Jordan Cove Energy Project, LP
USACE Section 404/10Permit Application
October 2014

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TAB: A. Application Forms and Supplemental Information

US Army Corps
Of Engineers (Portland District)

Jordan Cove Energy Project
Permit Application Form

DATE STAMP

AGENCIES WILL ASSIGN NUMBERS

Corps Action ID Number | Oregon Department of State Lands No

SEND ONE SIGNED COPY OF YOUR APPLICATION TO EACH AGENCY

US Army Corps of Engineers:
District Engineer
ATTN: CENWP-OD-GPPO
Box 2946
Portland, OR 97208-2946
503-808-4373

AND

DSL - West of the Cascades:
State of Oregon
Department of State Lands
775 Summer Street, Suite 100
Salem, OR 97301-1279
503-986-5200

OR

DSL - East of the Cascades:
State of Oregon
Department of State Lands
1645 NE Forbes Road, Suite 112
Bend, Oregon 97701
541-388-6112

AND

Send DSL Application Fees to:
State of Oregon
Department of State Lands
775 Summer Street, Suite 100
Salem, OR 97301-1279
(Attach a copy of the first page of the application)

(1) APPLICANT INFORMATION

Applicant Name and Address	Jordan Cove Energy Project L.P. Attn: Bob Braddock Vice President – Project Manager 125 Central Avenue, Suite 380 Coos Bay, OR 97420	Business Phone # Home Phone # Fax # Email	303-748-3746 N/A N/A bobbraddock@attglobal.net
Authorized Agent Name and Address Check one Consultant ☒ Contractor ☐	David Evans and Associates, Inc. Attn: Sean Sullivan 2100 SW River Parkway Portland, OR 97201	Business Phone # Home Phone # Fax # Email	503-223-6663 N/A N/A sps@deainc.com
Property Owner Name and Address If different from above[1]	See Property Owners in Part A, Part B and Part C	Business Phone # Home Phone # Fax # Email	

(2) PROJECT LOCATION

Street, Road or Other Descriptive Location		Legal Description (attach *tax lot map**)			
See Block 2 of Parts A, B & C		Township	Range	Section	Quarter/Quarter
		See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C
In or near (City or Town)	County	Tax Map #		Tax Lot #[2]	
See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C		See Block 2 of Parts A, B & C	
Wetland/Waterway (pick one)	River Mile (if known)	Latitude (in DD.DDDD format)		Longitude (in DD.DDDD format)	
See Block 2 of Parts A and B	See Block 2 of Parts A, B & C	See Block 2 of Parts A, B & C		See Block 2 of Parts A, B & C	
Directions to the site	See Block 2 of Parts A, B & C				

[1] If applicant is not the property owner, permission to conduct the work must be attached.
[2] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(3) PROPOSED PROJECT INFORMATION

Type: Fill ☒ Excavation (removal) ☒ In-Water Structure ☐ Maintain/Repair an Existing Structure ☐

Brief Description: See Block 3 of Parts A, B and C

Fill

Riprap ☐ Rock ☐ Gravel ☐ Organics ☐ Sand ☐ Silt ☐ Clay ☐ Other: ☐

Wetlands See Block 3 in Parts A, B & C	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	--
	--	--							
	Impact Area in Acres	Dimensions (feet)							
	--	L'	--	W'	--	H'	--		
Waters below OHW See Block 3 in Parts A, B & C	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	--
	--	--							
	Impact Area in Acres	Dimensions (feet)							
	--	L'	--	W'	--	H'	--		

Removal

Wetlands See Block 3 in Parts A, B & C	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	--
	--	--							
	Impact Area in Acres	Dimensions (feet)							
	--	L'	--	W'	--	H'	--		
Waters below OHW See Block 3 in Parts A, B & C	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	--
	--	--							
	Impact Area in Acres	Dimensions (feet)							
	--	L'	--	W'	--	H'	--		

Total acres of construction related ground disturbance (If 1 acre or more a 1200-C permit may be required from DEQ) See Parts A, B & C

Is the disposal area upland? Yes ☐ No ☐ Impervious surface created? <1 acre ☐ >1 acre? ☒

See Block 3 in Parts A, B & C

	Yes	No
Are you aware of any state or federally listed species on the project site?	X	
Are you aware of any Cultural/Historic Resources on the project site?	X	
Is the project site within a national Wild & Scenic River?		X
*Is the project site within a State Scenic State Scenic Waterway?**		X

If yes, please explain in the project description (in block 4)

(4) PROPOSED PROJECT PURPOSE AND DESCRIPTION

Purpose and Need:

*Provide a description of the public, social, economic, or environmental benefits of the project along with any supporting formal actions of a public body (e.g. city or county government), as appropriate.**

See Block 4 of Parts A, B and C

Project Description:

Please describe in detail the proposed removal and fill activities, including the following information:

- Volumes and acreages of all fill and removal activities in waterway or wetland separately
- Permanent and temporary impacts
- Types of materials (e.g., gravel, silt, clay, etc.)
- How the project will be accomplished (i.e., describe construction methods, equipment, site access)
- *Describe any changes that the project may make to the hydraulic and hydrologic characteristics (e.g., general direction of stream and surface water flow, estimated winter and summer flow volumes.) of the waters of the state, and an explanation of measures taken to avoid or minimize any adverse effects of those changes.*
- Is any of the work already complete? Yes ☐ No ☐ If yes, please describe the completed work.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Project Drawings

State the number of project drawing sheets included with this application: See Block 4 in Parts A and B

A complete application must include a location map, site plan, cross-section drawings and recent aerial photo as follows and as applicable to the project:

- **Location map** (must be legible with street names)
  - Site plan including;
  - Entire project site and activity areas
  - Existing and proposed contours
  - Location of ordinary high water, wetland boundaries or other jurisdictional boundaries
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Map scale or dimensions and north arrow
  - Location of staging areas
  - Location of construction access
  - Location of cross section(s), as applicable
  - Location of mitigation area, if applicable
- **Cross section drawing**(s) including;
  - Existing and proposed elevations
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Ordinary high water and/or wetland boundary or other jurisdictional boundaries
  - Map scale or dimensions
- **Recent Aerial photo** (1:200, or if not available for your site, the highest resolution available)

Will any construction debris, runoff, etc., enter a wetland or waterway? Yes ☐ No ☐

If yes, describe the type of discharge and show the discharge location on the site plan.

See Block 4 of Parts A, B and C

Estimated project start date:	See Block 4 of Parts A, B and C	Estimated project completion date:	See Block 4 of Parts A, B and C

(5) PROJECT IMPACTS AND ALTERNATIVES

Alternatives Analysis:

Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland. (Include alternative design(s) with less impact and reasons why the alternative(s) were not chosen. Reference OAR 141-085-0565 (1) through (6) for more information).*

See Block 5 of Parts A, B and C

Measures to Minimize Impacts

Describe what measures you will use (before and after construction) to minimize impacts to the waterway or wetland. These may include but are not limited to the following:

- *For projects with ground disturbance include an erosion control plan or description of other best management practices (BMP's) as appropriate. (For more information on erosion control practices see DEQ's Oregon Sediment and Erosion Control Manual)*
- *For work in waterways where fish or flowing water are likely to be present, discuss how the work area will be isolated from the flowing water.*
- *If native migratory fish are present (or were historically present) and you are installing, replacing or abandoning a culvert or other potential obstruction to fish passage, complete and attach a statement of how the Fish Passage Requirements, set by the Oregon Department of Fish and Wildlife will be met.*

See Block 5 of Parts A, B and C

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Description of resources in project area

Ocean ☐ Estuary ☐ River ☐ Lake ☐ Stream ☐ Freshwater Wetland ☐

Describe the existing **physical and biological characteristics** of the wetland/waterway site by area and type of resource (Use separate sheets and photos, if necessary).

For wetlands, include, as applicable:

- *Cowardin and Hydrogeomorphic(HGM) wetland class(s)**
- *Dominant plant species by layer (herb, shrub, tree)**
- Whether the wetland is freshwater or tidal
- *Assessment of the functional attributes of the wetland to be impacted**
- Identify any vernal pools, bogs, fens, mature forested wetland, seasonal mudflats, or native wet prairies in or near the project area.)

For waterways, include a description of, as applicable:

- *Channel and bank conditions**
- *Type and condition of riparian vegetation**
- *Channel morphology (i.e., structure and shape)**
- *Stream substrate**
- Fish and wildlife (type, abundance, period of use, significance of site)
- *General hydrological conditions (e.g. stream flow, seasonal fluctuations)**

See Block 5 of Parts A, B and C

*Describe the existing **navigation, fishing and recreational** use of the waterway or wetland.**

See Block 5 of Parts A, B and C

Site Restoration/Rehabilitation

- *For temporary disturbance of soils and/or vegetation in waterways, wetlands or riparian areas, please discuss how you will restore the site after construction including any monitoring, if necessary**

See Block 5 of Parts A, B and C

Mitigation

*Describe the reasonably expected adverse effects of the development of this project and how the effects will be mitigated.**

- *For permanent impact to wetlands, complete and attach a Compensatory Wetland Mitigation (CWM) Plan. (See OAR 141-085-0705 for plan requirements)**
- *For permanent impact to waters other than wetlands, complete and attach a Compensatory Non-Wetland Mitigation (CNWM) plan (See OAR 141-085-0765 for plan requirements)**
- *For permanent impact to estuarine wetlands, you must submit a CWM plan.**

See Block 5 of Parts A, B and C

Mitigation Location Information (Fill out only when mitigation is proposed or required)

Proposed mitigation (Check all that apply):

- ☐ *Onsite Mitigation*
- ☐ *Offsite Mitigation*
- ☐ *Mitigation Bank*
- ☐ *Payment to Provide*

Type of mitigation:

- ☐ *Wetland Mitigation*
- ☐ *Mitigation for impacts to other waters*
- ☐ *Mitigation for impacts to navigation, fishing, or recreation*

Street, Road or Other Descriptive Location	*Legal Description (attach tax lot map*)*			
See Block 5 of Parts A, B and C	*Quarter/Quarter*	*Section*	*Township*	*Range*

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

In or near (City or Town)	*County*	*Tax Map #*	*Tax Lot #*[3]
Wetland/Waterway (pick one)	*River Mile (if known)*	*Latitude (in DD.DDDD format)*	*Longitude (in DD.DDDD format)*
Name of waterway/watershed/HUC		*Name of mitigation bank (if applicable)*	

(6) ADDITIONAL INFORMATION

Adjacent to R-F Site and Physical Mitigation Site Property Owners and Their Address *(if more than 5, attach printed labels*)*

See Block 6 of Parts A, B and C

Has the proposed activity or any related activity received the attention of the Corps of Engineers or the Department of State Lands in the past, e.g., wetland delineation, violation, permit, lease request, etc.?

Yes ☐ No ☐

If yes, what identification number(s) were assigned by the respective agencies:

Corps #	See Block 6 of Parts A, B and C	State of Oregon #	See Block 6 of Parts A, B and C

Has a wetland delineation been completed for this site? *Yes* ☐ *No* ☐

*If yes by whom?**	See Block 6 of Parts A, B and C

Has the wetland delineation been approved by DSL or the COE? *Yes* ☐ *No* ☐

*If yes, attach a concurrence letter. **

See Block 6 of Parts A, B and C

[3] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date

Comments:

See Block 7 of Parts A, B and C

(8) *COASTAL ZONE CERTIFICATION **

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Applicant Signature	Date
See Block 8 of Parts A, B and C	See Block 8 of Parts A, B and C

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(9) SIGNATURES FOR JOINT APPLICATION

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or Dept. of State Lands staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. *I understand that payment of the required state processing fee does not guarantee permit issuance. The fee for the state application must accompany the application for completeness.*

Amount enclosed	*N/A*

Print /Type Name	Title	Print /Type Name	Title
Robert L. Braddock	V.P., Project Manager	Sean P. Sullivan	Project Manager
Applicant Signature	Date	**Authorized Agent Signature**	Date
Robert L Braddock	October 16, 2014	SPSullivan	October 16, 2014

Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for authorization to conduct removal/fill activities on such lands. This signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied.*

Print /Type Name	Title	Print /Type Name	Title
Property Owner Signature	Date	***Mitigation Property Owner Signature***	Date
See Block 9 of Parts A, B and C		See Block 9 of Parts A, B and C	

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

JORDAN COVE ENERGY PROJECT

SECTION 404/10 APPLICATION

March 28, 2014

Revised

October 16, 2014

Part A: Jordan Cove LNG Terminal Supplemental Information

Part A: JORDAN COVE LNG TERMINAL PROJECT
Supplemental Information

This document contains information that supplements the JPA Form for the Jordan Cove Energy Project, and is specific to the Jordan Cove LNG Terminal component of the Jordan Cove Energy Project, which also includes the Pacific Connector Gas Pipeline Project and the Slip and Access Channel Project. The information contained herein generally follows the format of the JPA Form so as to be organized and presented in a way that is familiar to the agencies.

(1) Applicant information

Applicant Name and Address	The Applicant's information is in the JPA Form.	Business Phone # Home Phone # Fax # Email	
Authorized Agent Name and Address Check one Consultant ☐ Contractor ☐	The Authorized Agent's information is in the JPA Form.	Business Phone # Home Phone # Fax # Email	
Property Owner Name and Address If different from above[1]	Below MLLW, site is owned by DSL 775 Summer Street NE Salem, OR 97301	Business Phone # Home Phone # Fax # Email	503.378.3805 NA 503.378.4844 NA
Property Owner Name and Address If different from above	APCO Coos Property LLC Joseph McKeown	Business Phone # Home Phone # Fax # Email	 alpeirce@frontier.com

(2) Project Location

Street, Road or Other Descriptive Location		Legal Description (attach *tax lot map**)			
South of Trans Pacific Parkway; West of Jordan Cove Road. See Figure i-1 Project Vicinity.		Township	Range	Section	Quarter/Quarter
		25S	13W	various	various
In or near (City or Town)	County	Tax Map #		Tax Lot #[2]	
North Bend	Coos	See Figures i-2.7, i-2.8		See Figures i-2.7, i-2.8	
Wetland/Waterway (pick one)	River Mile (if known)	Latitude (in DD.DDDD format)		Longitude (in DD.DDDD format)	
Coos Bay	7.3	43.425346 (approximate)		124.16767 (approximate)	
Directions to the site	Highway 101 north of Coos Bay, then Southwest on Trans Pacific Parkway.				

[1] If applicant is not the property owner, permission to conduct the work must be attached.
[2] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(3) Proposed Project Information

Type: Fill ☒ Excavation (removal) ☒ In-Water Structure ☒ Maintain/Repair an Existing Structure ☐

Brief Description: Construct new Slip and Access Channel and LNG Export Terminal and appurtenant facilities (Liquefaction Site, Utility Corridor/Access Road, South Dunes Power Plant, SORSC, Trans Pacific Parkway Improvements, and Workforce Housing)

Fill

Riprap ☒ Rock ☐ Gravel ☒ Organics ☐ Sand ☒ Silt ☒ Clay ☐ Other: ☒ Concrete, Pile

Wetlands (Estuarine and Freshwater)	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	~5.65 million CY
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		

Removal

Wetlands (Estuarine and Freshwater)	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	~100,000
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		

Total acres of construction related ground disturbance (If 1 acre or more a 1200-C permit may be required from DEQ) More than 5 acres

Is the disposal area upland? Yes ☒ No ☐ Impervious surface created? 0<1 acre ☐ 0>1 acre? ☒

	Yes	No
Small portions of the disposal site area are freshwater wetland and their fill is subject to this permit.		
Are you aware of any state or federally listed species on the project site?	X	
Are you aware of any Cultural/Historic Resources on the project site?	X	
Is the project site within a national Wild & Scenic River?		X
*Is the project site within a State Scenic State Scenic Waterway?**		X

If yes, please explain in the project description (in block 4)

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(4) Proposed Project Purpose and Description

Purpose and Need:

*Provide a description of the public, social, economic, or environmental benefits of the project along with any supporting formal actions of a public body (e.g. city or county government), as appropriate.**

Please refer to Federal Energy Regulatory Commission [FERC] Resource Report 1 – General Project Description.

Project Description:

Please describe in detail the proposed removal and fill activities, including the following information:

- Volumes and acreages of all fill and removal activities in waterway or wetland separately
- Permanent and temporary impacts
- Types of materials (e.g., gravel, silt, clay, etc.)
- How the project will be accomplished (i.e., describe construction methods, equipment, site access)
- *Describe any changes that the project may make to the hydraulic and hydrologic characteristics (e.g., general direction of stream and surface water flow, estimated winter and summer flow volumes) of the waters of the state, and an explanation of measures taken to avoid or minimize any adverse effects of those changes.*
- Is any of the work already complete? Yes ☐ No ☒ If yes, please describe the completed work.

In addition, for fish habitat or wetland restoration or enhancement activities, complete the information requested in supplemental Fish Habitat or Wetland Restoration and Enhancement form.

Project Drawings

State the number of project drawing sheets included with this application: Approximately 70 project figures and design sheets are included. Drawings are also provided in the October 2014 Compensatory Wetland Mitigation Plan.

A complete application must include a location map, site plan, cross-section drawings and recent aerial photo as follows and as applicable to the project:

- **Location map** (must be legible with street names)
  - Site plan including;
  - Entire project site and activity areas
  - Existing and proposed contours
  - Location of ordinary high water, wetland boundaries or other jurisdictional boundaries
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Map scale or dimensions and north arrow
  - Location of staging areas
  - Location of construction access
  - Location of cross section(s), as applicable
  - Location of mitigation area, if applicable
- **Cross section drawing**(s) including;
  - Existing and proposed elevations
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Ordinary high water and/or wetland boundary or other jurisdictional boundaries
  - Map scale or dimensions
- **Recent Aerial photo** (1:200, or if not available for your site, the highest resolution available)

Will any construction debris, runoff, etc., enter a wetland or waterway? Yes ☒ No ☐

If yes, describe the type of discharge and show the discharge location on the site plan.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

1. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP L.P.) is requesting authorization to site, construct, and operate a natural gas liquefaction and LNG terminal and associated facilities ("Jordan Cove LNG Terminal Project" or "LNG Terminal", subsequently referred to as the Project) on the bay side of the North Spit of Coos Bay, Oregon (see Figure i-1, Project Vicinity).

Natural gas will be delivered to the Project site (via the gas pipeline, which will connect the Project with existing Pacific Gas and Electric Company [PG&E] intrastate pipeline and interstate natural gas pipeline systems), where it will be conditioned, cooled into a liquid, stored in two full-containment 160,000 m^3 LNG storage tanks, and loaded on to LNG carriers for export at newly constructed marine facilities.

Such marine facilities include an access channel and a slip that are described herein, and will ultimately be operated and maintained by the Oregon International Port of Coos Bay (Port). The Slip and Access Channel Project will connect the existing Coos Bay Navigation Channel and the Project site at approximately Coos Bay Navigation Channel Mile 7.3. Proposed maintenance dredging of the Slip and Access Channel is expected to occur every two to four years. It is anticipated that approximately 90 ships per year will be required to transport the LNG from the Project site, based on the estimated size of the LNG carriers expected to call upon the LNG terminal. Figure i-2, Study Area and Delineated Wetlands, shows the study area and all wetlands and waters delineated within the Project vicinity. The Project footprint is defined as the area that will be both temporarily and permanently impacted by the Project and the Slip and Access Channel Project.

Impacts resulting from the Project and the Slip and Access Channel Project have been minimized to the greatest extent practicable, as discussed in the Federal Energy Regulatory Commission (FERC) Resource Reports. As such, the information contained in this permit application does not repeat the extensive analyses and the rationale behind the layout of the facilities that will be placed on top of the fill within the Project area. Along these lines, wetland impacts are discussed in regards to the removal-fill activities that will occur and that will result in impacts, not in regards to the placement of the building or facility that will be constructed after placement of fill material. Please refer to the FERC Resource Reports, particularly Resource Report 10 – Alternatives. for additional information on how the Project design was evaluated and selected as proposed. All figures and design sheets are included as Appendix A of this application. An updated set of Figures has been provided in October 2014. An Impacts Bulk Upload Template, also provided to the USACE in October 2014 provides a table of aquatic resource impacts in a USACE-requested format. Appendix C provides detailed information on the proposed construction schedule.

1.1. Project Location (Figure i-1)

The location of the Project has been selected to comply with rules and codes regarding public safety, design contingency, and access in the event of an emergency situation. All facilities and components will be constructed in accordance with governing regulations, including 33 Code of Federal Regulations (CFR) Part 127 for the marine facilities, the U.S. Department of Transportation (DOT) Federal Safety Standards for Liquefied Natural Gas Facilities, both 49 CFR Part 193 and National Fire Protection Association (NFPA) Standard 59A for LNG facilities, and the codes and standards referenced therein. Furthermore, nearly all permanent Project facilities will be located on industrial land within unincorporated Coos County, owned by Fort Chicago LNG II U.S. L.P., an affiliate of JCEP L.P. (see Figure i-1, Project Vicinity).

1.2. Project Description

The LNG Terminal and Slip and Access Channel Projects are made up of the following components:

(1) **Slip and Access Channel** – where LNG vessels will enter the slip via the access channel, get loaded with LNG, and leave for export.

(2) **Barge Berth** – where fill will be placed to construct a barge berth and dredging will occur to access the barge berth.

(3) **LNG Liquefaction and Terminal Site** – where natural gas will be liquefied and stored in large containment storage tanks for future loading onto LNG vessels for export;

(4) **Utility Corridor/Access Road** – which will provide an interconnecting corridor (during facility construction [referred to as the excavated material haul road] and operation) between the LNG Liquefaction and Terminal Site and the South Dunes Power Plant Site for gas pipelines and transmission lines as well as transporting equipment and maintenance staff, etc.;

(5) **Southwest Oregon Regional Safety Center (SORSC)** – which will provide emergency response services for the facility and the southern Oregon region;

(6) **South Dunes Power Plant Site (SDPP) –** which will contain a 420 megawatt (MW) power plant and related facilities to provide the energy required to cool and thereby liquefy the natural gas.

(7) **Industrial Wastewater Line and Water Line Relocation –** an industrial wastewater line and water line, which will need to be relocated for Project construction;

(8) **Trans Pacific Parkway and Highway 101 Intersection Improvements –** where Trans Pacific Parkway will be widened at three locations to provide safe ingress/egress for construction traffic and will be symmetrically widened at the Highway 101 intersection to create a left-turn lane from TPP onto northbound 101**;**

(9) **North Point Workforce Housing Project (NPWHP)** – which will consist of temporary housing and amenities for approximately 2,000 workers during project construction; and

(10) **Temporary Facilities Laydown Area** – where construction staging and temporary laydown of equipment will occur during construction of the Project.

Each of these Project components is shown in Appendix A, Figures, and described in further detail below. Figure i-2 shows the study area boundary and all delineated wetlands. The Impacts Bulk Upload Template, provides a summary of all of the freshwater wetland and estuarine impacts resulting from the Project. JCEP L.P. has evaluated multiple design features that are intended to avoid and minimize impacts to wetlands and waters. These avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts, and in the 404(b)(1) guidelines document provided to the U.S. Army Corps of Engineers (USACE).

1.3. Project Construction Schedule

Construction activities for the Project are expected to begin at the end of the third quarter of 2015. Construction of the LNG terminal and the slip is expected to take approximately 42 months, as shown on the general schedule for the major project construction activities (see Appendix C, Figure 1). As shown in the schedule, the dredging required to remove the barrier berm and create the access channel will occur during the Oregon Department of Fish and Wildlife (ODFW) designated in-water work window (which is October 1 through February 15). Figure i-3 shows temporary facilities, staging, and laydown areas that are thought to be necessary for construction of the Project at the time of submittal.

1.4. Endangered Species Act (ESA) Compliance

Informal coordination with Chris Claire at ODFW and Chuck Wheeler at the National Marine Fisheries Service (NMFS) regarding proposed in-water work has continue through the fall of 2013. Additionally, a Biological Assessment (BA) is being prepared to address USACE's and Oregon Department of State Lands' (DSL's) requests for additional information regarding the effects of the Project on sensitive fish and invertebrate species and their habitats within the Project action area. Also included in the BA is an assessment of the Project's effects on Essential Fish Habitat as required under the Magnuson-Stevens Act (MSA). Refer to the BA for more details regarding construction methods and species impacts. More formal consultation with NMFS is expected to occur during the permitting process. It is anticipated that a Biological Opinion (BO) for the Project and the Slip and Access Channel Project will be issued in spring or summer of 2015.

To minimize impacts on fisheries, to reduce the total period of estuary turbidity, and to extend the time available for construction, dredging for access to the Barge Berth will be done in two separate phases, mirroring the construction approach for the Port's Slip and Access Channel. The first phase (called the upland phase) will include only upland excavation and construction not subject to regulation under Section 10/404 or the Oregon Removal-Fill Statute, because the work will not be in a jurisdictional wetland, water of the United States, or water of the State. The second phase (called the in-water phase) will be performed in waters of the United States and waters of the State and is subject to the requirements of Section 10/404 and the Removal-Fill Statute, including limiting in-water activities to the approved in-water work window. This phasing is intended to allow year-round work on Phase 1 while minimizing impacts to the waters of Coos Bay by complying with the in-water work window for in-water construction activities.

Phase 2 will be constructed between October 1 and February 15 (consistent with the ODFW in-water work guidelines), when fisheries considerations allow in-water work.

In-water work associated with the barge berth and access, fill placement on the west side of the Mill Site/South Dunes Site (also referred to as the South Dunes Site) within the estuary, Trans Pacific Parkway improvements, and the NPWHP bridge will be conducted during the approved in-water work window.

1.5. Cultural Resources

Shallow subsurface probing and pedestrian surveys for archaeological/cultural resources have been conducted throughout nearly the entire Project footprint (see Figure i-4). In areas where deeper excavation may be required (e.g., construction of the slip, installation of power poles for transmission lines or installation of bridge bents), additional, deeper archaeological probing and testing is now underway or is planned in the future. Preliminary coordination with the State Historic Preservation Office (SHPO) and the tribes (Coquille Indian Tribe, Confederated Tribes of Siletz Indians, and Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians) has been initiated. This information has been provided to USACE for the purpose of Section 404/10 permitting. Extensive cultural resources documentation is located in FERC Resource Report 4 and can be made available upon request.

1.6. Impervious Area and Hydraulic Characteristics

Impervious surfaces of the Project site are described in FERC Resource Report 2. The LNG facility will be designed to provide drainage of surface water to designated areas for disposal in accordance with 49 CFR § 193.2159. Proper drainage and disposal of stormwater will be accomplished by a system of ditches, swales, and collection sumps (where needed).

Stormwater collected in areas with no potential for contamination will be allowed to flow to or be pumped directly to a system of stormwater ditches and swales and ultimately drain to the slip. Because water in the slip will mix with the rest of Coos Bay, which is subject to tidal fluctuations, no changes to Coos Bay hydraulic characteristics are anticipated.

Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped to or will flow to the oily water collection sumps. Stormwater collected from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline. See Section 1.7 for additional details.

1.7. Stormwater Treatment

The stormwater facilities will be designed to provide drainage of surface water to designated areas for disposal in accordance with 49 CFR § 193.2159. Proper drainage and disposal of stormwater will be accomplished by a system of ditches and swales. Stormwater collected in areas that have no potential for contamination (such as roof runoff) will be allowed to flow to or be pumped directly to a system of stormwater ditches, which will provide some level of treatment and ultimately drain to the slip. Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped to or allowed to flow to the oily water collection sumps. Stormwater collected from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline.

Stormwater treatment will be provided for each bridge and new or modified roadway. Stormwater will not be allowed to flow directly into wetlands or jurisdictional waters. Stormwater discharge will be treated, and in some cases detained, prior to discharge into waters of the State or the United States. Detailed stormwater treatment plans will be prepared with the 60-percent design plans. Stormwater treatment will utilize a variety of common Best Management Practices (BMPs) for treatment. These may include any one or a combination of the following: infiltration, stormwater detention ponds, biofiltration swales, filter strips, bioslopes, detention vaults, and detention tanks. Additionally, treatment BMPs shall utilize compost-amended soils as necessary to remove metal pollutants, such as copper. To the extent possible, infiltration will be the preferred treatment option. Maximizing infiltration will reduce the Project's overall footprint. Where lower infiltration rates are found, or where sandy soils may allow direct subsurface flow to jurisdictional waters or wetlands, the stormwater management plan will employ the other treatment BMPs listed above.

1.8. Hydrologic Changes

Extensive studies have been completed for the dredging of the slip and access channel and as it relates to hydrologic, hydraulic and sediment-related changes. The modeling results, provided by Coast and Harbor Engineering, demonstrated that the potential effects of slip construction (including the dredging of the access channel) would be localized to the area of the activity. This information has been documented and is available in Resource Report 2. Sedimentation and maintenance requirements have also been addressed and are predicted to be minimal, as documented in Resource Report 1, Appendix E.1). An analysis of turbidity during construction concluded that turbidity generation resulting from construction and maintenance dredging will likely not be significant (See Tab H of the June 2013 Slip and Access Channel Project 404 Application – Report on Turbidity Due to Dredging).

Hydrologic analysis indicates that the slip will have current velocities on the order of 0.1 to 0.2 meters per second (m/s) (see Sediment Sampling and Analysis Report in FERC Resource Report 2, Appendix B.2). Because the slip will be essentially perpendicular to the navigation channel and there will be low velocities within the slip, excavation for the slip is not anticipated to affect overall hydrologic function within the bay or overall sediment accumulation and deposition patterns. There may be some deposition of sandy silt material from upstream areas, but as calculated in the hydrologic study, quantities are expected to be relatively small—about 88,000 to 175,000 cubic yards (CY) per year—and will be removed by maintenance dredging every two to four years. Moreover, the bathymetry near the proposed LNG Liquefaction and Terminal Site, where LNG loading onto vessels will occur, and at adjoining locations is relatively stable, as demonstrated by recent hydrosurveys.

Based on evaluation of all of the different estimates, the design sedimentation rates for the slip and the access channel dredging are 0.16 feet per year and 0.56 feet per year, respectively. This translates to approximately 8,500 CY per year and 29,200 CY per year, respectively.

Sedimentation and maintenance dredging requirements would likely be reduced at the access channel area over time due to natural stabilization and adjustment processes. Predicted volumes for maintenance dredging in the access channel are 26,100 CY per year after 10 years, 21,900 CY per year after 25 years, and 14,800 CY per year after 50 years. A copy of the Coast and Harbor Engineering (C&H) Report, which includes this analysis, is provided as Appendix E.1 in FERC Resource Report 1.

1.9. Tsunami Protection Measures

The impacts and hazards of tsunamis to an industrialized area were well illustrated during the 2011 Tohoku, Japan earthquake. This tsunami was generated by an offshore subduction zone earthquake; subsidence occurred and increased the impacts of the tsunami significantly in some areas. Because similar earthquakes and subsidence are of concern off the Oregon Coast, the lessons learned from 2011 earthquake in Japan regarding subsidence, runup, scour, and foundation performance, etc. provide a useful case history for evaluating hazards at the Project site. The tsunami hazard at the facility will also be evaluated for a subduction zone rupture consistent with the new FERC recommendations, including the 2,475 year return. Currently, new modeling is being developed to evaluate impacts from an earthquake and tsunami to the Project site, and the results from these models will be filed when they are complete (in approximately two to three months).

A Project site-specific tsunami hazard study completed by Zhang (2012) evaluated the tsunami inundation elevation for the pre- and post-construction geometries and found minimal differences. This study is currently being revised to include the 2,475 year hazard-level tsunami scenario and previously completed deterministic studies. To mitigate the tsunami hazard, JCEP L.P. has proposed designing the Project facilities, including the LNG Liquefaction and Terminal Site, at elevations that exceed the design-level tsunami. A detailed description of the tsunami hazard and the design elements incorporated into the Project to address the tsunami potential is provided in FERC Resource Report 6 – Geological Resources, which can be made available upon request.

All bridges have been designed to meet the requirements for Oregon Department of Transportation (ODOT) 100-year flood events and include design measures to minimize potential impacts in the event of a tsunami. Design standards and criteria for bridge structures are provided in Appendix D – Bridge Design Standards and Criteria. Furthermore, the Mill Site/South Dunes Site will be raised to an approximate elevation of 46 feet, and at Ingram Yard (the LNG Liquefaction and Terminal Site) berms will be constructed around the terminal facilities to an approximate elevation of 46 feet, which is above the tsunami inundation zone. Additional information regarding tsunami event modeling is provided in FERC Resource Report 6.

1.10. Public Health and Safety

The Project has been designed to comply with public health and safety standards. The following Project elements have been incorporated to prevent interference with public health and safety:

- The landside area will be fenced and posted with signs to prevent general public access and public interaction with industrial activities. Further, landside access to Port facilities will be manned or electronically controlled.
- Safety criteria will be applied.

The Project will be located outside the airport approach surfaces and downstream of the railroad bridge, to reduce the possibility of vessel allisions with the bridge.

2. Project Components

Figure i-4, LNG Project Footprint (see Appendix A), shows the area that will be both temporarily and permanently impacted by the Project. The following sections and updated figures and sheets provide more details. As previously mentioned, avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts.

2.1. Slip and Access Channel (Sheets 1-1 – 1-3)

As mentioned previously, a Slip and Access Channel will be constructed between the existing navigation channel and the LNG terminal. Permanent wetland impacts are required below HMT to construct the slip and access channel. The slip is necessary to provide a safe and protected berth location for LNG vessels outside the navigational channel.

The width of the currently proposed slip is 800 feet, east sheet pile face to west sheet pile face, with a constant depth within the slip of -45 feet. Since original design, the width has always been established by the requirements of the LNG terminal without consideration for what might be the disposition of the west side of the slip. The 800-foot slip width is determined by the need of the LNG terminal to be able to move an LNG vessel off of the LNG berth on the east side of the slip in the event of an incident within the LNG upland facilities that might threaten the safety of the LNG vessel at berth. As an example, should there be a fire within the LNG terminal it would be important to have the flexibility to move the vessel away from the LNG berth. This would be particularly important if the incident was created by the leakage of LNG at or near the LNG vessel loading structure. If the tide were at a low stage it might not be possible to allow the vessel to move out of the slip into the navigation channel to allow transit out to sea. Having the 800 foot slip width provides the flexibility needed for tugs to move the LNG vessel away from a hazard at the terminal or at the LNG loading dock to the relative safety of the west side of the slip.

LNG Carriers (LNGC) may draw a fully laden draft of up to 13.0 meters. The LNGC “LNG Rivers”, a 138,000 cubic meter vessel, is used as the template for vessel movements into the JCEP slip and during vessel transit simulations. This vessel, in a fully laden state, draws 12.3 meters of draft. The rule of thumb to maneuver an LNGC is to maintain an under keel clearance of approximately 10% of the loaded draft. The ebbing associated with a tsunami that might occur on lower low water (LLW) tide is also factored into the design. Establishing the slip depth at -45 feet will ensure that a fully laden LNGC and located within the Slip is at negligible risk of touching the bottom of the slip during such an extreme event. All of these factors plus a margin for error set the design depth of the slip at approximately 45 feet. The “flare” of the access channel is designed to allow a vessel to safely maneuver into and out of the slip without having the vessel hull come into contact with the slip bottom.

2.1.1. Slip and Access Channel Construction Staging

Construction staging will occur north of the slip location in uplands (see Appendix A, Figure i-3, Temporary Facilities). Access to the Slip and Access Channel construction area will occur via existing gravel and paved roads as well as a temporary excavated material haul road. Excavated material from the slip will be transported on the excavated material haul road (which is discussed in further detail in the Utility Corridor/Access Road section, below). Dredged material from the access channel will be transported via the hydraulic dredge pipeline entirely on existing pavement and riprap on Roseburg Forest Products property. See Appendix A, Figure i-3, Temporary Facilities, which shows the excavated material haul road and the hydraulic dredge pipeline corridor.

Slip dredging will occur in two phases. The first phase will occur while the berm is in place. During this phase fresh water will fill the dredge pocket created behind the berm. This water is used as the transport medium to suspend the sand that is slurry transported to the Mill Site. At the Mill Site the slurry is discharged into a settling basin and the sand settles out to leave a decant water. Any decant water that does not percolate through the sandy bottom of the settling basin will be returned by a second pipeline system back to the dredge pocket. This is strictly a closed loop freshwater operation with no direct communication to the Waters of the U.S. The second phase of dredging occurs when the dredge is working from the Coos Bay side using the salty water of Coos Bay to transport the dredged sand to the Mill Site. The decant water from this phase is also returned to the dredge pocket. For some period of time while the berm is still intact there is no communication with Waters of the U.S. but once the berm is breached there will be communication with Waters of the U.S.

For further construction methods for each phase of the Project, refer to Section 1.3.2 of FERC Resource Report 1.

2.1.2. Slip (Sheets 1-1 – 1-3)

Construction of the approximate 30-acre slip and the marine facilities site will be conducted behind a barrier berm that would isolate the construction area from the Coos Bay estuary and open channel. As such, the proposed slip and marine facilities will be excavated and constructed from and within existing upland, respectively. Approximately 30.8 acres of upland area will be excavated for the slip. No impacts to wetlands or waters will occur during this time.

The inside dimensions at the toe of the slope in the slip are approximately 800 feet along the northern boundary and approximately 1,500 feet and 1,200 feet along the western and eastern boundaries, respectively. The minimum water depth within the slip is - 45 feet NAVD88 (North American Vertical Datum of 1988 [Please note: All Project and Slip and Access Channel Project elevations are in NAVD88 if not specified]). Side slopes are anticipated to be initially constructed at 3 horizontal (H): 1 vertical (V), and the top of the slope is proposed at elevation +25 feet NAVD88.

JCEP L.P. will utilize the east side of the slip for the LNG ship berth. Tug-assist berths will be located on the north side of the slip. The area above the sheet pile wall on the west side of the slip will be used to create a berm as a location for the placement of dredge material (subsequently referred to as the West Slip Stockpile Site). Creation of a berm at the West Slip Stockpile Site will effectively preclude any immediate development of the west side of the slip.

The eastern and western sides of the slip will be formed by the OPEN CELL® sheet pile technology developed and patented by PND Engineers, Inc. OPEN CELL® sheet pile technology is being used at the Sabine Pass LNG Terminal. Unlike conventional sheet pile retaining walls that maintain a clean linear berth face, the OPEN CELL® sheet pile structure face is designed to uniformly deform into a scalloped face as the landside static loads are applied. The engineering advantage of this technology is that the structural integrity of the sheet pile wall is created by the post-construction stressing of the wall by driving the sheet piles, including the tie-back walls first, then excavating the material from the water side area. This approach results in the upland load stretching out the wall to reach its final scalloped face. When the sheets are driven, the wall is a perfectly straight line. It is only after the material on the water side is excavated that the equalizing load on the water side is removed, thereby forcing the shore side load to stretch the piled walls and lock them into place, creating a very stable structure. The sheet pile system will be designed to support the dead loads of the soils and structures and the live loads of the LNG ship and equipment, as well as to meet the seismic criteria for the facility and water-imposed loads.

The OPEN CELL® sheet pile structure will allow the LNG carriers to be moored approximately one meter from the side of the slip. The LNG carrier loading arm/docking platform slab deck will be constructed of concrete behind the OPEN CELL® sheet pile wall. The LNG carrier mooring dolphins, breasting dolphins, and loading arm platform and structures will be constructed on the upland area behind the OPEN CELL® sheet piles. Four breasting structures and six mooring structures will be provided for berthing the LNG ship. The breasting dolphins will be attached to the front of the concrete loading arm/docking platform and will be equipped with fenders sized to safely berth and moor the full range of LNG carriers authorized to call on the LNG terminal. The mooring dolphins will be located onshore and will also be constructed from concrete on pile-supported foundations. The mooring structures will be provided with suitable access, quick release hooks, and lighting. Land-based mobile cranes with pile driving equipment will be located on the land side of the OPEN CELL® sheet pile walls. All piles required for the LNG loading structure as well as for all of the mooring dolphins will be driven on dry land, and no open water pile driving will be required. The loading arm/docking platform will be a reinforced concrete slab/beam structure, approximately 115 feet wide by 60 feet deep and supported on piles. The majority of sheet piles and tail walls will be driven from the land while the slip construction activities are isolated from Coos Bay. The southern end of the east slip OPEN CELL® wall will be protected with riprap where it connects with the Barge Berth as shown in Sheet 1-3. To the extent possible, riprap will be placed while the barrier berm is still in place. Riprap wall or slope protection is not proposed on the west side of the slip.

Four marine loading arms will be installed on the concrete base of the loading arm/docking platform slab deck. A mezzanine-type elevated platform, located above the concrete support deck, will be constructed of steel and used for maintenance of the triple swivel assembly of the arms. LNG spill containment will be addressed at the main concrete lower platform level, where a concrete curbed and sloped area will contain LNG spillage. Drainage from this point will be via the LNG spill collection trough to the marine area impoundment basin. Plan and elevation views of the slip and the LNG carrier berth, including the loading arm structures, are provided in Sheets 3-1 through 3-3.

2.1.2.1. Wetland Impacts

Riprap will be placed at the base of the OPEN CELL® sheet pile wall for slope protection near the transition to the barge berth and will extend below the existing HMT. Riprap fill volumes below HMT are included with the Barge Berth volume shown in the Impacts Bulk Upload Template.

2.1.3. Access Channel (Sheets 1-1 – 1-3)

An access channel would also be created to connect the slip and the federally maintained Coos Bay Navigation Channel at approximately Channel Mile 7.3. The access channel will be configured/oriented so that LNG ships can dock safely, away from other ship traffic in the channel, and to facilitate emergency egress. The access channel is approximately 2,300 feet long, from the slip to the navigation channel (taking into account the bend in the navigation channel at this point of intersection).The access channel is approximately 800 feet wide at the mouth of the slip. The distance from the closest edge (north edge) of the navigation channel to the mouth of the slip is approximately 700 feet. The walls of the access channel would be sloped to meet the existing bottom contours at an angle of 3 feet H: 1 foot V, and the top of the slope is proposed at elevation +25 feet NAVD88. The eastern side of the slip will be used for an LNG berth and the northern end will be used for a tractor tug dock.

The access channel connecting the slip to the Coos Bay Navigation Channel will be dredged either before or after the berm is removed. Dredging of the access channel will be completed by hydraulic dredge and crane-mounted clamshell, both operating from upland and/or from a barge. The clamshell dredge may be necessary to excavate surface material that may contain rocky and woody debris, and sand from the access channel. Clamshell-dredged material will be loaded onto a barge then taken to the barge berth and transported to the designated disposal location. Isolation of the dredging and pile driving to install the OPEN CELL® sheet pile walls surrounding the slip is not proposed for several reasons: (1) sand particles will settle quickly and not cause significant turbidity, (2) the conservation measures listed in Section 5 below will ensure Department of Environmental Quality (DEQ) turbidity standards are maintained, and (3) all construction work will be conducted during the approved in-water work period. Details regarding disposal are described in further detail in Section 2.1.5, below.

2.1.3.1. Wetland/Estuarine Resource Impacts

The access channel will cover approximately 30 acres below the Highest Measured Tide (HMT) line. Impact quantities resulting from dredging of the access channel (including impacts to existing deep subtidal strata below -15 feet in depth, existing shallow subtidal strata [including eelgrass habitat] between the mean lower low water [MLLW] line and -15 feet, and existing intertidal strata between the MLLW and the HMT elevations) are provided in the Impacts Bulk Upload Template. All in-water work associated with constructing the access channel will be conducted during the ODFW in-water work window.

2.1.4. Barrier Berm (Sheets 1-1)

The basic concept is to excavate the majority of the proposed slip area (approximately 4.3 million cubic yards [MCY] of 5.65 MCY total) and construct most of the in-water structures while maintaining a natural physical barrier berm between the slip and Coos Bay. Old Jordan Cove Road (now abandoned as a result of completion of the Trans Pacific Parkway) runs along the Coos Bay shoreline and will be kept intact to form the crest of the barrier berm during the entire upland phase construction effort.

Once the upland phase activities (excavation and dredging of the slip and installation of the marine facilities) have been completed, the existing barrier berm, which would be approximately 40 feet wide at its crest, will be removed (approximately 0.5 MCY). This will connect the slip to Coos Bay. The in-water phase work will include excavation/dredging of the barrier berm and access channel (up to 1.3 MCY), and filling for creation of the barge berth. In-water work will occur during the ODFW in-water work window (October 15 through February 15).

2.1.4.1. Wetland/Estuarine Resource Impacts

Impacts resulting from dredging the barrier berm would be primarily to intertidal estuarine habitat and have been included under the access channel dredging impacts in the Impacts Bulk Upload Template.

2.1.5. Dredged and Excavated Material Placement

The amount of material proposed to be excavated and dredged to create the new slip is approximately 4.3 MCY (approximately 2.3 MCY excavated and 2.0 MCY dredged). During creation of the slip, dry excavated material will be hauled by trucks to the Mill Site/South Dunes Site via the excavated material haul road to use as fill. Material to be removed to create the slip below elevation -10 feet will be hydraulically transported to the Mill Site/South Dunes Site via the hydraulic dredge pipeline corridor.

An additional 1.3 MCY will be dredged to create the access channel, creating a total of 5.6 MCY of material to be dredged and excavated for creation of both the slip and the access channel. Excavated and dredged material would be disposed of primarily at the following two locations: (1) the adjacent Mill Site/South Dunes Site (upland; future location of the South Dunes Power Plant), and (2) the Ingram Yard/LNG Liquefaction and Terminal Site (upland) north of the slip. A very small portion of material would be placed at the West Slip Stockpile Site (see Appendix A, Figure 1-2), which is located between the riparian buffer boundary for Henderson Property and the OPEN CELL® sheet pile wall on the west side of the slip.

Future maintenance dredging is included with this action and would be required to maintain navigational depths for deep draft vessels that call at the new marine terminal. The 37,700 CY of material per year from the maintenance dredging will be placed at the U.S. Environmental Protection Agency (EPA)-designated offshore Site F (see FERC Resource Report 7 – Soils, Appendix H-7), as is the current maintenance dredge practice for the Coos Bay Navigation Channel. Detailed sediment transport modeling was conducted and verified by C&H. Additional information regarding the results of this modeling is provided in FERC Resource Report 1, and a copy of the Draft Volume 3 of the C&H Technical Report is provided as Appendix E.1 to FERC Resource Report 1. Material dredged for maintenance will likely be disposed of at the U.S. EPA-designated offshore Site F.

With the exception of the material from the maintenance dredging, all 5.6 MCY will be used beneficially by the Project in raising both the Ingram Yard/LNG Liquefaction and Terminal Site and the Mill Site/South Dunes Site to elevations above the tsunami inundation zone.

Additional information on dredged material disposal is provided in the Excavated and Dredged Material Management Plan (see Tab D of the June 2013 LNG Project 404 Application).

2.1.5.1. Wetland/Estuarine Resource Impacts

Impacts resulting from the placement of dredged and excavated material from the Slip and Access Channel are provided in the following sections; specifically, dredged and excavated material that will be placed at the Ingram Yard/LNG Liquefaction and Terminal Site that will result in wetland impacts is described under (2) LNG Liquefaction and Terminal Site, and dredged and excavated material that will be placed at the Mill Site/South Dunes Site that will result in wetland impacts is described in (4) SORSC Site, (5) South Dunes Power Plant Site, and in the Impacts Bulk Upload Template. In addition, maintenance dredging is proposed to occur every two to four years in Waters of the U.S. within the slip and access channel.

2.2. LNG Liquefaction and Terminal Site (Sheets 2-1 – 2-3)

The LNG Liquefaction Site is located immediately north of the slip. Development for the LNG Liquefaction Site will occur almost entirely within upland areas. Minor wetland impacts in the northern portion of the LNG Liquefaction Site will occur as a result of the need to place surplus fill material on land owned and/or controlled by JCEP L.P. (see Section 2.2.1.5 for additional details). The LNG Terminal Site is located on the east side of the slip. The LNG Terminal Site will be developed on both upland and estuarine areas. Installation of the LNG loading arm and associated equipment will occur entirely on upland and will not result in any wetland impacts. On the other hand, placement of fill for installation of the barge berth will result in some impacts to estuarine resources (see Section 2.2.2.3 for additional details).

2.2.1. LNG Liquefaction Site (Sheets 2-1)

In summary, the LNG Liquefaction Site will contain the following components:

- An LNG storage system consisting of two full-containment LNG storage tanks, each with a net capacity of 160,000 m^3 (1,006,000 barrels); and
- An emergency vent system; an LNG spill containment system; a fire water system; fuel gas, nitrogen, instrument/plant air and service water facility systems; various hazard detection, control, and prevention systems; utilities (lights, etc.); and buildings and support facilities (stormwater and wastewater systems, etc.).

Additional information on the development occurring in uplands and associated with the LNG Liquefaction Site (LNG tank construction sequence, LNG tank foundation, etc.) is provided in FERC Resource Report 1 – General Project Description.

2.2.1.1. Site Preparation and Ground Improvements

Construction site preparation will require clearing, ground improvements (via vibratory compaction and removal of an organic layer, for example), filling, and grading of the site to an approximate elevation of +30 feet NAVD 88 for the base of the LNG storage tank area and approximately +46 feet NAVD 88 for the process areas. Temporary ditches, sediment fences, and silt traps will be installed as necessary. Individual excavations will then be made for equipment foundations. Following completion of foundations, the site will be brought up to final grade. Final grading and landscaping will consist of gravel-surfaced areas, asphalt-surfaced areas, concrete-paved surfaces, and grass areas (the final site elevation will be raised above the tsunami inundation zone).

Ground improvements refer to the removal of an organic layer of soil, followed by vibratory compaction of the subsurface sand below and on perimeters of the project footprint. Ground improvements will occur no more than 50 feet outside the toe of slope. Site work will begin with grubbing and removal of the organic layer, followed by sand vibratory compaction which includes filling localized compacted areas with sand to make the soils more dense. Compaction may cause soil settlement to occur approximately 5 to 7 feet outside of the point of treatment. Following compaction, the top 3 feet of wetland areas will be returned to original elevations and can be loosened or scarified to allow vegetation planting. Ground improvements are considered temporary impacts because wetland hydrology sources are not anticipated to be impacted, soils will be amended as needed, and hydrophtic vegetation will be replanted.

2.2.1.2. Excavated Material Placement

Grading of the areas to be occupied by the Project facilities will entail approximately 2.5 MCY of cut and fill. Any material remaining from that work, including final grading and landscaping, will be used to raise the South Dunes Site utilized for the pipeline gas conditioning facility and to raise the access/utility corridor between the LNG terminal and the South Dunes Site. Approximately 3.5 MCY of material will be available for the South Dunes Site and the access/utility corridor to raise the existing elevation to approximately +46 to +48 feet NAVD 88. The material available to raise the elevation of these areas will come from the excavation of the Slip and Access Channel.

2.2.1.3. Foundations

Geotechnical studies have been completed to determine the soil properties of the existing subsurface materials and to identify the foundation design criteria for structures associated with the Project. To supplement the previous geotechnical investigation work, additional testing was conducted in spring and summer 2014. This geotechnical testing was coordinated with the appropriate federal, state, and local agencies to ensure compliance with applicable regulations.

Geotechnical investigations recommend soil compaction (i.e. ground improvements) at locations throughout the project areas. In general, the foundations for all equipment and structures, including the LNG storage tanks, process equipment, and pipe racks, will be mat type. Foundations for all critical process equipment and structures located outside of the storm surge barrier will be installed at an elevation of +46 feet. Seismic hazard studies are discussed in FERC Resource Report 6 – Geological Resources, including discussion of the lessons learned from the Tokohu earthquake of March 11, 2011, in Japan.

2.2.1.4. Materials and Equipment Delivery

Final transportation to the Project site will occur by road, rail, and marine transport. An existing rail line is located adjacent to the Project site. The kinds of materials and the mode of delivery to the site will depend on their origin, size, and weight. It is anticipated that the larger and heavier pieces of equipment will arrive by marine transport. These delivery options will be further evaluated in final design.

JCEP L.P. is reviewing transportation methods for the large pieces of equipment and is proposing to develop a barge berth to be used for material and/or equipment shipment during construction. This barge berth will be placed at the eastern edge of the access channel, utilizing the area dredged for the Slip and Access Channel as the berth and the area behind the OPEN CELL® sheet pile walls as the dock surface. A heavy equipment haul road will be constructed from the barge berth face to the South Dunes Power Plant Site. The heavy equipment haul truck route (see Appendix A, Figure i-3, Temporary Facilities) will follow an easement through the Roseburg Forest Products property up to Jordan Cove Road. It will follow Jordan Cove Road until it intersects with an existing road that was used by Weyerhaeuser during operation of its linerboard facility (which is also a portion of the route of the access/utility corridor to the LNG terminal). The trucks will not cross Trans Pacific Parkway at any time, and the only potential conflict will be with chip truck traffic to the Roseburg Forest Products wood chip facility. Wood chip truck traffic will be given the right-of-way over heavy equipment haul truck traffic by using flag men to halt heavy haul truck traffic until passing vehicles have passed the intersection. The heavy equipment haul truck route will be on JCEP L.P.-owned land or easements granted by Roseburg Forest Products to JCEP L.P. Traffic surveys of the anticipated construction-related traffic have been conducted, and measures have been proposed to mitigate adverse effects. These are discussed in detail in FERC Resource Report 5 - Socioeconomics.

JCEP L.P. further envisions that some bulk materials, such as insulation, will be shipped in standardized containers. Fabrication shops will be used to create pipe spool pieces and other prefabricated units of equipment and skid-mounted process equipment modules. Delivery to the site will occur in accordance with the construction schedule. Where practical, skid-mounted equipment will be used during delivery.

The Coos Bay Rail Link (CBR), which is owned by the Port, is now suitable for delivery of materials to the Project site.

2.2.1.5. Wetland Impacts

The only permanent wetland impacts that will result from the LNG Liquefaction Site involve surplus fill material placement from excavation and dredging. This surplus fill material will be placed in the northwest and northeast corners of the LNG Liquefaction Site. Therefore, Wetland 2013-4 will be partially filled and Wetland 2013-3 will be filled with surplus material. While permanent construction activities are not proposed beyond the toe of slope, temporary impacts at Wetland 2013-4 may occur adjacent to the toe of slope as a result of site preparation activities, ground improvements, and erosion and sediment control maintenance activities. These temporary impacts, if any, will be rectified as described in the Site Restoration/Rehabilitation section in Block 5. See the Impacts Bulk Upload Template for additional details.

2.2.2. LNG Terminal Site (Sheet 2-2)

In summary, the LNG Terminal Site will have the following components:

- A protected LNG carrier loading berth constructed on an OPEN CELL® technology sheet pile slip wall and capable of accommodating LNG carriers ranging in capacity from 89,000 m^3 to 160,000 m^3;
- An LNG carrier cargo loading system consisting of three, 16-inch loading arms and one 16-inch vapor return arm, a gangway tower, firewater monitors, service utilities, and associated valves and piping (designed for 10,000 m^3 per hour (m^3/hr) rate with a peak capacity of 12,000 m^3/hr);
- An LNG transfer line consisting of one 2,300-foot-long, 36-inch-diameter line that will connect the shore-based storage system with the LNG loading system;
- A pipeline gas conditioning facility consisting of two feed gas cleaning and dehydration trains with a combined natural gas throughput of approximately 1 Bscf/d;
- Four natural gas liquefaction trains, each with the export capacity of 1.5 MMTPA;
- A refrigerant storage and resupply system;

- An Aerial Cooling System (Fin-Fan);
- An LNG storage system consisting of two full-containment LNG storage tanks, each with a net capacity of 160,000 m^3 (1,006,000 barrels), and each equipped with three fully submerged LNG in-tank pumps sized for approximately 11,600 gallons per minute (gpm) each;
- An LNG transfer line consisting of one 2,300-foot-long, 36-inch-diameter line that will connect the shore-based storage system with the LNG loading system;
- An LNG carrier cargo loading system designed to load LNG at a rate of 10,000 m^3/hr with a peak capacity of 12,000 m^3/hr, consisting of three 16-inch loading arms and one 16-inch vapor return arm;
- A protected LNG carrier loading berth constructed on an OPEN CELL® technology sheet pile slip wall and capable of accommodating LNG carriers with a range of capacities;
- The improvement of an existing, on-site unimproved road and utility corridor to become the primary roadway and utility interconnection between the LNG Terminal and South Dunes Sites, including between the pipeline gas conditioning units on the South Dunes Power Plant Site and the liquefaction trains on the LNG Terminal Site;
- A boil off gas (BOG) recovery system used to control the pressure in the LNG storage tanks;
- Electrical, nitrogen, fuel gas, lighting, instrument/plant air and service water facility systems;
- An emergency vent system (ground flare);
- An LNG spill containment system, a fire water system, and various other hazard detection, control, and prevention systems; and
- Utilities, buildings, and support facilities.

2.2.2.1. Barge Berth (Sheet 2-3)

A barge berth will be constructed on the east side of the slip. The barge berth will be used during project construction to transport equipment and large modules to the Mill Site/South Dunes Site via the heavy equipment haul road. The barge berth may be used to offload dredged Access Channel material from barges onto trucks. The barge berth will be located on the eastern side of the access channel and bordered by an OPEN CELL® sheet pile wall and riprap slope stabilization on the west side of the barge berth. The concept and construction technique for the OPEN CELL® sheet pile wall surrounding the barge berth are the same as those described for the east side of the slip. Riprap is proposed east and west of the barge berth to prevent scour.

2.2.2.1.1. *Constraints to the Location and Size of the Barge Berth*

The size of the barge berth is dictated by the size of the vessels that will be required to deliver components to the project site during the construction phase. Due to limitations of the road and rail networks that serve Coos Bay a large number of components must be moved to the site by water. The conclusions of the Overland Transportation Study conducted by logistics firm Omega Morgan for the Jordan Cove construction contracting team of Kiewit-Black &Veatch (KBV) concluded that " All of the major large equipment and modules must be brought to the site via ocean transit and offloaded at the barge dock (berth)." The largest modules will originate from Asian ship yards that will need to be transported via HandiMax size vessels that have an overall length ranging from 492 feet upwards to 656 feet. The 520-foot breasting length of the proposed barge berth barely provides sufficient length to accommodate the larger HandiMax vessels and associated mooring requirements (see Sheet 1-3). Construction of a smaller (less overall breasting face) barge berth would preclude the use of HandiMax vessels and the ability to deliver the large modules to the site.

The location of the barge berth must be assessed holistically, in the context of adjacent facilities and required functions of not just the barge berth but also all the areas adjacent to the barge berth. As a result of this holistic approach the location of the barge berth has been established to fulfill its primary function while creating the minimum of environmental impact.

The location of the barge berth is constrained by three primary LNG facility functional requirements. First, the WNW corner of the barge berth is fixed by the location of the southernmost mooring bollard (dolphin) for the LNG ship berth located on the eastern side of the slip. The southernmost mooring bollard has been established in the location necessary to secure the LNG vessel at the LNG berth during high wind conditions. Under high wind conditions forces are exerted upon the mooring lines that are used to attach the LNG ship to the shore side mooring bollards. Ideally the southernmost mooring bollard would be located even further to the south to reduce the load placed on this individual bollard and allow a more equitable distribution of the wind load forces amongst the remaining five bollards. However, moving this southernmost bollard further to the south results in greater environmental impacts. As a trade-off between safety, that cannot be compromised, and environmental impacts, which must be minimized, the facility engineers have set the southernmost bollard location as is presently identified and added substantial subsurface anchoring features (deadmen) to allow the present location to safely fulfill the ship mooring function, without failure risk under high wind condition. The location of the southernmost mooring bollard therefore sets the northwestern corner of the barge berth.

Second, there must be sufficient shore side surface area available to allow for the positioning of the very large cranes necessary to handle the unloading as well as the positioning of the large Scheuerle trailers that are then used to move these large components from the barge berth into final position. Setback from the edge of the barge berth is required to ensure that both the loaded cranes or loaded Scheuerle trailers do not cause the sheet pile edge of the barge berth to fail under load. Clearance for safety and to allow for the maneuvering of both cranes and Scheuerle trailers requires the bench topside of the barge berth be substantial.

Third, once the Scheuerle trailers have been loaded they need to travel the haul road that connects the barge berth deck at elevation 20 feet MSL to the process area of the LNG facility located at an elevation of 46 feet MSL. These multi-axle Scheuerle trailers can move up a gradient of approximately 2-3 degrees. The combination of the very shallow slope and the 26 foot elevation gain forces the northern edge of the barge deck to be approximately 1/4 mile from the southern edge of the process area. Without this spacial separation it would be impossible to transport the heavy loads up the slope.

2.2.2.1.2. *Long Term Need for the Barge Berth*

The large equipment components initially delivered either by barge or HandiMax vessel to the LNG terminal will need to be maintained and possibly replaced over the useful life of the project. Access by water remains the only delivery method to move the damaged or irreparable components off of the site and to deliver new or refurbished large components to the site. The barge dock provides the only location for these components to be delivered once the facility is constructed and placed in operation since equipment congestion on the site precludes the use of other marine landing areas either within the slip or at other marine facilities located on the North Spit.

2.2.2.1.3. *Construction Approach*

Material used to backfill the area behind the OPEN CELL® sheet pile structure will be obtained from an existing dune immediately north of the barge berth. Material will be pushed from the land towards the bay during the approved in-water work window. Also during the approved in-water work window, additional temporary fill material will be placed outside of the permanent barge berth structure. The material will provide the contractor an area from which to drive the OPEN CELL® sheet pile, and avoid the need to construct a work platform. Also, this additional temporary fill material around the barge berth

will act as a sound buffer to eliminate the risk of acoustic disturbance to fish species during pile driving, thus allowing for pile driving to occur in the dry outside of the in-water work window. Removal of temporary fill and dredging of the barge berth access to accommodate water-based access along the face of the barge berth will occur concurrently with dredging described in section 2.1. Based on the detailed turbidity analysis conducted by C&H and its conclusions regarding the nature of the material that would be used as fill for the barge berth, slope armoring around the additional temporary fill will not be required.

Access to the Barge Berth construction area will occur via existing gravel and paved roads as well as a temporary excavated material haul road, which is also utilized for construction access to the slip and access channel work areas. Existing surfaces in the footprint of the proposed access channel that are dominated by rocky or woody material will be dredged using a clamshell dredge, located on land or on a barge. Dredged material from the access channel will be transported via the hydraulic dredge pipeline entirely on existing pavement and riprap on Roseburg Forest Products property, and by trucks after offloading dredged material from barges. See Appendix A, Figure i-3, Temporary Facilities, which shows the excavated material haul road and the hydraulic dredge pipeline corridor.

2.2.2.2. Wastewater Systems

Sanitary waste from the LNG loading berth building located at the LNG Terminal Site will be directed to a holding tank. A sanitary waste contractor will remove the contents of the tank as necessary and dispose of the contents at authorized disposal sites through the contractor's permits. Sanitary waste from the remainder of the buildings will be directed to on-site septic systems.

2.2.2.3. Wetland Impacts

Both temporary and permanent impact quantities resulting from filling the barge berth (including impacts to existing intertidal strata below HMT) are provided in the Impacts Bulk Upload Template. The fill volumes include riprap necessary for slope protection on the west side of the barge berth face. Barge Berth impacts will result in permanent loss of eelgrass and intertidal habitat. The additional temporary fill that will be placed outside of the permanent footprint for the barge berth is discussed in further detail below in the "Minimization Measures" section.

2.3. Utility Corridor/Access Road (Sheets 3-1 – 3-3)

2.3.1. Utility Corridor/Access Road and Haul Road (Sheet 3-1)

An existing access road and utility corridor will be improved to provide access between the LNG Liquefaction and Terminal Site and the pipeline gas conditioning facilities located on the South Dunes Site. The corridor is approximately one mile long and 150 feet wide (toe of slope to toe of slope). It is located entirely on existing JCEP L.P. property or on property for which JCEP LP holds an option to acquire and hence involves no other landowner. The access corridor (also referred to as the excavated material temporary haul road and the eastern portion of the heavy equipment temporary haul road) will be utilized initially for the movement of earthwork equipment for the grading and cutting/filling of the two sites, and then for the movement of equipment and materials during construction, and finally during operations for control of access and security of the LNG terminal. By upgrading this corridor, JCEP L.P. will reduce traffic impacts on the existing Trans Pacific Parkway in the area of the LNG terminal and the South Dunes Power Plant.

The corridor will include a two-lane, 24-foot-wide roadway, 12-foot-wide shoulders, a median and safety berms on the sides, retaining walls, and bridge structures that will avoid and/or minimize impacts to wetlands. The west bridge will extend over another access road and a rail serving the Roseburg Forest Products' terminal. Additionally, the corridor will contain a double circuit overhead 115 kilovolt (kV) power transmission line and a pipeway corridor that includes the feed gas supply to the Project, a fuel gas pipeline to the South Dunes Power Plant, a backup pilot gas line, telecommunications lines, and redundant control circuitry. All gas pipeline, electrical, and water utilities will be carried on the proposed bridges to span, and thus avoid, the wetlands.

All environmental resource surveys, including a water body survey, wetland delineation, threatened and endangered species survey, and cultural resources survey, have been conducted on the corridor route. The results of the waterbody survey and wetland delineation are provided in FERC Resource Report 2 – Water Use and Quality. The results of the threatened and endangered species survey are provided in FERC Resource Report 3 – Fish, Wildlife, and Vegetation. The results of the cultural resources survey of the corridor are provided in FERC Resource Report 4 – Cultural Resources.

2.3.1.1. Wetland Impacts

Temporary impacts (e.g., compaction, disturbance of vegetation) are expected at Wetlands 2013-1 and 2013-2 to allow access during wall construction, but temporary fill or removal of material is not expected. Temporary disturbance areas are provided in Appendix A – Figures, and the Impacts Bulk Upload Template. Site restoration measures are discussed in the Site Restoration/Rehabilitation section in Block 5.

2.3.2. West Utility Corridor/Access Road Bridge (Sheet 3-2)

The west utility corridor bridge will be 607 feet long and nearly 41 feet wide. It will span Jordan Cove Road and Wetland 2013-6. Pile-supported footings will support concrete columns, bent caps, and girders. The bridge will have four spans consisting of two end abutments, with one interior bent placed on uplands and two interior bents placed in wetlands. The footing for each bent will include a 28-inch steel pile and a 44-foot by 32-foot concrete seal over the pile. Abutment slope protection will be placed outside of the wetland boundary. Bridge plans are included in Appendix A, Bridge and Roadway Plans.

2.3.2.1. Construction Approach

A temporary access and excavated material haul road will be constructed in wetlands (Wetland 2013-6 and Wetland 2012-2) adjacent to the alignment of the new east and west utility corridor bridges to facilitate bridge construction. Fill material will be extended from the haul road to cofferdam locations to provide access to construct the bridge. Some of the permanent footing will be built into the temporary embankment used for the excavated material haul road, which will be placed over geotextile fabric and in the wetland. The footing and column will be built before all temporary fill is removed.

A sheet pile cofferdam will be constructed around the perimeter of each new footing located in the wetlands. Temporary shoring walls will be used as needed at the other foundations. The inside of the cofferdam will be excavated to the bottom of the footing seal elevation (elevation -16 feet). Without dewatering, steel pipe pile will be driven with an impact hammer inside the cofferdam. Once pile is driven, a 4- to 10-foot-thick concrete seal will be poured over the pile. The concrete will displace water as it is poured, allowing the water to be pumped into Baker Tanks, or a similar device designed to contain potential contaminants, for disposal at an approved location. The cofferdam will provide a dry working area for construction of the concrete footing, column, and crossbeam. Steel pile protruding from the seal will be cut at the top to the proper elevation, and the permanent footing will be formed and poured. Columns will then be formed and poured, and the crossbeam will be constructed on the columns. The sheet pile cofferdam will be removed, crossbeams will be formed and poured on columns, and pre-cast concrete girders will be set. Operating from the temporary haul road, cranes will lift girders into place from each end. Once girders are placed the contractor will form and pour the concrete deck and place the barrier rails.

2.3.2.2. Wetland Impacts

The temporary haul road will require temporary fill and removal impacts. Construction logistics require this fill material to be in place for greater than 24 months. A new bridge bent will require permanent fill material in Wetland 2013-6. Removal fill quantities and acres of impacts are provided in the Impacts Bulk Upload Template.

2.3.3. East Utility Corridor/Access Road Bridge (Sheet 3-3)

The east utility corridor bridge will be 300 feet long and nearly 41 feet wide. It will span Wetland E, east of Jordan Cove Road. The bridge type and construction will be identical to that of the west utility corridor bridge. The two-span bridge will consist of two end abutments placed on uplands and one interior bent placed in Wetland E. Abutment slope protection will be placed approximately 5 feet outside the wetland boundary.

2.3.3.1. Construction Approach

As mentioned above, construction of this bridge will be nearly identical to construction of the west utility corridor bridge. Cofferdams are anticipated at the foundation in the wetland due to the high water table. Temporary shoring walls will be utilized as needed at the abutments.

A sheet pile retaining wall will be constructed between Jordan Cove Road and the east utility corridor bridge to prevent further wetland impacts from fill slopes. The wall will not require permanent or temporary wetland impacts. Construction will take approximately four to eight months.

2.3.3.2. Wetland Impacts

A temporary access and haul road will be constructed in Wetland E and a small portion of Wetland C, and will require temporary impacts. The road will be constructed using aggregate material placed over geotextile fabric. Material will be removed following construction. A retaining wall will be constructed north of Wetland D to minimize temporary or permanent wetland impacts. Temporary impacts along the north boundary of Wetland D are anticipated for construction of the retaining wall. Temporary removal-fill quantities and acres of impacts are provided in the Impacts Bulk Upload Template.

2.4. SORSC Site (Sheet 4-1)

The Southwest Oregon Regional Safety Center (SORSC) is a multi-agency emergency response and training facility located on the North Spit adjacent to the South Dunes Power Plant Site. The complex is designed to house the personnel and equipment needed to respond to emergency events on the North Spit. The SORSC building houses the Jordan Cove Fire Department, Coos County Sheriff's Department Operations, and classrooms for the Southwest Oregon Community College. Additional office space is available for representatives of the U.S. Coast Guard (USCG), Oregon State Fire Marshal, and the Port. Classroom space will be used to conduct specialized LNG fire training for both the college and the region's emergency response community. The site also includes an overpass over the Roseburg Forest Products rail spur and Jordan Cove Road to facilitate efficient access to the Project area in the event of an emergency.

All of the regional emergency response agencies listed above were involved in the SORSC site selection. The following site selection criteria were developed by the Emergency Response Planning group to determine feasible locations:

- On the North Spit and west of the CBR mainline (to ensure that the fire department could respond to an event at the LNG terminal and would not be impacted by a vehicular accident on the McCullough Bridge or a train on the CBR mainline blocking Trans Pacific Parkway);
- Far enough away from the LNG terminal so that the SORSC would not be impacted by an event at the LNG terminal; and
- Above the tsunami inundation elevation.

The location of the SORSC shown in Sheet 4-1 is the only location that met the above criteria for site selection.

2.4.1. Wetland Impacts

Wetlands A and B will be filled with excavated and dredged material, and SORSC development will occur on top of the fill. See the Impacts Bulk Upload Template for additional details.

2.5. South Dunes Power Plant Site (Sheet 5-1)

JCEP L.P. will obtain authorization from the Energy Facility Siting Council (EFSC) to construct and operate the South Dunes Power Plant, a natural gas-fueled, combined cycle generating plant that will provide electrical power to the Project. The South Dunes Site is on the site of the former Weyerhaeuser linerboard mill, which closed in 2003 and has since been demolished. Access to the site will be from Highway 101 and then west on the Trans Pacific Parkway, two miles north of North Bend.

The site is currently clear of any significant structures or vegetation, with the exception of a water tank and the PacifiCorp Jordan Point substation. The site elevation will be increased using material excavated and dredged from the slip. The PacifiCorp Jordan Point substation will be relocated on-site after the new substation location has been raised to a final grade elevation of approximately 40 feet. It is anticipated that, except for structures with high overturning moments, spread footing and slab-on-grade foundations will be used to support the plant equipment and buildings. Equipment required for the facility will be delivered to the site via the heavy equipment haul road.

The South Dunes Power Plant will produce 420 MW of electrical power for the Project, as well as process steam that will be used in conditioning gas before its delivery for liquefaction at the LNG terminal. It will consist of two 170 MW blocks of high-efficiency combined cycle combustion turbine generation. Three combustion turbine generators (CTGs), three heat recovery steam generators (HRSGs), and one steam turbine generator (STG), will collectively compose each power block, adding approximately 40 MW to each 170 MW block for a total output of 420 MW.

Each CTG will produce electricity, with the exhaust gases from the CTGs supplying heat to the HRSGs. Steam produced in the HRSGs will be used to power the STGs to produce additional electricity and process steam. Duct burners fueled by natural gas in the HRSGs will allow for production of additional steam and additional electricity from the STGs when needed. Steam exhausted from the STGs will be condensed in air-cooled condensers, and the resulting condensate will be returned to the HRSGs to remake steam.

Fuel will be supplied primarily in the form of boil off gas (BOG) from the Project. Some additional natural gas will be supplied from the gas pipeline, which will connect to a metering station to be located in the southern portion of the South Dunes Power Plant Site. The pipeline and metering station will be installed, owned, and operated by others. Water will be supplied by the Coos Bay-North Bend Water Board (CBNBWB) through an existing pipeline that connects to the South Dunes Power Plant Site.

One new switchyard with generator transformers will be constructed on-site to switch/direct the power produced by both power blocks. The voltage will be stepped up to 115 kV for transmission to the LNG terminal.

The CTGs, HRSGs, and STGs will be outdoor units, given the relatively moderate ambient conditions of the area. A control and administrative building will provide space for plant controls and offices for plant personnel. A separate water treatment area will provide a location for the equipment necessary to purify the raw water, producing demineralized water for use in the power plant steam cycle and amine solution for CO_2 removal. The site will also support metering and conditioning facilities for the natural gas supply used by both the South Dunes Power Plant and the LNG terminal. The pipeline being installed by the Pacific Connector Gas Pipeline Project connects seamlessly to the SDPP Site at the metering station at the south end of the SDPP Site. Impacts, if any, resulting from installation of the gas pipeline upstream of its connection to the metering station are described in Part B of this application, which was provided by Pacific Connector Gas Pipeline, L.P.

2.5.1.1. Site Preparation and Perimeter Access

Site preparation and ground improvements will be required at the South Dunes Site, including but not limited to the areas under the planned fill at the perimeter of the SDPP between the east end of the East Bridge and eastward to approximately 200 feet southeast of Wetland M, and along the east side of the fill limits at Wetland J. Ground improvements are required for slope stabilization and include vibratory consolidation of material. Ground improvements will occur as described in Section 2.2.1.1, with the exception that Wetland M, a tidal wetland, would only be returned to original elevations if settlement is determined to be detrimental to the wetland functions and values. Most ground improvements will occur within approximately 15 feet of the toe of slope, with the exception of the east side of the SDPP, where ground improvements will extend up to 50 feet east of the toe of slope.. Limited access for maintenance and repair of erosion and sediment control measures and site preparation of fill slopes may require temporary wetland disturbances of up to 15 feet outside the toe of slope at Wetlands M and J. If these wetland disturbances occur, they will be restored as described in the Site Restoration/ Rehabilitation section in Block 5.

2.5.2. Wetland Impacts

Several wetlands (i.e. I, H, J, L, M, N, 2012-7) will be wholly or partially permanently filled when the elevation of the South Dunes site is raised. Wetlands F and G will also be filled, but they are not subject to regulation under Section 404 and therefore mitigation for those sites is not proposed. It is the applicant's understanding, based upon discussions with Bill Mason, DEQ, and the applicable terms of the CWS and related regulations, that Wetlands F and G are not "waters of the United States" subject to permitting requirements under Section 404 when, as in this instance, such areas constitute treatment ponds subject to an NPDES permit. For further explanation of the applicant's understanding, please see the letter from Steve Pfeiffer, Perkins Coie, dated March 29, 2013 in Tab F of the June 2013 LNG Project 404 Application. See Impacts Bulk Upload Template for additional information regarding removal and fill areas (acres) and removal and fill volumes (CY).

Fill material will include excavated and dredged material from the Slip and Access Channel and the LNG Liquefaction and Terminal Site, as described in the Excavated and Dredged Material Management Plan (Tab D). While construction impacts are not proposed beyond the toe of slope, site preparation, ground improvements, and erosion control activities will result in temporary impacts at Wetland J and Wetland M. A retaining wall will be constructed at the north end of Wetland J to minimize permanent wetland impacts at this location. Temporary disturbance areas are provided in the Impacts Bulk Upload Template. Site restoration measures are discussed in the Site Restoration/Rehabilitation section in Block 5.

2.5.3. Railroad Bridge (Sheet 5-2)

An existing Roseburg Forest Products rail spur will need to be relocated due to the placement of fill material on the Mill Site/South Dunes Site. Relocating the rail spur requires the installation of a new rail bridge. The bridge will be a six-span concrete structure spanning Wetland 2012-4. It will be nearly 269 feet long and nearly 21 feet wide and supported on steel pile. End and interior spans will be approximately 45 feet. Each of the seven bents will consist of an eight-pile footing and a concrete pile cap. Five interior bents will be located in the wetlands, with end bents located on upland fill slopes. Bridge plans are included in Appendix D.

2.5.3.1. Construction Approach

Construction of the new railroad bridge will begin with construction of a temporary work bridge. The temporary work bridge will be approximately 28 feet wide with six spans and will be approximately 255 feet long. The temporary work bridge will be placed south of the proposed railroad bridge.

It is likely that the temporary work bridge will use two steel piles per bent with a steel frame and a timber deck. The temporary work bridge end abutment will be constructed on dry land and outside the Wetland 2012-4 boundary, while approximately four of the interior bents will be placed in Wetland 2012-4. All pile may be driven with an impact hammer since no fish are present in this open-water wetland. The temporary work bridge approaches and access road will be gravel. The temporary work bridge will be in place for approximately four to eight months.

The permanent pile for the new railroad bridge will be driven with an impact hammer from the temporary work bridge located to the south of the railroad bridge. All pile will be driven and then cut off at the necessary elevation, and a pre-cast concrete cap will be fastened to the top of the pile bent. Pre-cast concrete girders will be brought in on the work bridge and set on the concrete pile caps with cranes. Railroad ballast, ties, and one set of rail tracks will be placed on the pre-cast girders. Finally, walkways will be constructed on the sides of the girders.

2.5.3.2. Wetland Impacts

Steel piles for the temporary work bridge will result in temporary impacts to Wetland 2012-4. Steel piles for the permanent railroad bridge will result in permanent impacts to Wetland 2012-4. The temporary work bridge is estimated to be in place for less than one year. All permanent and temporary impacts are listed in the Impacts Bulk Upload Template.

2.6. Industrial Wastewater and Water Line Relocation (Sheet 6-1)

Excavation associated with Project construction will require the relocation of an existing industrial wastewater line and water line.

2.6.1. Industrial Wastewater Line Relocation

To allow the development of the Slip and Access Channel, the existing industrial wastewater pipeline will need to be relocated (see Appendix A, Sheet 6-1). The pipeline will be relocated as part of the site clearing, grading, and excavation activities for the Project. Currently, the pipeline carries approximately 500,000 gallons of wastewater per day, which is water that JCEP L.P. purchases from the CBNBWB to keep the ocean diffusers operational. There will be no wetland impacts resulting from the industrial wastewater line relocation. Additional information is provided in FERC Resource Report 1 – General Project Description.

2.6.2. Water Line Relocation

The Roseburg Forest Products terminal currently uses two one-million-gallon water tanks supplied from wells to charge its firewater system. Both of these obsolete tanks will be decommissioned once the Project is placed in service. In order to maintain the water supply to the Roseburg fire water system, a new 12-inch-diameter tap from the existing CBNBWB water line will be made and connected to the Roseburg fire water system (see Sheet 6-1).

The CBNBWB has a potable water line that runs along Trans Pacific Parkway. The CBNBWB also has two raw water lines, one for each of the well fields on the North Spit. One raw water line runs from the well field located to the north of the former linerboard mill site and was the source of water to the mill. A second raw water line connects a well field located to the west of the Project site and to the north of the Trans Pacific Parkway to a water treatment plant. Before the potable water line was constructed, this plant provided the potable water on the North Spit. JCEP L.P. is planning to extend the raw line (before it gets to the treatment plant) to the Project site and to use that water for the concrete batch plant, compaction during site grading (if required), dust suppression during construction, and supplementation of the potable water available for hydrostatic testing as well as any other construction activity requiring water.

Wetlands F and G are considered jurisdictional under Section 402, but as wastewater treatment systems they are not jurisdictional under Section 404. JCEP has coordinated with DEQ on this matter.

2.6.3. Wetland Impacts

No aquatic resources will be impacted as a result of the relocation of the industrial wastewater pipeline. At the lagoon on the west end the new pipeline will tap into the existing pipeline without impacts to resources. The pipeline will be abandoned in place, except where it will be removed where it crosses the proposed slip in uplands.

2.7. Trans Pacific Parkway and Highway 101 Improvements (Sheet 7-1)

To accommodate larger vehicles that will need access to the Project site during construction and operation of the export facility, Trans Pacific Parkway will be symmetrically widened to provide a left-turn lane onto northbound Highway 101. The existing travel lanes are 11 feet wide with less than 1 foot between the edge of pavement and fog line; most areas have a wide gravel shoulder. The proposed improvements would provide a wider turning radius on both sides of Trans Pacific Parkway at Highway 101, two 12-foot travel lanes, a 12-foot left-turn lane, 6-foot shoulders with guardrail, and a 5-foot gravel shoulder on the bay side of the guardrail. Intersection improvement plans are included in Appendix D, Bridge and Roadway Plans.

