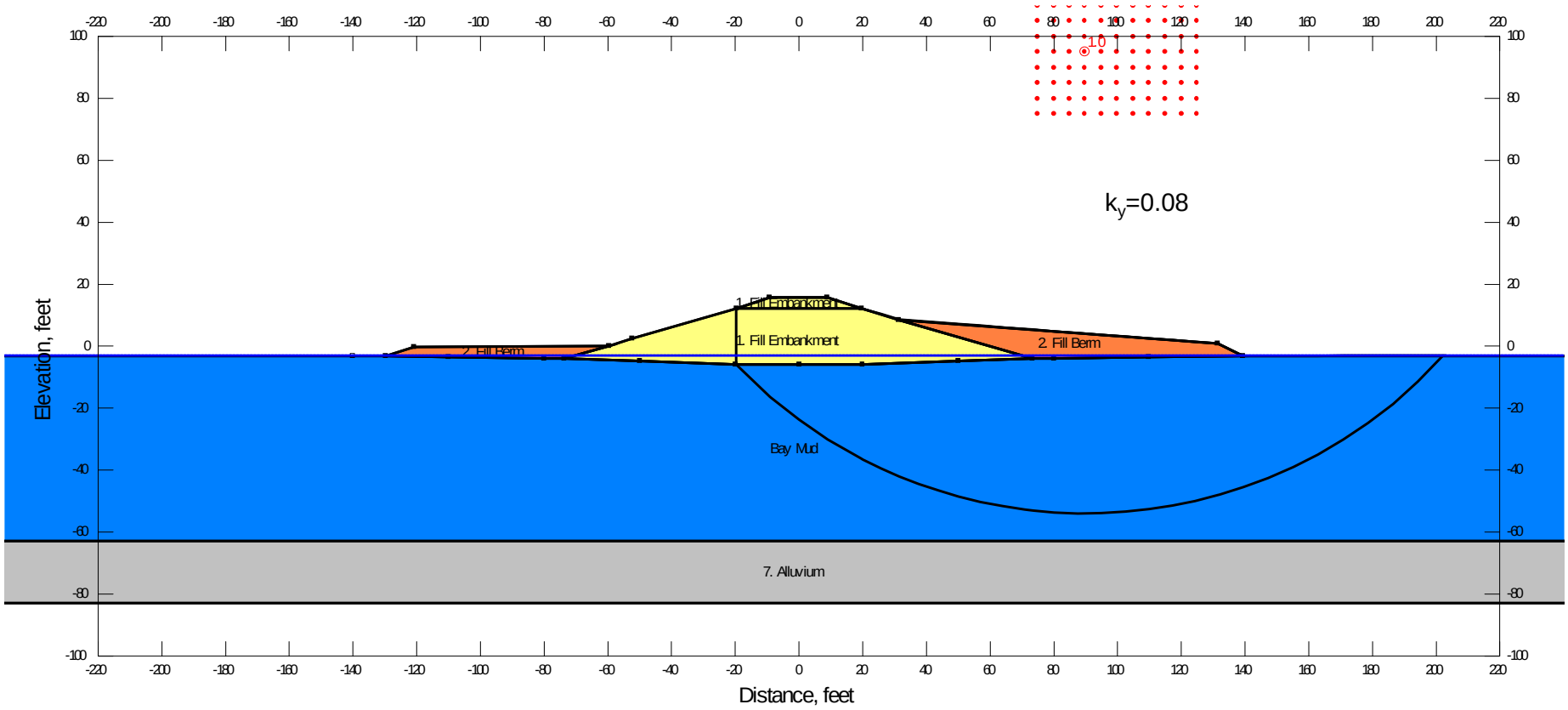


Immediately-After-Second-Stage Construction
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-11

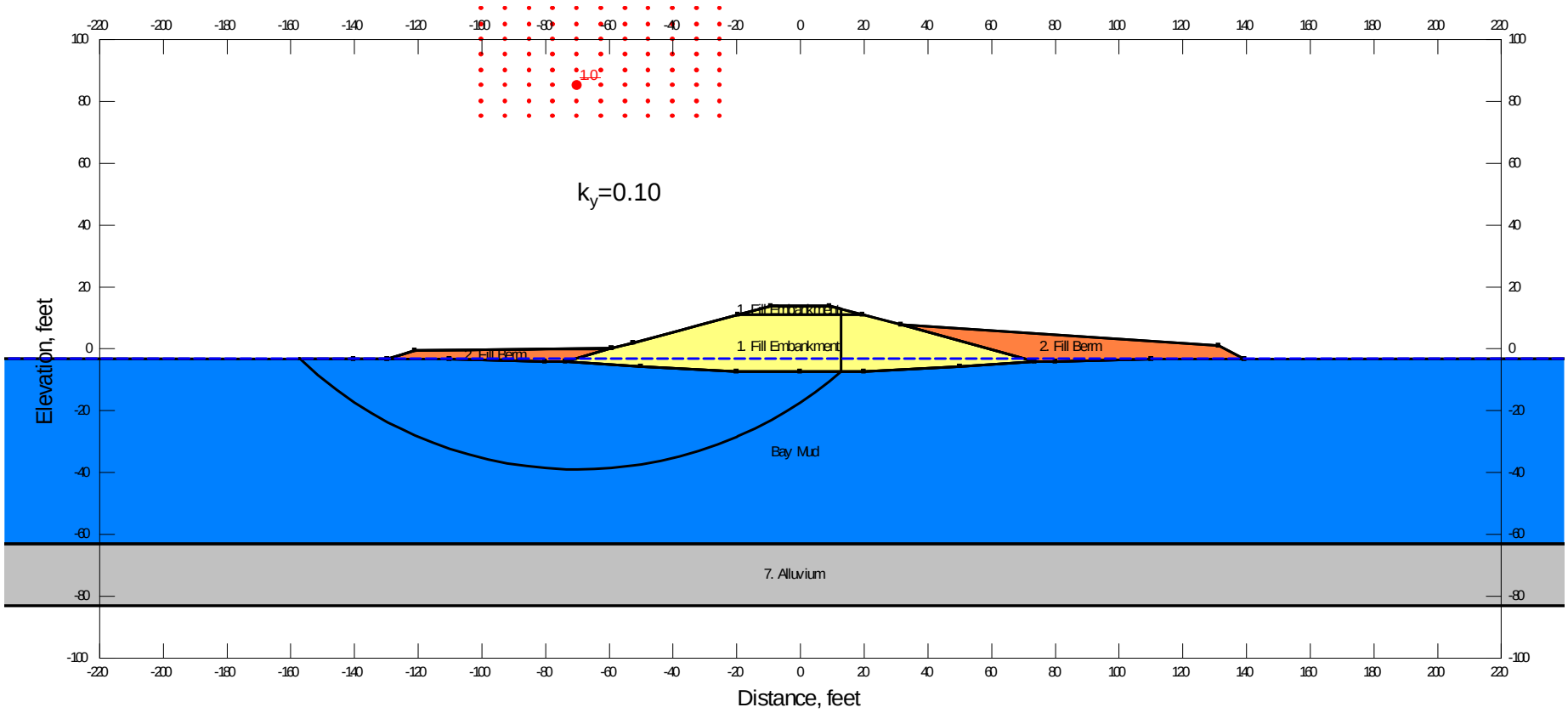


Immediately-After-Second-Stage Construction
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-12

