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May 10, 2019

Steven L. Pfeiffer
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VIA OVERNIGHT DELIVERY AND EMAIL

Carolyn Johnson, Community Development Administrator
Public Works & Community Development Department
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

Re: City of Coos Bay Estuarine Permit Application
Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA
Initial Filing from Jordan Cove Energy Project L.P.

Dear Carolyn:

This office represents Jordan Cove Energy Project L.P. ("JCEP"). Enclosed for filing are the original and two copies of a *Land Use Development Review Application* and related narrative (with exhibits) ("Application") requesting approval of an Estuarine Permit from the City of Coos Bay ("City") to conduct eelgrass mitigation as an allowed activity within the Coos Bay Estuary Management Plan ("CBEMP") Aquatic Unit 52-NA. I will also email you an electronic copy of the Application materials. Please process this filing.

JCEP is requesting that the City process the Application pursuant to its Type II procedures in order to allow public notice and an opportunity to comment before the City makes a decision in this matter. Also enclosed is a check made payable to "City of Coos Bay" for the Type II filing fee of $350.00.

I am JCEP's representative in this matter. Please provide me copies with all notices, staff reports, decisions, and public comments pertaining to the Application. Feel free to contact me or if there are any questions or if you need additional information. We look forward to working with the City toward approval of the Application.

Thank you for your assistance.

Very truly yours,

Steven L. Pfeiffer

cc: Client (via email) (w/encls.)

PERKINSCOIE

1201 Third Ave
Suite 4900
Seattle, WA 98101

VENDOR: **228196-001**
City of Coos Bay

CHECK NO.: **2135051**

INVOICE DATE	INV. NO.	COMMENT	INV. AMOUNT
05/10/2019	20190510	Permit Application fee	350.00

TOTAL CHECK AMOUNT $350.00

THE ORIGINAL DOCUMENT HAS A WHITE REFLECTIVE WATERMARK ON THE BACK. HOLD AT AN ANGLE TO VIEW. DO NOT CASH IF NOT PRESENT.

PERKINSCOIE

1201 Third Ave
Suite 4900
Seattle, WA 98101

U.S. Bank - Seattle
1420 Fifth Avenue
Seattle, WA 98101

19-10/1250

DATE 05/15/2019

CHECK NO. 2135051

Amount
***********$350.00

PAY *Three Hundred Fifty and 00/100 Dollar(s)***

PERKINS COIE
VOID IF NOT NEGOTIATED WITHIN SIX MONTHS

PAY TO ORDER OF: City of Coos Bay

John M. Devaney

⑈2135051⑈ ⑆125000105⑆ 153595416220⑈

COPYBAN CAPTURE® ANTI-FRAUD PROTECTION FORM NO. 9851B

City of Coos Bay
Community Development · 500 Central Avenue · Coos Bay, Oregon 97420
Telephone 541.269.1181 · Fax 541.269.8916 · coosbay.org

LAND USE DEVELOPMENT REVIEW APPLICATION

For Office Use Only	
STAFF CONTACT	PROJECT NO(S).

Type of Review (Please check all that apply):

- [ ] Annexation
- [ ] Appeal and Review
- [ ] Architectural Design Review
- [ ] Conditional Use
- [ ] Cultural Resources
- [X] Estuarine Use/Activities
- [ ] Home Occupation
- [ ] Legislative/Text Amendment
- [ ] Lot Line Adjustment
- [ ] Partition
- [ ] Planned Unit Development
- [ ] Site Plan and Architectural Review
- [ ] Subdivision
- [ ] Temporary Use
- [ ] Vacation
- [ ] Variance
- [ ] Zone Change
- [ ] Other______________

Pre-Application applications require a different application form available on the City website or at City Hall.

Site Location/Address:
The Eelgrass Mitigation Area and Donor Site have no address.
These areas are located on submerged aquatic lands in the Coos Bay Estuary, southwest of the Southwest Regional Oregon Airport, within the City of Coos Bay 52-NA CBEMP zoning unit.

Assessor's Map No./Tax Lot(s): N/A

Zoning: Aquatic Unit 52-NA, Lower Bay

Total Land Area: 27.94 acres (9.34 acres Eelgrass Mitigation Area + 18.6 acres Donor Site)

Detailed Description of Proposal:

Eelgrass mitigation in 52-NA CBEMP zone unit. See attached narrative.

Applicant/Owner Name: (please print) Jordan Cove Energy Project L.P.
Phone:
Address: Attn: Meagan Masten, 111 SW 5th Avenue, Suite 1100
Email: MMasten@pembina.com
City State Zip: Portland, OR 97209

Applicant's Representative: (please print) Seth King
Phone: 503.727.2024
Address: Perkins Coie LLP, 1120 NW Couch Street, Tenth Floor
Email: SKing@perkinscoie.com
City State Zip: Portland, OR 97209

1. Provide evidence that you are the owner or purchaser of the property or have the written permission of owner(s) to make an application.
2. Copy of the deed for the subject property.
3. Attach (a) a certified list of names and addresses of all owners of property within designated distance of the exterior boundaries of the subject property according to the latest adopted County tax role and (b) an assessor's map showing all lots and parcels of land within that area.
4. Address the Decision Criteria or Goals/Standards outlined in the Coos Bay Municipal Code chapter(s) related to your request.
5. Additional information: Date construction is expected to begin; estimated completion date of the total project and of individual segments; and anticipated future development.
6. **Ten (10) complete hard-copy sets** (single sided) of application & submitted documents must be included with this application.
   One (1) complete set of digital application materials must also be submitted electronically or on CD in Word format.
   Additional copies may be required as directed by the Coos Bay Director of Community Development.

The undersigned property owner(s) hereby authorizes the filing of this application, and authorizes on site review by authorized staff. I hereby agree to comply with all code requirements applicable to my application. Acceptance of this application does not infer a complete submittal. All amendments to the Coos Bay Development Code and to other regulations adopted after the application is approved shall be enforced where applicable. Approved applications and subsequent development is not vested under the provisions in place at the time of the initial application.

Natalie Eades 5/9/19

Applicant's signature | Date | Owner's signature ***(required)*** | Date

BEFORE THE PLANNING DIRECTOR

OF THE CITY OF COOS BAY, OREGON

In the Matter of a Request to Authorize Development of an Eelgrass Mitigation Site in the 52-NA Zone.	**NARRATIVE FILED BY JORDAN COVE ENERGY PROJECT L.P. IN SUPPORT OF THE APPLICATION FOR AN ESTUARINE PERMIT**

I. Land Use Request

Jordan Cove Energy Project L.P. ("JCEP") files this application ("Application") requesting approval of an Estuarine Permit from the City of Coos Bay ("City") to authorize JCEP's development of an "Eelgrass Mitigation Site" to offset potential impacts to eelgrass habitat from the construction and operation of JCEP's liquefied natural gas terminal to be located on the North Spit in unincorporated Coos County. JCEP's proposed activity is described in detail below but generally involves creating new eelgrass mitigation habitat in the Coos Bay Estuary near the west end of the Southwest Oregon Regional Airport ("Airport") runway.

As described in this narrative, and as supported by the evidentiary basis and analysis cited herein, the proposed mitigation project complies with the Coos Bay Municipal Code ("CBMC") as an allowed activity in the 52-NA CBEMP zone and is consistent with the management objectives thereof. Accordingly, JCEP requests the City approve the Application.

II. Project Description

A. General Project Overview

This Application seeks an Estuarine Permit to allow mitigation (new eelgrass beds) in the 52-NA CBEMP zone. The components of the project, as described further below, include recontouring an existing unvegetated sandbar to create an area of optimal eelgrass habitat, and then transplanting eelgrass from a nearby "Donor Site" into the mitigation area. JCEP notes that this Estuarine Application is substantially similar to a March 22, 2007 Oregon International Port of Coos Bay application for Estuarine Review, *Estuarine Activity #ZON2007-00034 - Mitigation*, which sought (and received) verification from the City that eelgrass mitigation is an allowed activity in the same area of the 52-NA zone.

See Exhibit A.1, *Oregon International Port of Coos Bay Application for Estuarine Review (March 22, 2007);* Exhibit A.2, *Final Order - Notice of Planning Commission Decision and Order (June 12, 2007)*.

B. Site Description, Zoning, Ownership

The proposed Eelgrass Mitigation Site and Donor Site are both located within the CBEMP 52-NA management unit in the Lower Bay of the Coos Bay Estuary. The Oregon Department of State Lands ("DSL") is the owner/manager of the estuarine submerged land. JCEP is requesting DSL's signed consent to the Application and will supplement the record with this consent when it is received.

The proposed Eelgrass Mitigation Site is an unvegetated intertidal shoal comprised of medium to coarse sand, located due south of the Airport runway. The top of the shoal is currently at an elevation of +2.7 ft mean lower-low water ("MLLW") (+2.0 ft NAVD88), with the outer boundaries at approximately +0.7 ft MLLW (0 ft NAVD88). *See* Exhibit B, *Compensatory Wetland Mitigation Plan, Appendix A, Figure E-2 (November 1, 2018)*. In 2018, David Evans and Associates ("DEA") conducted eelgrass investigations at the proposed mitigation site and confirmed that the area has no eelgrass or only stray (potentially transitory) eelgrass present. *See* Exhibit B, at 10; Appendix A, Figure E-3. The Donor Site is an area of dense eelgrass beds approximately 1500 feet southwest of the Eelgrass Mitigation Site, which will provide the eelgrass stock for the mitigation project.

Dredge spoil disposal in the 1950s created dredge spoil "islands" that likely contributed to the creation of the existing shoal at the Eelgrass Mitigation Site. Subsequent removal of a dredge spoil island in 1988 and construction of the airport runway extension blocked the tidal channels responsible for potential shoal formation. Since the current configuration of the runway now prevents additional shoaling, proposed recontouring of these sediments to optimal elevations for eelgrass growth presents a unique opportunity to restore eelgrass habitat modified by historic in-water work. *See* Exhibit B at 48-49; Appendix D.

C. Proposed Mitigation Activity

The project is intended to offset anticipated impacts to at least 2.3 acres of eelgrass habitat in the Coos Bay estuary from the Jordan Cove LNG Project; such impacts are located, in part, in the City, and, in part, in unincorporated Coos County. To achieve this, the mitigation project will reduce and recontour a boundary area of approximately 9.34 acres to establish approximately 6.78 acres of new habitat that will support a minimum of 2.7 acres of established clustered eelgrass beds. *See* Exhibit B at 5; Appendix A, Figure E-1.

1. Creation of the Eelgrass Mitigation Area

An evaluation of both eelgrass distribution and depth indicates that the principal limiting factor for eelgrass in the general vicinity of the Eelgrass Mitigation Site is elevation. Indeed, based on studies in Coos Bay, it is known that eelgrass tends to occur between approximately +2.31 ft and -4.77 ft (NAVD 88; +3.03 to -3.95 ft MLLW; citing Thom et al. 2003). These findings are further supported by hydrographic survey work conducted by DEA at the proposed Eelgrass Mitigation Site in 2018, 2014, 2010, and 2007, and the South Slough National Estuarine Research Reserve (SSNERR) in 2016. Based on these various surveys, eelgrass was found to be consistently most abundant adjacent to the proposed mitigation site between elevations 0.0 and -2.0 ft NAVD 88 (+0.72 to -1.28 ft MLLW), and in particular between -1.0 and -2.0 ft NAVD 88 (-0.28 to -1.28 ft MLLW). *See* Exhibit B at 10, 42. Accordingly, the proposal is to reduce and recontour a 9.34 acres area of the intertidal shoal down to an average 1.0 to -2.0 ft NAVD 88 (-0.28 to -1.28 ft MLLW) depth to create 6.78 acres of optimal eelgrass habitat. *See* Exhibit B, Appendix D; Appendix A, Figure E-1. This will match the depth of adjacent areas where robust eelgrass beds occur and will facilitate tidal circulation at the mitigation site. The volume of shoal material removed is estimated to be .04 million cubic yards (MCY), which will be deposited at the APCO 2 site located in the City of North Bend, Oregon (pursuant to separate local, state and federal permitting).

The proposed mitigation work has been designed to avoid and minimize impacts to nearby eelgrass beds or temporary impacts to stray eelgrass that may occur in the grading footprint; however, a preconstruction survey of eelgrass and bathymetry will take place during the main growing season (i.e., summer) before excavation is scheduled. Additionally, final contour limits will be established to avoid disturbance to eelgrass around the perimeter of the Eelgrass Mitigation Site. Any temporary impacts that are unavoidable, based on the preconstruction survey, will be accounted for in the final planting plan. *See* Exhibit B (CWMP, at 9-10).

After recontouring, the site will be left to stabilize for at least one winter storm cycle. *See* Exhibit B at 10). The area will then be planted with donor stock, as described below.

2. Donor Site

To the southwest of the proposed Eelgrass Mitigation Site, eelgrass becomes quite dense and continuous. A portion of this area has been designated as the ideal donor stock site ("Donor Site") for obtaining eelgrass to transplant to the mitigation area. The Donor Site is located approximately 1,500 feet southwest of the Eelgrass Mitigation Site and occupies approximately 18.6 acres of relatively continuous and dense eelgrass beds (*see* Exhibit B, Appendix A, Figure E-4; Exhibit C, *404 Permit Public Notice - Project Update Supplement*, Figure 7). In 2018, DEA conducted a survey of this area, and the Donor Site was mapped using underwater video geo-referenced in real time to a sub meter GPS and bed boundaries were established based on that portion of the eelgrass bed where shoot densities were highest. Eelgrass densities were obtained by divers who collected shoot count data along five, approximately 300 foot-long, transects spaced throughout the bed, as shown in Exhibit B, Appendix A, Figure E-4.

The mean eelgrass density within the Donor Site was calculated at 53.5 shoots/meter squared (m^2). U.S. Army Corps of Engineers ("USACE") guidelines suggest that harvesting 10 percent of shoots from an existing eelgrass bed will not harm the donor bed habitat[1], such that approximately 0.15 acre (617 m^2) of eelgrass could be harvested for the mitigation site (the higher the densities of the potential donor bed, the smaller the acreage that would need to be harvested). Therefore, donor shoots would need to be harvested from at least 1.5 acres (6,170 m^2) of intact eelgrass to meet the transplant needs of the Eelgrass Mitigation Site. The selected eelgrass Donor Site has been measured at 18.6 acres and is more than adequate to meet the needs of the Eelgrass Mitigation Site. *See* Exhibit B at 12.

3. Eelgrass Transplanting Methodology

Eelgrass plants from the Donor Site will be harvested by thinning existing locations within the bed without denuding or leaving bare areas. The selected Donor Site has similar physical conditions as the Eelgrass Mitigation Site to ensure successful transplanting conditions. In addition, the Donor Site is close to the mitigation site, will have a similar bed elevation, and so will increase the likelihood that the planting stock will be adapted to local environmental conditions.

The methodology for transplanting eelgrass will follow best practices as demonstrated by prior Coos Bay eelgrass mitigation projects (i.e., similar to the approach used in the eelgrass mitigation efforts associated with the Airport runway extension project (McCollough pers. comm. 2006), which was considered successful (Rumrill pers. comm. 2006 and ODSL 1997)) and USACE guidelines. This methodology includes (as provided in Exhibit B at 10-12) the following:

- Harvesting donor stock will occur after the site has stabilized during the preferred time for transplanting eelgrass (i.e., spring and summer).

[1] USACE: *Technical Report, Eelgrass (Zostera marina L.) Restoration in the Pacific Northwest: Recommendations to Improve Project Success*, Report No. WA-RD 706.1, 2008.

- Eelgrass shoots will be harvested from the Donor Site by hand or by the use of small hand tools (e.g., garden trowel) to minimize damage to shoots. Each shoot will have intact portions of the rhizome mat.

- The amount of time between removal of eelgrass plants from the donor bed and their subsequent transplanting in the mitigation site will be minimized; eelgrass will typically be held for less than 72 hours after harvest and before transplanting.

- Until planted, the donor stock will be kept submerged and in a low light environment to prevent desiccation and thermal shock. Plants will remain wet during transport (e.g., stored in a tote or cooler filled with water that is exchanged on a regular basis) and if held overnight, will be stored in a submerged cage or mesh bag tied to a dock or mooring pile.

- Harvested eelgrass shoots will be processed into discrete planting units (PUs) by tying the shoots loosely together at the base of the stem above the rhizome with a biodegradable line and tied to a degradable marine staple. The marine staple will anchor the PU to the bottom substrate and allow the rhizomes to reestablish within the substrate. Each PU would be composed of 3-10 shoots.

- Within the Eelgrass Mitigation site, there will be established ten, 100 ft by 100 ft, planting parcels (10,000 square ft total) that will be planted with PUs (*see* Exhibit B, Appendix A, Figure E-1).

- The PUs will be arranged in the planting parcels with each PU installed on 3-ft centers throughout the Eelgrass Mitigation Site (*see* Exhibit B, Appendix A, Figure E-1).

Upon transplanting the ten planting parcels, the project would total approximately 33,000 eelgrass shoots (11,000 PUs of at least 3 shoots per PU) planted 3-foot on center within the Eelgrass Mitigation Site. This planting plan would provide at least 2.7 acres of transplanted eelgrass at an initial density of 3 shoots per square meter. *See* Exhibit B at 10-12.

III. Coos Bay Municipal Code

17.352.010 General.

Uses and activities permitted by the Coos Bay estuary management plan are subject to general and special conditions and policies to comply with statewide planning goals and the Coos Bay estuary plan as adopted by the city of Coos Bay. Compliance with

these conditions and policies must be verified; therefore, all uses and activities under jurisdiction of the Coos Bay estuary management plan must be reviewed.

RESPONSE: The CBEMP has been acknowledged by the State to be consistent with the Statewide Planning Goals, including Goal 16 Estuarine Resources. As verified in this application, the CBEMP identifies mitigation in the 52-NA zone as an approved activity ("A"), not subject to general or specific conditions. Therefore, because the proposed mitigation is consistent with the CBEMP, which has already been acknowledged by the Land Conservation and Development Commission ("LCDC") to be in compliance with Statewide Planning Goals, no further state approval is required. The Application and this narrative provide the required review by the City of the proposed mitigation activity.

17.352.020 Initiation.

A request to permit these uses and activities may be initiated by a property owner or authorized agent through a Type I review process and application to the community development department.

RESPONSE: Due to the potential public interest in the mitigation activity subject to this Application, JCEP requests a Type II review procedure pursuant to CBMC 17.130.090. As stated, DSL is the owner/manager of the subject sites, and JCEP will supplement the Application with DSL's signed consent within the completeness review period.

17.352.030 Application.

An application may include any or all of the following items at the discretion of the director. The applicant shall provide three copies of the required information.

(1) A general location map of the property and a detailed parcel map of the property, each on approximately eight-inch-by-11-inch paper.

RESPONSE: A location map of the Eelgrass Mitigation Area and Donor Site is provided in Exhibit B, Appendix A, Figure E-4 and Exhibit C, Figure 7, to this narrative.

(2) Address and legal description of the property.

RESPONSE: The Eelgrass Mitigation Area and Donor Site have no address. These areas are located on submerged aquatic lands in the Coos Bay Estuary, southwest of the Airport, within the 52-NA CBEMP zoning unit.

(3) Detailed description of the proposed use or activity.

RESPONSE: A detailed description of the proposed mitigation activity is provided in Section II of this narrative.

(4) Statement explaining how the proposed use and/or activity complies with the applicable management plan and title provisions.

RESPONSE: A statement explaining how the proposed mitigation activity complies with the CBEMP Lower Aquatic Unit 52-NA provisions is provided in Section II of this narrative.

IV. Zoning Districts and Use Classifications

A. 52-NA Zone

1. Management Objective

MANAGEMENT OBJECTIVE: The supporting documentation for the CBEMP acknowledges the importance of the Southwest Oregon Regional Airport (formerly North Bend Municipal Airport) and allows for its continued operation through adoption of Exception 21 in the Plan. This aquatic unit contains extensive eelgrass beds with associated fish and waterfowl habitat, and shall be managed to maintain these resources in their natural condition to protect their productivity, while allowing alteration, including fill for airport use, in accordance with FAA requirements for safety. Dredging of a small channel on the north side of the proposed airport fill shall be necessary as a form of mitigation to maintain tidal currents. Maintenance only of the existing sewage treatment plant and storm water outfalls shall be permitted.

RESPONSE: The City should find that the proposed activity is consistent with the management objective because it addresses an objective specifically identified in the 52-NA zone (i.e., eelgrass beds). The Application will establish new eelgrass beds in an area that cannot currently support eelgrass due to shoaling from historic dredge spoils which prevent optimal depth for eelgrass habitat. Accordingly, the project will ensure productivity of "eelgrass beds with associated fish and waterfowl habitat" and satisfies the management objective of the 52-NA zone.

2. ACTIVITIES:

*** * * ***

5. Mitigation A

*** * * ***

3.2 Policy Definitions.

*** * * ***

<u>MITIGATION</u>: The creation, restoration, or enhancement of an estuarine area to maintain the functional characteristics and processes of the estuary, such as its natural biological productivity, habitats, and species diversity, unique features and water quality (ORS 541.626).

<u>RESPONSE</u>: The CBEMP management classification for the 52-NA zone expressly designates “Mitigation” as an allowed (“A”) activity. The City’s CBEMP, *Management Framework - Definitions, Policies and Standards, and Plan Provisions* states: “The definitions set forth below are a matter of policy, and shall be used in the implementation and interpretation of this Plan.” The proposed eelgrass mitigation project meets the definition of “mitigation,” quoted above, because it will “create,” “restore” and “enhance” an estuarine area (i.e., the Eelgrass Mitigation Site) by establishing new eelgrass beds in an area currently void of eelgrass and too shallow to provide suitable eelgrass habitat. The project will create optimal depth for eelgrass and transplant stock from the Donor Site thereby establishing new eelgrass beds and related habitat. This will improve the functional characteristics and processes of the estuary by promoting “natural biological productivity,” “habitats,” and “species diversity” of eelgrass beds, which (as called out in the 52-NA management objective) provides associated fish and waterfowl habitat.

Studies confirm that eelgrass provides cover and food for a large number of organisms including burrowing, bottom-dwelling invertebrates; diatoms and algae; herring that deposit eggs clusters on leaves; tiny crustaceans and fish that hide and feed among the blades; and, larger fish, crabs (including Dungeness crabs) and wading birds that forage in the meadows at various tides. Eelgrass provides shelter for a variety of fish and may lower predation, allowing more opportunity for foraging. The protective structure of eelgrass leaves is beneficial for smaller organisms and juvenile life history stages of fish. *See* <u>Exhibit</u> D, *Applicant-Prepared Draft Biological Assessment (September 2018)* at 3-351.

Therefore, the requested activity meets the definition of “mitigation” as an allowed activity in the 52-NA zone.

GENERAL CONDITIONS:

None

SPECIAL CONDITIONS:

None[2]

RESPONSE: There are no general conditions listed for the 52-NA Zone. There are also no special conditions that apply to the activity of "Mitigation" in the 52-NA zone.

IV. Conclusion

Based upon this narrative and the referenced and attached evidence, the Application satisfies the approval criteria of the CBMC and the CBEMP. Therefore, the City should approve the Application and authorize the proposed mitigation activity.

[2] This is consistent with the findings and approval of the City of Coos Bay Planning Commission in its June 12, 2007 *Final Order - Notice of Planning Commission Decision and Order* regarding the Oregon International Port of Coos Bay's similar Application for Estuarine Review, *Estuarine Activity #ZON2007-00034 - Mitigation*, which confirmed that there are no general or special conditions for the activity of eelgrass mitigation in the 52-NA zone pursuant to similar conditions in place at that time. *See* Exhibit A.2.

Perkins Coie

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Mark D. Whitlow
PHONE: (503) 727-2073
FAX: (503) 795-4073
EMAIL: MWhitlow@perkinscoie.com

March 22, 2007

Ms. Laura Barron
Planning Administrator
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

Re: Application for Estuarine Review

Dear Laura:

This office represents the Oregon International Port of Coos Bay. Enclosed for filing is the Port's application for estuarine review to verify that mitigation is an allowed activity in District 52-NA of the Coos Bay Estuary Management Plan (CBEMP). Also enclosed is the Port's filing fee in the sum of $375.00. The Port's application has been signed by Jeffrey T. Bishop, Director. We will obtain written consent from DSL and forward it to you in the near future. As stated in the application, there are no other ownerships within 200 feet of the proposed mitigation site.

I will be out of the office until Thursday, March 29, 2007. In my absence, please do not hesitate to contact Frank Flynn (503) 727-2266 or my secretary, Donna Friberg (503) 727-2095.

Thank you for your assistance and cooperation in this matter.

Very truly yours,

Mark D. Whitlow

Mark D. Whitlow

Enclosures
cc: Oregon International Port of Coos Bay w/encl.
Stefanie Slyman
Frank Flynn

63023-0002/LEGAL13109235.1

APPLICATION TO CITY OF COOS BAY FOR MITIGATION ACTIVITY IN CBEMP ZONING DISTRICT 52-NA

TABLE OF CONTENTS

I. INTRODUCTION

The International Port of Coos Bay (the "Port") seeks verification from the City of Coos Bay that mitigation is an allowed activity in district 52-NA of the Coos Bay Estuary Management Plan ("CBEMP"), subject only to the management unit objective for the district. Any mitigation work performed by the Port based upon this verification will be done under a separate joint permit to be issued by the Department of State Lands ("DSL") and the U.S. Army Corps of Engineers ("USACOE").

II. DESCRIPTION OF PROPOSED MITIGATION

The Port proposes to establish an approximate two-acre mitigation site in CBEMP district 52-NA located in the Lower Bay of the Coos Bay Estuary. Specifically, the mitigation site is located due south to the west end of the Airport runway adjacent to existing eelgrass beds that were established as part of the Airport's mitigation associated with its runway extension in the 1980s. **(Figure 1, Vicinity Map).** This site was selected by the Port's environmental consultants in coordination with the Oregon Department of Fish and Wildlife ("ODFW"), the South Slough National Estuarine Reserve and the Coos Bay Watershed Council.

The total mitigation area has been sized for approximately two (2) acres situated in three (3) subareas so that a minimum of 1.15 total acres of low- to high-density eelgrass beds will ultimately be established. While the precise boundaries of the mitigation subareas can only be determined in the Joint Permit process, it will generally take place as follows. Two subareas are islands located approximately 700' and 1200' to the south and southwest of the Airport runway. These islands are to be shaved down to a mean lower water elevation to connect with existing adjacent eelgrass habitat. The third subarea is located approximately 3400' feet southwest of the runway in a deeper water area to be filled to the mean lower water elevation to connect with adjacent eelgrass habitat. **(Figure 2, Airport Mitigation Site).**

The proposed mitigation will be constructed using the method that was used by the Airport for mitigation for the runway extension project conducted in the 1980s. That mitigation effort was accepted by state and federal regulators and is considered to be highly successful. The Port proposes to follow the same successful sequencing and methodology for establishing eelgrass as was then used by the Airport. This sequence involves excavation the first year while allowing the site to stabilize over one winter storm season, and in the second year the site is planted with eelgrass from an adjacent donor site. All earthwork will take place during the in-water work period, which occurs between October 1st and February 15th.

III. APPLICABLE APPROVAL CRITERIA

The applicable approval criteria for this application are contained in the City of Coos Bay Land Development Ordinance ("LDO") Chapter 1.4, Uses of Land, Chapter 5.10, Estuarine and Coastal Shoreland Uses and Activity and the applicable CBEMP provisions for zoning district 52-NA. LDO language is indicated by quotes.

"CHAPTER 1.4 USES OF LAND"

"Section 3. ESTUARINE AND COASTAL SHORELAND USES AND ACTIVITIES

1. Except as otherwise provided in this ordinance, the adopted Coos Bay Estuary Management Plan shall be implemented and administered under the procedures of this ordinance within the City of Coos Bay.

2. Estuarine and shoreland areas shall be defined by the Coos Bay Estuary Management Plan. Allowable, conditional, and prohibited uses and activities within these areas shall be consistent with the Plan and shall be subject to the general and special conditions of that Plan, its policies, inventory document, and maps, in addition to development standards of this ordinance.

Because management units of the Plan may encompass more than one zoning district, the uses allowed within the shoreland areas shall be those listed for the underlying zone contained in this ordinance. Since this ordinance does not specify activities, such as dredging or shoreland stabilization, nor address aquatic areas, the activities within the shoreland and the uses and activities of the aquatic areas shall be those listed in the Plan."

Response: The LDO establishes an estuarine review procedure to verify allowed uses and activities within the aquatic areas of the CBEMP. The Plan lists mitigation as an allowed activity in district 52-NA.

"CHAPTER 5.10 ESTUARINE AND COASTAL SHORELAND USES AND ACTIVITY"

"Section 1. GENERAL

Uses and activities permitted by the Coos Bay Estuary Management Plan are subject to general and special conditions and policies to comply with statewide planning goals. Compliance with these conditions and policies must be verified; therefore, all uses and activities under jurisdiction of the Coos Bay Estuary Management Plan must be reviewed."

Response: The CBEMP has been acknowledged by the State to be consistent with the Statewide Planning Goals, including Goal 16. As verified in this application, the CBEMP identifies mitigation in the 52-NA district as an approved use ("A"), not subject to general or special conditions. Therefore, because the proposed mitigation is consistent with the CBEMP, which has already been acknowledged by the Land Conservation and Development Commission ("LCDC") to be in compliance with Statewide Planning Goals, no further demonstration of compliance is required.

"Section 2. INITIATION
A request to permit these uses and activities may be initiated by a property owner or authorized agent through an application to the Department of Community Services. If an application has been filed with the Division of State Lands for a state or federal waterway permit, the information contained on the application may be sufficient for review. However, the City application fee shall not be waived."

Response: The Port has filed an application with DSL/USACOE for a joint state/federal "waterway" permit. The Port is seeking verification with the City of Coos Bay Department of Community Services that mitigation activity is allowed in CBEMP zoning district 52-NA located in the City limits.

"Section 3. APPLICATION
An application may include any or all of the following items at the discretion of staff. The applicant shall provide one copy of the written information and two copies of the map."

"1. A general location map of the property and a detailed parcel map of the property, each on approximately 8" x 11" paper."

Response: See **Figure 2** for the location of the mitigation site.

"2. Address and legal description of the property."

Response: The site has no address. The mitigation subareas are located in the waters of the Lower Bay of the Coos Bay Estuary, southwest of the Coos Bay Airport in the 52-NA CBEMP zoning district. None of the external boundaries of the mitigation subareas are located within 250' of any adjacent properties.

"3. Detailed description of the proposed use or activity."

Response: The detailed description of the proposed mitigation activity is provided in section II of this application, Description of Proposed Mitigation.

"4. Statement explaining how the proposed use and/or activity complies with the Plan and ordinance provisions."

Response: Mitigation is listed as an allowed activity in the Lower Bay Aquatic Unit 52, Management Classification – NA subject only to the management objective of this district and any applicable general and special conditions. The Management Objective is provided below. There are no applicable general or special conditions.

"Lower Bay, Aquatic Unit- 52, Management Classification – NA"

"**Management Objective:** This aquatic unit contains extensive eelgrass beds with associated fish and waterfowl habitat, and shall accordingly be managed to maintain these resources in their natural condition in order to protect their productivity.

Dredging of a small channel on the north side of the proposed airport fill shall be necessary as a form of mitigation to maintain tidal currents.

Maintenance only of the existing sewage treatment plant outfall shall be permitted."

Response: The proposed mitigation is consistent with this management objective as it will expand the area covered by eelgrass in this district which will, in turn, increase fish and waterfowl habitat.

"Activities"

Response: Mitigation is listed as an allowed activity, subject to applicable general and special conditions of which there are none as demonstrated below.

"General Conditions: None"

Response: There are no applicable general conditions in the 52-NA zoning district in which mitigation is proposed.

"Special Conditions, Activities"

Response: There are no applicable special conditions for the activity of mitigation in the 52-NA zoning district.

IV. CONCLUSION

As demonstrated by the foregoing responses, mitigation is an allowed activity in district 52-NA, subject only to the management objective of the 52-NA district, with which it is consistent. It is not subject to any general or special conditions. Therefore, the activity of mitigation is consistent with the CBEMP and, consequently, applicable Statewide Planning Goals. Any mitigation work to be performed by the Port will be done under a Joint Permit from DSL and the USACOE.

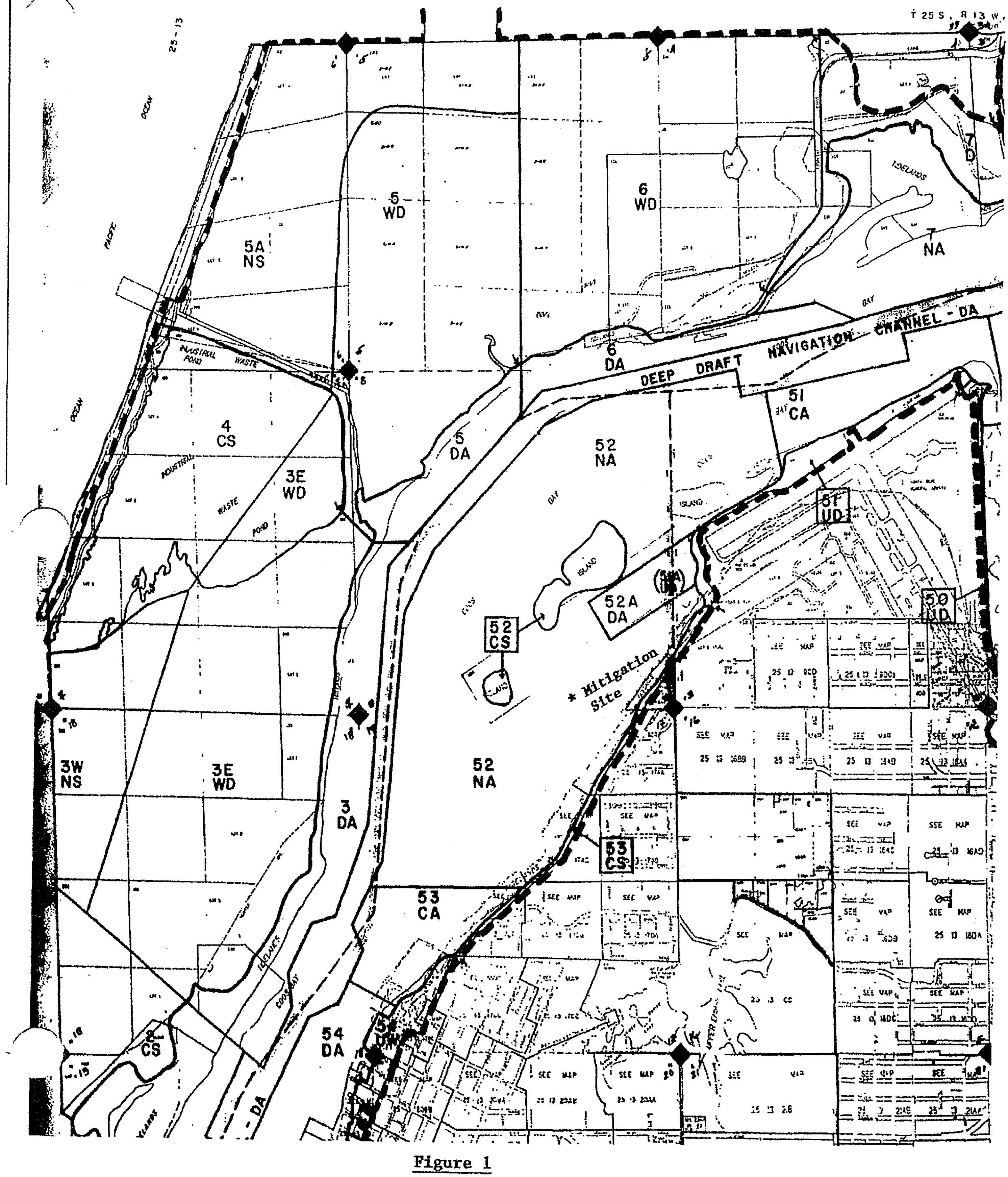
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Figure 1

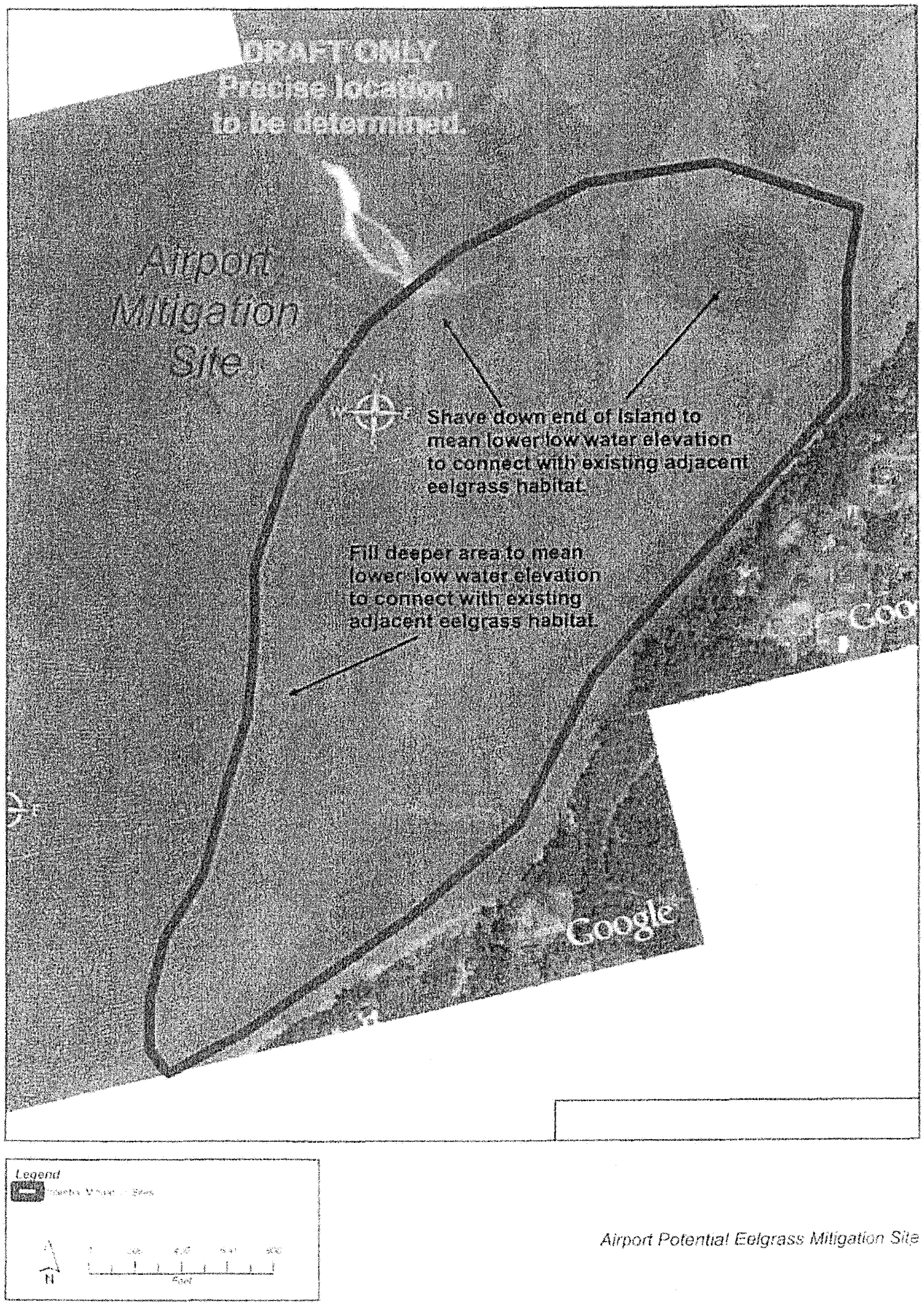

DRAFT ONLY
Precise location
to be determined.
Airport
Mitigation
Site
Shave down end of island to
mean lower low water elevation
to connect with existing adjacent
eelgrass habitat.
Fill deeper area to mean
lower low water elevation
to connect with existing
adjacent eelgrass habitat.
Google
Legend
Airport Potential Eelgrass Mitigation Site

FIGURE 2

City of Coos Bay

Public Works & Development Dept.

500 Central Ave., Coos Bay, Oregon 97420 • Phone (541) 269-8918
Fax (541) 269-8916

FINAL ORDER
NOTICE OF PLANNING COMMISSION DECISION AND ORDER

APPLICATION: **Estuarine Activity #ZON2007-00034 - Mitigation**

APPLICANT: Oregon International Port of Coos Bay
PO Box 1215, Coos Bay, OR 97420

OWNER: Oregon Department of State Lands
775 Summer Street NE, Salem, OR 97301

AGENT: Mark Whitlow, Perkins Coie
1120 NW Couch Street, 10th Floor
Portland, OR 97209-04128

LOCATION: T. 25, R. 13, S. 08: 700 feet and 1,200 feet south and southwest of the Airport runway, and 3,400 feet southwest of the runway.

ORDER: Approved on Tuesday, June 12, 2007
Planning Commission Final Vote:
Yea: Chairman Bruce Harlan, Commissioners Jim Berg, Chris Coles, Chris Hood, Rex Miller, and Steve Donovan
Nay: None **Abstain:** None

APPEAL PROVISIONS: See page 2.

DECISION CRITERIA AND THE ADOPTED FINDINGS OF FACT AND CONCLUSIONS:
See pages 3 - 5

FINAL ACTION

The Planning Commission verified that mitigation activity is allowed outright in aquatic unit 52-NA of the Coos Bay Estuary Management Plan, as consistent with the Management Objective of aquatic unit 52-NA and approved Estuarine Activity Application #ZON2007-00034, based on findings, conclusions and the applicant's submitted evidence, to allow approximately 1.15 acres of intended mitigation in aquatic unit 52-NA. The exact location for the eelgrass creation or enhancement is yet to be determined. Any mitigation activity to be performed is subject to approval of a Joint Permit Application by the DSL and USACE.
The decision to approve will become final at **5:00 PM on July 2, 2007** unless an appeal is filed.

APPEAL PROVISION

A decision by the Planning Commission may be appealed to the Coos Bay City Council by an affected party. The party must file a letter of intent to appeal with the City Recorder, which includes the required fee, within fifteen (15) days from the date of the decision. A notice of appeal shall contain all of the following:

1. Identification of the decision to be reviewed.

2. Statement of the interest of the appellant and whether the appellant has "standing to appeal." An individual is said to have "standing to appeal" if the person:

   a. appeared before the Planning Commission orally or in writing, and

   b. the person's interests are adversely affected by the decision.

3. Reasons the appellant feels aggrieved by the decision, and how the Planning Commission erred in its decision.

The scope of the review shall be limited to the issues raised in the request for appeal. The Hearings Body will consider evidence in the record, evidence submitted at the appeal hearing which is relevant to the issues under review, and oral or written arguments submitted at the time of the appeal hearing addressing those issues.

Questions regarding the appeal procedure may be directed to the Public Works and Development Department, City Hall, 500 Central, Coos Bay, Oregon or phone (541) 269-8918.

DECISION CRITERIA, FINDINGS & CONCLUSIONS

Under Coos Bay Land Development Ordinance 5.10, Estuarine and Coastal Shoreland Uses and Activity, uses and activities permitted by the Coos Bay Estuary Management Plan (CBEMP) are subject to the relevant CBEMP management objectives and, where applicable, to general and special conditions and policies to comply with statewide planning goals. Compliance with the management objectives, conditions and policies must be verified.

The following is a list of the decision criteria applicable to the request. Each of the criteria is followed by findings or justification statements which may be adopted by the Planning Commission to support their conclusions.

Although each of the findings or justification statements specifically applies to at least one of the Decision Criteria any of the statements may be used to support the Commission's final decision.

Based on their conclusions, the Commission must approve, approve with conditions, or deny the application. Conditions may be used by the Commission in order to address specific concerns about the request.

DESCRIPTION OF PROPOSED MITIGATION PROPOSED UNDER A JOINT PERMIT APPLICATION

The mitigation activity discussed below is conceptual in nature and is presented for informational purposes only. The proposed conceptual mitigation activity is subject to modification during the evaluation of the Joint Permit Application being reviewed by the Oregon Department of State Lands (DSL) and the U.S. Army Corps of Engineers (USACOE).

The Port proposes to establish a one-to-two acre mitigation site in CBEMP aquatic unit 52-NA located in the Lower Bay of the Coos Bay Estuary. The mitigation site is located due south to the west end of the airport runway adjacent to existing eelgrass beds that were established as part of the Airport's mitigation associated with its runway extension in the 1980s. See *Attachment A-11.*

This site was selected by the Port's environmental consultants in coordination with the Oregon Department of Fish & Wildlife (ODFW), the South Slough National Estuarine Reserve and the Coos Bay Watershed Council.

The mitigation area is situated in three (3) possible subareas so that a minimum of 1.15 total acres of low-to-high density eelgrass beds will ultimately be established. Generally, two subareas are inter-tidal sand bars, referred to as "islands" in the applicant's submitted information, located approximately 700 feet and 1,200 feet to the south and southwest of the airport runway. These areas are to be shaved down to a mean lower water elevation to connect with existing adjacent eelgrass habitat. The Port proposes to excavate, or shave the inter-tidal sand bar areas, the first year and allow the site to stabilize over one winter storm season. In the second year the site will be planted with eelgrass from an adjacent donor site. This is the same method that was used by the Airport for mitigation for the runway extension project conducted in the 1980s. All earthwork will take place during the in-water work period, which occurs between October 1st and February 15th.

The third possible subarea is located approximately 3,400 feet southwest of the runway in a deeper water area to be filled to the mean lower water elevation to connect with adjacent eelgrass habitat.

The purpose of the mitigation is to compensate for the loss of eelgrass beds expected to occur during dredging between a proposed multi-purpose marine shipping berth and the existing navigation channel.

All mitigation work will be done under a Joint Permit from DSL and USACOE.

DECISION CRITERIA AND FINDINGS

1. The Coos Bay Land Development Ordinance (LDO) establishes an estuarine review procedure to verify allowed uses and activities within the aquatic areas of the CBEMP. The Plan lists mitigation as an allowed activity in aquatic unit 52-NA.

   FINDINGS:

   A. Estuarine uses and activities are defined by the CBEMP. Allowable, conditional, and prohibited uses and activity within these areas shall be consistent with the Plan and shall be subject to the general and special conditions of the Plan, its policies, inventory document, and maps, in addition to development standards of the Coos Bay Land Development Ordinance.

   B. The CBEMP has been acknowledged by the State to be consistent with the Statewide Planning Goals, including Goal 16, Estuarine Resources. As verified in this application, the CBEMP identifies mitigation in the 52-NA unit as an allowed use ("A"), not subject to general or special conditions. Therefore, because the proposed mitigation is consistent with the CBEMP, which has already been acknowledged by the Land Conservation and Development Commission to be in compliance with Statewide Planning Goals, no further demonstration of compliance is required. Aquatic unit 52-NA is at *Attachment B.*

   C. A letter was received from the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians dated April 19, 2007, stating there are no known cultural resources in the project area. Therefore, the Tribes have no objections to the proposed project. The Tribes' letter is at *Attachment C.*

   D. The activity proposed is mitigation intended to offset impact to the estuary from a development activity.

2. Mitigation is listed as an allowed activity in the Lower Bay aquatic unit 52-NA, subject only to the management objective of this unit and any applicable general and special conditions. The Management Objective is provided below. There are no general or special conditions.

> *Management Objective:*
>
> *This aquatic unit contains extensive eelgrass beds with associated fish and waterfowl habitat, and shall accordingly be managed to maintain these resources in their natural condition in order to protect their productivity.*
>
> *Dredging of a small channel on the north side of the proposed airport fill shall be necessary as a form of mitigation to maintain tidal currents.*

FINDINGS:

A. Two areas where mitigation will take place are located approximately 700 feet and 1,200 feet to the south and southwest of the Airport runway. These areas, or islands, are to be shaved down to a mean lower water elevation to connect with existing adjacent eelgrass habitat. The Port proposes to excavate, or shave the inter-tidal sand bar areas, the first year and allow the site to stabilize over one winter storm season. In the second year the site will be planted with eelgrass from an adjacent donor site. This is the same method that was used by the Airport for mitigation for the runway extension project conducted in the 1980s. All earthwork will take place during the in-water work period, which occurs between October 1st and February 15th.

B. A third area where mitigation will take place is located approximately 3,400 feet southwest of the runway in a deeper water area to be filled to the mean lower water elevation to connect with adjacent eelgrass habitat.

C. A minimum of 1.15 total acres of low-to-high density eelgrass beds will be established by the mitigation.

EFFECTIVE DATE OF APPROVAL:
Unless a different time limit has been established by Commission action, approval shall be withdrawn if the authorized construction or use is not commenced within one year or is not pursued diligently to completion, or, if authorized occupancy or use has been discontinued for over 120 consecutive days.

The effective date of the permit may be delayed if substantive conditions are attached to the approval. The Commission may grant an extension of time for a period not to exceed one year if circumstances beyond the control of the applicant cause delays.

Laura Barron
Laura Barron
Planning Administrator

DATE: June 15, 2007

Attachments: A - Applicant's submitted information
B - CBEMP Aquatic Unit 52-NA
C - Letter dated April 19, 2007, from Confederated Tribes

c: Jeffrey Bishop, Oregon International Port of Coos Bay
Mark Whitlow, Perkins Coie
Department of State Lands
South Slough National Estuarine Reserve
City of North Bend
Oregon Department of Fish and Wildlife
Coos County
Department of Environmental Quality
Jody McCaffree
US Army Corps of Engineers
US Fish & Wildlife Service
National Marine Fisheries Service
Dave Perry, DLCD
Camby Collier
David Lohman
Marcella Weaver
Dennis Phillips

G:\DCS\PLANNING\Final Orders\2007\FO07-034 Est Activity.doc

City of Coos Bay

Public Works & Development Dept.

500 Central Ave., Coos Bay, Oregon 97420
Phone (541) 269-8918 Fax (541) 269-8916

RECEIVED
APR 19 2007
PERKINS COIE

WRITTEN NOTICE
Estuarine Activity

Notice is hereby given that a public hearing will be held by the City of Coos Bay as follows:

HEARING BODY:	Planning Commission
DATE & TIME:	**May 8, 2007 at 6:00 p.m.**
LOCATION:	City Council Chambers, City Hall, 500 Central Ave., Coos Bay
APPLICANT:	OR International Port of Coos Bay PO Box 1215, Coos Bay, OR 97420
OWNER:	OR Department of State Lands 775 Summer Street NE, Salem, OR 97301-1279
LOCATION:	T. 25, R. 13, S. 08: 700 feet and 1,200 feet south and southwest of the Airport runway; and, 3,400 feet southwest of the runway.
SUBJECT:	**Estuarine Use ZON2007-00034** Mitigation in Aquatic Unit 52-NA

REQUEST SUMMARY:
The applicant is requesting verification that proposed mitigation which will take place at the above referenced locations is permitted under Coos Bay Estuary Management Plan aquatic unit 52-NA. Mitigation is proposed in three areas so that a minimum of 1.15 total acres of low-to-high density eelgrass beds will be established. The mitigation is designed to compensate for impacts to eelgrass expected to occur during dredging between a proposed multi-purpose marine shipping berth and the existing navigation channel.

REVIEW CRITERIA:
As set forth by Land Development Ordinance Chapter 5.10, final verification by the Planning Commission will be based upon findings that substantiate the management objective of aquatic unit 52-NA is met and any applicable general and special conditions are satisfied. There are no general or special conditions applicable to the mitigation at this location.

The management objective states:

> *This aquatic unit contains extensive eelgrass beds with associated fish and waterfowl habitat, and shall accordingly be managed to maintain these resources in their natural condition in order to protect their productivity.*
>
> *Dredging of a small channel on the north side of the proposed airport fill shall be necessary as a form of mitigation to maintain tidal currents.*

The final decision by the Planning Commission may be appealed to the City Council as provided in LDO Chapter 5.4.

HEARING PROCEDURE:
The hearing will be conducted in accordance with LDO Chapter 5.3 and all testimony must address the decision criteria referenced above. Written comments addressing the findings necessary for a decision may be submitted prior to the date of the hearing and will be considered at the hearing. Failure to raise an issue during the hearing, in person or by letter, or failure to provide sufficient specificity to afford the decision maker an opportunity to respond to the issue may preclude further appeal on that issue. If prior to the conclusion of the hearing, any participant requests the opportunity to present additional evidence, arguments or testimony regarding the application, the hearing will either be continued or the record will be left open for at least seven days after the hearing.

ADDITIONAL INFORMATION:
A copy of the application, all material submitted in support of the application and the applicable criteria are available for inspection at the Public Works and Development Department, City Hall, 500 Central, Coos Bay, Oregon. Upon request, copies of these materials will be provided for a reasonable fee.

A copy of the staff report concerning this application will be available for inspection at least seven (7) days prior to the Planning Commission hearing at the Public Works and Development Department. Upon request copies of the staff report will be provided for a reasonable fee. A copy of these materials may be obtained at a reasonable cost from the Department.

Detailed information pertaining to the conduct of the public hearing and submission of evidence is available upon request by contacting the Public Works and Development Department. Those wishing further information shall contact Laura Barron, Planning Administrator, at (541) 269-8918.

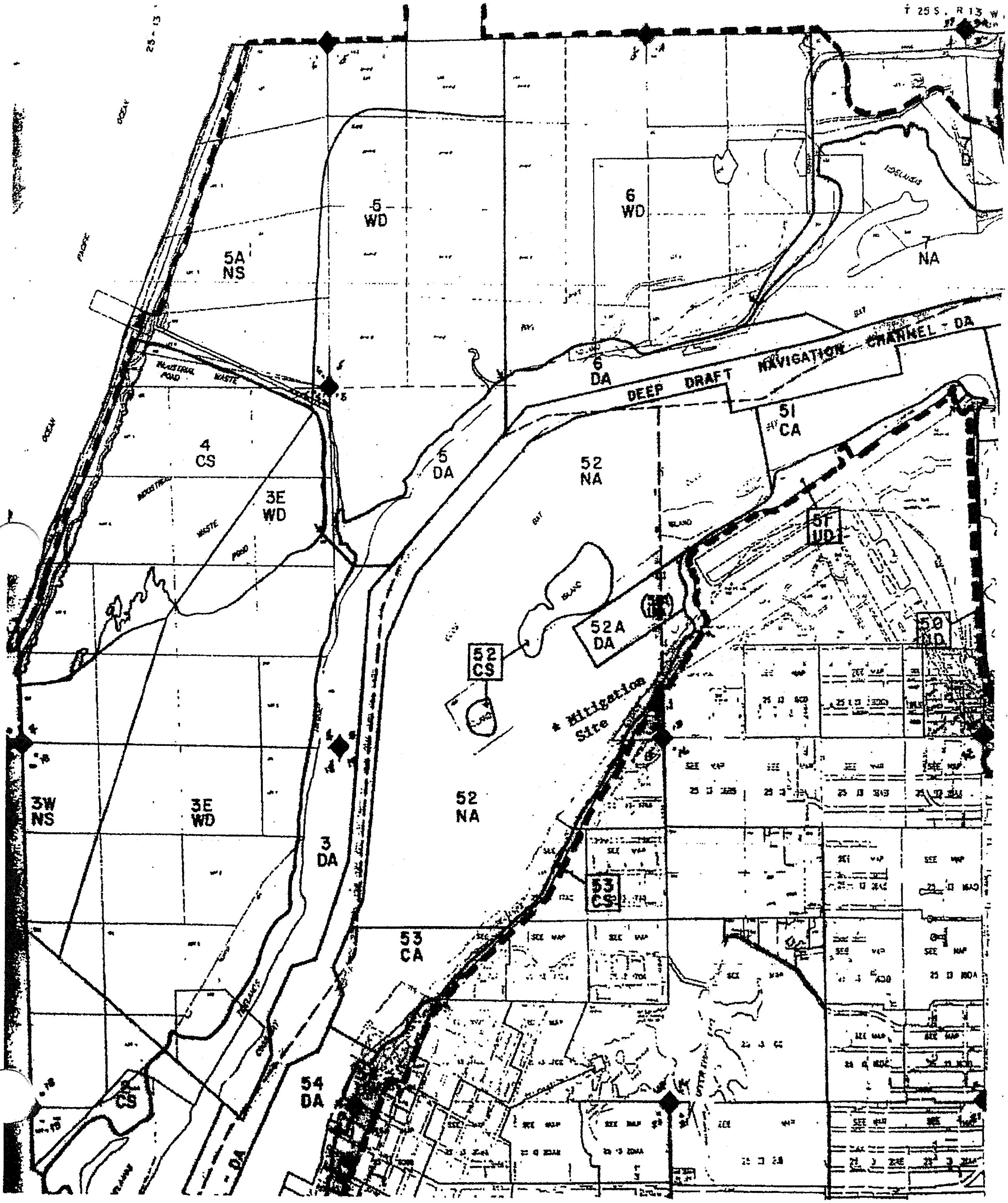
Notice to Mortgagee, Lien Holder, Vendor, or Seller: If you receive this notice it shall be promptly forwarded to the purchaser.

Laura Barron

Laura Barron, Planning Administrator

Notice Mailed: April 17, 2007

Attachment: Map
G:\DCS\PLANNING\Mailed Notice\2007\Mn07-034



T 25 S, R 13 W
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Mitigation Site
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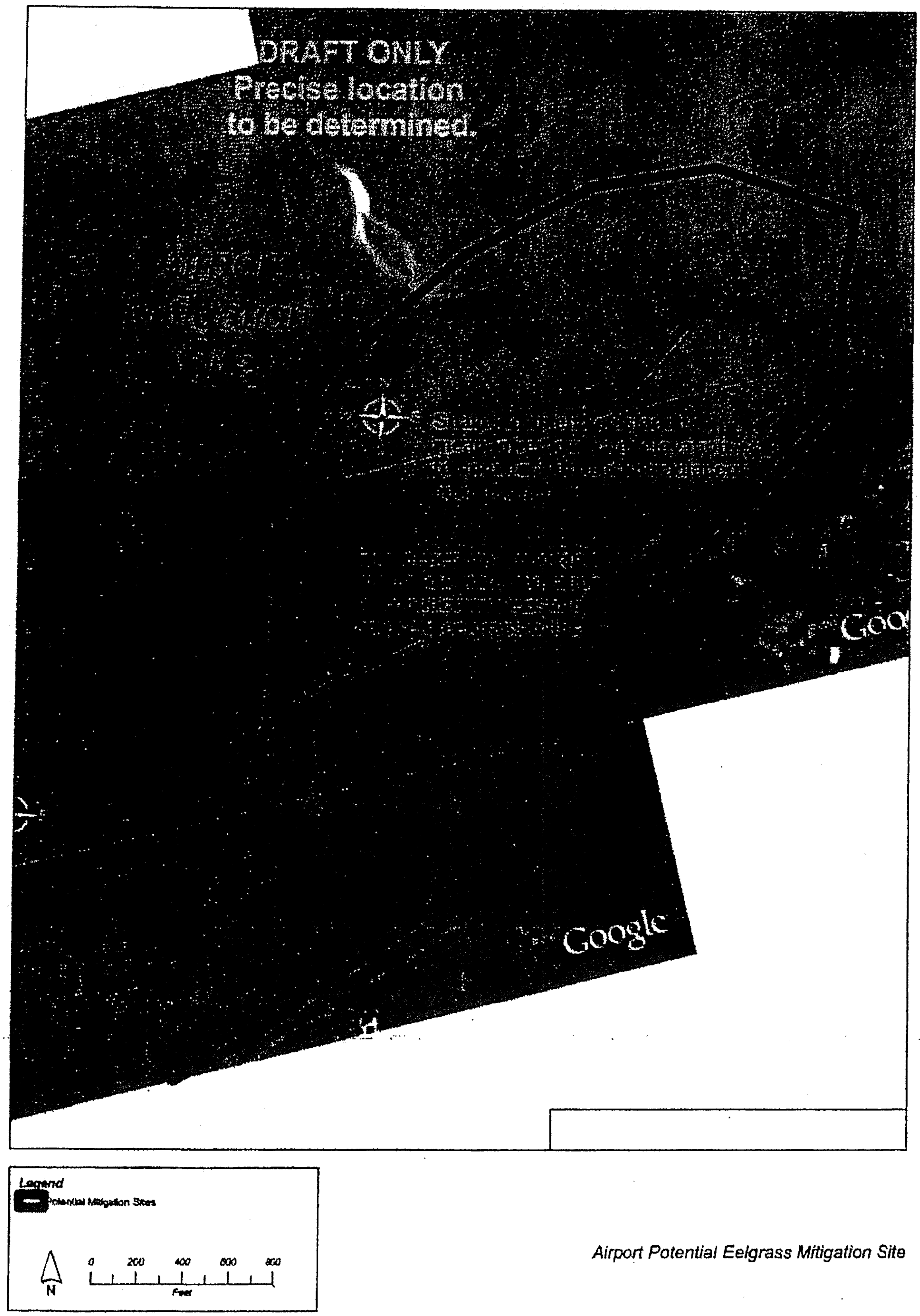
Figure 1



Airport Potential Eelgrass Mitigation Site

FIGURE 2

Perkins Coie

1120 N.W. Couch Street, Tenth Floor
Portland, OR 97209-4128
PHONE: 503.727.2000
FAX: 503.727.2222
www.perkinscoie.com

Mark D. Whitlow
PHONE: (503) 727-2073
FAX: (503) 795-4073
EMAIL: MWhitlow@perkinscoie.com

March 22, 2007

Ms. Laura Barron
Planning Administrator
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

Re: Application for Estuarine Review

Dear Laura:

This office represents the Oregon International Port of Coos Bay. Enclosed for filing is the Port's application for estuarine review to verify that mitigation is an allowed activity in District 52-NA of the Coos Bay Estuary Management Plan (CBEMP). Also enclosed is the Port's filing fee in the sum of $375.00. The Port's application has been signed by Jeffrey T. Bishop, Director. We will obtain written consent from DSL and forward it to you in the near future. As stated in the application, there are no other ownerships within 200 feet of the proposed mitigation site.

I will be out of the office until Thursday, March 29, 2007. In my absence, please do not hesitate to contact Frank Flynn (503) 727-2266 or my secretary, Donna Friberg (503) 727-2095.

Thank you for your assistance and cooperation in this matter.

Very truly yours,

Mark Whitlow

Mark D. Whitlow

Enclosures
cc: Oregon International Port of Coos Bay w/encl.
Stefanie Slyman
Frank Flynn

63023-0002/LEGAL13109235.1

APPLICATION TO CITY OF COOS BAY FOR MITIGATION ACTIVITY IN CBEMP ZONING DISTRICT 52-NA

TABLE OF CONTENTS

I. INTRODUCTION

The International Port of Coos Bay (the "Port") seeks verification from the City of Coos Bay that mitigation is an allowed activity in district 52-NA of the Coos Bay Estuary Management Plan ("CBEMP"), subject only to the management unit objective for the district. Any mitigation work performed by the Port based upon this verification will be done under a separate joint permit to be issued by the Department of State Lands ("DSL") and the U.S. Army Corps of Engineers ("USACOE").

II. DESCRIPTION OF PROPOSED MITIGATION

The Port proposes to establish an approximate two-acre mitigation site in CBEMP district 52-NA located in the Lower Bay of the Coos Bay Estuary. Specifically, the mitigation site is located due south to the west end of the Airport runway adjacent to existing eelgrass beds that were established as part of the Airport's mitigation associated with its runway extension in the 1980s. **(Figure 1, Vicinity Map)**. This site was selected by the Port's environmental consultants in coordination with the Oregon Department of Fish and Wildlife ("ODFW"), the South Slough National Estuarine Reserve and the Coos Bay Watershed Council.

The total mitigation area has been sized for approximately two (2) acres situated in three (3) subareas so that a minimum of 1.15 total acres of low- to high-density eelgrass beds will ultimately be established. While the precise boundaries of the mitigation subareas can only be determined in the Joint Permit process, it will generally take place as follows. Two subareas are islands located approximately 700' and 1200' to the south and southwest of the Airport runway. These islands are to be shaved down to a mean lower water elevation to connect with existing adjacent eelgrass habitat. The third subarea is located approximately 3400' feet southwest of the runway in a deeper water area to be filled to the mean lower water elevation to connect with adjacent eelgrass habitat. **(Figure 2, Airport Mitigation Site).**

The proposed mitigation will be constructed using the method that was used by the Airport for mitigation for the runway extension project conducted in the 1980s. That mitigation effort was accepted by state and federal regulators and is considered to be highly successful. The Port proposes to follow the same successful sequencing and methodology for establishing eelgrass as was then used by the Airport. This sequence involves excavation the first year while allowing the site to stabilize over one winter storm season, and in the second year the site is planted with eelgrass from an adjacent donor site. All earthwork will take place during the in-water work period, which occurs between October 1st and February 15th.

III. APPLICABLE APPROVAL CRITERIA

The applicable approval criteria for this application are contained in the City of Coos Bay Land Development Ordinance ("LDO") Chapter 1.4, Uses of Land, Chapter 5.10, Estuarine and Coastal Shoreland Uses and Activity and the applicable CBEMP provisions for zoning district 52-NA. LDO language is indicated by quotes.

"CHAPTER 1.4 USES OF LAND"

"Section 3. ESTUARINE AND COASTAL SHORELAND USES AND ACTIVITIES

1. Except as otherwise provided in this ordinance, the adopted Coos Bay Estuary Management Plan shall be implemented and administered under the procedures of this ordinance within the City of Coos Bay.

2. Estuarine and shoreland areas shall be defined by the Coos Bay Estuary Management Plan. Allowable, conditional, and prohibited uses and activities within these areas shall be consistent with the Plan and shall be subject to the general and special conditions of that Plan, its policies, inventory document, and maps, in addition to development standards of this ordinance.

Because management units of the Plan may encompass more than one zoning district, the uses allowed within the shoreland areas shall be those listed for the underlying zone contained in this ordinance. Since this ordinance does not specify activities, such as dredging or shoreland stabilization, nor address aquatic areas, the activities within the shoreland and the uses and activities of the aquatic areas shall be those listed in the Plan."

Response: The LDO establishes an estuarine review procedure to verify allowed uses and activities within the aquatic areas of the CBEMP. The Plan lists mitigation as an allowed activity in district 52-NA.

"CHAPTER 5.10 ESTUARINE AND COASTAL SHORELAND USES AND ACTIVITY"

"Section 1. GENERAL

Uses and activities permitted by the Coos Bay Estuary Management Plan are subject to general and special conditions and policies to comply with statewide planning goals. Compliance with these conditions and policies must be verified; therefore, all uses and activities under jurisdiction of the Coos Bay Estuary Management Plan must be reviewed."

Response: The CBEMP has been acknowledged by the State to be consistent with the Statewide Planning Goals, including Goal 16. As verified in this application, the CBEMP identifies mitigation in the 52-NA district as an approved use ("A"), not subject to general or special conditions. Therefore, because the proposed mitigation is consistent with the CBEMP, which has already been acknowledged by the Land Conservation and Development Commission ("LCDC") to be in compliance with Statewide Planning Goals, no further demonstration of compliance is required.

"Section 2. INITIATION
A request to permit these uses and activities may be initiated by a property owner or authorized agent through an application to the Department of Community Services. If an application has been filed with the Division of State Lands for a state or federal waterway permit, the information contained on the application may be sufficient for review. However, the City application fee shall not be waived."

Response: The Port has filed an application with DSL/USACOE for a joint state/federal "waterway" permit. The Port is seeking verification with the City of Coos Bay Department of Community Services that mitigation activity is allowed in CBEMP zoning district 52-NA located in the City limits.

"Section 3. APPLICATION
An application may include any or all of the following items at the discretion of staff. The applicant shall provide one copy of the written information and two copies of the map."

"1. A general location map of the property and a detailed parcel map of the property, each on approximately 8" x 11" paper."

Response: See **Figure 2** for the location of the mitigation site.

"2. Address and legal description of the property."

Response: The site has no address. The mitigation subareas are located in the waters of the Lower Bay of the Coos Bay Estuary, southwest of the Coos Bay Airport in the 52-NA CBEMP zoning district. None of the external boundaries of the mitigation subareas are located within 250' of any adjacent properties.

"3. Detailed description of the proposed use or activity."

Response: The detailed description of the proposed mitigation activity is provided in section II of this application, Description of Proposed Mitigation.

"4. Statement explaining how the proposed use and/or activity complies with the Plan and ordinance provisions."

Response: Mitigation is listed as an allowed activity in the Lower Bay Aquatic Unit 52, Management Classification – NA subject only to the management objective of this district and any applicable general and special conditions. The Management Objective is provided below. There are no applicable general or special conditions.

"Lower Bay, Aquatic Unit- 52, Management Classification – NA"

"**Management Objective**: This aquatic unit contains extensive eelgrass beds with associated fish and waterfowl habitat, and shall accordingly be managed to maintain these resources in their natural condition in order to protect their productivity.

Dredging of a small channel on the north side of the proposed airport fill shall be necessary as a form of mitigation to maintain tidal currents.

Maintenance only of the existing sewage treatment plant outfall shall be permitted."

Response: The proposed mitigation is consistent with this management objective as it will expand the area covered by eelgrass in this district which will, in turn, increase fish and waterfowl habitat.

"Activities"

Response: Mitigation is listed as an allowed activity, subject to applicable general and special conditions of which there are none as demonstrated below.

"General Conditions: None"

Response: There are no applicable general conditions in the 52-NA zoning district in which mitigation is proposed.

"Special Conditions, Activities"

Response: There are no applicable special conditions for the activity of mitigation in the 52-NA zoning district.

IV. CONCLUSION

As demonstrated by the foregoing responses, mitigation is an allowed activity in district 52-NA, subject only to the management objective of the 52-NA district, with which it is consistent. It is not subject to any general or special conditions. Therefore, the activity of mitigation is consistent with the CBEMP and, consequently, applicable Statewide Planning Goals. Any mitigation work to be performed by the Port will be done under a Joint Permit from DSL and the USACOE.

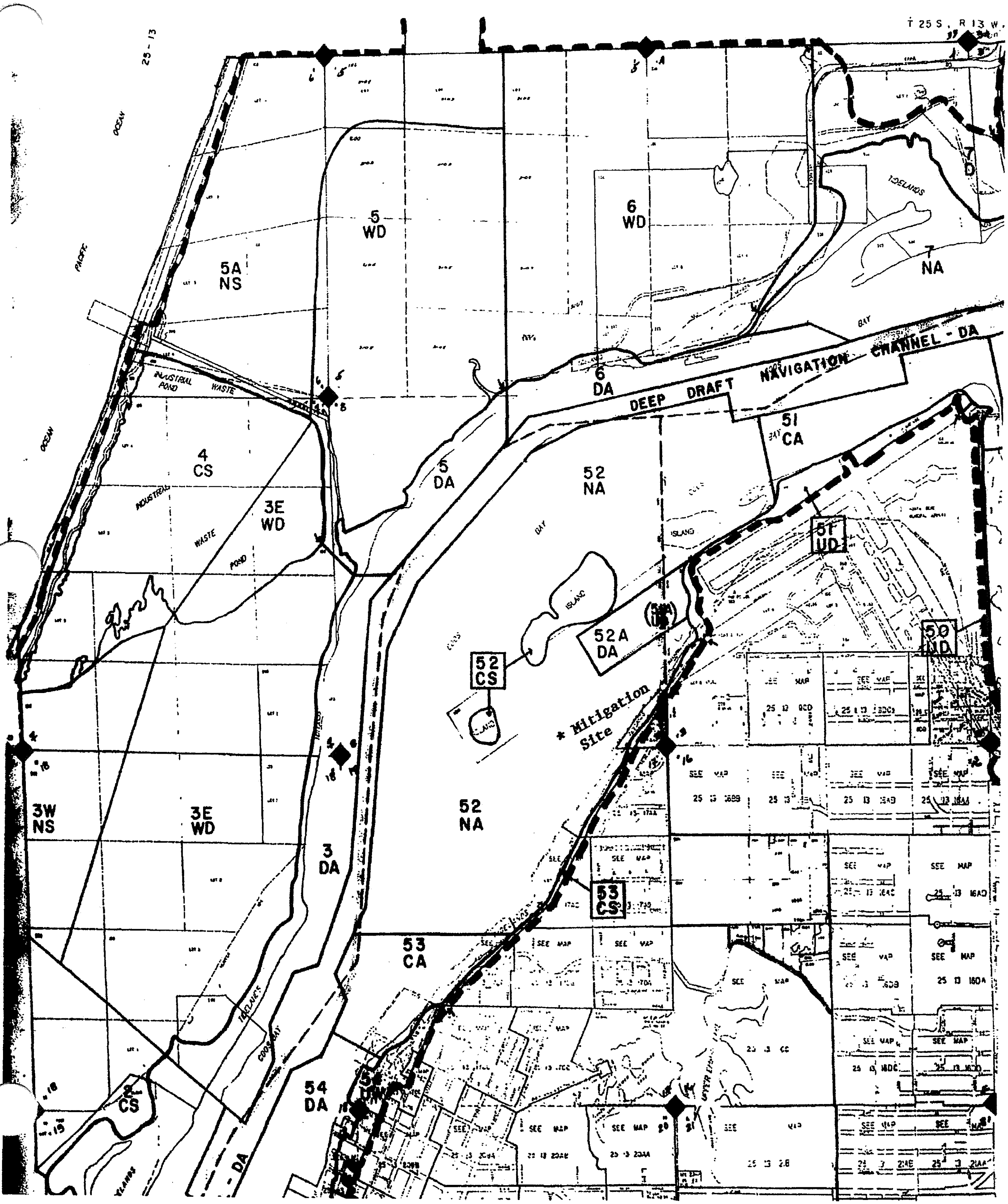


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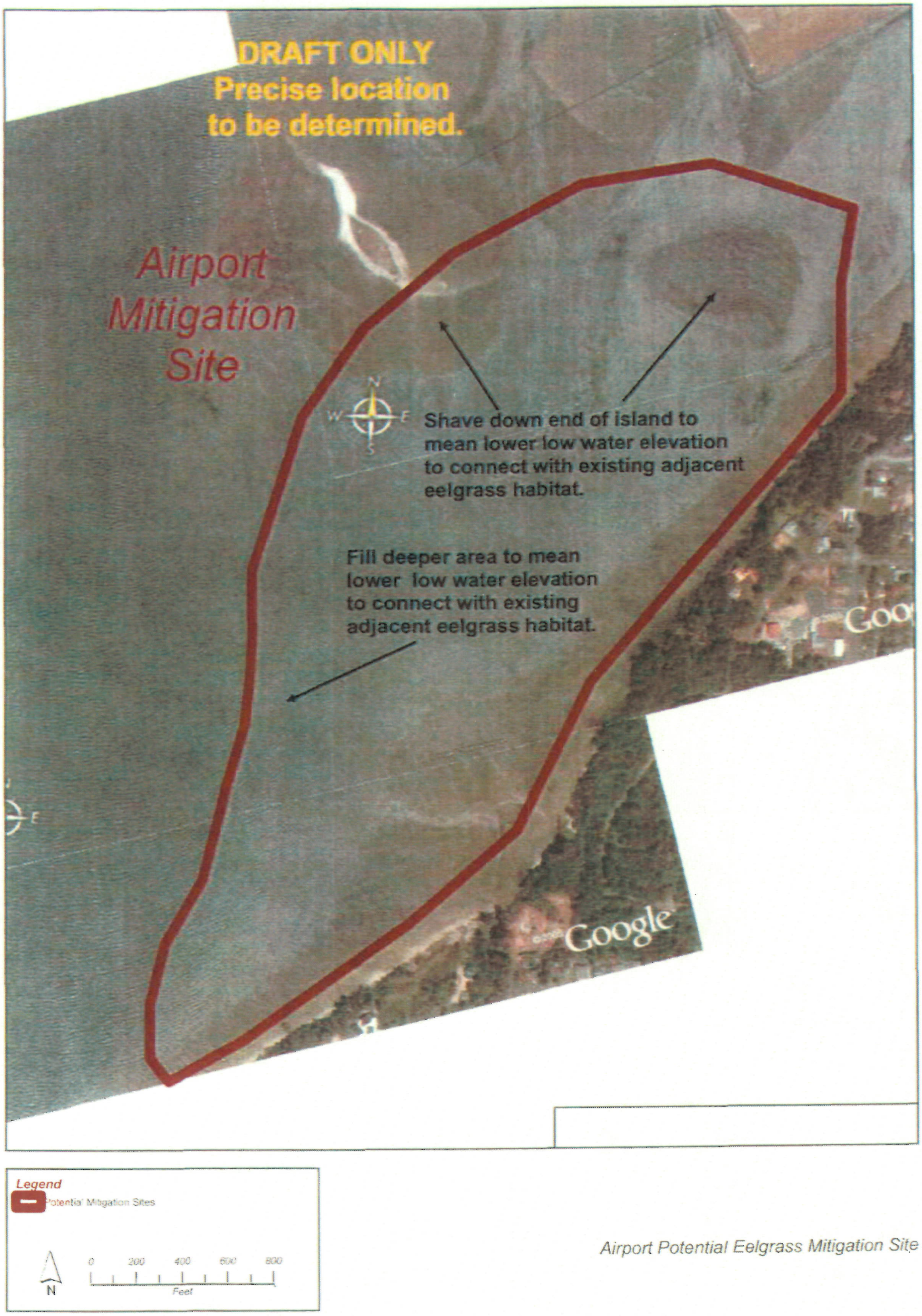
Figure 1


DRAFT ONLY
Precise location
to be determined.
Airport
Mitigation
Site
Shave down end of island to
mean lower low water elevation
to connect with existing adjacent
eelgrass habitat.
Fill deeper area to mean
lower low water elevation
to connect with existing
adjacent eelgrass habitat.
Google
Legend
Potential Mitigation Sites
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Feet
N
Airport Potential Eelgrass Mitigation Site

FIGURE 2

Jordan Cove Energy Project
and
Pacific Connector Gas Pipeline Project

Compensatory Wetland Mitigation Plan

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TABLE OF CONTENTS

Tables

1. *COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW*

1.1 INTRODUCTION

Jordan Cove Energy Project, LP (JCEP) is seeking authorization from the Federal Energy Regulatory Commission (FERC) under Section 3 of the Natural Gas Act (NGA) to site, construct, and operate a natural gas liquefaction and liquefied natural gas (LNG) export facility (LNG Terminal), located on the bay side of the North Spit of Coos Bay, Oregon. JCEP will design the LNG Terminal to receive a maximum of 1,200,000 dekatherms per day (Dth/d) of natural gas and produce a maximum of 7.8 million tonnes per annum (mtpa) of LNG for export. The LNG Terminal will turn natural gas into its liquid form via cooling to about -260º Fahrenheit (F), and in doing so it will reduce in volume to approximately 1/600th of its original volume, making it easier and more efficient to transport.

In order to supply the LNG Terminal with natural gas, Pacific Connector Gas Pipeline, LP (PCGP) is proposing, under a separate Section 7c NGA authorization, to contemporaneously construct and operate a new, approximately 229-mile-long, 36-inch-diameter natural gas transmission pipeline from interconnections with the existing Ruby Pipeline LLC and Gas Transmission Northwest LLC (GTN) systems to the LNG Terminal (Pipeline, and collectively with the LNG Terminal, the Project).

This Compensatory Wetland Mitigation (CWM) Plan includes proposed mitigation at two sites within the Coos Bay Estuary, the Eelgrass Mitigation site and the Kentuck Project site. Each site provides for the minimum mitigation acreage/credits required to meet regulatory requirements plus additional acreage in which to conduct voluntary habitat improvements. Where appropriate, the distinction between required mitigation versus voluntary efforts is noted in this CWM Plan. The distinction is primarily with respect to the acreage of improvements to various habitat types and how much is required versus how much is voluntary.

The proposed LNG Terminal will result in unavoidable, permanent impacts to freshwater wetlands and estuarine habitats (collectively referred to as wetlands in this document except where there is a need to distinguish the difference) within the intertidal and shallow subtidal zone of Coos Bay, as provided below in Table 1. These resources provide important ecological functions to the greater Coos Bay ecosystem, and are regulated by state and federal agencies. Note that the Oregon Department of State Lands (ODSL) treats temporary impacts lasting more than two-years (long duration) as a permanent impact; whereas, the U.S. Army Corps of Engineers (USACE) does not. For consistency sake between the two agencies, this CWM Plan only covers actual permanent impacts. All temporary impacts, short and long duration, will be addressed in a separate site restoration plan.

The proposed Pipeline will result in permanent impacts to wetlands in the form of permanently converting forested and scrub-shrub wetlands to emergent wetlands as a result of temporary disturbance activities involved with pipe installation. Conversion from one Cowardin class to another Cowardin class is viewed as a permanent wetland impact by the USACE and ODSL due to an overall loss of wetland functions (Oregon Revised Statutes [ORS] 141-085-0680). The permanent wetland type conversion impacts from the Pipeline, which total less than one acre, would occur across eight fifth-field watersheds (HUC 10). Most of the conversion impacts within the affected watersheds would be less than 0.1 acre with only one watershed experiencing a permanent conversion impact exceeding 0.2 acre which would occur within the Olalla Creek –

Lookingglass Creek Watershed (HUC 1710030212). Previously, PCGP proposed to mitigate the conversion impacts at the Cow Hollow Mitigation Bank which is within the Olalla Creek – Lookingglass Creek Watershed, where the largest conversion impact (0.37 acre) would occur. However, ODSL had concerns that this mitigation bank was not a viable option due to the lack of available credits. PCGP and the Bank Owner prepared a mitigation plan as Phase II of the Cow Hollow Bank on lands adjacent to the existing Cow Hollow Mitigation Bank, but based on ODSL's reservations concerning the Phase II proposal and because there were no other mitigation bank service areas that overlapped the pipeline, PCGP dropped the use of mitigation banks from further consideration. Instead, PCGP chose to consolidate mitigation in a single location that would have a high likelihood of success and that would be co-located with the JCEP LNG Terminal's compensatory mitigation obligations at the Kentuck Project in Coos Bay, Oregon. Further, the Pipeline's permanent wetland impacts consist of small, individual impacts spread over a large geographic area, and, therefore, it is impractical to conduct wetland mitigation at multiple, small sites in various watersheds crossed by the Pipeline.

This CWM Plan specifically covers compensatory mitigation for permanent impacts to freshwater wetlands and estuarine resources proposed within the Project sites (Table 1 and Appendix A, Figures O-1A and O-1B; also see Appendix C for a detailed breakdown of Pipeline permanent impacts by watershed). As previously noted short and long duration temporary impacts are addressed in a separate site restoration plan. Development features that result in freshwater wetland and estuarine impacts and that are covered in this CWM Plan include:

LNG Terminal: Ingram Yard
LNG Terminal: Slip and access channel
LNG Terminal: Material Offloading Facility (MOF)
LNG Terminal: South Dunes site
LNG Terminal: Access and Utility Corridor
LNG Terminal: Trans Pacific Parkway/U.S. Highway 101 (US-101) Intersection Widening
LNG Terminal: Impacts associated with construction of the Kentuck Project mitigation site
Pipeline: Areas of forested and scrub-shrub wetland converted to emergent wetland

Table 1. Summary of Permanent Freshwater Wetland and Estuarine Impacts Being Mitigated

Habitat Category	Cowardin Code*	Project Habitat Description	Permanent Impact (Acres) ***
LNG Terminal			
Freshwater Wetland	PFO	Forested wetland	0.29
	PEM	Emergent wetland	1.15
	PAB	Emergent wetland and water	0.48
Estuarine	E2USN	Intertidal sand/mudflat	11.89
	E1UB	Shallow subtidal habitat (i.e., unvegetated areas from 0 feet to -15 feet Mean Lower Low Water ("MLLW") datum)	4.32
	E2EM	Saltmarsh	0.06
	E2AB	Eelgrass	2.26
	E2RS	Riprap road embankment below Highest Measured Tide ("HMT")	0.51
		Total all LNG Terminal	**20.89**
Pipeline**			
Freshwater Wetland	PFO, PSS	Forested and scrub-shrub wetland converted to emergent wetland	0.91
		Total all Pipeline	**0.91**
Impacts at Kentuck Site			
Freshwater Wetland	PFO	Forested wetland	0.85
	PEM	Emergent wetland	4.55
Estuarine	E2RS	Riprap road embankment below HMT	0.07
		Total all Kentuck Site	**5.47**
		Total all impacts being mitigated	**27.34**

* Cowardin classes: E2AB = estuarine, intertidal, aquatic bed; E2USN = estuarine, intertidal, unconsolidated shore, regularly flooded (i.e., mudflat); E1UB = estuarine, subtidal, uncosolidated bottom; E2EM = estuarine, intertidal, emergent; E2RS = estuarine, intertidal, rocky shore; PFO = palustrine forested; PSS = palustrine scrub-shrub; PEM = palustrine emergent; and PAB = palustrine aquatic bed.

** A detailed breakdown of permanent wetland impacts related to the Pipeline is provided in Appendices A (map) and B (table).

*** Impact values provided to the third decimal place for JLNG Terminal impacts, for consistency with joint permit application impact table. All other values provided to two decimal places.

As shown in Table 1, a total of 27.34 acres of permanent impacts will require mitigation. 26.36 acres of these impacts are attributable to the LNG Terminal, which includes the LNG Terminal development impacts (20.96 acres), the impacts associated with construction of the Kentuck Project mitigation site (5.47acres), and the impacts to 2.26 acres of existing eelgrass resources within the intertidal zone of the proposed LNG Access Channel. The remaining 0.91 acre of impacts are attributable to the Pipeline.

Mitigation of permanent impacts to wetlands from construction and operation of the LNG Terminal and related facilities will occur at two sites: the Eelgrass Mitigation site and the Kentuck Project site. Mitigation for the Pipeline will occur only at the Kentuck Project site.

The Eelgrass Mitigation site (9.34 acres) consists of a locally high area in the Coos Bay estuary, southwest of the Southwest Oregon Regional Airport (SORA), which is bordered by eelgrass. This locally high area was likely created by estuarine processes that have since been blocked by the airport runway extension constructed in the 1980s (Appendix D). Site elevations are currently too high to support eelgrass (+2.7 feet MLLW); mitigation activities will include lowering the elevations to match those of surrounding eelgrass beds and planting the site with eelgrass. Appendix D provides a historical geomorphic analysis that indicates that the Eelgrass Mitigation Site will remain stable after grading and planting. The most recent eelgrass surveys conducted in 2018 by DEA found that eelgrass is not present within the site boundaries, though adjacent eelgrass beds are present. The extent of grading of the final eelgrass mitigation site will be limited to avoid surrounding areas of existing eelgrass habitat. The site boundaries will be finalized after pre-construction eelgrass surveys have been completed.

The Kentuck Project includes two main components totaling approximately 100 acres adjacent to Kentuck Slough and Kentuck Creek. Kentuck Creek flows to Kentuck Slough. In this CWM Plan Kentuck Creek is used to refer to the portion of the drainage generally above the historic head of tide, while Kentuck Slough is used to refer to the portion of the drainage generally below the historic head of tide. The first Kentuck Project component (91.46 acres), which includes the majority of the former Kentuck Golf Course, consists of diked (i.e., levee construction) historical tide lands that will be reconnected to the estuary and result in a combination of tide channels, mudflats, salt marsh, and fringing freshwater wetland communities. The second component (9.14 acres) is located at the far northeast end of the former golf course and will feature a freshwater floodplain reconnection to Kentuck Creek. Construction of the Kentuck Project will entail roughly 5.47 acres of permanent impacts to wetlands, with mitigation for these impacts incorporated into this plan.

In Oregon, it is a longstanding and common practice for the USACE regulatory program to accept the State's wetland mitigation ratios when considering CWM Plans. Therefore, Oregon ODSL wetland mitigation ratios have been used to determine mitigation acreages presented in this plan. ODSL mitigation ratios are: 1 acre of restored wetland for each 1 acre of impacted wetland; 1.5 acres of created wetland for each 1 acre of impacted wetland; and 3 acres of enhanced wetland for each 1 acre of impacted wetland.

Mitigation at the Kentuck Project site will be achieved through enhancement activities (i.e., converting disturbed freshwater wetland back to historic estuarine habitats), and thus calculated using a 3:1 ratio. However, some activities may result in actual restoration; that is, some historical wetlands that are currently upland may be restored to wetland. For Kentuck Project site mitigation credit accounting purposes, all potential restoration will be considered contingency, because all of the mitigation needs can very likely be met through the proposed enhancement areas.

Eelgrass mitigation actions will be considered enhancement since they entail improving functions of existing estuarine habitat (i.e., sand/mudflat) to that of eelgrass habitat. Therefore, a 3:1 ratio will be used for initial eelgrass mitigation. Given a proposed impact to 2.26 acres of eelgrass (Table 1), a 3:1 impact to enhancement ratio will be 6.78 acres of initial eelgrass enhancement. This will be more than satisfied by the proposed grading of a 9.34 acre site at optimal elevations for eelgrass planting and colonization. However, for eelgrass, unlike wetlands, maintaining a 3 to 1 final ratio is not feasible and the USACE has recommended a final mitigation ratio of 1.2:1 after 5 years of post-construction monitoring (USACE 2018a). Therefore, the final mitigation requirement will be 2.71 acres of eelgrass (2.26 X 1.2) after a 5 year post-construction monitoring period. This final ratio is the objective for proposed eelgrass mitigation. The final eelgrass mitigation ratio, if justified, may also be reduced by the proposed salvage of existing eelgrass within the project area and transplantation to adjacent recipient sites prior to dredging actions (see Section 3.4.3). The final eelgrass mitigation requirement will be reduced by the amount of transplanted eelgrass that has successfully reestablished at the recipient sites. Successful reestablishment will be documented by annual quantitative monitoring.

This proposed CWM Plan has been prepared in accordance with the Oregon Administrative Rules (OAR) of the Oregon DSL for Compensatory Wetland and Tidal Waters Mitigation (OAR 141-085-0680). The plan also meets the requirements of the federal rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Part 332), commonly referred to as the "mitigation rule."

1.2 ECOLOGICAL GOALS AND OBJECTIVES

The goals and objectives of this CWM Plan seek to offset the loss of acreage and functions provided by the wetland resources that would be impacted by the Project. Specific goals and objectives for each proposed mitigation area are provided below, with additional detail provided in Section 7.1, Performance Standards. It should be noted that acreages proposed below are primarily the minimums based on the standard ODSL 3:1 enhancement ratios and USACE mitigation ratio of 1.2:1 for eelgrass, and that additional voluntary habitat improvement acreage is planned for beyond these minimums. In some instances voluntary efforts are included in the goals and objectives discussion to help clarify the distinction between required mitigation versus the voluntary efforts at each site.

1.2.1 Eelgrass Mitigation Site

The Eelgrass Mitigation site is intended to offset impacts to eelgrass habitat resulting from the LNG Terminal. The Pipeline does not impact eelgrass habitat.

Mitigation Goal 1: At the proposed Eelgrass Mitigation Site, establish a population of eelgrass equivalent to the impact site with the addition of the prescribed regulatory ratio (i.e., 2.71 acres). The stability of the population size and density shall be comparable to surrounding beds and reflect the overall natural fluctuation of eelgrass coverage and density within the bay (monitoring will include reference sites to enable tracking of natural fluctuations of eelgrass coverage and densities).

(Note that the eelgrass mitigation site will encompass 9.34 acres. As proposed, this intertidal area would be excavated to a similar elevation as the surrounding areas currently populated by eelgrass.)

To achieve this goal, the following objectives will be met:

Objective 1.1: Establish elevations suitable for eelgrass establishment over a minimum of 6.78 acres (i.e., 3 to 1 mitigation ratio for enhancement projects).

Objective 1.2: Establish a resultant 2.71 acres of eelgrass beds after 5-years of post-construction monitoring (i.e., a final mitigation ratio of 1.2 to 1 impact site to mitigation site, prescribed by the USACE). To maintain ecological functions, the densities of eelgrass at the Eelgrass Mitigation Site would be statistically no different than eelgrass densities within the adjacent reference site and within the proposed Access Channel prior to dredging. Quantitative density counts within both areas are similar and not statistically different from each other (53.5 shoots/m^2 at the Reference Area and 54.0 shoots/m^2at the Access Channel; details are available in the 2018 Eelgrass Summary Report [DEA 2018a]). The maturity and expansion of the planted eelgrass mitigation site over the 5-year post-construction monitoring period will also have to meet annual performance standards of areal coverage and density, as outlined in Section 7.1. In the case that eelgrass densities increase or decline within the Reference Site over the post-construction period, reference densities will be used to measure performance. This is consistent with maintaining the ecologically functional equivalent of current conditions within Coos Bay while following both ODSL and USACE guidelines.

It should also be noted that Objective 1.2 acreage may be reduced based on the amount of impact site acreage that can be salvaged and transplanted to other areas. Subject to agency consultation and approval, the project proposes to remove eelgrass from the Access Channel prior to dredging and transplant it to the Jordan Cove embayment a full two seasons before the eelgrass mitigation site will be planted. Jordan Cove was evaluated and found to be an acceptable recipient site for eelgrass transplants during eelgrass and bathymetric surveys conducted in 2018 (DEA 2018; see Section 3.4.3). Two seasons of monitoring the salvaged transplants will be conducted in Jordan Cove to verify what has established. Data would be used to recalculate (and potentially reduce) the total eelgrass mitigation requirement at the Eelgrass Mitigation Site based on the amount of eelgrass that has reestablished in Jordan Cove. Approval by the USACE and ODSL would be required before implementing this approach.

Objective 1.3: Reestablish eelgrass beds temporarily impacted from construction of the eelgrass mitigation site. The mitigation site shall be surveyed during the summer growing season prior to the proposed winter dredging activities to document potential incidental impacts that may occur. The functional acreage equivalent will be restored.

Objective 1.4: There will be no lasting depletion or harm to eelgrass donor beds, documented by annual monitoring requirements. This objective does not apply to eelgrass that would be salvaged from the impact site.

1.2.2 Kentuck Project Site – Tidal Reconnection Area (LNG Terminal)

The LNG Terminal's additional mitigation needs will be provided for in the Tidal Reconnection Area.

Mitigation Goal 2: Restore tidal connectivity to a minimum of 72.51 acres of historic tide lands within the former golf course site, which will result in a diverse array of habitat types including mudflat, tide channels, salt marsh, and fringing freshwater wetlands. This acreage is based on a 3:1 ratio of LNG Terminal impacts presented in Table 1, including permanent impacts at the Kentuck Site but not including eelgrass impacts.

Approximately 91 acres of construction will be undertaken to achieve this goal, including approximately 18 acres of voluntary habitat improvements above the minimum requirements. Additionally, JCEP anticipates providing substantially more vegetated habitat (e.g., salt marsh) than the minimum required because of salt marsh's higher productivity and historical loss within the watershed relative to mudflat. An estimated 28 percent of tidal wetland (e.g., salt marsh) has been lost within the bay compared to an estimated 18-percent loss of tidal flats (e.g., mudflat), and there is currently roughly four and a half times more tide flat than tidal wetland within the bay (Borde et. al. 2003). Proposed plant community elevations and species composition are based on a reference site immediately adjacent to the mitigation site in Kentuck Inlet.

To achieve this goal, the following objectives will be met:

Objective 2.1: Restore tidal reconnection to the site that allows for free exchange of tidal water from Kentuck Inlet. The reconnection will allow ecosystem processes to function similar to historic pre-settlement conditions to the greatest extent practicable given historic alterations at the site and within the watershed and also based on site constraints and adjacent property owner concerns. This objective will be achieved by installing a new bridge along East Bay Drive that meets Oregon Department of Fish and Wildlife (ODFW) fish passage criteria, National Marine Fisheries Service (NMFS) standards, and (based on hydrodynamic modeling) has been designed to allow for full tidal exchange within the site during a single tide cycle.

Objective 2.2: Allow for continuity of ecological processes to occur between Kentuck Inlet, the project site, and Kentuck Slough, including fish passage. This objective will be achieved by installing the bridge along East Bay Drive as noted in Objective 2.1 as well as a muted tidal regulator (MTR) (i.e., fish friendly tidegate) towards the upper end of the site to create a direct connection between the site and Kentuck Slough. An additional fish friendly culvert (i.e., box culvert with native substrate bottom) will be installed to reestablish tidal connection to a drainage now blocked by an earthen berm/irrigation pond. All structures will be designed to meet ODFW fish passage criteria and NMFS standards.

Objective 2.3: Provide a range of aquatic habitat regimes within the site to support native plant species. This objective will be achieved through site grading to provide a range of tidal regimes within the site, including areas of salt marsh (particularly lower marsh elevations), mudflats, grading of primary and secondary tide channels, and habitat pools.

Objective 2.4: Provide aquatic habitat features to further support native aquatic species, including rearing salmonids. This objective will be achieved through installation of wood habitat structures in habitat pools, channels, and other areas subject to periodic tidal inundation. At a minimum the following will be included:

- 4 five-log free standing habitat structures
- 13 three-log bank tied habitat structures
- 12 one-log root wads
- 2 habitat pools

Objective 2.5: Establish a diversity of vegetated estuarine and freshwater wetland habitat types dominated by native species (i.e., salt marsh, and palustrine forested, scrub-shrub, and emergent communities). At a minimum 22.35 acres of vegetated habitats shall be established to offset vegetated wetland impacts (i.e., Table 1 LNG Terminal impacts, including Kentuck impacts, to PFO, PSS, PEM, PAB, and E2EM habitats) at a 3:1 ratio. This objective will be achieved by grading site elevations that are supportive of salt marsh establishment (based on nearby reference salt marsh). Fringing freshwater wetlands are anticipated to form along the upper margins of the site that occur near sources of freshwater (i.e., tributary streams, and seeps and shallow subsurface flows from the hillside that runs along the south side of the site). There will be a natural interplay between salt water from the bay and freshwater inputs that ultimately dictates the boundary between freshwater wetland/salt marsh communities. Salt marsh elevations are anticipated to range between approximately 5.5 ft to 8.5 ft NAVD 88 and the majority of proposed vegetated areas have been designed to these elevations. Maximum site elevations (not including levee and roadways) extend up to an elevation of 10.0 ft NAVD 88, which is just below the highest measured tide elevation for Coos Bay (10.26 ft NAVD 88). Elevations have only been extended up to 10.0 ft where freshwater tributary and hillside inputs are anticipated and therefore freshwater wetland plant species are likely to grow.

1.2.3 Kentuck Project Site – Freshwater Floodplain Reconnection Area (Pipeline)

The Pipeline's mitigation needs will be provided for in the Freshwater Floodplain Reconnection Area.

Mitigation Goal 3: Improve wetland and aquatic habitat functions by restoring ecological processes along a reach of Kentuck Creek and its adjacent, diked and grazed wetland floodplain. This will entail reestablishing floodplain connection to a minimum of approximately 2.73 acres of historical floodplain adjacent to Kentuck Creek (i.e., 3:1 ratio of PCGP impacts noted in Table 1), and establishing a mix of forested and scrub-shrub wetland habitats. Approximately 9.14 acres of construction will be undertaken to achieve this goal, including approximately 6.41 acres of voluntary habitat improvements above the minimum requirements. Per recommendation from NMFS, realigning a portion of Kentuck Creek through the site will also occur in order to improve instream habitat.

To achieve this goal, the following objectives will be met:

Objective 3.1: Improve in-stream habitat channel complexity to support native aquatic species. This objective will be met by realigning the creek through the Freshwater Floodplain Reconnection Area instead of following its current course along the northeast property boundary. Channel sinuosity will be increased to approximate estimated historic conditions and the channel cross-section will simulate a natural channel as opposed to the current partially maintained ditch-like channel. The existing channel will be plugged at its upstream end where it enters the site to divert water to the new channel, while the remainder of the existing channel will be left in place as a backwater habitat feature and to allow flow inputs from Mettman Creek and an existing drain from an adjacent property.

Objective 3.2: Increase instream habitat structural complexity. This objective will be achieved through installation of large wood, including root wads. At a minimum the following will be included:

- 1 complex wood structure
- 5 three-log bank tied habitat structures
- 2 one-log root wads

Objective 3.3: Allow for floodplain connection between the creek and its historic floodplain. This objective will be achieved by realigning the creek as described in Objective 3.1 as well as removing the existing levee along the northeast boundary of the site.

Objective 3.4: Enhance wetland functions through the establishment of native forested and scrub-shrub wetland plant communities. This objective will be achieved by a combination of site grading that will add microtopographic relief and planting the site with native trees, shrubs, and emergent wetland species. The microtopography will result in varied hydrologic regimes to support a higher diversity of plant species. Trees and shrubs will border both sides of the creek providing shading as well as food sources (i.e., macroinvertebrates) to fish.

1.3 OVERVIEW OF CWM CONCEPT AND FUNCTIONS AND VALUES REPLACEMENT

CWM activities will occur at two separate sites—the Eelgrass Mitigation site and the Kentuck Project site—with each site addressing a different need (Figure O-1A in Appendix A). Location information is provided in Section 2, CWM Site Information. Lost functions and values at the existing wetland sites will be replaced by conducting mitigation in suitable locations within the Coos Bay estuary that will result in self-sustaining, complex habitats connected to adjacent ecosystems. Additional discussion of functional replacement is provided in Section 5, Functions and Values Assessment and in Appendices Appendix E and Appendix F, which provide the results of project functional assessments for the LNG Terminal and PCGP project components, respectively. Appendix E includes a summary table of proposed function and value losses and gains for wetlands associated with mitigation at the Kentuck Project site.

Currently there are no approved eelgrass functional assessments approved for use in Oregon and a search for other suitable rapid eelgrass functional assessments that could be applied to the project was unfruitful. The California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA 2014) states that “In absence of a complete functional assessment, eelgrass distribution and density should serve as a proxy for eelgrass habitat function." Therefore, eelgrass density data were collected from existing eelgrass beds within the proposed Access Channel as well as the selected Reference Site. Eelgrass density and area coverage are integral to the performance criteria developed to measure acceptable progress at the eelgrass mitigation site over a 5-year post-construction monitoring program.

1.3.1 Eelgrass Mitigation Site

1.3.1.1 Site Description

To mitigate for permanent impacts to approximately 2.26 acres of eelgrass, JCEP proposes to initially enhance a minimum of approximately 6.78 acres of existing intertidal habitat to support a minimum of 2.71 acres of eelgrass beds due south of the SORA Airport (Figure O-1A). This effort is considered to be enhancement because it improves the functionality of existing estuarine habitat. As previously noted, enhancement projects in Oregon require a 3 to 1 ratio of mitigation to impact acreage. After 5-years of post-construction monitoring, the USACE requires a ratio of 1.2:1 mitigation site to impact site measured as an eelgrass area, hence a final mitigation total of 2.71 acres. As noted in Section 1.2.1, the total size of the site is designed to be 9.34 acres, which is substantially greater than the minimum 6.78 acres to meet a 3:1 initial eelgrass mitigation ratio. Conceptual design plans for the Eelgrass Mitigation site are provided in Figure E1. Based on documented evidence of eelgrass presence in Coos Bay, it is known that eelgrass tends to occur between approximately +2.31 ft and -4.77 ft (NAVD 88; +3.03 to -3.95 ft MLLW; Thom et al. 2003). These findings are further supported by hydrographic survey work conducted by DEA at the proposed Eelgrass Mitigation Site in 2018, 2014, 2010, and 2007, and the SSNERR in 2016. Based on these various surveys, eelgrass was found to be consistently most abundant adjacent to the proposed mitigation site between elevations 0.0 and -2.0 ft NAVD 88 (+0.72 to -1.28 ft MLLW, and in particular between -1.0 and -2.0 ft NAVD 88 (-0.28 to -1.28 ft MLLW).

The existing Eelgrass Mitigation Site is an unvegetated intertidal shoal comprised of medium to course sand. The top of the shoal is at an elevation of +2.7 ft MLLW (+2.0 ft NAVD88), with the outer boundaries at approximately +0.7 ft MLLW (0 ft NAVD88; Figure E2). In 2018, DEA conducted additional eelgrass investigations at the site and confirmed that no eelgrass is present within the grading boundaries (Figure E3). Large eelgrass patches were present east and south of the site. Areas west of the site become quite shallow approaching a remnant of a dredge spoil island created in the 1950s. Very small patches were observed in this area. Farther to the southwest, eelgrass becomes quite dense and continuous; this area was selected as the donor and reference site (see Section 1.3.1.3). An evaluation of both eelgrass distribution and bathymetry indicates that the principal limiting factor for eelgrass in the general vicinity of the Eelgrass Mitigation Site is elevation.

The proposed approach is to excavate the locally high area surrounded by eelgrass down to approximately -1.0 to -2.0 ft NAVD 88 (-0.28 to -1.28 ft MLLW; Figure E1). The site will be left to stabilize for at least one winter storm cycle. The area would then be planted with donor stock in subsequent years. Because excavation would need to occur within the ODFW recommended in-water work window (October 1 through February 15), it does not coincide with the preferred time for transplanting eelgrass (i.e., spring and summer). For this reason, eelgrass transplanting will not occur immediately following the completion of excavation. A similar work sequencing approach was used in the eelgrass mitigation efforts associated with the SORA runway extension project (McCollough pers. comm. 2006), which was considered successful (Rumrill pers. comm. 2006 and ODSL 1997).

Proposed grading has been designed to avoid and minimize impacts to nearby eelgrass beds. This area is proposed for grading in order to tie into desired elevations where more robust beds occur and to facilitate tidal circulation at the mitigation site. This could lead to temporary impacts to eelgrass that may occur in the grading footprint; however, preconstruction survey of eelgrass and bathymetry will take place during the main growing season (i.e., summer) before excavation is scheduled. Additionally, final excavation and grading limits will be established to avoid disturbance to eelgrass around the perimeter of the site. Temporary impacts that are unavoidable, based on the preconstruction survey, will be accounted for in the final planting plan that will be prepared prior to planting activities that would occur after the first storm season post-excavation. Areas of disturbance would be considered temporary, since excavation would result in elevations more conducive to promoting eelgrass growth.

1.3.1.2 Transplant Procedures

Guidance standards for planting eelgrass have not been established for eelgrass transplant projects. This allows the restoration biologist to be flexible based on site conditions. Best Available Science and successful methodologies currently in use include the following:

- Harvest eelgrass shoots from an identified and delineated donor bed by hand or by the use of small hand tools (e.g., garden trowel) to minimize damage to shoots. Each shoot will have intact portions of the rhizome mat.
- Harvested eelgrass shoots will be processed into discrete planting units (PUs) by tying the shoots loosely together at the base of the stem above the rhizome with a biodegradable line and tied to a degradable marine staple. The marine staple will anchor the PU to the bottom substrate and allow the rhizomes to reestablish within the substrate. Each PU would be composed of 3-10 shoots;
- Within the Eelgrass Mitigation site, establish ten, 100 ft by 100 ft planting parcels (10,000 square ft) that will be planted with PUs (Figure E1).
- Arrange the PUs in the planting parcels with each PU installed on 3-ft centers throughout the eelgrass mitigation site (Figure E1).

Upon transplanting the ten planting parcels, this would total approximately 33,000 eelgrass shoots (11,000 PUs of at least 3 shoots per PU) planted 3-foot on center within the Eelgrass Mitigation Site. This planting plan would provide approximately 2.3 acres of transplanted area at an initial density of 3 shoots per square meter.

1.3.1.3 Donor Stock

A suitable donor bed was identified during eelgrass surveys conducted in 2018 (DEA 2018a). The donor bed is located approximately 1,500 feet southwest of the eelgrass mitigation site and occupies approximately 18.6 acres of relatively continuous and dense eelgrass (Figure E4). The donor bed was mapped using underwater video georeferenced in realtime to a sub meter GPS; bed boundaries were established based on that portion of the eelgrass bed where shoot densities were highest. Eelgrass densities were obtained by divers who collected shoot count data along five, approximately 300 ft transects spaced throughout the bed, as shown in Figure E4.

In total, shoot counts were conducted at 144 quadrat ($0.25m^2$) locations randomly spaced within the 5 transects, as shown in Table 2; methodologies are presented below in Section 1.3.1.5.

Table 2. Eelgrass Density Data Collected Within the Selected Donor Bed

Donor Bed Transects	Number of Quadrats	Shoots/m^2
Northwest Transect	27	63.3
South Transect	29	67.7
Center Transect	28	50.0
East Transect	32	35.5
Southeast Transect	28	51.0
Total Number of Quadrats	**144**	
Mean Shoots/m^2		**53.5**

The mean density within the donor bed was calculated at 53.5 shoots/m^2. USACE guidelines state that no more than 10 percent of shoots from an existing eelgrass bed may be harvested for donor material, such that approximately 0.15 acre (617 m^2) of eelgrass could be harvested for the mitigation site (the higher the densities of the potential donor bed, the smaller the acreage that would need to be harvested). Therefore, donor shoots would need to be harvested from at least 1.5 acres (6,170 m^2) of intact eelgrass to meet the transplant needs of the eelgrass mitigation site. The selected eelgrass donor bed has been measured at 18.6 acres and is more than adequate to meet the needs of the mitigation site.

Eelgrass plants will be harvested in a manner to thin an existing location within the bed without denuding or leaving bare areas. The selected donor bed will have similar physical conditions as the Eelgrass Mitigation Site. In addition, the donor bed is close to the mitigation site, will have a similar bed elevation, and so will increase the likelihood that the planting stock will be adapted to local environmental conditions.

Eelgrass shoots from the donor site will be kept submerged in site water and handled carefully to avoid heat stress and desiccation. The amount of time between removal of eelgrass plants from the donor bed and their subsequent transplanting in the mitigation site will be minimized; eelgrass will typically be held for less than 72 hours after harvest and before transplanting. Until planted, the donor stock must be kept submerged and in a low light environment to prevent desiccation and thermal shock. Plants will remain wet during transport (e.g., stored in a tote or cooler filled with water that is exchanged on a regular basis) and if held overnight, will be stored in a submerged cage or mesh bag tied to a dock or mooring pile.