A sheet pile wall will be installed, as a retaining wall, to minimize fill material in Coos Bay due to road widening. However, the wall will result in permanent impacts below HMT elevation. The wall will be approximately 600 feet long on both sides of Trans Pacific Parkway. Existing riprap will be removed for sheet pile to be driven. Riprap will then be placed back in the bay at the toe of the sheet pile wall for wall protection.

In addition to the improvements at Highway 101, entrances to the project site will be improved at three locations along TPP. Entrance A is located south of Wetland PAN-A; Entrance C is located at Jordan Cove Road; and Entrance D is located south of Horsefall Road and adjacent to Wetland 2012-5. A fourth entrance, Entrance B, was developed but not advanced for further consideration. These entrances already exist but will require improvements to accommodate large truck traffic, equipment and material deliveries, employee access, and safe ingress/egress.

2.7.1. Construction Staging Areas

Short term lane closures at the TPP/Highway 101 intersection are likely to be necessary due to the narrow travel lanes. Construction staging and access is likely to occur on gravel shoulders and in portions of the travel lane. Limited materials will be stored on site due to space constraints. An excavator and crane (for pile driving) will be staged on the road shoulder during widening of the Trans Pacific Parkway/Highway 101 intersection. Riprap will be hauled to a temporary storage site, then brought back to the site for placement. Temporary lane closures are expected during construction of the TPP project site entrances.

2.7.2. Wetland Impacts

A very small portion of tidally influenced wetlands (below HMT) will be impacted due to the symmetrical widening of Trans Pacific Parkway at Highway 101. Permanent wetland impacts will be avoided at the TPP project site entrances. A retaining wall will be constructed on the north side of Wetland 2012-5 to avoid permanent wetland impacts. The retaining wall will result in temporary wetland impacts to Wetland 2012-5. See the Impacts Bulk Upload Template for additional information regarding impact quantities.

2.8. North Point Workforce Housing Project (Sheet 8-1)

The North Point Workforce Housing Project (NPWHP), consisting of housing and amenities for approximately 2,000 workers, will be developed for use during the construction of the Project. This temporary housing will consist of prefabricated, modular buildings with private rooms organized around common areas, including a dining area, exercise facility, and on-site laundry. The workforce housing facilities will be managed by a professional lodging staff who will oversee cleanliness, security, and adherence to strict operational rules. The workforce housing facility will be located on the southern side of Coos Bay, between the Southern Oregon Regional Airport and the Highway 101 Bridge.

CBNBWB will supply water service to the site of the NPWHP. Workforce housing construction will include the addition of permanent underground water mains supplying fire hydrants located on the site. Coordination with the City of North Bend and ODOT is underway regarding traffic impact analyses. Below is a summary of the additional facilities that will be installed at the NPWHP:

- The site will have a permanent connection to the North Bend sanitary sewer system. This will be left in place following the decommissioning of the NPWHP, and will require the upgrading of an outdated lift station.
- Electric power for the camp will be supplied by Pacific Power from a construction power interconnection that will be removed when the NPWHP is decommissioned.
- A bridge (the workforce housing bridge) will provide access to and from the NPWHP (see Appendix A.1, Sheet 8-2A). This bridge will remain as a permanent feature after the NPWHP is decommissioned.

2.8.1. Wetland Impacts

The proposed NPWHP has been configured to minimize wetland impacts to the greatest extent practicable. Fill will need to be placed over Wetland APC-D in order to level out the site and to place the prefabricated modules that will accommodate worker housing.

2.8.2. North Point Workforce Housing Bridge (Sheet 8-2)

The workforce housing bridge will be constructed for the purpose of providing access to and from the NPWHP. The bridge will span a tidal mudflat in Coos Bay at the Al Pierce Company (APCO) property. The proposed single-span bridge will be 200 feet long and nearly 40.5 feet wide. It will include an 8-foot sidewalk on the bridge deck. The bridge will include two concrete abutments on pile supported footings and placed above the elevation of 10.26 feet (NAVD88). Material Stabilized Earth (MSE) walls extending landward from the abutments will eliminate the need for fill material to extend below the HMT or wetlands. Workforce Housing bridge plans are included in Appendix D.

2.8.2.1. Construction Approach

Construction of the new NPWHP bridge will begin with construction of a temporary work bridge. The temporary work bridge will be approximately 30 feet wide and 280 feet long with seven 40-foot spans. The temporary work bridge will be placed north of the proposed NPWHP bridge. It is likely that the temporary work bridge will use three steel piles per bent with a steel frame and a steel or concrete bridge deck. The temporary work bridge will begin and end in dry land. The end bents will be outside the HMT boundary, while five of the interior bents, including 15 steel piles will be installed below HMT. Steel pile will be driven and pulled with a vibratory hammer to minimize potential barotrauma impacts to fish. The piles may be tested with impact pile drivers to determine if they are properly set. The temporary work bridge approaches and access road will be gravel. The temporary work bridge will be in place for less than 24 months.

The steel plate girders for the new bridge will be assembled and installed on site. Precast deck panels will be installed between each of the four steel girders. A cast in place concrete deck will be poured over the steel girders and deck panels. Finally, a walkway will be constructed on the south side of the bridge and rails will be installed on both sides. No cofferdams will be needed.

2.8.2.2. Wetland Impacts

The proposed NPWHP bridge has been configured to minimize temporary wetland and tidal waters impacts to the greatest extent practicable and avoid permanent wetland impacts. This bridge design proposes only temporary impacts to tidal waters of Coos Bay. Temporary impacts are estimated to have a duration of less than 24 months. Refer to the Impacts Bulk Upload Template for all temporary wetland and waters impacts.

2.9. Temporary Facilities (Figure i-3)

Temporary facilities required during construction of the Project are shown in Appendix A, Figure i-3.

2.9.1. Heavy Equipment Haul Road

A heavy equipment haul road is required to transport large modules and equipment from the barge berth on the east side of the slip to the Mill Site/South Dunes Site. To prevent the need for the haul road, an additional barge berth would need to be placed south of the Mill Site/South Dunes Site. This additional barge berth at the southern end of the Mill Site/South Dunes Site was evaluated and was determined infeasible, because it would result in significant impacts to mudflat and eelgrass habitats due to the shallow bathymetry in this area.

The use of Jordan Cove Road to transport modules/heavy equipment during Project construction does not pose a safety or operational threat to Roseburg Forest Products due to a very low trip frequency. Only an approximate 50 trips total during Project construction would be required to transport modules/heavy equipment to the Mill Site/South Dunes Site. As such, disruption to Roseburg Forest Products operations will be minimized to the greatest extent practicable through close coordination with Roseburg Forest Products staff.

2.9.1.1. Wetland Impacts

The heavy equipment haul road will not result in any wetland impacts.

2.9.2. Excavated Material Haul Road

A 60-foot-wide excavated material haul road that accommodates two-way traffic from the excavation site (Ingram Yard/LNG Liquefaction and Terminal Site and the slip) to the disposal site (Mill Site/South Dunes Site) is critical to meeting the ODFW-approved in-water work window (October 1 through February 15). Additionally, the excavated material haul road east of Jordan Cove Road would serve as the laydown area for the hydraulic dredge line, which would transport dredge material from the slip to the proposed disposal site location at the Mill Site/South Dunes Site.

Currently, approximately 200 trucks per day use Jordan Cove Road to transport wood chips in and out of Roseburg Forest Products. Excavated material haul truck trip frequency would be approximately 10 to 15 trucks per hour (estimated based on 100-ton haul trucks). Therefore, the use of Jordan Cove Road to transport excavated material/sand from the slip to the Mill Site/South Dunes Site presents a potential conflict with the operations and wood chip truck maneuvering of Roseburg Forest Products. The route will not cross Trans Pacific Parkway at any time, and only one crossing with Jordan Cove Road is proposed. At this crossing, wood chip truck traffic will be given the right-of-way over haul truck traffic by using flag men to halt haul truck traffic until passing vehicles have passed the intersection. The excavated material truck haul road will be on JCEP L.P.-owned land, and the hauling activities will not cause any additional effects other than those associated with the access/utility corridor.

Throughout the duration of project construction, the excavated material haul road will be used to transport excavated material to the Mill Site/South Dunes Site, because the proposed utility corridor/access road bridges would not be able to support these haul trucks. To ensure safe and efficient maneuvering, the excavated material haul road requires specific slopes, resulting in a relatively wide fill prism in certain areas, as shown in Appendix A, Sheets 3-2A and 3-3A.

The excavated material haul road must be at least 60 feet wide to accommodate haul trucks moving through two-way traffic. If two-way traffic is not accommodated, an alternate one-way haul road would be required, potentially impacting additional wetlands.

2.9.2.1. Wetland Impacts

The excavated material haul road will result in temporary wetland impacts. Project construction logistics require the excavated material haul road to be in place for greater than 24 months. Temporary impacts will occur to Wetland 2013-6, Wetland 2012-2, Wetland C, and Wetland E. These impacts have been previously discussed in Sections 2.3.2.2 and 2.3.3.2.

Estimated project start date:	October 2015	Estimated project completion date:	Spring 2018

(5) Project Impacts and alternatives

Alternatives Analysis:

Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland. (Include alternative design(s) with less impact and reasons why the alternative(s) were not chosen. Reference OAR 141-085-0565 (1) through (6) for more information).*

Please see FERC Resource Report 10 – Alternatives for information regarding the various alternatives that were evaluated for the Project.

Measures to Minimize Impacts

Describe what measures you will use (before and after construction) to minimize impacts to the waterway or wetland. These may include but are not limited to the following:

- *For projects with ground disturbance include an erosion control plan or description of other best management practices (BMP's) as appropriate. (For more information on erosion control practices see DEQ's Oregon Sediment and Erosion Control Manual)*
- *For work in waterways where fish or flowing water are likely to be present, discuss how the work area will be isolated from the flowing water.*
- *If native migratory fish are present (or were historically present) and you are installing, replacing or abandoning a culvert or other potential obstruction to fish passage, complete and attach a statement of how the Fish Passage Requirements, set by the Oregon Department of Fish and Wildlife will be met.*

Since the inception of the Jordan Cove Energy Project in 2005 there has been a clearly outlined philosophy to avoid impacts of any and all wetlands. This having been said, it was also known that due to the "water dependent" character of a liquefied natural gas facility, whether import or export, there would be a conflict with this philosophy created by the need to move ocean going vessels into a berth that does not currently exist in the Coos Bay estuary. The size of the vessels used to transport LNG requires a berth of at minimum 1,000 feet of overall length. No such berth exists in the lower Coos Bay, the only area where vessels of this size can transit due to constraints imposed by the railroad bridge located at RM 9.2

During the original LNG JPA filed in 2009 the footprint of the project covered essentially the area as is now impacted in the current JPA. The primary difference, however, is in the fact that the Import JPA utilized the eastern portions of the project site (Mill Site, aka South Dunes Site) solely for the purpose of disposal of dredge spoils generated by the construction of the slip and access channel. During the Import JPA there were zero acres of freshwater impact on the Mill Site and only a fraction of an acre of freshwater wetlands impacted at the Port stockpile site where dredge spoils were temporarily staged prior to sale and removal for use as construction sand. This Port stockpile site is no longer used as the entire dredge spoils are now used on the proposed Project footprint to raise the site elevation above the tsunami inundation level, an elevation of nominally +46 feet MSL.

When the project transitioned from Import to Export, the current project configuration, the equipment footprint for the necessary facilities roughly doubled in size with the Mill Site, formerly used only for dredge spoils disposal, now needing to be raised and graded to a tsunami resistant height of +46 feet MSL to become the platform for a 420MW power plant, administration building, natural gas conditioning complex and Southern Oregon Regional Safety Center or SORSC (fire station and sheriff's substation). In addition there was the need to create a road and utility corridor that was also tsunami resistant at an elevation of +46 feet MSL that connects the SORSC with the LNG Terminal and the South Dunes Power Plant. This entire complex now requires rigorously defined equipment spacing among the SORCS, gas conditioning plant, power plant, and administration building. All of these safety regulation spacing requirements require creative use of the available real estate, particularly on the Mill Site, the location of the former Weyerhaeuser paper mill that contained numerous small freshwater wetlands dispersed throughout the property in such a manner that there was no way JCEP L.P. could find to preserve these small discontinuous wetlands and meet all of the safety spacing requirements, and achieve the tsunami resistant placement of the facilities.

The following is a list of additional measures specific to project components including design alternatives and BMPs that further minimize unavoidable impacts:

Large Module Transport, Materials, and Equipment Delivery

1. Final transportation to the Project site will be undertaken by road, rail, and possibly marine transport. An existing rail line is located adjacent to the Project site. The kinds of materials and the mode of delivery to the site will depend on the origin, size, and weight of the material. It is anticipated that the larger and heavier pieces of equipment will arrive by marine transport.
2. Traffic surveys have been conducted of the anticipated construction-related traffic, and appropriate measures have been proposed to mitigate adverse effects, as applicable, such as symmetrical widening at the Trans Pacific Parkway and Highway 101 intersection. (Most heavy/oversized equipment will be delivered by marine transport to a barge berth adjacent to the Slip and Access Channel.)
3. Fuel storage and equipment servicing areas will be located at least 100 feet from wetlands and waterways, unless full containment of potential contaminants is provided.
4. Track-mounted equipment, large cranes, and other equipment whose limited mobility makes it impractical to move them for refueling will take precautions to minimize the risk of fuel reaching wetlands and waterways.

LNG Facilities

1. Temporary ditches, sediment fences, and silt traps will be installed as necessary as the site is cleared, filled, and graded.
2. Before filling the LNG storage tanks, the hydrotest water source will be tested to ensure that the water will meet all applicable code requirements and to prevent discharge of contaminated water.
3. In each case the small amount of water that remains in the tank after the bulk transfer/emptying operation has taken place will be treated so that it meets discharge water quality criteria prior to discharge.
4. A 50-foot buffer will be maintained between the LNG terminal and the east edge of the Henderson Property. There will be no encroachment into the buffer.

Utility Corridor/Access Road

1. A wall will be installed along the utility corridor west of Jordan Cove Road to avoid impacts to Wetland D. The face of the wall will be set back approximately 20 feet from the wetland boundary. There will be no temporary impacts to Wetland D as a result of wall construction.
2. Retaining walls will be constructed to avoid permanent impacts to Wetland 2013-1 and 2013-2.
3. Bridges will be constructed along the utility corridor on both the west side and the east side of Jordan Cove Road to avoid wetland impacts to the greatest extent practicable. BMPs will be implemented during bridge construction to minimize temporary impacts to wetlands as much as possible.
4. No bridge bents will be placed and no excavation will occur in Wetland C, which will be partially filled to avoid cultural resource impacts.
5. The contractor will follow BMPs for in-water installation of green concrete during construction of the concrete slabs, abutments, or other pier structures.

Rail Relocation

1. A permanent bridge will be installed to span Wetland 2012-4 and minimize impacts to the greatest extent possible. A temporary bridge will be installed to minimize the construction-related impacts of the permanent bridge.
2. A wall will be installed adjacent to the rail bridge relocation area. The face of the wall will be set back approximately 10 feet from the wetland boundary. There will be no temporary impacts to Wetland 2012-4 as a result of wall construction.

On-site Roadways and Parking Lots

1. Stormwater collected in areas that have no potential for contamination will be allowed to flow or be pumped directly to a system of stormwater ditches, which ultimately drain to the slip.
2. Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped or will flow to the oily water collection sumps. Collected stormwater from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline (see FERC Resource Report 1).

South Dunes Power Plant

1. Retaining walls on the north side of Wetland 2012-5 will avoid permanent wetland impacts.
2. Areas where ground improvements occur in wetlands outside the toe of slope will be restored to pre-project wetland conditions.

Trans Pacific Parkway Improvements

1. All piling used to construct the soldier pile walls will be concrete or steel piling; no treated timbers will be used.
2. All stormwater runoff at Trans Pacific Parkway/Highway 101 will be treated using water quality manholes or cartridge systems.
3. Project specifications will require pile to be driven using a vibratory hammer to the extent practicable to prevent noise impacts to humans, and fish and bird species. The piles may be tested with impact pile drivers to determine if they are properly set.
4. Construction of a retaining wall at Trans Pacific Parkway/Highway 101 will minimize fill impacts due to widening.
5. Retaining walls will avoid permanent wetland impacts at Trans Pacific Parkway entrances to the project site.

North Point Workforce Housing Project (NPWHP)

1. A single-span bridge that avoids permanent impacts is proposed to connect the mainland to the island.
2. All piling used to construct the soldier pile walls will be concrete or steel piling; no treated timbers will be used.
3. Water that comes into contact with green concrete during pouring of the concrete deck will be pumped into Baker Tanks for disposal at an approved location.
4. Project specifications will require pile to be driven using a vibratory hammer to the extent practicable to prevent noise impacts to humans, and fish and bird species. The piles may be tested with impact pile drivers to determine if they are properly set.

Erosion Control

1. Areas disturbed by construction of the Project facilities will be stabilized with temporary erosion controls until construction is complete, unless covered by equipment, gravel or other covering.
2. Staging areas and access roads will comply with National Pollution Discharge Elimination System (NPDES) and other permitting requirements that pertain to erosion and sediment control and pollution control.
3. Following construction and where appropriate, the site will be final graded, and BMPs will be applied to prevent erosion.
4. To minimize the potential for erosion, JCEP L.P. has modified the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures), creating Project-specific Plan and Procedures. A copy of the Project-specific Procedures is provided in Appendix C.2 of FERC Resource Report 2 – Water Use and Quality and a copy of the Project-specific Plan is provided in Appendix B.7 of FERC Resource Report 7 – Soils.
5. After water line and wastewater line installation, sites will be graded and re-seeded to the extent practicable to comply with anticipated 1200-C requirements.
6. Disturbed areas not already covered by equipment, such as long-term exposed slopes, will be stabilized with a seed mixture specified by the Natural Resources Conservation Service (NRCS) as being capable of surviving in highly permeable, xeric regimes, binding loose sand, and withstanding burial and deflation from Aeolian processes, as appropriate.
7. Native species will be used and if any non-native species are required for specific problem areas, species will be selected that will not become nuisance species to the surrounding areas.
8. Fertilizers will be prohibited within 150 feet of wetlands and waterways except when required to vegetate slopes that are close to wetlands and waterways for the purposes of stabilization and erosion control. If fertilizers are applied to vegetated slopes that are closer than 150 feet away from wetlands and waterways, then BMPs (e.g., silt fences, straw bales, earthen berms, etc.) will be implemented to prevent fertilizer from entering the wetland or waterway.

LNG Carriers

1. LNG carriers will average five knots within the Coos Bay Navigation Channel. At this speed, the LNG carriers do not create waves that are any greater than the waves generated by the more than 200 deep draft vessels per year that once called on the Oregon International Port of Coos Bay. During this peak period of ship activity, no excessive channel erosion was reported. Accordingly, with the lack of channel erosion under previously higher shipping levels and of appreciable wakes at the speed limitation of the LNG ships anticipated for the channel, no excessive erosion due to LNG ships is anticipated. Therefore no measures for protecting the shoreline are anticipated. Extensive hydrodynamic modeling has confirmed this assertion and is provided in FERC Resource Report 2 – Water Use and Quality, in Appendix H.2.
2. A Ship-Strike Mitigation Plan has been developed as part of the BA to minimize potential ship strikes to cetaceans, and possibly other listed (Steller sea lion, sea turtles) and non-listed marine species by LNG carriers.
3. An LNG Management Plan has been developed as part of the BA to minimize risk of spills and releases at sea (see the BA for additional details).
4. Mandatory USCG regulations for ballast water in LNG carriers would be fully complied with to minimize potential introduction of exotic species.
5. Thermal impacts from vessel discharge (both cooling and ballast water) will be minimized by natural tidal cycles and localized mixing.

Barge Berth and Access Channel Construction

1. All permanent and temporary fill associated with barge berth construction will be placed during the approved ODFW in-water work window (October 1 through February 15) to minimize potential impacts to fish species through the avoidance of vulnerable salmonid life stages and peak migration periods. Due to the nature of the fill material and tidal conditions, slope armoring/erosion control measures will not need to be implemented around the temporary fill (see the C&H Engineering Report). It will take between two and three weeks to place both the permanent fill (approximately 22,000 CY) and temporary fill (approximately 5,000 CY) for the barge berth. This fill material will be pushed outward from the shoreline towards the access channel.
2. Additional temporary fill will be placed outside of the barge berth bulkhead face to (1) create a "dry" environment for pile driving, and (2) provide access to construct the bulkhead structure and therefore eliminate the need to install a pile-founded work trestle or to use barges for access (which would require additional dredging).
3. All piles will be driven "in the dry" in order to minimize acoustic disturbances to fish and aquatic species. Also, creation of this "dry" environment will allow for piles to be driven outside of the approved ODFW in-water work window, if necessary (additional coordination and consultation with ODFW and NMFS is underway). Driving the sheet pile for the barge berth bulkhead structure will take approximately 16 weeks (assuming a double shift construction schedule).

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

4. BMPs will be installed around the additional temporary fill if turbidity exceeds permitted levels.
5. Any additional temporary fill placed beyond the area of permanent impact of the access channel will be dredged during the approved in-water work window and restored to pre-construction conditions. Dredging/removal of this additional fill material will take approximately one day.

Snowy Plover Impact Minimization Measures

The stockpiling of material dredged from the slip at the Port Stockpile Site was going to occur when the Project was first planned as an import facility. Because of the snowy plover population on the North Spit, there was a concern that this Port Stockpile Site could attract snowy plover individuals from this population. To address this concern, JCEP L.P. participated in the development of a number of conservation measures to reduce the potential effects on the North Spit snowy plover population due to the construction of the Project. Although the construction activity that was of the greatest concern for the snowy plover population is no longer part of the Project, and therefore the Project will not have direct impacts to snowy plover habitat or populations, JCEP L.P. will still commit to the proposed conservation measures as described in the following paragraphs (see the BA and FERC Resource Report 3 for additional details):

1. Current management activities and use restrictions within the Coos Bay North Spit Recreation Management Area relative to the snowy plover population include:
    a. Predator management (i.e., nest enclosures, lethal and non-lethal predator removal, and hazing);
    b. Symbolic fencing (ropes and signs installed around nesting areas);
    c. Habitat restoration (removal of European beachgrass, placement of shell hash, maintenance of gaps through the dunes);
    d. Public outreach and education provided by Bureau of Land Management (BLM) staff;
    e. Monitoring of snowy plover populations; and
    f. Recreational use restrictions in place from March 15 to September 15 each year, including:
        i. Seasonal re-routing of the foredune road;
        ii. Vehicles, camping, and dogs are prohibited; and
        iii. Kite flying would be prohibited under the draft conservation plan; and
    g. Non-prohibited recreational use (i.e., jogging, beach combing, horseback riding) is restricted to the wet sand outside of roped and signed breeding areas.

In addition to these conservation measures, JCEP L.P. has agreed to mitigate Project impacts to western snowy plovers through implementation of BMPs and education and outreach programs. Increased predator density related to increased human presence and habitat removal was identified as a potential concern related to Project construction. JCEP L.P. will address these concerns through the following BMPs:

1. Staff will be trained on snowy plover regulations, recreational use restrictions, and conservation measures in the area such as controlling litter, avoiding nesting and foraging areas, keeping pets on a leash, and remaining on established roads and trails (see Appendix K of the 2001 Plover Recovery Plan; FERC BA). The training program may be implemented by state/local agencies (such as the Oregon Coast Aquarium, National Park Service, Western Snowy Plover Working Team, or Oregon Coast Community College) or an appropriate entity that may have pre-existing experience in plover education and outreach programs.
2. Environmental training will also be provided to operational personnel to ensure that all personnel are aware of and comply with the management tools in place to affect the recovery and maintenance of the snowy plover population on the North Spit. Printed educational materials would be posted at the Project site for the life of the LNG terminal. Materials would also be distributed to existing North Spit employers for their use in training their personnel. The types of educational materials may vary, but could include posters, table tents, maps, brochures, or fact sheets. Numerous sources for existing educational materials are provided in Appendix K of the Plover Recovery Plan.
3. Interpretive signs, education materials, and kiosks will be posted at the LNG facilities or other approved locations.
4. JCEP L.P. will fund one additional entry-level Wildlife Services position dedicated to snowy plover predator monitoring and control during the 42-month construction period. This additional position would allow Wildlife Services to better evaluate predator densities and more quickly and effectively respond in the unlikely event that predator pressure on the Coos Bay North Spit increases during Project construction.
5. During construction and operation, the facility will be kept clear of construction debris, food wastes, and garbage that could attract snowy plover predators.
6. The dredged material placement areas will be regularly policed to ensure that no denning is occurring in the hillocks. This should not be as significant a concern as it was previously for the Port Stockpile Site, because these placement areas will be continuously disturbed as part of Project construction, which will discourage use by individual birds. However, if necessary, nylon mesh or other exclusion fencing would be installed around the perimeter of the placement areas to prevent the establishment of coyote or skunk dens until the slopes are stabilized or constructed upon.
7. Covered, animal-proof receptacles will be provided in eating and break areas, parking lots, and at appropriate locations around the construction site. Construction site areas will be policed on a daily basis to remove any food or other debris left by construction workers. During operations, the Project site would be regularly inspected to ensure that no garbage is allowed to accumulate.
8. Structures associated with the Project will be monitored to discourage use by avian predator species. Frequent inspections will ensure that nests are not being constructed, and any nest that was found would be removed immediately. It is anticipated that there would be sufficient inspections and other activities mandated by safety and security requirements to keep the structures nest-free. However, in the unlikely event that a nest becomes established and it is not discovered until young birds are present, the disposition of the nest would be handled in accordance with the provisions of the Migratory Bird Treaty Act.

<u>SLIP AND ACCESS CHANNEL IMPACT MINIMIZATION MEASURES</u>

Timing of Dredging Activities

1. All in-water work associated with the proposed Project, including dredging of the access channel and barrier berm removal, will be conducted during the approved in-water work period for Coos Bay (October 1 to February 15) to minimize potential impacts to fish species through the avoidance of vulnerable salmonid life stages and peak migration periods.
2. To minimize the impacts of construction of the marine facilities on fisheries, reduce the total period of estuary turbidity, and extend the time available for construction, a two-phase construction methodology will be used to construct the slip: (1) the upland phase and (2) the in-water work phase.
3. Phase 1, the upland phase, will consist of excavation and dredging of the slip, which will be isolated from Coos Bay by an earthen barrier berm and therefore will not be subject to the ODFW in-water work window. The berm will be removed during the approved in-water work period (October 1 to February 15) to minimize effects of turbidity on sensitive fish and invertebrate resources.

Upland Slip Excavation Erosion Control Measures

1. Excavation of most of the material from the slip will be completed behind a barrier berm and therefore will not be subject to the ODFW in-water work window.
2. Only material essential for creating the slip and constructing upland structures and only surfaces that need to be recontoured to accommodate the slip or supporting structures will be grubbed and cleared. All areas where the existing topography can be maintained will be kept in the current, natural state.
3. Material from the slip will be placed in two upland areas—the South Dunes Power Plant Site and the LNG Liquefaction and Terminal Site—and will be used as permanent filling to raise the site elevation to +30 as required for the Project. No permanent/long-term disposal sites are anticipated by the Project. Should there be a need, these permanent disposal sites will be stabilized using a seed mix to minimize windblown sand from being deposited on roads, upland habitats, and waterways.
4. A 50-foot buffer along the east border of Henderson Property will be maintained in order to avoid both permanent and temporary wetland impacts at Henderson Property. There will be no encroachment into the buffer. Henderson Property will be fenced with construction fencing to prevent equipment from entering and with erosion control fencing to prevent any soils from being deposited in the wetland.

Dredging

1. Dredging of the Access channel and slip would be performed primarily with a cutter-head suction dredge to minimize turbidity and during the approved in-water work window.
2. The dredge cutter head, potentially operated from a barge, will be held at the substrate level to the extent practicable. The intake will be raised no more than a maximum of three feet above the sediment surface for brief periods of purging or flushing the intake system.
3. Material removed by the hydraulic cutter-head suction dredges will be sent to the South Dunes Site and the LNG Liquefaction and Terminal Site.
4. The hydraulic dredge transport pipeline for hydraulic transportation of excavated materials (including the decant water return line) will follow the shoreline of the Roseburg Forest Products chip loading facility and will not result in additional land disturbance. It will be approximately 8,650 feet long, with an approximate construction right-of-way width of 8 feet and will be placed directly on the ground surface from the slip site across the Roseburg Forest Products property until the point where it follows the route of the future access/utility corridor.
5. At the point that the hydraulic dredge transport pipeline follows the access road/utility corridor eastbound, it will be covered with the fill used to develop the access road/utility corridor. No excavation of the existing ground surface will occur to install the pipelines, because the pipelines will be placed on fill material and temporarily covered by additional fill material. Where not covered, the pipelines will be held in place by cross bracing anchored into the soil. In the area of the Roseburg Forest Products chip ship berth, the pipeline will be placed on the riprap along the shoreline so that it does not affect the docking and loading of the wood chip vessels.
6. The hydraulic dredge transport pipelines will be able to span any affected wetlands or water bodies without the need to place any structures in the wetlands or water bodies.
7. The hydraulic dredge transport pipeline will be a fused polypropylene (seamless) pipeline and will be provided with secondary containment at wetland crossings (if any) or in areas adjacent to water bodies (e.g., the bay) to ensure that those water bodies will not be affected by any breaks or leaks.
8. If mechanical dredging is required in the bay, a close-lipped clamshell bucket will be used that seals around its edges to minimize the potential for entrainment of listed fish species and minimize turbidity and contaminant releases to the water column. Dredging during the freshwater phase would not require use of a close-lipped clamshell dredge since the work area would be isolated from the bay.
9. If used, the clamshell bucket will be lowered and raised slowly through the water column to reduce potential for entrainment of fish species and minimize turbidity increases.
10. None of the material collected in the bucket will be allowed to return to the waterway.
11. Any large man-made debris that is removed with the dredged material will be transported to an appropriate disposal site.
12. Dredging and Global Positioning System (GPS) software will be utilized to model the dredge prism and track previously dredged areas to ensure that dredging efficiency is maximized.
13. A post-dredge bathymetry survey will be conducted to ensure that only the material that was identified to be dredged was removed to the proper, authorized depth.
14. Construction lighting during dredging and other in-water work activities and safety lighting for the slurry pipeline will meet all USCG requirements but will not be intense enough or result in sufficient illumination to cause significant biological effects.

Disposal

1. The dredged material will be handled in a manner consistent with local, state, and federal regulations. No significant reduction in quality or quantity of riparian habitat at a disposal site will occur.
2. Permanent or long-term disposal sites will be stabilized using a seed mix to minimize windblown sand from being deposited on roads, upland habitats, and waterways.
3. The South Dunes Site, LNG Liquefaction and Terminal Site, and stockpile locations will be contained by berms, and will be sufficiently large to dewater the dredge slurry. With the exception of the maintenance dredged material, no in-water disposal of dredged material or re-handling activities will occur in Coos Bay.
4. In the case of fresh (low salinity) decant water from material dredged behind the berm, the water that doesn't percolate into the sand below will be returned to the dredge pocket, thus eliminating impacts to Coos Bay at the disposal site location.
5. In the case of saline decant water from material dredged to remove the barrier berm, the decant water that doesn't percolate into the sand below will be discharged to the slip via a submerged outfall pipe, thus reducing impacts from increased turbidity.
6. In the case of saline decant water from material dredged to dredge the access channel, the decant water that doesn't percolate into the sand below will be discharged in proximity to the Mill Site/South Dunes Site via a submerged outfall pipe, thus reducing impacts from increased turbidity.
7. If maintenance dredge material is transported via barge to Site F a bin-barge with one or multiple cells or flat-deck barge with watertight sideboards will be used to enclose the dredged material, including sediment and water. No material will be allowed to leak from the bins or overtop the walls. The barge will be loaded so that enough of the freeboard remains to allow for safe movement of the barge and its material on its planned route to the approved disposal facility.

In-water Dredging Turbidity Minimization Measures

1. The following measures will be implemented to reduce turbidity impacts resulting from dredging activities:
    a. Testing Procedures – to ensure procedures are consistent and accurate.
    b. Water Quality Monitoring – to be performed during in-water activity to ensure compliance with federal and state standards.
    c. Corrective Measures – If testing results indicate out-of-compliance situations, work will cease until corrective actions are taken.

Acoustic Disturbances

1. All pile work is planned to be performed "in the dry" with vibratory hammers. However, if any pile needs to be driven in Coos Bay waters, it will be done during the approved in-water work window, and if necessary, appropriate noise reductions measures will be implemented.
2. Use of impact hammers for sheet pile installation is not planned; however, if necessary, impact hammers will be used behind the barrier berm and outside of Coos Bay waters, entirely "in the dry" within upland areas.

Slip Design

3. All piling will be concrete or steel piling; no treated timbers will be used.
4. The slip has been designed to avoid direct impacts to Henderson Marsh, located to the west.
5. A 50-foot buffer will be maintained between the slip and the east edge of Henderson Marsh. There will be no encroachment into the buffer.
6. The bank slopes of the Slip and Access Channel will be appropriately designed to help prevent erosion.
7. Impact hammers may be used to drive pile in non-fish bearing waters and in the dry where site conditions aren't conducive to vibratory means.
8. Limited use of impact hammers may be required to proof pile where pile is installed in fish-bearing waters during the in-water work window. Mitigation measures (e.g., sound attenuation measures) would be used to minimize impacts to fish.

Marine Structures

1. Land-based mobile cranes with pile driving equipment will be located on the land side of the OPEN CELL® sheet pile walls, entirely within upland areas.
2. Any piling for the LNG loading structure or mooring dolphins will be driven on the land side of the OPEN CELL® sheet pile walls, entirely "in the dry" within upland areas.

Shoreline Erosion Protection and Prevention

1. Where necessary, the slip shoreline will be protected from wave action, wind erosion, propeller wash, and rainfall runoff using an appropriate method (e.g., stone, articulated block reinforcement).
2. For the portion of the slip, including the area above +25 feet NAVD88, that is not expected to be subjected to wind wave and water level conditions under operating conditions, alternative erosion protection means will be used. This area may be protected using appropriate BMPs (e.g., CCMs, grout-injected geotextile fabric mattresses (fabriform), and/or geotextile reinforced vegetative planting). In addition, hydrodynamic modeling has indicated that during peak periods of ship activity, no excessive channel erosion is expected. Therefore, no measures for protecting the shoreline of the Project site are anticipated.

Spill Prevention and Design

1. The contractor will follow BMPs for in-water installation of green concrete during construction of the concrete slabs, abutments, or other pier structures.
2. All equipment used will be clean and inspected daily prior to use to ensure that the equipment has no fluid leaks. Should a leak develop during use, the leaking equipment shall be shut down and not used again until it has been adequately repaired. At no time will any fuels or oils be allowed to enter any water body.
3. Floating spill containment booms and absorbent booms will be maintained on-site during all phases of construction to facilitate the cleanup in the case of accidental spills. Containment booms will be installed in instances where there is a potential for release of petroleum or other toxic substances. Absorbent booms will be deployed within the containment boom if sheen is observed.
4. A spill prevention, control, and containment plan will be prepared and implemented. Location of vehicles, equipment and fuel storage areas, and fuel containment measures will be approved and monitored by a contractor-designated Environmental Manager.

Site Restoration

1. Following the Slip and Access Channel dredging activities and site filling activities, long-term exposed slopes will be stabilized with a seed mixture specified by the NRCS as being capable of surviving in highly permeable, xeric regimes, binding loose sand, and withstanding burial and deflation from aeolian processes.
2. Native species will be used and, if any non-native species are required for specific problem areas, species will be selected that will not become nuisance species to the surrounding areas.
3. The slurry and decant water pipelines will be removed, and any areas disturbed by these pipelines will be restored to pre-construction conditions.

Mitigation

Proposed conservation and mitigation actions that would be implemented as part of the Project to compensate for the loss of eelgrass and unvegetated mudflat habitat are expected to more than offset the losses incurred during Project construction. Mitigation details are provided in the October 2014 Compensatory Wetland Mitigation Plan.

Description of resources in project area

Ocean	☐	Estuary	☒	River	☐	Lake	☐	Stream	☐	Freshwater Wetland	☒

Describe the existing **physical and biological characteristics** of the wetland/waterway site by area and type of resource (Use separate sheets and photos, if necessary).

For wetlands, include, as applicable:

- *Cowardin and Hydrogeomorphic(HGM) wetland class(s)**
- *Dominant plant species by layer (herb, shrub, tree)**
- Whether the wetland is freshwater or tidal
- *Assessment of the functional attributes of the wetland to be impacted**
- Identify any vernal pools, bogs, fens, mature forested wetland, seasonal mudflats, or native wet prairies in or near the project area.)

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

For waterways, include a description of, as applicable:

- *Channel and bank conditions**
- *Type and condition of riparian vegetation**
- *Channel morphology (i.e., structure and shape)**
- *Stream substrate**
- Fish and wildlife (type, abundance, period of use, significance of site)
- *General hydrological conditions (e.g. stream flow, seasonal fluctuations)**

See attached Map of Wetlands, Impacts, and Mitigation Areas (Figure i-2, Sheet 1) for a complete map of delineated wetlands within the project vicinity.

Estuarine Wetlands

The Project reach of Coos Bay consists of a relatively narrow intertidal and shallow subtidal bench that drops off abruptly where it meets the adjacent main navigation channel. The Project will impact intertidal and shallow subtidal estuarine resources along this narrow bench. Eelgrass beds occur as linear beds along estimated elevation contours of +1.0 to -1.0 meters MLLW. The majority of the eelgrass beds are of medium to high density (i.e., at least 40 percent cover). Unvegetated sand/mudflat occurs in the shallowest areas.

The hydrogeomorphic (HGM) class of wetlands to be impacted by the Project is “estuarine fringe,” which extends down to a depth of 2 meters (6.6 feet) or approximately mean daily lower tide. No HGM class is provided for resources below the 2-meter depth. Cowardin classes of site resources include estuarine, intertidal, unconsolidated shore, regularly flooded (E2USN), and estuarine, subtidal, unconsolidated bottom, subtidal (E1UBL).

Impact quantities are provided in the Impacts Bulk Upload Template.

Freshwater Wetlands

Historically, the wetlands in the general Project vicinity consisted of interdunal freshwater wetlands and estuarine salt marsh and mudlfats. However, considerable development and land alterations have occurred in much of the proposed Project area over the past century or so. Current-day freshwater wetlands, particularly those being impacted by the proposed Project, now consist of a combination of remnant wetlands surrounded by adjacent fill material and new wetlands that formed on top of fill. Two wetlands, F and G, which are not regulated under Section 404, were designed to be sludge ponds to support a mill that formerly occupied the property. Most wetlands are of the depressional HGM class, with hydrology primarily driven by the regional groundwater table. Vegetation types, based on the Cowardin classification system, include palustrine forested, scrub-shrub, and emergent communities. Plant communities are dominated by native species, with generally low presence of non-native species. Bordering uplands typically consist of sandy fill dominated by non-native grasses and shrubs or concrete/paved surfaces from past development activities. A few upland areas contain second growth native forest.

Impact quantities are provided in the Impacts Bulk Upload Template.

Essential Fish Habitat

Coos Bay is designated as Essential Fish Habitat (EFH) for several Coastal Pelagic Species (CPS), West Coast Groundfish, and Pacific Salmon. After careful analysis of the life histories and EFH requirements for species that could potentially be impacted by the proposed project, the Biological Evaluation (BE)/BA concluded that the potential direct, indirect, and cumulative effects of the proposed project actions are “likely to adversely affect" EFH in the short term. The implementation of proposed conservation and mitigation measures would minimize short-term impacts and help ensure that there are no adverse long-term impacts to EFH for these species. No significant long-term effects to EFH were identified or anticipated.

*Describe the existing **navigation, fishing and recreational** use of the waterway or wetland.**

Coos Bay is used for commercial shipping (primarily timber products). Recreational boating, fishing and clamming also occur in the bay and along its shores; however, the beach area at the slip location is not highly used (compared to other areas) for clamming. Commercial fishermen operate out of Coos Bay; commercial oyster farming also occurs in the bay.

The shoreline at the proposed site is industrial property and access to this area is limited for safety reasons.

Site Restoration/Rehabilitation

- *For temporary disturbance of soils and/or vegetation in waterways, wetlands or riparian areas, please discuss how you will restore the site after construction including any monitoring, if necessary**

Generally, all temporary disturbances to wetland and upland areas will be rectified and restored to pre-project conditions. Temporary disturbance to estuarine and freshwater resources is anticipated in these following areas:

1. Temporary estuarine impacts at the Barge Berth will occur as a result of placing fill material to construct the Barge Berth sheet pile wall. Temporary fill material will be removed and the area will be restored to pre-project contours.
2. Temporary estuarine impacts at the Highway 101/Trans Pacific Parkway Intersection are due to temporary removal of riprap so that sheet pile can be driven beneath the elevation of the existing riprap fill material. Following sheet pile driving, riprap will be placed back in the same location to protect the existing roadway embankment and sheet pile wall.
3. Temporary freshwater wetland impacts will result at the railroad bridge in Wetland 2012-4 due to temporary work bridge pile. These pile will be removed following construction, less than 24 months following their original placement. It is assumed that the sandy soils will naturally backfill the pile voids and rectification, aside from pile removal, is not necessary.
4. Temporary freshwater wetland impacts will result from construction of the Utility Corridor Access Road Bridge at Wetlands 2013-6, C, and E. As in Wetland 2012-4, temporary pile used for a work bridge will be removed upon project completion. These minor impacts are expected to naturally backfill.
5. Temporary freshwater impacts will occur to Wetlands 2013-1 and 2013-2 as a result of constructing retaining walls to avoid permanent impacts to these wetlands along the Utility Corridor/Access Road. Temporary access to the base of the walls is anticipated for their construction.
6. Minor estuarine impacts will result from a temporary pile-supported work bridge at the North Point Workforce Housing Bridge. Approximately 15 round steel pile will be in place for less than 24 months.

7. While construction of permanent facilities is not anticipated beyond the toe of the fill slope, perimeter site preparation activities, installation and maintenance of erosion and sediment control measures and ground improvements adjacent to the toe of slope may cause settlement or temporary disturbances beyond the toe of slope. If temporary disturbances or settlement in wetlands does occur and is determined to be detrimental to wetland functions and values, then the site will be returned to its pre-construction condition using the following measures: a) alleviate compaction by cultivating the area within 12 inches of the surface, b) return the area to pre-disturbed grades using native material, and c) replace vegetation in-kind.
8. Following ground improvements at Wetland J, the top three feet of soil will be returned to original elevations and will be loosened, and replanted with native wetland vegetation.

Areas disturbed by construction of the Project facilities will be stabilized with temporary erosion controls until construction is complete, unless covered by equipment, gravel or other covering. Following construction, the site will be final graded, and BMPs will be applied to prevent erosion. To minimize the potential for erosion, JCEP L.P. has modified the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures), creating Project-specific Plan and Procedures. A copy of the Project-specific Procedures is located in Appendix B.2 of FERC Resource Report 2 – Water Use and Quality, and a copy of the Project-specific Plan is located in Appendix B.7 of FERC Resource Report 7 – Soils.

Mitigation

*Describe the reasonably expected adverse effects of the development of this project and how the effects will be mitigated.**

- *For permanent impact to wetlands, complete and attach a Compensatory Wetland Mitigation (CWM) Plan. (See OAR 141-085-0705 for plan requirements)**
- *For permanent impact to waters other than wetlands, complete and attach a Compensatory Mitigation (CM) plan (See OAR 141-085-0765 for plan requirements)**
- *For permanent impact to estuarine wetlands, you must submit a CWM plan.**

Mitigation for loss of aquatic habitat is addressed in the October 2014 Compensatory Wetland Mitigation Plan.

Mitigation for loss to upland habitats has been under negotiation with ODFW; additional details are provided in FERC Resource Report 3.

Mitigation Location Information (Fill out only when mitigation is proposed or required)

Proposed mitigation (Check all that apply):		*Type of mitigation:*	
☒	*Onsite Mitigation*	☒	*Wetland Mitigation*
☒	*Offsite Mitigation*	☒	*Mitigation for impacts to other waters*
☐	*Mitigation Bank*	☐	*Mitigation for impacts to navigation, fishing, or recreation*
☐	*Payment to Provide*		

Street, Road or Other Descriptive Location	*Legal Description (attach tax lot map*)*			
	Quarter/Quarter	*Section*	*Township*	*Range*
West Jordan Cove Mitigation Site (freshwater wetlands), Coos Bay North Bend Airport (eelgrass), Kentuck Sough Golf Course (intertidal flats)	varies		varies	varies

In or near (City or Town)	*County*	*Tax Map #*	*Tax Lot #*[3]
Coos Bay	Coos County	n/a	n/a
Wetland/Waterway (pick one)	*River Mile (if known)*	*Latitude (in DD.DDDD format)*	*Longitude (in DD.DDDD format)*
n/a	n/a	n/a	n/a

Name of waterway/watershed/HUC	*Name of mitigation bank (if applicable)*
Coos Bay estuary/Coos Bay watershed/HUC #17100304	n/a

(6) Additional information

Adjoining Property Owners and Their Address and Phone Numbers *(if more than 5, attach printed labels*)*

Owner	Tax Lot ID	Address	City	State	Zip
APCO Coos Properties, LLC	25S13W10TL0110000 25S13W10TL0090000	P.O. Box 300	Coos Bay	OR	97420
Brock, Gregory	25S13W10TL0080200	600 Chappell Way	North Bend	OR	97459
Bureau of Land Management (USA)	25S13W04TL0020000	1300 Airport Ln	North Bend	OR	97459

[3] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Owner	Tax Lot ID	Address	City	State	Zip
Heaton, Byron T. & Tamara J.	25S12W06BTL0300000	94631 Kentuck Way Ln	North Bend	OR	97459
City of North Bend	25S13W10TL0140000 25S13W10TL0130000 25S13W10TL0120000 25S13W10TL0070000	P.O. Box B	North Bend	OR	97459
Colton, Mary K.	25S12W06BTL0200000	97425 Kentuck Way Ln	North Bend	OR	97459
Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians	25S12W06BTL0320000	1245 Fulton Ave.	Coos Bay	OR	97420
Coos County	24S13W34DTL0060200 24S13W34DTL0060000 24S13W34DTL0010000 24S13W34DTL0060500 24S13W34DTL0200100 24S13W34DTL0260000 25S12W06BTL0340000	250 N. Baxter St.	Coquille	OR	97423
Culp , Joanne; etal	25S12W06CTL0080000	94506 Golf Course Ln	North Bend	OR	97459
Davis, Brett L. & Sally	25S12W06BTL0190000	94715 Kentuck Way Ln	North Bend	OR	97459
Don & Rose Freeman Trust	25S12W07TL0060000	94532 Golf Course Ln	North Bend	OR	97459
Douglas A. Parker Revocable Living Trust	24S13W34CTL0140000	2136 Stanton Ave	North Bend	OR	97459
DSP Enterprise, LLC	25S13W10TL0080300	726 Chappell Way	North Bend	OR	97459
Edwards, Lorryann; L/E	25S12W06DTL040000	94911 Kentuck Way Ln	North Bend	OR	97459
Fort Chicago Holdings II U.S., LLC.	25S13W03TL0020000 25S13W05TL0020000 25S13W05TL0010000 25S13W04TL0040000 25S13W04TL0010000 25S13W04TL0010100 25S13W12ATL0010000 25S13W01DTL0040000 25S13W06CTL0010000 25S12W07TL0079900	125 Central Ave Suite 380	Coos Bay	OR	97420
Gertrude E. Wickett Trust	25S12W06CTL0090000 25S12W07TL0050100	94506 Golf Course Ln	North Bend	OR	97459
Gertrude E. Wickett Trust; etal	25S12W07TL0070000 25S12W07TL0070000 25S13W12ATL0020000	94506 Golf Course Ln	North Bend	OR	97459
Gould , Brian D. & Gould, Molly M.	25S13W12ATL0060000	1937 Channel St.	North Bend	OR	97459
Kerwin, Charles C.	25S13W12ATL0050000 25S13W12ATL0040000	P.O. Box 704	North Bend	OR	97459
Lone Rock Timber Investments I, LLC	25S12W06CTL0060100 25S12W07TL0050000 25S12W06DTL0050000 25S12W06BTL0220000	P.O. Box 1127	Roseburg	OR	97470
LTM, Inc	25S13W10TL0010000	600 Chappell Parkway	North Bend	OR	97459
Oregon Dunes Sand Park, LLC	24S13W34CTL0170000	P.O. Box 97	Coos Bay	OR	97420
Oregon International Port of Coos Bay	25S13W05TL0030000 24S13W32TL0020000 25S13W04TL0050000 24S13W34DTL0060100 25S12W00TL0020000	P.O. Box 1215	Coos Bay	OR	97420-0311
Haga , Richard R.	25S12W06BL0360000	66512 Gurney Rd	North Bend	OR	97459
Rose, Michael E.; et al	25S12W06BTL0210000 25S12W06BTL0220000	P.O. Box 688	North Bend	OR	97459
Roseburg Forest Products Co.	25S13W04TL0030000	P.O. Box 1088	Roseburg	OR	97470
Samuel, Stephan R.	25S12W06CTL0040000	94559 Kentuck Way Ln	North Bend	OR	97459
State of Oregon	25S13W10TL0080000	1600 State St.	Salem	OR	97310
State of Oregon Dept of Transportation	25S13W10TL00899Z1	355 Capital St. NE, RM 411	Salem	OR	97301
Suburban Gas Co.@ Buckey Gas Products Co.	25S13W10TL00800A1	One Liberty PZ	Liberty	MO	64068
United States of America	4S13W32TL0010000 24S13W33TL00100002 25S13W00TL0010000	68028 Horsefall Rd	North Bend	OR	97459
Wallace & Gertrude Wickett TST; et al	25S12W06CTL0070000	94506 Golf Course Ln	North Bend	OR	97459
Walters, Joshua R.	25S12W06CTL0050200 25S12W06CTL0050000	94557 Kentuck Way Ln	North Bend	OR	97459
Webb , Dean A. & Deborah C.	25S13W12ATL0030000	94252 Golf Course Ln	North Bend	OR	97459

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Has the proposed activity or any related activity received the attention of the Corps of Engineers or the Department of State Lands in the past, e.g., wetland delineation, violation, permit, lease request, etc.?

Yes ☒ No ☐

If yes, what identification number(s) were assigned by the respective agencies:

Corps #	NWP-2012-441	State of Oregon #	WD#s: 2010-0337, 2011-0065, 2012-0313, 2013-0116, 2013-0188, 2013-0193, 2013-0218, 2013-0253, 2014-0090; DSL Permit # 47712-RF. 54908-RF, 54909-RF

Has a wetland delineation been completed for this site? *Yes* ☒ *No* ☐

*If yes by whom?**	SHN Consulting Engineers (Henderson Marsh Eastern Boundary; Ingram Yard/LNG Liquefaction and Terminal Site; In Proximity to Utility Corridor and Mill Site/South Dunes Site) & David Evans and Associates, Inc. (South and North Panhandle Sites; Mill Site/South Dunes Site; Kentuck Mitigation Site, APCO Coos Properties, North Point Workforce Housing Access)

Has the wetland delineation been approved by DSL or the COE? *Yes* ☒ *No* ☐

*If yes, attach a concurrence letter. **

A Preliminary Jurisdictional Determination was delivered to the applicant in March 2014. On October 6, 2014, Tyler Krug responded with an e-mail concurring that the USACE will not regulate Wetlands F and G under Section 404. DSL concurrence has been received for each of the wetland delineations listed above.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
(to be completed by local planning official) *

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date

Comments:

The proposed Project is located in Coos County, Oregon and also in the City of North Bend, Oregon. Signed affidavits from the County and City follow.

A complete Land Use Compatibility Statement (LUCS) signed by the County is included in Tab G of the June 2013 LNG Project 404 Application.

The Applicant is developing a Conditional Use Permit application to be submitted to the City for the conditional use of “temporary work force housing” at the NPWHP site. A copy of Ordinance 1982 which allows temporary work force housing as a conditional use within the Heavy Industrial Zone, M-H was adopted by the City on October 8, 2013.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☒ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☒ Conditional Use Approval
- ☒ Development Permit
- ☒ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☒ Zone Change
- ☐ Other

An application has ☒ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date
David K. Voss	David K. Voss	City Planner	North Bend Coos	8/09/14

Comments:

Also REQ'S Estuary Permit.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

v. 07-07-09

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☑ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date
Jill Rolfe	Jill Rolfe	Planning Director	Coos	9/16/13

Comments: Project has been reviewed and received prior approvals or is permitted outright

- *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

(8) COASTAL ZONE CERTIFICATION *

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Robert L. Braddock	Vice President – Project Manager, Jordan Cove Energy Project, L.P.
Applicant Signature	Date 10-16-2014
Robert L Braddock	

(9) SIGNATURES FOR JOINT APPLICATION

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or Dept. of State Lands staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. *I understand that payment of the required state processing fee does not guarantee permit issuance. The fee for the state application must accompany the application for completeness.*

Amount enclosed	**n/a**

Print /Type Name	Title	Print /Type Name	Title
Robert L. Braddock	Vice President – Project Manager, Jordan Cove Energy	Sean Sullivan	Sr. Associate/Project Manager David Evans and Associates, Inc.
Applicant Signature	Date 10-16-2014	**Authorized Agent Signature**	Date 10-16-2014
Robert L Braddock			

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for authorization to conduct removal/fill activities on such lands. This signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied.*	
Print /Type Name	Title
Joseph McKeown	*Manager* *APCO Coos Properties, LLC*
Property Owner Signature	Date 9-12-2013

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

JORDAN COVE ENERGY PROJECT

SECTION 404/10 APPLICATION

OCTOBER 11, 2013

Part B: Pacific Connector Gas Pipeline, LP Supplemental Information

Part B replaces the individual Joint Permit Application Form submitted at earlier date for the referenced project

Part B: Pacific Connector Gas Pipeline Supplemental Information

This document contains information that supplements the JPA Form for the Jordan Cove Energy Project, and is specific to the Pacific Connector Gas Pipeline component of the Jordan Cove Energy Project, which also includes the Jordan Cove LNG Terminal Project and the Slip and Access Channel Project. The information contained herein generally follows the format of the JPA Form so as to be organized and presented in a way that is familiar to the agencies.

(1) APPLICANT INFORMATION

Applicant Name and Address	The Applicant's information is included in the JPA form.	Business Phone # Home Phone # Fax # Email
Authorized Agent Name and Address Check one Consultant ☒ Contractor ☐	The Authorized Agent's information is included in the JPA form.	Business Phone # Home Phone # Fax # Email
Property Owner Name and Address If different from above[1]	Multiple – Pacific Connector must obtain an easement prior to commencing construction. Appendix A provides a list of the landowners where wetlands/waterbodies would be affected by the PCGP Project.	Business Phone # Home Phone # Fax # Email

(2) PROJECT LOCATION

Street, Road or Other Descriptive Location		Legal Description (attach *tax lot map**)			
See Appendix B – Figure 1.1-1 for a general location map and for detail see 1:24:000 USGS topographic-based location maps of the PCGP Project. Also see Section 1.4 of Project Description (Appendix C).		Township	Range	Section	Quarter/Quarter
		See Appendix A (Landowner Information Associated with Wetlands Table) and Appendix B.			
In or near (City or Town)	County	Tax Map #		Tax Lot #[2]	
Coos Bay, North Bend, Dillard, Myrtle Creek, Trail, Klamath Falls and Malin	Coos, Douglas, Jackson, Klamath counties.	Please see Environmental Alignment Sheets		See Appendix A – Landownership Table	
Wetland/Waterway (pick one)	River Mile (if known)	Latitude (in DD.DDDD format)		Longitude (in DD.DDDD format)	
See Appendix A (Multiple Tables)		MP 1.47R = 43.4325 MP 228.13 = 42.0335		MP 1.47R = -124.2402 MP 228.13 = -121.3753	
Directions to the site	See USGS topographic-based location maps in Appendix B and Environmental Alignment Sheets (provided as hard copies and on CD). The USGS-topographic location maps provide the proposed access roads. The proposed pipeline is 231.82 miles long. Pacific Connector will provide specific directions upon request.				

[1] If applicant is not the property owner, permission to conduct the work must be attached.
[2] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(3) PROPOSED PROJECT INFORMATION

Type: Fill ☒ Excavation (removal) ☒ In-Water Structure ☐ Maintain/Repair an Existing Structure ☐

Brief Description: Appendix C provides a detailed Project Description. The PCGP Project includes installation of a 231.82-mile, 36-inch diameter natural gas pipeline and associated aboveground facilities from the proposed Jordan Cove Liquefied Natural Gas Terminal in Coos Bay, being developed by Jordan Cove Energy Project, L.P., to interconnects with two interstate natural gas pipelines near Malin, Oregon. The PCGP is the proposed supply pipeline for the proposed Jordan Cove Terminal.

Fill

Riprap ☐ Rock ☐ Gravel ☐ Organics ☐ Sand ☐ Silt ☐ Clay ☐ Other: ☒

The native material that is removed from the pipeline trench during excavation will be used to backfill the trench once the pipe is in place. Table 2A-3 in Appendix 2A in Appendix E provides excavated removal and fill volumes for each wetland and waterbody crossed by the Project. No wetlands will be permanently filled.

See Table 2A-3 in Appendix 2A in Appendix E for dimensions.

Wetlands	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	**87,454.19**
	None	**87,454.19 (see explanation above)**							
	Impact Area in Acres	Dimensions (feet)							
	None	L'		W'		H'			
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	**39,117.61**
	None	**39,117.61 (see explanation above). 26,496.36 cy of this volume is associated with the 2.45-mile crossing of Haynes Inlet.**							
	Impact Area in Acres	Dimensions (feet)							
	None	L'		W'		H'			

Removal

Wetlands	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	**87,454.19**
	None	**87,454.19 (see explanation above)**							
	Impact Area in Acres	Dimensions (feet)							
	None	L'		W'		H'			
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	**39,117.61**
	None	**39,117.61 (see explanation above)**							
	Impact Area in Acres	Dimensions (feet)							
	None	L'		W'		H'			

Total acres of construction related ground disturbance (If 1 acre or more a 1200-C permit may be required from DEQ) **238.96**

Is the disposal area upland? Yes ☐ No ☐ Impervious surface created? <1 acre ☐ >1 acre? ☐

	Yes	No	If yes, please explain in the project description (in block 4)
Are you aware of any state or federally listed species on the project site?	x		
Are you aware of any Cultural/Historic Resources on the project site?	x		
Is the project site within a national Wild & Scenic River?		x	
*Is the project site within a State Scenic State Scenic Waterway?**		x	

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(4) PROPOSED PROJECT PURPOSE AND DESCRIPTION

Purpose and Need:

*Provide a description of the public, social, economic, or environmental benefits of the project along with any supporting formal actions of a public body (e.g. city or county government), as appropriate.**

Environmental Resource Reports were prepared as part of the application submitted to the Federal Energy Regulatory Commission (FERC or Commission) by Pacific Connector Gas Pipeline, LP (Pacific Connector) to construct and operate the Pacific Connector Gas Pipeline (PCGP) Project, a new 231.82-mile, 36-inch diameter interstate natural gas transmission system and related facilities (FERC Docket No. CP13-492-000).

The proposed PCGP system will extend from the proposed Jordan Cove Liquefied Natural Gas (LNG) Terminal (Jordan Cove Terminal), being developed by Jordan Cove Energy Project, L.P. (JCEP), to interconnects with two interstate natural gas pipelines near Malin, Oregon. The PCGP is the proposed supply pipeline for the proposed Jordan Cove Terminal (FERC Docket No. CP13-483-000).

Pacific Connector Gas Pipeline Company, LLC, the general partner for Pacific Connector Gas Pipeline, LP, entered into an Engineering, Procurement and Construction Management Agreement and an Operations and Maintenance Agreement with Williams Pacific Connector Gas Operator, LLC (Williams Pacific Operator), whereby Williams Pacific Operator will design, manage the procurement and construction, commission and operate, maintain and manage the day-to-day business affairs of PCGP, as a contractor for the owners. The new transmission system will have a design capacity of not less than 1.06 billion cubic feet per day (bcf/d), assuming a receipt pressure of approximately 900 psig from the supply interconnects near Malin and delivery pressure of 850 psig at the proposed Jordan Cove Terminal at Coos Bay. The maximum allowable operating pressure (MAOP) of the PCGP system will be 1,480 psig. The general location of the PCGP Project is provided in Appendix B and Appendix C.

The PCGP Project will extend generally southeast from the Jordan Cove Terminal traversing Coos, Douglas, Jackson, and Klamath counties in Oregon. The PCGP Project will interconnect with the Gas Transmission Northwest and Ruby Pipeline LCC systems at the terminus of the project (milepost [MP] 228.13[3]) near Malin, Oregon. In addition, the PCGP Project will interconnect at MP 71.46 with Williams' Northwest Pipeline (Northwest Pipeline) gas transmission system near Myrtle Creek, Oregon. Northwest Pipeline provides service, directly and indirectly through local distribution companies, to customers in southwestern Oregon via its Grant's Pass Lateral.

Purpose

The proposed PCGP Project will connect the existing pipeline systems converging near Malin, Oregon and the proposed Jordan Cove Terminal at Coos Bay, Oregon. The PCGP Project will link a natural gas supply hub where energy is competitively traded on a daily basis to a new LNG export terminal. The PCGP route crosses or is located in the vicinity of existing natural gas infrastructure in several locations. The PCGP Project scope currently includes an interconnect with Northwest Pipeline's Grants Pass Lateral. Williams Pacific Operator is willing to consider incorporating other interconnect facilities into the PCGP Project as necessary to address the needs of other interested parties in the Pacific Northwest. Combining the PCGP Project and the Jordan Cove Terminal provides international customers on the Pacific Rim, in addition to Hawaii, and regional customers in the Pacific Northwest access to abundant natural gas supplies from the U.S. Rocky Mountain and western Canadian supply basins.

Need

The primary need for Pacific Connector is to supply approximately 1.02 Bcf/d (1,020,000 Dth/d) of firm transportation service to the Jordan Cove Terminal. The Jordan Cove Terminal, located on the bay side of the North Spit of Coos Bay, is designed to receive, liquefy, store and load LNG onto LNG ships for delivery to export markets. The PCGP Project and the Jordan Cove Terminal are a market driven response to the availability of burgeoning and abundant natural gas supplies in the United States and Canada and the rising robust international demand for natural gas. The PCGP Project is strategically located to provide market outlets for supplies from both western Canadian and U.S. Rocky Mountain supply basins and the Jordan Cove Terminal is strategically located to serve growing international, particularly Asian, natural gas markets, as well as natural gas markets in the non-contiguous states of Hawaii and Alaska. The PCGP Project will also be capable of delivering approximately 40MMcf/d (40,000 Dth/d) of natural gas to markets along its route, including markets on Northwest's Grants Pass Lateral.

[3] The Project's total length (231.82 miles) does not equal the Project's ending MP (228.13) because of engineering station equations that have been integrated into the alignment due to the various reroutes and alternatives that have been incorporated into the Project design since Pacific Connector set mileposts in 2007.

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Schedule (A detailed schedule is provided in the Project Description in Appendix C.)

Pacific Connector anticipates starting construction in fourth quarter 2015 when civil surveys and access road improvements will be initiated. Pacific Connector plans to conduct clearing in some forested areas starting in 2015 prior to mainline construction in 2016. Additionally, Pacific Connector anticipates starting construction of the Coos Bay water route segment (MPs 1.67R to 4.10R) in November 2015 to allow pipeline installation to occur during the recommended in-water work period established by the Oregon Department of Fish and Wildlife (ODFW). Horizontal directional drills (HDD) of three waterbodies (Coos, Rogue, and Klamath rivers) and Direct Pipe (DP) technology for a fourth waterbody (South Umpqua River) are scheduled for 2016 to allow sufficient time to pursue permits for alternative crossing locations or methods for these rivers in the unlikely event the proposed HDDs/DP are unsuccessful. Pacific Connector also anticipates beginning construction in the Klamath Basin area (MPs 188 to 228) in fourth quarter 2015 or early 2016. Figure 1.3-1 in Appendix C provides a general schedule for the project.

Mainline and facility construction is planned to begin spring 2016 with the in-service date scheduled for fourth quarter 2017. Restoration of construction disturbance is expected to begin once construction is completed; restoration would start as early as fall 2016 and continue into 2017 and would be completed by the end of the winter season in early 2017/2018 when forest, wetland, and riparian plantings would be installed. Depending on site-specific conditions, it may be necessary to continue restoration through spring 2018. Timber clearing in areas of Northern Spotted Owl (NSO) and Marbled Murrelet (MAMU) would be conducted outside the critical breeding seasons[4]. Construction activities in 2016 and 2017 are scheduled to take advantage of the drier periods of the year to minimize winter construction, to reduce potential environmental impacts and construction safety risks.

The proposed pipeline will cross numerous irrigation canals and ditches in agricultural fields in Klamath County. To minimize agricultural impacts and to schedule the crossings of the majority of the canals and ditches when they are dry and not in use, Pacific Connector is proposing to construct in the winter of 2015 and 2016 in the Klamath Basin. The winter construction schedule will also minimize the crossing of high groundwater areas in the Klamath Basin which are a result of irrigation operations and canal leakage or drainage. Pacific Connector has developed a Winter Construction Plan for the Klamath Basin (Spread 5) (see Appendix 1E in Appendix C), which outlines the measures that will be implemented to minimize potential effects from winter construction.

Pacific Connector plans to conduct forest clearing starting fourth quarter 2015 and during the majority of 2016, prior to mainline construction, to minimize overall work space and temporary extra work area (TEWA) requirements. TEWA requirements have been minimized by proposing a two-year construction window because the same work areas used to stage right-of-way logging activities and provide log storage and decking space in 2015 and 2016 would then be utilized for pipeline construction activities in 2016 and 2017. Logging concurrently with pipeline construction would require additional space to work safely and efficiently, and potential clearing delays could force construction activities into the winter rainy season, increasing the potential for erosion and safety hazards. Therefore, scheduling construction activities over a two-year period will minimize winter construction requirements resulting from seasonal and biological construction windows. The schedule for clearing activities in 2015 and 2016 will be determined after biological confirmation surveys have been completed in early 2015 and once areas of known seasonal restrictions have been identified along the project route. Temporary erosion control and stabilization measures will be installed where necessary in areas of disturbance during 2016 construction. These measures will be maintained throughout construction until the project is in-service and disturbed areas are stable.

Pacific Connector has determined that to efficiently construct the PCGP, pipeline construction will be divided into at least five construction spreads. The construction spreads will include all timber clearing, construction, and restoration activities within a specific milepost range along the project. The extent of each construction spread is provided in the table below.

Spread	Milepost Range	Length (miles) [1]
1	1.47R – 49.73	53.00
2	49.73 – 94.67	42.44
3	94.67 – 132.10	41.24
4	132.10 – 188.00	50.75
5	188.00 – 228.13	44.59

[1] Due to adjustments to the proposed route (and the addition of equations), the length of each spread cannot be calculated by subtracting the mileposts.

[4] Timber clearing in areas of active NSO sites would occur between 10/1 and 2/28 and in areas of known MAMU between 9/16 and 3/31.

Federal and State-Listed Species

Pacific Connector prepared Resource Report 3 as part of the June 2013 FERC Certificate application (provided electronically with the JPA), which provided detailed information regarding federal and state-listed species, impacts to them, and proposed mitigation measures. Pacific Connector will submit an Applicant-Prepared Draft Biological Assessment to FERC, which will detail the Project's impacts to federally-listed species. Pacific Connector has been consulting with FWS, NMFS, Forest Service, BLM, and ODFW throughout the FERC pre-filing and NEPA process and will continue to do so throughout the various federal and state permitting processes.

Cultural Resources

Pacific Connector prepared Resource Report 4 (provided electronically with the JPA) and a cultural resource survey report based on survey activities between 2006 and 2013 that have been submitted to FERC, SHPO, Forest Service, BLM, and Native American Indian Tribes that may have interest in the PCGP Project. Pacific Connector continues to consult with these agencies and tribes regarding review of and mitigation for various sites. Pacific Connector is in the process of contacting landowners and securing permits to conduct cultural resources surveys on unsurveyed properties during the spring/summer of 2013. As stipulated in the previous project Memorandum of Agreement, the Project Historic Properties Management Plan (HPMP) will be updated to include site-specific avoidance and protection plans following completion of all surveys, but prior to construction. Currently, the schedule for the completion of all surveys is between May 1, 2013, and the second quarter of 2015, subject to obtaining access to denied areas. Pacific Connector will ensure that all remaining cultural resources investigations, as identified in the project HPMP, are completed prior to construction. FERC is the lead agency for Section 106 consultation.

Formal Governmental Actions

Please refer to Table 1.10-1 in Appendix C for a list of required agency permits/approvals and anticipated dates of permit application submittals. There have been no formal agency decisions to date.

Project Description:

Please describe in detail the proposed removal and fill activities, including the following information:

- Volumes and acreages of all fill and removal activities in waterway or wetland separately

  See Table 2A-3 in Appendix 2A (Wetland Table) in Appendix E for acreages of impact as well as the removal/fill volumes associated with each wetland and/or waterbody affected by the PCGP Project.

- Permanent and temporary impacts

  See Table 2A-3 in Appendix 2A in Appendix E for the permanent and temporary wetland/waterbody impacts associated with the PCGP Project. The only permanent impact associated with the Project (1.48 acres) will be from the conversion of a mixture of forested and shrub wetlands to a mixture of shrub and herbaceous wetlands required to facilitate corrosion and leak surveys according to Department of Transportation (DOT) regulations in 49 CFR Part 192, *"Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards;"* 18 CFR Part 380.15, *"Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities."*

- Types of materials (e.g., gravel, silt, clay, etc.)

  Native material that is removed from the pipeline trench during excavation will be used to backfill once the pipe is installed in the trench. Fill material will be the native soil or gravel material that is screened to exclude rock greater than a predetermined size.

- How the project will be accomplished (i.e., describe construction methods, equipment, site access)

  Appendices C and E describe the general construction procedures for the PCGP Project and the waterbody crossing construction procedures. Most waterbodies will be crossed using a dry crossing method (i.e., fluming or dam and pump) in order to isolate the work area from the stream flow. Fluming procedures are provided in Appendix 2C and Dam and Pump Procedures are provided in Appendix 2D in Appendix E. Conventional bores are proposed for three of the waterbody crossings (Kentuck Slough/MP 6.28R, Catching Slough/MP 11.11, and Medford Aqueduct/ MP133.38). Typical drawings are provided in Appendix E (see Appendix 2E). The South Umpqua River will be crossed twice. Pacific Connector proposes to cross I-5, the South Umpqua River (MP 71.30), Dole Road, and a railroad using a single Direct Pipe crossing. The Direct Pipe feasibility evaluation of this crossing is provided in Appendix E (see Appendix 2I). The second crossing of the South Umpqua River (MP 94.73) will be crossed using a diverted open-cut. Appendix E (see Appendix 2E) includes the Site-Specific Crossing Plan for this location. The Coos (MP 11.13R), Rogue (MP 122.65), and Klamath (MP 199.38) rivers are proposed as horizontal directional drills (HDDs). Appendix E (see Appendix 2G) provides the feasibility analyses for the three HDD crossings. Within the Coos Bay Estuary (Haynes Inlet), the pipeline will be installed using a wet open-cut method (see Appendix F).

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Pacific Connector will implement the measures in the Spill Prevention, Containment, and Countermeasures Plan (SPCC) prepared for the PCGP Project (see Appendix 2B in Appendix E) as well as the BMPs described in the project-specific Erosion Control and Revegetation Plan (ECRP) (Appendix 1B in Appendix C) and FERC's Wetland and Waterbody Construction and Mitigation Procedures (Attachment B to the ECRP) and FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Attachment A to the ECRP).

- *Describe any changes that the project may make to the hydraulic and hydrologic characteristics (e.g., general direction of stream and surface water flow, estimated winter and summer flow volumes.) of the waters of the state, and an explanation of measures taken to avoid or minimize any adverse effects of those changes.*
  The preconstruction drainage contours will be restored following installation of the pipeline. Appendices C, E, and G detail the measures which will be implemented to avoid and minimize adverse effects to wetlands and waterbodies.

- Is any of the work already complete? Yes ☐ No ☒ If yes, please describe the completed work

Project Drawings

State the number of project drawing sheets included with this application: Environmental Alignment Sheets (24x36) = 228 sheets with aerial photography, 1 cover page, (on DVD – additional hard copies available upon request)

A complete application must include a location map, site plan, cross-section drawings and recent aerial photo as follows and as applicable to the project:

- **Location map** (must be legible with street names)
  - Site plan including;
  - Entire project site and activity areas – see Environmental Alignment Sheets.
  - Existing and proposed contours – see Environmental Alignment Sheets (contours following construction will be restored to their approximate original contours).
  - Location of ordinary high water, wetland boundaries or other jurisdictional boundaries – see Environmental Alignment Sheets.
  - Identification of temporary and permanent impact areas within waterways or wetlands – see Environmental Alignment Sheets and individual wetland figures in Appendix B to the Wetland Report).
  - Map scale or dimensions and north arrow – all maps include a map scale or dimensions and a north arrow.
  - Location of staging areas – see Environmental Alignment Sheets.
  - Location of construction access – see Environmental Alignment Sheets and the Project General Location Maps provided in Appendix B.
  - Location of cross section(s), as applicable – Not applicable.
  - Location of mitigation area, if applicable –see Appendix G for the Project's Compensatory Wetland Mitigation Plan.
- **Cross section drawing**(s) including; – see Appendix 2E in Appendix E
  - Existing and proposed elevations (contours following construction will be restored to their approximate original contours)
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Ordinary high water and/or wetland boundary or other jurisdictional boundaries
  - Map scale or dimensions
- **Recent Aerial photo** (1:200, or if not available for your site, the highest resolution available) – see Environmental Alignment Sheets.

Will any construction debris, runoff, etc., enter a wetland or waterway? Yes ☐ No ☐

Estimated project start date:	November 2015

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(5) PROJECT IMPACTS AND ALTERNATIVES

Alternatives Analysis:

Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland. (Include alternative design(s) with less impact and reasons why the alternative(s) were not chosen. Reference OAR 141-085-0565 (1) through (6) for more information).*

Due to the linear nature of a pipeline, it is impossible to avoid crossing wetlands and waterbodies along the 232 miles of the Project alignment. The preferred route for the PCGP Project was developed by considering construction requirements for a large diameter, high pressure, natural gas transmission pipeline. Constructability/integrity requirements were the primary consideration for routing the PCGP Project while minimizing potential impacts to sensitive resources such as the number of waterbody crossings and landowner encumbrances. Avoidance of scenic waterways, byways, wildernesses, national parks and monuments was also a factor in development of the proposed alignment. Where practicable, the alignment of the PCGP Project utilized existing pipeline and powerline corridors while maintaining a safe distance between these existing utilities and the proposed pipeline.

The proposed route has been developed through an iterative process that included numerous meetings with landowners, federal and state agencies, and various tribes. The proposed route was publicly scoped, reviewed, analyzed, and permitted through FERC's NEPA process and is documented in FERC's Draft EIS (FERC, 2008) and Final EIS (FERC, 2009) under Docket CP07-441-000. The following agencies participated as cooperating agencies in preparation of the Draft EIS and Final EIS under Docket CP07-441-000:

USDA Forest Service, Pacific Northwest Region
Department of the Army, Corps of Engineers, Portland District
US Environmental Protection Agency, Region 10
US Department of Homeland Security Coast Guard, Portland
US Department of Transportation, Pipeline and Hazardous Materials Safety Administration
US Department of the Interior Bureau of Land Management, Oregon State Office
US Department of the Interior Bureau of Reclamation, Klamath Basin Area Office
US Department of the Interior Fish and Wildlife Service, Oregon State Office
Douglas County, Oregon

Although FERC vacated the Certificate/Order in 2012, Pacific Connector's current proposed route under Docket No. CP13-492-000 is essentially the same as the 2009 FEIS route.

Pacific Connector submitted a FERC Certificate application on June 6, 2013 for the PCGP Project. Resource Report 10 (Alternatives) from the FERC Certificate application has been included as Appendix D in this Joint Permit Application. It describes the route selection process that Pacific Connector conducted to select the proposed PCGP Project alignment, as well as the alternative routes or routing segments that were considered during the project's FERC Pre-filing process. The Project's routing selection process has had extensive review by federal and state agencies as well as the public, including consultations with affected landowners. .

Measures to Minimize Impacts

Describe what measures you will use (before and after construction) to minimize impacts to the waterway or wetland. These may include but are not limited to the following:

- *For projects with ground disturbance include an erosion control plan or description of other best management practices (BMP's) as appropriate. (For more information on erosion control practices see DEQ's Oregon Sediment and Erosion Control Manual)*
- *For work in waterways where fish or flowing water are likely to be present, discuss how the work area will be isolated from the flowing water.*
- *If native migratory fish are present (or were historically present) and you are installing, replacing or abandoning a culvert or other potential obstruction to fish passage, complete and attach a statement of how the Fish Passage Requirements, set by the Oregon Department of Fish and Wildlife will be met.*

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The following plans, some of which have been specifically prepared for the PCGP Project, address the three bulleted items above.

- Wetland and Waterbody Mitigation Plan (Appendix G)
- ECRP (Appendix 1B in Appendix C)
- FERC's Wetland and Waterbody Procedures (Attachment B to ECRP provided in Appendix 1B in Appendix C)
- FERC's Upland Plan (Attachment A to ECRP provided in Appendix 1B in Appendix C)
- SPCC Plan (Appendix 2B in Appendix E)
- Hydrostatic Test Plan (Appendix I)
- Culvert Crossing Best Management Practices (Appendix K)
- Contaminated Substances Discovery Plan (Appendix L)
- Fish Salvage Plan (Appendix R)

All work will be isolated from flowing water, except in Haynes Inlet in the Coos Bay Estuary, by utilizing dry crossing methods:

- Fluming Procedures (Appendix 2C in Appendix E)
- Dam and Pump Procedures (Appendix 2D in Appendix E)
- Diverted Open Cut Design (South Umpqua River #2 Crossing Plan - see Appendix 2E in Appendix E)
- Conventional Bore (see Kentuck Slough, Catching Slough, and Medford Aqueduct, in Appendix 2E in Appendix E)

Measures to minimize impacts while working in Haynes Inlet in the Coos Bay Estuary are outlined in the Estuary Crossing Reports (Appendix F).

A Direct Pipe installation has been proposed to minimize impacts to the South Umpqua River #1. An overview of Direct Pipe technology and a feasibility evaluation is provided in Appendix 2I in Appendix E.

The pipeline would be installed using HDD crossing methods across the Coos, Rogue, and Klamath rivers. Feasibility studies for these crossings are provided in Appendix 2G in Appendix E.

Description of resources in project area

Ocean ☐ Estuary ☒ River ☒ Lake ☒ Stream ☒ Freshwater Wetland ☒

Describe the existing **physical and biological characteristics** of the wetland/waterway site by area and type of resource (Use separate sheets and photos, if necessary).

For wetlands, include, as applicable:

- *Cowardin and Hydrogeomorphic(HGM) wetland class(s)**
- *Dominant plant species by layer (herb, shrub, tree)**
- Whether the wetland is freshwater or tidal
- *Assessment of the functional attributes of the wetland to be impacted**
- Identify any vernal pools, bogs, fens, mature forested wetland, seasonal mudflats, or native wet prairies in or near the project area.)

For waterways, include a description of, as applicable:

- *Channel and bank conditions**
- *Type and condition of riparian vegetation**
- *Channel morphology (i.e., structure and shape)**
- *Stream substrate**
- Fish and wildlife (type, abundance, period of use, significance of site)
- *General hydrological conditions (e.g. stream flow, seasonal fluctuations)**

See the wetland delineation report provided with this application and the HGM Report in Appendix J.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

*Describe the existing **navigation, fishing and recreational** use of the waterway or wetland.**

The PCGP Project will affect 272 perennial and intermittent waterbodies with various associated navigational, fishing and recreational uses. Appendix E describes the beneficial uses of the basins crossed by the Project. Table 2A-2 in Appendix 2A in Appendix E lists the Oregon Department of Forestry stream classification for each waterbody crossed. The Fish Utilization table in Appendix A also includes the fish presence for each waterbody crossed by the Project.

Site Restoration/Rehabilitation

- *For temporary disturbance of soils and/or vegetation in waterways, wetlands or riparian areas, please discuss how you will restore the site after construction including any monitoring, if necessary**

Please see the Wetland and Waterbody Mitigation Plan included as Appendix G. Also see Section 10.0 (Restoration) in the ECRP in Appendix 1B in Appendix C.

Mitigation

*Describe the reasonably expected adverse effects of the development of this project and how the effects will be mitigated.**

- *For permanent impact to wetlands, complete and attach a Compensatory Wetland Mitigation (CWM) Plan. (See OAR 141-085-0705 for plan requirements)**
- *For permanent impact to waters other than wetlands, complete and attach a Compensatory Non-Wetland Mitigation (CNWM) plan (See OAR 141-085-0765 for plan requirements)**
- *For permanent impact to estuarine wetlands, you must submit a CWM plan.**

See Section 2.3.3 in Appendix E and Appendix G – Wetland and Waterbody Mitigation Plan.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Mitigation Location Information (Fill out only when mitigation is proposed or required)

Proposed mitigation *(Check all that apply):*	☒ *Onsite Mitigation*	*Type of mitigation:*	
	☒ *Offsite Mitigation*	☒ *Wetland Mitigation*	
	☐ *Mitigation Bank*	☐ *Mitigation for impacts to other waters*	
	☐ *Payment to Provide*	☐ *Mitigation for impacts to navigation, fishing, or recreation*	

Street, Road or Other Descriptive Location	*Legal Description (attach tax lot map*)*			
The PCGP Project's Wetland and Waterbody Mitigation Plan is provided in Appendix G. The Compensatory Wetland Mitigation Plan is provided in Attachment 6 of Appendix G.	*Quarter/Quarter*	*Section*	*Township*	*Range*
		6	25 S	12 W

In or near (City or Town)	*County*	*Tax Map #*	*Tax Lot #*[5]
North Bend	Coos	25S12W06C	0010000400
Wetland/Waterway (pick one)	*River Mile (if known)*	*Latitude (in DD.DDDD format)*	*Longitude (in DD.DDDD format)*
Kentuck Slough		43.42811526	3124.1762352
Name of waterway/watershed/HUC		*Name of mitigation bank (if applicable)*	
Coos Bay-Frontal Pacific Ocean - 1710030403			

(6) ADDITIONAL INFORMATION

Adjacent to R-F Site and Physical Mitigation Site Property Owners and Their Address *(if more than 5, attach printed labels*)*

See Appendix A (Landownership Information Associated with Wetlands Table).