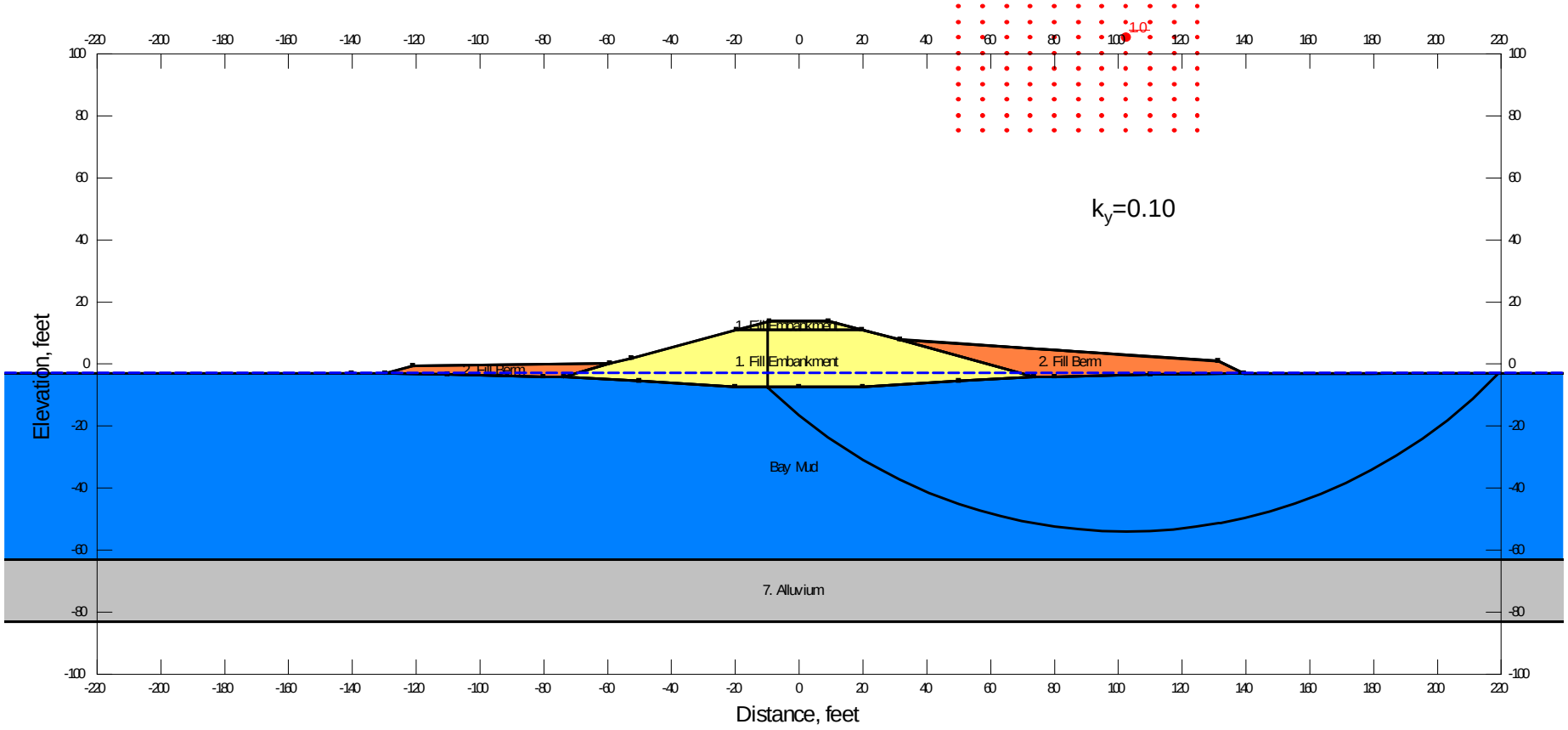


Long-Term
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-13

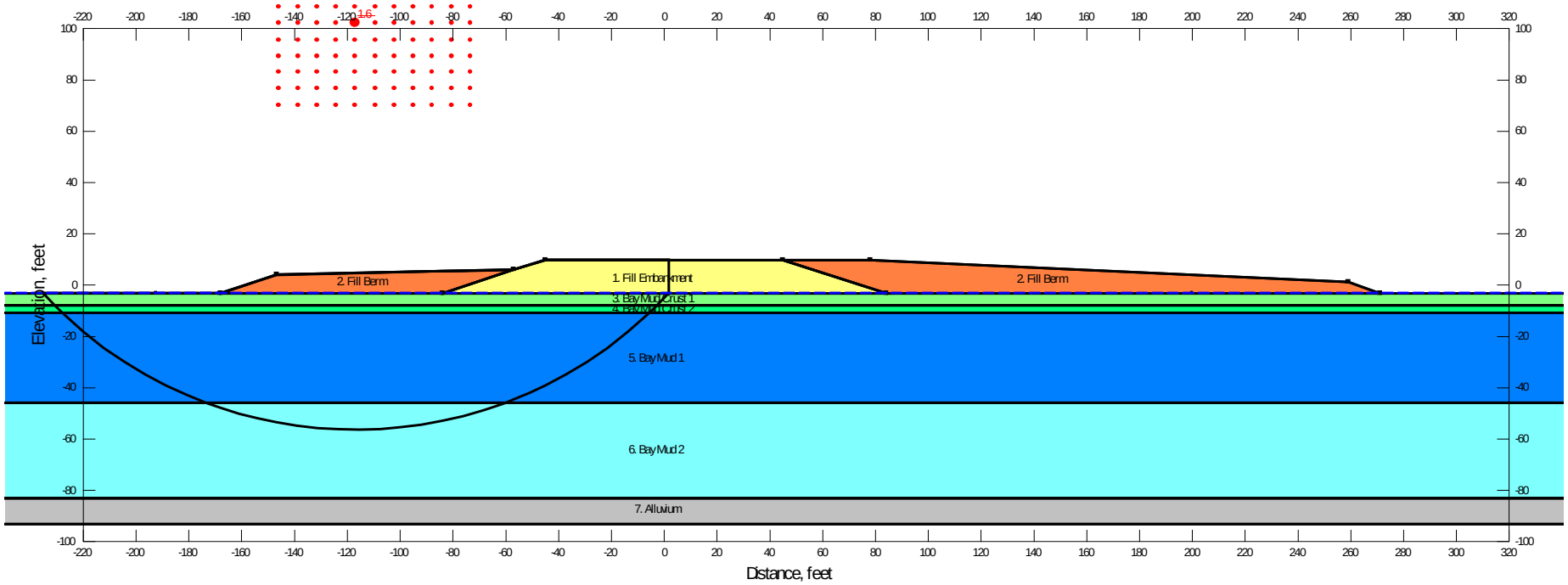


Long-Term
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 1

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-14

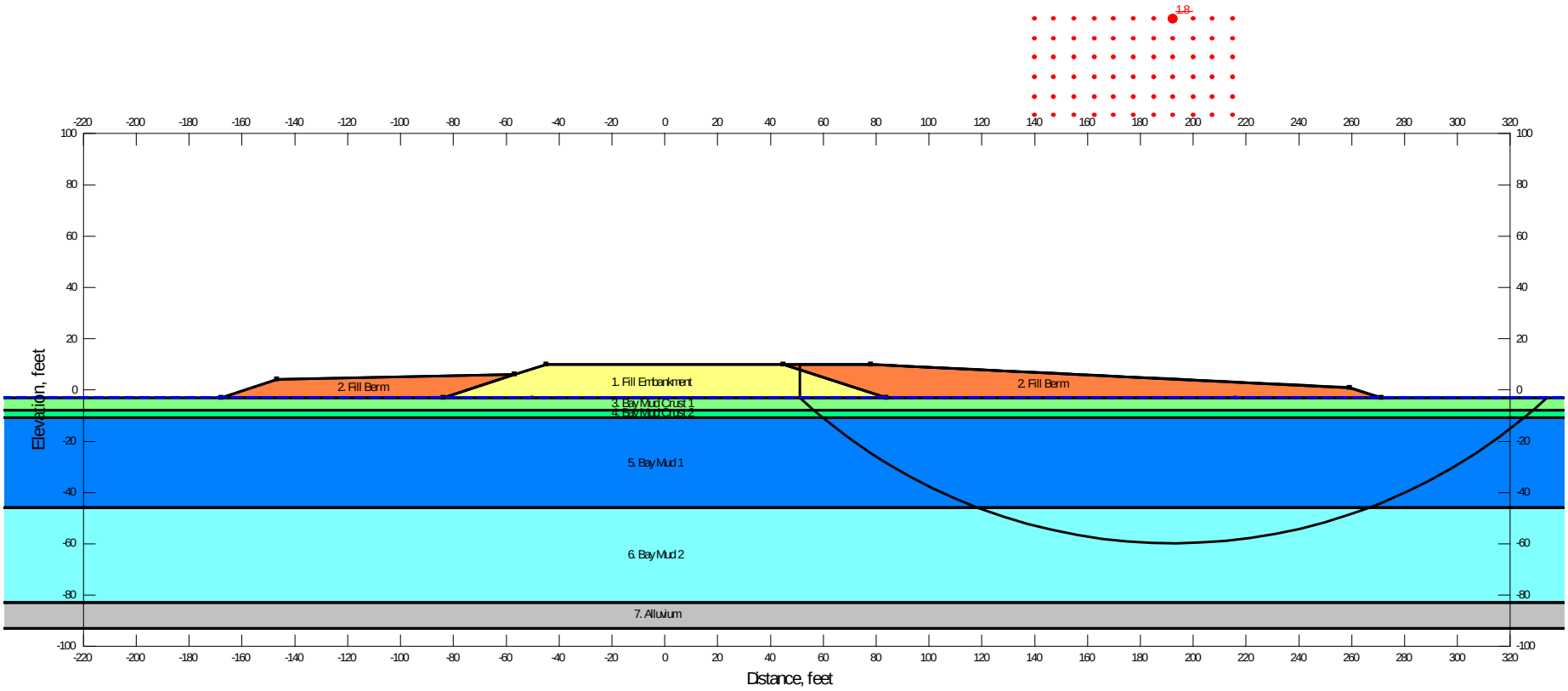


Immediately-After-First-Stage Construction (Year One)
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-15