1.3.1.4 Reference Site

A suitable reference site, quantitatively delineated, will be needed to provide the basis for measuring mitigation success over time. Optimally, reference sites should be within the general vicinity of the eelgrass mitigation site and will have similar elevations, salinity regimes, current velocities, light penetration, sediment characteristics, and other water quality parameters that naturally affect eelgrass growth. The donor bed as described above in Section 1.3.1.3 will be the reference site for the Eelgrass Mitigation Site. At 18.6 acres, it is large enough and meets all of the requirements of both a donor bed and reference site. An area within this site will be defined as the reference area and not harvested for transplant material. Where eelgrass at the mitigation site declines coincident with and similarly to decline at the reference site, it is appropriate to scale the decline at the reference site to results from the mitigation site. However, if eelgrass expands within the reference site, the impact site will only be evaluated against the pre-construction condition of the reference site and not the expanded condition, as per USACE guidance (USACE 2018a).

1.3.1.5 Eelgrass Survey Methods

The USACE presents guidelines for conducting Tier 1 qualitative and Tier 2 quantitative eelgrass surveys (USACE 2016; 2018b). Surveys conducted by DEA in 2018 meet both of these requirements. Eelgrass surveys of potentially affected areas in Coos Bay were conducted under the USACE guidance using Method 3 (underwater video) and using the Eelgrass Delineation Detection Method A for defining boundaries (USACE 2018b), which meets Tier 1 requirements. This was followed by diver based quadrat counts within the delineated habitat to quantitatively determine eelgrass density. The number of quadrats needed for each transect were determined in realtime as quadrat shoot counts were communicated from the diver to the platform vessel and immediately entered into a spreadsheet that ran ongoing tests of statistical robustness. This approach meets and surpasses the requirements of the USACE Tier 2 quantitative surveys (USACE 2016). This approach also satisfies the Washington Department of Fish and Wildlife (WDFW) Eelgrass/Macroalgae Habitat Survey Guidelines (WDFW 2008).

As per the protocols, the eelgrass survey was initiated using a geo-referenced video system and on-board eelgrass biologist (Dr. Jason Stutes) to document the extent of subtidal eelgrass (*Zostera marina*) and macroalgae in the proposed project area. The video-based mapping system employed to map submerged vegetation uses a combination of underwater digital video, differential GPS, and allows for on-board audio annotation. It has a usable geo-referenced resolution of less than 1 meter.

Macroalgae, eelgrass, benthic substrates, and habitats were viewed and recorded to map potential subtidal eelgrass/macroalgae habitat. Large invertebrate fauna and fish visible during the survey were also noted. The survey tracks were oriented perpendicular to shore to detect the presence of eelgrass while compensating for wind and current. Subsequent tracks meandered between the deep and shallow edge of the eelgrass bed to document the extent of the bed on a finer geographic scale. If *Zostera japonica* was suspected to occur in the area or potentially viewed on the survey transect. Divers were deployed to obtain a sample to verify the species of the macrovegetation.

For the quantitative, diver based portion of the survey, shoot density was surveyed for areas where eelgrass was detected and initiated immediately after the underwater video survey. Using randomly placed 0.25-square-meter (m^2) quadrats placed within the delineated eelgrass bed boundaries, counts at each location were taken until the requirements for statistical robustness for detecting differences among means ($\alpha = 0.10$ and power $[1 - \beta] = 0.90$) was met or variance around the computed mean remained static. Transects were approximately 300 feet on length. Differences in average density were tested using a one-way Analysis of Variance (ANOVA). Average densities were compared between transects and among sample sites.

This quantitative survey methodology was used to delineate eelgrass beds within the proposed Access Channel to accurately determine and update the acreage and density of the JCEP eelgrass mitigation requirement. These methods were also used at the donor/reference site bed to characterize both the acreage and density to determine appropriate harvest rates for the eelgrass mitigation site and to provide the basis for future performance monitoring.

1.3.2 Kentuck Project Site

Historically, the Kentuck Project site provided estuarine habitats (i.e., salt marsh, mudflats, tide channels, and fringing freshwater wetlands) that were hydrologically connected to the Kentuck Slough and Coos Bay estuary systems. However, circa the 1920's, the Kentuck Project site was diked and converted to agricultural uses. Eventually the site was converted into an 18-hole golf course before reverting back to agricultural use (i.e., pasture) in 2009.

The mitigation concept involves restoration activities to return the Kentuck Project site to its natural potential, given existing on-site and off-site constraints that include local transportation systems, access to and protection of adjacent private property, and Kentuck Drainage District requirements. Conceptual design plans for the Kentuck Project site are provided in Appendix A, Figures K-1 through K-8 and erosion and sediment control plans (ESCP) are provided in Appendix B. Figures are organized as follows:

- Figure K-1: existing conditions
- Figures K-2 through K-8: proposed finished conditions, including monitoring plan
- Appendix B (multiple sheets): 1200-C ESCP (Rev. B), including staged construction sequencing

Mitigation activities will establish a combination of native estuarine habitats (i.e., salt marsh, tidal sand/mudflats, and tide channels) and freshwater wetland habitat types (i.e., palustrine forested, scrub-shrub, and emergent) that will interact to provide a holistic coastal ecosystem. Mitigation activities will also result in an uplift in ecosystem functions and are expected to be particularly beneficial to coho salmon recovery and support of Chinook salmon. Socio-cultural benefits (e.g., public use trail and tribal ethnobotanical interests) will also be incorporated into the site to the extent feasible.

As shown in the draft ESCP (Appendix B), the Kentuck Project Site will be constructed in phases. The five phases are listed below, with additional description provided on Sheet C003:

- Phase 1: Stripping and temporary grading of site, construction of temporary stream diversion, construction of East Bay Road and Bridge.
- Phase 2: Dewatering of dredge sands
- Phase 3: Mass grading and levee widening
- Phase 4: Site stabilization, Golf Course Lane construction, trail and boardwalk construction, removal of temporary stream diversion.
- Phase 5: Permanent seeding and planting

Additional details of the Kentuck Project Site concept are provided below. The discussion is broken into the two main areas of the site, which are referred to as the Kentuck Tidal Reconnection Area and the Freshwater Floodplain Reconnection Area.

1.3.2.1 Kentuck Tidal Reconnection Area

The Kentuck Tidal Reconnection Area will restore tidal connectivity to historic tide lands within the former golf course site, which will result in a diverse array of habitat types including mudflat, tide channels, salt marsh, and fringing freshwater wetlands that support native plant communities and fish and wildlife species. A list of key project components is provided below, with further discussion provided thereafter. See Section 1.2.2 for a list of associated measurable ecologically based objectives and Section 7.2.1 for a list of associated performance standards (a.k.a. success criteria).

- Construct a new bridge in East Bay Drive to allow tidal exchange between Kentuck Inlet and the Kentuck Project site.
- Remove or plug the existing culverts and tidegate located near the intersection of East Bay Drive and Golf Course Lane.
- Augment approximately 6,000 linear feet of levee along the Kentuck Project site and Kentuck Slough.
- Install a MTR in the augmented levee to provide fish passage and hydraulic exchange between the former golf course and Kentuck Slough.
- Restore tidal connection to the former irrigation pond creek system by constructing a fish-passable culvert or structure through Golf Course Lane.
- Construct and/or enhance approximately 11,500 linear feet of tide channels.
- Install fish habitat features (e.g., simple and complex wood structures, habitat pools)
- Establish a combination of estuarine and fringing freshwater wetland habitats, (i.e., salt marsh, palustrine forested, scrub-shrub, and emergent wetland).
- Install a publicly accessible trail, to be located along the top of the augmented levee, and a boardwalk that will cross the northeast end of the site and follow near the toe of slope of the adjacent hillside.

Tidal reconnection will be achieved by constructing a new East Bay Drive bridge to allow tidal exchange between Kentuck Inlet and the mitigation site. A new tidegate array, including a MTR gate, will be placed towards the upstream end of the Kentuck Project site to allow for fish passage from the site to Kentuck Slough and to allow freshwater flows from the slough to enter the site, thus providing an important salinity mixing zone for outgoing smolts. Kentuck Slough would be substantially rerouted to flow through the new tidegate array and through the new bridge into Kentuck Inlet. The existing levee between the golf course area and Kentuck Slough will be repaired and/or augmented to protect upstream properties from tidal influence.

The proposed location of the MTR as well as the relocation of the portion of the levee that will separate the Kentuck Tidal Reconnection Area from the Kentuck Freshwater Floodplain Reconnection Area were based on two competing factors – the desire to restore as much of the site to its historic estuarine condition versus avoiding the potential for impacts of salinity intrusion to adjacent property owners. ODSL (1989) shows the historic head of tide occurring at the northeast corner of the overall Kentuck Site, near the confluence of Mettman Creek with Kentuck Creek. NMFS has expressed the desire to place the MTR structure as close to this historic head of tide location as possible. However, modeling efforts have shown that a plume of saline water could travel as much as 1,000 feet upstream of the MTR location, particularly during times of low stream flow. Therefore, as a precaution to the upstream property owner and to gain support with the Kentuck Drainage District, the MTR was shifted 1,000 feet lower than the historic head of tide location. Similarly, the proposed new levee was shifted southward on the property to provide a further buffer between the Kentuck Tidal Reconnection Area and the adjacent property owner. In addition to reducing property owner concerns, the shifting of the levee further to the southwest also has the benefit of providing important freshwater floodplain wetland habitat that ODFW and NMFS have expressed would have particular benefits to Coho salmon smolts that are not yet ready for the more saline conditions that would occur in the tidal reconnection portion of the Kentuck Site.

The existing ditched main channel through the Kentuck Project site runs for approximately 6,000 feet before draining via a tidegated culvert under a small levee on the east side of East Bay Drive. Water then flows under East Bay Drive via a roughly 10-foot-diameter fish-passable culvert owned by Coos County. The existing main channel through the site will be enhanced and rerouted to connect the tidegate array and bridge. Secondary tide channels will be constructed to connect with the main channel running through the site. Existing tributaries that drain into the Kentuck Project site will also connect with the enhanced main channel. The existing 10-foot-diameter culvert under East Bay Drive will be removed or plugged, and the small levee with the tidegated culvert just east of the road will be removed. A new culvert, which will be installed through the existing earthen dam associated with the former golf course irrigation pond, will restore tidal connection and fish access to the drainage upstream of the dam. Instream habitat features, such as large wood and habitat pools, will be included to support salmonids (Appendix A, Figures K-3A, 3B, and 7A-7C).

East Bay Drive and Golf Course Lane will also be improved as part of the mitigation project construction. East Bay Drive will be raised approximately 3 feet at its lowest point south of the existing Kentuck Slough Bridge. Approximately 1,900 total linear feet of the golf course access road will be raised approximately 3 to 8 feet, so that the road will be above projected high tide elevations, including storm surge and projected future sea level rise. Every effort will be made to minimize the roadway prism. The design is constrained by private property and highly compressible soils. While walls could be used to minimize the footprint, embankment is preferred in this setting to provide transitional shoreline habitat. Roadway needed for access during construction only will be removed and restored as appropriate to adjacent natural conditions.

Survey information confirms that elevations within the Kentuck Project site are appropriate for establishing mudflat habitat. The primary salt marsh surface at the nearby reference site (immediately downstream of East Bay Road) occurs between approximately elevations 5.5 feet and 8.5 feet North American Vertical Datum of 1988 (NAVD 88). However, typical elevations within the golf course range between 2.0 and 4.0 feet NAVD 88. These lower elevations in the former golf course preclude the establishment of vegetation, and therefore mudflat would be the predominant habitat type without intervention. As a result, grades will be increased where practicable to foster additional salt marsh establishment along the edges of the mitigation site. Current design includes increasing the elevations of parts of the site to better support establishment of salt marsh and fringe freshwater wetlands; however, conducting this work is dependent on having suitable material to import to raise grades. Because of this, mitigation goals and objectives are focused on providing the minimum amount of salt marsh and freshwater wetlands required to offset impacts to vegetated wetland and estuarine habitat types (excluding eelgrass), but with the understanding that the establishment of additional salt marsh and freshwater wetlands and a subsequent decrease in bare mudflat is a desirable outcome.

Proposed design elevations should be conducive to the establishment of salt marsh communities throughout much of the site (see Appendix A, Figures). Freshwater wetlands should form along the site margins, particularly where seeps and freshwater tributaries flow from the hillside into the site. Salt marsh vegetation is anticipated to establish by natural recruitment (i.e., self-seeding by seed brought in from adjacent marsh areas by the tides). Experience of the South Slough National Estuarine Research Reserve (SSNER) suggests that natural recruitment is an appropriate means of establishing salt marsh vegetation at mitigation and restoration sites, and that planting should not be needed (Cornu pers. comm. 2014). Craig Cornu of SSNER also noted that non-native annual salt marsh species, such as brass buttons (*Cotula coronopifolia*), often colonize a newly established salt marsh site during the first few years, but then typically begin to be outcompeted within the third year after establishment of the site. Natural recruitment may be utilized as the primary method for establishing salt marsh habitat, with supplemental plantings provided along the upper margins of salt marsh. However, more intensive seeding may be applied if it is determined to be of benefit to either salt marsh establishment or erosion control needs. Native freshwater wetland plant communities will be planted with species common to Oregon coastal palustrine forested and scrub-shrub wetlands. For example, fringing willow communities are highly beneficial in supporting food sources (e.g., macroinvertebrates) for rearing juvenile salmonids, and therefore native willows will be an important component of the plant palette. Areas anticipated to be in salt marsh-to-freshwater wetland transition zones/elevations will also be planted with a mix of species that are adapted to a variety of salinity conditions, such as meadow barley (*Hordeum brachyantherum*), tufted hair-grass (*Deschampsia caespitosa*), and Hooker's willow (*Salix hookeriana*).

To achieve the proposed design elevations, dredge material from the berm and Access Channel of the LNG Terminal will be beneficially utilized. Dredged materials will be transported by barge to the edge of the Federal Navigation Channel near Kentuck Inlet, where they will then be remobilized and pumped via pipeline into the Kentuck Project site. Materials will be allowed to dewater, and rough grading will occur. It will be desirable to allow rough-graded material to sit for a minimum of one year (subject to final geotechnical recommendations) before final grading to allow for material settling and compression of the underlying soils. This process will reduce the amount of settling that is otherwise anticipated to occur after the reintroduction of tidal influence. Prior to rough-grading, the upper 12 to 18 inches of top soil will be removed and stockpiled. This material will later be placed over the final graded material to improve the growing substrate. Some blending of the native soil with dredge material may occur to avoid a sharp transition between native and imported material.

A new Kentuck Slough levee will be built because of the poor condition of the existing levee (Appendix A, Figures K-2A, 2B, 6A, and 6B). The existing slough-side face of the levee will remain intact at the direction of the Kentuck Drainage District. A rocked or paved maintenance access road will run across the top of the levee and also serve as part of a proposed public use trail that would follow the perimeter of the Kentuck Project site. Every effort will be made to minimize the footprint of the proposed levee during final design.

In addition to the proposed levee trail section, the trail would consist of both boardwalk and soft path (i.e., surfaced with wood chips or gravel) sections. The trail has been sited to allow the public to experience the various habitats proposed for the Kentuck Project, while avoiding and minimizing impacts to the extent practicable. Previous iterations of the trail included spurs that extended into the body of the site; however, these were removed to avoid direct impacts (i.e., boardwalk construction) and potential indirect impacts (i.e., human disturbance to wildlife). The trail is only anticipated to cross wetlands at the eastern end, where the crossing is needed to complete the trail, and at several small crossing along the southern hillslope where site topography will make it difficult to push the trail further upslope away from the wetland edge.

In addition to levee and tidegate construction, the proposed mitigation will remove, to the greatest extent practicable, existing golf course improvements in the mitigation site, such as fencing, ditches, foot bridges, and culverts.

Mitigation construction activities (e.g., new levee construction, road improvements, septic drain field protection) will result in permanent wetland impacts within the mitigation site (Appendix A, Figures K-5A and 5B). These activities and associated impacts are needed to successfully construct the Kentuck Project, while protecting adjacent properties from the risk of salt water intrusion and to continue to provide access to properties post construction. For example, Golf Course Lane elevations will need to be raised above high tide plus storm surge and future projected sea level rise. This CWM Plan accounts for these impacts and provides the mitigation required to offset these unavoidable impacts. Bioengineering approaches will be reviewed during final design to assess opportunities to provide additional habitat benefits along the edges of the above-mentioned structural components of the project (concept example provided in Appendix A, Figure K-7D). Regarding construction activity impacts to forested wetlands, specifically Kentuck Wetland 4A located on the south side of Golf Course Lane, alternatives that would avoid or minimize impacts have been considered, but eliminated because they are not practicable, or not accepted by the landowners whose property would be affected. As previously described, raising the profile of Golf Course Lane is necessary to maintain the only access to adjacent and nearby private residences and properties. The property owners will not accept salt water intrusion on their property, so using culverts, bridges, or other elevated roadways are not viable; only embankment would preclude saltwater intrusion. However, the embankment would impound overland flows on to these properties. Given the surrounding grades and anticipated post-restoration water surface elevations, it is not feasible to drain the area above the road with culverts through the road prism because doing so would allow salt water intrusion and would flood the private land. NMFS has previously commented that tidegates are not desirable at these locations, either. But even if tidegates were allowed, the private land above the road would still be flooded during storm events occurring during high tides; the rising tide would close the gate forcing storm runoff to back onto the private land. It is also reasonable to assume that saltwater intrusion and/or repeated flooding would be detrimental to the existing forested wetland.

In all of these scenarios, the property owner's septic fields would be flooded, which is also a fatal flaw. The only practical solution remaining is to construct the roadway embankment and fill the adjacent land above the roadway to raise the septic fields and allow storm runoff to sheet flow over the road. Further, because the owners will not accept saltwater intrusion or freshwater impoundment on their properties, the area beyond that required for the septic fields must also be filled to allow sheet flow across the road.

Finally, a sump and pump scenario was considered that would reduce the amount of fill and forested wetland impact. In this scenario, runoff would be collected along the upper edge of roadway embankment via an open ditch and directed to a sump where it would be pumped through a pipe placed in the roadway embankment to discharge into the former golf course. The pipe's invert would be set above the anticipated high tide water surface to prevent salt water intrusion. However, this alternative was eliminated because it is not practicable. Specifically, the alternative relies in perpetuity on electrical and mechanical means to prevent damage to adjacent private property and flooding of the septic fields for these properties.

The proposed mitigation at the Kentuck Tidal Reconnection Area will offset permanently impacted estuarine and freshwater wetland acreage and functions and values. A discussion of functions and values replacement is provided in Section 1.5 and Section 5.

1.3.2.2 Kentuck Freshwater Floodplain Reconnection Area

The northeast end of the Kentuck Project site will be reconnected to Kentuck Creek, outside of the previously described tidal reconnection area, and therefore will provide restored freshwater wetland floodplain habitat. This Freshwater Floodplain Reconnection Area provides mitigation for Pipeline impacts, which consist of conversion of palustrine forested and scrub-shrub wetlands to emergent wetlands. Therefore, forested and scrub-shrub wetlands are the dominant habitat types proposed for this area. Per recommendation from NMFS (NMFS and JCEP October 26, 2017 meeting), realigning a portion of Kentuck Creek through the site will also occur in order to improve instream habitat. A list of key project components is provided below, with further discussion provided thereafter.

- Realign approximately 1,350 feet of the Kentuck Creek channel to provide increased in-channel complexity similar to historic natural conditions.
- Install large wood within the realigned stream channel in order to provide habitat structural components.
- Remove approximately 1,560 linear feet of existing levee between Kentuck Creek and the Kentuck Project site.
- Regrade the site to provide wetland hydrology and micro-topography to support a variety of plant species (forested and scrub-shrub wetland), and to the extent practical, provide access and refugia to fish during high flow events.

The existing levee that separates Kentuck Creek from the Kentuck Project site will be removed in this area, allowing flood flows to enter the floodplain bench. The improved levee, which is described above, will be relocated at this end of the Kentuck Project to provide the separation between the tidal reconnection and freshwater floodplain reconnection components of the Kentuck Project site. Minor grading within the freshwater floodplain reconnection area will occur in order to provide micro-topographic relief, which should allow for establishment of diverse plant communities and provide fish refugia habitat during periods of high water. Similar to the tidal portion of the Kentuck Project described above, because willows are highly supportive of rearing salmonids, they will be an important component of the plant communities.

The current alignment of Kentuck Creek, which runs along the northeast property line, will be shifted to the west and into the project site. The existing channel lacks habitat complexity and is confined by levees. Shifting the channel will allow for a more natural channel form to be established, allow for the placement of instream habitat structures (e.g., large wood), and allow plantings to occur on both sides of the channel. The upper portion of the existing channel will be plugged to force flows into the new channel. The lower portion of the existing channel will be left intact to function as a back water channel and also to receive inflows from Mettman Creek and an existing drain from an adjacent property.

The proposed mitigation at the Kentuck Freshwater Floodplain Reconnection Area will offset permanently impacted estuarine and freshwater wetland acreage and functions and values. A discussion of functions and values replacement is provided in Section 1.5 and Section 5.

1.4 SUMMARY OF IMPACTS AND CWM ACREAGE/CREDITS

A summary of freshwater wetland and estuarine resource impacts that will require mitigation is provided in Table 3. As previously noted short and long duration temporary impacts are addressed in a separate site restoration plan. Table 4 provides a summary of mitigation acreage and credits by the type of mitigation proposed (i.e., enhancement or restoration). Table 5 provides a summary of mitigation acreage by habitat type, Cowardin class, and hydrogeomorphic (HGM) class. The mitigation sites are larger than the actual area needed for mitigation. Therefore, work in the additional acreage at these sites is considered to be voluntary habitat improvements above and beyond mitigation requirements. Table 4 and Table 5 provide acreages for the entirety of the mitigation sites including areas of voluntary habitat improvements, whereas Section 1.2, Ecological Goals and Objectives, provides acreages specific to the mitigation requirements based on actual impacts. The habitat acreages in Table 5 should be considered rough estimates based on planting plan designs; however, final habitat acreage is likely to vary as the mitigation sites mature. This is particularly the case for vegetated communities at the Kentuck Tidal Reconnection Area, where the boundaries between communities are highly dependent on the interplay of high salinity water from the bay and freshwater inputs from inflowing creeks, seeps, and groundwater. The grading and planting plans for the Kentuck Tidal Reconnection Area have been designed so that proposed freshwater wetland habitat types would trend towards estuarine (i.e., salt marsh) habitats rather than upland habitats, should the interplay of fresh and saline waters not occur as anticipated. This will help assure that overall wetland mitigation objectives for vegetated wetland acreage is achieved, rather than some of the acreage potentially ending up as an upland community.

Table 3. Project Impacts Requiring Compensatory Mitigation

Wetland and Estuarine Resources	Cowardin Class Type*	Hydrogeomorphic (HGM) Class	Permanent Impacts (Acres)
Eelgrass at Slip and Access Channel	E1/E2AB	Estuarine	2.26
Intertidal Sand/Mudflat at Slip and Access Channel	E2US	Estuarine	10.25
Shallow Subtidal at Slip and Access Channel	E1UB	Estuarine	4.25
Salt Marsh at Slip and Access Channel	E2EM	Estuarine	0.06
Intertidal Sand/Mudflat at MOF	E2US	Estuarine	1.64
Shallow Subtidal at MOF	E1UB	Estuarine	0.07
2012-2	PEM	Slope/flats	0.02
2013-6	PEM	Depression	0.69
Wetland C	PFO	Depression	0.26
Wetland E	PAB	Depression	0.48
Wetland H (East)	PEM	Slope/flats	0.09
Wetland H (West)	PEM	Slope/flats	0.01
Wetland I (North)	PEM	Slope/flats	0.27
Wetland J	PEM	Slope/flats	0.07
Intertidal Riprap Embankment at Trans Pacific Parkway/US-101	E2RS	Estuarine	0.51
Wetland K	PFO	Depression	0.03
Kentuck-Wetland A1	PEM	Slope/flats	4.30
Kentuck-Wetland A2**	PEM	Slope/flats	0.07
Kentuck-Wetland A3	PEM	Slope/flats	0.14
Kentuck-Wetland A4	PFO	Slope/flats	0.85
Kentuck-Wetland A7	PEM	Slope/flats	0.04
Kentuck-Intertidal Riprap Embankment at East Bay Drive	E2RS	Estuarine	0.07
Pipeline Impacts (see Appendix B for breakdown)	PFO/PSS	various	0.91
		Total	**27.34**

* Cowardin classes: E1/E2AB = estuarine, subtidal/intertidal, aquatic bed; E2USN = estuarine, intertidal, unconsolidated shore, regularly flooded (i.e., mudflat); E1UB = estuarine, subtidal, uncosolidated bottom; E2EM = estuarine, intertidal, emergent; E2RS = estuarine, intertidal, rocky shore; PFO = palustrine forested; PSS = palustrine scrub-shrub; PEM = palustrine emergent; and PAB = palustrine aquatic bed.

** These are impacts associated with proposed boardwalks, a small portion of which extends into Wetland A1, but are included in the acreage calculation for Wetland A2 for ease of tracking.

Table 4. Mitigation and Voluntary Habitat Improvements Summary by Mitigation Type, Acres, Ratios, and Credits*

Mitigation Site	Mitigation Type	Total Mitigation Acres**, ***	Mitigation Ratio	Total Credits Available	Credits Needed (i.e., impacts)	Voluntary Habitat Improvement Credits
Eelgrass	Enhancement	**9.34**	3:1	**3.11**	**2.26**	**0.85**
Kentuck –Tidal Reconnection Area						
Kentuck Site – Tidal Reconnection Area	Enhancement	87.54	3:1	29.18	--	--
	Restoration	3.92	1:1	3.92	--	--
	Subtotal	**91.46**		**33.10**	**24.17**	**8.93**
Kentuck –Freshwater Floodplain Reconnection Area******						
Kentuck Site – Freshwater Floodplain Reconnection Area	Enhancement	7.50	3:1	2.50	--	--
	Restoration	1.64	1:1	1.64	--	--
	Subtotal	**9.14**		**4.14**	**0.91**	**3.23**
	Kentuck Subtotal	**100.60**		**37.24**	**25.08**	**12.16**
	Total All Sites	**109.94**		**40.35**	**27.34**	**13.01**

* Voluntary Habitat Improvement credits are based on the total mitigation credits for a given area minus proposed impacts. Pipeline impacts and associated mitigation have been asigned to the Kentuck – Freshwater Floodplain Reconnection Area, and non-eelgrass LNG Terminal impacts and associated mitigation have been assigned to the Kentuck –Tidal Reconnection Area.

** The mitigation sites are larger than the actual area needed for mitigation, which will result in additional habitat improvements referred to as "voluntary habitat improvements" in this CWM Plan. This table provides acreage and credits for the entirety of the proposed mitigation sites including the voluntary habitat improvements, whereas Section 1.2, Ecological Goals and Objectives, provides acreages specific to mitigation requirements based on permanent impacts.

*** Only includes area of potential mitigation credits (i.e., excludes impacts at mitigation sites.)

**** Area of proposed unvegetated realigned Kentuck Channel (area below 4 ft elevation contour [NAVD 88]) is not included in above acreages. This feature is viewed as proving positive ecological benefits, but is not a wetland habitat.

Table 5. Mitigation and Voluntary Habitat Improvements Summary by Habitat Type, Cowardin Class, and HGM Class

Mitigation Site	Habitat Type*	Cowardin Class**	HGM Class	Acres****
Eelgrass	Eelgrass	E1/2AB	Estuarine	9.34
Kentuck Project – Tidal Reconnection Area	Tidal mudflat	E2USN	Estuarine	34.75
	Salt marsh	E2EM	Estuarine	44.58
	Willow Scrub-Shrub Wetland ***	E2FO	Estuarine	8.71
	Forested Wetland ***	E2FO	Estuarine	3.42
			Subtotal	**100.8**
Kentuck Project – Freshwater Floodplain Reconnection Area	Willow Scrub-Shrub Wetland	PSS	Riverine	4.71
	Forested Wetland	PFO	Riverine	3.41
	Unvegetated Channel*****	R2	n/a	1.02
			Subtotal	**9.14**
Total All Sites				**109.94**

* Habitat type refers to the estimated plant communities shown on conceptual design sheets provided in Appendix A.

** Cowardin classes: E1/E2AB = estuarine, subtidal/intertidal, aquatic bed; E2USN = estuarine, intertidal, unconsolidated shore, regularly flooded (i.e., mudflat); E2EM = estuarine, intertidal, emergent; PFO = palustrine forested; PSS = palustrine scrub-shrub; and PEM = palustrine emergent; R2 = riverine lower perennial.

*** Cowardin and HGM classes for freshwater wetland communities at the Kentuck Project – Tidal Reconnection Area are considered to be estuarine, because they are located below Highest Measured Tide and are likely to experience some tidal influence at the groundwater/tidal prism interface. Acreage of these habitat types is based on proposed habitat communities; however, the actual areas occupied by these communities as the site matures are likely to vary based on the interplay between salt water from the bay and freshwater inputs from inflowing creeks, seeps, and groundwater.

**** Acreage is for entire area of mitigation site that could provide mitigation credits (i.e., required mitigation plus voluntary habitat improvements). See Section 1.2, Ecological Goals and Objectives for acreages specific to minimum requirements. Areas of impacts at mitigation sites not included.

***** The acreage of unvegetated channel has only been calculated for the proposed realigned channel section. Acreage of remaining existing channel has not been included. For eelgrass, this acreage assumes that the entire original site design will recolonize after initial transplantation.

1.5 SUMMARY OF NET GAINS AND LOSSES OF FUNCTIONS AND VALUES

A discussion of functional replacement is provided in Section 5, Functions and Values Assessment and in Appendix E and Appendix F, which provide the results of project functional assessments for the LNG Terminal and PCGP project components, respectively. Appendix E includes a summary table of proposed function and value losses and gains for wetlands associated with mitigation at the Kentuck Project site. Currently there are no approved eelgrass functional assessments approved for use in Oregon and a search for other suitable rapid eelgrass functional assessments that could be applied to the project was unfruitful. The California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA 2014) states that "In absence of a complete functional assessment, eelgrass distribution and density should serve as a proxy for eelgrass habitat function." Therefore, data on eelgrass density at the proposed impact site has been provided and is intended to serve as a surrogate for eelgrass function (i.e., higher density equals higher function).

Proposed mitigation will result in a net increase in acreage of impacted habitats and, because mitigation habitats will function in a manner equivalent to or better than those habitats being impacted, it is anticipated that there would be a net gain in overall functions and values. Lost estuarine functions will be offset at the Kentuck Project site and the Eelgrass Mitigation site, both of which are situated in and/or will result in a considerably more complex and diverse array of habitats than at the slip impact site, thus resulting in an overall uplift in functions lost. For example, impacted shoreline habitats primarily consist of moderately productive unvegetated sand/mudflats. Impacts to these habitats will be offset at the Kentuck Project site through restoration of a substantially larger and more diverse assemblage of estuarine habitats, including salt marsh, sand/mudflats, and tide channels. This rich mosaic of estuarine habitats is expected to improve estuarine functions, including water quality, wildlife, and fish.

Impacted freshwater wetlands primarily consist of areas bordered by formerly developed industrial land. Mitigation will create freshwater fringe wetlands adjacent to the estuarine habitats to be restored at the Kentuck Project site. Habitat features will be incorporated that further support recovery of listed coho salmon. In addition, the Kentuck Project site will incorporate public access features, such as trails and tribal ethnobotanical elements (e.g., plant species of tribal importance and interpretative signage). Such community and cultural elements are currently absent at the impact locations, because the impact areas are in industrial lands.

Pipeline impacts consist of very small acreage impacts and only a partial reduction in function. These impacts will be offset at a consolidated site that will provide clear ecosystem benefits by restoring floodplain connection to Kentuck Creek, which will in turn benefit flood control, water quality, wildlife, and fish functions, including providing high flow refugia and food chain support that will directly benefit listed coho salmon.

2. *CWM SITE INFORMATION*

2.1 CWM SITE OWNER NAME AND CONTACT INFORMATION

The proposed Eelgrass Mitigation site is and will be owned by the State of Oregon.

The Kentuck Project site is owned by Fort Chicago LNG II U.S. LLC, a wholly-owned indirect subsidiary of Pembina Pipeline Corporation.

Project contact information is:

Attention: Derik Vowels, Lead Environmental Advisor
Jordan Cove LNG, LLC
111 SW 5th Ave., Suite 1100
Portland, OR 97204
Phone: (971) 940-7814

2.2 LEGAL AGREEMENT FOR PROPERTY USE AND LONG-TERM PROTECTION IF SITE IS NOT APPLICANT-OWNED

2.2.1 Eelgrass Mitigation Site

JCEP anticipates endowing a third-party conservation entity that will hold an easement from the State of Oregon for the mitigation site. Clauses necessary to protect the site will be written into the easement. A draft easement document with protection clauses and legal description will be provided prior to permit issuance, to be included as Appendix G. Information about riparian owners with potential proprietary rights is provided in the project Removal-Fill Application.

2.2.2 Kentuck Project

JCEP is an applicant; therefore, a legal agreement for the use and long-term protection of the site is not proposed. Although earthwork is proposed on properties south of Golf course Lane (tax lots 300, 400, and 500, see Figure K-2A), no mitigation credits are being sought on these properties and therefore they will not be included in conservation easements associated with the site. Proposed work on these properties is intended to preserve the viability of their septic fields. JCEP will enter into agreements with the property owners for work conducted on their properties.

2.3 LOCATION INFORMATION

2.3.1 Eelgrass Mitigation Site

Impacts to eelgrass resources will be mitigated at a shallow, unvegetated intertidal island located to the southwest of the SORA runway (Tax map #25-13-08, lot # not applicable, Township 25 South, Range 13 West, Section 8). The proposed mitigation site is owned by the State of Oregon, with management authority held by ODSL. Appendix G provides a draft easement for the mitigation site.

2.3.2 Kentuck Project

The Kentuck Project site is located east of North Bend, Oregon (Township 25 South, Range 12 West, Sections 6 and 7; Township 25 South, Range 13 West, Sections 1 and 12, Willamette Meridian). Tax maps and lots are: 25s12w06c lot 100, 25s13w12a lot 100, and 25s13w1d lot 400.

3. *CWM SITE SELECTION AND DESIGN PRINCIPLES (ODSL PRINCIPAL OBJECTIVES)*

3.1 REPLACEMENT

The proposed CWM will replace impacted functions and values through in-kind or like-kind mitigation, thereby enhancing the same or similar types of habitats that are being impacted. Net acreage of impacted habitats will be greater after the Project and CWM than under existing conditions as a result of the standard mitigation ratios required by Oregon law.

3.2 CWM PROVIDES LOCAL REPLACEMENT FOR LOCALLY IMPORTANT FUNCTIONS AND VALUES LOST, IF APPLICABLE

CWM for Terminal impacts will take place in proximity to the proposed impact sites, thereby providing local replacement of lost functions and values. Eelgrass mitigation will take place roughly opposite the Federal Navigation Channel from the impact site. Mudflat, salt marsh, and fringing freshwater mitigation will occur within the Coos Bay estuary system, 3 to 4 miles from the impact site.

As noted in Section 1, Introduction, the proposed Pipeline will result in permanent impacts to wetlands in the form of permanent conversion from one Cowardin class to another Cowardin class as a result of temporary disturbance activities involved with pipe installation. Conversion from a forested to an emergent wetland condition is viewed as a permanent wetland impact by the USACE and ODSL due to an overall loss of wetland functions (Oregon Revised Statutes [ORS] 141-085-0680). The permanent wetland type conversion impacts from the Pipeline, which total less than one acre, would occur across eight fifth-field watersheds (HUC 10). Most of the conversion impacts within the affected watersheds would be less than 0.1 acre with only one watershed experiencing a permanent conversion impact exceeding 0.2 acre which would occur within the Olalla Creek – Lookingglass Creek Watershed (HUC 1710030212). Previously, PCGP proposed to mitigate the conversion impacts at the Cow Hollow Mitigation Bank which is within the Olalla Creek – Lookingglass Creek Watershed, where the largest conversion impact (0.37 acre) would occur. However, ODSL had concerns that this mitigation bank was not a viable option due to the lack of available credits. PCGP and the Bank Owner prepared a mitigation plan as Phase II of the Cow Hollow Bank on lands adjacent to the existing Cow Hollow Mitigation Bank, but based on ODSL’s reservations concerning the Phase II proposal and because there were no other mitigation bank service areas that overlapped the pipeline, PCGP dropped the use of mitigation banks from further consideration. Instead, PCGP chose to consolidate mitigation in a single location that would have a high likelihood of success and that would be co-located with the JCEP LNG Terminal’s compensatory mitigation obligations at the Kentuck Project in Coos Bay, Oregon. Further, the Pipeline’s permanent wetland impacts consist of small, individual impacts spread over a large geographic area, and, therefore, it is impractical to conduct wetland mitigation at multiple, small sites in various watersheds crossed by the Pipeline. It is also important to note that the Pipeline impacts will result only in a partial loss of wetland functions, as opposed to a loss of acreage and all functions, because these wetlands will still remain, but with what is considered to be a lower functioning habitat type than existed before the Pipeline.

3.3 CWM IS SELF-SUSTAINING AND MINIMIZES MAINTENANCE NEEDS

Each mitigation site has been designed to be self-sustaining to the greatest extent practicable. The Eelgrass Mitigation site will not rely on water control structures or other intensively managed structures to maintain wetland hydrology. The Kentuck Project requires a new tidegate structure to protect adjacent and upstream properties. Mitigation at the former golf course is not viable without this structure. However, the mitigation site will maintain a free and open connection to the Coos Bay estuary as a result of the installation of a bridge along East Bay Drive that will result in removal of the existing culvert (owned by Coos County) and tidegate that connect the golf course to the estuary.

To assure proper functioning of the MTR structure it will be monitored at least once annually with an on-site visit, but with additional visits as necessary post heavy storm events. The condition of structural components will be recorded and recommendations provided to implement maintenance, repair, or replacement, if applicable. An MTR Operation and Maintenance Plan will be developed during final design of the project and will include a plan for long-term endowment for responsibility of MTR inspection, maintenance and repairs, and replacements as warranted.

3.4 SITING CONSIDERATIONS FOR ECOLOGICAL SUITABILITY

3.4.1 Alternatives Analysis – Eelgrass Mitigation Site

The proposed Eelgrass Mitigation site was selected after an updated rigorous evaluation of potential sites by DEA. The review assessed 10 sites throughout the bay and evaluated each based on ecological conditions suitable for eelgrass growth. These conditions included appropriate salinity concentrations, moderate flow/circulation, appropriate depths relative to MLLW, distance from potential pollution sources, stability and longevity of the bed, and the presence of other nearby eelgrass beds. The review also assessed land availability and constructability issues.

Site selection of mitigation sites is an important factor in determining the ultimate success of an eelgrass mitigation project. Through review of existing eelgrass mapping surveys, habitat surveys, and site assessments, 10 sites were initially investigated as presented below and in Figure E5:

1. Old Hatchery Site
2. Airport Site (selected site)
3. Pony Slough
4. APCO Sites
5. Dredge Islands –Area A
6. Dredge Islands –Area B
7. Dredge Islands –Area C
8. West Shoreline

9. Jordan Cove
10. Haynes Inlet

Sites were reviewed against a list of criteria in order to evaluate the potential for a successful eelgrass mitigation project. These criteria included land availability, ecological conditions, presence of other nearby eelgrass beds, and whether a viable design was available and constructible. Evaluation criteria are listed in Table 6 along with the processes used to rank them. Table 7 provides a resultant matrix of the 10 potential mitigation sites evaluated using these criteria.

Table 6. Eelgrass Mitigation Sites Evaluation Matrix Criteria

Land Availability	• Do current zoning and/or development plans preclude use of the site for mitigation? Are the landowners willing to provide easements for access and use of the site for mitigation? • An assumption has been made that intertidal areas, which are under ownership by the State, would generally be available for mitigation purposes so long as there are no existing easements on those lands (i.e. oyster beds, utility easements, etc.).
Ecological Conditions	• Physical: mild current, low wave impact (Coos Bay-North Bend Airport prevailing high winds in summer are from the north and west-northwest, prevailing high winds in winter are from the south-southwest and the southwest [Oregon Climate Service 2002]), sediment stability (low erosion and low sediment deposition), low to moderate turbidity • Chemical: moderate to high salinity, away from source of nutrient overloading (i.e. storm water and sewage treatment outfalls) • Biological conditions suitable for eelgrass (i.e. limited bioturbation, etc.) were indirectly evaluated based on presence of eelgrass at or nearby the potential mitigation site, as described below.
Presence of Nearby Eelgrass of Medium to High Density	• Eelgrass Surveys: Did review of existing eelgrass surveys from 2005 to 2017 show eelgrass mapped adjacent to the potential mitigation site? • Field Verified: Did subsequent field surveys identify existing eelgrass beds of medium to high density (i.e. percent cover) in or near the prospective mitigation site?
Viable Design/Constructability	• Viable Design: Is there a design strategy available with a high likelihood of successfully establishing eelgrass and other intertidal habitats? Can this be done without having a significant adverse effect on surrounding resources? • Constructability: If there is a viable design strategy, can it be readily constructed in an environmentally sensitive manner? (i.e., Would costs be in-line with overall project costs? Can appropriate equipment reach the site? Would construction result in significant adverse effects to surrounding resources?

Table 7. Potential Eelgrass Mitigation Site Evaluation Matrix*

	Land Availability	**Ecological Conditions (Physical and Chemical)**	***Presence of Nearby Eelgrass, Medium to High Density***		**Viable Design / Constructability**
			Eelgrass Abundance Mapped in Previous Surveys	**Field Verified**	
Old Hatchery Site	**Yes**	**Good to Moderate**	**Yes Abundant**	**Yes**	**Potential / Potential**
Airport Site	**Yes**	**Good to Moderate**	**Yes Abundant**	**Yes**	**Potential / Potential**
Pony Slough	Yes	Poor to moderate	Yes Abundant in limited areas	Yes	Unlikely / not applicable
APCO Sites	Yes	Poor to moderate	Yes Abundant in limited areas	Yes	Unlikely / not applicable
Dredge Islands –Area A	Yes	Poor to Moderate	Minor abundance	Minor	Unlikely/ not applicable
Dredge Islands –Area B	Yes	Poor to Moderate	Minor abundance	Minor	Unlikely/ not applicable
Dredge Islands –Area C	Yes	Poor	None to minor abundance	No	Unlikely/ not applicable
West Shoreline	No	Poor to Moderate	None to minor abundance	None to Minor	Potential / Potential
Jordan Cove	**Yes**	**Good to Moderate**	**Yes Abundant**	**Yes**	**Potential / Potential**
Haynes Inlet	**Yes**	**Moderate**	**Minor abundance**	**No**	**Potential / Potential**

* Bolded Sites proceeded to further evaluation

Using the criteria developed in Table 6, six of the sites were eliminated from consideration (Table 7). These six sites either had poor to moderate ecological conditions for eelgrass; had no or minor amounts of existing eelgrass or eelgrass habitat, or were not available for mitigation because of institutional reasons. Sites such as Pony Slough contain existing eelgrass resources, but only at the mouth; this site was eliminated because only a small area of suitable habitat was available for mitigation (Figure E5). Similarly, relatively dense, but narrow eelgrass beds are located adjacent to the APCO Sites, but existing bathymetries suggest that eelgrass already occupies optimal elevations with little room for expansion. The West Shoreline Site, southwest of JCEP is an area that may be developed in the future; using this site for eelgrass mitigation would preclude any alteration of the existing intertidal zone. The three dredge island sites were eliminated from consideration because of poor to moderate site conditions and the fact that eelgrass was only observed at appreciable densities during the earliest EPA (2005) survey. These early surveys were conducted using remote-sensing technologies (aerial photography) from a fixed-wing aircraft with no ground-truthing and likely overestimated eelgrass coverage. Subsequent studies that ground-truthed aerial surveys, such as the SSNERR work conducted in 2016, did not find substantial eelgrass resources (Figure E5).

After this evaluative process, the 10 initial sites were narrowed down to four sites in which additional analyses were conducted. The four sites are situated throughout lower and middle portions of Coos Bay, from Haynes Inlet to the lower bay (Figure E5). The four sites further evaluated include:

1. Haynes Inlet
2. Old Hatchery Site
3. Jordan Cove
4. Eelgrass Mitigation Site near the Airport

3.4.1.1 Haynes Inlet

The Haynes Inlet site is located in upper portions of the inlet at the edge of eelgrass beds documented by US EPA in 2005 (EPA 2005; Figure E5). This site was considered a mitigation alternative as a means to expand the northern reach of native eelgrass in Coos Bay. The property is privately held but considered available to JCEP as a potential mitigation area.

Existing conditions at the site consist of a broad, shallow grade mudflat composed of fine-grained, highly organic mud from an elevation of +4 feet MLLW to the lowest reaches of the intertidal zone. Sediments were relatively firm within the middle intertidal zone, but gradually became unconsolidated with distance from the shoreline. At the north end of the property, Larson Slough discharges to the Haynes Inlet's intertidal zone. The mudflat is widest adjacent to the slough and extends from the shore for as much as 700 feet offshore. Brackish conditions resulting from bay inputs and freshwater flowing from the slough have created optimal conditions for the formation of an expansive Lyngby's sedge marsh (*Carex lyngbyei*), which extends from the northern edge of the property for approximately 700 feet south (Figure E6; DEA 2018b). The marsh is at an approximate elevation of +5.0 to +6.0 feet MLLW. Small areas of pickleweed (*Salicornia virginica*) and salt grass (*Distichlas spicata*) were observed within the sedge marsh, but not at dominant densities.

Native eelgrass (*Z. marina*) was not observed during eelgrass surveys conducted in mid-May 2018. An eelgrass survey following Tier 1 guidelines developed by the USACE was conducted over the length of the property (USACE 2018b; DEA 2018b). A near continuous band of non-native *Z. japonica* was observed at approximate elevations of between +3.5 feet and +4.0 feet MLLW (Photo 1); mapped eelgrass on the site is presented in Figure E6.

Photo 1 - Continuous, dense Z. japonica *in the middle intertidal zone*

This site was eliminated from further considerations for the following reasons:

- No native eelgrass was observed during eelgrass surveys conducted in 2018.
- The widespread presence of fine-grained, high organic content sediments found in this portion of Haynes Inlet and the soft, unconsolidated nature of sediments at optimal elevations for *Z. marina* may preclude native eelgrass growth at appreciable densities.
- Native eelgrass within Coos Bay has generally been observed within lower intertidal zones composed of fine to medium sands. A habitat shift from sandy sediments in the main portions of Coos Bay to a fine-grained mudflat within upper Haynes Inlet may be the reason for a lack of native eelgrass on the site. Transplants within this area may have a high probability of failure.

3.4.1.2 Old Hatchery Site

The Old Hatchery site is situated due south of an abandoned fish hatchery facility located on the west shoreline of lower Coos Bay, approximately 2.6 miles southwest of JCEP (Figure E7). The area where potential mitigation opportunities exist are situated on State owned land within the intertidal zone adjacent to a Port of Coos Bay property. A small island is located in this area, which NOAA navigation charts note as a dredge spoil island. The site appears to be relatively protected from wind waves and excessive current velocities. Sediments are composed of fine to medium grained sands. Water clarity is good compared to upper reaches of the bay. Large patches of eelgrass were noted in the general area, and in particular surrounding portions of the island (Figure E7). The patches occur within a distinct elevation zone (DEA 2007).

At the north end of the island, where it extends into the intertidal zone, water depths remain too shallow to support eelgrass. This area is a sandy reach of intertidal zone extending to the northeast, beyond the island, forming a partially submerged spit for approximately 1,200 feet. The spit has eelgrass on all sides (Figure E7). An opportunity exists to excavate and grade this area to the elevation of the surrounding eelgrass to significantly expand this bed by approximately 1.5 acres.

DEA has eliminated this site from further consideration for the following reasons:

- Early agency input by the Oregon Department of Fish and Wildlife has determined that the area currently provides important ecological functions in its existing condition as a vegetated island and intertidal spit. Although removal of a portion of the dredge disposal island at this site could improve aquatic resource function, a concern was expressed that performing mitigation at this site could potentially degrade the existing high quality resources.
- Existing habitat processes that formed the shallow intertidal spit would remain after the area is regraded and planted with eelgrass, indicating that the longevity of the eelgrass mitigation site may not be sufficient to meet the mitigation needs of JCEP. The existing dredge spoil island and nearshore drift processes likely provide a continuous source of sediment for the shallow spit. Reburial is the likely long-term outcome.

3.4.1.3 Jordan Cove Embayment

The Jordan Cove embayment, located approximately 0.5 miles east of JCEP is a shallow, very low gradient embayment with continuous to patchy eelgrass beds along much of the outer bay (Figure E8). Much of the embayment consists of a broad intertidal or shallow subtidal sand flat composed of fine sands. Existing eelgrass coverage within the bay appears to be substantial suggesting that conditions for eelgrass colonization are good (DEA 2018a). An assessment of eelgrass surveys over the years has found that a limited degree of overlap has occurred in the areal distribution of the resource between 2005 and 2016. Based on this and the low gradient of the embayment, it is anticipated that sediment may shift from year to year affecting the optimal conditions that eelgrass would require in order to effectively colonize or expand.

DEA has eliminated this site from further consideration as a primary means of eelgrass mitigation for the following reasons:

- The shifting nature of eelgrass colonies within Jordan Cove may make it difficult for a mitigation site to comply with annual performance monitoring criteria or successfully meet eelgrass mitigation requirements.
- The amount of area available for eelgrass mitigation may not be sufficient to satisfy the eelgrass requirements of JCEP (e.g., an area that will allow an initial mitigation area of 3:1 mitigation area to impact site or a final mitigation requirement of 1.2:1[(2.3 acres]).

However, based on the substantial amount of existing eelgrass resource within Jordan Cove, the shallow water habitat that exists, and due to its close proximity to JCEP, this site may be a suitable site for receiving eelgrass transplants removed from the proposed Access Channel before it is dredged (DEA 2018a). As a result, JCEP plans to remove eelgrass from the Access Channel prior to dredging so it can be transplanted at Jordan Cove. Further details of eelgrass salvage from the Access Channel and transplantation to Jordan Cove is presented in Section 3.4.3.

3.4.1.4 Airport Site (JCEP Proposed Eelgrass Mitigation Site)

3.4.1.4.1 Overview

Based on the before-mentioned screening criteria, the Airport Site has been identified as JCEP's preferred Eelgrass Mitigation Site. It is located due south of the proposed Access Channel on the eastern shoreline of the bay as described in Section 1.3.1 (Figures E1, E2, and E3). The existing site is an elevated shoal associated with runway expansion at SORA. The shoal was likely created by estuarine processes that have since been blocked by the airport runway extension constructed in 1988 (Appendix D).

The site consists of an unvegetated intertidal shoal comprised of medium to course-textured sand. The top of the shoal is at an elevation of +2.7 feet MLLW (+2.0 feet NAVD88), with the outer boundaries at approximately +0.7 feet MLLW (0 feet NAVD88; Figure E2). Eelgrass surveys conducted in 2018 found no fringing eelgrass within the existing grading boundary. Patchy eelgrass beds have been found to the east and south (Figure E3), and substantial continuous eelgrass beds have been found to the southwest (donor and reference site; Figure E4). To the north, waters shallow approaching the airport runway, and to the west, remnants of a dredge spoil island are present.

The proposed approach is to excavate the locally high area surrounded by eelgrass down to approximately -1.0 to -2.0 ft NAVD 88 (-0.28 to -1.28 ft MLLW). The site will be left to stabilize for at least one winter storm cycle. The area would then be planted with donor stock in subsequent years. Because excavation would need to occur within the ODFW recommended in-water work window (October 1 through February 15), it does not coincide with the preferred time for transplanting eelgrass (i.e., spring and summer). The area is proposed for grading in order to tie into desired elevations where more robust beds occur and to facilitate tidal circulation at the mitigation site.

3.4.1.4.2 Site Stability

Hydrodynamic and sediment transport modeling was conducted at the site to determine if the proposed grade reduction would likely remain over time or whether sediment accretion would occur (Moffatt & Nichol 2018; CHE 2014; Appendix I). One study evaluated substrate stability after sediment removal and the other evaluated sediment transport to determine the potential for future sediment redeposition at the site. Study results indicate that the eelgrass mitigation site will remain at stable elevations once the site has been excavated and graded and eelgrass transplantation has been completed. Studies by CHE (2014) also indicate that local currents at the site reflect velocities that should allow transplanted eelgrass to remain stable and that substrate erosion is not expected. Studies by Moffatt & Nichol (2018) indicate that proposed bathymetric changes at the eelgrass mitigation site will not become altered to a significant extent over time. This confirms that estuarine processes that may have created the shoal are no longer present. These studies are appended to this Compensatory Wetland Mitigation Plan in Appendix I.

Modeling results are consistent with a historical geomorphic analysis conducted, as presented in Appendix D. Historical aerial photos show that the shoal appeared to be first formed as a result of secondary tidal channels running through the area, depositing sediments onto the shoal as the channels widened and lost velocity. These tidal channels were defined in part, by one of two dredge spoil islands placed northwest and west of the site when the federal navigation channel was deepened between 1948 and 1951. These processes appear to have created the shoal over time between the 1950s and 1980s (Figures E9 and E10). The larger of the dredge spoil islands was subsequently removed and used as fill material for a 2,000 foot airport runway extension constructed in 1988 (Figure E11). Remnants of the smaller dredge spoil island remains due west of the shoal, defining the edge of the proposed eelgrass donor bed and reference site (Figure E4). After the extended runway was completed in 1988, it has completely blocked the tidal channel responsible for creating the shoal (Figure E12). As indicated by the modeling results, there no longer are estuarine tidal processes that can re-form the shoal after grading and planting it with eelgrass. Additional details of the historical geomorphic analysis is presented in Appendix D.

3.4.1.4.3 *Increase in Ecological Function*

From a regulatory perspective, the proposed mitigation site previously received ODSL approval as part of ODSL authorization (ODSL # 37712-RF), which has since been withdrawn by the applicant to better align the USACE and ODSL permits for the overall project. Though the site will convert one intertidal habitat with existing ecological functions into another, the area was likely created by in-water work activities (placement of dredge spoil islands) before the airport runway extension was constructed in 1988. The area is also of insufficient elevations to have developed a vegetated upland and remains largely unvegetated. Proposed mitigation will increase ecological functions to a high degree over approximately 5.7 acres of isolated unvegetated sand flat. It will also restore the area where historical in-water construction (airport runway extension) changed estuarine processes resulting in substantially lowered ecological functions.

In addition, ODSL considers compensatory mitigation for eelgrass restoration as removing existing material near existing eelgrass beds to establish elevations and a hydrologic regime suitable for supporting eelgrass beds (ODSL 2016).

3.4.2 Summary Conclusions – Site Suitability and Alternatives Analysis

The site suitability evaluation and Alternatives Analysis has developed the criteria necessary to carefully evaluate and select a number of potential mitigation sites within Coos Bay to serve the mitigation needs of JCEP. The Alternatives Analysis leads to the conclusion that the proposed site southwest of the airport is the preferred eelgrass mitigation site to compensate for anticipated losses of existing eelgrass and habitat from the proposed dredging of the Access Channel. This conclusion was reached because of the following site and design attributes: Of the 10 sites evaluated, the preferred mitigation site meets all of the selection criteria necessary to maximize the success of eelgrass mitigation (Table 6).

- Physical, water quality, and ecological conditions are optimal for eelgrass transplantation after site preparation.
- The existing elevated shoal has adjacent eelgrass beds, documented over multiple years and field verified.
- The site meets engineering design requirements and is readily constructible.
- The site is a state owned aquatic land available to conduct long-term compensatory mitigation.
- Long-term mitigation at this site will not interfere with future economic development within Coos Bay.
- The area can be protected by the state from future development to preserve the mitigation site to serve the compensatory mitigation requirements of JCEP.
- Based on historical aerial photo analysis, it has been determined that the existing shoal is the result of estuarine processes that were enhanced by the placement of a dredge spoil island in the area and has been subsequently blocked by the construction of the airport runway extension. This has been further confirmed by sediment modeling conducted by JCEP.

- The site is of sufficient size to more than meet the eelgrass mitigation requirements to compensate for proposed losses of eelgrass habitat at the Access Channel.
- Eelgrass mitigation at the preferred site in conjunction with proposed removal of existing eelgrass within the Access Channel prior to dredging and transplantation to recipient areas meets the USACE requirement of avoiding and minimization of impacts.
- The preferred eelgrass mitigation site can be readily monitored over time to determine the short and long-term success of proposed mitigation.

3.4.3 Eelgrass Salvage and Transplantation from the Access Channel

The existing eelgrass resource within the proposed Access Channel of the LNG Facility has been consistently present since 2005. The most recent eelgrass survey conducted by DEA in September 2018 (DEA 2018a), as well as observations during a site visit in May 2018 (DEA 2018b) show a near continuous *Z. marina* bed running the length of the Access Channel (Figure E10; Photo 2).

Photo 2 - Existing* Z. marina *eelgrass within the proposed Access Channel – May 2018

The latest acreage of the Access Channel eelgrass bed is the same as that found in 2017 (1.90 acres; Figure E13). The 2018 survey also conducted a Tier 2 eelgrass survey where quantitative densities were collected. Divers collected eelgrass shoot counts from 85 quadrats from three, approximately 300 foot transects within the Access Channel. Mean shoot counts from the three transects were remarkably similar, indicating that the eelgrass bed is uniformly dense. Mean shoot counts were 54.0 shoots per square meter (Table 8).

Table 8. Eelgrass Density Data Collected within the Proposed Access Channel.

Access Channel Transects	Number of quads	Shoots/m^2
Access channel south	29	53.8
Access channel middle	29	52.6
Access channel east	27	55.6
Total Number of Quadrats	**85**	**--**
Mean Shoots/m^2	**--**	**54.0**

As reported in Section 3.4.1.3 above, eelgrass available to be salvaged within the Access Channel prior to dredging will be transplanted to a suitable recipient site. The selected recipient site is the Jordan Cove embayment located 0.5 miles east of the Access Channel (Figure E8). A Tier 1 eelgrass survey was also conducted in Jordan Cove in 2018 to carefully delineate the existing eelgrass boundaries so that these areas can be avoided during transplantation, and so that monitoring events will only delineate transplants rather than from existing eelgrass. In addition, a bathymetric survey of Jordan Cove was conducted to identify optimal areas away from existing eelgrass beds to transplant (DEA 2018a). As a result of these two surveys, two areas within Jordan Cove were identified as potential recipients for eelgrass transplantation, as shown in Figure E14. The two areas are along the outer bay, and combined, encompass approximately 2.1 acres at elevations between approximately +1.3 feet and -2.0 feet MLLW. The two areas are free of eelgrass and run along the same elevation as existing eelgrass, situated between an existing shallow shoal to the east and the Jordan Cove shoreline to the north. The two areas are also of sufficient size to receive all of the eelgrass from the proposed Access Channel.

The eelgrass salvage and transplantation project proposes to remove eelgrass from the Access Channel two seasons before planting at the eelgrass mitigation site begins. Eelgrass removal will follow procedures outlined for donor beds (Section 1.3.1.3) to remove eelgrass and ready it for transplantation, except that the entire bed will be removed. It is anticipated that removal will occur using both on-foot field biologists at lower tidal elevations and divers at higher tidal elevations. Post-removal processing will involve preparing and storing PUs as outlined in Section 1.3.1.2, though it is anticipated that planting will occur at densities approaching those of the original bed within the Access Channel. The transplant of larger sods of eelgrass with staples to hold them in place may also be conducted. This methodology was successfully used recently for large scale transplants in Puget Sound, Washington for the Washington Department of Natural Resources (Gaekle J., WA Dept. of Natural Resources, pers. comm. 2018).

Seasonal post-transplant monitoring would be conducted to verify the level of transplant success. These data would be used to determine if reduction in JCEPs total eelgrass requirement at the Eelgrass Mitigation Site is justified. Data would be used to recalculate (and potentially reduce) the total eelgrass mitigation requirement at the Eelgrass Mitigation Site based on the amount of eelgrass that has reestablished in Jordan Cove over the 5-year monitoring period.

Approval by the USACE and ODSL would be required before implementing this approach. However, the USACE would consider this a conservation measure built into the design of the project. In this way, it would be considered a recommended action to both avoid and minimize impacts to existing eelgrass, as well as minimize the temporal loss of the resource. ODSL would likely consider this action a contingency mitigation to supplement the preferred mitigation site.

Two other sites were considered for transplantation in areas adjacent and immediately west of the Access channel located between existing pile dikes. After discussions with JCEP's environmental and permitting group, it was determined that areas adjacent to shorelines potentially used for industrial purposes should be avoided to avoid limiting future development. An eelgrass transplantation site in this area may preclude shoreline alterations that may be necessary for waterfront development.

3.4.4 Kentuck Project

The proposed Kentuck Project site was selected partly through the same investigation of eelgrass sites (DEA 2007). This site historically provided mudflat, salt marsh, tide channel, and fringing freshwater habitats. The site historically also was an important transitional rearing habitat for coho salmon, because it would have provided an important brackish water mixing zone between the inflowing freshwater of Kentuck Creek and the more saline waters of the bay. Because of subsidence related to diking and draining activities, the site can now support primarily mudflat habitats.

Proposed design would raise grades throughout much of the site in order to provide a diverse and complex suite of habitats. Grades would be raised through the beneficial reuse of dredge material associated with other aspects of the Project. Dredge material is anticipated to be predominantly sand. The proposed approach for grading the site will be to strip the upper 12 to 18 inches of top soil before applying dewatered dredge material. The stockpiled top soil, which is predominantly silt loam (Coquille silt loam and Nestucca silt loam) will then be reapplied. Some blending of the dredge material with top soil may occur to aid soil cohesiveness and avoid having a sharp contrast of soil types within the soil profile. Use of the existing top soil will provide nutrients for plant establishment and also aid with soil cohesiveness. That said, salt marsh and freshwater wetland vegetation appears to grow quite well in sandy soils as evidenced by the communities that grow from this substrate along the Coos Bay North Spit. Wetland delineation work by DEA has observed the soils here often have very little fine material or organics. Site construction methods including timing and approaches to material import and dewatering, top soil salvage, mass grading, channel construction, erosion control measures, etc. will be prepared as part of final design with documentation provided to ODSL and other agencies either prior to permit issuance or as a condition of permits.

Design has been based on modeling from WEST Consultants as well as input from NMFS and ODFW over the years. A final hydrology and hydraulics report will be completed around mid-fall of 2018 that will include hydrodynamic modeling of the slough system based on proposed site conditions. Modeling will include an analysis of salinity fluctuations and sediment transport. The final report will be made available to ODSL, USACE and other reviewing agencies. ODFW and NMFS will also review and provide input on the MTR design, including how best to time the gate function to best support salmonids. The proposed MTR, new bridge, and box culvert at the irrigation pond will all be designed to meet ODFW fish passage criteria and coordination with ODFW is taking place to assure compliance with their requirements.

3.4.5 Minimizes Temporal Loss

3.4.5.1 Eelgrass Mitigation

As reported in Section 3.4.3, JCEP proposes to remove eelgrass from the proposed Access Channel prior to dredging and transplanting it to suitable habitats within adjacent Jordan Cove (Figure E14). Rather than a primary mitigation site, this action would be a conservation measure built into the design of the project, or contingency mitigation to lower JCEPs total eelgrass mitigation requirement by the amount of eelgrass that successfully establishes in the embayment. Removal and transplantation prior to dredging would also constitute an advanced action conducted prior to impacts, hence lowering the potential temporal losses of ecological functions. In addition, this would satisfy USACE comments (USACE 2018a) to consider options that would further avoid/minimize impacts to eelgrass.

3.4.5.2 Kentuck Mitigation Site

Mitigation work will be conducted concurrently with Project construction, a period of approximately 60 months. Mitigation work will begin at the front end of the construction schedule, where feasible, in an effort to minimize temporal loss of ecological functions. However, the construction schedule will also emphasize measures that are likely to lead to the long-term success of the Project-related mitigation work. For example, allowing imported dredge material to be rough graded and then to sit for a minimum of six months will allow for settling to occur before final grading, which will improve the ability to achieve the target elevations.

To assure proper functioning of the MTR structure it will be monitored at least once annually with an on-site visit, but with additional visits as necessary post heavy storm events. The condition of structural components will be recorded and recommendations provided to implement maintenance, repair, or replacement, if applicable. An MTR Operation and Maintenance Plan will be developed during final design of the project and will include a plan for long-term endowment for responsibility of MTR inspection, maintenance and repairs, and replacements as warranted.

4. *CWM EXISTING SITE CONDITIONS (BASELINE INFORMATION)*

4.1 WETLAND DELINEATION OR DETERMINATION

4.1.1 Eelgrass Mitigation Site

A wetland delineation report has not been prepared for the proposed Eelgrass Mitigation site, though several recent eelgrass surveys have been conducted since 2005 with the most recent in 2018. The site is an unvegetated elevated intertidal shoal of medium to course sand, historically surrounded by eelgrass. The top of the shoal is at an elevation of +2.7 feet MLLW (+2.0 feet NAVD88), with the outer boundaries at approximately +0.7 feet MLLW (0 feet NAVD88; Figure E2). Earlier eelgrass surveys conducted in 2005 (EPA 2005) and 2010 (DEA 2010) mapped areas of eelgrass along the southwest perimeter (fringe) of the proposed grading limits (Appendix A Figure E2; Figure E9). However, the latest eelgrass surveys conducted in 2016 (SSNERR 2016) and 2018 (DEA 2018a) showed no eelgrass within the proposed grading limits. The site is clearly an estuarine resource feature that is subject to ODSL and USACE jurisdiction.

Moffatt & Nichol (2017) prepared a Sediment Transport Analysis technical memorandum that evaluated the potential for scour and/or shoaling at the proposed eelgrass mitigation site. The analysis concludes that changes in bathymetry post construction are not likely. This is consistent with a historical geomorphic analysis of the area that found it likely that placement of a dredge spoil island to the north in the 1950s contributed to the formation of the existing shoal at the Eelgrass Mitigation Site. Subsequent construction of the airport runway extension altered local hydrodynamic patterns and estuarine processes. With the current extended runway configuration, the processes that created the shoal are no longer present. (Moffatt & Nichol 2018).

4.1.2 Kentuck Project

Wetland delineation reports have been prepared for the Kentuck Project site (DEA 2009 [updated via DEA 2016, ODSL WD #2010-0337R, concurrence received August 18, 2016], DEA 2014 [ODSL WD #2014-0350, concurrence received February 23, 2016]). The wetland delineation reports provide the following site description:

The approximately 133-acre former golf course is located adjacent to the south bank of Kentuck Slough, between River Mile 0.0 and River Mile 0.9. Prior to diking, the area consisted of mudflats, and low and high salt marsh plant communities located along a broad intertidal terrace. The property has been diked from Coos Bay and the slough, and (until 2009 has been operated as a golf course. Near the northwest corner of the property, the Kentuck Slough channel flows under East Bay Road through a bridge with a tidegate structure, where flows then enter Kentuck Inlet, an arm of the Coos Bay Estuary. The site is also hydraulically connected to Kentuck Inlet by way of a 10-foot-diameter culvert and tidegate near the southeast corner of the property under East Bay Drive.

Portions of the original channel and smaller tributary channels remain on the golf course; however, they have been notably altered, and additional drainage ditches have been added. The presence of the levee and East Bay Drive section have resulted in the conversion of the property from an estuarine (i.e., saltwater and brackish water) system to a freshwater system. Historically the site had a bi-directional hydrologic connection (i.e., tidal flow in and out) with the slough channel and Coos Bay. Currently, the site is protected from tidal inundation, and drainage only occurs in one direction.

The approximately 100-acre historical flood terrace has been delineated as an emergent wetland (palustrine emergent Cowardin class) plant community dominated by lawn grasses, with scattered native and ornamental tree plantings. Since golf course operations ceased, circa 2009, the flood terrace has reverted to wet pasture and is grazed by cattle. The areas outside of the former maintained golf course grounds consist of forested wetlands (palustrine forested Cowardin class) and upland forest. Historically, the flood terrace would have been classified as an estuarine wetland.

4.2 HYDROGEOMORPHIC ("HGM") AND COWARDIN CLASSES/SUBCLASSES AT CWM SITE

4.2.1 Eelgrass Mitigation Site

Based on the *Guidebook for HGM-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles* (Adamus 2001), the proposed Eelgrass Mitigation site can be classified as Estuarine Fringe, Embayment (EFE). Estuarine Fringe sites include areas whose hydrodynamics are influenced mainly by the daily bi-directional movement of tides and where the deep water edge is defined by the 2-meter depth contour, as measured from mean daily low tide (Adamus 2001). The Estuarine Fringe, Embayment (EFE) subclass typically receives more of its hydrologic inputs from the ocean than from rivers and is less influenced by seasonal runoff events.

The Cowardin class of the proposed Eelgrass Mitigation site is estuarine, intertidal, unconsolidated shore, regularly flooded (E2USN).

4.2.2 Kentuck Project

The former golf course wetlands would be classified as a slope wetland under the HGM classification system, because groundwater provides the dominant source of hydrology; however, these wetlands could also be placed in the "flats" class due to the notable effect that direct precipitation can have on water levels there. Prior to diking, the golf course wetlands would have been classified as an estuarine wetland. Under the Cowardin classification system, this wetland would now be classified as a palustrine emergent wetland (PEM). The small amount of forested area within the site would be classified as palustrine forested wetlands (PFO).

The narrow fringe wetlands within the Kentuck Slough channel would be classified as estuarine, intertidal, emergent wetlands (Cowardin class) closer to the tidegate, and as PEM wetlands (Cowardin class) farther from the tidegate. The western portions of these wetlands, which experience brackish water conditions, would be classified as an estuarine fringe, marine-sourced, high tidal wetland under the HGM classification system. The eastern portions, which experience freshwater conditions, would be classified as an estuarine fringe, river-sourced wetland under the HGM classification system.

4.3 EXISTING AND PROPOSED HYDROLOGY

4.3.1 Eelgrass Mitigation Site – Existing Hydrology

Coos Bay is the water source for the Eelgrass Mitigation site. The site consists of an unvegetated sandflat below the average high tide elevation of Coos Bay and is surrounded by deeper water areas. The sandflat is exposed during lower tides.

4.3.2 Eelgrass Mitigation Site – Proposed Hydrology

Coos Bay is the water source at the Eelgrass Mitigation site. The site will be situated near the MLLW elevation (-0.7 feet MLLW; 0 feet NAVD88; Figure E2), which will allow nearly permanent inundation of the site, except during very low tides. This is the natural hydrologic condition at which eelgrass flourishes within the bay, including areas adjacent to the Eelgrass Mitigation site.

4.3.3 Kentuck Project – Existing Hydrology

Hydrology within the Kentuck Project site is driven primarily by groundwater elevations and secondarily by direct precipitation. During wetland delineation efforts, groundwater was typically observed in soil pits from 10 inches depth to within an inch or two of the surface. Saturation typically occurred 2 inches above this depth. These conditions are typical of wintertime conditions. In summer, groundwater elevations are typically a foot or two deeper (Culp pers. comm. 2009). These observations are consistent with hydrology conditions described in the Coos County soils survey (USDA 1989). Hydrology is also provided by seeps near the base of hill slopes, where shallow subsurface flows come to the surface.

During site investigations shallow ponding has been observed in many locations throughout the golf course, but it was most pronounced in the western half. Ground topography throughout the golf course varies slightly, with roughly 2 to 3 feet of difference in topographic relief from location to location. Some flooding occurs from the surface drainages, particularly during high and incoming tides, when the tidegate on the culvert at the southwest corner of the golf course is closed. This effect is exacerbated during heavy or prolonged steady precipitation events.

Hydrology for the narrow fringe wetlands adjacent to the Kentuck Slough channel is primarily a function of flooding by tidal inundation and high flows within the Kentuck Slough channel. A high water table and saturation were observed in the soil pits. Shallow inundation (i.e., approximately 6 inches) occurred during high tide. The existing MTR tide gate at the Kentuck Slough bridge limits salt water intrusion into the slough; however, a tidal backwater affect is still experienced in the slough when the gate closes and freshwater backs up behind the gate during incoming tides.

4.3.4 Kentuck Project – Proposed Hydrology

As previously noted, in this CWM Plan Kentuck Creek is used to refer to the portion of the drainage generally above the historic head of tide, while Kentuck Slough is used to refer to the portion of the drainage generally below the historic head of tide.

Hydrology to the Kentuck Project –Tidal Reconnection Area will be provided by tidal inundation from Coos Bay/Kentuck Inlet. Normal tidal cycles will substantially flood the property twice daily. The proposed new bridge opening will be designed, based on hydrodynamic modeling, to allow the entire site to be fully exposed to tidal influence with only limited tidal muting anticipated. Salt marsh occurs up to approximately 8.5 ft elevation (NAVD 88) at the salt marsh reference site located in Kentuck Inlet. This suggests that typical tidal affects within the Kentuck Project --Tidal Reconnection Area will provide wetland hydrology at least up to this elevation. Most of the proposed site grading has been designed to be no higher than elevation 8.5 ft, not including infrastructure such as the new levee or roadway improvements. However, elevations have been designed to extend up to 10.0 ft elevation where freshwater inputs from hillside seepage, shallow subsurface flow, and where the eastern tributary stream enters the site. It is anticipated that the combination of these freshwater inputs interplaying with tidal influence will provide wetland hydrology to these slightly higher areas of the site which are intended to support fringing freshwater wetland communities. No portion of the site, aside from infrastructure features, have been designed to occur above highest measured tide (elevation 10.26 ft NAVD 88). Flows from Kentuck Slough will be partially routed through the site. The current irrigation pond, formed by an earthen berm across a small drainage, drains to the former golf course through a standpipe/culvert water control structure. Golf Course Lane currently runs along the bottom of the berm. The proposed project will raise the elevation of the road above tidal influence and replace the current irrigation pond setup by installing a box culvert with native stream bed to allow tidal influence into the irrigation pond area. This will change the freshwater pond to estuarine habitat that is fish accessible. Some of the fringing emergent marsh habitat will convert to salt marsh; however, areas above elevation 8.5 ft are likely to remain as freshwater marsh since fresh surface and groundwater inputs will continue to provide hydrology to the wetland post tidal connection. A final hydrology and hydraulics report will be completed around early summer of 2018 that will include hydrodynamic modeling of the slough system based on proposed site conditions. Modeling will include an analysis of the extent of tidal influence across the site, including salinity regimes that can then be used to assess where reed canarygrass establishment could be prevented.

Hydrology to the Kentuck Project – Freshwater Floodplain Reconnection Area will be provided by direct precipitation and a seasonally high groundwater table, as is currently the case. Kentuck Creek overbank flows will also provide a source of wetland hydrology.

4.4 EXISTING PLANT COMMUNITY DISTRIBUTIONS AND ABUNDANCE OF EXOTIC SPECIES

4.4.1 Eelgrass Mitigation Site

The proposed Eelgrass Mitigation site is primarily devoid of vegetation; however, some drift macroalgae may pass through the site. Some of the deeper areas adjacent to the proposed site contain eelgrass beds (*Z. marina*) and associated epiphytic algae.

4.4.2 Kentuck Project

The approximately 100-acre historical flood terrace has been delineated as an emergent wetland (palustrine emergent Cowardin class) plant community dominated by lawn/pasture grasses, with scattered native and ornamental tree plantings. Since golf course operations ceased, circa 2009, the flood terrace has reverted to wet pasture and is grazed by cattle. The areas outside of the formerly maintained golf course grounds consist of forested wetlands (palustrine forested Cowardin class) and upland forest. A small and narrow fringe of high salt marsh community occurs along the lower portion of the Kentuck Slough channel. Six plant communities were identified during the wetland delineation and are described below.

4.4.2.1 Pasture Community

The Pasture community was is dominated by Kentucky bluegrass (*Poa pratensis*, FAC). This community occurs in the flats portion of the former golf course. Reed canarygrass (*Phalaris arundinacea*, FACW) and soft rush (*Juncus effusus*, FACW) are also prominent in places, having established since golf course maintenance activities ceased. This plant community is considered to be hydrophytic, because greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

A second type of this community was found in upland locations, and it contains Kentucky bluegrass and hairy cat's ear (*Hypochaeris radicata*, FACU). This second community type occurs on maintained hill slopes. This type of the Pasture plant community is considered to be non-hydrophytic, because no greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

Tree plantings occur in localized groupings throughout the former golf course, but they are not considered dominant. Tree species included Sitka spruce (*Picea sitchensis*, FAC), shore pine (*Pinus contorta*, FAC), and various ornamental species.

4.4.2.2 Weedy Upland

The Weedy Upland community is located primarily along the levee protecting the golf course from the Kentuck Slough channel. It is also occasionally found along semi-maintained areas along the toe of slopes along the south side of the site. The Weedy Upland community is dominated by Himalayan blackberry (*Rubus armeniacus*, FACU), trailing blackberry (*Rubus ursinus*, FACU), Scotch broom (*Cytisus scoparius*, UPL), tall fescue (*Schedonorus phoenix*, FAC), reed canarygrass, Kentucky bluegrass, and orchard grass (*Dactylis glomerata*, FACU). Hooker willow (*Salix hookeriana*, FACW) is also occasionally found in this community. This plant community is considered to be non-hydrophytic, because no greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

4.4.2.3 Forested Wetland Community

The Forested Wetland community occurs at the base of hillside ravines along the south side of the golf course, where maintenance activities do not occur. Dominant vegetation consists of red alder (*Alnus rubra*, FAC), Oregon crab apple (*Malus fusca*, FACW), salmon berry (*Rubus spectabilis*, FAC), twin berry (*Lonicera involucrata*, FAC), trailing blackberry, small-fruited bulrush (*Scirpus microcarpus*, OBL), stinging nettle (*Urtica dioica*, FAC), slough sedge (*Carex obnupta*, OBL), skunk cabbage (*Lysichiton americanum*, OBL), deer fern (*Blechnum spicant*, FAC), creeping buttercup (*Ranunculus repens*, FACW), water parsley (*Oenanthe sarmentosa*, OBL), and youth on age (*Tolmiea menziesii*, FAC). This plant community is considered to be hydrophytic, because greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

4.4.2.4 Forested Upland Community

The Forested Upland community occurs on the hillsides adjacent to the Forested Wetland community and maintained portions of the golf course. Dominant vegetation consists of Douglas fir (*Pseudotsuga menziesii*, FACU), red alder, cascara (*Rhamnus pershiana*, FAC), red elderberry (*Sambucus racemosa*, FACU), salmon berry, evergreen huckleberry (*Vaccinium ovatum*, UPL), salal (*Gaultheria shallon*, FACU), trailing blackberry, sword fern (*Polystichum munitum*, FACU), and deer fern. This plant community is considered to be non-hydrophytic, because no greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

4.4.2.5 High Salt Marsh Community

The High Salt Marsh community is located towards the western end of Kentuck Slough, where some tidal influence occurs and results in saltwater/brackish water conditions. Dominant species include Lyngby sedge (*Carex lyngbyei*, OBL), with salt grass (*Distichlis spicata*, FACW) and tufted hairgrass (*Deschampsia caespitosa*, FACW) as common subdominants. This plant community is considered to be hydrophytic, because greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

4.4.2.6 Reed Canarygrass Community

The Reed Canarygrass community is located towards the eastern end of Kentuck Slough. Tidal influence occurs; however, freshwater conditions predominate. Reed canarygrass is the sole dominant in this community. This community transitions into the High Salt Marsh community to the west, where water conditions grade from predominantly fresh to predominantly brackish. The Reed Canarygrass community is considered to be hydrophytic, because greater than 50 percent of the dominant plants with known indicator status are hydrophytic.

4.5 SITE CONSTRAINTS OR LIMITATIONS

4.5.1 Eelgrass Mitigation Site

Potential site constraints include the following:

- Site access for construction and monitoring is limited to barge and other watercraft.
- Dynamic site conditions are susceptible to force majeure (i.e., catastrophic events such as severe storm surge, tsunami, etc.). Note, hydrodynamic-sediment transport modeling has shown that the project will not result in noticeable changes to sedimentation at the site (Moffatt & Nichol 2018).
- Construction activities will need to be adjusted to assure minimization of impacts to adjacent eelgrass beds.
- Coordination and clearances from the nearby airport may be needed.

4.5.2 Kentuck Project

Potential site constraints include the following:

- Opening the golf course to tidal influence creates the risk of increased flooding potential and saltwater intrusion to adjacent and upstream landowners. New levee construction and repair and/or enhancement of the existing levee are therefore required to reduce this risk. Levee construction and/or repair will result in additional wetland impacts that are accounted for in this plan.
- Portions of East Bay Drive and the golf course access road need to be elevated above tidal elevations to allow continued access to private residences and/or to comply with Coos County requirements. Road improvements will result in additional wetland impacts that are accounted for in this plan.
- Two overhead power lines traverse the mitigation site. Accommodations will need to be made to provide access to power poles.
- The site has encountered substantial subsidence that has required the import of fill to raise grades in order to provide desired habitat types. Importing this fill will entail transshipment of a large volume of JCEP dredge material to the site (this process is covered in detail in JCEP's Dredge Material Management Plan).
- PCGP proposes to install a new gas pipeline under the Kentuck Project site.

4.6 ENHANCEMENT PROJECTS

4.6.1 Eelgrass Site

Transplantation of eelgrass at the Eelgrass Mitigation Site will enhance habitat conditions degraded by historical anthropogenic activities. Dredge spoil disposal in the 1950s when the Federal Navigation Channel was deepened created a dredge spoil island that likely contributed to the creation of the existing shoal at the Eelgrass Mitigation Site. Subsequent removal of the dredge spoil island in 1988 and construction of the airport runway extension blocked the tidal channels responsible for shoal formation. Prior to these events, historical aerial photography showed an enlargement of the shoal between the 1950s and 1970s (Appendix D). Since the current configuration of the runway now prevents additional shoaling, proposed removal of these sediments to optimal elevations for eelgrass growth and expansion presents a unique opportunity to restore eelgrass habitats modified by historic in-water work.

4.6.2 Kentuck Site

4.6.2.1 Factors Leading to Degraded Condition

Enhancement will occur at the Kentuck Project site. Before alteration, the area consisted of mudflats, and low and high salt marsh plant communities located along a broad intertidal terrace. The property has been diked from Coos Bay and managed for various uses over the decades, including use as pasture for grazing and use as a golf course. The factors leading to the degraded condition at the Kentuck Project site include the construction of levees and resulting isolation from Kentuck Inlet and Coos Bay; the construction of Kentuck Golf Course and appurtenances (e.g., cart paths, bridges, culverts); significant changes in vegetative communities resulting from altered site hydrology; and pumping and maintenance activities associated with golf course operations.

4.6.2.2 How CWM Plan Will Reverse Degradation

The CWM Plan will reverse degradation by breaching the levee and restoring tidal hydrology to the historical estuarine wetland, removing golf course appurtenances, and providing for the re-establishment of mudflat, salt marsh, and fringing freshwater wetland plant communities. Similarly, floodplain reconnection will occur at the far northeast end of the site, which will allow for establishment of freshwater wetland dominated by native species.

5. FUNCTIONS AND VALUES ASSESSMENT

5.1 ASSESSMENT METHODS USED

Wetland functions and values were evaluated for impacted wetlands and the mitigation sites pre- and post-mitigation. Table 9 lists the assessment methods used for various aspects of this CWM Plan.

Table 9. Functional Assessment Methods Used to Support this CWM Plan

Project and Components	Method: Rationale
LNG Terminal	
Freshwater wetland impacts	Oregon Rapid Wetland Assessment Protocol ("ORWAP"): This is the approved method for assessing functions and values in Oregon, particularly for projects that entail multiple wetland types.
Existing tidal habitats and Eelgrass Mitigation site (intertidal sand/mudflats, shallow subtidal, eelgrass, salt marsh, riprap embankment below HMT)	Best Professional Judgement and Eelgrass Densities: These habitats occur at the proposed slip and access channel, the Trans Pacific Parkway/US-101 intersection, along the west side of East Bay Drive at the Kentuck Project, and at the Eelgrass Mitigation site. ORWAP is not intended to assess these types of estuarine resources, with the exception of salt marsh. Other methods for assessing these habitats in Oregon are not available. Salt marsh impacts are extremely small (0.06 acre) and are located adjacent to the other habitats noted above, and therefore have been included in this category. Based on literature review it is presumed that high density eelgrass provides a higher level of function than low density eelgrass (NOAA 2014). This concept informs the collection of quantitative data on eelgrass densities at reference sites and the establishment of performance criteria to meet those densities by the end of the prescribed post-construction monitoring period.
Kentuck Project, pre- and post-mitigation	ORWAP: This method is appropriate for evaluating all wetland types at the site in its existing condition. This method also covers the many wetland types that will result post-mitigation. ORWAP does consider the presence of mudflats within the greater vegetated portion of a site. Therefore, mudflats that will form at the site have been included as a part of the overall site assessment.
Pipeline	
Forested and scrub-shrub wetlands converted to emergent wetlands	Best Professional Judgement: PCGP has not had site access to a number of the wetlands that will be impacted by the Pipeline. For purposes of this mitigation plan, PCGP conducted a functional assessment based on best professional judgement. Once access is allowed and site visits conducted, PCGP will follow up with an ORWAP-based assessment.

5.2 FUNCTIONS AND VALUES ASSESSMENT

Lost functions and values at the existing wetland sites will be replaced by conducting mitigation in suitable locations within the Coos Bay estuary that will result in self-sustaining, complex habitats connected to adjacent ecosystems. Appendix E and Appendix F provide the results of project functional assessments for the LNG Terminal and PCGP project components, respectively. Appendix E includes a summary table of proposed function and value losses and gains for wetlands associated with mitigation at the Kentuck Project site.

Currently there are no approved eelgrass functional assessments approved for use in Oregon and a search for other suitable rapid eelgrass functional assessments that could be applied to the project was unfruitful. The California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA 2014) states that "In absence of a complete functional assessment, eelgrass distribution and density should serve as a proxy for eelgrass habitat function." Therefore, data on eelgrass density at the proposed impact site has been provided and is intended to serve as a surrogate for eelgrass function (i.e., higher density equals higher function).

5.2.1 Conclusions of LNG Terminal and PCGP Functions and Values Assessments

5.2.1.1 LNG Terminal Function and Values Assessment Summary

Based on ORWAP, freshwater wetland group functions and values likely to be most affected by the LNG Terminal and that rated higher for values are Aquatic Habitat and Ecosystem Support functions. No functions at the proposed Kentuck Project site, under existing conditions, rated as higher. Meanwhile, post-mitigation scores for both the Kentuck Project site Tidal Reconnection Area and Freshwater Floodplain Reconnection Area rated as higher for Water Quality Support, Fish Habitat, Aquatic Habitat, and Ecosystem Support functions, all which received higher value ratings as well. These ratings suggest: (1) proposed mitigation at the Kentuck Project site results in functional uplift of important wetland values, and (2) the uplift at the Kentuck Project site will occur, at a minimum, to the same higher functioning and valued group functions that will be lost at the freshwater impact sites.

Estuarine habitat functions will be lost at the proposed LNG Terminal. Functions such as shellfish habitat, waterbird habitat, primary production, cover for juvenile fish, and egg-laying attachment areas for herring and other aquatic organisms may be provided at this impact site; however, due to site conditions, the impact site likely does not provide these functions at as high a level as some of the more diverse and ecologically complex locations found elsewhere in the bay. Lost estuarine functions will be offset at the Kentuck Project site and the Eelgrass Mitigation site, both of which are situated in and/or will result in a considerably more complex and diverse array of habitats than at the slip impact site, thus resulting in an overall uplift in functions lost.

5.2.1.2 Pipeline Function and Values Assessment Summary

For the Pipeline, functional impacts are likely to result in reduced functioning at a given impacted wetland rather than wholesale loss of function, because permanent wetland impacts entail a conversion of wetlands from forested or scrub-shrub wetland habitat to emergent wetland habitat, with emergent habitats often providing lower levels of function. Furthermore, Pipeline acreage impacts are all quite small. The largest single impact is 0.29 acre, with almost all other impacts being less than 0.10 acre. Estimated higher rating functions and values at the ORWAP group level likely to be reduced by the Pipeline impacts to forested and scrub-shrub wetlands include: Water Quality, Aquatic Support, and Ecosystem Support. The Pipeline's wetland functions and values impacts will be offset at the Kentuck Project site – Freshwater Reconnection Area. As described above for LNG Terminal freshwater impacts, ORWAP shows that the Kentuck Project site will result in notable uplift of functions that are of high value. The functional uplift also aligns with the higher functions and values estimated to be impacted by the Pipeline.

6. *MAPS, DRAWINGS, AND CONSTRUCTION SPECIFICATIONS*

6.1 SCALED SITE PLAN AND CROSS SECTIONS

Scaled site plans and cross sections for both mitigation sites are provided in Appendix A.

6.2 CONSTRUCTION SCHEDULE

Construction of the Project is anticipated to begin in the first half of 2020 and last approximately 60 months.

6.2.1 Eelgrass Mitigation Site

A proposed sequencing schedule for the Eelgrass Mitigation site is provided in Table 10. Excavation at the site, to provide suitable bed elevation for subsequent eelgrass transplanting, is anticipated to begin in the fourth quarter of 2020, assuming permit issuance by the fourth quarter of 2019. Dredging of the access channel, where permanent eelgrass impacts will occur, is also anticipated to start the fourth quarter 2020. Prior to dredging, eelgrass salvage will take place and be transplanted to the recipient site in Jordan Cove during the 2nd quarter of 2020. The Eelgrass Mitigation site takes into account the following two key time periods that will affect mitigation activities:

- Dredging during ODFW-approved in-water work window for the estuary: October 1 through February 15.
- Transplanting during optimal eelgrass transplanting period: late spring and summer.

Table 10. Proposed Mitigation Project Sequencing Schedule – Eelgrass Mitigation Site

Time Period	Mitigation Activities
3Q2020 to 1Q2021	• Conduct salvage of exiting eelgrass within Access Channel and transplant to Jordan Cove during the spring and summer of 2020. • Install site dredge pipeline and infrastructure (pumping stations and loading dock) during in-water work window • During the fall months of the in-water work window, dredge mitigation site to appropriate elevations for eelgrass establishment • Remove dredge pipeline and infrastructure prior to end of in-water work window • Post-excavation bathymetric survey or cross sections to be used in monitoring site stability
2Q2021 to 2Q2022	• Allow site to remain idle through the 2020-2021 winter storm season • Monitor Jordan Cove transplants summer 2021
2Q2022 to 4Q2022	• Late spring 2022, conduct bathymetric survey to monitor site stability after second (2021-2022) winter storm season. If results indicate site is relatively stable, then further site-stability monitoring in subsequent years would only occur if other monitoring efforts discover a notable change in site elevations that could prevent the mitigation from meeting the performance standard for Objective 1.2. • Summer, monitor reference and donor sites for baseline conditions. Monitor Jordan Cove transplants summer of 2022. If justified, reduce total eelgrass mitigation site requirement • Summer, conduct first eelgrass collection and transplanting to planting beds at the Eelgrass Mitigation Site (Figure E1) • Summer, post-transplanting monitoring of mitigation site to determine compliance with agreed-upon planting plan • Fall/winter, evaluate mitigation work to date and determine whether any corrective measures are needed for next season.
2Q2023 to 4Q2023	• Late spring 2023, conduct third bathymetric survey to monitor site stability • Summer, conduct second and final eelgrass collection and transplanting efforts to remaining planting beds at the Eelgrass Mitigation Site (Figure E1) • Summer, monitor mitigation, reference, and donor sites • Fall/winter, evaluate mitigation work to date and determine whether any corrective measures are needed for next season.
2Q2024 to 4Q2024	• Summer, monitor mitigation, reference, and donor sites (first year in which percent cover at mitigation site can apply to meeting performance standard, assuming additional planting is not proposed for this year). • Fall/winter, evaluate mitigation work to date and determine whether any corrective measures are needed for next season.
2Q2025 to 4Q2025	• Summer, monitor mitigation, reference, and donor sites (second year in which percent cover at mitigation site can apply to meeting performance standard, assuming additional planting is not proposed for this year). • Fall/winter, evaluate mitigation work to date and determine whether any corrective measures are needed for next season. • If performance standards for Objective 1.2 have been met, then the mitigation project is considered compliant with permitting requirements and future monitoring is no longer required. If performance standards for Objective 1.2 have not been met, then additional monitoring would be required.

Time Period	Mitigation Activities
2026 to 2028	• Continue to monitor until performance standards for Objective 2 are met. If by the end of year 8 performance standards have still not been met, then JCEP will consult with the agencies to determine future actions.

* Schedule presumes all required permits have been obtained by the fourth quarter of 2019.

** Timing nomenclature: 3Q2020 = 3rd quarter of 2020 based on a standard calendar year (not fiscal year)

6.2.2 Kentuck Project

Mitigation construction for the Kentuck Project is anticipated to begin in earnest after installation of the PCGP pipeline at the Kentuck Project site. The construction schedule of the Kentuck Project site takes into account the following constraints:

- In-water work window for the estuary: October 1 through February 15.
- In-water work window for Kentuck Slough (i.e., above the existing tidegate): July 1 through September 15.

See Table 11 for the sequencing schedule for the Kentuck Project site.

Table 11. Proposed Mitigation Project Sequencing Schedule – Kentuck Project Site

Time Period *	Mitigation Activities

2Q2020 to 2Q2021	• Construct Kentuck site dredge material delivery pipeline/offloading facility.
	• Site prep for delivery of dredge material (continues through 3Q2021)
	  o Install erosion and sediment control measures
	  o Remove remnant golf course infrastructure
	  o Top soil stripping and stockpiling

3Q2021 to 4Q2022	• Delivery of dredge material begins 3Q2021.
	• Removal of dredge material pipeline/offload facility end of 2Q2022
	• Staged material dewatering and rough grading occurs through 3Q2022.
	• Begin construction of permanent and temporary infrastructure improvements:
	  o Temporary East Bay Drive detour.
	  o Permanent East Bay Drive roadway improvements
	  o East Bay Drive bridge, including cofferdams to prevent tidal exchange into golf course.
	  o Golf Course Lane improvements.
	• Potential grading and planting of Freshwater Floodplain Reconnection area to accelerate mitigation efforts at this part of the site. Reconnection would likely not take place until final site completion.

1Q2023 to 1Q2024	• Rough graded material allowed to sit for six months to surcharge site and accelerate consolidation/settling.
	• Continue constuction of infrastructure improvements, in addition to above:
	  o New Kentuck Slough levee
	  o New tidegate structure with MTR gate in Kentuck Slough, including cofferdams

2Q2024 to 4Q2024	• Final site grading and habitat structures (e.g., large wood installation) • Plant installation • Connect new channel at Freshwater Floodplain Reconnection area to upstream and downstream portions of existing Kentuck Creek/Slough. • Remove cofferdams at MTR and bridge to connect Tidal Reconnection area to tidal influence

* Schedule presumes all required permits have been obtained by the fourth quarter of 2019.

** Timing nomenclature: 3Q2020 = 3rd quarter of 2020 based on a standard calendar year (not fiscal year)

6.3 SCHEMATIC OF WATER CONTROL STRUCTURES

Water control structures are not anticipated for the Eelgrass Mitigation site. The Eelgrass Mitigation site will interact freely with Coos Bay. The Kentuck Project site will feature new tidegates. A schematic of the MTR gate array is included in Appendix A, Figure K-8B.

6.4 PLANTING LISTS

A planting list for the Kentuck Project is provided in Appendix A, Figure 7. As noted in Section 1.3.2.1, Kentuck Tidal Reconnection Area, salt marsh vegetation is anticipated to establish by natural recruitment, particularly within lower salt marsh areas. Planting at the Eelgrass Mitigation site will consist solely of eelgrass (*Z. marina*). Non-native eelgrass (e.g., *Z. japonica*) will not be planted. No more than 10 percent of eelgrass donor beds will be harvested, except as follows. Complete harvest of eelgrass plant stock from the proposed impact site or extensive use of eelgrass from oyster culture beds will be allowed where it is common practice to conduct extensive removal of eelgrass that interferes with oyster culture operations. An eelgrass collection and transplanting plan will be prepared as part of final design efforts and will be made available to the regulatory agencies for comment. It is assumed that preparation of this plan will be included as a condition of appropriate permits and that agency approval will be required before eelgrass disturbance can occur on the project. The plan will identify specific locations for potential harvest, known conditions at those locations, and an estimate of available eelgrass harvest material. Due to annual fluctuations in eelgrass presence and density, these locations will need to be reviewed prior to actual harvest time to determine the final locations for harvest. All sites that are used for harvest will be documented as part of as-built requirements and monitored as part of overall eelgrass monitoring efforts.

7. *PERFORMANCE STANDARDS AND MONITORING PLAN*

7.1 PERFORMANCE STANDARDS

Performance standards for each objective are presented below. Project objectives have been partially restated for the sake of convenience. The performance standards set the minimum requirements that need to be met to consider mitigation efforts successful. A monitoring plan has been developed to determine whether the mitigation sites are on track and will eventually meet the performance standards.

7.1.1 Eelgrass Mitigation Site

Mitigation Goal: At the proposed Eelgrass Mitigation Site, establish a stable population of eelgrass beds at an area of 1.2 times or greater the area and equivalent densities as the impact site (i.e., 2.71 acres or greater). The stability of the population size and density shall be comparable to surrounding beds and overall natural fluctuation of eelgrass populations within the bay (monitoring will include reference sites to enable tracking of natural fluctuations of eelgrass).

To achieve this goal, the following objectives will be met:

Objective 1.1: Establish elevations suitable for eelgrass establishment over a minimum of 6.78 acres (i.e., 3 to 1 mitigation ratio for enhancement projects).

A minimum of 6.78 acres within the mitigation site will be at elevations suitable for eelgrass establishment. Wave and current action may cause elevations to shift over time. This is acceptable as long as performance standards for Objective 1.2 are still likely to be met.

Objective 1.2: Establish a minimum of 2.71 acres of eelgrass beds at densities that reflect those found at a selected reference site. Increases in eelgrass density as the mitigation site matures must meet a prescribed annual performance criteria of density, which is based on a percentage of reference site density each year over a total 5-year post-construction monitoring period. By the end of the post-construction monitoring period, eelgrass density must be within 10 percent of the reference site.

It should be noted that eelgrass that is salvaged from the proposed impact site and successfully transplanted to a recipient site will be subtracted from the total eelgrass mitigation requirement. Successful transplant reestablishment shall be documented by multiple year monitoring.

Objective 1.3: Reestablish eelgrass beds temporarily impacted from eelgrass mitigation site construction. This includes any eelgrass that may be within site boundaries a season before excavation/grading activities begin

Objective 1.3 is essentially the same as Objective 1.2; however, the eelgrass areal coverage and densities shall be based on the pre-construction estimate of likely incidental impacts.

Objective 1.4: There will be no lasting depletion or harm to eelgrass donor beds.
Recovery of donor beds shall be assessed the year after harvest and subsequent years after that until it is documented that beds have returned to pre-harvest conditions relative to adjacent unharvested areas. This shall occur for up to three years. If after 3 years the performance standard is not met, then permitting agencies shall be consulted to discuss potential remedial actions**.** Conditions of adjacent beds will be assessed during each monitoring event to assess natural variation in eelgrass presence in the immediate vicinity and this information will be used to calibrate whether donor beds have returned to pre-harvest condition.

To achieve these objectives, performance standards have been developed, based on recommendations by the USACE. DEA proposes to use the performance metrics outlined in USACE comments, as follows:

- Percent survival of the transplanted shoots after 1 year**.**
- Measurements of the areal coverage (total areas occupied by eelgrass within the transplanted site, [e.g., square feet, meters, acres]) at each monitoring interval.
- Measurements of the shoot density (expressed as mean # shoots per square meter) within the vegetated areas of the transplant site, donor bed(s), and reference site(s) at each monitoring interval.

Performance standards and milestones would be developed in consultation with the USACE in advance of construction. DEA proposes the following, based on USACE standards:

> Year 1 – 40% coverage of eelgrass and 50% of the density of reference sites over not less than 1.2 times the area of the impact site (2.71 acres).
>
> Year 2 – 85% areal coverage of eelgrass and 60% of the density of initial transplant density over original transplanted area.
>
> Year 3 – 100% areal coverage of eelgrass and 75% of the density of reference sites over not less than 1.2 times the area of the impact site (2.71 acres).
>
> Year 4 – 100% areal coverage of eelgrass and 85% of the density of reference sites over not less than 1.2 times the area of the impact site (2.71 acres).
>
> Year 5 – 100% areal coverage of eelgrass and similar density of reference sites (not statistically different) over not less than 1.2 times the area of the impact site (2.71 acres).

Conducting monitoring at the 6-month mark after transplantation may not provide useful data or information if transplants occur during the optimal periods of mid-summer. Six months subsequent to transplantation would be mid-winter, during which transplants may not have a substantial showing above the sediments. These intervals will provide annual updates on the establishment and persistence of eelgrass during the growing season and detect potential early failures in eelgrass growth at the mitigation site that may suggest the need for additional actions (e.g., additional transplants).

7.2 KENTUCK PROJECT

7.2.1 Kentuck Project – Tidal Reconnection Area

Mitigation Goal 2: Restore tidal connectivity to a minimum of approximately 72.51 acres of historic tide lands within the former golf course site, which will result in a diverse array of habitat types including mudflat, tide channels, salt marsh, and fringing freshwater wetlands. This acreage is based on a 3:1 ratio of LNG Terminal impacts presented in Table 1, including permanent impacts at the Kentuck Site but not including eelgrass impacts.

Approximately 91 acres of construction will be undertaken to achieve this goal, including approximately 18 acres of voluntary habitat improvements above the minimum requirements. Additionally, JCEP anticipates providing substantially more vegetated habitat (e.g., salt marsh) than the minimum required because of salt marsh's higher productivity and historical loss within the watershed relative to mudflat. An estimated 28 percent of tidal wetland (e.g., salt marsh) has been lost within the bay compared to an estimated 18 percent loss of tidal flats (e.g., mudflat), and there is currently roughly four and a half times more tide flat than tidal wetland within the bay (Borde et. al. 2003), Proposed plant community elevations and species composition are informed by a reference site immediately adjacent to the mitigation site in Kentuck Inlet.

To achieve this goal, the following objectives will be met:

Objective 2.1: Restore tidal reconnection to the site that allows for free exchange of tidal water from Kentuck Inlet. The reconnection will allow ecosystem processes to function similar to historic pre-settlement conditions to the greatest extent practicable given historic alterations at the site and within the watershed and also based on site constraints and adjacent property owner concerns. This objective will be achieved by installing a new bridge along East Bay Drive that meets ODFW fish passage criteria, NMFS standards, and (based on hydrodynamic modeling) has been designed to allow for full tidal exchange within the site during a single tide cycle.

Performance Standard: *An as-built survey will show that the new bridge was built to specifications included in ODFW Fish Passage permit. Follow up visual inspection will occur as a part of annual vegetation monitoring, which will occur for five years.*

Objective 2.2: Allow for continuity of ecological processes to occur between Kentuck Inlet, the project site, and Kentuck Slough, including fish passage. This objective will be achieved by installing the bridge along East Bay Drive as noted in Objective 2.1 as well as a MTR (i.e., fish friendly tidegate) towards the upper end of the site to create a direct connection between the site and Kentuck Slough. An additional fish friendly culvert (i.e., box culvert with native substrate bottom) will be installed to reestablish tidal connection to a drainage now blocked by an earthen berm/irrigation pond. All structures will be designed to meet ODFW fish passage criteria and NMFS standards.

Performance Standard: *An as-built survey will show that the new bridge and MTR structure were built to specifications included in ODFW Fish Passage permit. Follow up visual inspection will occur as a part of annual vegetation monitoring, which will occur for 5 years.*

Objective 2.3: Provide a range of aquatic habitat regimes within the site to support native plant species. This objective will be achieved through site grading to provide a range of tidal regimes within the site, including areas of salt marsh (particularly lower marsh elevations), mudflats, grading of primary and secondary tide channels, and habitat pools.

Performance Standard: *An as-built survey will show that proposed grading was constructed as designed. Follow up visual inspection will occur as a part of annual vegetation monitoring.*

Objective 2.4: Provide aquatic habitat features to further support native aquatic species. This objective will be achieved through installation of complex wood structures (i.e., many pieces of large wood per structure) in habitat pools and simple wood structures (i.e., 1 to 3 pieces of large wood per structure) within channels. At a minimum the following will be included:

- 4 complex wood structures
- 11 simple wood structures
- 2 habitat pools

Performance Standard for Objectives 2.4: *An as-built survey will show that the proposed habitat features were properly constructed. Follow up visual inspection will occur as a part of annual vegetation monitoring.*

Objective 2.5: Establish a diversity of vegetated estuarine and freshwater wetland habitat types dominated by native species (i.e., salt marsh, and palustrine forested, scrub-shrub, and emergent communities). At a minimum 22.35 acres of vegetated habitats shall be established to offset vegetated wetland impacts (i.e. Table 1 LNG Terminal impacts, including Kentuck impacts, to PFO, PSS, PEM, PAB, and E2EM habitats) at a 3:1 ratio. This objective will be achieved by grading site elevations that are supportive of salt marsh establishment (based on nearby reference salt marsh). Fringing freshwater wetlands are anticipated to form along the upper margins of the site that occur near sources of freshwater (i.e., tributary streams, and seeps and shallow subsurface flows from the hillside that runs along the south side of the site). There will be a natural interplay between salt water from the bay and freshwater inputs that ultimately dictates the boundary between freshwater wetland/salt marsh communities. Salt marsh elevations are anticipated to range between approximately 5.5 ft to 8.5 ft NAVD 88 and the majority of proposed vegetated areas have been designed to these elevations. Maximum site elevations (not including levee and roadways) extend up to an elevation of 10.0 ft NAVD 88, which is just below the highest measured tide elevation for Coos Bay (10.26 ft NAVD 88). Elevations have only been extended up to 10.0 ft where freshwater tributary and hillside inputs are anticipated and therefore freshwater wetland plant species are likely to grow.

Performance Standard: *Annual monitoring will show that a minimum of 5.88 acres of vegetated wetland habitats have become established at the site. (Note, the entirety of the site, excluding bare mudflats, will be monitored for vegetation to assess overall conditions and to aid with invasive species control). Detailed vegetation performance standards are provided below.*

Performance Standard (based on standard ODSL vegetation performance criteria): *At the end of Year 5 (vegetation monitoring), the percent cover objectives enumerated below will be met, as determined through vegetation sample plots. These objectives are specific to the vegetation communities and minimum acreages noted above, and do not include mudflat areas. However, the entire Kentuck Project will be monitored, and plant communities will be managed to the same standards. Noxious weeds include those species designated as "A" or "B" by the Oregon Department of Agriculture Noxious Weed Control Program, as well as non-native cordgrass (Spartina sp.) species.*

1. *The cover of native herbaceous species is at least 60 percent.*
2. *The cover of invasive herbaceous species is no more than 20 percent.*
3. *The cover of invasive shrub or tree species is no more than 10 percent.*
4. *Bare substrate, in areas that clearly should have vegetation, represents no more than 20 percent cover.*
5. *By Year 3 and thereafter, there are at least three different native species. To qualify, a species must have at least 5 percent average cover in the habitat class, and occur in at least 10 percent of the plots sampled. (This time period may be extended in the salt marsh habitat to account for natural recruitment processes.)*

6. *Prevalence Index total for all strata is less than 3.0.*
7. *Woody vegetation: Woody vegetation will be established in fringing freshwater forested and willow scrub-shrub wetland areas. The precise extent of these areas is subject to the interaction of fresh water coming into the site and salt water coming in from the bay. This success criterion should be focused on areas that actually support freshwater communities, as observed post-mitigation, rather than the extent of these communities as shown on design plans. Where this is the case, the density of woody vegetation performance standard will be: At least 1,600 native plants (shrubs) and/or stems (trees) per acre, or the cover of native woody vegetation on the site is at least 50 percent in the scrub-shrub and forested communities. Native species volunteering on the site may be included; dead plants do not count. Woody vegetation standards should be met for two successive years without irrigation. The woody vegetation success criterion is specific to scrub-shrub and forested communities in which freshwater conditions predominate.*

7.2.1.1 Kentuck Project – Freshwater Floodplain Reconnection Area (Pipeline)

Mitigation Goal 3: Improve wetland and aquatic habitat functions by restoring ecological processes along a reach of Kentuck Creek and its adjacent, diked and grazed wetland floodplain. This will entail reestablishing floodplain connection to a minimum of approximately 2.73 acres of historical floodplain adjacent to Kentuck Creek (i.e., 3:1 ratio of PCGP impacts noted in Table 1), and establishing a mix of forested and scrub-shrub wetland habitats. Approximately 9.14 acres of construction will be undertaken to achieve this goal, including approximately 6.41 acres of voluntary habitat improvements above the minimum requirements. Per recommendation from NMFS, realigning a portion of Kentuck Creek through the site will also occur in order to improve instream habitat.

To achieve this goal, the following objectives will be met:

Objective 3.1: Improve in-stream habitat channel complexity to support native aquatic species. This objective will be met by realigning the creek through the Freshwater Floodplain Reconnection Area instead of following its current course along the northeast property boundary. Channel sinuosity will be increased to approximate estimated historic conditions and the channel cross-section will simulate a natural channel as opposed to the current partially maintained ditch-like channel. The existing channel will be plugged at its upstream end where it enters the site to divert water to the new channel, while the remainder of the existing channel will be left in place as a backwater habitat feature and to allow flow inputs from Mettman Creek and an existing drain from an adjacent property.

Performance Standard: *An as-built survey will show that the proposed creek realignment was constructed in accordance with the approved design. Follow up visual inspection will occur as a part of annual vegetation monitoring.*

Objective 3.2: Increase instream habitat structural complexity. This objective will be achieved through installation of large wood, including root wads. At a minimum the following will be included:

- 18 simple wood structures (or equivalent number of complex wood structures [i.e., 2 simple structures = 1 complex structure])
- 1 complex wood structure

Performance Standard: *An as-built survey will show that the proposed habitat features were properly constructed. Follow up visual inspection will occur as a part of annual vegetation monitoring.*

Objective 3.3: Allow for floodplain connection between the creek and its historic floodplain. This objective will be achieved by realigning the creek as described in Objective 3.1 as well as removing the existing levee along the northeast boundary of the site.