Label information is provided in Appendix H and labels will be provided upon request.

Has the proposed activity or any related activity received the attention of the Corps of Engineers or the Department of State Lands in the past, e.g., wetland delineation, violation, permit, lease request, etc.?

Yes ☒ No ☐

If yes, what identification number(s) were assigned by the respective agencies: Previous applications to the Corps and to DSL were withdrawn. The wetland delineation report review by DSL continues under #2010-0043.

Corps #		State of Oregon #	

Has a wetland delineation been completed for this site? *Yes* ☒ *No* ☐

*If yes by whom?**	*Jones and Stokes and Ecology and Environment*

[5] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Has the wetland delineation been approved by DSL or the COE? *Yes* ☐ *No* ☒
If yes, attach a concurrence letter. *

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) *

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date

Comments:

See attached forms from Coos, Douglas, Jackson, and Klamath counties.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(8) *COASTAL ZONE CERTIFICATION* *

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Randy Miller	Staff Environmental Scientist
Applicant Signature	Date
Randy Miller	June 20, 2013

(9) SIGNATURES FOR JOINT APPLICATION

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or Dept. of State Lands staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

As required by FERC, Pacific Connector must obtain an easement across all properties affected by the PCGP Project (through negotiations or condemnation) prior to construction. The easement acquisition process for each parcel is in varying stages; therefore, please contact Randy Miller to schedule site visits.

I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. *I understand that payment of the required state processing fee does not guarantee permit issuance. The fee for the state application must accompany the application for completeness.*

Amount enclosed	*$*

Print /Type Name	Title	Print /Type Name	Title
Applicant Signature	Date	**Authorized Agent Signature**	Date
Signatures are included in the JPA form.		Signatures are included in the JPA form.	

Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for authorization to conduct removal/fill activities on such lands. This signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied.*

Print /Type Name	Title	Print /Type Name	Title
Property Owner Signature	Date	***Mitigation Property Owner Signature***	Date
As required by FERC, Pacific Connector must obtain an easement across all properties affected by the PCGP Project (through negotiations or condemnation) prior to construction.			

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

JORDAN COVE ENERGY PROJECT

SECTION 404/10 APPLICATION

March 28, 2014

Revised

October 16, 2014

Part C: Slip and Access Channel Project Supplemental Information

Part C: SLIP AND ACCESS CHANNEL PROJECT
Supplemental Information

This document contains information that supplements the JPA Form for the Jordan Cove Energy Project, and is specific to the Slip and Access Channel component of the Jordan Cove Energy Project, which also includes the Jordan Cove LNG Terminal Project and Pacific Connector Gas Pipeline Project. The information contained herein generally follows the format of the JPA Form so as to be organized and presented in a way that is familiar to the agencies.

(1) Applicant information

Applicant Name and Address	The Applicant's information is in the JPA Form.	Business Phone # Home Phone # Fax # Email	
Authorized Agent Name and Address Check one Consultant ☐ Contractor ☐	The Authorized Agent's information is in the JPA Form.	Business Phone # Home Phone # Fax # Email	
Property Owner Name and Address If different from above[1]	Below MLLW, site is owned by DSL 775 Summer Street NE Salem, OR 97301	Business Phone # Home Phone # Fax # Email	503.378.3805 NA 503.378.4844 NA
Property Owner Name and Address If different from above		Business Phone # Home Phone # Fax # Email	

(2) Project Location

Street, Road or Other Descriptive Location		Legal Description (attach *tax lot map**)			
South of Trans Pacific Parkway; West of Jordan Cove Road. See Figure i-1 Project Vicinity.		Township	Range	Section	Quarter/Quarter
		25S	13W	various	various
In or near (City or Town)	County	Tax Map #		Tax Lot #[2]	
North Bend	Coos	See Figures i-2.7, i-2.8		See Figures i-2.7, i-2.8	
Wetland/Waterway (pick one)	River Mile (if known)	Latitude (in DD.DDDD format)		Longitude (in DD.DDDD format)	
Coos Bay	7.3	43.425346 (approximate)		124.16767 (approximate)	
Directions to the site	Highway 101 north of Coos Bay, then Southwest on Trans Pacific Parkway.				

[1] If applicant is not the property owner, permission to conduct the work must be attached.
[2] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(3) Proposed Project Information

Type: Fill ☒ Excavation (removal) ☒ In-Water Structure ☒ Maintain/Repair an Existing Structure ☐

Brief Description: Construct new Slip and Access Channel and LNG Export Terminal and appurtenant facilities (Liquefaction Site, Utility Corridor/Access Road, South Dunes Power Plant, SORSC, Trans Pacific Parkway Improvements, and Workforce Housing)

Fill

Riprap ☒ Rock ☐ Gravel ☒ Organics ☐ Sand ☒ Silt ☒ Clay ☐ Other: ☒ Concrete, Pile

Wetlands (Estuarine and Freshwater)	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	~5.65 million CY
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		

Removal

Wetlands (Estuarine and Freshwater)	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	~100,000
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		
Waters below OHW	Permanent (cy)	Temporary (cy)						Total cubic yards for project (including outside OHW/wetlands)	
	See Impacts Bulk Upload Template	See Impacts Bulk Upload Template							
	Impact Area in Acres	Dimensions (feet)							
	See Impacts Bulk Upload Template	L'	n/a	W'	n/a	H'	n/a		

Total acres of construction related ground disturbance (If 1 acre or more a 1200-C permit may be required from DEQ) More than 5 acres

Is the disposal area upland? Yes ☒ No ☐ Impervious surface created? 0<1 acre ☐ 0>1 acre? ☒

	Yes	No
Small portions of the disposal site area are freshwater wetland and their fill is subject to this permit.		
Are you aware of any state or federally listed species on the project site?	X	
Are you aware of any Cultural/Historic Resources on the project site?	X	
Is the project site within a national Wild & Scenic River?		X
*Is the project site within a State Scenic State Scenic Waterway?**		X

If yes, please explain in the project description (in block 4)

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(4) Proposed Project Purpose and Description

Purpose and Need:

*Provide a description of the public, social, economic, or environmental benefits of the project along with any supporting formal actions of a public body (e.g. city or county government), as appropriate.**

Please refer to Federal Energy Regulatory Commission [FERC] Resource Report 1 – General Project Description.

Project Description:

Please describe in detail the proposed removal and fill activities, including the following information:

- Volumes and acreages of all fill and removal activities in waterway or wetland separately
- Permanent and temporary impacts
- Types of materials (e.g., gravel, silt, clay, etc.)
- How the project will be accomplished (i.e., describe construction methods, equipment, site access)
- *Describe any changes that the project may make to the hydraulic and hydrologic characteristics (e.g., general direction of stream and surface water flow, estimated winter and summer flow volumes) of the waters of the state, and an explanation of measures taken to avoid or minimize any adverse effects of those changes.*
- Is any of the work already complete? Yes ☐ No ☒ If yes, please describe the completed work.

In addition, for fish habitat or wetland restoration or enhancement activities, complete the information requested in supplemental Fish Habitat or Wetland Restoration and Enhancement form.

Project Drawings

State the number of project drawing sheets included with this application: Approximately 70 project figures and design sheets are included. Drawings are also provided in the October 2014 Compensatory Wetland Mitigation Plan.

A complete application must include a location map, site plan, cross-section drawings and recent aerial photo as follows and as applicable to the project:

- **Location map** (must be legible with street names)
  - Site plan including;
  - Entire project site and activity areas
  - Existing and proposed contours
  - Location of ordinary high water, wetland boundaries or other jurisdictional boundaries
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Map scale or dimensions and north arrow
  - Location of staging areas
  - Location of construction access
  - Location of cross section(s), as applicable
  - Location of mitigation area, if applicable
- **Cross section drawing**(s) including;
  - Existing and proposed elevations
  - Identification of temporary and permanent impact areas within waterways or wetlands
  - Ordinary high water and/or wetland boundary or other jurisdictional boundaries
  - Map scale or dimensions
- **Recent Aerial photo** (1:200, or if not available for your site, the highest resolution available)

Will any construction debris, runoff, etc., enter a wetland or waterway? Yes ☒ No ☐

If yes, describe the type of discharge and show the discharge location on the site plan.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

1. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP L.P.) is requesting authorization to site, construct, and operate a natural gas liquefaction and LNG terminal and associated facilities ("Jordan Cove LNG Terminal Project" or "LNG Terminal", subsequently referred to as the Project) on the bay side of the North Spit of Coos Bay, Oregon (see Figure i-1, Project Vicinity).

Natural gas will be delivered to the Project site (via the gas pipeline, which will connect the Project with existing Pacific Gas and Electric Company [PG&E] intrastate pipeline and interstate natural gas pipeline systems), where it will be conditioned, cooled into a liquid, stored in two full-containment 160,000 m^3 LNG storage tanks, and loaded on to LNG carriers for export at newly constructed marine facilities.

Such marine facilities include an access channel and a slip that are described herein, and will ultimately be operated and maintained by the Oregon International Port of Coos Bay (Port). The Slip and Access Channel Project will connect the existing Coos Bay Navigation Channel and the Project site at approximately Coos Bay Navigation Channel Mile 7.3. Proposed maintenance dredging of the Slip and Access Channel is expected to occur every two to four years. It is anticipated that approximately 90 ships per year will be required to transport the LNG from the Project site, based on the estimated size of the LNG carriers expected to call upon the LNG terminal. Figure i-2, Study Area and Delineated Wetlands, shows the study area and all wetlands and waters delineated within the Project vicinity. The Project footprint is defined as the area that will be both temporarily and permanently impacted by the Project and the Slip and Access Channel Project.

Impacts resulting from the Project and the Slip and Access Channel Project have been minimized to the greatest extent practicable, as discussed in the Federal Energy Regulatory Commission (FERC) Resource Reports. As such, the information contained in this permit application does not repeat the extensive analyses and the rationale behind the layout of the facilities that will be placed on top of the fill within the Project area. Along these lines, wetland impacts are discussed in regards to the removal-fill activities that will occur and that will result in impacts, not in regards to the placement of the building or facility that will be constructed after placement of fill material. Please refer to the FERC Resource Reports, particularly Resource Report 10 – Alternatives. for additional information on how the Project design was evaluated and selected as proposed. All figures and design sheets are included as Appendix A of this application. An updated set of Figures has been provided in October 2014. An Impacts Bulk Upload Template, also provided to the USACE in October 2014 provides a table of aquatic resource impacts in a USACE-requested format. Appendix C provides detailed information on the proposed construction schedule.

1.1. Project Location (Figure i-1)

The location of the Project has been selected to comply with rules and codes regarding public safety, design contingency, and access in the event of an emergency situation. All facilities and components will be constructed in accordance with governing regulations, including 33 Code of Federal Regulations (CFR) Part 127 for the marine facilities, the U.S. Department of Transportation (DOT) Federal Safety Standards for Liquefied Natural Gas Facilities, both 49 CFR Part 193 and National Fire Protection Association (NFPA) Standard 59A for LNG facilities, and the codes and standards referenced therein. Furthermore, nearly all permanent Project facilities will be located on industrial land within unincorporated Coos County, owned by Fort Chicago LNG II U.S. L.P., an affiliate of JCEP L.P. (see Figure i-1, Project Vicinity).

1.2. Project Description

The LNG Terminal and Slip and Access Channel Projects are made up of the following components:

(1) **Slip and Access Channel** – where LNG vessels will enter the slip via the access channel, get loaded with LNG, and leave for export.

(2) **Barge Berth** – where fill will be placed to construct a barge berth and dredging will occur to access the barge berth.

(3) **LNG Liquefaction and Terminal Site** – where natural gas will be liquefied and stored in large containment storage tanks for future loading onto LNG vessels for export;

(4) **Utility Corridor/Access Road** – which will provide an interconnecting corridor (during facility construction [referred to as the excavated material haul road] and operation) between the LNG Liquefaction and Terminal Site and the South Dunes Power Plant Site for gas pipelines and transmission lines as well as transporting equipment and maintenance staff, etc.;

(5) **Southwest Oregon Regional Safety Center (SORSC)** – which will provide emergency response services for the facility and the southern Oregon region;

(6) **South Dunes Power Plant Site (SDPP) –** which will contain a 420 megawatt (MW) power plant and related facilities to provide the energy required to cool and thereby liquefy the natural gas.

(7) **Industrial Wastewater Line and Water Line Relocation –** an industrial wastewater line and water line, which will need to be relocated for Project construction;

(8) **Trans Pacific Parkway and Highway 101 Intersection Improvements –** where Trans Pacific Parkway will be widened at three locations to provide safe ingress/egress for construction traffic and will be symmetrically widened at the Highway 101 intersection to create a left-turn lane from TPP onto northbound 101**;**

(9) **North Point Workforce Housing Project (NPWHP)** – which will consist of temporary housing and amenities for approximately 2,000 workers during project construction; and

(10) **Temporary Facilities Laydown Area** – where construction staging and temporary laydown of equipment will occur during construction of the Project.

Each of these Project components is shown in Appendix A, Figures, and described in further detail below. Figure i-2 shows the study area boundary and all delineated wetlands. The Impacts Bulk Upload Template, provides a summary of all of the freshwater wetland and estuarine impacts resulting from the Project. JCEP L.P. has evaluated multiple design features that are intended to avoid and minimize impacts to wetlands and waters. These avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts, and in the 404(b)(1) guidelines document provided to the U.S. Army Corps of Engineers (USACE).

1.3. Project Construction Schedule

Construction activities for the Project are expected to begin at the end of the third quarter of 2015. Construction of the LNG terminal and the slip is expected to take approximately 42 months, as shown on the general schedule for the major project construction activities (see Appendix C, Figure 1). As shown in the schedule, the dredging required to remove the barrier berm and create the access channel will occur during the Oregon Department of Fish and Wildlife (ODFW) designated in-water work window (which is October 1 through February 15). Figure i-3 shows temporary facilities, staging, and laydown areas that are thought to be necessary for construction of the Project at the time of submittal.

1.4. Endangered Species Act (ESA) Compliance

Informal coordination with Chris Claire at ODFW and Chuck Wheeler at the National Marine Fisheries Service (NMFS) regarding proposed in-water work has continue through the fall of 2013. Additionally, a Biological Assessment (BA) is being prepared to address USACE's and Oregon Department of State Lands' (DSL's) requests for additional information regarding the effects of the Project on sensitive fish and invertebrate species and their habitats within the Project action area. Also included in the BA is an assessment of the Project's effects on Essential Fish Habitat as required under the Magnuson-Stevens Act (MSA). Refer to the BA for more details regarding construction methods and species impacts. More formal consultation with NMFS is expected to occur during the permitting process. It is anticipated that a Biological Opinion (BO) for the Project and the Slip and Access Channel Project will be issued in spring or summer of 2015.

To minimize impacts on fisheries, to reduce the total period of estuary turbidity, and to extend the time available for construction, dredging for access to the Barge Berth will be done in two separate phases, mirroring the construction approach for the Port's Slip and Access Channel. The first phase (called the upland phase) will include only upland excavation and construction not subject to regulation under Section 10/404 or the Oregon Removal-Fill Statute, because the work will not be in a jurisdictional wetland, water of the United States, or water of the State. The second phase (called the in-water phase) will be performed in waters of the United States and waters of the State and is subject to the requirements of Section 10/404 and the Removal-Fill Statute, including limiting in-water activities to the approved in-water work window. This phasing is intended to allow year-round work on Phase 1 while minimizing impacts to the waters of Coos Bay by complying with the in-water work window for in-water construction activities.

Phase 2 will be constructed between October 1 and February 15 (consistent with the ODFW in-water work guidelines), when fisheries considerations allow in-water work.

In-water work associated with the barge berth and access, fill placement on the west side of the Mill Site/South Dunes Site (also referred to as the South Dunes Site) within the estuary, Trans Pacific Parkway improvements, and the NPWHP bridge will be conducted during the approved in-water work window.

1.5. Cultural Resources

Shallow subsurface probing and pedestrian surveys for archaeological/cultural resources have been conducted throughout nearly the entire Project footprint (see Figure i-4). In areas where deeper excavation may be required (e.g., construction of the slip, installation of power poles for transmission lines or installation of bridge bents), additional, deeper archaeological probing and testing is now underway or is planned in the future. Preliminary coordination with the State Historic Preservation Office (SHPO) and the tribes (Coquille Indian Tribe, Confederated Tribes of Siletz Indians, and Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians) has been initiated. This information has been provided to USACE for the purpose of Section 404/10 permitting. Extensive cultural resources documentation is located in FERC Resource Report 4 and can be made available upon request.

1.6. Impervious Area and Hydraulic Characteristics

Impervious surfaces of the Project site are described in FERC Resource Report 2. The LNG facility will be designed to provide drainage of surface water to designated areas for disposal in accordance with 49 CFR § 193.2159. Proper drainage and disposal of stormwater will be accomplished by a system of ditches, swales, and collection sumps (where needed).

Stormwater collected in areas with no potential for contamination will be allowed to flow to or be pumped directly to a system of stormwater ditches and swales and ultimately drain to the slip. Because water in the slip will mix with the rest of Coos Bay, which is subject to tidal fluctuations, no changes to Coos Bay hydraulic characteristics are anticipated.

Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped to or will flow to the oily water collection sumps. Stormwater collected from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline. See Section 1.7 for additional details.

1.7. Stormwater Treatment

The stormwater facilities will be designed to provide drainage of surface water to designated areas for disposal in accordance with 49 CFR § 193.2159. Proper drainage and disposal of stormwater will be accomplished by a system of ditches and swales. Stormwater collected in areas that have no potential for contamination (such as roof runoff) will be allowed to flow to or be pumped directly to a system of stormwater ditches, which will provide some level of treatment and ultimately drain to the slip. Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped to or allowed to flow to the oily water collection sumps. Stormwater collected from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline.

Stormwater treatment will be provided for each bridge and new or modified roadway. Stormwater will not be allowed to flow directly into wetlands or jurisdictional waters. Stormwater discharge will be treated, and in some cases detained, prior to discharge into waters of the State or the United States. Detailed stormwater treatment plans will be prepared with the 60-percent design plans. Stormwater treatment will utilize a variety of common Best Management Practices (BMPs) for treatment. These may include any one or a combination of the following: infiltration, stormwater detention ponds, biofiltration swales, filter strips, bioslopes, detention vaults, and detention tanks. Additionally, treatment BMPs shall utilize compost-amended soils as necessary to remove metal pollutants, such as copper. To the extent possible, infiltration will be the preferred treatment option. Maximizing infiltration will reduce the Project's overall footprint. Where lower infiltration rates are found, or where sandy soils may allow direct subsurface flow to jurisdictional waters or wetlands, the stormwater management plan will employ the other treatment BMPs listed above.

1.8. Hydrologic Changes

Extensive studies have been completed for the dredging of the slip and access channel and as it relates to hydrologic, hydraulic and sediment-related changes. The modeling results, provided by Coast and Harbor Engineering, demonstrated that the potential effects of slip construction (including the dredging of the access channel) would be localized to the area of the activity. This information has been documented and is available in Resource Report 2. Sedimentation and maintenance requirements have also been addressed and are predicted to be minimal, as documented in Resource Report 1, Appendix E.1). An analysis of turbidity during construction concluded that turbidity generation resulting from construction and maintenance dredging will likely not be significant (See Tab H of the June 2013 Slip and Access Channel Project 404 Application – Report on Turbidity Due to Dredging).

Hydrologic analysis indicates that the slip will have current velocities on the order of 0.1 to 0.2 meters per second (m/s) (see Sediment Sampling and Analysis Report in FERC Resource Report 2, Appendix B.2). Because the slip will be essentially perpendicular to the navigation channel and there will be low velocities within the slip, excavation for the slip is not anticipated to affect overall hydrologic function within the bay or overall sediment accumulation and deposition patterns. There may be some deposition of sandy silt material from upstream areas, but as calculated in the hydrologic study, quantities are expected to be relatively small—about 88,000 to 175,000 cubic yards (CY) per year—and will be removed by maintenance dredging every two to four years. Moreover, the bathymetry near the proposed LNG Liquefaction and Terminal Site, where LNG loading onto vessels will occur, and at adjoining locations is relatively stable, as demonstrated by recent hydrosurveys.

Based on evaluation of all of the different estimates, the design sedimentation rates for the slip and the access channel dredging are 0.16 feet per year and 0.56 feet per year, respectively. This translates to approximately 8,500 CY per year and 29,200 CY per year, respectively.

Sedimentation and maintenance dredging requirements would likely be reduced at the access channel area over time due to natural stabilization and adjustment processes. Predicted volumes for maintenance dredging in the access channel are 26,100 CY per year after 10 years, 21,900 CY per year after 25 years, and 14,800 CY per year after 50 years. A copy of the Coast and Harbor Engineering (C&H) Report, which includes this analysis, is provided as Appendix E.1 in FERC Resource Report 1.

1.9. Tsunami Protection Measures

The impacts and hazards of tsunamis to an industrialized area were well illustrated during the 2011 Tohoku, Japan earthquake. This tsunami was generated by an offshore subduction zone earthquake; subsidence occurred and increased the impacts of the tsunami significantly in some areas. Because similar earthquakes and subsidence are of concern off the Oregon Coast, the lessons learned from 2011 earthquake in Japan regarding subsidence, runup, scour, and foundation performance, etc. provide a useful case history for evaluating hazards at the Project site. The tsunami hazard at the facility will also be evaluated for a subduction zone rupture consistent with the new FERC recommendations, including the 2,475 year return. Currently, new modeling is being developed to evaluate impacts from an earthquake and tsunami to the Project site, and the results from these models will be filed when they are complete (in approximately two to three months).

A Project site-specific tsunami hazard study completed by Zhang (2012) evaluated the tsunami inundation elevation for the pre- and post-construction geometries and found minimal differences. This study is currently being revised to include the 2,475 year hazard-level tsunami scenario and previously completed deterministic studies. To mitigate the tsunami hazard, JCEP L.P. has proposed designing the Project facilities, including the LNG Liquefaction and Terminal Site, at elevations that exceed the design-level tsunami. A detailed description of the tsunami hazard and the design elements incorporated into the Project to address the tsunami potential is provided in FERC Resource Report 6 – Geological Resources, which can be made available upon request.

All bridges have been designed to meet the requirements for Oregon Department of Transportation (ODOT) 100-year flood events and include design measures to minimize potential impacts in the event of a tsunami. Design standards and criteria for bridge structures are provided in Appendix D – Bridge Design Standards and Criteria. Furthermore, the Mill Site/South Dunes Site will be raised to an approximate elevation of 46 feet, and at Ingram Yard (the LNG Liquefaction and Terminal Site) berms will be constructed around the terminal facilities to an approximate elevation of 46 feet, which is above the tsunami inundation zone. Additional information regarding tsunami event modeling is provided in FERC Resource Report 6.

1.10. Public Health and Safety

The Project has been designed to comply with public health and safety standards. The following Project elements have been incorporated to prevent interference with public health and safety:

- The landside area will be fenced and posted with signs to prevent general public access and public interaction with industrial activities. Further, landside access to Port facilities will be manned or electronically controlled.
- Safety criteria will be applied.

The Project will be located outside the airport approach surfaces and downstream of the railroad bridge, to reduce the possibility of vessel allisions with the bridge.

2. Project Components

Figure i-4, LNG Project Footprint (see Appendix A), shows the area that will be both temporarily and permanently impacted by the Project. The following sections and updated figures and sheets provide more details. As previously mentioned, avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts.

2.1. Slip and Access Channel (Sheets 1-1 – 1-3)

As mentioned previously, a Slip and Access Channel will be constructed between the existing navigation channel and the LNG terminal. Permanent wetland impacts are required below HMT to construct the slip and access channel. The slip is necessary to provide a safe and protected berth location for LNG vessels outside the navigational channel.

The width of the currently proposed slip is 800 feet, east sheet pile face to west sheet pile face, with a constant depth within the slip of -45 feet. Since original design, the width has always been established by the requirements of the LNG terminal without consideration for what might be the disposition of the west side of the slip. The 800-foot slip width is determined by the need of the LNG terminal to be able to move an LNG vessel off of the LNG berth on the east side of the slip in the event of an incident within the LNG upland facilities that might threaten the safety of the LNG vessel at berth. As an example, should there be a fire within the LNG terminal it would be important to have the flexibility to move the vessel away from the LNG berth. This would be particularly important if the incident was created by the leakage of LNG at or near the LNG vessel loading structure. If the tide were at a low stage it might not be possible to allow the vessel to move out of the slip into the navigation channel to allow transit out to sea. Having the 800 foot slip width provides the flexibility needed for tugs to move the LNG vessel away from a hazard at the terminal or at the LNG loading dock to the relative safety of the west side of the slip.

LNG Carriers (LNGC) may draw a fully laden draft of up to 13.0 meters. The LNGC “LNG Rivers”, a 138,000 cubic meter vessel, is used as the template for vessel movements into the JCEP slip and during vessel transit simulations. This vessel, in a fully laden state, draws 12.3 meters of draft. The rule of thumb to maneuver an LNGC is to maintain an under keel clearance of approximately 10% of the loaded draft. The ebbing associated with a tsunami that might occur on lower low water (LLW) tide is also factored into the design. Establishing the slip depth at -45 feet will ensure that a fully laden LNGC and located within the Slip is at negligible risk of touching the bottom of the slip during such an extreme event. All of these factors plus a margin for error set the design depth of the slip at approximately 45 feet. The “flare” of the access channel is designed to allow a vessel to safely maneuver into and out of the slip without having the vessel hull come into contact with the slip bottom.

2.1.1. Slip and Access Channel Construction Staging

Construction staging will occur north of the slip location in uplands (see Appendix A, Figure i-3, Temporary Facilities). Access to the Slip and Access Channel construction area will occur via existing gravel and paved roads as well as a temporary excavated material haul road. Excavated material from the slip will be transported on the excavated material haul road (which is discussed in further detail in the Utility Corridor/Access Road section, below). Dredged material from the access channel will be transported via the hydraulic dredge pipeline entirely on existing pavement and riprap on Roseburg Forest Products property. See Appendix A, Figure i-3, Temporary Facilities, which shows the excavated material haul road and the hydraulic dredge pipeline corridor.

Slip dredging will occur in two phases. The first phase will occur while the berm is in place. During this phase fresh water will fill the dredge pocket created behind the berm. This water is used as the transport medium to suspend the sand that is slurry transported to the Mill Site. At the Mill Site the slurry is discharged into a settling basin and the sand settles out to leave a decant water. Any decant water that does not percolate through the sandy bottom of the settling basin will be returned by a second pipeline system back to the dredge pocket. This is strictly a closed loop freshwater operation with no direct communication to the Waters of the U.S. The second phase of dredging occurs when the dredge is working from the Coos Bay side using the salty water of Coos Bay to transport the dredged sand to the Mill Site. The decant water from this phase is also returned to the dredge pocket. For some period of time while the berm is still intact there is no communication with Waters of the U.S. but once the berm is breached there will be communication with Waters of the U.S.

For further construction methods for each phase of the Project, refer to Section 1.3.2 of FERC Resource Report 1.

2.1.2. Slip (Sheets 1-1 – 1-3)

Construction of the approximate 30-acre slip and the marine facilities site will be conducted behind a barrier berm that would isolate the construction area from the Coos Bay estuary and open channel. As such, the proposed slip and marine facilities will be excavated and constructed from and within existing upland, respectively. Approximately 30.8 acres of upland area will be excavated for the slip. No impacts to wetlands or waters will occur during this time.

The inside dimensions at the toe of the slope in the slip are approximately 800 feet along the northern boundary and approximately 1,500 feet and 1,200 feet along the western and eastern boundaries, respectively. The minimum water depth within the slip is - 45 feet NAVD88 (North American Vertical Datum of 1988 [Please note: All Project and Slip and Access Channel Project elevations are in NAVD88 if not specified]). Side slopes are anticipated to be initially constructed at 3 horizontal (H): 1 vertical (V), and the top of the slope is proposed at elevation +25 feet NAVD88.

JCEP L.P. will utilize the east side of the slip for the LNG ship berth. Tug-assist berths will be located on the north side of the slip. The area above the sheet pile wall on the west side of the slip will be used to create a berm as a location for the placement of dredge material (subsequently referred to as the West Slip Stockpile Site). Creation of a berm at the West Slip Stockpile Site will effectively preclude any immediate development of the west side of the slip.

The eastern and western sides of the slip will be formed by the OPEN CELL® sheet pile technology developed and patented by PND Engineers, Inc. OPEN CELL® sheet pile technology is being used at the Sabine Pass LNG Terminal. Unlike conventional sheet pile retaining walls that maintain a clean linear berth face, the OPEN CELL® sheet pile structure face is designed to uniformly deform into a scalloped face as the landside static loads are applied. The engineering advantage of this technology is that the structural integrity of the sheet pile wall is created by the post-construction stressing of the wall by driving the sheet piles, including the tie-back walls first, then excavating the material from the water side area. This approach results in the upland load stretching out the wall to reach its final scalloped face. When the sheets are driven, the wall is a perfectly straight line. It is only after the material on the water side is excavated that the equalizing load on the water side is removed, thereby forcing the shore side load to stretch the piled walls and lock them into place, creating a very stable structure. The sheet pile system will be designed to support the dead loads of the soils and structures and the live loads of the LNG ship and equipment, as well as to meet the seismic criteria for the facility and water-imposed loads.

The OPEN CELL® sheet pile structure will allow the LNG carriers to be moored approximately one meter from the side of the slip. The LNG carrier loading arm/docking platform slab deck will be constructed of concrete behind the OPEN CELL® sheet pile wall. The LNG carrier mooring dolphins, breasting dolphins, and loading arm platform and structures will be constructed on the upland area behind the OPEN CELL® sheet piles. Four breasting structures and six mooring structures will be provided for berthing the LNG ship. The breasting dolphins will be attached to the front of the concrete loading arm/docking platform and will be equipped with fenders sized to safely berth and moor the full range of LNG carriers authorized to call on the LNG terminal. The mooring dolphins will be located onshore and will also be constructed from concrete on pile-supported foundations. The mooring structures will be provided with suitable access, quick release hooks, and lighting. Land-based mobile cranes with pile driving equipment will be located on the land side of the OPEN CELL® sheet pile walls. All piles required for the LNG loading structure as well as for all of the mooring dolphins will be driven on dry land, and no open water pile driving will be required. The loading arm/docking platform will be a reinforced concrete slab/beam structure, approximately 115 feet wide by 60 feet deep and supported on piles. The majority of sheet piles and tail walls will be driven from the land while the slip construction activities are isolated from Coos Bay. The southern end of the east slip OPEN CELL® wall will be protected with riprap where it connects with the Barge Berth as shown in Sheet 1-3. To the extent possible, riprap will be placed while the barrier berm is still in place. Riprap wall or slope protection is not proposed on the west side of the slip.

Four marine loading arms will be installed on the concrete base of the loading arm/docking platform slab deck. A mezzanine-type elevated platform, located above the concrete support deck, will be constructed of steel and used for maintenance of the triple swivel assembly of the arms. LNG spill containment will be addressed at the main concrete lower platform level, where a concrete curbed and sloped area will contain LNG spillage. Drainage from this point will be via the LNG spill collection trough to the marine area impoundment basin. Plan and elevation views of the slip and the LNG carrier berth, including the loading arm structures, are provided in Sheets 3-1 through 3-3.

2.1.2.1. Wetland Impacts

Riprap will be placed at the base of the OPEN CELL® sheet pile wall for slope protection near the transition to the barge berth and will extend below the existing HMT. Riprap fill volumes below HMT are included with the Barge Berth volume shown in the Impacts Bulk Upload Template.

2.1.3. Access Channel (Sheets 1-1 – 1-3)

An access channel would also be created to connect the slip and the federally maintained Coos Bay Navigation Channel at approximately Channel Mile 7.3. The access channel will be configured/oriented so that LNG ships can dock safely, away from other ship traffic in the channel, and to facilitate emergency egress. The access channel is approximately 2,300 feet long, from the slip to the navigation channel (taking into account the bend in the navigation channel at this point of intersection).The access channel is approximately 800 feet wide at the mouth of the slip. The distance from the closest edge (north edge) of the navigation channel to the mouth of the slip is approximately 700 feet. The walls of the access channel would be sloped to meet the existing bottom contours at an angle of 3 feet H: 1 foot V, and the top of the slope is proposed at elevation +25 feet NAVD88. The eastern side of the slip will be used for an LNG berth and the northern end will be used for a tractor tug dock.

The access channel connecting the slip to the Coos Bay Navigation Channel will be dredged either before or after the berm is removed. Dredging of the access channel will be completed by hydraulic dredge and crane-mounted clamshell, both operating from upland and/or from a barge. The clamshell dredge may be necessary to excavate surface material that may contain rocky and woody debris, and sand from the access channel. Clamshell-dredged material will be loaded onto a barge then taken to the barge berth and transported to the designated disposal location. Isolation of the dredging and pile driving to install the OPEN CELL® sheet pile walls surrounding the slip is not proposed for several reasons: (1) sand particles will settle quickly and not cause significant turbidity, (2) the conservation measures listed in Section 5 below will ensure Department of Environmental Quality (DEQ) turbidity standards are maintained, and (3) all construction work will be conducted during the approved in-water work period. Details regarding disposal are described in further detail in Section 2.1.5, below.

2.1.3.1. Wetland/Estuarine Resource Impacts

The access channel will cover approximately 30 acres below the Highest Measured Tide (HMT) line. Impact quantities resulting from dredging of the access channel (including impacts to existing deep subtidal strata below -15 feet in depth, existing shallow subtidal strata [including eelgrass habitat] between the mean lower low water [MLLW] line and -15 feet, and existing intertidal strata between the MLLW and the HMT elevations) are provided in the Impacts Bulk Upload Template. All in-water work associated with constructing the access channel will be conducted during the ODFW in-water work window.

2.1.4. Barrier Berm (Sheets 1-1)

The basic concept is to excavate the majority of the proposed slip area (approximately 4.3 million cubic yards [MCY] of 5.65 MCY total) and construct most of the in-water structures while maintaining a natural physical barrier berm between the slip and Coos Bay. Old Jordan Cove Road (now abandoned as a result of completion of the Trans Pacific Parkway) runs along the Coos Bay shoreline and will be kept intact to form the crest of the barrier berm during the entire upland phase construction effort.

Once the upland phase activities (excavation and dredging of the slip and installation of the marine facilities) have been completed, the existing barrier berm, which would be approximately 40 feet wide at its crest, will be removed (approximately 0.5 MCY). This will connect the slip to Coos Bay. The in-water phase work will include excavation/dredging of the barrier berm and access channel (up to 1.3 MCY), and filling for creation of the barge berth. In-water work will occur during the ODFW in-water work window (October 15 through February 15).

2.1.4.1. Wetland/Estuarine Resource Impacts

Impacts resulting from dredging the barrier berm would be primarily to intertidal estuarine habitat and have been included under the access channel dredging impacts in the Impacts Bulk Upload Template.

2.1.5. Dredged and Excavated Material Placement

The amount of material proposed to be excavated and dredged to create the new slip is approximately 4.3 MCY (approximately 2.3 MCY excavated and 2.0 MCY dredged). During creation of the slip, dry excavated material will be hauled by trucks to the Mill Site/South Dunes Site via the excavated material haul road to use as fill. Material to be removed to create the slip below elevation -10 feet will be hydraulically transported to the Mill Site/South Dunes Site via the hydraulic dredge pipeline corridor.

An additional 1.3 MCY will be dredged to create the access channel, creating a total of 5.6 MCY of material to be dredged and excavated for creation of both the slip and the access channel. Excavated and dredged material would be disposed of primarily at the following two locations: (1) the adjacent Mill Site/South Dunes Site (upland; future location of the South Dunes Power Plant), and (2) the Ingram Yard/LNG Liquefaction and Terminal Site (upland) north of the slip. A very small portion of material would be placed at the West Slip Stockpile Site (see Appendix A, Figure 1-2), which is located between the riparian buffer boundary for Henderson Property and the OPEN CELL® sheet pile wall on the west side of the slip.

Future maintenance dredging is included with this action and would be required to maintain navigational depths for deep draft vessels that call at the new marine terminal. The 37,700 CY of material per year from the maintenance dredging will be placed at the U.S. Environmental Protection Agency (EPA)-designated offshore Site F (see FERC Resource Report 7 – Soils, Appendix H-7), as is the current maintenance dredge practice for the Coos Bay Navigation Channel. Detailed sediment transport modeling was conducted and verified by C&H. Additional information regarding the results of this modeling is provided in FERC Resource Report 1, and a copy of the Draft Volume 3 of the C&H Technical Report is provided as Appendix E.1 to FERC Resource Report 1. Material dredged for maintenance will likely be disposed of at the U.S. EPA-designated offshore Site F.

With the exception of the material from the maintenance dredging, all 5.6 MCY will be used beneficially by the Project in raising both the Ingram Yard/LNG Liquefaction and Terminal Site and the Mill Site/South Dunes Site to elevations above the tsunami inundation zone.

Additional information on dredged material disposal is provided in the Excavated and Dredged Material Management Plan (see Tab D of the June 2013 LNG Project 404 Application).

2.1.5.1. Wetland/Estuarine Resource Impacts

Impacts resulting from the placement of dredged and excavated material from the Slip and Access Channel are provided in the following sections; specifically, dredged and excavated material that will be placed at the Ingram Yard/LNG Liquefaction and Terminal Site that will result in wetland impacts is described under (2) LNG Liquefaction and Terminal Site, and dredged and excavated material that will be placed at the Mill Site/South Dunes Site that will result in wetland impacts is described in (4) SORSC Site, (5) South Dunes Power Plant Site, and in the Impacts Bulk Upload Template. In addition, maintenance dredging is proposed to occur every two to four years in Waters of the U.S. within the slip and access channel.

2.2. LNG Liquefaction and Terminal Site (Sheets 2-1 – 2-3)

The LNG Liquefaction Site is located immediately north of the slip. Development for the LNG Liquefaction Site will occur almost entirely within upland areas. Minor wetland impacts in the northern portion of the LNG Liquefaction Site will occur as a result of the need to place surplus fill material on land owned and/or controlled by JCEP L.P. (see Section 2.2.1.5 for additional details). The LNG Terminal Site is located on the east side of the slip. The LNG Terminal Site will be developed on both upland and estuarine areas. Installation of the LNG loading arm and associated equipment will occur entirely on upland and will not result in any wetland impacts. On the other hand, placement of fill for installation of the barge berth will result in some impacts to estuarine resources (see Section 2.2.2.3 for additional details).

2.2.1. LNG Liquefaction Site (Sheets 2-1)

In summary, the LNG Liquefaction Site will contain the following components:

- An LNG storage system consisting of two full-containment LNG storage tanks, each with a net capacity of 160,000 m^3 (1,006,000 barrels); and
- An emergency vent system; an LNG spill containment system; a fire water system; fuel gas, nitrogen, instrument/plant air and service water facility systems; various hazard detection, control, and prevention systems; utilities (lights, etc.); and buildings and support facilities (stormwater and wastewater systems, etc.).

Additional information on the development occurring in uplands and associated with the LNG Liquefaction Site (LNG tank construction sequence, LNG tank foundation, etc.) is provided in FERC Resource Report 1 – General Project Description.

2.2.1.1. Site Preparation and Ground Improvements

Construction site preparation will require clearing, ground improvements (via vibratory compaction and removal of an organic layer, for example), filling, and grading of the site to an approximate elevation of +30 feet NAVD 88 for the base of the LNG storage tank area and approximately +46 feet NAVD 88 for the process areas. Temporary ditches, sediment fences, and silt traps will be installed as necessary. Individual excavations will then be made for equipment foundations. Following completion of foundations, the site will be brought up to final grade. Final grading and landscaping will consist of gravel-surfaced

areas, asphalt-surfaced areas, concrete-paved surfaces, and grass areas (the final site elevation will be raised above the tsunami inundation zone).

Ground improvements refer to the removal of an organic layer of soil, followed by vibratory compaction of the subsurface sand below and on perimeters of the project footprint. Ground improvements will occur no more than 50 feet outside the toe of slope. Site work will begin with grubbing and removal of the organic layer, followed by sand vibratory compaction which includes filling localized compacted areas with sand to make the soils more dense. Compaction may cause soil settlement to occur approximately 5 to 7 feet outside of the point of treatment. Following compaction, the top 3 feet of wetland areas will be returned to original elevations and can be loosened or scarified to allow vegetation planting. Ground improvements are considered temporary impacts because wetland hydrology sources are not anticipated to be impacted, soils will be amended as needed, and hydrophtic vegetation will be replanted.

2.2.1.2. Excavated Material Placement

Grading of the areas to be occupied by the Project facilities will entail approximately 2.5 MCY of cut and fill. Any material remaining from that work, including final grading and landscaping, will be used to raise the South Dunes Site utilized for the pipeline gas conditioning facility and to raise the access/utility corridor between the LNG terminal and the South Dunes Site. Approximately 3.5 MCY of material will be available for the South Dunes Site and the access/utility corridor to raise the existing elevation to approximately +46 to +48 feet NAVD 88. The material available to raise the elevation of these areas will come from the excavation of the Slip and Access Channel.

2.2.1.3. Foundations

Geotechnical studies have been completed to determine the soil properties of the existing subsurface materials and to identify the foundation design criteria for structures associated with the Project. To supplement the previous geotechnical investigation work, additional testing was conducted in spring and summer 2014. This geotechnical testing was coordinated with the appropriate federal, state, and local agencies to ensure compliance with applicable regulations.

Geotechnical investigations recommend soil compaction (i.e. ground improvements) at locations throughout the project areas. In general, the foundations for all equipment and structures, including the LNG storage tanks, process equipment, and pipe racks, will be mat type. Foundations for all critical process equipment and structures located outside of the storm surge barrier will be installed at an elevation of +46 feet. Seismic hazard studies are discussed in FERC Resource Report 6 – Geological Resources, including discussion of the lessons learned from the Tokohu earthquake of March 11, 2011, in Japan.

2.2.1.4. Materials and Equipment Delivery

Final transportation to the Project site will occur by road, rail, and marine transport. An existing rail line is located adjacent to the Project site. The kinds of materials and the mode of delivery to the site will depend on their origin, size, and weight. It is anticipated that the larger and heavier pieces of equipment will arrive by marine transport. These delivery options will be further evaluated in final design.

JCEP L.P. is reviewing transportation methods for the large pieces of equipment and is proposing to develop a barge berth to be used for material and/or equipment shipment during construction. This barge berth will be placed at the eastern edge of the access channel, utilizing the area dredged for the Slip and Access Channel as the berth and the area behind the OPEN CELL® sheet pile walls as the dock surface. A heavy equipment haul road will be constructed from the barge berth face to the South Dunes Power Plant Site. The heavy equipment haul truck route (see Appendix A, Figure i-3, Temporary Facilities) will follow an easement through the Roseburg Forest Products property up to Jordan Cove Road. It will follow Jordan Cove Road until it intersects with an existing road that was used by Weyerhaeuser during operation of its linerboard facility (which is also a portion of the route of the access/utility corridor to the LNG terminal). The trucks will not cross Trans Pacific Parkway at any time, and the only potential conflict will be with chip truck traffic to the Roseburg Forest Products wood chip facility. Wood chip truck traffic will be given the right-of-way over heavy equipment haul truck traffic by using flag men to halt heavy haul truck traffic until passing vehicles have passed the intersection. The heavy equipment haul truck route will be on JCEP L.P.-owned land or easements granted by Roseburg Forest Products to JCEP L.P. Traffic surveys of the anticipated construction-related traffic have been conducted, and measures have been proposed to mitigate adverse effects. These are discussed in detail in FERC Resource Report 5 - Socioeconomics.

JCEP L.P. further envisions that some bulk materials, such as insulation, will be shipped in standardized containers. Fabrication shops will be used to create pipe spool pieces and other prefabricated units of equipment and skid-mounted process equipment modules. Delivery to the site will occur in accordance with the construction schedule. Where practical, skid-mounted equipment will be used during delivery.

The Coos Bay Rail Link (CBR), which is owned by the Port, is now suitable for delivery of materials to the Project site.

2.2.1.5. Wetland Impacts

The only permanent wetland impacts that will result from the LNG Liquefaction Site involve surplus fill material placement from excavation and dredging. This surplus fill material will be placed in the northwest and northeast corners of the LNG Liquefaction Site. Therefore, Wetland 2013-4 will be partially filled and Wetland 2013-3 will be filled with surplus material. While permanent construction activities are not proposed beyond the toe of slope, temporary impacts at Wetland 2013-4 may occur adjacent to the toe of slope as a result of site preparation activities, ground improvements, and erosion and sediment control maintenance activities. These temporary impacts, if any, will be rectified as described in the Site Restoration/Rehabilitation section in Block 5. See the Impacts Bulk Upload Template for additional details.

2.2.2. LNG Terminal Site (Sheet 2-2)

In summary, the LNG Terminal Site will have the following components:

- A protected LNG carrier loading berth constructed on an OPEN CELL® technology sheet pile slip wall and capable of accommodating LNG carriers ranging in capacity from 89,000 m^3 to 160,000 m^3;
- An LNG carrier cargo loading system consisting of three, 16-inch loading arms and one 16-inch vapor return arm, a gangway tower, firewater monitors, service utilities, and associated valves and piping (designed for 10,000 m^3 per hour (m^3/hr) rate with a peak capacity of 12,000 m^3/hr);
- An LNG transfer line consisting of one 2,300-foot-long, 36-inch-diameter line that will connect the shore-based storage system with the LNG loading system;
- A pipeline gas conditioning facility consisting of two feed gas cleaning and dehydration trains with a combined natural gas throughput of approximately 1 Bscf/d;
- Four natural gas liquefaction trains, each with the export capacity of 1.5 MMTPA;
- A refrigerant storage and resupply system;
- An Aerial Cooling System (Fin-Fan);
- An LNG storage system consisting of two full-containment LNG storage tanks, each with a net capacity of 160,000 m^3 (1,006,000 barrels), and each equipped with three fully submerged LNG in-tank pumps sized for approximately 11,600 gallons per minute (gpm) each;
- An LNG transfer line consisting of one 2,300-foot-long, 36-inch-diameter line that will connect the shore-based storage system with the LNG loading system;

- An LNG carrier cargo loading system designed to load LNG at a rate of 10,000 m^3/hr with a peak capacity of 12,000 m^3/hr, consisting of three 16-inch loading arms and one 16-inch vapor return arm;
- A protected LNG carrier loading berth constructed on an OPEN CELL® technology sheet pile slip wall and capable of accommodating LNG carriers with a range of capacities;
- The improvement of an existing, on-site unimproved road and utility corridor to become the primary roadway and utility interconnection between the LNG Terminal and South Dunes Sites, including between the pipeline gas conditioning units on the South Dunes Power Plant Site and the liquefaction trains on the LNG Terminal Site;
- A boil off gas (BOG) recovery system used to control the pressure in the LNG storage tanks;
- Electrical, nitrogen, fuel gas, lighting, instrument/plant air and service water facility systems;
- An emergency vent system (ground flare);
- An LNG spill containment system, a fire water system, and various other hazard detection, control, and prevention systems; and
- Utilities, buildings, and support facilities.

2.2.2.1. Barge Berth (Sheet 2-3)

A barge berth will be constructed on the east side of the slip. The barge berth will be used during project construction to transport equipment and large modules to the Mill Site/South Dunes Site via the heavy equipment haul road. The barge berth may be used to offload dredged Access Channel material from barges onto trucks. The barge berth will be located on the eastern side of the access channel and bordered by an OPEN CELL® sheet pile wall and riprap slope stabilization on the west side of the barge berth. The concept and construction technique for the OPEN CELL® sheet pile wall surrounding the barge berth are the same as those described for the east side of the slip. Riprap is proposed east and west of the barge berth to prevent scour.

2.2.2.1.1. *Constraints to the Location and Size of the Barge Berth*

The size of the barge berth is dictated by the size of the vessels that will be required to deliver components to the project site during the construction phase. Due to limitations of the road and rail networks that serve Coos Bay a large number of components must be moved to the site by water. The conclusions of the Overland Transportation Study conducted by logistics firm Omega Morgan for the Jordan Cove construction contracting team of Kiewit-Black &Veatch (KBV) concluded that " All of the major large equipment and modules must be brought to the site via ocean transit and offloaded at the barge dock (berth)." The largest modules will originate from Asian ship yards that will need to be transported via HandiMax size vessels that have an overall length ranging from 492 feet upwards to 656 feet. The 520-foot breasting length of the proposed barge berth barely provides sufficient length to accommodate the larger HandiMax vessels and associated mooring requirements (see Sheet 1-3). Construction of a smaller (less overall breasting face) barge berth would preclude the use of HandiMax vessels and the ability to deliver the large modules to the site.

The location of the barge berth must be assessed holistically, in the context of adjacent facilities and required functions of not just the barge berth but also all the areas adjacent to the barge berth. As a result of this holistic approach the location of the barge berth has been established to fulfill its primary function while creating the minimum of environmental impact.

The location of the barge berth is constrained by three primary LNG facility functional requirements. First, the WNW corner of the barge berth is fixed by the location of the southernmost mooring bollard (dolphin) for the LNG ship berth located on the eastern side of the slip. The southernmost mooring bollard has been established in the location necessary to secure the LNG vessel at the LNG berth during high wind conditions. Under high wind conditions forces are exerted upon the mooring lines that are used to attach the LNG ship to the shore side mooring bollards. Ideally the southernmost mooring bollard would be located even further to the south to reduce the load placed on this individual bollard and allow a more equitable distribution of the wind load forces amongst the remaining five bollards. However, moving this southernmost bollard further to the south results in greater environmental impacts. As a trade-off between safety, that cannot be compromised, and environmental impacts, which must be minimized, the facility engineers have set the southernmost bollard location as is presently identified and added substantial subsurface anchoring features (deadmen) to allow the present location to safely fulfill the ship mooring function, without failure risk under high wind condition. The location of the southernmost mooring bollard therefore sets the northwestern corner of the barge berth.

Second, there must be sufficient shore side surface area available to allow for the positioning of the very large cranes necessary to handle the unloading as well as the positioning of the large Scheuerle trailers that are then used to move these large components from the barge berth into final position. Setback from the edge of the barge berth is required to ensure that both the loaded cranes or loaded Scheuerle trailers do not cause the sheet pile edge of the barge berth to fail under load. Clearance for safety and to allow for the maneuvering of both cranes and Scheuerle trailers requires the bench topside of the barge berth be substantial.

Third, once the Scheuerle trailers have been loaded they need to travel the haul road that connects the barge berth deck at elevation 20 feet MSL to the process area of the LNG facility located at an elevation of 46 feet MSL. These multi-axle Scheuerle trailers can move up a gradient of approximately 2-3 degrees. The combination of the very shallow slope and the 26 foot elevation gain forces the northern edge of the barge deck to be approximately 1/4 mile from the southern edge of the process area. Without this spacial separation it would be impossible to transport the heavy loads up the slope.

2.2.2.1.2. *Long Term Need for the Barge Berth*

The large equipment components initially delivered either by barge or HandiMax vessel to the LNG terminal will need to be maintained and possibly replaced over the useful life of the project. Access by water remains the only delivery method to move the damaged or irreparable components off of the site and to deliver new or refurbished large components to the site. The barge dock provides the only location for these components to be delivered once the facility is constructed and placed in operation since equipment congestion on the site precludes the use of other marine landing areas either within the slip or at other marine facilities located on the North Spit.

2.2.2.1.3. *Construction Approach*

Material used to backfill the area behind the OPEN CELL® sheet pile structure will be obtained from an existing dune immediately north of the barge berth. Material will be pushed from the land towards the bay during the approved in-water work window. Also during the approved in-water work window, additional temporary fill material will be placed outside of the permanent barge berth structure. The material will provide the contractor an area from which to drive the OPEN CELL® sheet pile, and avoid the need to construct a work platform. Also, this additional temporary fill material around the barge berth will act as a sound buffer to eliminate the risk of acoustic disturbance to fish species during pile driving, thus allowing for pile driving to occur in the dry outside of the in-water work window. Removal of temporary fill and dredging of the barge berth access to accommodate water-based access along the face of the barge berth will occur concurrently with dredging described in section 2.1. Based on the detailed turbidity analysis conducted by C&H and its conclusions regarding the nature of the material that would be used as fill for the barge berth, slope armoring around the additional temporary fill will not be required.

Access to the Barge Berth construction area will occur via existing gravel and paved roads as well as a temporary excavated material haul road, which is also utilized for construction access to the slip and access channel work areas. Existing surfaces in the footprint of the proposed access channel that are dominated by rocky or woody material will be dredged using a clamshell dredge, located on land or on a barge. Dredged material from the access channel will be transported via the hydraulic dredge pipeline entirely on existing pavement and riprap on Roseburg Forest Products property, and by trucks after offloading dredged material from barges. See Appendix A, Figure i-3, Temporary Facilities, which shows the excavated material haul road and the hydraulic dredge pipeline corridor.

2.2.2.2. Wastewater Systems

Sanitary waste from the LNG loading berth building located at the LNG Terminal Site will be directed to a holding tank. A sanitary waste contractor will remove the contents of the tank as necessary and dispose of the contents at authorized disposal sites through the contractor's permits. Sanitary waste from the remainder of the buildings will be directed to on-site septic systems.

2.2.2.3. Wetland Impacts

Both temporary and permanent impact quantities resulting from filling the barge berth (including impacts to existing intertidal strata below HMT) are provided in the Impacts Bulk Upload Template. The fill volumes include riprap necessary for slope protection on the west side of the barge berth face. Barge Berth impacts will result in permanent loss of eelgrass and intertidal habitat. The additional temporary fill that will be placed outside of the permanent footprint for the barge berth is discussed in further detail below in the "Minimization Measures" section.

2.3. Utility Corridor/Access Road (Sheets 3-1 – 3-3)

2.3.1. Utility Corridor/Access Road and Haul Road (Sheet 3-1)

An existing access road and utility corridor will be improved to provide access between the LNG Liquefaction and Terminal Site and the pipeline gas conditioning facilities located on the South Dunes Site. The corridor is approximately one mile long and 150 feet wide (toe of slope to toe of slope). It is located entirely on existing JCEP L.P. property or on property for which JCEP LP holds an option to acquire and hence involves no other landowner. The access corridor (also referred to as the excavated material temporary haul road and the eastern portion of the heavy equipment temporary haul road) will be utilized initially for the movement of earthwork equipment for the grading and cutting/filling of the two sites, and then for the movement of equipment and materials during construction, and finally during operations for control of access and security of the LNG terminal. By upgrading this corridor, JCEP L.P. will reduce traffic impacts on the existing Trans Pacific Parkway in the area of the LNG terminal and the South Dunes Power Plant.

The corridor will include a two-lane, 24-foot-wide roadway, 12-foot-wide shoulders, a median and safety berms on the sides, retaining walls, and bridge structures that will avoid and/or minimize impacts to wetlands. The west bridge will extend over another access road and a rail serving the Roseburg Forest Products' terminal. Additionally, the corridor will contain a double circuit overhead 115 kilovolt (kV) power transmission line and a pipeway corridor that includes the feed gas supply to the Project, a fuel gas pipeline to the South Dunes Power Plant, a backup pilot gas line, telecommunications lines, and redundant control circuitry. All gas pipeline, electrical, and water utilities will be carried on the proposed bridges to span, and thus avoid, the wetlands.

All environmental resource surveys, including a water body survey, wetland delineation, threatened and endangered species survey, and cultural resources survey, have been conducted on the corridor route. The results of the waterbody survey and wetland delineation are provided in FERC Resource Report 2 – Water Use and Quality. The results of the threatened and endangered species survey are provided in FERC Resource Report 3 – Fish, Wildlife, and Vegetation. The results of the cultural resources survey of the corridor are provided in FERC Resource Report 4 – Cultural Resources.

2.3.1.1. Wetland Impacts

Temporary impacts (e.g., compaction, disturbance of vegetation) are expected at Wetlands 2013-1 and 2013-2 to allow access during wall construction, but temporary fill or removal of material is not expected. Temporary disturbance areas are provided in Appendix A – Figures, and the Impacts Bulk Upload Template. Site restoration measures are discussed in the Site Restoration/Rehabilitation section in Block 5.

2.3.2. West Utility Corridor/Access Road Bridge (Sheet 3-2)

The west utility corridor bridge will be 607 feet long and nearly 41 feet wide. It will span Jordan Cove Road and Wetland 2013-6. Pile-supported footings will support concrete columns, bent caps, and girders. The bridge will have four spans consisting of two end abutments, with one interior bent placed on uplands and two interior bents placed in wetlands. The footing for each bent will include a 28-inch steel pile and a 44-foot by 32-foot concrete seal over the pile. Abutment slope protection will be placed outside of the wetland boundary. Bridge plans are included in Appendix A, Bridge and Roadway Plans.

2.3.2.1. Construction Approach

A temporary access and excavated material haul road will be constructed in wetlands (Wetland 2013-6 and Wetland 2012-2) adjacent to the alignment of the new east and west utility corridor bridges to facilitate bridge construction. Fill material will be extended from the haul road to cofferdam locations to provide access to construct the bridge. Some of the permanent footing will be built into the temporary embankment used for the excavated material haul road, which will be placed over geotextile fabric and in the wetland. The footing and column will be built before all temporary fill is removed.

A sheet pile cofferdam will be constructed around the perimeter of each new footing located in the wetlands. Temporary shoring walls will be used as needed at the other foundations. The inside of the cofferdam will be excavated to the bottom of the footing seal elevation (elevation -16 feet). Without dewatering, steel pipe pile will be driven with an impact hammer inside the cofferdam. Once pile is driven, a 4- to 10-foot-thick concrete seal will be poured over the pile. The concrete will displace water as it is poured, allowing the water to be pumped into Baker Tanks, or a similar device designed to contain potential contaminants, for disposal at an approved location. The cofferdam will provide a dry working area for construction of the concrete footing, column, and crossbeam. Steel pile protruding from the seal will be cut at the top to the proper elevation, and the permanent footing will be formed and poured. Columns will then be formed and poured, and the crossbeam will be constructed on the columns. The sheet pile cofferdam will be removed, crossbeams will be formed and poured on columns, and pre-cast concrete girders will be set. Operating from the temporary haul road, cranes will lift girders into place from each end. Once girders are placed the contractor will form and pour the concrete deck and place the barrier rails.

2.3.2.2. Wetland Impacts

The temporary haul road will require temporary fill and removal impacts. Construction logistics require this fill material to be in place for greater than 24 months. A new bridge bent will require permanent fill material in Wetland 2013-6. Removal fill quantities and acres of impacts are provided in the Impacts Bulk Upload Template.

2.3.3. East Utility Corridor/Access Road Bridge (Sheet 3-3)

The east utility corridor bridge will be 300 feet long and nearly 41 feet wide. It will span Wetland E, east of Jordan Cove Road. The bridge type and construction will be identical to that of the west utility corridor bridge. The two-span bridge will consist of two end abutments placed on uplands and one interior bent placed in Wetland E. Abutment slope protection will be placed approximately 5 feet outside the wetland boundary.

2.3.3.1. Construction Approach

As mentioned above, construction of this bridge will be nearly identical to construction of the west utility corridor bridge. Cofferdams are anticipated at the foundation in the wetland due to the high water table. Temporary shoring walls will be utilized as needed at the abutments.

A sheet pile retaining wall will be constructed between Jordan Cove Road and the east utility corridor bridge to prevent further wetland impacts from fill slopes. The wall will not require permanent or temporary wetland impacts. Construction will take approximately four to eight months.

2.3.3.2. Wetland Impacts

A temporary access and haul road will be constructed in Wetland E and a small portion of Wetland C, and will require temporary impacts. The road will be constructed using aggregate material placed over geotextile fabric. Material will be removed following construction. A retaining wall will be constructed north of Wetland D to minimize temporary or permanent wetland impacts. Temporary impacts along the north boundary of Wetland D are anticipated for construction of the retaining wall. Temporary removal-fill quantities and acres of impacts are provided in the Impacts Bulk Upload Template.

2.4. SORSC Site (Sheet 4-1)

The Southwest Oregon Regional Safety Center (SORSC) is a multi-agency emergency response and training facility located on the North Spit adjacent to the South Dunes Power Plant Site. The complex is designed to house the personnel and equipment needed to respond to emergency events on the North Spit. The SORSC building houses the Jordan Cove Fire Department, Coos County Sheriff's Department Operations, and classrooms for the Southwest Oregon Community College. Additional office space is available for representatives of the U.S. Coast Guard (USCG), Oregon State Fire Marshal, and the Port. Classroom space will be used to conduct specialized LNG fire training for both the college and the region's emergency response community. The site also includes an overpass over the Roseburg Forest Products rail spur and Jordan Cove Road to facilitate efficient access to the Project area in the event of an emergency.

All of the regional emergency response agencies listed above were involved in the SORSC site selection. The following site selection criteria were developed by the Emergency Response Planning group to determine feasible locations:

- On the North Spit and west of the CBR mainline (to ensure that the fire department could respond to an event at the LNG terminal and would not be impacted by a vehicular accident on the McCullough Bridge or a train on the CBR mainline blocking Trans Pacific Parkway);
- Far enough away from the LNG terminal so that the SORSC would not be impacted by an event at the LNG terminal; and
- Above the tsunami inundation elevation.

The location of the SORSC shown in Sheet 4-1 is the only location that met the above criteria for site selection.

2.4.1. Wetland Impacts

Wetlands A and B will be filled with excavated and dredged material, and SORSC development will occur on top of the fill. See the Impacts Bulk Upload Template for additional details.

2.5. South Dunes Power Plant Site (Sheet 5-1)

JCEP L.P. will obtain authorization from the Energy Facility Siting Council (EFSC) to construct and operate the South Dunes Power Plant, a natural gas-fueled, combined cycle generating plant that will provide electrical power to the Project. The South Dunes Site is on the site of the former Weyerhaeuser linerboard mill, which closed in 2003 and has since been demolished. Access to the site will be from Highway 101 and then west on the Trans Pacific Parkway, two miles north of North Bend.

The site is currently clear of any significant structures or vegetation, with the exception of a water tank and the PacifiCorp Jordan Point substation. The site elevation will be increased using material excavated and dredged from the slip. The PacifiCorp Jordan Point substation will be relocated on-site after the new substation location has been raised to a final grade elevation of approximately 40 feet. It is anticipated that, except for structures with high overturning moments, spread footing and slab-on-grade foundations will be used to support the plant equipment and buildings. Equipment required for the facility will be delivered to the site via the heavy equipment haul road.

The South Dunes Power Plant will produce 420 MW of electrical power for the Project, as well as process steam that will be used in conditioning gas before its delivery for liquefaction at the LNG terminal. It will consist of two 170 MW blocks of high-efficiency combined cycle combustion turbine generation. Three combustion turbine generators (CTGs), three heat recovery steam generators (HRSGs), and one steam turbine generator (STG), will collectively compose each power block, adding approximately 40 MW to each 170 MW block for a total output of 420 MW.

Each CTG will produce electricity, with the exhaust gases from the CTGs supplying heat to the HRSGs. Steam produced in the HRSGs will be used to power the STGs to produce additional electricity and process steam. Duct burners fueled by natural gas in the HRSGs will allow for production of additional steam and additional electricity from the STGs when needed. Steam exhausted from the STGs will be condensed in air-cooled condensers, and the resulting condensate will be returned to the HRSGs to remake steam.

Fuel will be supplied primarily in the form of boil off gas (BOG) from the Project. Some additional natural gas will be supplied from the gas pipeline, which will connect to a metering station to be located in the southern portion of the South Dunes Power Plant Site. The pipeline and metering station will be installed, owned, and operated by others. Water will be supplied by the Coos Bay-North Bend Water Board (CBNBWB) through an existing pipeline that connects to the South Dunes Power Plant Site.

One new switchyard with generator transformers will be constructed on-site to switch/direct the power produced by both power blocks. The voltage will be stepped up to 115 kV for transmission to the LNG terminal.

The CTGs, HRSGs, and STGs will be outdoor units, given the relatively moderate ambient conditions of the area. A control and administrative building will provide space for plant controls and offices for plant personnel. A separate water treatment area will provide a location for the equipment necessary to purify the raw water, producing demineralized water for use in the power plant steam cycle and amine solution for CO_2 removal. The site will also support metering and conditioning facilities for the natural gas supply used by both the South Dunes Power Plant and the LNG terminal. The pipeline being installed by the Pacific Connector Gas Pipeline Project connects seamlessly to the SDPP Site at the metering station at the south end of the SDPP Site. Impacts, if any, resulting from installation of the gas pipeline upstream of its connection to the metering station are described in Part B of this application, which was provided by Pacific Connector Gas Pipeline, L.P.

2.5.1.1. Site Preparation and Perimeter Access

Site preparation and ground improvements will be required at the South Dunes Site, including but not limited to the areas under the planned fill at the perimeter of the SDPP between the east end of the East Bridge and eastward to approximately 200 feet southeast of Wetland M, and along the east side of the fill limits at Wetland J. Ground improvements are required for slope stabilization and include vibratory consolidation of material. Ground improvements will occur as described in Section 2.2.1.1, with the exception that Wetland M, a tidal wetland, would only be returned to original elevations if settlement is determined to be detrimental to the wetland functions and values. Most ground improvements will occur within approximately 15 feet of the toe of slope, with the exception of the east side of the SDPP, where ground improvements will extend up to 50 feet east of the toe of slope.. Limited access for maintenance and repair of erosion and sediment control measures and site preparation of fill slopes may require temporary wetland disturbances of up to 15 feet outside the toe of slope at Wetlands M and J. If these wetland disturbances occur, they will be restored as described in the Site Restoration/ Rehabilitation section in Block 5.

2.5.2. Wetland Impacts

Several wetlands (i.e. I, H, J, L, M, N, 2012-7) will be wholly or partially permanently filled when the elevation of the South Dunes site is raised. Wetlands F and G will also be filled, but they are not subject to regulation under Section 404 and therefore mitigation for those sites is not proposed. It is the applicant's understanding, based upon discussions with Bill Mason, DEQ, and the applicable terms of the CWS and related regulations, that Wetlands F and G are not "waters of the United States" subject to permitting requirements under Section 404 when, as in this instance, such areas constitute treatment ponds subject to an NPDES permit. For further explanation of the applicant's understanding, please see the letter from Steve Pfeiffer, Perkins Coie, dated March 29, 2013 in Tab F of the June 2013 LNG Project 404 Application. See Impacts Bulk Upload Template for additional information regarding removal and fill areas (acres) and removal and fill volumes (CY).

Fill material will include excavated and dredged material from the Slip and Access Channel and the LNG Liquefaction and Terminal Site, as described in the Excavated and Dredged Material Management Plan (Tab D). While construction impacts are not proposed beyond the toe of slope, site preparation, ground improvements, and erosion control activities will result in temporary impacts at Wetland J and Wetland M. A retaining wall will be constructed at the north end of Wetland J to minimize permanent wetland impacts at this location. Temporary disturbance areas are provided in the Impacts Bulk Upload Template. Site restoration measures are discussed in the Site Restoration/Rehabilitation section in Block 5.

2.5.3. Railroad Bridge (Sheet 5-2)

An existing Roseburg Forest Products rail spur will need to be relocated due to the placement of fill material on the Mill Site/South Dunes Site. Relocating the rail spur requires the installation of a new rail bridge. The bridge will be a six-span concrete structure spanning Wetland 2012-4. It will be nearly 269 feet long and nearly 21 feet wide and supported on steel pile. End and interior spans will be approximately 45 feet. Each of the seven bents will consist of an eight-pile footing and a concrete pile cap. Five interior bents will be located in the wetlands, with end bents located on upland fill slopes. Bridge plans are included in Appendix D.

2.5.3.1. Construction Approach

Construction of the new railroad bridge will begin with construction of a temporary work bridge. The temporary work bridge will be approximately 28 feet wide with six spans and will be approximately 255 feet long. The temporary work bridge will be placed south of the proposed railroad bridge.

It is likely that the temporary work bridge will use two steel piles per bent with a steel frame and a timber deck. The temporary work bridge end abutment will be constructed on dry land and outside the Wetland 2012-4 boundary, while approximately four of the interior bents will be placed in Wetland 2012-4. All pile may be driven with an impact hammer since no fish are present in this open-water wetland. The temporary work bridge approaches and access road will be gravel. The temporary work bridge will be in place for approximately four to eight months.

The permanent pile for the new railroad bridge will be driven with an impact hammer from the temporary work bridge located to the south of the railroad bridge. All pile will be driven and then cut off at the necessary elevation, and a pre-cast concrete cap will be fastened to the top of the pile bent. Pre-cast concrete girders will be brought in on the work bridge and set on the concrete pile caps with cranes. Railroad ballast, ties, and one set of rail tracks will be placed on the pre-cast girders. Finally, walkways will be constructed on the sides of the girders.

2.5.3.2. Wetland Impacts

Steel piles for the temporary work bridge will result in temporary impacts to Wetland 2012-4. Steel piles for the permanent railroad bridge will result in permanent impacts to Wetland 2012-4. The temporary work bridge is estimated to be in place for less than one year. All permanent and temporary impacts are listed in the Impacts Bulk Upload Template.

2.6. Industrial Wastewater and Water Line Relocation (Sheet 6-1)

Excavation associated with Project construction will require the relocation of an existing industrial wastewater line and water line.

2.6.1. Industrial Wastewater Line Relocation

To allow the development of the Slip and Access Channel, the existing industrial wastewater pipeline will need to be relocated (see Appendix A, Sheet 6-1). The pipeline will be relocated as part of the site clearing, grading, and excavation activities for the Project. Currently, the pipeline carries approximately 500,000 gallons of wastewater per day, which is water that JCEP L.P. purchases from the CBNBWB to keep the ocean diffusers operational. There will be no wetland impacts resulting from the industrial wastewater line relocation. Additional information is provided in FERC Resource Report 1 – General Project Description.

2.6.2. Water Line Relocation

The Roseburg Forest Products terminal currently uses two one-million-gallon water tanks supplied from wells to charge its firewater system. Both of these obsolete tanks will be decommissioned once the Project is placed in service. In order to maintain the water supply to the Roseburg fire water system, a new 12-inch-diameter tap from the existing CBNBWB water line will be made and connected to the Roseburg fire water system (see Sheet 6-1).

The CBNBWB has a potable water line that runs along Trans Pacific Parkway. The CBNBWB also has two raw water lines, one for each of the well fields on the North Spit. One raw water line runs from the well field located to the north of the former linerboard mill site and was the source of water to the mill. A second raw water line connects a well field located to the west of the Project site and to the north of the Trans Pacific Parkway to a water treatment plant. Before the potable water line was constructed, this plant provided the potable water on the North Spit. JCEP L.P. is planning to extend the raw line (before it gets to the treatment plant) to the Project site and to use that water for the concrete batch plant, compaction during site grading (if required), dust suppression during construction, and supplementation of the potable water available for hydrostatic testing as well as any other construction activity requiring water.

Wetlands F and G are considered jurisdictional under Section 402, but as wastewater treatment systems they are not jurisdictional under Section 404. JCEP has coordinated with DEQ on this matter.

2.6.3. Wetland Impacts

No aquatic resources will be impacted as a result of the relocation of the industrial wastewater pipeline. At the lagoon on the west end the new pipeline will tap into the existing pipeline without impacts to resources. The pipeline will be abandoned in place, except where it will be removed where it crosses the proposed slip in uplands.

2.7. Trans Pacific Parkway and Highway 101 Improvements (Sheet 7-1)

To accommodate larger vehicles that will need access to the Project site during construction and operation of the export facility, Trans Pacific Parkway will be symmetrically widened to provide a left-turn lane onto northbound Highway 101. The existing travel lanes are 11 feet wide with less than 1 foot between the edge of pavement and fog line; most areas have a wide gravel shoulder. The proposed improvements would provide a wider turning radius on both sides of Trans Pacific Parkway at Highway 101, two 12-foot travel lanes, a 12-foot left-turn lane, 6-foot shoulders with guardrail, and a 5-foot gravel shoulder on the bay side of the guardrail. Intersection improvement plans are included in Appendix D, Bridge and Roadway Plans.

A sheet pile wall will be installed, as a retaining wall, to minimize fill material in Coos Bay due to road widening. However, the wall will result in permanent impacts below HMT elevation. The wall will be approximately 600 feet long on both sides of Trans Pacific Parkway. Existing riprap will be removed for sheet pile to be driven. Riprap will then be placed back in the bay at the toe of the sheet pile wall for wall protection.

In addition to the improvements at Highway 101, entrances to the project site will be improved at three locations along TPP. Entrance A is located south of Wetland PAN-A; Entrance C is located at Jordan Cove Road; and Entrance D is located south of Horsefall Road and adjacent to Wetland 2012-5. A fourth entrance, Entrance B, was developed but not advanced for further consideration. These entrances already exist but will require improvements to accommodate large truck traffic, equipment and material deliveries, employee access, and safe ingress/egress.

2.7.1. Construction Staging Areas

Short term lane closures at the TPP/Highway 101 intersection are likely to be necessary due to the narrow travel lanes. Construction staging and access is likely to occur on gravel shoulders and in portions of the travel lane. Limited materials will be stored on site due to space constraints. An excavator and crane (for pile driving) will be staged on the road shoulder during widening of the Trans Pacific Parkway/Highway 101 intersection. Riprap will be hauled to a temporary storage site, then brought back to the site for placement. Temporary lane closures are expected during construction of the TPP project site entrances.

2.7.2. Wetland Impacts

A very small portion of tidally influenced wetlands (below HMT) will be impacted due to the symmetrical widening of Trans Pacific Parkway at Highway 101. Permanent wetland impacts will be avoided at the TPP project site entrances. A retaining wall will be constructed on the north side of Wetland 2012-5 to avoid permanent wetland impacts. The retaining wall will result in temporary wetland impacts to Wetland 2012-5. See the Impacts Bulk Upload Template for additional information regarding impact quantities.

2.8. North Point Workforce Housing Project (Sheet 8-1)

The North Point Workforce Housing Project (NPWHP), consisting of housing and amenities for approximately 2,000 workers, will be developed for use during the construction of the Project. This temporary housing will consist of prefabricated, modular buildings with private rooms organized around common areas, including a dining area, exercise facility, and on-site laundry. The workforce housing facilities will be managed by a professional lodging staff who will oversee cleanliness, security, and adherence to strict operational rules. The workforce housing facility will be located on the southern side of Coos Bay, between the Southern Oregon Regional Airport and the Highway 101 Bridge.

CBNBWB will supply water service to the site of the NPWHP. Workforce housing construction will include the addition of permanent underground water mains supplying fire hydrants located on the site. Coordination with the City of North Bend and ODOT is underway regarding traffic impact analyses. Below is a summary of the additional facilities that will be installed at the NPWHP:

- The site will have a permanent connection to the North Bend sanitary sewer system. This will be left in place following the decommissioning of the NPWHP, and will require the upgrading of an outdated lift station.
- Electric power for the camp will be supplied by Pacific Power from a construction power interconnection that will be removed when the NPWHP is decommissioned.
- A bridge (the workforce housing bridge) will provide access to and from the NPWHP (see Appendix A.1, Sheet 8-2A). This bridge will remain as a permanent feature after the NPWHP is decommissioned.

2.8.1. Wetland Impacts

The proposed NPWHP has been configured to minimize wetland impacts to the greatest extent practicable. Fill will need to be placed over Wetland APC-D in order to level out the site and to place the prefabricated modules that will accommodate worker housing.

2.8.2. North Point Workforce Housing Bridge (Sheet 8-2)

The workforce housing bridge will be constructed for the purpose of providing access to and from the NPWHP. The bridge will span a tidal mudflat in Coos Bay at the Al Pierce Company (APCO) property. The proposed single-span bridge will be 200 feet long and nearly 40.5 feet wide. It will include an 8-foot sidewalk on the bridge deck. The bridge will include two concrete abutments on pile supported footings and placed above the elevation of 10.26 feet (NAVD88). Material Stabilized Earth (MSE) walls extending landward from the abutments will eliminate the need for fill material to extend below the HMT or wetlands. Workforce Housing bridge plans are included in Appendix D.

2.8.2.1. Construction Approach

Construction of the new NPWHP bridge will begin with construction of a temporary work bridge. The temporary work bridge will be approximately 30 feet wide and 280 feet long with seven 40-foot spans. The temporary work bridge will be placed north of the proposed NPWHP bridge. It is likely that the temporary work bridge will use three steel piles per bent with a steel frame and a steel or concrete bridge deck. The temporary work bridge will begin and end in dry land. The end bents will be outside the HMT boundary, while five of the interior bents, including 15 steel piles will be installed below HMT. Steel pile will be driven and pulled with a vibratory hammer to minimize potential barotrauma impacts to fish. The piles may be tested with impact pile drivers to determine if they are properly set. The temporary work bridge approaches and access road will be gravel. The temporary work bridge will be in place for less than 24 months.

The steel plate girders for the new bridge will be assembled and installed on site. Precast deck panels will be installed between each of the four steel girders. A cast in place concrete deck will be poured over the steel girders and deck panels. Finally, a walkway will be constructed on the south side of the bridge and rails will be installed on both sides. No cofferdams will be needed.

2.8.2.2. Wetland Impacts

The proposed NPWHP bridge has been configured to minimize temporary wetland and tidal waters impacts to the greatest extent practicable and avoid permanent wetland impacts. This bridge design proposes only temporary impacts to tidal waters of Coos Bay. Temporary impacts are estimated to have a duration of less than 24 months. Refer to the Impacts Bulk Upload Template for all temporary wetland and waters impacts.

2.9. Temporary Facilities (Figure i-3)

Temporary facilities required during construction of the Project are shown in Appendix A, Figure i-3.

2.9.1. Heavy Equipment Haul Road

A heavy equipment haul road is required to transport large modules and equipment from the barge berth on the east side of the slip to the Mill Site/South Dunes Site. To prevent the need for the haul road, an additional barge berth would need to be placed south of the Mill Site/South Dunes Site. This additional barge berth at the southern end of the Mill Site/South Dunes Site was evaluated and was determined infeasible, because it would result in significant impacts to mudflat and eelgrass habitats due to the shallow bathymetry in this area.

The use of Jordan Cove Road to transport modules/heavy equipment during Project construction does not pose a safety or operational threat to Roseburg Forest Products due to a very low trip frequency. Only an approximate 50 trips total during Project construction would be required to transport modules/heavy equipment to the Mill Site/South Dunes Site. As such, disruption to Roseburg Forest Products operations will be minimized to the greatest extent practicable through close coordination with Roseburg Forest Products staff.

2.9.1.1. Wetland Impacts

The heavy equipment haul road will not result in any wetland impacts.

2.9.2. Excavated Material Haul Road

A 60-foot-wide excavated material haul road that accommodates two-way traffic from the excavation site (Ingram Yard/LNG Liquefaction and Terminal Site and the slip) to the disposal site (Mill Site/South Dunes Site) is critical to meeting the ODFW-approved in-water work window (October 1 through February 15). Additionally, the excavated material haul road east of Jordan Cove Road would serve as the laydown area for the hydraulic dredge line, which would transport dredge material from the slip to the proposed disposal site location at the Mill Site/South Dunes Site.

Currently, approximately 200 trucks per day use Jordan Cove Road to transport wood chips in and out of Roseburg Forest Products. Excavated material haul truck trip frequency would be approximately 10 to 15 trucks per hour (estimated based on 100-ton haul trucks). Therefore, the use of Jordan Cove Road to transport excavated material/sand from the slip to the Mill Site/South Dunes Site presents a potential conflict with the operations and wood chip truck maneuvering of Roseburg Forest Products. The route will not cross Trans Pacific Parkway at any time, and only one crossing with Jordan Cove Road is proposed. At this crossing, wood chip truck traffic will be given the right-of-way over haul truck traffic by using flag men to halt haul truck traffic until passing vehicles have passed the intersection. The excavated material truck haul road will be on JCEP L.P.-owned land, and the hauling activities will not cause any additional effects other than those associated with the access/utility corridor.

Throughout the duration of project construction, the excavated material haul road will be used to transport excavated material to the Mill Site/South Dunes Site, because the proposed utility corridor/access road bridges would not be able to support these haul trucks. To ensure safe and efficient maneuvering, the excavated material haul road requires specific slopes, resulting in a relatively wide fill prism in certain areas, as shown in Appendix A, Sheets 3-2A and 3-3A.

The excavated material haul road must be at least 60 feet wide to accommodate haul trucks moving through two-way traffic. If two-way traffic is not accommodated, an alternate one-way haul road would be required, potentially impacting additional wetlands.

2.9.2.1. Wetland Impacts

The excavated material haul road will result in temporary wetland impacts. Project construction logistics require the excavated material haul road to be in place for greater than 24 months. Temporary impacts will occur to Wetland 2013-6, Wetland 2012-2, Wetland C, and Wetland E. These impacts have been previously discussed in Sections 2.3.2.2 and 2.3.3.2.

Estimated project start date:	October 2015	Estimated project completion date:	Spring 2018

(5) Project Impacts and alternatives

Alternatives Analysis:

Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland. (Include alternative design(s) with less impact and reasons why the alternative(s) were not chosen. Reference OAR 141-085-0565 (1) through (6) for more information).*

Please see FERC Resource Report 10 – Alternatives for information regarding the various alternatives that were evaluated for the Project.