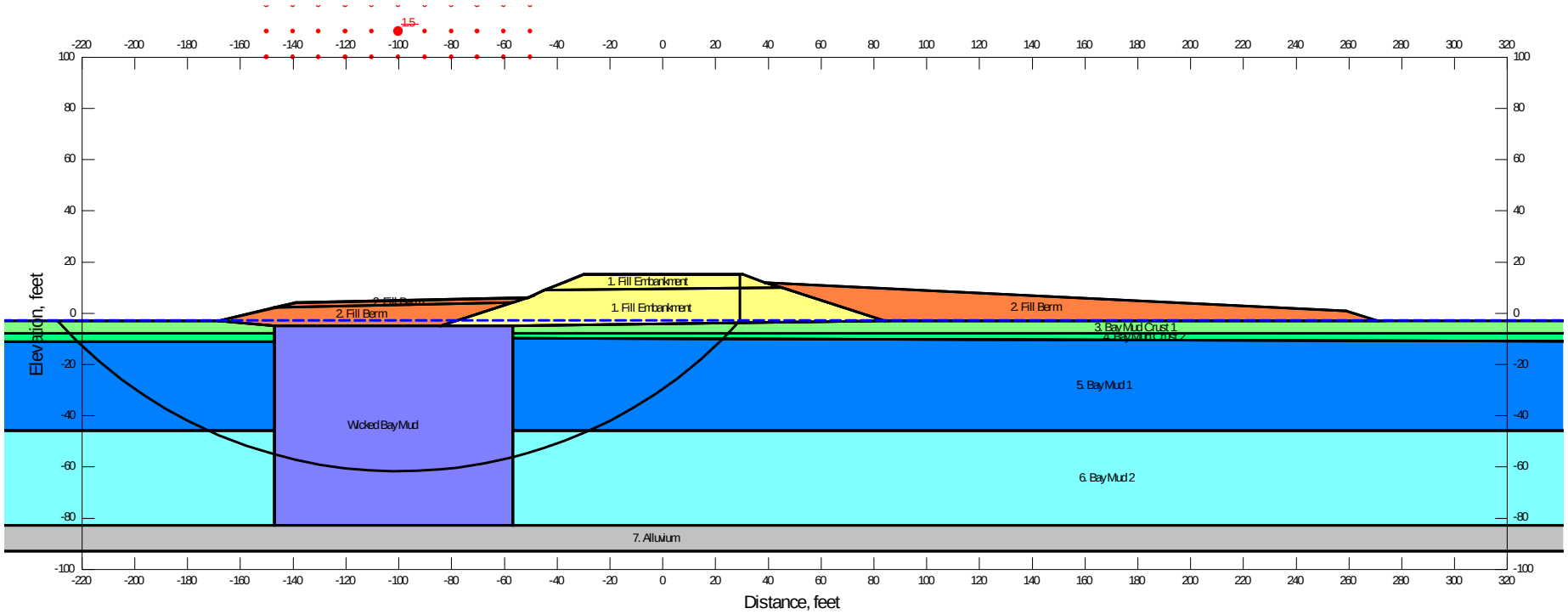


Immediately-After-First-Stage Construction (Year One)
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-16

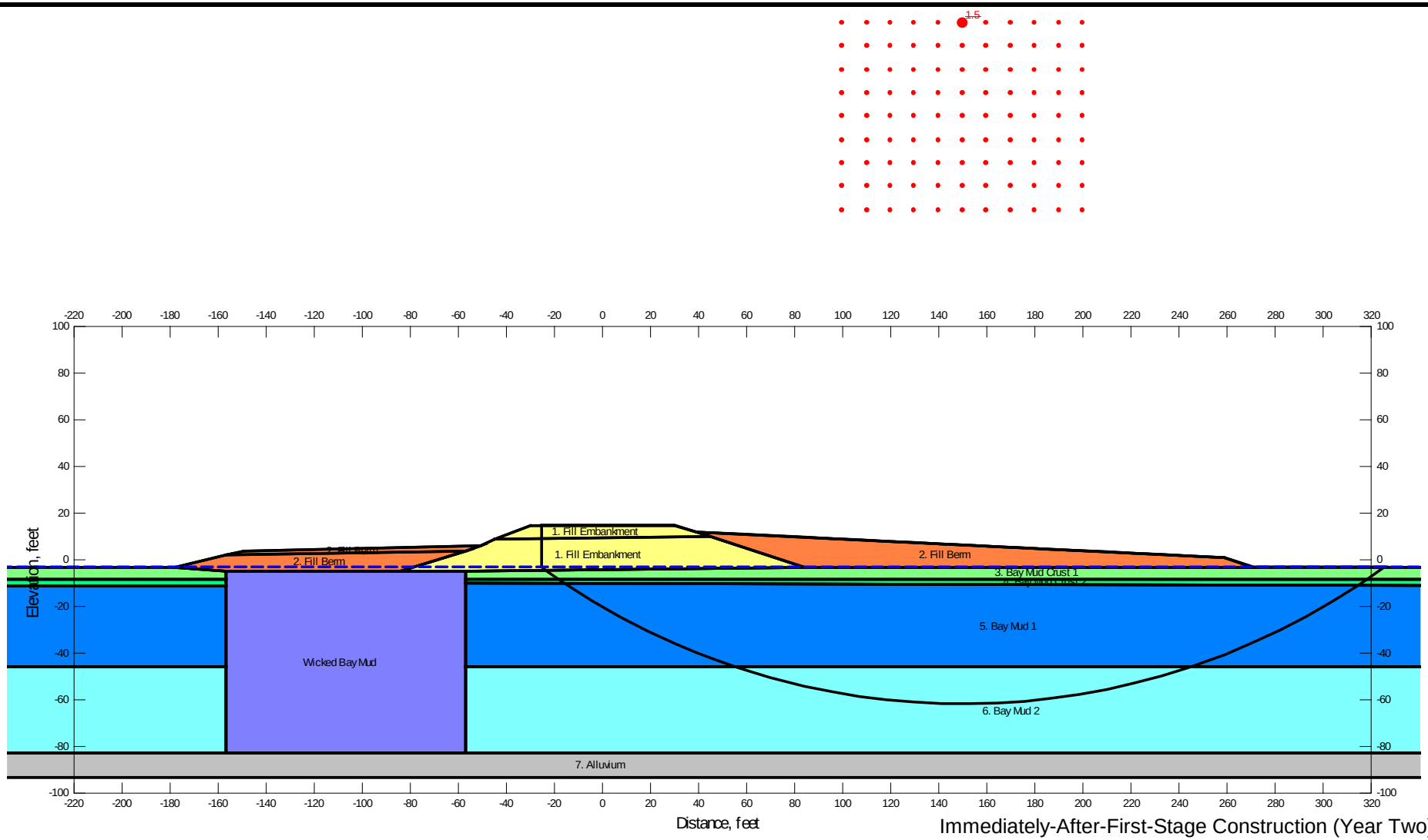


Immediately-After-First-Stage Construction (Year Two)
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-17