Performance Standard: *An as-built survey will show that the existing levee was removed in accordance with approved plans. Follow up visual inspection will occur as a part of annual vegetation monitoring.*

Objective 3.4: Enhance wetland functions through the establishment of native forested and scrub-shrub wetland plant communities. This objective will be achieved by a combination of site grading that will add microtopographic relief and planting the site with native trees, shrubs, and emergent wetland species. The microtopography will result in varied hydrologic regimes to support a higher diversity of plant species. Trees and shrubs will border both sides of the creek providing shading as well as food sources (i.e., macroinvertebrates) to fish.

Performance Standard (based on standard ODSL vegetation performance criteria): *At the end of Year 5 (vegetation monitoring), the percent cover objectives enumerated below will be met, as determined through vegetation sample plots. Noxious weeds include those species designated as "A" or "B" by the Oregon Department of Agriculture Noxious Weed Control Program.*

8. *The cover of native herbaceous species is at least 60 percent.*
9. *The cover of invasive herbaceous species is no more than 20 percent.*
10. *The cover of invasive shrub or tree species is no more than 10 percent.*
11. *Bare substrate, in areas that clearly should have vegetation, represents no more than 20 percent cover.*
12. *By Year 3 and thereafter, there are at least three different native species. To qualify, a species must have at least 5 percent average cover in the habitat class, and occur in at least 10 percent of the plots sampled. (This time period may be extended in the salt marsh habitat to account for natural recruitment processes.)*
13. *Prevalence Index total for all strata is less than 3.0.*
14. *Woody vegetation: Woody vegetation will be established in fringing freshwater forested and willow scrub-shrub wetland areas. The precise extent of these areas is subject to the interaction of fresh water coming into the site and salt water coming in from the bay. This success criterion should be focused on areas that actually support freshwater*

communities, as observed post-mitigation, rather than the extent of these communities as shown on design plans. Where this is the case, the density of woody vegetation performance standard will be: At least 1,600 native plants (shrubs) and/or stems (trees) per acre, or the cover of native woody vegetation on the site is at least 50 percent in the scrub-shrub and forested communities. Native species volunteering on the site may be included; dead plants do not count. Woody vegetation standards should be met for two successive years without irrigation. The woody vegetation success criterion is specific to scrub-shrub and forested communities in which freshwater conditions predominate.

7.3 MONITORING PLAN

The purpose of the mitigation monitoring requirement is to provide information for the agencies to:
(a) determine whether the mitigation project complies with the conditions of the authorization;
(b) evaluate whether the mitigation project meets the goals, objectives, and performance standards of the mitigation plan; and (c) provide information for removal-fill program monitoring.

JCEP will monitor the mitigation sites and provide a post-construction report and annual written monitoring report or reports to USACE and ODSL. Monitoring reports will include all data necessary to document compliance with goals, objectives, and performance standards associated with the CWM Plan. This data may include photographs, topographic surveys, plant survival data, hydrologic data, and other information as required to demonstrate compliance.

The reports will include the following sections:

1. Introduction
2. Goals, objectives, and performance standards
3. Methods
4. Results
5. Summary and recommendations
6. Figures
7. Appendices with data and photographs

7.3.1 Monitoring Schedule

7.3.1.1 Eelgrass Mitigation Site

Pre-construction monitoring will occur at the proposed Access Channel, eelgrass mitigation site, and at the reference and donor site. Post-construction monitoring will be conducted for a minimum of five years but may extend up to eight years if Objective 2 is not met within the first five years, as described in Table 10.

7.3.1.2 Kentuck Project Site

Monitoring will be conducted for at least five years unless otherwise specified by USACE or ODSL.

7.3.2 Monitoring Methods

7.3.2.1 Eelgrass Mitigation Site

To assess the likelihood of meeting the goals, objectives, and performance standards for the Eelgrass Mitigation site, the following monitoring efforts will be conducted. Pre-construction and post-construction monitoring will occur meeting the guideline requirements developed by the USACE (2016), either a Tier 1 Qualitative or Tier 2 Quantitative eelgrass surveys. *In-situ* monitoring using divers or waders, depending on the water depth, will be conducted in order to assess percent survival of transplanted shoots, and shoot density of eelgrass in the transplanted beds, both of which are essential components of any eelgrass mitigation monitoring plan. Shoot density is the most commonly used metric to assess mitigation performance (Thom et al. 2008).

Monitoring will determine the area of eelgrass (e.g., square feet, meters, acres) and shoot density of plants (mean number of shoots per square meter) at Year 0, 1, 2, 3 ,4 ,and 5 after completing the eelgrass mitigation.

Tier 1 surveys are proposed for the following:

- Tier 1 surveys will be used to determine areas where temporary construction impacts will occur (e.g., where a hydraulic dredge line crosses an existing eelgrass bed).
- Tier 1 surveys will be used as a tool to avoid/minimize impacts to existing eelgrass beds.
- Tier 1 surveys will be used to identify locations of potential donor beds, with additional detail captured using Tier 2 surveys.
- Tier 1 surveys will be used to identify recipient sites within Jordan Cove to transplant eelgrass from the Access Channel prior to dredging.

Tier 2 quantitative surveys are proposed at the following locations:

- During pre-construction periods within the proposed dredge prism of the Access Channel adjacent to the Federal Navigation Channel (FNC), data will be collected to quantify the area and density of eelgrass offshore from the proposed LNG Terminal slip.
- During pre-construction periods, Tier 2 surveys will be conducted to quantify the density of eelgrass donor beds identified during Tier 1 surveys. In this way, only 10 percent or less of existing eelgrass within the donor bed will be harvested for transplantation.
- During post-construction periods, Tier 2 surveys will be conducted to quantify the density of eelgrass donor beds to assess healthy recovery of these beds post-harvest.

- During both pre- and post-construction periods, Tier 2 surveys will be conducted within a nearby reference area or areas likely within existing eelgrass beds adjacent to the mitigation site, to measure natural expansion and contraction of eelgrass colonies over time. Reference sites may also be established near donor beds. The location of reference areas will be confirmed during final engineering design.
- During both pre- and post-construction periods, Tier 2 surveys will be conducted within the Jordan Cove transplant areas to determine eelgrass transplant success and the potential reduction of eelgrass mitigation requirements
- Post-construction Tier 2 surveys will be conducted at the eelgrass mitigation site and compared to the reference site(s) and performance standards included in Project permits (e.g. USACE and DSL permits). Proposed performance standards are described in Section 6.

The analyses of monitoring data will be statistically rigorous, and include the following statistical considerations:

- Low probability of a Type I error - concluding there is loss of eelgrass when, in fact, there is not. This issue is addressed by selecting a small value for α in statistical analyses, usually 0.10.
- Low probability of a Type II error - failing to detect a loss of eelgrass when, in fact, there is one. Selecting a small value for β (applying high statistical power, $(1-\beta)$ ensures this. Power set at 0.90 provides low probability of a Type II error.

The duration of monitoring activities will be determined based on whether the Eelgrass Mitigation site has met the performance standards. Specifically, monitoring would continue until performance standards for Objective 1.2 are met, which would require a minimum monitoring period of five years. If, by the end of Year 5, performance standards have not been met, then JCEP will consult with the regulatory agencies (USACE and ODSL) to determine future actions.

7.3.2.2 Kentuck Project Site

To assess the likelihood of meeting the goals and objectives for the Kentuck Project site, the following monitoring efforts will be conducted. Although only a portion of the site is needed to meet performance criteria, monitoring will take place across the entire site in order to assess overall site conditions and potential management needs.

Monitoring at the Kentuck Project site will consist of a post-construction site review to verify construction/removal of the specified bridge, levees, tidegates, channel reconstruction/enhancement, and other earthwork. This site review will occur shortly after completion of the proposed construction work. Site conditions will be documented with photographs and summarized in a report or technical memorandum (i.e., an as-built report). After construction, additional monitoring will occur for a period of five years.

Details of the monitoring plan are provided below and cover the Tidal Reconnection Area and Freshwater Floodplain Reconnection Area:

1. **Structures and habitat features (Objectives/performance standards 2.1, 2.2, 2.3, 2.4, 3.1, and 3.2)**

    - As-built report to document constructed per approved design
    - Visual inspection winter high flow/storm period (Year 1 and 2): inspect for stability and signs of scour risks
    - Visual inspection summer low flow period (Years 1 – 5, can be timed with annual vegetation monitoring): inspect for stability, evidence of excessive scour or deposition.

2. **Vegetation monitoring (Objectives/performance standards 2.5 and 3.4) (See Appendix A, Figures K-3A and 3B for proposed monitoring plots layout)**

    Purpose: Assess establishment of plant communities.

    - Vegetation monitoring will follow methods outlined in "Routine Monitoring Guidance for Vegetation" (ODSL 2009). Which generally includes the following:
        - Vegetation plots in areas with proposed plant communities (not needed in mudflats) (Years 1 - 5) (see Section 7.1, Performance Standards, for additional details).
        - Map approximate extent of vegetated wetland/estuarine communities, including the edge of bare mudflat which is anticipated to adjust over time.

3. **Photo documentation (See Appendix A, Figures K-3A and 3B for proposed photo point layout)**

    Purpose: Visually document site changes over time.

    - Permanent photo points will be established around the site. Photo documentation will occur in conjunction with other monitoring efforts (Years 1 - 5).
    - Supplemental photos will be taken as appropriate to document site functionality as well as potential problem areas.

7.4 CONTINGENCY PLAN/ADAPTIVE MANAGEMENT PLAN

7.4.1 Eelgrass Mitigation Site

Contingency measures are based on principles of adaptive management. If monitoring shows that the performance standards are not being met or are not on a path to being met by the end of the monitoring period, then contingency measures will be needed. The following contingency measures are proposed to address potential foreseeable problems. Actual contingency measures would be based on monitoring data and site circumstances during the monitoring period:

1. If eelgrass transplants are surviving and appear healthy, but colonization of open areas is occurring too slowly or not at all, then additional transplanting may take place from identified donor beds. A review of reference site conditions would take place to determine if lack of colonization may be due to eelgrass trends in the area as opposed to mitigation site performance.
2. If eelgrass transplants are not surviving or appear unhealthy, then the following contingency measure would occur:
   - Mitigation site monitoring data will be compared with monitoring of the donor site and a reference site to determine whether poor eelgrass survivorship/health is occurring in adjacent areas, with the following potential courses of action:
     - If survivorship/health is poor in nearby areas, then the mitigation site could potentially be re-transplanted. However, this re-transplantation should only occur once nearby eelgrass populations are healthy again.
     - If survivorship/health is good in nearby areas, then a review of transplanting technique and site elevations will occur to determine whether inappropriate installation methods were used, and/or whether elevations have changed and may be the root cause of poor success.
       - If inappropriate installation methods are found to have been used, then the site may be retransplanted once the installation method issue has been rectified.
       - If installation methods are deemed adequate, but elevations have changed so that they do not support eelgrass, then an assessment of site stability will be performed. If it is deemed possible to regrade the site, with acceptable adjustment so that elevations will be maintained naturally, then the site could be retransplanted. Replanting would occur at least one year after regrading occurs.
       - If installation methods are deemed adequate, elevations have not changed or have changed but cannot be appropriately rectified, and no other rectifiable source of plant failure can be identified, then no further actions would be proposed for this site. JCEP and the agencies would then discuss alternative mitigation strategies.

3. Replanting Schedule:

   - After the completion of initial planting, if performance standards are not met during Year 2, and/or Year 3 monitoring, and site conditions are favorable for transplantation and growth at the eelgrass mitigation site, additional transplantation will be conducted each year to bolster bed densities subject to consultation with agencies.
   - Annual monitoring will also occur in Jordan Cove, the recipient site for eelgrass salvaged from the proposed Access Channel before dredging. The amount of eelgrass that has reestablished will be used to adjust performance standards. If the relative success of eelgrass transplants in Jordan Cove is greater than at the eelgrass mitigation site, and performance standards are still not met, then additional transplants can occur in Jordan Cove.
   - If Year 4 monitoring results are not within 20 percent of performance standards, other potential eelgrass mitigation sites will be investigated with agency consultation.

7.4.2 Kentuck Project

If the site does not meet the performance standards, including the identification of potential concerns to surrounding infrastructure, the potential cause or causes of the deficiencies or concerns will be evaluated as they arise, and solutions offered to the agencies.

8. *LONG-TERM PROTECTION AND FINANCIAL SECURITY INSTRUMENTS*

8.1 PROTECTION INSTRUMENT

8.1.1 Eelgrass Mitigation Site

The proposed Eelgrass Mitigation site is and will be owned by the State of Oregon.

JCEP anticipates endowing or otherwise funding a local non-profit organization that meets the requirements of Oregon Revised Statute (ORS) 271.715(3)(b) to provide near-term (i.e., permit monitoring period) and long-term management and maintenance of all mitigation sites associated with the Project. JCEP anticipates this entity would hold the conservation easement from the State of Oregon for the Eelgrass Mitigation site. Clauses necessary to protect the site will be written into the easement(s). A draft easement document including protection clauses will be provided in Appendix F prior to permit issuance.

During the construction and monitoring periods, floating signage and/or buoy markers will be used that identify the site as a mitigation site and that prohibit anchoring.

8.1.2 Kentuck Project

JCEP anticipates preparing and recording a deed restriction for the Kentuck Project site before commencing the work. A draft protection instrument will be provided in Appendix H.

8.2 PROPOSED FINANCIAL SECURITY INSTRUMENT

JCEP will provide a surety bond specifically for the purpose of guaranteeing CWM site performance. In addition, JCEP will provide personal guarantees or other appropriate sureties (e.g., a letter of credit from the managing partner of the Limited Partnership or its parent company) that secures compliance with mitigation obligations and promises to make all reasonable efforts to maintain the business entity in an active status until all mitigation obligations have been satisfied. A financial security instrument will be provided prior to permit issuance. A draft letter of credit is provided in Appendix J.

8.3 LONG-TERM MAINTENANCE PLAN (POST-MONITORING PERIOD)

8.3.1 Anticipated Ownership

The Eelgrass Mitigation site will be owned by the State of Oregon, with an easement held by an appropriate third party. JCEP, or a sister company, will own the Kentuck Project site.

8.3.2 Anticipated Long-term Maintenance Actions

Long-term maintenance actions at the mitigation sites will take effect after the permit monitoring period has ended, which assumes that performance criteria have been met. Long-term maintenance actions could include the following, on an as-needed basis:

- At a minimum, conduct an annual site visit at each mitigation site to document potential management and maintenance needs
- Tidegate and bridge maintenance
- Levee maintenance
- Invasive/noxious weed control
- Garbage/debris removal
- Installation of protective signage and/or other deterrents if vandalism or inappropriate activities occur
- Maintenance of “no anchor” signage/buoys at the Eelgrass Mitigation site
- Installation of new native plantings and/or habitat features

A long-term management plan that incorporates the principles of adaptive management will be prepared as a condition of approval of the permit. The plan will discuss long-term management goals, general monitoring and maintenance guidance, reporting requirements, and roles and responsibilities. In line with the principles of adaptive management, the long-term management plan will be considered a living document that may be revised over time in an effort to best serve conservation needs and on-the-ground realities.

8.3.3 Entity Responsible for Maintenance

JCEP anticipates endowing or otherwise funding a local non-profit organization that meets the requirements of ORS 271.715(3)(b) to provide near-term (i.e., permit monitoring period) and long-term management and maintenance of all mitigation sites associated with the Project. JCLNG is actively discussing long-term easement and maintenance responsibilities with conservation organizations. The site conservation easement holder and long-term management entity and contractual mechanism will be provided to ODSL prior to issuance of the Removal-Fill permit.

8.3.4 Anticipated Funding Source

JCEP will create an endowment to fund long-term maintenance of the mitigation sites.

9. *PREPARERS AND CONTRIBUTORS*

Ethan Rosenthal, DEA Ecologist, and Jim Starkes, DEA Senior Biologist authored this report. Sean Sullivan, DEA Senior Project Manager, provided the quality review. Jason Stutes, GeoEngineers Senior Marine Ecologist, provided technical expertise and quality review regarding eelgrass mitigation. Shay Witten, DEA Project Assistant, prepared the report drafts. Sara Gilbert, GIS Manager and Jim Culpepper, Senior Design Technician/CAD Manager, provided graphics.

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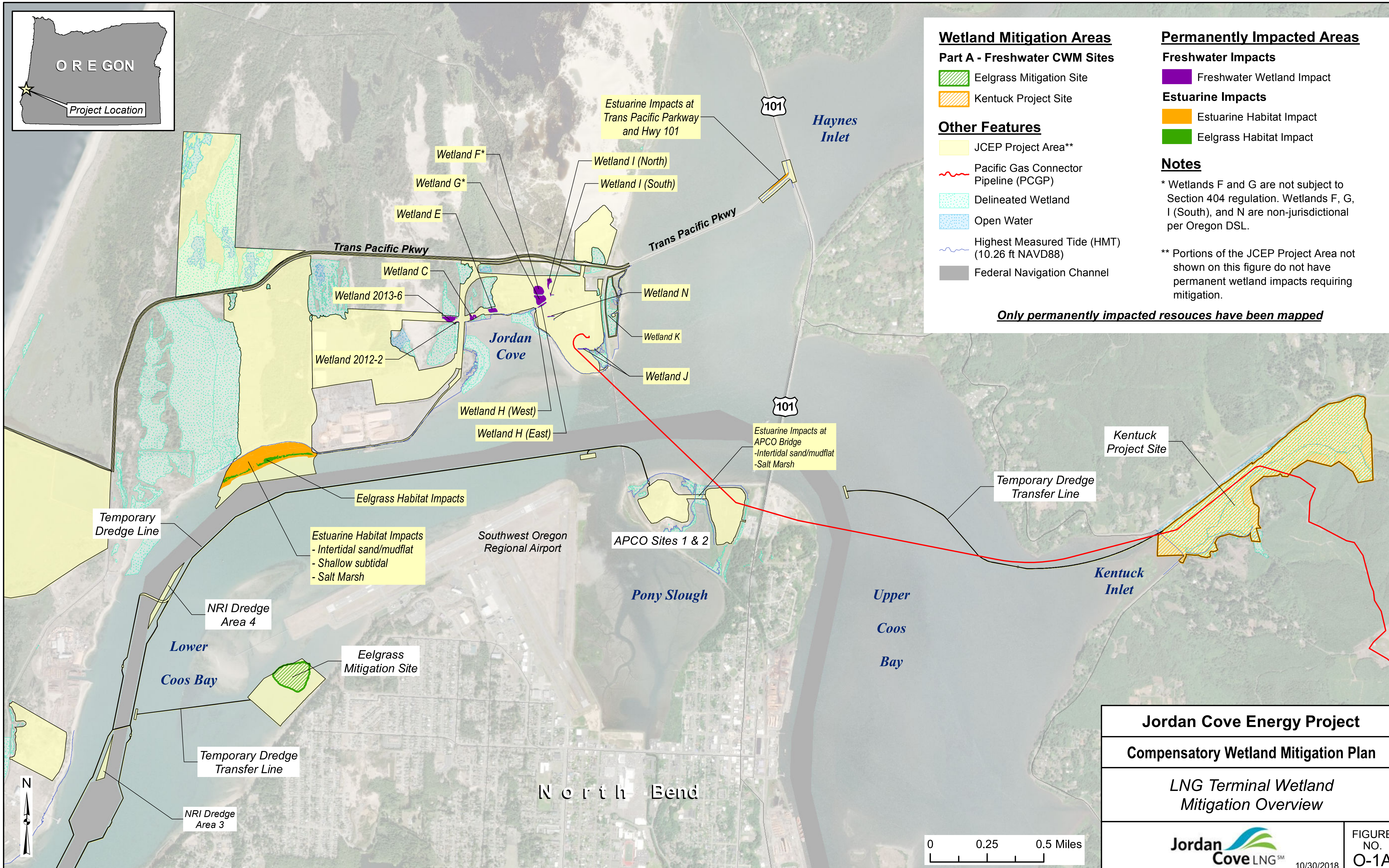
11. *APPENDICES*

APPENDIX A: FIGURES



Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

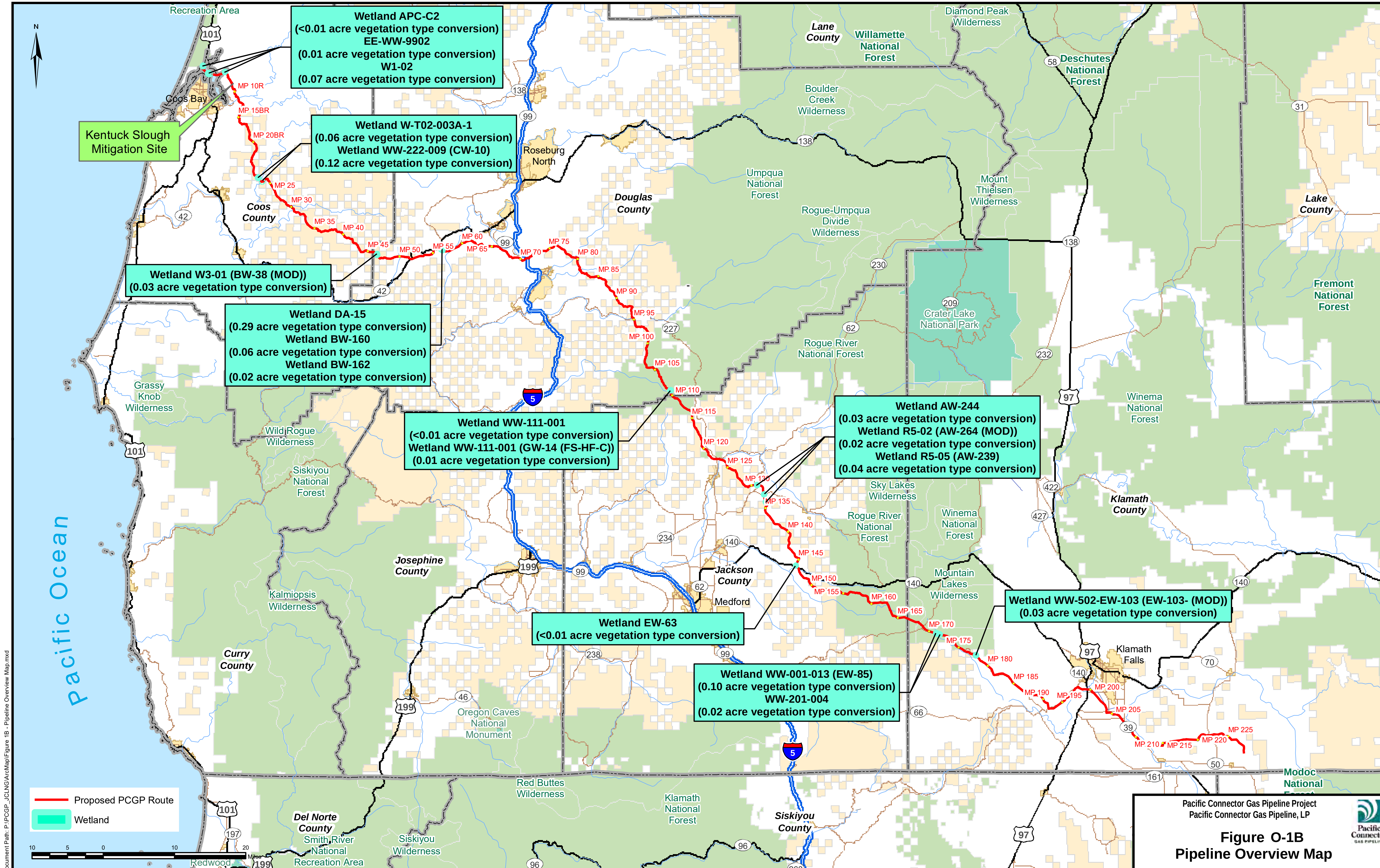
LNG Terminal Wetland Mitigation Overview

Jordan Cove LNG℠

10/30/2018

FIGURE NO. O-1A

\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-DSL-CWMP\Figure O-1A CWM Overview.mxd Sast Oct 30, 2018 9:55AM



Wetland APC-C2
(<0.01 acre vegetation type conversion)
EE-WW-9902
(0.01 acre vegetation type conversion)
W1-02
(0.07 acre vegetation type conversion)
Kentuck Slough Mitigation Site
Wetland W-T02-003A-1
(0.06 acre vegetation type conversion)
Wetland WW-222-009 (CW-10)
(0.12 acre vegetation type conversion)
Wetland W3-01 (BW-38 (MOD))
(0.03 acre vegetation type conversion)
Wetland DA-15
(0.29 acre vegetation type conversion)
Wetland BW-160
(0.06 acre vegetation type conversion)
Wetland BW-162
(0.02 acre vegetation type conversion)
Wetland WW-111-001
(<0.01 acre vegetation type conversion)
Wetland WW-111-001 (GW-14 (FS-HF-C))
(0.01 acre vegetation type conversion)
Wetland AW-244
(0.03 acre vegetation type conversion)
Wetland R5-02 (AW-264 (MOD))
(0.02 acre vegetation type conversion)
Wetland R5-05 (AW-239)
(0.04 acre vegetation type conversion)
Wetland WW-502-EW-103 (EW-103- (MOD))
(0.03 acre vegetation type conversion)
Wetland EW-63
(<0.01 acre vegetation type conversion)
Wetland WW-001-013 (EW-85)
(0.10 acre vegetation type conversion)
WW-201-004
(0.02 acre vegetation type conversion)
Pacific Ocean
Coos Bay
Coos County
Douglas County
Roseburg North
Lane County
Willamette National Forest
Deschutes National Forest
Diamond Peak Wilderness
Boulder Creek Wilderness
Umpqua National Forest
Rogue-Umpqua Divide Wilderness
Mount Thielsen Wilderness
Lake County
Fremont National Forest
Crater Lake National Park
Rogue River National Forest
Winema National Forest
Sky Lakes Wilderness
Klamath County
Mountain Lakes Wilderness
Klamath Falls
Jackson County
Medford
Josephine County
Grassy Knob Wilderness
Wild Rogue Wilderness
Siskiyou National Forest
Kalmiopsis Wilderness
Curry County
Oregon Caves National Monument
Red Buttes Wilderness
Klamath National Forest
Siskiyou County
Del Norte County
Smith River National Recreation Area
Siskiyou Wilderness
Redwood National Park
Modoc National Forest
Recreation Area
Proposed PCGP Route
Wetland
Pacific Connector Gas Pipeline Project
Pacific Connector Gas Pipeline, LP
Figure O-1B
Pipeline Overview Map
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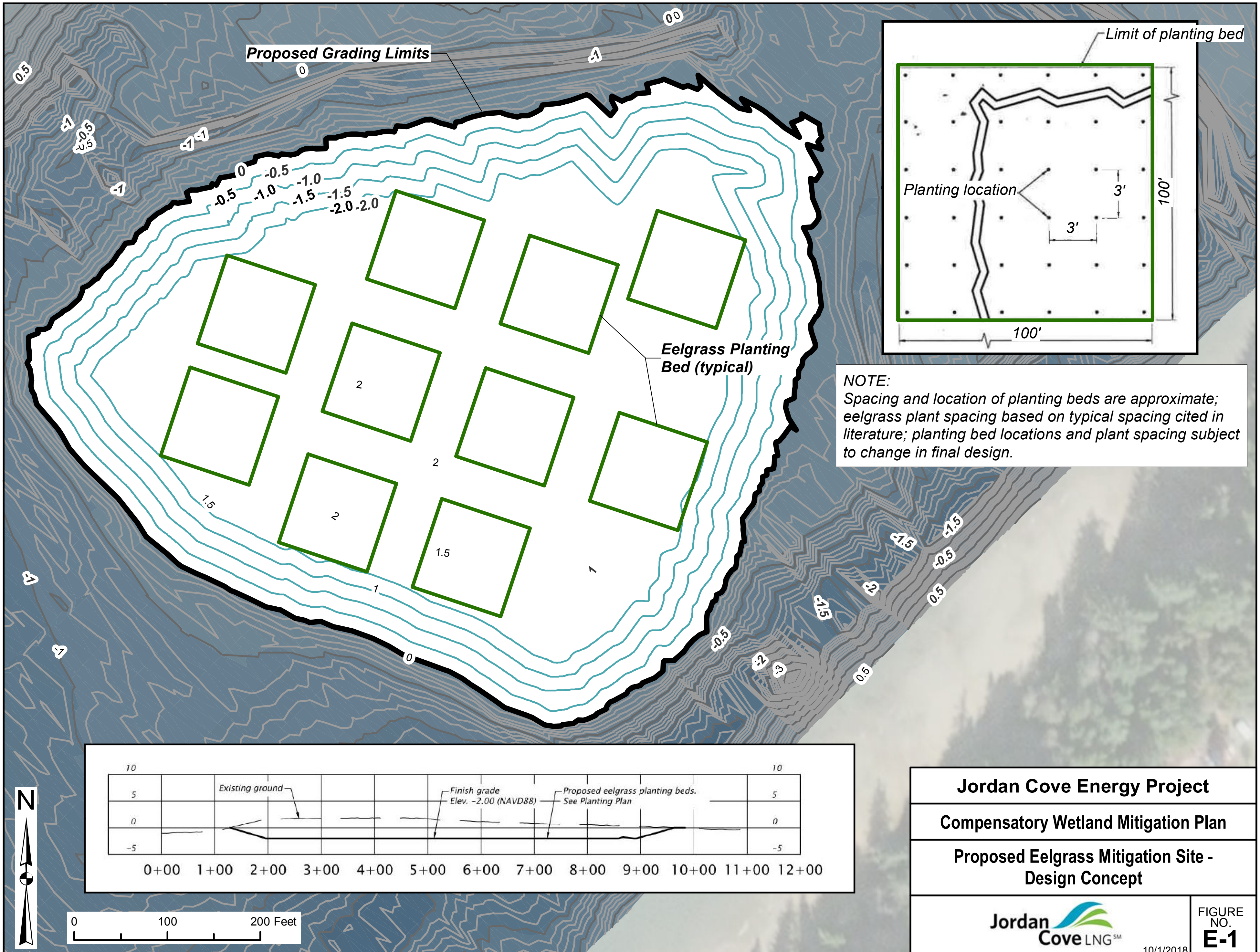
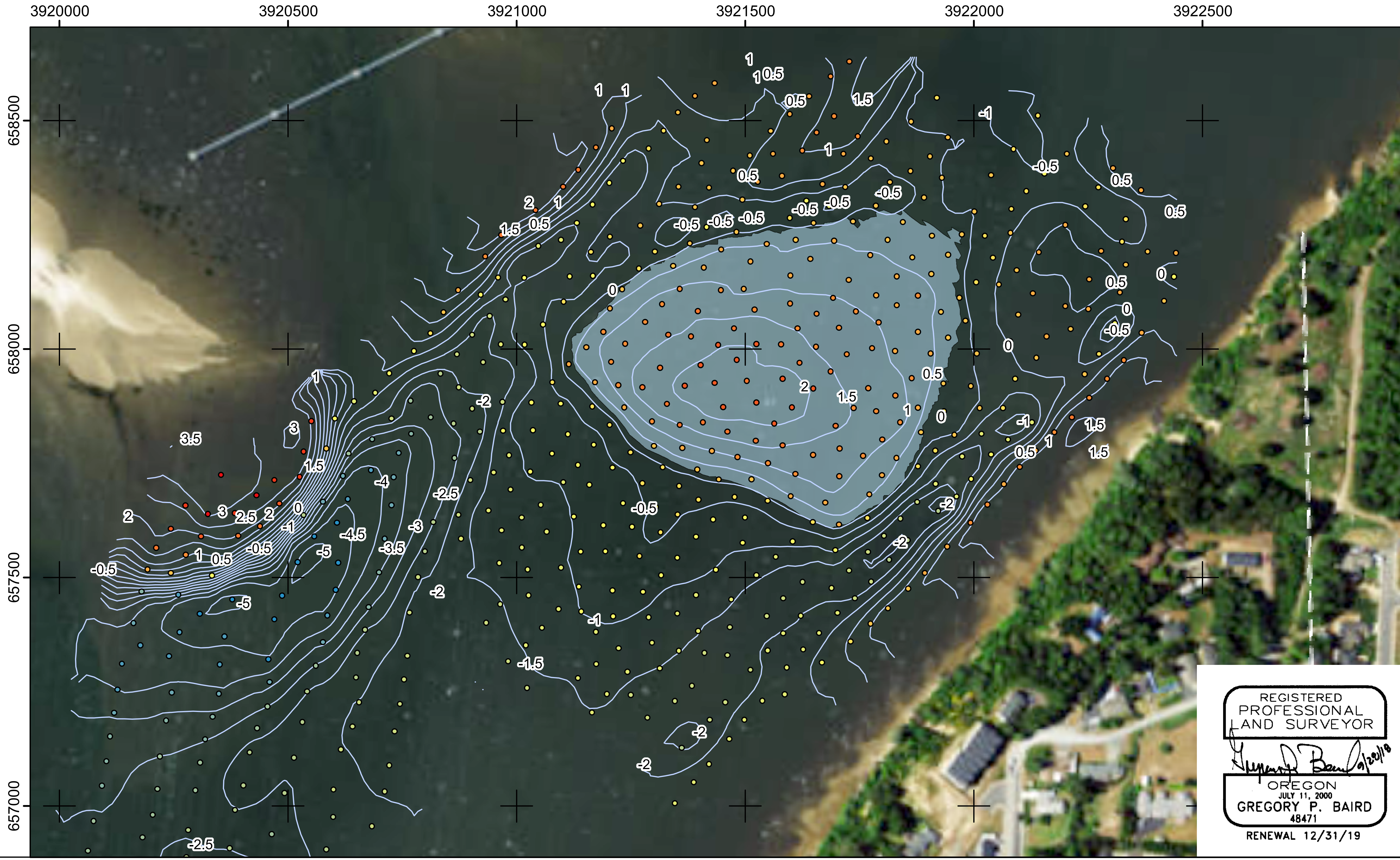


\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-1 CWMP_Proposed Eelgrass Mitigation Site - Design Concept.mxd 10/3/2018



Elevation (feet)

-5.0 - -4.5	-3.0 - -2.5	-1.0 - 0	1.0 - 1.5	3.0 - 3.5
-4.5 - -4.0	-2.5 - -2.0	-0.5 - 0	1.5 - 2.0	
-4.0 - -3.5	-2.0 - -1.5	0 - 0.5	2.0 - 2.5	
-3.5 - -3.0	-1.5 - -1.0	0.5 - 1.0	2.5 - 3.0	

0.5 ft Contour
Oregon South Graticule
Mitigation Site Boundary

N W E S

0 60 120 180 240
UNITS IN FEET

0 20 40 80 120
UNITS IN METERS

Volume limited to that within the constraining boundary - Object 8270
Datum Elevation: -2.00 Ft NAVD88
Area within boundary: 406,858.57 Sq. Ft. (9.3402 Acres)
Total triangulated area: 406,858.57 Sq. Ft. (9.3402 Acres)

Excavation Volume Beneath Datum (Cu. Yd.)	Fill Volume Above Datum(Cu. Yd.)
0.0	46,535.1

Net Difference: 46,535.1 Cu. Yd. excess volume above datum

Jordan Cove Eelgrass Mitigation Site Elevation Contour Map (NAVD88)

CCOS BAY, OREGON

DAVID EVANS AND ASSOCIATES INC.
MARINE SERVICES

SURVEY BY:
David Evans and Associates, Inc

DATE OF SURVEY:
August 2018

HORIZONTAL DATUM:
North American Datum of 1983 (NAD83), State Plane Coordinate System, OregonSouth Zone, Intl. Feet

VERTICAL DATUM:
North American Vertical Datum of 1988 (NAVD88)

THIS HYDROGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECTION OF A NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS/THE HYDROGRAPHIC SOCIETY OF AMERICA, CERTIFIED HYDROGRAPHER

NICHOLAS LESNIKOWSKI
NSPS/THSOA CERTIFIED HYDROGRAPHER (206)

DATE: 9/28/2018
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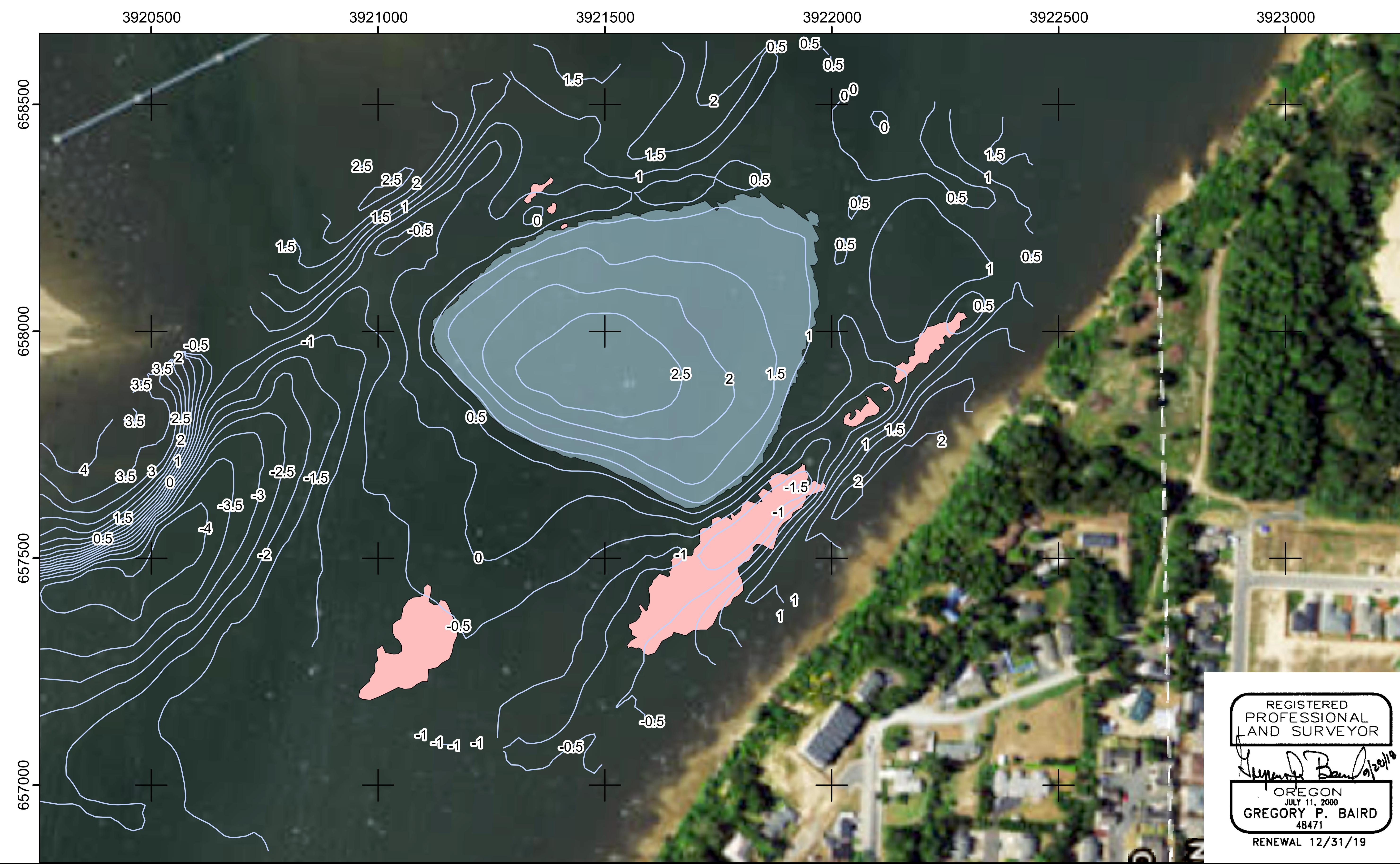
DRAWN: VEP
CHECKED:
REVISION NUMBER: 0

SCALE: 1" = 200'

CONTRACT NUMBER:

FILE:

FIGURE NO.
E-2



0.5 ft Contour

Oregon South Graticule

High Density Eelgrass

Mitigation Site Boundary

N
W E
S

0 60 120 180 240
UNITS IN FEET

0 20 40 80 120
UNITS IN METERS

Jordan Cove Eelgrass Mitigation Site Eelgrass Coverage (MLLW)

COOS BAY, OREGON

DAVID EVANS AND ASSOCIATES INC.
MARINE SERVICES

SURVEY BY:
David Evans and Associates, Inc.

DATE OF SURVEY:
August 2018

HORIZONTAL DATUM:
North American
Datum of 1983 (NAD83),
State Plane Coordinate System,
OregonSouth Zone, Intl. Feet

VERTICAL DATUM:
Mean Lower Low Water (MLLW)

THIS HYDROGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECTION OF A NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS/THE HYDROGRAPHIC SOCIETY OF AMERICA, CERTIFIED HYDROGRAPHER

NICHOLAS LESNIKOWSKI
NSPS/THSOA CERTIFIED
HYDROGRAPHER (206)

DATE:	9/28/2018
DESIGN:	VEP
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CHECKED:	
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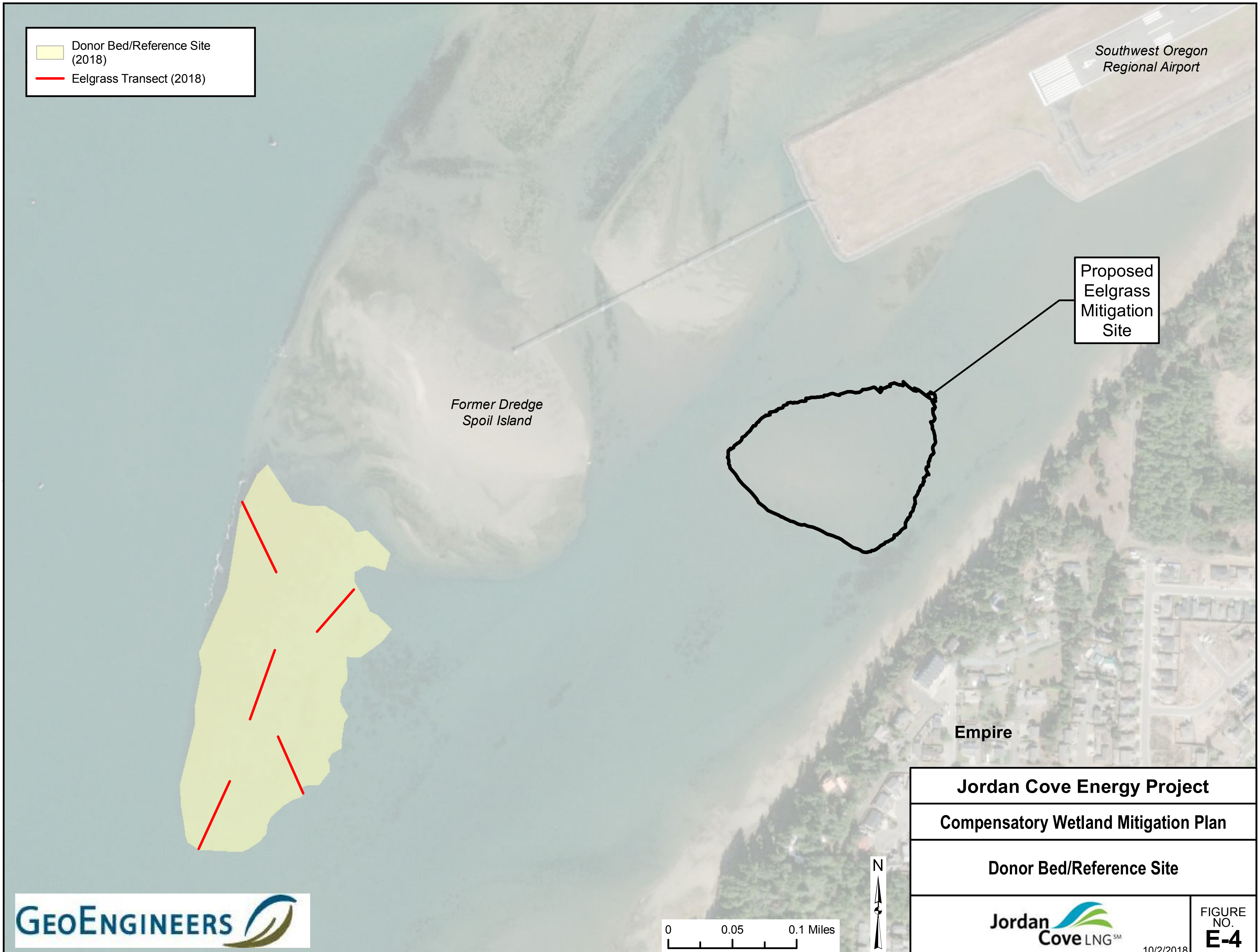
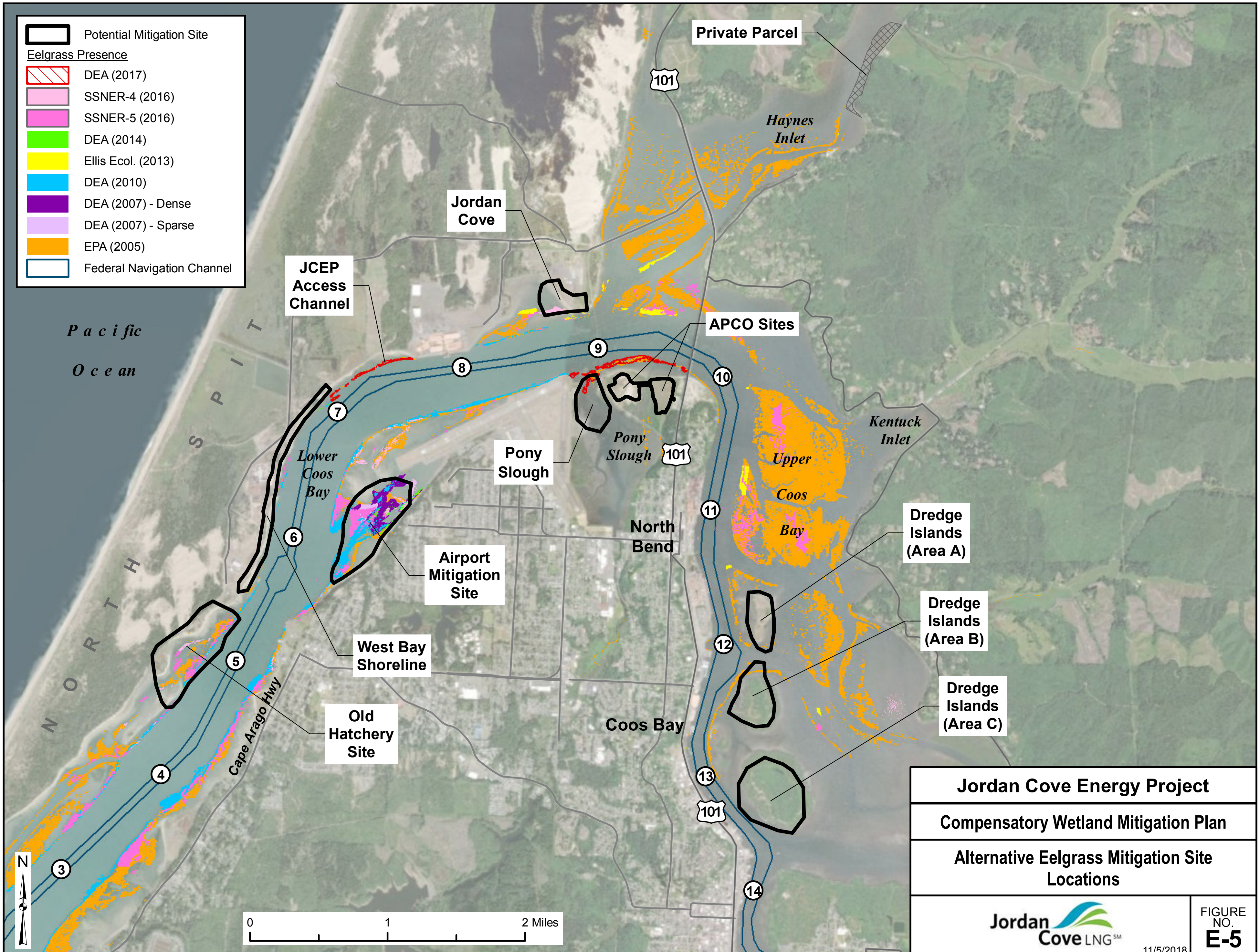
CONTRACT NUMBER:	
FILE:	

FIGURE NO.
E-3



\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-4 GeoEngineers Eelgrass Mitigation Site.mxd 10/3/2018



Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

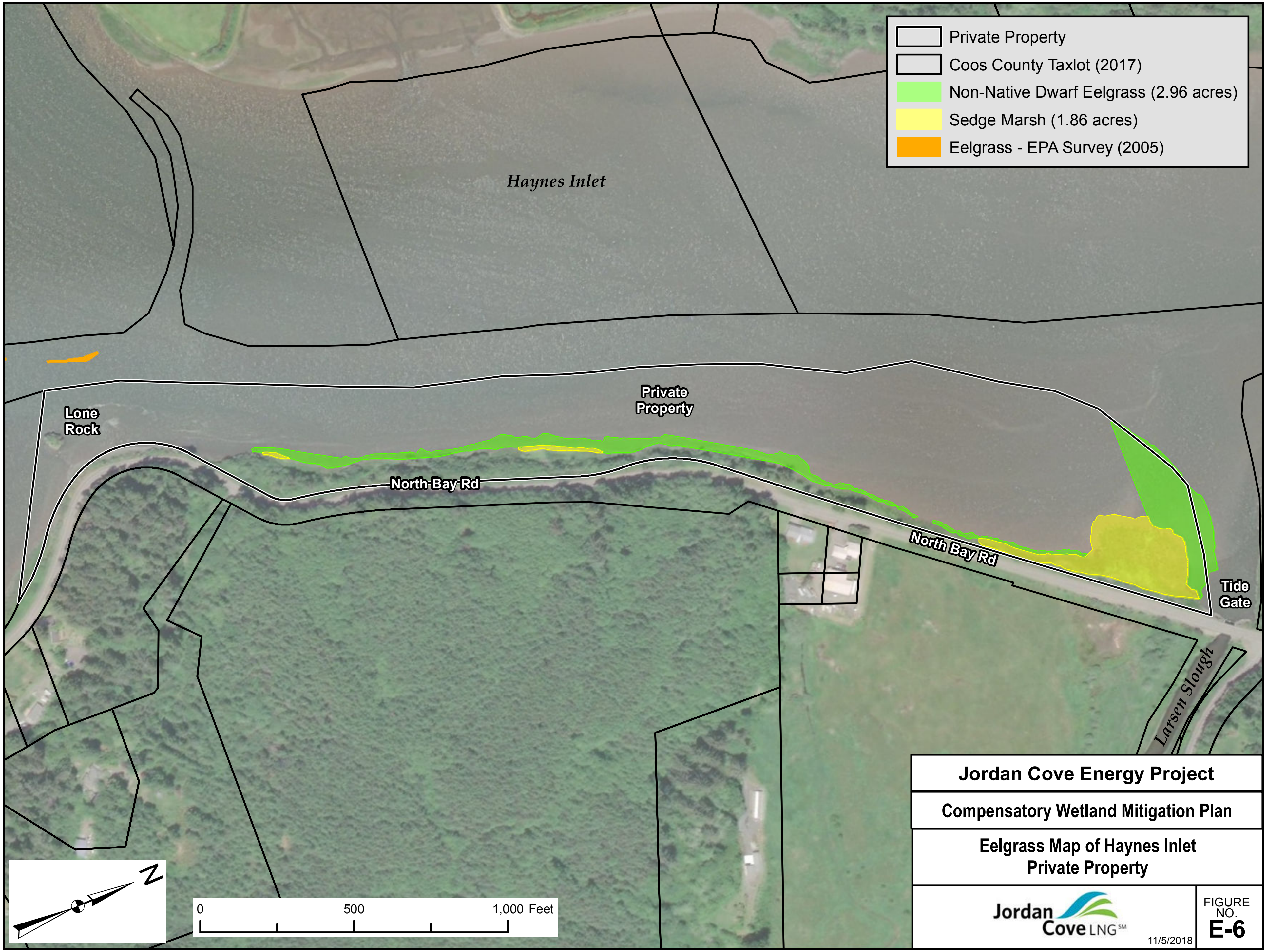
Alternative Eelgrass Mitigation Site Locations

Jordan Cove LNG℠

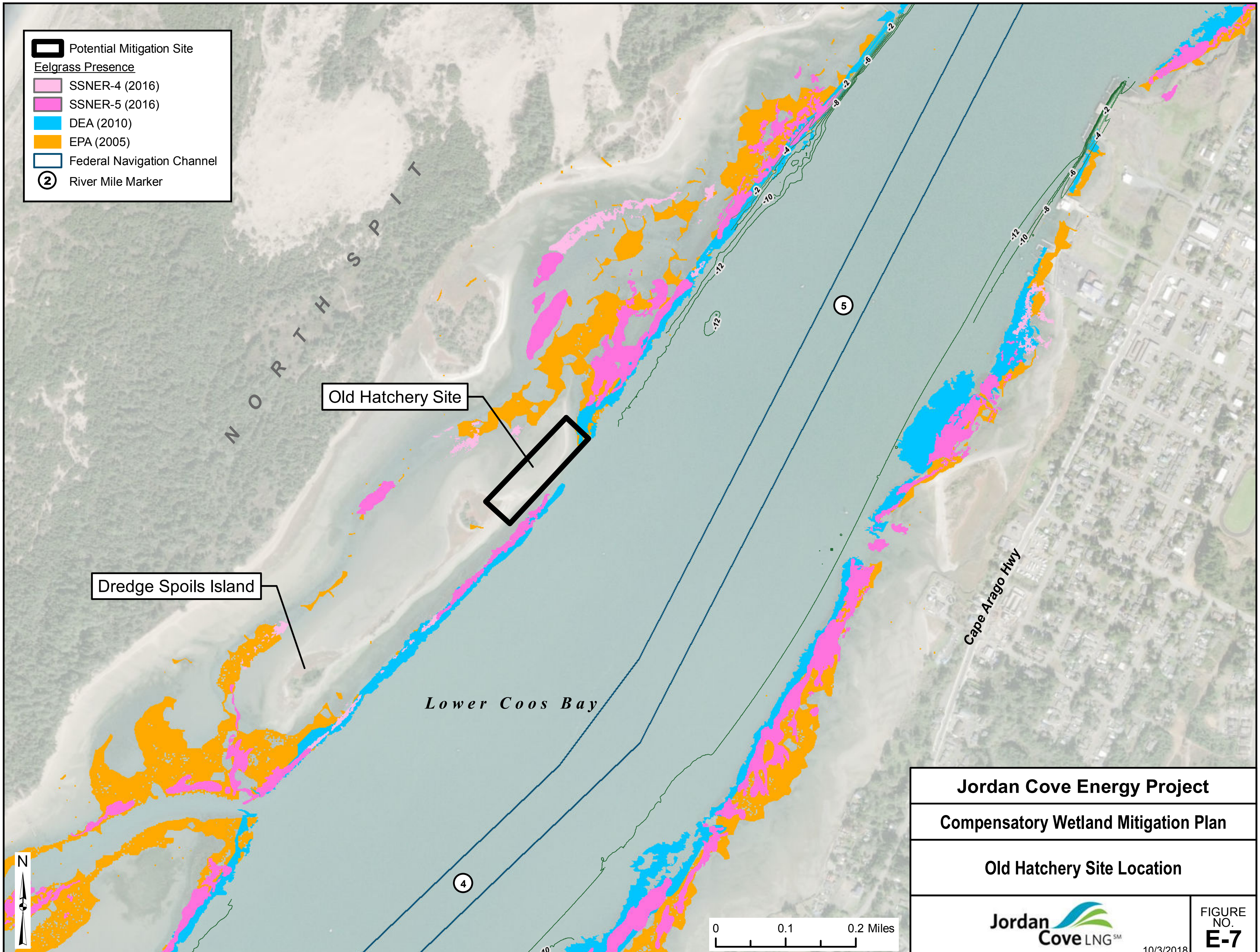
11/5/2018

FIGURE NO. E-5

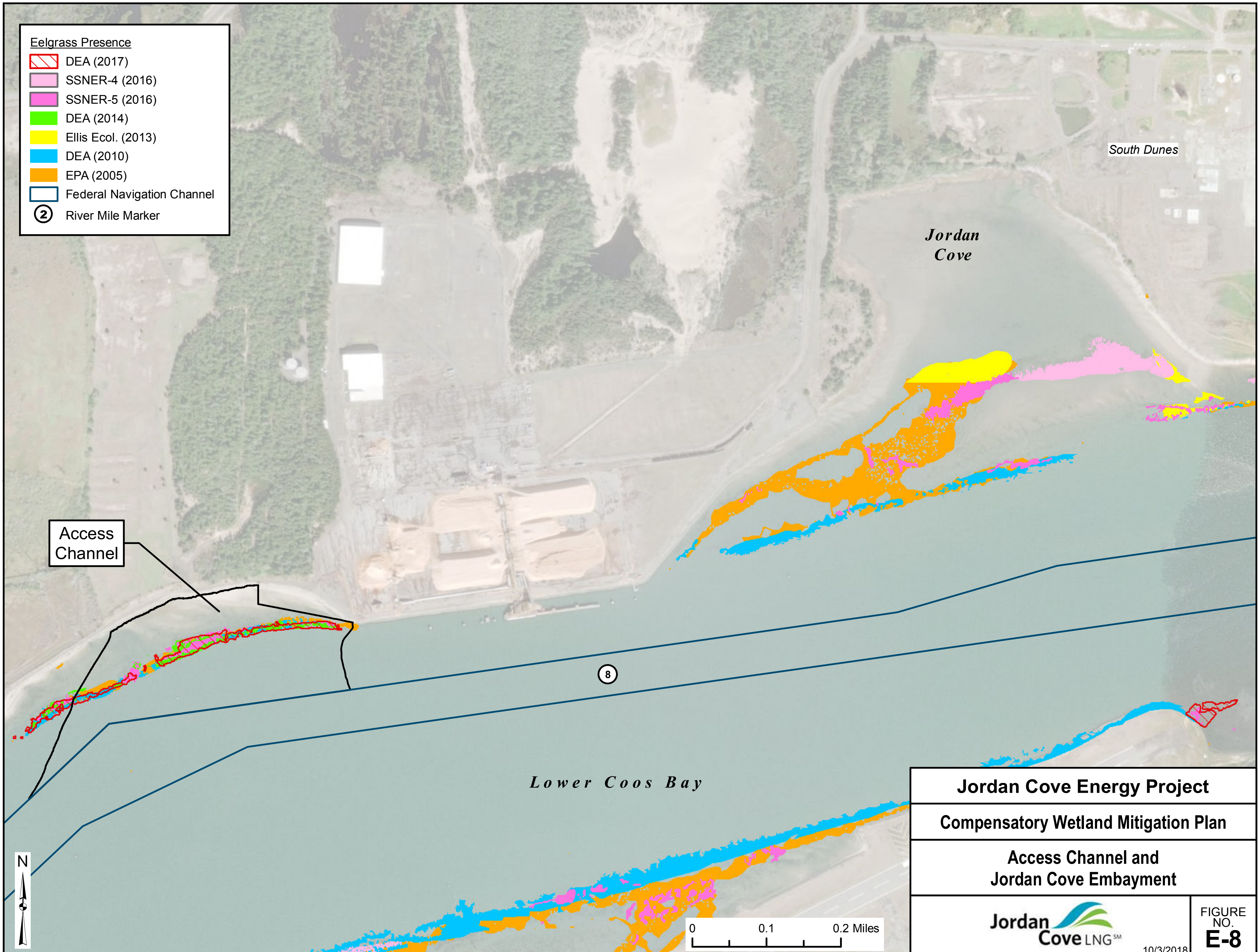
\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-5 Alternative Eelgrass Mitigation Site Locations.mxd 11/5/2018



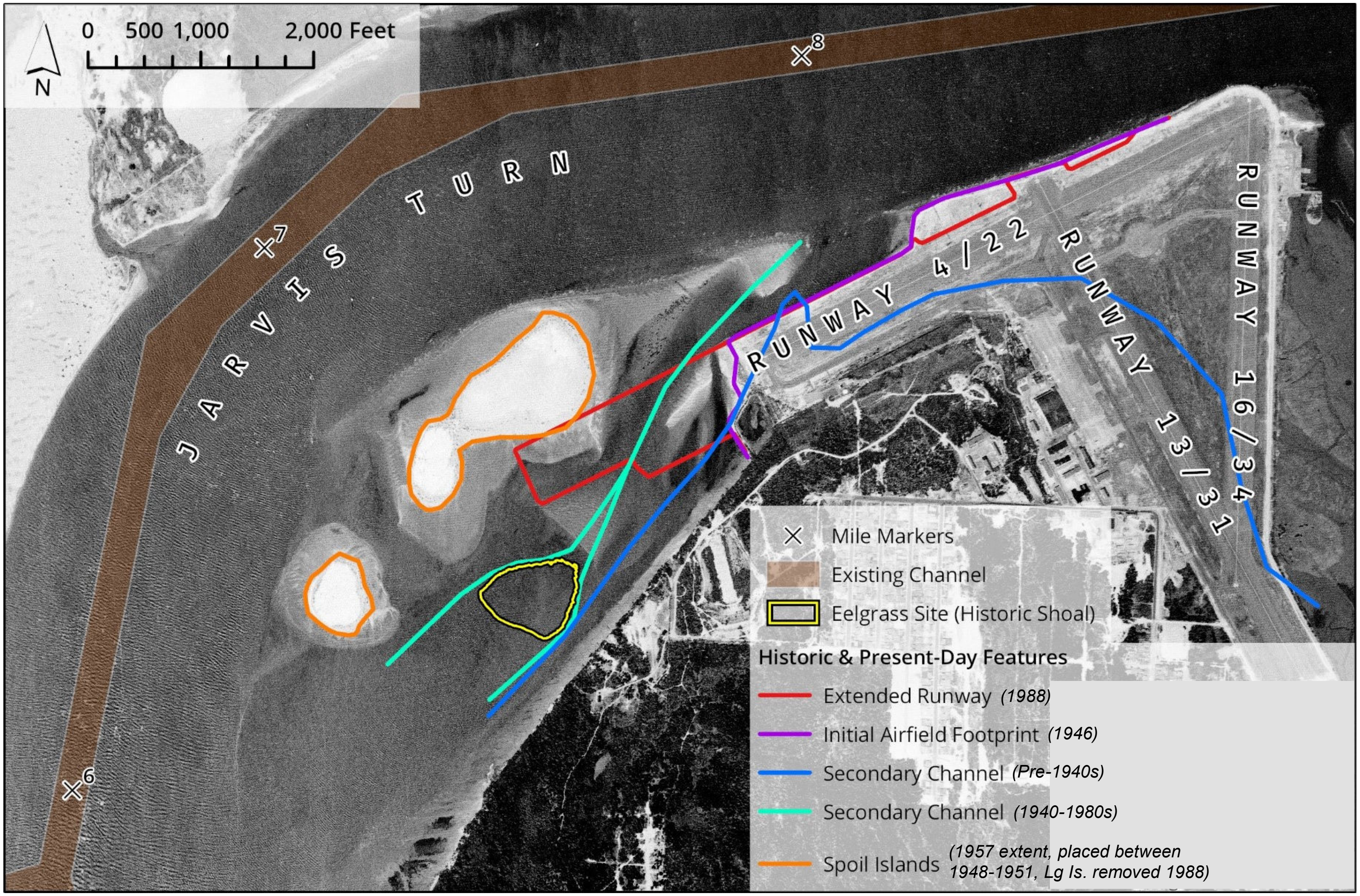
Private Property
Coos County Taxlot (2017)
Non-Native Dwarf Eelgrass (2.96 acres)
Sedge Marsh (1.86 acres)
Eelgrass - EPA Survey (2005)
Haynes Inlet
Private Property
Lone Rock
North Bay Rd
North Bay Rd
Tide Gate
Larsen Slough
N
0
500
1,000 Feet
Jordan Cove Energy Project
Compensatory Wetland Mitigation Plan
Eelgrass Map of Haynes Inlet
Private Property
Jordan Cove LNG℠
11/5/2018
FIGURE NO.
E-6



\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-7 Old Hatchery Site Location.mxd 10/3/2018



\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-8 Access Channel and Jordan Cove Embayment.mxd 10/3/2018



moffatt & nichol

Jordan Cove Energy Project	
Compensatory Wetland Mitigation Plan	
1957 USGS Aerial	
Jordan Cove LNG℠ 9/27/2018	FIGURE NO. E-9

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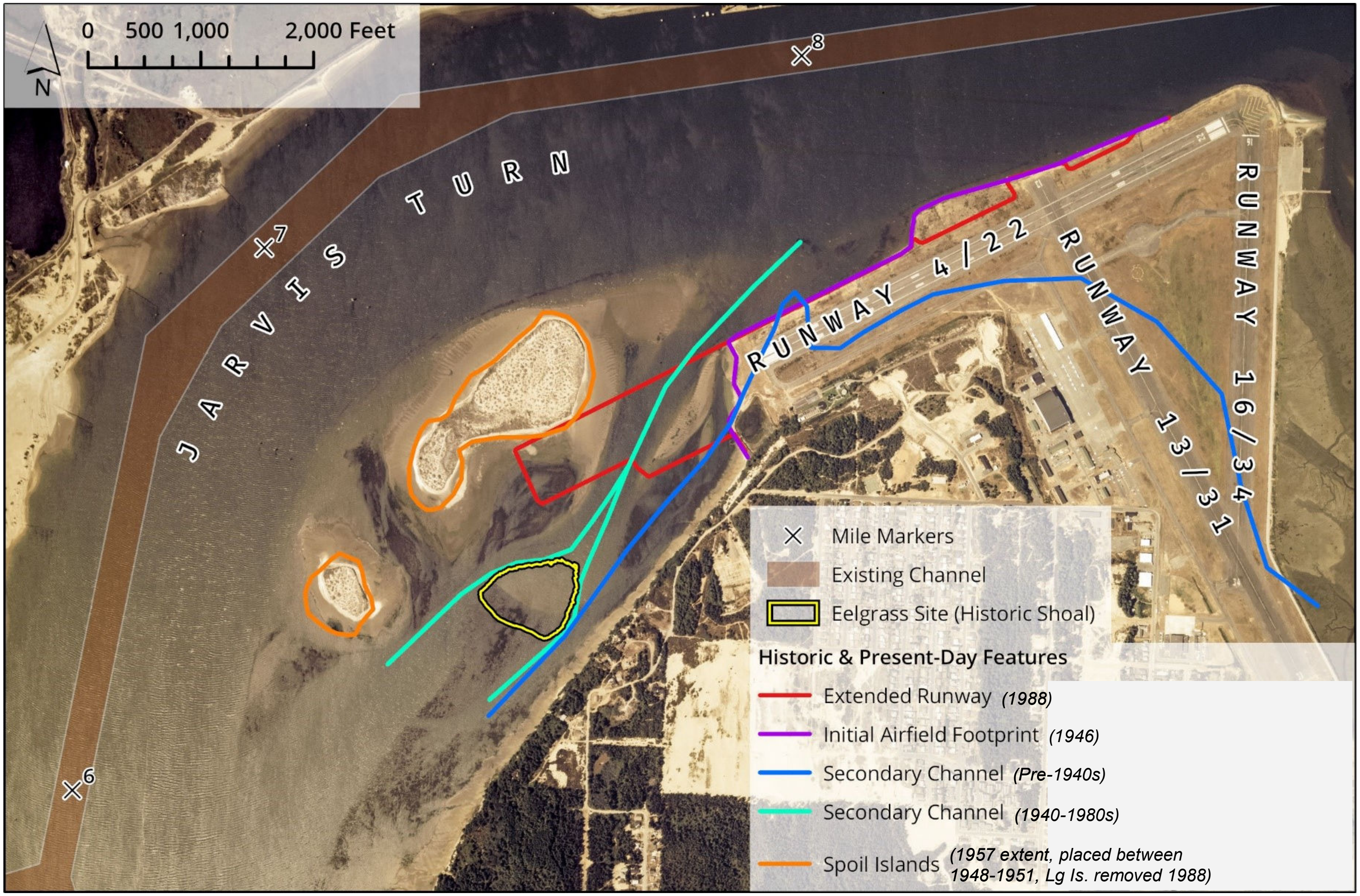

moffatt & nichol

Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

1977 USGS Aerial

Jordan Cove LNG℠

9/27/2018

FIGURE NO. **E-10**

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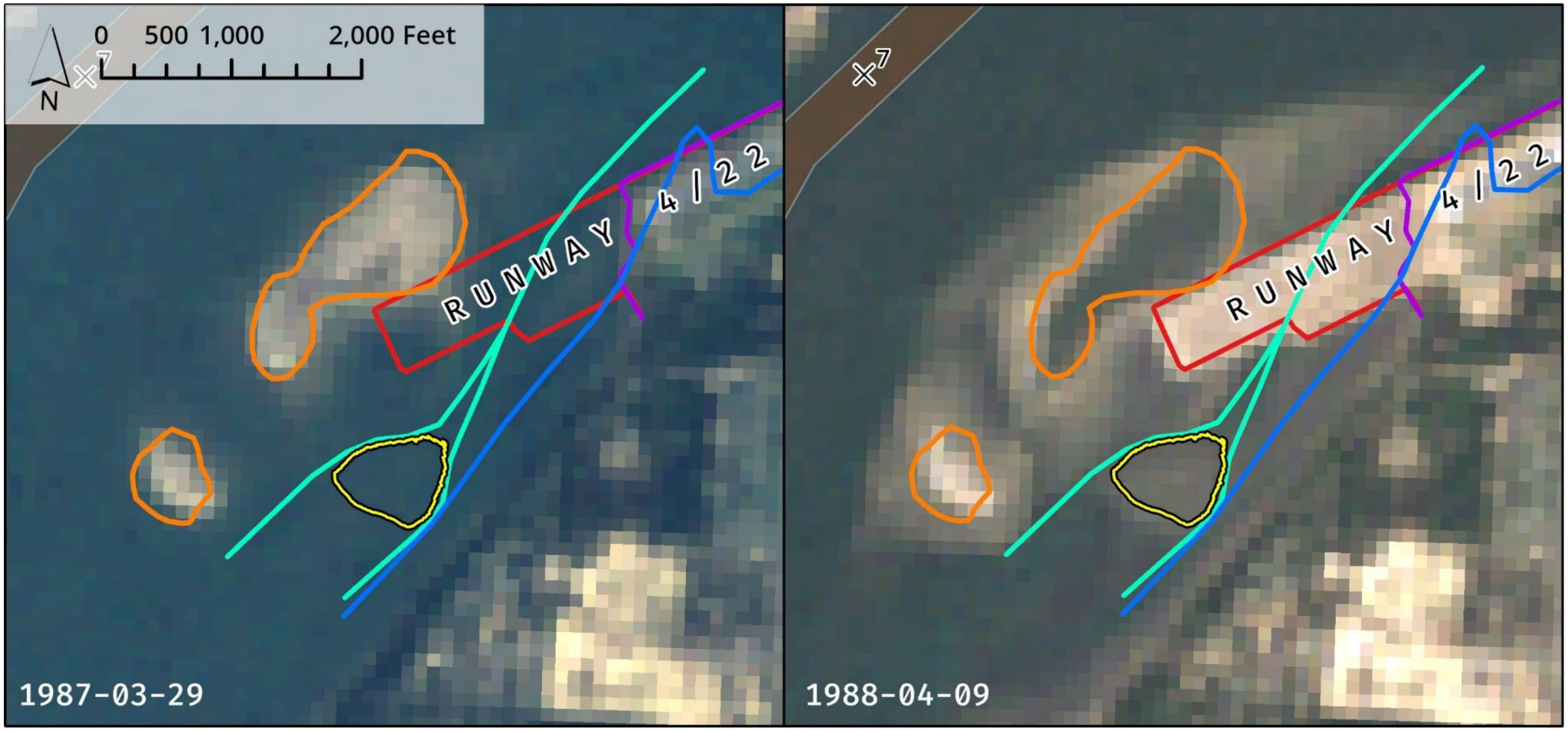

× Mile Markers

Existing Channel

Eelgrass Site (Historic Shoal)

Historic & Present-Day Features

Extended Runway *(1988)*

Initial Airfield Footprint *(1946)*

Secondary Channel *(Pre-1940s)*

Secondary Channel *(1940-1980s)*

Spoil Islands *(1957 extent, placed between 1948-1951, Lg Is. removed 1988)*

Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

1987-1988 Aerials

Jordan Cove LNG℠

9/27/2018

FIGURE NO. **E-11**

moffatt & nichol

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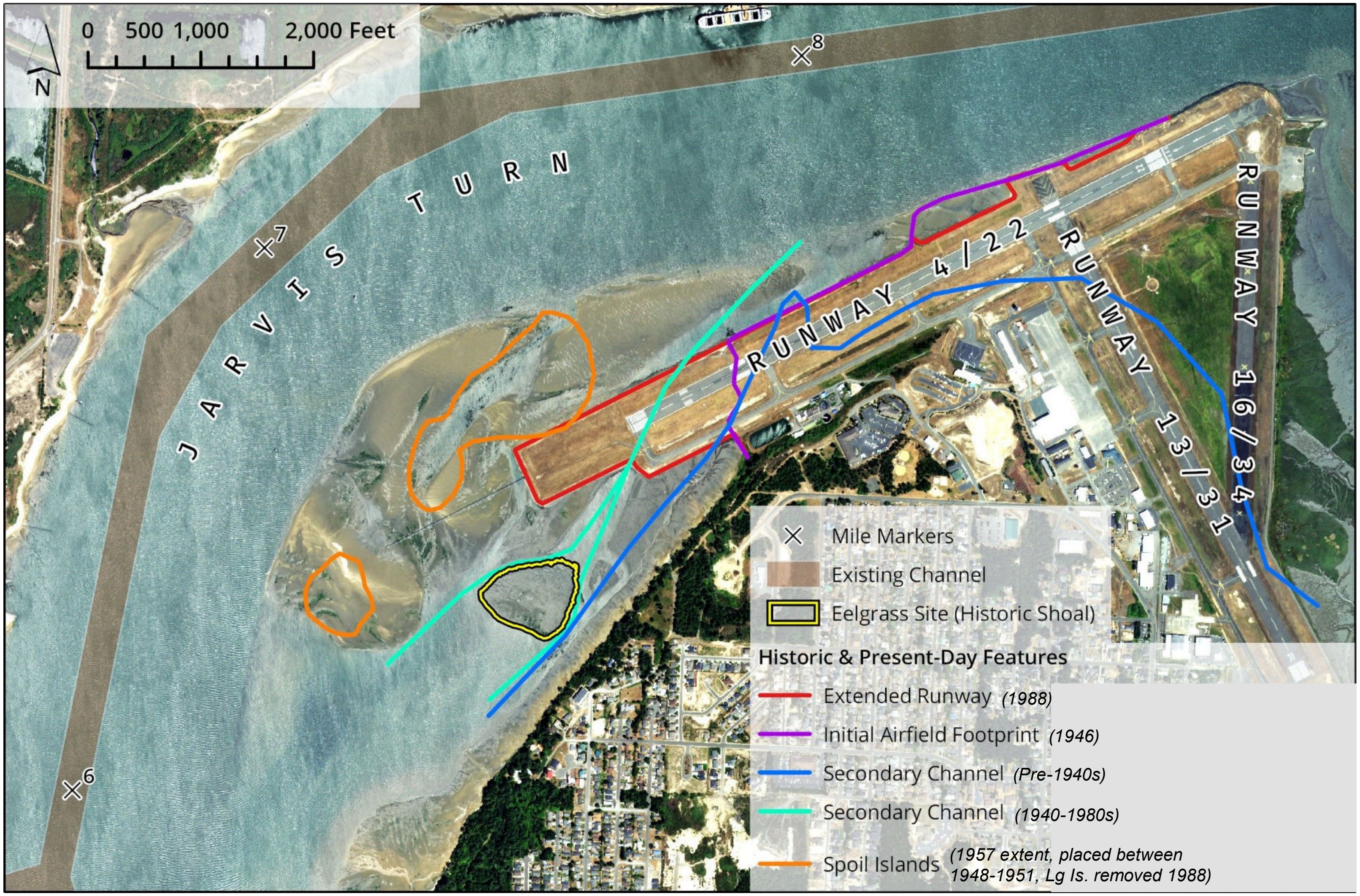

moffatt & nichol

Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

2016 USDA Aerial

Jordan Cove LNG℠

9/27/2018

FIGURE NO. **E-12**

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Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

Access Channel

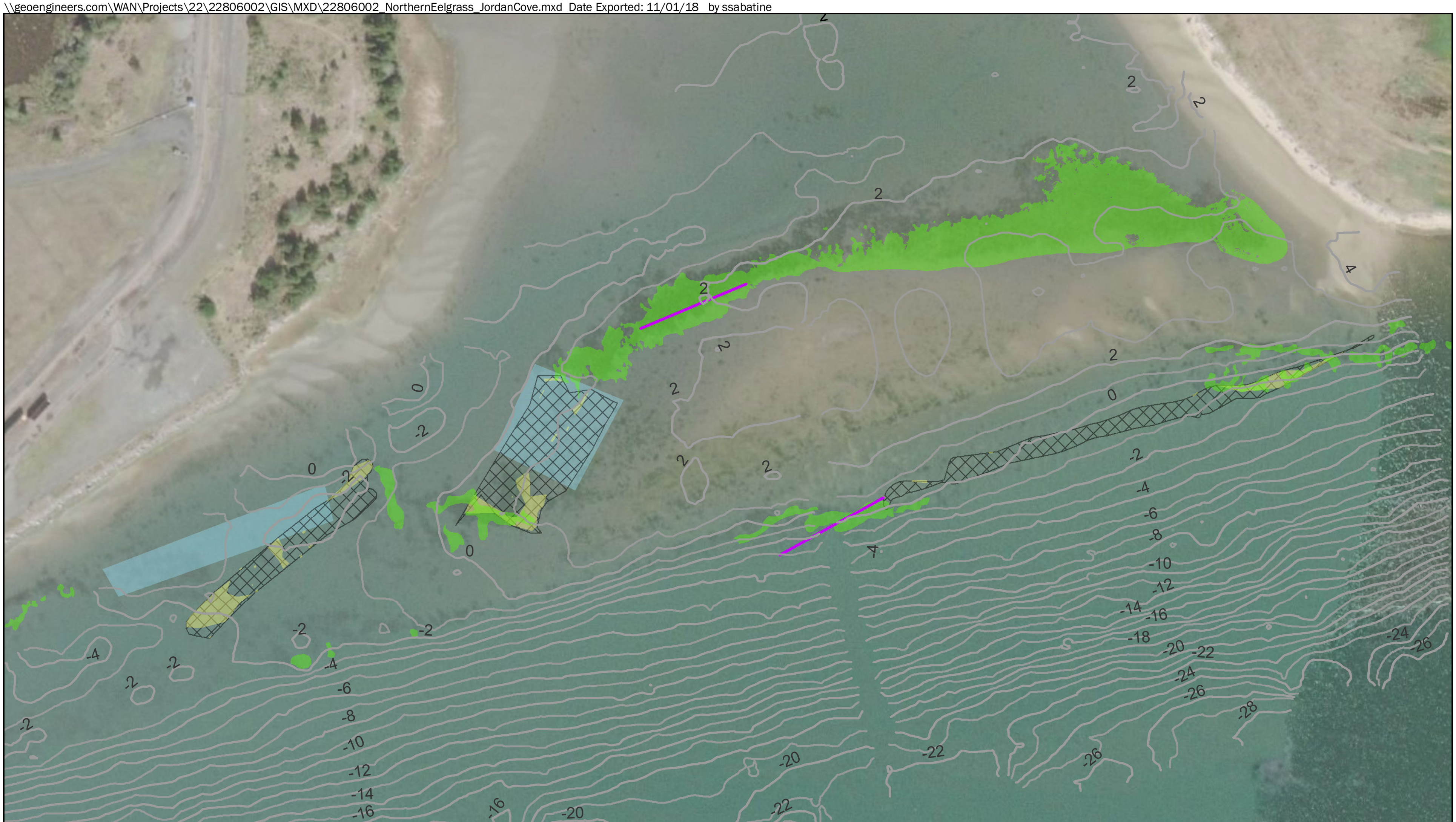
Jordan Cove LNG℠

10/2/2018

FIGURE NO.
E-13

\\deainc.com\files\PROJECT\J\JLNG00000001\0600INFO\GS\Maps\Permit-USACE-CWMP\Sheet E-13 Access Channel.mxd 10/3/2018

\\geoengineers.com\WAN\Projects\22\22806002\GIS\MXD\22806002_NorthernEelgrass_JordanCove.mxd Date Exported: 11/01/18 by ssabatine



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial image from ESRI Data Online.

Projection: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

Legend

- Bathymetric Contour (Int Ft, MLLW)
- Transect
- SSNERR Eelgrass Survey (2016)
- DEA Eelgrass Survey (2018)
- DEA Survey Boundary
- Transplant Area

N W E S

100 0 100

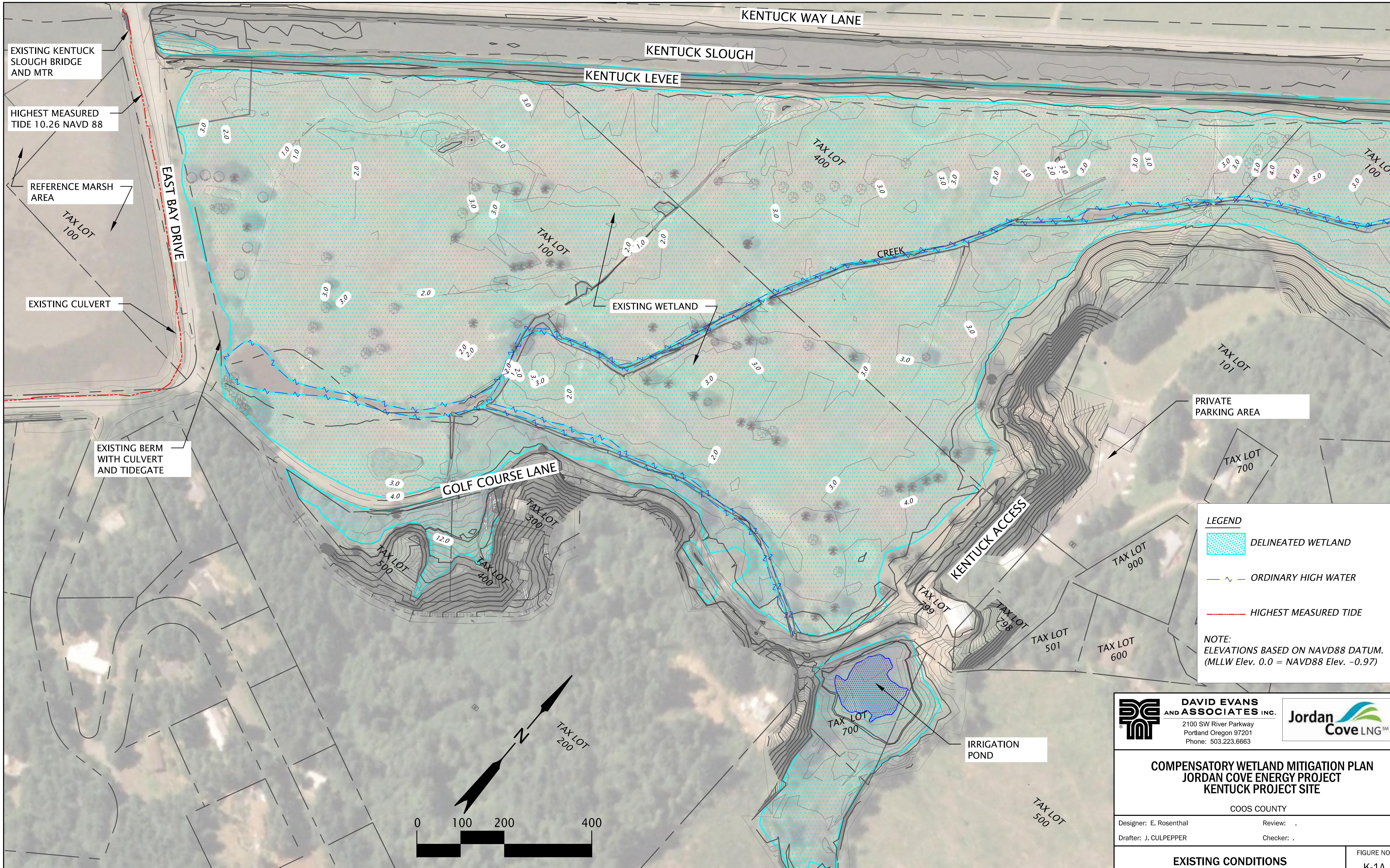
Feet

Eelgrass Distribution in Jordan Cove and Proposed Eelgrass Transplant Recipient Sites

Jordan Cove LNG
Coos Bay, Oregon

GEOENGINEERS

Figure E-14



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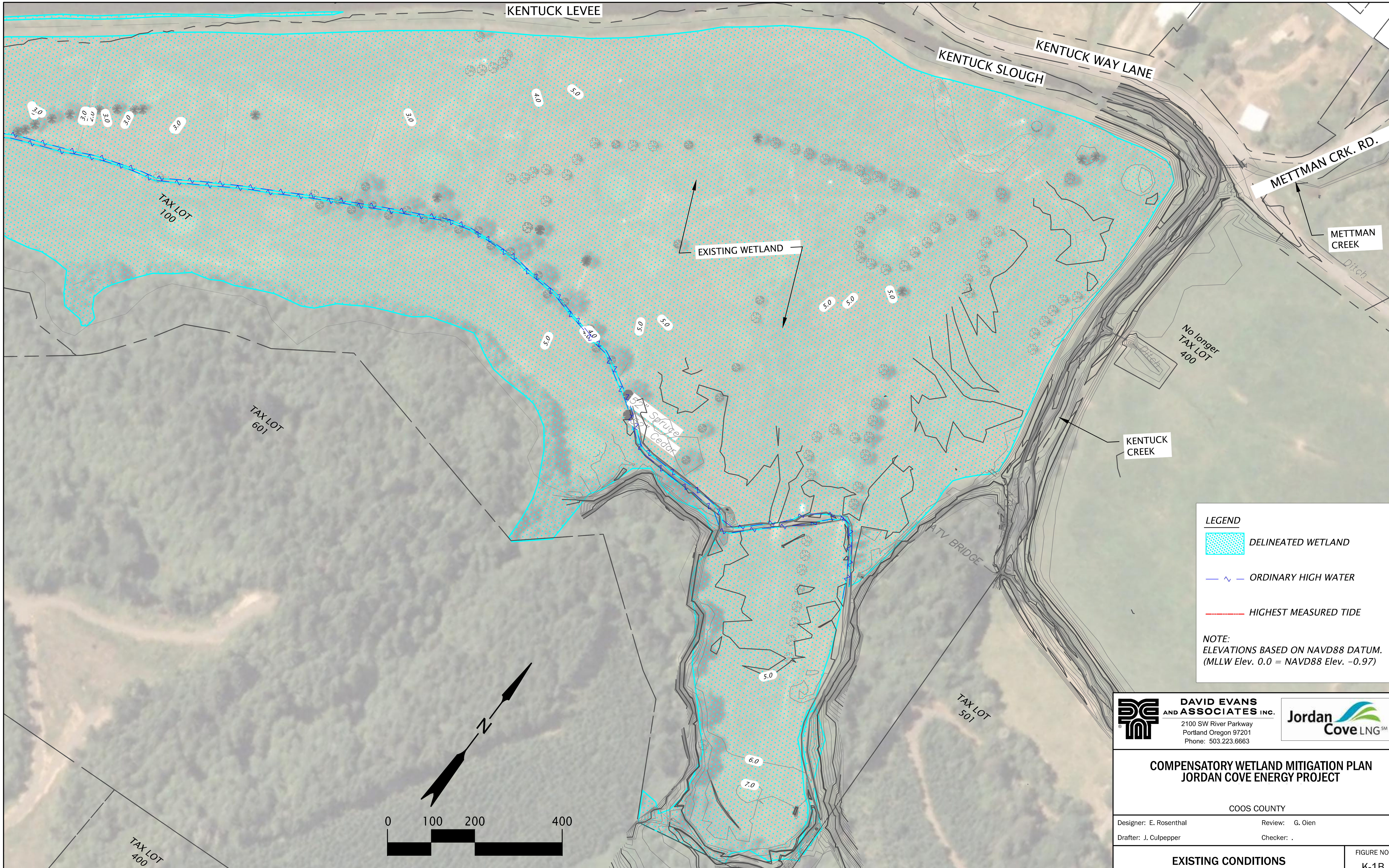

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Jordan Cove LNG℠

COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT

COOS COUNTY

Designer: E. Rosenthal	Review: G. Oien
Drafter: J. Culpepper	Checker: .

EXISTING CONDITIONS — FIGURE NO. K-1B

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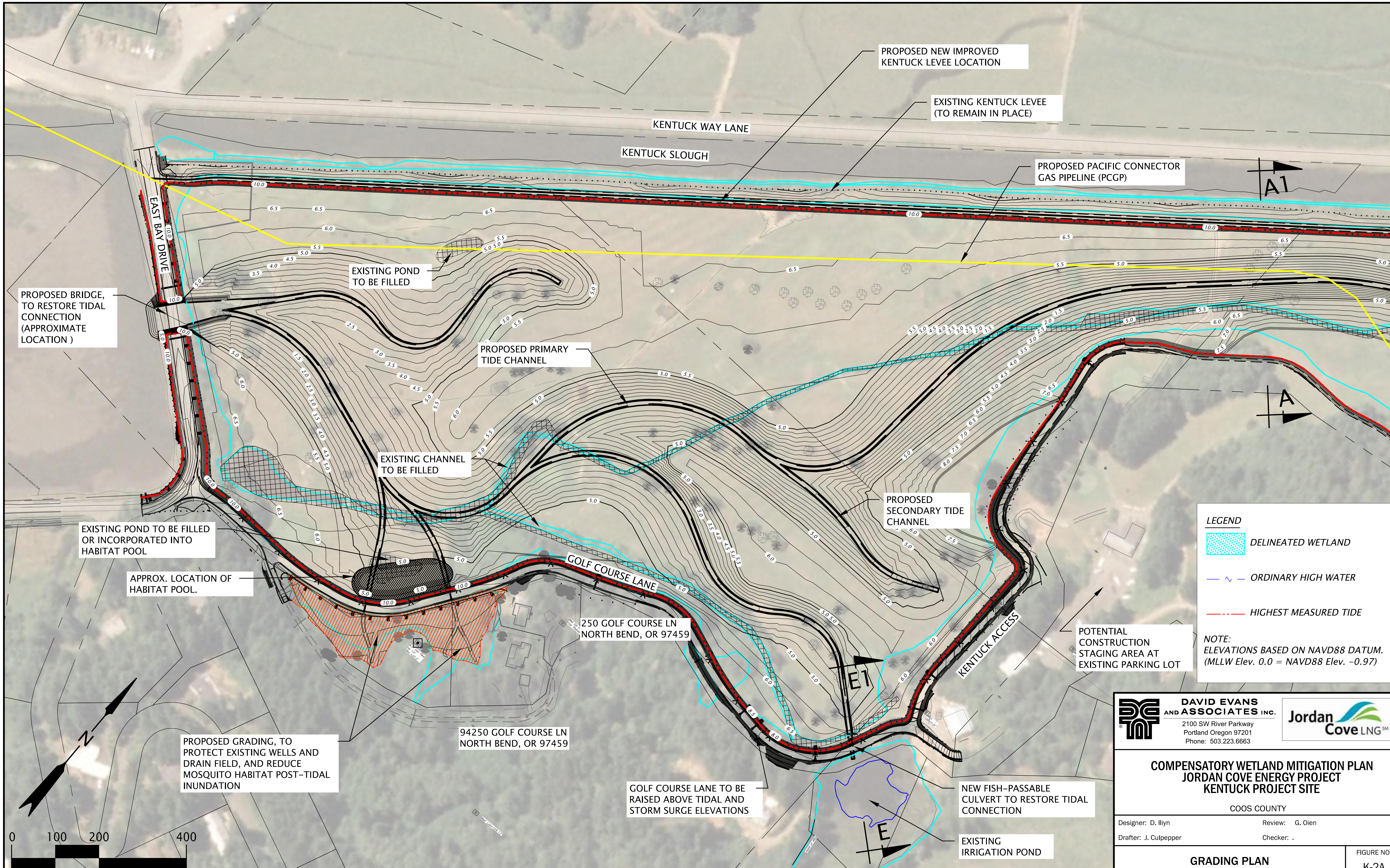

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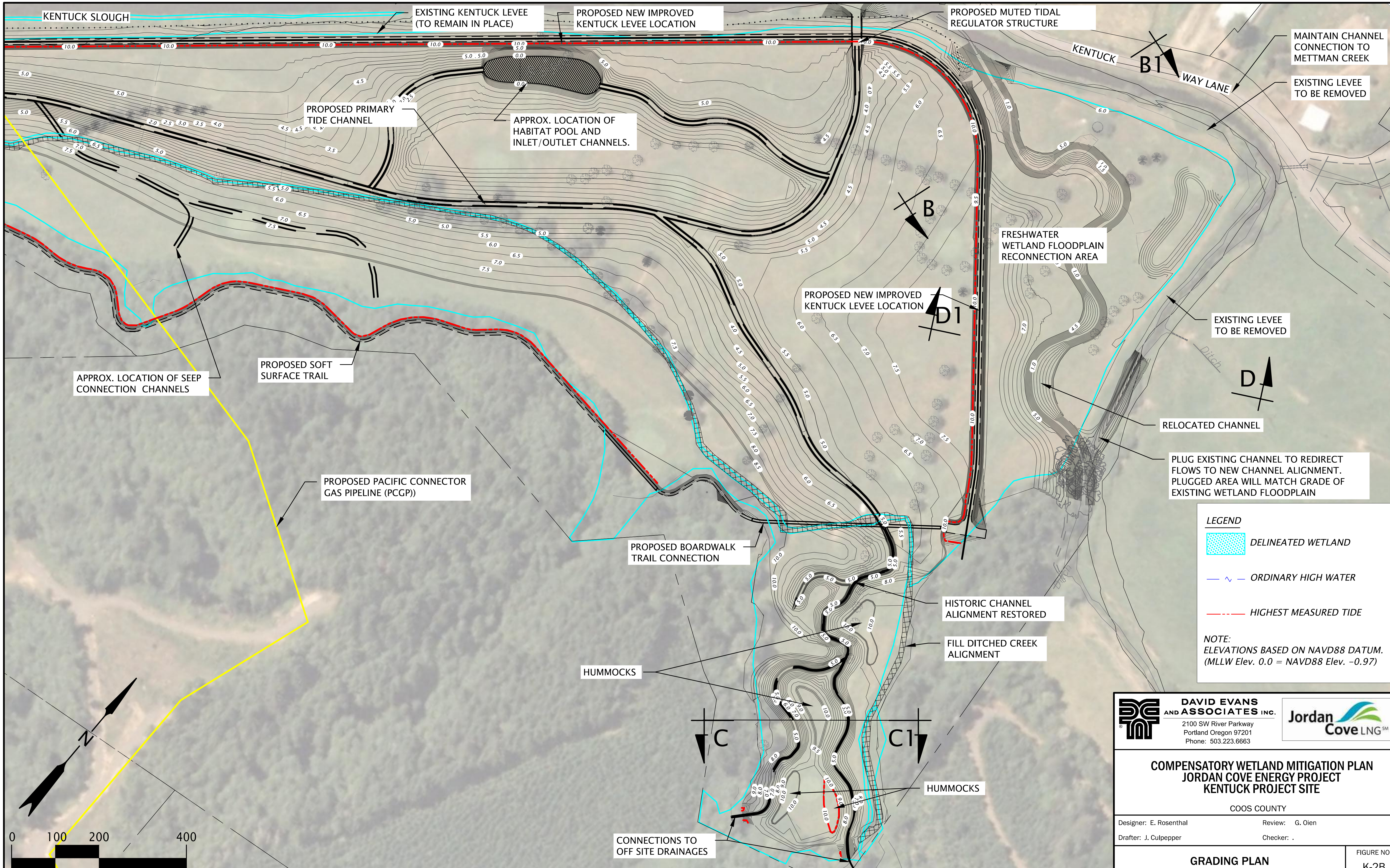

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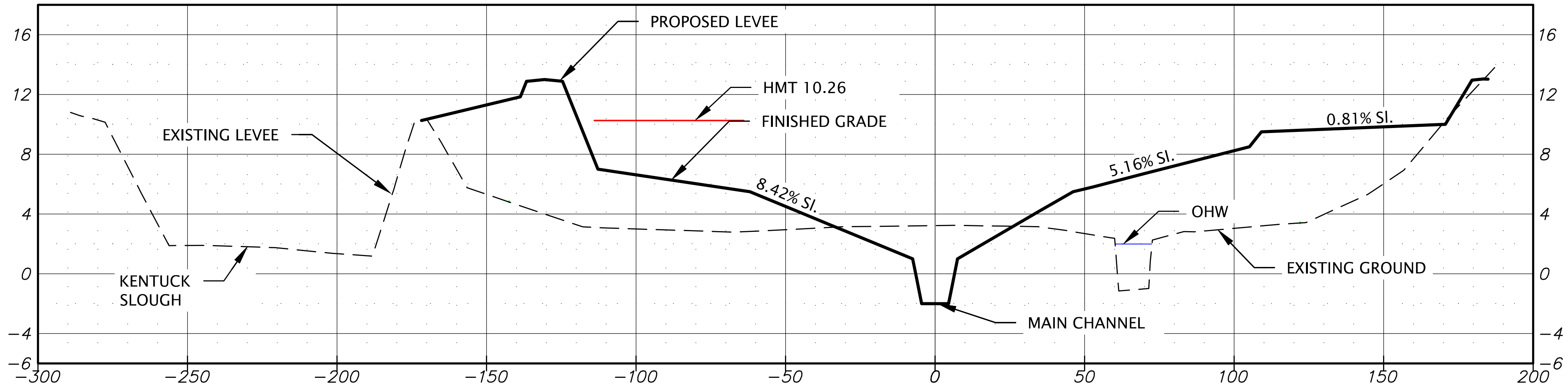
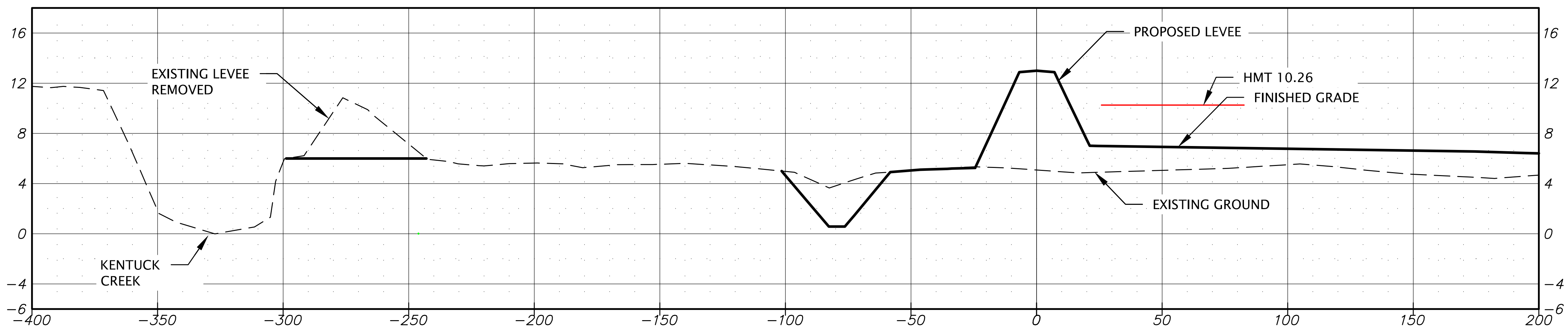
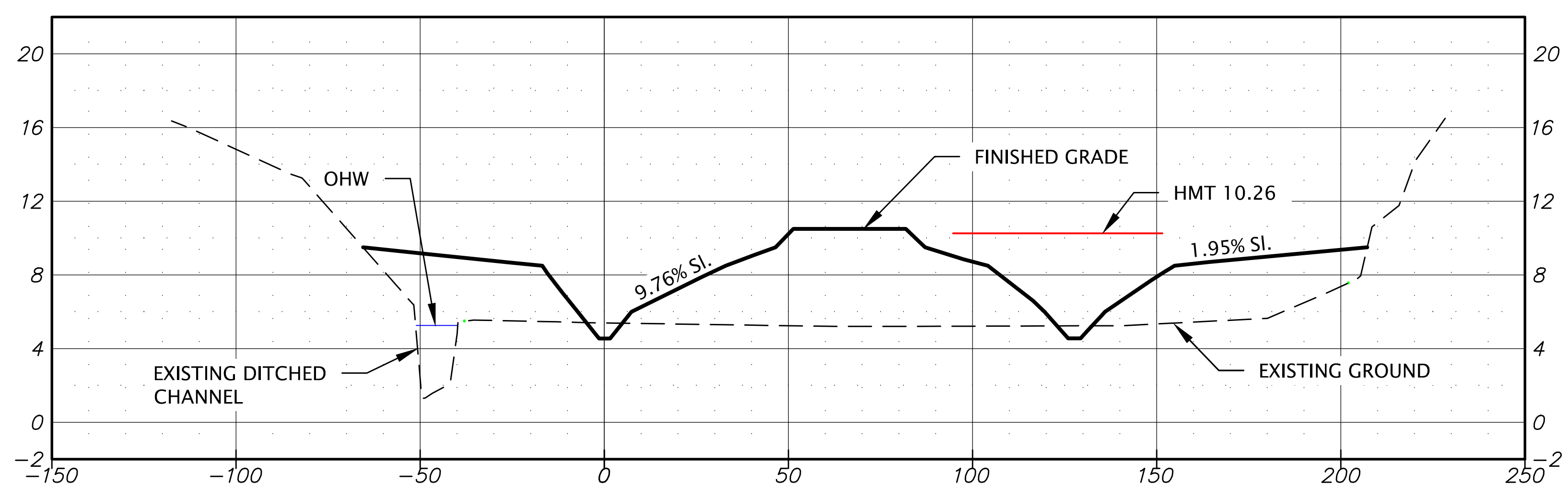


SECTION A1-A



SECTION B1-B



SECTION C1-C

NOTE:
ORDINARY HIGH WATER (OHW) BASED ON EXISTING CONDITIONS. HIGHEST MEASURED TIDE (HMT) BASED ON POST-TIDAL RECONNECTION CONDITION

ELEVATIONS BASED ON NAVD88 DATUM.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

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COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: E. Rosenthal	Review: G. Oien
Drafter: J. Culpepper	Checker:
GRADING PLAN	FIGURE NO. K-2C

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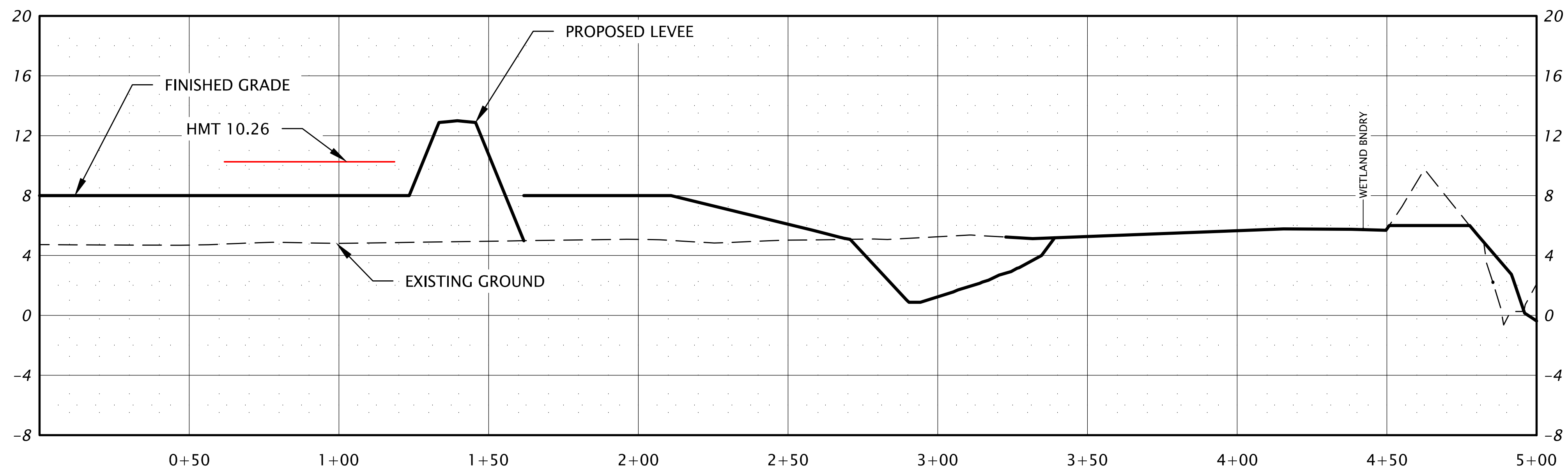
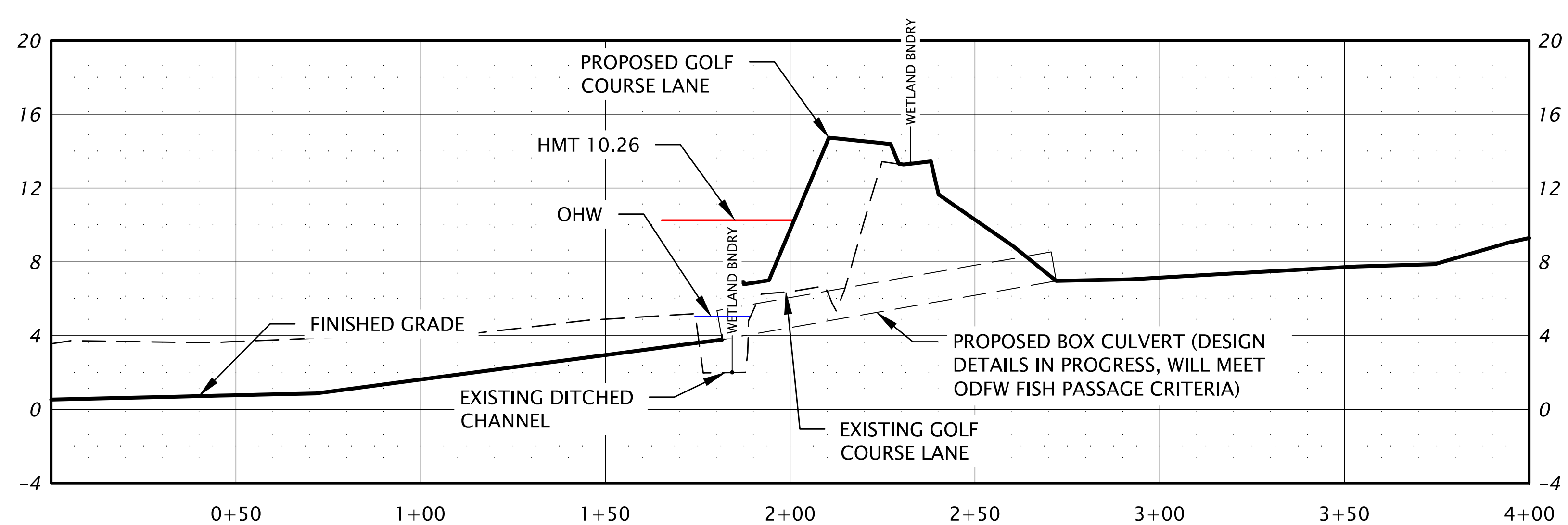


SECTION D1-D



SECTION E1-E

NOTE:
ORDINARY HIGH WATER (OHW) BASED ON EXISTING CONDITIONS. HIGHEST MEASURED TIDE (HMT) BASED ON POST-TIDAL RECONNECTION CONDITION

ELEVATIONS BASED ON NAVD88 DATUM.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

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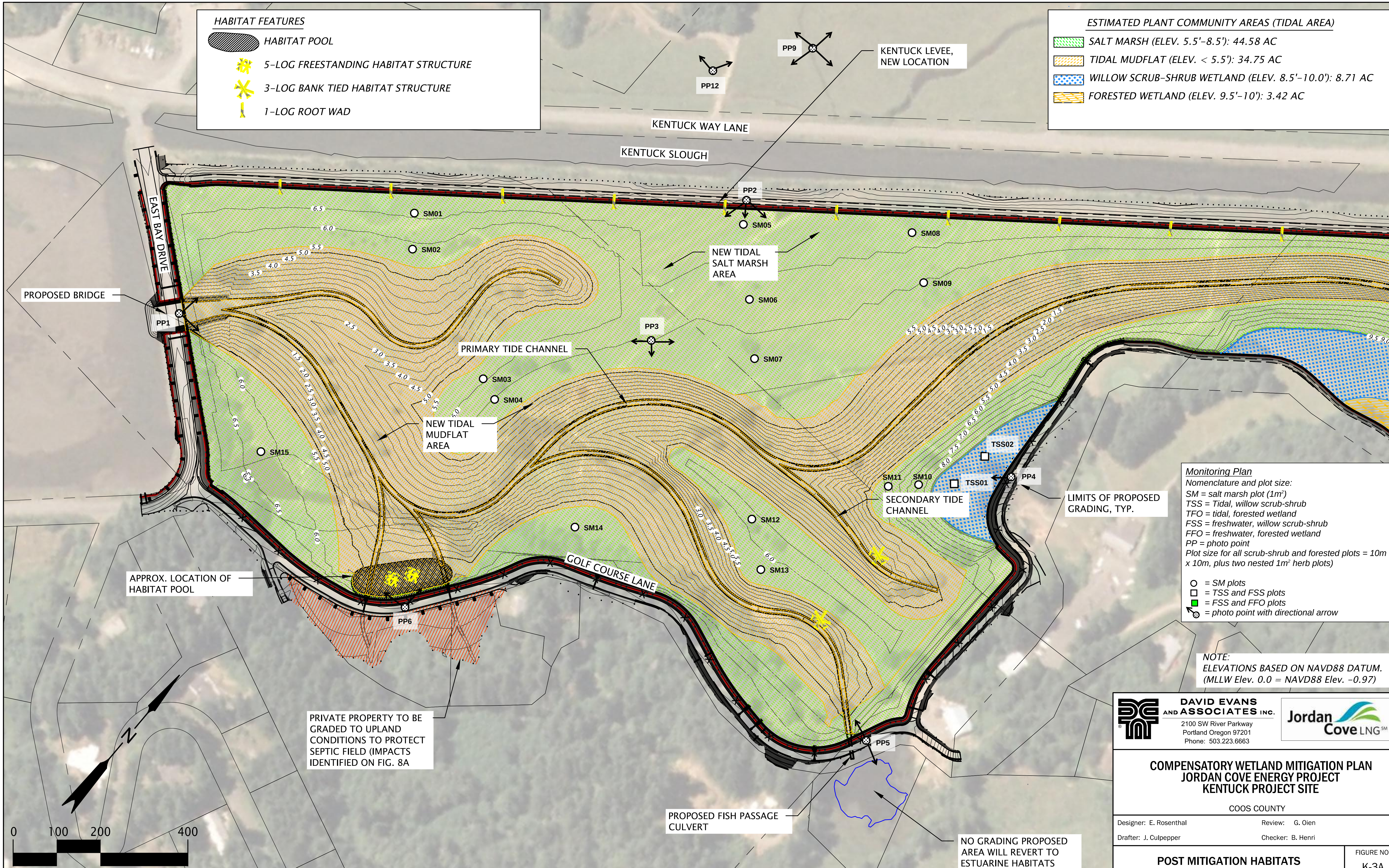
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: E. Rosenthal — Review: G. Oien
Drafter: J. Culpepper — Checker: .