Measures to Minimize Impacts

Describe what measures you will use (before and after construction) to minimize impacts to the waterway or wetland. These may include but are not limited to the following:

- *For projects with ground disturbance include an erosion control plan or description of other best management practices (BMP's) as appropriate. (For more information on erosion control practices see DEQ's Oregon Sediment and Erosion Control Manual)*
- *For work in waterways where fish or flowing water are likely to be present, discuss how the work area will be isolated from the flowing water.*
- *If native migratory fish are present (or were historically present) and you are installing, replacing or abandoning a culvert or other potential obstruction to fish passage, complete and attach a statement of how the Fish Passage Requirements, set by the Oregon Department of Fish and Wildlife will be met.*

Since the inception of the Jordan Cove Energy Project in 2005 there has been a clearly outlined philosophy to avoid impacts of any and all wetlands. This having been said, it was also known that due to the "water dependent" character of a liquefied natural gas facility, whether import or export, there would be a conflict with this philosophy created by the need to move ocean going vessels into a berth that does not currently exist in the Coos Bay estuary. The size of the vessels used to transport LNG requires a berth of at minimum 1,000 feet of overall length. No such berth exists in the lower Coos Bay, the only area where vessels of this size can transit due to constraints imposed by the railroad bridge located at RM 9.2

During the original LNG JPA filed in 2009 the footprint of the project covered essentially the area as is now impacted in the current JPA. The primary difference, however, is in the fact that the Import JPA utilized the eastern portions of the project site (Mill Site, aka South Dunes Site) solely for the purpose of disposal of dredge spoils generated by the construction of the slip and access channel. During the Import JPA there were zero acres of freshwater impact on the Mill Site and only a fraction of an acre of freshwater wetlands impacted at the Port stockpile site where dredge spoils were temporarily staged prior to sale and removal for use as construction sand. This Port stockpile site is no longer used as the entire dredge spoils are now used on the proposed Project footprint to raise the site elevation above the tsunami inundation level, an elevation of nominally +46 feet MSL.

When the project transitioned from Import to Export, the current project configuration, the equipment footprint for the necessary facilities roughly doubled in size with the Mill Site, formerly used only for dredge spoils disposal, now needing to be raised and graded to a tsunami resistant height of +46 feet MSL to become the platform for a 420MW power plant, administration building, natural gas conditioning complex and Southern Oregon Regional Safety Center or SORSC (fire station and sheriff's substation). In addition there was the need to create a road and utility corridor that was also tsunami resistant at an elevation of +46 feet MSL that connects the SORSC with the LNG Terminal and the South Dunes Power Plant. This entire complex now requires rigorously defined equipment spacing among the SORCS, gas conditioning plant, power plant, and administration building. All of these safety regulation spacing requirements require creative use of the available real estate, particularly on the Mill Site, the location of the former Weyerhaeuser paper mill that contained numerous small freshwater wetlands dispersed throughout the property in such a manner that there was no way JCEP L.P. could find to preserve these small discontinuous wetlands and meet all of the safety spacing requirements, and achieve the tsunami resistant placement of the facilities.

The following is a list of additional measures specific to project components including design alternatives and BMPs that further minimize unavoidable impacts:

Large Module Transport, Materials, and Equipment Delivery

1. Final transportation to the Project site will be undertaken by road, rail, and possibly marine transport. An existing rail line is located adjacent to the Project site. The kinds of materials and the mode of delivery to the site will depend on the origin, size, and weight of the material. It is anticipated that the larger and heavier pieces of equipment will arrive by marine transport.
2. Traffic surveys have been conducted of the anticipated construction-related traffic, and appropriate measures have been proposed to mitigate adverse effects, as applicable, such as symmetrical widening at the Trans Pacific Parkway and Highway 101 intersection. (Most heavy/oversized equipment will be delivered by marine transport to a barge berth adjacent to the Slip and Access Channel.)
3. Fuel storage and equipment servicing areas will be located at least 100 feet from wetlands and waterways, unless full containment of potential contaminants is provided.
4. Track-mounted equipment, large cranes, and other equipment whose limited mobility makes it impractical to move them for refueling will take precautions to minimize the risk of fuel reaching wetlands and waterways.

LNG Facilities

1. Temporary ditches, sediment fences, and silt traps will be installed as necessary as the site is cleared, filled, and graded.
2. Before filling the LNG storage tanks, the hydrotest water source will be tested to ensure that the water will meet all applicable code requirements and to prevent discharge of contaminated water.
3. In each case the small amount of water that remains in the tank after the bulk transfer/emptying operation has taken place will be treated so that it meets discharge water quality criteria prior to discharge.
4. A 50-foot buffer will be maintained between the LNG terminal and the east edge of the Henderson Property. There will be no encroachment into the buffer.

Utility Corridor/Access Road

1. A wall will be installed along the utility corridor west of Jordan Cove Road to avoid impacts to Wetland D. The face of the wall will be set back approximately 20 feet from the wetland boundary. There will be no temporary impacts to Wetland D as a result of wall construction.
2. Retaining walls will be constructed to avoid permanent impacts to Wetland 2013-1 and 2013-2.
3. Bridges will be constructed along the utility corridor on both the west side and the east side of Jordan Cove Road to avoid wetland impacts to the greatest extent practicable. BMPs will be implemented during bridge construction to minimize temporary impacts to wetlands as much as possible.
4. No bridge bents will be placed and no excavation will occur in Wetland C, which will be partially filled to avoid cultural resource impacts.
5. The contractor will follow BMPs for in-water installation of green concrete during construction of the concrete slabs, abutments, or other pier structures.

Rail Relocation

1. A permanent bridge will be installed to span Wetland 2012-4 and minimize impacts to the greatest extent possible. A temporary bridge will be installed to minimize the construction-related impacts of the permanent bridge.
2. A wall will be installed adjacent to the rail bridge relocation area. The face of the wall will be set back approximately 10 feet from the wetland boundary. There will be no temporary impacts to Wetland 2012-4 as a result of wall construction.

On-site Roadways and Parking Lots

1. Stormwater collected in areas that have no potential for contamination will be allowed to flow or be pumped directly to a system of stormwater ditches, which ultimately drain to the slip.
2. Stormwater collected in areas that are potentially contaminated with oil or grease will be pumped or will flow to the oily water collection sumps. Collected stormwater from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline (see FERC Resource Report 1).

South Dunes Power Plant

1. Retaining walls on the north side of Wetland 2012-5 will avoid permanent wetland impacts.
2. Areas where ground improvements occur in wetlands outside the toe of slope will be restored to pre-project wetland conditions.

Trans Pacific Parkway Improvements

1. All piling used to construct the soldier pile walls will be concrete or steel piling; no treated timbers will be used.
2. All stormwater runoff at Trans Pacific Parkway/Highway 101 will be treated using water quality manholes or cartridge systems.
3. Project specifications will require pile to be driven using a vibratory hammer to the extent practicable to prevent noise impacts to humans, and fish and bird species. The piles may be tested with impact pile drivers to determine if they are properly set.
4. Construction of a retaining wall at Trans Pacific Parkway/Highway 101 will minimize fill impacts due to widening.
5. Retaining walls will avoid permanent wetland impacts at Trans Pacific Parkway entrances to the project site.

North Point Workforce Housing Project (NPWHP)

1. A single-span bridge that avoids permanent impacts is proposed to connect the mainland to the island.
2. All piling used to construct the soldier pile walls will be concrete or steel piling; no treated timbers will be used.
3. Water that comes into contact with green concrete during pouring of the concrete deck will be pumped into Baker Tanks for disposal at an approved location.
4. Project specifications will require pile to be driven using a vibratory hammer to the extent practicable to prevent noise impacts to humans, and fish and bird species. The piles may be tested with impact pile drivers to determine if they are properly set.

Erosion Control

1. Areas disturbed by construction of the Project facilities will be stabilized with temporary erosion controls until construction is complete, unless covered by equipment, gravel or other covering.
2. Staging areas and access roads will comply with National Pollution Discharge Elimination System (NPDES) and other permitting requirements that pertain to erosion and sediment control and pollution control.
3. Following construction and where appropriate, the site will be final graded, and BMPs will be applied to prevent erosion.
4. To minimize the potential for erosion, JCEP L.P. has modified the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures), creating Project-specific Plan and Procedures. A copy of the Project-specific Procedures is provided in Appendix C.2 of FERC Resource Report 2 – Water Use and Quality and a copy of the Project-specific Plan is provided in Appendix B.7 of FERC Resource Report 7 – Soils.
5. After water line and wastewater line installation, sites will be graded and re-seeded to the extent practicable to comply with anticipated 1200-C requirements.
6. Disturbed areas not already covered by equipment, such as long-term exposed slopes, will be stabilized with a seed mixture specified by the Natural Resources Conservation Service (NRCS) as being capable of surviving in highly permeable, xeric regimes, binding loose sand, and withstanding burial and deflation from Aeolian processes, as appropriate.
7. Native species will be used and if any non-native species are required for specific problem areas, species will be selected that will not become nuisance species to the surrounding areas.
8. Fertilizers will be prohibited within 150 feet of wetlands and waterways except when required to vegetate slopes that are close to wetlands and waterways for the purposes of stabilization and erosion control. If fertilizers are applied to vegetated slopes that are closer than 150 feet away from wetlands and waterways, then BMPs (e.g., silt fences, straw bales, earthen berms, etc.) will be implemented to prevent fertilizer from entering the wetland or waterway.

LNG Carriers

1. LNG carriers will average five knots within the Coos Bay Navigation Channel. At this speed, the LNG carriers do not create waves that are any greater than the waves generated by the more than 200 deep draft vessels per year that once called on the Oregon International Port of Coos Bay. During this peak period of ship activity, no excessive channel erosion was reported. Accordingly, with the lack of channel erosion under previously higher shipping levels and of appreciable wakes at the speed limitation of the LNG ships anticipated for the channel, no excessive erosion due to LNG ships is anticipated. Therefore no measures for protecting the shoreline are anticipated. Extensive hydrodynamic modeling has confirmed this assertion and is provided in FERC Resource Report 2 – Water Use and Quality, in Appendix H.2.
2. A Ship-Strike Mitigation Plan has been developed as part of the BA to minimize potential ship strikes to cetaceans, and possibly other listed (Steller sea lion, sea turtles) and non-listed marine species by LNG carriers.
3. An LNG Management Plan has been developed as part of the BA to minimize risk of spills and releases at sea (see the BA for additional details).
4. Mandatory USCG regulations for ballast water in LNG carriers would be fully complied with to minimize potential introduction of exotic species.
5. Thermal impacts from vessel discharge (both cooling and ballast water) will be minimized by natural tidal cycles and localized mixing.

Barge Berth and Access Channel Construction

1. All permanent and temporary fill associated with barge berth construction will be placed during the approved ODFW in-water work window (October 1 through February 15) to minimize potential impacts to fish species through the avoidance of vulnerable salmonid life stages and peak migration periods. Due to the nature of the fill material and tidal conditions, slope armoring/erosion control measures will not need to be implemented around the temporary fill (see the C&H Engineering Report). It will take between two and three weeks to place both the permanent fill (approximately 22,000 CY) and temporary fill (approximately 5,000 CY) for the barge berth. This fill material will be pushed outward from the shoreline towards the access channel.
2. Additional temporary fill will be placed outside of the barge berth bulkhead face to (1) create a "dry" environment for pile driving, and (2) provide access to construct the bulkhead structure and therefore eliminate the need to install a pile-founded work trestle or to use barges for access (which would require additional dredging).
3. All piles will be driven "in the dry" in order to minimize acoustic disturbances to fish and aquatic species. Also, creation of this "dry" environment will allow for piles to be driven outside of the approved ODFW in-water work window, if necessary (additional coordination and consultation with ODFW and NMFS is underway). Driving the sheet pile for the barge berth bulkhead structure will take approximately 16 weeks (assuming a double shift construction schedule).

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

4. BMPs will be installed around the additional temporary fill if turbidity exceeds permitted levels.
5. Any additional temporary fill placed beyond the area of permanent impact of the access channel will be dredged during the approved in-water work window and restored to pre-construction conditions. Dredging/removal of this additional fill material will take approximately one day.

Snowy Plover Impact Minimization Measures

The stockpiling of material dredged from the slip at the Port Stockpile Site was going to occur when the Project was first planned as an import facility. Because of the snowy plover population on the North Spit, there was a concern that this Port Stockpile Site could attract snowy plover individuals from this population. To address this concern, JCEP L.P. participated in the development of a number of conservation measures to reduce the potential effects on the North Spit snowy plover population due to the construction of the Project. Although the construction activity that was of the greatest concern for the snowy plover population is no longer part of the Project, and therefore the Project will not have direct impacts to snowy plover habitat or populations, JCEP L.P. will still commit to the proposed conservation measures as described in the following paragraphs (see the BA and FERC Resource Report 3 for additional details):

1. Current management activities and use restrictions within the Coos Bay North Spit Recreation Management Area relative to the snowy plover population include:
    a. Predator management (i.e., nest enclosures, lethal and non-lethal predator removal, and hazing);
    b. Symbolic fencing (ropes and signs installed around nesting areas);
    c. Habitat restoration (removal of European beachgrass, placement of shell hash, maintenance of gaps through the dunes);
    d. Public outreach and education provided by Bureau of Land Management (BLM) staff;
    e. Monitoring of snowy plover populations; and
    f. Recreational use restrictions in place from March 15 to September 15 each year, including:
        i. Seasonal re-routing of the foredune road;
        ii. Vehicles, camping, and dogs are prohibited; and
        iii. Kite flying would be prohibited under the draft conservation plan; and
    g. Non-prohibited recreational use (i.e., jogging, beach combing, horseback riding) is restricted to the wet sand outside of roped and signed breeding areas.

In addition to these conservation measures, JCEP L.P. has agreed to mitigate Project impacts to western snowy plovers through implementation of BMPs and education and outreach programs. Increased predator density related to increased human presence and habitat removal was identified as a potential concern related to Project construction. JCEP L.P. will address these concerns through the following BMPs:

1. Staff will be trained on snowy plover regulations, recreational use restrictions, and conservation measures in the area such as controlling litter, avoiding nesting and foraging areas, keeping pets on a leash, and remaining on established roads and trails (see Appendix K of the 2001 Plover Recovery Plan; FERC BA). The training program may be implemented by state/local agencies (such as the Oregon Coast Aquarium, National Park Service, Western Snowy Plover Working Team, or Oregon Coast Community College) or an appropriate entity that may have pre-existing experience in plover education and outreach programs.
2. Environmental training will also be provided to operational personnel to ensure that all personnel are aware of and comply with the management tools in place to affect the recovery and maintenance of the snowy plover population on the North Spit. Printed educational materials would be posted at the Project site for the life of the LNG terminal. Materials would also be distributed to existing North Spit employers for their use in training their personnel. The types of educational materials may vary, but could include posters, table tents, maps, brochures, or fact sheets. Numerous sources for existing educational materials are provided in Appendix K of the Plover Recovery Plan.
3. Interpretive signs, education materials, and kiosks will be posted at the LNG facilities or other approved locations.
4. JCEP L.P. will fund one additional entry-level Wildlife Services position dedicated to snowy plover predator monitoring and control during the 42-month construction period. This additional position would allow Wildlife Services to better evaluate predator densities and more quickly and effectively respond in the unlikely event that predator pressure on the Coos Bay North Spit increases during Project construction.
5. During construction and operation, the facility will be kept clear of construction debris, food wastes, and garbage that could attract snowy plover predators.
6. The dredged material placement areas will be regularly policed to ensure that no denning is occurring in the hillocks. This should not be as significant a concern as it was previously for the Port Stockpile Site, because these placement areas will be continuously disturbed as part of Project construction, which will discourage use by individual birds. However, if necessary, nylon mesh or other exclusion fencing would be installed around the perimeter of the placement areas to prevent the establishment of coyote or skunk dens until the slopes are stabilized or constructed upon.
7. Covered, animal-proof receptacles will be provided in eating and break areas, parking lots, and at appropriate locations around the construction site. Construction site areas will be policed on a daily basis to remove any food or other debris left by construction workers. During operations, the Project site would be regularly inspected to ensure that no garbage is allowed to accumulate.
8. Structures associated with the Project will be monitored to discourage use by avian predator species. Frequent inspections will ensure that nests are not being constructed, and any nest that was found would be removed immediately. It is anticipated that there would be sufficient inspections and other activities mandated by safety and security requirements to keep the structures nest-free. However, in the unlikely event that a nest becomes established and it is not discovered until young birds are present, the disposition of the nest would be handled in accordance with the provisions of the Migratory Bird Treaty Act.

<u>SLIP AND ACCESS CHANNEL IMPACT MINIMIZATION MEASURES</u>

Timing of Dredging Activities

1. All in-water work associated with the proposed Project, including dredging of the access channel and barrier berm removal, will be conducted during the approved in-water work period for Coos Bay (October 1 to February 15) to minimize potential impacts to fish species through the avoidance of vulnerable salmonid life stages and peak migration periods.
2. To minimize the impacts of construction of the marine facilities on fisheries, reduce the total period of estuary turbidity, and extend the time available for construction, a two-phase construction methodology will be used to construct the slip: (1) the upland phase and (2) the in-water work phase.
3. Phase 1, the upland phase, will consist of excavation and dredging of the slip, which will be isolated from Coos Bay by an earthen barrier berm and therefore will not be subject to the ODFW in-water work window. The berm will be removed during the approved in-water work period (October 1 to February 15) to minimize effects of turbidity on sensitive fish and invertebrate resources.

Upland Slip Excavation Erosion Control Measures

1. Excavation of most of the material from the slip will be completed behind a barrier berm and therefore will not be subject to the ODFW in-water work window.
2. Only material essential for creating the slip and constructing upland structures and only surfaces that need to be recontoured to accommodate the slip or supporting structures will be grubbed and cleared. All areas where the existing topography can be maintained will be kept in the current, natural state.
3. Material from the slip will be placed in two upland areas—the South Dunes Power Plant Site and the LNG Liquefaction and Terminal Site—and will be used as permanent filling to raise the site elevation to +30 as required for the Project. No permanent/long-term disposal sites are anticipated by the Project. Should there be a need, these permanent disposal sites will be stabilized using a seed mix to minimize windblown sand from being deposited on roads, upland habitats, and waterways.
4. A 50-foot buffer along the east border of Henderson Property will be maintained in order to avoid both permanent and temporary wetland impacts at Henderson Property. There will be no encroachment into the buffer. Henderson Property will be fenced with construction fencing to prevent equipment from entering and with erosion control fencing to prevent any soils from being deposited in the wetland.

Dredging

1. Dredging of the Access channel and slip would be performed primarily with a cutter-head suction dredge to minimize turbidity and during the approved in-water work window.
2. The dredge cutter head, potentially operated from a barge, will be held at the substrate level to the extent practicable. The intake will be raised no more than a maximum of three feet above the sediment surface for brief periods of purging or flushing the intake system.
3. Material removed by the hydraulic cutter-head suction dredges will be sent to the South Dunes Site and the LNG Liquefaction and Terminal Site.
4. The hydraulic dredge transport pipeline for hydraulic transportation of excavated materials (including the decant water return line) will follow the shoreline of the Roseburg Forest Products chip loading facility and will not result in additional land disturbance. It will be approximately 8,650 feet long, with an approximate construction right-of-way width of 8 feet and will be placed directly on the ground surface from the slip site across the Roseburg Forest Products property until the point where it follows the route of the future access/utility corridor.
5. At the point that the hydraulic dredge transport pipeline follows the access road/utility corridor eastbound, it will be covered with the fill used to develop the access road/utility corridor. No excavation of the existing ground surface will occur to install the pipelines, because the pipelines will be placed on fill material and temporarily covered by additional fill material. Where not covered, the pipelines will be held in place by cross bracing anchored into the soil. In the area of the Roseburg Forest Products chip ship berth, the pipeline will be placed on the riprap along the shoreline so that it does not affect the docking and loading of the wood chip vessels.
6. The hydraulic dredge transport pipelines will be able to span any affected wetlands or water bodies without the need to place any structures in the wetlands or water bodies.
7. The hydraulic dredge transport pipeline will be a fused polypropylene (seamless) pipeline and will be provided with secondary containment at wetland crossings (if any) or in areas adjacent to water bodies (e.g., the bay) to ensure that those water bodies will not be affected by any breaks or leaks.
8. If mechanical dredging is required in the bay, a close-lipped clamshell bucket will be used that seals around its edges to minimize the potential for entrainment of listed fish species and minimize turbidity and contaminant releases to the water column. Dredging during the freshwater phase would not require use of a close-lipped clamshell dredge since the work area would be isolated from the bay.
9. If used, the clamshell bucket will be lowered and raised slowly through the water column to reduce potential for entrainment of fish species and minimize turbidity increases.
10. None of the material collected in the bucket will be allowed to return to the waterway.
11. Any large man-made debris that is removed with the dredged material will be transported to an appropriate disposal site.
12. Dredging and Global Positioning System (GPS) software will be utilized to model the dredge prism and track previously dredged areas to ensure that dredging efficiency is maximized.
13. A post-dredge bathymetry survey will be conducted to ensure that only the material that was identified to be dredged was removed to the proper, authorized depth.
14. Construction lighting during dredging and other in-water work activities and safety lighting for the slurry pipeline will meet all USCG requirements but will not be intense enough or result in sufficient illumination to cause significant biological effects.

Disposal

1. The dredged material will be handled in a manner consistent with local, state, and federal regulations. No significant reduction in quality or quantity of riparian habitat at a disposal site will occur.
2. Permanent or long-term disposal sites will be stabilized using a seed mix to minimize windblown sand from being deposited on roads, upland habitats, and waterways.
3. The South Dunes Site, LNG Liquefaction and Terminal Site, and stockpile locations will be contained by berms, and will be sufficiently large to dewater the dredge slurry. With the exception of the maintenance dredged material, no in-water disposal of dredged material or re-handling activities will occur in Coos Bay.
4. In the case of fresh (low salinity) decant water from material dredged behind the berm, the water that doesn't percolate into the sand below will be returned to the dredge pocket, thus eliminating impacts to Coos Bay at the disposal site location.
5. In the case of saline decant water from material dredged to remove the barrier berm, the decant water that doesn't percolate into the sand below will be discharged to the slip via a submerged outfall pipe, thus reducing impacts from increased turbidity.
6. In the case of saline decant water from material dredged to dredge the access channel, the decant water that doesn't percolate into the sand below will be discharged in proximity to the Mill Site/South Dunes Site via a submerged outfall pipe, thus reducing impacts from increased turbidity.
7. If maintenance dredge material is transported via barge to Site F a bin-barge with one or multiple cells or flat-deck barge with watertight sideboards will be used to enclose the dredged material, including sediment and water. No material will be allowed to leak from the bins or overtop the walls. The barge will be loaded so that enough of the freeboard remains to allow for safe movement of the barge and its material on its planned route to the approved disposal facility.

In-water Dredging Turbidity Minimization Measures

1. The following measures will be implemented to reduce turbidity impacts resulting from dredging activities:
    a. Testing Procedures – to ensure procedures are consistent and accurate.
    b. Water Quality Monitoring – to be performed during in-water activity to ensure compliance with federal and state standards.
    c. Corrective Measures – If testing results indicate out-of-compliance situations, work will cease until corrective actions are taken.

Acoustic Disturbances

1. All pile work is planned to be performed "in the dry" with vibratory hammers. However, if any pile needs to be driven in Coos Bay waters, it will be done during the approved in-water work window, and if necessary, appropriate noise reductions measures will be implemented.
2. Use of impact hammers for sheet pile installation is not planned; however, if necessary, impact hammers will be used behind the barrier berm and outside of Coos Bay waters, entirely "in the dry" within upland areas.

Slip Design

3. All piling will be concrete or steel piling; no treated timbers will be used.
4. The slip has been designed to avoid direct impacts to Henderson Marsh, located to the west.
5. A 50-foot buffer will be maintained between the slip and the east edge of Henderson Marsh. There will be no encroachment into the buffer.
6. The bank slopes of the Slip and Access Channel will be appropriately designed to help prevent erosion.
7. Impact hammers may be used to drive pile in non-fish bearing waters and in the dry where site conditions aren't conducive to vibratory means.
8. Limited use of impact hammers may be required to proof pile where pile is installed in fish-bearing waters during the in-water work window. Mitigation measures (e.g., sound attenuation measures) would be used to minimize impacts to fish.

Marine Structures

1. Land-based mobile cranes with pile driving equipment will be located on the land side of the OPEN CELL® sheet pile walls, entirely within upland areas.
2. Any piling for the LNG loading structure or mooring dolphins will be driven on the land side of the OPEN CELL® sheet pile walls, entirely "in the dry" within upland areas.

Shoreline Erosion Protection and Prevention

1. Where necessary, the slip shoreline will be protected from wave action, wind erosion, propeller wash, and rainfall runoff using an appropriate method (e.g., stone, articulated block reinforcement).
2. For the portion of the slip, including the area above +25 feet NAVD88, that is not expected to be subjected to wind wave and water level conditions under operating conditions, alternative erosion protection means will be used. This area may be protected using appropriate BMPs (e.g., CCMs, grout-injected geotextile fabric mattresses (fabriform), and/or geotextile reinforced vegetative planting). In addition, hydrodynamic modeling has indicated that during peak periods of ship activity, no excessive channel erosion is expected. Therefore, no measures for protecting the shoreline of the Project site are anticipated.

Spill Prevention and Design

1. The contractor will follow BMPs for in-water installation of green concrete during construction of the concrete slabs, abutments, or other pier structures.
2. All equipment used will be clean and inspected daily prior to use to ensure that the equipment has no fluid leaks. Should a leak develop during use, the leaking equipment shall be shut down and not used again until it has been adequately repaired. At no time will any fuels or oils be allowed to enter any water body.
3. Floating spill containment booms and absorbent booms will be maintained on-site during all phases of construction to facilitate the cleanup in the case of accidental spills. Containment booms will be installed in instances where there is a potential for release of petroleum or other toxic substances. Absorbent booms will be deployed within the containment boom if sheen is observed.
4. A spill prevention, control, and containment plan will be prepared and implemented. Location of vehicles, equipment and fuel storage areas, and fuel containment measures will be approved and monitored by a contractor-designated Environmental Manager.

Site Restoration

1. Following the Slip and Access Channel dredging activities and site filling activities, long-term exposed slopes will be stabilized with a seed mixture specified by the NRCS as being capable of surviving in highly permeable, xeric regimes, binding loose sand, and withstanding burial and deflation from aeolian processes.
2. Native species will be used and, if any non-native species are required for specific problem areas, species will be selected that will not become nuisance species to the surrounding areas.
3. The slurry and decant water pipelines will be removed, and any areas disturbed by these pipelines will be restored to pre-construction conditions.

Mitigation

Proposed conservation and mitigation actions that would be implemented as part of the Project to compensate for the loss of eelgrass and unvegetated mudflat habitat are expected to more than offset the losses incurred during Project construction. Mitigation details are provided in the October 2014 Compensatory Wetland Mitigation Plan.

Description of resources in project area

Ocean	☐	Estuary	☒	River	☐	Lake	☐	Stream	☐	Freshwater Wetland	☒

Describe the existing **physical and biological characteristics** of the wetland/waterway site by area and type of resource (Use separate sheets and photos, if necessary).

For wetlands, include, as applicable:

- *Cowardin and Hydrogeomorphic(HGM) wetland class(s)**
- *Dominant plant species by layer (herb, shrub, tree)**
- Whether the wetland is freshwater or tidal
- *Assessment of the functional attributes of the wetland to be impacted**
- Identify any vernal pools, bogs, fens, mature forested wetland, seasonal mudflats, or native wet prairies in or near the project area.)

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

For waterways, include a description of, as applicable:

- *Channel and bank conditions**
- *Type and condition of riparian vegetation**
- *Channel morphology (i.e., structure and shape)**
- *Stream substrate**
- Fish and wildlife (type, abundance, period of use, significance of site)
- *General hydrological conditions (e.g. stream flow, seasonal fluctuations)**

See attached Map of Wetlands, Impacts, and Mitigation Areas (Figure i-2, Sheet 1) for a complete map of delineated wetlands within the project vicinity.

Estuarine Wetlands

The Project reach of Coos Bay consists of a relatively narrow intertidal and shallow subtidal bench that drops off abruptly where it meets the adjacent main navigation channel. The Project will impact intertidal and shallow subtidal estuarine resources along this narrow bench. Eelgrass beds occur as linear beds along estimated elevation contours of +1.0 to -1.0 meters MLLW. The majority of the eelgrass beds are of medium to high density (i.e., at least 40 percent cover). Unvegetated sand/mudflat occurs in the shallowest areas.

The hydrogeomorphic (HGM) class of wetlands to be impacted by the Project is "estuarine fringe," which extends down to a depth of 2 meters (6.6 feet) or approximately mean daily lower tide. No HGM class is provided for resources below the 2-meter depth. Cowardin classes of site resources include estuarine, intertidal, unconsolidated shore, regularly flooded (E2USN), and estuarine, subtidal, unconsolidated bottom, subtidal (E1UBL).

Impact quantities are provided in the Impacts Bulk Upload Template.

Freshwater Wetlands

Historically, the wetlands in the general Project vicinity consisted of interdunal freshwater wetlands and estuarine salt marsh and mudlfats. However, considerable development and land alterations have occurred in much of the proposed Project area over the past century or so. Current-day freshwater wetlands, particularly those being impacted by the proposed Project, now consist of a combination of remnant wetlands surrounded by adjacent fill material and new wetlands that formed on top of fill. Two wetlands, F and G, which are not regulated under Section 404, were designed to be sludge ponds to support a mill that formerly occupied the property. Most wetlands are of the depressional HGM class, with hydrology primarily driven by the regional groundwater table. Vegetation types, based on the Cowardin classification system, include palustrine forested, scrub-shrub, and emergent communities. Plant communities are dominated by native species, with generally low presence of non-native species. Bordering uplands typically consist of sandy fill dominated by non-native grasses and shrubs or concrete/paved surfaces from past development activities. A few upland areas contain second growth native forest.

Impact quantities are provided in the Impacts Bulk Upload Template.

Essential Fish Habitat

Coos Bay is designated as Essential Fish Habitat (EFH) for several Coastal Pelagic Species (CPS), West Coast Groundfish, and Pacific Salmon. After careful analysis of the life histories and EFH requirements for species that could potentially be impacted by the proposed project, the Biological Evaluation (BE)/BA concluded that the potential direct, indirect, and cumulative effects of the proposed project actions are "likely to adversely affect" EFH in the short term. The implementation of proposed conservation and mitigation measures would minimize short-term impacts and help ensure that there are no adverse long-term impacts to EFH for these species. No significant long-term effects to EFH were identified or anticipated.

*Describe the existing **navigation, fishing and recreational** use of the waterway or wetland.**

Coos Bay is used for commercial shipping (primarily timber products). Recreational boating, fishing and clamming also occur in the bay and along its shores; however, the beach area at the slip location is not highly used (compared to other areas) for clamming. Commercial fishermen operate out of Coos Bay; commercial oyster farming also occurs in the bay.

The shoreline at the proposed site is industrial property and access to this area is limited for safety reasons.

Site Restoration/Rehabilitation

- *For temporary disturbance of soils and/or vegetation in waterways, wetlands or riparian areas, please discuss how you will restore the site after construction including any monitoring, if necessary**

Generally, all temporary disturbances to wetland and upland areas will be rectified and restored to pre-project conditions. Temporary disturbance to estuarine and freshwater resources is anticipated in these following areas:

1. Temporary estuarine impacts at the Barge Berth will occur as a result of placing fill material to construct the Barge Berth sheet pile wall. Temporary fill material will be removed and the area will be restored to pre-project contours.
2. Temporary estuarine impacts at the Highway 101/Trans Pacific Parkway Intersection are due to temporary removal of riprap so that sheet pile can be driven beneath the elevation of the existing riprap fill material. Following sheet pile driving, riprap will be placed back in the same location to protect the existing roadway embankment and sheet pile wall.
3. Temporary freshwater wetland impacts will result at the railroad bridge in Wetland 2012-4 due to temporary work bridge pile. These pile will be removed following construction, less than 24 months following their original placement. It is assumed that the sandy soils will naturally backfill the pile voids and rectification, aside from pile removal, is not necessary.
4. Temporary freshwater wetland impacts will result from construction of the Utility Corridor Access Road Bridge at Wetlands 2013-6, C, and E. As in Wetland 2012-4, temporary pile used for a work bridge will be removed upon project completion. These minor impacts are expected to naturally backfill.
5. Temporary freshwater impacts will occur to Wetlands 2013-1 and 2013-2 as a result of constructing retaining walls to avoid permanent impacts to these wetlands along the Utility Corridor/Access Road. Temporary access to the base of the walls is anticipated for their construction.
6. Minor estuarine impacts will result from a temporary pile-supported work bridge at the North Point Workforce Housing Bridge. Approximately 15 round steel pile will be in place for less than 24 months.

7. While construction of permanent facilities is not anticipated beyond the toe of the fill slope, perimeter site preparation activities, installation and maintenance of erosion and sediment control measures and ground improvements adjacent to the toe of slope may cause settlement or temporary disturbances beyond the toe of slope. If temporary disturbances or settlement in wetlands does occur and is determined to be detrimental to wetland functions and values, then the site will be returned to its pre-construction condition using the following measures: a) alleviate compaction by cultivating the area within 12 inches of the surface, b) return the area to pre-disturbed grades using native material, and c) replace vegetation in-kind.
8. Following ground improvements at Wetland J, the top three feet of soil will be returned to original elevations and will be loosened, and replanted with native wetland vegetation.

Areas disturbed by construction of the Project facilities will be stabilized with temporary erosion controls until construction is complete, unless covered by equipment, gravel or other covering. Following construction, the site will be final graded, and BMPs will be applied to prevent erosion. To minimize the potential for erosion, JCEP L.P. has modified the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures), creating Project-specific Plan and Procedures. A copy of the Project-specific Procedures is located in Appendix B.2 of FERC Resource Report 2 – Water Use and Quality, and a copy of the Project-specific Plan is located in Appendix B.7 of FERC Resource Report 7 – Soils.

Mitigation

*Describe the reasonably expected adverse effects of the development of this project and how the effects will be mitigated.**

- *For permanent impact to wetlands, complete and attach a Compensatory Wetland Mitigation (CWM) Plan. (See OAR 141-085-0705 for plan requirements)**
- *For permanent impact to waters other than wetlands, complete and attach a Compensatory Mitigation (CM) plan (See OAR 141-085-0765 for plan requirements)**
- *For permanent impact to estuarine wetlands, you must submit a CWM plan.**

Mitigation for loss of aquatic habitat is addressed in the October 2014 Compensatory Wetland Mitigation Plan.

Mitigation for loss to upland habitats has been under negotiation with ODFW; additional details are provided in FERC Resource Report 3.

Mitigation Location Information (Fill out only when mitigation is proposed or required)

Proposed mitigation (Check all that apply):		*Type of mitigation:*	
☒	*Onsite Mitigation*	☒	*Wetland Mitigation*
☒	*Offsite Mitigation*	☒	*Mitigation for impacts to other waters*
☐	*Mitigation Bank*	☐	*Mitigation for impacts to navigation, fishing, or recreation*
☐	*Payment to Provide*		

Street, Road or Other Descriptive Location	*Legal Description (attach tax lot map*)*			
	Quarter/Quarter	*Section*	*Township*	*Range*
West Jordan Cove Mitigation Site (freshwater wetlands), Coos Bay North Bend Airport (eelgrass), Kentuck Sough Golf Course (intertidal flats)	varies		varies	varies

In or near (City or Town)	*County*	*Tax Map #*	*Tax Lot #*[3]
Coos Bay	Coos County	n/a	n/a
Wetland/Waterway (pick one)	*River Mile (if known)*	*Latitude (in DD.DDDD format)*	*Longitude (in DD.DDDD format)*
n/a	n/a	n/a	n/a

Name of waterway/watershed/HUC	*Name of mitigation bank (if applicable)*
Coos Bay estuary/Coos Bay watershed/HUC #17100304	n/a

(6) Additional information

Adjoining Property Owners and Their Address and Phone Numbers *(if more than 5, attach printed labels*)*

Owner	Tax Lot ID	Address	City	State	Zip
APCO Coos Properties, LLC	25S13W10TL0110000 25S13W10TL0090000	P.O. Box 300	Coos Bay	OR	97420
Brock, Gregory	25S13W10TL0080200	600 Chappell Way	North Bend	OR	97459
Bureau of Land Management (USA)	25S13W04TL0020000	1300 Airport Ln	North Bend	OR	97459

[3] Attach a copy of all tax maps with the project area highlighted.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Owner	Tax Lot ID	Address	City	State	Zip
Heaton, Byron T. & Tamara J.	25S12W06BTL0300000	94631 Kentuck Way Ln	North Bend	OR	97459
City of North Bend	25S13W10TL0140000 25S13W10TL0130000 25S13W10TL0120000 25S13W10TL0070000	P.O. Box B	North Bend	OR	97459
Colton, Mary K.	25S12W06BTL0200000	97425 Kentuck Way Ln	North Bend	OR	97459
Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians	25S12W06BTL0320000	1245 Fulton Ave.	Coos Bay	OR	97420
Coos County	24S13W34DTL0060200 24S13W34DTL0060000 24S13W34DTL0010000 24S13W34DTL0060500 24S13W34DTL0200100 24S13W34DTL0260000 25S12W06BTL0340000	250 N. Baxter St.	Coquille	OR	97423
Culp , Joanne; etal	25S12W06CTL0080000	94506 Golf Course Ln	North Bend	OR	97459
Davis, Brett L. & Sally	25S12W06BTL0190000	94715 Kentuck Way Ln	North Bend	OR	97459
Don & Rose Freeman Trust	25S12W07TL0060000	94532 Golf Course Ln	North Bend	OR	97459
Douglas A. Parker Revocable Living Trust	24S13W34CTL0140000	2136 Stanton Ave	North Bend	OR	97459
DSP Enterprise, LLC	25S13W10TL0080300	726 Chappell Way	North Bend	OR	97459
Edwards, Lorryann; L/E	25S12W06DTL040000	94911 Kentuck Way Ln	North Bend	OR	97459
Fort Chicago Holdings II U.S., LLC.	25S13W03TL0020000 25S13W05TL0020000 25S13W05TL0010000 25S13W04TL0040000 25S13W04TL0010000 25S13W04TL0010100 25S13W12ATL0010000 25S13W01DTL0040000 25S13W06CTL0010000 25S12W07TL0079900	125 Central Ave Suite 380	Coos Bay	OR	97420
Gertrude E. Wickett Trust	25S12W06CTL0090000 25S12W07TL0050100	94506 Golf Course Ln	North Bend	OR	97459
Gertrude E. Wickett Trust; etal	25S12W07TL0070000 25S12W07TL0070000 25S13W12ATL0020000	94506 Golf Course Ln	North Bend	OR	97459
Gould , Brian D. & Gould, Molly M.	25S13W12ATL0060000	1937 Channel St.	North Bend	OR	97459
Kerwin, Charles C.	25S13W12ATL0050000 25S13W12ATL0040000	P.O. Box 704	North Bend	OR	97459
Lone Rock Timber Investments I, LLC	25S12W06CTL0060100 25S12W07TL0050000 25S12W06DTL0050000 25S12W06BTL0220000	P.O. Box 1127	Roseburg	OR	97470
LTM, Inc	25S13W10TL0010000	600 Chappell Parkway	North Bend	OR	97459
Oregon Dunes Sand Park, LLC	24S13W34CTL0170000	P.O. Box 97	Coos Bay	OR	97420
Oregon International Port of Coos Bay	25S13W05TL0030000 24S13W32TL0020000 25S13W04TL0050000 24S13W34DTL0060100 25S12W00TL0020000	P.O. Box 1215	Coos Bay	OR	97420-0311
Haga , Richard R.	25S12W06BL0360000	66512 Gurney Rd	North Bend	OR	97459
Rose, Michael E.; et al	25S12W06BTL0210000 25S12W06BTL0220000	P.O. Box 688	North Bend	OR	97459
Roseburg Forest Products Co.	25S13W04TL0030000	P.O. Box 1088	Roseburg	OR	97470
Samuel, Stephan R.	25S12W06CTL0040000	94559 Kentuck Way Ln	North Bend	OR	97459
State of Oregon	25S13W10TL0080000	1600 State St.	Salem	OR	97310
State of Oregon Dept of Transportation	25S13W10TL00899Z1	355 Capital St. NE, RM 411	Salem	OR	97301
Suburban Gas Co.@ Buckey Gas Products Co.	25S13W10TL00800A1	One Liberty PZ	Liberty	MO	64068
United States of America	4S13W32TL0010000 24S13W33TL00100002 25S13W00TL0010000	68028 Horsefall Rd	North Bend	OR	97459
Wallace & Gertrude Wickett TST; et al	25S12W06CTL0070000	94506 Golf Course Ln	North Bend	OR	97459
Walters, Joshua R.	25S12W06CTL0050200 25S12W06CTL0050000	94557 Kentuck Way Ln	North Bend	OR	97459
Webb , Dean A. & Deborah C.	25S13W12ATL0030000	94252 Golf Course Ln	North Bend	OR	97459

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Has the proposed activity or any related activity received the attention of the Corps of Engineers or the Department of State Lands in the past, e.g., wetland delineation, violation, permit, lease request, etc.? Yes ☒ No ☐ If yes, what identification number(s) were assigned by the respective agencies:			
Corps #	NWP-2012-441	State of Oregon #	WD#s: 2010-0337, 2011-0065, 2012-0313, 2013-0116, 2013-0188, 2013-0193, 2013-0218, 2013-0253, 2014-0090; DSL Permit # 47712-RF. 54908-RF, 54909-RF
Has a wetland delineation been completed for this site? *Yes* ☒ *No* ☐			
*If yes by whom?**	SHN Consulting Engineers (Henderson Marsh Eastern Boundary; Ingram Yard/LNG Liquefaction and Terminal Site; In Proximity to Utility Corridor and Mill Site/South Dunes Site) & David Evans and Associates, Inc. (South and North Panhandle Sites; Mill Site/South Dunes Site; Kentuck Mitigation Site, APCO Coos Properties, North Point Workforce Housing Access)		
Has the wetland delineation been approved by DSL or the COE? *Yes* ☒ *No* ☐ *If yes, attach a concurrence letter. ** A Preliminary Jurisdictional Determination was delivered to the applicant in March 2014. On October 6, 2014, Tyler Krug responded with an e-mail concurring that the USACE will not regulate Wetlands F and G under Section 404. DSL concurrence has been received for each of the wetland delineations listed above.			

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
(to be completed by local planning official) *

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date

Comments:

The proposed Project is located in Coos County, Oregon and also in the City of North Bend, Oregon. Signed affidavits from the County and City follow.

A complete Land Use Compatibility Statement (LUCS) signed by the County is included in Tab G of the June 2013 LNG Project 404 Application.

The Applicant is developing a Conditional Use Permit application to be submitted to the City for the conditional use of “temporary work force housing” at the NPWHP site. A copy of Ordinance 1982 which allows temporary work force housing as a conditional use within the Heavy Industrial Zone, M-H was adopted by the City on October 8, 2013.

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☑ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date
Jill Rolfe	Jill Rolfe	Planning Director	Coos	9/16/13

Comments: Project has been reviewed and received prior approvals or is permitted outright

- *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

(8) COASTAL ZONE CERTIFICATION *

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Robert L. Braddock	Vice President – Project Manager, Jordan Cove Energy Project, L.P.
Applicant Signature	Date 10-16-2014
Robert L Braddock	

(9) SIGNATURES FOR JOINT APPLICATION

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or Dept. of State Lands staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. *I understand that payment of the required state processing fee does not guarantee permit issuance. The fee for the state application must accompany the application for completeness.*

Amount enclosed	**n/a**

Print /Type Name	Title	Print /Type Name	Title
Robert L. Braddock	Vice President – Project Manager, Jordan Cove Energy	Sean Sullivan	Sr. Associate/Project Manager David Evans and Associates, Inc.
Applicant Signature	Date 10-16-2014	**Authorized Agent Signature**	Date 10-16-2014
Robert L Braddock			

Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for authorization to conduct removal/fill activities on such lands. This signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied.*

Print /Type Name	Title
Property Owner Signature	Date

- ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

Part A: LNG Terminal Project; Attachments

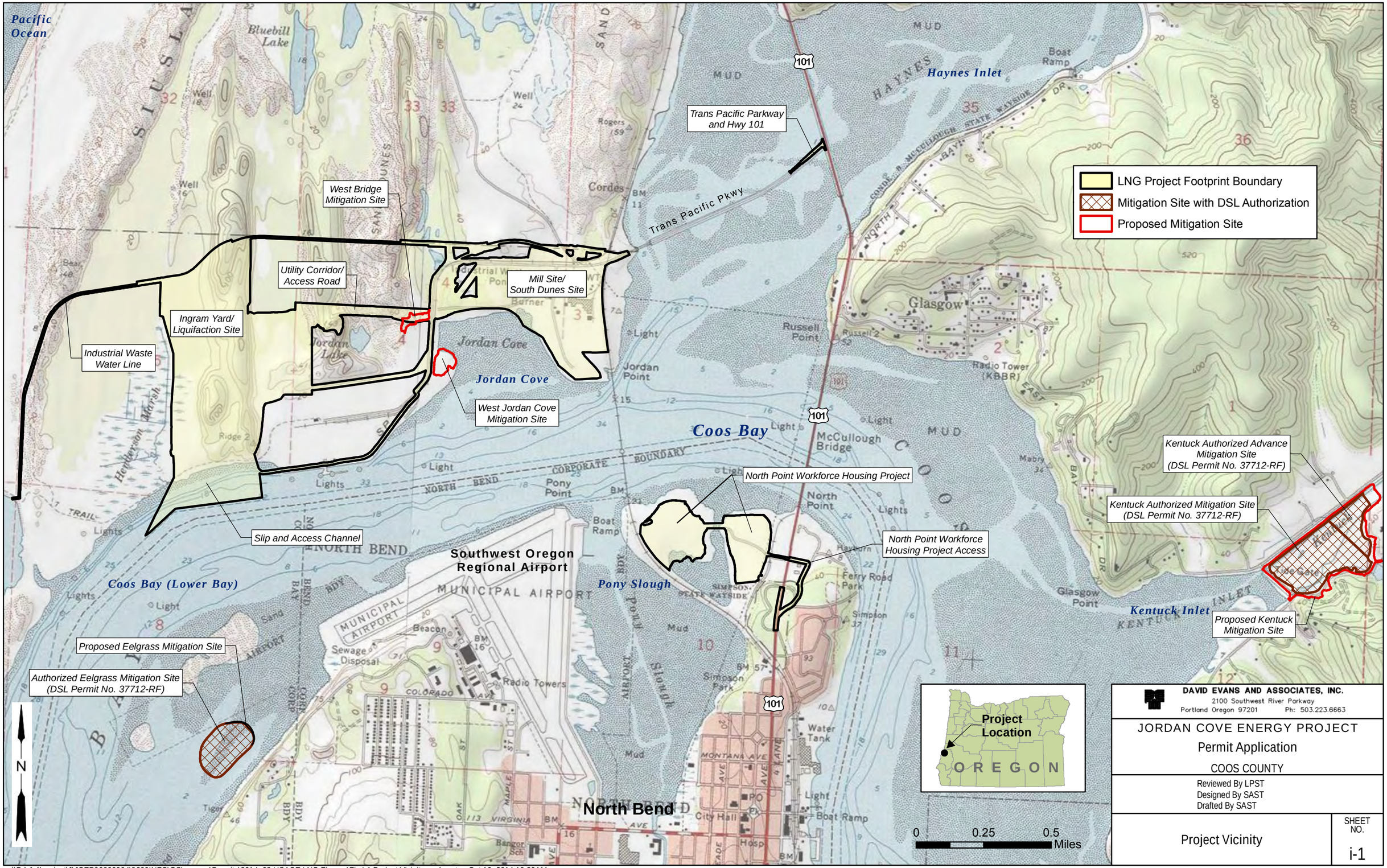
Part A – Tab A: LNG Terminal Project; Appendices

Part A – Tab A.A: LNG Terminal Project; Figures

USACE Figures (October 2014)

A.1. Figures/Sheets

Figure	i-1	Project Vicinity
Figure	i-2.1	Study Area and Delineated Wetlands
Figure	i-2.2	Panhandle Delineated Wetlands and Study Area Boundary
Figure	i-2.3	Mill Site Delineated Wetlands and Study Area Boundary
Figure	i-2.4	Delineated Wetlands, Habitat, and Study Area Boundary
Figure	i-2.5	North Point Workforce Housing Project Delineated Wetlands and Study Area Boundary
Figure	i-2.6	Kentuck Delineated Wetlands and Study Area Boundary
Figure	i-2.7	Tax Lots
Figure	i-2.8	Tax Lots
Sheet	i-3	Temporary Facilities
Sheet	i-4	LNG Project Footprint Boundary/Map Index
Sheet	1-1	Slip and Access Channel Footprint Boundary
Sheet	1-2	LNG Berth Layout
Sheet	1-3	Conceptual Barge Berth Site Plan
Sheet	2-1	LNG Liquefaction Site and Terminal N. Footprint Boundary
Sheet	2-2	LNG Liquefaction Site and Terminal S. Footprint Boundary
Sheet	2-3	Barge Berth Temporary Sand Fill Slope
Sheet	3-1	Utility Corridor Footprint Boundary
Sheet	3-2A	Utility Corridor (West) Footprint Boundary
Sheet	3-2B	Utility Corridor (West) Cross Sections
Sheet	3-3A	Utility Corridor (East) Footprint Boundary
Sheet	3-3B	Utility Corridor (East) Cross Sections
Sheet	4-1	Southwest Oregon Regional Safety Center
Sheet	5-1	South Dunes Power Plant Footprint Boundary
Sheet	5-2	Railroad Bridge Footprint Boundary
Sheet	6-1	Industrial Wastewater Line and Water Line Relocation
Sheet	7-1	Trans Pacific Parkway Footprint Boundary
Sheet	8-1	North Point Workforce Housing Project Footprint Boundary
Sheet	8-2	North Point Workforce Housing Project Bridge Footprint Wetland Impacts



DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT

Permit Application

COOS COUNTY

Reviewed By LPST
Designed By SAST
Drafted By SAST

Project Vicinity

SHEET NO. i-1

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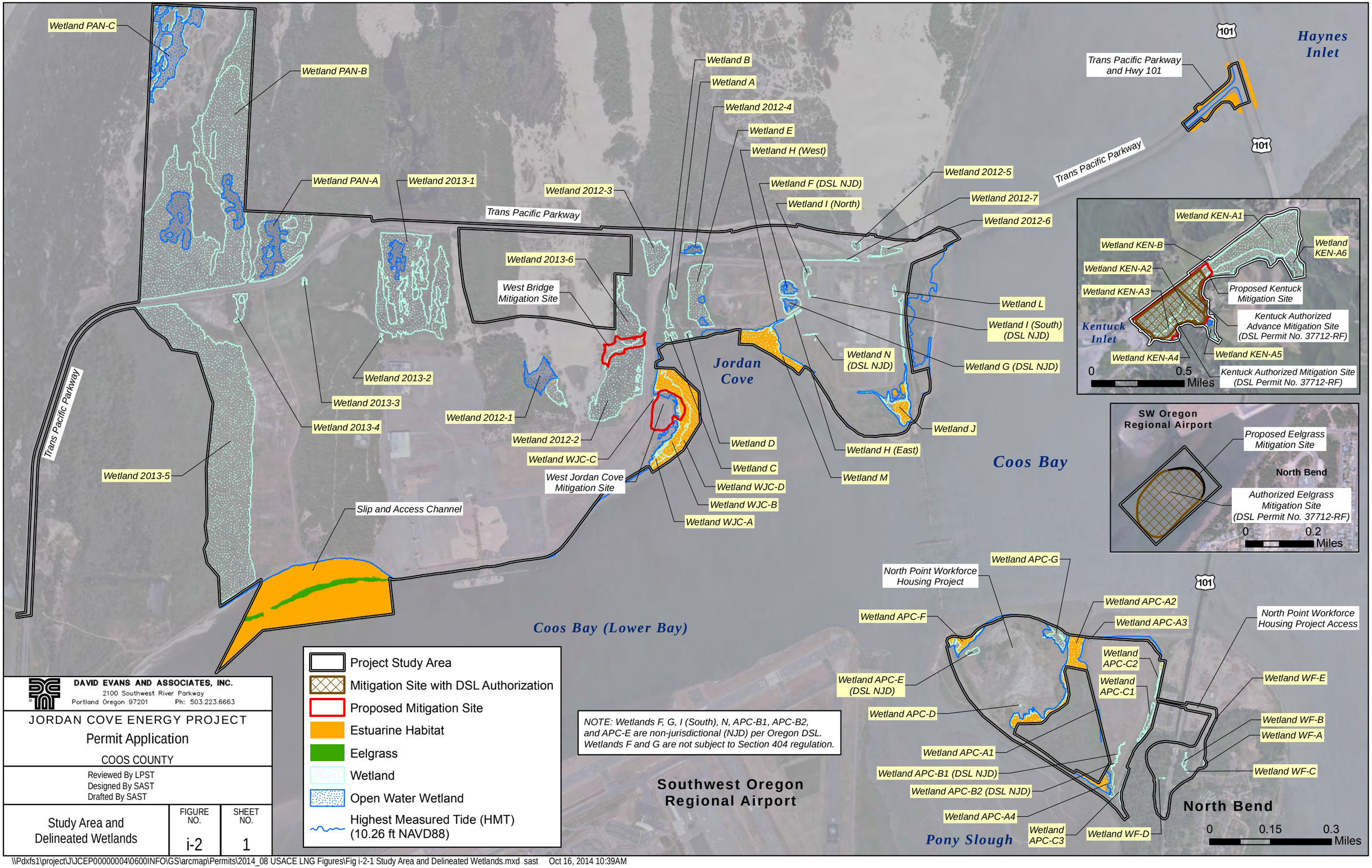

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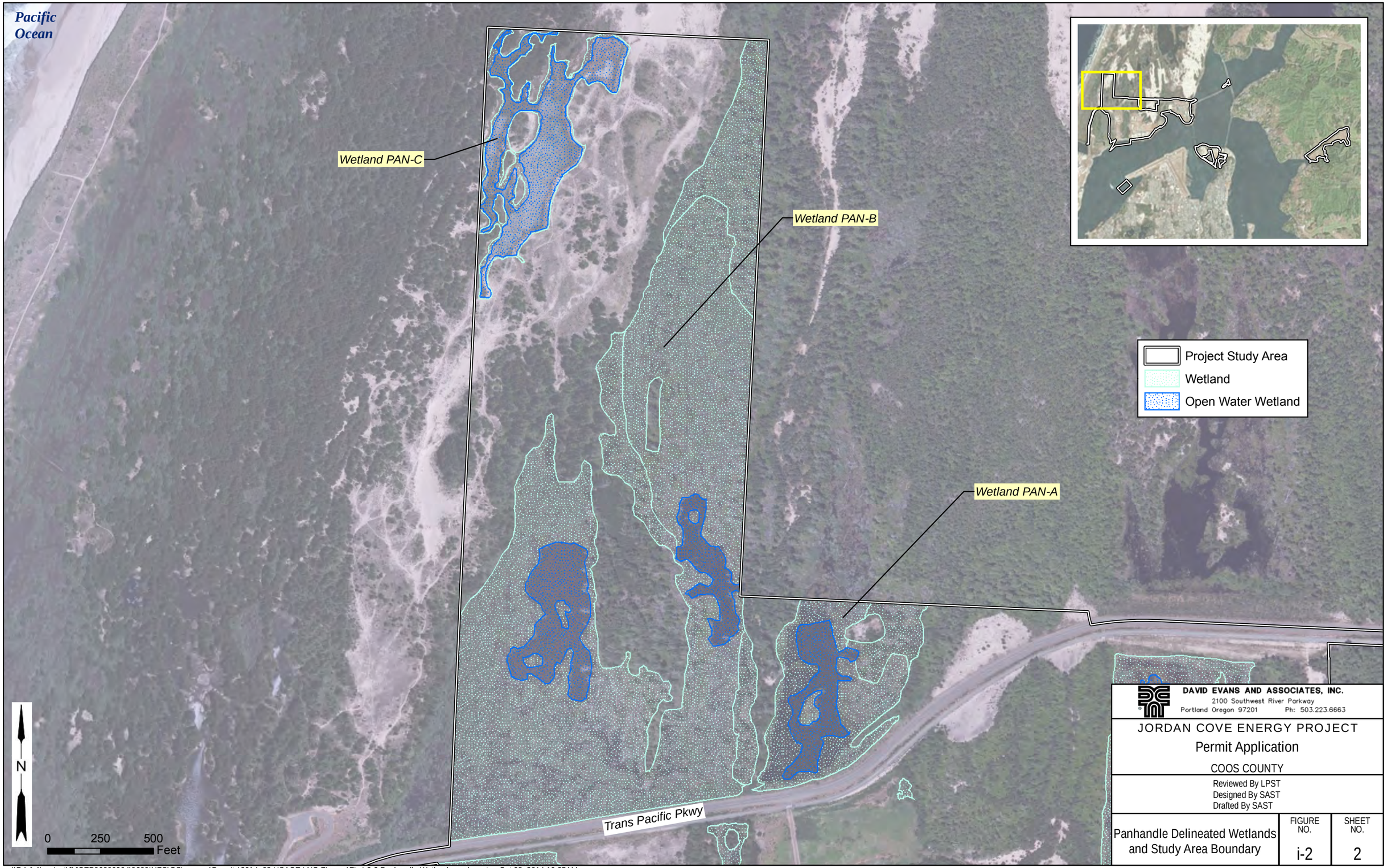

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
Permit Application
COOS COUNTY

Reviewed By LPST
Designed By SAST
Drafted By SAST

Panhandle Delineated Wetlands and Study Area Boundary	FIGURE NO.	SHEET NO.
	i-2	2

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-2 Panhandle Wetlands.mxd sast Oct 08, 2014 10:25AM

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
Permit Application
COOS COUNTY

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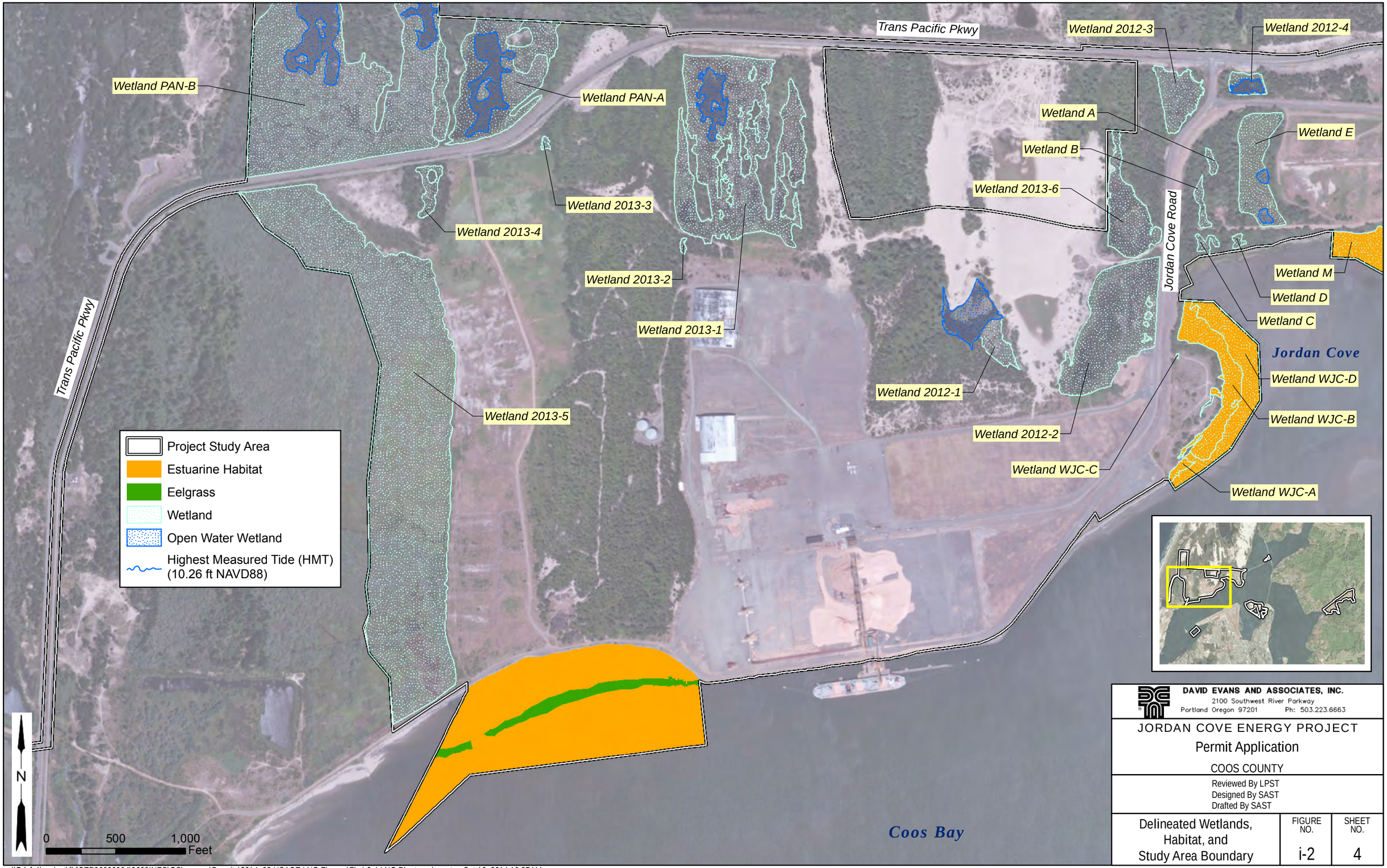
Designed By SAST
Drafted By SAST

Mill Site Delineated Wetlands and Study Area Boundary	FIGURE NO.	SHEET NO.
	i-2	3

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-3 Mill Site.mxd sast Oct 08, 2014 10:26AM



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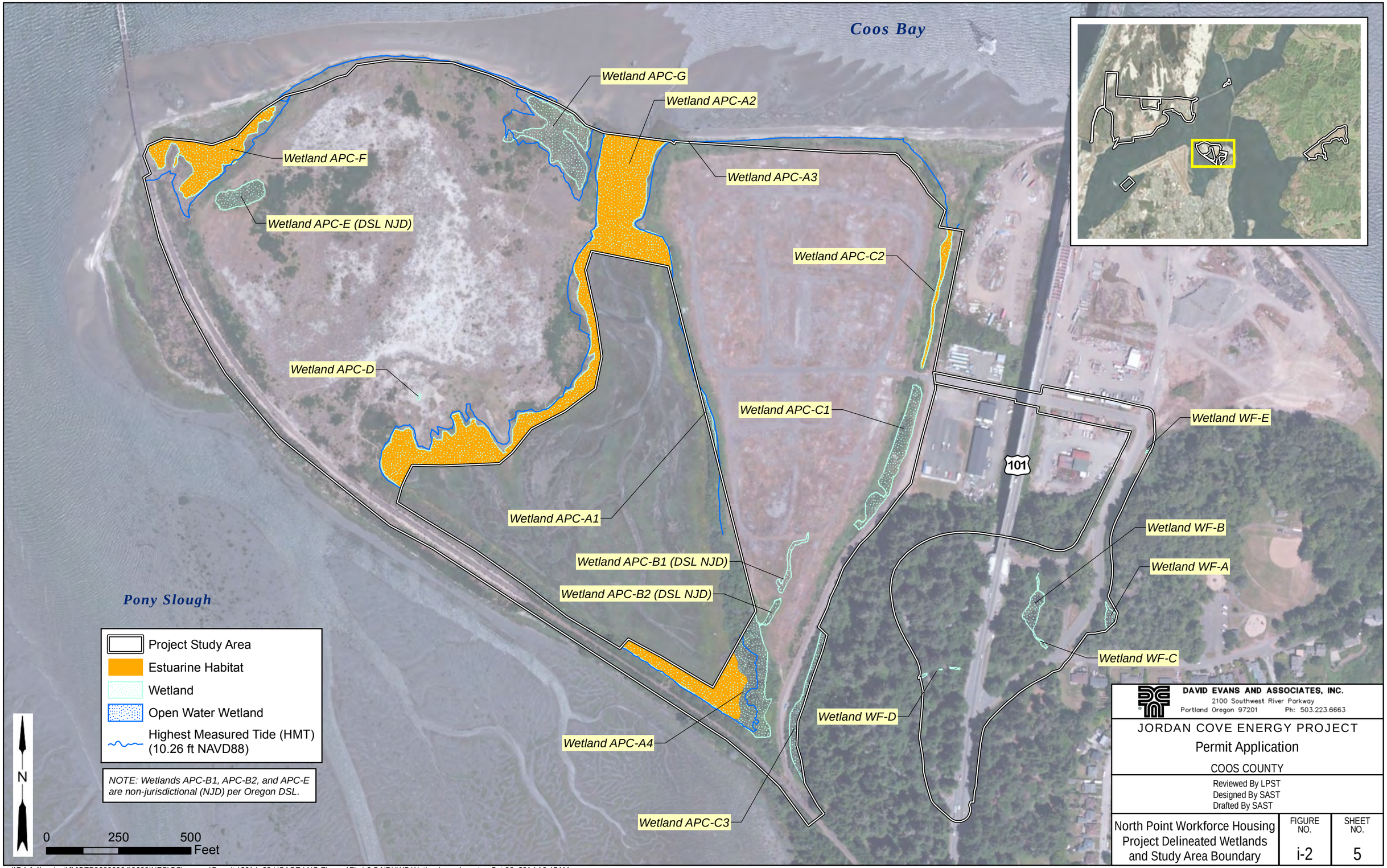

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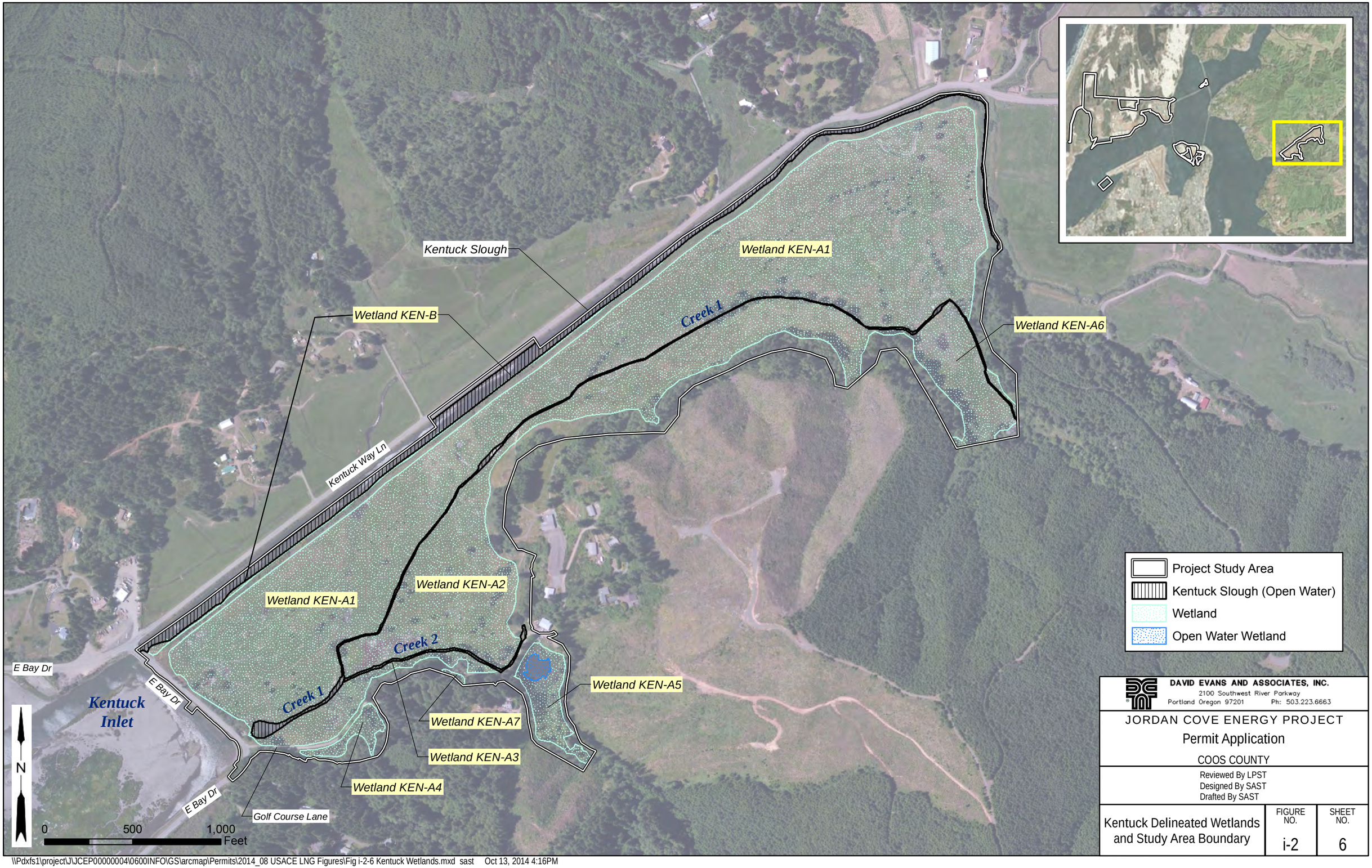

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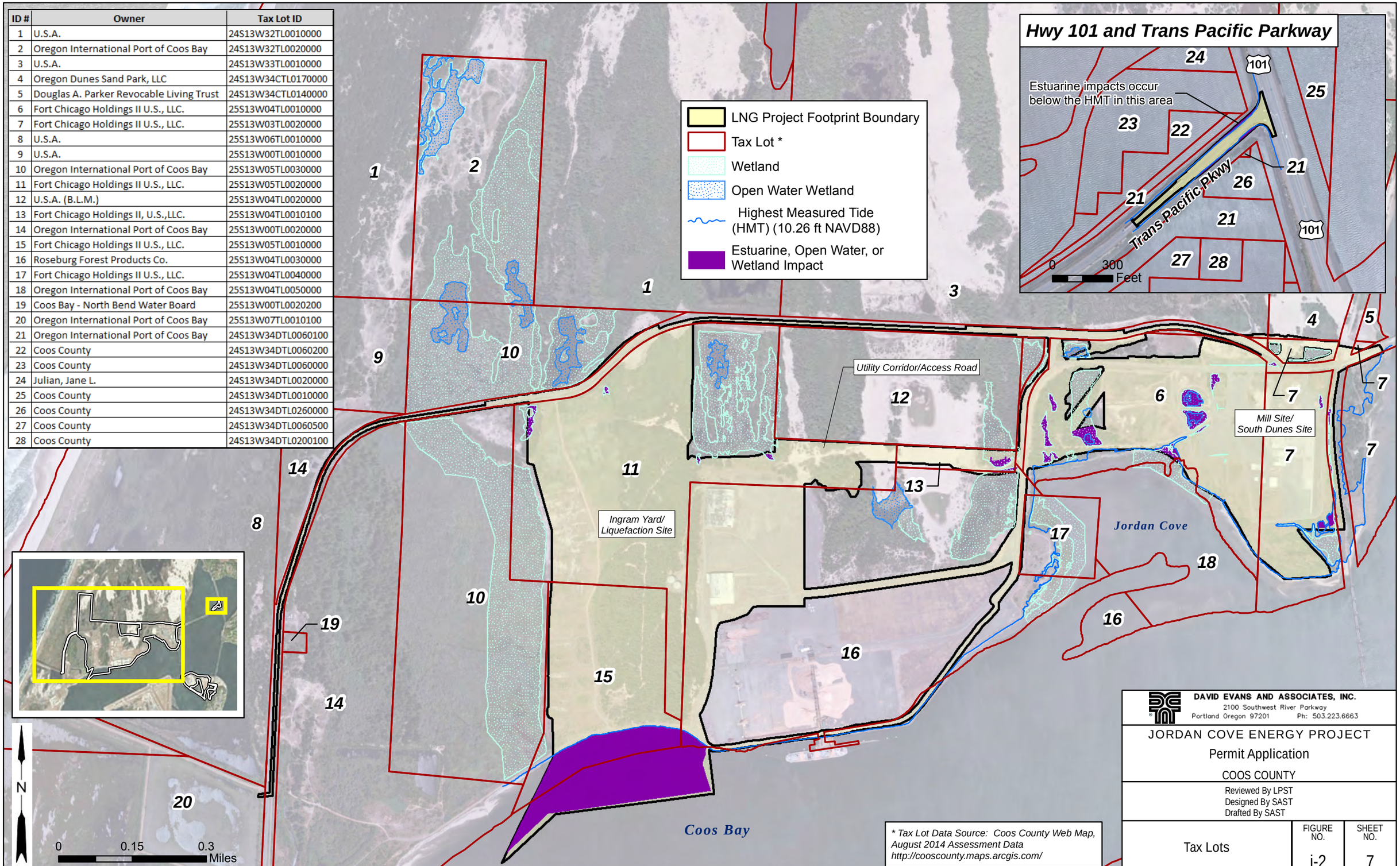
Drafted By SAST

Kentuck Delineated Wetlands and Study Area Boundary	FIGURE NO.	SHEET NO.
	i-2	6

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-6 Kentuck Wetlands.mxd sast Oct 13, 2014 4:16PM

ID #	Owner	Tax Lot ID
1	U.S.A.	24S13W32TL0010000
2	Oregon International Port of Coos Bay	24S13W32TL0020000
3	U.S.A.	24S13W33TL0010000
4	Oregon Dunes Sand Park, LLC	24S13W34CTL0170000
5	Douglas A. Parker Revocable Living Trust	24S13W34CTL0140000
6	Fort Chicago Holdings II U.S., LLC.	25S13W04TL0010000
7	Fort Chicago Holdings II U.S., LLC.	25S13W03TL0020000
8	U.S.A.	25S13W06TL0010000
9	U.S.A.	25S13W00TL0010000
10	Oregon International Port of Coos Bay	25S13W05TL0030000
11	Fort Chicago Holdings II U.S., LLC.	25S13W05TL0020000
12	U.S.A. (B.L.M.)	25S13W04TL0020000
13	Fort Chicago Holdings II, U.S.,LLC.	25S13W04TL0010100
14	Oregon International Port of Coos Bay	25S13W00TL0020000
15	Fort Chicago Holdings II U.S., LLC.	25S13W05TL0010000
16	Roseburg Forest Products Co.	25S13W04TL0030000
17	Fort Chicago Holdings II U.S., LLC.	25S13W04TL0040000
18	Oregon International Port of Coos Bay	25S13W04TL0050000
19	Coos Bay - North Bend Water Board	25S13W00TL0020200
20	Oregon International Port of Coos Bay	25S13W07TL0010100
21	Oregon International Port of Coos Bay	24S13W34DTL0060100
22	Coos County	24S13W34DTL0060200
23	Coos County	24S13W34DTL0060000
24	Julian, Jane L.	24S13W34DTL0020000
25	Coos County	24S13W34DTL0010000
26	Coos County	24S13W34DTL0260000
27	Coos County	24S13W34DTL0060500
28	Coos County	24S13W34DTL0200100



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COOS COUNTY

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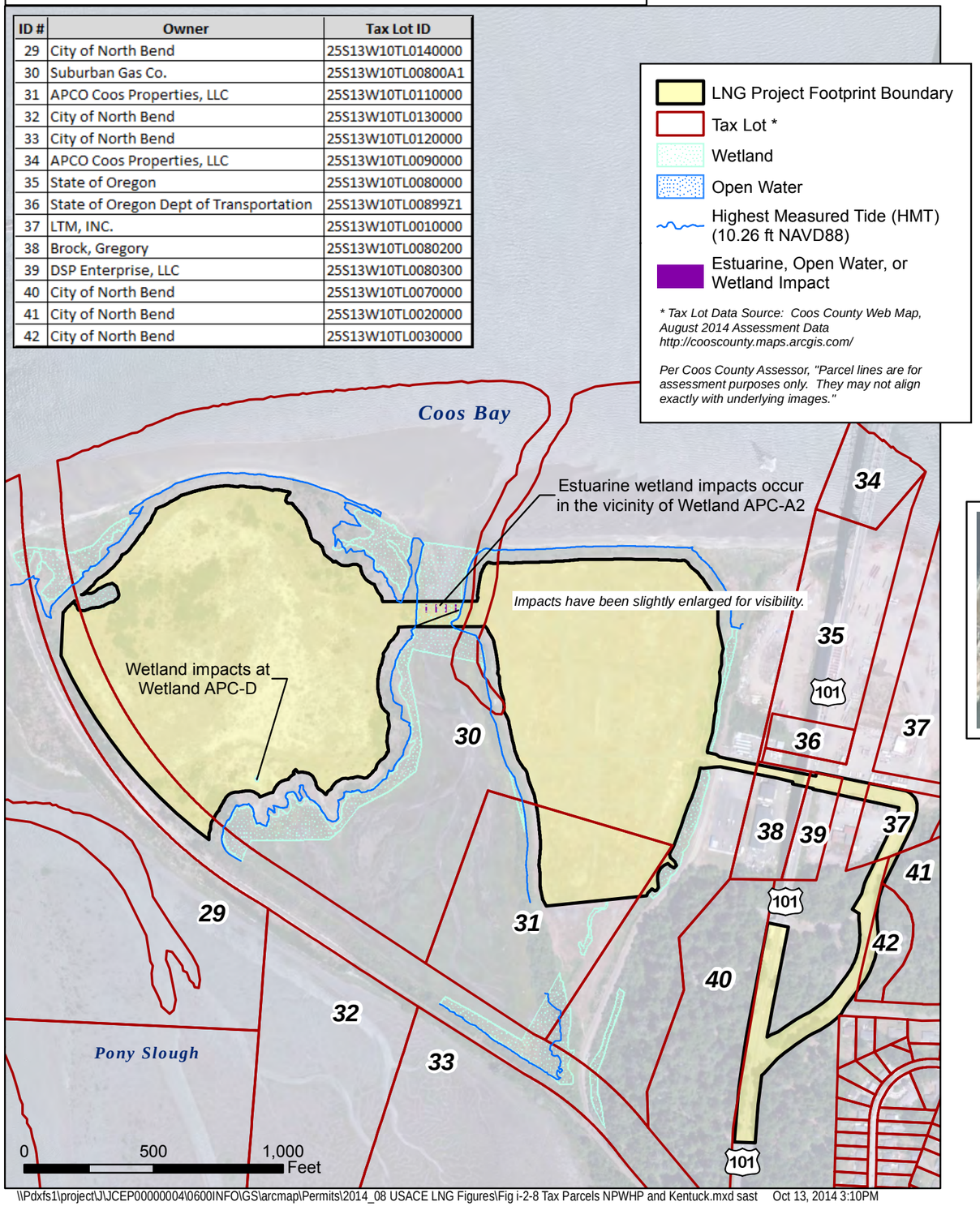
Tax Lots	FIGURE NO.	SHEET NO.
	i-2	7

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-7 Tax Parcels JCEP.mxd sast Oct 13, 2014 3:35PM

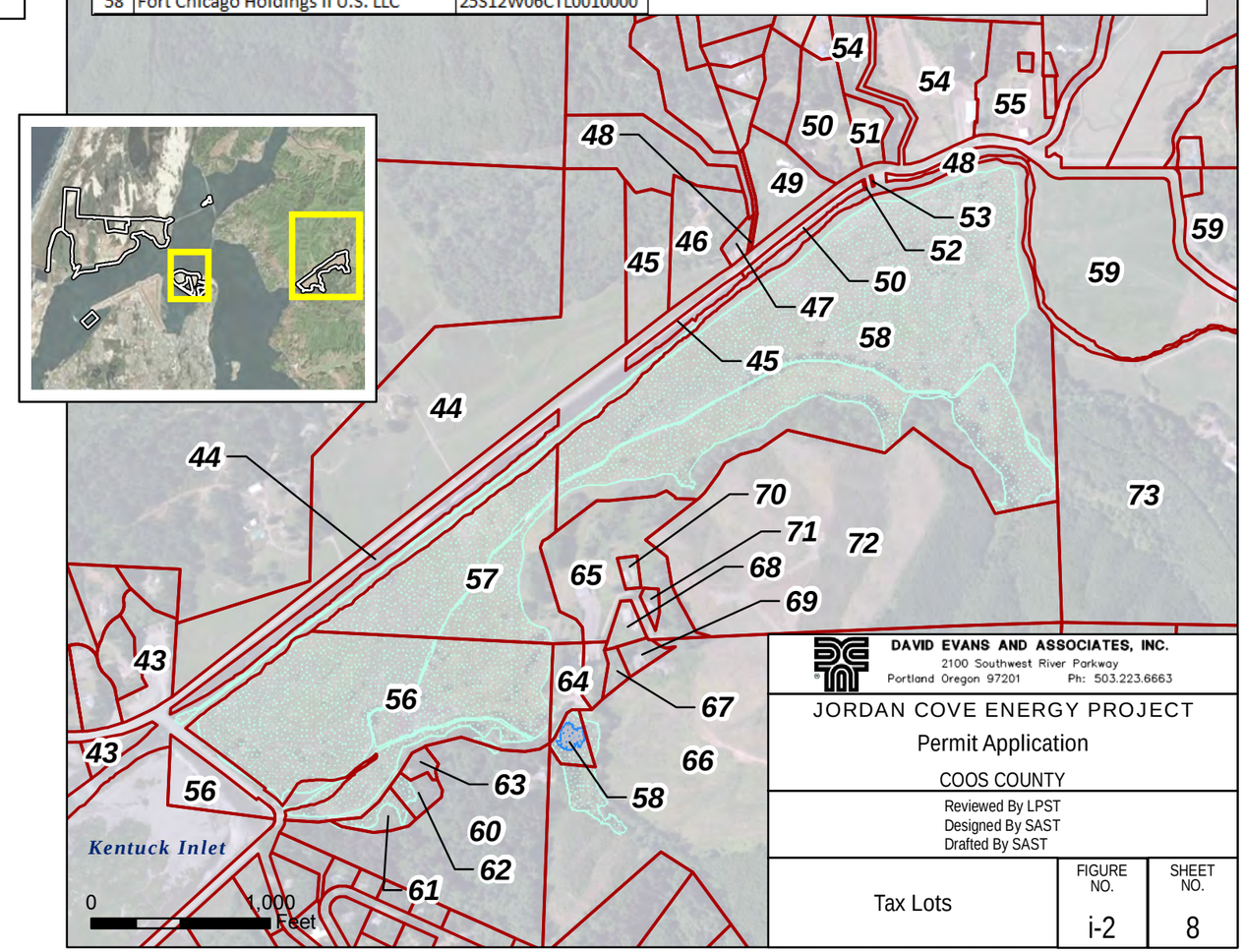
North Point Workforce Housing Project and Access

ID #	Owner	Tax Lot ID
29	City of North Bend	25S13W10TL0140000
30	Suburban Gas Co.	25S13W10TL00800A1
31	APCO Coos Properties, LLC	25S13W10TL0110000
32	City of North Bend	25S13W10TL0130000
33	City of North Bend	25S13W10TL0120000
34	APCO Coos Properties, LLC	25S13W10TL0090000
35	State of Oregon	25S13W10TL0080000
36	State of Oregon Dept of Transportation	25S13W10TL00899Z1
37	LTM, INC.	25S13W10TL0010000
38	Brock, Gregory	25S13W10TL0080200
39	DSP Enterprise, LLC	25S13W10TL0080300
40	City of North Bend	25S13W10TL0070000
41	City of North Bend	25S13W10TL0020000
42	City of North Bend	25S13W10TL0030000



Kentuck Mitigation Site

ID #	Owner	Tax Lot ID	ID #	Owner	Tax Lot ID
43	Gould, Brian D. & Gould, Molly M.	25S13W12ATL0060000	59	Edwards, Lorryann; L/E	25S12W06DTL0040000
44	Gary E. Smith Trust	25S13W01DTL0010000	60	Gertrude E. Wickett Trust; etal	25S13W12ATL0020000
45	Walters, Joshua R.	25S12W06CTL0050000	61	Kerwin, Charles C.	25S13W12ATL0050000
46	Walters, Joshua R.	25S12W06CTL0050200	62	Kerwin, Charles C.	25S13W12ATL0040000
47	Samuel, Stephan R.	25S12W06CTL0040000	63	Webb, Dean A. & Deborah C.	25S13W12ATL0030000
48	Haga, Richard R.	25S12W06BTL0360000	64	Fort Chicago Holdings II U.S. LLC	25S12W07TL0079900
49	Heaton, Byron T. & Tamara J.	25S12W06BTL0300000	65	Gertrude E. Wickett Trust; etal	25S12W07TL0070000
50	Rose, Michael E.; et al	25S12W06BTL0220000	66	Lone Rock Timber Investments I, LLC	25S12W07TL0050000
51	Rose, Michael E.; et al	25S12W06BTL0210000	67	Gertrude E. Wickett Trust	25S12W07TL0050100
52	Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians	25S12W06BTL0320000	68	Gertrude E. Wickett Trust	25S12W06CTL0090000
53	Coos County	25S12W06BTL0340000	69	Don & Rose Freeman Trust	25S12W07TL0060000
54	Davis, Brett L. & Sally	25S12W06BTL0190000	70	Wallace & Gertrude Wickett TST; etal	25S12W06CTL0070000
55	Colton, Mary K.	25S12W06BTL0200000	71	Culp, Joanne; etal	25S12W06CTL0080000
56	Fort Chicago Holdings II U.S. LLC	25S13W12ATL0010000	72	Lone Rock Timber Investments I, LLC	25S12W06CTL0060100
57	Fort Chicago Holdings II U.S. LLC	25S13W01DTL0040000	73	Lone Rock Timber Investments I, LLC	25S12W06DTL0050000
58	Fort Chicago Holdings II U.S. LLC	25S12W06CTL0010000			



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Drafted By SAST

Tax Lots

FIGURE NO. i-2

SHEET NO. 8

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-8 Tax Parcels NPWHP and Kentuck.mxd sast Oct 13, 2014 3:10PM

Trans Pacific Parkway

Ingram Yard/
Liquefaction Site

Mill Site/
South Dunes Site

Jordan Cove

Jordan Cove Rd

Coos Bay

LNG Project Footprint Boundary

Temporary Facilities

Stock Pile Area

Laydown Area

Other

Hydraulic Dredge Material Pipeline Route

Excavated Material Truck Haul Road

Heavy Equipment Truck Haul Road

N

0 0.1 0.2 Miles

SW Oregon
Regional Airport

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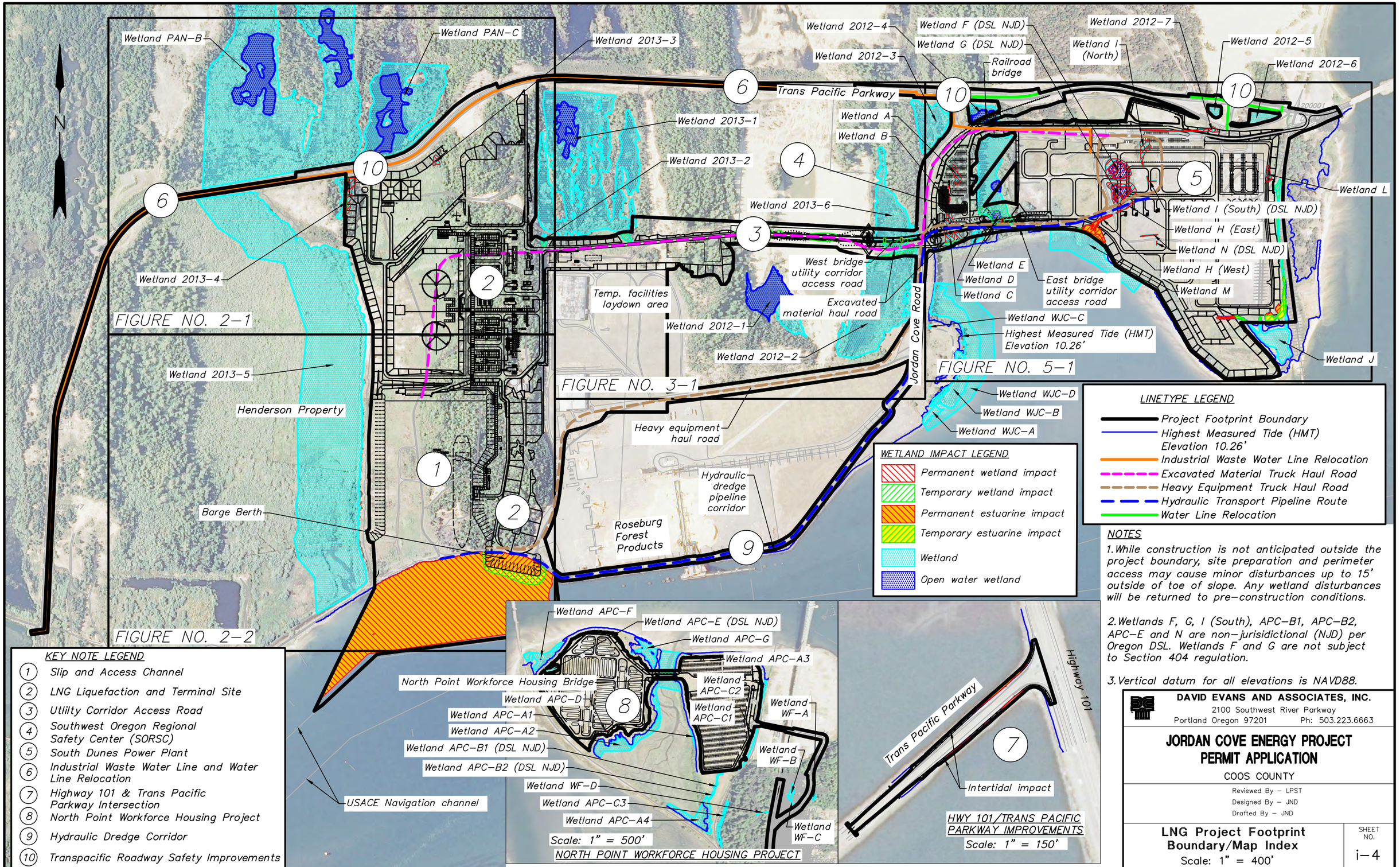
Temporary Facilities

SHEET NO.
i-3

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-3 Temporary Facilities.mxd sast Oct 08, 2014 10:48AM



NOTES

1. While construction is not anticipated outside the project boundary, site preparation and perimeter access may cause minor disturbances up to 15' outside of toe of slope. Any wetland disturbances will be returned to pre-construction conditions.