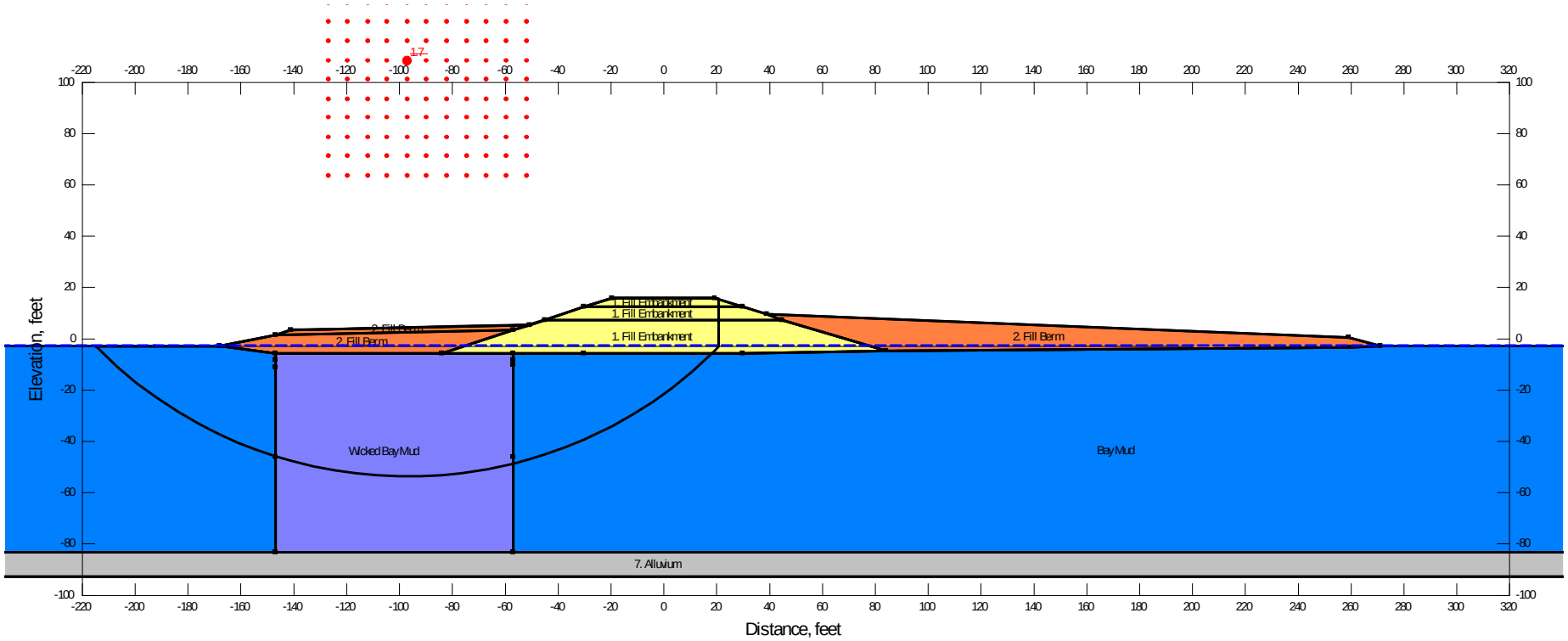


Immediately-After-First-Stage Construction (Year Two)
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-18

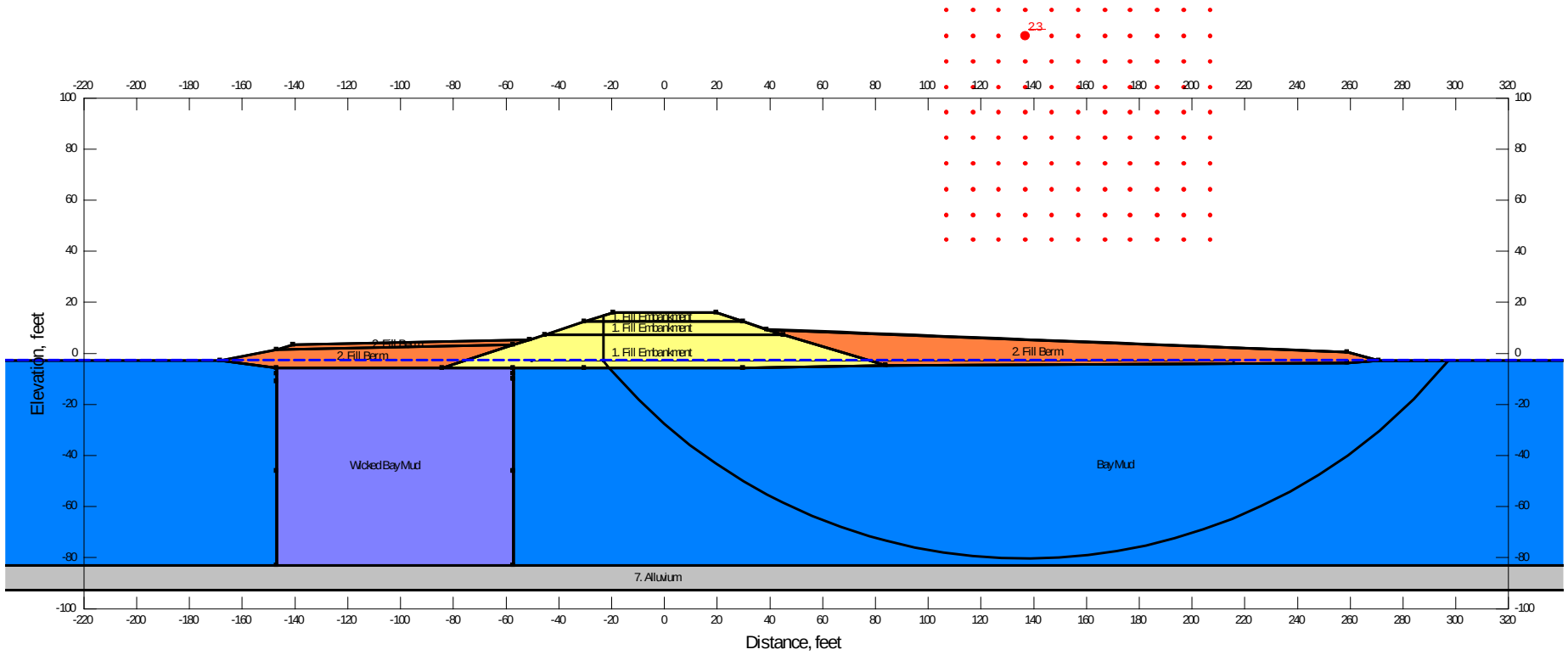


Immediately-After-Second-Stage Construction
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-19

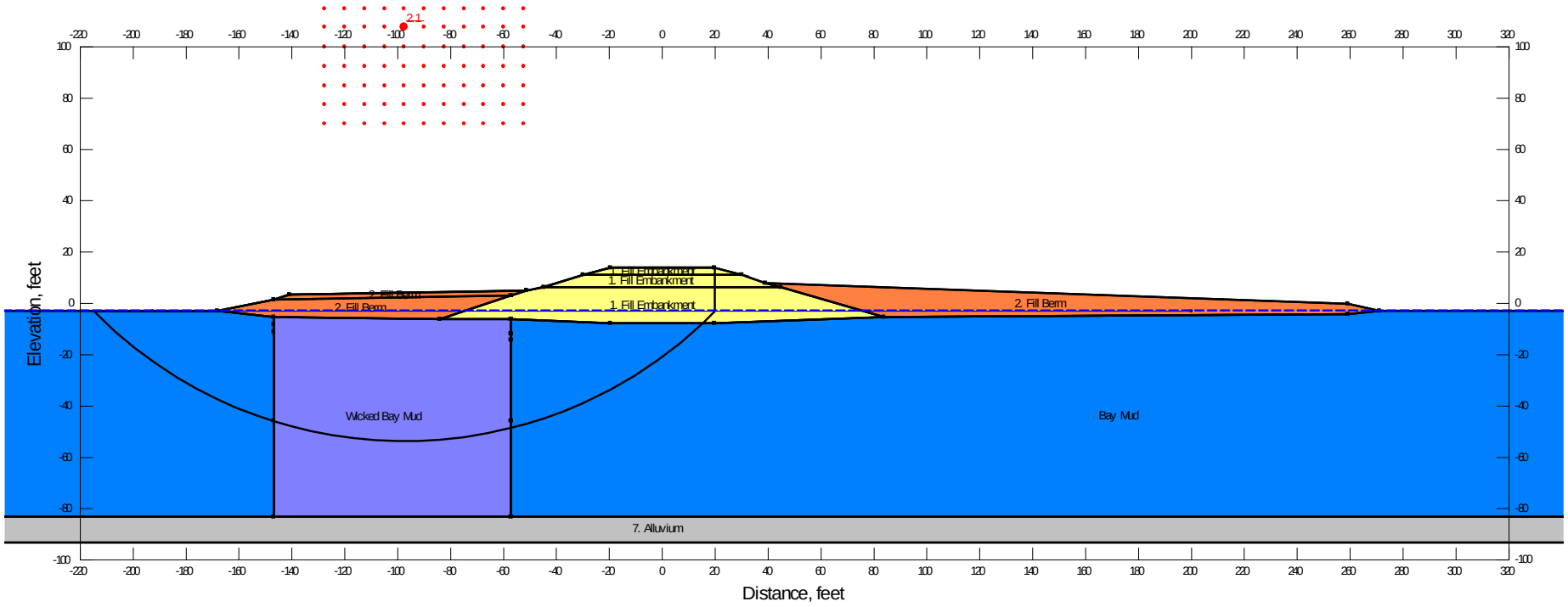


Immediately-After-Second-Stage Construction
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-20