GRADING PLAN — FIGURE NO. K-2D



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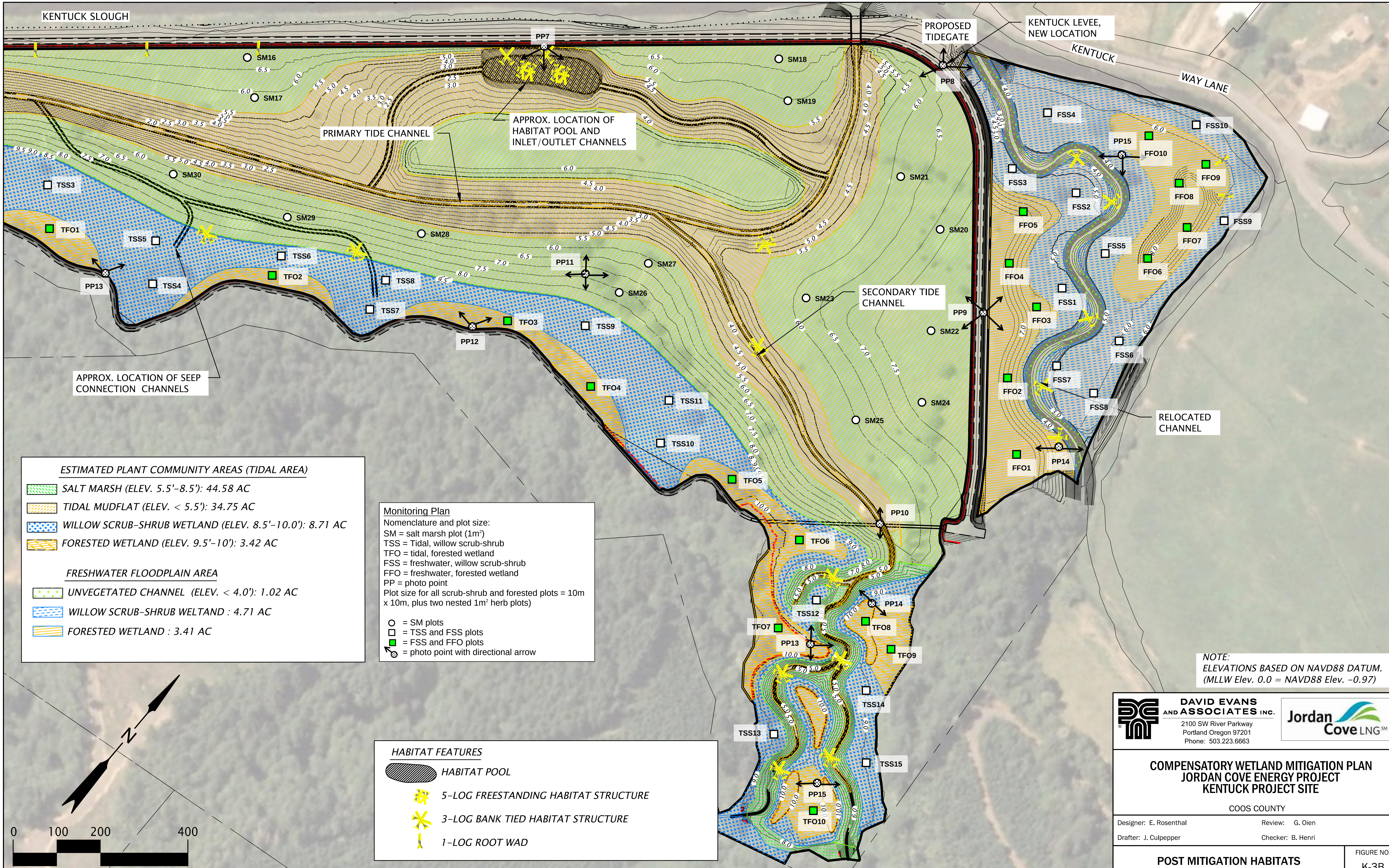

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Kentuck Site Proposed Planting List

-species subject to change per design refinements and availability

Kentuck Site (Salt Marsh- Plantings and Estimated Volunteer Recruitment)				
Deschampsia cespitosa	*Tufted hairgrass*	*FACW*		
Hordeum brachyantherum	*Meadow barley*	*FACW*		
Carex lyngbei	*Lyngby's sedge*	*OBL*		
Grindelia integrifolia	*Gumweed*	*FACW*		
Argentina egedii	*Pacific silverweed*	*OBL*		
Distichlis spicata	*Saltgrass*	*FACW*		
Scirpus americanus	*American threesquare*	*OBL*		
Salicornia virginica	*Pickleweed*	*OBL*		
Schoenoplectus pungens	*Common threesquare*	*OBL*		
Kentuck Site (Freshwater Wetland Plantings)			**Forest Community**	**Willow Scrub-Shrub**
Alnus rubra	*Red alder*	*FAC*	*X*	
Picea sitchensis	*Sitka spruce*	*FAC*	*X*	*X (low density)*
Myrica californica	*California wax myrtle*	*FACW*	*X*	*X*
Malus fusca	*Oregon crab apple*	*FACW*	*X*	
Salix hookeriana	*Hooker's willow*	*FACW*	*X*	*X (high density)*
Lonicera involucrata	*twinberry*	*FAC*	*X*	*X*
Spiraea douglasii	*Douglas spirea*	*FACW*	*X*	*X*
Rubus spectabilis	*salmon berry*	*FAC*	*X*	
Carex obnupta	*slough sedge*	*OBL*	*X*	*X*
Juncus ensifolius	*daggerleaf rush*	*FACW*	*X*	*X*
Scirpus microcarpus	*small-fruited bulrush*	*OBL*	*X*	
Argentina egedii	*Pacific silverweed*	*OBL*	*X*	*X*
Distichlis spicata	*Salt grass*	*FACW*	*X*	*X*
Hordeum brachyantherum	*Meadow barley*	*FACW*	*X*	*X*
Deschampsia caespitosa	*tufted hairgrass*	*FACW*	*X*	*X*

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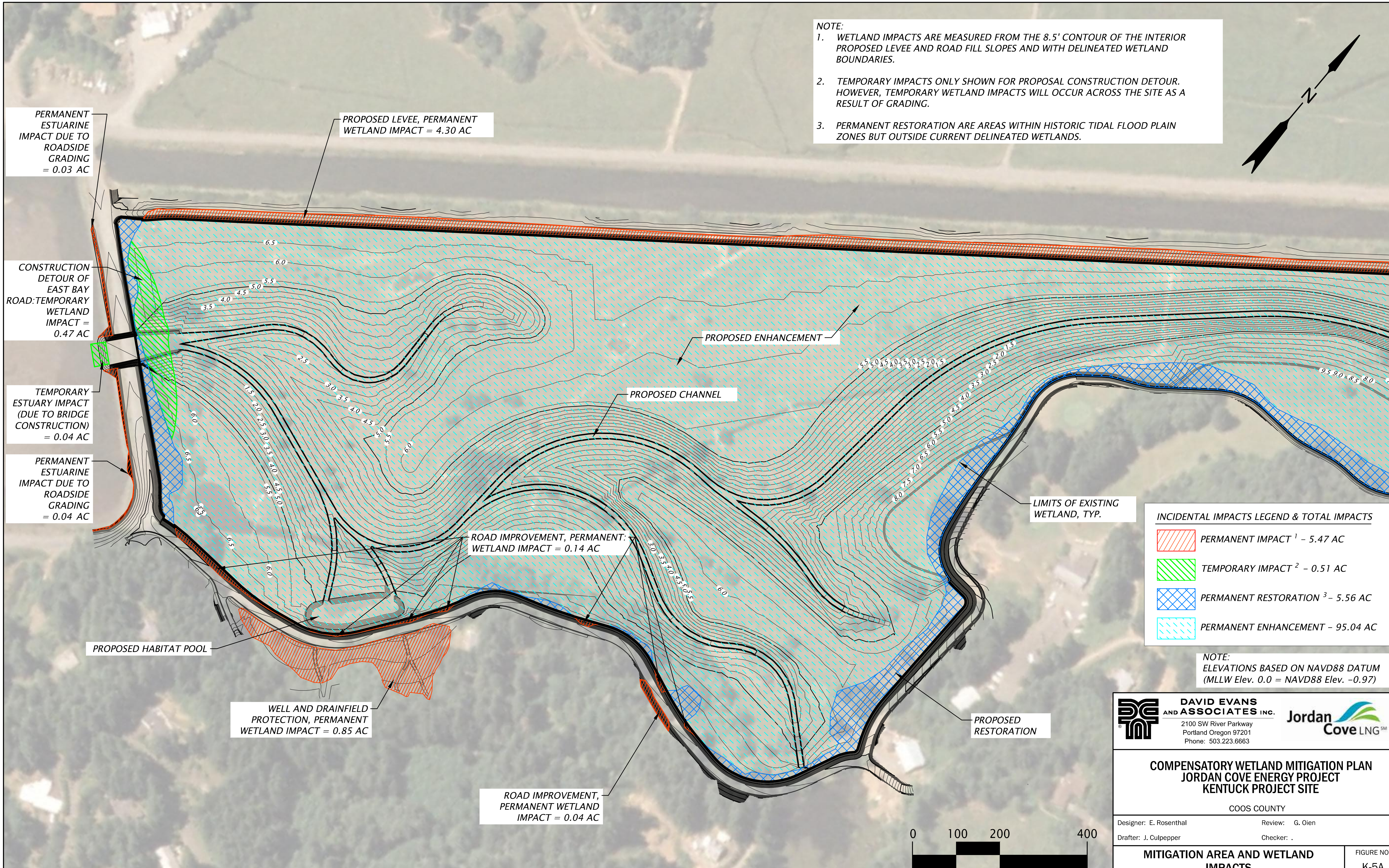
COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: E. Rosenthal Review: G. Oien
Drafter: J. Culpepper Checker: .

PROPOSED PLANTING PLAN

FIGURE NO. K-4


NOTE:
1. WETLAND IMPACTS ARE MEASURED FROM THE 8.5' CONTOUR OF THE INTERIOR PROPOSED LEVEE AND ROAD FILL SLOPES AND WITH DELINEATED WETLAND BOUNDARIES.
2. TEMPORARY IMPACTS ONLY SHOWN FOR PROPOSAL CONSTRUCTION DETOUR. HOWEVER, TEMPORARY WETLAND IMPACTS WILL OCCUR ACROSS THE SITE AS A RESULT OF GRADING.
3. PERMANENT RESTORATION ARE AREAS WITHIN HISTORIC TIDAL FLOOD PLAIN ZONES BUT OUTSIDE CURRENT DELINEATED WETLANDS.
N
PERMANENT ESTUARINE IMPACT DUE TO ROADSIDE GRADING = 0.03 AC
PROPOSED LEVEE, PERMANENT WETLAND IMPACT = 4.30 AC
CONSTRUCTION DETOUR OF EAST BAY ROAD:TEMPORARY WETLAND IMPACT = 0.47 AC
PROPOSED ENHANCEMENT
TEMPORARY IMPACT ESTUARY IMPACT (DUE TO BRIDGE CONSTRUCTION) = 0.04 AC
PROPOSED CHANNEL
PERMANENT ESTUARINE IMPACT DUE TO ROADSIDE GRADING = 0.04 AC
LIMITS OF EXISTING WETLAND, TYP.
ROAD IMPROVEMENT, PERMANENT WETLAND IMPACT = 0.14 AC
INCIDENTAL IMPACTS LEGEND & TOTAL IMPACTS
PERMANENT IMPACT 1 – 5.47 AC
TEMPORARY IMPACT 2 – 0.51 AC
PERMANENT RESTORATION 3 – 5.56 AC
PERMANENT ENHANCEMENT – 95.04 AC
NOTE:
ELEVATIONS BASED ON NAVD88 DATUM (MLLW Elev. 0.0 = NAVD88 Elev. -0.97)
PROPOSED HABITAT POOL
WELL AND DRAINFIELD PROTECTION, PERMANENT WETLAND IMPACT = 0.85 AC
PROPOSED RESTORATION
ROAD IMPROVEMENT, PERMANENT WETLAND IMPACT = 0.04 AC
0 100 200 400
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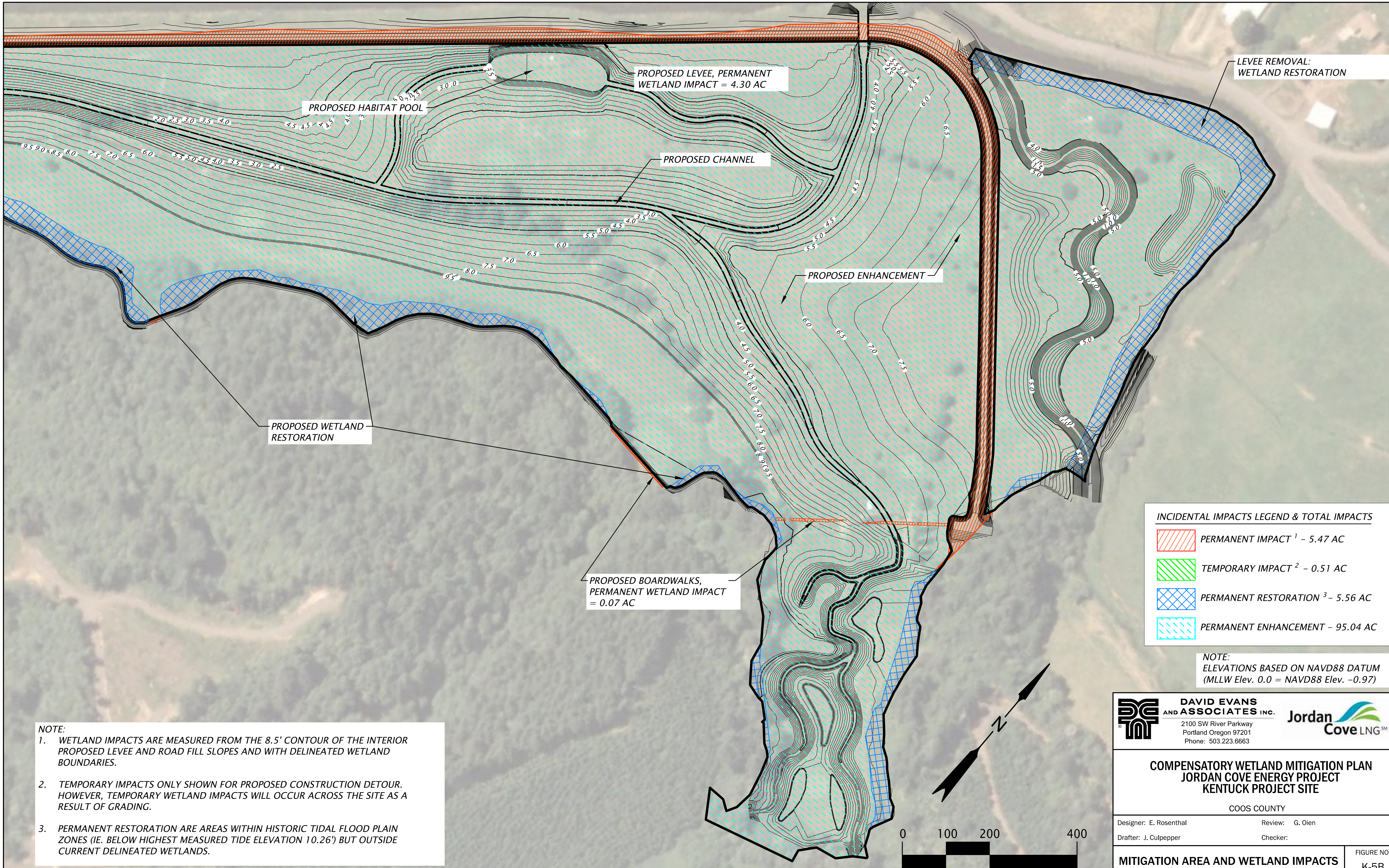
Jordan Cove LNG
COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE
COOS COUNTY
Designer: E. Rosenthal
Review: G. Oien
Drafter: J. Culpepper
Checker: .
MITIGATION AREA AND WETLAND IMPACTS
FIGURE NO.
K-5A


LEVEE REMOVAL: WETLAND RESTORATION
PROPOSED LEVEE, PERMANENT WETLAND IMPACT = 4.30 AC
PROPOSED HABITAT POOL
PROPOSED CHANNEL
PROPOSED ENHANCEMENT
PROPOSED WETLAND RESTORATION
PROPOSED BOARDWALKS, PERMANENT WETLAND IMPACT = 0.07 AC
INCIDENTAL IMPACTS LEGEND & TOTAL IMPACTS
PERMANENT IMPACT 1 – 5.47 AC
TEMPORARY IMPACT 2 – 0.51 AC
PERMANENT RESTORATION 3 – 5.56 AC
PERMANENT ENHANCEMENT – 95.04 AC
NOTE:
ELEVATIONS BASED ON NAVD88 DATUM (MLLW Elev. 0.0 = NAVD88 Elev. -0.97)
NOTE:
1. WETLAND IMPACTS ARE MEASURED FROM THE 8.5' CONTOUR OF THE INTERIOR PROPOSED LEVEE AND ROAD FILL SLOPES AND WITH DELINEATED WETLAND BOUNDARIES.
2. TEMPORARY IMPACTS ONLY SHOWN FOR PROPOSED CONSTRUCTION DETOUR. HOWEVER, TEMPORARY WETLAND IMPACTS WILL OCCUR ACROSS THE SITE AS A RESULT OF GRADING.
3. PERMANENT RESTORATION ARE AREAS WITHIN HISTORIC TIDAL FLOOD PLAIN ZONES (IE. BELOW HIGHEST MEASURED TIDE ELEVATION 10.26') BUT OUTSIDE CURRENT DELINEATED WETLANDS.
N
0 100 200 400
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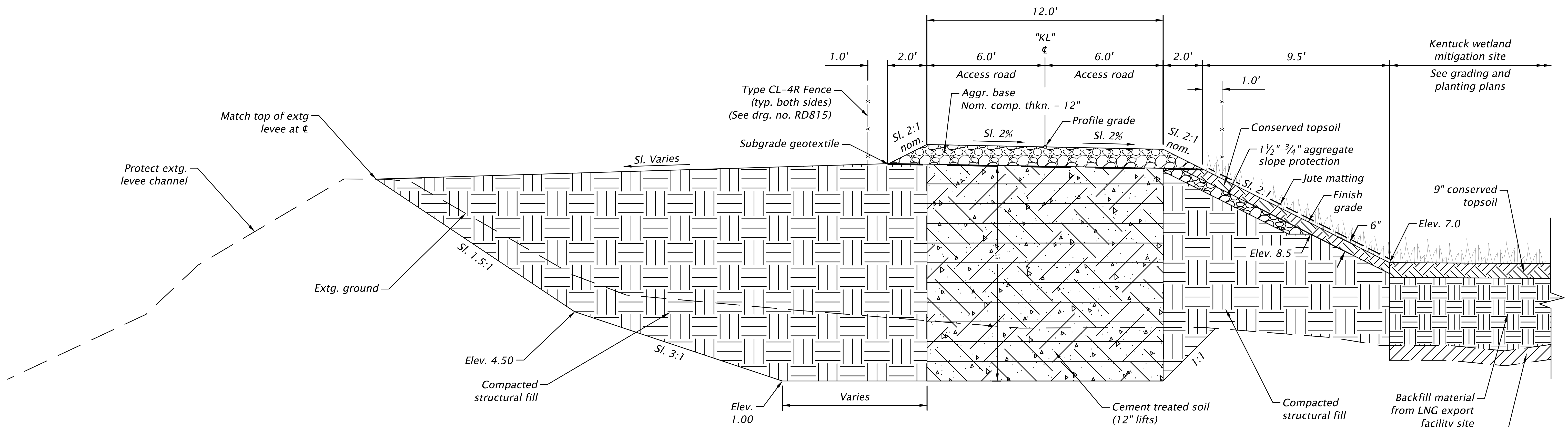
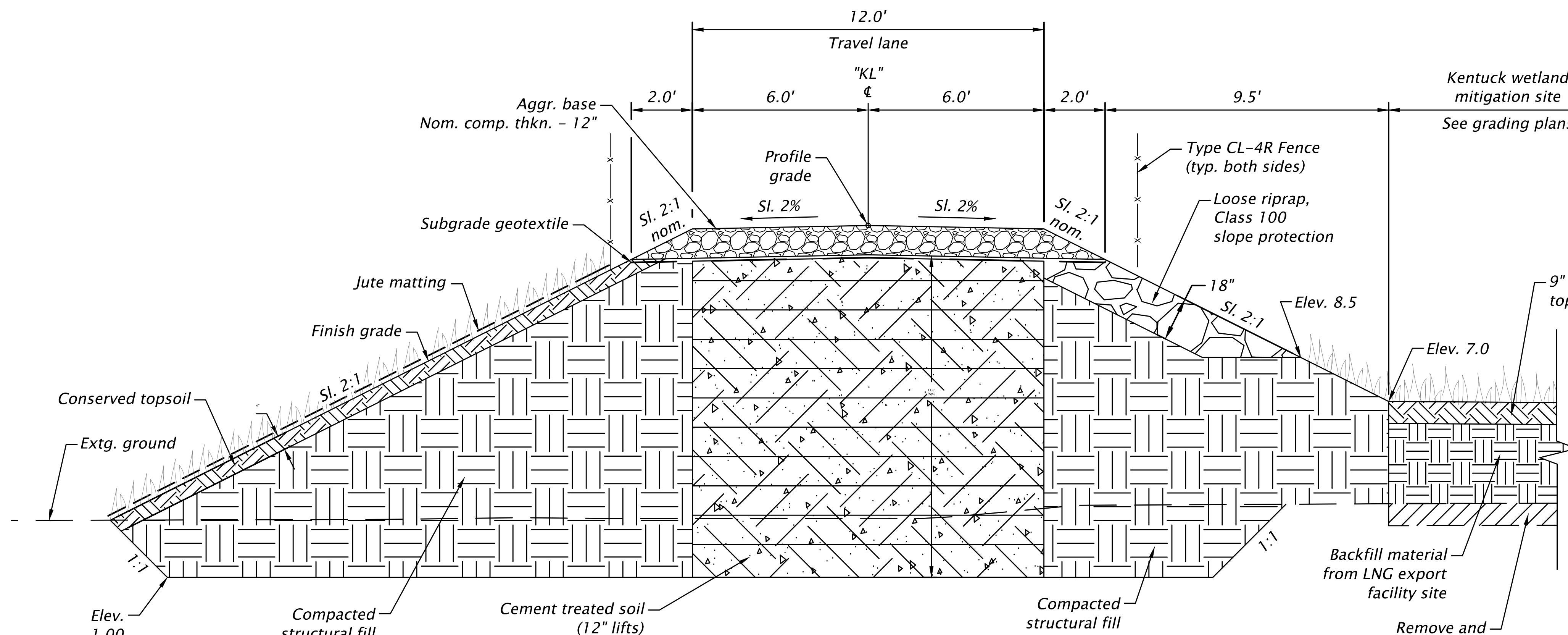
Phone: 503.223.6663
Jordan Cove LNG
COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE
COOS COUNTY
Designer: E. Rosenthal
Review: G. Oien
Drafter: J. Culpepper
Checker:
MITIGATION AREA AND WETLAND IMPACTS
FIGURE NO.
K-5B



KENTUCK LEVEE ADJACENT TO EXISTING LEVEE



KENTUCK LEVEE RELOCATED

Notes:

-Final levee foundation design to be determined per additional geotehcnical investigations

-Bioengineering approaches to improve habitat conditions along levee face and road embankments internal to Kentuck Project to be reviewed as part of final design (See Figure 10D for example concepts).

Elevations based on NAVD88 datum.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

-DRAFT-
NOT TO BE USED FOR CONSTRUCTION

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JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: D. Iliyn | Review: G. Oien
Drafter: J. Culpepper | Checker: .

TYPICAL SECTIONS

FIGURE NO. K-6A

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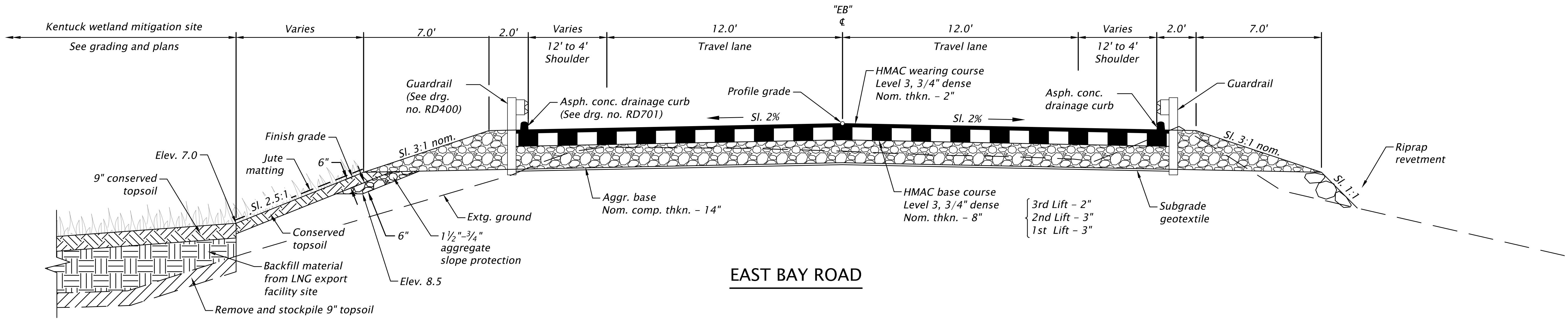
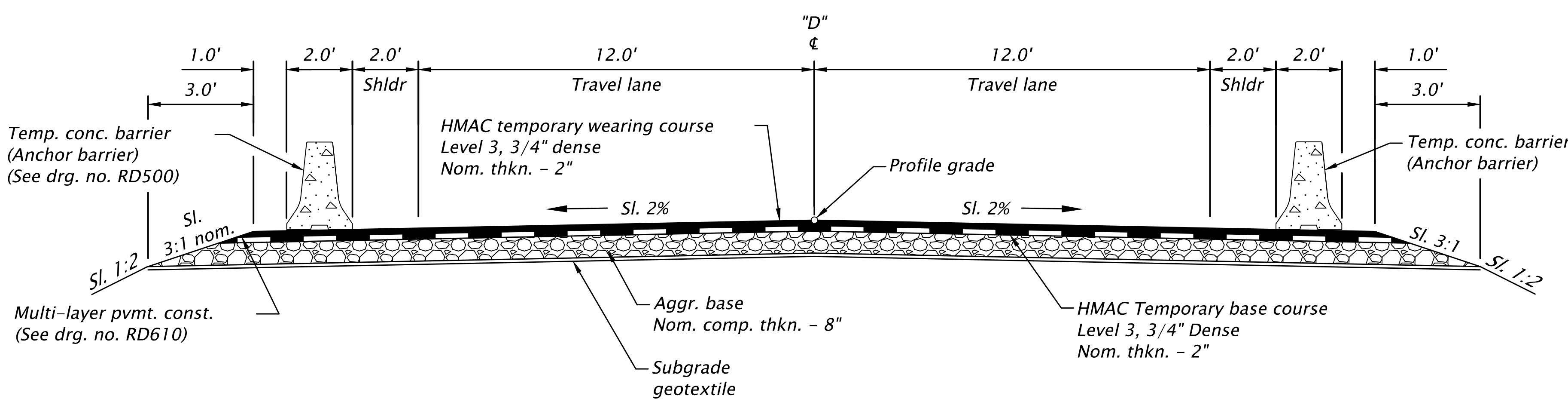


EAST BAY ROAD



EAST BAY ROAD DETOUR

Notes:

-Bioengineering approaches to improve habitat conditions along levee face and road embankments internal to Kentuck Project to be reviewed as part of final design (See Figure 10D for example concepts).

Elevations based on NAVD88 datum.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

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COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: D. Iliyn	Review: G. Oien
Drafter: J. Culpepper	Checker: CHECKED_BY

TYPICAL SECTIONS

FIGURE NO. K-6B

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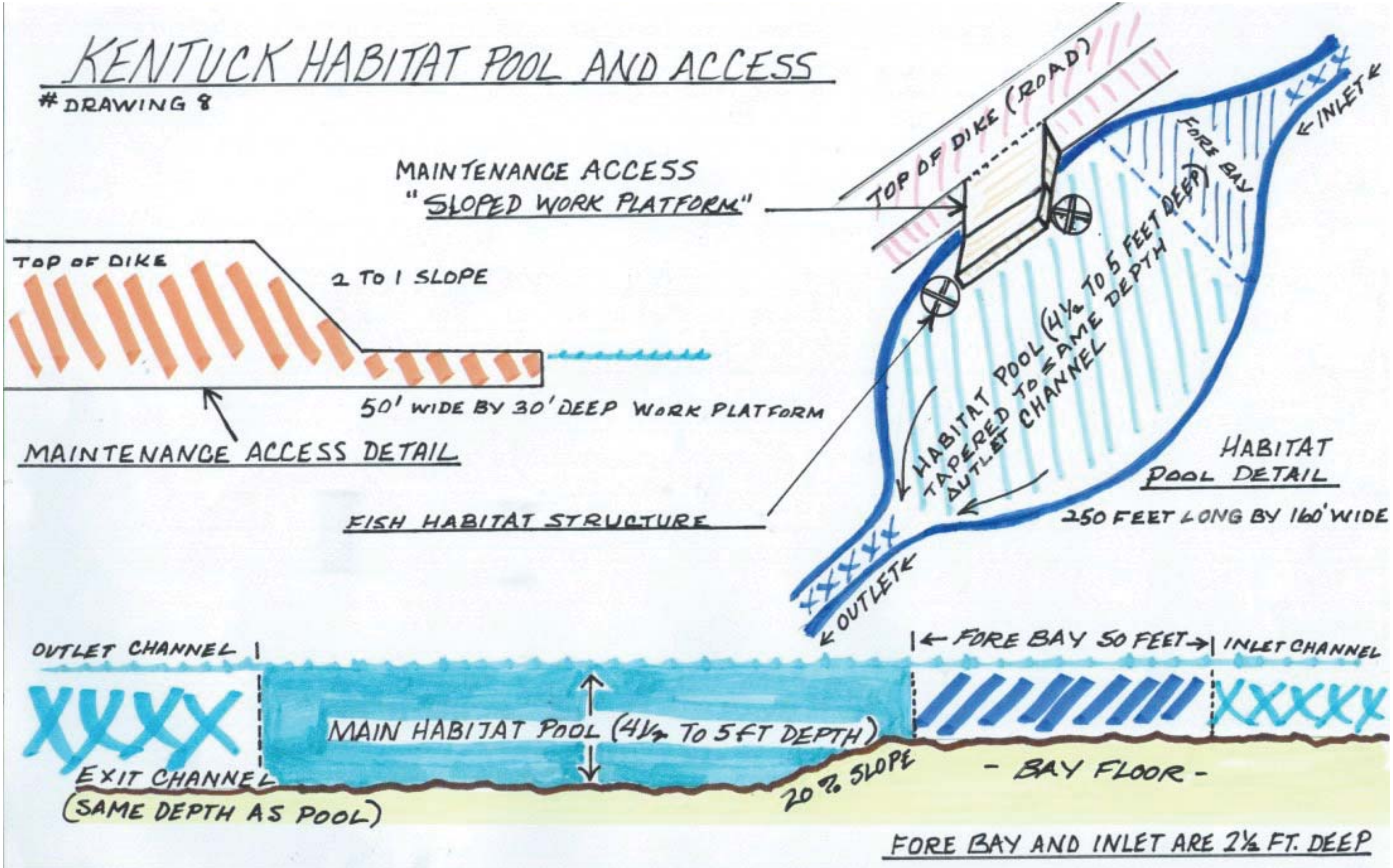
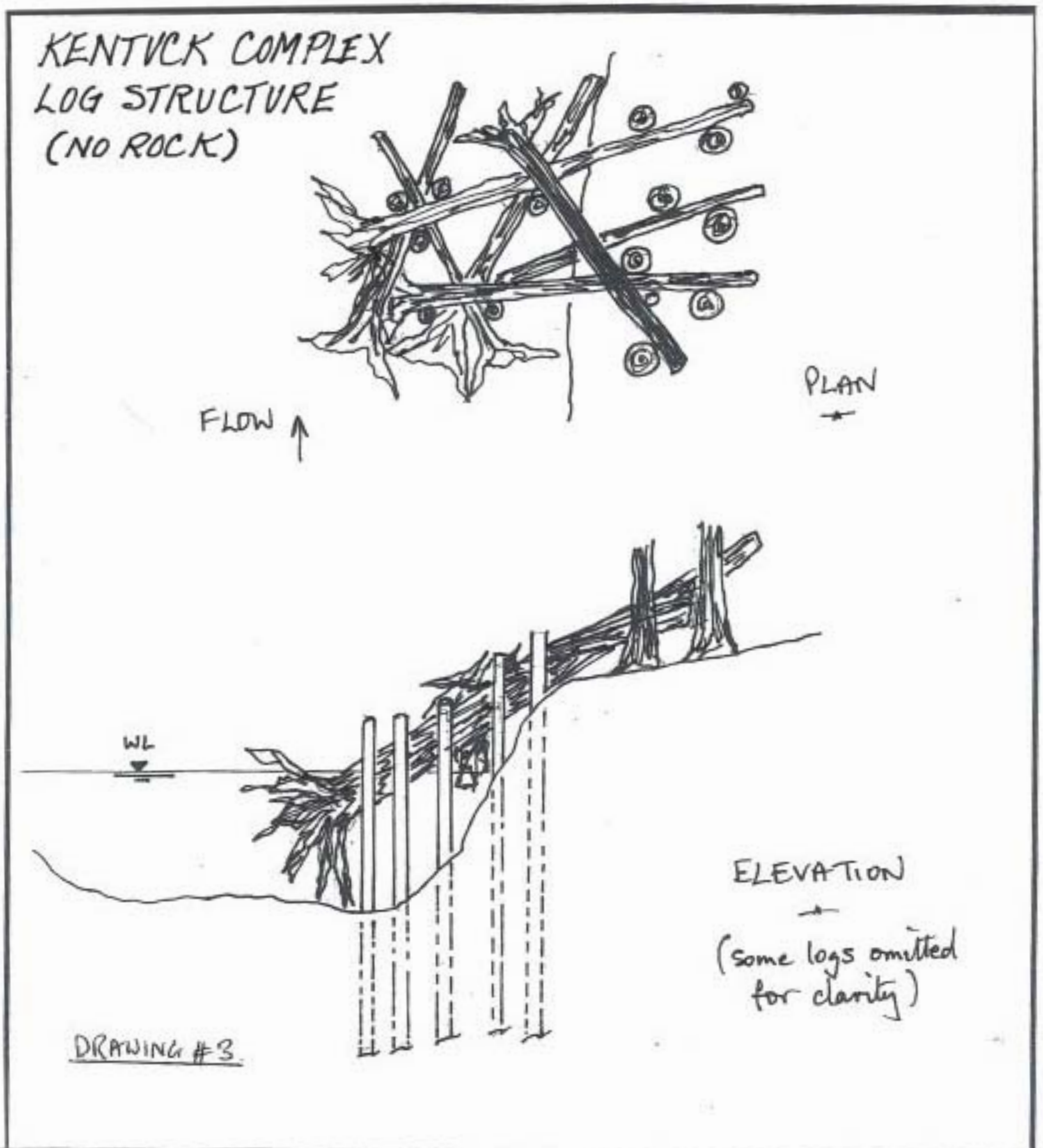


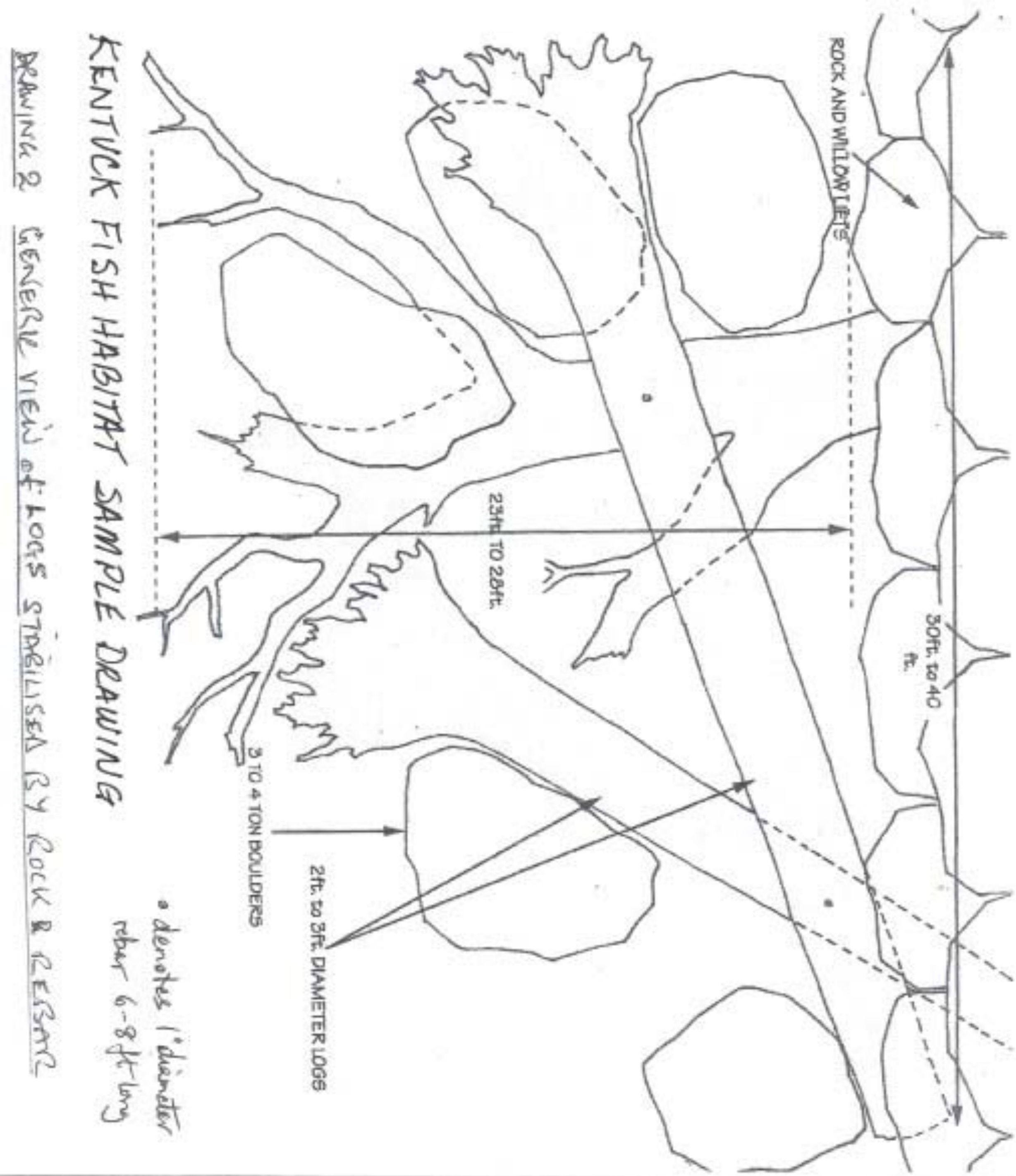
Figure K-7A
Kentuck Project Site
Habitat Pool Concept

P.O. Box 5924, Charleston, Oregon 97420
By: Dr. John L. Gardiner MBE, PE, for River Docs, Llc



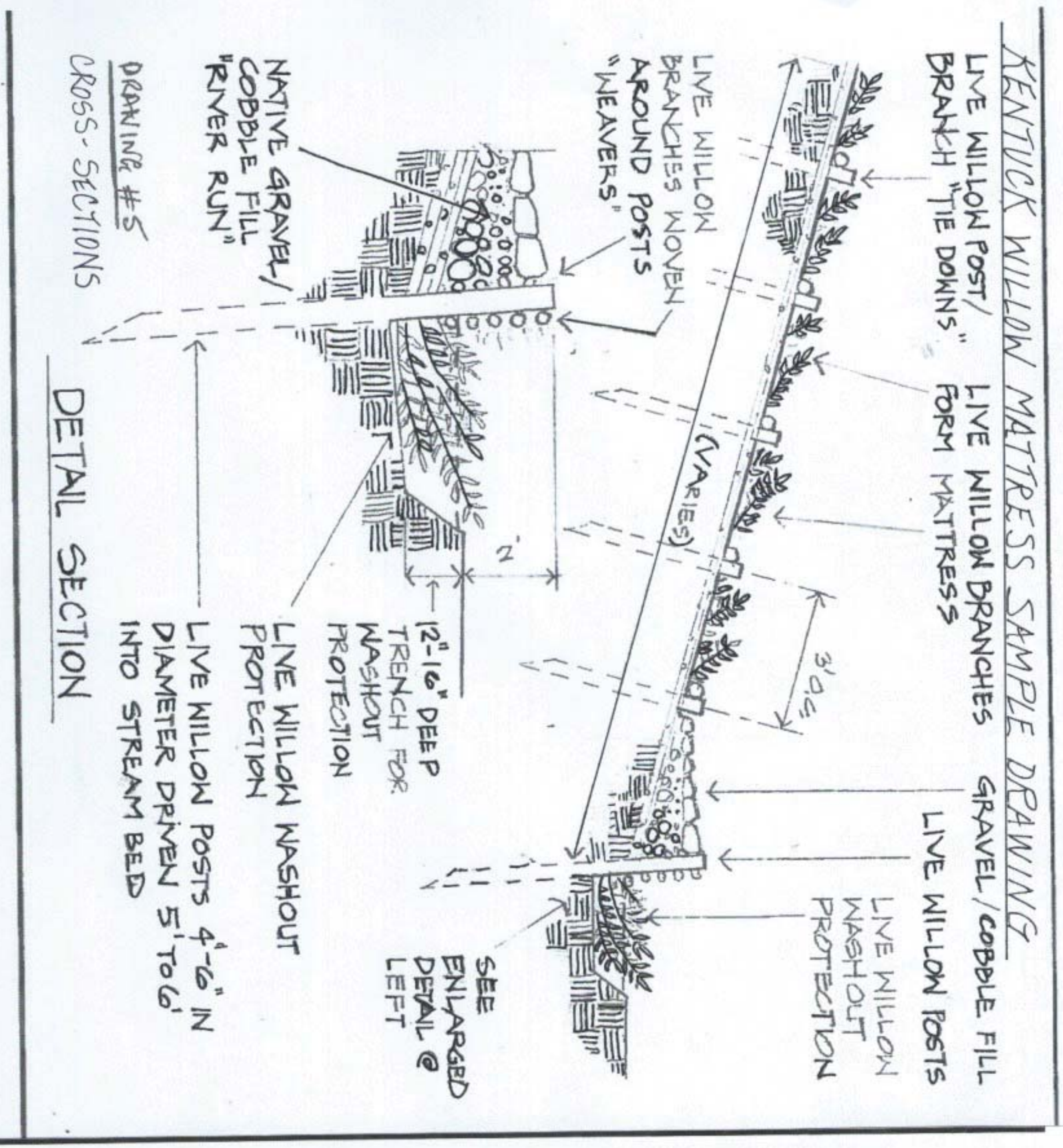
River Docs
P.O. Box 5924, Charleston, Oregon 97420
By: Dr. John L. Gardiner MBE, PE, for River Docs, Llc.

Figure K-7B
Kentuck Project Site
Complex Log Structure Concept



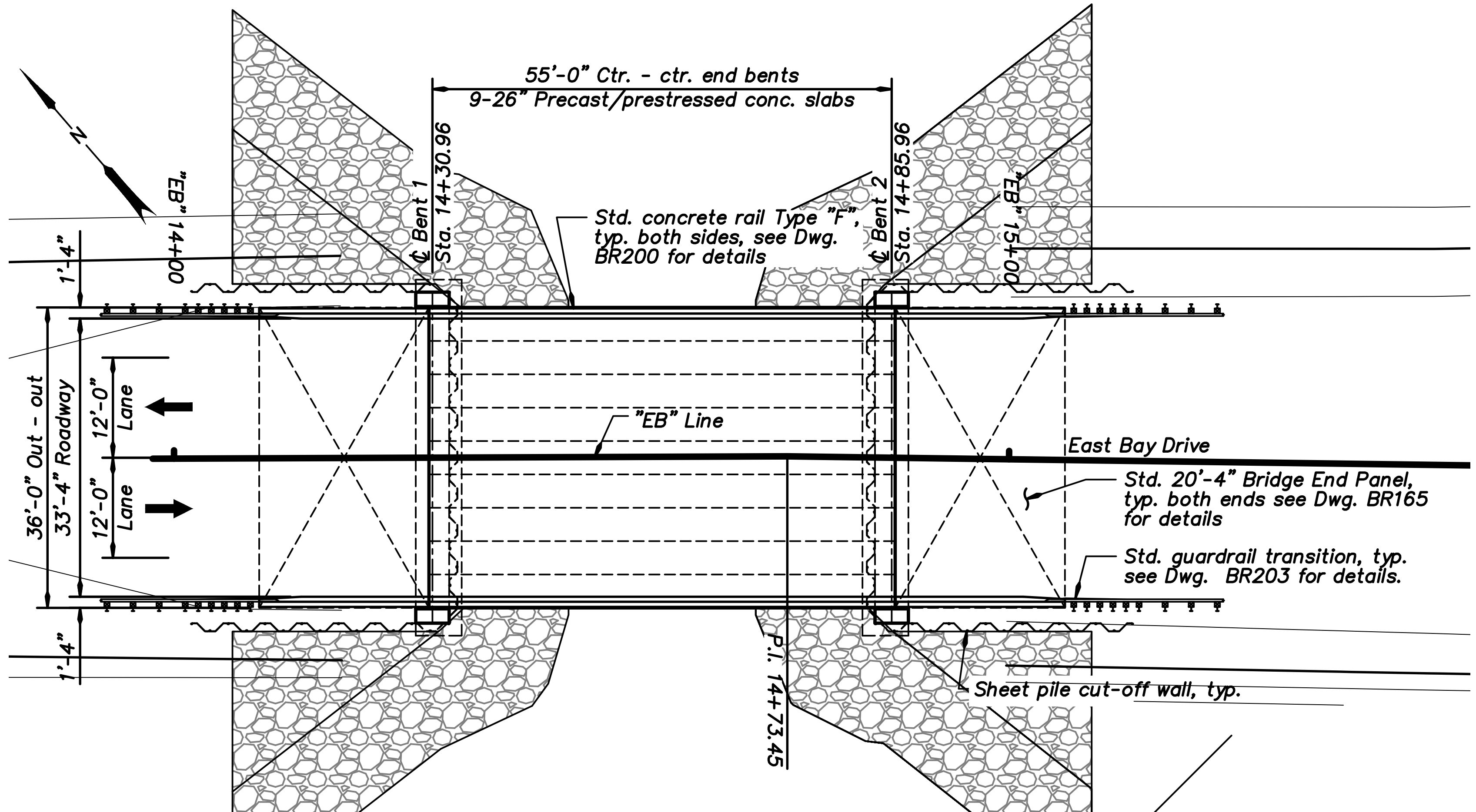
River Docs
P.O. Box 5924, Charleston, Oregon 97420
By: Dr. John L. Gardiner MBE, PE, for River Docs, Llc.

Figure K-7C
Kentuck Project Site
Complex Log Structure Concept

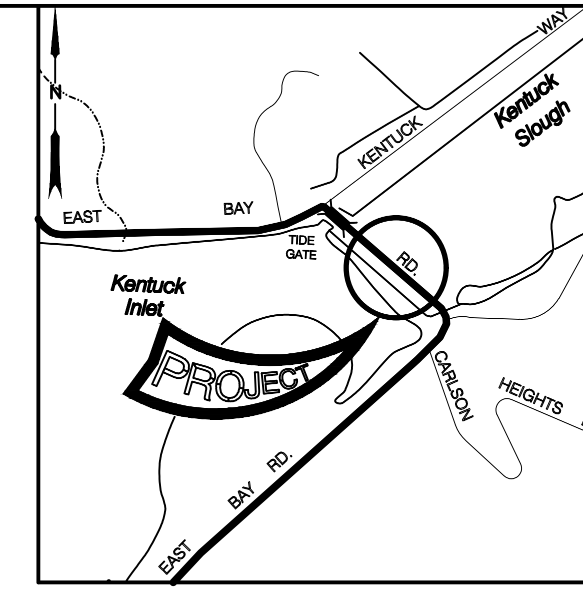


River Docs
P.O. Box 5924, Charleston, Oregon 97420
By: Dr. John L. Gardiner MBE, PE, for River Docs, Llc.

Figure K-7D
Kentuck Project Site
Bioengineered Slope Concept

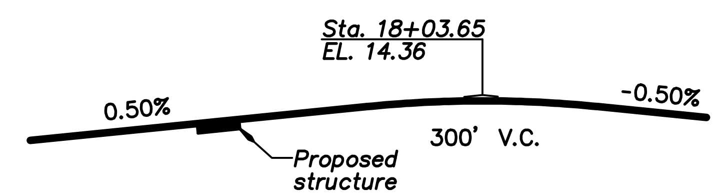


PLAN
Scale: 1" = 10'-0"

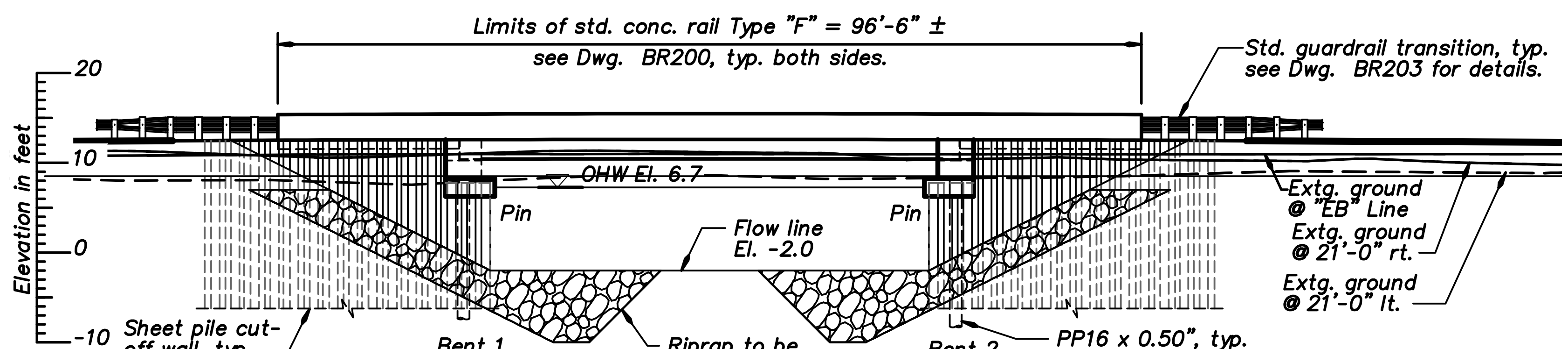


SEC. 12, T. 25 S., R. 13 W., W.M.

LOCATION MAP
No Scale



GRADELINE DIAGRAM
No Scale



Note:
Elevations shown are based on North American Vertical Datum, 1988.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

ELEVATION
Scale: 1" = 10'-0"

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COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: L. Baughman
Review: T. Stones
Drafter: J. Culpepper
Checker: A. Calcagno

PROPOSED EAST BAY BRIDGE

FIGURE NO.
K-8A

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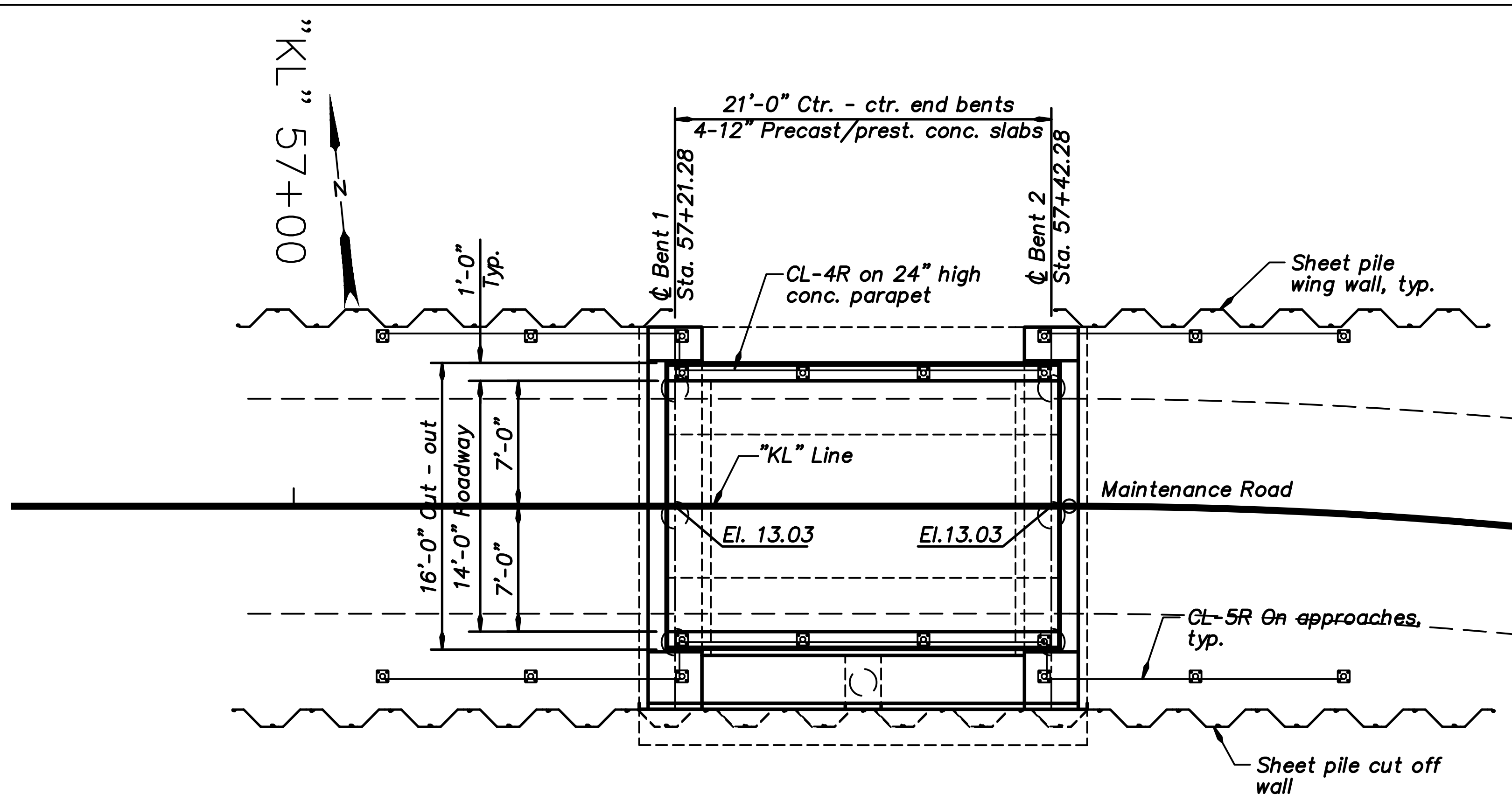
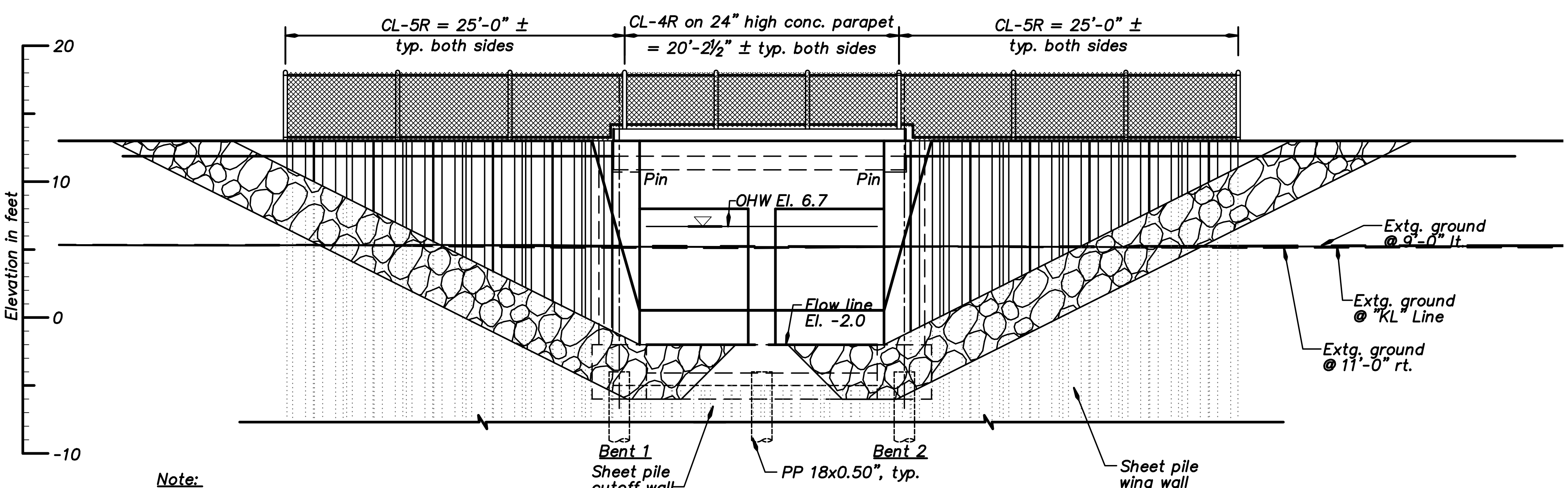


PLAN

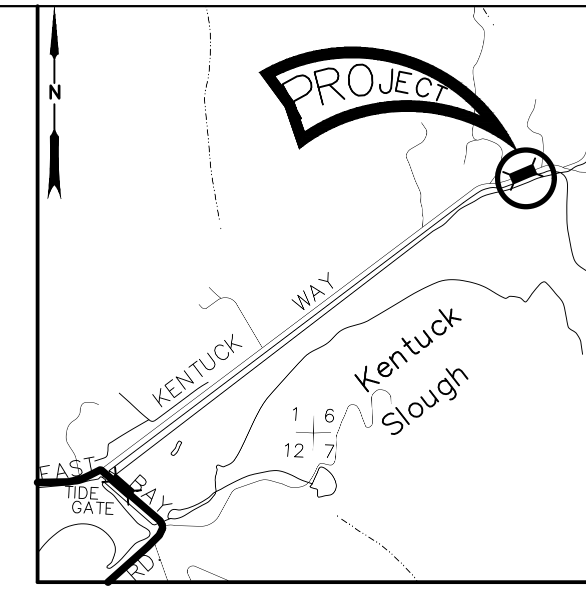
Scale: 1" = 5'-0"



Note:
Elevations shown are based on North American Vertical Datum, 1988. To convert to MLLW Datum add 0.97 ft.

ELEVATION

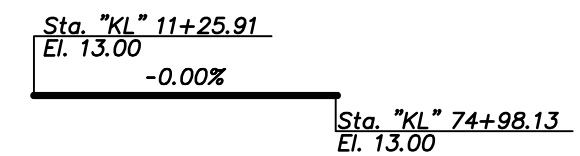
Scale: 1" = 5'-0"



SEC. 1, T. 25 S., R. 13 W., W.M.

LOCATION MAP

No Scale



Note:
Gradeline is top of aggregate wearing surface at centerline maintenance road.

GRADELINE DIAGRAM

No Scale

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KENTUCK PROJECT SITE

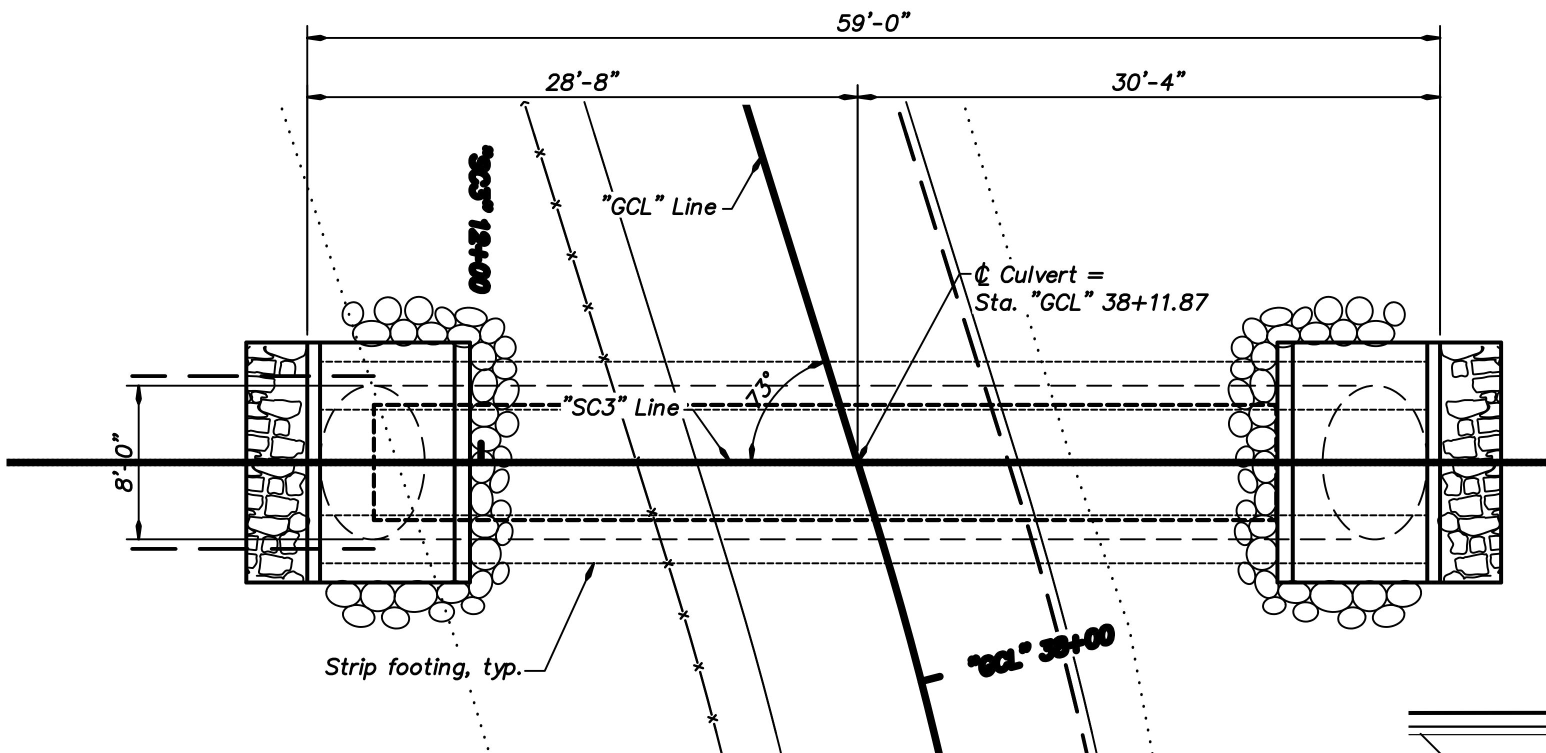
COOS COUNTY

Designer: J. Stroud	Review: T. Stones
Drafter: J. Culpepper	Checker: A. Calcagno

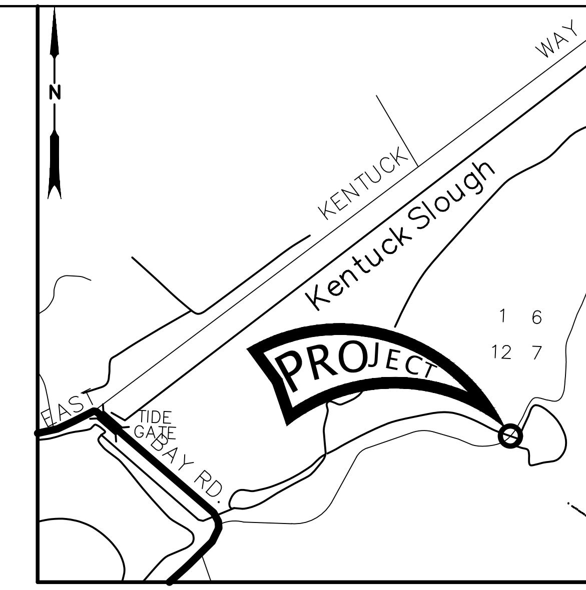
PROPOSED KENTUCK SLOUGH DIKE BRIDGE

FIGURE NO. K-8B

C:\pw_work\jordan_cove_lng\jxc\dms02490\EB801_KPS_PE01 9/21/2018 10:46 AM Jim Culpepper

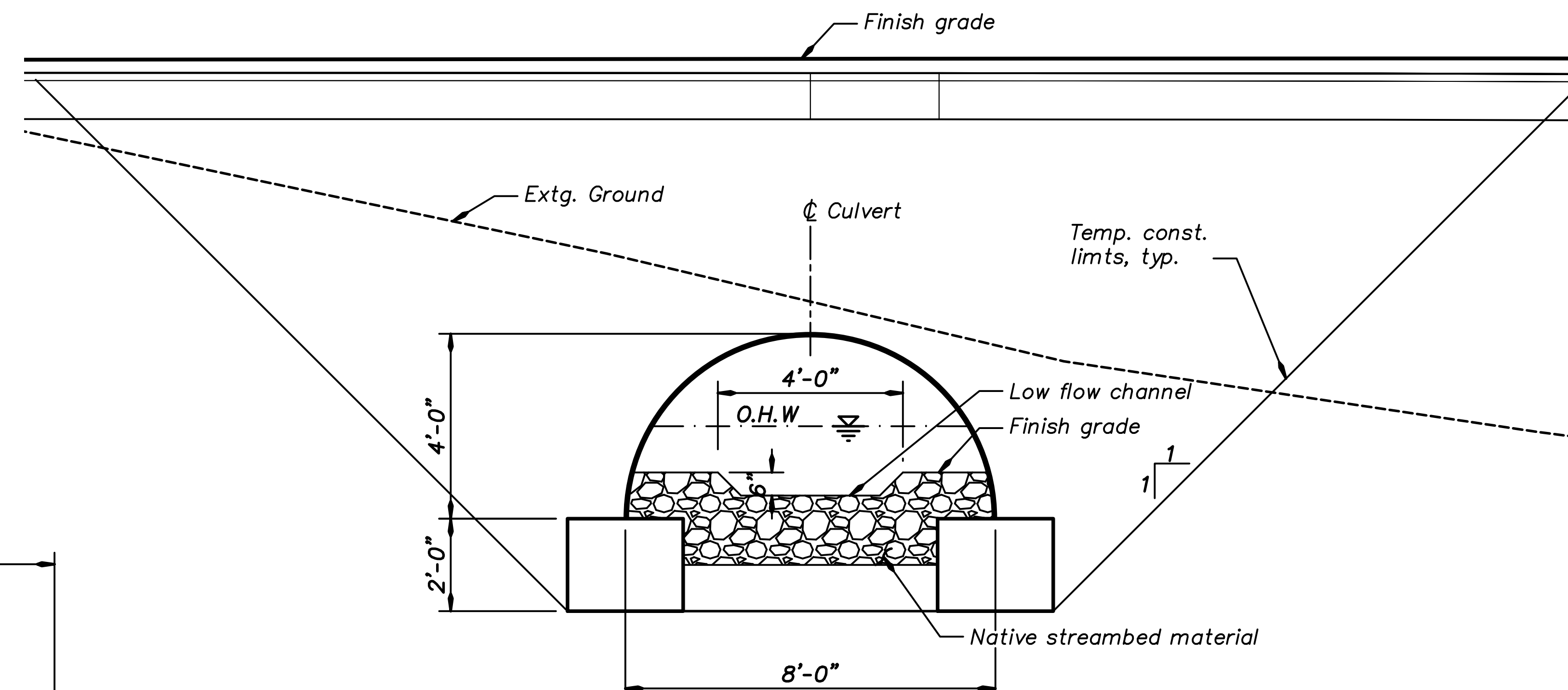


PLAN
Scale: 1" = 5'-0"

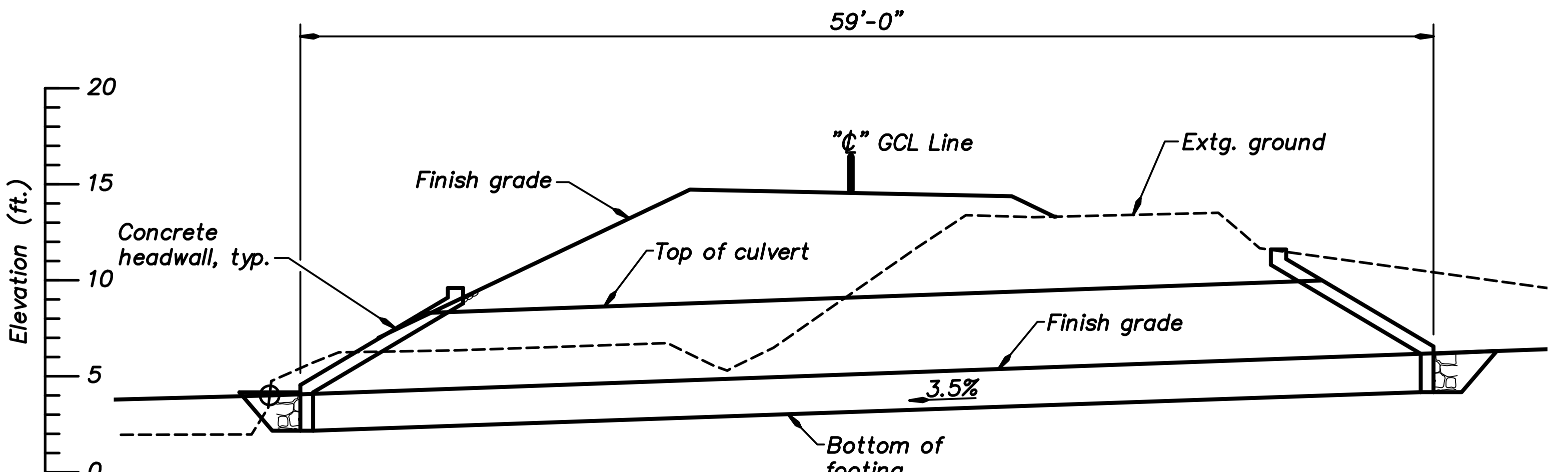


SEC. 1, T. 25 S., R. 13 W., W.M.

LOCATION MAP
No Scale



TYPICAL SECTION
No Scale



Note:
Elevations shown are based on North American Vertical Datum, 1988.
(MLLW Elev. 0.0 = NAVD88 Elev. -0.97)

ELEVATION
Scale: 1" = 5'-0"

DAVID EVANS AND ASSOCIATES INC.
2100 SW River Parkway
Portland Oregon 97201
Phone: 503.223.6663

Jordan Cove LNG℠

COMPENSATORY WETLAND MITIGATION PLAN
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

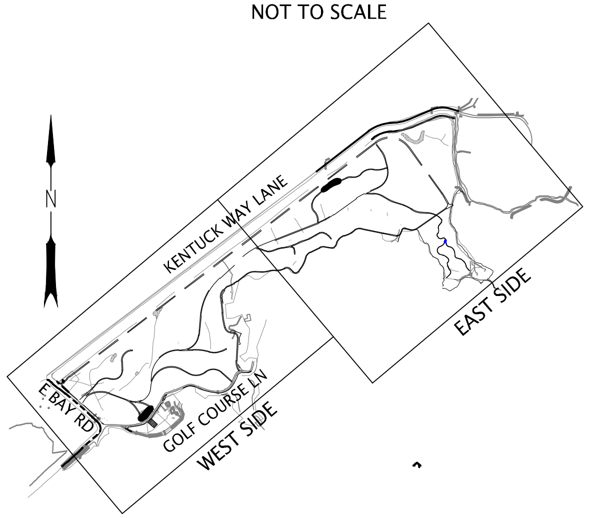
Designer: L. Baughman | Review: T. Stones
Drafter: J. Culpepper | Checker: A. Calcagno

PROPOSED GOLF COURSE LANE CULVERT | FIGURE NO. K-8C

APPENDIX B: 1200-C EROSION SEDIMENT CONTROL PLAN FIGURES

SITE AND KEY MAP

NOT TO SCALE



VICINITY MAP

NOT TO SCALE

T.25S, R.12W, Sec. 6, 7;
T.25S, R.13W, Sec. 1, 12 W.M.

PROJECT LOCATION:

Located east of North Bend, Oregon (Township 25 South, Range 12 West, Sections 6 and 7; Township 25 South, Range 13 West, Sections 1 and 12, Willamette Meridian).

Latitude: 43.426073
Longitude: -124.180924

PROPERTY DESCRIPTION:

The Kentuck Project site is located east of North Bend, Oregon (Township 25 South, Range 12 West, Sections 6 and 7; Township 25 South, Range 13 West, Sections 1 and 12, Willamette Meridian). Tax maps and lots are: 25s12w06c lot 100, 25s13w12a lot 100, and 25s13w1d lot 400.

ATTENTION EXCAVATORS:

Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of these rules from the center by calling 503-232-1987. If you have any questions about the rules, you may contact the center. You must notify the center at least two business days, before commencing an excavation. Call 503-246-6699.

The permittee is required to meet all the conditions of the 1200-C permit. This ESCP and general conditions have been developed to facilitate compliance with the 1200-C permit requirements. In cases of discrepancies or omissions, the 1200-C permit requirements supercede requirements in this plan. (Refer to State of Oregon DEQ 1200-C General Permit, NPDES Stormwater Discharge Permit.) Furthermore, this ESCP has been developed to adhere to the Federal Energy Regulatory Commission (FERC) Upland Erosion Control, Revegetation, and Maintenance Plan (May 2013 Version).

ESC PLAN FOR SITES OVER 5 ACRES

OWNER/DEVELOPER

Fort Chicago LNG II U.S. LLC
Jordan Cove LNG
5615 Kirby Drive, Suite 500
Houston, Texas 77005
(971) 232-8637
Contact: Derik Vowels, Lead Environmental Advisor

CIVIL ENGINEER

David Evans And Associates, Inc.
2100 SW River Parkway
Portland, Oregon 97201
(503) 223-6663
Contact: Brady Berry, PE

NARRATIVE DESCRIPTIONS

EXISTING SITE CONDITIONS:

Located east of North Bend, Oregon, the project site historically provided estuarine habitats (i.e., salt marsh, mudflats, tide channels, and fringing freshwater wetlands) that were hydrologically connected to the Kentuck Slough and Coos Bay estuary systems. However, circa the 1940s, the Kentuck Project site was diked and converted to agricultural uses. Eventually the site was converted into an 18-hole golf course before reverting back to agricultural use (i.e., pasture) in 2009.

DEVELOPED CONDITIONS:

The mitigation concept involves restoration activities to return the Kentuck Project site to its natural potential, given existing on-site and off-site constraints that include local transportation systems, access to and protection of adjacent private property, and Kentuck Drainage District requirements. Mitigation activities will establish a combination of habitat types including tidal mudflat, salt marsh, and wetlands that will interact to provide a holistic coastal ecosystem, will result in an uplift in ecosystem functions, and are expected to be particularly beneficial to coho salmon recovery and support of Chinook salmon. Socio-cultural benefits will be incorporated into the site to the extent feasible. Proposed improvements consist of construction of a new bridge in East Bay Drive, removal or plugging of existing culverts, levee augmentation with MTR installation, construction of a fish-passage culvert/structure, habitat establishment, and installation of a publicly accessible trail.

INSPECTION FREQUENCY:

SITE CONDITION	MINIMUM FREQUENCY
1. Active period	Daily when stormwater runoff, including runoff from snow melt, is occurring. At least once every fourteen (14) calendar days regardless of whether stormwater runoff is occurring.
2. Prior to the site becoming inactive or in anticipation of site inaccessibility	Once to ensure that erosion and sediment control measures are in working order. Any necessary maintenance and repair must be made prior to leaving the site.
3. Inactive periods greater than fourteen (14) consecutive calendar days	Once every month.
4. Periods during which the site is inaccessible due to inclement weather	If practical, inspections must occur daily at a relevant and accessible discharge point or downstream location.
5. Periods during which discharge is unlikely due to frozen conditions	Monthly. Resume monitoring immediately upon melt, or when weather conditions make discharges likely.

**Hold a pre-construction meeting of project construction personnel that includes the inspector to discuss erosion and sediment control measures and construction limits. (Schedule A.8.c.i.(3), 1200-C General Permit)*
**All inspections must be made in accordance with DEQ 1200-C permit requirements.*
**Inspection logs must be kept in accordance with DEQ's 1200-C permit requirements.*
**Retain a copy of the ESCP and all revisions on site and make it available on request To DEQ, agent, or the local municipality. During inactive periods of greater than seven (7) consecutive calendar days, retain the ESCP at the construction site or at another location. (Schedule B.2.a, 1200-C General Permit)*

NATURE OF CONSTRUCTION ACTIVITY:

Erosion and sediment control measures installation, clearing activities, site prep for dredge material delivery	2Q2020 - 1Q2021
Mass grading, dewatering of dredge material, begin construction of permanent and temporary infrastructure improvements	4Q2021 - 4Q2022
Dewatering of dredge material, continued construction of infrastructure improvements	1Q2023 - 1Q2024
Final grading and habitat structures, final stabilization, channel connection	2Q2024 - 4Q2024

Total site area: 106 acres
Total disturbed area: 106 acres

SOIL CLASSIFICATIONS:

12 Coquille silt loam
(0-1% slopes, very poorly drained)
41 Nestucca silt loam
(0-3% slopes, somewhat poorly drained)

RECEIVING WATER BODIES:

Kentuck Slough
Kentuck Creek
Coos Bay Estuary

PERMITTEE'S SITE INSPECTOR:

Name: TBD
Company/Agency: --
Phone Number: --
Fax Number: --
E-Mail Address: --

Description Of Experience:
15 Years Experience In Construction Inspection, Certified CESCL in Oregon State.

SHEET INDEX

BMP MATRIX FOR CONSTRUCTION PHASES

Refer to DEQ Guidance Manual for a comprehensive list of available BMPs.

	PHASE 1 *see description	PHASE 2 *see description	PHASE 3 *see description	PHASE 4 *see description	PHASE 5 *see description	WET WEATHER (OCT 1 - MAY 31)
EROSION PREVENTION						
SOIL TACKIFIERS		X	X	X	X	X
TEMPORARY MULCH		X	X	X	X	X
PLASTIC SHEETING						X
SLOPE AND CHANNEL MATTING		X	X	X	X	
COMPOST BLANKET				X	X	X
PERMANENT SEEDING/PLANTING				X	X	
SEDIMENT CONTROL						
PERIMETER SEDIMENT CONTROL	**X	X	X	X		X
SEDIMENT FENCE (INTERIOR)		X	X	X		X
SEDIMENT BARRIERS		X	X	X		X
DIVERSION DIKES/SWALES	X	X	X	X		X
STOCKPILE MANAGEMENT		X	X	X		X
DUST CONTROL		X	X			
RUN OFF CONTROL						
CONSTRUCTION ENTRANCE	**X	X	X	X	X	X
PIPE SLOPE DRAIN	X	X	X	X		X
ENERGY DISSIPATERS	X	X	X	X		X
OUTLET PROTECTION	X	X	X	X		X
UNPAVED ROADS GRAVELED, OR OTHER BMP ON THE ROAD	X	X	X	X		X
CHECK DAMS		X	X	X	X	X
COIR LOGS				X	X	
POLLUTION PREVENTION						
CONCRETE TRUCK WASHOUT	X					
PROPER SIGNAGE	X	X	X	X	X	X
HAZ WASTE MGMT	X	X	X	X	X	X
SPILL KIT ON-SITE	X	X	X	X	X	X

*** Signifies BMP that will be installed prior to any ground disturbing activity.*
PHASES OF CONSTRUCTION:
** PHASE 1: Stripping & temp grading of site, construction of temp stream diversion, construction of E Bay Road and bridge*
** PHASE 2: Dewatering of dredge sands*
** PHASE 3: Mass grading and levee widening*
** PHASE 4: Site stabilization, Golf Course Lane construction, trail and boardwalk construction, removal of temp stream diversion*
** PHASE 5: Permanent seeding & planting*
** For details on construction phasing, See ESC Plan Phasing Notes on sht. C003.*

RATIONALE STATEMENT

A comprehensive list of available best management practices (BMP) options based on DEQ's guidance manual has been reviewed to complete this erosion and sediment control plan. Some of the above listed BMP's were not chosen because they were determined to not effectively manage erosion prevention and sediment control for this project based on specific site conditions, including soil conditions topographic constraints, accessibility to the site, and other related conditions, as the project progresses and there is a need to revise the ESC plan, an action plan will be submitted.

Initial

NO.	DATE	BY/CHK.	APPD.	REVISION AND RECORD OF ISSUE
2	9/26/18	BH	TS	Rev B - Issued for Review
1	8/10/18	BH	TS	Rev A - Issued for Review

DOC. CONTROL NO.: J1-600-CIV-KEY-DEA-00001-01 Rev B-ISSUED FOR REVIEW

DRAFT PLANS FOR REVIEW ONLY

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Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: B. Henri | Review: B. Guthrie
Drafter: T. Danisch | Checker: -

ESCP COVER SHEET

SHEET NO. C001

PRE-CONSTRUCTION, CLEARING, AND DEMOLITION NOTES

1. All base ESC measures (perimeter sediment control, construction entrances, inlet protection, etc.) must be in place, functional, and approved in an initial inspection, prior to commencement of construction activities.
2. Sediment barriers approved for use are shown in the standard details and drawings listed on sheet C003.
3. Sensitive resources including, but not limited to, trees, wetlands, and riparian protection areas shall be clearly delineated with orange construction fencing or chain link fencing in a manner that is clearly visible to anyone in the area. No activities are permitted to occur beyond the construction barrier.
4. Construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures including, but not limited to, street sweeping and vacuuming, may be required to insure that all paved areas are kept clean for the duration of the project.
5. Run-on and run-off controls shall be in place and functioning prior to beginning substantial construction activities. Run-on and run-off control measures are listed in the BMP matrix on sheet C001, and are shown in the standard details and drawings listed on sheet C003.

STANDARD EROSION AND SEDIMENT CONTROL PLAN DRAWING NOTES *(Refer to Oregon DEQ 1200-C General Permit, NPDES Stormwater Design Permit)*

1. Hold a pre-construction meeting of project construction personnel that includes the inspector to discuss erosion and sediment control measures and construction limits. (Schedule A.8.c.i.(3))
2. All inspections must be made in accordance with DEQ 1200-C permit requirements. (Schedule A.12.b and Schedule B.1)
3. Inspection logs must be kept in accordance with DEQ's 1200-C permit requirements. (Schedule B.1.c and B.2)
4. Retain a copy of the ESCP and all revisions on site and make it available on request to DEQ, Agent, or the local municipality. During inactive periods of greater than seven (7) consecutive calendar days, the above records must be retained by the permit registrant but do not need to be at the construction site. (Schedule B.2.c)
5. All permit registrants must implement the ESCP. Failure to implement any of the control measures or practices described in the ESCP is a violation of the permit. (Schedule A 8.a)
6. The ESCP must be accurate and reflect site conditions. (Schedule A.12.c.i)
7. Submission of all ESCP revisions is not required. Submittal of the ESCP revisions is only under specific conditions. Submit all necessary revision to DEQ or Agent within 10 days. (Schedule A.12.c.iv. and v)
8. Phase clearing and grading to the maximum extent practical to prevent exposed inactive areas from becoming a source of erosion. (Schedule A.7.a.iii)
9. Identify, mark, and protect (by construction fencing or other means) critical riparian areas and vegetation including important trees and associated rooting zones, and vegetation areas to be preserved. Identify vegetative buffer zones between the site and sensitive areas (e.g., wetlands), and other areas to be preserved, especially in perimeter areas. (Schedule A.8.c.i.(1) and (2))
10. Preserve existing vegetation when practical and re-vegetate open areas. Re-vegetate open areas when practicable before and after grading or construction. Identify the type of vegetative seed mix used. (Schedule A.7.a.v)
11. Maintain and delineate any existing natural buffer within the 50-feet of waters of the state. (Schedule A.7.b.i.and (2(a)(b))
12. Install perimeter sediment control, including storm drain inlet protection as well as all sediment basins, traps, and barriers prior to land disturbance. (Schedule A.8.c.i.(5))
13. Control both peak flow rates and total stormwater volume, to minimize erosion at outlets and downstream channels and streambanks. (Schedule A.7.c)
14. Control sediment as needed along the site perimeter and at all operational internal storm drain inlets at all times during construction, both internally and at the site boundary. (Schedule A.7.d.i)
15. Establish concrete truck and other concrete equipment washout areas before beginning concrete work. (Schedule A.8.c.i.(6))
16. Apply temporary and/or permanent soil stabilization measures immediately on all disturbed areas as grading progresses. Temporary or permanent stabilizations measures are not required for areas that are intended to be left unvegetated, such as dirt access roads or utility pole pads.(Schedule A.8.c.ii.(3))
17. Establish material and waste storage areas, and other non-stormwater controls. (Schedule A.8.c.i.(7))
18. Prevent tracking of sediment onto public or private roads using BMPs such as: construction entrance, graveled (or paved) exits and parking areas, gravel all unpaved roads located onsite, or use an exit tire wash. These BMPs must be in place prior to land-disturbing activities. (Schedule A 7.d.ii and A.8.c.i(4))
19. When trucking saturated soils from the site, either use water-tight trucks or drain loads on site. (Schedule A.7.d.ii.(5))
20. Control prohibited discharges from leaving the construction site, i.e., concrete wash-out, wastewater from cleanout of stucco, paint and curing compounds. (Schedule A.6)
21. Use BMPs to prevent or minimize stormwater exposure to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery, as well as debris, fertilizer, pesticides and herbicides, paints, solvents, curing compounds and adhesives from construction operations. (Schedule A.7.e.i.(2))
22. Implement the following BMPs when applicable: written spill prevention and response procedures, employee training on spill prevention and proper disposal procedures, spill kits in all vehicles, regular maintenance schedule for vehicles and machinery, material delivery and storage controls, training and signage, and covered storage areas for waste and supplies. (Schedule A. 7.e.iii.)
23. Use water, soil-binding agent or other dust control technique as needed to avoid wind-blown soil. (Schedule A 7.a.iv)
24. The application rate of fertilizers used to reestablish vegetation must follow manufacturer's recommendations to minimize nutrient releases to surface waters. Exercise caution when using time-release fertilizers within any waterway riparian zone. (Schedule A.9.b.iii)
25. If an active treatment system (for example, electro-coagulation, flocculation, filtration, etc.) for sediment or other pollutant removal is employed, submit an operation and maintenance plan (including system schematic, location of system, location of inlet, location of discharge, discharge dispersion device design, and a sampling plan and frequency) before operating the treatment system. Obtain plan approval before operating the treatment system. Operate and maintain the treatment system according to manufacturer's specifications. (Schedule A.9.d)
26. Temporarily stabilize soils at the end of the shift before holidays and weekends, if needed. The registrant is responsible for ensuring that soils are stable during rain events at all times of the year. (Schedule A 7.b)
27. As needed based on weather conditions, at the end of each workday soil stockpiles must be stabilized or covered, or other BMPs must be implemented to prevent discharges to surface waters or conveyance systems leading to surface waters. (Schedule A 7.e.ii.(2))
28. Construction activities must avoid or minimize excavation and bare ground activities during wet weather. (Schedule A.7.a.i)
29. Sediment fence: remove trapped sediment before it reaches one third of the above ground fence height and before fence removal. (Schedule A.9.c.i)
30. Other sediment barriers (such as biobags): remove sediment before it reaches two inches depth above ground height and before BMP removal. (Schedule A.9.c.i)
31. Catch basins: clean before retention capacity has been reduced by fifty percent. Sediment basins and sediment traps: remove trapped sediments before design capacity has been reduced by fifty percent and at completion of project. (Schedule A.9.c.iii& iv)
32. Within 24 hours, significant sediment that has left the construction site, must be remediated. Investigate the cause of the sediment release and implement steps to prevent a recurrence of the discharge within the same 24 hours. Any in-stream clean-up of sediment shall be performed according to the Oregon Department of State Lands required timeframe. (Schedule A.9.b.i)
33. The intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments. (Schedule A.9.b.ii)
34. The entire site must be temporarily stabilized using vegetation or a heavy mulch layer, temporary seeding, or other method should all construction activities cease for 30 days or more. (Schedule A.7.f.i)
35. Provide temporary stabilization for that portion of the site where construction activities cease for 14 days or more with a covering of blown straw and a tackifier, loose straw, or an adequate covering of compost mulch until work resumes on that portion of the site. (Schedule A.7.f.ii)
36. Do not remove temporary sediment control practices until permanent vegetation or other cover of exposed areas is established. Once construction is complete and the site is stabilized, all temporary erosion controls and retained soils must be removed and disposed of properly, unless doing so conflicts with local requirements. (Schedule A.8.c.iii(1) and D.3.c.ii and iii)

GRADING, STREET AND UTILITY EROSION AND SEDIMENT CONSTRUCTION NOTES

1. Seed used for temporary or permanent seeding shall be composed of one of the following mixtures, unless otherwise authorized:
   A. Permanently seeded areas require native seed mixes. Permanent seeding will be shown on the mitigation planting plans.
   B. Standard temporary seeding mix (min. 100 lb./ac.)
      1. Annual Ryegrass (40% by weight)
      2. Creeping Red Fescue (60% by weight)
2. Slope to receive temporary or permanent seeding shall have the surface roughened by means of track-walking or the use of other approved implements. Surface roughening improves seed bedding and reduces run-off velocity.
3. Long term slope stabilization measures shall include the establishment of permanent vegetative cover via seeding with approved mix and application rate.
4. Temporary slope stabilization measures shall include: covering exposed soil with plastic sheeting, straw mulching, wood chips, or other approved measures.
5. Stockpiled soil or strippings shall be placed in a stable location and configuration. During "wet weather" periods, stockpiles shall be covered with plastic sheeting or straw mulch. Sediment fence is required around the perimeter of the stockpile.
6. Exposed cut or fill areas shall be stabilized through the use of temporary seeding and mulching, erosion control blankets or mats, mid-slope sediment fences or wattles, or other appropriate measures. Slopes exceeding 25% may require additional erosion control measures.
7. Areas subject to wind erosion shall use appropriate dust control measures including the application of a fine spray of water, plastic sheeting, straw mulching, or other approved measures.
8. Construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures including, but not limited to, tire washes, street sweeping, and vacuuming may be required to insure that all paved areas are kept clean for the duration of the project.
9. Active inlets to storm water systems shall be protected through the use of approved inlet protection measures. All inlet protection measures are to be regularly inspected and maintained as needed.
10. Saturated materials that are hauled off-site must be transported in water-tight trucks to eliminate spillage of sediment and sediment-laden water.
11. An area shall be provided for the washing out of concrete trucks in a location that does not provide run-off that can enter the storm water system. If the concrete wash-out area cannot be constructed greater than 50' from any discharge point, secondary measures such as berms or temporary settling pits may be required. The wash-out shall be located within six feet of truck access and be cleaned when it reaches 50% of the capacity.
12. Sweepings from exposed aggregate concrete shall not be transferred to the storm water system. Sweepings shall be picked up and disposed in the trash.
13. Avoid paving in wet weather when paving chemicals can run-off into the storm water system.
14. Use BMPs such as check-dams, berms, and inlet protection to prevent run-off from reaching discharge points.
15. Cover catch basins, manholes, and other discharge points when applying seal coat, tack coat, etc. to prevent introducing these materials to the storm water system.

NO.	DATE	BY / CHK.	APPD.	REVISION AND RECORD OF ISSUE
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1	8/10/18	BH	TS	Rev A - Issued for Review

DOC. CONTROL NO.: J1-600-CIV-KEY-DEA-00002-01 Rev B-ISSUED FOR REVIEW

DRAFT PLANS FOR REVIEW ONLY

DAVID EVANS AND ASSOCIATES INC.
2100 SW River Parkway
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Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: B. Henri | Review: B. Guthrie
Drafter: T. Danisch | Checker: -

ESCP NOTES

SHEET NO. C002

ESC PLAN BMP LEGEND

- Temporary Construction Fencing
- Construction Entrance
- Sediment Fence
- Concrete Truck Wash Out Facility
- Slope and Channel Matting
- Check Dam (compost filter sock)

CWS STANDARD DETAILS

CWS Drawing No.

810 – Plastic sheeting
815 – Pipe slope drain
820 – Outlet protection, rip rap
830 – Surface roughening, cat tracking
850 – Diversion dike / swale
915 – Inlet protection, bio-filter bags
940 – Spacing tables

ODOT STANDARD DRAWINGS

RD1000 – Construction entrances
RD1005 – Aggregate, sandbag, and biofilter bag check dams
RD1006 – Wattle / fiber roll and compost filter sock check dams
RD1030 – Biofilter bag / sand bag sediment barrier and fiber roll sediment barrier
RD1032 – Compost filter sock sediment barrier
RD1033 – Compost filter berm series sediment barrier
RD1040 – Sediment fence
RD1055 – Slope and channel matting
RD1070 – Concrete truck wash out facility
DET6017 – Compost erosion blanket

STANDARD DETAILS

Sediment barrier, coir log

Note:
Some of the BMPs in the Standard Details and Standard Drawings currently listed may not be shown on the ESC plans at this time. These BMPs will be available to the contractor for use during construction, specified in the final ESC design or required for Emergency and Wet Weather stockpiled materials.

ESC PLAN PHASING NOTES**

PHASE 1:
Construction activities include the reconstruction (raising the elevation) of E Bay Rd, construction of the new bridge at E Bay Rd, clearing and grubbing the site, performing temporary grading, and building the diversion dike and swale for the temporary stream diversion. Perimeter controls, including temporary construction fencing, construction entrances, perimeter sediment fence and inlet protection, will be installed prior to beginning construction. A temporary coffer dam, to be designed by the bridge engineers, will be installed between the E Bay Rd bridge and the bay, isolating the construction area from tidal influence. Fish will be removed and excluded from work area.

Topsoil throughout the site will be excavated, and stockpiled in the form of the temporary diversion berm.
All disturbed soils will be stabilized according to the requirements set out in the ESC notes and plans. Temporary pipe slope drains will be used to divert existing streams to undisturbed areas while the diversion dike and swale are under construction. The diversion swale will be stabilized with channel matting and check dams before existing streams are diverted to the swale, to ensure that flows will be clean and free of sedimentation by the time they leave the site through the existing culvert. The site is otherwise isolated by existing topography and perimeter controls, and construction activities will be fully contained.

PHASE 2:
Construction activities mainly revolve around the construction and operation of the dredge sand de-watering facility, which will be located on the west end of the site. (The dredge sand de-watering facility is described in more detail on the Phase 2 Notes and Keynotes sheet, C122.)

Runoff from the dredge sand de-watering facility will be free of most sediment by the time it leaves the vicinity of the facility itself, but the flows will be directed, through an upturned pipe penetrating the diversion dike, into the temporary diversion swale at a point where the runoff must flow through several check dams before leaving the site. The intent is that this will remove any remaining fine particles from the dredge sands runoff, before the water exits the site through the existing culvert.

PHASE 3:
Construction activities consist of mass grading throughout the site, widening of the existing Kentuck Levee (on the interior side), relocation of the levee at the east end of the site, construction of the Muted Tidal Regulator (MTR) tide gate in the levee, and ongoing dredge sand de-watering. The relocation of the levee in the western portion of the site is proposed to create a freshwater mitigation area and restore historic channels of Kentuck Creek. Mass grading will occur as dredge sand becomes available for use from the de-watering facility. The Pacific Connector Gas Pipe (PCGP) line, which will run through the site underground, is anticipated to be installed during this phase, prior to completion of mass grading. When mass grading and de-watering are complete, the de-watering facility will be removed and the area will be graded according to the grading plan.

Disturbed soils will be stabilized with temporary mulch and seeding as required, while grading activities progress. Perimeter BMPs will be maintained, and installed in new areas as required. The diversion swale will be isolated from construction activities by the stabilized diversion dike, and it will continue to provide diversion for existing streams and treat sediment-laden water from the dredge sand de-watering facility.

PHASE 4:
Construction includes the regrading (raising) of Golf Course Ln, construction of the soft surface trail and boardwalk along the southern edge of the site, and stabilization of all graded areas. Permanent stream stabilization and bio-engineering features, including coir soil lifts and habitat structures, will be installed following mass grading. Streambed gravels will be placed in the bottom of the freshwater channel, northeast of the relocated dike. The diversion dike and swale will be removed in stages, as the new channels become sufficiently stabilized, with the help of proposed pipe slope drains throughout the process, and the coffer dam between E Bay Bridge and the bay will be removed. As the diversion dike and swale are removed, those areas will be graded according to the proposed grading plan, and those soils will be stabilized. Perimeter controls, including construction entrances, sediment fence, temporary construction fence and inlet protection, will remain in place until permanent stabilization is established.

PHASE 5:
This phase consists of permanent stabilization through mitigation planting. The permanent stabilization plans are copies of the Compensatory Wetland Mitigation (CWM) Plans for the Kentuck site, which illustrate how the site will be planted. When the site is considered permanently stabilized with established plantings, the remaining perimeter controls will be removed.

**Phases described are the anticipated order of construction activities. The construction sequencing may be changed according to contractor "means and methods." However, all specified BMPs are required for corresponding construction activities as shown on the plans.

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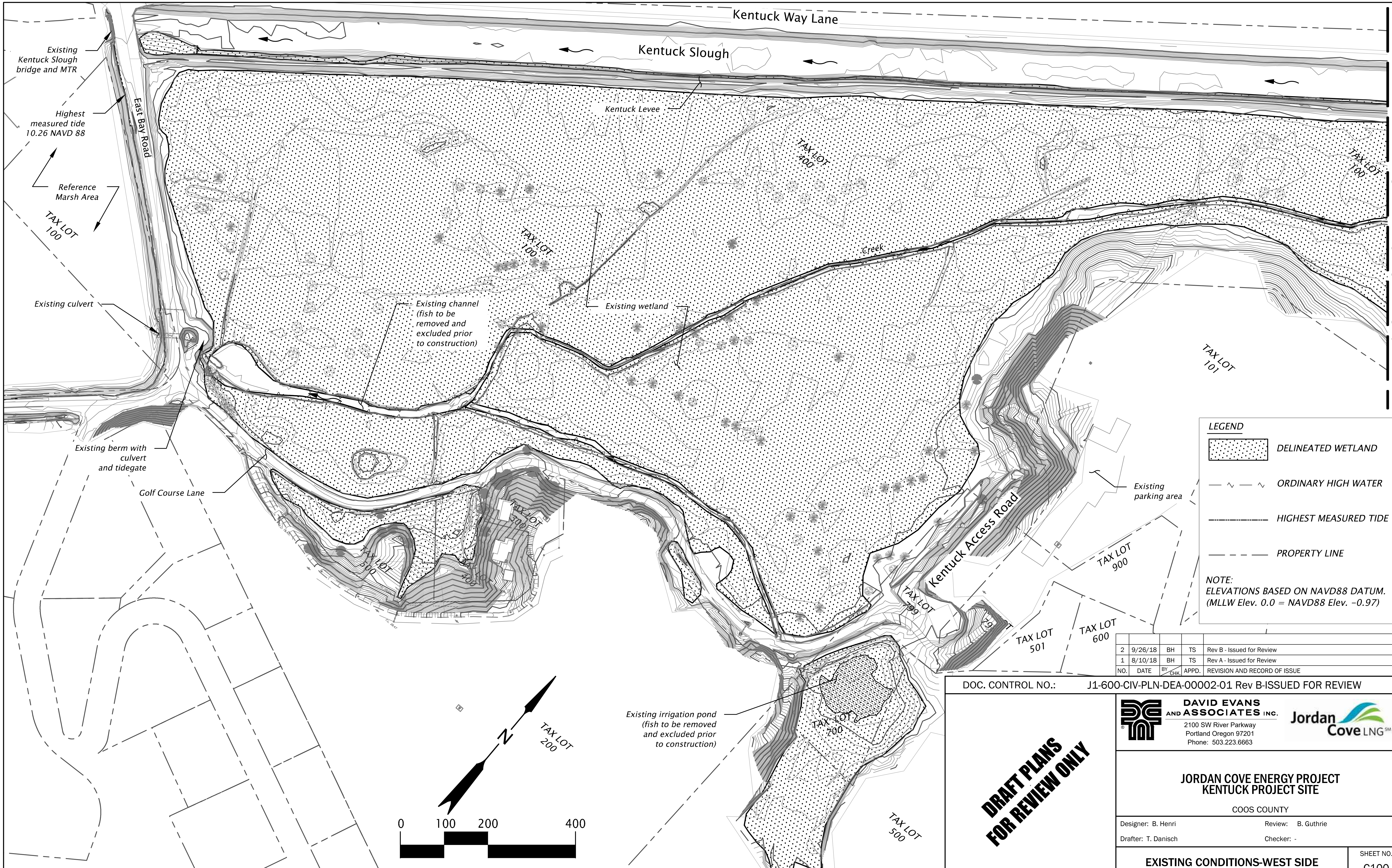
JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: B. Henri Review: B. Guthrie
Drafter: T. Danisch Checker: -

ESCP LEGEND & DETAILS LIST

SHEET NO. C003



LEGEND

- DELINEATED WETLAND
- ORDINARY HIGH WATER
- HIGHEST MEASURED TIDE
- PROPERTY LINE

NOTE:
ELEVATIONS BASED ON NAVD88 DATUM.
(MLLW Elev. 0.0 = NAVD88 Elev. −0.97)

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EXISTING CONDITIONS-WEST SIDE

SHEET NO. C100

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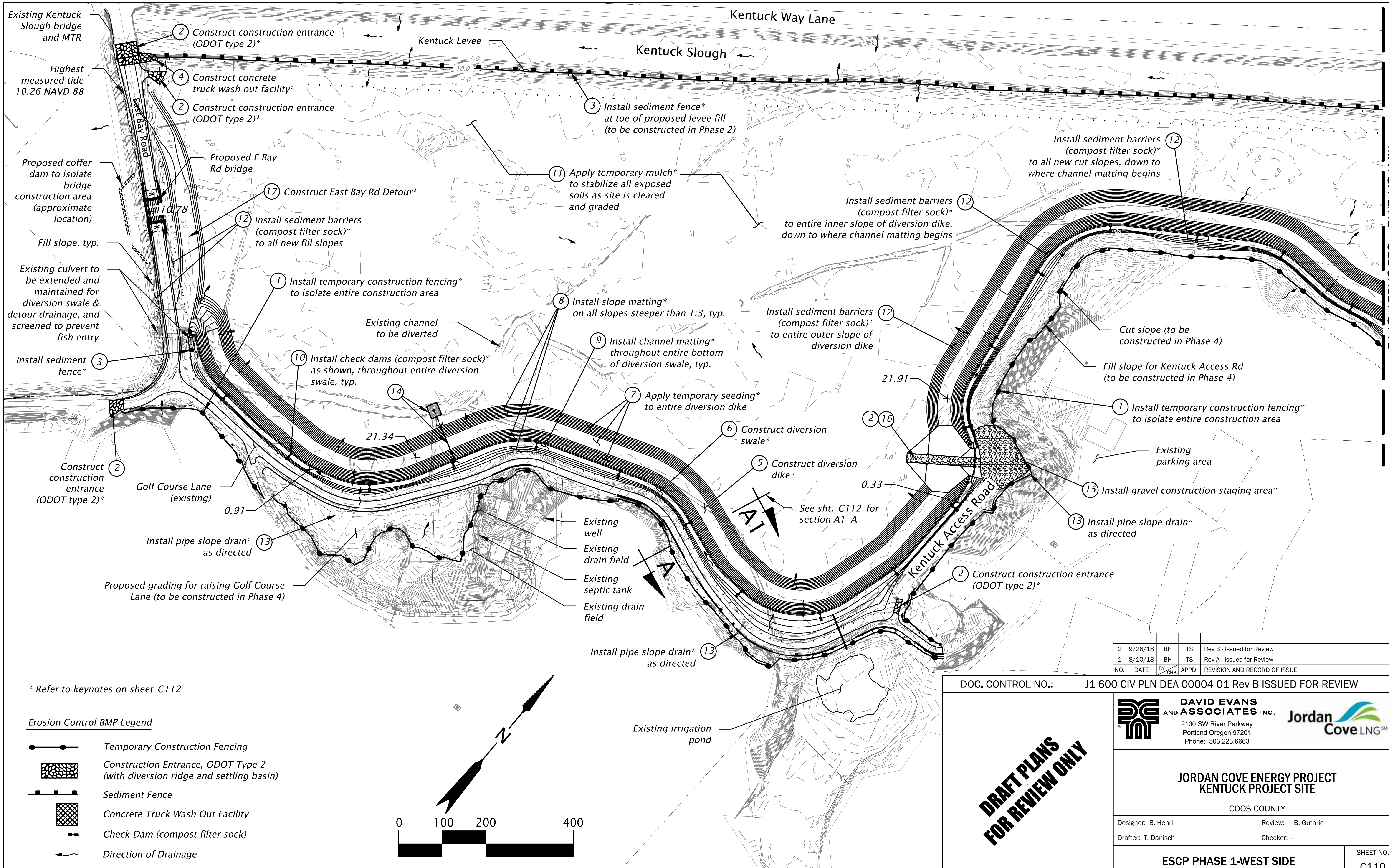
EXISTING CONDITIONS-EAST SIDE — SHEET NO. C101

C:\pw_work\dea\kelley Roper\dms04977\C100_KPS_EX01 10/1/2018 2:15 PM Kelly Roper


Existing Kentuck Slough bridge and MTR
Highest measured tide 10.26 NAVD 88
Kentuck Way Lane
Kentuck Levee
Kentuck Slough
2 Construct construction entrance (ODOT type 2)*
4 Construct concrete truck wash out facility*
2 Construct construction entrance (ODOT type 2)*
3 Install sediment fence* at toe of proposed levee fill (to be constructed in Phase 2)
East Bay Road
Proposed E Bay Rd bridge
Proposed coffer dam to isolate bridge construction area (approximate location)
17 Construct East Bay Rd Detour*
11 Apply temporary mulch* to stabilize all exposed soils as site is cleared and graded
12 Install sediment barriers (compost filter sock)* to all new cut slopes, down to where channel matting begins
12 Install sediment barriers (compost filter sock)* to entire inner slope of diversion dike, down to where channel matting begins
12 Install sediment barriers (compost filter sock)* to all new fill slopes
Fill slope, typ.
10.78
Existing culvert to be extended and maintained for diversion swale & detour drainage, and screened to prevent fish entry
1 Install temporary construction fencing* to isolate entire construction area
8 Install slope matting* on all slopes steeper than 1:3, typ.
12 Install sediment barriers (compost filter sock)* to entire outer slope of diversion dike
Existing channel to be diverted
9 Install channel matting* throughout entire bottom of diversion swale, typ.
Install sediment fence* 3
10 Install check dams (compost filter sock)* as shown, throughout entire diversion swale, typ.
Cut slope (to be constructed in Phase 4)
Fill slope for Kentuck Access Rd (to be constructed in Phase 4)
21.91
14
7 Apply temporary seeding* to entire diversion dike
1 Install temporary construction fencing* to isolate entire construction area
21.34
2 16
6 Construct diversion swale*
Existing parking area
5 Construct diversion dike*
-0.33
15 Install gravel construction staging area*
Construct construction entrance (ODOT type 2)* 2
Golf Course Lane (existing)
-0.91
A1
See sht. C112 for section A1-A
13 Install pipe slope drain* as directed
Kentuck Access Road
Install pipe slope drain* as directed 13
Existing well
Existing drain field
A
Existing septic tank
Existing drain field
Proposed grading for raising Golf Course Lane (to be constructed in Phase 4)
2 Construct construction entrance (ODOT type 2)*
Install pipe slope drain* as directed 13
MATCH LINE – SEE SHEET C112
* Refer to keynotes on sheet C112
Erosion Control BMP Legend
Temporary Construction Fencing
Construction Entrance, ODOT Type 2 (with diversion ridge and settling basin)
Sediment Fence
Concrete Truck Wash Out Facility
Check Dam (compost filter sock)
Direction of Drainage
N
0 100 200 400
Existing irrigation pond
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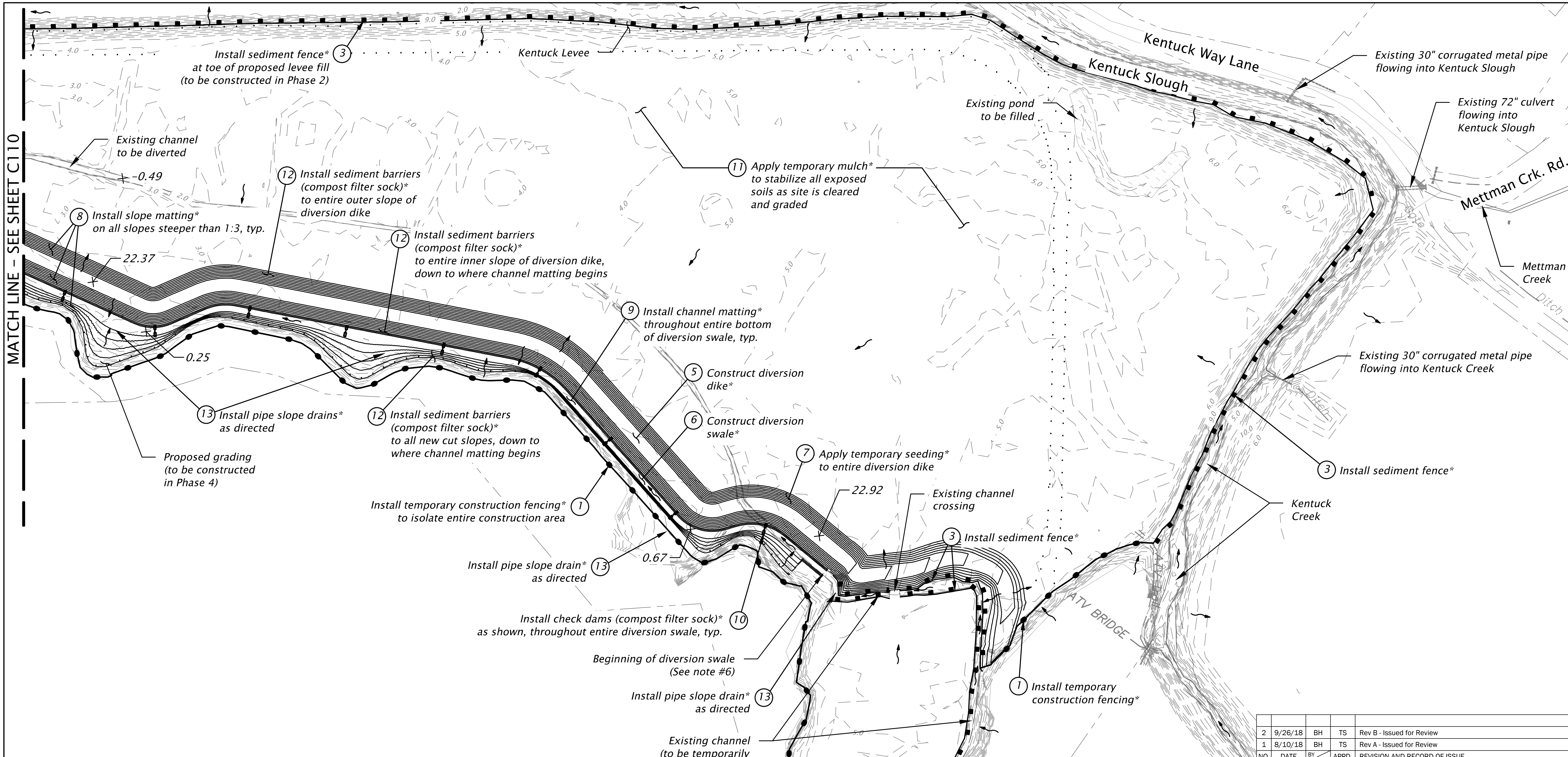
KENTUCK PROJECT SITE
COOS COUNTY
Designer: B. Henri
Review: B. Guthrie
Drafter: T. Danisch
Checker: -
ESCP PHASE 1-WEST SIDE
SHEET NO.
C110

ESCP - PHASE 1 - STRIPPING & TEMP GRADING OF SITE, CONSTRUCTION OF TEMP STREAM DIVERSION, CONSTRUCTION OF E BAY RD AND BRIDGE



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ESCP PHASE 1-EAST SIDE

SHEET NO. C111

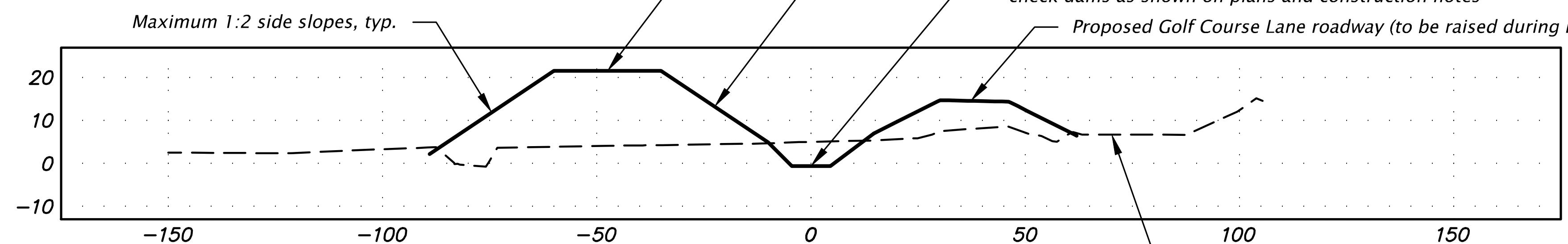
Phase 1 Construction Notes

1. *Install temporary construction fencing (See specifications section _____)*
2. *Construct construction entrance, ODOT type 2 (See ODOT drawing no. RD1000)*
3. *Install sediment fence, ODOT type 1 where site conditions permit trenching. Install ODOT type 2 where rock or tree roots prevent trenching. (See ODOT drawing no. RD1040) On existing Kentuck Levee, install sediment fence at toe of proposed fill to be constructed in Phase 2 (See section B1 – B, sht. C123)*
4. *Construct concrete truck wash out facility (See ODOT drawing no. RD1070)*
5. *Construct diversion dike as shown on plans (See CWS drawings no. 850 and typical section, sht.C102)*
6. *Construct diversion swale as shown on plans (See CWS drawings no. 850 and typical section, sht. C102)*
7. *Apply temporary seeding to entire diversion dike. Apply before installation of slope matting. (See specifications section _____)*
8. *Install slope matting on slopes steeper than 3:1, where shown (See ODOT drawing no. RD1055)*
9. *Install channel matting on diversion swale bottom, extending a minimum of 4' up channel sides (See ODOT drawing no. RD1055 and typical section, sht. ___)*
10. *Install check dam, compost filter sock, in diversion swale as shown on plans (200' on center, typ.) (See ODOT drawing no. RD1006)*
11. *Install temporary mulch to stabilize exposed soils as temp. grading progresses (See specs sections _____ and _____ for soil stabilization and mulching requirements)*
12. *Install sediment barrier (compost filter sock) parallel to contours. Place on slopes according to spacing table on ODOT drawing. (See ODOT drawing no. RD1032)*
13. *Install pipe slope drain as directed, to be field located where required during construction of temp. stream diversion (See CWS drawing no. 815)*
14. *Install temporary outfall structure (See C203)*
15. *Install gravel construction staging area*
16. *Access with gravel construction access*
17. *Construct East Bay Rd. Detour*

Note

Any BMPs shown outside the property or easement lines are for graphic clarity. All BMPs to be located within the project property or easements.