2. Wetlands F, G, I (South), APC-B1, APC-B2, APC-E and N are non-jurisidictional (NJD) per Oregon DSL. Wetlands F and G are not subject to Section 404 regulation.

3. Vertical datum for all elevations is NAVD88.

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT PERMIT APPLICATION

COOS COUNTY

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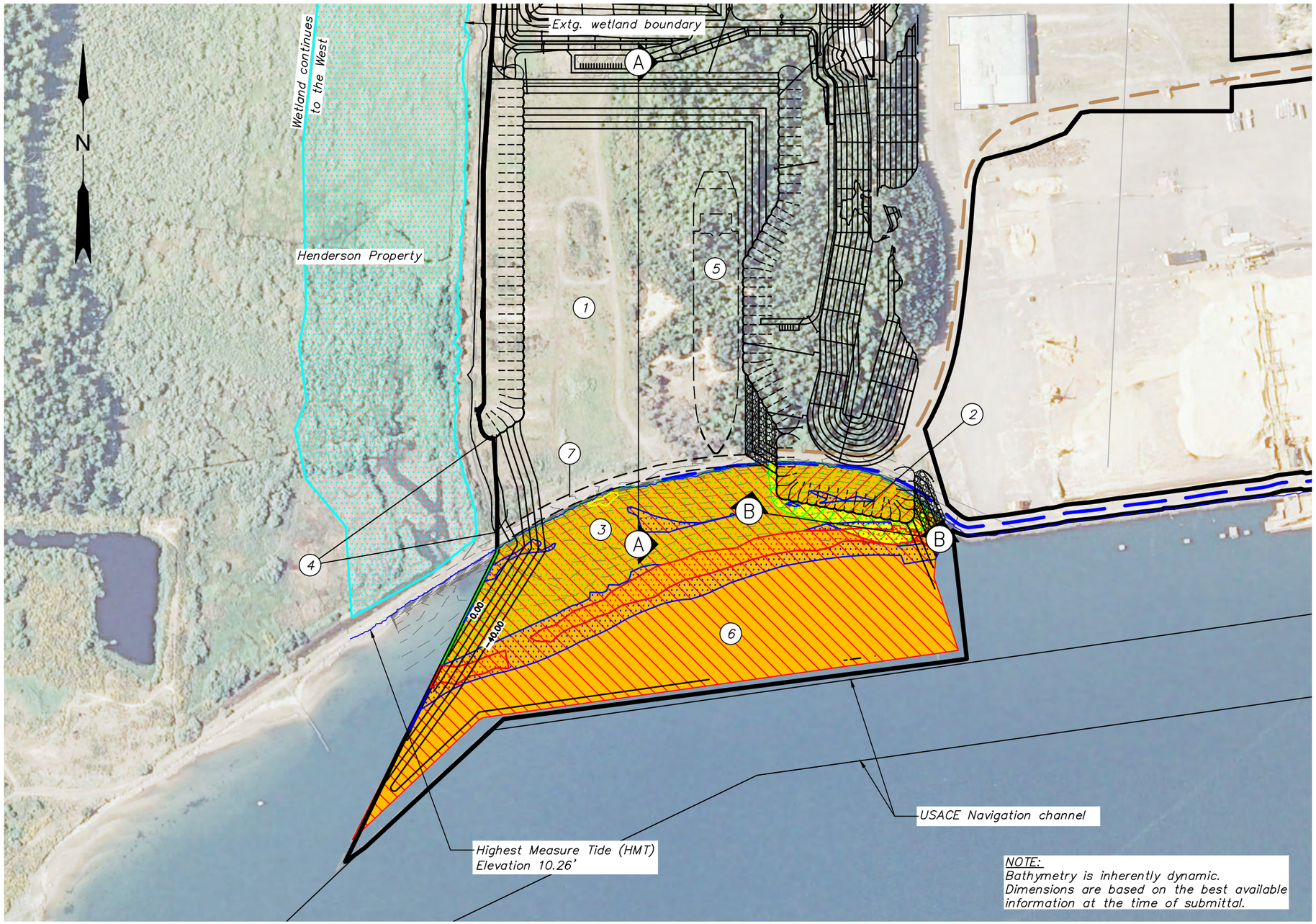
Designed By – JND
Drafted By – JND

LNG Project Footprint Boundary/Map Index
Scale: 1" = 400'

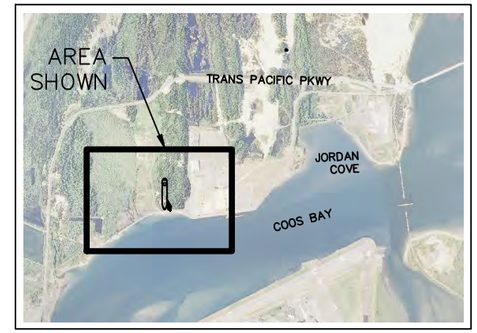
SHEET NO. i-4



1 / 1-1 SLIP AND ACCESS CHANNEL PROJECT FOOTPRINT

SCALE: 1"=400'

0 200 400 800



2 / 1-1 KEY MAP

SCALE: 1"=5000'

LEGEND

1. Slip
2. Barge berth
3. Access channel
4. Sheet pile wall
5. LNG vessel
6. Deep sub-tidal excavation (below -15ft)
7. Temporary insitu berm (approx. 40ft wide)

- Project Footprint Boundary
- Proposed contour
- Heavy Equipment Truck Haul Road
- Hydraulic Transport Pipeline Route
- Inter-tidal area
- Shallow sub-tidal area
- Salt marsh habitat area
- Eel-grass habitat area
- Wetland

RESOURCE IMPACT LEGEND

- Permanent estuarine impact
- Temporary estuarine impact

NOTE: Vertical datum for all elevations is NAVD88.

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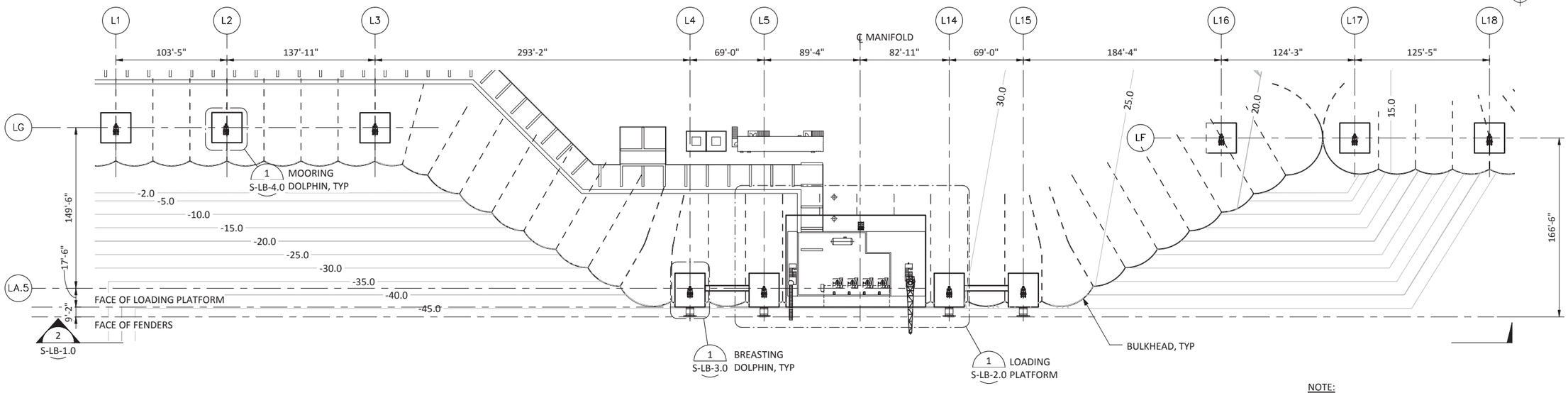
Slip and Access Channel Footprint Boundary

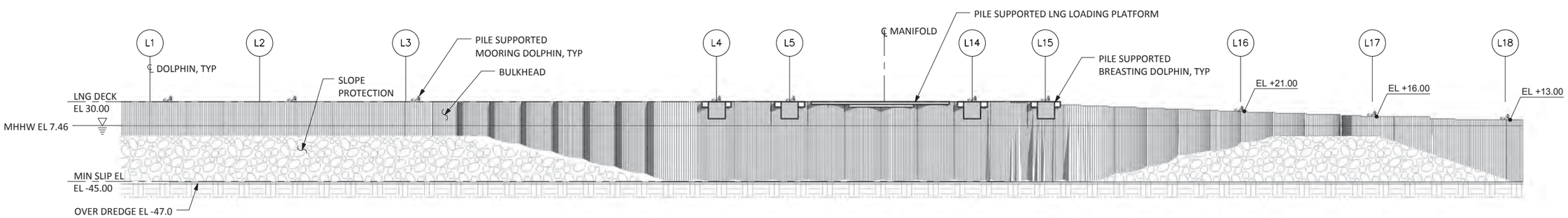
SHEET NO. 1–1



NOTE:
LNG EQUIPMENT SHOWN PER LAYOUT
PROVIDED BY B&U ON 4 JUNE 2014

1 G-3.0 PLAN - LNG BERTH LAYOUT

SCALE: 1" = 50'-0"



NOTES:
MOORING AND BREASTING DOLPHIN LAYOUT
DIMENSIONS SHOWN WILL BE ADJUSTED AS
REQUIRED TO MATCH BULKHEAD CONFIGURATION

Cross Section A-A;
See Sheet 1-1

2 S-LB-1.0 ELEVATION - LNG BERTH

SCALE: 1" = 50'-0"

50' 0 50' 100'
SCALE: 1" = 50'-0"

Sheet 1-2

PDA - DRAFT

BergerABAM
33301 9th Avenue South, Suite 300
Federal Way, Washington 98003-2600
(206) 431-2300 Fax: (206) 431-2250

NO.	DATE	REVISION AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP

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BLACK & VEATCH CORPORATION

ENGINEER	DRAWN
EAS	JDM
CHECKED	DATE
REH	08/14/2014

JORDAN COVE ENERGY PROJECT L.P.
COOS BAY, OREGON

LNG BERTH LAYOUT

PROJECT	DRAWING NUMBER	REV
A13.0245	– 0000 – 7	
CODE		
AREA	S-LB-1.0	

8/14/2014 2:31:02 PM C:\Users\jason.mendenhall\Documents_Revit_Projects\A13.0245 Jordan Cove LNG Terminal_Central_jason.mendenhall.x2380.rvt

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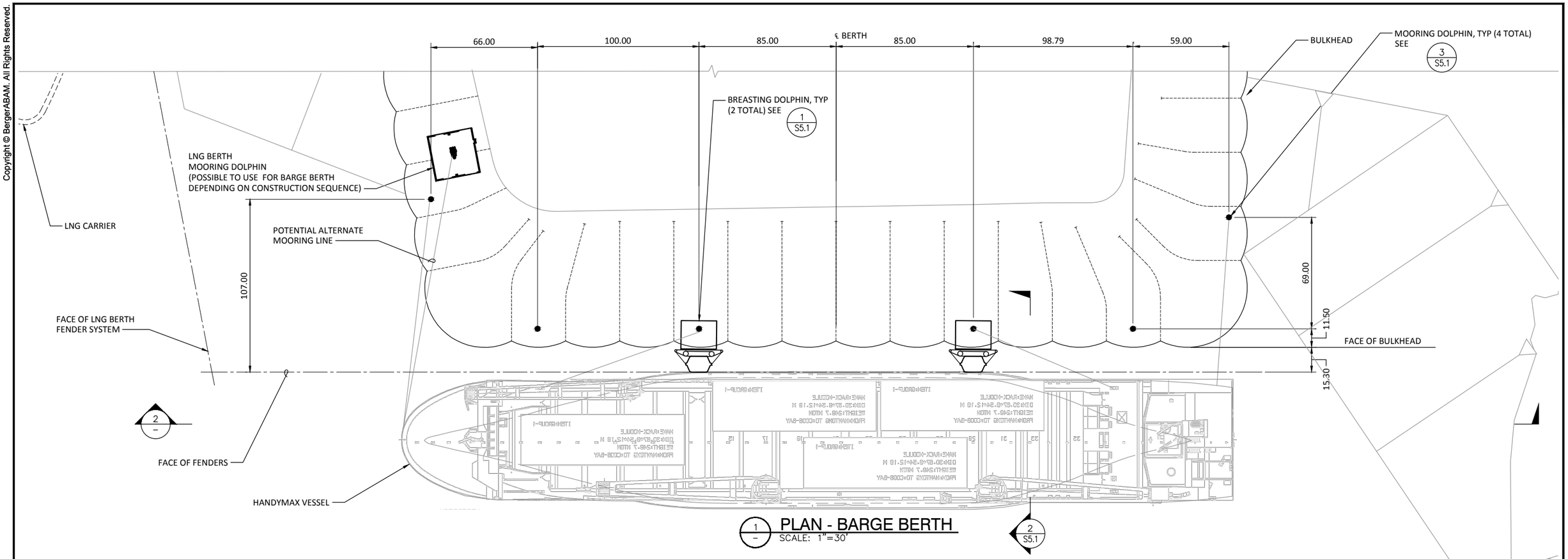
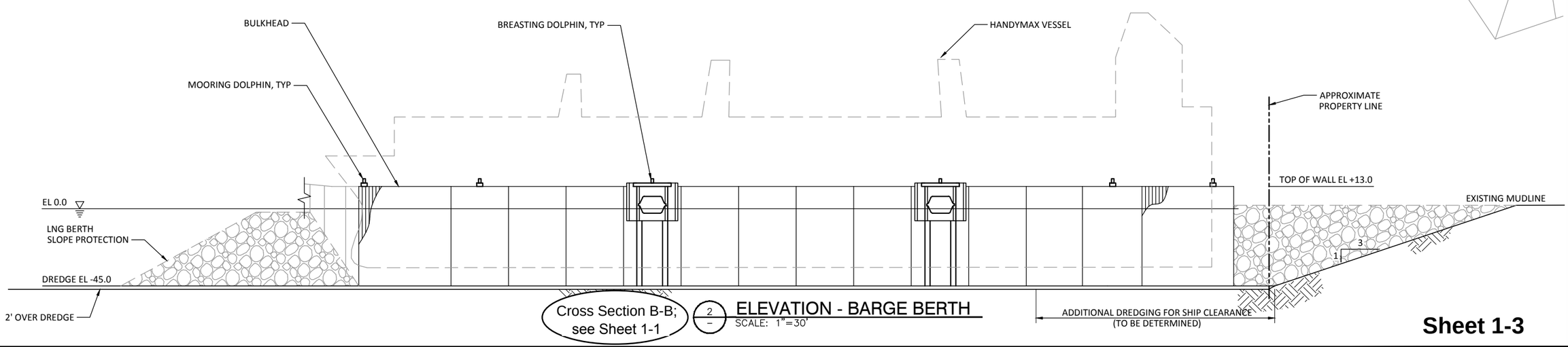


1/– PLAN - BARGE BERTH
SCALE: 1"=30'



2/– ELEVATION - BARGE BERTH
SCALE: 1"=30'

Sheet 1-3

MARK	REVISION DESCRIPTION	BY	APP.	DATE

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33301 9th Avenue South, Suite 300
Federal Way, Washington 98003-2600
(206) 431-2300 Fax: (206) 431-2250

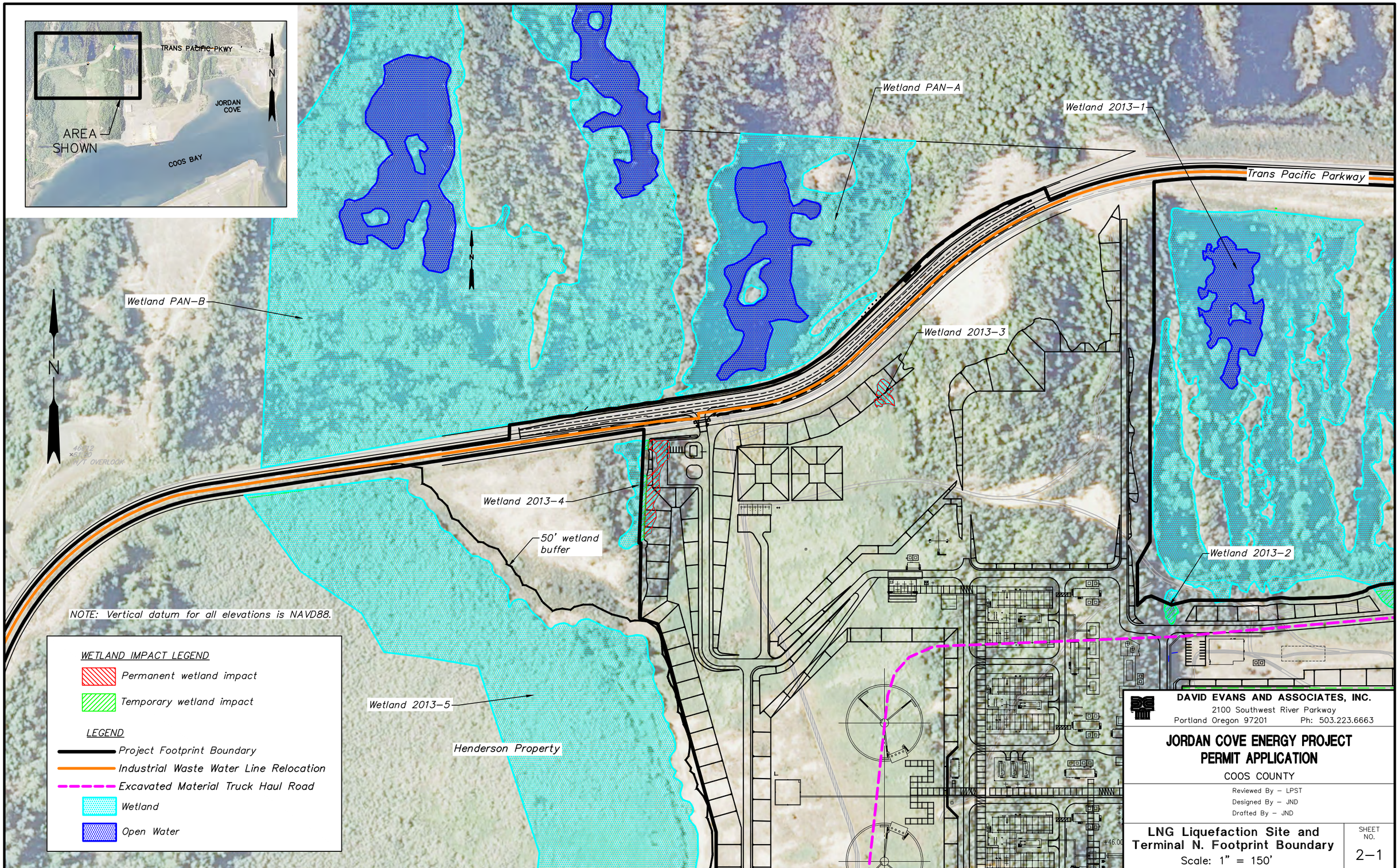
DRAWN BY MDB
DESIGN BY EAS
CHECK BY FLY
PROJ MGR EWO

JORDAN COVE ENERGY PROJECT L.P.
JORDAN COVE LNG TERMINAL COOS BAY, OREGON
APPENDIX A PRE PDA PHASE DRAWINGS

CONCEPTUAL BARGE BERTH SITE PLAN

DRAWING NO. **S5.0**
PROJECT NO. A13.0245
DATE: 12/13/13
SHEET NO. 1 OF 2

Last Saved by: Evan.sheesley on: Dec 16, 2013 8:49 AM File: Q:\FederalWay\2013\A13.0245\CADD\Design\EAS\BARGE BERTHS5-0.dwg



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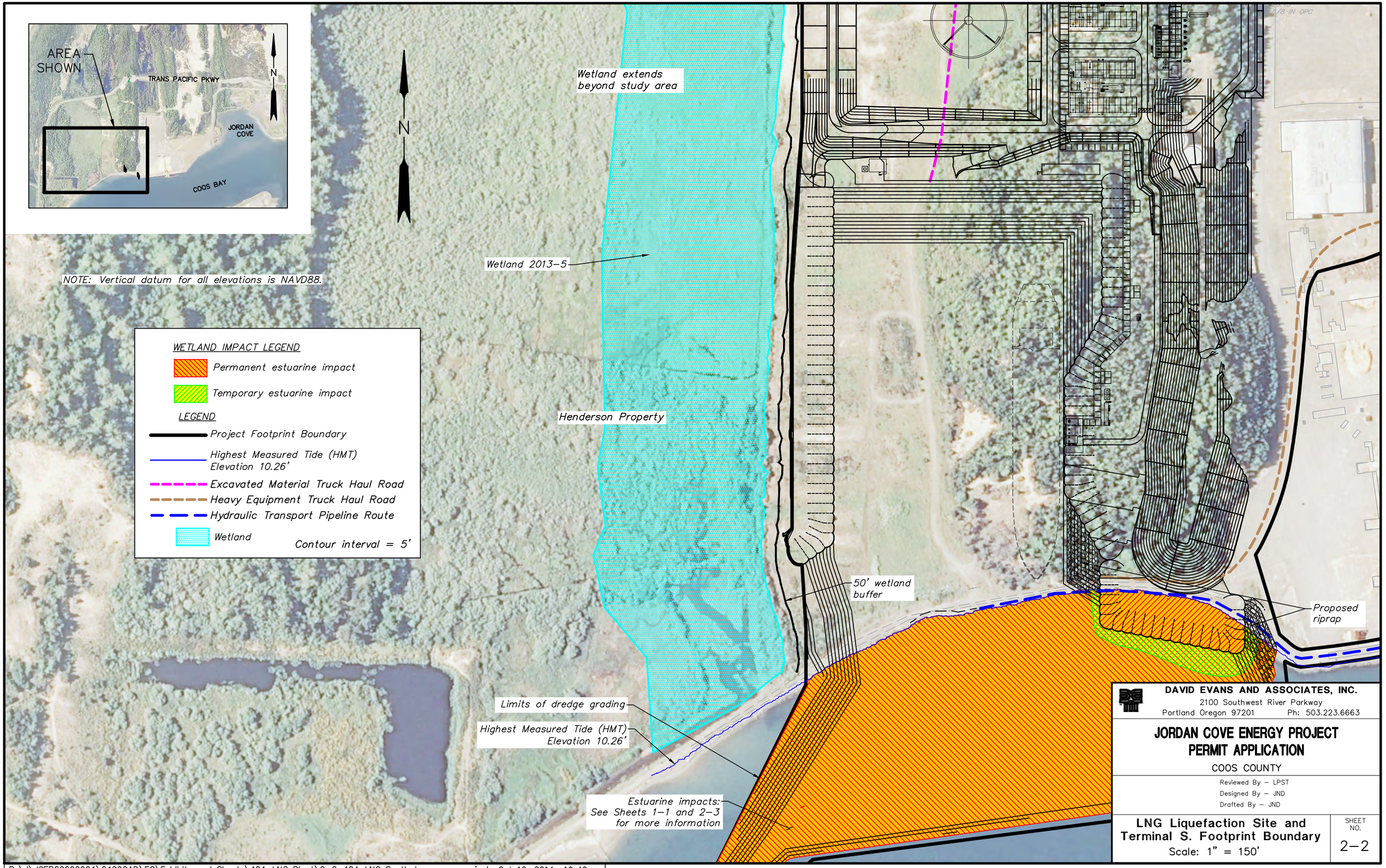
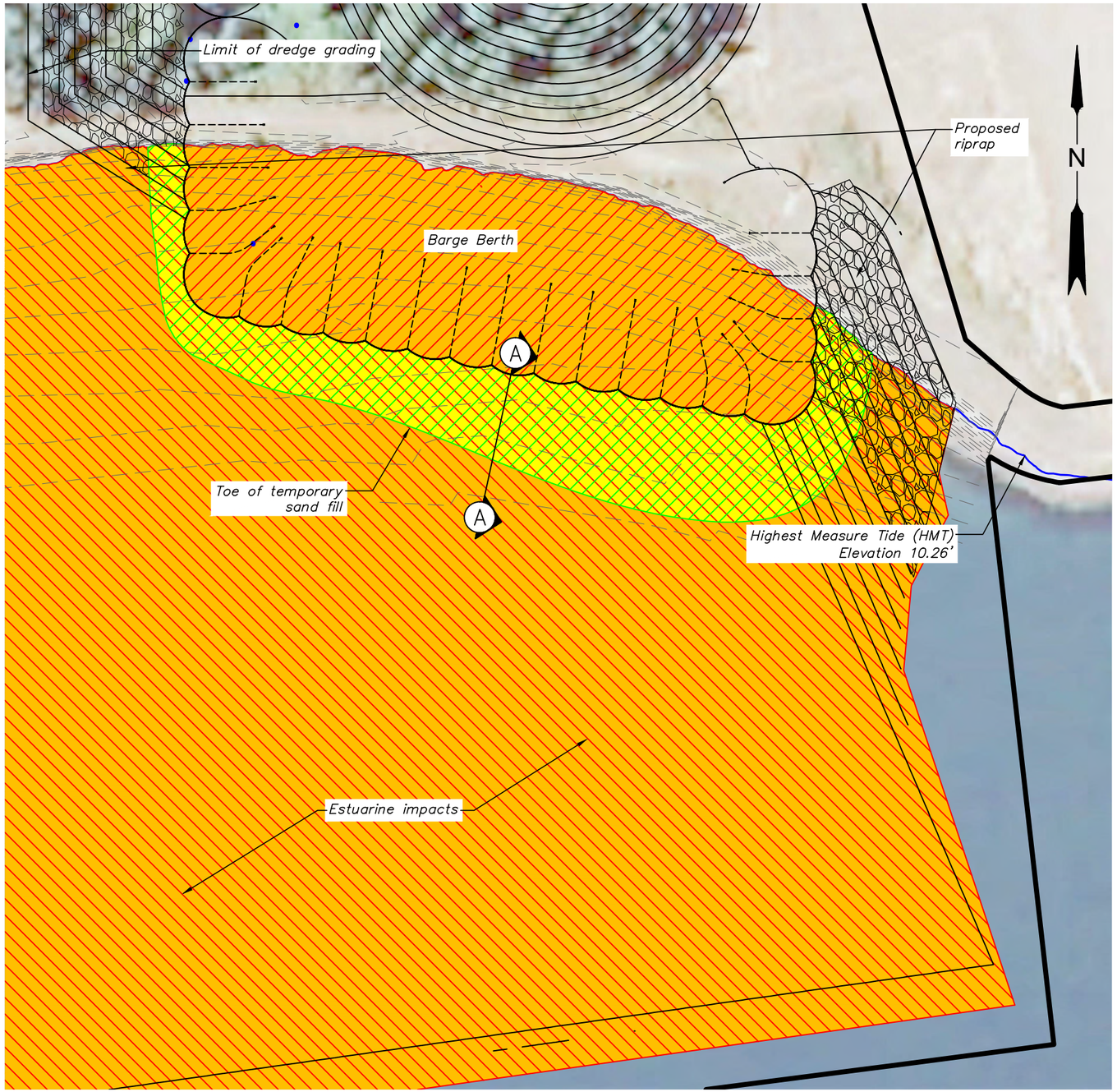
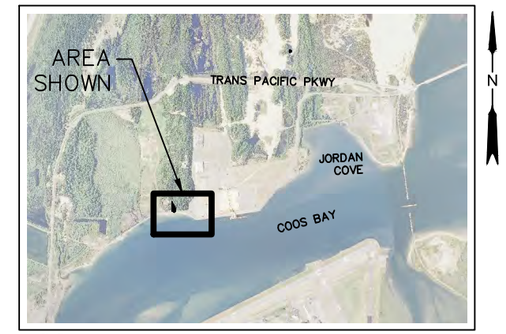

AREA SHOWN
TRANS PACIFIC PKWY
JORDAN COVE
COOS BAY
N
Wetland extends beyond study area
Wetland 2013-5
NOTE: Vertical datum for all elevations is NAVD88.
WETLAND IMPACT LEGEND
Permanent estuarine impact
Temporary estuarine impact
LEGEND
Project Footprint Boundary
Highest Measured Tide (HMT) Elevation 10.26'
Excavated Material Truck Haul Road
Heavy Equipment Truck Haul Road
Hydraulic Transport Pipeline Route
Wetland
Contour interval = 5'
Henderson Property
50' wetland buffer
Proposed riprap
Limits of dredge grading
Highest Measured Tide (HMT) Elevation 10.26'
Estuarine impacts: See Sheets 1-1 and 2-3 for more information
DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663
JORDAN COVE ENERGY PROJECT
PERMIT APPLICATION
COOS COUNTY
Reviewed By - LPST
Designed By - JND
Drafted By - JND
LNG Liquefaction Site and Terminal S. Footprint Boundary
Scale: 1" = 150'
SHEET NO.
2-2
P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\404-LNG Plant\2-2_404_LNG South.dwg jnd Oct 16, 2014 10:49am

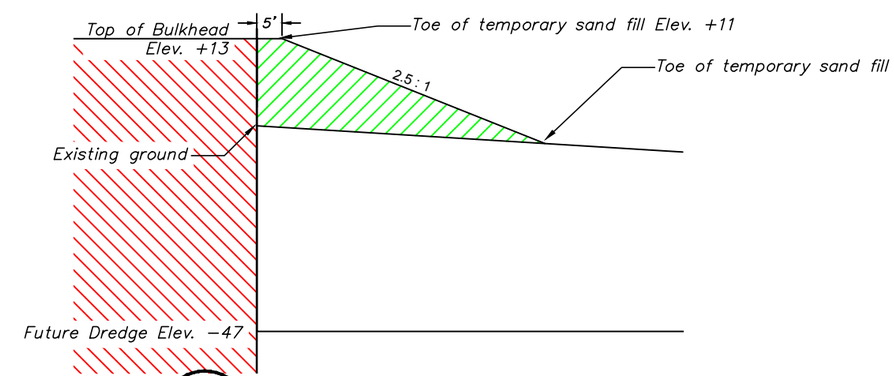


1 / 2-3 **BARGE BERTH TEMPORARY SAND FILL SLOPE**
SCALE: 1"=100'

0 50 100 200



2 / 2-3 **KEY MAP**
SCALE: 1"=5000'



3 / 2-3 **SECTION A-A**
SCALE:NTS

NOTE: Vertical datum for all elevations is NAVD88.

IMPACT LEGEND

- Permanent estuarine impact area
- Temporary estuarine impact area
- Heavy Equipment Truck Haul Road
- Hydraulic Transport Pipeline Route
- Highest Measured Tide (HMT) Elevation 10.26'

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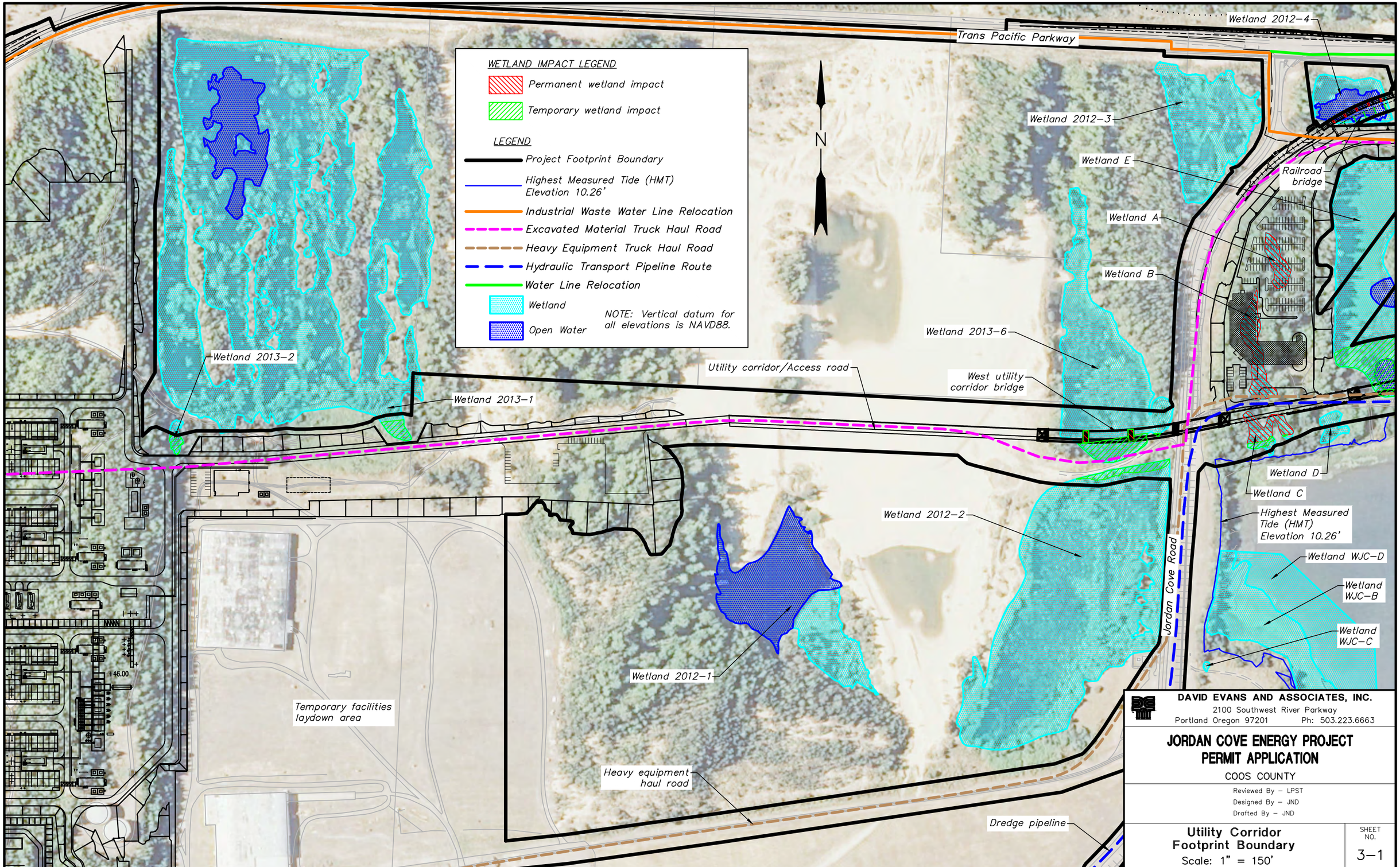
Barge Berth Temporary Sand Fill Slope

SHEET NO. 2–3



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JORDAN COVE ENERGY PROJECT
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Utility Corridor Footprint Boundary
Scale: 1" = 150'

SHEET NO. 3–1

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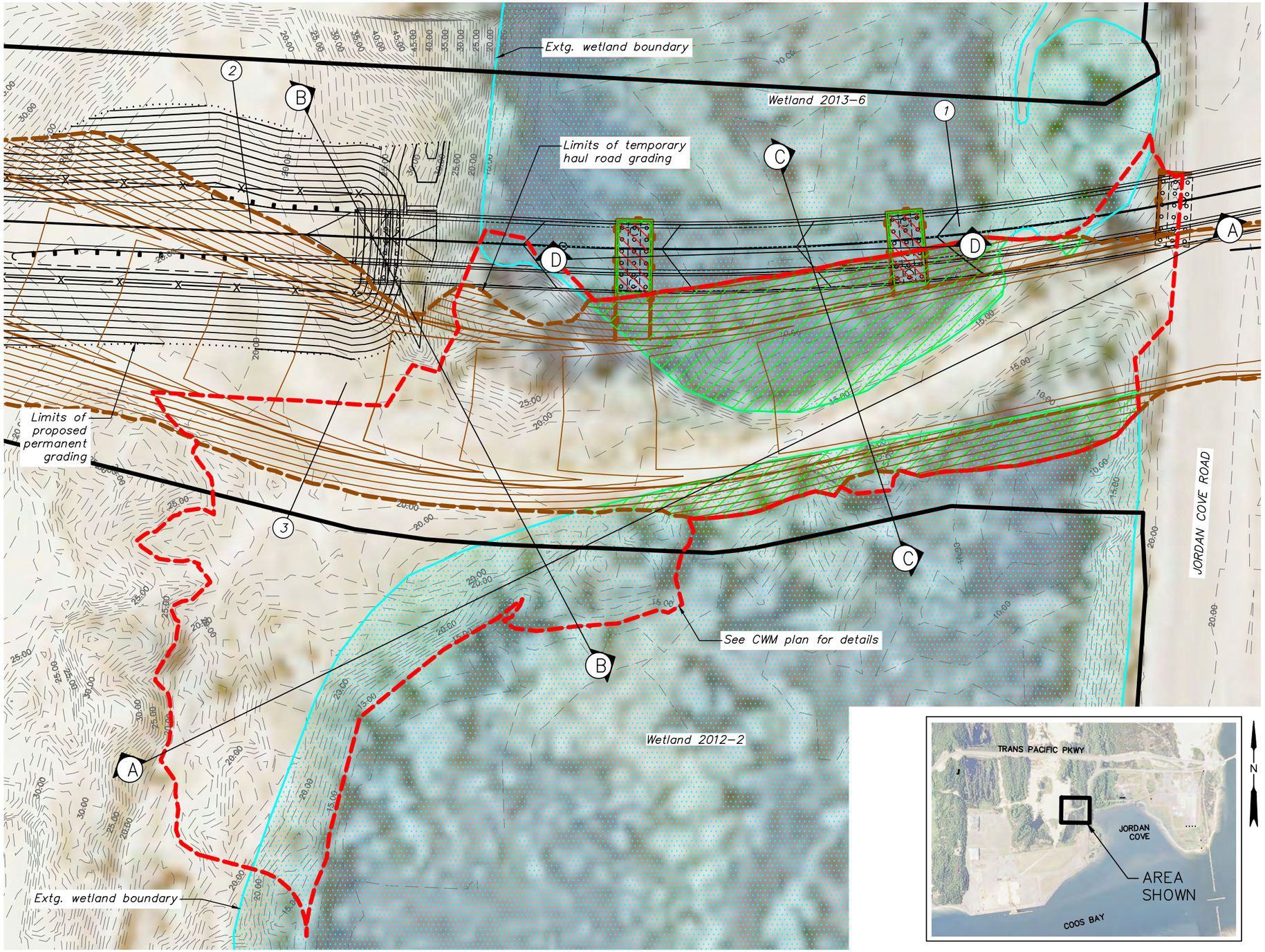

1 / 3-2A UTILITY CORRIDOR (WEST) PROJECT FOOTPRINT

SCALE: 1"=60'

2 / 3-2A KEY MAP

SCALE: 1"=3000'

LEGEND

- (1) Utility Corridor Bridge
- (2) Utility Corridor and Access Road
- (3) Temporary excavated material haul road
- Project Footprint Boundary
- Existing contour (1' interval)
- Proposed contour (1' interval)
- Temporary contour (2' interval)
- Edge of temporary haul road
- Edge of temporary haul road grading
- Coffer dam (temporary)
- CWM grading limits. See CWM plan for details
- Wetland

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

0 30 60 120

NOTE: Vertical datum for all elevations is NAVD88.

DAVID EVANS AND ASSOCIATES, INC.
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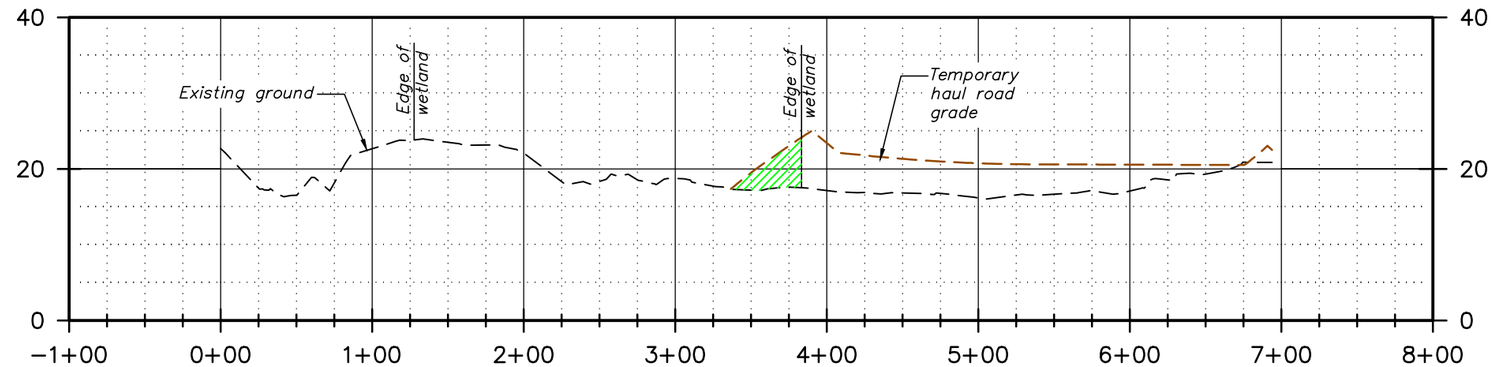
JORDAN COVE ENERGY PROJECT
PERMIT APPLICATION

COOS COUNTY

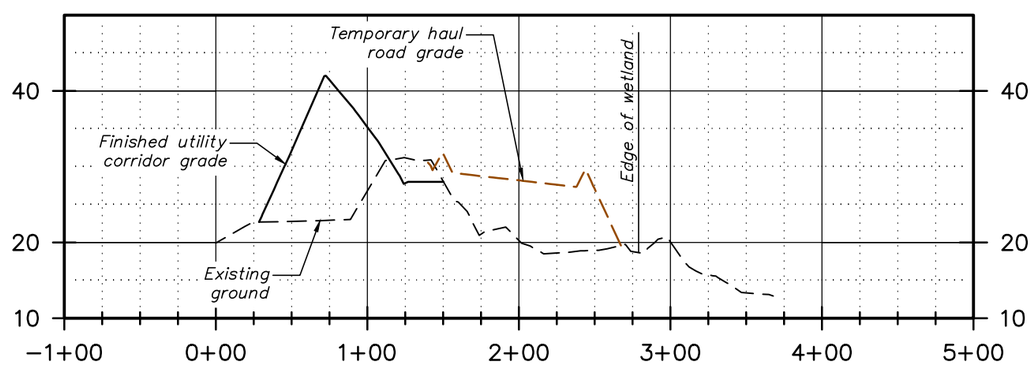
Reviewed By – LPST
Designed By – JND
Drafted By – JND

Utility Corridor (West) Footprint Boundary

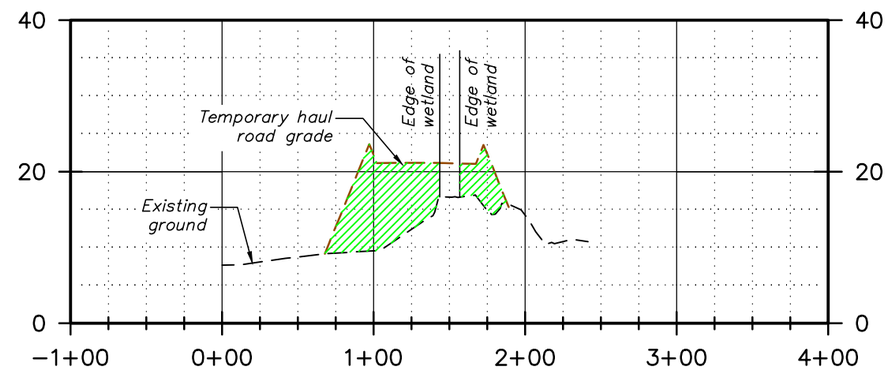
SHEET NO. 3–2A



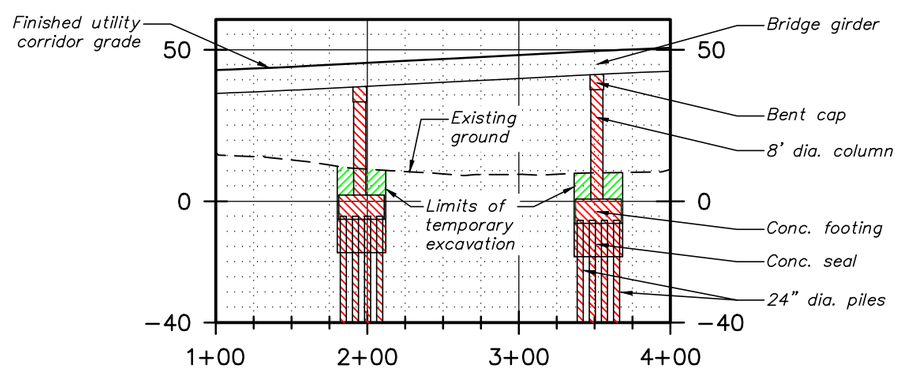
1 / 3-2B SECTION A-A
SCALE: H:1"=100' V:1"=20'



2 / 3-2B SECTION B-B
SCALE: H:1"=100' V:1"=20'



3 / 3-2B SECTION C-C
SCALE: H:1"=100' V:1"=20'



4 / 3-2B SECTION D-D
SCALE: H:1"=100' V:1"=50'

NOTE: Vertical datum for all elevations is NAVD88.

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

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JORDAN COVE ENERGY PROJECT
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Utility Corridor (West)
Cross Sections

SHEET NO. 3–2B

1 / 3-3A UTILITY CORRIDOR (EAST) PROJECT FOOTPRINT

SCALE: 1"=100'

2 / 3-3A KEY MAP

SCALE: 1"=3000'

LEGEND

- (1) Utility Corridor Bridges
- (2) Utility Corridor and Access Road
- (3) Temporary excavated material haul road
- (4) Sheet pile retaining wall
- (5) Southern Oregon Regional Safety Center (SORSC)
- Project Footprint Boundary
- Existing contour (1' interval)
- Proposed contour (1' interval)
- Temporary contour (2' interval)
- Coffer dam (temporary)
- Edge of temporary haul road grading
- Edge of temporary haul road
- Highest Measured Tide (HMT) Elevation 10.26'
- Wetland
- Open water

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

0 50 100 150

NOTE: Vertical datum for all elevations is NAVD88.

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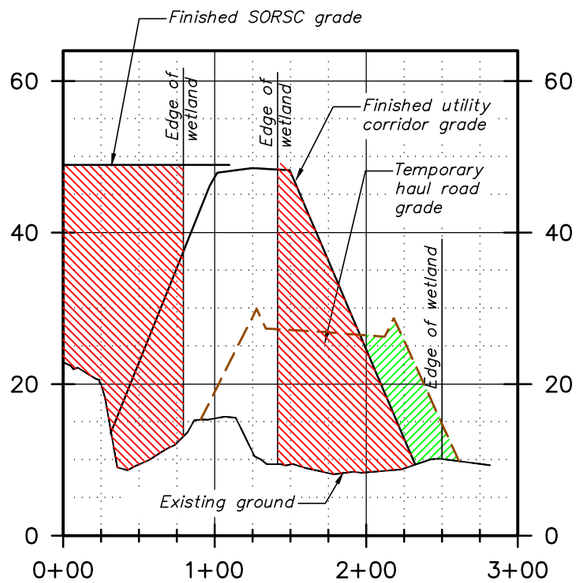
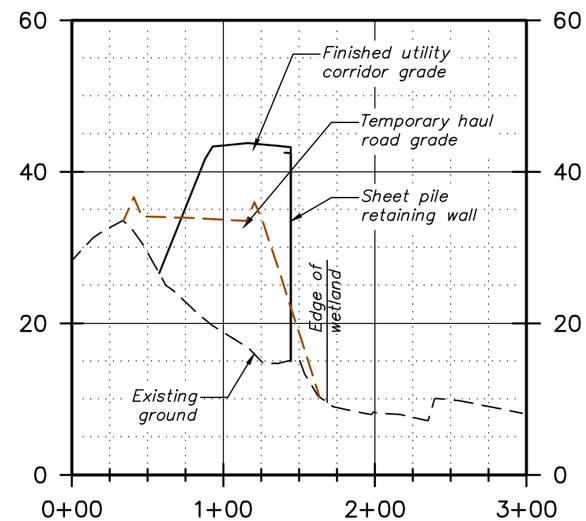
Utility Corridor (East) Footprint Boundary

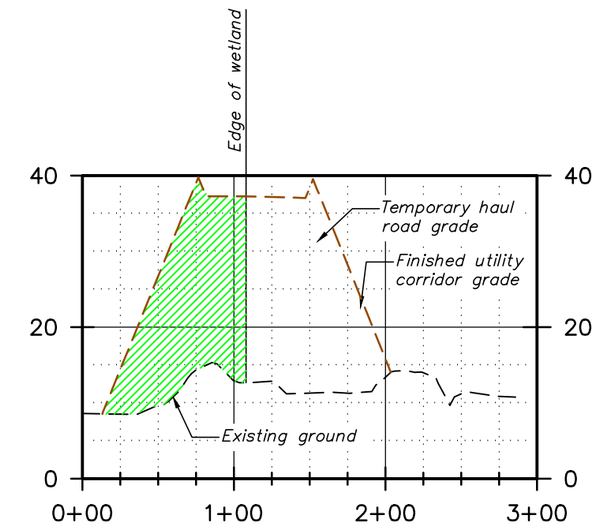
SHEET NO. 3–3A



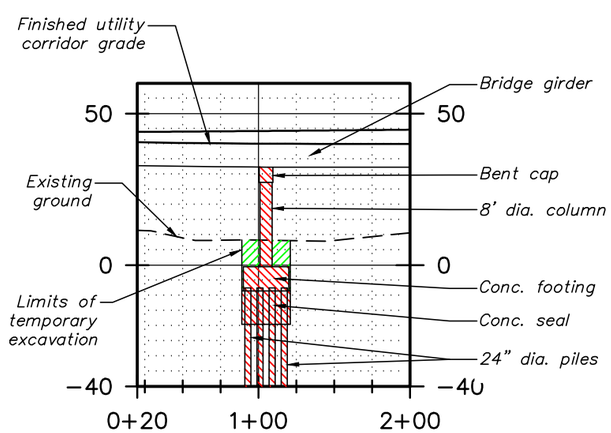
1 / 3-3B **SECTION A-A**
SCALE: H:1"=100' V:1"20'



2 / 3-3B **SECTION B-B**
SCALE: H:1"=100' V:1"20'



3 / 3-3B **SECTION C-C**
SCALE: H:1"=100' V:1"20'



4 / 3-3B **SECTION D-D**
SCALE: H:1"=100' V:1"20'

NOTE: Vertical datum for all elevations is NAVD88.

WETLAND IMPACT LEGEND

Permanent wetland impact

Temporary wetland impact

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JORDAN COVE ENERGY PROJECT
PERMIT APPLICATION
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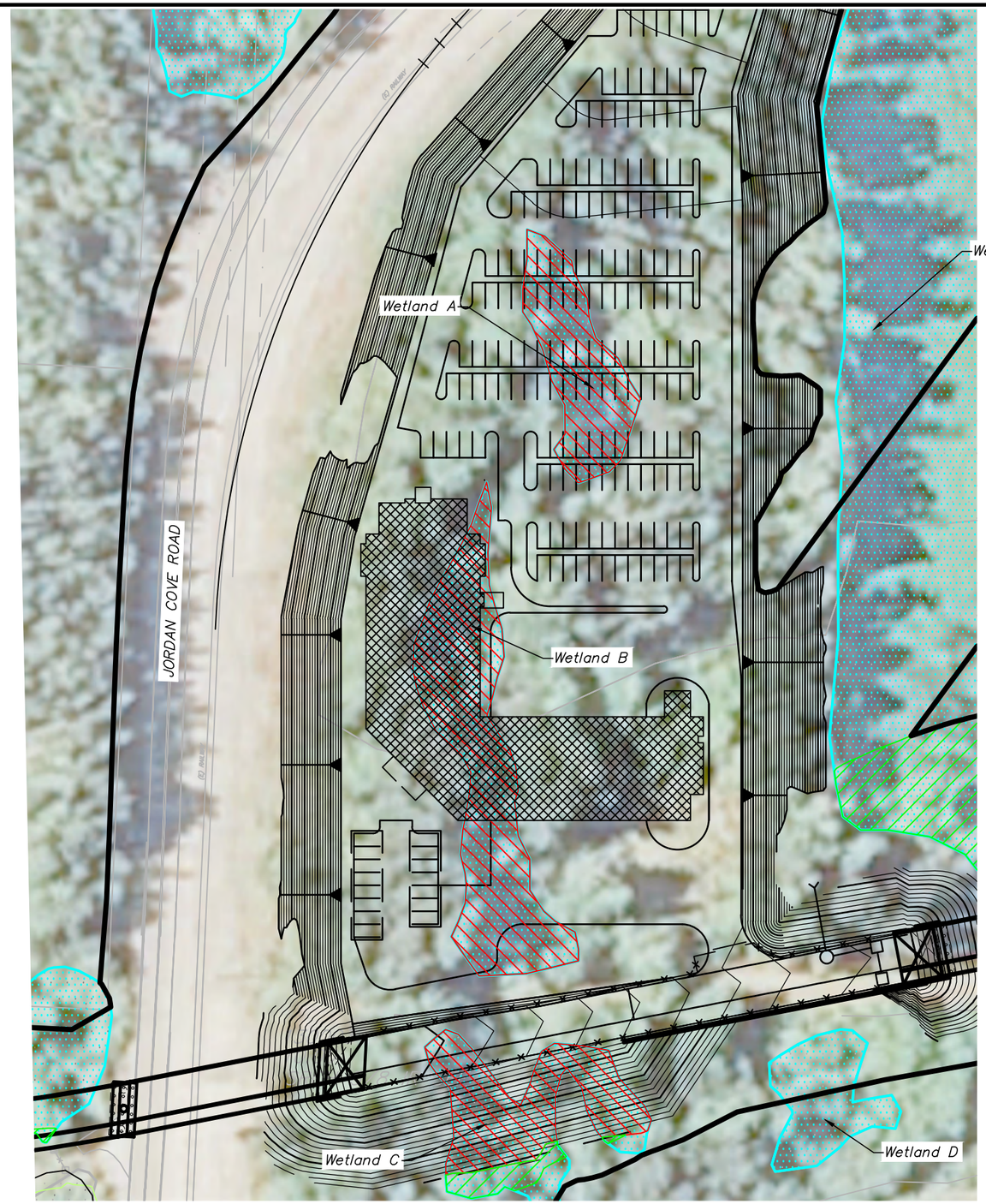
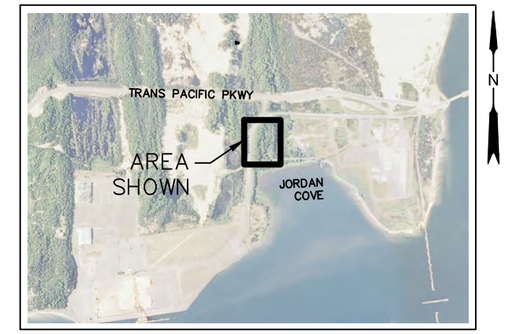
Utility Corridor (East)
Cross Sections

SHEET NO. 3–3B



1 / 4-1 SORSC PROJECT FOOTPRINT
SCALE: 1"=100'



2 / 4-1 KEY MAP
SCALE: 1"=3000'

LEGEND

- Project Footprint Boundary
- Wetland
- Proposed contour (1' interval)

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

0 50 100 200

NOTE: Vertical datum for all elevations is NAVD88.

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JORDAN COVE ENERGY PROJECT
PERMIT APPLICATION
COOS COUNTY

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Southwest Oregon Regional Safety Center

SHEET NO. 4–1

Trans Pacific Parkway

Wetland 2012–5

Wetland 2012–6

Wetland 2012–7

Existing Old Jordan Cove Road

Wetland E

Wetland A

Wetland B

Wetland I (North)

Wetland F (DSL NJD)

Wetland I (South) (DSL NJD)

Wetland G (DSL NJD)

Wetland L

Wetland H (East)

Wetland N (DSL NJD)

Wetland H (West)

Wetland D

East Utility Corridor Bridge

Highest Measured Tide (HMT) Elevation 10.26'

Wetland M

Wetland C

Proposed metering station

Jordan Cove Road

Wetland WJC–B

Wetland WJC–D

Wetland WJC–C

Wetland J

N

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact
- Permanent estuarine impact
- Temporary estuarine impact

LEGEND

- Project Footprint Boundary
- Highest Measured Tide (HMT) Elevation 10.26'
- Industrial Waste Water Line Relocation
- Excavated Material Truck Haul Road
- Heavy Equipment Truck Haul Road
- Hydraulic Transport Pipeline Route
- Water Line Relocation
- Wetland
- Open Water

NOTES

1. Wetlands F, G, I (South), and N are non–jurisidictional (NJD) per Oregon DSL. Wetlands F and G are not subject to Section 404 regulation.

2. Vertical datum for all elevations is NAVD88.

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JORDAN COVE ENERGY PROJECT PERMIT APPLICATION

COOS COUNTY

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South Dunes Power Plant Footprint Boundary

Scale: 1" = 150'

SHEET NO. 5–1

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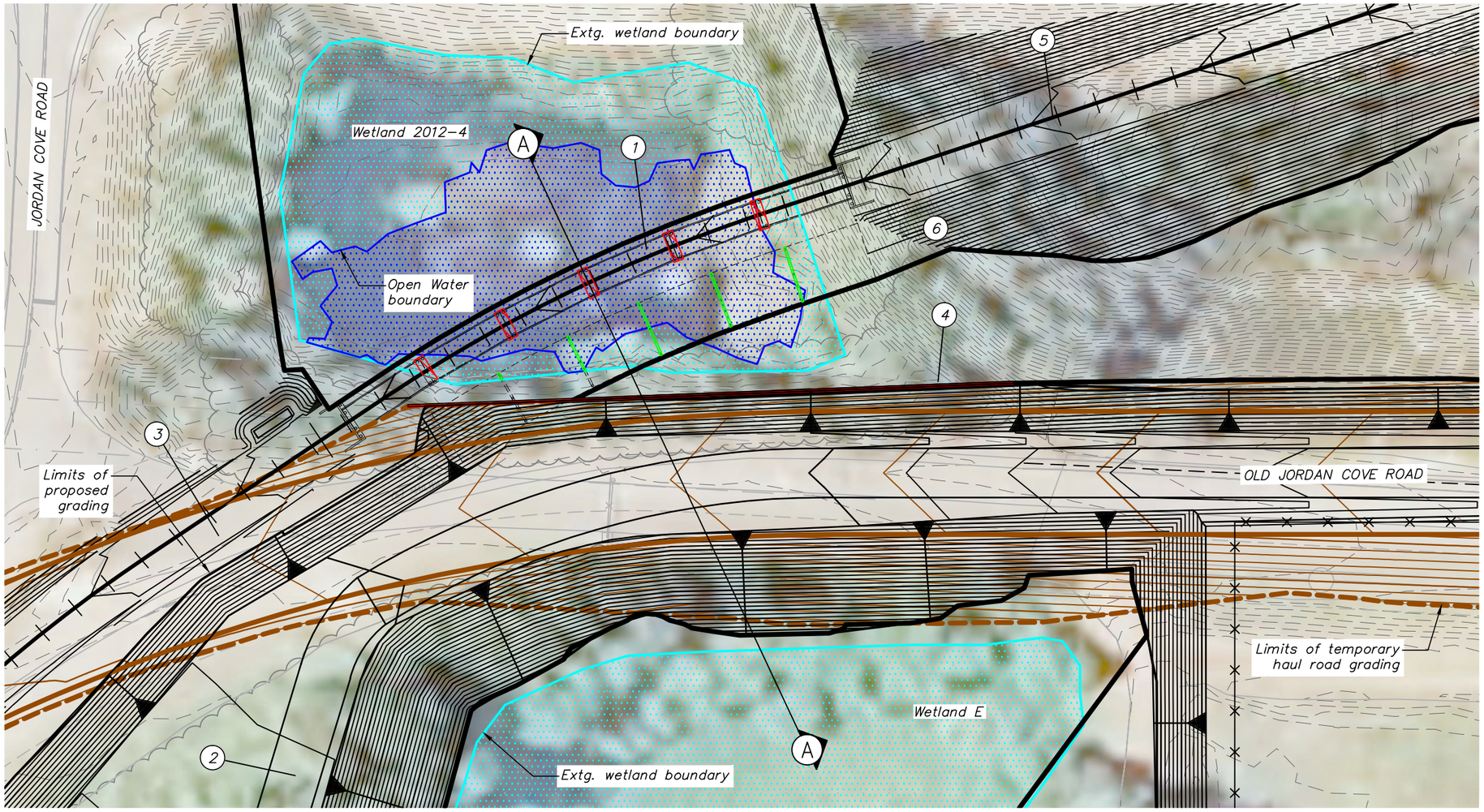


1 / 5-2 RAILROAD BRIDGE PROJECT FOOTPRINT

SCALE: 1"=60'

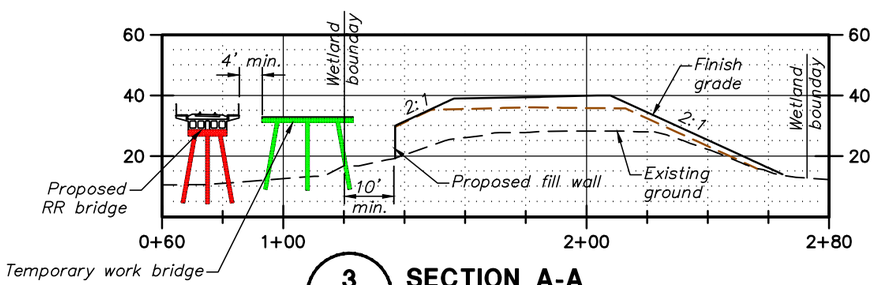
LEGEND

- (1) Railroad Bridge
- (2) SORSC Road
- (3) Temporary excavated material haul road
- (4) Retaining wall
- (5) Railroad realignment
- (6) Temporary work bridge
- Project Footprint Boundary
- Existing contour (1' interval)
- Proposed contour (1' interval)
- Temporary contour (2' interval)
- Edge of temporary haul road
- Edge of temporary haul road grading
- Wetland
- Open water

WETLAND IMPACT LEGEND

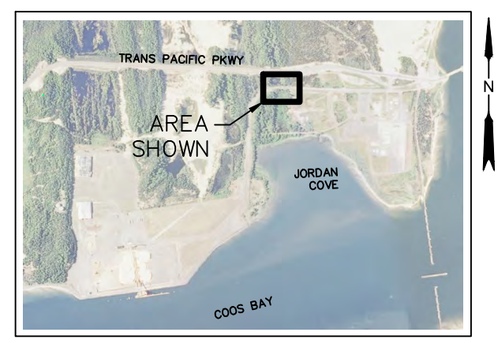
- Permanent wetland impact
- Temporary wetland impact

0 30 60 120



3 / 5-2 SECTION A-A

SCALE: 1"=50'



2 / 5-2 KEY MAP

SCALE: 1"=3000'

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Railroad Bridge Footprint Boundary

SHEET NO. 5–2

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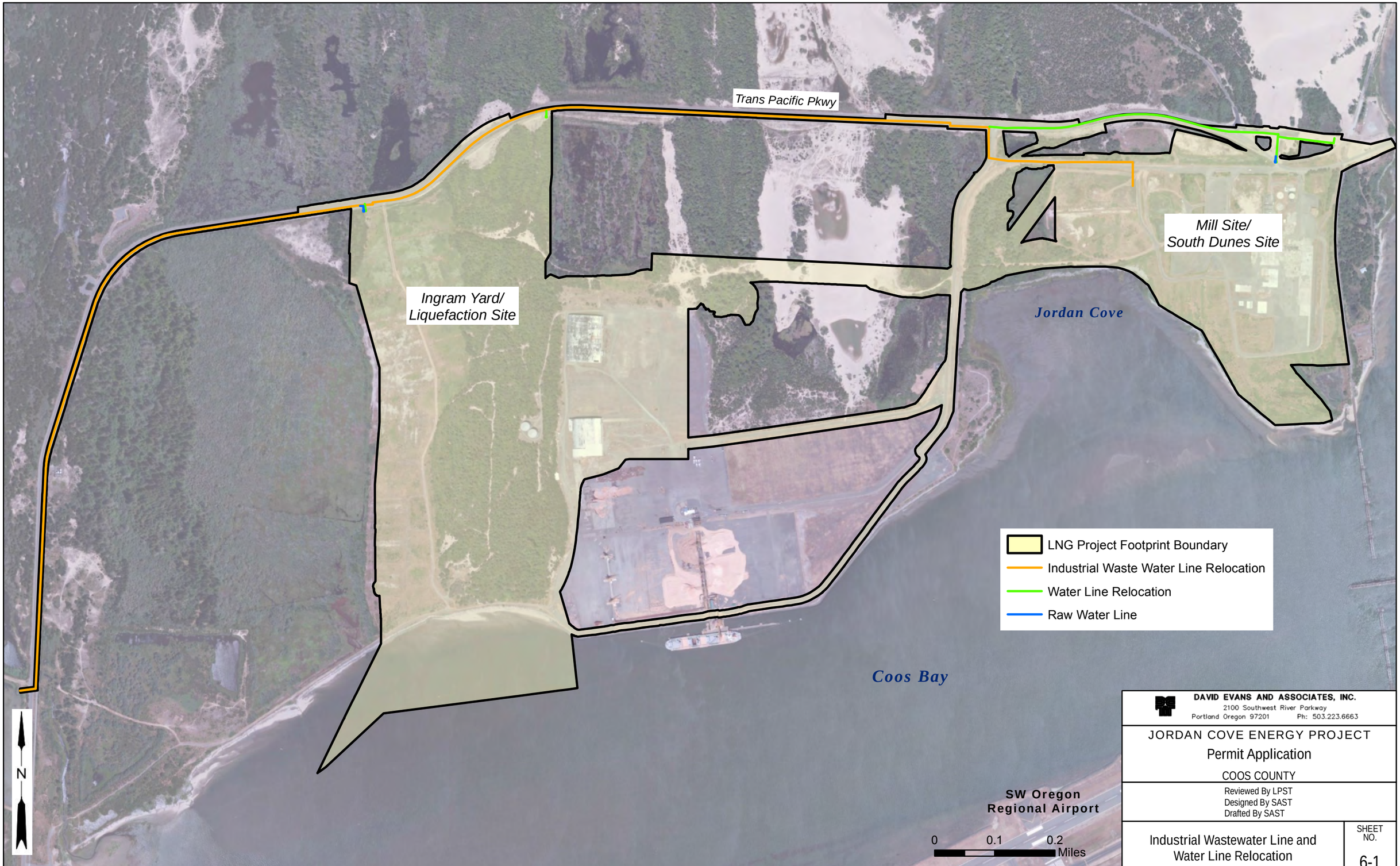

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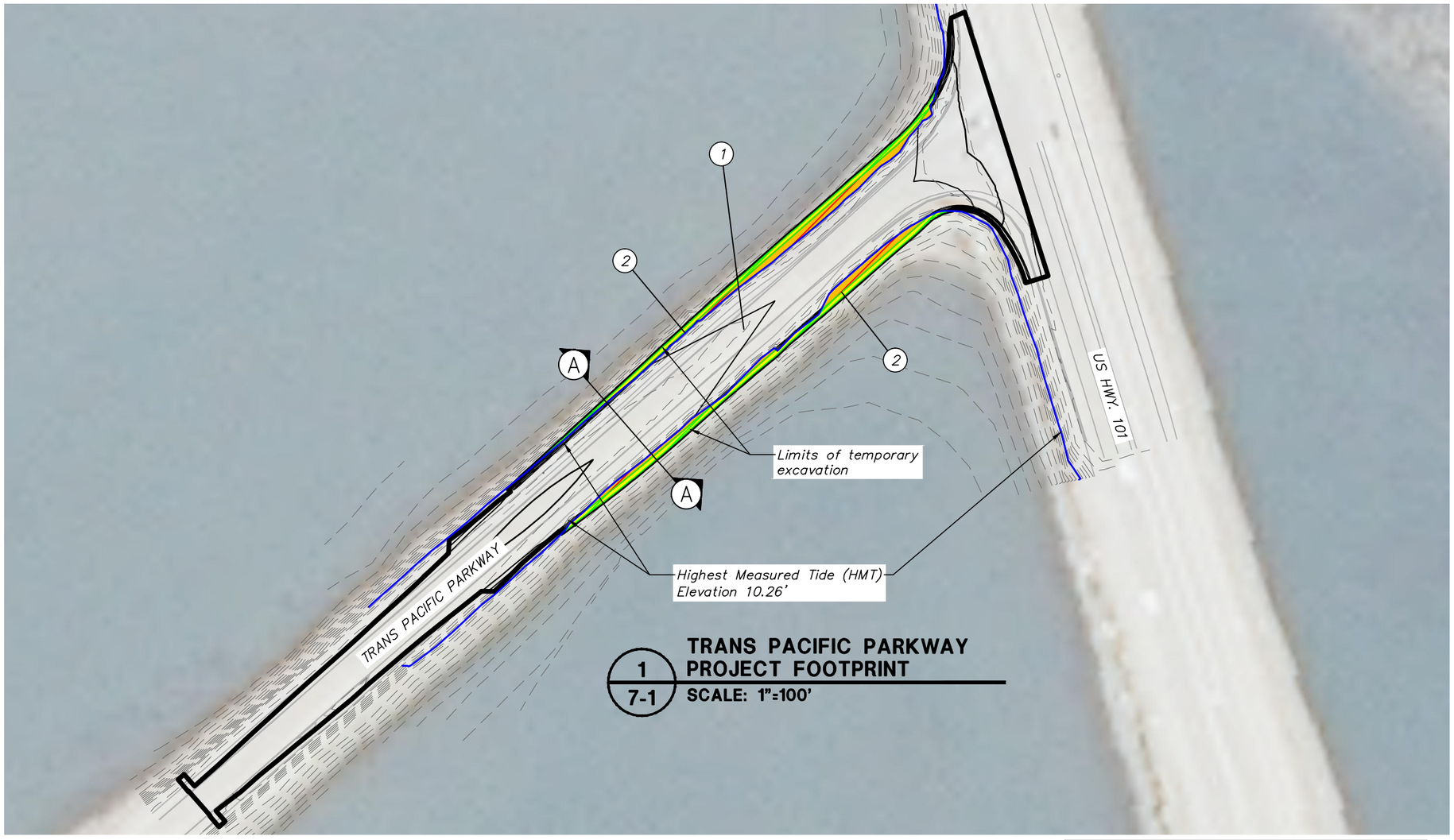
JORDAN COVE ENERGY PROJECT
Permit Application
COOS COUNTY

Reviewed By LPST
Designed By SAST
Drafted By SAST

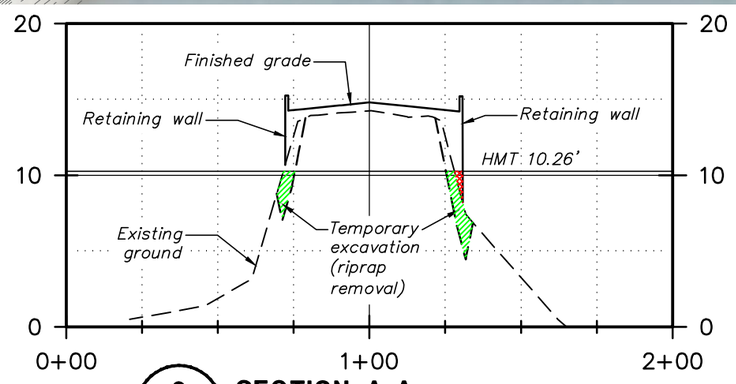
Industrial Wastewater Line and Water Line Relocation

SHEET NO. 6-1

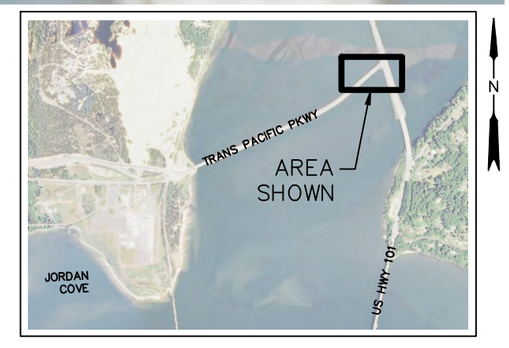
\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig 6-1 Industrial Wastewater and Water Line Relocation.mxd sast Oct 08, 2014 10:16AM



1 / 7-1 **TRANS PACIFIC PARKWAY PROJECT FOOTPRINT**
SCALE: 1"=100'



2 / 7-1 **SECTION A-A**
SCALE: H:1"=50' V:1"=10'



3 / 7-1 **KEY MAP**
SCALE: 1"=3000'

LEGEND

- (1) *Trans Pacific Parkway*
- (2) *Sheet pile retaining wall*
- *Project Footprint Boundary*
- *Existing contour (1' interval)*
- *Proposed contour (1' interval)*
- *Highest Measured Tide (HMT) Elevation 10.26'*

IMPACT LEGEND

- *Temporary estuarine impact*
- *Permanent estuarine impact*

0 50 100 200

NOTE: Vertical datum for all elevations is NAVD88.