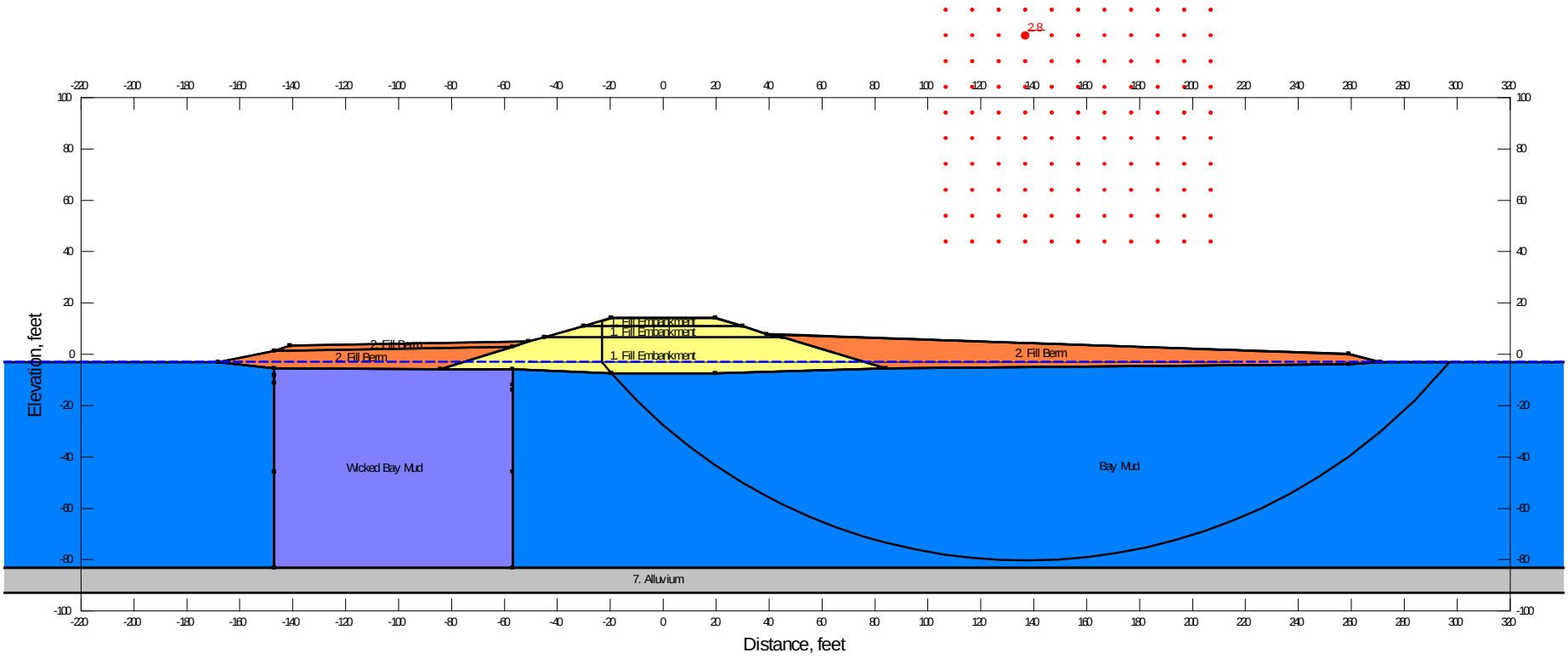


Long-Term
Landside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-21

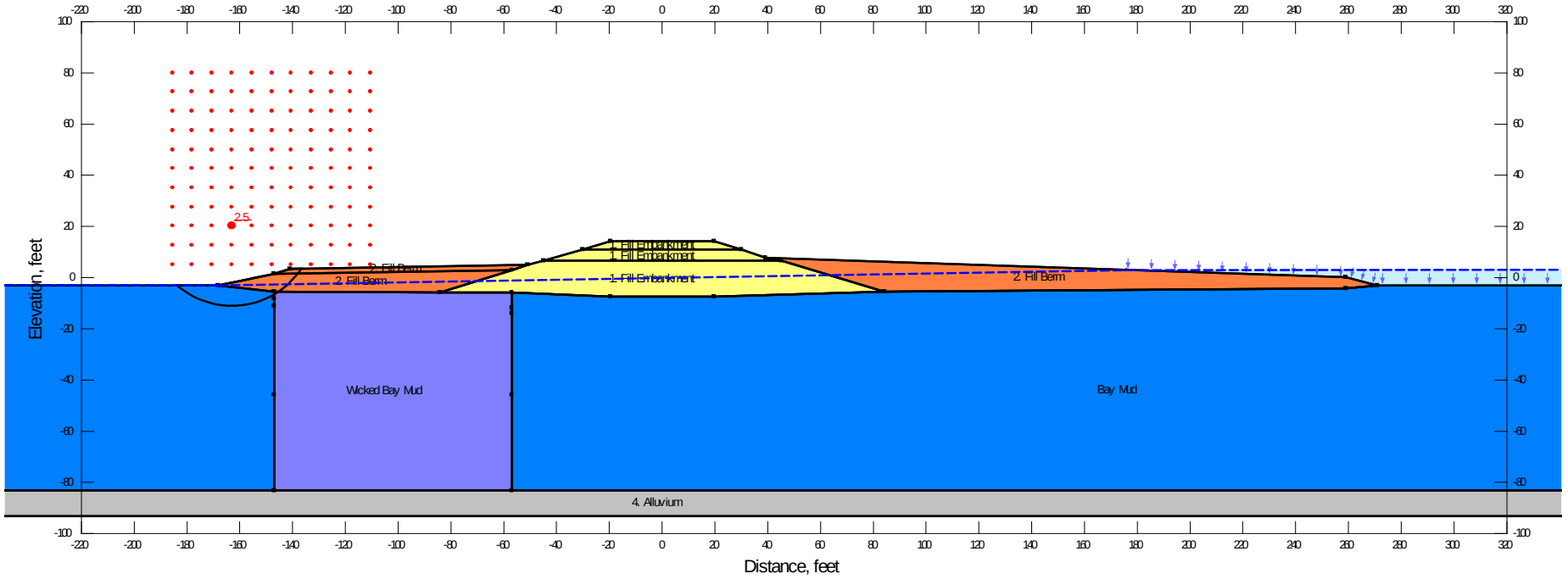


Long-Term
Waterside, Undrained Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-22

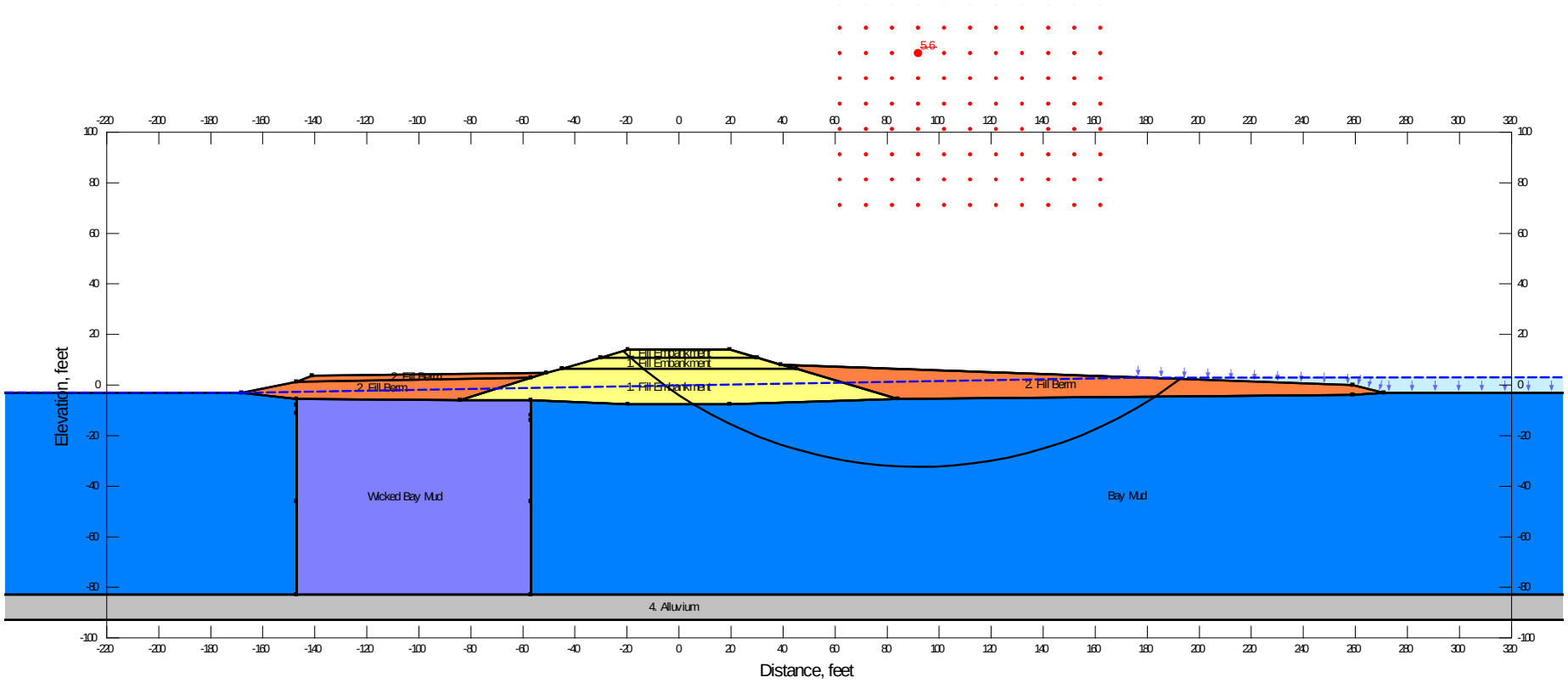


Long-Term
Landside, Effective Stress Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-23