Note:
Diversion dike will be sized as needed to stockpile all topsoil on the site, for redistribution as planting media during finish grading. Dike shown on plans, and section below, is the anticipated maximum size.



SECTION A1 – A: TYPICAL SECTION AT PROPOSED DIVERSION DIKE AND SWALE

SCALE: 1" = 40'

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KENTUCK PROJECT SITE

COOS COUNTY

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Review: B. Guthrie
Drafter: T. Danisch
Checker: -

ESCP PHASE 1 NOTES & KEYNOTES

SHEET NO. C112

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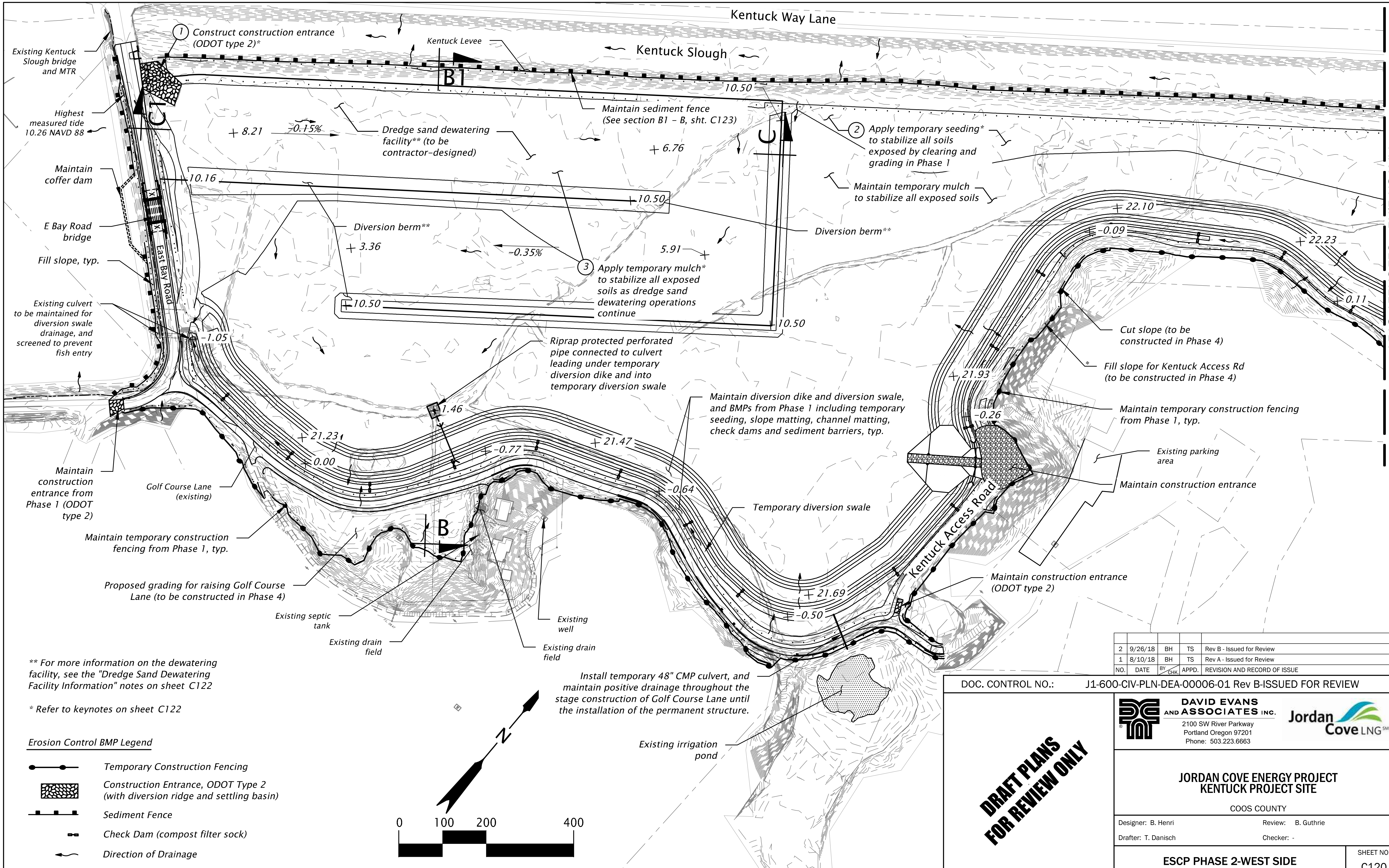

** For more information on the dewatering facility, see the "Dredge Sand Dewatering Facility Information" notes on sheet C122

* Refer to keynotes on sheet C122

Erosion Control BMP Legend

- Temporary Construction Fencing
- Construction Entrance, ODOT Type 2 (with diversion ridge and settling basin)
- Sediment Fence
- Check Dam (compost filter sock)
- Direction of Drainage

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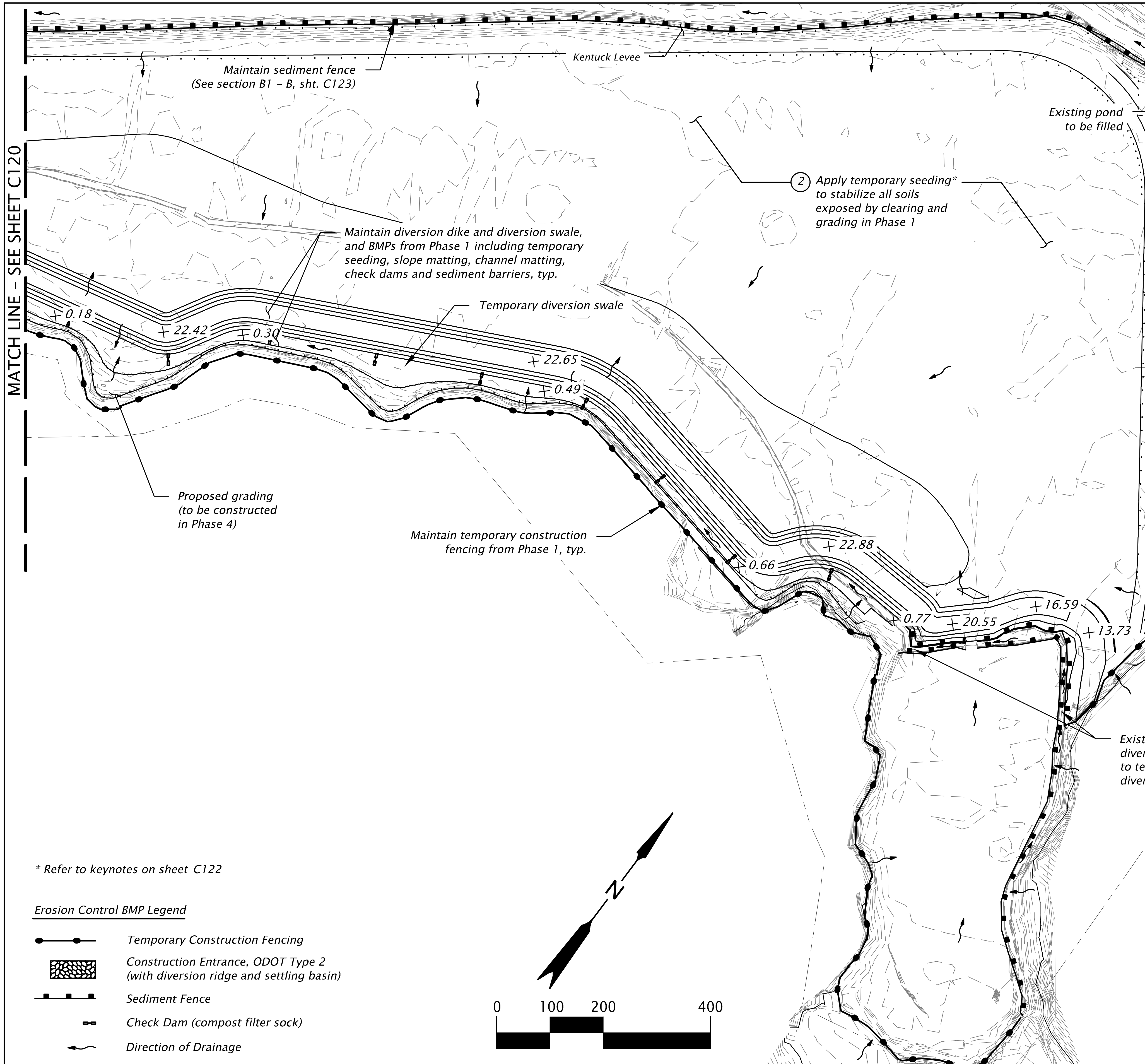
ESCP PHASE 2-WEST SIDE

SHEET NO. C120



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ESCP PHASE 2-EAST SIDE

SHEET NO. C121

Phase 2 Construction Notes

1. *Construct construction entrance, ODOT type 2 (See ODOT drawing no. RD1000)*
2. *Apply temporary seeding (See specifications section _____)*
3. *Install temporary mulch to stabilize exposed soils as temp. grading progresses (See specs sections _____ and _____ for soil stabilization and mulching requirements)*

Note

Any BMPs shown outside the property or easement lines are for graphic clarity. All BMPs to be located within the project property or easements.

Dredge Sand Dewatering Facility information:

The dewatering facility will be constructed to dewater dredge sand material, which will be used on site for mass grading. The facility is designed with impermeable diversion berms and swales, graded to direct runoff out of the complex.

Dredge sand material will be delivered to the project site via temporary pipeline, anticipated to cross through the intersection of East Bay Road and the Kentuck Levee. Saturated dredge sand material will be placed within the dewatering facility in lifts.

Fully dewatered material will be excavated from the dewatering complex, and deposited throughout the Kentuck site via access along the existing Kentuck Levee. The dewatered dredge sand material will be used in mass grading as it becomes available, to be followed by stockpiled topsoil which will be layered above it for mitigation planting.

Runoff from the dewatering facility will be treated as it leaves the facility, travelling through a temporary sedimentation swale and into a riprap protected perforated pipe. The pipe will be installed to penetrate the temporary diversion berm which was constructed for temporary stream diversion. Through this pipe, runoff will be conveyed out of the complex and into the temporary stream diversion swale, where the runoff will travel through several check dams before leaving the site through the existing culvert at the southwest corner of the site.

The dredge sand dewatering facility, as shown on sheet C120, is conceptual and is shown for illustrative purposes. The dewatering complex will be placed and constructed according to contractor means and methods, and may be relocated within the site to accommodate construction sequencing. Runoff and sediment control BMPs must be effectively applied, ensuring that facility runoff is free of sediment before leaving the project site.

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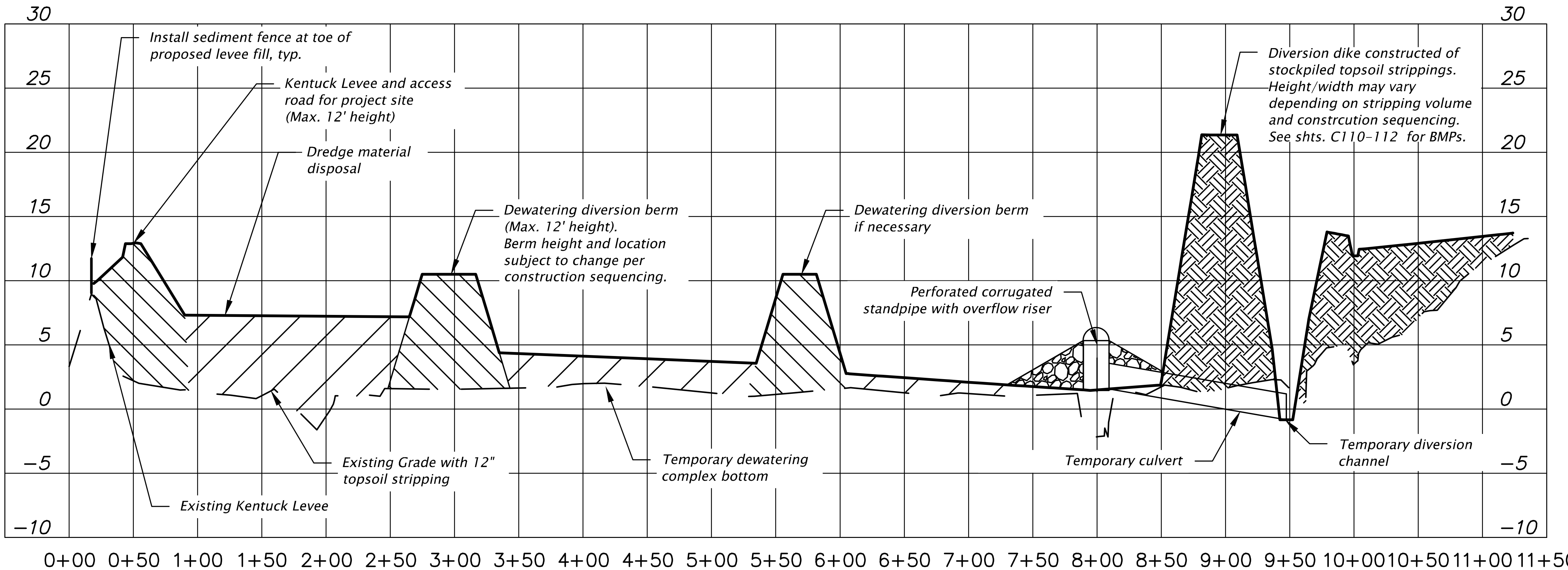
ESCP PHASE 2 NOTES & KEYNOTES

SHEET NO. C122



SECTION B1 – B: DIVERSION COMPLEX SECTION

SCALE: HORIZONTAL 1" = 100', VERTICAL 1"=10'

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ESCP PHASE 2 PROFILES

SHEET NO. C123

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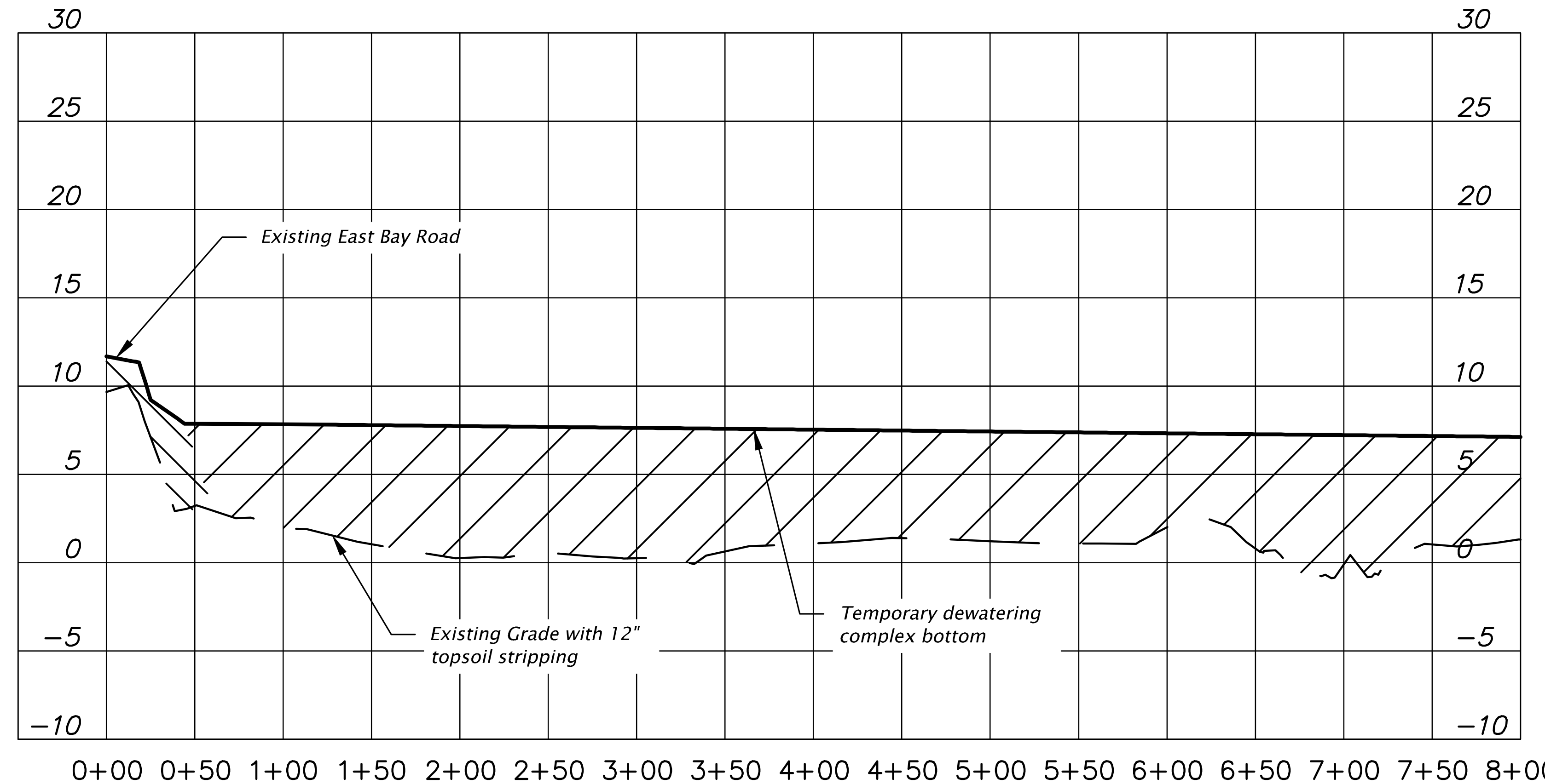
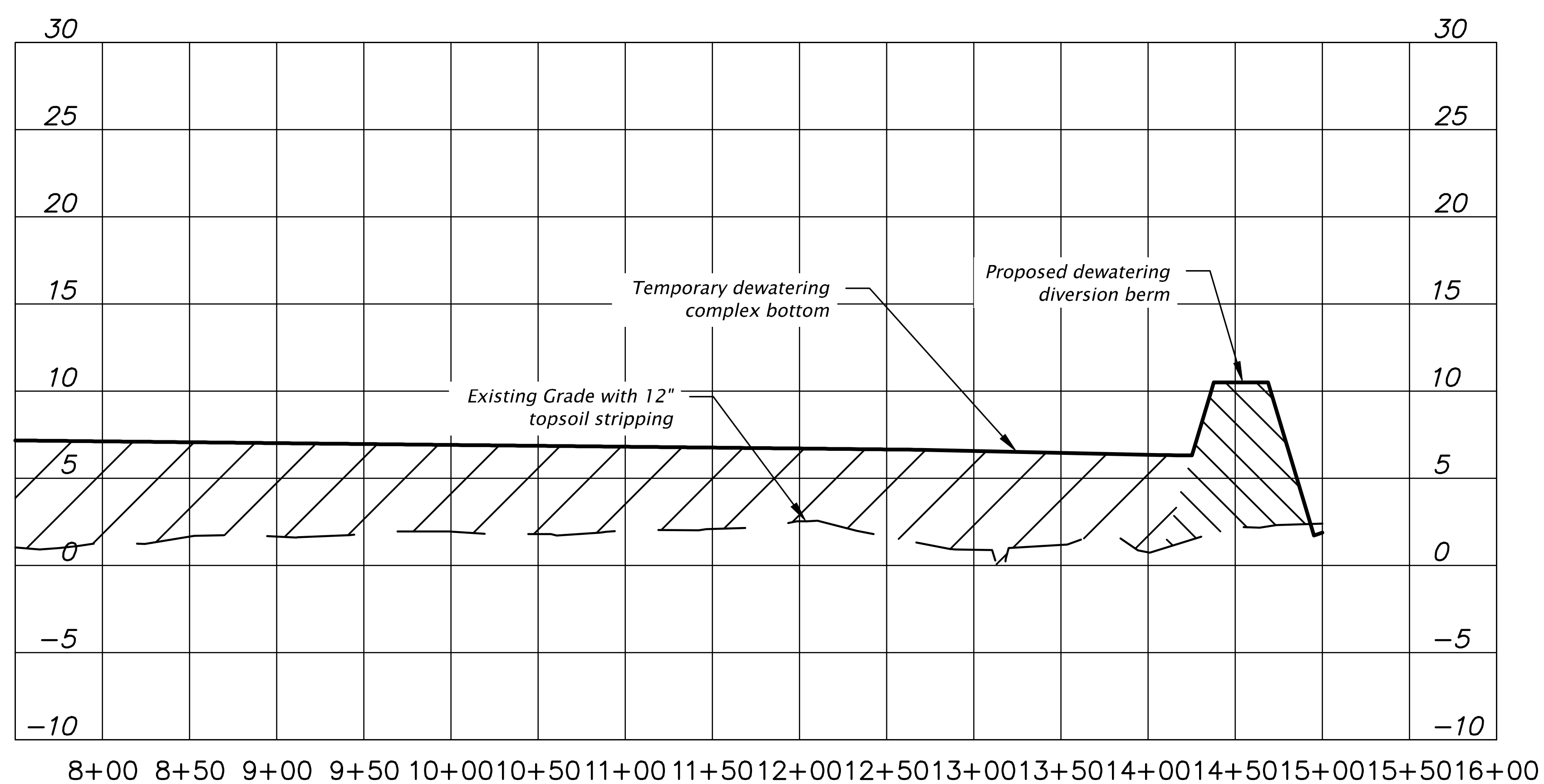


SECTION C1 – C: DIVERSION COMPLEX PROFILE 1

SCALE: HORIZONTAL 1" = 100', VERTICAL 1"=10'



SECTION C1 – C: DIVERSION COMPLEX PROFILE 2

SCALE: HORIZONTAL 1" = 100', VERTICAL 1"=10'

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ESCP PHASE 2 PROFILES

SHEET NO. C124

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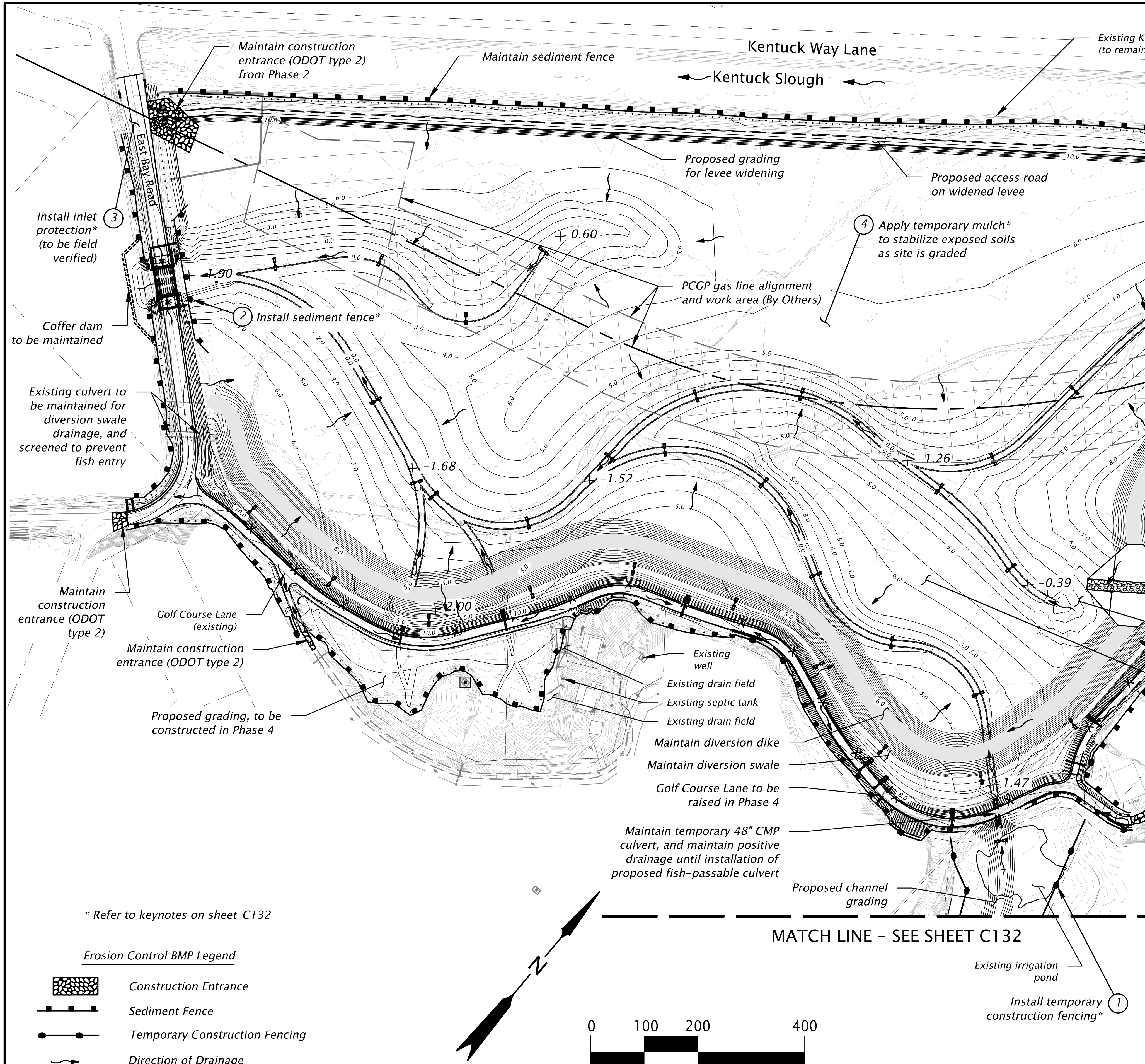

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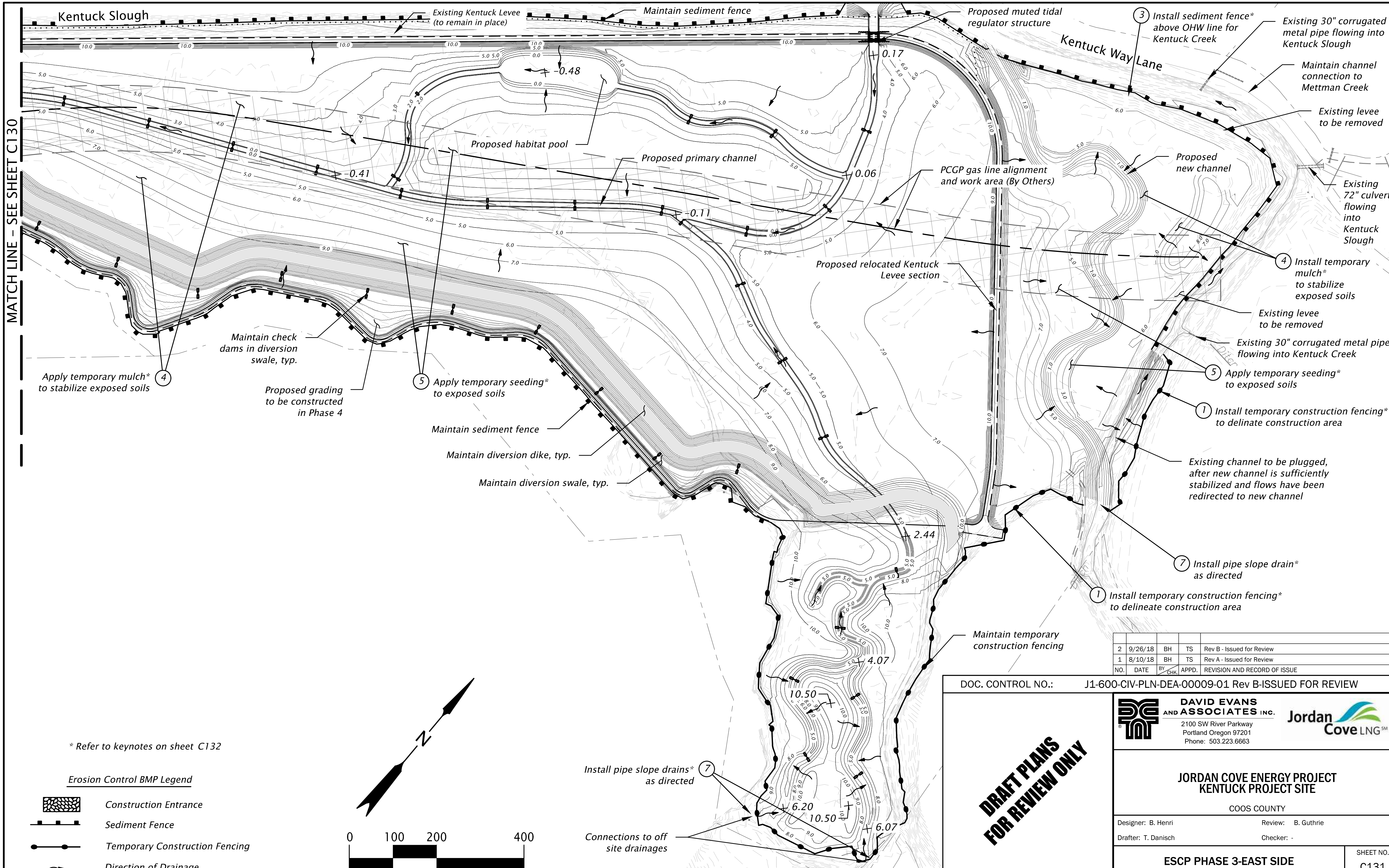
ESCP PHASE 3-WEST SIDE

SHEET NO. C130



* Refer to keynotes on sheet C132

Erosion Control BMP Legend

- Construction Entrance
- Sediment Fence
- Temporary Construction Fencing
- Direction of Drainage

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Drafter: T. Danisch
Checker: -

ESCP PHASE 3-EAST SIDE

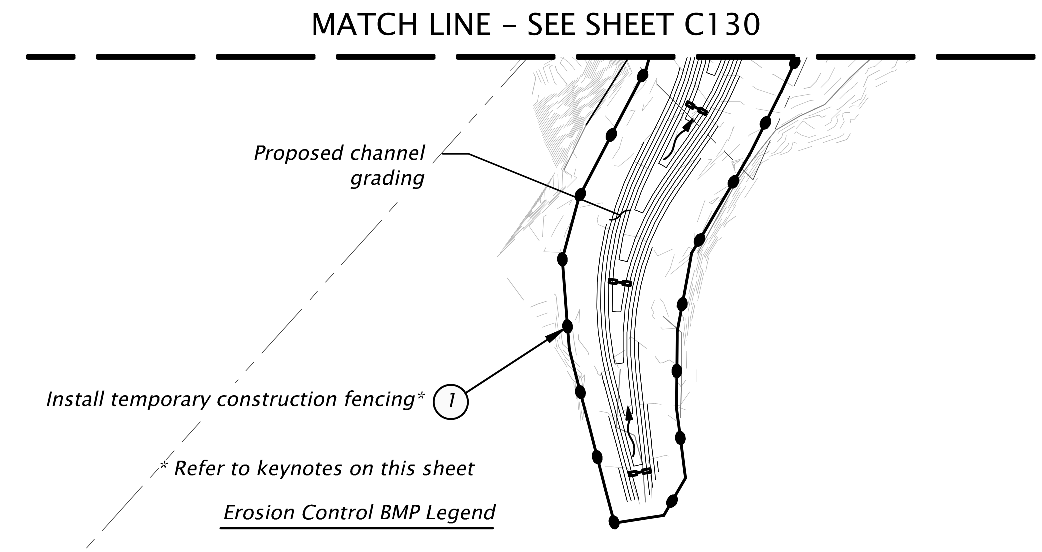
SHEET NO. C131

Phase 3 Construction Notes

1. *Install temporary construction fencing (See specifications section _____)*
2. *Install sediment fence (See ODOT drawing no. RD1040)*
3. *Install sediment barrier, ODOT type 1, where site conditions permit trenching. install ODOT type 2 where rock or tree roots prevent trenching. (See ODOT drawing no. RD1032)*
4. *Apply temporary mulch to stabilize exposed soils as needed, while final grading progresses (See specs sections _____ and _____ for soil stabilization and mulching requirements)*
5. *Apply temporary seeding to exposed soils as needed, while final grading progresses (See specs sections _____ and _____ for soil stabilization and seeding requirements)*
6. *Install sediment barrier (compost filter sock) parallel to contours. Place on scopes according to spacing table on ODOT drawing. (See ODOT drawing no. RD1032)*
7. *Install pipe slope drain as directed, to be field located where required during Phase 3 grading to prevent off site drainages from entering unstabilized construction areas (See CWS drawing no. 815)*

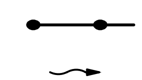
Note

Any BMPs shown outside the property or easement lines are for graphic clarity. All BMPs to be located within the project property or easements.



** Refer to keynotes on this sheet*

Erosion Control BMP Legend



Temporary Construction Fencing

Direction of Drainage

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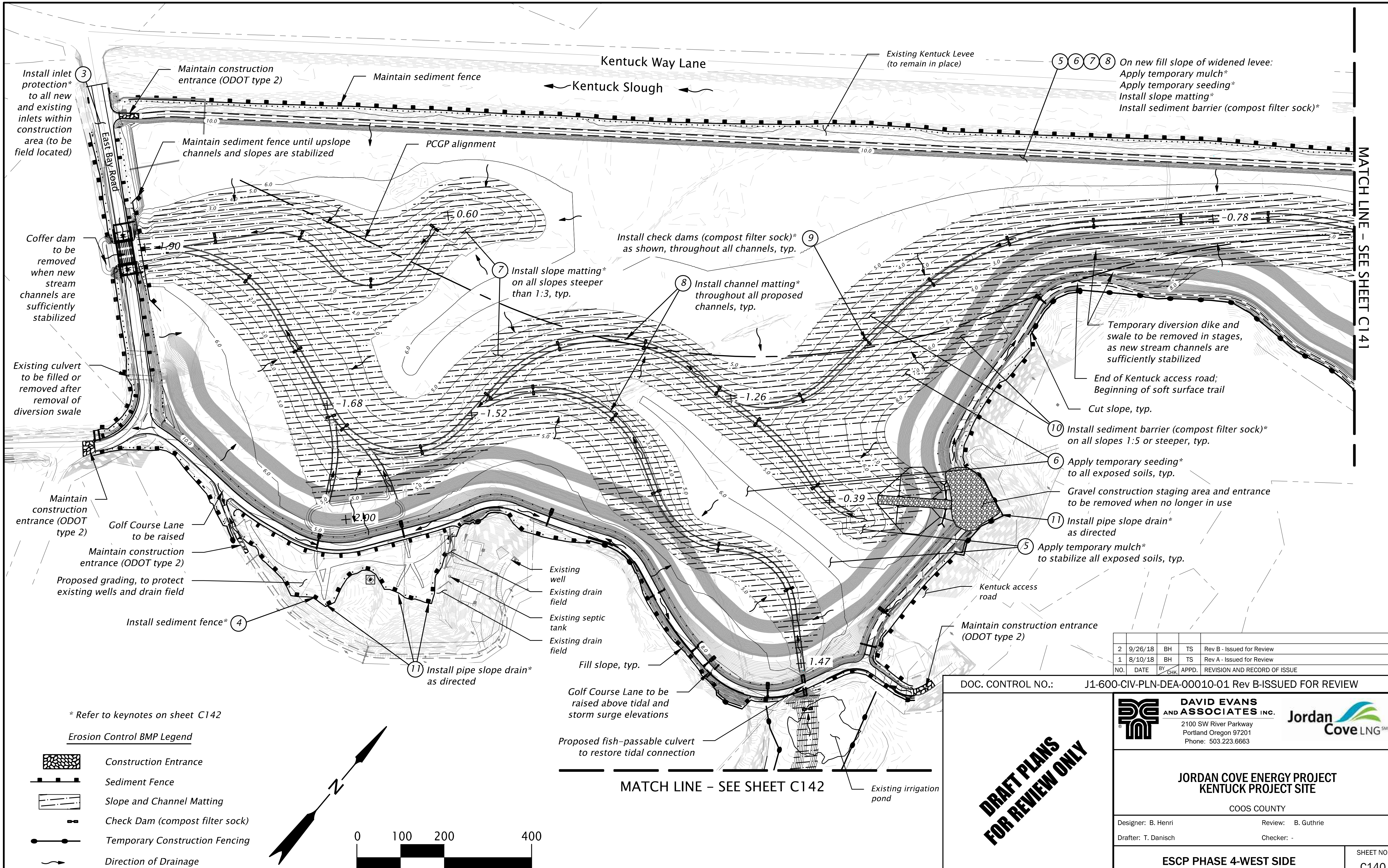
ESCP PHASE 3 NOTES & KEYNOTES

SHEET NO. C132



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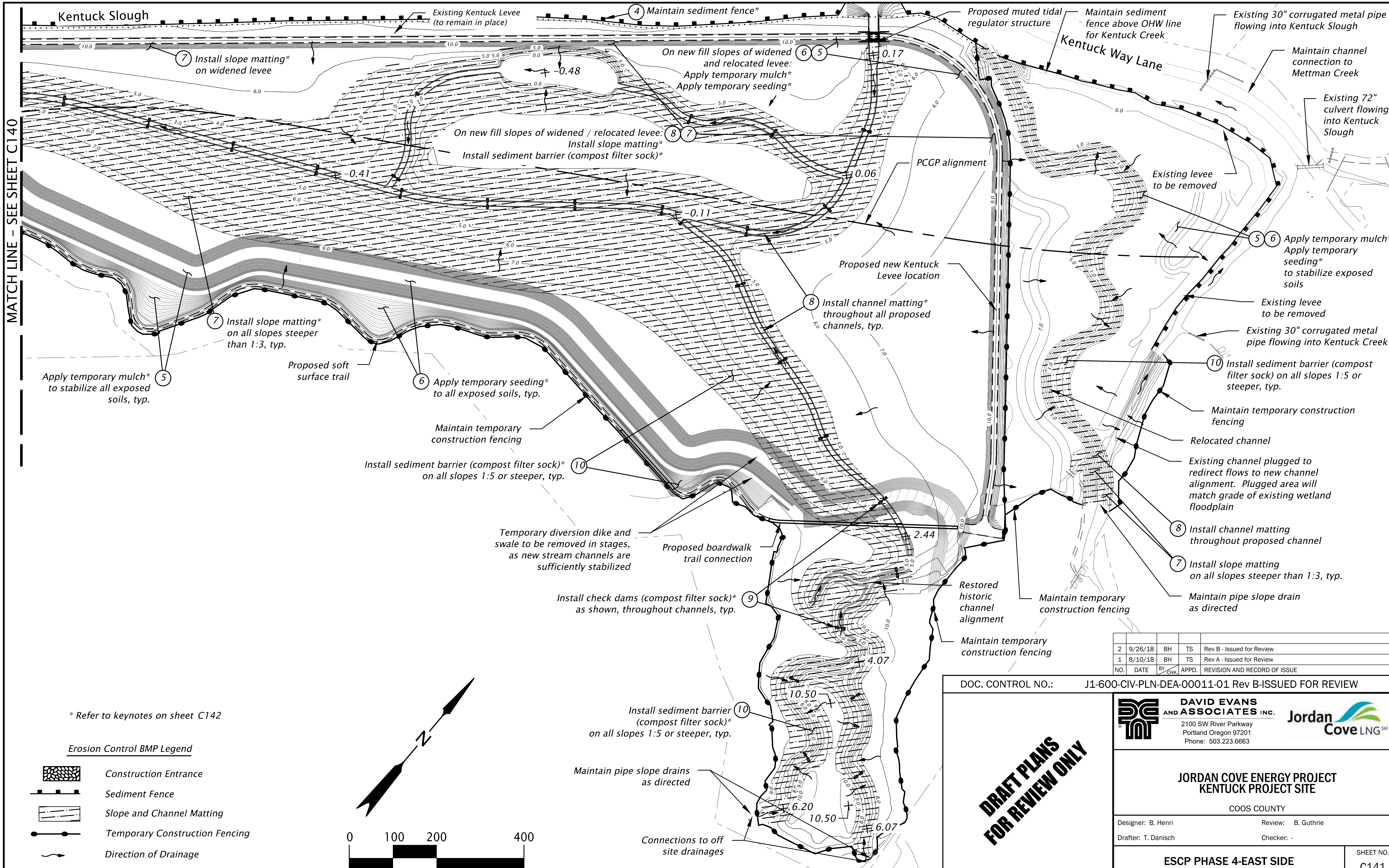
ESCP PHASE 4-WEST SIDE

SHEET NO. C140



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ESCP PHASE 4-EAST SIDE

SHEET NO. C141

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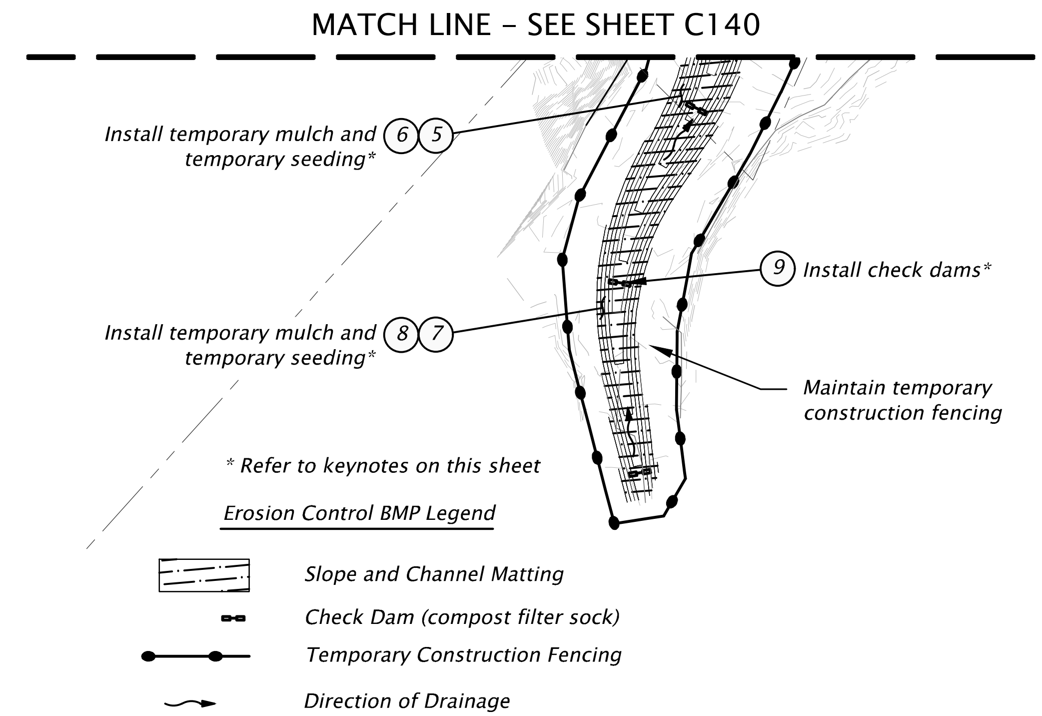
Phase 4 Construction Notes

1. *Install temporary construction fencing (See specifications section _____)*
2. *Construct construction entrance, ODOT type 2 (See ODOT drawing no. RD1000)*
3. *Install sediment fence (See ODOT drawing no. RD1040)*
4. *Install sediment barrier, ODOT type 1, where site conditions permit trenching. install ODOT type 2 where rock or tree roots prevent trenching. (See ODOT drawing no. RD1032)*
5. *Apply temporary mulch to stabilize exposed soils as final grading progresses (See specs sections _____ and _____ for soil stabilization and mulching requirements)*
6. *Apply temporary seeding to exposed soils. Apply after installation of temporary mulch, and before installation of slope or channel matting, as applicable. (See specifications section _____)*
7. *Install slope matting on slopes steeper than 3:1, where shown. (See ODOT drawing no. RD1055)*
8. *Install channel matting on channel bottom extending a minimum of 4' up channel sides (See ODOT drawing no. RD1055 and typical section, sheet ___)*
9. *Install check dam, compost filter sock, as shown on plans (200' on center, typ.) (See ODOT drawing no. RD1006)*
10. *Install sediment barrier (compost filter sock) parallel to contours. Place on scopes according to spacing table on ODOT drawing. (See ODOT drawing no. RD1032)*
11. *Install pipe slope drain as directed, to be field located where required during Phase 4 grading and removal of temp. stream diversion (See CWS drawing no. 815)*

Note

Any BMPs shown outside the property or easement lines are for graphic clarity. All BMPs to be located within the project property or easements.



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Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

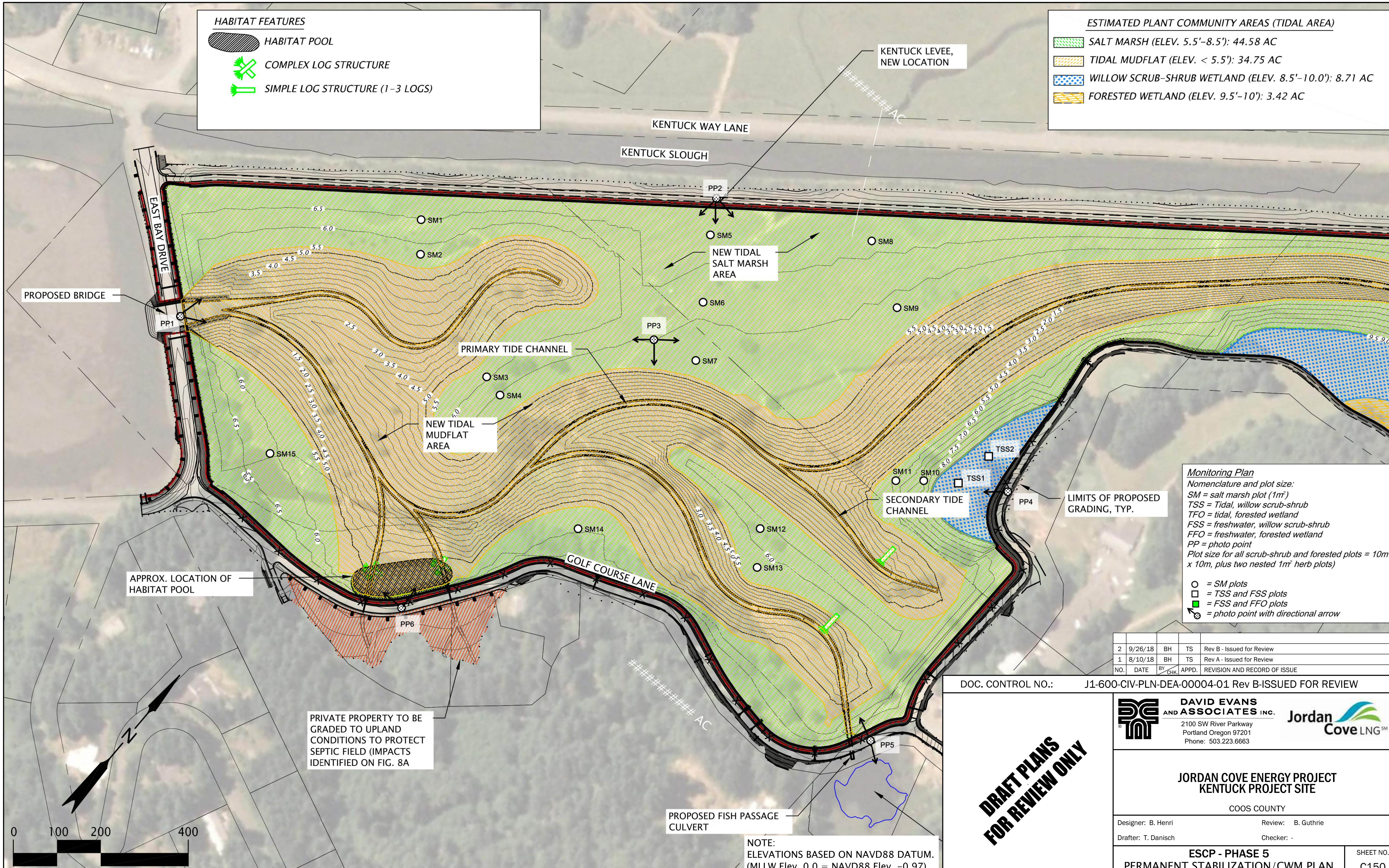
COOS COUNTY

Designer: B. Henri | Review: B. Guthrie
Drafter: T. Danisch | Checker: -

ESCP PHASE 4 NOTES & KEYNOTES

SHEET NO. C142

ESCP - PHASE 5 - PERMANENT STABILIZATION AND COMPENSATORY WETLAND MITIGATION PLAN



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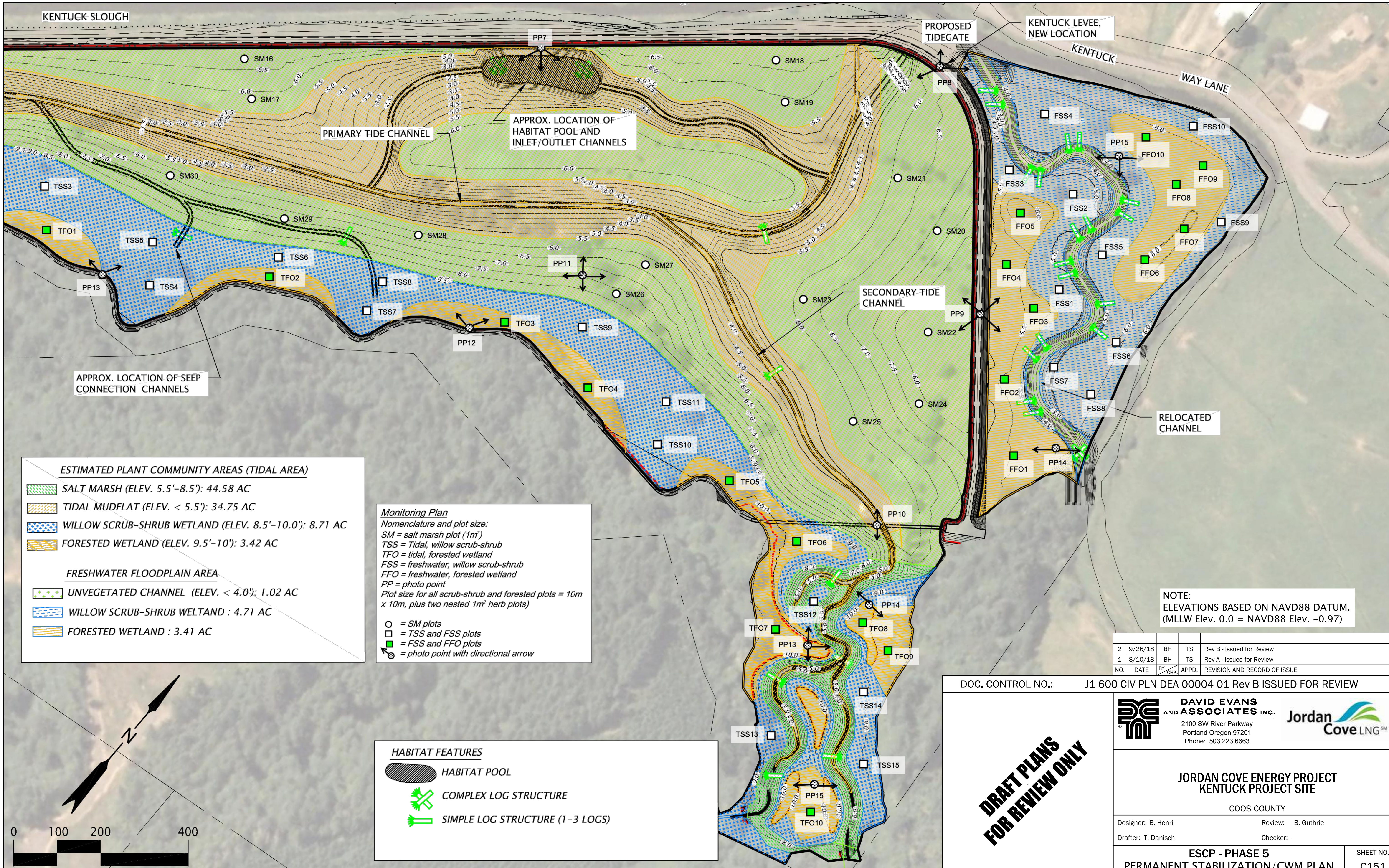
ESCP - PHASE 5 - PERMANENT STABILIZATION AND COMPENSATORY WETLAND MITIGATION PLAN



ESTIMATED PLANT COMMUNITY AREAS (TIDAL AREA)

- *SALT MARSH (ELEV. 5.5'–8.5'): 44.58 AC*
- *TIDAL MUDFLAT (ELEV. < 5.5'): 34.75 AC*
- *WILLOW SCRUB–SHRUB WETLAND (ELEV. 8.5'–10.0'): 8.71 AC*
- *FORESTED WETLAND (ELEV. 9.5'–10'): 3.42 AC*

FRESHWATER FLOODPLAIN AREA

- *UNVEGETATED CHANNEL (ELEV. < 4.0'): 1.02 AC*
- *WILLOW SCRUB–SHRUB WELTAND : 4.71 AC*
- *FORESTED WETLAND : 3.41 AC*

Monitoring Plan

Nomenclature and plot size:
SM = salt marsh plot (1m²)
TSS = Tidal, willow scrub-shrub
TFO = tidal, forested wetland
FSS = freshwater, willow scrub-shrub
FFO = freshwater, forested wetland
PP = photo point
Plot size for all scrub-shrub and forested plots = 10m x 10m, plus two nested 1m² herb plots)

○ = SM plots
□ = TSS and FSS plots
■ = FSS and FFO plots
= photo point with directional arrow

HABITAT FEATURES

- *HABITAT POOL*
- *COMPLEX LOG STRUCTURE*
- *SIMPLE LOG STRUCTURE (1–3 LOGS)*

NOTE:
ELEVATIONS BASED ON NAVD88 DATUM.
(MLLW Elev. 0.0 = NAVD88 Elev. –0.97)

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Jordan Cove LNG

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KENTUCK PROJECT SITE

COOS COUNTY

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Drafter: T. Danisch Checker: -

ESCP - PHASE 5
PERMANENT STABILIZATION/CWM PLAN

SHEET NO. C151

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Kentuck Site Proposed Planting List

-species subject to change per design refinements and availability

Kentuck Site (Salt Marsh- Plantings and Estimated Volunteer Recruitment)				
Deschampsia cespitosa	*Tufted hairgrass*	*FACW*		
Hordeum brachyantherum	*Meadow barley*	*FACW*		
Carex lyngbei	*Lyngby's sedge*	*OBL*		
Grindelia integrifolia	*Gumweed*	*FACW*		
Argentina egedii	*Pacific silverweed*	*OBL*		
Distichlis spicata	*Saltgrass*	*FACW*		
Scirpus americanus	*American threesquare*	*OBL*		
Salicornia virginica	*Pickleweed*	*OBL*		
Schoenoplectus pungens	*Common threesquare*	*OBL*		
Kentuck Site (Freshwater Wetland Plantings)			**Forest Community**	**Willow Scrub-Shrub**
Alnus rubra	*Red alder*	*FAC*	*X*	
Picea sitchensis	*Sitka spruce*	*FAC*	*X*	*X (low density)*
Myrica californica	*California wax myrtle*	*FACW*	*X*	*X*
Malus fusca	*Oregon crab apple*	*FACW*	*X*	
Salix hookeriana	*Hooker's willow*	*FACW*	*X*	*X (high density)*
Lonicera involucrata	*twinberry*	*FAC*	*X*	*X*
Spiraea douglasii	*Douglas spirea*	*FACW*	*X*	*X*
Rubus spectabilis	*salmon berry*	*FAC*	*X*	
Carex obnupta	*slough sedge*	*OBL*	*X*	*X*
Juncus ensifolius	*daggerleaf rush*	*FACW*	*X*	*X*
Scirpus microcarpus	*small-fruited bulrush*	*OBL*	*X*	
Argentina egedii	*Pacific silverweed*	*OBL*	*X*	*X*
Distichlis spicata	*Salt grass*	*FACW*	*X*	*X*
Hordeum brachyantherum	*Meadow barley*	*FACW*	*X*	*X*
Deschampsia caespitosa	*tufted hairgrass*	*FACW*	*X*	*X*

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COOS COUNTY

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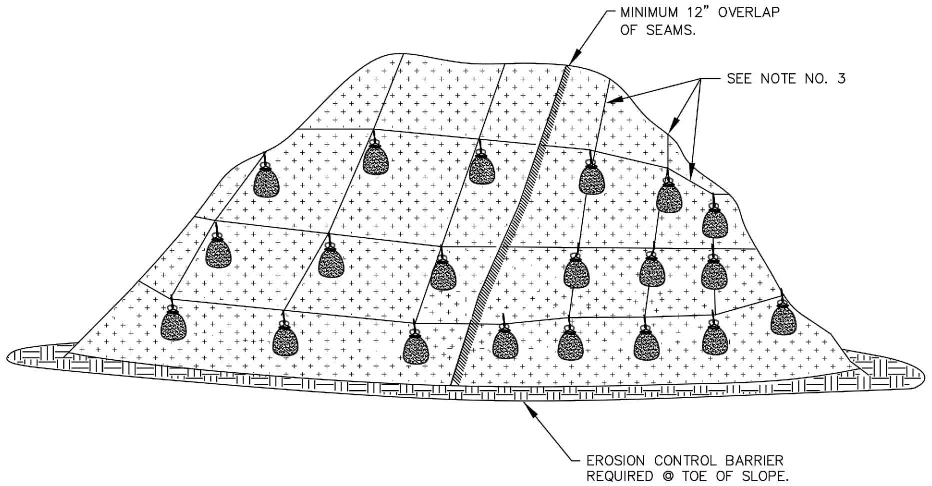
Drafter: T. Danisch   Checker: -

ESCP - PHASE 5
PERMANENT STABILIZATION/CWM PLAN

SHEET NO. C152

FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.



PLASTIC SHEETING

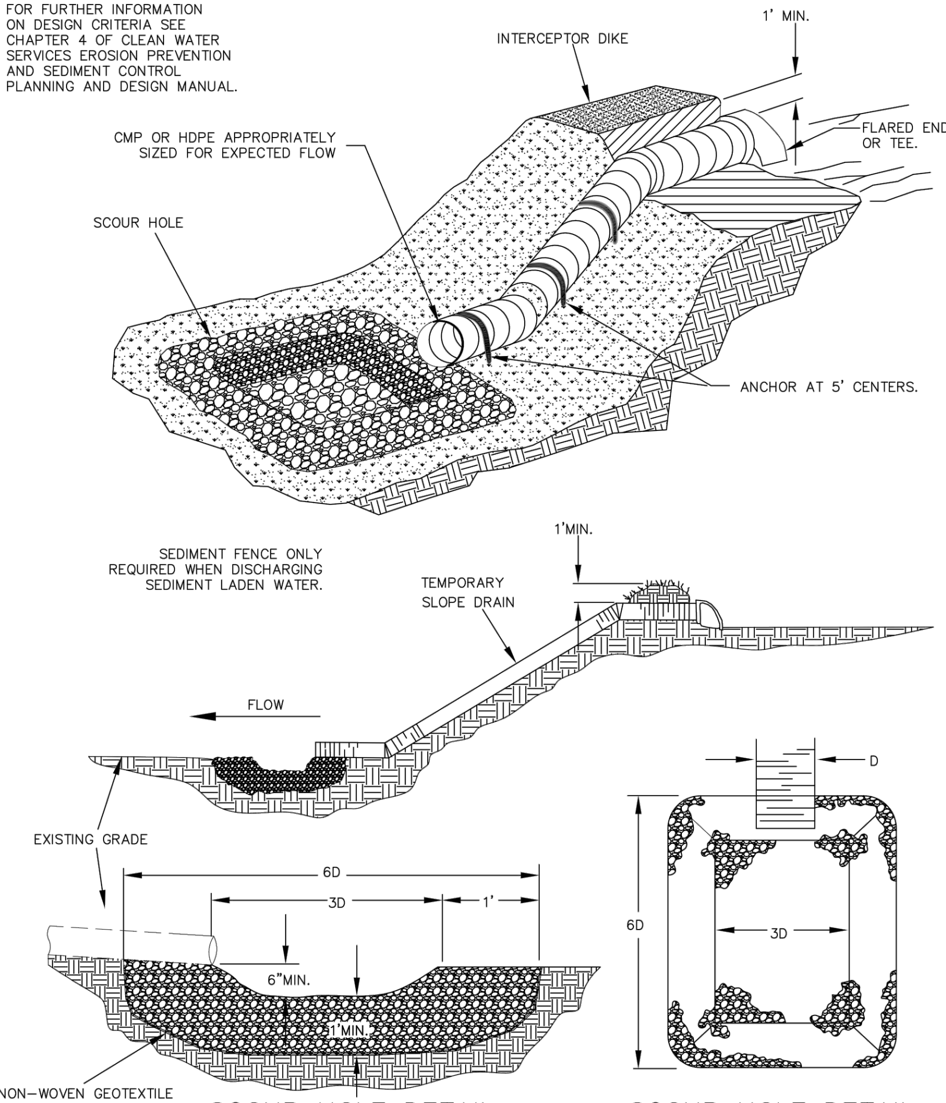
NOTES:

1. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
2. BARRIER REQUIRED @ TOE OF STOCK PILE.
3. COVERING MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR APPROVED EQUAL ON ROPES WITH A MAXIMUM 10' GRID SPACING IN ALL DIRECTIONS.
4. PLASTIC TO EXTEND MINIMUM 1' BEYOND TOE OF SLOPE

PLASTIC SHEETING | CleanWater Services

DRAWING NO. 810 REVISED 12-16

FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.



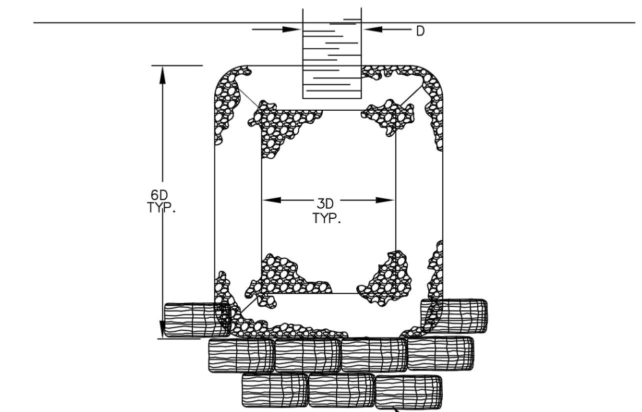
SCOUR HOLE DETAIL FRONT VIEW

SCOUR HOLE DETAIL TOP VIEW

PIPE SLOPE DRAIN | CleanWater Services

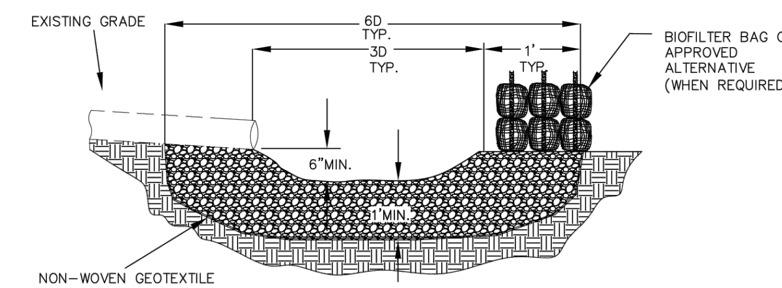
DRAWING NO. 815 REVISED 12-16

FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.



PLAN VIEW

NTS



PROFILE

NOTES:

1. BIO BAGS ONLY REQUIRED WHEN DISCHARGING SEDIMENT LADEN WATER.
2. STAKING OF BAGS REQUIRED WITH EITHER METHOD USING (2) 1"x 2" WOOD STAKES OR APPROVED EQUAL PER BAG.

OUTLET PROTECTION RIP RAP | CleanWater Services

DRAWING NO. 820 REVISED 12-16

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COOS COUNTY

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Drafter: T. Danisch Checker: -

EROSION CONTROL DETAILS

SHEET NO. C700

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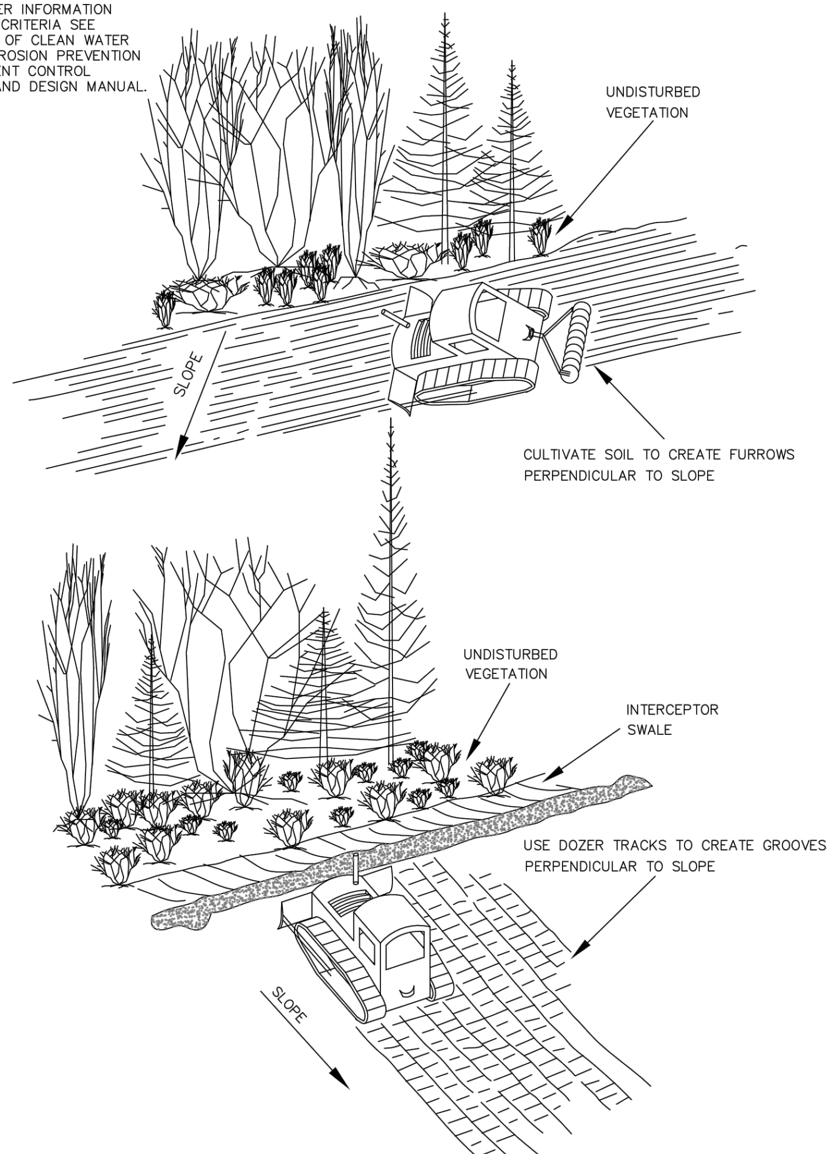
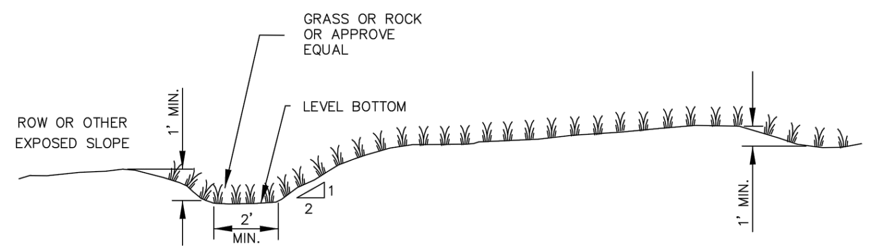


SURFACE ROUGHENING CAT TRACKING

DRAWING NO. 830 REVISED 12-16

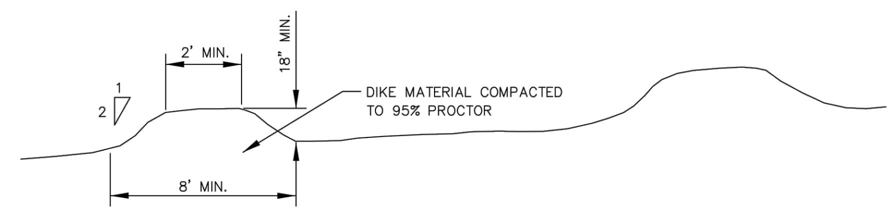
CleanWater Services

FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.



BOTTOM WIDTH	2 FEET MINIMUM; THE BOTTOM WIDTH SHALL BE LEVEL
DEPTH	1 FOOT MINIMUM
SIDE SLOPE	2H:1V OR FLATTER
GRADE	MAXIMUM 5 PERCENT, WITH POSITIVE DRAINAGE TO A SUITABLE OUTLET (SUCH AS SEDIMENTATION POND)

DIVERSION SWALE



TEMPORARY DIVERSION DIKE

SLOPE	SPACING
<5%	300 FEET
5-10%	200 FEET
10-40%	100 FEET

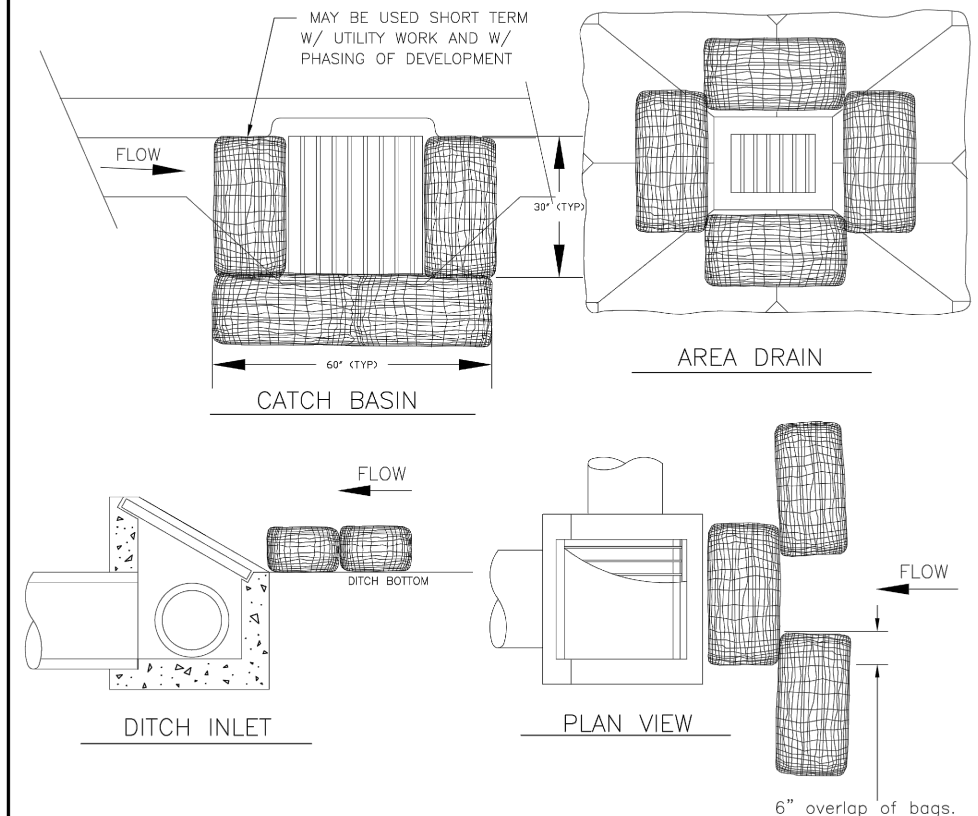
NOTES:

1. IMMEDIATELY UPON CONSTRUCTION, ESTABLISHED VEGETATION OR EROSION CONTROL BLANKETS ARE REQUIRED.

DIVERSION DIKE / SWALE

DRAWING NO. 850 REVISED 12-16

CleanWater Services



NOTES:

1. ADDITIONAL MEASURES MUST BE CONSIDERED DEPENDING ON SOIL TYPES.
2. BIO-FILTER BAGS SHOULD BE STAKED WHERE APPLICABLE USING (2) 1"x2" WOODEN STAKES OR APPROVED EQUAL PER BAG.
3. WHEN USING 30" BIO-BAGS TO PROTECT A CATCH BASIN YOU MUST HAVE 4 BAGS AND THEY SHALL BE OVERLAPPED BY 6".

FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.

INLET PROTECTION TYPE 4

DRAWING NO. 915 REVISED 12-16

CleanWater Services

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EROSION CONTROL DETAILS

SHEET NO. C701

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FOR FURTHER INFORMATION ON DESIGN CRITERIA SEE CHAPTER 4 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.

SPACING FOR CHECK DAMS

DITCH GRADE	6 INCH	12 INCH	18 INCH
6%	NOT ALLOWED	16 FT O.C.	26 FT O.C.
5%	NOT ALLOWED	20 FT	30 FT
4%	NOT ALLOWED	26 FT	40 FT
3%	15 FT	33 FT	50 FT
2%	25 FT	50 FT	80 FT

BARRIER SPACING FOR GENERAL APPLICATION

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS

% SLOPE	SLOPE	MAXIMUM SPACING ON SLOPE
10% OR FLATTER	10:1 OR FLATTER	300 FT
>10% OR <15%	>10:1 OR <7.5:1	150 FT
>15% OR <20%	>7.5:1 OR <5:1	100 FT
>20% OR <30%	>5:1 OR <3.5:1	50 FT
>30% OR <50%	>3.5:1 OR <2:1	25 FT

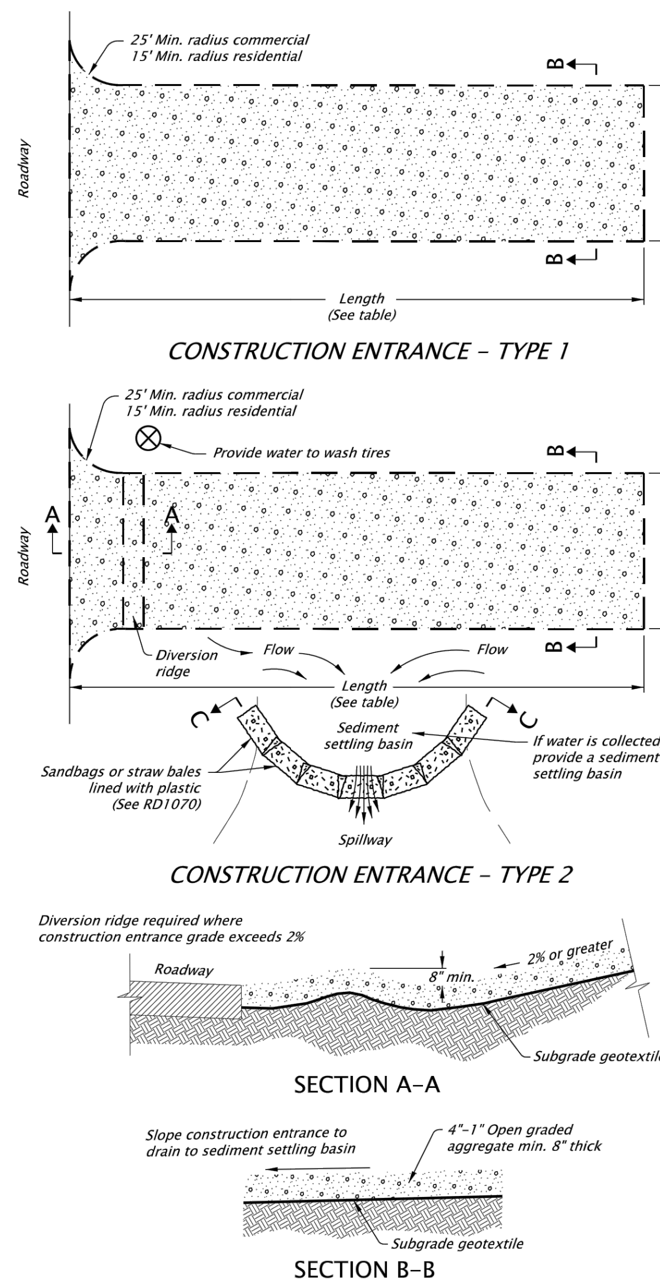
NOTES:

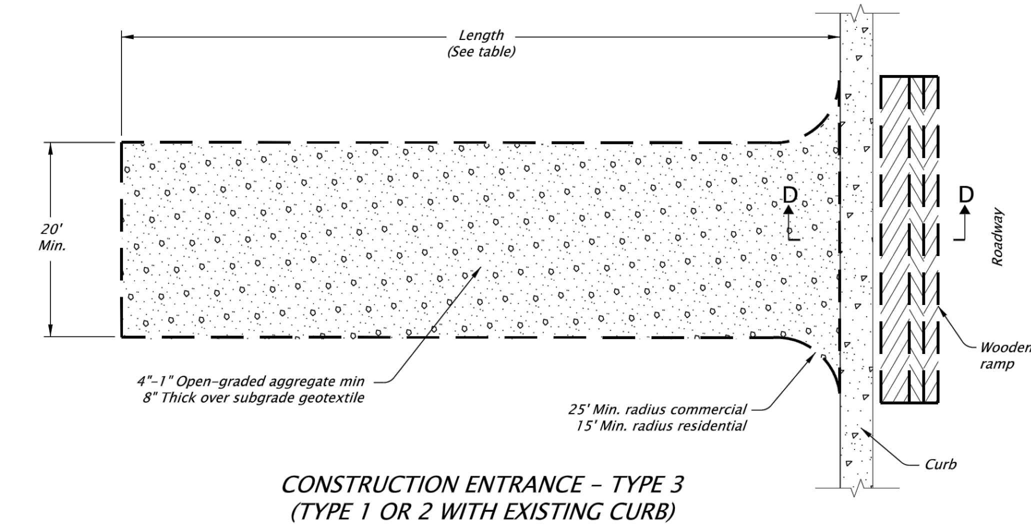
1. FOR MORE INFORMATION REGARDING THESE TABLES SEE CHAPTER 4 TABLES 4-3 AND 4-7 OF CLEAN WATER SERVICES EROSION PREVENTION AND SEDIMENT CONTROL DESIGN MANUAL.

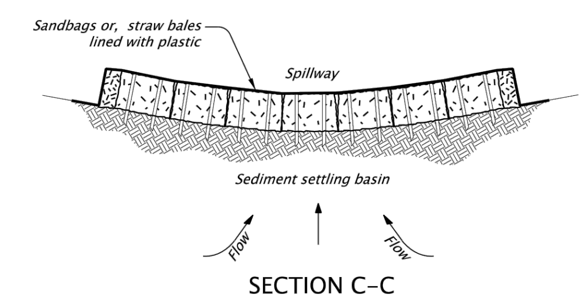
SPACING TABLES

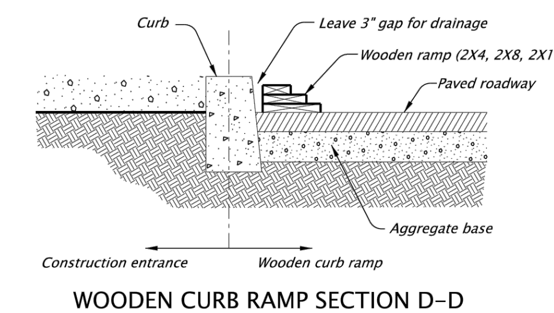
DRAWING NO. 940 REVISED 12-16

Clean Water Services









Notes:

1. The type 1 entrance is a simple entrance without a diversion ridge or settling basin.
2. The wooden ramp may be used on either type 1 or type 2 entrances in situations where there is curb and the curb is not removed for the construction entrance.

CONSTRUCTION ENTRANCE TABLE MINIMUM LENGTH

Length (FT)	Area Of Exposed Soil (Acre)
20	0.25
50	0.25 < A < 1.0
100	A > 1.0

CALC. BOOK NO. 6408

BASELINE REPORT DATE July 2014

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

CONSTRUCTION ENTRANCES

2018

DATE | REVISION DESCRIPTION

Effective Date: June 1, 2018 - November 30, 2018 RD1000

NO.	DATE	BY	CHK.	APPD.	REVISION AND RECORD OF ISSUE
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EROSION CONTROL DETAILS

SHEET NO. C702

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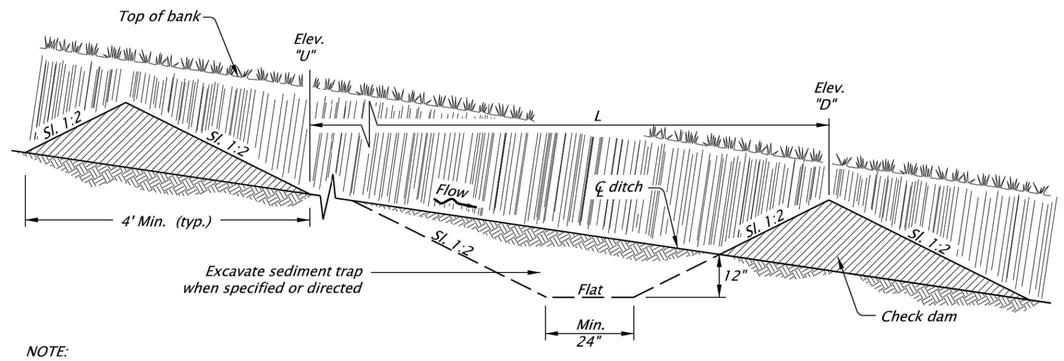
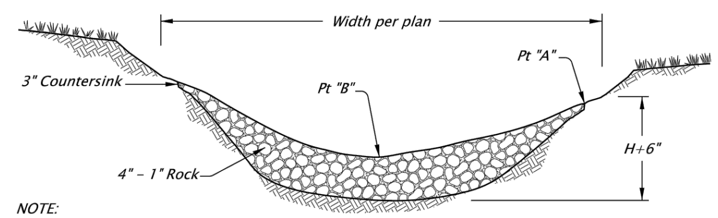


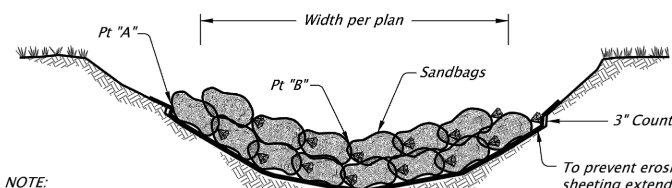
NOTE:
L = Spacing along swale or ditch so that Elevation "U" equals Elevation "D".

TYPICAL PROFILE SECTION CHECK DAMS (SHOWN WITH AGGREGATE)



NOTE:
Pt "A" must be a minimum of 6" higher than Pt "B"

AGGREGATE CHECK DAM - TYPE 1



NOTE:
Pt "A" must be a minimum of 6" higher than Pt "B"

SANDBAG CHECK DAM - TYPE 4

NOTES:

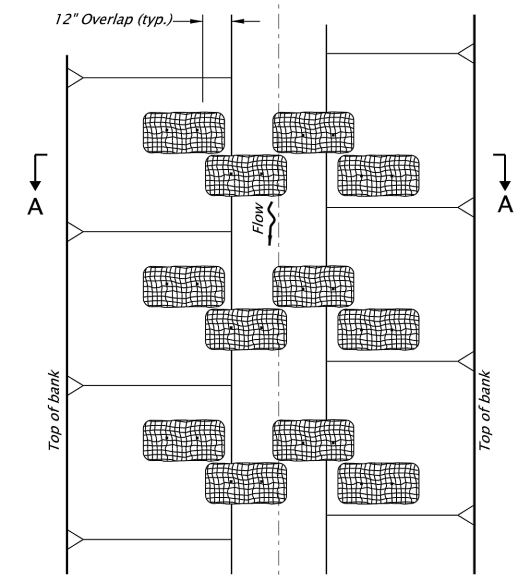
1. Type 3 - stake biofilter bags with two 2" X 2" X 18" (min.) wood stakes per bag. Drive stakes a minimum of 6" into the ground and flush with the top of the bags. Omit stakes if placed over paved surfaces. Overlap bags 6" min at each joint.
2. Type 4 - Tightly abut or overlap ends of sandbags at each joint.
3. Spacing between check dams for all check dam types shall comply with the typical profile section shown above.

MAXIMUM CHECK DAM SPACING "L"

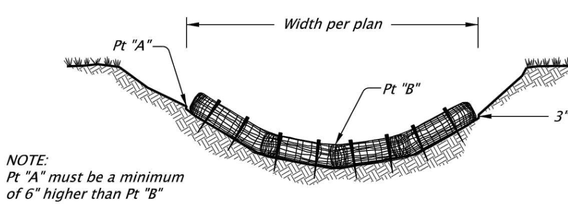
Ditch Grade	H=8"	H=12"	H=18"	H=24"
10%	* *	* *	15'	20'
9%	* *	* *	16'	22'
8%	* *	* *	18'	25'
7%	* *	* *	21'	28'
6%	* *	16'	25'	33'
5%	* *	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

* * Not Allowed H = Min. dam height

RD1005



PLAN



NOTE:
Pt "A" must be a minimum of 6" higher than Pt "B"

SECTION A-A
BIOFILTER BAG CHECK DAM - TYPE 3

CALC. BOOK NO. 6407

BASELINE REPORT DATE November 2017

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

CHECK DAMS TYPE 1, 3 AND 4

2018

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EROSION CONTROL DETAILS

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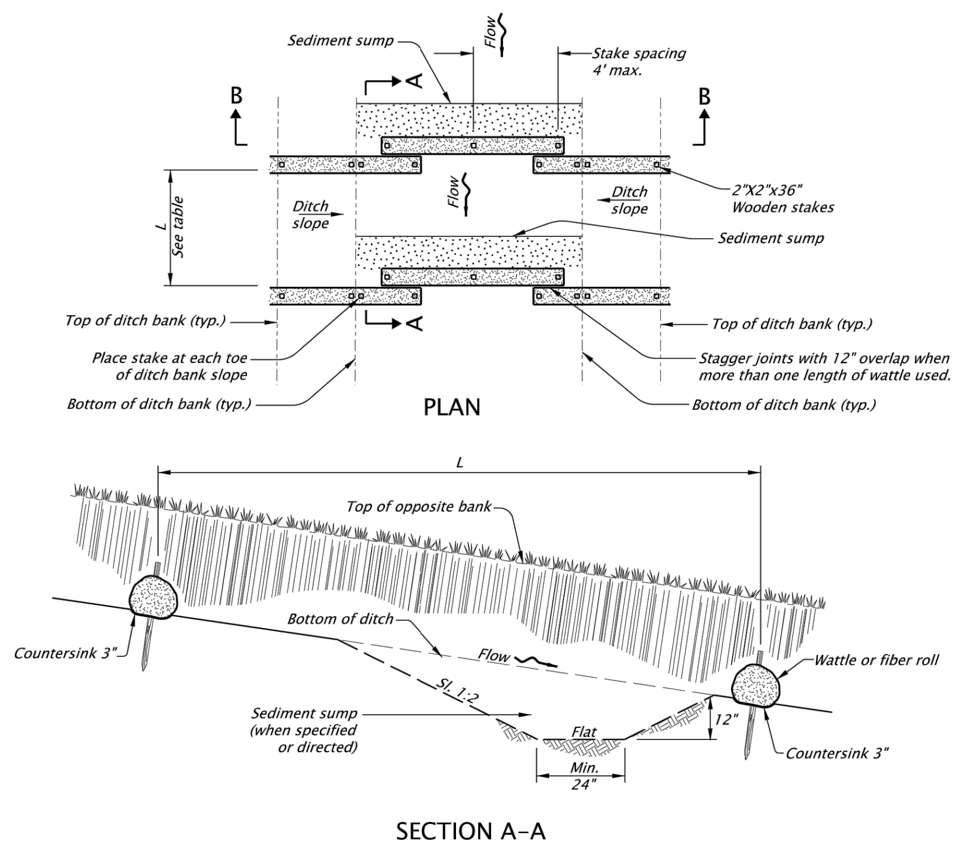
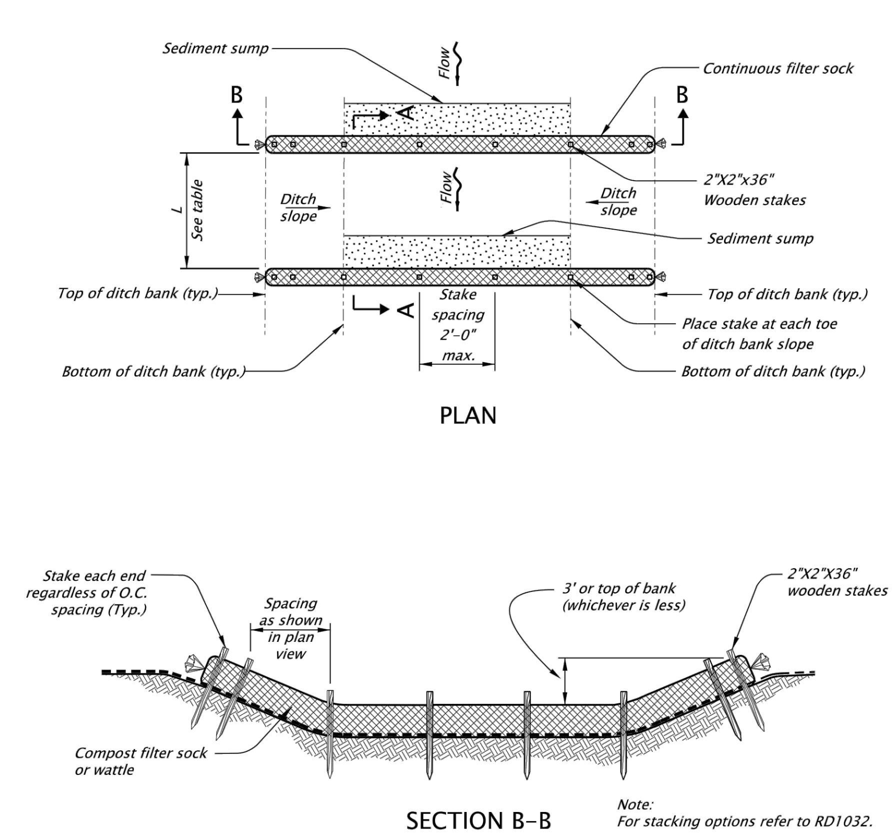
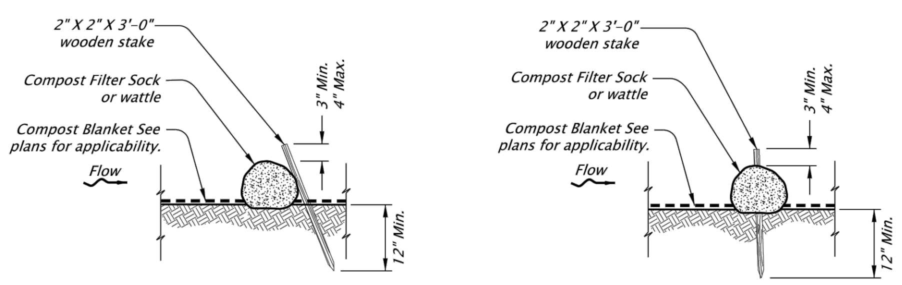


WATTLE / FIBER ROLL CHECK DAM - TYPE 2



COMPOST FILTER SOCK CHECK DAM - TYPE 6



FIBER ROLL STAKING

MAXIMUM CHECK DAM SPACING "L"

Ditch Grade	H=8"	H=12"	H=18"	H=24"
10%	* *	* *	15'	20'
9%	* *	* *	16'	22'
8%	* *	* *	18'	25'
7%	* *	* *	21'	28'
6%	* *	16'	25'	33'
5%	* *	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

* * Not Allowed   H = Min dam height

CALC. BOOK NO. 6402, 6406, 6407

BASELINE REPORT DATE November 2017

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NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

OREGON STANDARD DRAWINGS

CHECK DAMS
TYPE 2 AND 6

2018

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Effective Date: June 1, 2018 - November 30, 2018

RD1006

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RD1006

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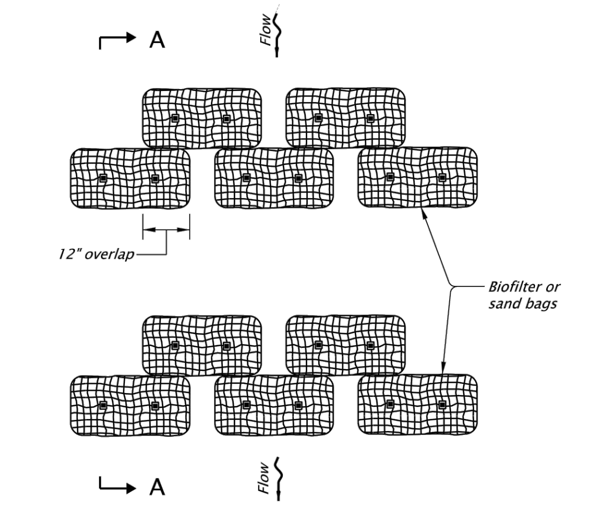
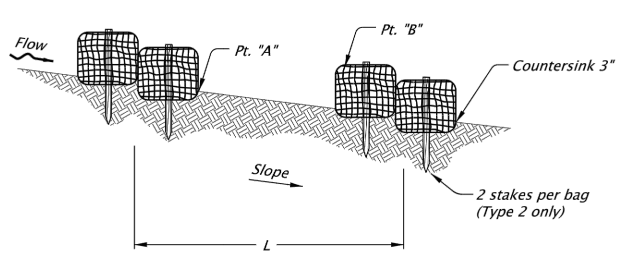
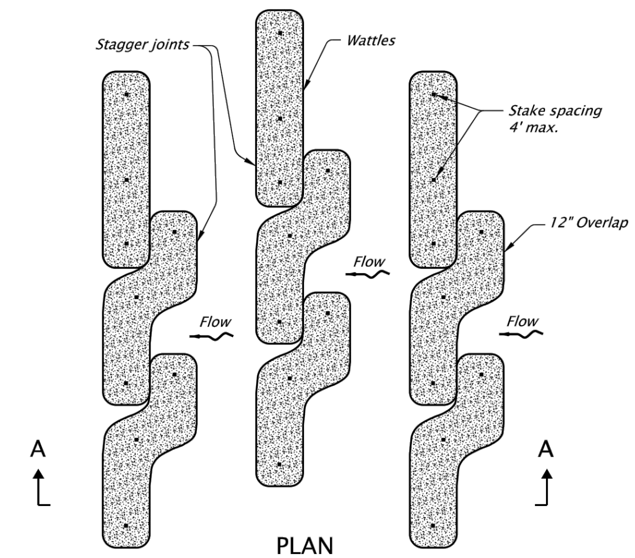


PLAN



SECTION A-A

BIOFILTER BAG / SAND BAG BARRIER - TYPE 2 AND 4



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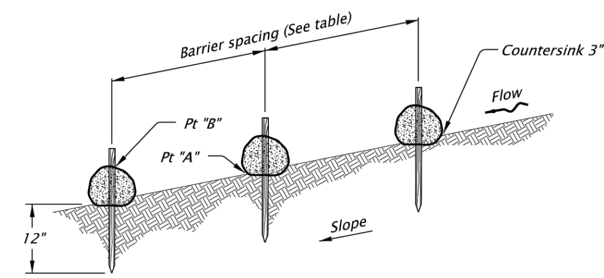

SECTION A-A

FIBER ROLL BARRIER - TYPE 3

Notes:

1. *For type 2 barrier, drive stakes flush with top of bag and into undisturbed ground a min. of 12". Omit stakes if bags are placed on paved surface.*
2. *For type 2 and 4 barrier, space bags (L) so that the elevation of point "A" is less than or equal to the elevation of point "B".*

Type 2 - Biofilter bags
Type 3 - Wattles
Type 4 - Sand bags

BARRIER SPACING

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS		
% SLOPE	% SLOPE	MAXIMUM SPACING ON SLOPE
10% Flatter	1:10 or Flatter	300'
10 > % ≥ 15	10 > X ≥ 7.5	150'
15 > % ≥ 20	7.5 > X ≥ 5	100'
20 > % ≥ 30	5 > X ≥ 3	50'
Steeper than 30%	Steeper than 1:3	25'

CALC. BOOK NO. 6402, 6406, 6407

BASELINE REPORT DATE January 2016

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

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OREGON STANDARD DRAWINGS

SEDIMENT BARRIER
TYPE 2, 3 AND 4

2018

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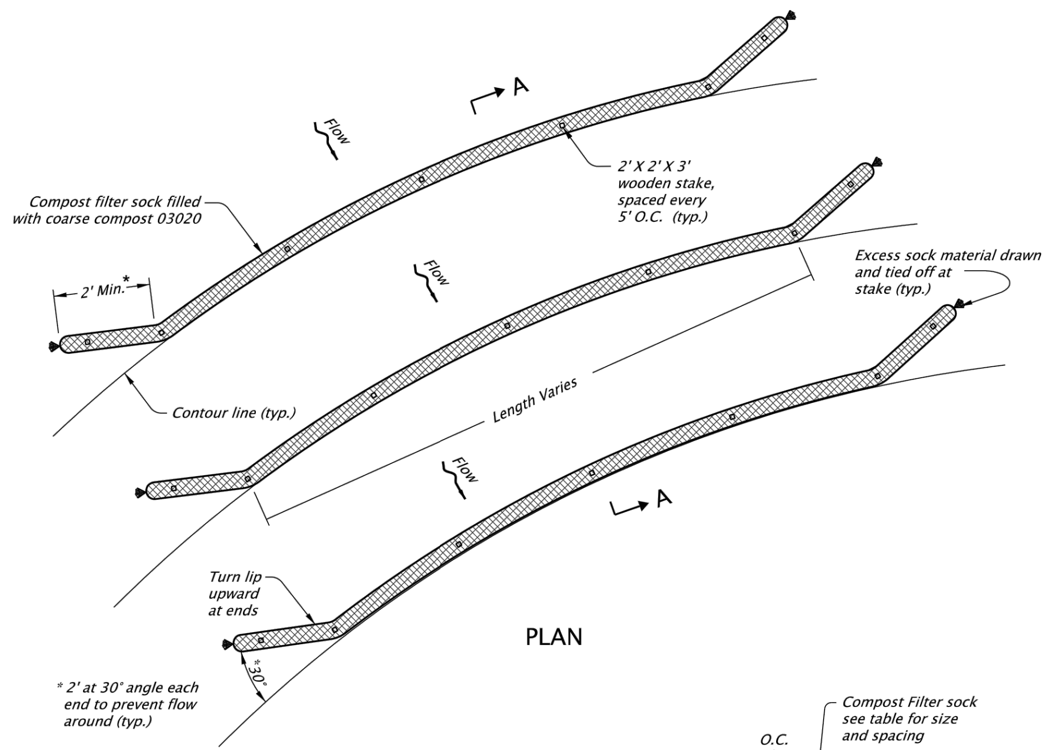
rd1032.dgn 06-01-2017



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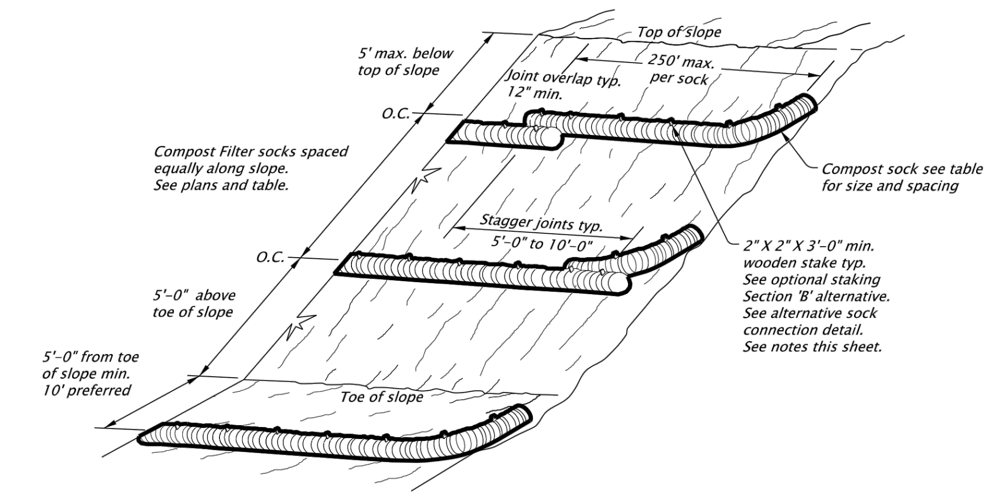
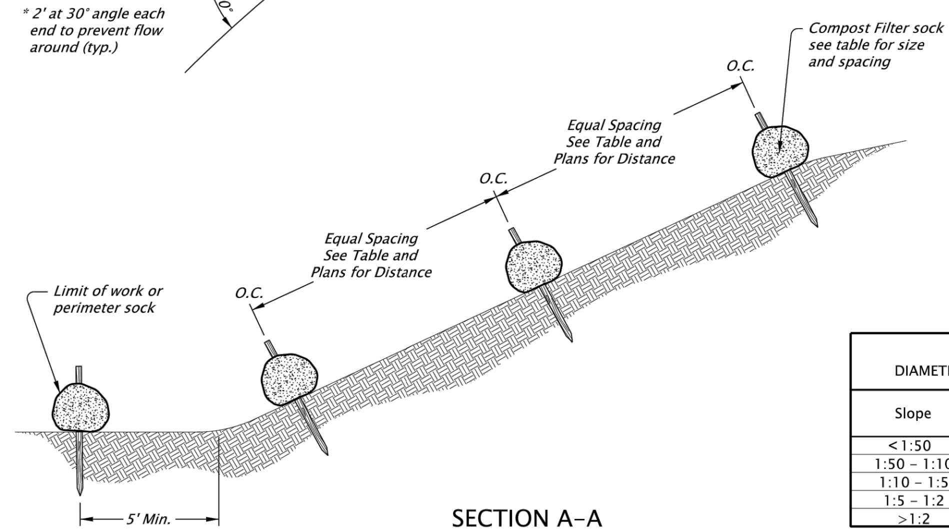
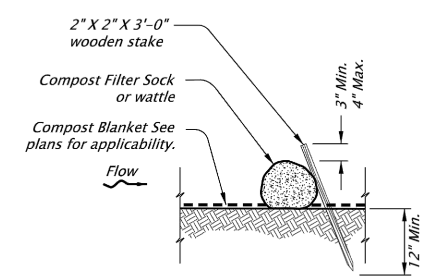


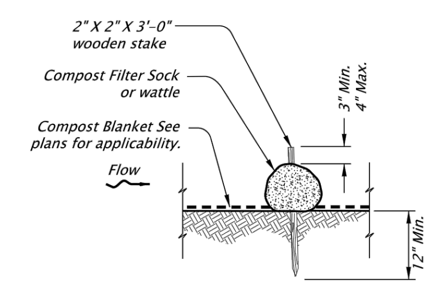
SLOPE APPLICATION – PERSPECTIVE VIEW



SECTION A-A



ALTERNATIVE 1 (Staking)



ALTERNATIVE 2 (Staking)

COMPOST FILTER SOCK
DIAMETER AND SPACING BASED ON SLOPE

Slope	Spacing (Ft)	Diameter (In)
<1:50	250	8
1:50 - 1:10	125	12
1:10 - 1:5	100	12
1:5 - 1:2	50	18
>1:2	25	18

COMPOST FILTER SOCK

RD1032

CALC. BOOK NO. 6403, 6404, 6405

BASELINE REPORT DATE July 2014

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

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OREGON STANDARD DRAWINGS

SEDIMENT BARRIER
TYPE 8

2018

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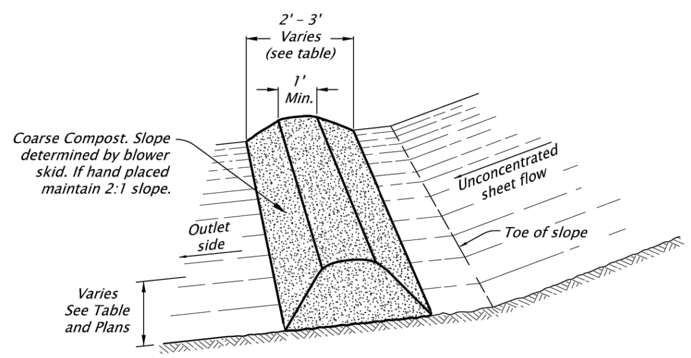
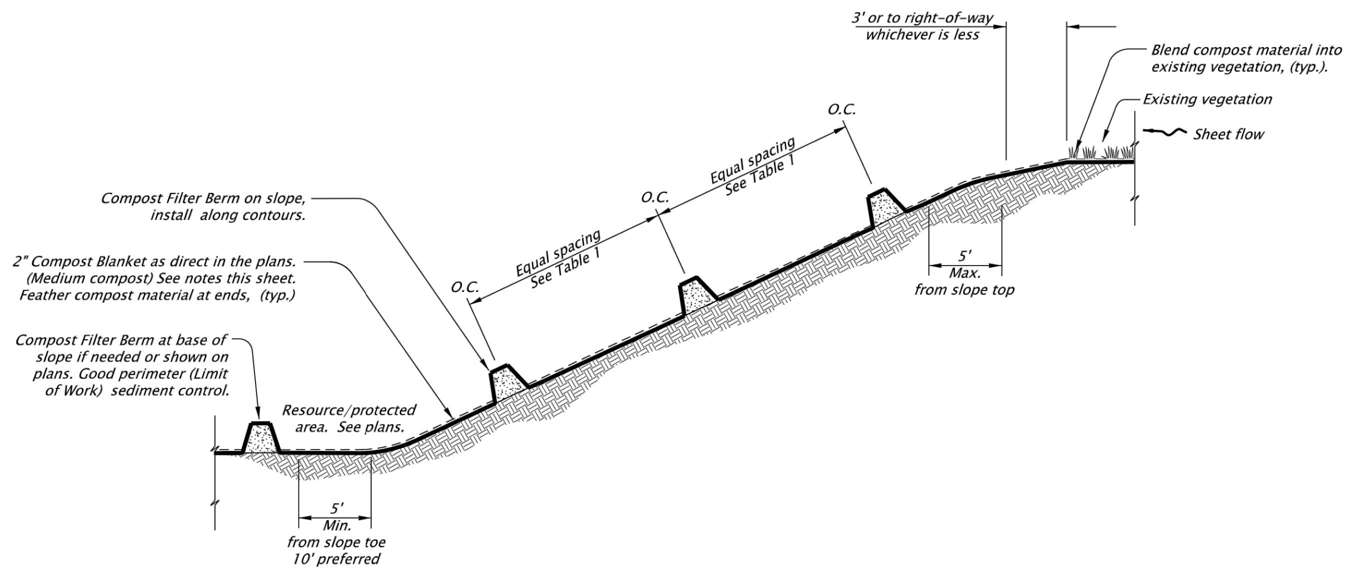


COMPOST FILTER BERM - TYPE 9

COMPOST FILTER BERM DIMENSIONS AND SPACING BASED ON SLOPE				
Slope	Berm Spacing	Berm Dimensions		
		Height	Bottom width	Top width
< 50:1	250 ft	1 ft	2 ft (min.)	1 ft
50:1 - 10:1	125 ft	1 ft	2 ft (min.)	1 ft
10:1 - 5:1	100 ft	1 ft	2 ft (min.)	1 ft
3:1 - 2:1	50 ft	1.3 ft	2.6 ft (min.)	1 ft
> 2:1		1.5 ft	3 ft (min.)	1 ft

Compost Filter Berm General Notes

1. Compost filter berms are sediment control devices for areas where runoff occurs as sheet flow. See Section 00280, Oregon Standard Specifications.
2. The maximum drainage area for a continuous berm shall be 1/4 acre per 100 linear feet of filter berm.
3. Where possible, berms should be placed away from the toe of slopes a minimum of 5 feet (10 feet preferred) to allow for energy dissipation and sediment storage.
4. Direct the outlet side of filter berm, located at base of slope, onto a stabilized area, such as vegetation and/or aggregate.
5. Place filter berms along or on the ground contour with the ends of the filter berm turned up slope per details. Adequate area shall be provided behind berm for ponding.
6. Compost filter berms may be vegetated with temporary or permanent seeding after placement.
7. If placed in area with existing ground vegetation, cut vegetation to 2-4 inches above grade at berm footprint. Do not remove existing vegetation or cut back outside berm footprint unless directed by Agency.
8. If soils are exposed apply compost blanket per details and specifications.