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JORDAN COVE ENERGY PROJECT
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COOS COUNTY

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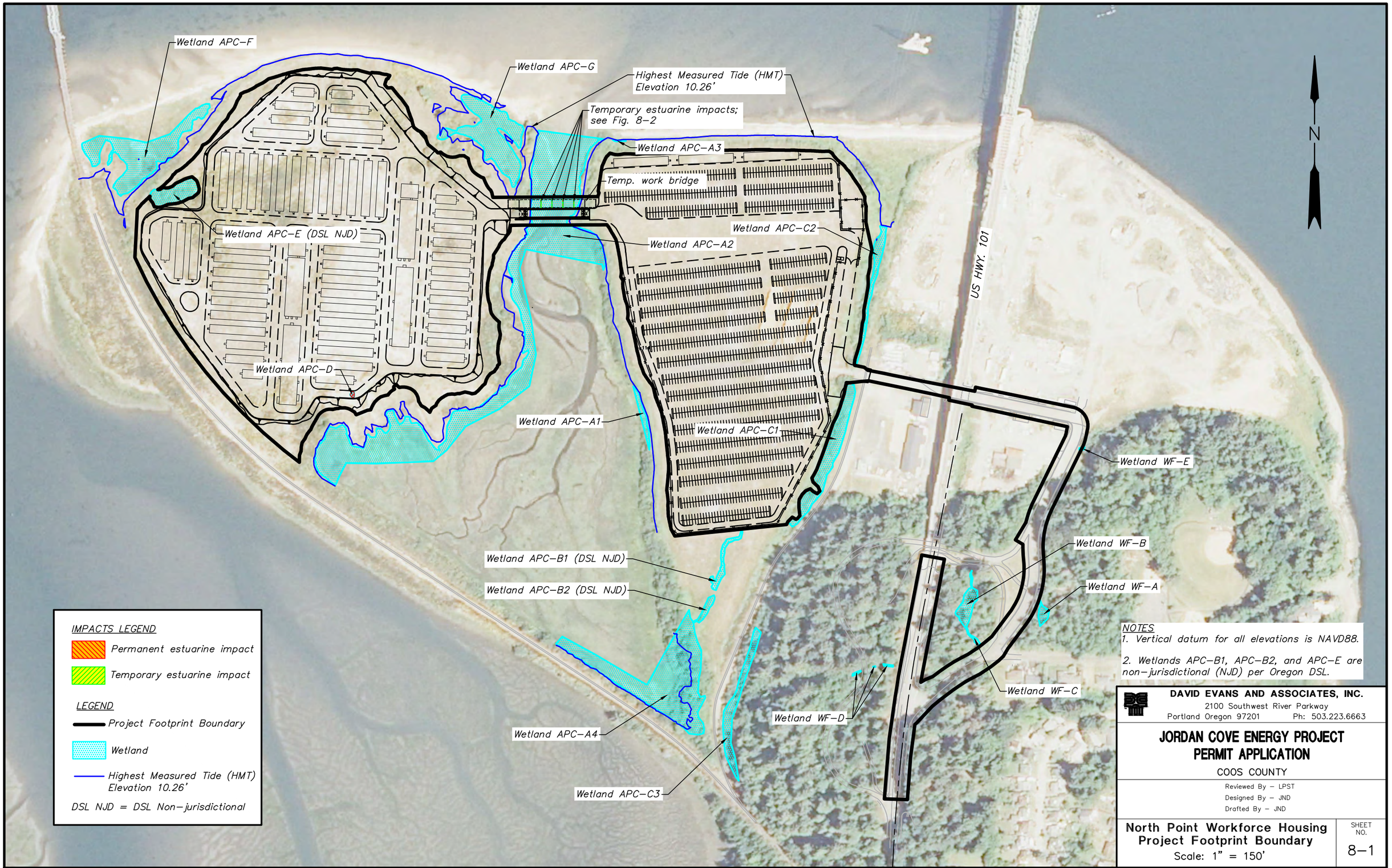
Drafted By – JND

Trans Pacific Parkway Footprint Boundary

SHEET NO. 7–1



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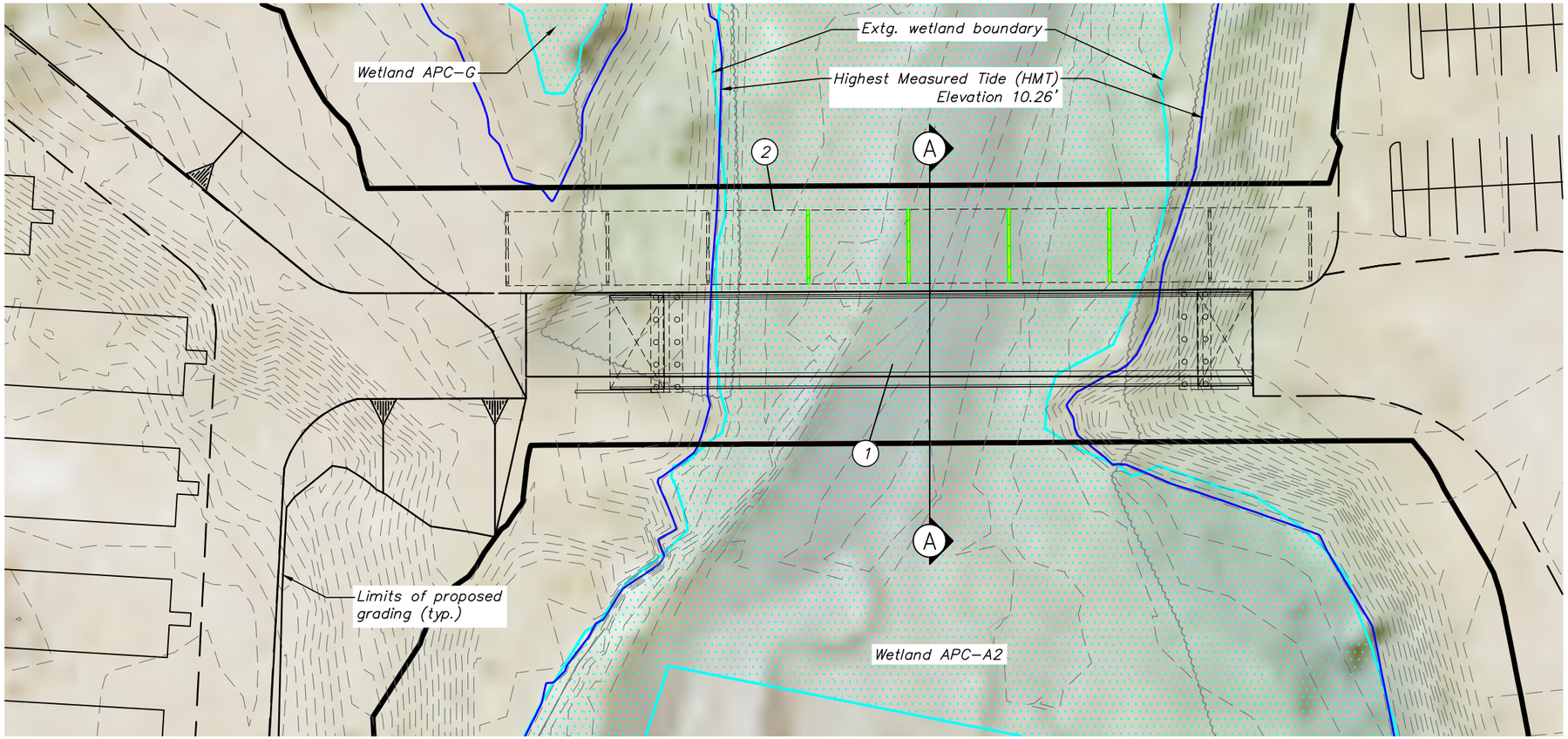


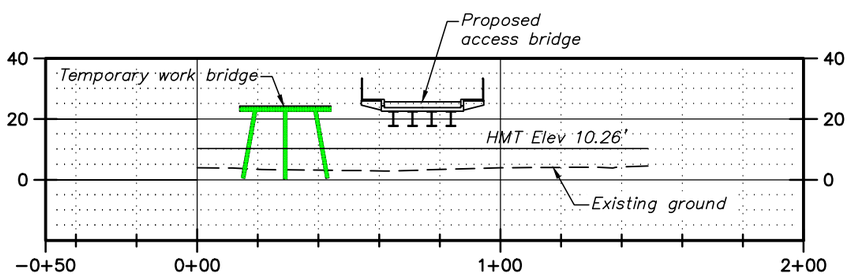
1 / 8-2 NORTH POINT WORKFORCE HOUSING PROJECT BRIDGE PROJECT FOOTPRINT
SCALE: 1"=50'

LEGEND

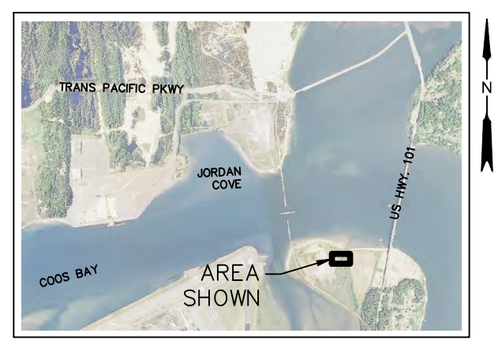
- (1) Permanent access bridge
- (2) Temporary work bridge
- LNG Project Footprint Boundary
- Existing contour (1' interval)
- Highest Measured Tide (HMT) Elevation 10.26'
- Wetland

IMPACTS LEGEND

- Temporary estuarine impact



2 / 8-2 SECTION A-A
SCALE: 1"=50'



3 / 8-2 KEY MAP
SCALE: 1"=5000'

0 25 50 100

NOTE: Vertical datum for all elevations is NAVD88.

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JORDAN COVE ENERGY PROJECT PERMIT APPLICATION
COOS COUNTY

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Designed By – JND
Drafted By – JND

North Point Workforce Housing
Project Bridge Footprint Wetland Impacts

SHEET NO. 8–2

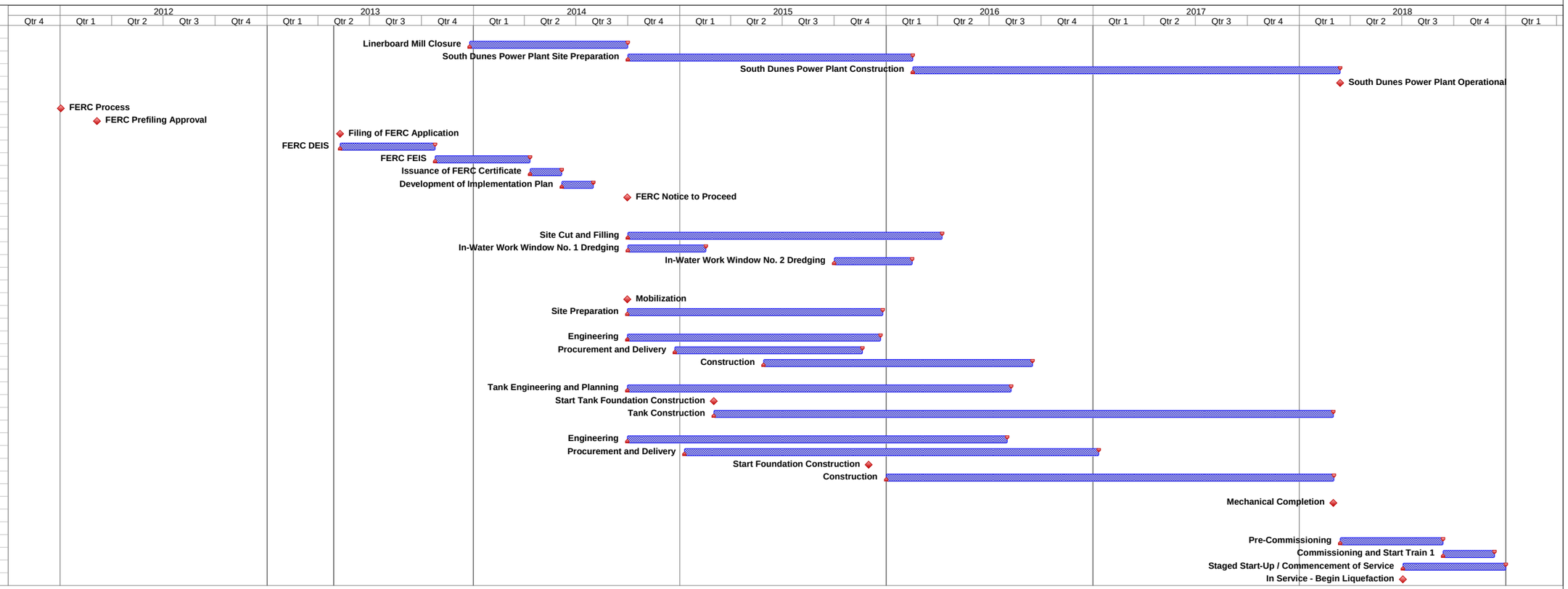
Part A – Tab A.B: LNG Terminal Project; Wetland Impacts Table

Waters_Name	Name	Activity	Resource_Type	Permanent_Loss	Impact_Duration	Initially_Proposed_Area	Proposed_Area	Authorized_Area	Units_Area	Area_Type	Initially_Proposed_Linear	Proposed_Linear	Authorized_Linear	Units_Linear	Debits	Notes
	Wetland 2012-4 (1)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.008			Acres	Fill	270			Yards		Permanent Railroad bridge footings; 0.055 oen water
	Wetland 2012-7	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.200			Acres	Fill	6683			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland 2013-3	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.100			Acres	Fill	6161			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland 2013-4 (1)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.287			Acres	Fill	3594			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland 2013-6 (2)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.034			Acres	Fill	4350			Yards		Permanent bridge footings
	Wetland A	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.202			Acres	Fill	9766			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland APC-D	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.005			Acres	Fill	212			Yards		Permanent fill for development of North Point Workforce Housing facility
	Wetland B	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.412			Acres	Fill	20333			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland C (1)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.217			Acres	Fill	6955			Yards		Wetland filled to for permanent haul road and bridge approach
	Wetland E (2)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.018			Acres	Fill	2020			Yards		Permanent bridge footing; 0.016 open water
	Wetland H (east)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.087			Acres	Fill	4732			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland I (north)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.266			Acres	Fill	13564			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland I (south)	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.010			Acres	Fill	503			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland J	Discharge of fill material	Non-Tidal Wetland		Permanent	0.033			Acres	Fill	1265			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland L	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.114			Acres	Fill	5041			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland N	Discharge of fill material	Non-Tidal Wetland	YES	Permanent	0.019			Acres	Fill	951			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland 2012-2	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.150			Acres	Fill	1113			Yards		Temporary fill and subsequent removal of material for haul road
	Wetland 2012-4 (2)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.002			Acres	Fill	65			Yards		Temporary work bridge bents with steel pile; 0.0009 open water
	Wetland 2012-5	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.120			Acres	Fill	20			Yards		Construction of retaining wall
	Wetland 2013-1	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.098			Acres	Fill	0					Wetland will be temporarily disturbed during construction of retaining wall
	Wetland 2013-2	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.048			Acres	Removal	0					Wetland will be temporarily disturbed during construction of retaining wall
	Wetland 2013-4 (2)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.086			Acres	Removal	0					Site preperation may temporarily disturb wetlands
	Wetland 2013-6 (1)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.312			Acres	Fill	4326			Yards		Temporary fill and subsequent removal of material for haul road
	Wetland 2013-6 (3)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.005			Acres	Fill	80			Yards		Cofferdam and temporary piling needed to build permanent bridge footing
	Wetland C (2)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.039			Acres	Fill	1299			Yards		Temporary fill and subsequent removal of material for haul road
	Wetland E (1)	Discharge of fill material	Non-Tidal Wetland	NO	Temporary	0.958			Acres	Fill	37944			Yards		Temp. fill and subsequent removal for haul road; includes footing cofferdam
	Wetland J	Work (non-fill, Section 10)	Non-Tidal Wetland	NO	Temporary	0.535			Acres	Removal	3450			Yards		Site preperation and ground improvements; areas will be restored
	Coos Bay Deep Subtidal @ S&A	Dredging (Section 10)	Other	YES	Permanent	13.897			Acres	Removal	371776			Yards		Access channel below HMT
	Coos Bay Eelgrass @ S&A	Dredging (Section 10)	Other	YES	Permanent	2.560			Acres	Removal	177094			Yards		Access channel below HMT
	Coos Bay HMT @ Trans Pacific Parkway and Hwy101	Discharge of fill material	Other	YES	Permanent	0.054			Acres	Fill	404			Yards		Permanent fill of riprap for TPP improvements
	Coos Bay HMT @ Wetland J (1)	Discharge of fill material	Other	YES	Permanent	0.141			Acres	Fill	3339			Yards		Area below HMT filled to raise site to +46 feet MSL to avoid tsunami inundation
	Coos Bay HMT @ Wetland M	Discharge of fill material	Other	YES	Permanent	0.181			Acres	Fill	5063			Yards		Area below HMT filled to raise site to +46 feet MSL to avoid tsunami inundation
	Coos Bay Eelgrass @ Barge Berth	Discharge of fill material	Other	NO	Temporary	Temporary BB			Acres	Fill	temporary BB			Yards		Temporary BB fill below HMT (0.255 ac); Temp. impacts overlap with permanent @ S&A
	Coos Bay HMT @ Trans Pacific Parkway and Hwy101	Removal	Other	NO	Temporary	0.056			Acres	Removal	390			Yards		Temporary removal of riprap for TPP improvements
	Coos Bay HMT @ Wetland J (2)	Discharge of fill material	Other		Temporary	0.272			Acres	Fill				Yards		Site preperation and ground improvements
	Coos Bay HMT @ Wetland M	Discharge of fill material	Other		Temporary	0.029			Acres	Removal	0					Site preperation ground improvements may disturb of wetlands
	Coos Bay Intertidal @ S&A	Dredging (Section 10)	Tidal Wetland	YES	Permanent	8.495			Acres	Removal	1215740			Yards		Access channel below HMT
	Coos Bay Intertidal @ Barge Berth	Discharge of fill material	Tidal Wetland	YES	Permanent	1.616			Acres	Fill	21666			Yards		Permanent material for Barge Berth development below HMT
	Coos Bay Salt Marsh @ S&A	Dredging (Section 10)	Tidal Wetland	YES	Permanent	0.055			Acres	Removal	permanent S&A			Yards		Access channel below HMT; see volume under Intertidal @ S&A
	Coos Bay Shallow Subtidal @ Barge Berth	Discharge of fill material	Tidal Wetland	YES	Permanent	0.074			Acres	Fill	permanent S&A			Yards		Barge Berth development below HMT
	Coos Bay Shallow Subtidal @ S&A	Dredging (Section 10)	Tidal Wetland	YES	Permanent	3.409			Acres	Removal	permanent S&A			Yards		Access channel below HMT; see volume under Intertidal @ S&A
	Wetland H (west)	Discharge of fill material	Tidal Wetland	YES	Permanent	0.062			Acres	Fill	3596			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Wetland M (1)	Discharge of fill material	Tidal Wetland	YES	Permanent	0.212			Acres	Fill	5025			Yards		Wetland filled to raise site to +46 feet MSL to avoid tsunami inundation
	Coos Bay Intertidal@ Barge Berth	Discharge of fill material	Tidal Wetland	NO	Temporary	Temporary BB			Acres	Fill	3589			Yards		Temporary material for Barge Berth construction below HMT; 0.618
	Coos Bay Shallow Subtidal @ Barge Berth	Discharge of fill material	Tidal Wetland	NO	Temporary	Temporary BB			Acres	Fill	temporary BB			Yards		Temporary BB fill below HMT (0.126 ac); Temp. impacts overlap with permanent @ BB
	Wetland APC-A2	Discharge of fill material	Tidal Wetland	NO	Temporary	0.003			Acres	Fill	85			Yards		Temporary work bridge piles in wetland
	Wetland M (2)	Work (non-fill, Section 10)	Tidal Wetland	NO	Temporary	0.087			Acres	Fill				Yards		Site preperation may temporarily disturb wetlands

Part A – Tab A.C: LNG Terminal Project; Construction Schedule

Figure 1.3-3
JCEP LNG Terminal Project
Construction Schedule

ID	Task Name
1	**Nonjurisdictional Facilities**
2	Linerboard Mill Closure
3	South Dunes Power Plant Site Preparation
4	South Dunes Power Plant Construction
5	South Dunes Power Plant Operational
6	**FERC Process**
7	FERC Process
8	**FERC Prefiling Approval**
9	Filing of FERC Application
10	FERC DEIS
11	FERC FEIS
12	**Issuance of FERC Certificate**
13	Development of Implementation Plan
14	**FERC Notice to Proceed**
15	
16	**General Site Work**
17	Site Cut and Filling
18	In-Water Work Window No. 1 Dredging
19	In-Water Work Window No. 2 Dredging
20	
21	**LNG Terminal Facilities**
22	**Mobilization**
23	**Site Preparation**
24	**Marine (excluding in-water work)**
25	Engineering
26	Procurement and Delivery
27	Construction
28	**LNG Storage Tanks**
29	Tank Engineering and Planning
30	Start Tank Foundation Construction
31	Tank Construction
32	**LNG and Gas Conditioning Facilites**
33	Engineering
34	Procurement and Delivery
35	Start Foundation Construction
36	Construction
37	
38	**Mechanical Completion**
39	
40	**Commissioning and Testing**
41	Pre-Commissioning
42	Commissioning and Start Train 1
43	Staged Start-Up / Commencement of Service
44	In Service - Begin Liquefaction



Note (Sept. 2014):
Start and end dates have changed; however, duration of tasks will remain approximately the same. An updated project schedule will be provided when it becomes available.

Project: JC Schedule
Date: Mon 4/29/13

Task		Summary		External Milestone		Inactive Milestone		Duration-only		Start-only		Deadline	
Split		Project Summary		Inactive Task		Inactive Summary		Manual Summary Rollup		Finish-only			
Milestone		External Tasks		Inactive Task		Manual Task		Manual Summary		Progress			

Part A – Tab A.D: LNG Terminal Project; Bridge Design Standards and Criteria.

Jordan Cove Energy Project
Draft Bridge Design Criteria – Roadway Bridges and Utility Corridor

BASIS OF DESIGN SUMMARY

The following design criteria and standards were used in developing the Price Development Agreement (PDA) Phase design concept plans and specifications for the proposed Utility Corridor and Workforce Housing Development bridges, including certain Owner-specified design features and criteria.

1. **Design Specifications:**
   a. ODOT Bridge Design & Drafting Manual (BDDM), 2004, with updates through December 2012.
   b. AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 2012.
   c. AASHTO Guide Specifications for LRFD Seismic Bridge Design, 1st edition, 2009, with 2010 interims.
   d. ODOT Highway Design Manual, 2012.
   e. Manual of Uniform Traffic Control Devices (MUTCD) and Oregon supplements.

2. **Design Loading and Load Combinations:**
   a. Dead Loads (DC, DW):

i. Concrete	150 pcf
ii. Steel	490 pcf
iii. Bridge Rail:	
3'-6" Type "F"	518 plf (exterior barrier)
2'-8" Type "F"	335 plf (interior barrier – adjacent to pipes)
iv. Future Wearing Surface	25 psf
v. Utilities:	
Utility Corridor-	
36-in. diameter gas	306 plf (empty) + 773 plf (water)
12-in. diameter gas	65 plf (empty) + 47 plf (water)
Workforce Housing Bridge-	
12-in. diameter water	50 plf (empty) + 49 plf (water)
6-in. diameter sanitary	19 plf (empty) + 13 plf (water)
Power/communication conduits	1@26 plf, 5@14 plf, 1@5 plf

   b. Live Loads (LL, IM):
      i. AASHTO HL-93 notional live load.
      ii. ODOT OR-STP-5BW and OR-STP-4E permit trucks as defined in the ODOT BDDM.
      iii. The maximum number of design traffic lanes for superstructure and substructure design shall be based on a design 12'-0" lane in accordance with AASHTO LRFD 3.6.1.1.1.
      iv. Dynamic Load Allowance (IM) per AASHTO LRFD 3.6.2.
         1. Dynamic load allowance shall not be applied to pier foundations which are entirely below ground.
      v. Multiple presence factors per AASHTO LRFD 3.6.1.1.2.

   c. Wind Loads (WS, WL):
      i. Application of the wind loads shall be in accordance with AASHTO LRFD 3.8.

   d. Seismic Loads (EQ):
      i. Design seismic events:
         1. No Collapse - 7% probability of exceedance in 75 years (1,000-year return period)

2. Servicable - 14% probability of exceedance in 75 years (500-year return period)

ii. LL_{EQ} = 0.0 in the extreme event case

iii. Hydraulic Loading Resulting from Tsunami Forces: Hydraulic loading and scour effects resulting from tsunami forces have been neglected by direction of the Owner. Utility Corridor structures are assumed to be located outside of the design tsunami influence area. Structures shall not be relied upon for post-tsunami evacuation and recovery.

iv. Importance category:

1. 1000-year event: Other
2. 500-year event: Essential

v. Site Class: D

vi. Dampening coefficient: 5%

vii. Earthquake Resisting System (ERS):

1. Type 1 (ductile substructure with essentially elastic superstructure)

e. Thermal Forces (TU):

i. The design mean temperature is 52° F.

ii. Uniform thermal effects for concrete elements are as follows:

1. Minimum temperature of 22° F
2. Maximum temperature of 72° F.
3. Thermal coefficient (concrete): 0.000006 ft/ft/^{o} F.

f. Load Combinations:

i. Per AASHTO Tables 3.4.1-1 and 3.4.1-2.

3. <u>Design Life</u>:

50 years

4. <u>Geotechnical Design Criteria:</u>

Geotechnical design criteria furnished by Geotechnical Research, Inc. (GRI) under contract to Jordan Cove Energy Project, LP.

Ref: *Preliminary Geotechnical Report, Utility Corridor Bridges BR01 and BR02, Coos County, Oregon dated July 17, 2014*

Ref: *Preliminary Geotechnical Report, North Point Workforce Housing Bridge, Jordan Cove LNG Project, Coos County, Oregon dated July 17, 2014*

5. <u>Materials:</u>

a. Concrete:

i. Precast concrete girders	TBD
ii. Bridge Decks	High Performance Concrete (HPC) Class 4000
iii. All other cast-in-place concrete	Class 4000

b. Reinforcing Steel:

i. Reinforcing steel:
ASTM A706, Grade 60 (all columns and locations where welding is required)
ASTM A706, Grade 60 or ASTM A615, Grade 60 (all other locations)

ii. Epoxy coated reinforcing steel in all bridge decks and end panels, uncoated in all other locations

c. Prestressing Steel:
   i. Prestressing strand, ASTM A416, grade 270, low relaxation — f_{pu} = 270 ksi
      1. Apparent modulus: — Es = 28,500 ksi
      2. Yield stress (90% f_{pu}): — f_{py} = 243 ksi

d. Structural Steel:
   ASTM A709, Grade 50

e. Piling:
   i. Pipe Pile: ASTM A252, Grade 3
   ii. H-Pile: ASTM A572, Grade 50

6. <u>Concrete Cover</u>:

a. Concrete cover measured from the face of the concrete to the face of any reinforcement bar shall be:
   i. Precast members — 1”
   ii. Top of deck slab — 2.5”
   iii. Footings cast against soil: — 3”
   iv. At all other locations: — 2”

Jordan Cove Energy Project
Draft Bridge Design Criteria – Railroad Bridges

BASIS OF DESIGN SUMMARY

The following design criteria and standards were used in developing the Price Development Agreement (PDA) Phase design concept plans and specifications for the proposed Roseburg Forest Products (RFP) heavy rail bridge, including certain Owner-specified design features and criteria.

1. **Design Specifications:**
   a. American Railway Engineering and Maintenance of Way Association (AREMA) 2012 Manual for Railway Engineering

      Structures
      i. Chapter 8 – Concrete Structures and Foundations
      ii. Chapter 9 – Seismic Design for Railway Structures

2. **Design Loading and Load Combinations:**
   a. Dead Loads (D):

i.	Concrete	150 pcf
ii.	Steel	490 pcf
iii.	Track	200 plf (per track)
iv.	Ballast	120 pcf
v.	Utilities	TBD

   b. Live Loads (L, I):
      i. Cooper E-80
      ii. Diesel Impact in accordance with AREMA 2.2.3 d(1)
         1. Impact shall not be applied to pier foundations which are entirely below ground.

   c. Wind Loads (W):
      i. Application of the wind loads shall be in accordance with AREMA 2.2.3 h

   d. Seismic Loads (EQ):
      i. Design seismic events:
         1. Ground Motion Level 1 (50-100 year return period)
         2. Ground Motion Level 2 (200-500 year return period)
         3. Ground Motion Level 3 (1000-2400 year return period)
      ii. Limit States:
         1. Serviceability: Level 1 Ground Motion
         2. Ultimate: Level 2 Ground Motion
         3. Survivability: Level 3 Ground Motion
      iii. Site Coefficient: 1.2
      iv. Dampening Adjustment Factor: 1.0
      v. Hydraulic Loading Resulting from Tsunami Forces: The bridge location is assumed to be located above the design tsunami influence zone, by Owner direction. Therefore, no hydraulic loading or scour is assumed in this design.

e. Thermal Forces (TU):
   i. Uniform thermal effects for concrete elements are as follows:
      1. Temperature Rise: 30° F
      2. Temperature Fall: 40° F.
      3. Thermal coefficient (concrete): 0.000006 ft/ft/^{o} F.

f. Load Combinations:
   i. Load Factor Design per AREMA Tables 2.2.4 c and 9.1.8 (copies attached).

3. <u>Design Life:</u>

75 years

4. <u>Geotechnical Design Criteria</u>:

Geotechnical design criteria furnished by Geotechnical Research, Inc. (GRI) under contract to Jordan Cove Energy Project, LP.

Ref: *Preliminary Geotechnical Report, Railroad Spur Bridge Over Wetland, Jordan Cove LNG Project, Coos County, Oregon dated July 17, 2014*

5. <u>Materials</u>:

a. Concrete:
   i. Precast concrete girders — TBD
   ii. All cast-in-place concrete — High Performance Concrete (HPC) Class 4000

b. Reinforcing Steel:
   i. Reinforcing steel:
      ASTM A706, Grade 60 (all columns and locations where welding is required)
      ASTM A706, Grade 60 or ASTM A615, Grade 60 (all other locations)
   ii. Epoxy coated reinforcing steel in all locations

c. Prestressing Steel:
   i. Prestressing strand, ASTM A416, grade 270, low relaxation — f_{pu} = 270 ksi
      1. Apparent modulus: — Es = 28,500 ksi
      2. Yield stress (90% f_{pu}): — f_{py} = 243 ksi

d. Piling:
   i. Pipe Pile: ASTM A252, Grade 3
   ii. H-Pile: ASTM A572, Grade 50

6. <u>Concrete Cover</u>:

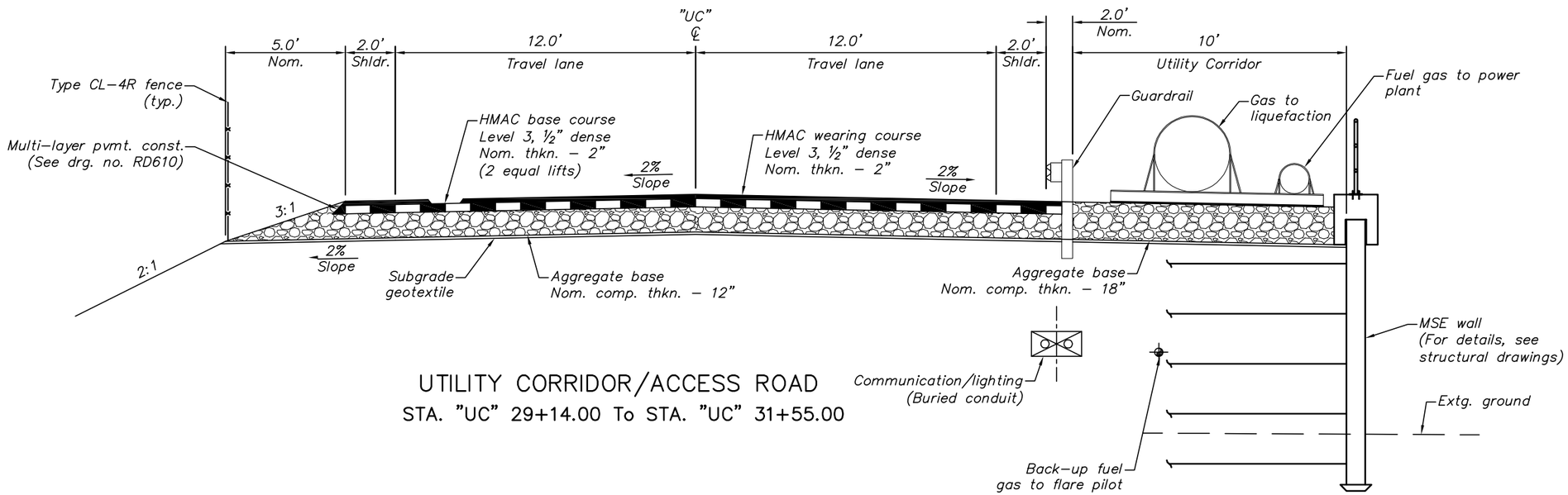
a. Concrete cover measured from the face of the concrete to the face of any reinforcement bar shall be:
   i. Precast members – prestressing tendons — 1.5”
   ii. Precast members – stirrups, ties, spirals — 1”
   iii. CIP Members - Principal Reinforcement — 2.5”
   iv. CIP Members - Stirrups, ties and spirals — 2”
   v. Footings cast against soil: — 3”

Part A – Tab A.E: LNG Terminal Project; Bridge, Rail, and Roadway Plans

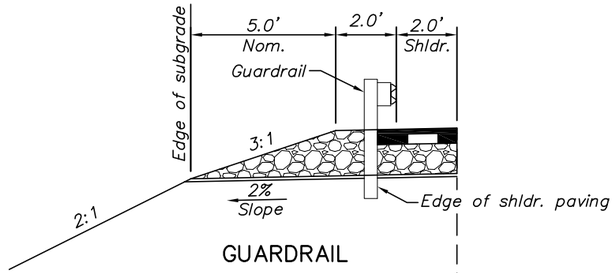
USACE Bridge and Roadway Plans (October 2014)

1 Typical Section, Utility Corridor / Access Road
2 Plan and Profile Sheet 3, Utility Road / Access Road
3 Plan and Profile Sheet 4, Utility Road / Access Road
4 Plan and Profile Sheet 5, Utility Road / Access Road
5 Plan and Profile Sheet 5A, Utility Road / Access Road
6 Plan and Profile Sheet 6, Utility Road / Access Road
7 Track Alignment, Utility Corridor / Access Road
8 Plan and Elevation, Utility Corridor O'Xing RR & Jordan Cove Rd
9 General Notes and Typical Deck Sec., Utility Corridor O'Xing RR & Jordan Cove Rd
10 Foundation Plan, Utility Corridor O'Xing RR & Jordan Cove Rd
11 Plan and Elevation, Utility Corridor Over Wetland
12 Foundation Plan, Utility Corridor Over Wetland
13 Interior Bent Plan and Elevation, Utility Corridor Over Wetland
14 General Notes and Typical Wall Section Sheet B301, Utility Corridor Retaining Wall
15 General Notes and Typical Wall Section Sheet B302, Utility Corridor Retaining Wall
16 Plan and Elevation, Rail Spur
17 Foundation Plan, Rail Spur
18 Bent 7 Plan and Elevation, Rail Spur
19 Typical Section, Trans Pacific Parkway / US 101 Intersection
20 Plan and Profile Sheet 3, Trans Pacific Parkway / US 101 Intersection
21 Plan and Profile Sheet 4, Trans Pacific Parkway / US 101 Intersection
22 Wall Plan, Trans Pacific Parkway / US 101 Intersection
23 General Notes and Details, Trans Pacific Parkway / US 101 Intersection
24 Plan and Elevation, North Point (Peirce)
25 General Notes and Typical Deck Section, North Point (Peirce)
26 Foundation Plan, North Point (Peirce)
27 Grading Plan, Kentuck Mitigation Site
28 Typical Section, Kentuck Levee
29 General Construction Sheet 3, Kentuck Levee
30 General Construction Sheet 4, Kentuck Levee
31 General Construction, Sheet 5, Kentuck Levee
32 Typical Section, Golf Course Lane
33 Kerwin & Webb Properties Grading Plan, Golf Course Lane
34 General Construction 3, Golf Course Lane
35 General Construction Kerwin & Webb Driveway, Golf Course Lane
36 General Construction Sheet 4, Golf Course Lane
37 General Construction Sheet 5, Golf Course Lane
38 General Construction Sheet 6, Golf Course Lane
39 General Construction Sheet 7, Golf Course Lane
40 Typical Section, Kentuck Access
41 General Construction Sheet 3, Kentuck Access

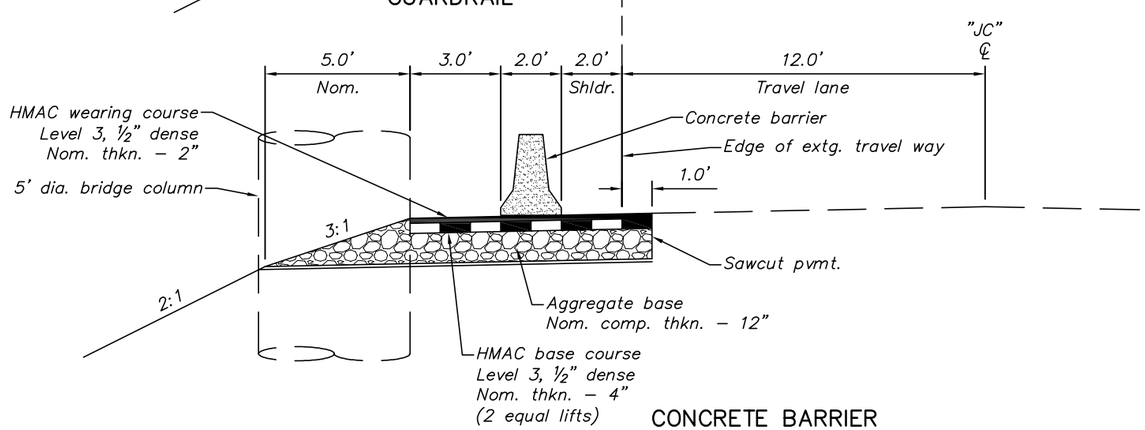
42 General Construction Sheet 4, Kentuck Access
43 General Construction Sheet 5, Kentuck Access
44 Typical Section, East Bay Road
45 Detour Plan Sheet 2C, East Bay Road
46 Detour Plan Sheet 2C-2, East Bay Road
47 General Construction Sheet 3, East Bay Road
48 General Construction Sheet 4, East Bay Road
49 Plan and Elevation, East Bay Drive Bridge, Kentuck Mitigation Site
50 Plan and Elevation, Kentuck Slough Dike Bridge, Kentuck Mitigation Site



UTILITY CORRIDOR/ACCESS ROAD
STA. "UC" 29+14.00 To STA. "UC" 31+55.00



GUARDRAIL



CONCRETE BARRIER

JORDAN COVE ROAD
STA. "JC" 51+40.65 To STA. "JC" 53+49.62

NOTE:
1. Side-slopes are shown as horiz. to vert.

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – T. Wheeler
Designed By – J. DeMello
Drafted By – J. DeMello

TYPICAL SECTION

SHEET NO. 2A

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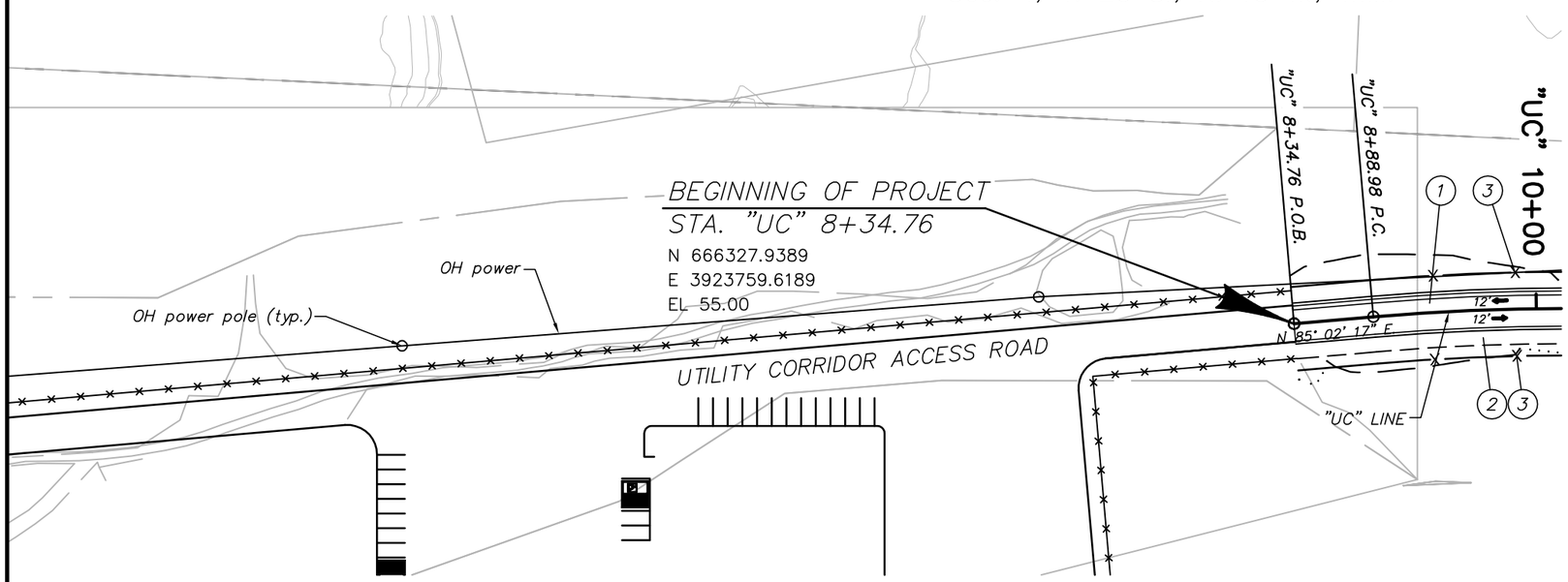
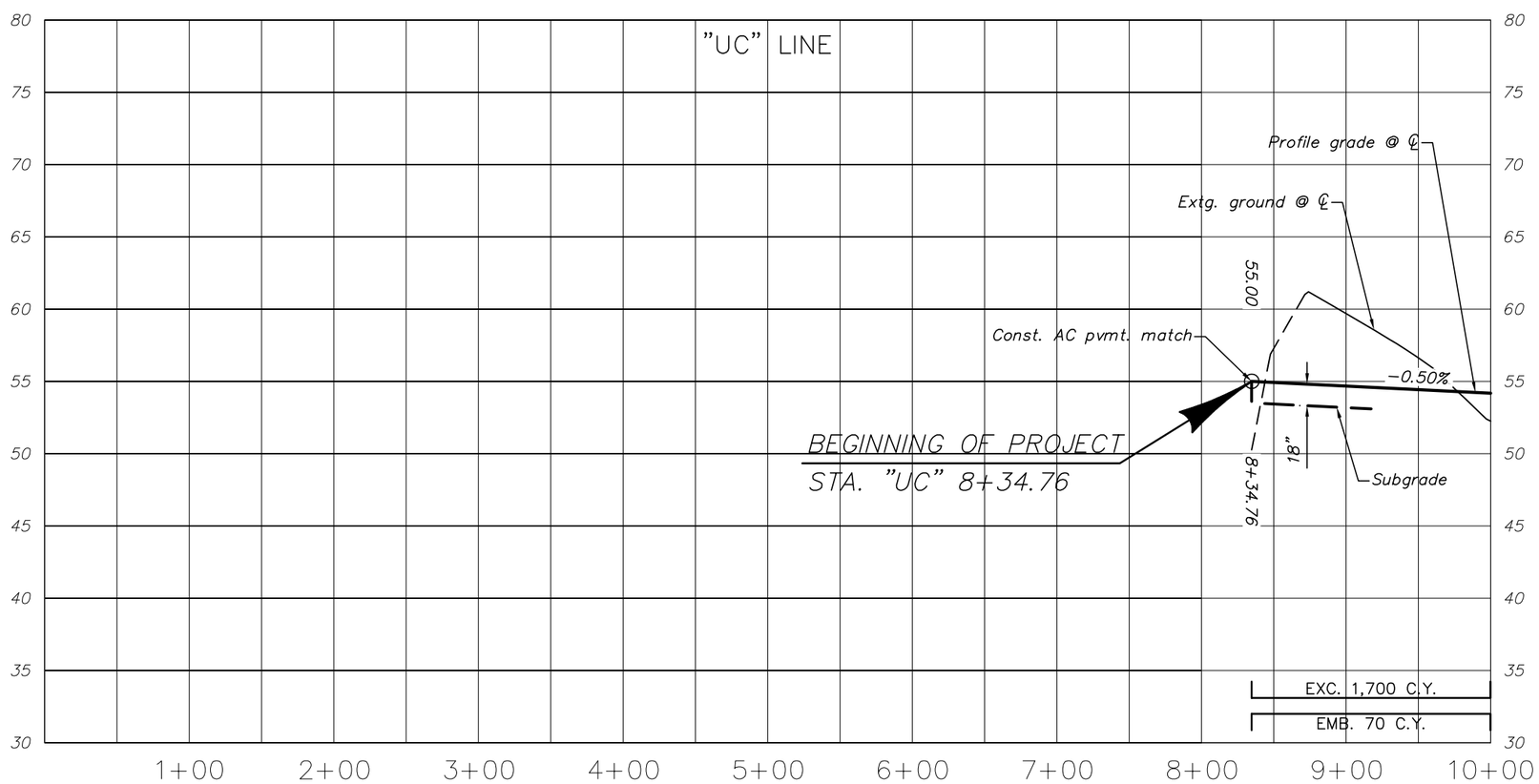


N

1. Const. Utility Corridor Access Road (For details, see sheets 2 & 2A)
2. Const. 10' Utility Corridor (For details, see sheets 2 & 2A)
3. Const. type CL-4R fence (See drg. no RD815)



LEGEND
Cut slope line
Fill slope line
Security fence

-DRAFT-
NOT TO BE USED
FOR CONSTRUCTION

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 3

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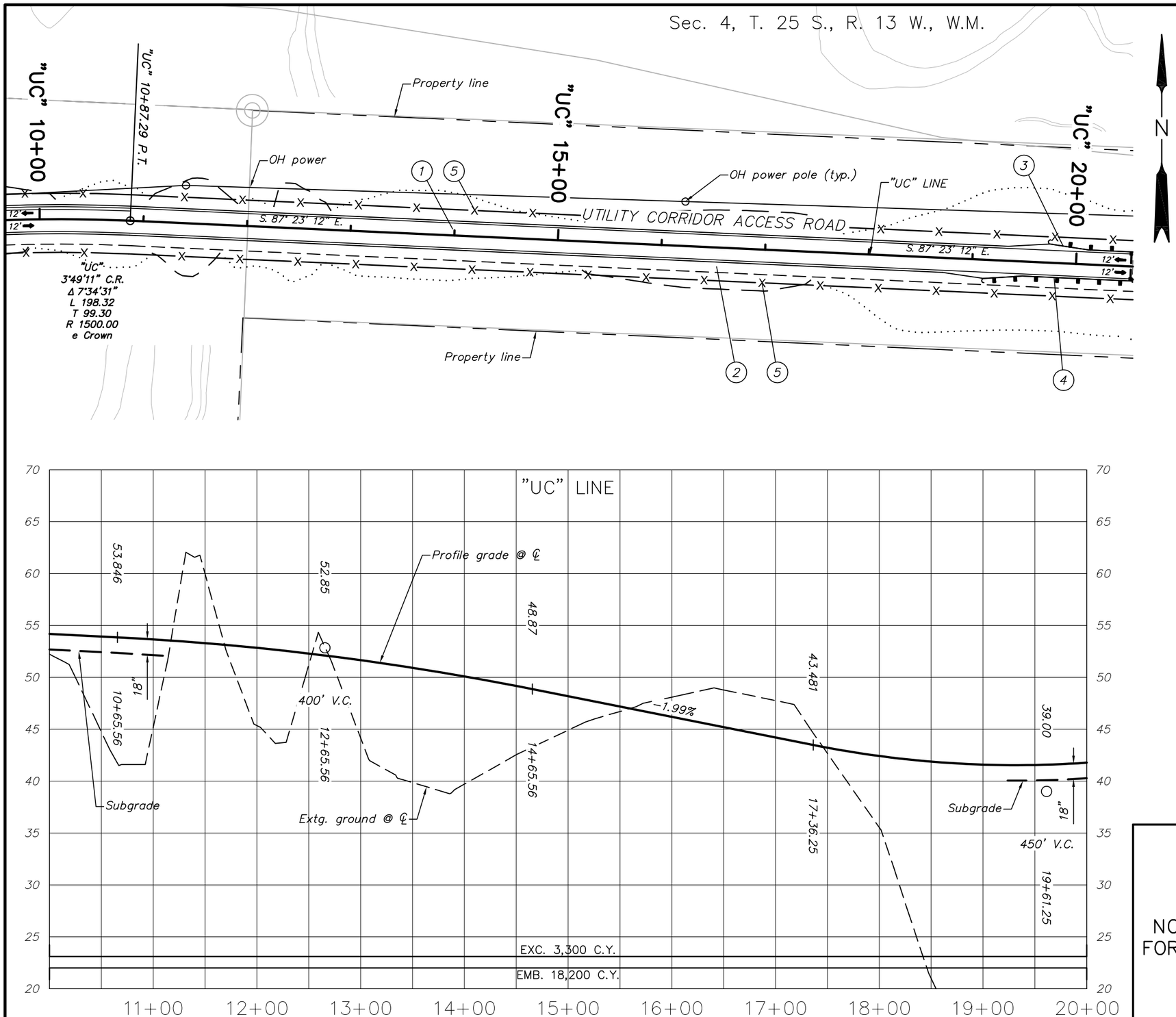

1. Const. Utility Corridor Access Road
   (For details, see sheets 2 & 2A)

2. Const. 10' Utility Corridor
   (For details, see sheets 2 & 2A)

3. Sta. "UC" 19+74.11 to Sta. "UC" 20+54.65, Lt.
   Const. guardrail – 12.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. 3'–6" Type "F" bridge rail to guardrail transition
   (See drg nos. RD400, RD405, RD410, RD415, RD420, RD440, & BR291)

4. Sta. "UC" 19+11.61 to Sta. "UC" 20+54.65', Rt.
   Const. guardrail – 75' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. Type "F" bridge rail to guardrail transition
   (See drg no. BR203)

5. Const. type CL–4R fence
   (See drg. no. RD815)

LEGEND
Cut slope line
Fill slope line
Security fence

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 4

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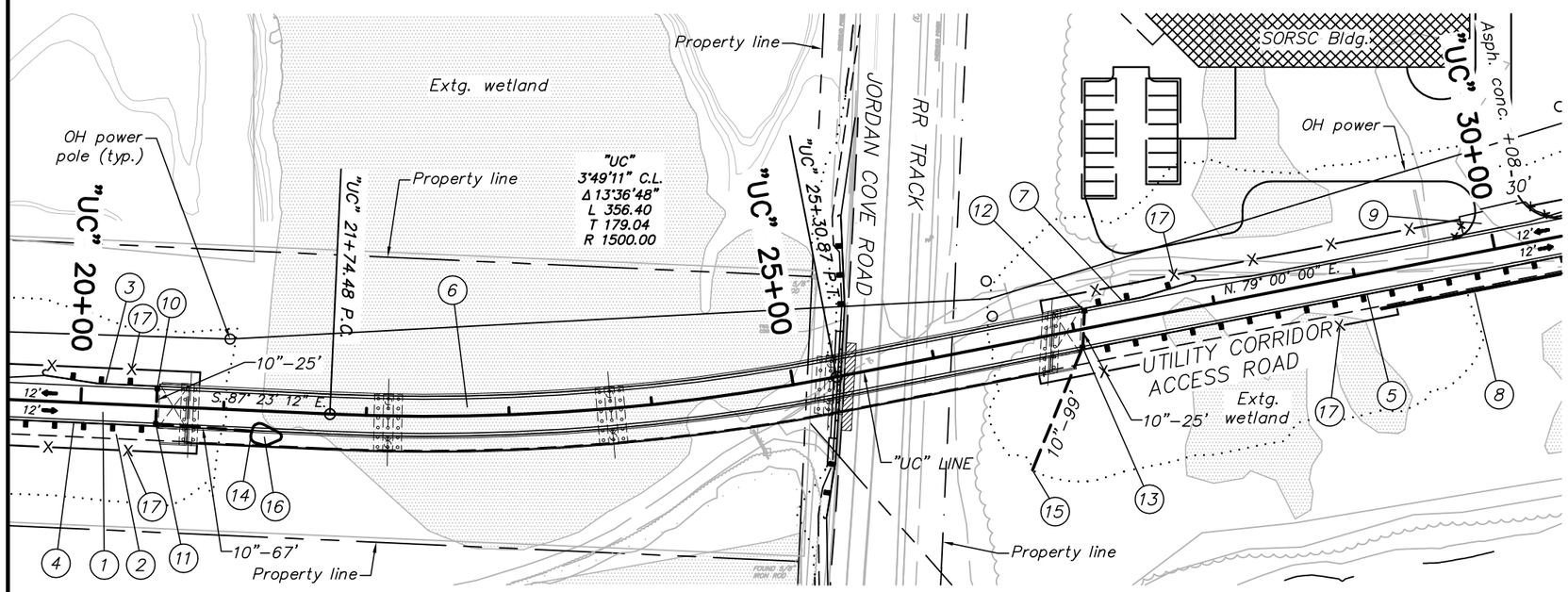

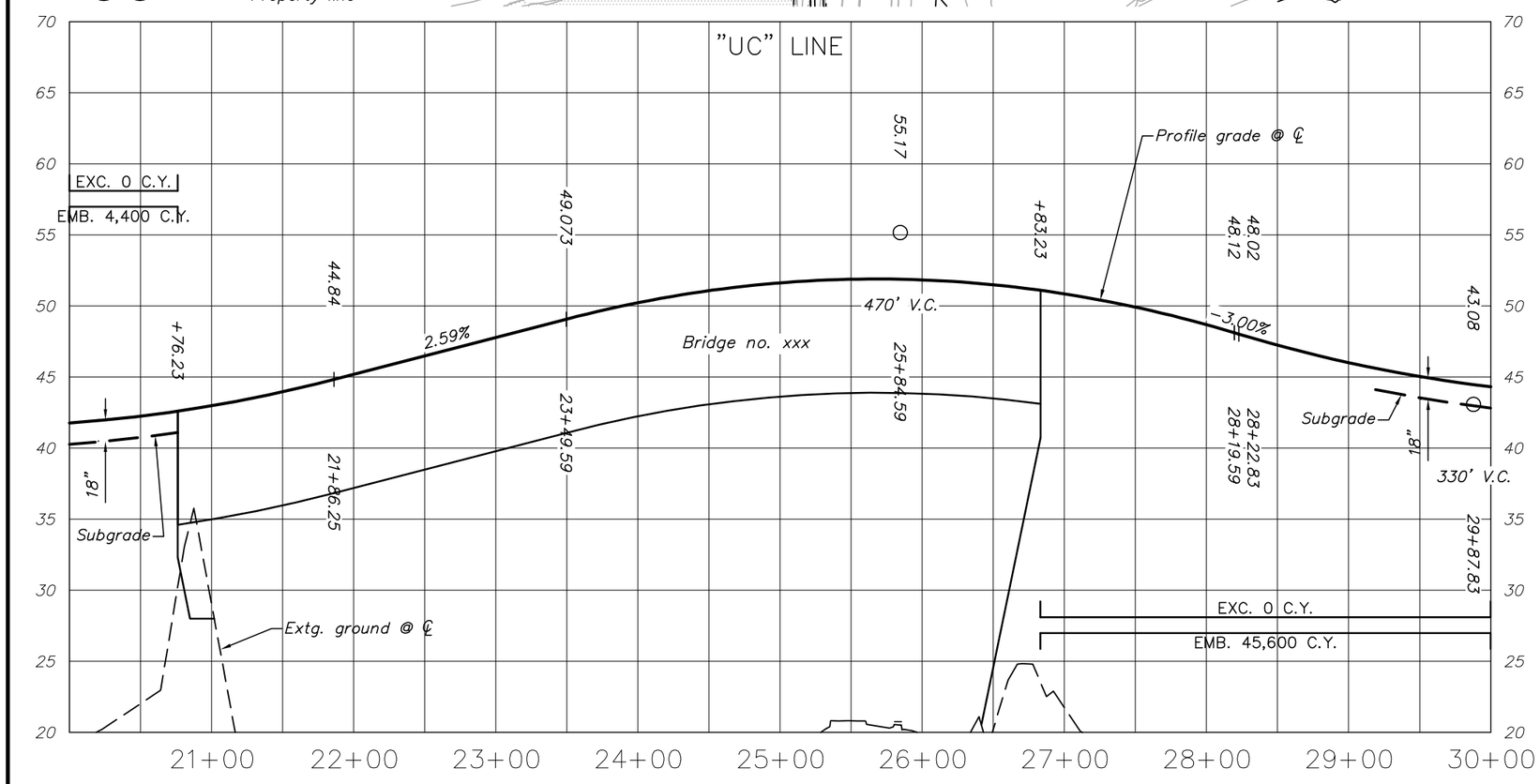

1. Const. Utility Corridor Access Road
   (For details, see sheets 2 & 2A)
2. Const. 10' Utility Corridor
   (For details, see sheets 2 & 2A)
3. See sht. 4, note 3
4. See sht. 4, note 4
5. Sta. "UC" 27+01.36 to Sta. "UC" 31+47.20, Rt.
   Const. guardrail – 384' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. Type "F" bridge rail to guardrail transition
6. Const. bridge no. xxxx
   Const. structure – 607'
   Rdwy. width – 28' with utility platform, Rt.
   (For drg. nos., see sht. 1A)
7. Sta. "UC" 27+08.34 to Sta. "UC" 27+88.87, Lt.
   Const. guardrail – 12.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. 3'-6" Type "F" bridge rail to guardrail transition
8. Structure no. xxx
   Sta. "UC" 29+14.00 to Sta. "UC" 31+55.00, Rt.
   Const. retaining wall
   (For drg. nos., see sht. 1A)
9. Const. appr.
   (See drg. no. RD715)
10. Sta. "UC" 20+53, Lt.
    Const. inlet Type G-2
    (For details, see drg. no. RD364)
11. Sta. "UC" 20+53, Rt.
    Const. inlet Type G-2
    Inst. 10" sew. pipe – 25'
12. Sta. "UC" 27+10, Lt.
    Const. inlet Type G-2
13. Sta. "UC" 27+04, Rt.
    Const. inlet Type G-2
    Inst. 10" sew. pipe – 25'
14. Sta. "UC" 21+20, 14', Rt.
    Const. outfall
    Inst. 10" sew. pipe – 67'
    Inst. class 50 riprap – 10 C.Y.
15. Sta. "UC" 26+53, 90', Rt.
    Const. outfall
    Inst. 10" sew. pipe – 99'
    Inst. class 50 riprap – 10 C.Y.
16. Const. water quality pond
17. Const. type CL-4R fence
    (See drg. no. RD815)

NOTE:
See sheet 5A for improvements to Jordan Cove Road.

LEGEND
Cut slope line
Fill slope line
Security fence

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 5

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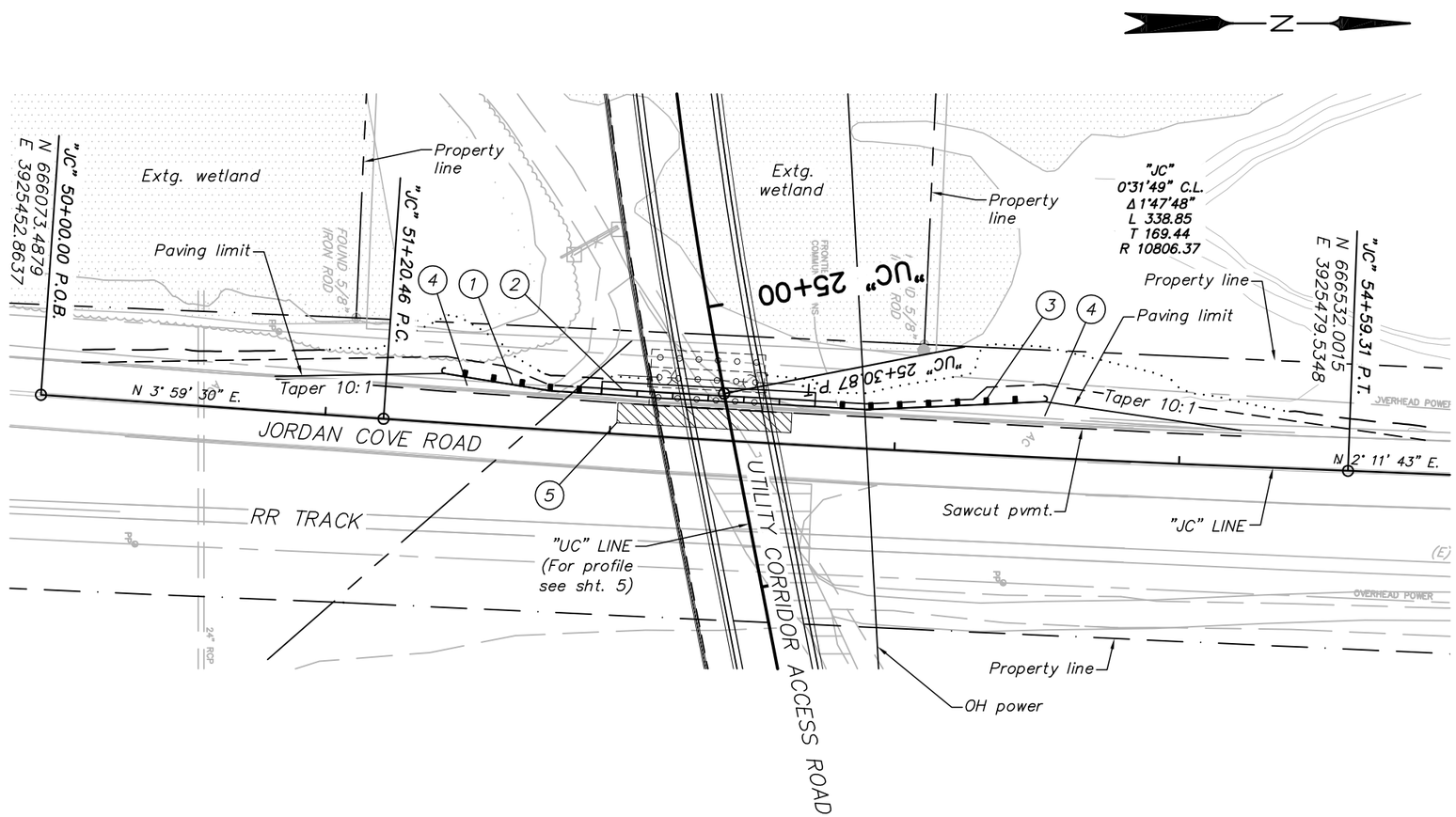
Sec. 4, T. 25 S., R. 13 W., W.M.



1. Sta. "JC" 51+40.65 to Sta. "JC" 51+96.20, Lt.
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, non–flared
   Test level – 2
   Const. guardrail to conc. barrier transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD420, & RD530)

2. Sta. "JC" 51+96.20 to Sta. "JC" 52+71.30, Lt.
   Const. conc. shldr. barrier – 75'
   Anchor barrier
   E=0
   (See drg. nos. RD500, RD516, & RD530)

3. Sta. "JC" 52+71.30 to Sta. "JC" 53+51.78, Lt.
   Const. guardrail – 25' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, non–flared
   Test level – 2
   Const. guardrail to conc. barrier transition

4. Const. AC pvmt. widening
   (For details, see sht. 2A)

5. Const. full depth pavement repair
   Match permanent pavement section
   (For details, see sht. 2A)

LEGEND
Cut slope line
Fill slope line

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 5A

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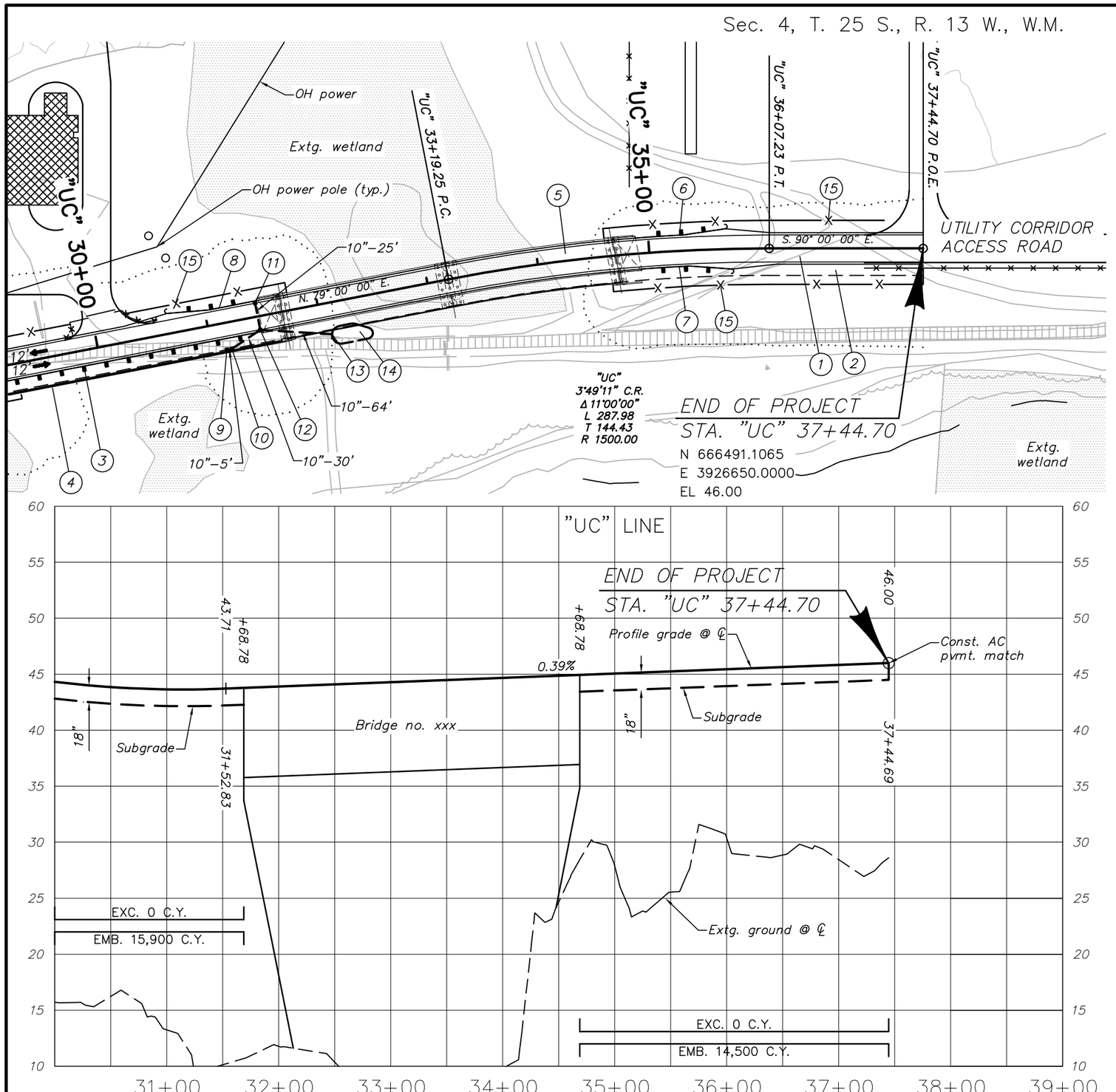

1. Const. Utility Corridor Access Road (For details, see sheets 2 & 2A)
2. Const. 10' Utility Corridor (For details, see sheets 2 & 2A)
3. See sht. 5, note 5
   Const. guardrail (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. Type "F" bridge rail to guardrail transition
4. See sht. 5, note 8
   Const. retaining wall
5. Const. bridge no. xxxx
   Const. structure – 300'
   Rdwy. width – 28' width utility platform, Rt.
   (For drg. nos., see sht. 1A)
6. Sta. "UC" 34+88.78 to Sta. "UC" 35+68.52, Lt.
   Const. guardrail – 12.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. 3'–6" Type "F" bridge rail to guardrail transition
7. Sta. "UC" 34+91.99 to Sta. "UC" 35+73.33, Rt.
   Const. guardrail – 12.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. Type "F" bridge rail to guardrail transition
8. Sta. "UC" 30+66.66 to Sta. "UC" 31+47.20, Lt.
   Const. guardrail – 12.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, flared
   Test level – 3
   W=4', E=0
   Const. 3'–6" Type "F" bridge rail to guardrail transition
9. Sta. "UC" 31+13, Rt.
   Const. inlet Type G–2
10. Sta. "UC" 31+18, Rt.
    Const. inlet Type G–2
    Inst. 10" sew. pipe – 5'
11. Sta. "UC" 31+46, Lt.
    Const. inlet Type G–2
12. Sta. "UC" 31+46, Rt.
    Const. inlet Type G–2
    Inst. 10" sew. pipe – 25'
    Inst. 10" sew. pipe – 30'
13. Sta. "UC" 32+08, 28', Rt.
    Const. outfall
    Inst. 10" sew. pipe – 64'
    Inst. class 50 riprap – 10 C.Y.
14. Const. water quality pond
15. Const. type CL–4R fence (See drg. no. RD815)

LEGEND
Cut slope line
Fill slope line
Security fence

–DRAFT–
NOT TO BE USED FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 6

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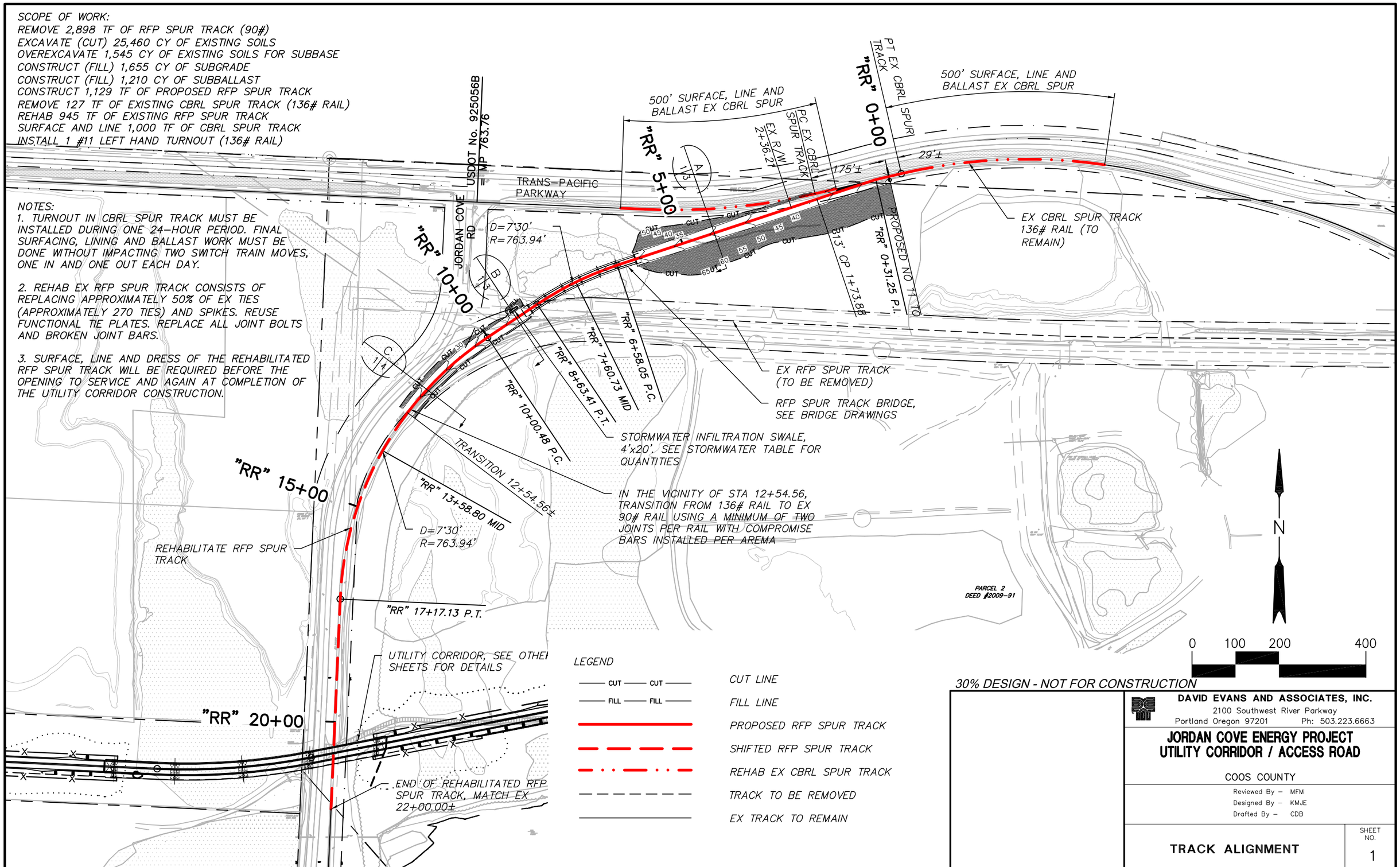
SCOPE OF WORK:
REMOVE 2,898 TF OF RFP SPUR TRACK (90#)
EXCAVATE (CUT) 25,460 CY OF EXISTING SOILS
OVEREXCAVATE 1,545 CY OF EXISTING SOILS FOR SUBBASE
CONSTRUCT (FILL) 1,655 CY OF SUBGRADE
CONSTRUCT (FILL) 1,210 CY OF SUBBALLAST
CONSTRUCT 1,129 TF OF PROPOSED RFP SPUR TRACK
REMOVE 127 TF OF EXISTING CBRL SPUR TRACK (136# RAIL)
REHAB 945 TF OF EXISTING RFP SPUR TRACK
SURFACE AND LINE 1,000 TF OF CBRL SPUR TRACK
INSTALL 1 #11 LEFT HAND TURNOUT (136# RAIL)

NOTES:
1. TURNOUT IN CBRL SPUR TRACK MUST BE INSTALLED DURING ONE 24-HOUR PERIOD. FINAL SURFACING, LINING AND BALLAST WORK MUST BE DONE WITHOUT IMPACTING TWO SWITCH TRAIN MOVES, ONE IN AND ONE OUT EACH DAY.

2. REHAB EX RFP SPUR TRACK CONSISTS OF REPLACING APPROXIMATELY 50% OF EX TIES (APPROXIMATELY 270 TIES) AND SPIKES. REUSE FUNCTIONAL TIE PLATES. REPLACE ALL JOINT BOLTS AND BROKEN JOINT BARS.

3. SURFACE, LINE AND DRESS OF THE REHABILITATED RFP SPUR TRACK WILL BE REQUIRED BEFORE THE OPENING TO SERVICE AND AGAIN AT COMPLETION OF THE UTILITY CORRIDOR CONSTRUCTION.



30% DESIGN - NOT FOR CONSTRUCTION

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

Reviewed By – MFM
Designed By – KMJE
Drafted By – CDB

TRACK ALIGNMENT

SHEET NO. 1

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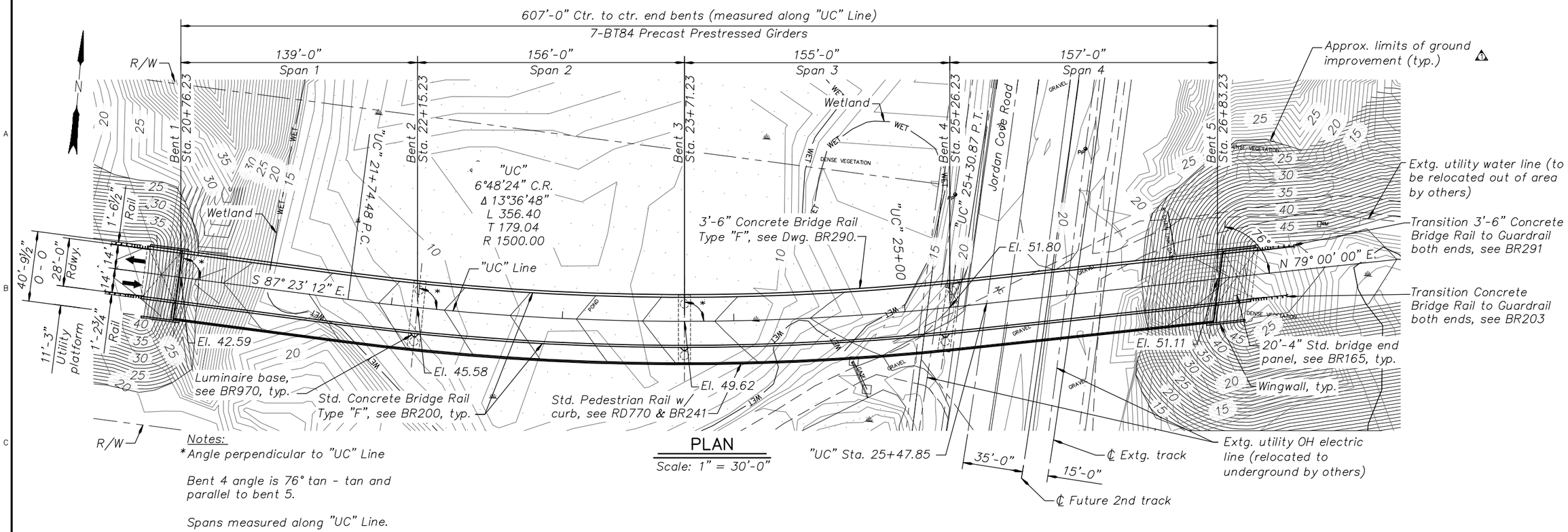


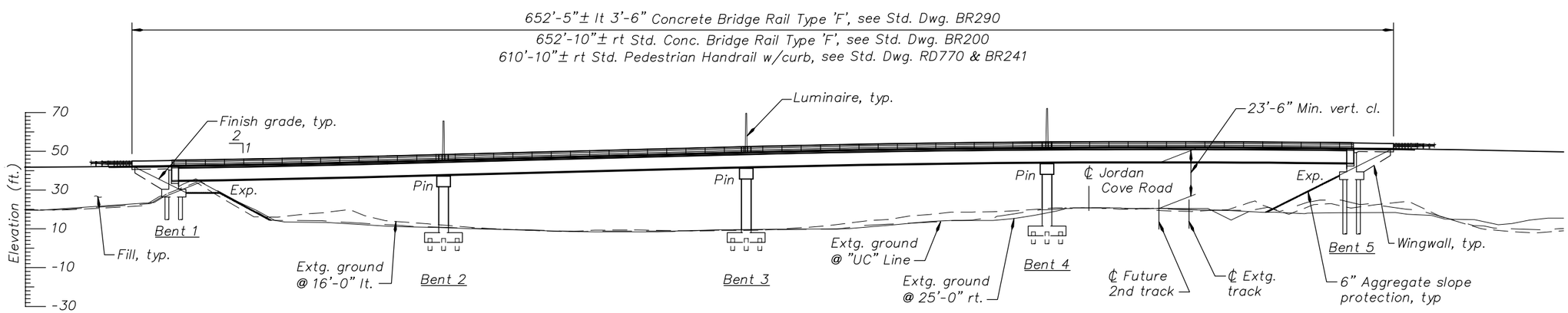
Notes:
*Angle perpendicular to "UC" Line

Bent 4 angle is 76° tan - tan and parallel to bent 5.

Spans measured along "UC" Line.

PLAN

Scale: 1" = 30'-0"



Notes:
Elevations are based on North American Vertical Datum 1988 (NAVD88).

DEVELOPED ELEVATION

Scale: 1" = 30'-0"

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ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	07/23/2014	ADDED GROUND IMPROVEMENT LIMITS	ACM	DMJ			BSN

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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR O'XING RR & JORDAN COVE RD
PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER | REV –
CODE
AREA
B101

General Notes:
Provide all materials and perform all work according to the Oregon Standard Specifications for Construction 2008.

Bridge is designed in accordance with the 2012 AASHTO LRFD Bridge Design Specifications (including interim revisions) and the 2004 ODOT Bridge Design & Drafting Manual (BDDM), updated August 2012. Design for tsunami loading was not considered.

Seismic design is performed by multi-mode analysis in accordance with the 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design as modified by the ODOT Bridge Design & Drafting Manual (revised August 2012) for the 500-year (Serviceable) and 1000-year (No Collapse) and Seismic Design Category D design criteria.

Design includes an allowance of 25 psf for future wearing surface and the following Live Loads according to the 2012 AASHTO LRFD Bridge Design Specifications (including interim revisions). Design assumes ground improvements as recommended in Preliminary Geotechnical Report, GRI, dated July 17, 2014.

Service and Strength-I Limit States:
HL-93: Design truck or the design tandems and the design lane load.

Strength-II Limit States:
ODOT Type STP-5BW Permit truck
ODOT Type STP-4E Permit truck

Provide vertical column reinforcement according to ASTM Specification A706. No splice of vertical column reinforcement is permitted.

Provide spiral column reinforcement according to ASTM Specification A706, AASHTO Specifications M31 (ASTM A615) Grade 60, AASHTO M225 (ASTM A496), or AASHTO M32 (ASTM A82).

Provide all other reinforcing steel according to ASTM Specification A706, or AASHTO M31 (ASTM A615) Grade 60.
Provide field bent or welded reinforcement according to ASTM Specification A706.

Use epoxy coated reinforcing steel in deck and bridge end panel.