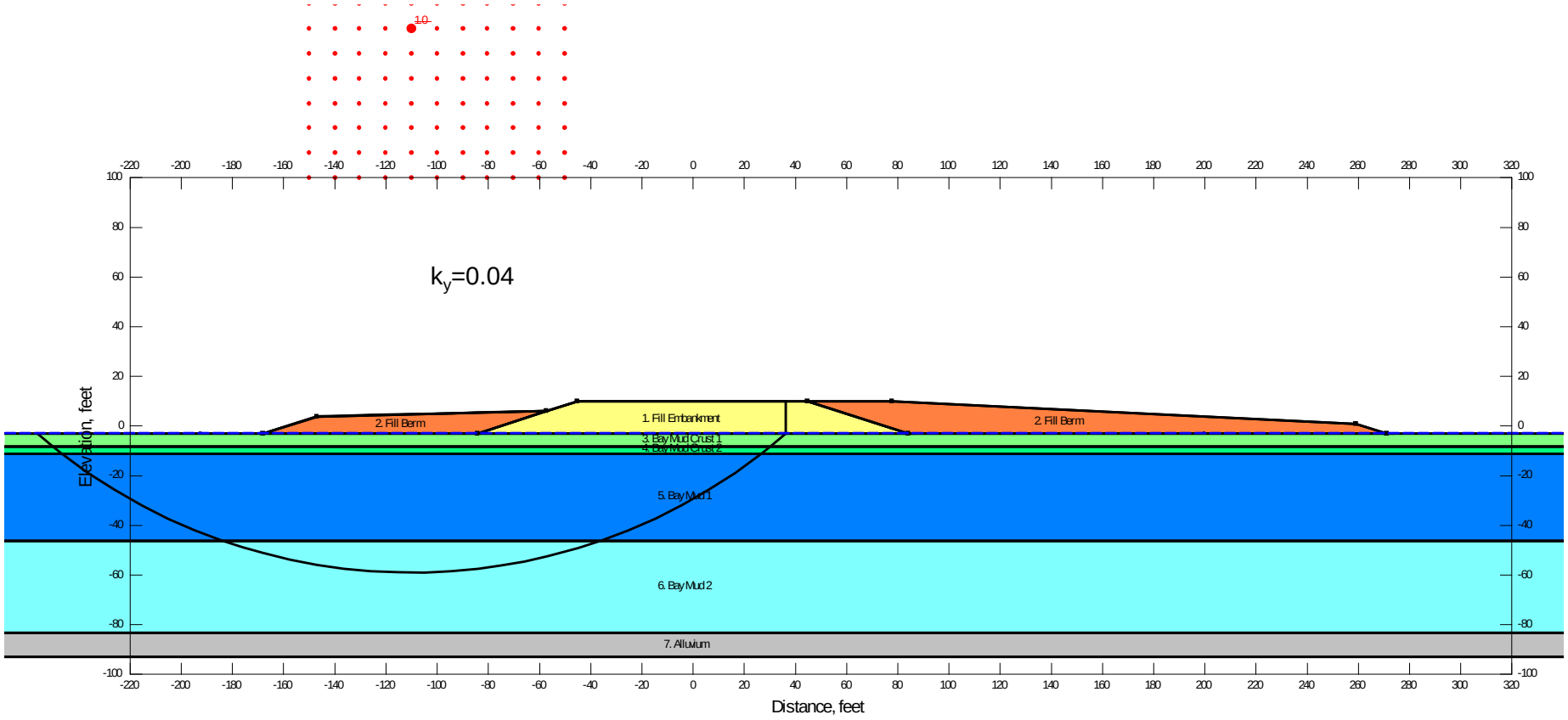


Long-Term
Waterside, Effective Stress Analysis

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-24

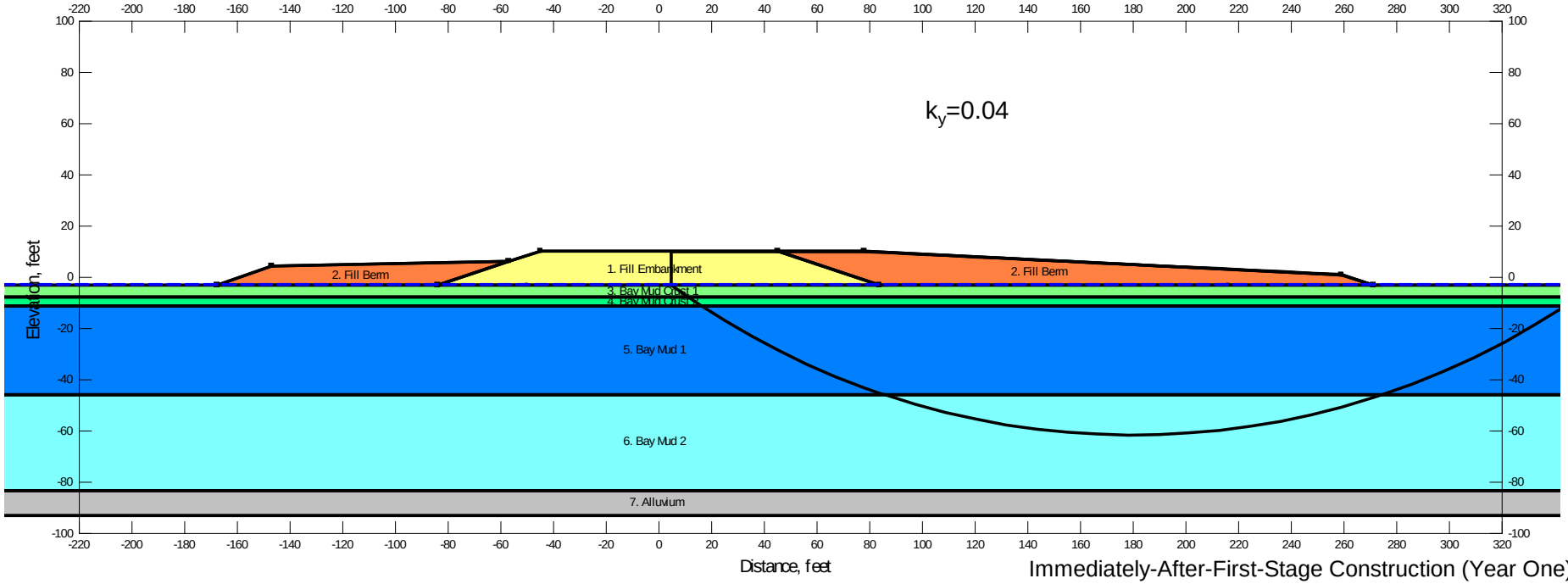


Immediately-After-First-Stage Construction (Year One)
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-25