COMPOST FILTER BERM SERIES

rd1033.dgn 06-01-2017

RD1033

CALC. BOOK NO. 6403, 6404, 6405

BASELINE REPORT DATE July 2014

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

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OREGON STANDARD DRAWINGS

SEDIMENT BARRIER
TYPE 9

2018

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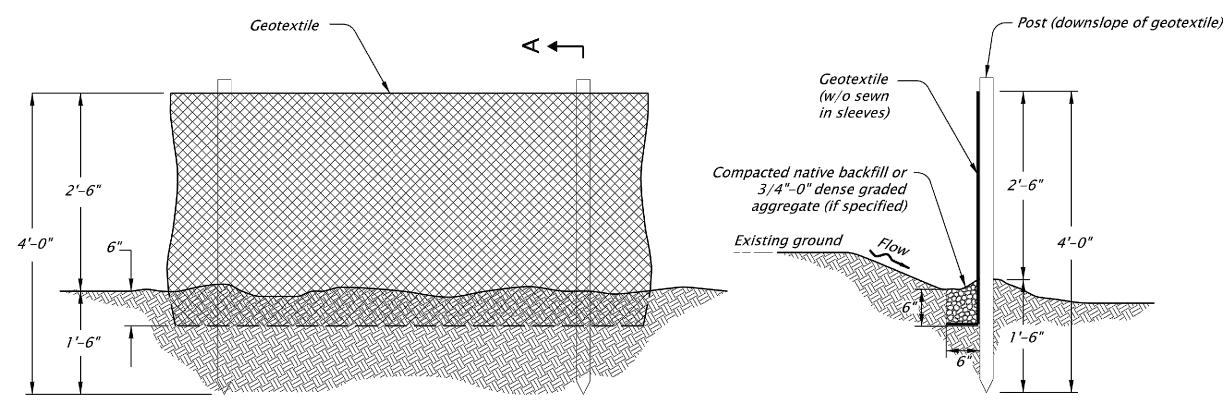
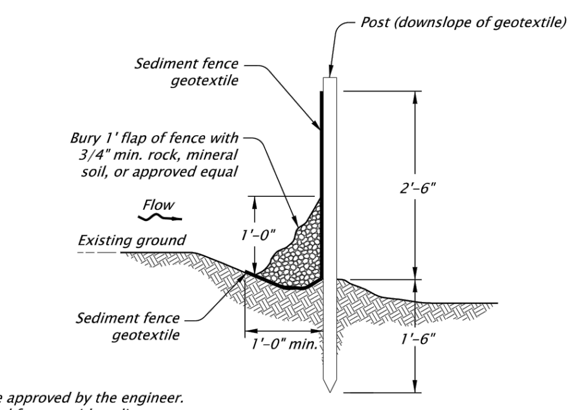


FRONT VIEW

SECTION A–A

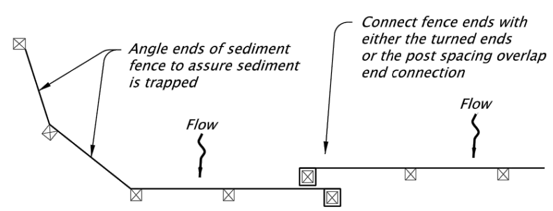
SEDIMENT FENCE AND GEOTEXTILE BURY DETAIL – TYPE 1



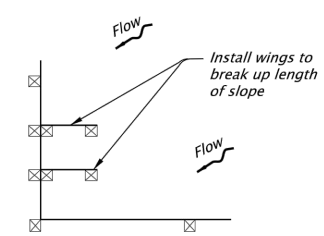
NOTES:

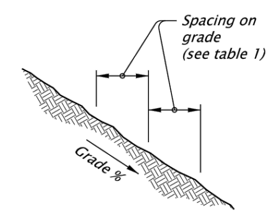
1. *Use must be approved by the engineer.*
2. *Not approved for use with sediment fencing with sewn-in post sleeves.*

ALTERNATE SEDIMENT FENCE W/O TRENCHING – TYPE 2



PLAN VIEW





TERMINATION AT CORNER OR PROPERTY LINE

NOTES:

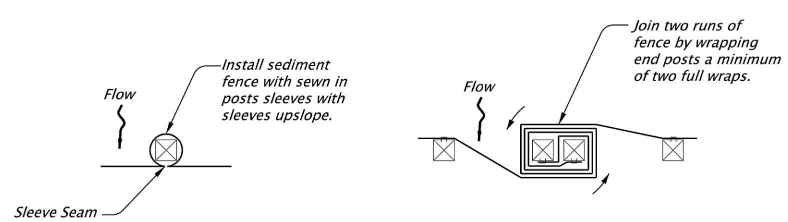
1. *Use 2" X 2" wood fence posts.*
2. *Posts to be installed on downhill side of sediment fence geotextile. Position posts to prevent separation from geotextile.*
3. *Compact filter fabric trench backfill and soil on uphill side of fence.*
4. *Locate fence no closer than three feet to the toe of a slope.*
5. *Wing spacing shall comply with table 1.*

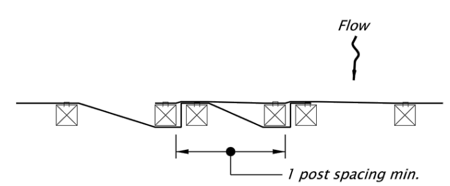
TABLE 1
FENCE SPACING
FOR GENERAL APPLICATION

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS	
GRADE	MAXIMUM SPACING ON GRADE
Grade < 10%	300'
10% ≤ Grade < 15%	150'
15% ≤ Grade < 20%	100'
20% ≤ Grade < 30%	50'
30% ≤ Grade	25'

TABLE 2

POST SPACING	
6'	Sediment Fence with Geotextile elongation less than 50%
4'	Sediment Fence with Geotextile elongation 50% or more





GEOTEXTILE WITH POST SLEEVES

TURNED ENDS CONNECTION

POST SPACING OVERLAP CONNECTION

GEOTEXTILE END CONNECTIONS

CALC. BOOK NO. 6403, 6404, 6405

BASELINE REPORT DATE November 2017

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OREGON STANDARD DRAWINGS

SEDIMENT FENCE

2018

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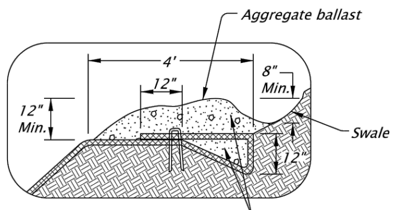


FIGURE A1

TOP OF BANK ANCHOR TRENCH, H>3' AND TERMINAL SLOPE

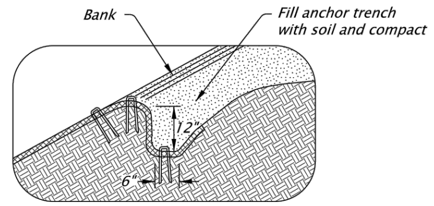


FIGURE A2

TOP OF BANK ANCHOR TRENCH, H<3'

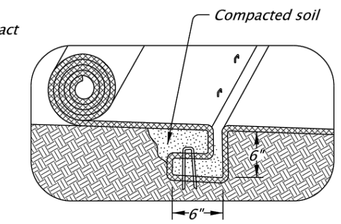


FIGURE A3

CHANNEL CHECK SLOT

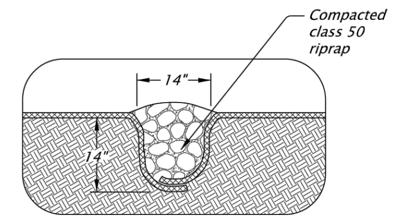


FIGURE A4

CHANNEL CHECK SLOT WITH ROCK BACKFILL

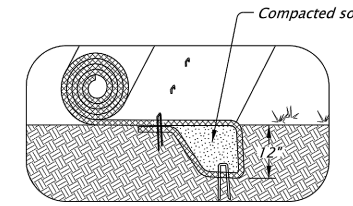
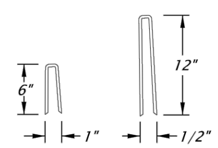


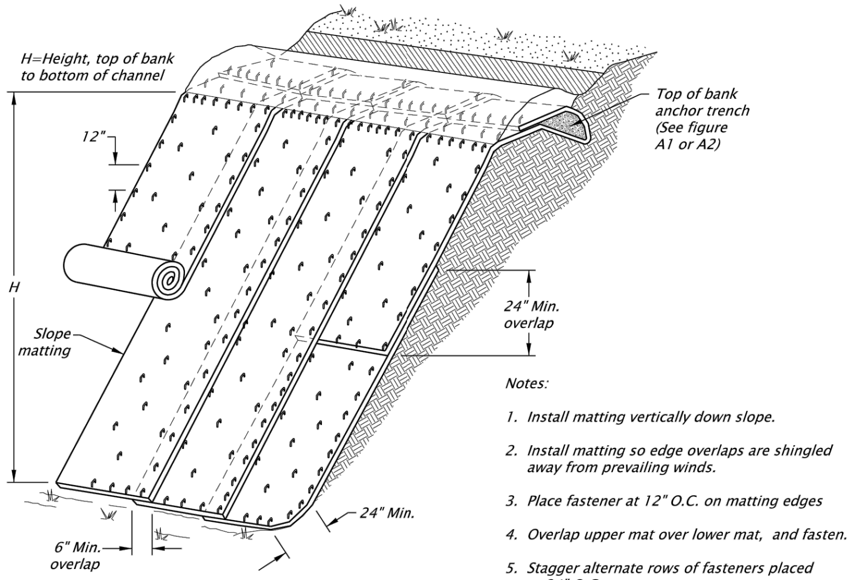
FIGURE A5

INITIAL CHANNEL ANCHOR TRENCH

rd1055.dgn 06-01-2017



STAPLES

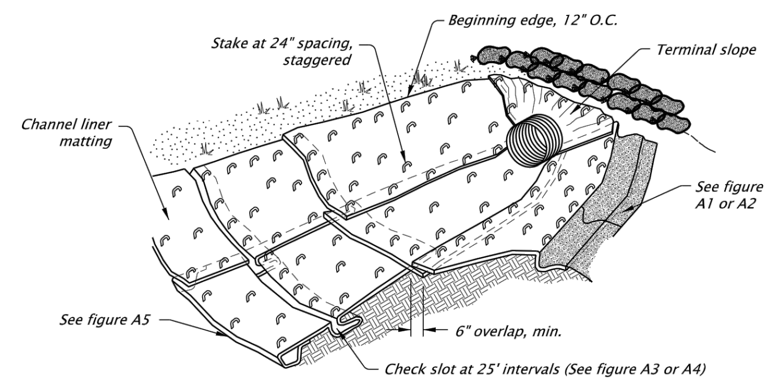


Notes:

1. Install matting vertically down slope.
2. Install matting so edge overlaps are shingled away from prevailing winds.
3. Place fastener at 12" O.C. on matting edges
4. Overlap upper mat over lower mat, and fasten.
5. Stagger alternate rows of fasteners placed at 24" O.C.
6. Extend mat 24" beyond toe of slope; fold mat back under 4" and fasten.

SLOPE ISOMETRIC VIEW

RD1055



CHANNEL ISOMETRIC VIEW

Notes:

1. Install channel liner matting, in the direction of water flow. Anchor upstream end of mat with check slot for culvert outfalls, place mat under pipe 12" minimum upstream from pipe outlet.
2. Construct check slots across channel bottom at 25' spacing and at the end of each mat (Fig. A3 or A4).
3. Overlap side channel liner matting edges 6" over the center channel liner matting and fasten edges 12" O.C. Continue overlap and stapling pattern for each additional side channel liner mat.
4. Lap upstream matting end 12" over beginning edge of downstream matting. Fasten 12" O.C.
5. Anchor top edge of side channel matting in trench and fasten 12" O.C. (Fig. A2).
6. Fasten matting interior at 24" O.C. with staggered spacing.
7. Construct initial anchor trench at downstream end of matting and terminal slope anchor at upstream end.

CALC. BOOK NO. 6403, 6404, 6405

BASELINE REPORT DATE July 2014

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OREGON STANDARD DRAWINGS

SLOPE AND CHANNEL MATTING

2018

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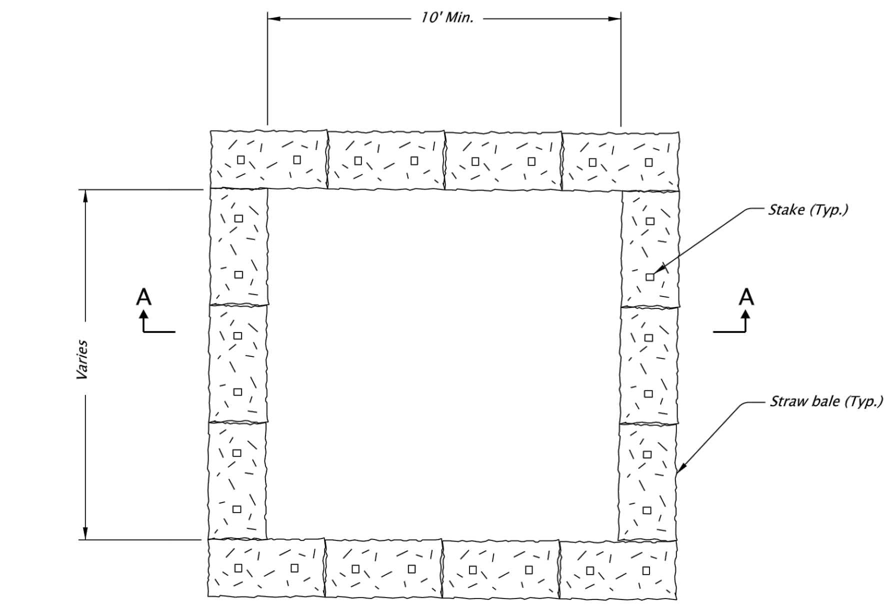
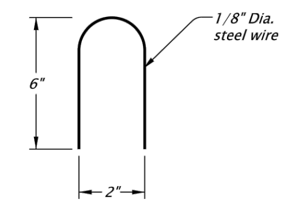


PLAN



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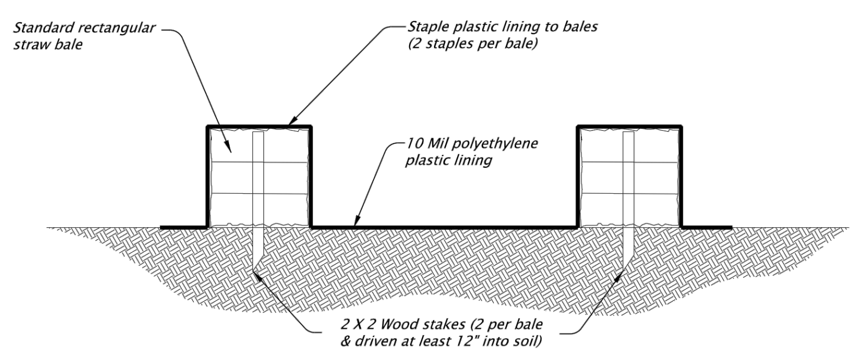

SECTION A–A

CONCRETE TRUCK WASH OUT FACILITY

RD1070

CALC. BOOK NO. 6403, 6404, 6405	BASELINE REPORT DATE July 2014
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Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: B. Henri
Review: B. Guthrie
Drafter: T. Danisch
Checker: -

EROSION CONTROL DETAILS

SHEET NO. C710

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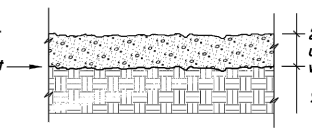
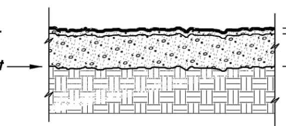
COMPOST BLANKET



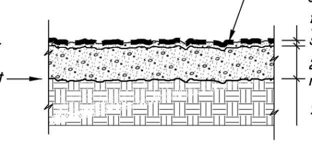
Note: See Standard Specifications 03020 for compost specifications.

APPLICATION - TEMPORARY/PERMANENT MULCHING
N.T.S.



Note: See Standard Specifications 03020 for compost specifications.

APPLICATION - TEMPORARY/PERMANENT VEGETATIVE COVER
N.T.S.



Note: See Standard Specifications 03020 for compost specifications.
See plans and specifications for matting when required.

APPLICATION - STEEP SLOPES, SHALLOW DITCHES & BIO-SWALES
N.T.S.

det6017.dgn 03-Nov-2015

DET6017

The selection and use of this detail, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES
DETAILS

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DETAIL NO. DET6017

NO.	DATE	BY / CHK.	APPD.	REVISION AND RECORD OF ISSUE
2	9/26/18	BH	TS	Rev B - Issued for Review
1	8/10/18	BH	TS	Rev A - Issued for Review

DOC. CONTROL NO.: J1-600-CIV-DTL-DEA-00012-01 Rev B-ISSUED FOR REVIEW

DRAFT PLANS FOR REVIEW ONLY

DAVID EVANS AND ASSOCIATES INC.
2100 SW River Parkway
Portland Oregon 97201
Phone: 503.223.6663

Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE

COOS COUNTY

Designer: B. Henri | Review: B. Guthrie
Drafter: T. Danisch | Checker: -

EROSION CONTROL DETAILS

SHEET NO. C711

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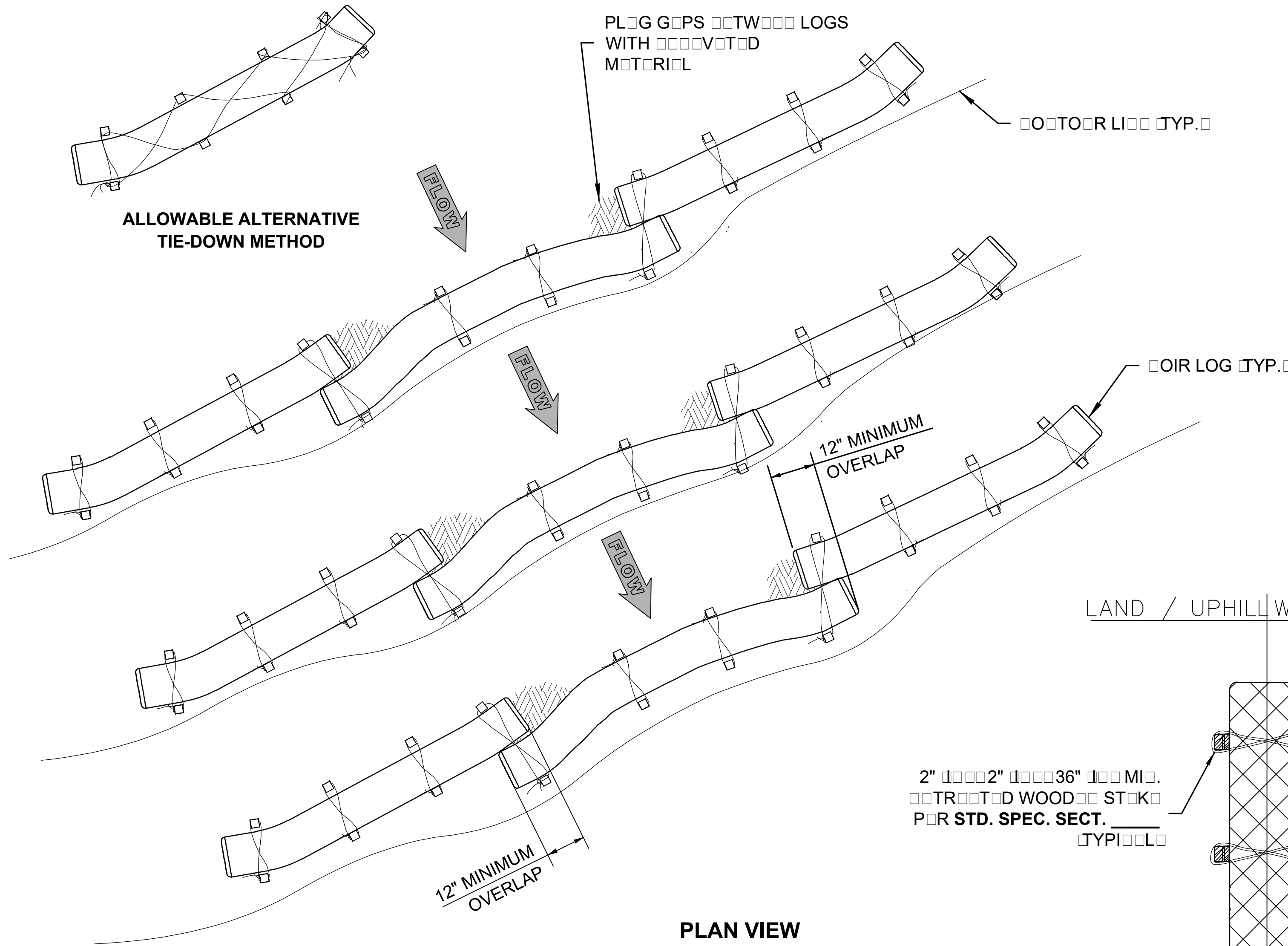
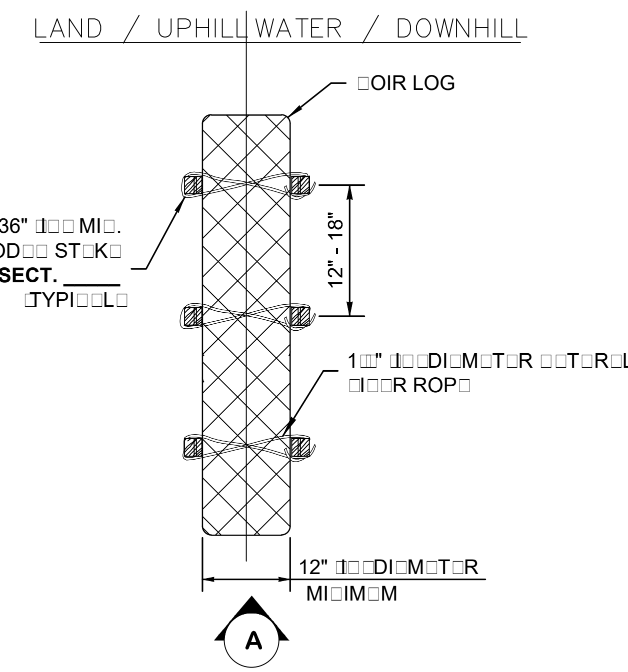


PLAN VIEW
PL□□□M□□T O□ SLOP□



PLAN VIEW

NOTES

1. □oir log□ □hall □e in□talled □tarting at the □otto□ o□the □lo□e and working □□hill.
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□. □lway□in□tall □oir log □er□endi□□lar to □lo□e along □onto□r line□. □nd□ □hall angle □□hill to □revent □low aro□nd the □oir log.
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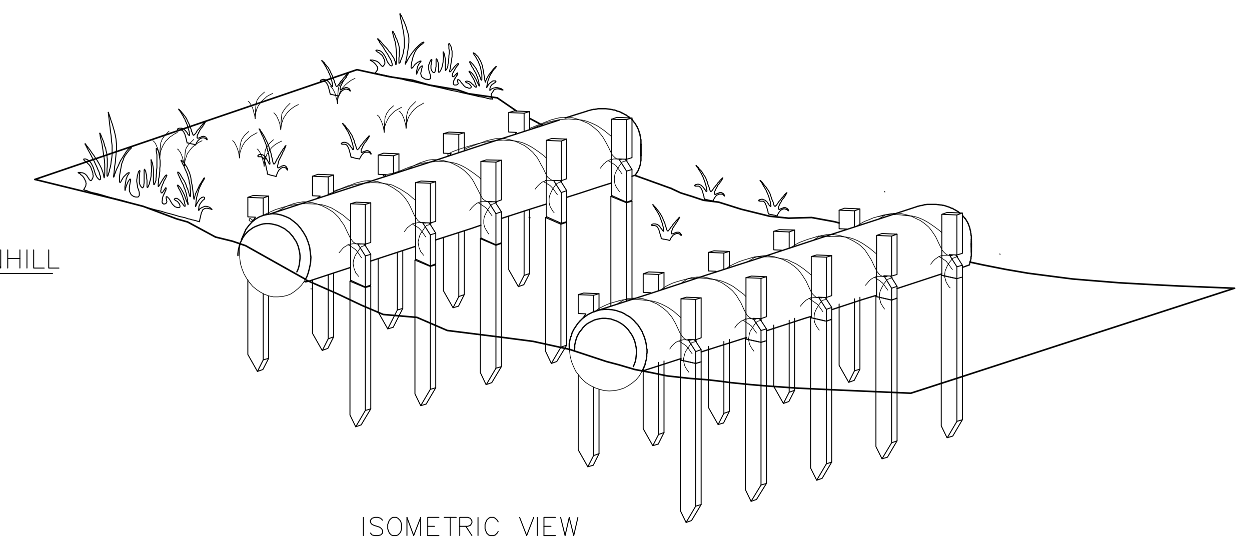
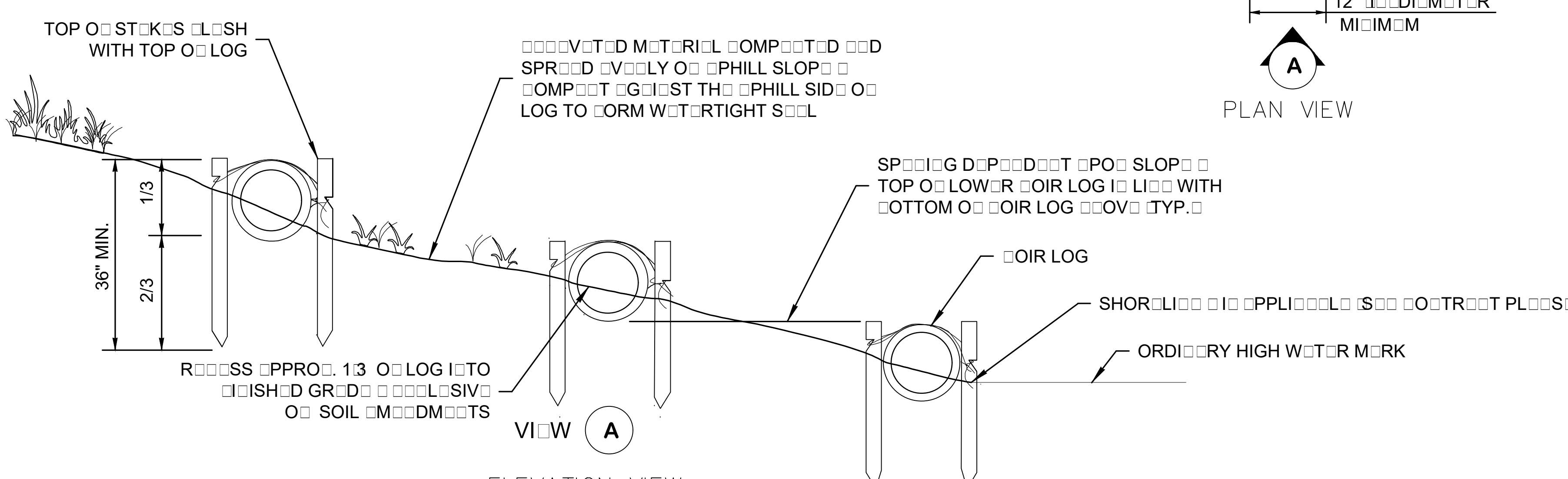


ISOMETRIC VIEW



ELEVATION VIEW
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NO.	DATE	BY / CHK.	APPD.	REVISION AND RECORD OF ISSUE
2	9/26/18	BH	TS	Rev B - Issued for Review
1	8/10/18	BH	TS	Rev A - Issued for Review

DOC. CONTROL NO.: J1-600-CIV-DTL-DEA-00013-01 Rev B-ISSUED FOR REVIEW

DRAFT PLANS FOR REVIEW ONLY

DAVID EVANS AND ASSOCIATES INC.
2100 SW River Parkway
Portland Oregon 97201
Phone: 503.223.6663

Jordan Cove LNG℠

JORDAN COVE ENERGY PROJECT
KENTUCK PROJECT SITE
COOS COUNTY

Designer: B. Henri Review: B. Guthrie
Drafter: T. Danisch Checker: -

EROSION CONTROL DETAILS

SHEET NO. C712

APPENDIX C: PIPELINE PERMANENT WETLAND IMPACTS BY WATERSHED

Pacific Connector Gas Pipeline Project Permanent Wetland Type Conversion Impacts

County	Watershed (HUC 10)	Wetland Name	Milepost	Cowardin Classification	CL Crossing Length (Feet)	Permanent Wetland Type Conversion (Acres)
Coos	Coos Bay-Frontal Pacific Ocean (1710030403)	APC-C2	1.16	PSS1R	15.0	< 0.01
		EE-WW-9902	1.22	PSSC	53.9	0.01
		W1-02	6.47	PFO	98.1	0.07
					Watershed Total	**0.08**
	North Fork Coquille River (1710030504)	W-T02-003A-1	22.50	PSSS1C	246.16	0.06
		WW-222-009 (CW-10)	23.38	PFOC	173.7	0.12
					Watershed Total	**0.18**
					Coos County Total	**0.26**
Douglas	Middle Fork Coquille River (1710030501)	W3-01 (BW-38 (MOD))	46.56	PFO1	39.4	0.03
					Watershed Total	**0.03**
	Olalla Creek-Lookingglass Creek (1710030212)	DA-15	56.69	PFO	415.8	0.29
		BW-160	56.75	PFOC	86.6	0.06
		BW-162	56.83	PFO/PEMC	28.2	0.02
					Watershed Total	**0.37**
	Upper Cow Creek (1710030206)	WW-111-001	109.17	PSS	11.0	<0.01
		WW-111-001 (GW-14 (FS-HF-C))	109.15		36.2	0.01
					Watershed Total	**0.01**
					Douglas County Total	**0.41**
Jackson	Big Butte Creek (1710030704)	AW-244	130.83	PSSC	125.5	0.03
		R5-02 (AW-264 (MOD))	132.77	PFO	15.9	0.01
					18.3	0.01
		R5-05 (AW-239)	133.92	PSSC	159.2	0.04

County	Watershed (HUC 10)	Wetland Name	Milepost	Cowardin Classification	CL Crossing Length (Feet)	Permanent Wetland Type Conversion (Acres)
					Watershed Total	0.09
	Little Butte Creek (1710030708)	EW-63	145.55	PEMC/PSSC	1.7	<0.01
					Watershed Total	<0.01
					Jackson County Total	**0.09**
Klamath	Spencer Creek (1801020601)	WW-001-013 (EW-85)	171.06	PFO/PSS	63.9	0.04
					83.4	0.06
		WW-201-004	171.60	PFO1A	30.93	0.02
		WW-502-EW-103 (EW-103 (MOD))	177.76	PEMC/PSSC	115.7	0.03
					Watershed Total	**0.15**
					Klamath County Total	**0.15**
					PCGP Project Total	**0.91**

APPENDIX D: EELGRASS SITE GEOMORPHIC HISTORY AND ANALYSIS

(J1-000-MAR-TNT-DEA-00001-00 Rev. A Septmber 28, 2018)

TECHNICAL MEMORANDUM

DATE:	September 20, 2018
ATTENTION:	Derik Vowels, Drew Jackson, P.E.
COMPANY:	Jordan Cove LNG, LLC (JCLNG)
ADDRESS:	5615 Kirby Drive, Suite 500, Houston, TX 77005
FROM:	Kyle Landon, P.E., William Gerken, P.E. – Moffatt & Nichol
SUBJECT:	Eelgrass Site Geomorphic History and Analysis
DEA PROJECT NAME:	Regulatory Permitting Services
DEA PROJECT NO:	JLNG0000-0003
DOCUMENT #	J1-740-TEC-TNT-DEA-00002-00
COPIES TO:	Jim Starkes, Sean Sullivan, Suzanne Cary, Ethan Rosenthal

1. INTRODUCTION

Jordan Cove Energy Project, LP (JCEP) is seeking authorization from the Federal Energy Regulatory Commission (FERC) under Section 3 of the Natural Gas Act (NGA) to site, construct, and operate a natural gas liquefaction and liquefied natural gas (LNG) export facility (LNG Terminal), located on the bay side of the North Spit of Coos Bay, Oregon. The LNG Terminal, related facilities, temporary construction sites, and other sites/actions associated with LNG Terminal construction are collectively referred to as the "JCEP Project Area" as shown on Figure 1-1.

One component of the JCEP Project is the construction of an Eelgrass Mitigation Site. The intent of the Eelgrass Mitigation Site is to lower the existing bottom grade of an elevated shoal and plant it with eelgrass as compensatory mitigation for the proposed construction of an Access Channel at the LNG Terminal. The shoal currently does not support eelgrass because of elevations that are too high for optimal growth. Most of this area is currently between elevations +1.0' and +2.7' MLLW (+0.0 ft and +2.0 ft NAVD88 based on a conversion factor of -0.72 ft and would be lowered to an elevation of -1.3 ft MLLW (-2.0 ft NAVD88; Figure 1-2).

In support of the permitting efforts for the JCEP, Moffatt & Nichol (M&N) has prepared this technical memorandum to describe the historic and anticipated geomorphic changes at the proposed Eelgrass Mitigation Site. Specifically, the purpose of this memorandum is to determine whether the forces that created the shoal at the existing site would also cause the deepened mitigation site to fill with sediment. The US Army Corps of Engineers expressed this concern in comments provided on the Compensatory Wetland Mitigation Plan. The memorandum consists of two main sections and a summary. The historic analysis section examines aerial photographs, charts, and construction drawings to document how the proposed mitigation site and surrounding areas have changed over time. The hydrodynamic modeling section summarizes the findings from previous modeling studies that are relevant to the proposed mitigation site. Lastly, the summary synthesizes the findings from the prior two sections.

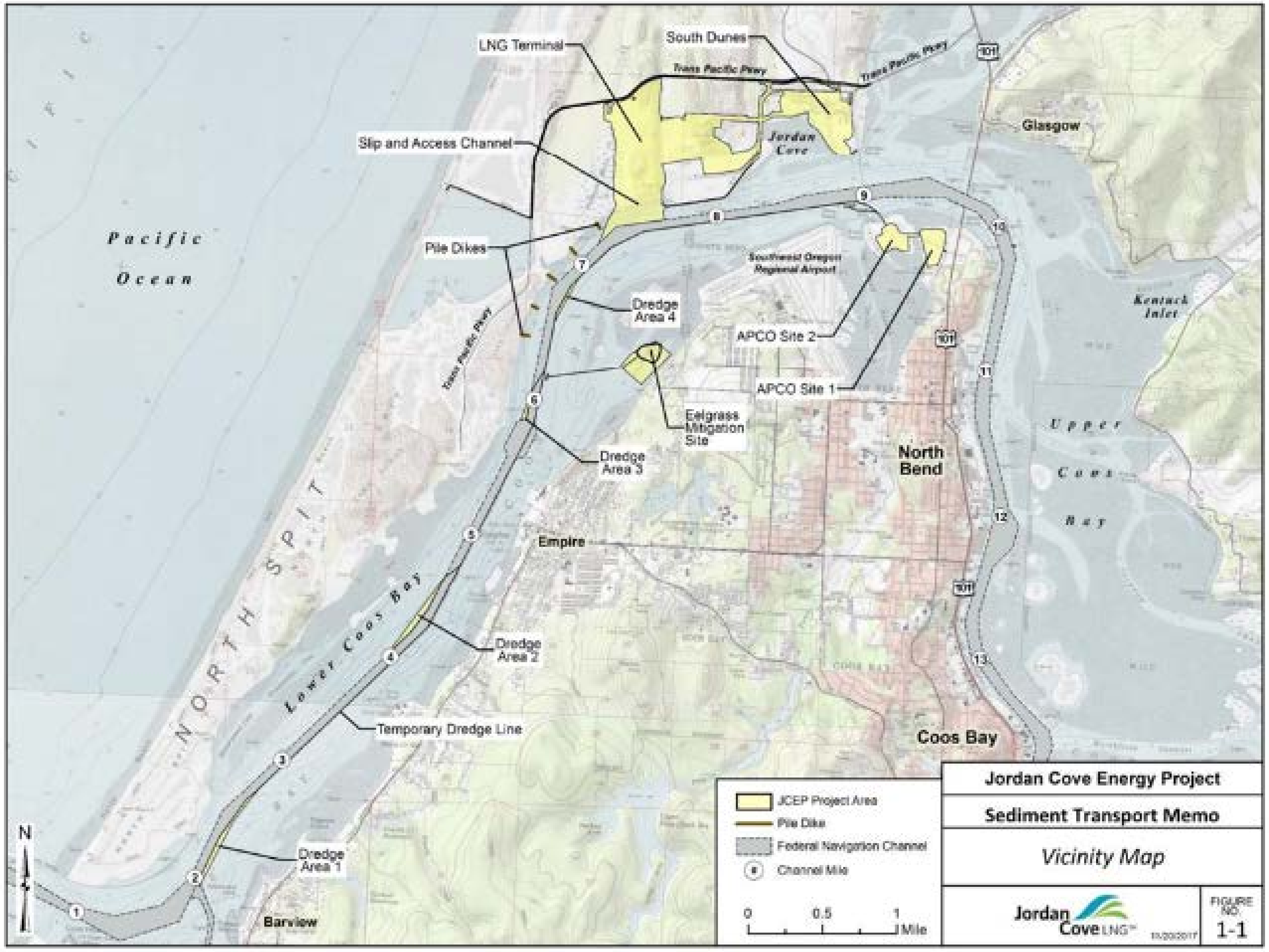

Figure 1-1. JCEP Project Area

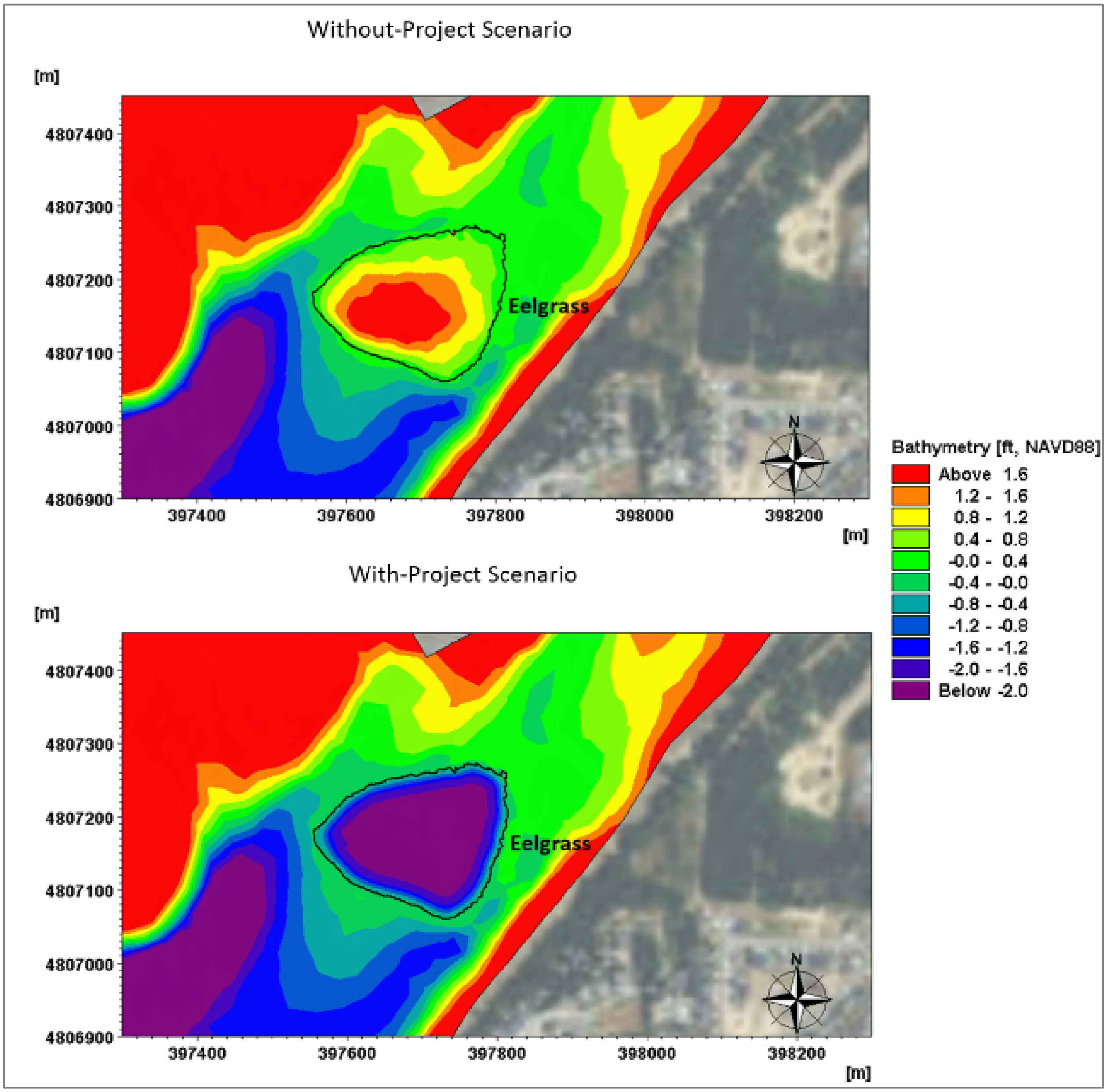

Figure 1-2. Bathymetry near the Proposed Eelgrass Mitigation Site *(Without-Project is shown in upper panel and With-Project is shown in lower panel)*

2. HISTORIC ANALYSIS

The Coos Bay estuary is a dynamic environment subjected to many changes as the population, water-dependent commerce, and level of development have increased over time. By examining the timing and the extent of localized changes in the vicinity of the Eelgrass Mitigation Site, the processes and stability of the proposed Eelgrass Mitigation Site can be understood better.

Prior to 1939, a small tidal channel wrapped along the bluffs of Pony Point, connecting Pony Slough to the main channel (Figure 2-1). Construction of the airfield on Pony Point began in 1939 and continued through 1946 (Figure 2-2). The first two runways (Runways 13/31 and 16/34) were built on fill placed in Pony Slough, followed by constructing the initial portion of runway roughly oriented in the east-west direction and alongside the navigation channel (Runway 4/22). This land reclamation project cut off the secondary channel to Pony Slough. Despite the construction of the airport, the secondary channel reformed across the western edge of Runway 4/22.

Between 1948 and 1951, the Coos Bay Federal Navigation Channel was deepened from 24 feet-MLLW to 30 feet-MLLW and much of the spoils were placed in shallow or intertidal areas of the bay. Construction drawings indicate that dredge spoils were placed in the intertidal zone of the inner bend of Jarvis Turn and alongside Runway 4/22 between River Miles 6 and 8 (Figure 2-3). Two islands formed on the inner bend of the Jarvis Turn as a result of the dredge spoil disposal operations. A 1957 aerial taken at a low tide shows the two spoil islands; however the spoil disposal area shown in Figure 2-3 farther east alongside Runway 4/22 is not apparent (Figure 2-4).

The spoil islands constricted the secondary channel altering the flow and sediment transport in the area. The increased flow velocity scoured the channel to an approximate depth of -8 feet MLLW, transporting suspended sediment from the main channel (Gonor et al. 1979). A delta-shaped shoal can be observed on the ebb-side of the constriction in the 1957 aerial (Figure 2-4). The shoal is fed by sediment that falls out of the water column after being carried through the constriction. By 1977, the shoal had grown and moved westward, toward the limits of the proposed Eelgrass Mitigation Site (Figure 2-5). Over the next decade, the shoal continued expanding and moving west. It is likely that dredge spoils blown from the unvegetated islands also contributed to the deposition in the tidal flats south east of the islands.

Between 1987 and 1988, Runway 4/22 was extended approximately 2,000 feet to the west (Figure 2-6). During this time, spoil material from the largest island was used as a source of fill for extending the runway footprint, and portions of the site were used for intertidal and eelgrass mitigation (CH2M Hill 1990; Figure 2-7). The expanded runway footprint obstructed the secondary channel, and reduced flow and sediment transport near the proposed Eelgrass Mitigation Site (Figure 2-8). The shoal has remained unchanged after the runway extension since the processes driving the shoal creation were eliminated. Sediment transport in the area is presently driven by significant, episodic events such as large wind storms from the west.

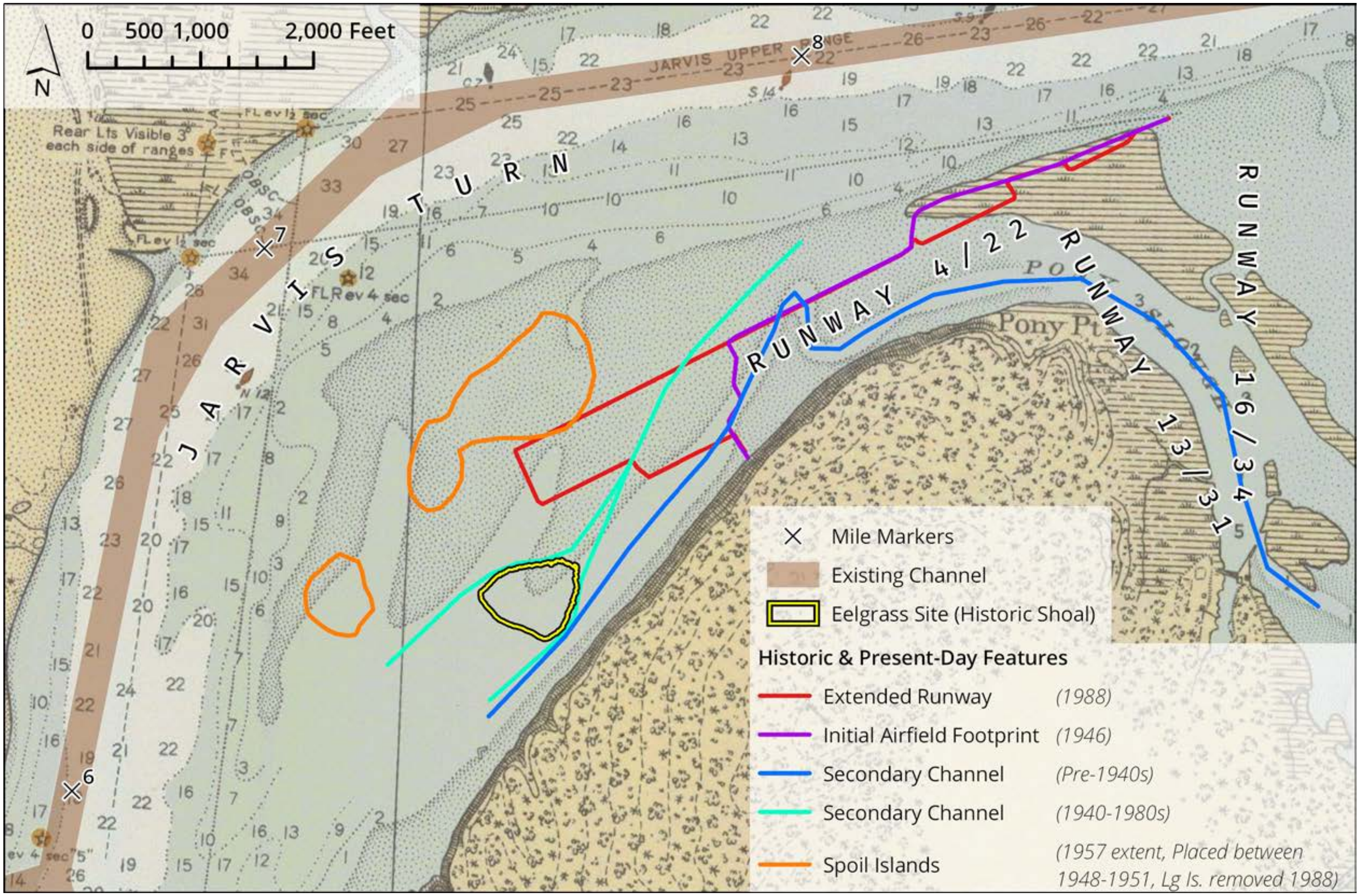

Figure 2-1. 1936 NOAA Navigation Chart

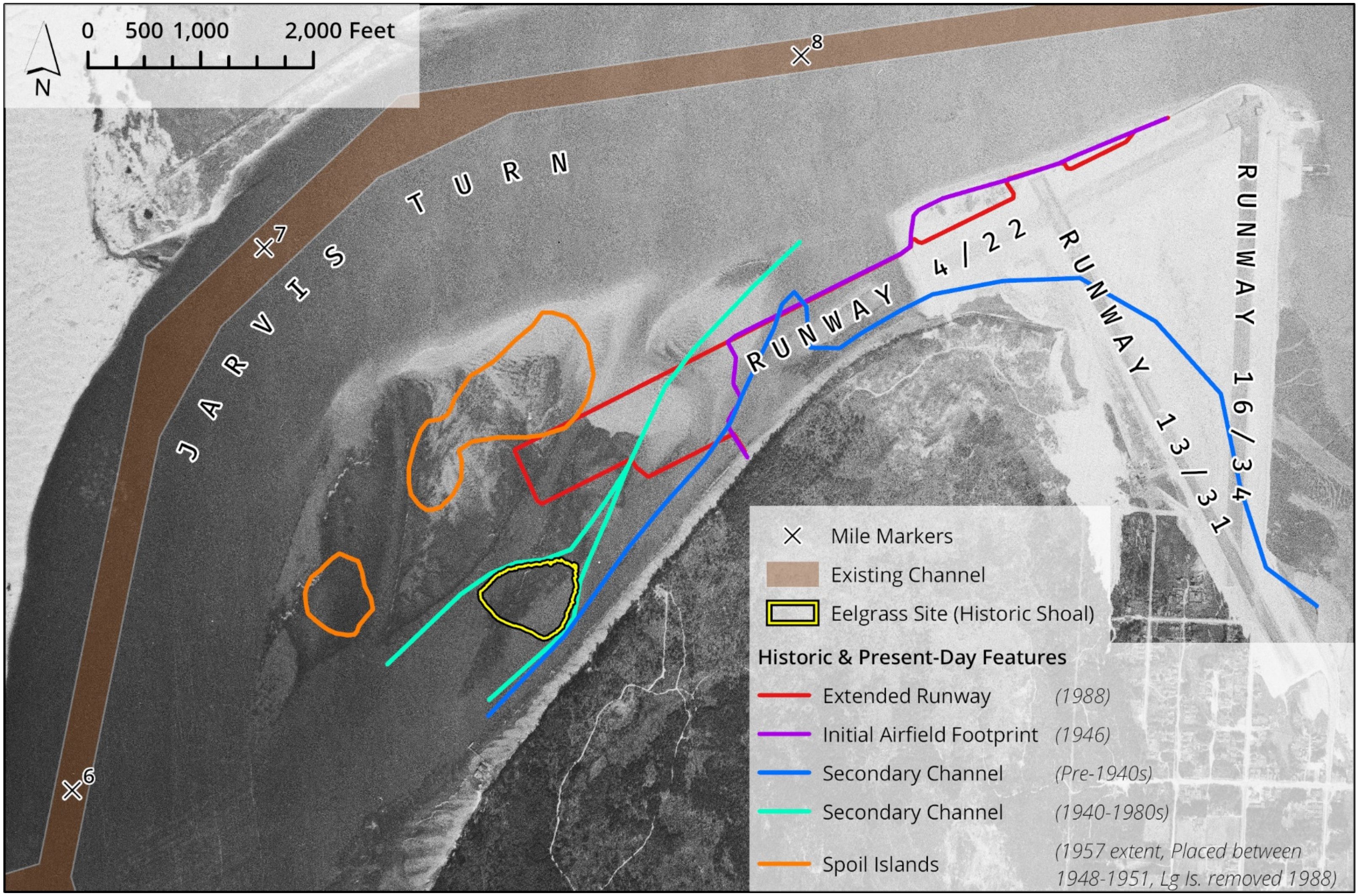

Figure 2-2. 1942 Aerial

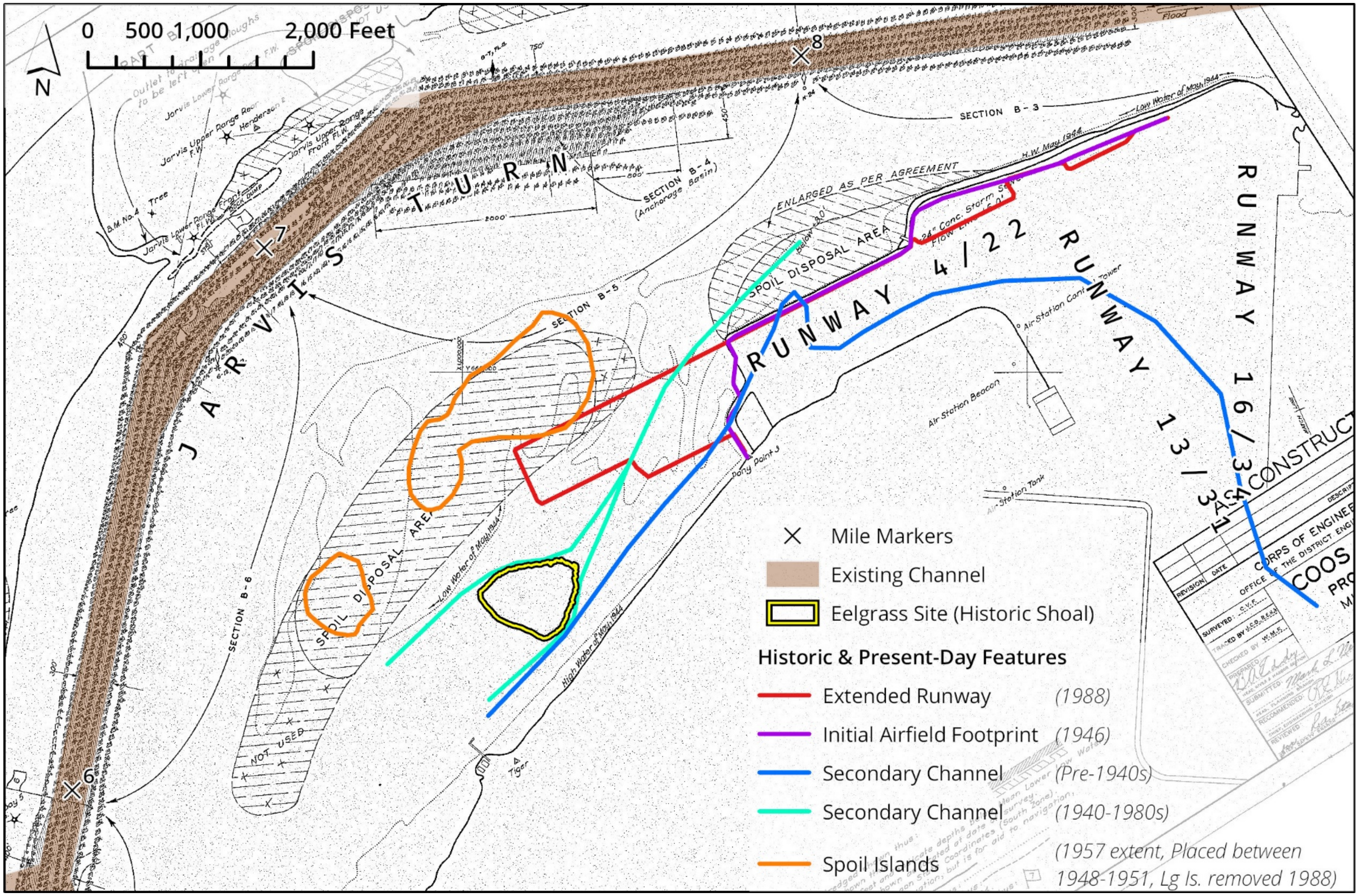

Figure 2-3. 1949 USACE Proposed Dredging and Disposal Plan (CB-1-385)

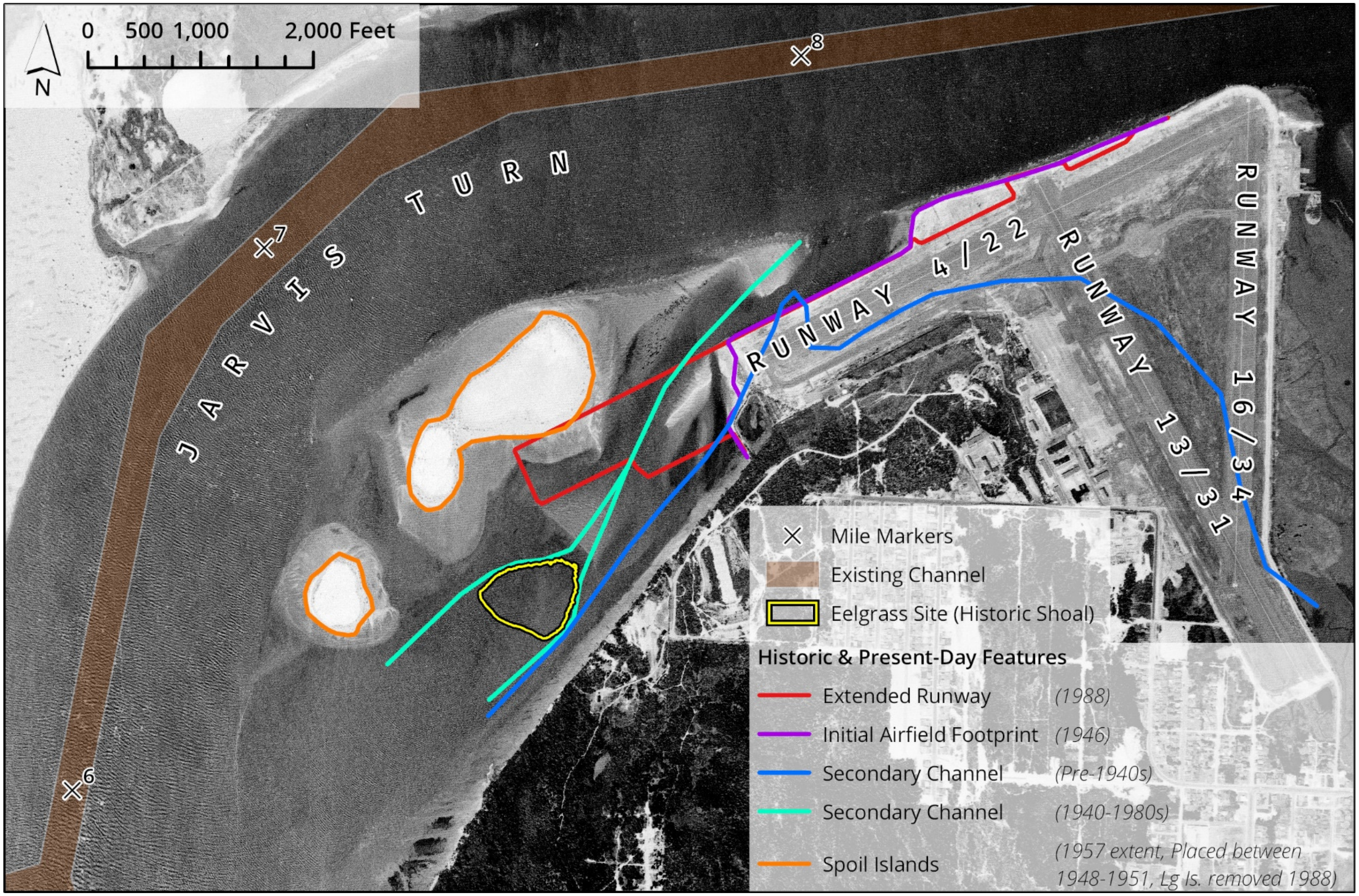

Figure 2-4. 1957 USGS Aerial

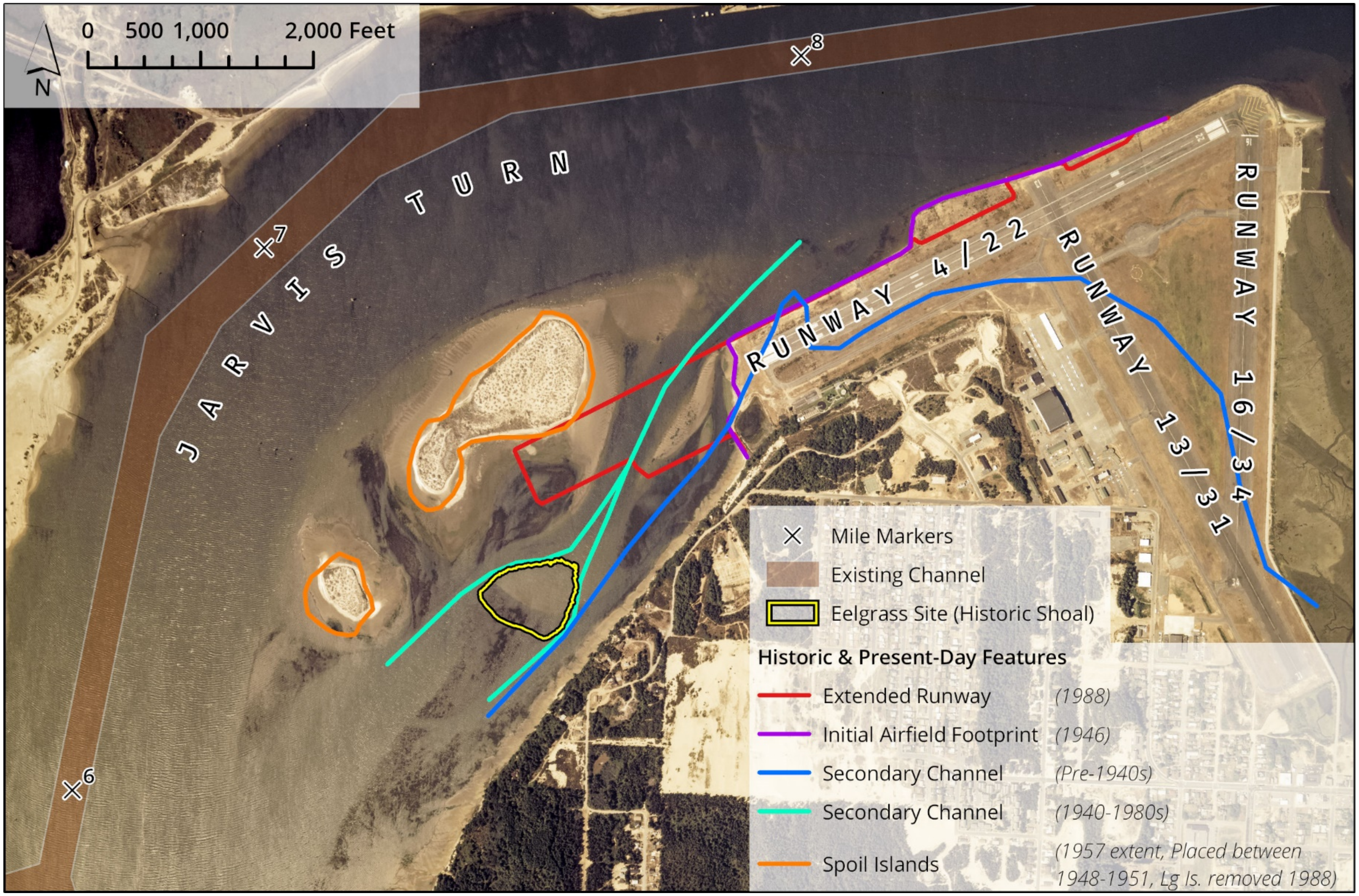

Figure 2-5. 1977 USGS Aerial

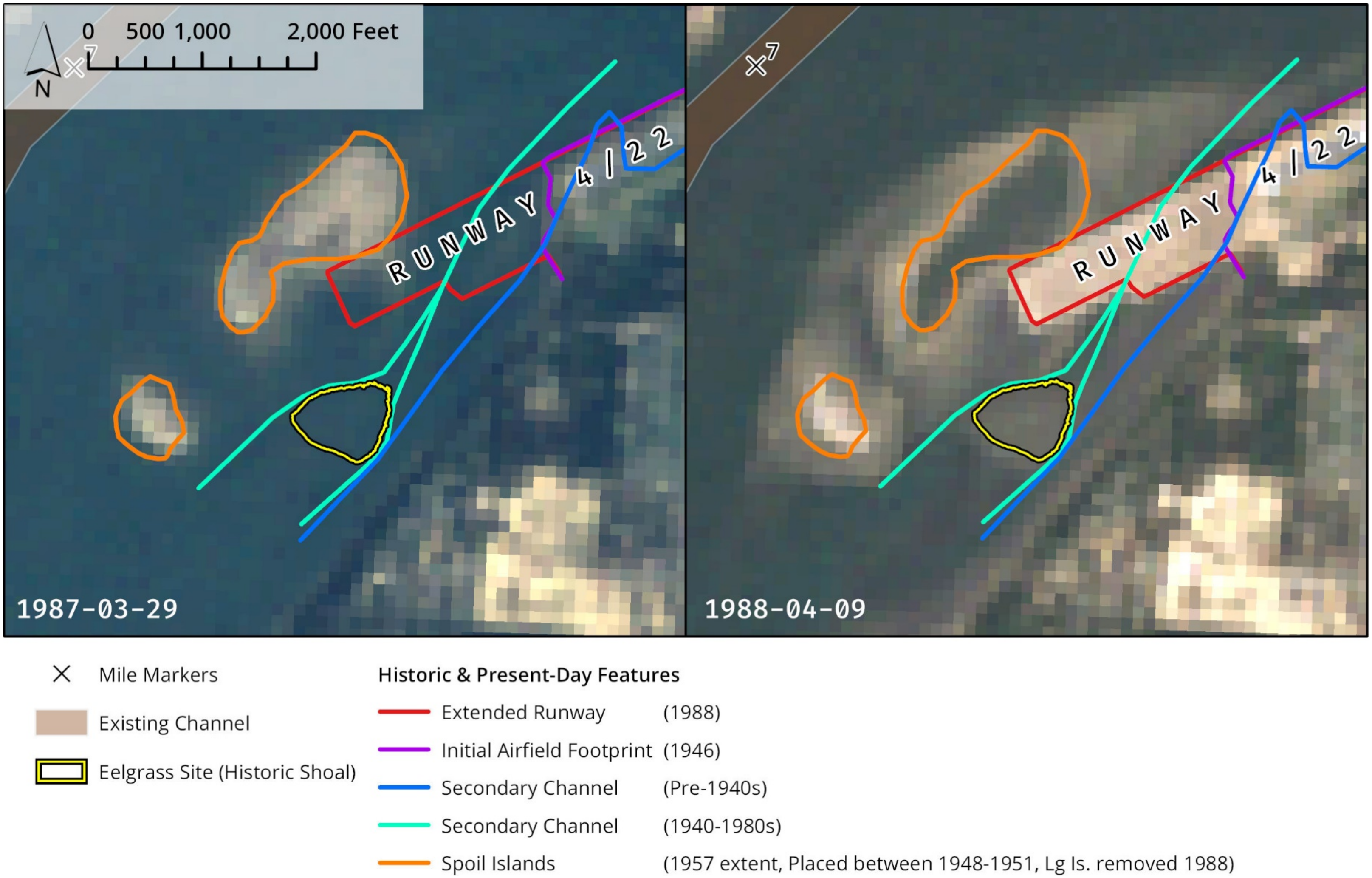

Figure 2-6. Satellite images showing the removal of the large dredge spoil island to construct the airport runway extension (1987-1988)

Figure 2-7. Partial removal of the spoil island, used as a source of fill for Runway 4/22 extension (1987), photo by Ward Robertson

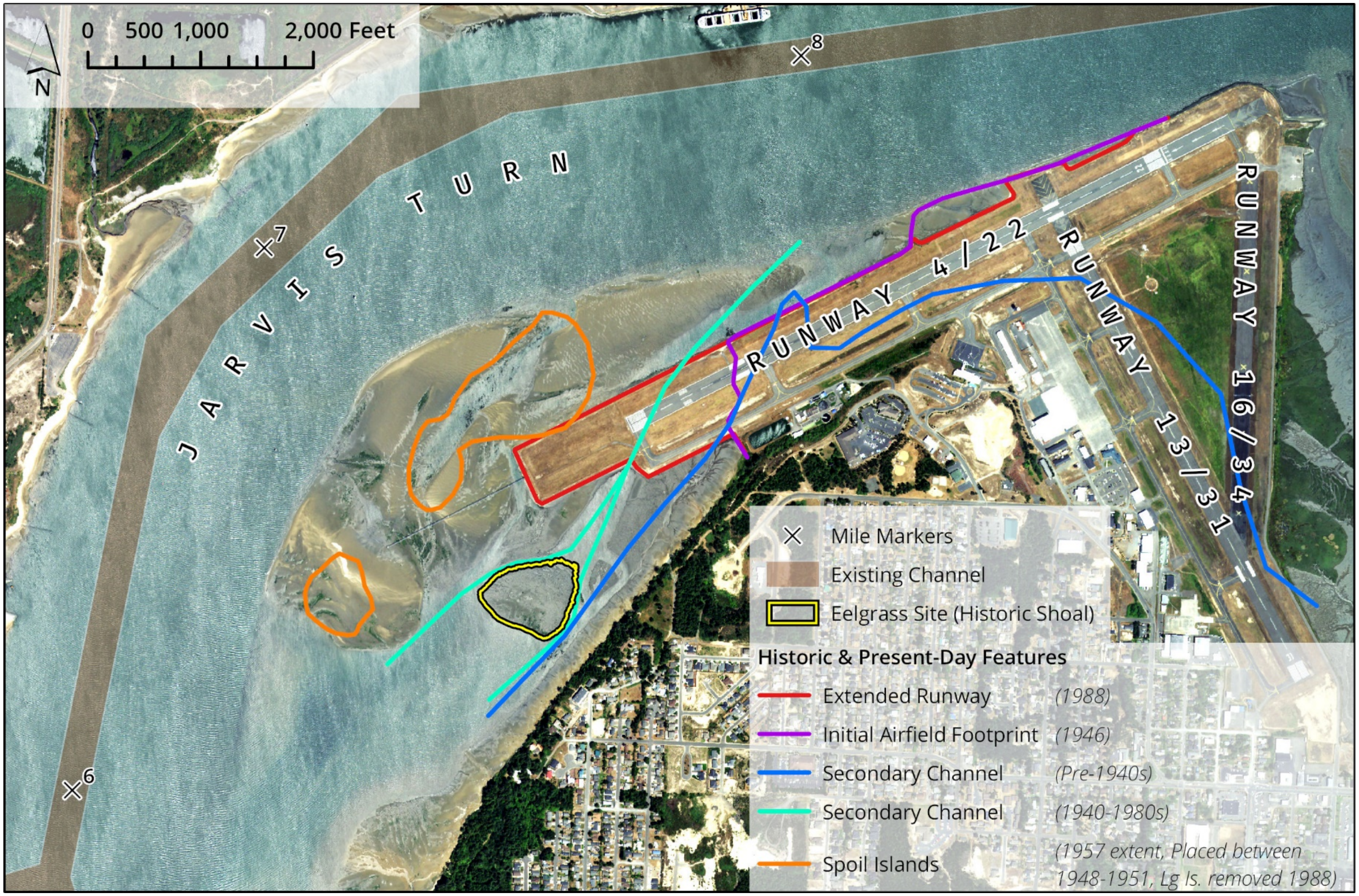

Figure 2-8. 2016 USDA Aerial

3. MODELING

In support of the permitting efforts for the JCEP, M&N has prepared two technical memoranda to summarize the hydrodynamics and sediment transport within the bay. Specifically, this memorandum should be used in parallel with the "Sediment Transport Analysis Technical Memorandum" and the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018a, 2018b). The hydrodynamic and sediment transport studies used MIKE-21 to model "Without-Project" (existing conditions) and "With-Project" scenarios. The With-Project scenario included the proposed Eelgrass Mitigation Site. A comparison of the two scenarios provides an indication of anticipated changes to channel flow and sedimentation resulting from the proposed JCEP.

A typical 3-month winter tide cycle was used to model sediment transport. The With-Project and Without-Project scenarios used the same tide information and methodologies. Winter tidal conditions were used because these months tend to have the most extreme tidal currents and thus yield more conservative results. Winter months with larger tidal currents were applied in the model. The model configurations are discussed in detail in the hydrodynamic study and sediment transport study (M&N 2018a, M&N 2018b).

The sediment transport modeling result for the existing condition showed sand waves within the main channel and little sedimentation outside the main channel. A slight amount of deposition is shown just south of the proposed Eelgrass Mitigation Site (the existing delta-shaped shoal; (Figure 3-1). Other than the small depositional patch (less than 0.5ft deep and approximately 0.8 acres), the region south of Runway 4/22 is stable (OIPCB 2017).

A comparison of the With-Project and Without-Project modeling results show a large percentage reduction in currents (50%) at the Eelgrass Mitigation Site (Table 3-1). However, currents associated with the existing (i.e., Without-Project) and future With-Project conditions are quite small (0.2 knots) with a modeled net change of 0.1 knot. Given that the region south of Runway 4/22 is already static, the reduction in currents is unlikely to cause increased shoaling. A comparison of sediment transport modeling results supports this claim. Figure 3-2 shows no change in sedimentation near the Eelgrass Mitigation Site between the With and Without-Project conditions.

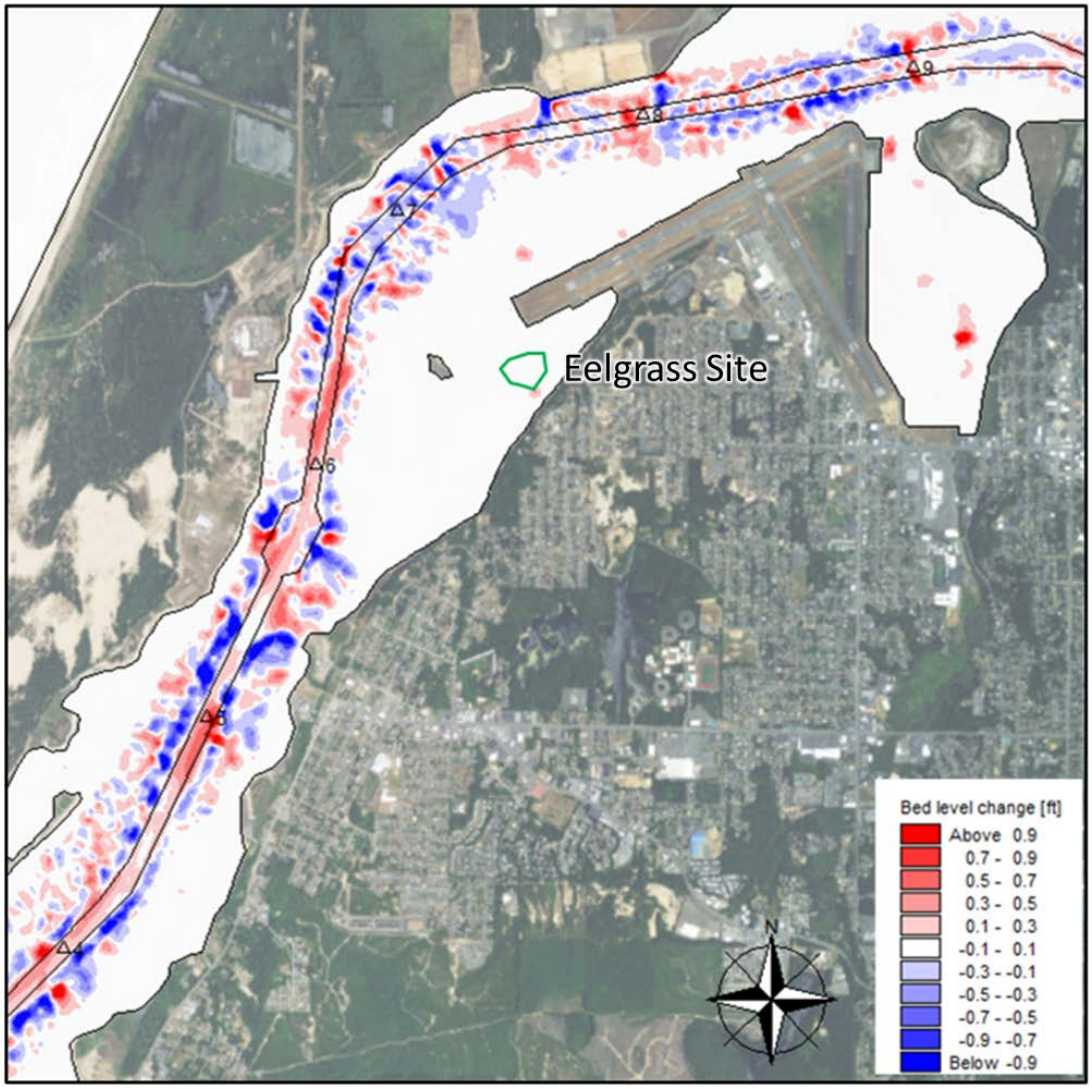

Figure 3-1. Model Result for the Existing Condition; Red – Shoaling, Blue - Erosion (OIPCB 2017)

Table 3-1. Modeled Current Change for the Eelgrass Mitigation Site (M&N 2018b)

	Mean Current Speed during Flood Tides (knots)	Mean Current Speed during Ebb Tides (knots)	99th Percentile Current Speed (knots)
Without-Project	0.2	0.1	0.4
With-Project	0.1	0.1	0.3
% Change	-50%	0%	-25%

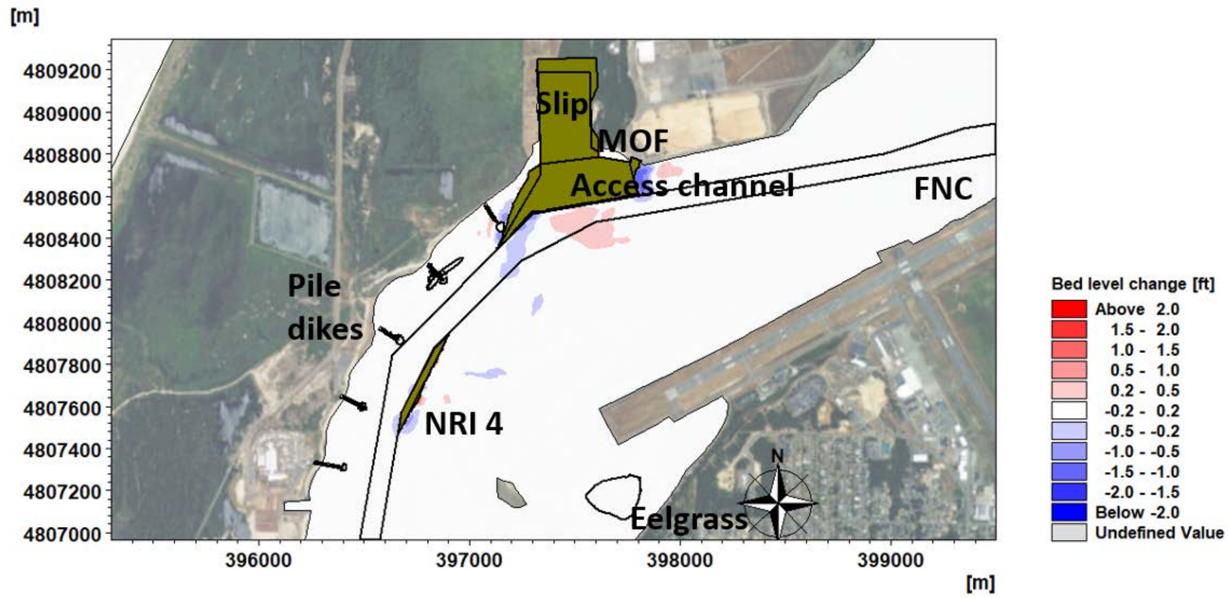

Figure 3-2. Difference of Bed Level Changes after One Year at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue – Erosion (M&N 2018a)

4. SUMMARY

This memorandum documents historic changes to the topography in the vicinity of the proposed Eelgrass Mitigation Site and determines how the constructed site will respond to hydrodynamic conditions within the estuary. Specifically, this memorandum determines whether the forces that created the existing shoal at the proposed site would cause the deepened mitigation site to fill with sediment. The site history and computer modeling of future conditions suggests that the proposed excavated Eelgrass Mitigation Site will remain stable.

The secondary channel that previously flowed over and delivered sediment to the proposed site is no longer active. Construction of the airport in 1946 and creation of dredge spoil islands in 1951 created conditions that led to the formation of the mound of sediment at the proposed Eelgrass Mitigation Site. In 1988, the airport was lengthened by approximately 2,000 feet to the west, effectively cutting off nearly all flow through the proposed site. Since this time, the proposed Eelgrass Mitigation Site has remained largely unchanged. Sediment transport modeling results support this, showing little-to-no change over the shallow region of the site. Models of the proposed JCEP (including the Eelgrass Mitigation Site) show no changes to the sedimentation patterns in the vicinity of the Eelgrass Mitigation Site. Therefore, after excavating, grading, and planting eelgrass at the proposed Eelgrass Mitigation Site, it is expected that the area will maintain its constructed depth and will not shoal back to its present-day elevation.

5. REFERENCES

CH2M Hill 1990. North Bend Runway Extension Status Report. Prepared for the City of North Bend, Oregon.

Gonor, J.J., Strehlow, D.R., Johnson, G.E., 1979. “Ecological Assessments at the North Bend Airport Extension Site: A Study of the Proposed North Bend, Oregon Airport Extension”.

Moffatt & Nichol (M&N), 2018a “Hydrodynamic Studies – Sediment Transport Analysis”. Prepared for JCLNG, May 2018. JCLNG Document No. J1-000-MAR-TNT-DEA-00003-00.

—, 2018b “Hydrodynamic Studies – Hydrodynamic Analysis Technical Memorandum”. Prepared for JCLNG, May 2018. JCLNG Document No. J1-000-MAR-TNT-DEA-00008-00.

—, 2017 “Navigation Reliability Improvement (NRI) Dredge Areas Evaluation Technical Memorandum”. Prepared for JCLNG, October 2017. JCLNG Document No. J1-000-MAR-TNT-DEA-00002-00

Oregon International Port of Coos Bay (OIPCB), 2017. “Coos Bay, Oregon, Section 204(f) Channel Modification Project: 60% Engineering Design Report”. October 31, 2017. JCLNG Document No. J1-000-MAR-RPT-PCB-00004-00.

APPENDIX E: LNG TERMINAL WETLAND FUNCTIONAL ASSESSMENT

(J1-000-TEC-TNT-DEA-00020-00 September 27, 2017)

TECHNICAL MEMORANDUM

DATE:	September 27, 2017
ATTENTION:	Caroline Burda, Senior Environmental Specialist
COMPANY:	Jordan Cove LNG
ADDRESS:	5615 Kirby Drive, Suite 500
FROM:	Ethan Rosenthal
SUBJECT:	Jordan Cove Energy Project Wetland Functional Assessment
DEA PROJECT NAME:	Jordan Cove LNG
DEA PROJECT NO:	JLNG0000-0003
DOCUMENT #	J1-000-TEC-TNT-DEA-00020-00
COPIES TO:	DEA File

1. INTRODUCTION

This memorandum provides the results of wetland functional assessments conducted for the Jordan Cove Energy Project ("JCEP Project") permitting effort. Wetland functional assessments were conducted for wetlands, including estuarine resources, located within the JCEP Project study area that will experience permanent impacts. The areas of the JCEP Project that will experience permanent wetland or estuarine resource impacts include: Ingram Yard, slip and access channel, Material Offloading Facility, South Dunes site, and the Trans Pacific Parkway/U.S. Highway 101 Intersection Widening. Functions and values were also assessed at the Kentuck Project mitigation site and the Eelgrass Mitigation site, both for the existing pre-mitigation condition and the designed post-mitigation condition. This memorandum is intended to provide the wetland functional assessment results. A discussion of project impacts, including avoidance and minimization measures, is provided in the permit application submittals to the U.S. Army Corps of Engineers ("USACE") and the Oregon Department of State Lands ("DSL").

2. METHODS

Wetland functions and values were evaluated for impacted wetlands and the mitigation sites pre- and post-mitigation. Table 1 lists the assessment methods used for various aspects of the project.

Table 1. Functional Assessment Methods Used for JCEP Permanent Wetland and Estuarine Impacts

Project and Components	Method: Rationale
Freshwater wetland impacts	Oregon Rapid Wetland Assessment Protocol ("ORWAP"): This is the approved method for assessing functions and values in Oregon, particularly for projects that entail multiple wetland types.
Existing tidal habitats and Eelgrass Mitigation site (intertidal sand/mudflats, shallow subtidal, eelgrass, salt marsh, riprap embankment below highest measured tide)	Best Professional Judgement ("BPJ"): BPJ entails the review of functions and values based on the knowledge and experience of a trained professional, as opposed to a more formulaic/model driven approach such as ORWAP. The habitats assessed using BPJ occur at the proposed slip and access channel, the Trans Pacific Parkway/US Highway 101 intersection, along the west side of East Bay Drive at the Kentuck Project, and at the Eelgrass Mitigation site. ORWAP is not intended to assess these types of estuarine resources, with the exception of salt marsh. Because impacts to salt marsh habitats are extremely small (0.06 acre) and are adjacent to the other habitats noted above, they have been included in this method due to their *de minimis* function relative to the surrounding impacted habitats.
Kentuck Project, pre- and post-mitigation	ORWAP: This method is appropriate for evaluating all wetland types at the site in its existing condition. This method also covers the many wetland types that will exist post-mitigation. ORWAP does consider the presence of mudflats within the greater vegetated portion of a site. Therefore, mudflats that will form at the site have been included as a part of the overall site assessment. Post-mitigation conditions were assessed seperately for the two Kentuck Project areas: Tidal Reconnection Area and Freshwater Floodplain Reconnection Area. These areas were evaluated seperately since the sources of hydrology—tidal and non-tidal—are distinctly different. However, each assessment of post-mitigation condition assumed that the other mitigation site was in place and therefore adjacent conditions would improve functions within the assessed area.

2.1 OREGON RAPID WETLAND ASSESSMENT PROTOCOL METHOD AND SPECIAL CONSIDERATIONS

ORWAP is a standardized protocol for assessing the functions and values of wetlands in Oregon. DSL led its development with funding from the U.S. Environmental Protection Agency and oversight by an advisory committee of state and federal agencies and private consultants. ORWAP outputs, like those of other methods, are not necessarily more accurate than judgments of a subject expert, partly because ORWAP spreadsheet models lack the intuitiveness and integrative skills of an actual person knowledgeable of a particular function, and models cannot anticipate every possible condition that may occur in nature (Adamus et al. 2016a).

The procedure for using ORWAP involves several steps. After data from the three-part form are entered into an Excel spreadsheet, ORWAP automatically generates scores intended to reflect the ability of a wetland to support the following functions: Water Storage and Delay, Sediment Retention and Stabilization, Phosphorus Retention, Nitrate Removal and Retention; Anadromous Fish Habitat; Resident Fish Habitat; Amphibian and Reptile Habitat; Waterbird Nesting Habitat; Waterbird Feeding Habitat; Aquatic Invertebrate Habitat; Songbird, Raptor, and Mammal Habitat; Water Cooling; Native Plant Diversity; Pollinator Habitat; Organic Nutrient Export; and Carbon Sequestration (Adamus et al. 2016a). For all but two of these functions, scores are given for both components of an ecosystem service: function and value (the Function Rating and the Value Rating, respectively). The functions are also condensed into thematic groups, called "grouped services." Grouped services ratings are what are required for regulatory use and include the following: Hydrologic Function, Water Quality Support, Fish Habitat, Aquatic Habitat, and Ecosystem Support. The individual functions are given a numeric score, while the grouped services are simply rated as "lower," "moderate," or "higher." If the function is completely absent, then a "zero" score is assigned. A "zero" score also may be assigned if the score ranked among the lowest of all wetlands in Oregon. The grouped rating is based on the highest scoring individual function within the particular group. ORWAP version 3.1 calculator spreadsheets, databases, and forms (Adamus et. al. 2016b) were used to conduct the wetland functional assessment for the JCEP permitting effort.

2.1.1 Special Consideration: Anadromous Fish Function

During implementation of ORWAP on portions of the project wetlands, it was observed that the ORWAP model sometimes greatly overstated the benefits to anadromous fish. The model does not have a simple question such as, "Do anadromous fish have access to the wetland?" Instead, the model attempts to get at this question indirectly through a series of related questions that don't take into account wetlands that might drain to anadromous fish-bearing waters via a non-fish-friendly tidegate or where a drainage connection might occur down a steep embankment that blocks fish passage. According to direction from DSL (Hicks pers. comm. 2017), when this issue arises it should be noted on the ORWAP cover sheet form and results can be manually adjusted. Because the ORWAP form is locked, it is not possible to adjust scores directly in the form, so these adjustments show up only in the attached summary table. The results section below notes any cases in which these adjustments apply in the assessment of project wetlands.

2.1.2 Special Consideration: Hydrologic and Water Quality Functions

ORWAP typically assigns Function Ratings for depressional wetlands lacking an outlet as "higher" for Hydrologic Function and Water Quality Support scores, regardless of any other characteristics of the wetland. The model essentially assumes that all water flowing in, including any pollutants, is trapped and therefore the wetland reduces downstream flooding, and pollutants cannot impact downstream waters. The scoring of these functions for project depressional wetlands followed this pattern. However, the value ratings of these functions for project wetlands generally rated "lower" or "moderate," presumably because the wetlands are quite small and located in the low end of the watershed, which means the functions are of relatively little benefit in these instances. The wetland characterization and results section below notes cases in which this situation applies to project wetlands.

3. WETLAND CHARACTERIZATION AND RESULTS

Wetlands requiring functional assessments are described below. These descriptions are intended to provide a general picture of the assessed wetlands as context for the more detailed assessment questions required by ORWAP or to provide the discussion of functions for resources in which BPJ was used to assess functions. ORWAP functional scores are summarized in the attached summary table. ORWAP cover pages and detailed score sheets for each assessment are provided as an attachment after the summary table. Detailed assessment worksheet forms, roughly 30 pages per assessed wetland, are available upon request.

3.1 IMPACTED WETLANDS

3.1.1 Wetlands 2013-6 and 2012-2 (Assessed Using ORWAP)

Wetlands 2013-6 and 2012-2 are interdunal emergent wetlands situated at a transition zone between generally less developed dune lands to the west and more disturbed developed areas to the east. The nearest source of disturbance to the wetland is Jordan Cove Road, which runs nearly adjacent to the east side of the wetlands. The wetlands have no surface outlet and are primarily fed by groundwater. Much of the wetlands are ponded year-round, ranging from up to 3 feet deep in the deeper areas during winter to just a few inches deep during summer. Wetland vegetation primarily consists of native emergent species, with some willow shrubs around the edges of the wetlands. The wetlands are bordered by coastal dune forest; however, as previously noted, Jordan Cove Road is close to the eastern boundary of the wetlands. A large expanse of sand dune, coastal dune forest, and wetlands are located to the west of the wetlands.

Notable findings from ORWAP include:

- Group scores that rated as “higher” for both the Function Rating and the Value Rating include: Aquatic Habitat and Ecosystem Support. The “higher” rating for Aquatic Habitat and Ecosystem Support make intuitive sense, because these wetlands are fairly intact and are bordered by other intact habitats.
- As noted in the methods section, Hydrologic Function and Water Quality Support function scores rated as “higher” solely because these wetlands have no outlet. However, the Value Rating for both of these functions was “lower.”
- The wetlands are not accessible to fish and likely do not have resident fish. ORWAP rated the Fish Habitat function as “lower”; however, this score was manually adjusted to zero in the attached summary table.

3.1.2 Wetland C (Assessed Using ORWAP)

Wetland C is a relatively small depressional forested wetland dominated by native plant species typical of the Oregon coast. The wetland is close to the shoreline of the geographic feature known as Jordan Cove. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road farther to the west, and cleared historic industrial land farther to the east. The wetland has no surface outlet and is primarily fed by groundwater. Minor ponding likely occurs in winter, and the wetland dries out in summer.

Notable findings from ORWAP include:

- Findings for Wetland C at the group level are essentially the same as those noted for Wetlands 2013-6 and 2012-2; see findings above.

3.1.3 Wetland E (Assessed Using ORWAP)

Wetland E is a deep depressional wetland dominated solely by yellow pond lily (*Nuphar luteum*). Ponding occurs throughout the year across the entirety of the wetland, with water surface elevations dropping roughly 2 to 3 feet from winter to summer. Yellow pond lily covers most of the water surface by summer; only a few small open water areas remain. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road farther to the west, and cleared historical industrial land farther to the east. The wetland has no surface outlet and is primarily fed by groundwater.

Notable findings from ORWAP include:

- Findings for Wetland C at the group level are essentially the same as those noted for Wetlands 2013-6 and 2012-2; see findings above.
- One exception to the similarity in findings is that the Fish Habitat function was not manually decreased from "lower" to zero for Wetland E, because this wetland contains a persistent source of ponded water that is several feet deep. Although it is not known if resident fish are present, it appears more likely that they are present at Wetland E than at Wetlands 2013-6 and 2012-2.

3.1.4 Wetlands H, I, J, and N (Assessed Using ORWAP)

Wetlands H, I, J, and N are all located in highly disturbed areas of the former Weyerhaeuser Mill property, now referred to as the South Dunes site. These wetlands consist of constructed drainage ditches and some flat wetland areas drained by the ditches. Vegetation is primarily a mix of native emergent and non-native grasses; however, some fringing willows might also be present. Surrounding areas consist of old concrete fill pads, and grass and shrub uplands dominated by non-native species that are occasionally maintained. Although these wetlands might drain to the bay, particularly during wetter months or high precipitation events, there is no fish access either because of fish-impassable culverts (i.e., tide gates or culvert elevation) or because the ditch bottoms are well above the elevation of high tides and outlet drainage spills over a steep embankment.

Notable findings from ORWAP include:

- No group functions rated as "high" for these wetlands, because all of these wetlands are situated in highly disturbed areas associated with past industrial activities. Non-native vegetation dominates these wetlands as well as the surrounding buffer areas. Some group functions did rate as "moderate"; however, this rating is most likely a result of more natural conditions farther afield, including relative proximity to the Coos Bay estuary.
- These wetlands are not accessible to fish, nor would they provide habitat to fish if access were provided. ORWAP rated the Fish Habitat function as "lower"; however, this score was manually adjusted to zero in the attached summary table.

3.1.5 Estuarine Resources at Proposed Access Channel (Assessed Using BPJ)

Permanently impacted estuarine resources at the proposed access channel consist mostly of unvegetated intertidal sand/mudflat, unvegetated shallow subtidal habitat, narrow bands of eelgrass along the intertidal/subtidal boundary, and a very small patch (<0.1 acre) of salt marsh vegetation. The habitats provide similar functions to one another; however, the salt marsh and eelgrass habitats tend to provide these functions to a greater extent. Flats habitats support algae and a variety of benthic invertebrates. These habitats are generally sheltered from strong currents and wave action, and their gradual slopes tend to dissipate wave and tidal energies. Sediment deposition and tidal/wave action are important factors that help develop and shape flats habitat. Tidal flat sediments vary from fine mud to cobbles. Sediments at the access channel range from course sand to mud. Shallow water depths allow for maximum light and warm temperatures, which may result in extensive algae blooms in the spring and summer. Diatoms are a very common type of algae that are distributed throughout the lower bay and contribute significantly to estuarine primary production. Mudflats and sand flats provide habitat to various shellfish species and ghost shrimp. Bottom-feeding fishes graze over flats during high tide. Flats habitats are important to juvenile salmonids, because they provide suitable substrate conditions to support primary productivity (benthic algae) and prey species (benthic macroinvertebrates). Eelgrass beds further support primary productivity, act as substrate and structure for epiphytic (attached) algae and other aquatic organisms, and provide important cover for juvenile fish. Herring and other aquatic organisms attach their eggs to eelgrass. Intertidal flats also provide feeding areas for waterfowl, shorebirds, and raptor species such as osprey. The habitats at the proposed access channel could provide all of these functions; however, likely not at a level as high as some of the more diverse and ecologically complex locations found elsewhere in the bay (e.g., Clam Island area).

3.2 MITIGATION SITES

3.2.1 Kentuck Project Wetlands – Existing Conditions (Assessed Using ORWAP)

Wetlands at the Kentuck Project site primarily consist of wet pasture that now occupies the former Kentuck Golf Course. Vegetation primarily consists of non-native grasses, with scattered native and ornamental trees. Hydrology is primarily driven by a high seasonal groundwater table along with direct precipitation. Some ponding occurs during the winter months, with excessive ponding occurring after heavy and/or persistent periods of rain. Ponding is generally absent in the summer, except for a few small excavated ponds/former golf course water hazards. Several small drainages enter the site from adjacent hillsides and flow to Kentuck Inlet (i.e., Coos Bay) via a tidegated culvert into a sump on the east side of East Bay Road and then to a non-tidegated culvert under East Bay Road. The site is hydrologically isolated from Kentuck Slough (inclusive of Kentuck Creek) by a levee. Currently, the site is inaccessible to fish from the bay and Kentuck Slough. Forested wetland, dominated by typical native coastal plant species, occurs on the south side of Golf Course Lane, and is also part of the overall site. These wetland areas are fed by subsurface flow and runoff from the adjacent hillside. There is also a small dam and irrigation pond that drains to the former golf course area. Drainage is via a standpipe. The irrigation pond contains perennial open water, areas of yellow pond lily, and emergent wetland dominated by native species. Forest lands border the east side of the site, and there is a combination of timber harvest and residential dwellings further upslope.

Notable findings from ORWAP include:

- No group scores rated as “higher” for both the Function Rating and Value Rating.
- Aquatic Habitat and Ecosystem Support functions ratings were manually adjusted from “higher” to “moderate.” ORWAP likely scored these as “higher” because some minor portions of the Kentuck Project site have intact habitats; however, these portions provide a poor point of comparison, because the majority of the site lacks intact native habitats and has been highly altered by past land use practices. A “moderate” rating is more appropriate for this site, because it is a former golf course that is slowly reverting back to more natural conditions but still experiences grazing and lacks overall diversity.
- ORWAP rated the Fish Habitat function as “moderate,” but this score was manually adjusted to “lower” in the attached summary table. The site wetlands and associated creeks are not accessible to anadromous fish but could have resident fish. ORWAP rated the individual “Resident Fish” function as “lower.”

3.2.2 Kentuck Project Wetlands – Post-mitigation, Tidal Reconnection Area (i.e., JCEP Mitigation) (Assessed Using ORWAP)

The Kentuck Site post-mitigation will contain two primary areas: one connected to tidal influence and the other not connected to tidal influence but connected to Kentuck Creek. This description covers the portion that will be connected to tidal influence and is intended to provide mitigation for the JCEP Project impacts.

After mitigation this area will consist of a combination of mudflats, salt marsh, tide channels, and fringing freshwater wetlands that will form a complex estuarine ecosystem providing a full connection and fish accessibility to and from Coos Bay. Willows are highly supportive of rearing salmonids and they will be an important component of the fringing wetland plant communities. The site will also be connected to Kentuck Slough via a muted tidal regulator (i.e., a fish-friendly tidegate structure). Hydrology will be provided primarily by tidal inundation, along with freshwater inputs from hillside seepage and incoming drainages.

Notable findings from ORWAP include:

- Group scores that rated as “higher” for both the Function Rating and Value Rating include: Water Quality Support, Fish Habitat Support, Aquatic Habitat Support, and Ecosystem Support. These high ratings make intuitive sense, because the area will be restored to a complex and diverse array of native habitat types that were historically present but have been lost in the estuary.
- The Hydrologic Function rated as “lower” for the Function Rating, likely only because the area will be a tidal wetland and therefore will not support flood control.

3.2.3 Kentuck Project Wetlands – Post-mitigation, Freshwater Floodplain Reconnection Area (i.e., PCGP Mitigation) (Assessed Using ORWAP)

The northeast end of the Kentuck Project site will be reconnected to Kentuck Creek, outside of the previously described Tidal Reconnection Area, and therefore will provide restored freshwater wetland floodplain habitat. This area will be focused on mitigation for the impacts of the Pacific Connector Gas Pipeline project ("PCGP Project"), which consist of conversion of palustrine forested and scrub-shrub wetlands to emergent wetlands. Therefore, forested and scrub-shrub wetlands are the dominant habitat types proposed for this area; however, a minor component of emergent wetland will also be provided. The existing levee that segregates Kentuck Creek from the Kentuck Project site will be removed in this area, allowing flood flows to enter the wetlands. Minor grading within the freshwater floodplain reconnection area will occur in order to provide microtopographic relief, which should allow for establishment of diverse plant communities and provide fish refugia habitat during periods of high water. Similar to the tidal portion of the Kentuck Project described above, because willows are highly supportive of rearing salmonids, they will be an important component of the plant communities.

Notable findings from ORWAP include:

- Group scores that rated as "higher" for both the Function Rating and Value Rating include: Water Quality Support, Fish Habitat Support, Aquatic Habitat Support, and Ecosystem Support. These high ratings make intuitive sense, because the area will be restored to a complex and diverse array of native habitat types along the Kentuck Creek floodplain that were historically present but have been lost.
- The Function Rating for Water Quality Support was manually increased from "moderate" to "higher," because it is assumed that the benefits of increased shade/lower water temperature and the trapping of sediments during high flows are likely underestimated by ORWAP, and will certainly be greater than the "moderate" rating ORWAP also calculated for the existing condition.
- The Value Ratings for Aquatic Habitat and Ecosystem Support functions were manually increased to "higher," because these functions are clearly valued in the watershed and because the assessment of the pre-mitigation condition rated them as "higher" value. Clearly, the improvement in site conditions should not reduce their value.

3.2.4 Eelgrass Mitigation Site – Existing Conditions (Assessed Using BPJ)

The proposed Eelgrass Mitigation site currently consists of a sand flat island situated several feet above mean lower low tide elevation. The island is exposed during lower low tides. Deeper areas surrounding the island contain eelgrass beds. Functions that are provided by sand flats and mudflats are described above in the discussion of "Estuarine Resources at Proposed Access Channel." Generally speaking, the functions provided occur at a lower level for bare sand flats than for areas with eelgrass beds. In addition, primary production and associated food chain support are lower in the bare sand flat areas than in the areas with eelgrass. The bare sand flat also lacks the substrate and structure to support epiphytic algae and other organisms that would increase primary and secondary productivity. Cover for juvenile fish is not provided.

3.2.5 Eelgrass Mitigation Site – Post-mitigation (Assessed Using BPJ)

The same functions provided pre-mitigation would be provided post-mitigation; however, these functions would be provided at a higher level. The presence of eelgrass would elevate levels of primary production and associated food chain support functions considerably. The eelgrass would also provide substrate and structure to support epiphytic algae and other organisms that would increase primary and secondary productivity. Cover for juvenile fish would be provided along with attachment sites for egg laying by herring and other aquatic organisms.

4. SUMMARY FINDINGS

Based on ORWAP, freshwater wetland group functions likely to be most affected by the JCEP Project and that received "higher" Function and Value Ratings are the Aquatic Habitat and Ecosystem Support functions. Under existing conditions, no functions at the proposed Kentuck Project mitigation site rated as "higher." On the other hand, post-mitigation Function Ratings for both the Kentuck Project Tidal Reconnection Area and the Kentuck Project Freshwater Floodplain Reconnection Area rated as "higher" for Water Quality Support, Fish Habitat, Aquatic Habitat, and Ecosystem Support, all of which received "higher" Value Ratings as well. These assessment results suggest two conclusions: first, proposed mitigation at both Kentuck Project areas results in a functional uplift of important wetland values, and second, the uplift at the Kentuck Project will occur, at a minimum, to the same "higher" Function Rating and Value Rating group functions that will be lost at the freshwater impact sites.

Estuarine habitat functions will be lost at the proposed slip location. As previously described, functions such as shellfish habitat, waterbird habitat, primary production, cover for juvenile fish, and egg laying attachment areas for herring and other aquatic organisms may be provided at this impact site; however, due to current site conditions, the impact site likely does not provide these functions at as high a level as some of the more diverse and ecologically complex locations found elsewhere in the bay. Lost estuarine functions will be offset at the Kentuck Project site and the Eelgrass Mitigation site, both of which are currently situated in and/or post-mitigation will result in a considerably more complex and diverse array of habitats than at the slip impact site, thus resulting in an overall uplift in functions.

As previously noted, this memorandum is only intended to provide the wetland functional assessment results. A discussion of project impacts, including avoidance and minimization measures, is provided in the Joint Permit Application submittal to the USACE and DSL.

5. REFERENCES

Adamus, P., J. Morlan, K. Verble. and A. Buckley. 2016b. Oregon Rapid Wetland Assessment Protocol (ORWAP, revised). Version 3.1 calculator spreadsheet, databases, and data forms. Oregon Department of State Lands, Salem, OR.

Adamus, P., K. Verble, and M. Rudenko. 2016a. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP, revised). Version 3.1. Oregon Dept. of State Lands, Salem, OR.

Dana Hicks, DSL, personal communication, August 18, 2017.

ATTACHMENTS

- Attachment 1: ORWAP Summary Table
- Attachment 2: ORWAP Cover Pages and Summary Scores

Attachment 1: ORWAP Summary Table

ORWAP Functional Assessment Summary Results for JCEP Project

Note: Group functions where both the Function Rating and Values Rating were "higher" have been shaded in green. These Group Functions will be emphasized in the comparison of impacts to mitigation.