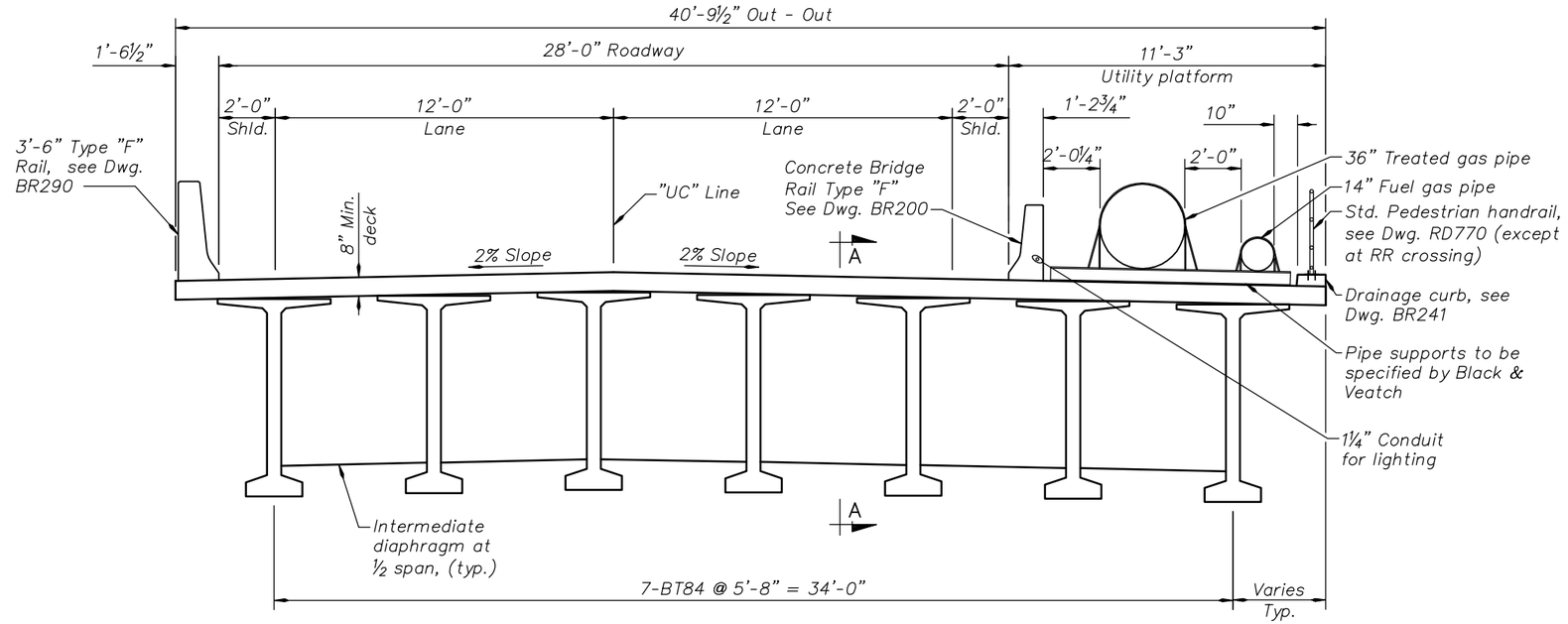
Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

Provide Class HPC4000 - 1½", 1", or ¾" concrete in bridge deck and bridge end panels.

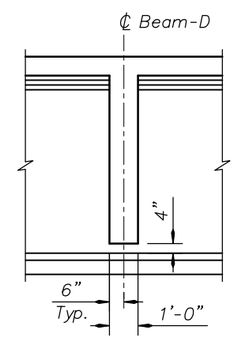
Provide Class 4000 -¾" concrete in cross beam, intermediate diaphragm, end diaphragm, and columns.

Provide Class 4000 - 1½" or 1", concrete for all footings.
Provide Class 4000 - 1½", 1", or ¾" concrete for all other concrete.

See Foundation Plan for foundation design notes.

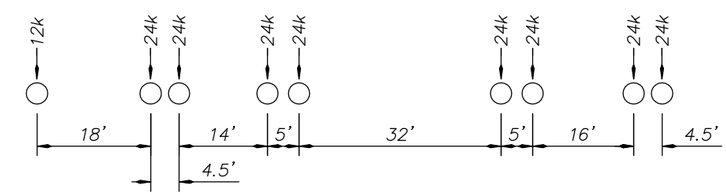


TYPICAL DECK SECTION
Scale: 3/8" = 1'-0"

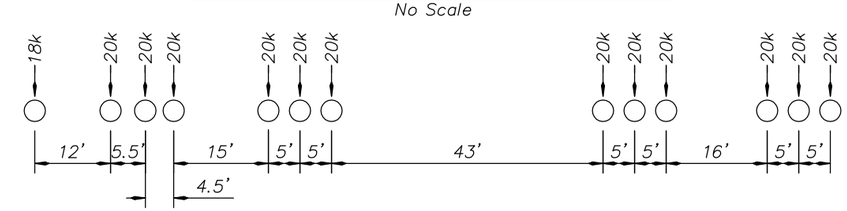


(BEAM-D)
SECTION A-A
Scale: 3/8" = 1'-0"

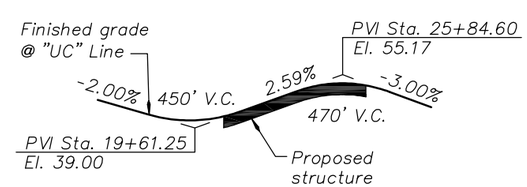
Description	Reinforcing (lbs/CY)
Deck	225
Beam-D	200



OR-STP-5BW PERMIT TRUCK DIAGRAM
No Scale



OR-STP-4E PERMIT TRUCK DIAGRAM
No Scale



GRADELINE DIAGRAM
No Scale

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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR O'XING RR & JORDAN COVE RD
GENERAL NOTES AND TYPICAL DECK SECTION

PROJECT 142488– DRAWING NUMBER B102 REV –
CODE
AREA

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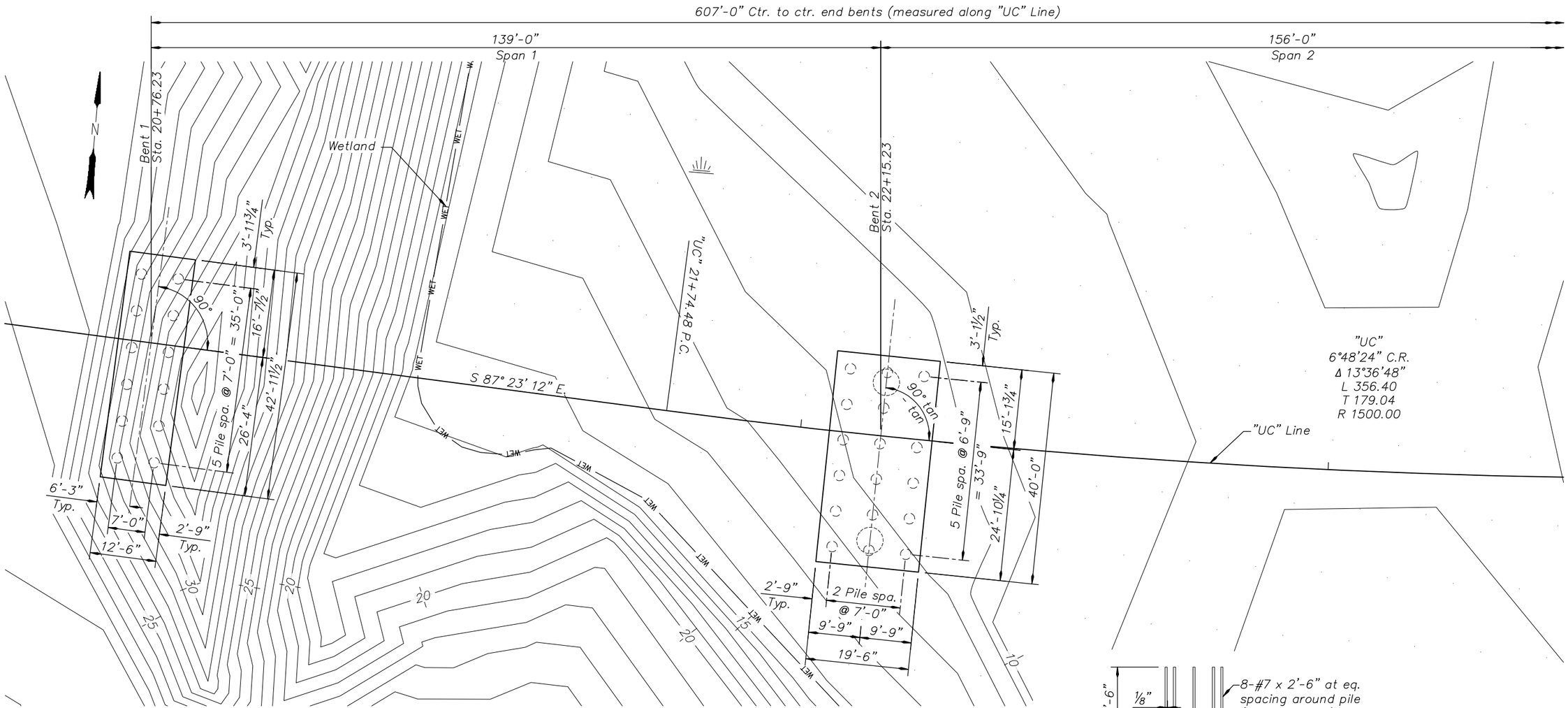
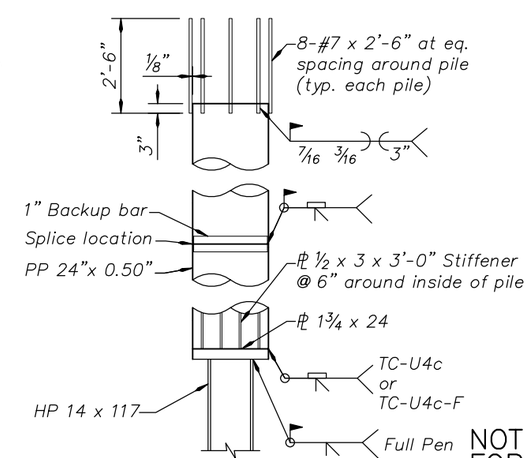


PLAN

Scale: 1" = 10'-0"



PILE DETAIL

No Scale

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FOUNDATION DESIGN NOTES:

Spans measured along "UC" Line.

Provide PP 24 x 0.5 ASTM A252, Grade 3 and HP 14 x 117 ASTM A572, Grade 50 for all bents.

All PP 24 x 0.5 sections to be filled with Class 4000- ¾" concrete with 8-#8 x cont., typ.

Determine nominal pile bearing resistance from the results of Pile Dynamic Analyzer (PDA) Testing.

Cut-off / top El: Recommend including 8' of cut-off length per pile or include pile splices in estimate in case pile runs long, typical all bents.

FOUNDATION TABLE

Location	Type	Est. tip El.	Cut-off / top El
		(Feet)	
Bent 1	PP 24" x 0.5"	-17.91	29.09
	HP14 x 117	-42.91	-
Bent 2	PP 24" x 0.5"	-42.00	6
	HP14 x 117	-67.00	-

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
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COOS BAY, OREGON

UTILITY CORRIDOR O'XING RR & JORDAN COVE RD
FOUNDATION PLAN (1 OF 3)

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B103

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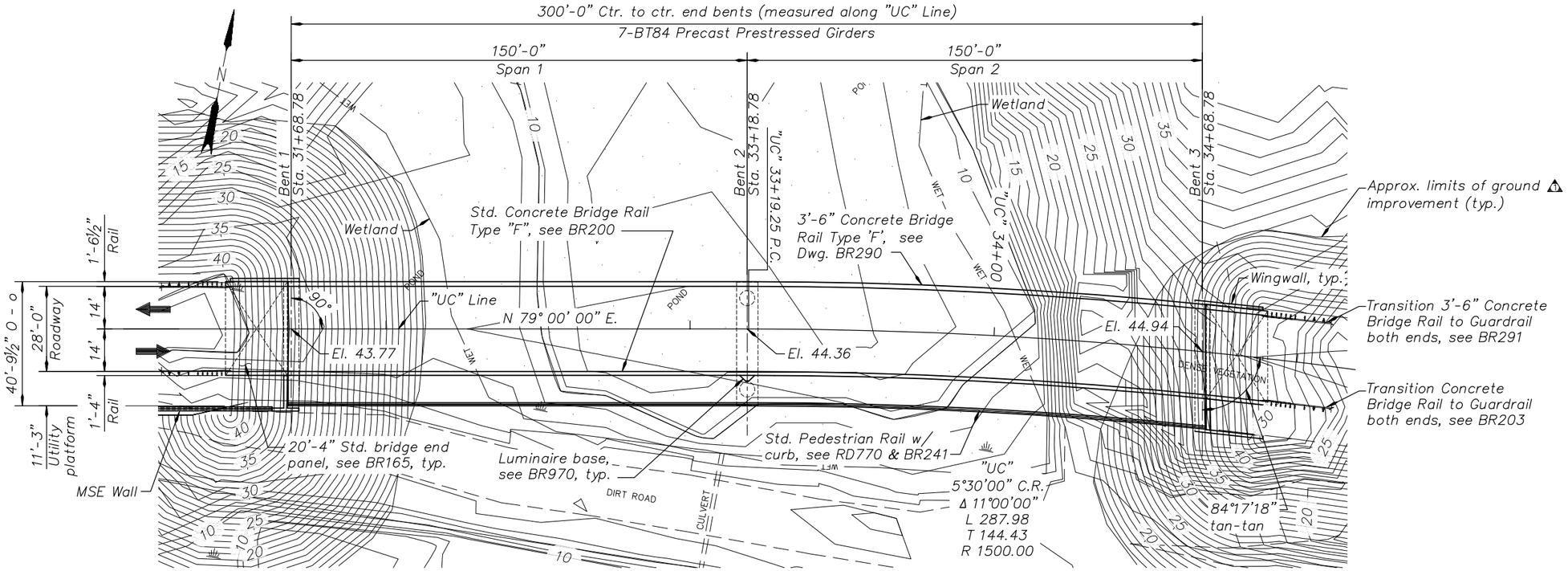
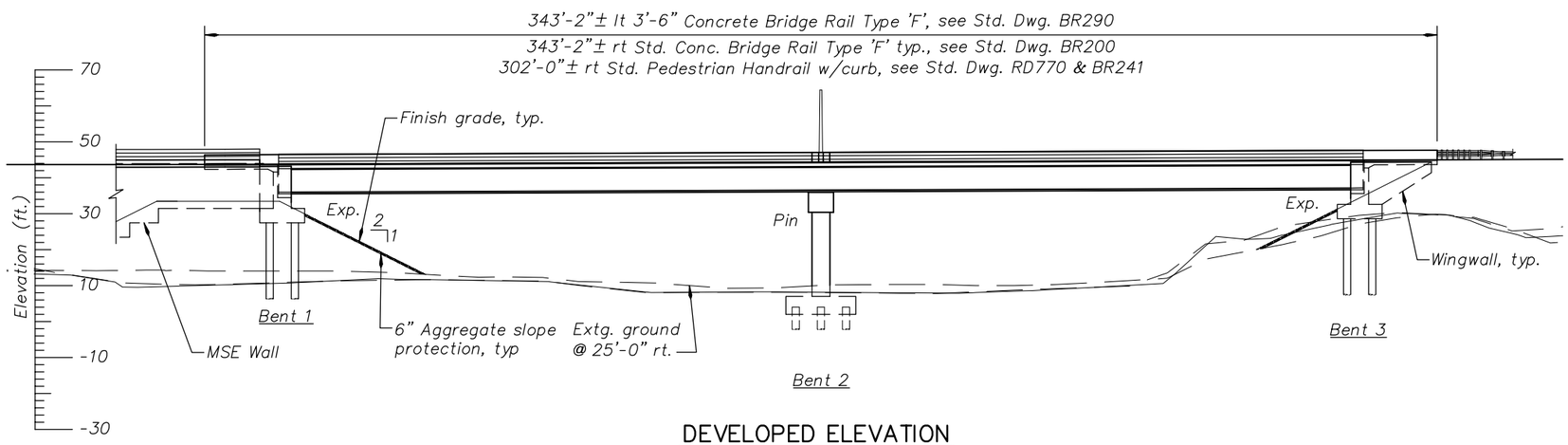


PLAN

Scale: 1" = 20'-0"

Notes:
All Bents are parallel.

Spans measured along "UC" Line.



DEVELOPED ELEVATION

Scale: 1" = 20'-0"

Notes:
Elevations are based on North American
Vertical Datum 1988 (NAVD88).

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1	07/23/2014	ADDED GROUND IMPROVEMENT LIMITS	ACM	DMJ			BSN

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UTILITY CORRIDOR OVER WETLAND
PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER B201 | REV –

CODE | AREA

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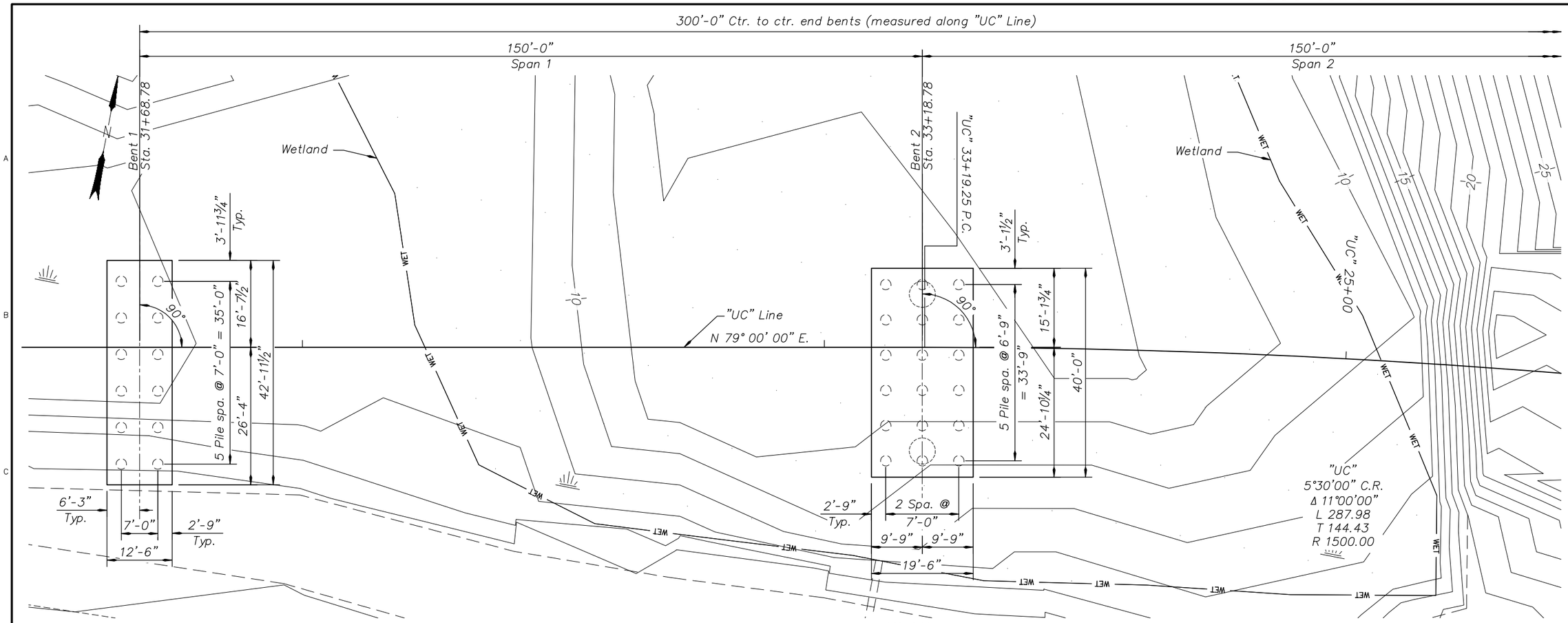
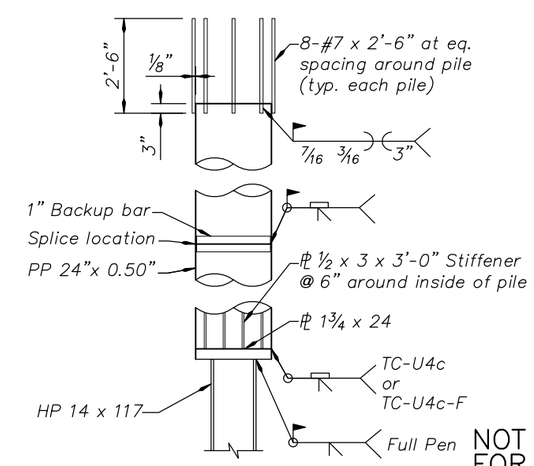


PLAN

Scale: 1" = 10'-0"



PILE DETAIL

No Scale

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FOUNDATION DESIGN NOTES:

Provide PP 24 x 0.5 ASTM A252, Grade 3 and HP 14 x 117 ASTM A572, Grade 50 for all bents.

All PP 24 x 0.5 sections to be filled with Class 4000- ¾" concrete with 8-#8 x cont., typ.

Determine nominal pile bearing resistance from the results of Pile Dynamic Analyzer (PDA) Testing.

Cut-off / top El: Recommend including 8' of cut-off length per pile or include pile splices in estimate in case pile runs long, typical all bents.

FOUNDATION TABLE

Location	Type	Est. tip El.	Cut-off / top El
		(Feet)	
Bent 1	PP 24" x 0.5"	7.50	29.50
	HP14 x 117	-17.50	-
Bent 2	PP 24" x 0.5"	-26.00	4.00
	HP14 x 117	-51.00	-

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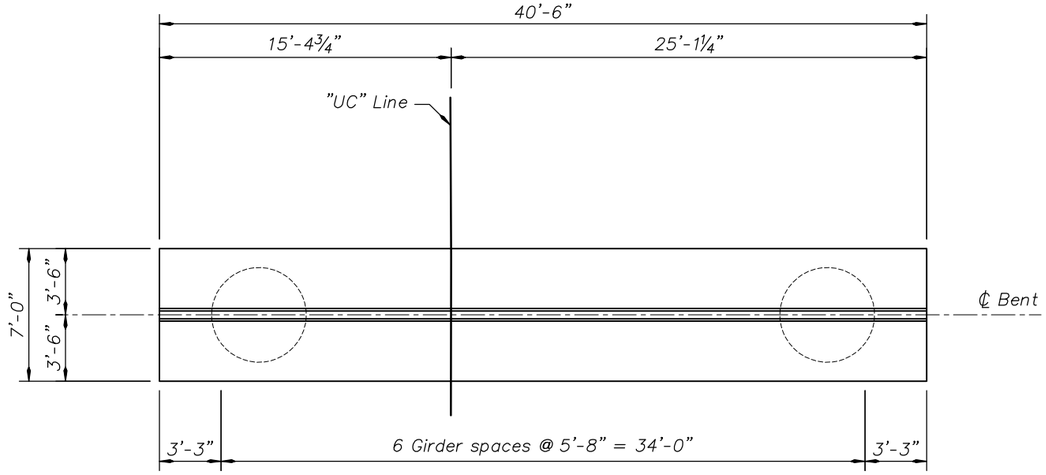
UTILITY CORRIDOR OVER WETLAND
FOUNDATION PLAN (1 OF 2)

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B203

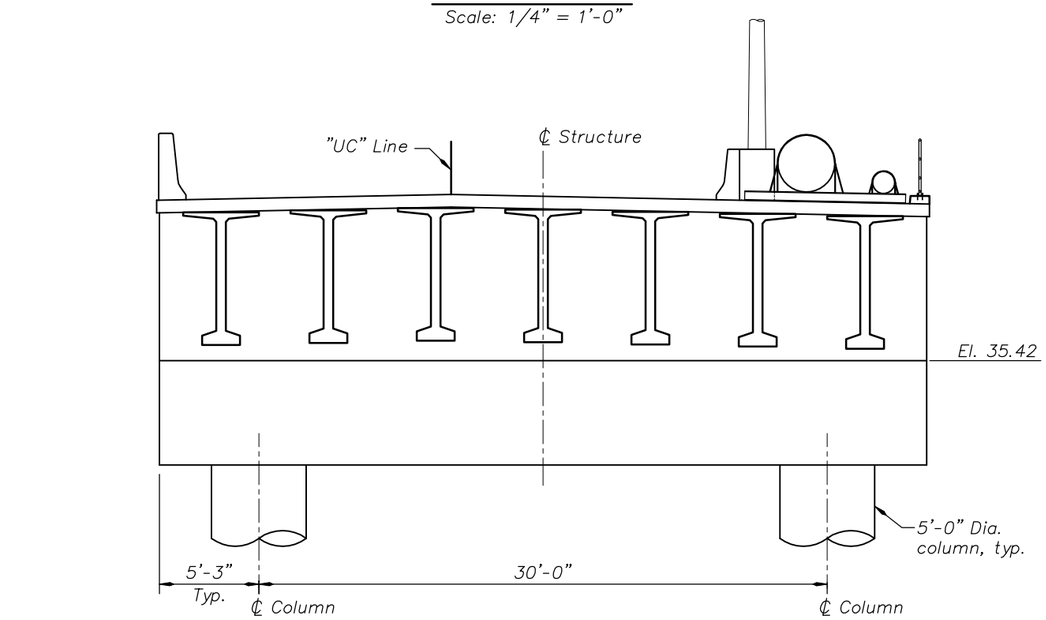
ALAN MITCHELL D1 ACAD G.204.0, SP2
A1ASL015 1=1
6/11/2014 10:42 AM

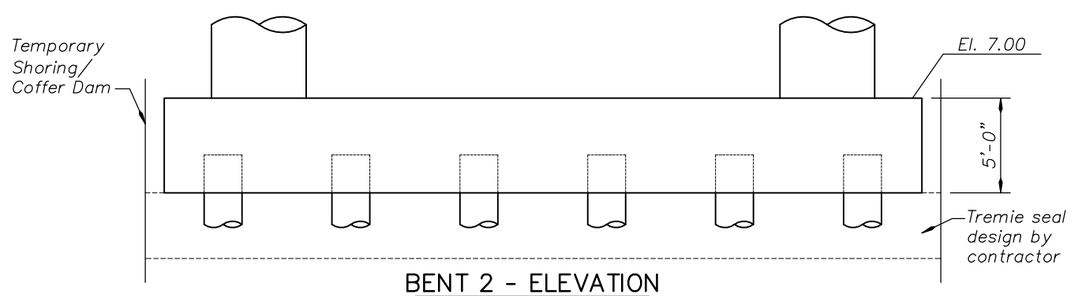


BENT 2 - PLAN

Scale: 1/4" = 1'-0"

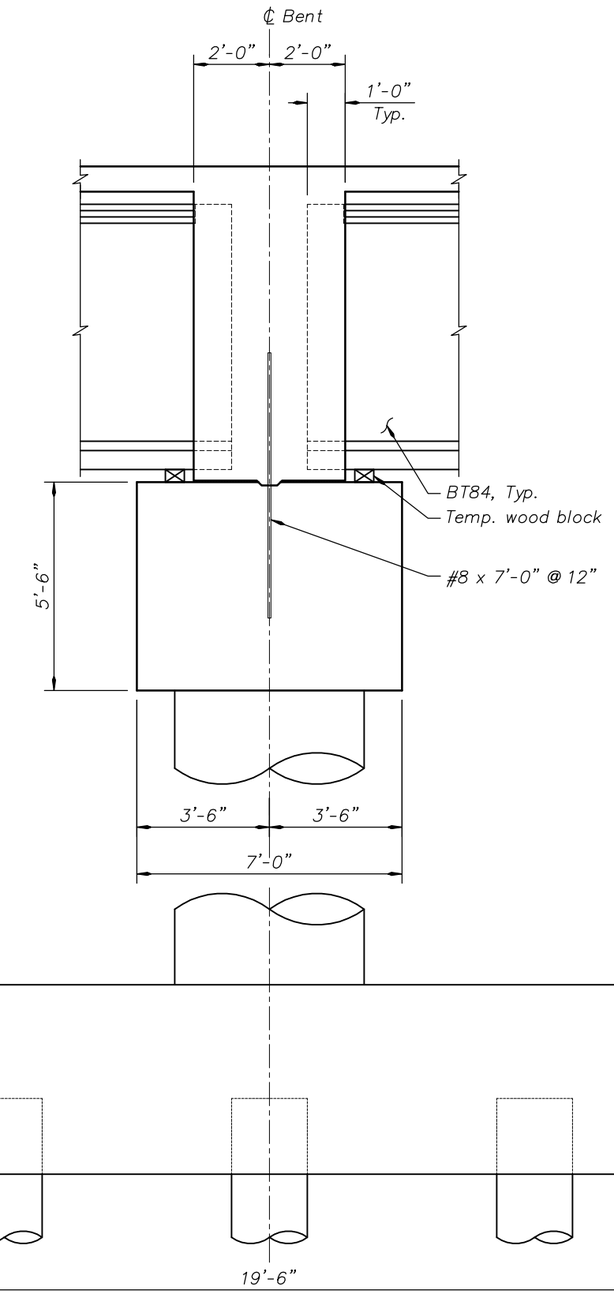
Description	Reinforcing (lbs/CY)
Diaphragm	150
Cross Beam	325
Column	425 1
Pile cap	200





BENT 2 - ELEVATION

Scale: 1/4" = 1'-0"



BENT 2 - SECTION

Scale: 1/2" = 1'-0"

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	07/23/2014	MODIFIED NOTE	ACM	DMJ			BSN

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BLACK & VEATCH CORPORATION

ENGINEER AJC | DRAWN ACM | CHECKED – | DATE mm-dd-yy

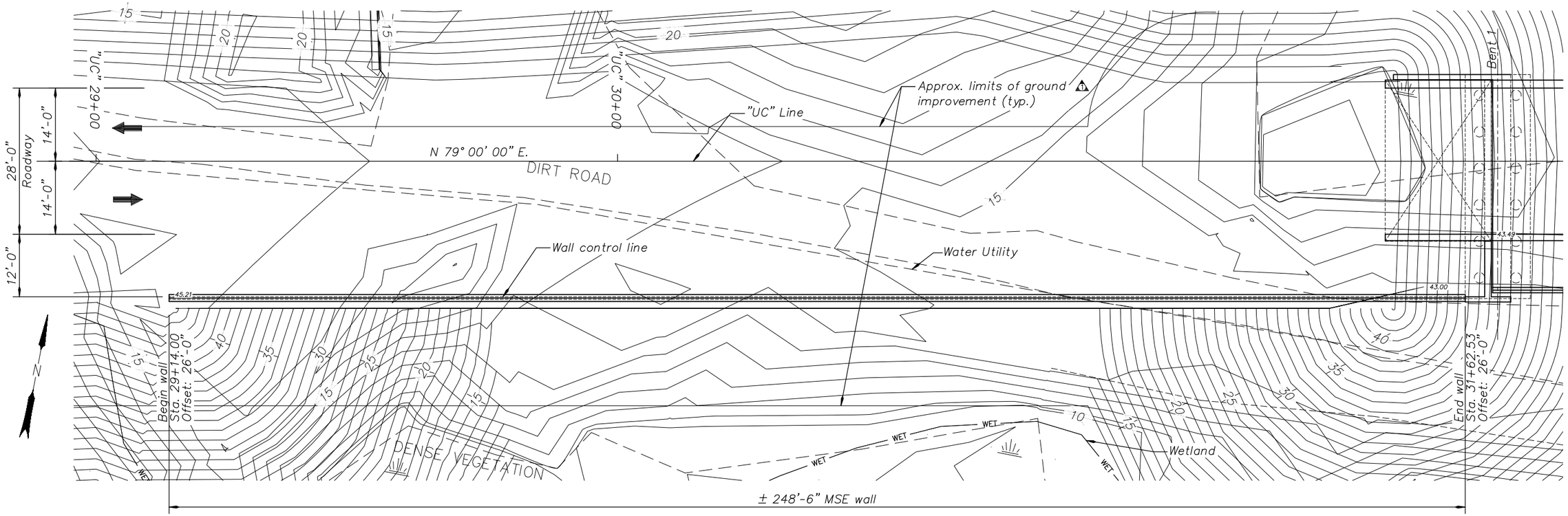
JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR OVER WETLAND
INTERIOR BENT PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER | REV –

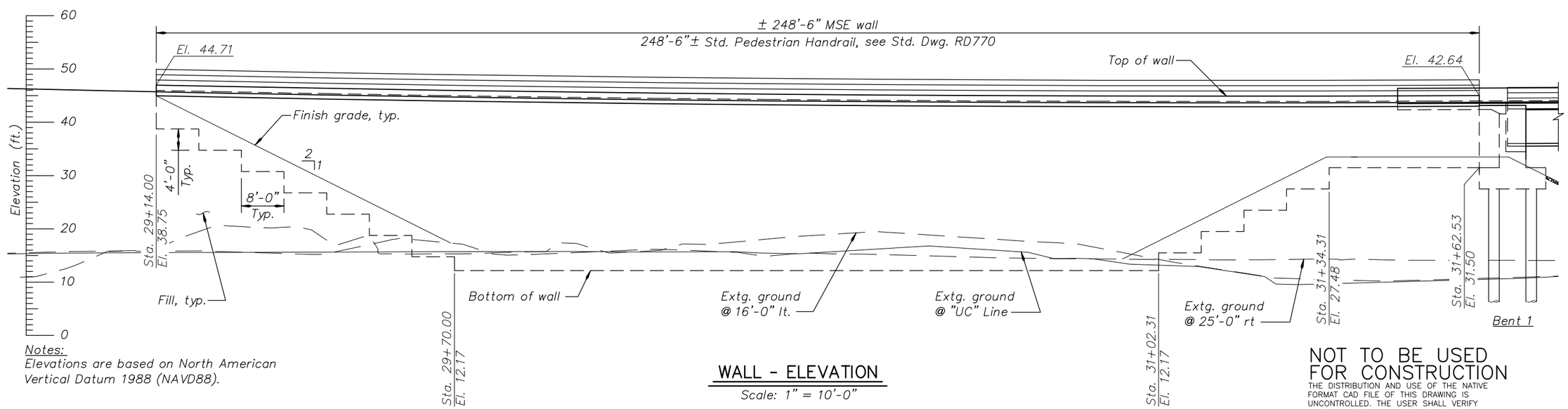
CODE | AREA | B206

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM



WALL - PLAN

Scale: 1" = 10'-0"



Notes:
Elevations are based on North American Vertical Datum 1988 (NAVD88).

WALL - ELEVATION

Scale: 1" = 10'-0"

NOT TO BE USED FOR CONSTRUCTION

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	07/23/2014	ADDED GROUND IMPROVEMENT LIMITS	ACM	DMJ			BSN

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BLACK & VEATCH CORPORATION

ENGINEER AMW | DRAWN ACM | CHECKED – | DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR RETAINING WALL
GENERAL NOTES AND TYPICAL WALL SECTION

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B301

ALAN MITCHELL D1 3:20 PM ACAD G.204.0, SP2
A1ASL015 1=1
7/22/2014

General Notes:
Provide all materials and perform all work according to the Oregon Standard Specifications for Construction 2008.

Mechanically stabilized earth (MSE) walls shall be designed (in order of precedence) in accordance with the following:
- AASHTO LRFD Bridge Design Specifications (as modified by the ODOT Geotechnical Design Manual (GDM); and
- Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, NHI-10-024 and NHI-10-025 (FHWA, 2009).

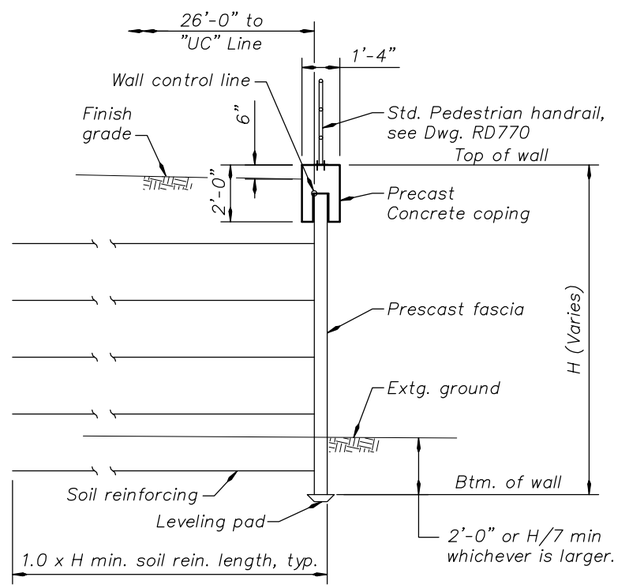
Unless otherwise noted, MSE wall analysis and design shall assume the following geotechnical properties for the reinforced MSE wall backfill:
- Friction angle of backfill: $\varphi = 34°$
- Backfill cohesion: c = 0 psf
- Wet unit weight of backfill: wet = 130.0 pcf
- Active lateral earth pressure coefficient (ka) for wall design shall be calculated using the Coulomb earth pressure theory in accordance with AASHTO Article 3.11.5.3 and Section 15.3.10.

Design assumes ground improvements as recommended in Preliminary Geotechnical Report, GRI, dated July 17, 2014.

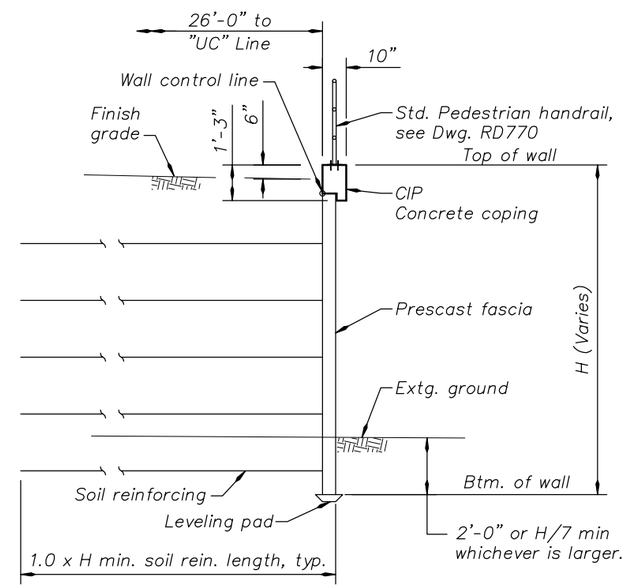
Design for tsunami loading was not considered.

Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

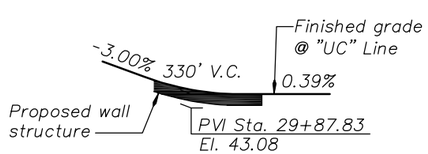
Provide Class 4000 - 1½", 1", or ¾" concrete for Cast-in-place coping.



PRECAST COPING
TYPICAL MSE WALL SECTION
Scale: 3/8" = 1'-0"



CAST-IN-PLACE COPING (OPTIONAL)
TYPICAL MSE WALL SECTION
Scale: 3/8" = 1'-0"



GRADELINE DIAGRAM
No Scale

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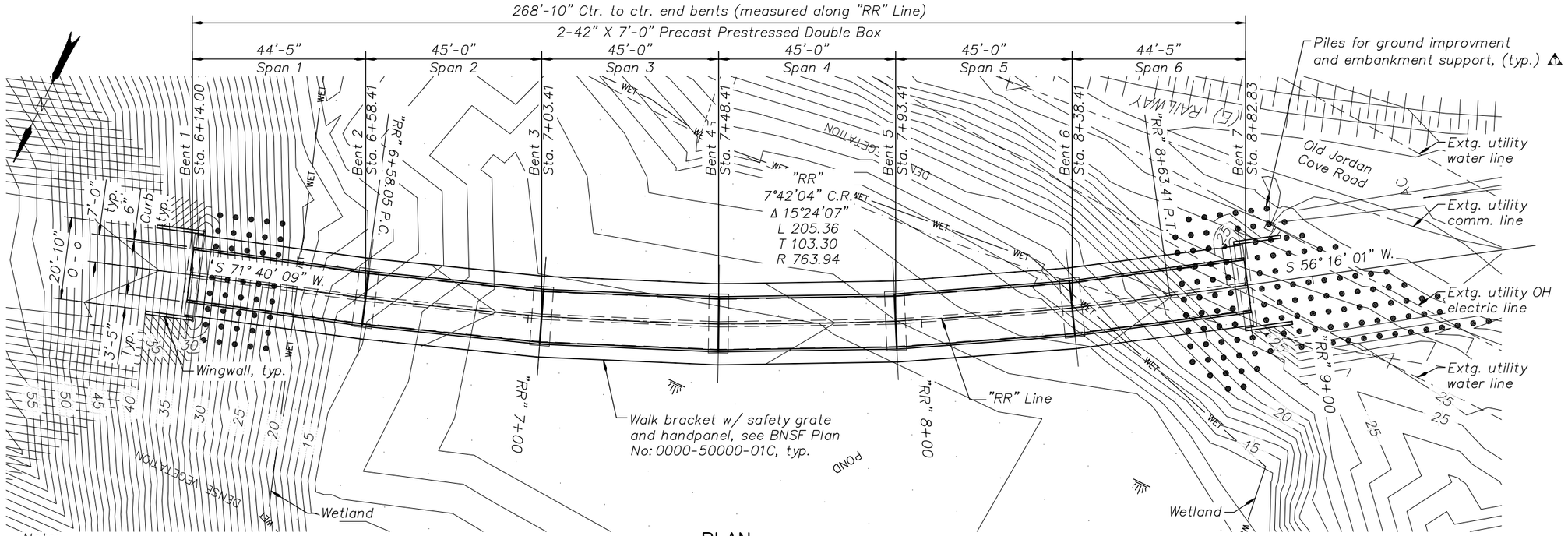
ENGINEER AMW | DRAWN ACM
CHECKED – | DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR RETAINING WALL
GENERAL NOTES AND TYPICAL WALL SECTION

PROJECT 142488– | DRAWING NUMBER | REV –
CODE | AREA | B302

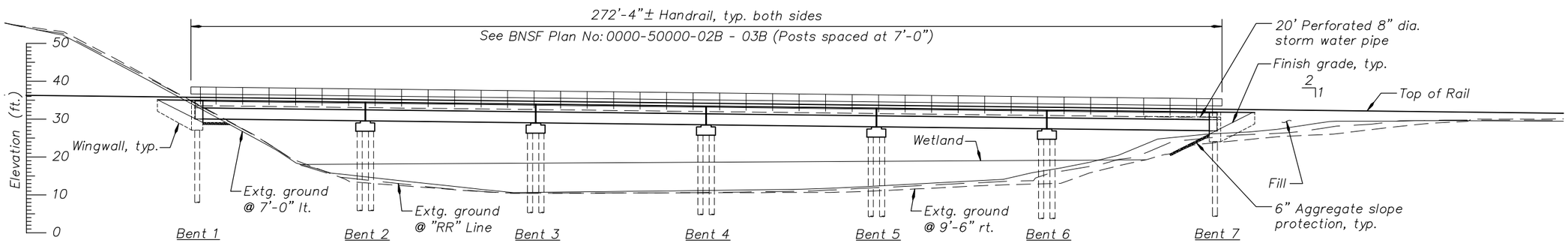
ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
6/11/2014 10:42 AM



Note:
All Bents are perpendicular to "RR" line.

PLAN

Scale: 1" = 15'-0"



Notes:
Elevations are based on North American Vertical Datum 1988 (NAVD88).

DEVELOPED ELEVATION

Scale: 1" = 15'-0"

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	07/23/2014	ADDED GROUND IMPROVEMENT PILES	ACM	DMJ			BSN

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CHECKED – DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

RAIL SPUR
PLAN AND ELEVATION

PROJECT 142488– DRAWING NUMBER REV –
CODE
AREA
B401

ALAN MITCHELL ACAD G.204.0, SP2
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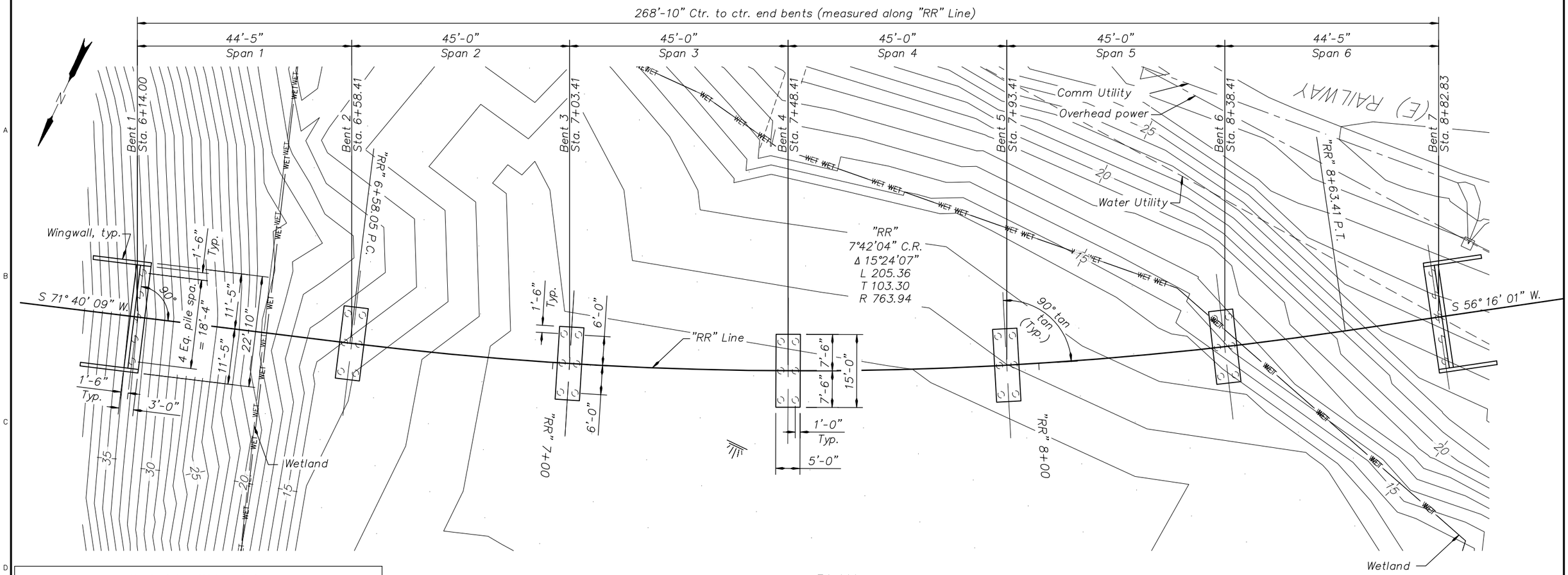
7/22/2014 3:20 PM



PLAN

Scale: 1" = 10'-0"

FOUNDATION TABLE

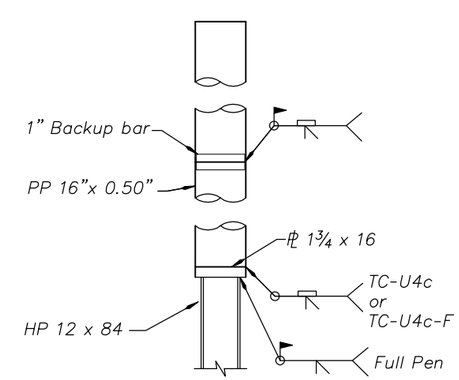
Location	Type	Est. tip El.	Cut-off / top El
		(Feet)	
Bent 1	PP 16" x 0.5"	10.00	27.95
	HP12 x 84	-15.00	-
Bent 2	PP 16" x 0.5"	-20.00	26.79
	HP12 x 84	-45.00	-
Bent 3	PP 16" x 0.5"	-20.00	26.27
	HP12 x 84	-45.00	-
Bent 4	PP 16" x 0.5"	-20.00	25.75
	HP12 x 84	-45.00	-
Bent 5	PP 16" x 0.5"	-20.00	25.23
	HP12 x 84	-45.00	-
Bent 6	PP 16" x 0.5"	-18.00	24.71
	HP12 x 84	-43.00	-
Bent 7	PP 16" x 0.5"	-2.00	24.86
	HP12 x 84	-27.00	-

FOUNDATION DESIGN NOTES:

Spans measured along "RR" Line.

Provide PP 16 x 0.5 ASTM A252, Grade 3 and HP 12 x 84 ASTM A572, Grade 50 for all bents.

Determine nominal pile bearing resistance from the results of Pile Dynamic Analyzer (PDA) Testing.



PILE DETAIL

No Scale

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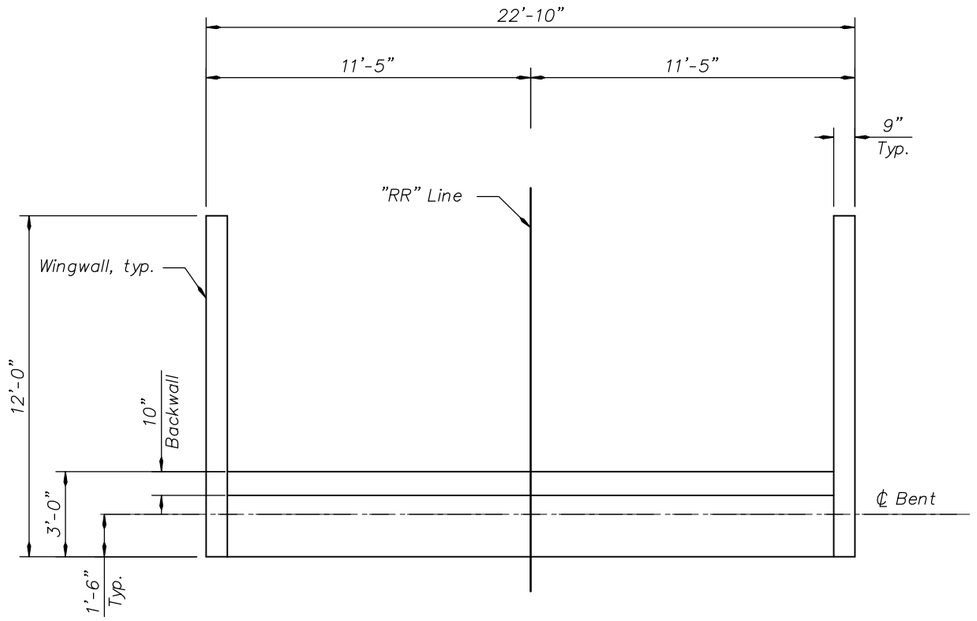
JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

RAIL SPUR
FOUNDATION PLAN

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B403

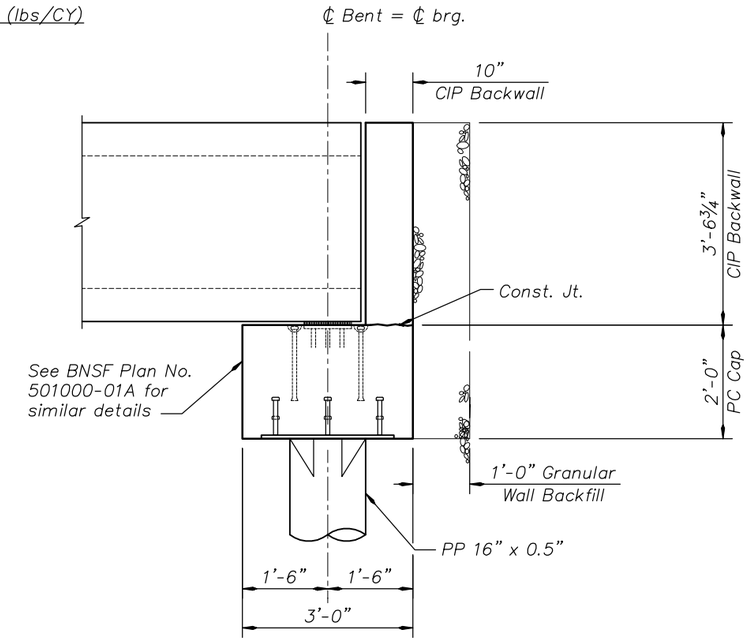
ALAN MITCHELL D1 6/11/2014 10:42 AM A1ASL015 ACAD 6.204.0, SP2 1=1



BENT 7 - PLAN

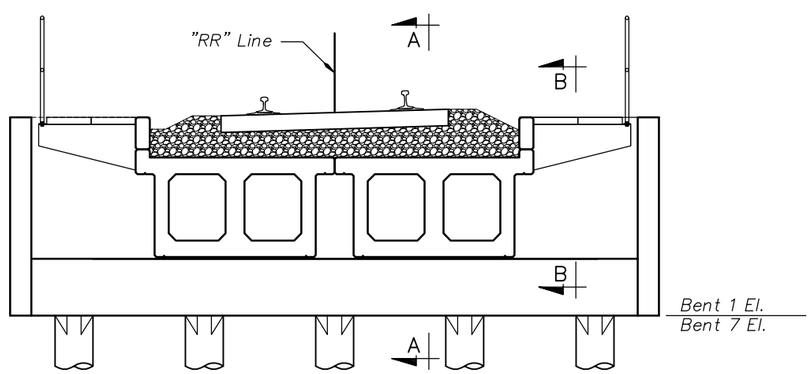
Scale: 3/8" = 1'-0"

Description	Reinforcing (lbs/CY)
Bent	200
Wing Wall	150



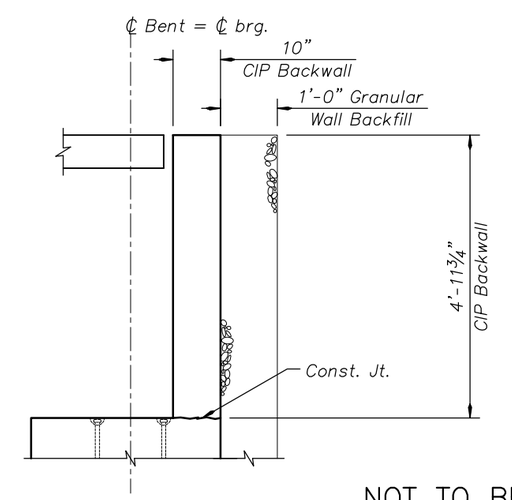
SECTION A-A

Scale: 3/4" = 1'-0"



BENT 7 - ELEVATION

Scale: 3/8" = 1'-0"



SECTION B-B

Scale: 3/4" = 1'-0"

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BLACK & VEATCH CORPORATION

ENGINEER DS | DRAWN ACM | CHECKED – | DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

RAIL SPUR
BENT 7 PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B404

ALAN MITCHELL ACAD G.204.0, SP2
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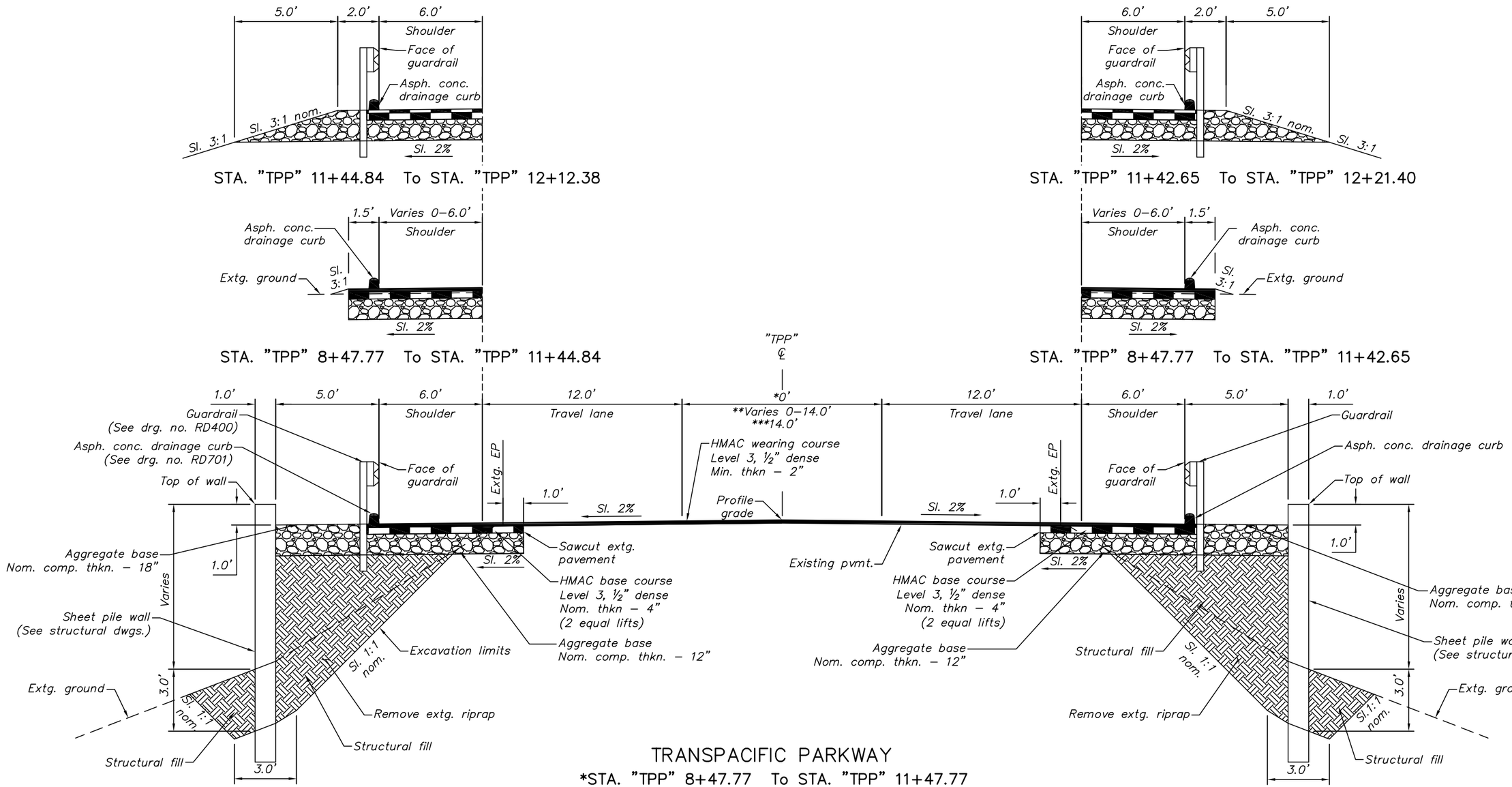

TRANSPACIFIC PARKWAY

*STA. "TPP" 8+47.77 To STA. "TPP" 11+47.77

** "TPP" 11+47.77 To "TPP" 14+47.77

*** "TPP" 14+47.77 To "TPP" 17+17.73

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PKWY. / US101 INTERSECTION

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

TYPICAL SECTION

SHEET NO. 2

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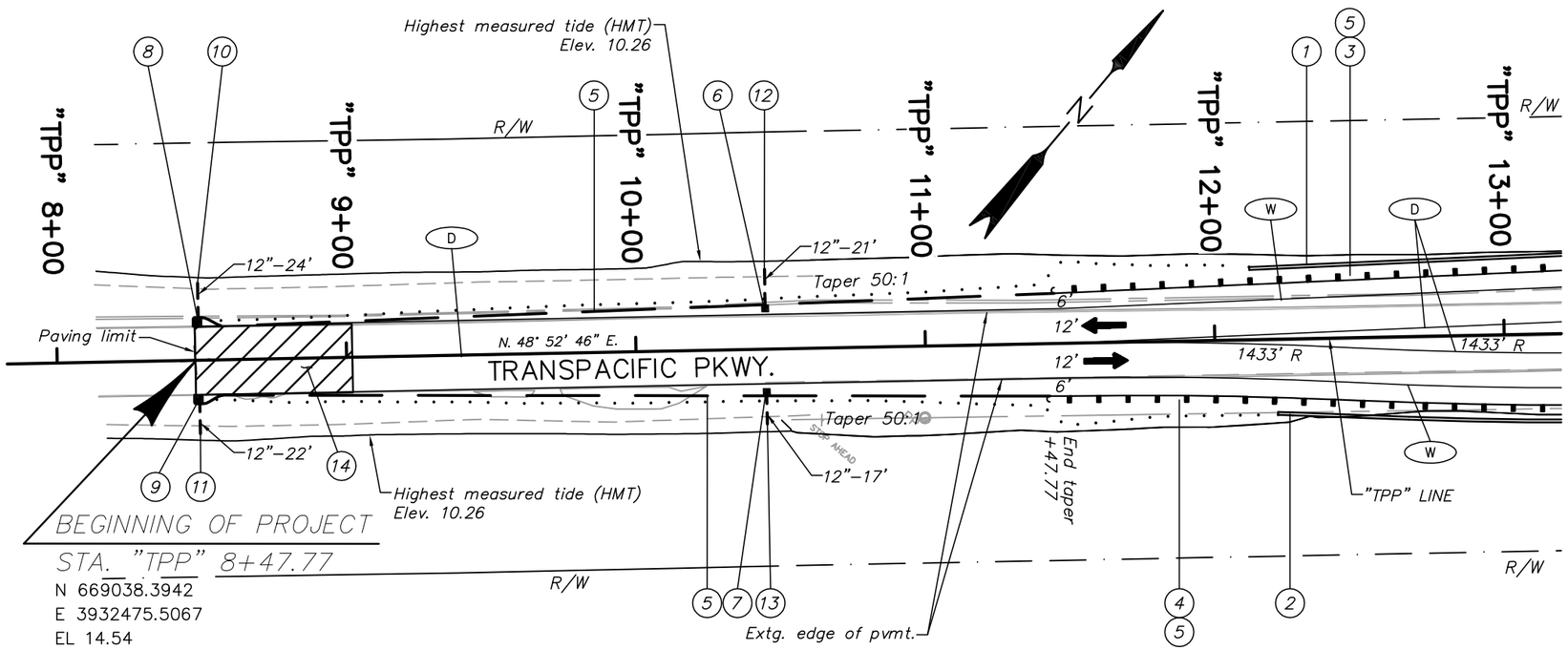
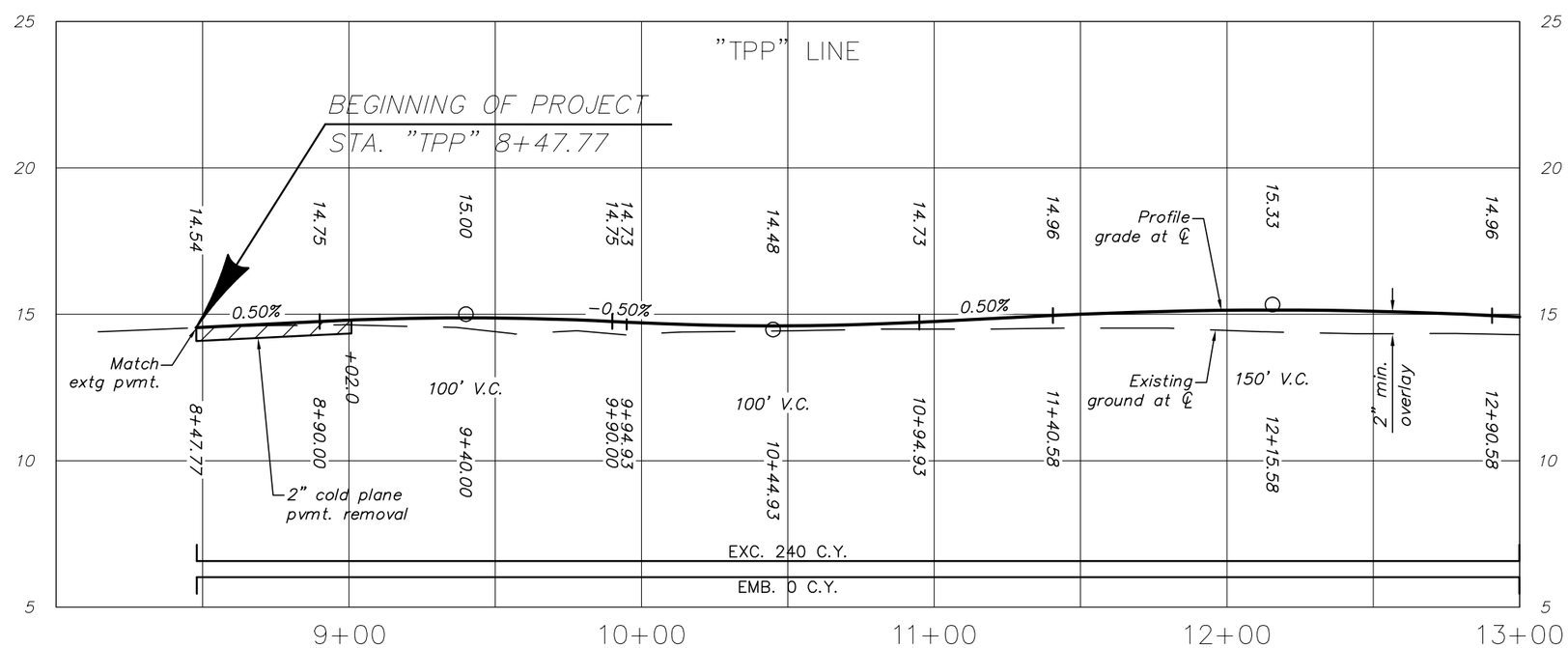
Sec. 34, T. 24 S., R. 13 W., W.M.



1. Structure no. xxxx
   Sta. "TPP" 12+12.38 to Sta. "TPP" 17+02.96, Lt.
   Const. retaining wall
   (For drg. nos., see sht. 1A)
2. Structure no. xxxx
   Sta. "TPP" 12+21.40 to Sta. "TPP" 16+50.60, Rt.
   Const. retaining wall
   (For drg. nos., see sht. 1A)
3. Sta. "TPP" 11+44.84 to Sta. "TPP" 17+08.68, Lt.
   Const. guardrail – 575' (Type 2A)
   Const. guardrail terminal, non–flared (L=37.5')
   Test level – 3
   W=1, E=0
   (See drg. nos. RD400, RD405, RD410, RD415, & RD420)
4. Sta. "TPP" 11+42.65 to Sta. "TPP" 17+08.32, Rt.
   Const. guardrail – 575' (Type 2A)
   Const. guardrail terminal, non–flared (L=37.5')
   Test level – 3
   W=1, E=0
   (See drg. nos. RD400, RD405, RD410, RD415, & RD420)
5. Const. asph. conc. drainage curb
   (See drg. no. RD701)
6. Sta. "TPP" 10+45, Lt.
   Const. water quality inlet
   (For details, see sht. 2B)
7. Sta. "TPP" 10+45, Rt.
   Const. water quality inlet
   (For details, see sht. 2B)
8. Sta. "TPP" 8+49, Lt.
   Const. water quality inlet
   (For details, see sht. 2B)
9. Sta. "TPP" 8+49, Rt.
   Const. water quality inlet
   (For details, see sht. 2B)
10. Sta. "TPP" 8+49, Lt.
    Const. outfall
    Inst. 12" sew. pipe – 24'
11. Sta. "TPP" 8+49, Rt.
    Const. outfall
    Inst. 12" sew. pipe – 22'
12. Sta. "TPP" 10+45, Lt.
    Const. outfall
    Inst. 12" sew. pipe – 21'
13. Sta. "TPP" 10+45, Rt.
    Const. outfall
    Inst. 12" sew. pipe – 17'
14. 2" cold plane pvmt.
    removal – 143 S.Y.



STRIPING LEGEND

- (D) Inst. double no–pass
- (W) Inst. 4" white line

LEGEND

Cut slope line ——— ——— ———

Fill slope line · · · · · · · · ·

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DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PKWY. / US101 INTERSECTION

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 3

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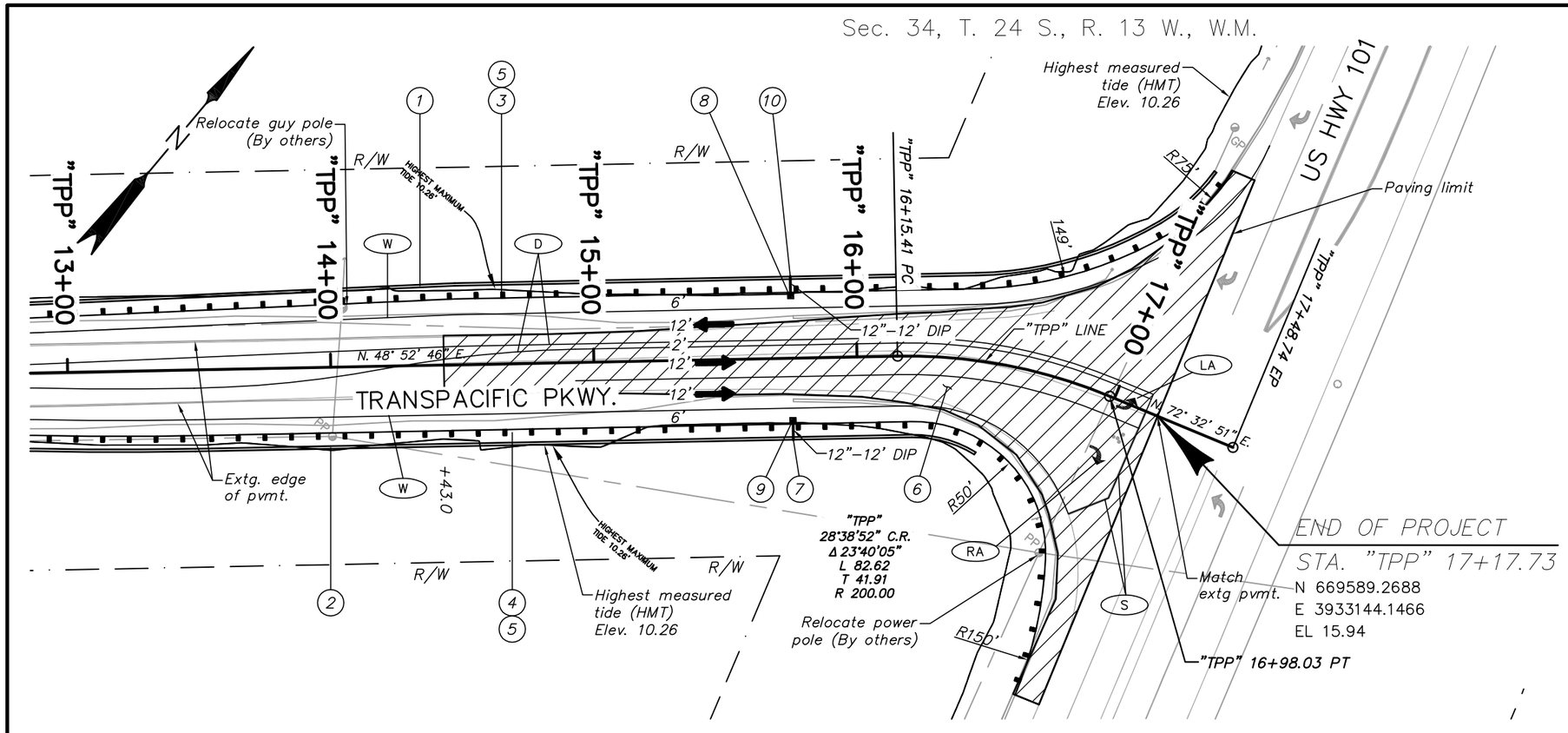
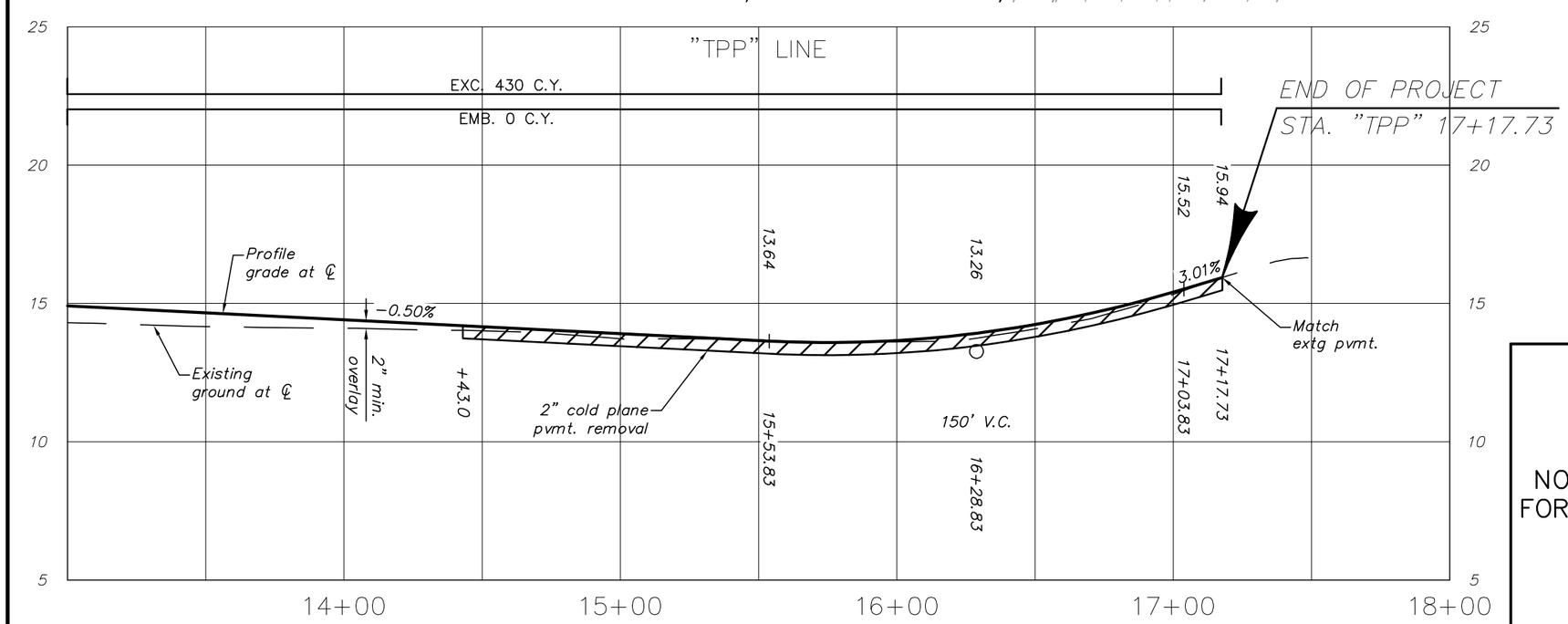


1. See sht. 3, note 1
   Const. retaining wall
2. See sht. 3, note 2
   Const. retaining wall
3. See sht. 3, note 3
   Remove extg. guardrail – 184'
   Connect to extg. guardrail
4. See sht. 3, note 4
   Remove extg. guardrail – 189'
   Connect to extg. guardrail
5. Const. asph. conc. drainage curb
6. 2" cold plane pvmt. removal – 1419 S.Y.
7. Sta. "TPP" 15+75, Rt.
   Const. outfall
   Inst. 12" sew. pipe – 12'
   Inst. class 50 riprap – 10 C.Y.
8. Sta. "TPP" 15+75, Lt.
   Const. water quality inlet
   (For details, see sht. 2B)
9. Sta. "TPP" 15+75, Rt.
   Const. water quality inlet
   (For details, see sht. 2B)
10. Sta. "TPP" 15+75, Lt.
    Const. outfall
    Inst. 12" sew. pipe – 12'
    Inst. class 50 riprap – 10 C.Y.



STRIPING LEGEND

- (D) Inst. double no–pass
- (S) Inst. 12" white stop bar
- (W) Inst. 4" white line
- (LA) Inst. left turn arrow (white)
- (RA) Inst. right turn arrow (white)

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PKWY. / US101 INTERSECTION

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 4

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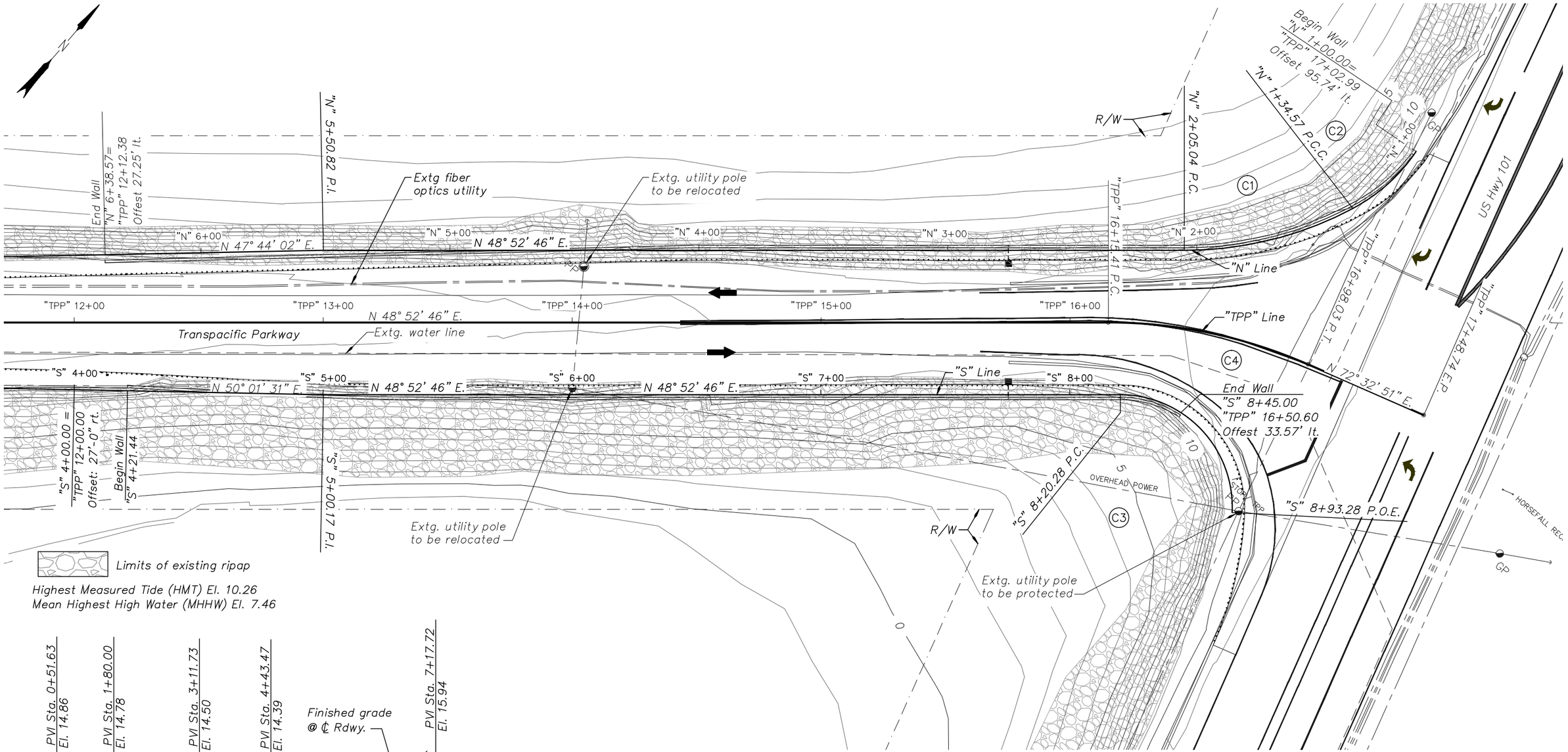
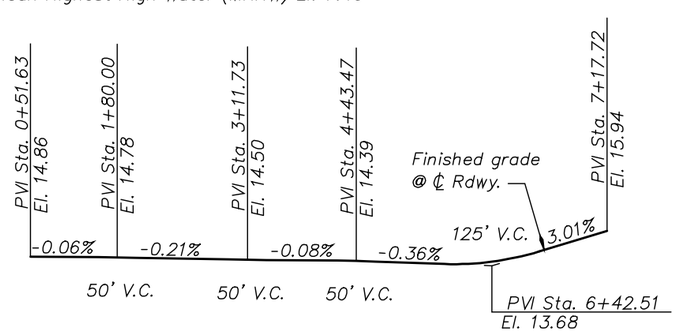


PLAN

Scale : 1" = 20'-0"



"TTP" GRADELINE DIAGRAM

No Scale

(C1)	(C2)	(C3)	(C4)
"N"	"N"	"S"	"TPP"
13°55'23" C.R.	14°08'55" C.R.	46°28'17" C.R.	28°38'52" C.R.
Δ 27°50'46"	Δ 28°17'49"	Δ 92°56'34"	Δ 23°40'05"
L 70.47	L 34.57	L 73.00	L 82.62
T 35.95	T 17.65	T 47.37	T 41.91
R 145.00	R 70.00	R 45.00	R 200.00

NOT TO BE USED FOR CONSTRUCTION

DATE	BY

REVIEW PLANS
Aug 29, 2014
DO NOT SCALE
DO NOT USE FOR CONSTRUCTION

ACCOMPANIED BY DWGS. See Dwg. ####

DRAFTER: Alan Mitchell
DESIGNER: Anthony Calcagno
CHECKER: Guido Portier
REVIEWER: Terry Stones

FOR REVIEW
EXPIRES:

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. xxxxx
DATE August 2014
CALC. BOOK -----

INTERSECTION RETAINING WALLS
JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PARKWAY/US101 INTERSECTION

WALL PLAN

SHEET 1 OF 3
DRAWING NO. B501

\\Pdxfs1\project\J\JCEP00000010\0400CAD\EB\SHEETS\EB501XJCEP010_PE01.dwg 8/29/2014 3:43 PM

Rotation: 0° Scale: 1:1

GENERAL NOTES:

Provide all materials and perform all work according to the 2008 Oregon Standard Specifications for Construction.

Walls are designed in accordance to the 2012 AASHTO LRFD Bridge Design Specifications, the ODOT Geotechnical Design Manual (GDM) 2013, and the 2004 ODOT Bridge Design & Drafting Manual (BDDM), updated October, 2013.

Seismic design is performed in accordance with the "AASHTO LRFD Seismic Bridge Design Specifications as modified by the "ODOT Geotechnical Design Manual" for 500- and 1000-year criteria. The Horizontal Peak Ground Acceleration Coefficients (PGA) for the 500 year (Serviceable) and 1000 year (No Collapse) return periods are 0.28g and 0.43g respectively, based on 2002 USGS Seismic Hazard Maps. The site is defined as a Site Class E with Site Factors (Fpga) of 1.30 and 0.90 respectively.