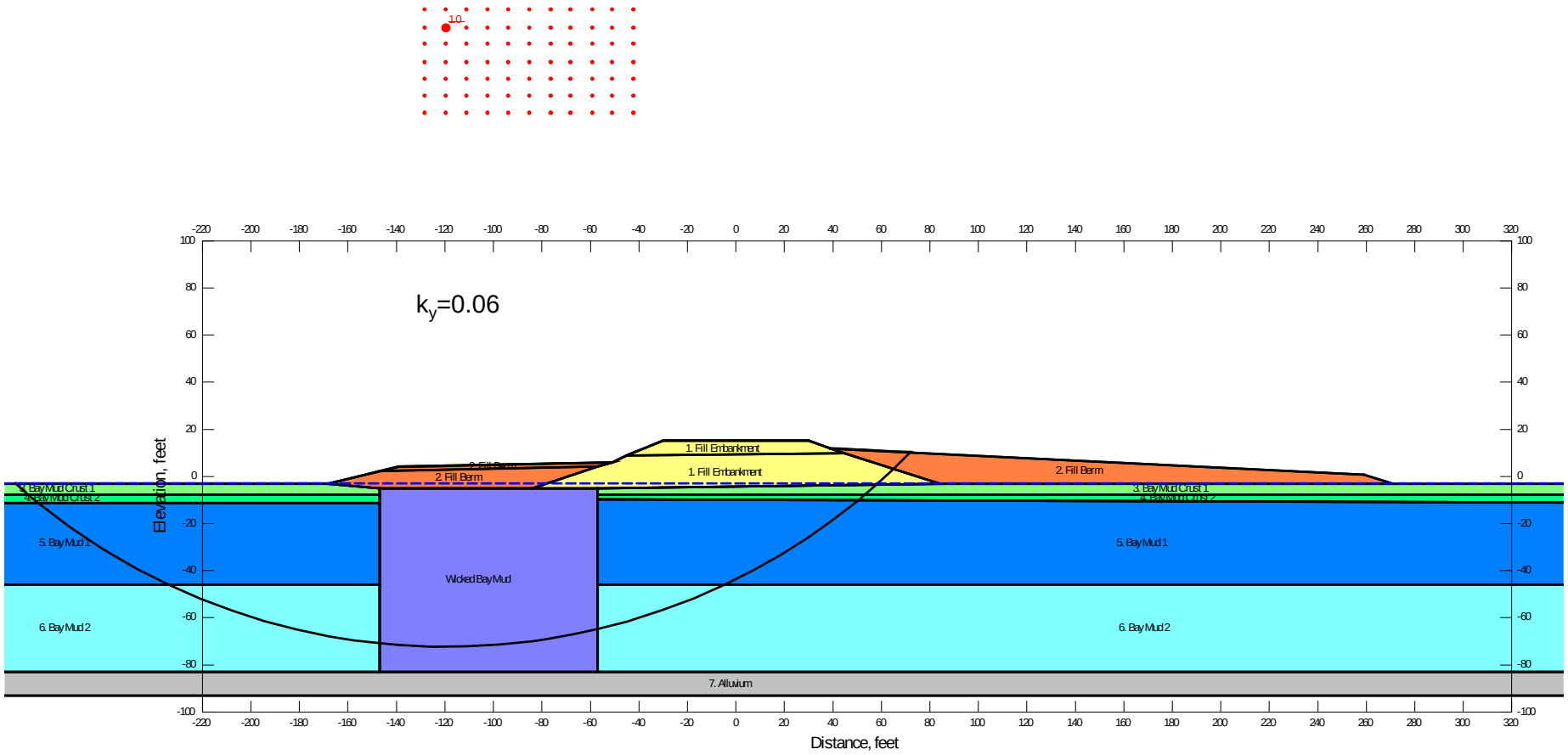


Immediately-After-First-Stage Construction (Year One)
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-26

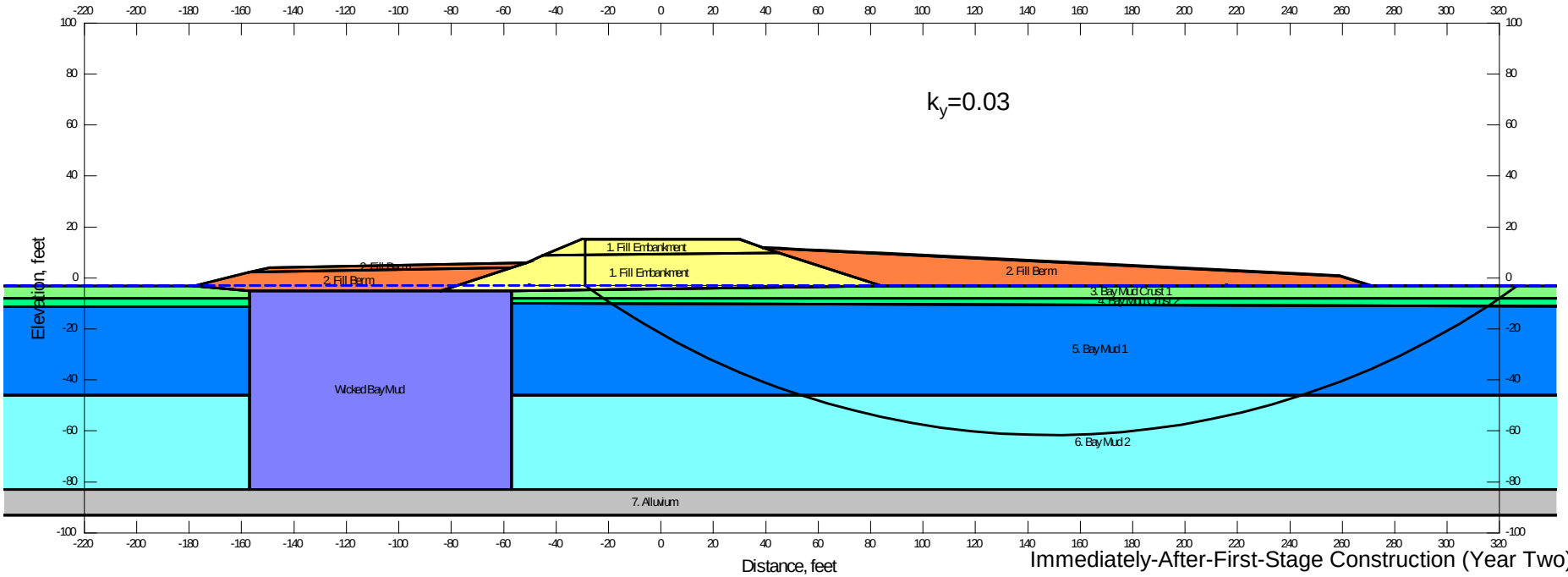


Immediately-After-First-Stage Construction (Year Two)
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-27

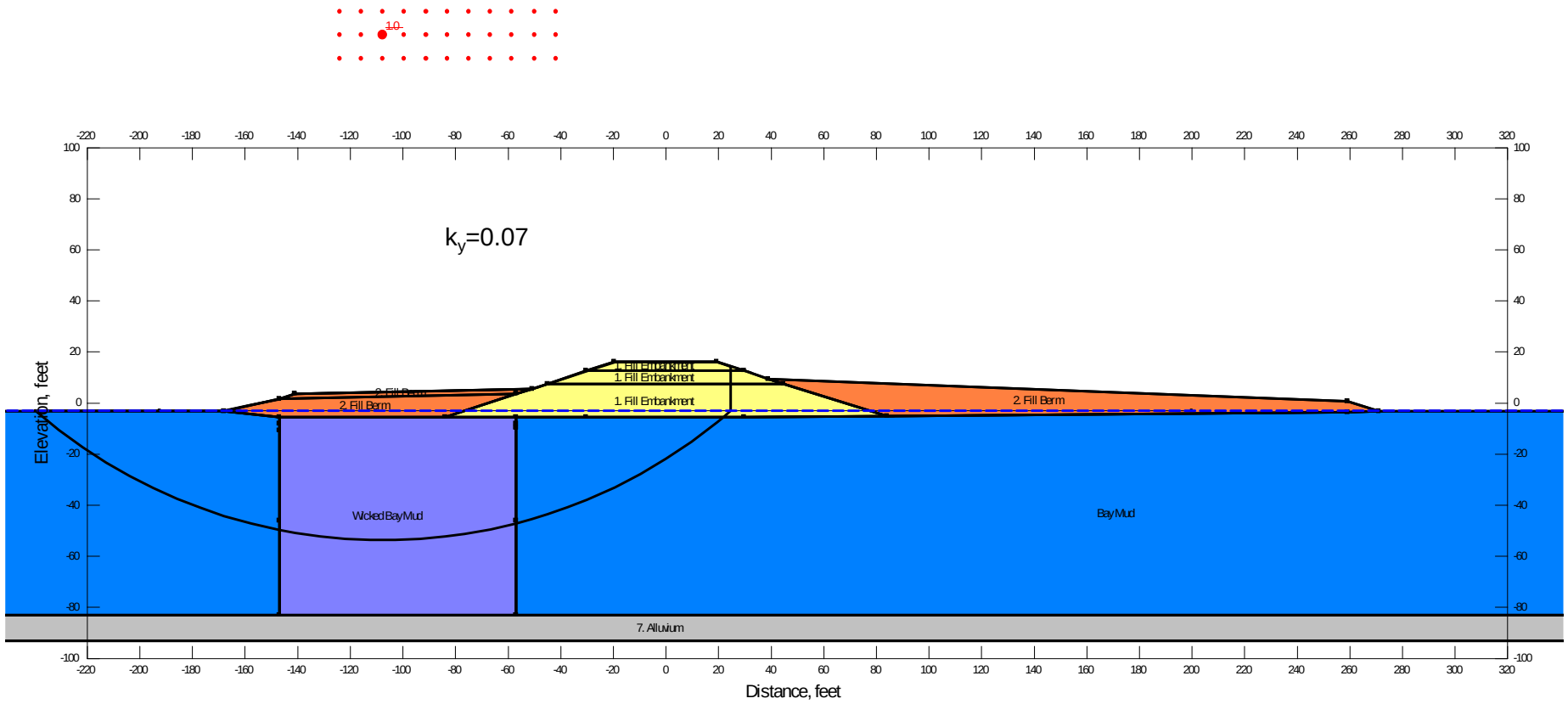


Immediately-After-First-Stage Construction (Year Two)
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-28