Impacted Wetlands

	Wetland C				Wetland E				Wetlands H, Wetland I, Wetland J, and Wetland N				Wetland 2013-6 and 2012-2			
GROUPS	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Higher	--	Lower	--	Higher	--	Lower	--	Moderate	--	Lower	--	Higher	--	Lower	--
Water Quality Support (SR, PR, or NR)	Higher	--	Moderate	--	Higher	--	Lower	--	Lower	--	Moderate	LM	Higher	--	Lower	--
Fish Habitat (FA or FR)	0 (2)	--	0 (2)	--	Lower	--	Lower	--	0 (2)	--	0 (2)	--	0 (2)	--	0 (2)	--
Aquatic Habitat (AM, WBF, or WBN)	Higher	--	Higher	--	Higher	MH	Higher	--	Moderate	--	Higher	--	Higher	MH	Higher	--
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Higher	MH	Higher	--	Higher	MH	Higher	--	Moderate	MH	Higher	--	Higher	MH	Higher	--

Kentuck Project Site, Pre- and Post-Mitigation

	Pre-Mitigation (i.e. Existing Conditions)				Post-Mitigation Tidal Reconnection Area				Post-Mitigation Freshwater Floodplain Reconnection Area			
GROUPS	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Lower	--	Lower	--	Lower	--	Lower	--	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Moderate	--	Higher	--	Higher	--	Higher	--	Higher (5)		Higher	
Fish Habitat (FA or FR)	Lower (1)	--	Higher	--	Higher	--	Higher	--	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Moderate (6)	--	Higher	--	Higher	--	Higher	--	Higher	MH	Higher (4)	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Moderate (6)	MH	0 (3)	0 (3)	Higher	--	Higher	--	Higher		Higher (4)	

Notes regarding ratings, including manual adjustments to ORWAP ratings.

(1) Rating manually adjusted to "Lower" because ORWAP currently not able to account for tidegates that prevent fish passage. Note score on individual worksheet is as calculated by ORWAP (i.e. moderate).

(2) A "0" rating was manually entered because ORWAP had rated the function as "lower" when in fact no function is provided due to a total lack of access by anadromous and resident fish.

(3) A "0" rating was asigned by ORWAP because the associated highest function within the Ecosystem Support group was "Organic Nutrient Export." ORWAP does not assess the value of Organic Nutrient Export.

(4) Values scores were manually increased to "higher" since the functions are clearly valued in the watershed and because the assessment of the pre-mitigation rated them to be of high value.

(5) Function Rating manually increased from "moderate" to "higher" since it is believed that shade/temperature benefits and trapping of sediments during high flows are likely underestimated by ORWAP and will certainly be greater than the "moderate" rating ORWAP also calculated for the existing condition.

(6) Manually adjusted from "higher" to "moderate". ORWAP likely scored as "higher" because some minor portions of the Kentuck Project have intact habitats; however, this provides a poor comparison when reviewing the majority of the site that lacks intact native habitats and that have been highly altered by past land use practices.

Attachment 2: ORWAP Cover Pages and Summary Scores

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland C
Investigator Name:	Phil Rickus
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	
Longitude (decimal degrees):	43.4339, -124.2492
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.29 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEMW, PFOC
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	no
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Relatively small depressional forested wetland dominated by natives. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road further to the west and cleared historic industrial land further to the east. The wetland has no surface outlet and is primarily fed by groundwater. Minor ponding likely occurs in winter with the wetland drying out in summer.

Site Name:	**Wetland C**
Investigator Name:	**Phil Rickus**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		4.85	Moderate	
Phosphorus Retention (PR)	10.00	Higher		2.27	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.80	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.40	Higher		3.47	Lower	
Waterbird Nesting Habitat (WBN)	6.64	Moderate	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.03	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	5.69	Moderate		2.47	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.04	Lower		5.00	Moderate	
Water Cooling (WC)	9.41	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.94	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	7.09	Higher	MH	5.77	Higher	MH
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	7.51	Higher				
Public Use & Recognition (PU)				3.16	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.71	Moderate	
Wetland Ecological Condition (EC)	1.92	Lower	
Wetland Stressors (STR)	2.86	Lower	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Moderate	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland E
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	43.4345
Longitude (decimal degrees):	-124.2482
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.5 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	15%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Ponded wetland dominated by yellow pond lilly. Hydrologic and WQ support function scores rated as "higher" solely due to wetland having no outlet. Otherwise, both would have rated as "lower." Values scores for both of these functions rated as "lower."

Site Name:	Wetland E
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		1.95	Lower	
Phosphorus Retention (PR)	10.00	Higher		2.03	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.61	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.08	Higher	MH	3.53	Lower	
Waterbird Nesting Habitat (WBN)	7.30	Higher	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.50	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	4.98	Moderate	LM	2.46	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.50	Lower		5.00	Moderate	
Water Cooling (WC)	8.43	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.63	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	0.00	Lower		0.00	Lower	
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	3.50	Lower	LM			
Public Use & Recognition (PU)				3.19	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.29	Moderate	
Wetland Ecological Condition (EC)	1.67	Lower	
Wetland Stressors (STR)	3.43	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Lower	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Higher	MH	Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland H (East), Wetland I (North and South), Wetland J, and Wetland N
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	43.436061
Longitude (decimal degrees):	-124.2429
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	1.44
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
Comments about the site or this ORWAP assessment (attach extra page if desired):	These wetlands are all of similar character and consist of highly disturbed ditch/drainage features and/or maintained areas within industrial grounds associated with the former Weyerhauser Mill site (now referred to as the South Dunes Site). Vegetation is mostly non-native and buffer areas are highly disturbed.

Site Name:	**Wetland H (East), Wetland I (North and South), Wetland J, and Wetland N**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	6.08	Moderate		0.00	Lower	
Sediment Retention & Stabilization (SR)	2.52	Lower		3.35	Moderate	LM
Phosphorus Retention (PR)	0.00	Lower		0.00	Lower	
Nitrate Removal & Retention (NR)	3.70	Lower	LM	3.79	Moderate	LM
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	5.54	Moderate		3.07	Lower	
Waterbird Nesting Habitat (WBN)	6.18	Moderate		10.00	Higher	
Waterbird Feeding Habitat (WBF)	6.13	Moderate	MH	10.00	Higher	
Aquatic Invertebrate Habitat (INV)	1.84	Lower		2.24	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.75	Lower		5.00	Moderate	
Water Cooling (WC)	1.00	Lower		0.00	Lower	
Native Plant Diversity (PD)	0.00	Lower		0.00	Lower	
Pollinator Habitat (POL)	3.05	Moderate		7.63	Higher	
Organic Nutrient Export (OE)	6.22	Moderate				
Carbon Sequestration (CS)	1.21	Lower				
Public Use & Recognition (PU)				3.31	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.63	Moderate	LM
Wetland Ecological Condition (EC)	3.35	Moderate	LM
Wetland Stressors (STR)	5.90	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Lower		Moderate	LM
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Moderate		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Pollinator Habitat (POL)	Moderate		Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland 2013-6 and 2012-2
Investigator Name:	Phil Rickus
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	
Longitude (decimal degrees):	
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.8 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	15%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Ponded wetland dominated by yellow pond lilly. Hydrologic and WQ support function scores rated as "higher" solely due to wetland having no outlet. Otherwise, both would have rated as "lower." Values scores for both of these functions rated as "lower." Fish Habitat should be rated as zero, since there is no fish access and resident fish are likely not present.

Site Name:	Wetland 2013-6 and 2012-2
Investigator Name:	Phil Rickus
Date of Field Assessment:	various during different times of year

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		1.95	Lower	
Phosphorus Retention (PR)	10.00	Higher		2.03	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.61	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.08	Higher	MH	3.55	Lower	
Waterbird Nesting Habitat (WBN)	7.45	Higher	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.60	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	4.98	Moderate	LM	2.46	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.50	Lower		5.00	Moderate	
Water Cooling (WC)	8.43	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.63	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	0.00	Lower		0.00	Lower	
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	3.63	Lower	LM			
Public Use & Recognition (PU)				3.19	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.29	Moderate	
Wetland Ecological Condition (EC)	1.67	Lower	
Wetland Stressors (STR)	3.43	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Lower	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Higher	MH	Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Kentuck Site (Pre-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4266
Longitude (decimal degrees):	-124.1797
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	100 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM, PFO, PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Slope/Flats
Soil Unit Mapped in Most of the AA:	Coquille silt loam
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Fish function score manually adjusted to low, since site is diked off from Coosy Bay and Kentuck Slough. Tidegated culvert prevents fish access. ORWAP currently does not account for blockage by tide gates.

Site Name:	**Kentuck Site (Pre-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	2.85	Lower		0.00	Lower	
Sediment Retention & Stabilization (SR)	5.02	Moderate		7.05	Higher	
Phosphorus Retention (PR)	2.71	Lower	LM	5.20	Moderate	
Nitrate Removal & Retention (NR)	4.48	Moderate	LM	10.00	Higher	
Anadromous Fish Habitat (FA)	7.36	Moderate	MH	10.00	Higher	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	6.95	Higher	MH	2.34	Lower	
Waterbird Nesting Habitat (WBN)	6.93	Moderate	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	8.90	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	3.26	Lower		1.04	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.47	Lower	LM	10.00	Higher	
Water Cooling (WC)	4.84	Moderate	MH	4.09	Moderate	
Native Plant Diversity (PD)	0.00	Lower		0.00	Lower	
Pollinator Habitat (POL)	5.20	Moderate		4.43	Moderate	
Organic Nutrient Export (OE)	7.30	Higher	MH			
Carbon Sequestration (CS)	5.16	Moderate				
Public Use & Recognition (PU)				2.06	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.75	Moderate	LM
Wetland Ecological Condition (EC)	2.75	Lower	LM
Wetland Stressors (STR)	5.83	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Lower		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Moderate		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Moderate	MH	Higher	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Organic Nutrient Export (OE)	Higher	MH	0.00	0.00

ORWAP Version 3.1. Cover Page: Basic Description of Assessment

Site Name:	Kentuck Site-Tidal (Post-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4197
Longitude (decimal degrees):	-124.1923
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	90 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	EEM, ESS, EFO, EUS
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	E
Soil Unit Mapped in Most of the AA:	N/A
If tidal, the tidal phase during most of visit:	N/A
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Assessment is based on the mitigation site design. 100 percent of the site has been visited; however, this site is currently diked of from tidal influence. Post-mitigation, the site will have tidal influence. Some freshwater wetlands have been included in the design, but will likely still have a degree of tidal influence via a fluctuating ground water surface.

Site Name:	**Kentuck Site-Tidal (Post-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	0.00	Lower		0.00	Lower	
Sediment Retention & Stabilization (SR)	7.39	Higher		8.75	Higher	
Phosphorus Retention (PR)	5.02	Moderate		3.18	Lower	LM
Nitrate Removal & Retention (NR)	5.87	Moderate		10.00	Higher	
Anadromous Fish Habitat (FA)	9.23	Higher		10.00	Higher	
Resident Fish Habitat (FR)	9.43	Higher		10.00	Higher	
Amphibian & Reptile Habitat (AM)	0.00	Lower		0.00	Lower	
Waterbird Nesting Habitat (WBN)	0.00	Lower		0.00	Lower	
Waterbird Feeding Habitat (WBF)	9.67	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	8.86	Higher		8.61	Higher	
Songbird, Raptor, Mammal Habitat (SBM)	10.00	Higher		10.00	Higher	
Water Cooling (WC)	0.00	Lower		0.00	Lower	
Native Plant Diversity (PD)	9.96	Higher		10.00	Higher	
Pollinator Habitat (POL)	7.57	Higher		2.58	Moderate	LM
Organic Nutrient Export (OE)	8.53	Higher				
Carbon Sequestration (CS)	8.90	Higher				
Public Use & Recognition (PU)				6.36	Moderate	MH

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	4.61	Higher	MH
Wetland Ecological Condition (EC)	10.00	Higher	
Wetland Stressors (STR)	5.00	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Lower		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Aquatic Invertebrate Habitat (INV)	Higher		Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Kentuck--Fresh (Post-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4266
Longitude (decimal degrees):	-124.1797
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	9 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PFO, PSS, PEM
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Riverine
Soil Unit Mapped in Most of the AA:	Coquille silt loam
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Assessment is based on the mitigation site design. 100 percent of the site has been visited; however, this site is currently diked of from Kentuck Creek. Post-mitigation, the site will be open to overbank flows during high water.

Site Name:	**Kentuck--Fresh (Post-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	5.92	Moderate		0.00	Lower	
Sediment Retention & Stabilization (SR)	5.00	Moderate		6.89	Higher	
Phosphorus Retention (PR)	2.99	Lower	LM	4.32	Moderate	
Nitrate Removal & Retention (NR)	5.29	Moderate		10.00	Higher	
Anadromous Fish Habitat (FA)	8.82	Higher		10.00	Higher	
Resident Fish Habitat (FR)	6.45	Higher	MH	10.00	Higher	
Amphibian & Reptile Habitat (AM)	6.98	Higher	MH	1.70	Lower	
Waterbird Nesting Habitat (WBN)	5.73	Moderate		10.00	Higher	
Waterbird Feeding Habitat (WBF)	4.26	Moderate		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	7.82	Higher		1.14	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.78	Moderate	LM	10.00	Higher	
Water Cooling (WC)	7.50	Higher		3.64	Moderate	
Native Plant Diversity (PD)	7.56	Higher		6.67	Moderate	MH
Pollinator Habitat (POL)	7.54	Higher		4.43	Moderate	
Organic Nutrient Export (OE)	7.68	Higher				
Carbon Sequestration (CS)	1.65	Lower				
Public Use & Recognition (PU)				3.92	Lower	LM

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.08	Lower	LM
Wetland Ecological Condition (EC)	5.90	Higher	
Wetland Stressors (STR)	3.13	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Moderate		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Amphibian & Reptile Habitat (AM)	Higher	MH	Lower	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Water Cooling (WC)	Higher		Moderate	

APPENDIX F: PIPELINE WETLAND FUNCTIONAL ASSESSMENT

ecology and environment, inc.

Jordan Cove LNG

Memorandum
High Value Wetlands

September 1, 2017

Wetland Functions and Values

Wetlands contribute to the ecological framework of Oregon's aquatic resources, which provide different environmental services. The U.S. Army Corps of Engineers and the Oregon Department of State Lands have outlined these environmental services in terms of functions and values. Wetland functions are their physical, chemical, and biological processes. Wetland values express the significance of functions to the needs of society (Adamus and Verble 2016).

Functional assessments of wetlands are often needed to broadly determine habitat losses and/or gains. Functional losses could arise when one wetland type is changed to another (i.e., wetland conversion), while gains could occur during wetland mitigation activities. Since some permanent wetland conversion will occur as a result of the project, the functions of wetlands that are directly impacted by project-related activities (e.g., clearing, grading, etc.) will be assessed using the Oregon Rapid Wetland Assessment Protocol (ORWAP). ORWAP is a system that rates wetland functions and values using a 0–10 scoring range. It rates wetlands according to 16 different functions (e.g. water storage, sediment retention, thermoregulation, habitat for different species, etc.) (Adamus and Verble 2016). These functions and values can be aggregated into Group Levels to serve as a helpful summary for the purposes of reporting ORWAP scores for regulatory programs. Primary groups include hydrologic function, water quality support, fish habitat, aquatic habitat, and ecosystem support (DSL 2016). When an ORWAP analysis is conducted, a wetland receives a rating for each group and function identified in Table 1.

Table 1 Oregon Rapid Wetland Assessment Protocol Wetland Groups and Functions

Primary Groups	Functions within Each Group
Hydrologic Function	• Water storage and delay
Water Quality Support	• Sediment retention and stabilization • Phosphorus retention • Nitrate removal and retention
Fish Habitat	• Anadromous fish habitat • Resident fish habitat
Aquatic Habitat	• Amphibian and reptile habitat • Water bird nesting habitat • Water bird feeding habitat
Ecosystem Support	• Water cooling • Aquatic invertebrate habitat • Native plant diversity • Pollinator habitat • Songbird, raptor and mammal habitat • Organic nutrient export

In 2009, a function assessment was completed by ICF Jones & Stokes using best professional judgment (BPJ) and the Judgmental Method. BPJ was used due to the large spatial scale of the project area and the overall similarity of most of the features encountered. The wetland acreage within the project area was totaled at the fifth-field HUC level, and the wetland functions and values were then cumulatively assessed for:

- Water quality and quantity functions;
- Fish and wildlife habitat functions;
- Native plant communities and species diversity functions; and
- Recreational and educational values.

Wetlands were classified using hydrogeomorphic (HGM) classes and/or subclasses according to their hydrologic source and landscape position. Each wetland was also classified according to the Cowardin (1979) system. Based on observable field indicators of the conditions and process, location of the wetlands within the watershed and proximity to other wetlands, and HGM and Cowardin classifications, the project delineated wetlands aggregated at the fifth-field HUC level were scored high, moderate, or low. Since access has not been granted to all parcels to prepare an updated HGM Report, the 2009 report was updated with current wetland data and acreages to reflect the pipeline corridor as of July 2017.

Aside from specific functions and values, three other, broader attributes to wetland health are determined when using ORWAP: ecological condition, stressors, and sensitivity. Ecological condition can be measured in general terms by vegetation composition and its comparable characteristics to reference wetland data. Stressors can be described by observing the degree to which the wetland has been subjected to negative human-influenced factors. Sensitivity of a wetland can be viewed as the wetland's "intrinsic resistance and resilience" to stressors, with a higher score denoting a more sensitive ecosystem.

Project Converted Wetlands

Removal of trees and other woody vegetation for the project would result in altering existing wetland community types. This would primarily entail conversion of scrub-shrub wetlands and forested wetlands to emergent wetlands. The project would permanently impact 0.83 acres of wetlands due to conversion. While current ORWAP field work has yet to be conducted, desktop analysis using wetland datasheets and previous ORWAP scores can give a generalized summary of the functions and values of permanently impacted wetlands along the project corridor.

Scrub-shrub wetlands, classified as PSS (palustrine scrub-shrub) by the National Wetland Inventory (NWI), are wetlands that are dominated by saplings and shrubs that are less than 20 feet tall (Cowardin et. al. 1979). Tree sapling and shrub species typical of the PSS wetlands subject to conversion along the project route include willows species (*Salix spp.*), Oregon ash (*Fraxinus latifolia*), Douglas spirea (*Spiraea douglasii*), and sweet briar (*Rosa eglanteria*). In some areas, PSS wetlands are co-dominant with emergent wetlands (palustrine emergent or PEM). While not applicable to every PSS wetland undergoing conversion, previous ORWAP data shows PSS wetlands exhibiting high function and value scores in the following aggregated groups: water quality, aquatic support, and terrestrial support (DEA 2013).

Forested wetlands, classified as PFO (palustrine forested) by the NWI, are dominated by trees and shrubs that are 20 feet or taller. Forested wetlands contain mature tree canopies and, depending on species, can have substantial shrub and ground cover layers. Tree species typical of the PFO wetlands subject to conversion along the project right-of-way include red alder (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), and various willow species (*Salix spp.*). While not applicable to every PFO wetland undergoing conversion, previous ORWAP data shows PFO wetlands exhibiting high function and value scores in water quality, aquatic support, and terrestrial support groups (DEA 2013). In instances where streams or other waterbodies are adjacent to a PFO, high function and value scores are expected within the fish support group, as trees and shrubs can shade waterbodies and provide temperature regulation among other services (ODFW 2017). Conversion of PSS and PFO wetland types to PEM types will result in changes to current wetland function and values. Since trees and shrubs typically provide more cover and habitat opportunities, it can be assumed that terrestrial support functions and values will be lower. If shade trees and shrubs are removed adjacent to fish-bearing waterbodies, it can be assumed that functions and values associated with the fish support group will be lower. However, exact changes in function and value scores are not known at this time. Field assessments will be carried out to apply the ORWAP to wetlands subject to conversion along the project corridor.

References

Adamus, P. and K. Verble. 2016. Manual for the Oregon Rapid Assessment Protocol (ORWAP), Version 3.1. Oregon Department of State Lands, Aquatic Resource Management Program. http://www.oregon.gov/dsl/WW/Documents/ORWAP_3_1_Manual_Nov_2016.pdf

David Evans and Associates (DEA). 2013. Pacific Connector Gas Pipeline Compensatory Wetland Mitigation Plan.

Department of State Lands (DSL). 2016. Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in the State and Federal Permit Programs. http://www.oregon.gov/dsl/WW/Documents/Guidance_for_Regulatory_Use_of_ORWAP_v3_1.pdf

Oregon Department of Fish and Wildlife (ODFW). 2017. The Oregon Conservation Strategy, Conserve Wetlands. http://oregonconservationstrategy.org/strategy-habitat/wetlands/

APPENDIX G: DRAFT EELGRASS MITIGATION SITE EASEMENT/PROTECTION MECHANISM

After recording, return to:
JORDAN COVE ENERGY PROJECT L.P. AND PACIFIC CONNECTOR GAS PIPELINE, LP
5615 KIRBY DRIVE, SUITE 500
HOUSTON, TX 77005

DEED OF CONSERVATION AND RESTORATION EASEMENT
FOR THE
Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Eelgrass Mitigation Site*, Corps permit # NWP-2017-41, DSL permit # 60697-RF*

THIS DEED OF CONSERVATION EASEMENT AND RESTORATION EASEMENT is made this ______ day of ______, 20__, by and between the State of Oregon Department of State Lands ("Department"), with an address of 775 Summer St NE # 100, Salem, OR 97301, in favor of [insert easement holder information] ("Grantee"). Jordan Cove Energy Project L.P., a Delaware limited partnership, acting through its general partner, Jordan Cove Energy Project, LLC, a Delaware limited liability company, and Pacific Connector Gas Pipeline, LP, a Delaware limited partnership, acting through its general partner, Pacific Connector Gas Pipeline, LLC, a Delaware limited liability company, 5615 Kirby Drive, Suite 500, Houston, TX 77005 is the applicant ("Applicant") for Removal-Fill Permit No. 60697 (the "DSL Permit"). The Department, Grantee, and Applicant together are referred to herein as the "Parties."

RECITALS

1. The Department is the owner of the real property described in Exhibit "A," attached hereto and by this reference incorporated herein (the "Property"). Applicant has designated the Property as a compensatory mitigation site in accordance with the DSL Permit approved by the Department, and the Department of the Army Permit No. NWP-2017-41 ("Corps Permit") approved by the US Army Corps of Engineers ("Corps").

2. The Department and Applicant desire and intend to provide for the perpetual protection and conservation of the wetland and waterway functions and values of the Property and for the management of the Property and improvements thereon, and to this end desire to

subject the Property to the covenants, restrictions, easements and other encumbrances hereinafter set forth, each and all of which is and are for the benefit of the Property;

3. The Department has accepted Applicant's mitigation plan for the Property under ORS 196.800 et seq, and the Corps has likewise accepted the mitigation plan under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act.

DEFINITIONS

1.1 "Department" shall mean and refer to the Department, the owner of the Property and the Grantor herein, and the owner's heirs, successors, and assigns.

1.2 "DSL Permit" shall mean the final document approved by the Department that includes the mitigation plan and which formally establishes the mitigation site and stipulates the terms and conditions of its construction, operation and long-term management. A copy of the DSL Permit may be obtained at the Department of State Lands, 775 Summer St. NE, Salem, OR 97301; phone 503-986-5200.

1.3 "Corps Permit" shall mean the final document approved and issued by the Corps which includes the mitigation plan describing where and how the compensatory mitigation will be completed, monitored, managed, and maintained. A copy of the Corps Permit associated with this easement may be obtained at the office of the US Army Corps of Engineers, Regulatory Branch, 333 SW First Ave., Portland, OR 97208; Phone 503-808-4373.

1.4 "Property" shall mean and refer to all real property subject to this easement, as more particularly set forth in Exhibit "A."

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the mutual covenants contained herein, and for other good and valuable consideration, the Department hereby conveys to Grantee, its successors and assigns, a perpetual conservation easement consisting of the rights and restrictions enumerated herein, over and across the Property (the "Easement").

2.1 **Purposes.** It is the purpose of the Easement to preserve, to protect in perpetuity, to enhance upon mutual agreement, and in the event of their degradation or destruction, to restore the wetland and waterway functions and values of the Property. It is further the purpose of this Easement to implement the mitigation plan, which has been approved by the Department and the Corps. To carry out this purpose, the following rights are conveyed to Grantee by this Easement:

A. To enter upon the Property at reasonable times with any necessary equipment or vehicles to inspect, determine compliance with the covenants and prohibitions contained in this Easement, and to enforce the rights herein granted in a manner that will not unreasonably interfere with the use and quiet enjoyment of the Property by the Department; and

B. To proceed at law or in equity to enforce the provision of this Easement and the covenants set forth herein, to prevent the occurrence of any of the prohibited uses set forth herein, and to require the restoration of such areas or features of the Property that may be damaged by any use that is inconsistent with this Easement.

2.2 **Department Representations.** The Department represents and warrants that after reasonable investigation, and to the best of its knowledge, that no hazardous materials or contaminants are present that conflict with the conservation purposes intended; that the Property is in compliance with all federal state, and local laws, regulations, and permits; that there is no pending litigation affecting, involving, or relating to the Property that would conflict with the intended conservation use; and that the Property is free and clear of any and all liens, claims, restrictions, easements and encumbrances that would interfere with the ability to protect and conserve the Property.

2.3 **Applicant Funding.** The Parties agree that Applicant has provided sufficient financial resources to Grantee to carry out the purposes of this Easement.

2.4 **Prohibited Uses.** Except as necessary to conduct, remediate or maintain the Property consistent with the DSL Permit and the Corps Permit and the mitigation plan, the actions prohibited by this Easement include:

A. There shall be no removal, destruction, cutting, trimming, mowing, alteration or spraying with biocides of any native vegetation in the Property, nor any disturbance or change in the natural habitat of the Property unless it promotes the mitigation goals and objectives established for the Property. Hazard trees that pose a specific threat to existing structures including fences or pedestrian trails may be felled and left on site. Dry grass only may be mowed after July 1 to abate fire hazard.

B. There shall be no agricultural, commercial, or industrial activity undertaken or allowed in the Property; nor shall any right of passage across or upon the Property be allowed or granted if that right of passage is used in conjunction with agricultural, commercial or industrial activity.

C. No domestic animals shall be allowed to graze or dwell on the Property.

D. There shall be no filling, excavating, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock minerals or other materials, nor any storage nor dumping of ashes, trash, garbage, or of any other material, and no changing of the topography of the land of the Property in any manner once the wetlands are constructed unless approved in writing by the Department and by the Corps.

E. There shall be no construction or placing of buildings, mobile homes, advertising signs, billboards or other advertising material, vehicles or other structures on the Property.

F. There shall be no legal or de facto division, subdivision or partitioning of the protected Property.

G. Use of motorized off-road vehicles is prohibited except on existing roadways.

2.5 **Reserved Rights.** The Department reserves all other rights accruing from the Department's ownership of the Property including but not limited to the exclusive possession of the Property, the right to transfer or assign the Department's interest in the same; the right to take action necessary to prevent erosion on the Property, to protect the Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Department specifically reserves the right to use the Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit.

2.6 **Assignment.** Grantee may assign this Easement with the Department's consent, which shall not be unreasonably withheld, provided that Grantee requires, as a condition of such assignment, that the conservation purposes of the Easement continue to be carried out.

2.7 **General Provisions.**

A. **Notice**. The Department and the Corps shall be provided with a 60-day advance written notice of any legal action concerning this Easement, or of any action to extinguish, void or modify this Easement, in whole or in part. This Easement, and the covenants, restrictions, and other encumbrances contained herein, are intended to survive foreclosure, tax sales, bankruptcy proceedings, zoning changes, adverse possession, abandonment, condemnation and similar doctrines or judgments affecting the Property. A copy of this recorded Easement shall accompany said notice.

B. **Validity**. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this

Easement, or the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

[Signatures Follow]

IN WITNESS WHEREOF, the undersigned have executed

this instrument this ___________ day of _______________________, 20_____.

GRANTOR:

By:________________________________
Title:______________________________
Date:______________________________

APPLICANT Jordan Cove Energy Project L.P., by and through its general partner, Jordan Cove Energy Project, LLC:

By:________________________________
Title:______________________________
Date:______________________________

APPLICANT Pacific Connector Gas Pipeline, LP, by and through its general partner, Pacific Connector Gas Pipeline, LLC:

By:________________________________
Title:______________________________
Date:______________________________

GRANTEE:

By:________________________________
Title:______________________________
Date:______________________________

Attachment:
Exhibit A, legal description and labeled map of the Property

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of the State of Oregon Department of State Lands, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Jordan Cove Energy Project, LP, acting through its general partner, Jordan Cove Energy Project, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Pacific Connector Gas Pipeline, LP, acting through its general partner, Pacific Connector Gas Pipeline, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of ______________________________________, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

APPENDIX H: DRAFT KENTUCK PROJECT SITE EASEMENT/PROTECTION MECHANISM

After recording, return to:

JORDAN COVE ENERGY PROJECT L.P. AND PACIFIC CONNECTOR GAS PIPELINE, LP
5615 KIRBY DRIVE, SUITE 500
HOUSTON, TX 77005

DEED OF CONSERVATION, RESTORATION, AND ACCESS EASEMENT
FOR THE
Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Kentuck Mitigation Site*, Corps permit # NWP-2017-41, DSL permit # 60697-RF*

THIS DEED OF CONSERVATION, RESTORATION, AND ACCESS EASEMENT is made this ______ day of ______, 20__, by and between the State of Oregon Department of State Lands ("Department"), with an address of 775 Summer St NE # 100, Salem, OR 97301, in favor of [insert easement holder information] ("Grantee"). Jordan Cove Energy Project L.P., a Delaware limited partnership, acting through its general partner, Jordan Cove Energy Project, LLC, a Delaware limited liability company, and Pacific Connector Gas Pipeline, LP, a Delaware limited partnership, acting through its general partner, Pacific Connector Gas Pipeline, LLC, a Delaware limited liability company, 5615 Kirby Drive, Suite 500, Houston, TX 77005 is the applicant ("Applicant") for Removal-Fill Permit No. 60697 (the "DSL Permit"). The Department, Grantee, and Applicant together are referred to herein as the "Parties."

RECITALS

1. The Department is the owner of the real property described in Exhibit "A," attached hereto and by this reference incorporated herein (the "Department Property"). Applicant is the owner of the real property described in Exhibit "B," attached hereto and by this reference incorporated herein (the "Applicant Property"). The Department Property and the Applicant Property together are referred to herein as the "Property."

2. Applicant has designated the Property as a compensatory mitigation site in accordance with the DSL Permit approved by the Department, and the Department of the Army

Permit No. NWP-2017-41 (“Corps Permit”) approved by the US Army Corps of Engineers (“Corps”).

3. The Department and Applicant desire and intend to provide for the perpetual protection and conservation of the wetland and waterway functions and values of the Property and for the management of the Property and improvements thereon, and to this end desire to subject the Property to the covenants, restrictions, easements and other encumbrances hereinafter set forth, each and all of which is and are for the benefit of the Property;

4. The Department has accepted Applicant’s mitigation plan for the Property under ORS 196.800 et seq, and the Corps has likewise accepted the mitigation plan under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act.

DEFINITIONS

1.1 “Department” shall mean and refer to the Department, the owner of the Property and the Grantor herein, and the owner’s heirs, successors, and assigns.

1.2 “DSL Permit” shall mean the final document approved by the Department that includes the mitigation plan and which formally establishes the mitigation site and stipulates the terms and conditions of its construction, operation and long-term management. A copy of the DSL Permit may be obtained at the Department of State Lands, 775 Summer St. NE, Salem, OR 97301; phone 503-986-5200.

1.3 “Corps Permit” shall mean the final document approved and issued by the Corps which includes the mitigation plan describing where and how the compensatory mitigation will be completed, monitored, managed, and maintained. A copy of the Corps Permit associated with this easement may be obtained at the office of the US Army Corps of Engineers, Regulatory Branch, 333 SW First Ave., Portland, OR 97208; Phone 503-808-4373.

1.4 “Property” shall mean and refer to all real property subject to this easement, as more particularly set forth in Exhibits “A” and “B.”

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the mutual covenants contained herein, and for other good and valuable consideration, the Department and Applicant hereby convey to Grantee, its successors and assigns, a perpetual conservation easement consisting of the rights and restrictions enumerated herein, over and across the Property (the “Easement”).

2.1 **Purposes.** It is the purpose of the Easement to preserve, to protect in perpetuity, to enhance upon mutual agreement, and in the event of their degradation or destruction, to restore the wetland and waterway functions and values of the Property. It is further the purpose of this Easement to implement the mitigation plan, which has been approved by the Department and the Corps. To carry out this purpose, the following rights are conveyed to Grantee by this Easement:

A. To enter upon the Property at reasonable times with any necessary equipment or vehicles to inspect, determine compliance with the covenants and prohibitions contained in this Easement, and to enforce the rights herein granted in a manner that will not unreasonably interfere with the use and quiet enjoyment of the Property by the Department and the Applicant; and

B. To proceed at law or in equity to enforce the provision of this Easement and the covenants set forth herein, to prevent the occurrence of any of the prohibited uses set forth herein, and to require the restoration of such areas or features of the Property that may be damaged by any use that is inconsistent with this Easement.

2.2 **Department Representations.** The Department represents and warrants that after reasonable investigation, and to the best of its knowledge, that no hazardous materials or contaminants are present that conflict with the conservation purposes intended; that the Property is in compliance with all federal state, and local laws, regulations, and permits; that there is no pending litigation affecting, involving, or relating to the Property that would conflict with the intended conservation use; and that the Property is free and clear of any and all liens, claims, restrictions, easements and encumbrances that would interfere with the ability to protect and conserve the Property.

2.3 **Applicant Funding.** The Parties agree that Applicant has provided sufficient financial resources to Grantee to carry out the purposes of this Easement.

2.4 **Prohibited Uses.** Except as necessary to conduct, remediate or maintain the Property consistent with the DSL Permit and the Corps Permit and the mitigation plan, the actions prohibited by this Easement include:

A. There shall be no removal, destruction, cutting, trimming, mowing, alteration or spraying with biocides of any native vegetation in the Property, nor any disturbance or change in the natural habitat of the Property unless it promotes the mitigation goals and objectives established for the Property. Hazard trees that pose a specific threat to existing structures including fences or pedestrian trails may be felled and left on site. Dry grass only may be mowed after July 1 to abate fire hazard.

B. There shall be no agricultural, commercial, or industrial activity undertaken or allowed in the Property; nor shall any right of passage across or upon the Property be allowed or granted if that right of passage is used in conjunction with agricultural, commercial or industrial activity.

C. No domestic animals shall be allowed to graze or dwell on the Property.

D. There shall be no filling, excavating, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock minerals or other materials, nor any storage nor dumping of ashes, trash, garbage, or of any other material, and no changing of the topography of the land of the Property in any manner once the wetlands are constructed unless approved in writing by the Department and by the Corps.

E. There shall be no construction or placing of buildings, mobile homes, advertising signs, billboards or other advertising material, vehicles or other structures on the Property.

F. There shall be no legal or de facto division, subdivision or partitioning of the protected Property.

G. Use of motorized off-road vehicles is prohibited except on existing roadways.

2.5 **Reserved Rights.** The Department reserves all other rights accruing from the Department's ownership of the Department Property, including but not limited to the exclusive possession of the Department Property, the right to transfer or assign the Department's interest in the same; the right to take action necessary to prevent erosion on the Department Property, to protect the Department Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Department Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Applicant reserves all other rights accruing from the Applicant's ownership of the Applicant Property, including but not limited to the exclusive possession of the Applicant Property, the right to transfer or assign the Applicant's interest in the same; the right to take action necessary to prevent erosion on the Applicant Property, to protect the Applicant Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Applicant Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Department specifically reserves the right to use the Department Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit. The Applicant specifically reserves the right to use the Applicant Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit.

2.6 **Access Easement.** Applicant hereby grants to the Department an easement and right of entry on the Applicant Property for the purpose of physically accessing the Applicant Property at all reasonable times to inspect the Applicant Property in order to monitor and to ascertain whether there has been compliance with this Easement and the DSL Permit. In the event that the Applicant Property lacks access via a public road or other common area, Applicant grants to the Department an easement over and across any other property of Applicant, the use of which is necessary to access the Applicant Property. The Applicant hereby grants to the Corps a right of entry to ascertain compliance with the Corps Permit and this Easement.

2.7 **Assignment.** Grantee may assign this Easement with the Department's consent, which shall not be unreasonably withheld, provided that Grantee requires, as a condition of such assignment, that the conservation purposes of the Easement continue to be carried out.

2.8 **General Provisions.**

A. **Notice**. The Department and the Corps shall be provided with a 60-day advance written notice of any legal action concerning this Easement, or of any action to extinguish, void or modify this Easement, in whole or in part. This Easement, and the covenants, restrictions, and other encumbrances contained herein, are intended to survive foreclosure, tax sales, bankruptcy proceedings, zoning changes, adverse possession, abandonment, condemnation and similar doctrines or judgments affecting the Property. A copy of this recorded Easement shall accompany said notice.

B. **Validity**. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

[Signatures Follow]

IN WITNESS WHEREOF, the undersigned have executed

this instrument this ___________ day of _______________________, 20_____.

GRANTOR:

By:________________________________
Title:______________________________
Date:______________________________

APPLICANT Jordan Cove Energy Project L.P., by and through its general partner, Jordan Cove Energy Project, LLC:

By:_ _______________________________
Title:______________________________
Date:______________________________

APPLICANT Pacific Connector Gas Pipeline, LP, by and through its general partner, Pacific Connector Gas Pipeline, LLC:

By:________________________________
Title:______________________________
Date:______________________________

GRANTEE:

By:________________________________
Title:______________________________
Date:______________________________

Attachment:
Exhibit A, legal description and labeled map of the Property

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of the State of Oregon Department of State Lands, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Jordan Cove Energy Project, L.P., acting through its general partner, Jordan Cove Energy Project, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Pacific Connector Gas Pipeline, LP, acting through its general partner, Pacific Connector Gas Pipeline, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of ______________________________________, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

APPENDIX I: SEDIMENT TRANSPORT ANALYSIS TECH MEMO

(J1-000-MAR-TNT-DEA-00003-00 September 19, 2018)

TECHNICAL MEMORANDUM

DATE:	September 19, 2018
ATTENTION:	Drew Jackson, P.E.
COMPANY:	Jordan Cove LNG, LLC (JCLNG)
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SUBJECT:	Sediment Transport Analysis
DEA PROJECT NAME:	Ad Hoc Permitting Support
DEA PROJECT NO:	JLNG0000-0003
M&N PROJECT NO:	9929-03, Task Order MN-1130-002
DOCUMENT #	J1-000-MAR-TNT-DEA-00003-00
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1. INTRODUCTION

Jordan Cove Energy Project, LP ("JCEP") is seeking authorization from the Federal Energy Regulatory Commission ("FERC") under Section 3 of the Natural Gas Act ("NGA") to site, construct, and operate a natural gas liquefaction and liquefied natural gas ("LNG") export facility ("LNG Terminal"), located on the bay side of the North Spit of Coos Bay, Oregon. The LNG Terminal, related facilities, temporary construction sites, and other sites/actions associated with LNG Terminal construction are collectively referred to as the "JCEP Project Area" as shown on Figure 1-1.

The JCEP Project Area is made up of the following selected components, among others not listed here because they are not relevant to the scope of this memorandum:

- Slip – a permanent facility between Ingram Yard and the Access Channel. LNG carriers will enter the Slip via the Access Channel, get loaded with LNG, and leave for export. The Slip will include an LNG carrier loading berth and LNG loading facilities, a tug berth, and an emergency lay berth to safely moor a temporarily disabled LNG carrier.
- Access channel – the Access Channel will be dredged north of the Federal Navigation Channel ("FNC") to provide LNG carriers with access from the FNC to the Slip.
- Material Offloading Facility ("MOF") – a permanent facility east of the Slip where fill will be placed to construct a barge berth. Dredging will occur to access the MOF.
- Navigation Reliability Improvements ("NRI") – four permanent dredge areas adjacent to the FNC that will allow for navigation efficiency and reliability for vessel transit under a broader weather window.

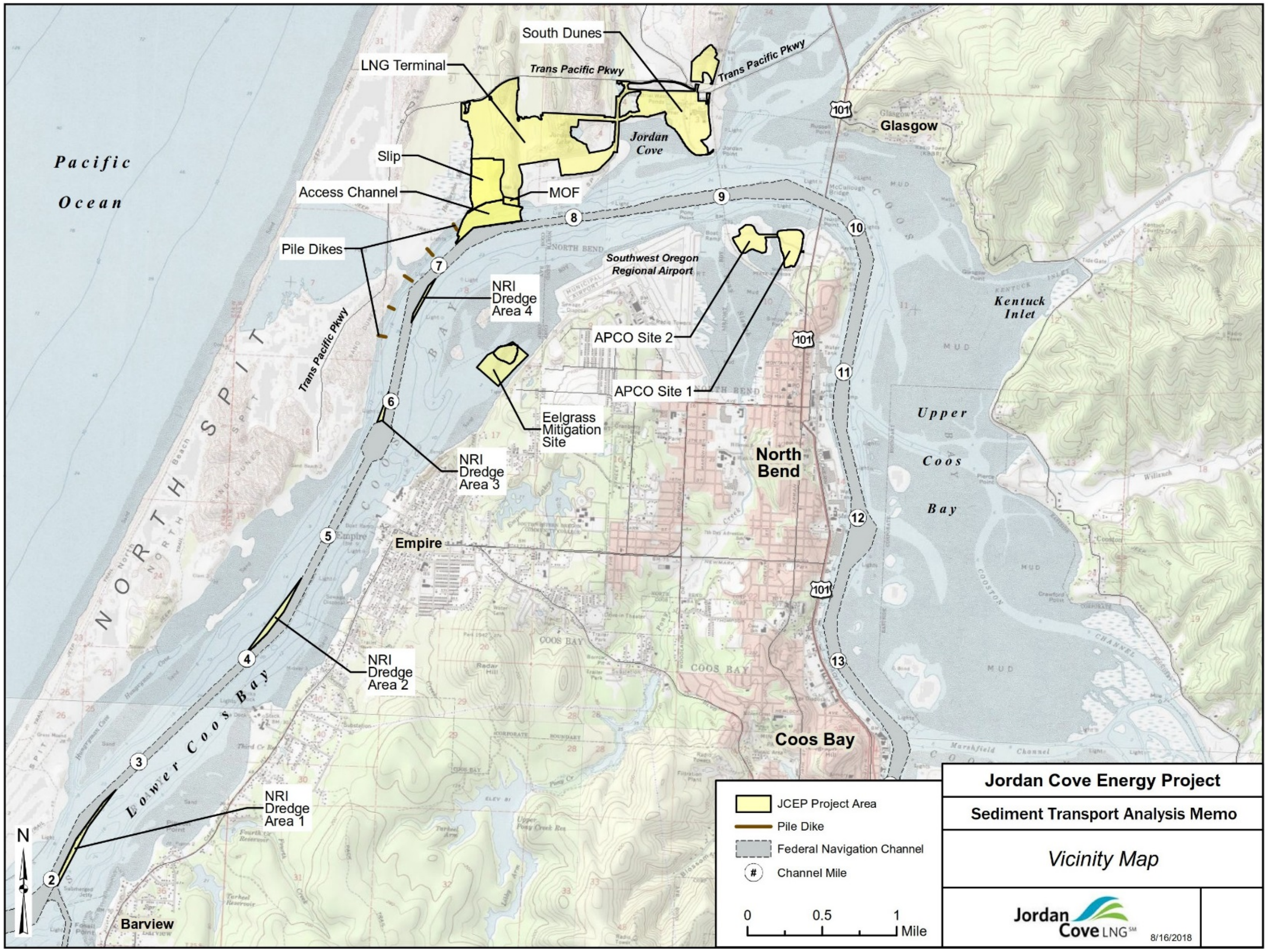


Figure 1-1. JCEP Project Area

In support of the permitting efforts for the JCEP, Moffatt & Nichol ("M&N") has prepared this technical memorandum to summarize the sediment transport analyses performed. The purposes of this study are to assess changes to existing sediment transport patterns due to the project, including the NRI, the Slip and Access Channel, the MOF, and the Eelgrass Mitigation site; to estimate shoaling and/or scour over the project areas and FNC; to assess any potential changes to the existing FNC; and to provide a basis for evaluating potential changes to the pile dikes.

The sediment transport analysis is part of the hydrodynamic studies package, and it is necessary to review this study along with other technical memorandums prepared for the project. Specifically, this study should be considered in parallel with the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Table 1-1 summarizes the two modeling scenarios evaluated, "Without-Project" and "With-Project", and the corresponding design features. The Without-Project scenario is based on the existing FNC with a channel depth of -38' MLLW (-37' navigation depth + 1' advance maintenance dredging). In areas which have historically maintained a depth below -38' MLLW, the existing bathymetry used in the Oregon International Port of Coos Bay's (OIPCB) Section 204(f) Channel Modification Project (OIPCB Project) modeling efforts (OIPCB 2017) was used. The With-Project scenario adopts the same FNC depths used in the Without-Project scenario, and adds the four NRI areas, the Slip and Access Channel, the MOF, and the Eelgrass Mitigation site. This approach allows the changes due to the JCEP to be evaluated.

All elevations in this document are referenced to MLLW tidal datum, unless otherwise noted. Additional details related to hydrodynamic modeling development, such as bathymetric sources and modeling grids, are provided in the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Table 1-1. Summary of Modeling Scenarios

Location	Without-Project	With-Project
Federal Navigation Channel Maintained Depth (ft, MLLW)	≤ -38.0	≤ -38.0*
NRI Dredged Depth (ft, MLLW)	Existing	-39.0
Access Channel Dredged Depth (ft, MLLW)	Existing	-46.7
Slip Dredged Depth (ft, MLLW)	N/A	-45.5
Side Slope for Sand Bottom (OIPCB 2017)	Existing	3H:1V (NRI 1-3) 4H:1V (NRI 4) 3H:1V (Slip & Access Channel)
Side Slope for Rock Bottom (OIPCB 2017)	Existing	1H:1V

* In this study, the water depth of 38 ft is a minimum depth in the FNC. The actual bathymetry used at the entrance and elsewhere is naturally deeper.

Construction side slopes for the Access Channel and NRI areas are used in the With-Project modeling scenario. These construction side slopes are stable against mass failure (sloughing) during and after construction. Stable construction side slopes are based on the analysis completed for the OIPCB Project (OIPCB 2017). Estimations of long-term equilibrated side slopes in non-rock (sand) material will vary. The majority of material to be removed for construction of the Access Channel, NRI 3 and NRI 4 is sand, portions of NRI 1 and NRI 2 are also composed of sandy material overlying rock. In these areas sand side slopes will equilibrate over time to a slope flatter than the initial construction slope. Estimations of long-term equilibrated side slopes in non-rock material can vary significantly. Based on analysis methodology followed on the OIPCB Project (OIPCB 2017b) the conservative long term equilibrated slopes may vary between approximately 5H:1V and 20H:1V

Estimated long-term equilibrated side slopes were not used in the With-Project scenario modeling. After the completion of initial construction dredging, side slopes will continue to evolve over a period of time (estimated 5 to 10 years depending on depth of dredge cut, slope material properties, hydraulic forces acting on slope, and other factors) until they reach a stable slope angle, after which sedimentation patterns may reach a quasi-equilibrium state. There is an inherent level of uncertainty in estimating the long-term equilibrium side slope configuration and the amount of time until long term equilibrium is reached. Construction side slopes were used in the sediment transport analysis to better show the potential changes in sedimentation patterns associated with the JCEP.

The material to be removed for construction of NRI 1 and NRI 2 is primarily rock; rock side slopes will not change from the 1H:1V initial construction slope, and no long-term adjustments for the equilibration process are warranted in these locations.

This revised technical memorandum includes results and analysis based on additional supplemental modeling completed to address issues and questions brought resulting from the U.S. Army Corps of Engineers (USACE), Northwest Division, Portland District (NWP) review of the 408 60% Design Package (Rev. A; JCLNG Document No. J1-000-MAR-TNT-DEA-00003-00). Modifications to the numeric model included matching the With-Project model generated bathymetric grid to the Without-Project model gridded bathymetry outside of the project areas. These corrections provide for a more representative/accurate comparison of results for sediment transport, particularly in the North Jetty Root/Log Spiral Bay and south of Pile Dike 7.3 areas.

2. SEDIMENT TRANSPORT MODELING

2.1 MODEL OVERVIEW

Sediment transport and deposition was modeled using the two-dimensional MIKE-21 Flexible Mesh (FM) model, with coupled hydrodynamic and sediment transport modules (DHI 2014). The sediment transport module considers the erosion, transport, and deposition of sediment due to currents and/or waves.

By coupling the hydrodynamic and sediment transport processes, the model calculates the depth-averaged flow velocity and the corresponding bed shear stress at every time step. The resultant bed shear stress is then internally compared with the critical shear stress, which is a function of the bottom material size. If the calculated bed shear stress exceeds the critical shear stress, the bottom material will be mobilized by the model, resulting in erosion.

Figure 2-1 shows the modeling domain used in both the hydrodynamic analysis and the sediment transport analysis. The model domain included the entire estuary and was not limited to the JCEP areas. A complete discussion of the model domain, modeling grid, and bathymetric sources is provided in the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Strongest ebb currents in the Coos Bay estuary typically occur in winter (Dec to April) because of strong freshwater inflows. Daily freshwater discharge for Coos River for water years (WYs) 2007 to 2012 is shown in Figure 2-2. This figure shows that largest variations (spikes) of freshwater inflow occur in winter as well. To capture the strongest currents and largest variations in freshwater inflow, the modeling period for production runs was selected to be a typical three-month winter tide cycle (January 1, 2011 through March 31, 2011). The year 2011 was selected for production runs because it represented a typical water year, as shown in Figure 2-2. This same period was evaluated by the OIPCB Project (OIPCB 2017) for calibrating their sediment transport model.

The sediment transport model includes a morphological speed-up/repetition factor of 4 for 1-year analysis or 12 for 3-year analysis so that this three-month representative tidal cycle can be repeated to provide a full year or three years of sedimentation, respectively.

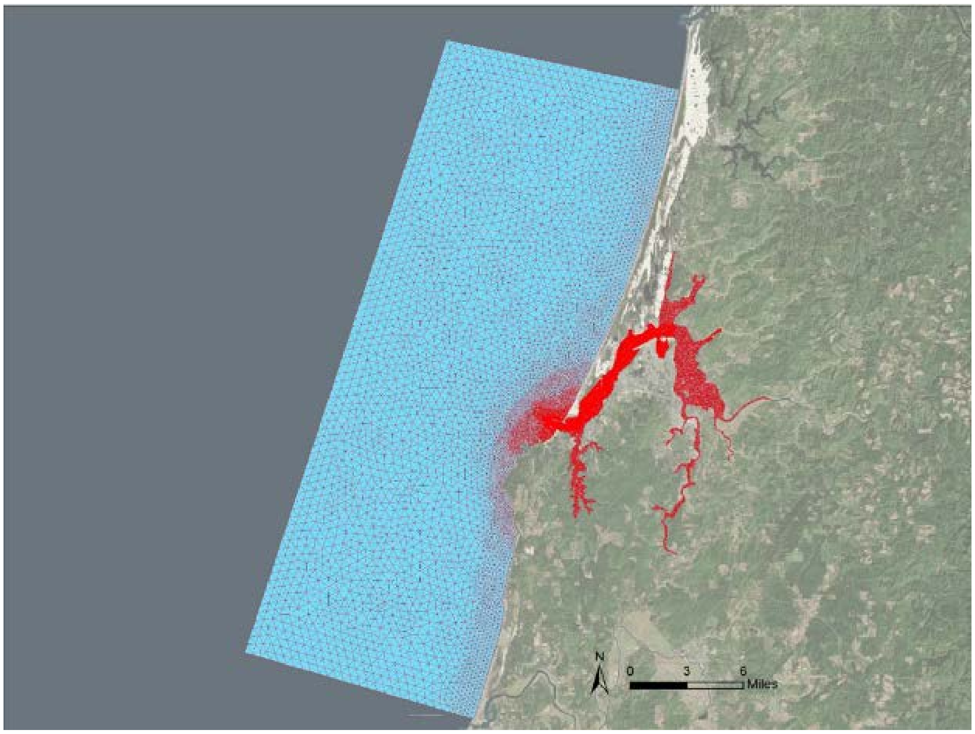


Figure 2-1. Modeling Domain and Elements with Varying Resolution

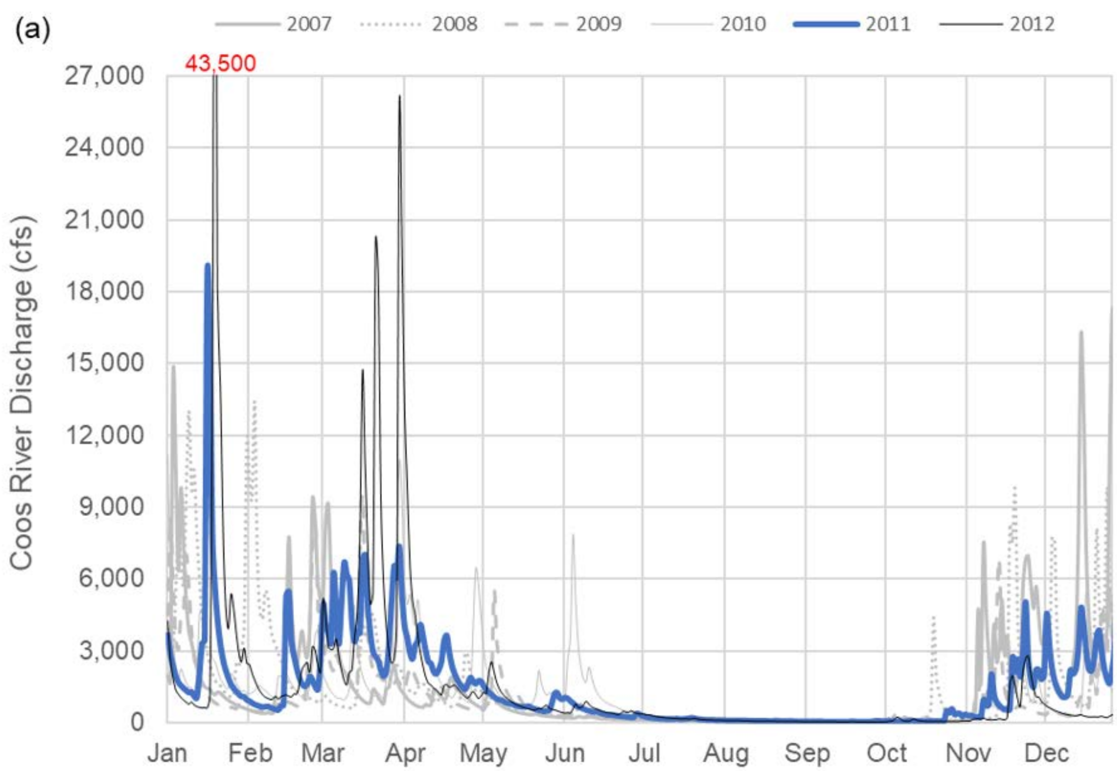


Figure 2-2. Coos River Discharge for Water Years (WYs) 2007 to 2012. WY 2011 is Highlighted.

2.2 MODEL SETUP

2.2.1 MAINTENANCE DREDGING SINCE 1998

Sediment dredged from the FNC, in the area below river mile (“RM”) 12, is typically classified by grain size as either silt or sand. Finer sediments originating from the Coos River and other tributaries typically settle out above RM 12 (USACE/USEPA 1986). Therefore, sediment loading from freshwater runoff is not included.

Table 2-1 provides the maintenance dredging quantities of sediment for the federally maintained channel between RM 2.5 and RM 12 from 1998 to 2014 (OIPCB 2017). This table displays the full period since the most recent channel deepening project, which occurred in fiscal year 1996. Figure 2-3 shows the location of each channel range.

Table 2-1. Coos Bay Channel Quantity Dredged in Cubic Yards between RM 2.5 and RM 12

Year	Coos Bay & Empire Ranges RM 2.5 to 6.0	Jarvis Ranges RM 6.0 to 9.0	North Bend Ranges RM 9.0 to 12.0
1998[1]	0	48,911	0
1999	36,138	79,819	95,566
2000	61,923	83,335	31,093
2001	0	128,662	19,141
2002	0	52,764	1,017
2003	28,954	44,075	0
2004	5,718	46,184	44,350
2005	0	23,181	30,435
2006	33,790	34,706	3,953
2007	35,162	81,063	49,655
2008	5,082	59,686	54,584
2009	62,507	44,681	15,226
2010	16,126	69,217	4,080
2011[2]		223,148	
2012		105,495	
2013		269,078	
2014		37,907	
Average[3]	22,000	61,000	29,000

Notes:
1. Data compiled from dredging records provided by the USACE, Portland District.
2. Data provided by the USACE, Portland District, Field Office, not including a breakdown by range. The total quantity includes the amount dredged in the Charleston Channel.
3. Averages above the Entrance Range are based on 1998 to 2010 with minor modifications to match the overall average for the period 1998 to 2014. Values are rounded to the nearest thousands.

2.2.2 GRAIN SIZE MEASUREMENTS

Information regarding sediment grain size within the Coos Bay estuary is available from three sources: USACE 2005 (USACE 2005), SHN Consulting Engineers & Geologists 2007 (SHN 2007), and Geotechnical Resources, Inc. 2011 (GRI 2011). Figure 2-4 shows that the measurements exhibit a mixture of larger grain sizes in the channel, and smaller grain sizes that may be in the channel or in shallow water areas. The larger grain sizes, assumed to reflect channel bottom conditions, vary between 0.30 and 0.44 mm from the entrance to RM 9, and decrease to around 0.2 – 0.25 mm between RM 10 and RM 11. The southern part of the Upper Bay, above RM 12, is characterized by much finer sediments with a typical grain size of 0.04 mm. Near the airport runway, sand samples show a grain size between 0.25 and 0.28 mm. The measurements show variation throughout the channel, including in the FNC. Based on the above information, Figure 2-5 shows the grain size map used for sediment transport modeling. Consistent with the data, the map assumes a grain size of 0.33 mm in a majority of the channel area from the entrance to RM 9. Along the sides in the Coos Bay and Empire Ranges, the same trend observed near the airport runway was extrapolated to reduce grain size to between 0.25 and 0.28 mm. A linear interpolation was used between grain size 0.25 mm near RM 10 to 0.18 mm above RM 12.

2.2.3 GEOPHYSICAL INVESTIGATIONS

Shallow rock underlies much of the FNC, from the entrance to approximately RM 6. When this underlying rock is close to the surface, it limits the potential for erosion. These geophysical investigations were primarily based on the depth to the rock layer compiled by DEA in 2017 (OIPCB 2017) within and close to the FNC. Outside the FNC, areas of shallow rock were estimated based on bathymetric features. Shallow rock was also included – that is, the sand layer was assumed to be thin – along hardened reaches of the shoreline at Roseburg Forest Products, part of the airport runway, and the shoreline close to the FNC in the North Bend Ranges.

In addition, the remaining visible piles within the pile dike structures were modeled as individual piles to capture the changes in flow resistance in the water column imposed by the pile dikes as the flow changes. The remaining identifiable rock features in the area of the pile dikes are designated as nonerodable surfaces in the model. Figure 2-3 indicates the location of pile dike structures and rock aprons.

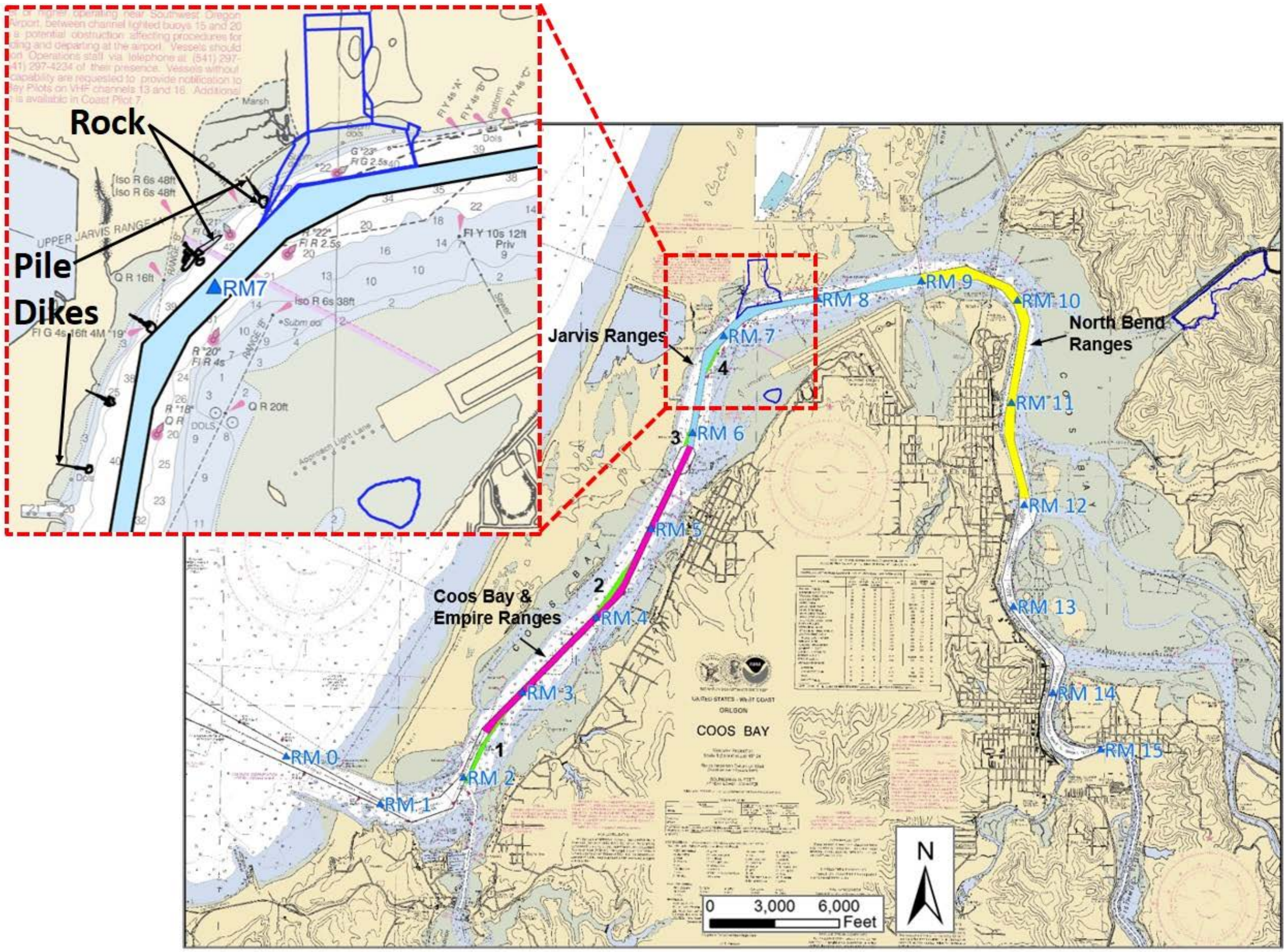


Image source: NOAA Nautical Chart, 18587 Coos Bay

Figure 2-3. Base Map Showing Channel Ranges Used in Shoaling Volume Calibration

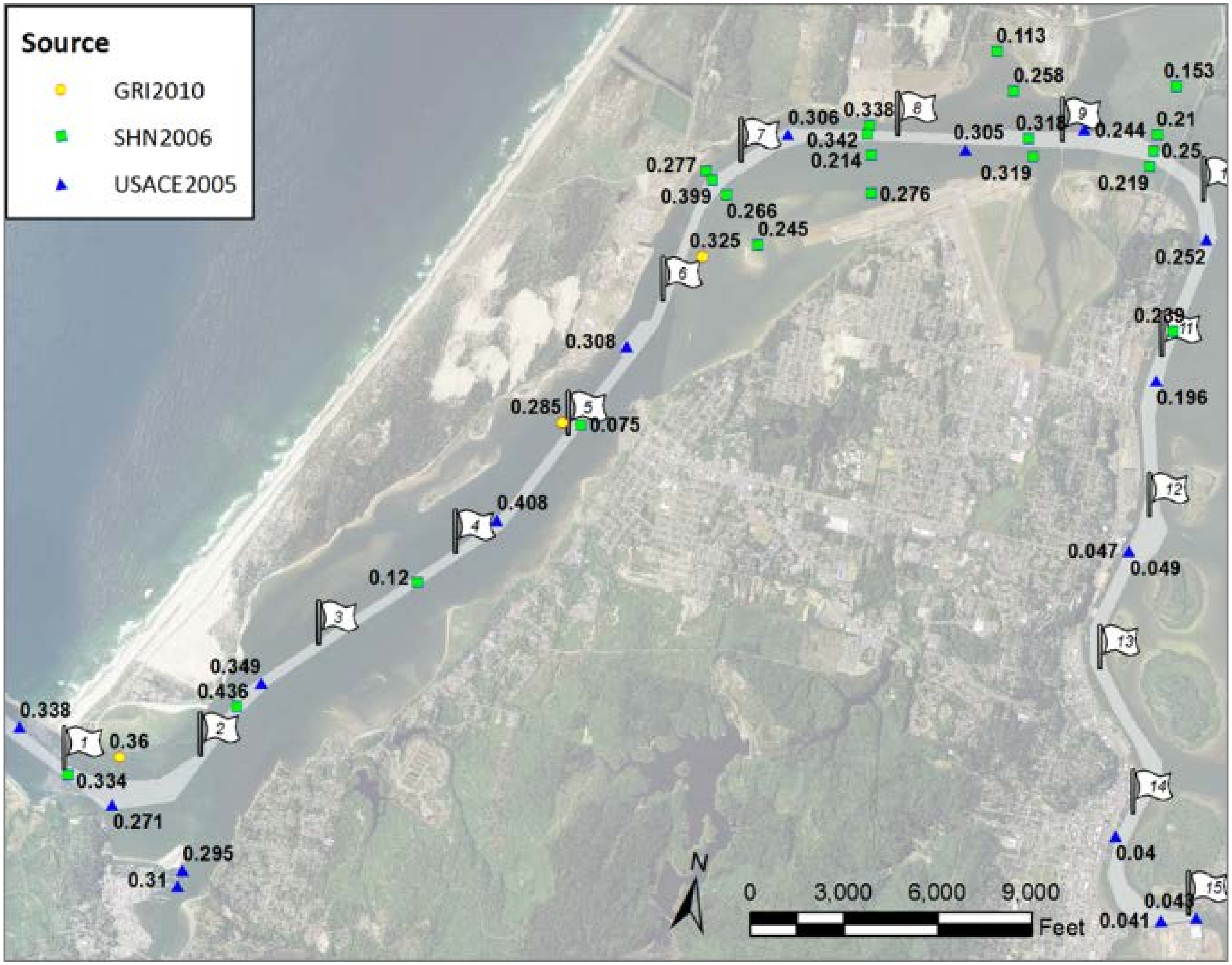


Figure 2-4. Measured Grain Size Map in millimeters

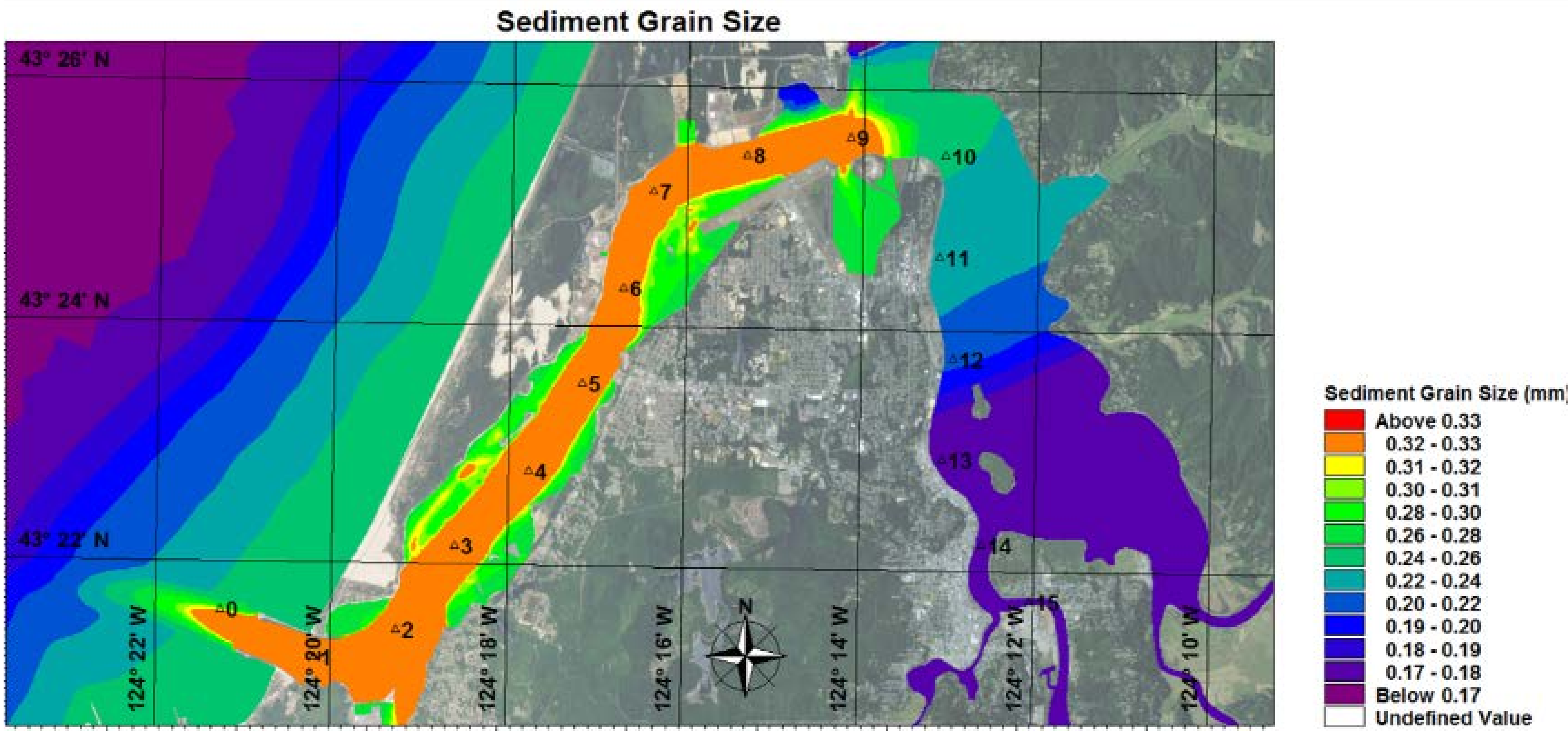


Figure 2-5. Simulated Grain Size Map in millimeters

2.2.4 INPUT PARAMETERS

Table 2-2 lists the primary input parameters used in the sediment transport module. These input parameters were adjusted during model refinement and calibration (described in Section 2.3).

Table 2-2. Input Parameters for Sediment Transport Module

Parameter	Value	Comments
Bedload Formula Suspended Load Formula	Van Rijn	Selected from four formulae available: Engelund & Fredsøe Engelund & Hansen Van Rijn Meyer-Peter and Müller
Bedload to Suspended Load Ratio	1 : 1.7	Relatively large suspended load fraction. Any ratio from entirely bedload to entirely suspended load is possible.
Model description	Non-Equilibrium	Uses advection-dispersion module to track suspended load
Porosity	0.4	Default value
Relative Sediment Density	2.65	Default value
Scaling Factor for Eddy Viscosity	1.0	Default value: dispersion follows hydrodynamic model
Bed Resistance	Manning's n = 0.025	Selected from four bed resistance available: Chezy number Manning's n Alluvial resistance Resistance from Hydrodynamic simulation

2.3 MODEL REFINEMENT AND CALIBRATION

The calibration for sediment transport modeling was based on the existing condition bathymetry (OIPCB 2017) and the annual average quantity of maintenance dredging since 1998 (Table 2-1).

Over an extended period of time, dredging records corroborate the average annual sedimentation rate reasonably well. Although the magnitude and frequency of dredging is dependent on budget and equipment capability on an annual basis, the amount of material removed depends on the sedimentation amounts and is limited by the authorized depths. The cumulative volume removed by dredging activities was deposited over the time between consecutive dredging events, and a deposition rate can be derived from this information. The uncertainty in this method is the exact surface area being dredged, however, the surface area is limited by the authorized dimensions. Therefore, over multiple dredging cycles, all deposited material within critical areas of the channel would be removed.

The approach of using average sedimentation rates over larger areas was selected to calibrate the model because numerical sediment transport models may have difficulty capturing bed level changes accurately in specific areas, such as channel turns and scour areas.

The four sediment theories presently available in the MIKE-21 sediment transport model are listed in Table 2-2. During model calibration, three out of the four were tested. Both the "Engelund & Fredsoe" and the "Engelund & Hansen" theory predict a higher shoaling rate in the Coos & Empire Ranges than the Jarvis Ranges, which is the reverse from the trend observed in the dredging records. Only the "Van Rijn" theory predicts the same trend, leading to the decision to base the analysis on the results predicted by the "Van Rijn" theory.

Using the "Van Rijn" theory, a series of bed load and suspended load combinations was tested during model calibration. The larger the bed load or suspended load, the greater the shoaling rate. The present load combination of 0.1/0.17 was found to best match the dredging records, and this specified load combination was based on model calibration.

Nominal porosity and relative sand density were considered. In this model, sand transport is primarily advective, while diffusive processes (usually not resolved in the model) are of less importance. It was noted that the model has a higher numerical diffusion compared to other similar models, which makes adjustments in diffusivity parameters less impactful.

In the coupled model setup, the hydrodynamic model and sediment transport models use different roughness parameters due to the nature of the numerical solutions. In the hydrodynamic model the roughness represents "apparent" roughness (which represent sediment characteristics, bedforms, and bed content). In the sediment transport model, roughness is used to compute bed shear stresses on the sediment particles only. Therefore, a single roughness value cannot satisfy both hydrodynamic and sediment transport solutions. The applied bed resistance of Manning's n equal to 0.025 was refined during the model calibration.

Table 2-3 and Figure 2-6 show that the model satisfactorily predicts the annual dredging volumes between RM 2.5 and RM 12.

Table 2-3. Calibration of Annual Shoaling Volume

Location	Average Dredge Volume, CY/year	Simulated Volume, CY/year	Ratio simulated / actual volume
Coos Bay & Empire Ranges	22,000	18,000	0.8
Jarvis Ranges	61,000	61,000	1.0
North Bend Ranges	29,000	30,000	1.0
Total	**112,000**	**109,000**	**1.0**

The modeling result for the existing condition shows sand waves between RM 6 and RM 10, and not much sedimentation beyond RM 11 (Figure 2-7). This is consistent with general USACE observations of sand waves between RM 6 and 7 and not much sedimentation beyond RM 11.

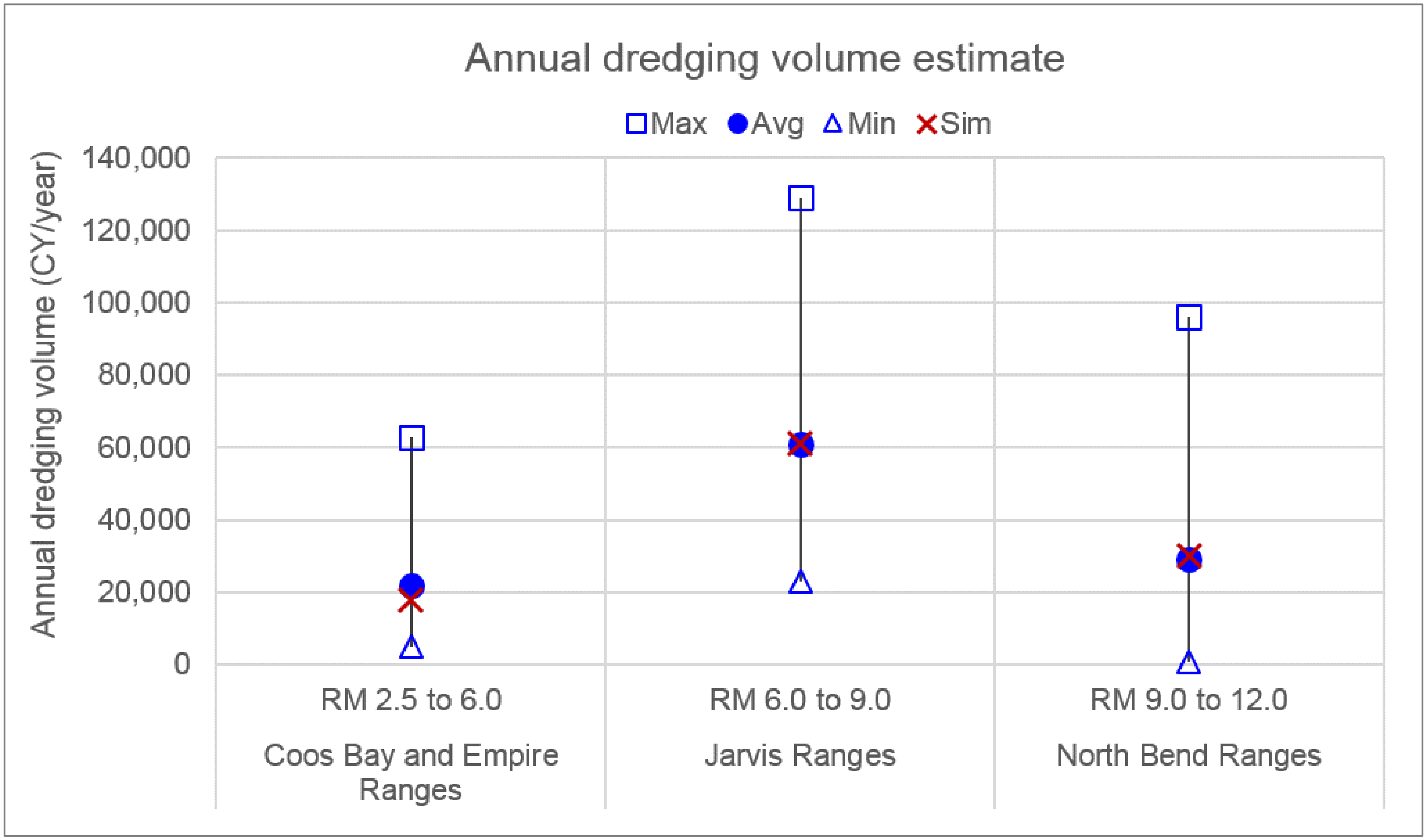


Figure 2-6. Calibration of Annual Shoaling Volume (Dredging Records vs. Simulation)

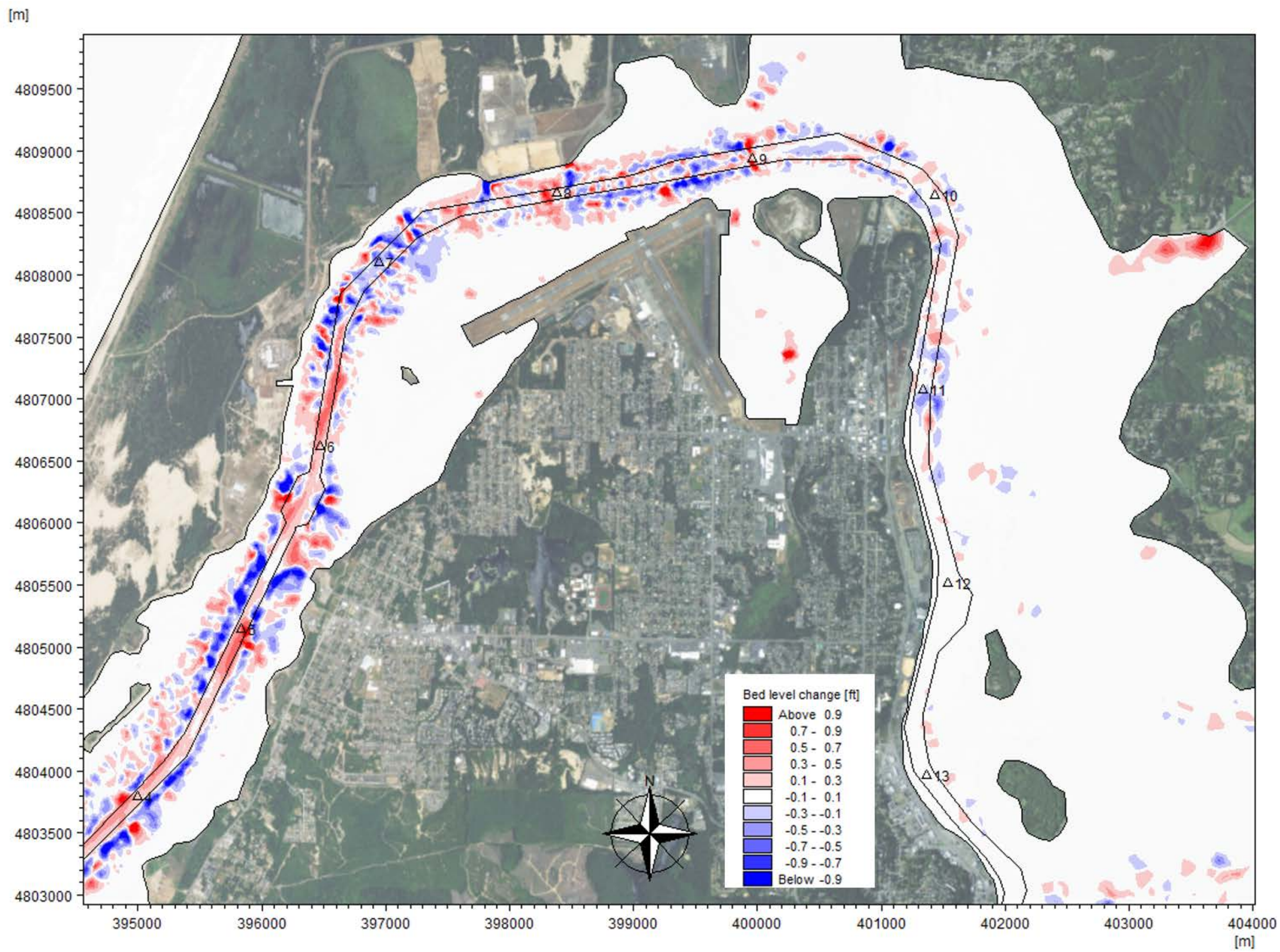


Figure 2-7. Model Result for the Existing Condition; Red – Shoaling, Blue - Erosion (OIPCB 2017)

2.4 MODELING RESULTS

Model results in terms of shoaling rates for "Without-Project" and "With-Project" scenarios were obtained. Comparison of the two scenarios provides an indication of the potential for changes in sedimentation rates resulting from the proposed JCEP Project.

2.4.1 CHANGES TO FEDERAL NAVIGATION CHANNEL

Table 2-4 compares the average shoaling rates at the same three channel ranges inside the FNC (see Figure 2-3) for a one-year and a three-year simulation of sediment transport for With Project and Without Project Conditions. Model results indicate that the average shoaling inside the FNC is not expected to change as a result of the proposed modifications.

Table 2-4. Comparison of Shoaling Rates Inside the Federal Navigation Channel

Location	Average Shoaling After One Year (ft)		Average Shoaling After Three Years (ft)	
	Without-Project	With-Project	Without-Project	With-Project
Coos Bay & Empire Ranges	0.1	0.1	0.2	0.2
Jarvis Ranges	0.3	0.3	0.7	0.7
North Bend Ranges	0.2	0.2	0.4	0.4

Figure 2-8 and Figure 2-12 presents the difference of bed level changes after one year and three years, respectively, between Without-Project and With-Project scenarios. Figure 2-9 through Figure 2-11, and Figure 2-13 through Figure 2-15 provide greater detail of the differences in bed level changes in the Lower Estuary, the Coos and Empire Ranges, and the Jarvis Ranges. Since the JCEP Project areas are dredged in the With-Project scenario, the areas beyond the FNC are removed by shading to avoid distraction from the assessment of changes inside the FNC.

From the results of the one-year run, most of the non-project area shows bed level changes less than 0.2 feet due to the JCEP Project. Some more noticeable changes of up to 1.2 ft in erosion were predicted locally near the intersection of the FNC with the Access Channel, near Pile Dike 7.3, and at the southern end of NRI 3 and NRI 4. Localized shoaling up to 0.4 ft in the FNC adjacent to the Access Channel are in a naturally deep section of the channel. It is noted that the study focuses on the differential sediment transport trend(s) observed in the modeling results, rather than the absolute values predicted by the model. Similar but somewhat greater changes in value and/or extents can be seen in the results of the three-year simulation comparison.

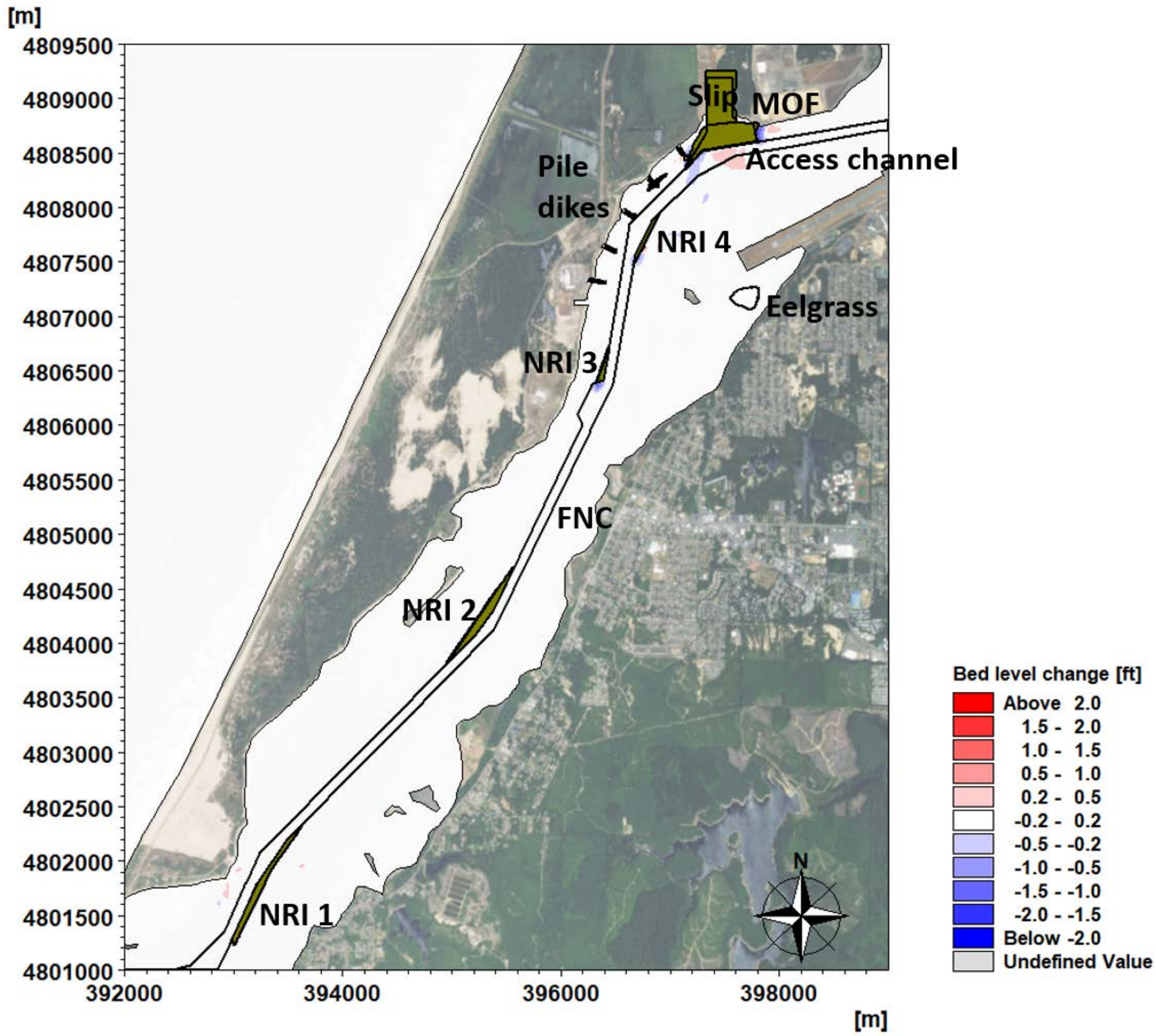


Figure 2-8. Difference of Bed Level Changes after One Year, Without-Project vs. With-Project Scenario; Red – Shoaling, Blue - Erosion

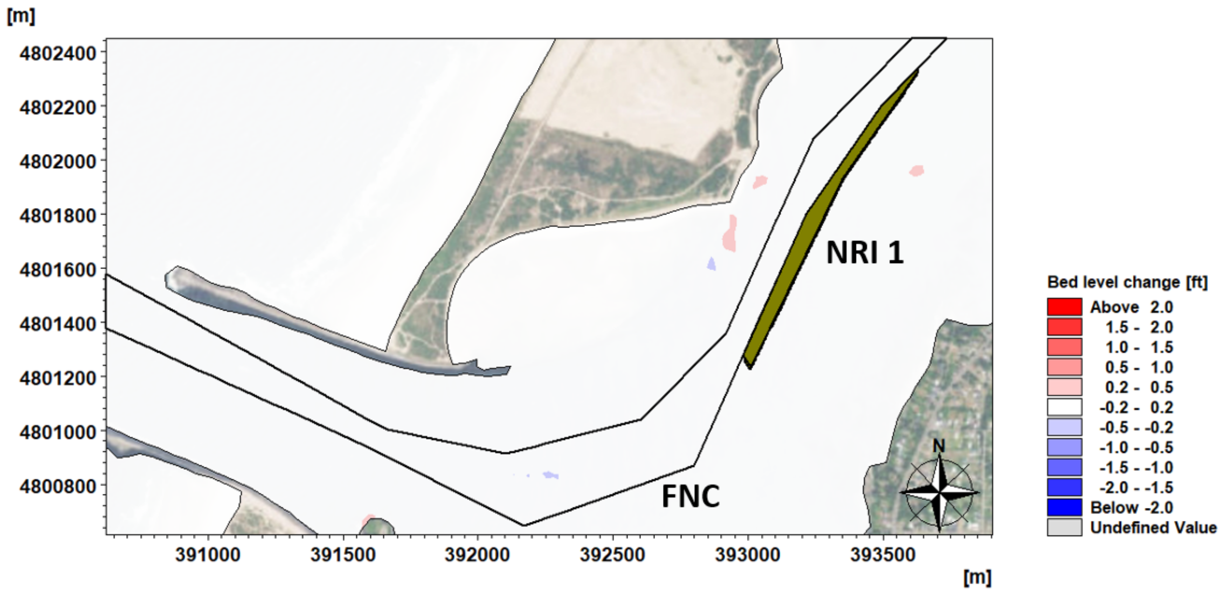


Figure 2-9. Difference of Bed Level Changes after One Year at the Lower Coos Bay Estuary, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

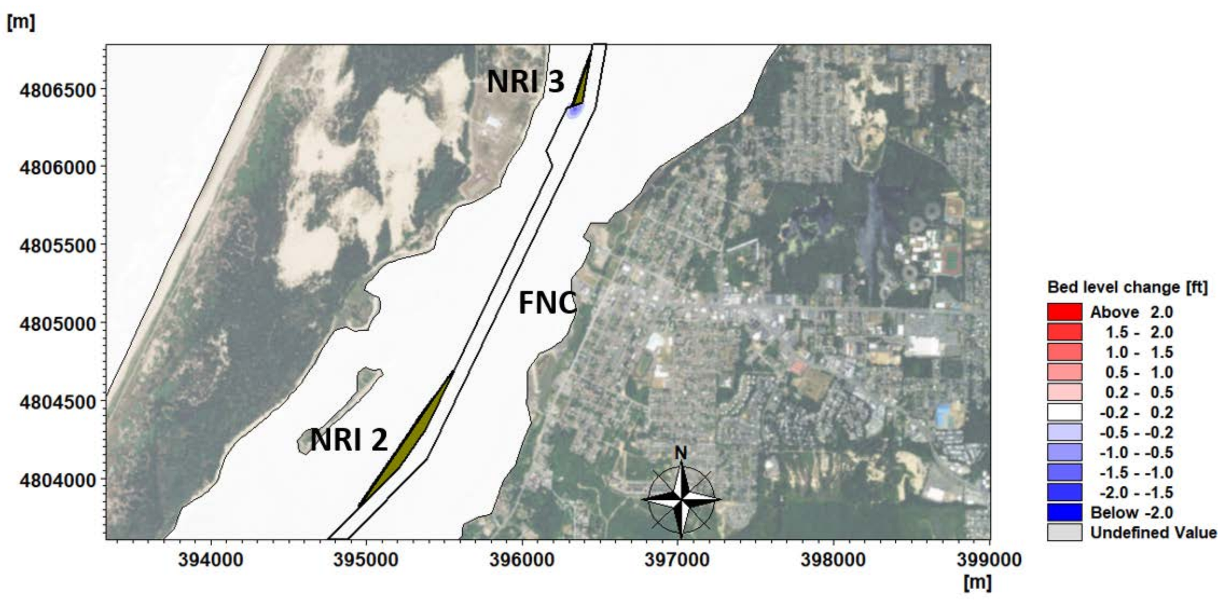


Figure 2-10. Difference of Bed Level Changes after One Year at the Coos & Empire Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

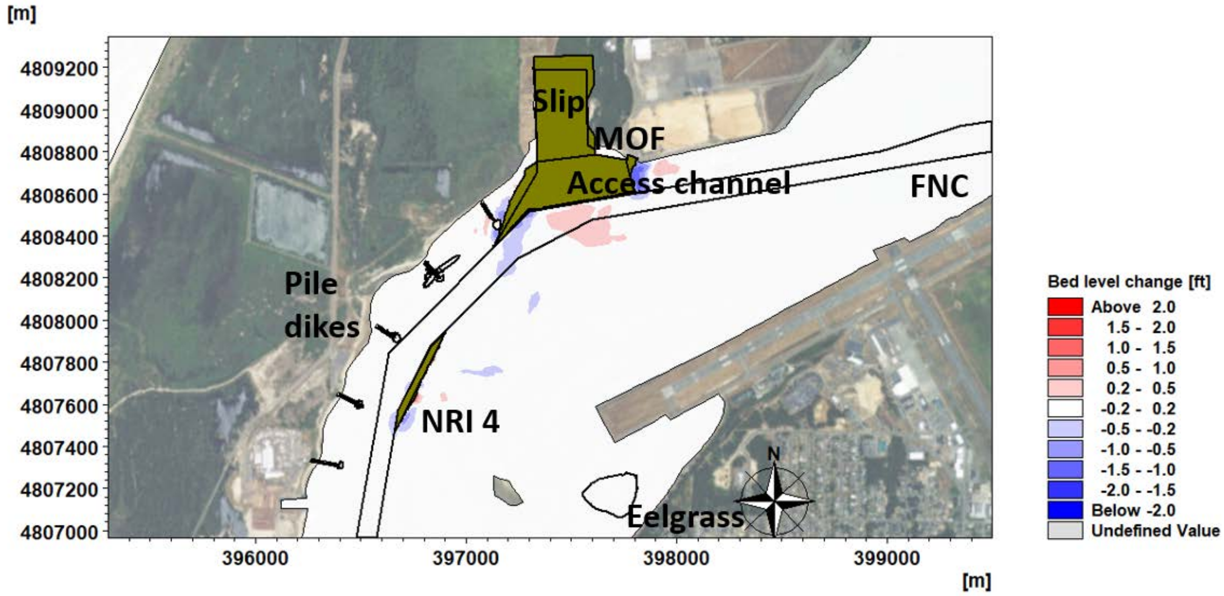


Figure 2-11. Difference of Bed Level Changes after One Year at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

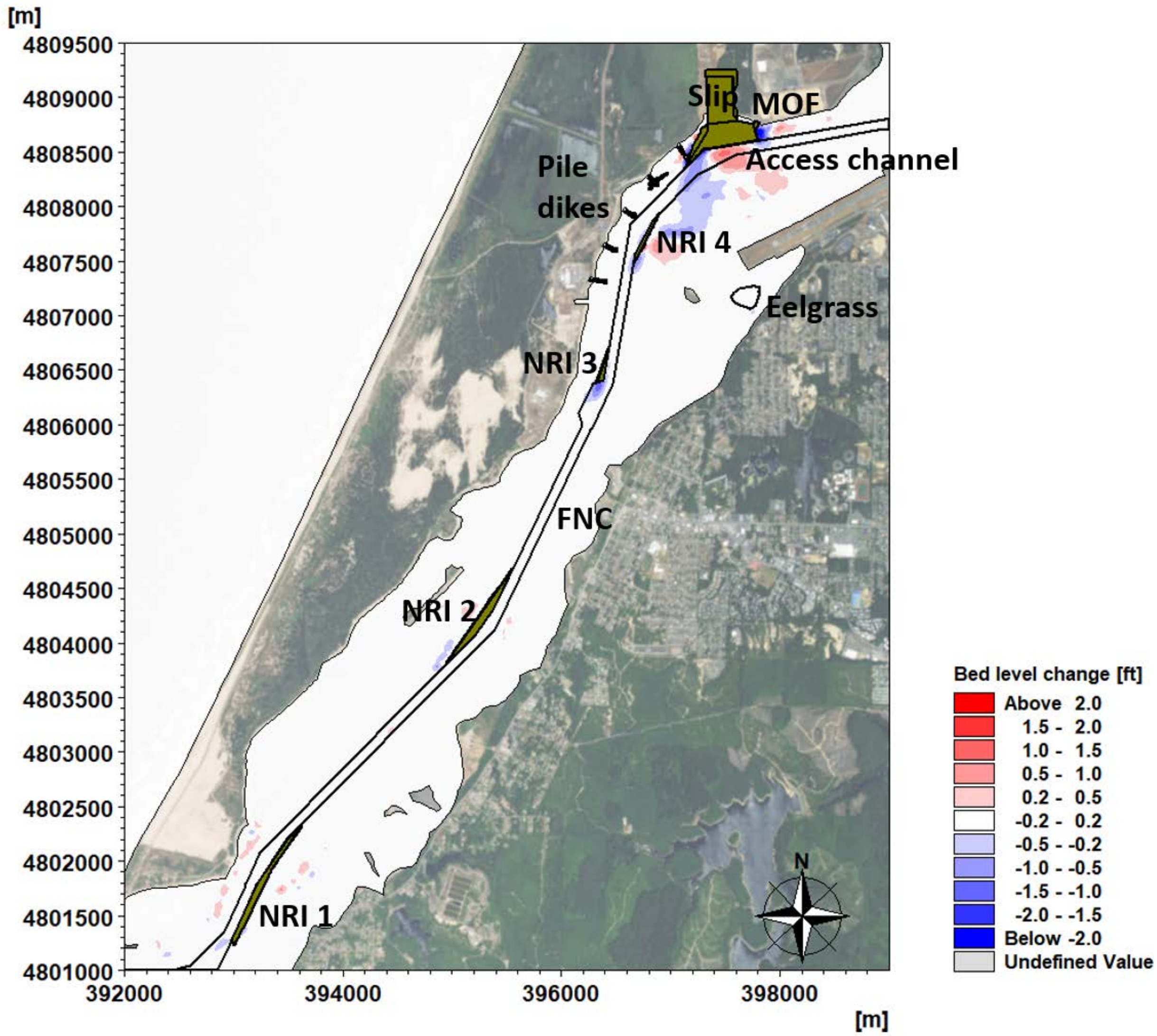


Figure 2-12. Difference of Bed Level Changes after Three Years, Without-Project vs. With-Project Scenario; Red – Shoaling, Blue - Erosion

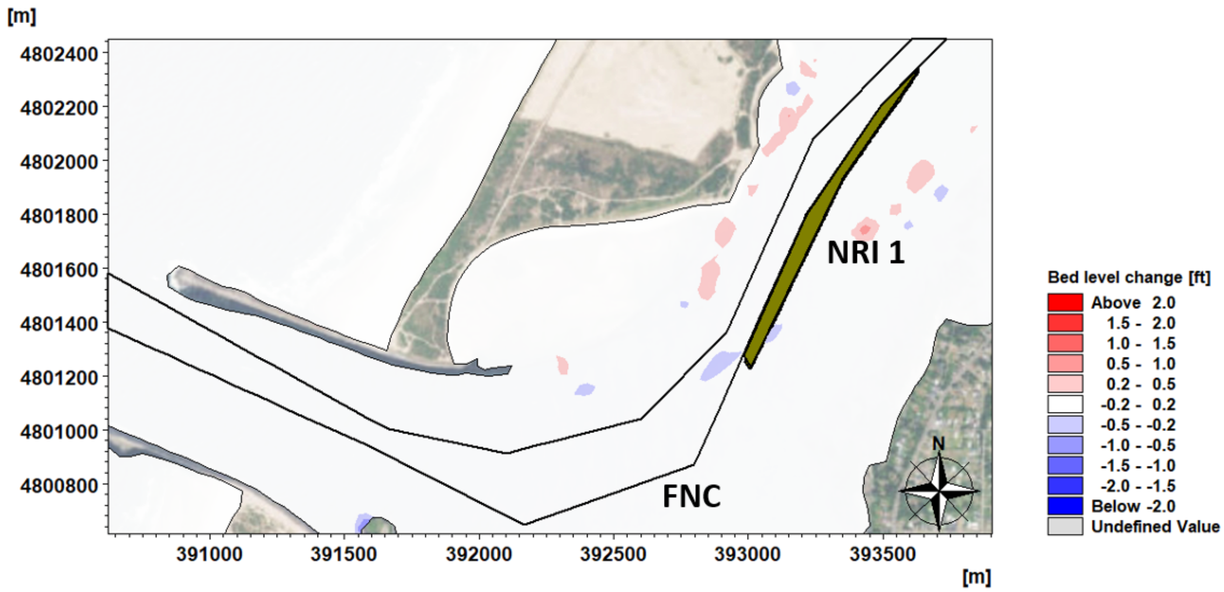


Figure 2-13. Difference of Bed Level Changes after Three Years at the Lower Coos Bay Estuary, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

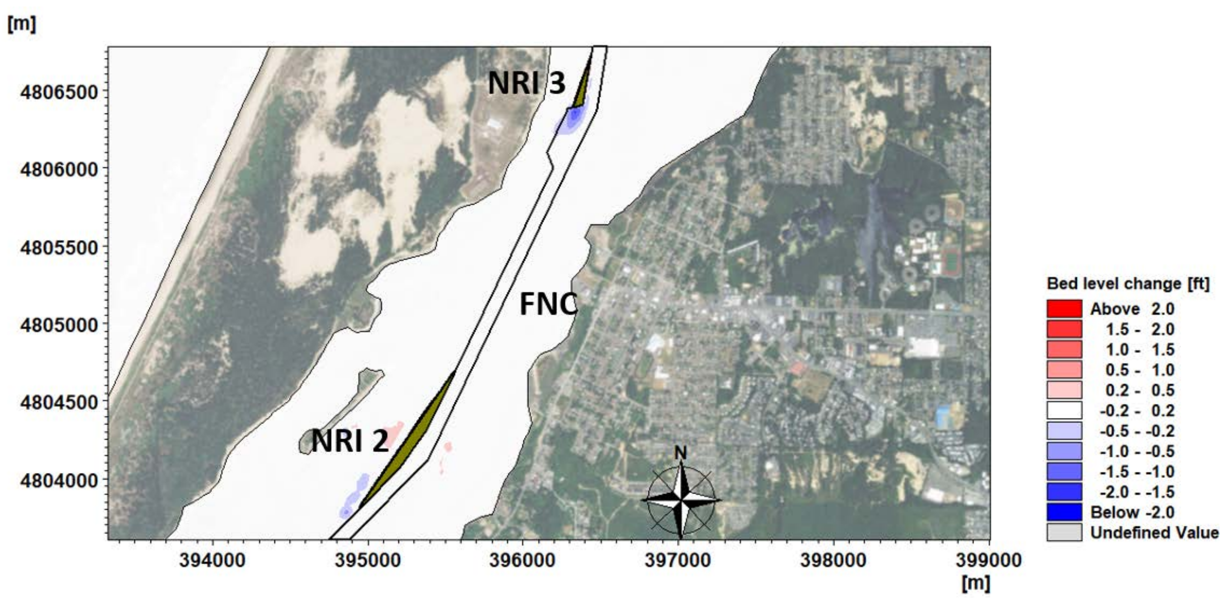


Figure 2-14. Difference of Bed Level Changes after Three Years at the Coos & Empire Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

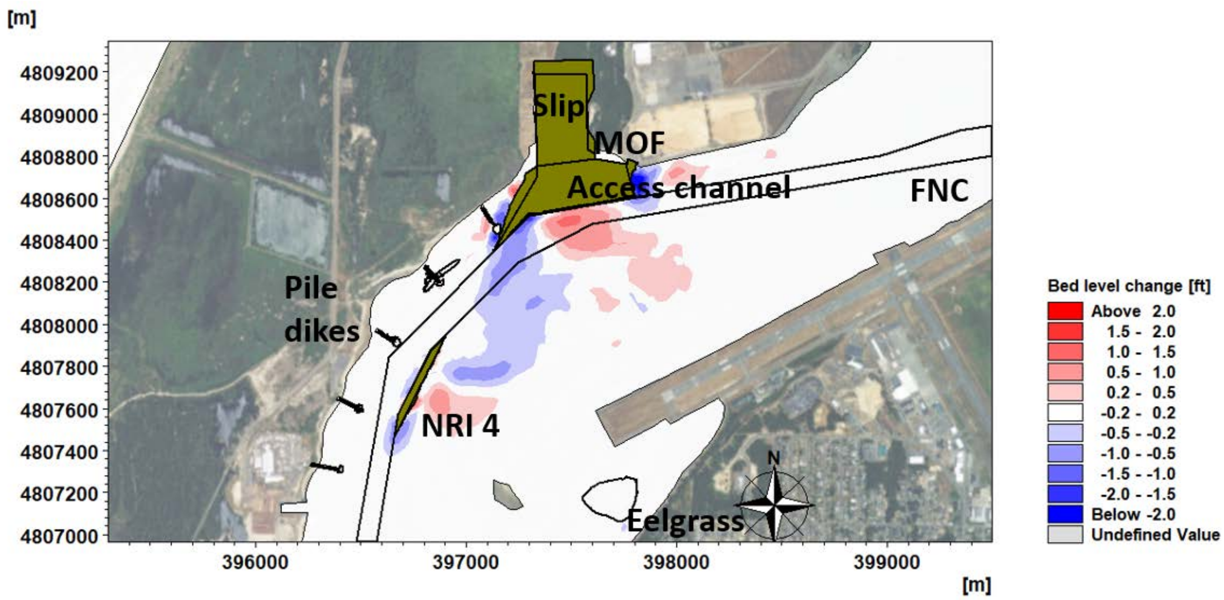


Figure 2-15. Difference of Bed Level Changes after Three Years at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

Figure 2-15 shows that the model predicts localized comparative erosion of 1.8 feet near the side slope of the Access Channel after three years. This is due to the construction of the Access Channel resulting in larger re-directed currents flowing through this area and re-joining the FNC at the southwest corner of the Access Channel and flow over and/or along the Access Channel dredge slope. The model indicates up to 2 feet of comparative erosion near the offshore end of Pile Dike 7.3. This area will be further analyzed to determine potential effects to Pile Dike 7.3 with results presented in a separate technical memorandum.

The model also predicts some localized shoaling of up to 1.1 feet in the FNC directly adjacent to the Access Channel after 3 years. This potential shoaling is in a historically naturally deep section of the channel where water depths generally range from approximately -39 to -41 feet MLLW and maintenance dredging has not typically been required. Actual sedimentation in this historically naturally deep area will be monitored by hydrographic survey in conjunction with monitoring surveys of the Slip, Access Channel, and NRI areas by the JCEP. Should sedimentation in this area over time result in conditions requiring maintenance dredging, maintenance dredging would be executed by the JCEP in conjunction with maintenance dredging of the NRI areas and access channel.

Figure 2-11 shows the model predicts the same general areas/patterns of erosion and deposition but to a lesser extent after 1 year.

2.4.2 SHOALING ESTIMATES AT THE PROJECT AREAS

Table 2-5 provides the average and maximum shoaling rates after one year and three years for the JCEP Project areas. Figure 2-14 through Figure 2-18 illustrate the results for each project area after one year. Figure 2-19 through Figure 2-23 illustrate the results for each project area after three years. All project areas, except NRI 4, experience a general trend of shoaling. The averaged shoaling of the three-year runs are not a multiple of the shoaling of the one-year runs because the hydraulic gradients, which drive sediment movements, change over time until a dynamic equilibrium state is reached.

Table 2-5. Shoaling Rates for the JCEP Project Areas

Location	RM	Shoaling After One Year (ft)		Shoaling After Three Years (ft)	
		Avg.	Max.	Avg.	Max.
NRI 1	2.0 - 2.5	< 0.1	0.1	0.2	0.4
NRI 2	4.0 - 4.5	0.2	0.6	0.7	1.6
NRI 3	6.0	0.6	1.1	1.5	2.5
NRI 4	6.5	0.2	1.2	0.4	1.3
Access Channel & MOF	7.5	0.1	1.2	0.3	1.5
JCEP Slip	7.5	< 0.1	0.6	< 0.1	0.8

A previous sedimentation analysis completed by Coast & Harbor Engineering (CHE 2011) indicated an annual sedimentation rate of approximately 0.2 ft. in the Slip, and 0.6 ft. in the Access Channel. These sedimentation values are of the same order of magnitude as those predicted by this analysis.

Figure 2-20 and Figure 2-25 indicate localized deposition in front of the MOF, localized erosion at the eastern side of the Slip, erosion of the design slope east of the MOF, and some localized erosion along the southwest side of the Access Channel.

The simulation results also show there are no noticeable sedimentation changes anticipated at the Eelgrass Mitigation site as a result of the proposed improvements.

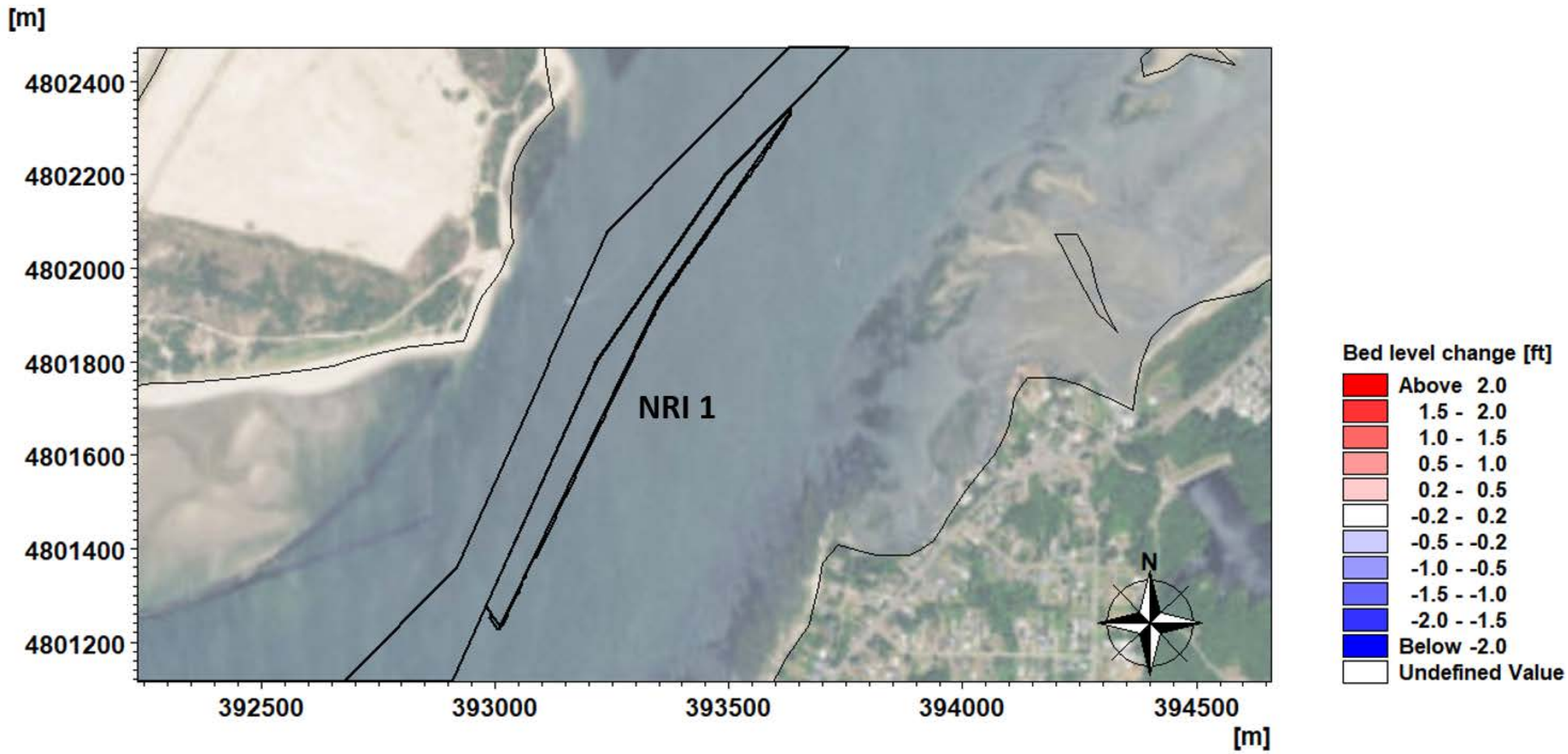


Figure 2-16. Bed Level Changes at NRI 1 after One Year for With-Project; Red – Shoaling, Blue - Erosion

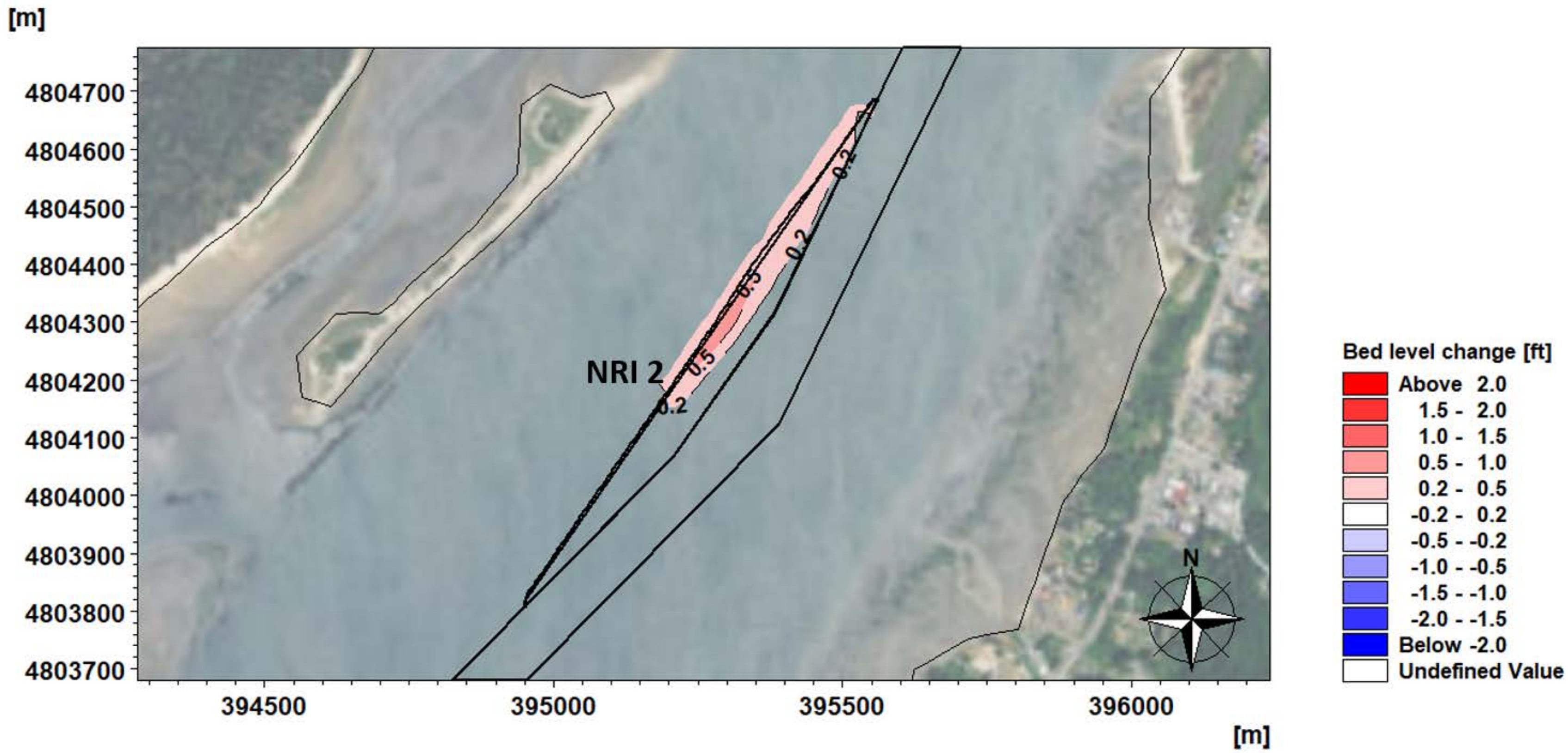


Figure 2-17. Bed Level Changes at NRI 2 after One Year for With-Project; Red – Shoaling, Blue - Erosion

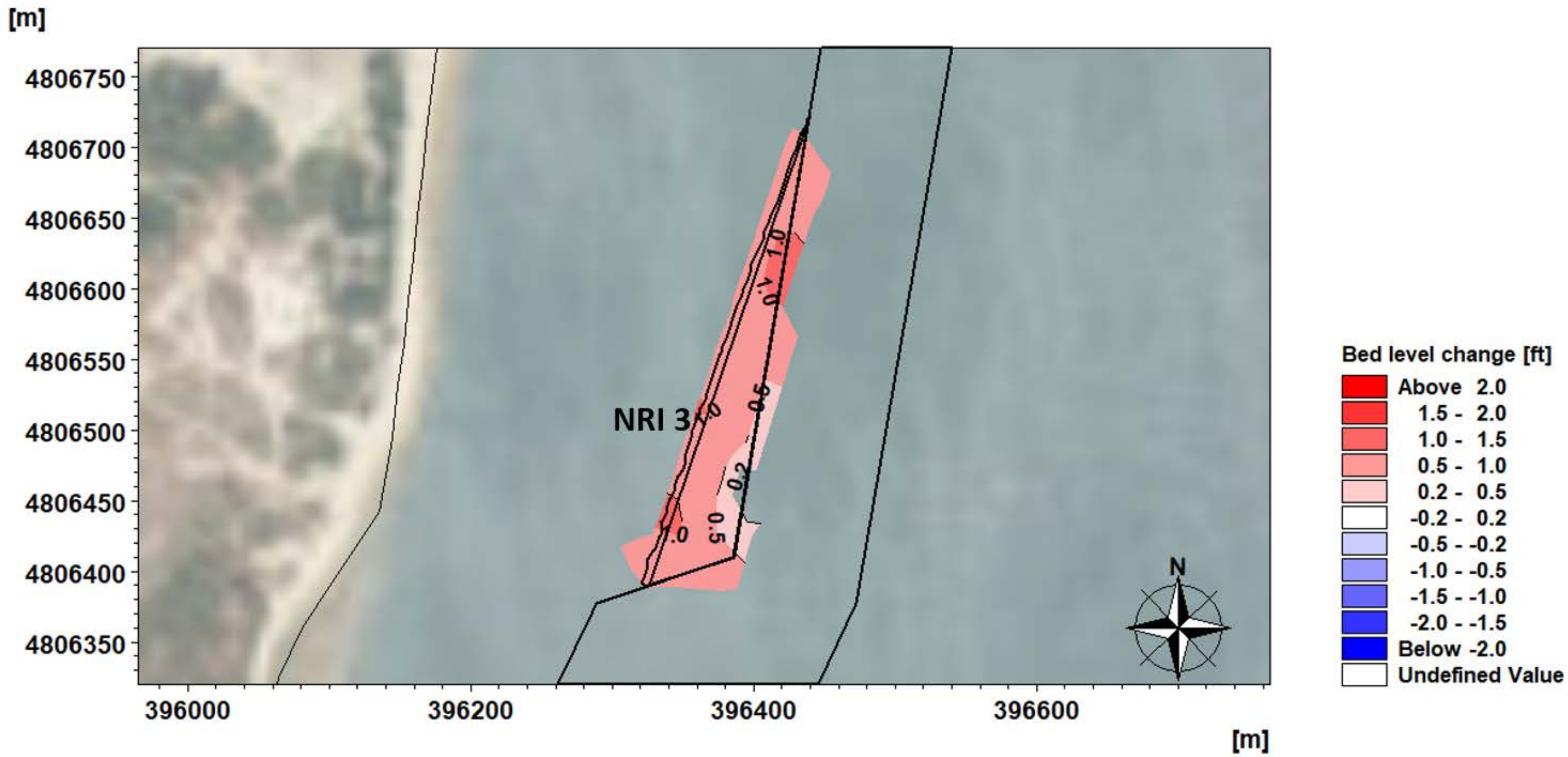


Figure 2-18. Bed Level Changes at NRI 3 after One Year for With-Project; Red – Shoaling, Blue - Erosion

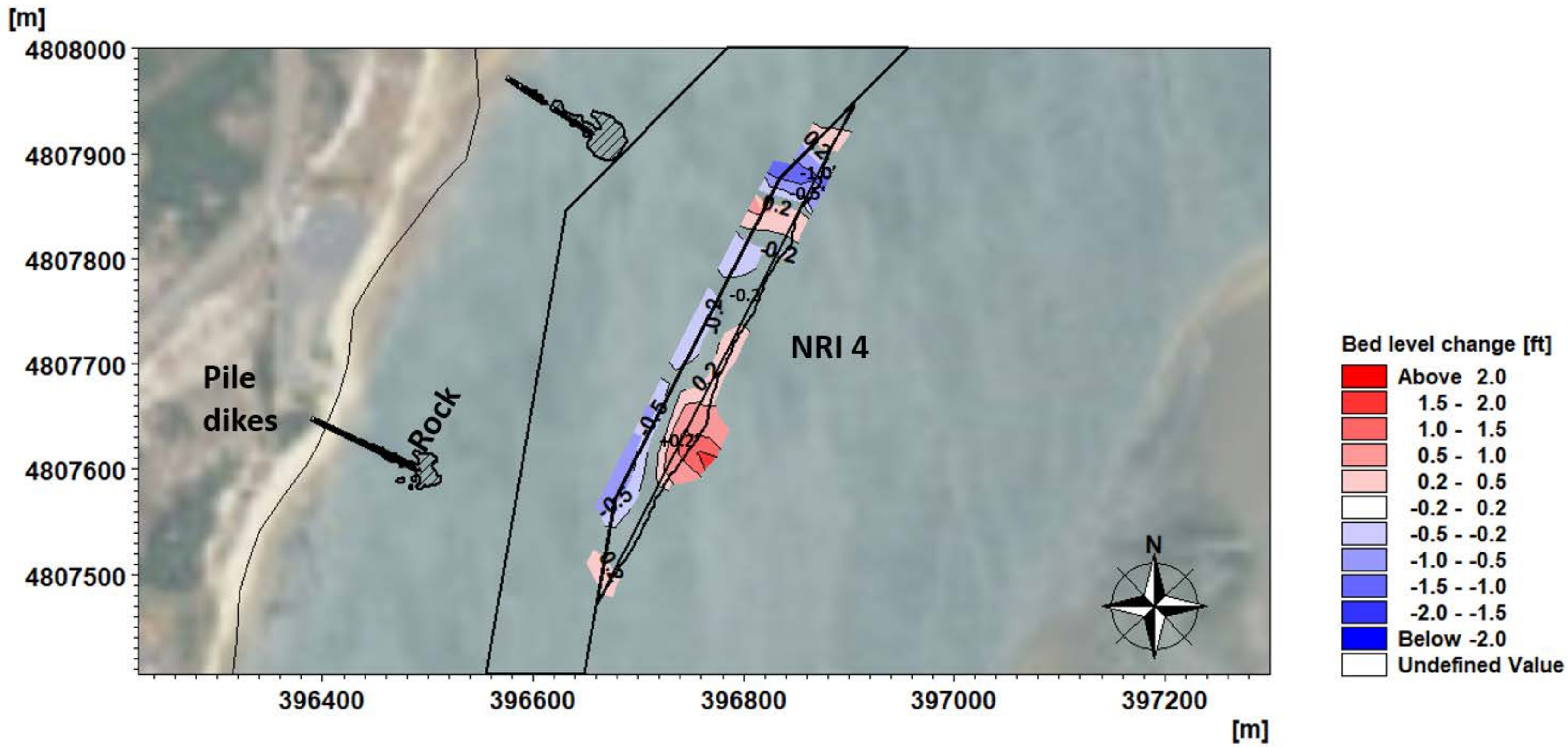


Figure 2-19. Bed Level Changes at NRI 4 after One Year for With-Project; Red – Shoaling, Blue - Erosion

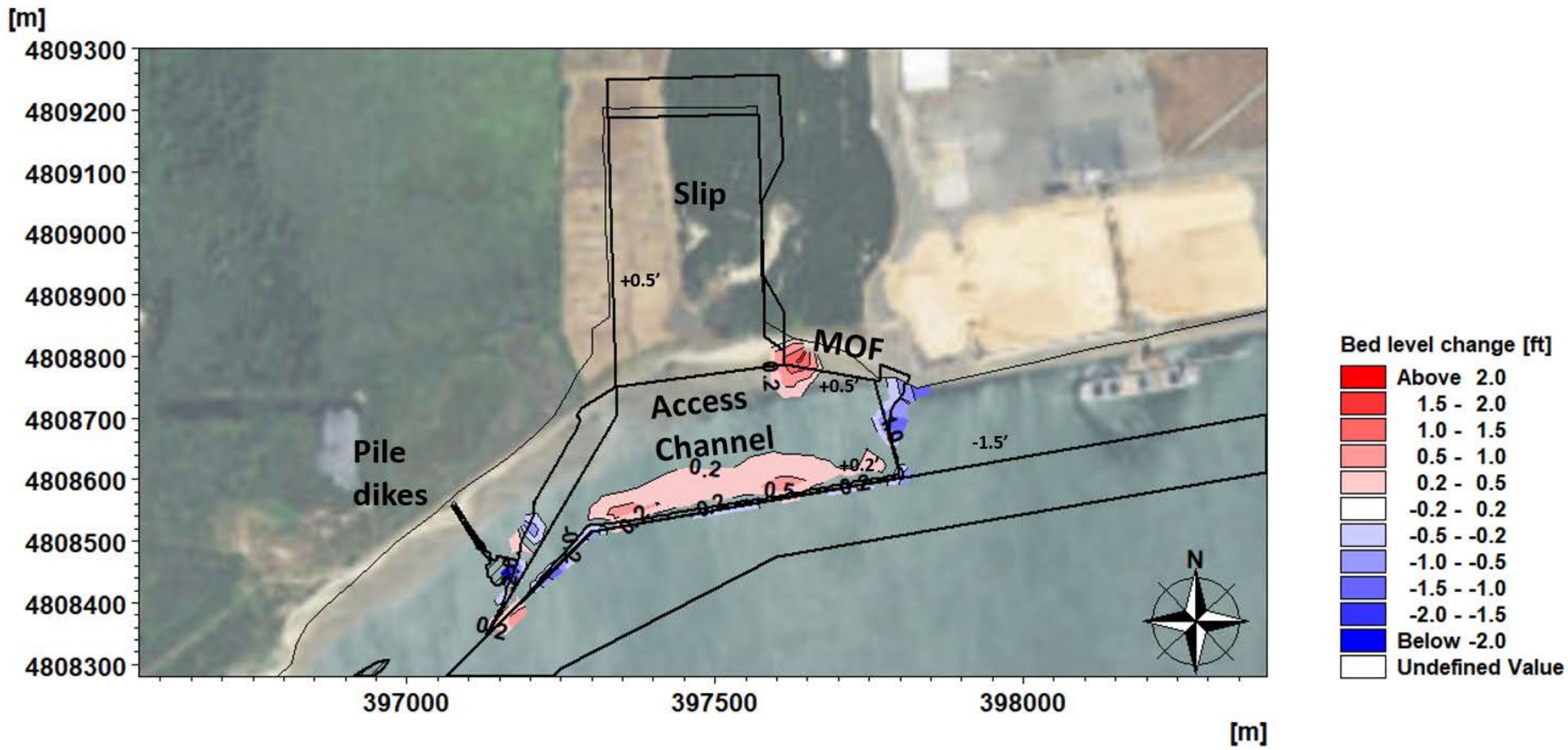


Figure 2-20. Bed Level Changes at the Slip, the Access Channel and the MOF after One Year for With-Project; Red – Shoaling, Blue - Erosion

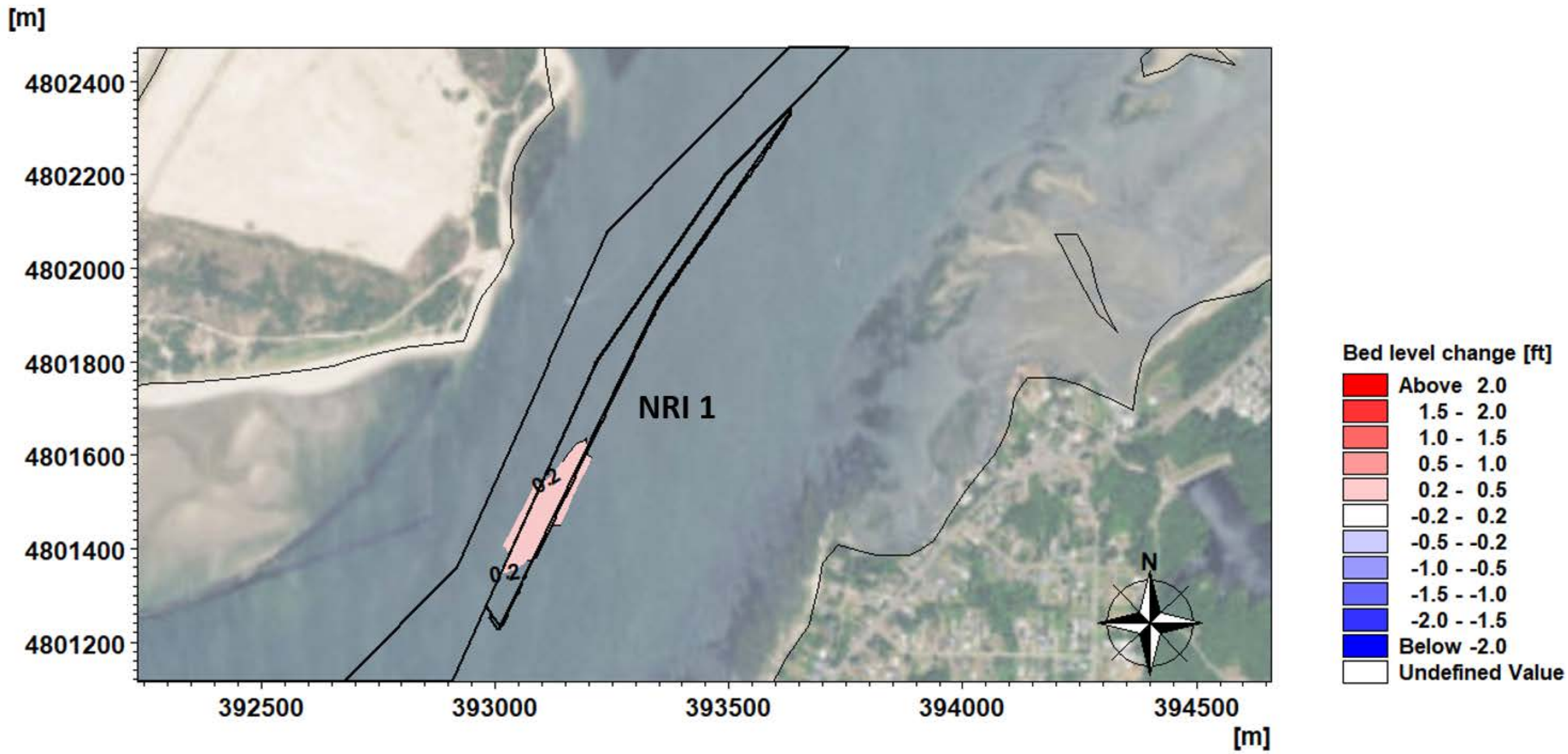


Figure 2-21. Bed Level Changes at NRI 1 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

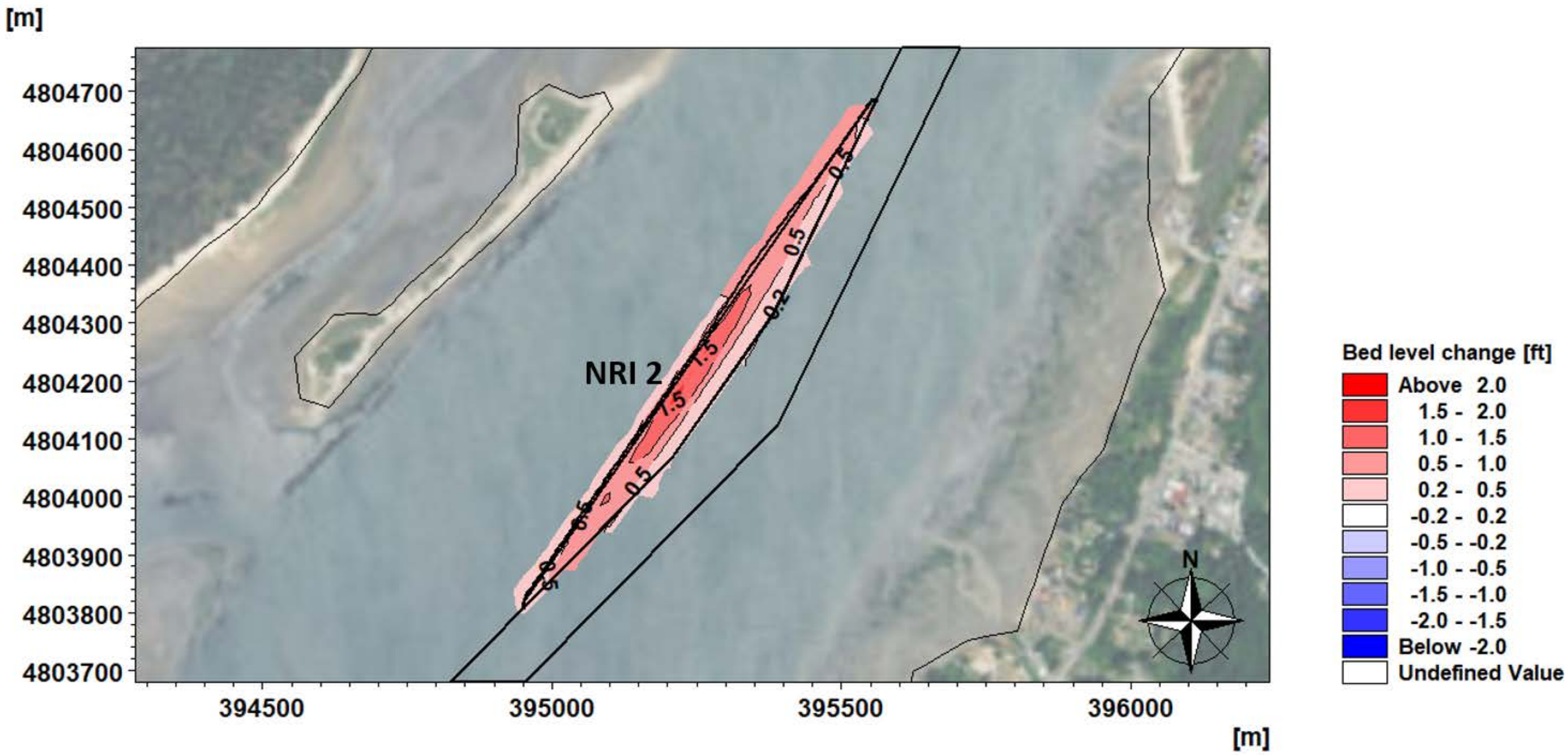


Figure 2-22. Bed Level Changes at NRI 2 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

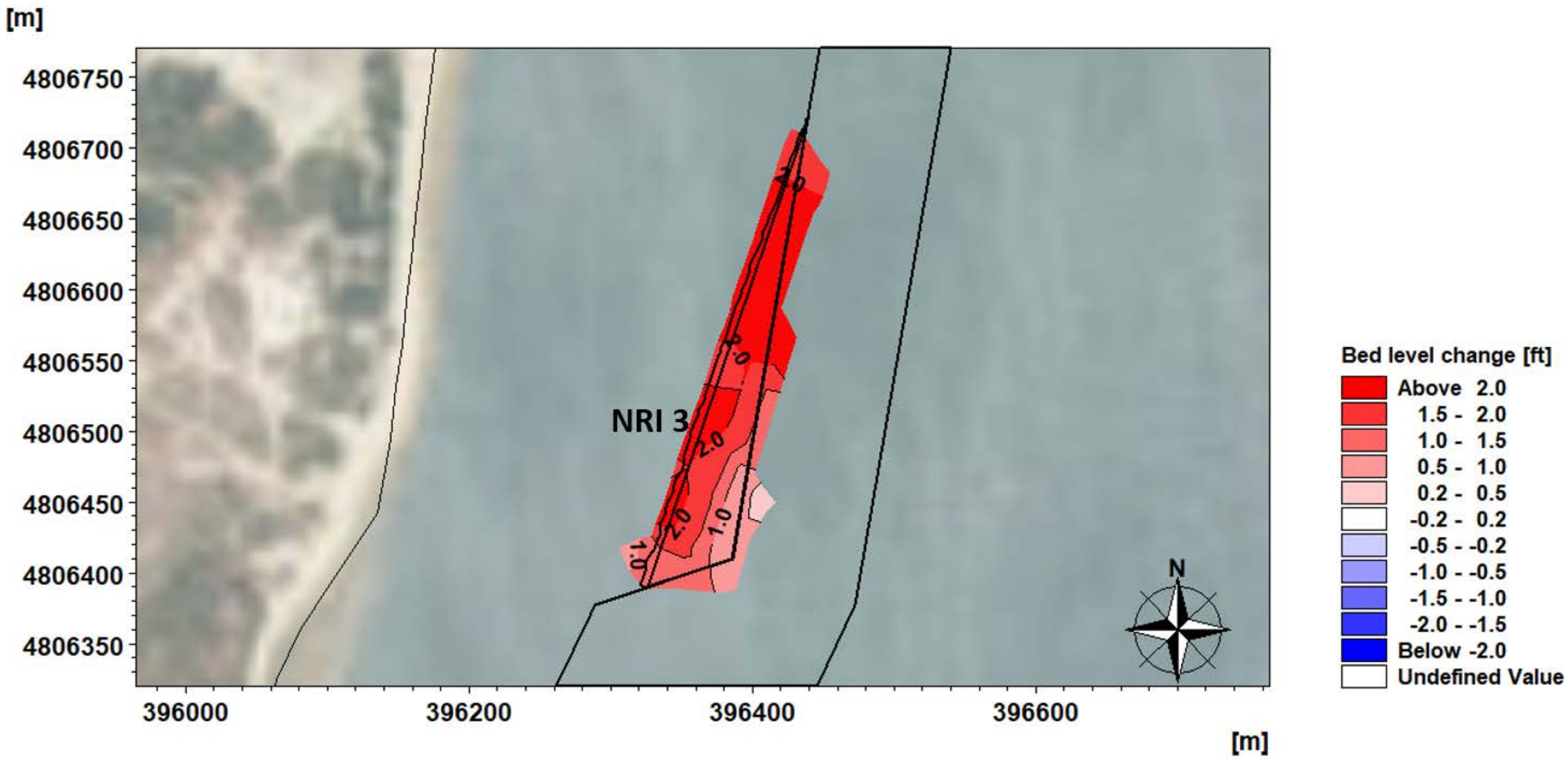


Figure 2-23. Bed Level Changes at NRI 3 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

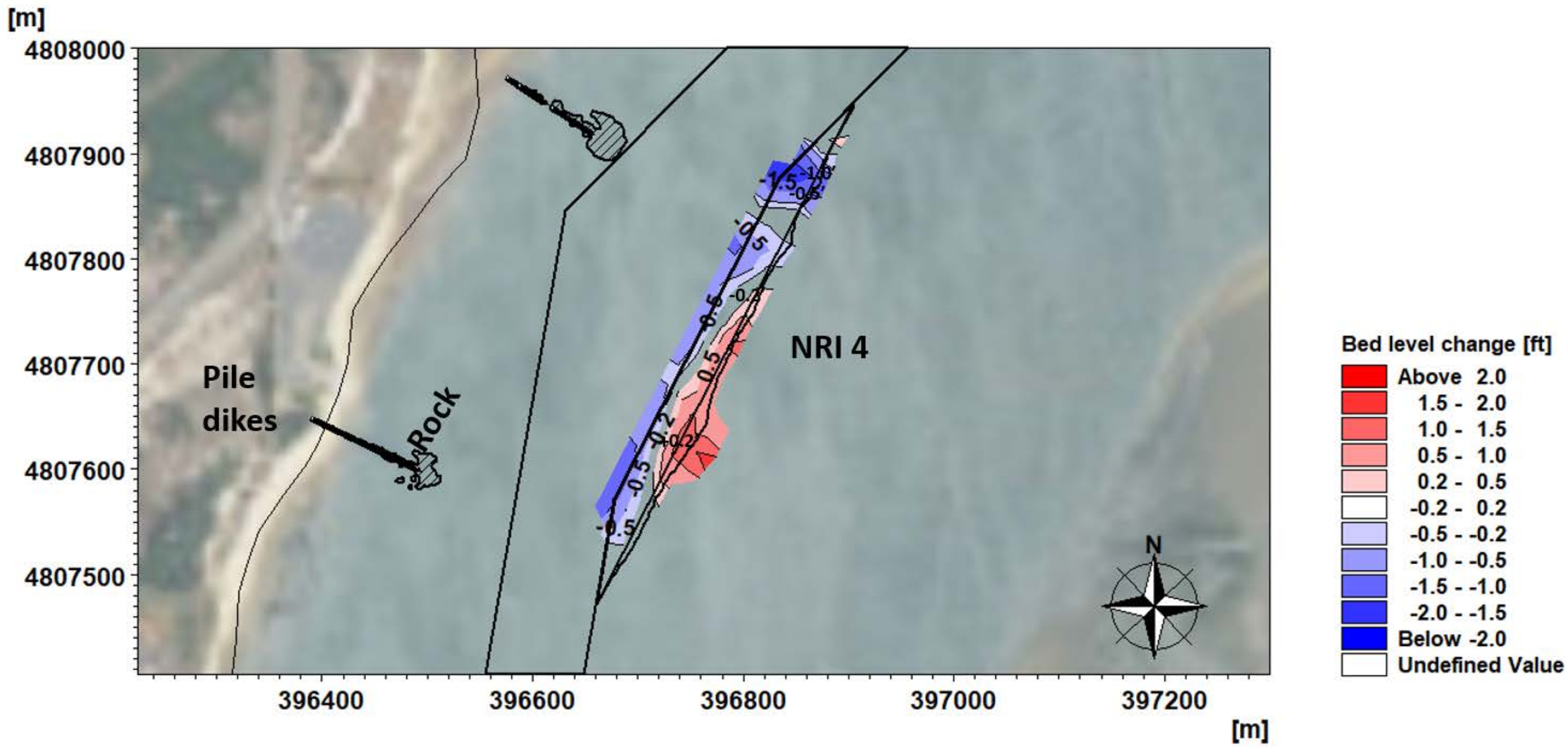


Figure 2-24. Bed Level Changes at NRI 4 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

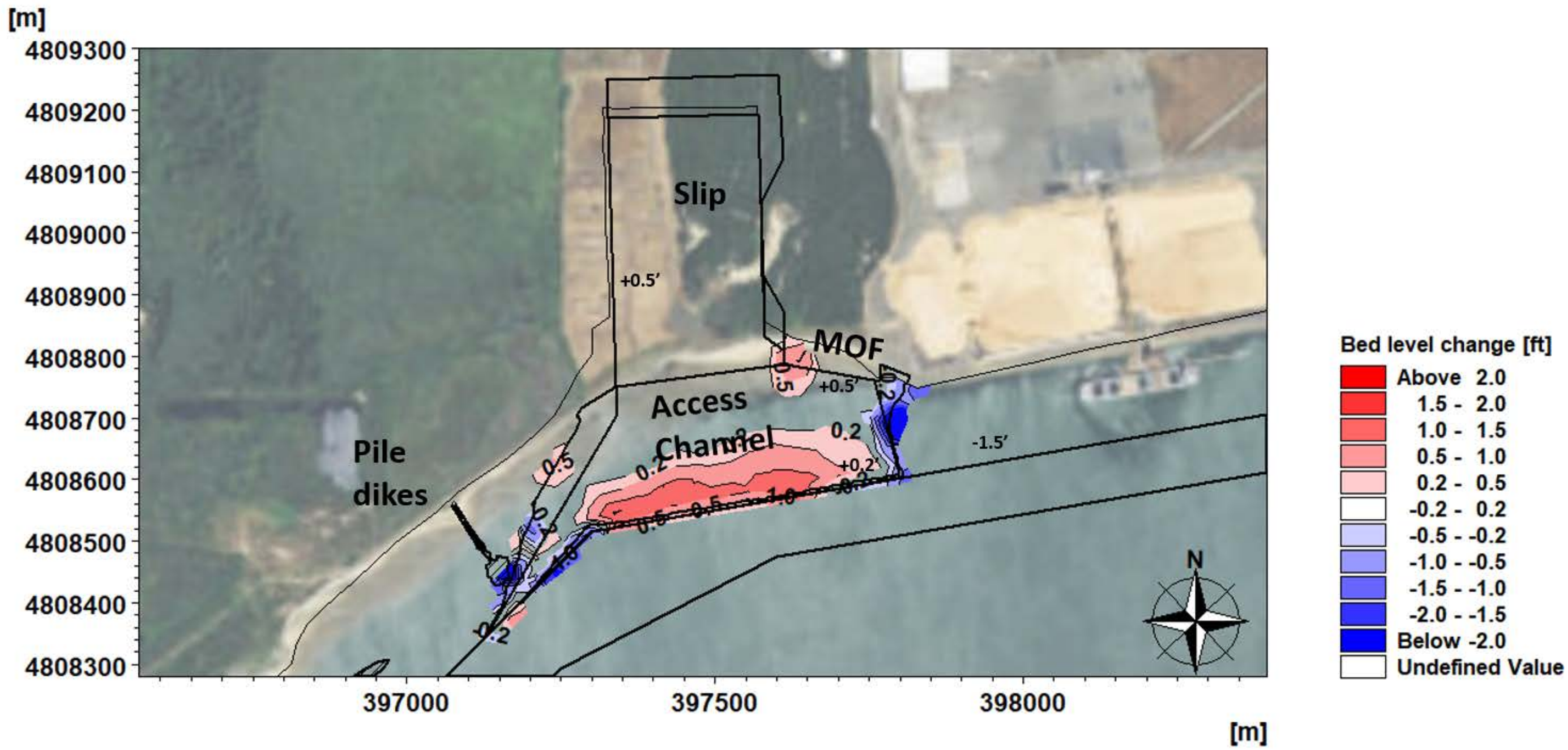


Figure 2-25. Bed Level Changes at the Slip, the Access Channel and the MOF after Three Years for With-Project; Red – Shoaling, Blue - Erosion

3. SUMMARY

M&N conducted a numerical modeling study to evaluate possible changes in sedimentation along the FNC as a result of implementing the With Project Conditions. The model was calibrated against records of annual dredge quantities provided by USACE for the Without Project condition. The model was then used to simulate With-Project condition. Comparison of model results for With-Project and Without-Project conditions indicated potential changes to sedimentation patterns in limited areas within the FNC and adjacent to the offshore end of Pile Dike 7.3.

Results of the one-year and three-year model simulations indicate that comparative (change between With-Project and Without-Project conditions) shoaling and/or erosion rates within the majority of the FNC and most of the non-project areas are less than 0.2 feet. Model results indicated that the JCEP (With-Project condition) could result in limited comparative erosion within the FNC at five locations when compared to the existing (Without-Project) condition. After 3 years, additional erosion of up to 0.4 feet south of NRI 1, 1.5 feet south of NRI 3, 0.7 feet south of NRI 4, 1.8 feet near the intersection of the FNC with the Access Channel, and 1.2 feet near the MOF is indicated.

Up to 2 feet of comparative erosion is indicated near the offshore end of Pile Dike 7.3. These areas of comparative erosion will not increase the overall volume of required maintenance dredging within the FNC or adversely impact navigation. The comparative erosion (bed lowering) near Pile Dike 7.3 will be further analyzed to determine potential effects to Pile Dike 7.3, with results presented in a separate technical memorandum. Only one area within the FNC, adjacent to the Access Channel, indicated comparative deposition (sedimentation) of 1.4 ft. However, this localized change would occur in a historically naturally-deep section of the channel (existing water depth of approximately -39 to -42 feet MLLW which is deeper than the authorized depth of -37 feet MLLW). Actual sedimentation in this historically naturally deep area will be monitored by hydrographic survey in conjunction with monitoring surveys of the Slip, Access Channel, and NRI areas by the JCEP. Should sedimentation in this area over time result in conditions requiring maintenance dredging, maintenance dredging would be executed by JCEP in conjunction with maintenance dredging of the NRI areas and access channel. JCEP will not increase maintenance dredging volumes or dredging intervals.

Modeling results also indicate localized erosion and deposition in the JCEP dredge areas following construction. Anticipated deposition was indicated in the NRI areas, the Access Channel, and the Slip, these areas will be maintained by the JCEP, are outside the FNC, and do not increase maintenance dredging within the FNC. Localized erosion and deposition was indicated adjacent to the MOF outside the FNC.

There are no noticeable sedimentation changes at the Eelgrass Mitigation site.

4. REFERENCES

Coast and Harbor Engineering (CHE), 2011. “Volume 3 – Jordan Cove Terminal & Access Channel Sedimentation and Maintenance Dredging Requirements”. Draft Technical Report, March 14, 2010. JCLNG Document No. J1-000-MAR-RPT-CHE-00003-00.

Danish Hydraulic Institute (DHI), 2014. “MIKE 21 Flow Model FM – Sand Transport Module User Guide”. JCLNG Document No. J1-000-MAR-PCD-DHI-00003-00.

GRI. 2011. “Coos Bay Channel Modification Section 203 Feasibility Study / Environmental Impact Study”. Geotechnical Data Report. Prepared for DEA. JCLNG Document No. J1-000-GEO-RPT-GRI-00054-00.

Moffatt & Nichol (M&N), 2018 “Hydrodynamic Studies – Hydrodynamic Analysis Technical Memorandum”. Prepared for JCLNG, May 2018. JCLNG Document No. J1-000-MAR-TNT-DEA-00008-00.

M&N, 2017 “Navigation Reliability Improvement (NRI) Dredge Areas Evaluation Technical Memorandum”. Prepared for JCLNG, October 2017. JCLNG Document No. J1-000-MAR-TNT-DEA-00002-00

Oregon International Port of Coos Bay (OIPCB), 2017. “Coos Bay, Oregon, Section 204(f) Channel Modification Project: 60% Engineering Design Report”. October 31, 2017. JCLNG Document No. J1-000-MAR-RPT-PCB-00004-00.

SHN, 2007. “Sediment Sampling and Analysis Report, Oregon Marine Gateway Terminal, Coos Bay, Oregon”. Prepared for The Port of Coos Bay and Jordan Cove Energy Project, LP. JCLNG Document No. J1-000-RGL-RPT-SHN-00029-00.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE/USEPA), 1986. “Coos Bay, Oregon: Dredged Material Disposal Site Designation”. JCLNG Document No. J1-000-RGL-RPT-AOE-00001-00.

USACE, 2005. “Coos Bay Sediment Quality Evaluation Report”. Prepared by Tim Sherman, Portland District Corps of Engineers, CENWP-EC-HR. March 2005. JCLNG Document No. J1-000-MAR-RPT-AOE-00002-00.

APPENDIX J: DRAFT LETTER OF CREDIT AND PERSONAL GUARANTEE

Month, Day, Year

Beneficiary:
State of Oregon acting by and through the
Oregon Department of State Lands
775 Summer Street NE
Salem, Oregon 97301-1279

IRREVOCABLE STANDBY LETTER OF CREDIT

Letter of Credit No. [number]   Amount U.S.$ [amount]

At the request and for the account of Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP (Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP at 4000, 585 – 8th Ave. S.W., Calgary, AB T2P 1G1, Canada), we MUFG Bank, Ltd., New York Branch hereby establish, effective immediately, this Irrevocable Letter of Credit No. [number] ("Letter of Credit") in favor of the State of Oregon, by and through the Oregon Department of State Lands ("Beneficiary") in the amount of U.S.$[amount] (as such amount may be reduced from time to time by partial draws hereunder, the "Stated Amount").

This Letter of Credit is being issued in connection with the Removal-Fill Permit No. 60697 granted to Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP , dated [date], as may be amended from time to time.

This Letter of Credit is issued, presentable, and payable at our offices at MUFG Bank, Ltd., New York Branch, 1251 Avenue of the Americas, New York, New York 10020, Attn. Trade Service Operations/ Standby LC Section, and expires with our close of business on [date] (the "Expiration Date").

Subject to the terms and conditions herein, funds under this Letter of Credit are available at sight against your draft drawn on us bearing upon its face the clause "Drawn under MUFG Bank, Ltd., New York Branch Letter of Credit Number [number] dated [date]" and accompanied by the following documents:

1. The original of the Letter of Credit and all subsequent amendments, if any; and
2. Your sight draft drawn on us (Exhibit A); and
3. A dated draw certificate signed by an official of the Oregon Department of State Lands on the Oregon Department of State Lands' letterhead in the form of Exhibit B or C to this Letter of Credit.

Partial and multiple draws are permitted under this Letter of Credit, provided that the Stated Amount of this Letter of Credit shall be permanently reduced by the amount of each such draw.

This Letter of Credit may not be transferred nor any of the rights hereunder assigned. Any purported transfer or assignment shall be void.

MUFG Bank, Ltd., New York Branch agrees that a draft drawn and presented in conformity with the terms of this Letter of Credit will be duly honored upon presentation. If a draft made by Beneficiary does not conform to the terms and conditions of this Letter of Credit, we will give Beneficiary prompt notice that the demand for payment will not be effective. Such notice will include a statement or reasons for the denial. Upon being notified that the demand for payment was not in conformity with this Letter of Credit, Beneficiary may attempt to correct the nonconforming demand; provided, however, that any draft or document presented to correct such nonconforming demand must be provided on or before the Expiration Date.

This Letter of Credit sets forth in full our undertaking and such undertaking shall not in any way be modified, amended, amplified, or limited by reference to any documents, instruments, or agreements referred to herein, except only the exhibits referred to above; any such reference shall not be deemed to incorporate by reference any document, instrument, or agreement except for such exhibits.

As far as otherwise expressly stated herein, this Letter of Credit is subject to, and governed by, the laws of the State of Oregon and to the International Standby Practices 1998 ('ISP98'), International Chamber of Commerce Publication No. 590, and as to matters not addressed by ISP98, this Letter of Credit shall be governed by the laws of the State of Oregon.

Sincerely,

____
(Authorized Signature)
(printed or typed name and title)

(This EXHIBIT A is an integral part of the irrevocable letter of credit number _____)

(Letterhead of Beneficiary)

SIGHT DRAFT

[Date]

MUFG BANK, LTD., NEW YORK BRANCH
1251 AVENUE OF THE AMERICAS
NEW YORK, NEW YORK 10020
ATTN. TRADE SERVICE OPERATIONS/ STANDBY LC SECTION

AT SIGHT, PAY TO THE ORDER OF: OREGON DEPARTMENT OF STATE LANDS THE SUM OF _____________________ U.S. DOLLARS

DRAWN UNDER MUFG BANK, LTD., NEW YORK BRANCH LETTER OF CREDIT NO. [number]

DATED (date)

STATE OF OREGON, acting by and through the DEPARTMENT OF STATE LANDS, as Beneficiary

By: _________________________________
(SIGNATURE)

Name: _______________________________
(PRINTED)

Title: _________________________________

PAYMENT OF THE AMOUNT SPECIFIED IN THIS DRAFT SHOULD BE WIRE TRANSFERRED TO THE BENEFICIARY IN ACCORDANCE WITH THE FOLLOWING INSTRUCTIONS:

Draw Certificate – Breach of Permit)
(This EXHIBIT B is an integral part of the irrevocable letter of credit number _______.)

(Letterhead of Beneficiary)

(Date)

MUFG Bank, Ltd., New York Branch
1251 Avenue of the Americas
New York, New York 10020
Attn. Trade Service Operations/ Standby LC Section

Drawn under MUFG Bank, Ltd., New York Branch Irrevocable Standby Letter of Credit Number [number] dated [Date of Letter of Credit]

Ladies and Gentlemen:

Any capitalized term used herein shall have the meaning defined for that term by the Letter of Credit.

The undersigned, the duly appointed and acting official of the Beneficiary, hereby certifies as follows:

1. Compensatory mitigation on Section (section), Township (township), Range (range), (County) County, Oregon, is not in compliance with Permit No. (ID number).

2. As a result of such breach of the Permit, the Beneficiary is entitled pursuant to the provisions of the Permit to make demand under the Letter of Credit in the amount of U.S.$ [amount].

3. The undersigned has concurrently presented to you its sight draft drawn in the amount specified in paragraph 2 above, which amount does not exceed the lesser of (a) the amount the Beneficiary is entitled to draw pursuant to the terms of the Permit, and (b) the Stated Amount as of the date hereof. The date of the sight draft is the date of this Certificate, which is not later than the Expiration Date.

DATED [date]

STATE OF OREGON, acting by and through the Department of State Lands, as Beneficiary

By: ____________________________

Title: __________________________

(Draw Certificate-election not to extend)

[This EXHIBIT C is an integral part of the irrevocable letter of credit number _____.]

Letterhead of Beneficiary)

[Date]

MUFG Bank, Ltd., New York Branch
1251 Avenue of the Americas
New York, New York 10020
Attn. Trade Service Operations/ Standby LC Section

Drawn under MUFG Bank, Ltd., New York Branch Irrevocable Standby Letter of Credit Number [number] dated [Date of Letter of Credit]

Ladies and Gentlemen:

Any capitalized term used herein shall have the meaning defined for that term by the Letter of Credit.

The undersigned, the duly appointed and acting official of the Beneficiary, hereby certifies as follows:

1. (bank) has heretofore provided written notice to the Beneficiary of the Bank's intent not to renew the Letter of Credit following the present Expiration Date thereof.

2. As a result of such notice, the Beneficiary is entitled pursuant to the provisions of the Permit to make demand under the Letter of Credit in the amount of U.S.$ [amount].

3. The undersigned has concurrently presented to you its sight draft drawn in the amount specified in paragraph 2 above, which amount does not exceed the lesser of (a) the amount the Beneficiary is entitled to draw pursuant to the terms of the Permit, and (b) the Stated Amount as of the date hereof. The date of the sight draft is the date of this Certificate, which is not later than the Expiration Date.

DATED [date]

STATE OF OREGON, acting by and through the
Department of State Lands, as Beneficiary

By: ____________________________

Title: __________________________

GUARANTY AGREEMENT

This GUARANTY AGREEMENT ("Agreement"), dated as of November 7, 2018, is by Jordan Cove Energy Project LLC (the "Guarantor") for the benefit of the State of Oregon, acting by and through its Department of State Lands (the "Department"), each (a "Party") and jointly, (the "Parties").

In consideration of the Department issuing or renewing a removal-fill permit to Jordan Cove Energy Project L.P. (the "Permit Applicant"), Guarantor agrees as follows:

1. STATEMENT OF GUARANTY

1.1 Guaranty of full and prompt payment. By executing this Joint and Several Personal Guaranty, Guarantor, as Principal, unconditionally and irrevocably guarantees full and prompt Reimbursement to Department. Guarantor's obligations for Reimbursement are initiated upon Department's written determination that Permit Applicant has failed to implement the mitigation project required by removal-fill permit number 60697-RF and that Department will need to implement the mitigation. Guarantor also unconditionally and irrevocably guarantees full and prompt payment when due of any and all expenses (including, without limitation, reasonable attorney fees and expenses, whether incurred at the trial or appellate level, in an arbitration or administrative proceeding, in bankruptcy (including, without limitation, any adversary proceeding, contested matter, or motion), or otherwise) reasonably incurred by the Department in pursuing Reimbursement and enforcing any rights under this Agreement.

1.2 Guaranty to indemnify and hold Department harmless. Guarantor agrees to indemnify and defend the State of Oregon, the Department and its officers, employees and agents from and against all claims, suits, actions, losses, damages, liabilities, costs and expenses of any nature whatsoever, including attorney fees ("Claims"), arising from or relating to implementation of the mitigation project required by removal-fill permit 60697-RF.

2. GUARANTY IS PERPETUAL AND ABSOLUTE

This Agreement is a perpetual and absolute continuing guaranty of payment and is not a guaranty of collection and represents a continuing obligation of Guarantor and will not be discharged until the Department releases Guarantor, or except by indefeasible payment in cash of the Reimbursement and full performance of Guarantor's other obligations under this Agreement. Guarantor guarantees that Reimbursement will be made in full to the Department within thirty (30) days of receipt of written demand, regardless of any law, regulation, or order now or hereafter in effect in any jurisdiction affecting any rights of the Department with respect to the Reimbursement. Time is of the essence. WITHOUT LIMITATION, THE LIABILITY OF GUARANTOR UNDER THIS AGREEMENT IS ABSOLUTE AND UNCONDITIONAL, AND THE GUARANTOR WAIVES ANY DISCHARGE OF GUARANTOR'S OBLIGATIONS UNDER THIS AGREEMENT THAT MAY ARISE BY OPERATION OF LAW.

3. WAIVER

3.1 Guarantor waives: (a) All notices other than demand for payment; (b) The filing of any claim with a court in the event of receivership or bankruptcy of the Permit Applicant; (c) Protest or notice regarding nonpayment of the Reimbursement; and (d) All demands, including, without limitation, any requirement that demand be made on the Permit Applicant as a condition precedent to Guarantor's obligations under this Agreement.

3.2 If, in the good-faith exercise of any of its rights and remedies, the Department forfeits any of its rights or remedies, including, without limitation, its right to enter a deficiency judgment against the Permit Applicant or any other Person, the Guarantor hereby consents to such action by the Department and waives any claim based on such action.

3.3 If applicable law prevents the Department from collecting interest on the Reimbursement, or to enforce or exercise any other right or remedy with respect to the Reimbursement, Guarantor will pay to the Department, on demand, the amount that otherwise would have been due and payable.

3.4 Guarantor assumes responsibility for keeping informed of the financial condition of the Permit Applicant and of each other guarantor, if any, and of all other circumstances bearing on the risk of nonpayment of the Reimbursement that diligent inquiry would reveal. The Department will have no duty to advise Guarantor of information known to the Department regarding any condition or circumstance bearing on such risks.

3.5 The Department will be under no obligation to marshal any assets in favor of Guarantor or otherwise.

3.6 Until Reimbursement has been fully and indefeasibly paid in cash and performed, Guarantor will have no right of subrogation, and Guarantor waives any right to enforce any remedy that the Department now has or may hereafter have against the Permit Applicant or any other person.

4. REMEDIES

4.1 The Department's delay in exercising or failure to exercise any right under this Agreement will not operate as a waiver of this Agreement, nor will any single or partial exercise of any right preclude any other or further exercise thereof or the exercise of any other right. The Department's remedies under this Agreement are cumulative and not exclusive of any remedies provided by law. The Department's failure at any time to require strict performance by the Permit Applicant, Guarantor, or any other Person of this Agreement, will not waive, affect, or diminish any right of the Department at any time to demand strict performance thereof. No action by the Department permitted hereunder will in any way affect or impair any of the Department's rights to seek any remedy provided by law, or the Guarantor's obligations. Any determination by a court of competent jurisdiction of the amount of Reimbursement will be conclusive and binding on the Guarantor.

4.2 GUARANTOR UNDERSTANDS THAT THE DEPARTMENT DOES NOT HAVE TO PURSUE THE PERMIT APPLICANT OR PURSUE ANY OTHER REMEDIES BEFORE DEMANDING PAYMENT FROM GUARANTOR. GUARANTOR FURTHER UNDERSTANDS THAT HE OR SHE MUST PAY AMOUNTS THEN DUE EVEN IF THE PERMIT APPLICANT OR ANY OTHER GUARANTOR DOES NOT MAKE THE PAYMENTS OR ARE OTHERWISE RELIEVED OF THE OBLIGATION TO MAKE PAYMENTS.

5. ASSIGNMENT, DELEGATION, TRANSFER

The Department may assign or otherwise transfer obligations owing to it under this Agreement. Guarantor shall not assign, delegate or otherwise transfer any of its rights or obligations under this Agreement.

6. REINSTATEMENT

This Agreement will remain in full force and effect and continue to be effective into perpetuity notwithstanding the following: (a) The filing of any petition by or against the Permit Applicant for liquidation or reorganization; (b) The Permit Applicant's insolvency; (c) The Permit Applicant's making of an assignment for the benefit of creditors; or (d) The appointment of a receiver or trustee for any of the Permit Applicant's assets, and will, to the fullest extent permitted by law, continue to be effective or be reinstated, as the case may be, if at any time payment and performance of any part of the Reimbursement is avoided, rescinded, or reduced in amount, or must otherwise be restored or returned, whether as a "voidable preference," a "fraudulent transfer," or otherwise, all as though such Reimbursement had not been made.

7. GOVERNING LAW AND FORUM

The laws of the State of Oregon govern all matters arising out of or relating to this Agreement. Any action or suit brought by the Parties relating to this Agreement must be brought and conducted solely and exclusively in the Circuit Court of Marion County for the State of Oregon in Salem, Oregon.

8. PROMISE TO MAINTAIN BUSINESS ENTITY

Guarantor agrees to make all reasonable efforts to maintain the business entity in active status until all mitigation obligations have been satisfied.

9. DEFINITIONS

"Removal-fill permit" means a permit issued by the Department under the Removal-Fill Law, ORS 196.800 et seq.

"Joint and Several Personal Guaranty" means a guaranty executed by a Principal that allows the Department to seek Reimbursement directly from a Guarantor's personal assets, and that requires Guarantor to indemnify the Department.

"Principal" means a shareholder, stockholder, limited partner, general partner, member, trustee, current beneficiary, or other principal of the Permit Applicant.

"Reimbursement" means payment to the State of Oregon for expenses incurred by the State of Oregon in implementing the mitigation required by removal-fill permit number 60697-RF (the "Permit") if and when the Permit Applicant has failed to implement such mitigation in accordance with the Permit.

Guarantor enters into this Agreement as of the date first written above.

/s/ [signature]
Tony Diocee, VP, Projects

GUARANTY AGREEMENT

This GUARANTY AGREEMENT ("Agreement"), dated as of November 7, 2018, is by Pacific Connector Gas Pipeline LLC (the "Guarantor") for the benefit of the State of Oregon, acting by and through its Department of State Lands (the "Department"), each (a "Party") and jointly, (the "Parties").

In consideration of the Department issuing or renewing a removal-fill permit to Pacific Connector Gas Pipeline, LP (the "Permit Applicant"), Guarantor agrees as follows:

1. STATEMENT OF GUARANTY

1.1 Guaranty of full and prompt payment. By executing this Joint and Several Personal Guaranty, Guarantor, as Principal, unconditionally and irrevocably guarantees full and prompt Reimbursement to Department. Guarantor's obligations for Reimbursement are initiated upon Department's written determination that Permit Applicant has failed to implement the mitigation project required by removal-fill permit number 60697-RF and that Department will need to implement the mitigation. Guarantor also unconditionally and irrevocably guarantees full and prompt payment when due of any and all expenses (including, without limitation, reasonable attorney fees and expenses, whether incurred at the trial or appellate level, in an arbitration or administrative proceeding, in bankruptcy (including, without limitation, any adversary proceeding, contested matter, or motion), or otherwise) reasonably incurred by the Department in pursuing Reimbursement and enforcing any rights under this Agreement.

1.2 Guaranty to indemnify and hold Department harmless. Guarantor agrees to indemnify and defend the State of Oregon, the Department and its officers, employees and agents from and against all claims, suits, actions, losses, damages, liabilities, costs and expenses of any nature whatsoever, including attorney fees ("Claims"), arising from or relating to implementation of the mitigation project required by removal-fill permit 60697-RF.

2. GUARANTY IS PERPETUAL AND ABSOLUTE

This Agreement is a perpetual and absolute continuing guaranty of payment and is not a guaranty of collection and represents a continuing obligation of Guarantor and will not be discharged until the Department releases Guarantor, or except by indefeasible payment in cash of the Reimbursement and full performance of Guarantor's other obligations under this Agreement. Guarantor guarantees that Reimbursement will be made in full to the Department within thirty (30) days of receipt of written demand, regardless of any law, regulation, or order now or hereafter in effect in any jurisdiction affecting any rights of the Department with respect to the Reimbursement. Time is of the essence. WITHOUT LIMITATION, THE LIABILITY OF GUARANTOR UNDER THIS AGREEMENT IS ABSOLUTE AND UNCONDITIONAL, AND THE GUARANTOR WAIVES ANY DISCHARGE OF GUARANTOR'S OBLIGATIONS UNDER THIS AGREEMENT THAT MAY ARISE BY OPERATION OF LAW.

3. WAIVER

3.1 Guarantor waives: (a) All notices other than demand for payment; (b) The filing of any claim with a court in the event of receivership or bankruptcy of the Permit Applicant; (c) Protest or notice regarding nonpayment of the Reimbursement; and (d) All demands, including, without limitation, any requirement that demand be made on the Permit Applicant as a condition precedent to Guarantor's obligations under this Agreement.

3.2 If, in the good-faith exercise of any of its rights and remedies, the Department forfeits any of its rights or remedies, including, without limitation, its right to enter a deficiency judgment against the Permit Applicant or any other Person, the Guarantor hereby consents to such action by the Department and waives any claim based on such action.

3.3 If applicable law prevents the Department from collecting interest on the Reimbursement, or to enforce or exercise any other right or remedy with respect to the Reimbursement, Guarantor will pay to the Department, on demand, the amount that otherwise would have been due and payable.

3.4 Guarantor assumes responsibility for keeping informed of the financial condition of the Permit Applicant and of each other guarantor, if any, and of all other circumstances bearing on the risk of nonpayment of the Reimbursement that diligent inquiry would reveal. The Department will have no duty to advise Guarantor of information known to the Department regarding any condition or circumstance bearing on such risks.

3.5 The Department will be under no obligation to marshal any assets in favor of Guarantor or otherwise.

3.6 Until Reimbursement has been fully and indefeasibly paid in cash and performed, Guarantor will have no right of subrogation, and Guarantor waives any right to enforce any remedy that the Department now has or may hereafter have against the Permit Applicant or any other person.

4. REMEDIES

4.1 The Department's delay in exercising or failure to exercise any right under this Agreement will not operate as a waiver of this Agreement, nor will any single or partial exercise of any right preclude any other or further exercise thereof or the exercise of any other right. The Department's remedies under this Agreement are cumulative and not exclusive of any remedies provided by law. The Department's failure at any time to require strict performance by the Permit Applicant, Guarantor, or any other Person of this Agreement, will not waive, affect, or diminish any right of the Department at any time to demand strict performance thereof. No action by the Department permitted hereunder will in any way affect or impair any of the Department's rights to seek any remedy provided by law, or the Guarantor's obligations. Any determination by a court of competent jurisdiction of the amount of Reimbursement will be conclusive and binding on the Guarantor.

4.2 GUARANTOR UNDERSTANDS THAT THE DEPARTMENT DOES NOT HAVE TO PURSUE THE PERMIT APPLICANT OR PURSUE ANY OTHER REMEDIES BEFORE DEMANDING PAYMENT FROM GUARANTOR. GUARANTOR FURTHER UNDERSTANDS THAT HE OR SHE MUST PAY AMOUNTS THEN DUE EVEN IF THE PERMIT APPLICANT OR ANY OTHER GUARANTOR DOES NOT MAKE THE PAYMENTS OR ARE OTHERWISE RELIEVED OF THE OBLIGATION TO MAKE PAYMENTS.

5. ASSIGNMENT, DELEGATION, TRANSFER

The Department may assign or otherwise transfer obligations owing to it under this Agreement. Guarantor shall not assign, delegate or otherwise transfer any of its rights or obligations under this Agreement.

6. REINSTATEMENT

This Agreement will remain in full force and effect and continue to be effective into perpetuity notwithstanding the following: (a) The filing of any petition by or against the Permit Applicant for liquidation or reorganization; (b) The Permit Applicant's insolvency; (c) The Permit Applicant's making of an assignment for the benefit of creditors; or (d) The appointment of a receiver or trustee for any of the Permit Applicant's assets, and will, to the fullest extent permitted by law, continue to be effective or be reinstated, as the case may be, if at any time payment and performance of any part of the Reimbursement is avoided, rescinded, or reduced in amount, or must otherwise be restored or returned, whether as a "voidable preference," a "fraudulent transfer," or otherwise, all as though such Reimbursement had not been made.

7. GOVERNING LAW AND FORUM

The laws of the State of Oregon govern all matters arising out of or relating to this Agreement. Any action or suit brought by the Parties relating to this Agreement must be brought and conducted solely and exclusively in the Circuit Court of Marion County for the State of Oregon in Salem, Oregon.

8. PROMISE TO MAINTAIN BUSINESS ENTITY

Guarantor agrees to make all reasonable efforts to maintain the business entity in active status until all mitigation obligations have been satisfied.

9. DEFINITIONS

"Removal-fill permit" means a permit issued by the Department under the Removal-Fill Law, ORS 196.800 et seq.
"Joint and Several Personal Guaranty" means a guaranty executed by a Principal that allows the Department to seek Reimbursement directly from a Guarantor's personal assets, and that requires Guarantor to indemnify the Department.
"Principal" means a shareholder, stockholder, limited partner, general partner, member, trustee, current beneficiary, or other principal of the Permit Applicant.
"Reimbursement" means payment to the State of Oregon for expenses incurred by the State of Oregon in implementing the mitigation required by removal-fill permit number 60697-RF (the "Permit") if and when the Permit Applicant has failed to implement such mitigation in accordance with the Permit.

Guarantor enters into this Agreement as of the date first written above.

/s/

Tony Diocee, VP Projects

404 Permit Public Notice Project Update Supplement

0	03/14/19	Issued for Use	J. Medema	J. Starkes	J. Medema	
B	03/07/19	Issued for Review	J. Medema	J. Starkes	J. Medema	
A	12/14/18	Issued for Review	J. Medema	J. Starkes	J. Medema	
REV	DATE	DESCRIPTION	BY	CHKD	APPVD	COMPANY APPROVAL

IP SECURITY	☐ Confidential	Total amount of pages including coversheet:	14
FOR CONTRACTOR DOCUMENTS	Contract No.	Contractor Document No.	Contractor Rev.
	DEA-041, SO 1030	467	2

JCL DOCUMENT NUMBER	Proj. Code	Unit / Location	Discipline	Doc. Type	Orig. Code	Sequence No.	Sheet No.
	J1	000	RGL	TNT	DEA	00011	00

Revision Modification Log

Document Title :	404 Permit Public Notice Project Update Supplement	**Rev. :**	0
Document No. :	J1-000-RGL-TNT-DEA-00011-00	**Rev. Date :**	03/14/19

Page No.	Section	Change Description
		Revised impact acreage numbers for APCO Temporary Dredge Off-Loading Facility previously stated in Rev B, based on updated calculations and conversation with Joel Shaich and Derik Vowels
		.

TECHNICAL MEMORANDUM

DATE:	March 14, 2019
ATTENTION:	Joel Shaich
COMPANY:	Jordan Cove LNG, LLC (JCLNG)
ADDRESS:	111 SW 5th Ave, Suite 1100 Portland, OR 97204
FROM:	Jason Medema, David Evans and Associates, Inc.
SUBJECT:	404 Permit Public Notice - Project Update Supplement
DEA PROJECT NAME:	Regulatory Permitting Services
DEA PROJECT NO:	JLNG0000-0003
DOCUMENT #	J1-000-RGL-TNT-DEA-00011-00
COPIES TO:	Derik Vowels, JCLNG; Sean Sullivan, DEA; Suzanne Carey, DEA

1. BACKGROUND

Jordan Cove Energy Project L.P. (JCEP) is seeking authorization from the Federal Energy Regulatory Commission (FERC) under Section 3 of the Natural Gas Act (NGA) to site, construct, and operate a natural gas liquefaction and liquefied natural gas (LNG) export facility (LNG Terminal), to be located on the bay side of the North Spit of Coos Bay, Oregon.

To support permitting for the LNG Terminal, related on-site and off-site facilities, and mitigation sites, David Evans and Associates, Inc. (DEA) prepared a Section 404/10 permit application for submittal to the U.S. Army Corps of Engineers (USACE). JCEP submitted the 404/10 Application for the LNG Terminal in combination with the Section 404/10 permit application for the pipeline to be built by Pacific Connector Gas Pipeline, LP on October 23, 2017. The public notice for the 404/10 permit was issued on May 22, 2018, and the public comment period ended on July 21, 2018. The public comment period was later extended until August 20, 2018.

Following the conclusion of the public comment period, JCEP incorporated several design changes to respond to USACE requests for mitigative measures and to otherwise address impacts on USACE jurisdictional wetlands and waters of the United States. As a result, DEA is providing a summary of the project details that have changed to aid the USACE in assessing the need for any supplement to the Section 404 public notice. These changes include the construction of a rock apron adjacent to Pile Dike 7.3, security fencing of Wetland K on the east South Dunes site, refinements to the locations of temporary dredge lines and dredge materials offloading areas; and the salvage of eelgrass from the Access Channel area prior to dredging (See Figure 1).

2. PROJECT DESIGN CHANGES AFFECTING WETLANDS AND WATERS

2.1 PILE DIKE ROCK APRON

During early coordination with the USACE Northwest Division, Portland District, Section 408 Project Development Team, the USACE asserted that additional measures were necessary to ensure that work associated with the Access Channel did not impair the usefulness of Pile Dike 7.3, which is located immediately west of the Access Channel. A rock apron has been proposed as a protective measure. The purpose of the Pile Dike Rock Apron is to arrest slope migration, or equilibration, before it can progress to a condition that could potentially impair the usefulness of Pile Dike 7.3 or be injurious to the public interest. The preliminary design involves a 50-foot-wide by 3-foot-thick by approximately 1,100-foot-long rock apron set back approximately 20 feet from the top (slope catch point) of the side slope of the Access Channel, within the proposed Access Channel footprint. The proposed design also includes an approximately 100-foot-long extension of the Slip's sheetpile bulkhead at the northwest corner of the Access Channel to minimize slope cut-back at this location. The total required rock volume for the Pile Dike Rock Apron is approximately 6,500 cubic yards (cy). The Pile Dike Rock Apron construction would result in approximately 1.52 acres of permanent impacts to shallow subtidal and intertidal habitat and the creation of an additional 0.37 acre of deep subtidal habitat relative to the original 404 application. Anticipated permanent impacts to eelgrass habitat would increase approximately 0.24 acre relative to the original 404 application; 0.19 acre of these impacts would result from the Pile Dike Rock Apron, while approximately 0.05 acre of estimated impacts would be attributable to updated eelgrass survey data. There would be no change in impacts to estuarine salt marsh (See Figures 2 and 3). The Pile Dike Rock Apron combined with the overall footprint of the Access Channel and Material Offloading Facility ("MOF") would result in the permanent loss of 16.03 acres of shallow subtidal and intertidal habitat, 0.06 acre of estuarine saltmarsh habitat, and approximately 2.14 acres of vegetated shallows (eelgrass). Approximately 17.9 acres of deep subtidal habitat would be created within the Slip and Access Channel.

The proposed Pile Dike Rock Apron would likely be placed during the same in-water work window as dredging/construction of the Access Channel side slope; however, it may occur during the following in-water work window. Construction of the rock apron following dredging of the Access Channel would allow for much or all of the apron rock to be placed from floating equipment, such as a material barge for the rock and a barge-mounted crane for placement.

If the contractor's equipment is unable to provide the reach necessary to place all rock from a floating platform, some work could occur using wide track/lower ground pressure equipment working in the intertidal zone. Land-based equipment would work in the dry or during low tide to the extent practicable. If site constraints require equipment to work in shallow water conditions, measures would be installed as needed to minimize turbidity. At the end of Pile Dike 7.3, the new rock apron will be placed directly over the visible apron rock in a careful manner, so the new rock apron will not extend towards the Access Channel beyond the end line of the existing visible rock. Construction is anticipated to take approximately one-in-water work window if all material is placed from floating equipment.

2.2 EASTERN SOUTH DUNES SITE

In order to secure the eastern boundary of the LNG Terminal property, JCEP proposes the addition of a fence and demolition of a disused building on the Eastern South Dunes site (see Figure 3). Wetland K and adjacent upland areas would be secured with an 8-foot-high chain link fence. Posts would be placed every 10 feet. Each post would be set in concrete footings approximately 1 foot by 1 foot by 3 feet deep. No new roadways adjacent to the fence would be created for construction. Maintenance access would be preserved and would include a 10-foot-wide corridor on either side of the fence (a total corridor width of 20 feet). A gate large enough for a vehicle would be installed in the fence at the far north end of the fence enclosure where the existing paved roadway and gravel road meet. A disused building, owned by JCEP, which was previously accessed by the existing gravel roadway but is not in a functional condition, will be demolished.

Aside from the construction and maintenance of the security fence and demolition of the disused building, no other work is planned in the area. The fence would be placed at the toe of the slope on the western edge of Wetland K. The eastern boundary of the fenced area would follow the estuarine limits and the existing roadway. No work is proposed in the estuarine area. Construction of the security fence would result in the permanent loss of approximately 0.1 acre of palustrine forested wetland (See Figure 4).

2.3 REFINEMENTS TO TEMPORARY DREDGE LINE AND OFF-LOADING LOCATIONS

2.3.1 APCO Temporary Dredge Off-Loading Area

Based on a review of existing land use, JCEP proposes to relocate the Temporary Dredge Off-Loading Area at the APCO Sites from an area that has a land use designation of natural aquatic (NA) to an area to the west that is designated developed aquatic (DA), thereby avoiding the area designated as NA. The revisions to the Temporary Dredge Off-Loading Area design would eliminate the previously proposed APCO Temporary Dredge Line and would require a much shorter hydraulic transfer line connecting to and following the Navigation Reliability Improvement (NRI) temporary dredge line to the APCO Sites (See Figure 4). The Temporary Dredge Off-loading Area would result in approximately 0.03 acre of temporary impacts to deep subtidal habitat. The relocation of the Temporary Dredge Off-Loading Area and the elimination of the APCO Temporary Dredge Line would result in a decrease of 0.83 acre of temporary impacts to deep subtidal habitat and would eliminate temporary impacts to approximately 0.03 acre of eelgrass.

2.3.2 Refinement of Federal Navigation Channel Dredge Line Crossing and Temporary Dredge Line Corridor

Based on more detailed execution planning that takes advantage of a naturally deep area, JCEP has refined the location of the temporary dredge line that would be placed on the bottom of and running along the outer limits of the Federal Navigation Channel (FNC) to connect the first NRI dredging location to APCO Site 2. Temporary navigation markers would be used where the dredge line temporarily crosses the FNC for NRI Dredge Areas 2 and 3. There are two viable alternatives for placement of the dredge line at these two dredge locations. One option is to use a floating line that connects the hydraulic cutter suction head dredge across the FNC and connect to the submerged pipeline on the east side of the channel at each of these two dredge areas. The line must be floated at this location, because the FNC is not deep enough to place a submerged pipeline and still maintain the required navigational underkeel clearance to the top of a submerged pipeline. The floating section of dredge line would need to be uncoupled to allow passage of deep draft vessels that are restricted to the FNC. The dredge line would be flushed prior to breaking the line to minimize the release of turbid water. The line would not be uncoupled for recreational or fishing vessels; passage of smaller, shallow draft vessels would be diverted around the section of floating line in an area with sufficient water depth that is appropriately marked and lighted.

An alternate option is to place a submerged material pipeline along the west side of the FNC to transport the dredge material from NRI Dredge Areas 2 and 3 and cross the FNC near Dredge Area 4 at approximately River Mile (RM) 6.7, where the FNC is deep enough to maintain adequate clearance to a submerged pipeline (See Figure 5). The pipeline would also be elevated at fixed locations to feed booster pumps. The booster pumps would be located on barges, which would be moored on the eastern side of the FNC using temporary piles and/or spuds, and would be used to move the dredge slurry toward APCO Sites 1 and 2 for disposal. The submerged pipeline would result in temporary impacts to approximately 0.07 acre of shallow subtidal and intertidal habitat and approximately 0.03 acre of eelgrass, representing no change in impacts to these habitat types. Temporary impacts to deep subtidal habitat would increase roughly 2.93 acres, from 9.9 acres to 12.83 acres.

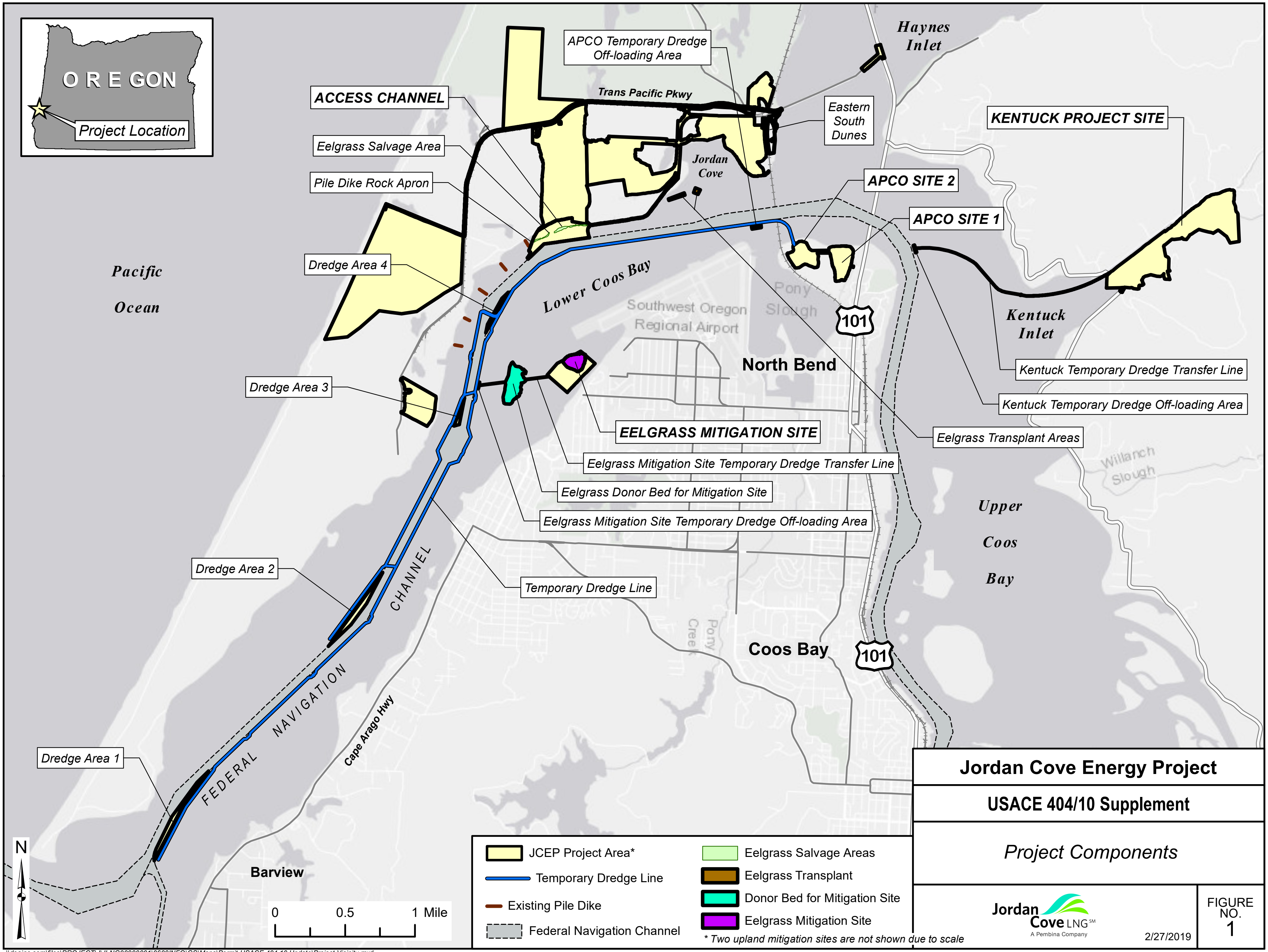
2.3.3 Relocation of Kentuck Temporary Dredge Transfer Line

In order to avoid eelgrass and cultural areas (fish weirs) the Kentuck Temporary Dredge Transfer Line would be slightly relocated from its previously proposed alignment. This change would also include a slight relocation of the Kentuck Temporary Dredge Off-Loading Area as well as the line's entry into the former golf course in order to keep the line within the area designated as DA and to avoid the mudflats in the mouth of Kentuck Inlet (See Figure 6). The relocation of the Kentuck Temporary Dredge Transfer Line would result in the addition of approximately 0.65 acre of temporary impacts to shallow subtidal and intertidal habitat. Temporary impacts to deep subtidal habitat would be reduced by approximately 0.62 acre, from 2.16 to 1.54 acres. Impacts to eelgrass would decrease slightly from 0.024 acre to 0.023 acre.

2.4 EELGRASS SALVAGE AND TRANSPLANTING

As noted above, dredging of the proposed Access Channel and construction of the Pile Dike Rock Apron would eliminate a total of approximately 2.14 acres of intertidal habitat occupied by eelgrass. JCEP proposes to mitigate this impact by creating an eelgrass mitigation site southwest of the Southwest Oregon Regional Airport. Approximately 6.78 acres of existing intertidal habitat would be prepared and graded to support a minimum of 2.71 acres of eelgrass beds. Eelgrass would be sourced from a delineated donor bed located approximately 1,500 feet southwest of the eelgrass mitigation site and transplanted to the site (See Figure 7).

In order to further avoid and minimize impacts to eelgrass, the 2.26 acres of existing eelgrass in the Access Channel would be salvaged prior to dredging and transplanted to two sites within Jordan Cove identified as suitable recipients for eelgrass transplantation. Eelgrass salvage and transplantation would take place two full seasons before the eelgrass mitigation site is planted; therefore, in addition to preventing the loss of eelgrass in the Access Channel, this action would minimize the temporal loss of eelgrass functions in Coos Bay. The salvage and transplant of eelgrass would not result in the removal of sediment or the placement of fill. Short-term, localized turbidity impacts could potentially result during eelgrass salvage; however, these impacts are expected to be minimal. Salvage would take place at roughly -3 feet MLLW, in shallow areas not characterized by swift currents. The substrate in the Access Channel area where eelgrass sods would be salvaged is characterized as medium to fine grained sands with a low fine silt content and very little substrate disturbance would take place during salvage. Settling of any sediments disturbed during salvage would begin immediately after removal. Turbidity in the waters surrounding eelgrass salvage activities would be expected to return to ambient background conditions within several hours following the completion of work. Minimal to no substrate disturbance would result from transplanting activities, because the eelgrass sods would be affixed to the substrate using marine staples. Salvage and transplanting would take one full season (3 months) and minor turbidity could result during each salvage event over that time. No turbidity impacts would occur following completion of eelgrass salvage and transplanting.



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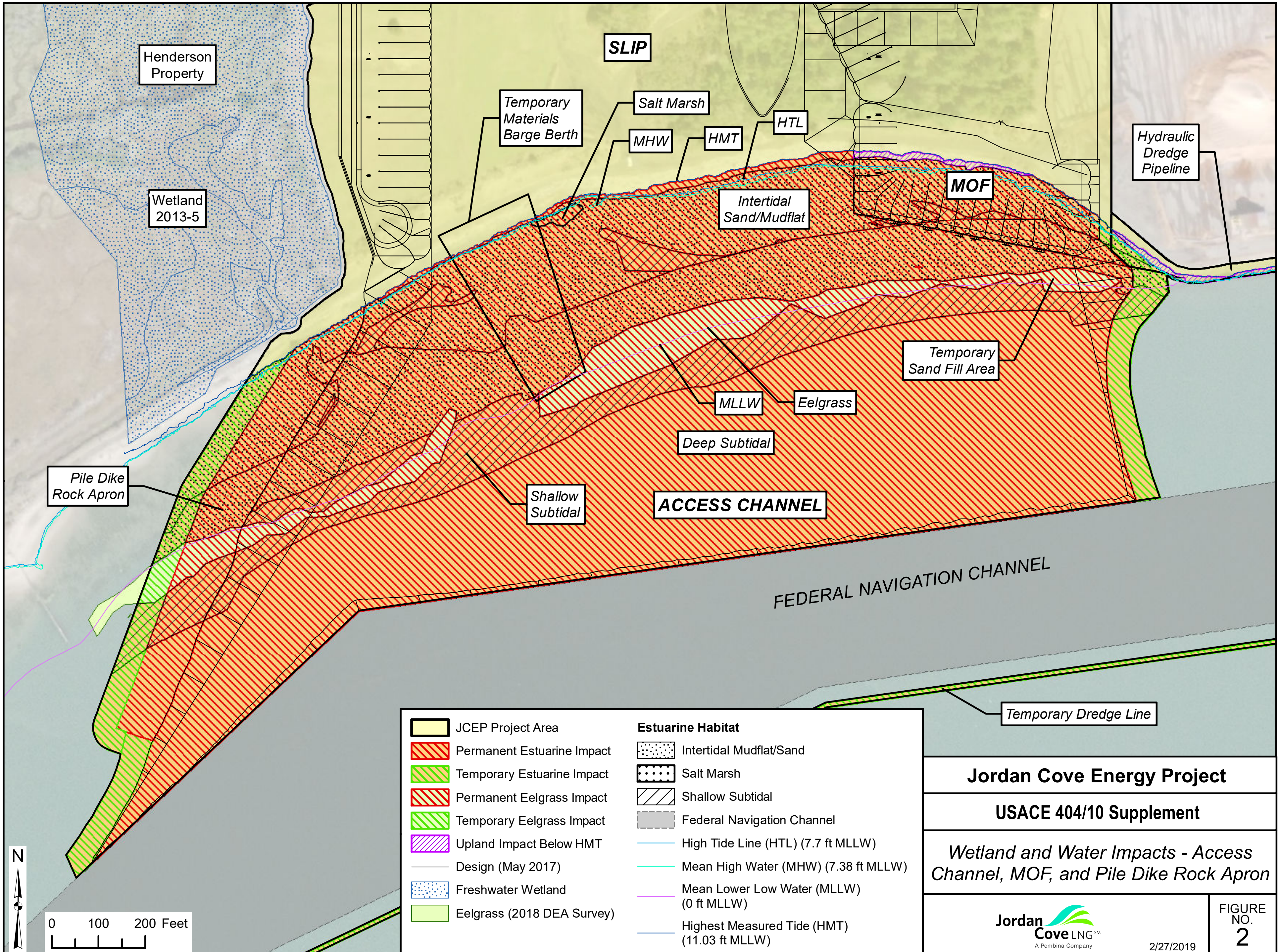

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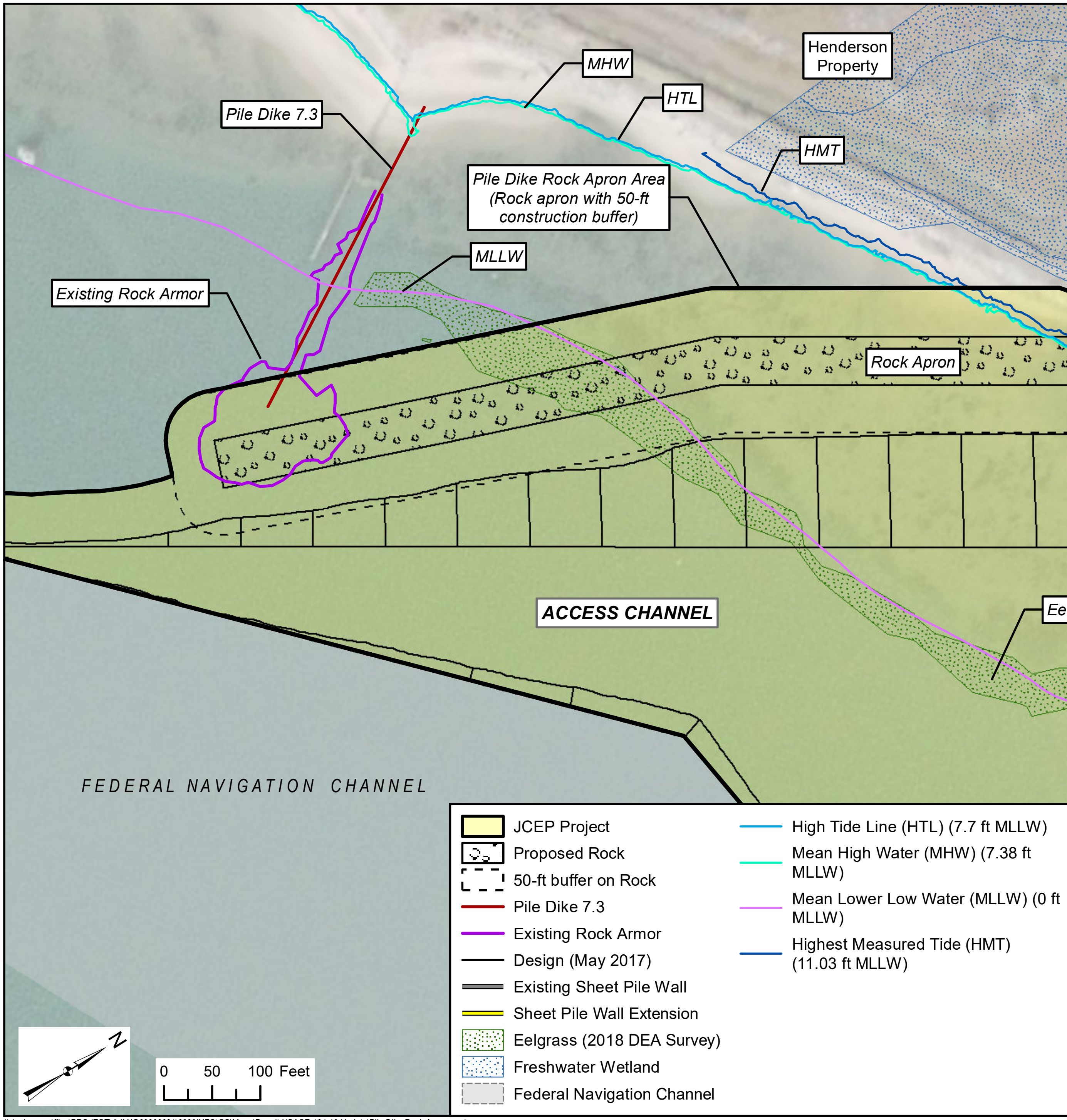

Jordan Cove Energy Project

USACE 404/10 Supplement

Pile Dike Rock Apron Area

Jordan Cove LNG℠ A Pembina Company

2/27/2019

FIGURE NO. 3

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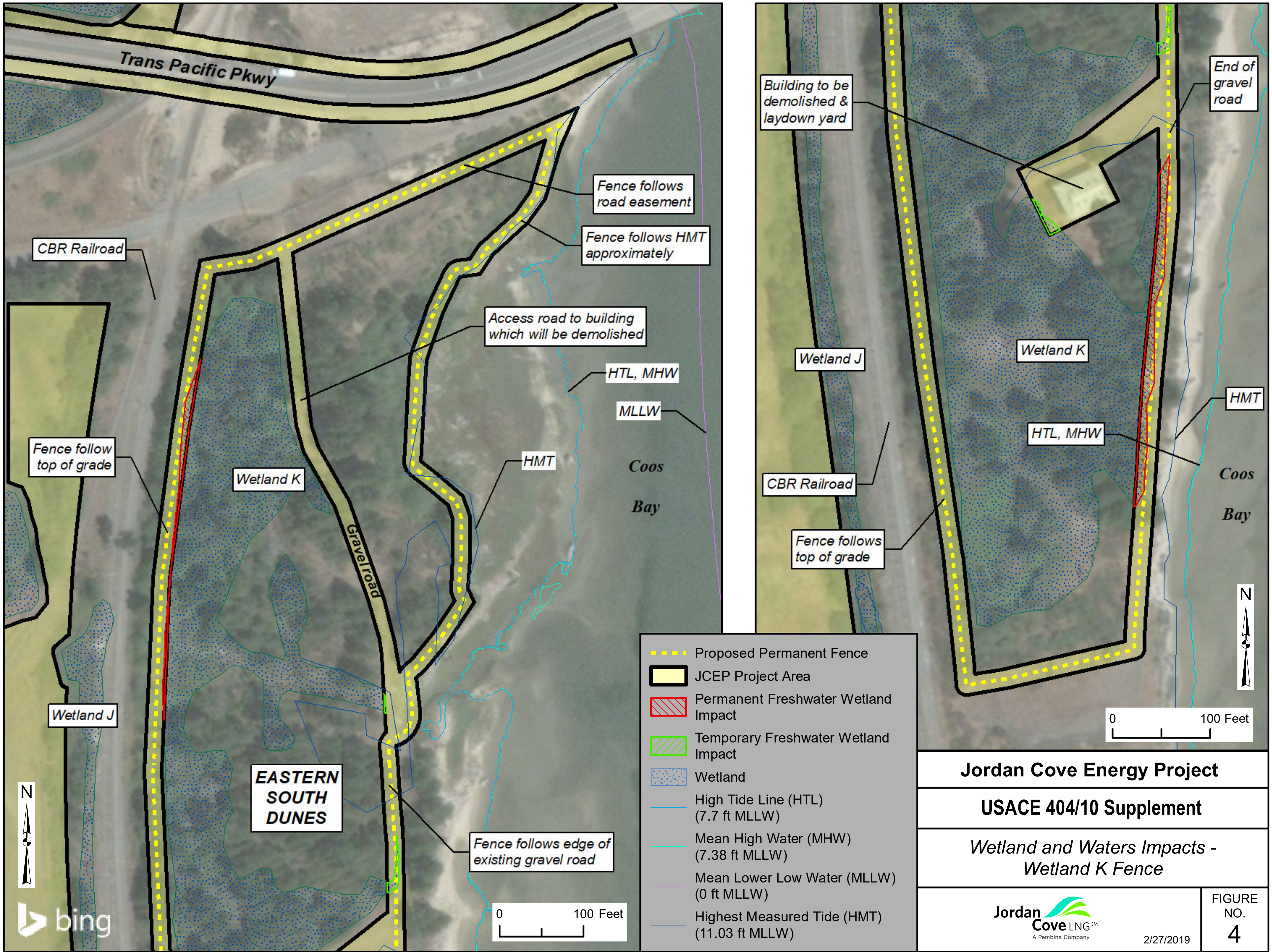

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Wetland and Waters Impacts - Wetland K Fence

Jordan Cove LNG℠
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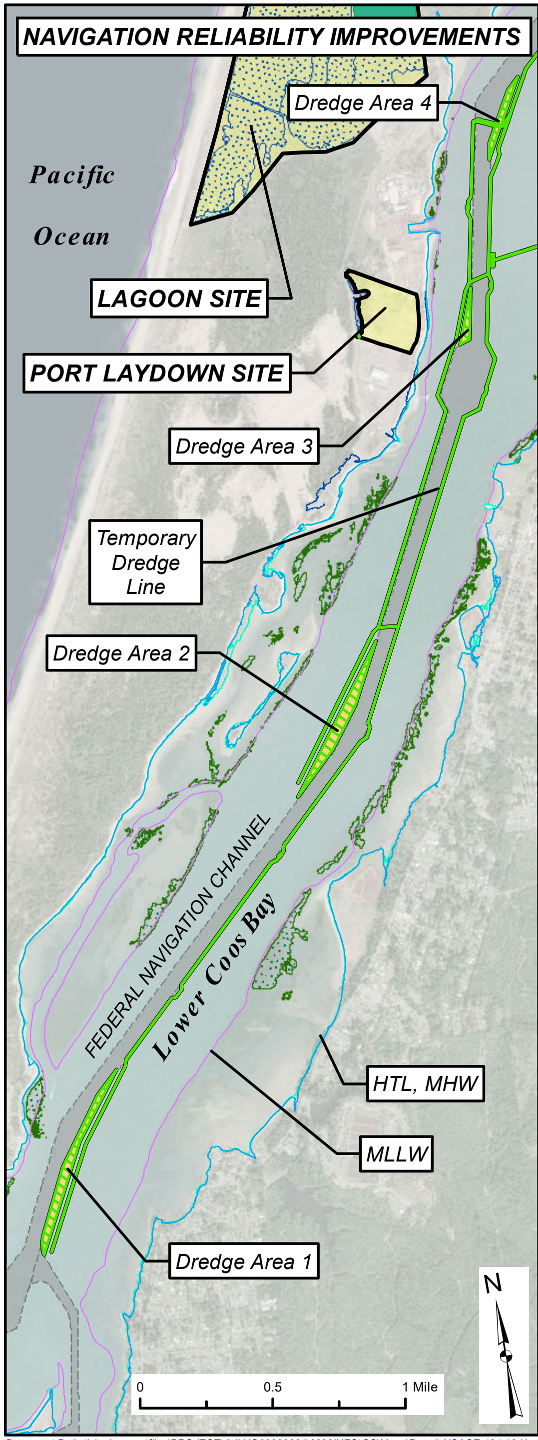
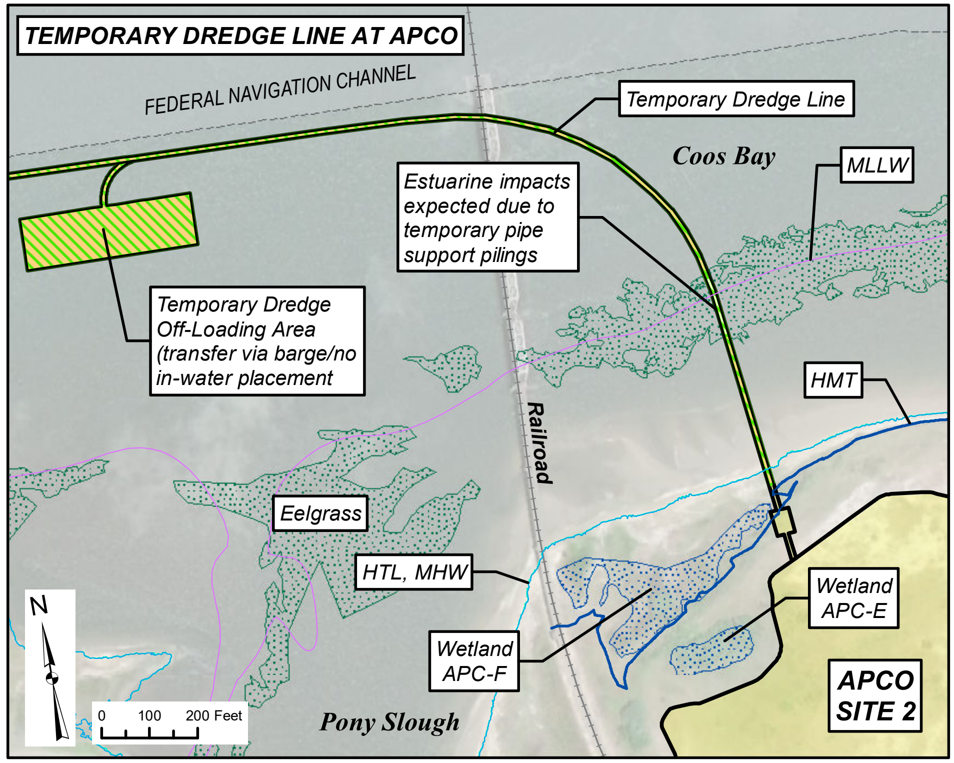
2/27/2019

FIGURE NO. 4





- JCEP Project Area
- Temporary Estuarine Impact
- Temporary Eelgrass Impact
- Eelgrass (2017 DEA Survey)
- Wetland
- Federal Navigation Channel
- High Tide Line (HTL) (7.7 ft MLLW)
- Mean High Water (MHW) (7.38 ft MLLW)
- Mean Lower Low Water (MLLW) (0 ft MLLW)
- Highest Measured Tide (HMT) (11.03 ft MLLW)

Jordan Cove Energy Project

USACE 404/10 Supplement

Wetland and Waters Impacts
NRIs & Temporary Dredge Line at APCO

Jordan Cove LNG℠ A Pembina Company

2/27/2019

FIGURE NO. 5

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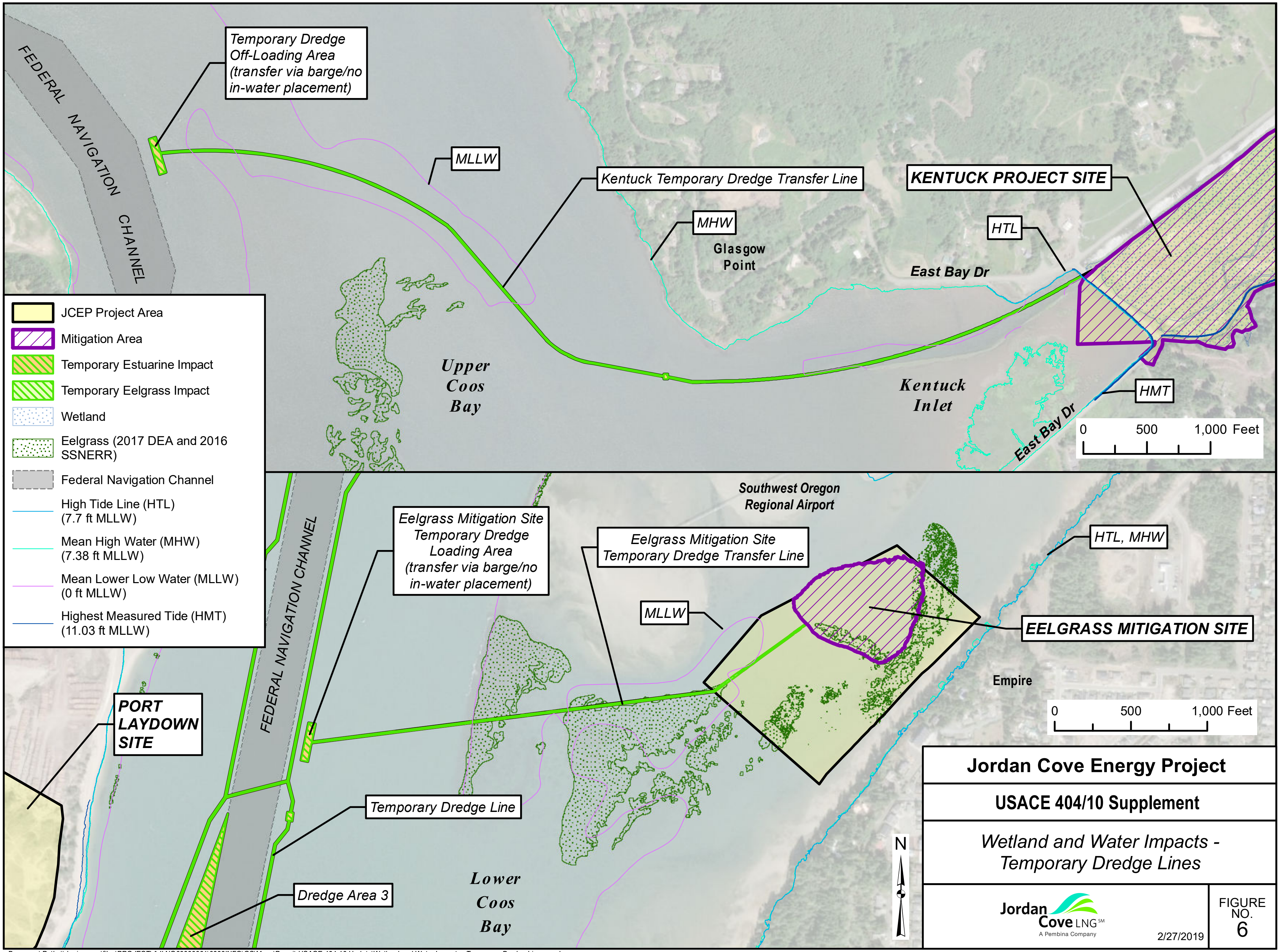

Jordan Cove Energy Project

USACE 404/10 Supplement

Wetland and Water Impacts - Temporary Dredge Lines

2/27/2019

FIGURE NO. 6

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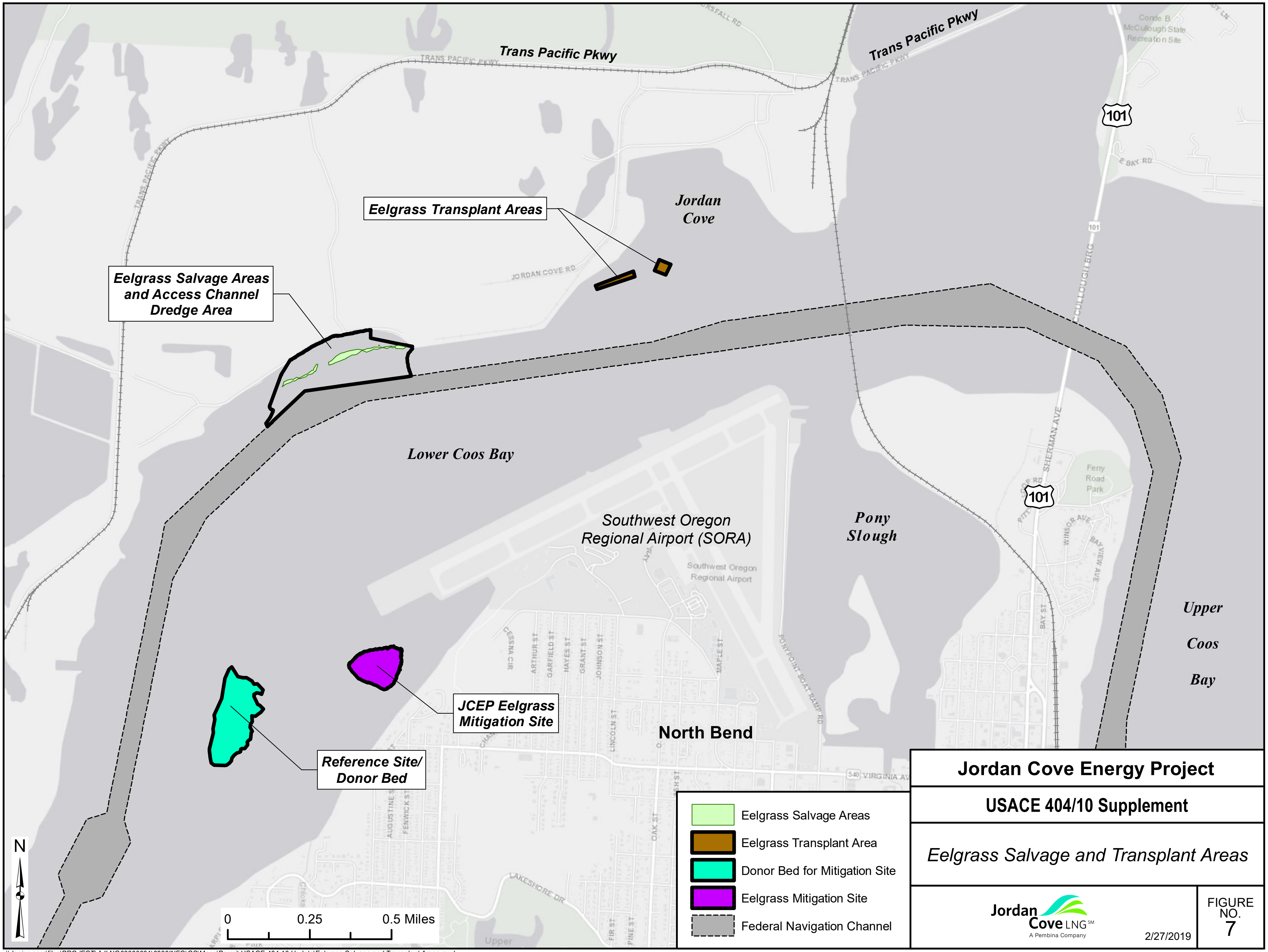

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APPLICANT-PREPARED

DRAFT

BIOLOGICAL ASSESSMENT

and

ESSENTIAL FISH HABITAT ASSESSMENT

for the

Jordan Cove Energy and Pacific Connector Gas Pipeline Project

Jordan Cove Energy Project, L.P.	Docket Nos. CP17-495-000
Pacific Connector Gas Pipeline Project, LP	CP17-494-000

Revised September 2018

Shallow Subtidal		3.637 *0.10*	*0.001*	0.074	*0.05*		0.38 *0.18*	*0.030*				
Salt Marsh		0.055	*0.003*									
Intertidal	*0.003*	9.16 *0.074*	*1.256*	1.635 *0.027*	*0.080*		1.27 *0.57*	*0.05*		*0.410*	*0.009*	0.512
Eelgrass		1.9 *0.110*	*0.023*				0.178 *0.11*	*0.03*		*0.114*	*0.023*	
Deep Subtidal		*17.564*				*26.979*	0.488 *0.632*	*12.95*	*0.911*	*0.530*	*1.543*	
Total	***0.003***	**14.755** ***21.023***	***1.283***	**1.709** ***0.027***	***0.13***	***26.979***	**2.316** ***1.484***	***13.06***	***0.911***	***1.068***	***2.184***	**0.512**
	Notes: Acreage in *italicized* font represents temporary impacts. Acreage in regular font represents permanent impacts.											

Prey species that are important for local fish species, likely including those for green sturgeon, rely on many of the same habitat conditions. Eelgrass habitat supplies a diverse habitat for fish (Murphy et al. 2000). Eelgrass is an important ecological component in Coos Bay affecting many species. For example, submerged aquatic grasses are important habitat for small prey species of adult lingcod (in Appendix B-2 of PFMC 2008). Submerged grass meadows provide cover and food for a large number of organisms including burrowing, bottom-dwelling invertebrates; diatoms and algae; herring that deposit eggs clusters on leaves; tiny crustaceans and fish that hide and feed among the blades; and, larger fish, crabs and wading birds that forage in the meadows at various tides. Eelgrass provides shelter for a variety of fish and may lower predation, allowing more opportunity for foraging. The protective structure attribute of eelgrass is primarily for smaller organisms and juvenile life history stages of fishes. Previous studies (Akins and Jefferson 1973) have reported that Coos Bay has 1,400 acres of lower intertidal and shallow subtidal flats covered by eelgrass meadows. Therefore, changes in eelgrass abundance may have food chain effects to green sturgeon.

Permanent eelgrass impacts at the access channel would affect less than 1% of the estimated total area where eelgrass was detected in lower Coos Bay. This impact would result in an unnoticeable and extremely localized, short-term loss in forage food available for green sturgeon. Located south of the impact site, the mitigation site would be created within an existing eelgrass bed to replace the narrow band of eelgrass habitat lost at the impact site. The mitigation site would take several years to develop, but it would result in a long-term benefit to eelgrass, listed fish, critical habitat, and EFH.

Benthic and epibenthic invertebrates that presently inhabit shallow intertidal and subtidal regions within the boundaries of the proposed access channel dredging area would be removed with the dredged material. Ghost shrimp and sand shrimp (adults, juveniles and larvae), amphipods, clams, Dungeness crab, and various fish species are important prey for green sturgeon.