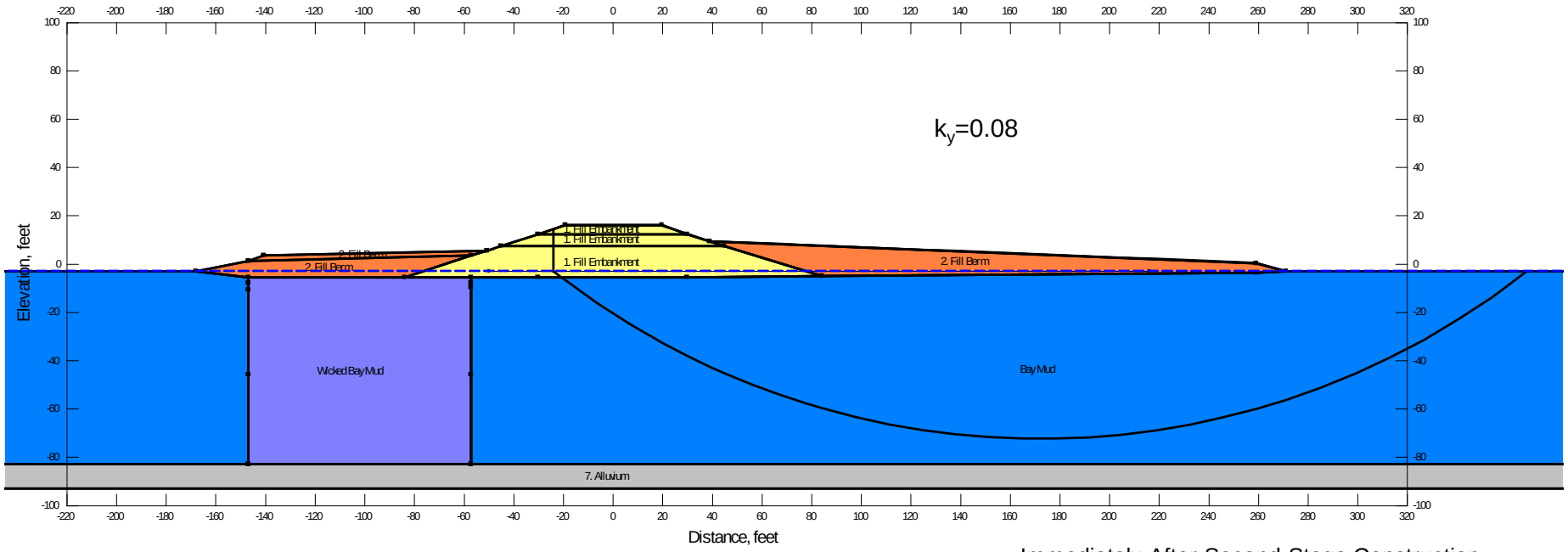


Immediately-After-Second-Stage Construction
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-29

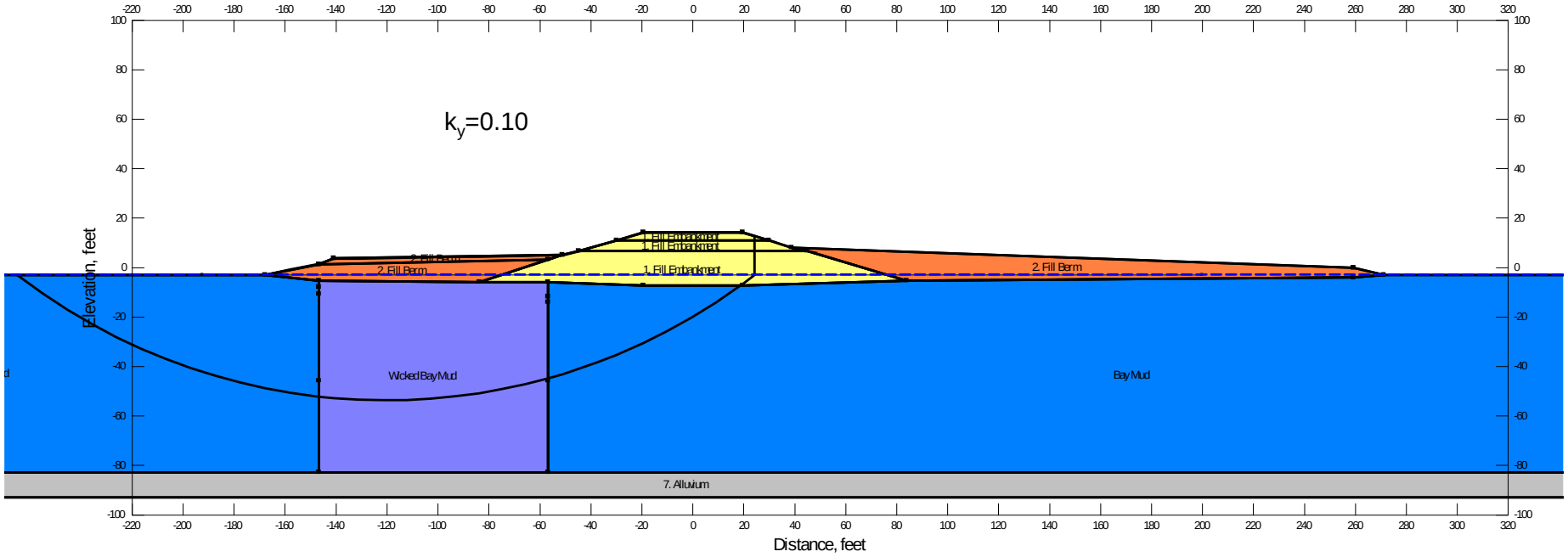


Immediately-After-Second-Stage Construction
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-30

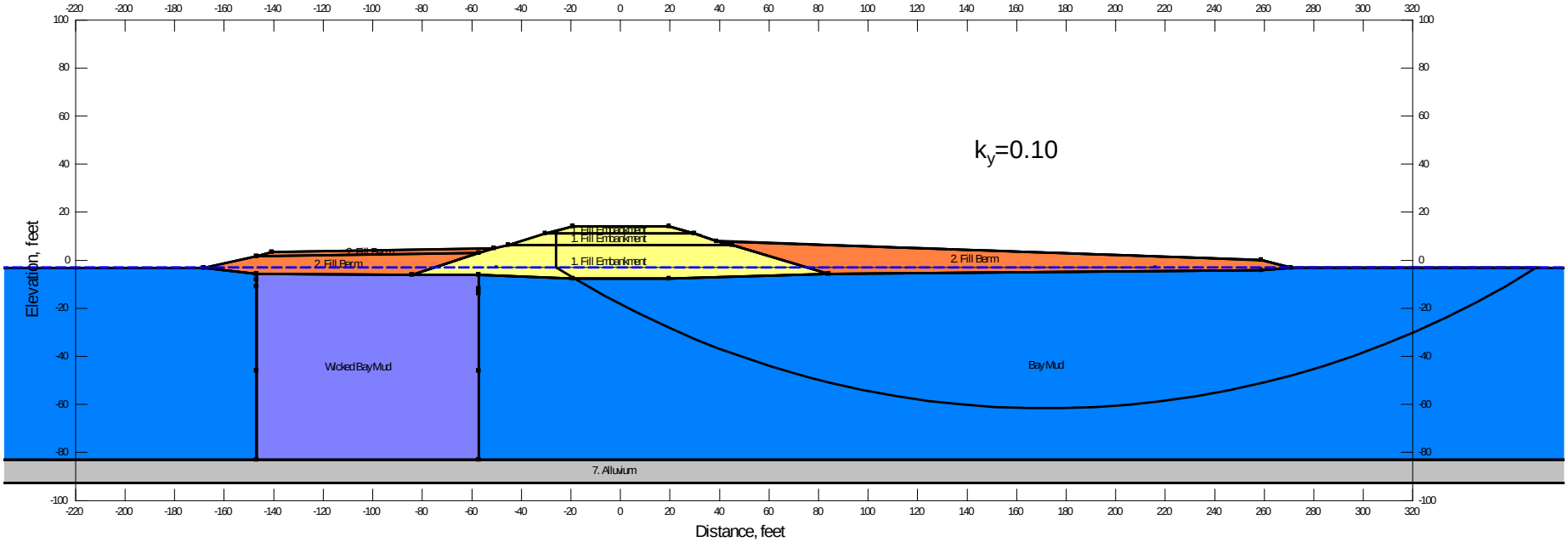


Long-Term
Landside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-31



Long-Term
Waterside, Undrained Analysis
Pseudo-Static

Bel Marin Keys Unit V Wetland Restoration
New Bayfront Levee
Marin County, California

Slope Stability Results
Soil Profile 2

Hultgren - Tillis Engineers	Project No. 831.01	Plate No. D-32