Provide all reinforcing steel according to ASTM Specification A706, or ASTM A615 Grade 60. Use the following splice lengths unless shown otherwise:

Reinforcing Splice Lengths (Class B) Grade 60											
Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11	#14	#18
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-9"	3'-7"	4'-6"	5'-9"	7'-0"	Not Permitted	

Increase all splice lengths 40% for horizontal bars placed that more than 12" of fresh concrete is cast below the bar.

Splice reinforcing steel at alternate bars, staggered at least one splice length or as far as possible, unless shown otherwise.

All reinforcing shall have 2" of concrete cover unless shown otherwise.

All reinforcing spacing is intended to be maximum unless shown otherwise.

Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

Field verify all dimensions prior to submitting drawings or fabricating materials.

Provide Class 3300 - 1½", 1", or ¾" concrete for all cast in place concrete.

For estimating purposes, all concrete has a reinforcement density of 200 lbs. per cubic yard.

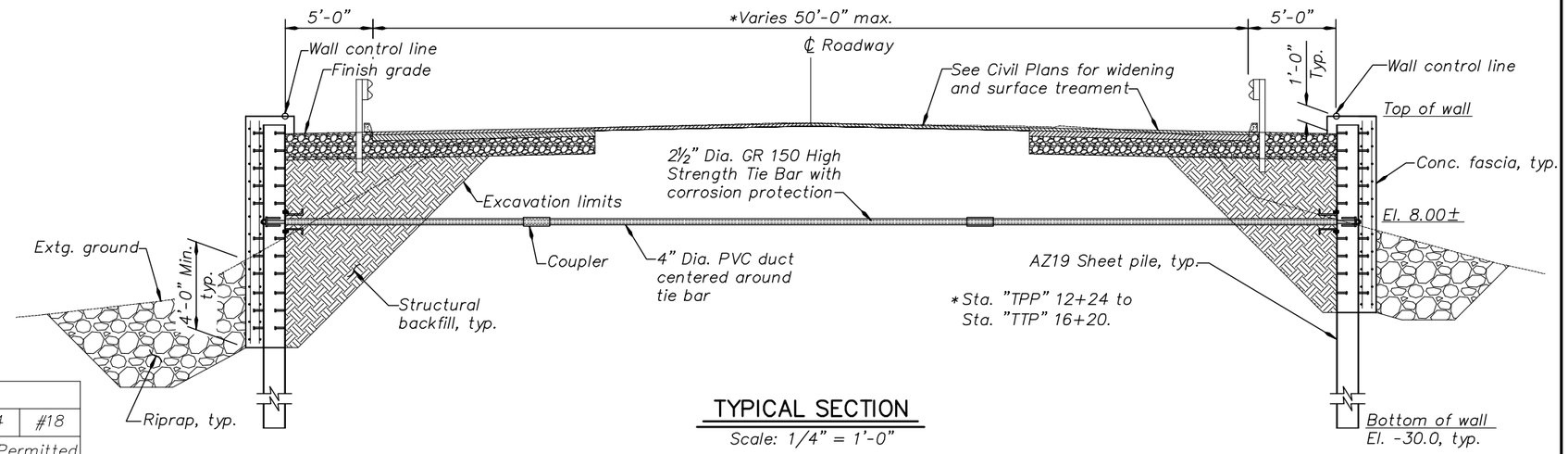
Tie back tendons to be High Strength GR150 ksi threaded bar with corrosion protection system.

All structural steel to be ASTM A709 GR 50 unless noted otherwise.

Provide 1" diameter Type 3 high-strength fasteners at structural connections according to AASHTO Specification M164 (ASTM A325) unless shown otherwise.

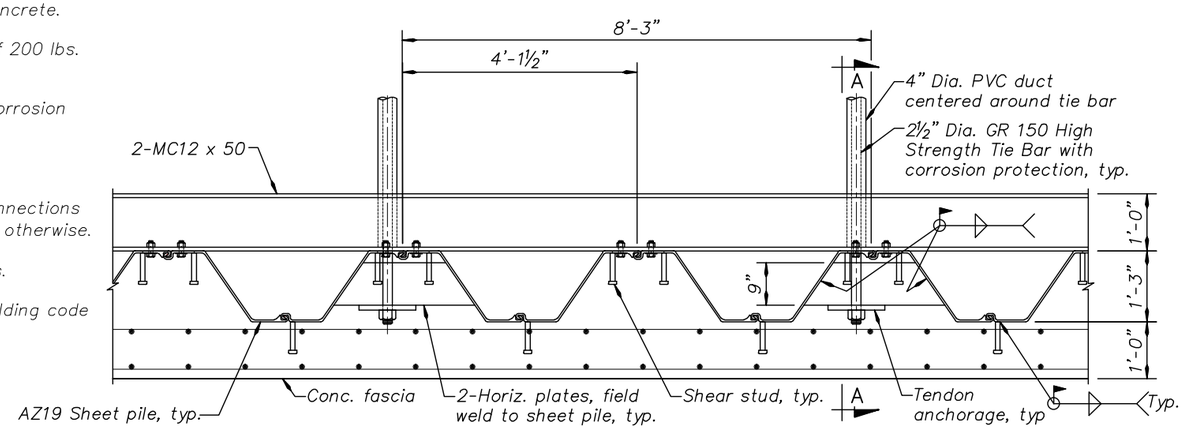
Shear connectors shall be ASTM A108 headed concrete anchor studs.

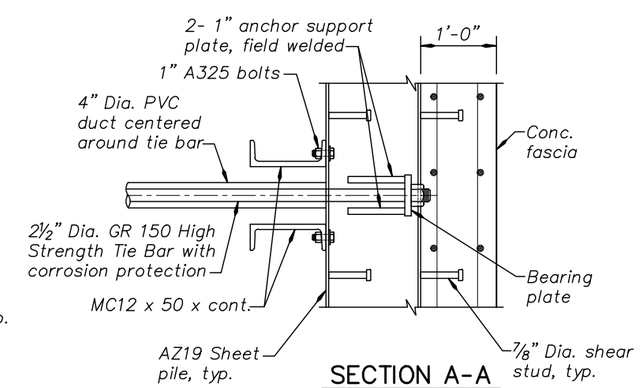
Produce welds according to the latest edition of AWS D1.5 bridge welding code



TYPICAL SECTION

Scale: 1/4" = 1'-0"





SECTION A-A

Scale: 1" = 1'-0"

NOT TO BE USED FOR CONSTRUCTION

DATE	BY

REVIEW PLANS
Aug 29, 2014
DO NOT SCALE
DO NOT USE FOR CONSTRUCTION

ACCOMPANIED BY DWGS. See Dwg. ####

DRAFTER: Alan Mitchell
DESIGNER: Anthony Calcagno
CHECKER: Guido Portier
REVIEWER: Terry Stones

FOR REVIEW
EXPIRES:

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. xxxxx
DATE August 2014
CALC. BOOK -----

INTERSECTION RETAINING WALLS
JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PARKWAY/US101 INTERSECTION

GENERAL NOTES AND DETAILS

SHEET 3 OF 3
DRAWING NO. B505

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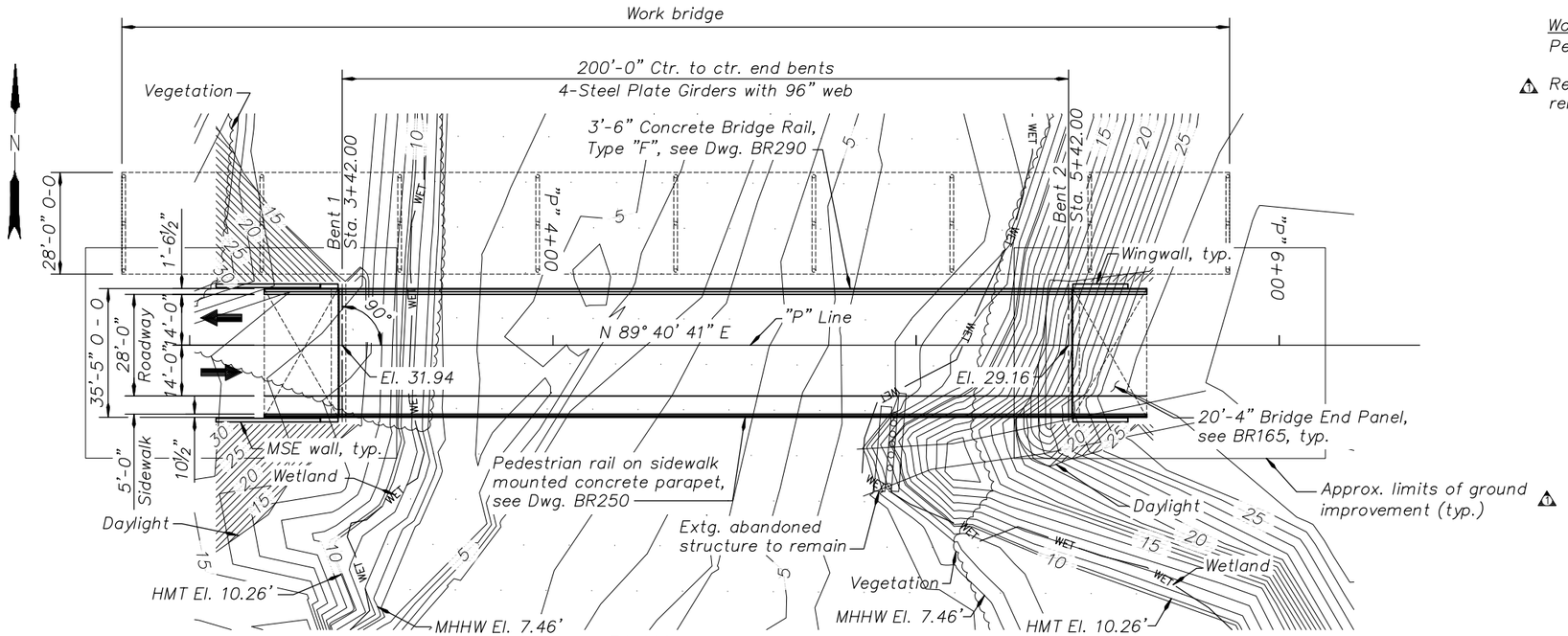


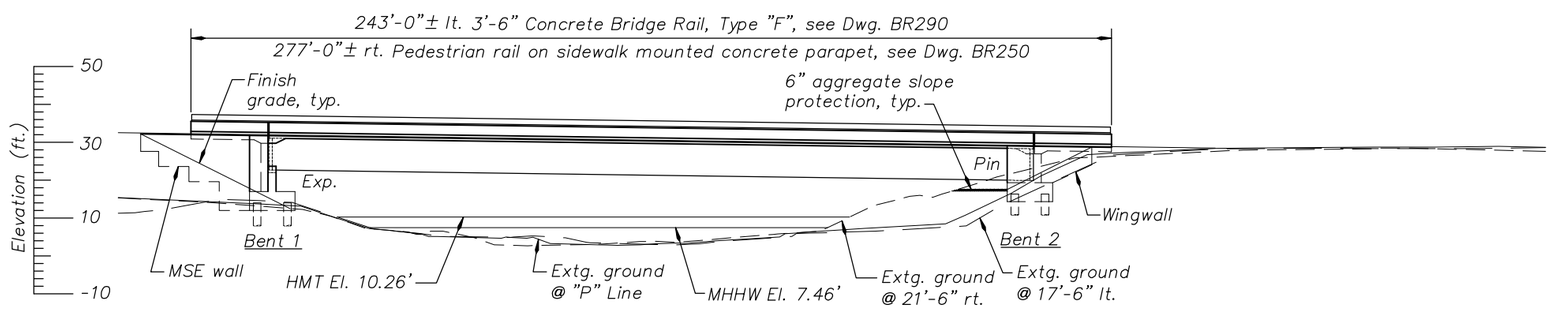
PLAN

Scale: 1" = 20'-0"

Work Bridge Notes:

Permits allow up to (12) 24" dia. piles within limits of wetland and HMT.

1 Remove the temporary work bridge when it is no longer needed. Fully remove all piling and other components and restore existing ground slopes.



ELEVATION

Scale: 1" = 20'-0"

Notes:

Elevations are based on North American Vertical Datum 1988 (NAVD88).

MHHW = Mean Higher High Water.

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	07/23/2014	ADDED GROUND IMPROVEMENT LIMITS AND NOTES	ACM	DMJ			BSN

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BLACK & VEATCH CORPORATION

ENGINEER DMJ | DRAWN ACM | CHECKED – | DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

NORTH POINT (PEIRCE)
PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER | REV –

CODE | AREA | B601

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM

General Notes:
Provide all materials and perform all work according to the Oregon Standard Specifications for Construction 2008.

Bridge is designed in accordance with the 2012 AASHTO LRFD Bridge Design Specifications (including interim revisions) and the 2004 ODOT Bridge Design & Drafting Manual (BDDM), updated August 2012. Design for tsunami loading was not considered.

Seismic design is performed in accordance with the 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design as modified by the ODOT Bridge Design & Drafting Manual (revised August 2012) for the 500-year (Serviceable) and 1000-year (No Collapse) design criteria. The Horizontal Peak Ground Acceleration Coefficients (PGA) for the 500 year (Serviceable) and 1000 year (No Collapse) return periods are 0.30g and 0.47g respectively, based on 2002 USGS Seismic Hazard Maps. The bridge site is defined as a Site Class D with Site Factors (Fpga) of 1.20 and 1.03 for the 500-year and 1000-year return periods, respectively.

Design includes an allowance of 25 psf for future wearing surface and the following Live Loads according to the 2012 AASHTO LRFD Bridge Design Specifications (including interim revisions). Design assumes ground improvements as recommended in Preliminary Geotechnical Report, GRI date July 17, 2014.

Service and Strength-I Limit States:
HL-93: Design truck or the design tandems and the design lane load.

Strength-II Limit States:
ODOT Type STP-5BW Permit truck
ODOT Type STP-4E Permit truck

Provide all reinforcing steel according to ASTM Specification A706, or AASHTO M31 (ASTM A615) Grade 60.
Provide field bent or welded reinforcement according to ASTM Specification A706.

Use epoxy coated reinforcing steel in deck and end panel.

Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

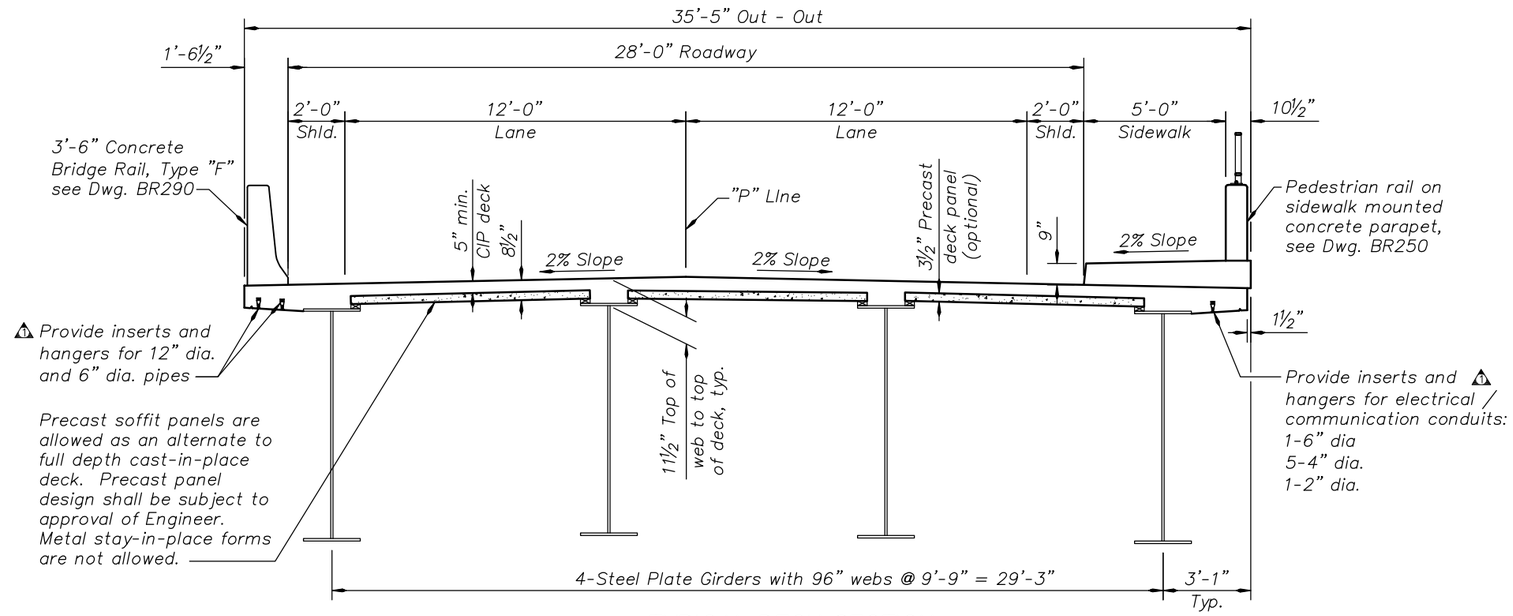
Provide Class HPC4000 - 1½", 1", or ¾" concrete in bridge deck and bridge end panels.

Provide Class 4000 - 1½" or 1", concrete for all footings.
Provide Class 4000 - 1½", 1", or ¾" concrete for all other concrete.

See Foundation Plan for foundation design notes.

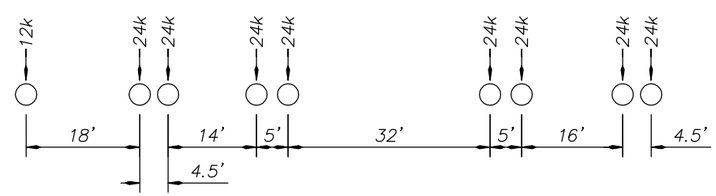
Use a shop-applied 3 coat paint system from the ODOT Qualified Product List (QPL) with organic or inorganic zinc primer. △1

All high strength fasteners shall be galvanized and field painted in accordance with 00560.29(b)(1)b the Standard Specifications. Repair all damaged or defective coatings in accordance with 00594.60 of the Standard Specifications. △1

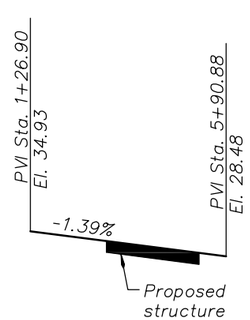


TYPICAL DECK SECTION
Scale: 3/8" = 1'-0"

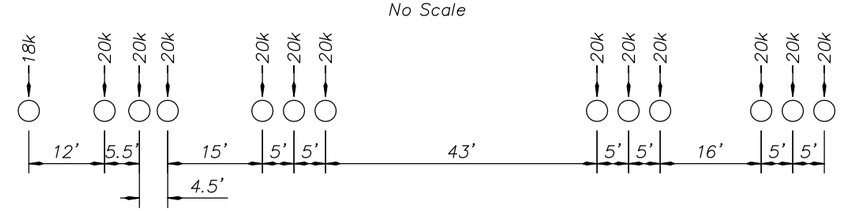
Description	Reinforcing (lbs/CY)
Deck	225



OR-STP-5BW PERMIT TRUCK DIAGRAM
No Scale



GRADELINE DIAGRAM
No Scale



OR-STP-4E PERMIT TRUCK DIAGRAM
No Scale

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
△1	07/23/2014	ADDED NOTES	ACM	DMJ			BSN

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BLACK & VEATCH CORPORATION

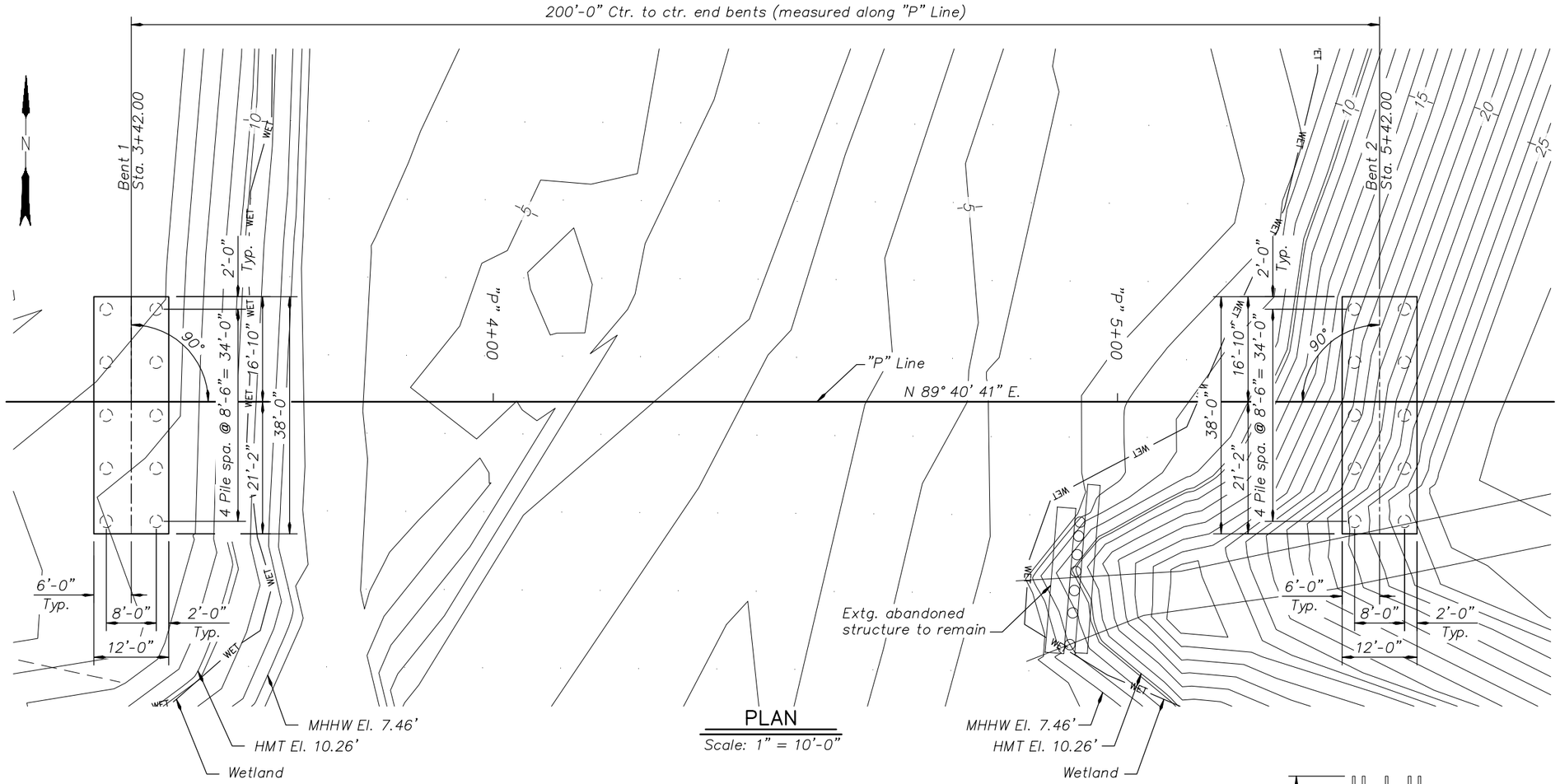
ENGINEER	DMJ	DRAWN	ACM
CHECKED	–	DATE	mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

NORTH POINT (PEIRCE)
GENERAL NOTES AND TYPICAL DECK SECTION

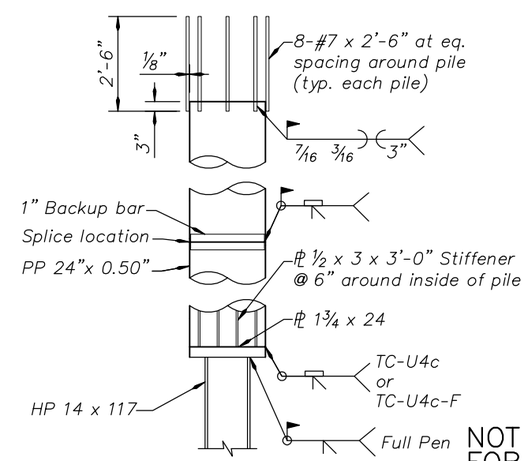
PROJECT 142488– | DRAWING NUMBER | REV –
CODE | AREA | B602

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM



PLAN

Scale: 1" = 10'-0"



PILE DETAIL

No Scale

FOUNDATION TABLE			
Location	Type	Est. tip El.	Cut-off / top El
		(Feet)	
Bent 1	PP 24" x 0.5"	-13.00	14.00
	HP14 x 117	-38.00	
Bent 2	PP 24" x 0.5"	4.00	16.23
	HP14 x 117	-21.00	

FOUNDATION DESIGN NOTES:

Provide PP 24 x 0.5 ASTM A252, Grade 3 and HP 14 x 117 ASTM A572, Grade 50 for all bents.

All PP 24 x 0.5 sections to be filled with Class 4000- 3/4" concrete with 8-#8 x cont., typ.

Determine nominal pile bearing resistance from the results of Pile Dynamic Analyzer (PDA) Testing.

Cut-off / top El: Recommend including 8' of cut-off length per pile or include pile splices in estimate in case pile runs long, typical all bents.

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ENGINEER AJC | DRAWN ACM | CHECKED – | DATE mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

NORTH POINT (PEIRCE)
FOUNDATION PLAN

PROJECT 142488– | DRAWING NUMBER B603 | REV –

CODE | AREA

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
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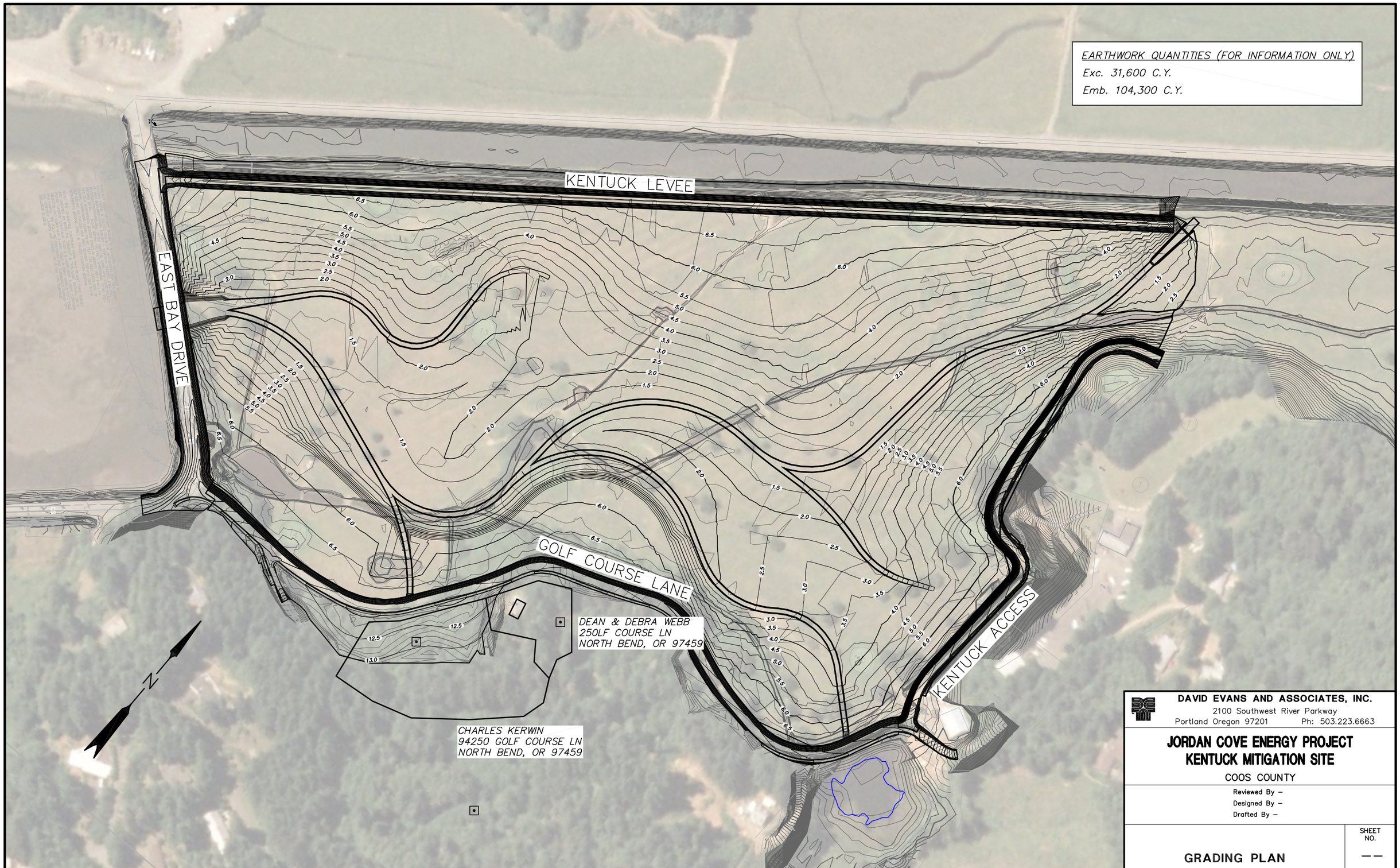

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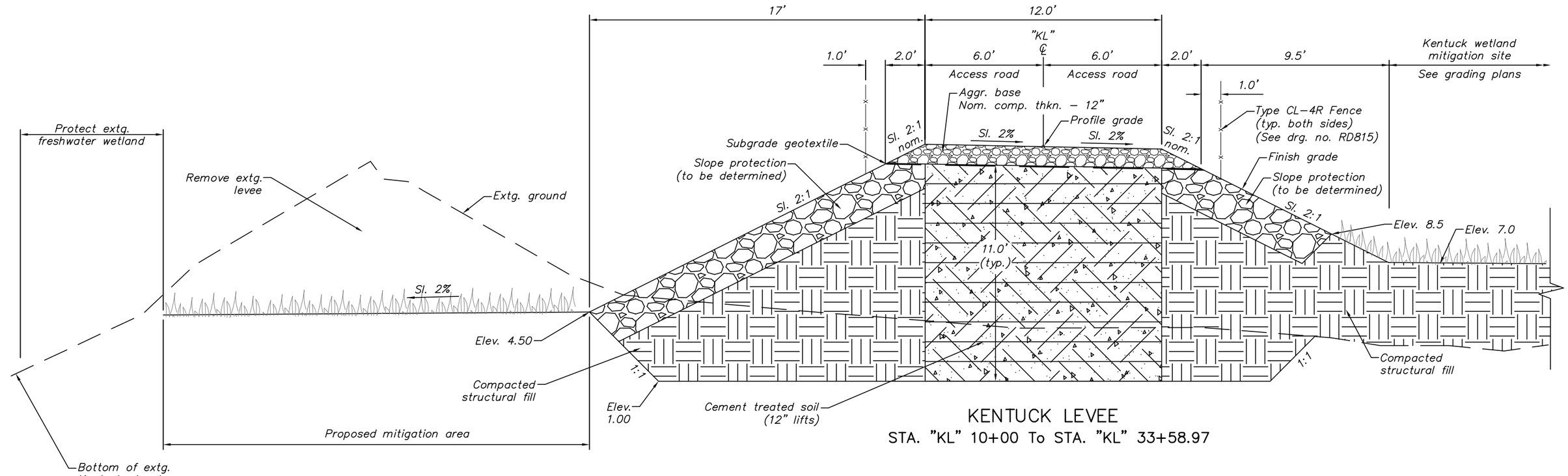
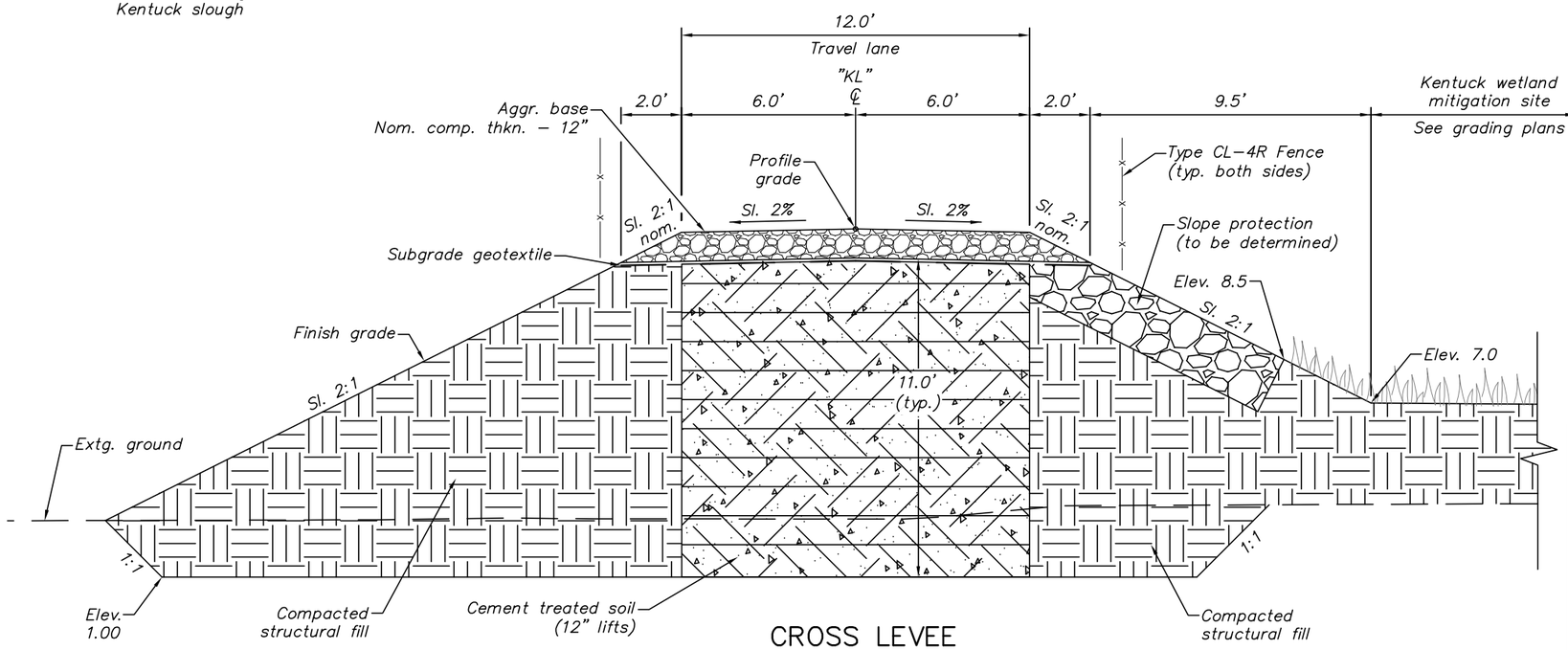


KENTUCK LEVEE

STA. "KL" 10+00 To STA. "KL" 33+58.97



CROSS LEVEE

STA. "KL" 33+58.97 To STA. "KL" 37+26.09

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DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J DeMello

TYPICAL SECTION

SHEET NO. 2

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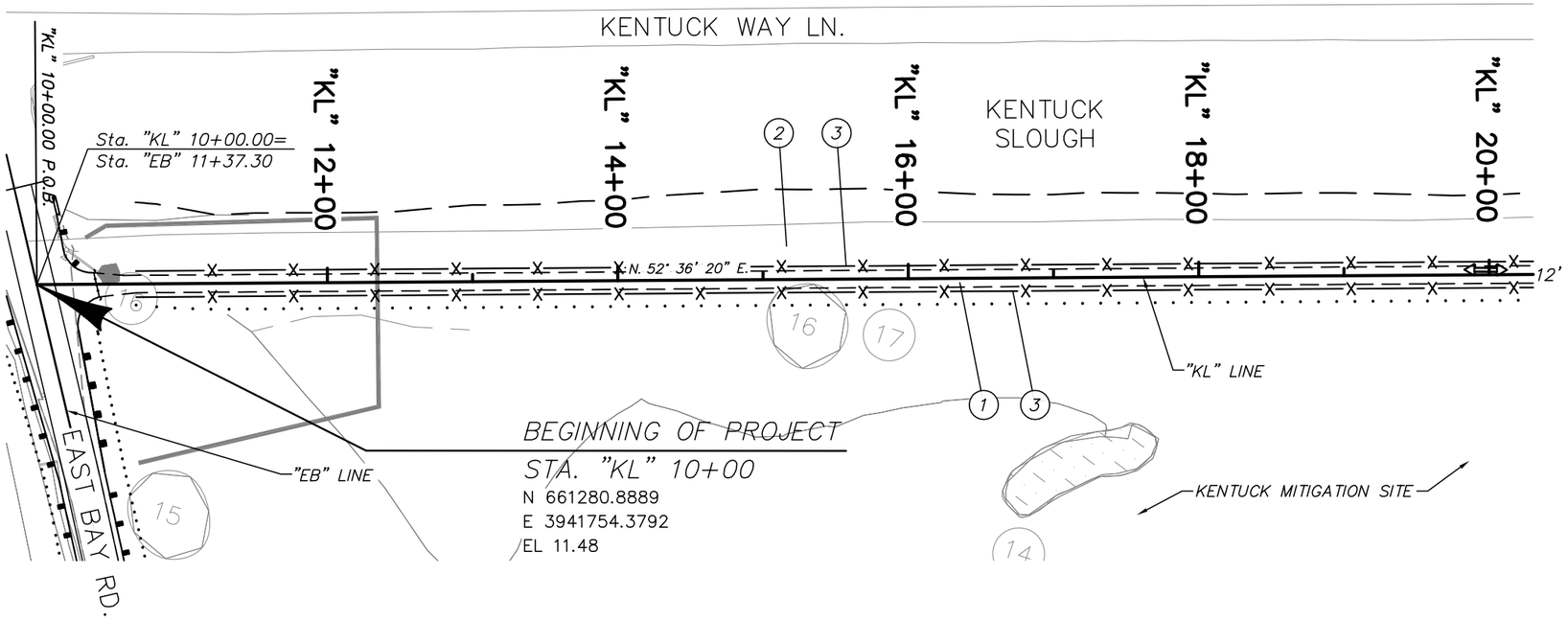
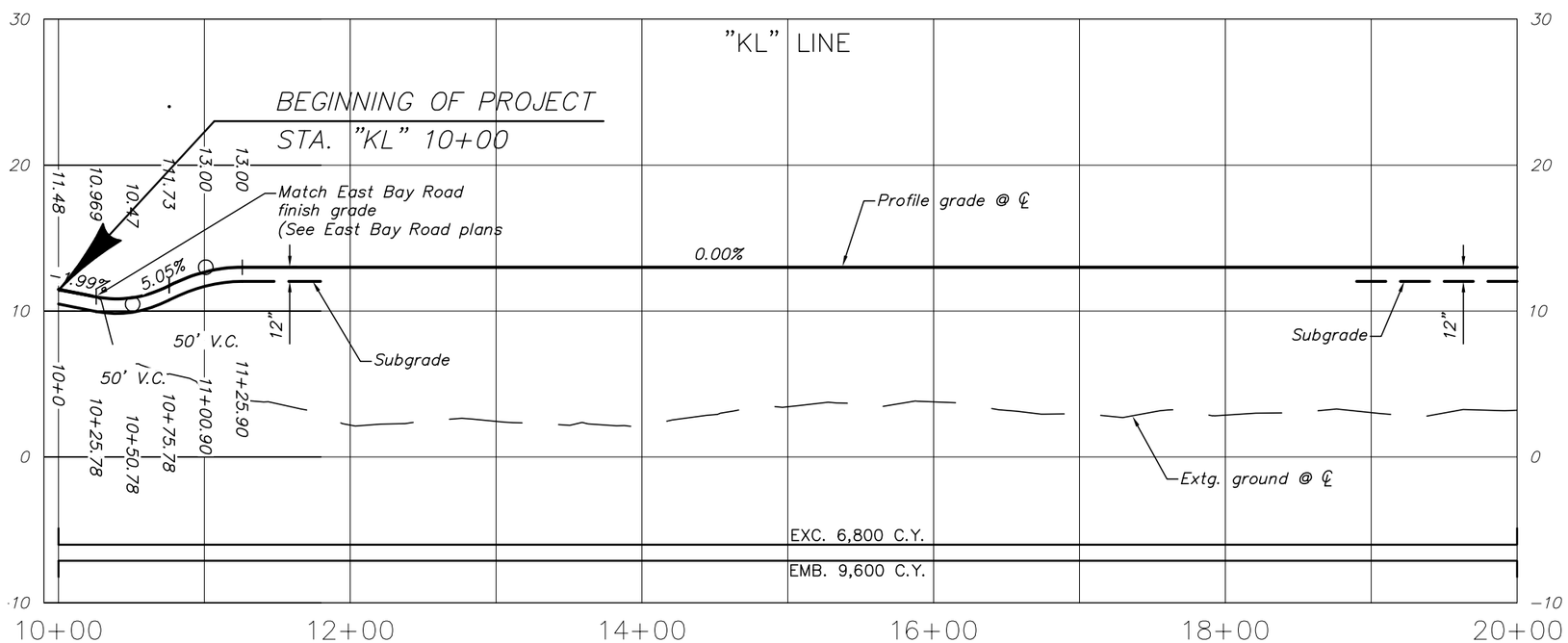
Secs. 12 & 1, T. 25 S., R. 13 W., W.M.



1. Const. levee and 12' access road (For details, see sheet 2)
2. Remove extg. levee (For details, see sheet 2)
3. Const. type CL-4R fence (See drg. no RD815)



LEGEND
Cut slope line
Fill slope line

-DRAFT-
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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

Reviewed By – G. Olen
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 3

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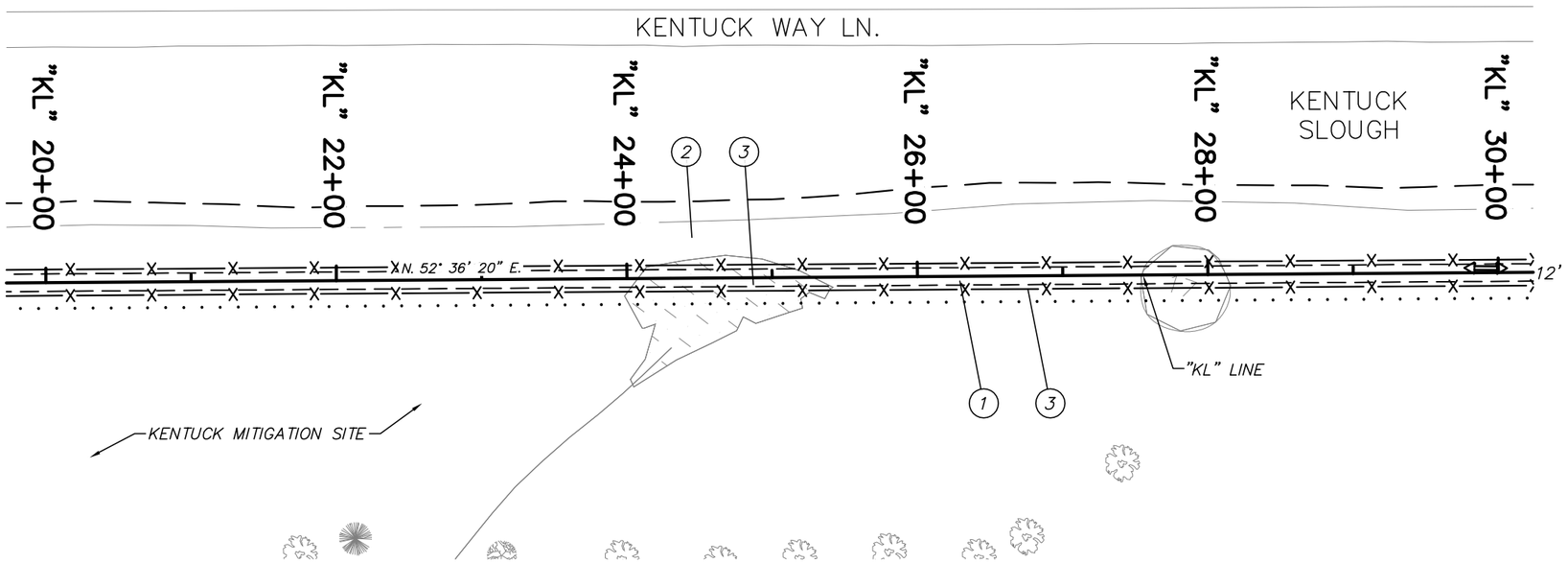
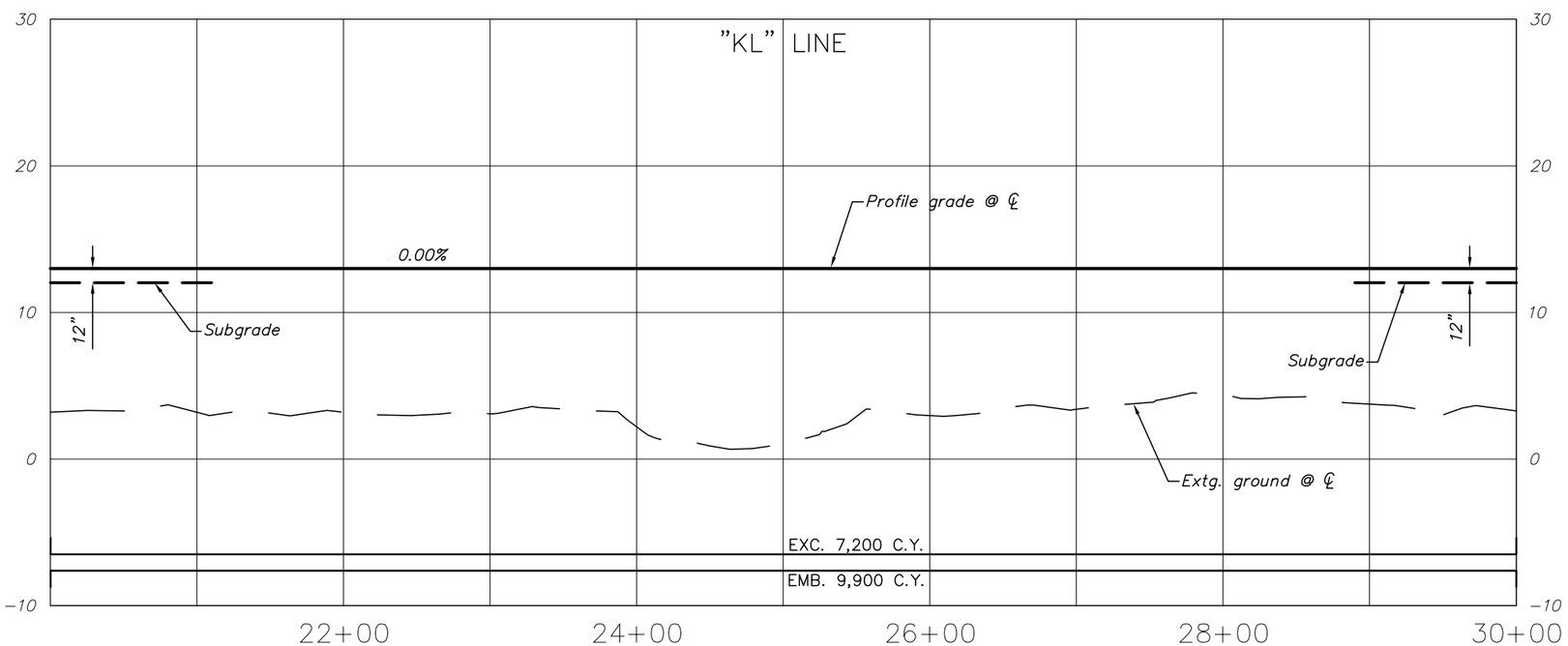
Sec. 1, T. 25 S., R. 13 W., W.M.



1. Const. levee and 12' access road (For details, see sheet 2)
2. Remove extg. levee (For details, see sheet 2)
3. Const. type CL-4R fence



LEGEND
Cut slope line
Fill slope line

-DRAFT-
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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 4

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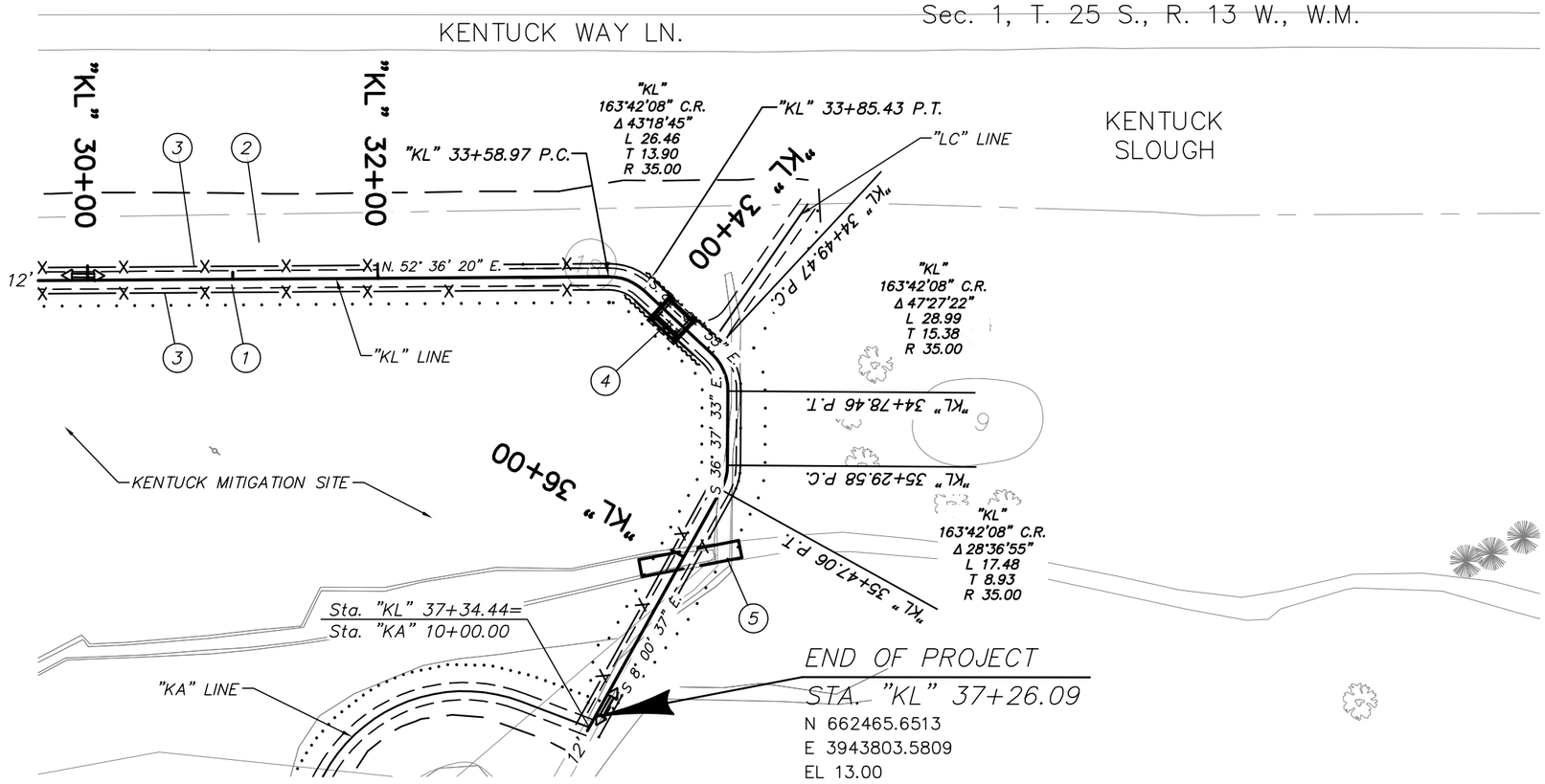
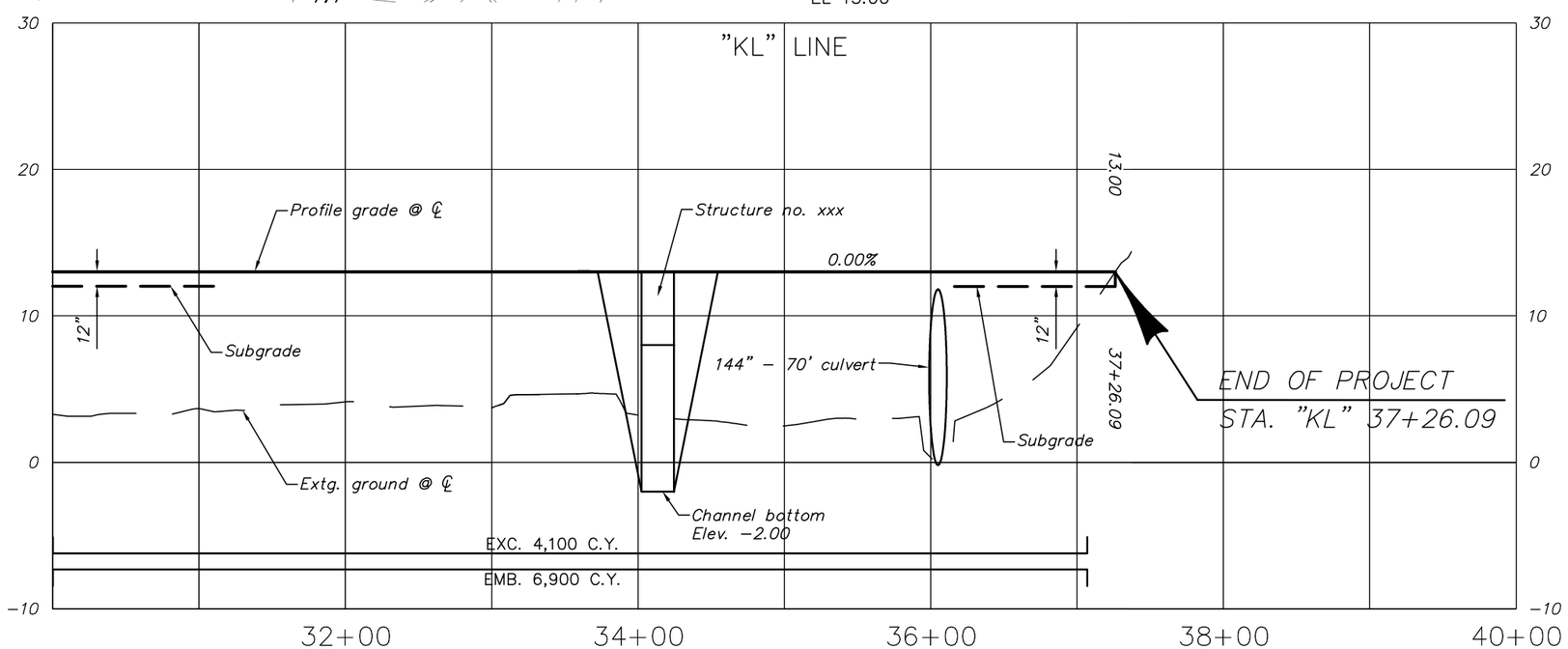


1. Const. levee and 12' access road (For details, see sheet 2)
2. Remove extg. levee (For details, see sheet 2)
3. Const. type CL–4R fence
4. Const. structure no. xxxx Const. tidegate structure – 22' (For drg. nos. see sht. 1A)
5. Const 144" – 70' culvert with tide gate (For drg. nos. see sht. 1A)



LEGEND
Cut slope line
Fill slope line

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 5

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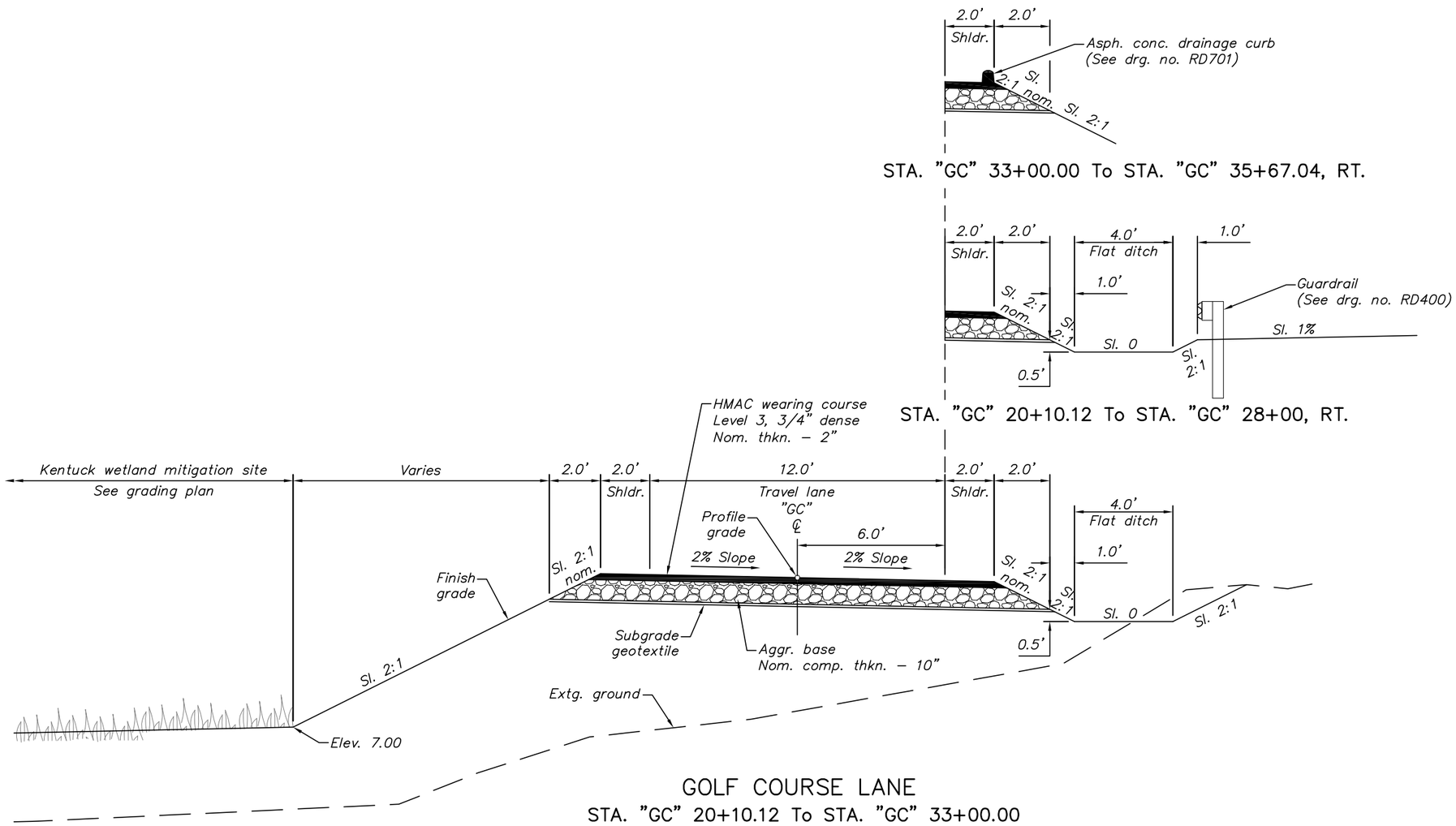

GOLF COURSE LANE

STA. "GC" 20+10.12 To STA. "GC" 33+00.00
"GC" 35+67.04 To "GC" 40+86.90

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

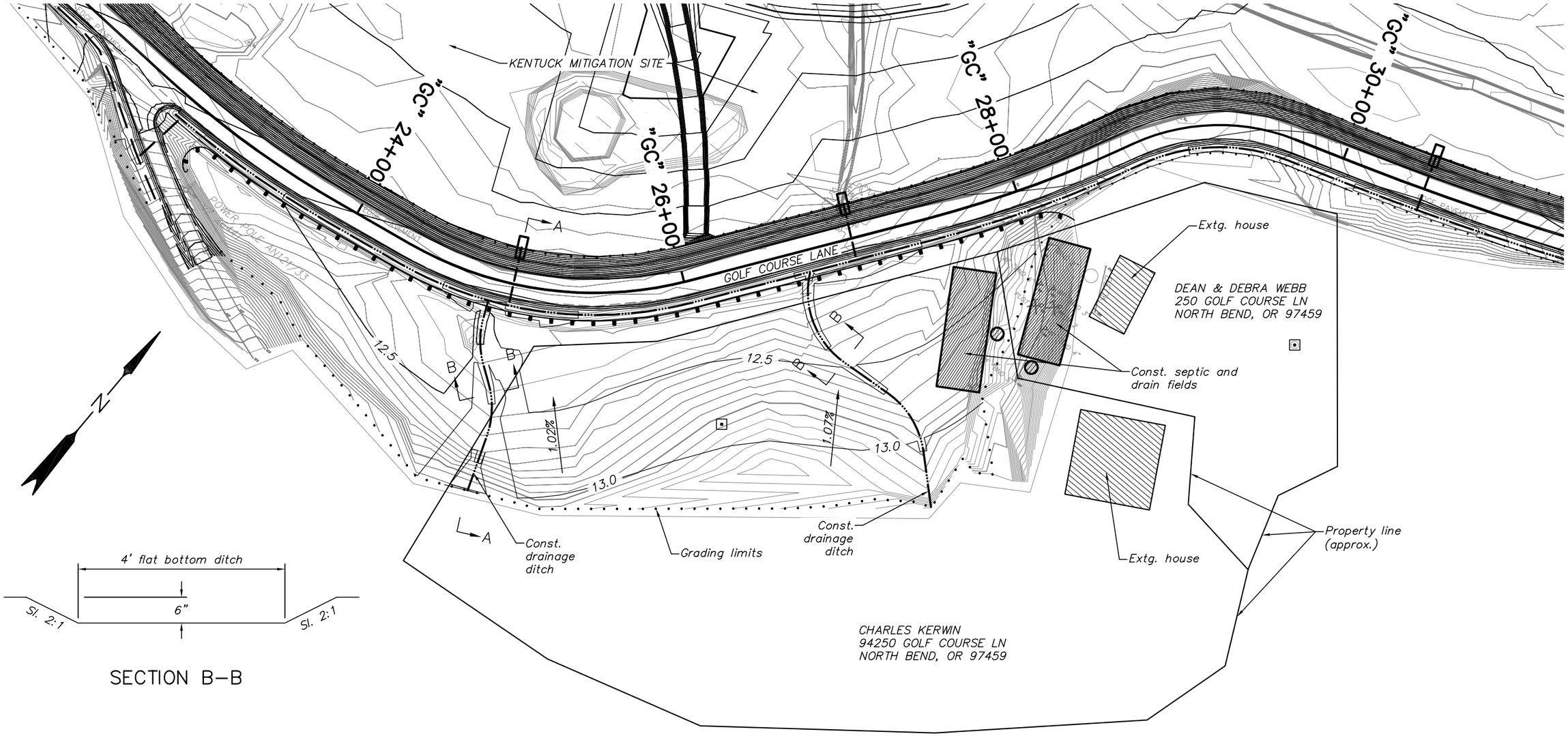
COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

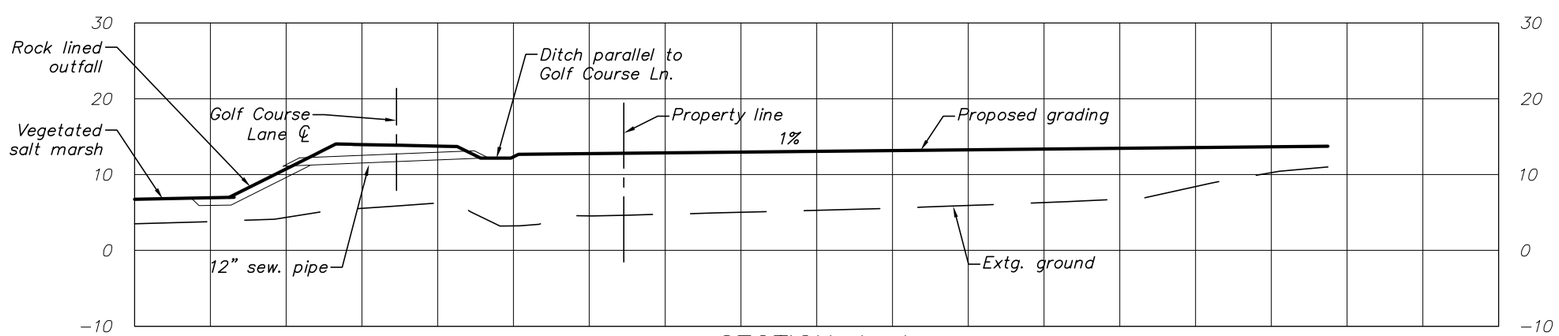
TYPICAL SECTION

SHEET NO. 2

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_Typical Sections.dwg jnd Aug 29, 2014 9:53am



SECTION B–B



SECTION A–A

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

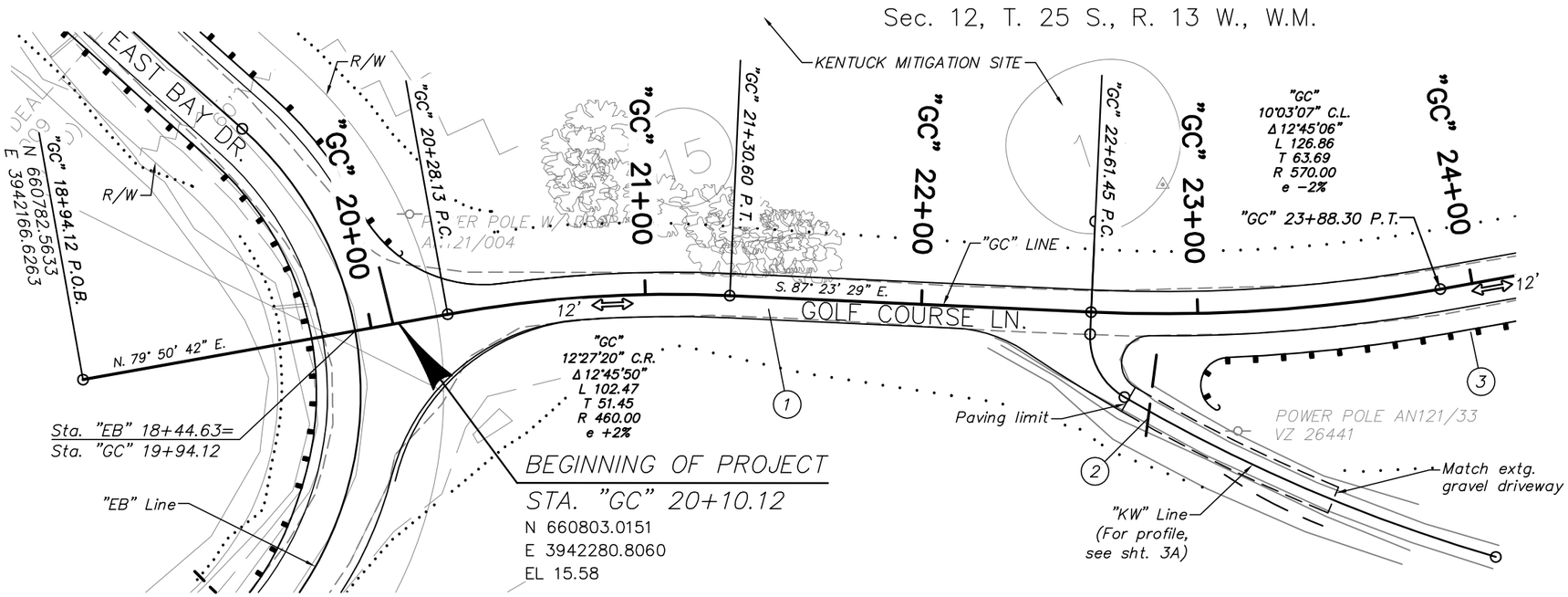
COOS COUNTY

Reviewed By –
Designed By –
Drafted By –

KERWIN & WEBB PROPERTIES
GRADING PLAN

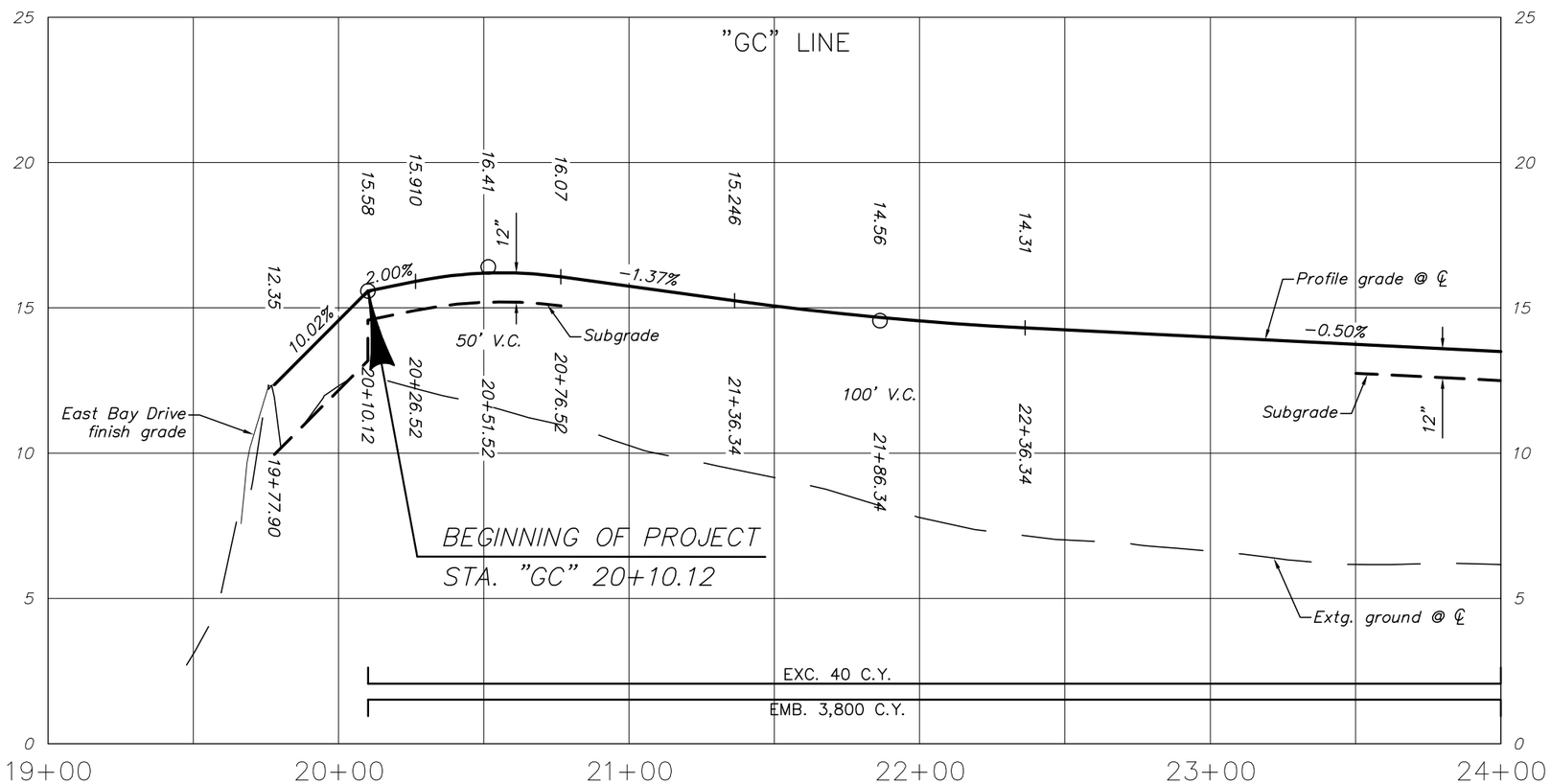
SHEET NO.
2B–2

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_KW Grading Plan.dwg jnd Aug 29, 2014 9:54am



1. Const. Golf Course Lane (For details, see sheet 2)
2. Inst. 12" culv. pipe – 30'
3. Sta. "GC" 23+10 to Sta. "GC" 28+25, Rt.
   Const. guardrail – 566' (Type 2A)
   Inst. end piece – 1 (Type B)
   (See drg. nos. RD400, RD405, RD410, & RD415)

N



LEGEND
Cut slope line
Fill slope line

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 3

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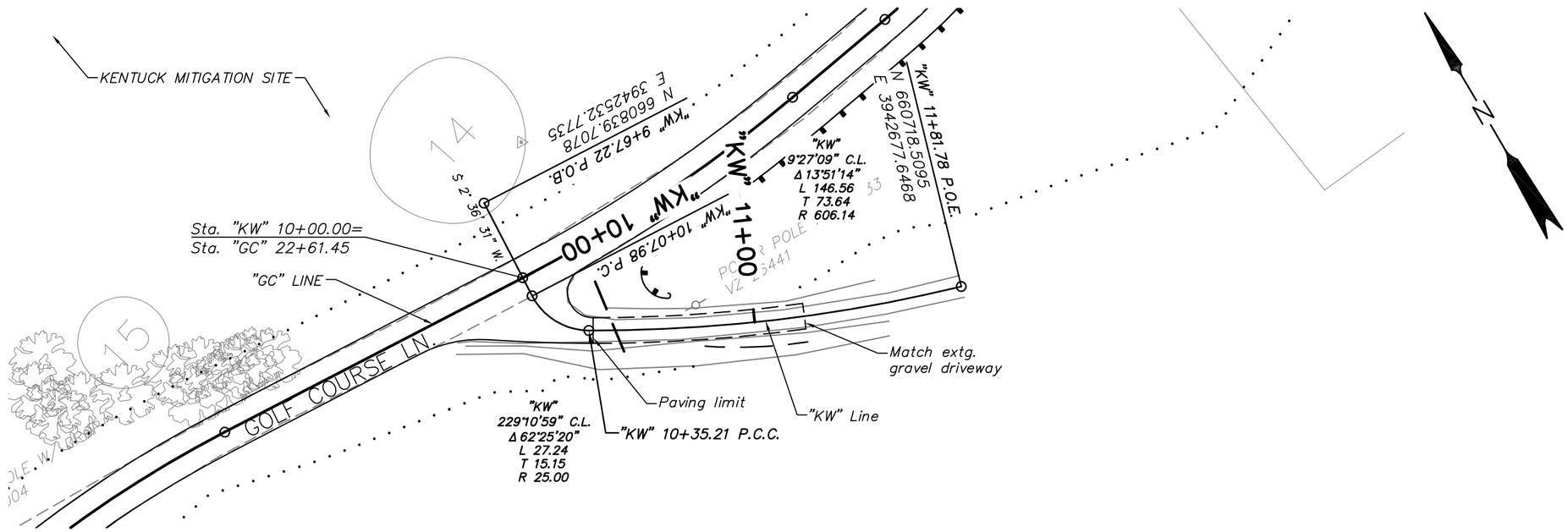

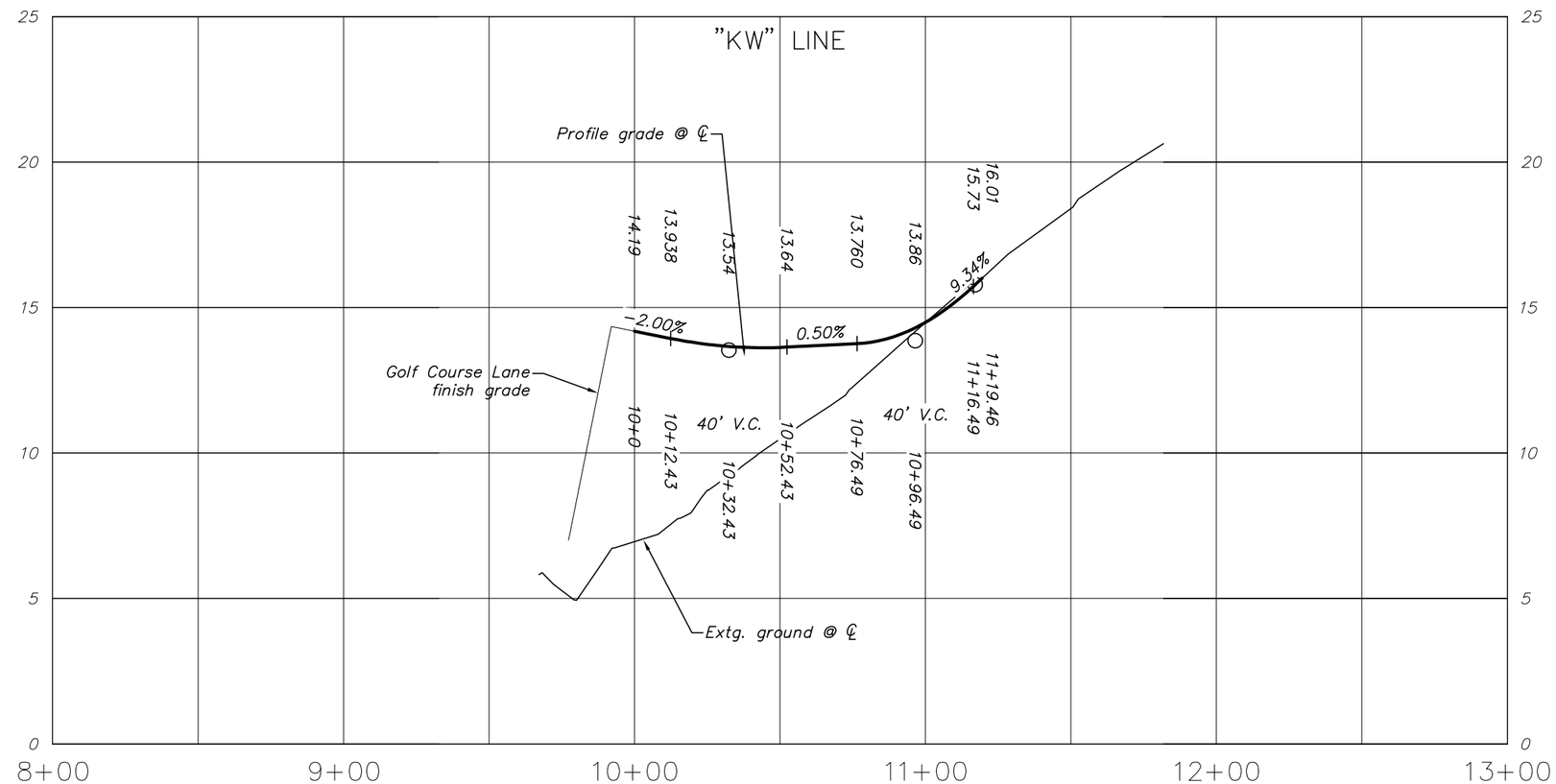

LEGEND
Cut slope line
Fill slope line

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

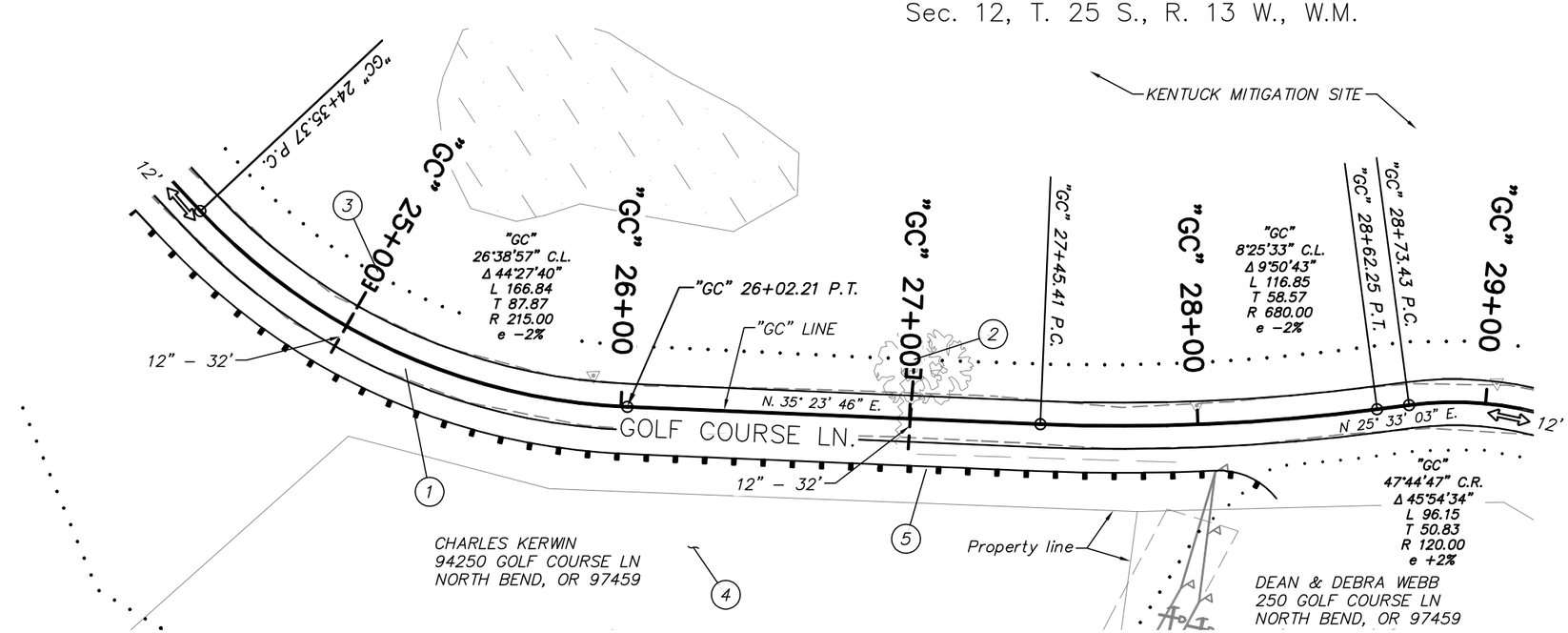
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION
KERWIN & WEBB DRIVEWAY

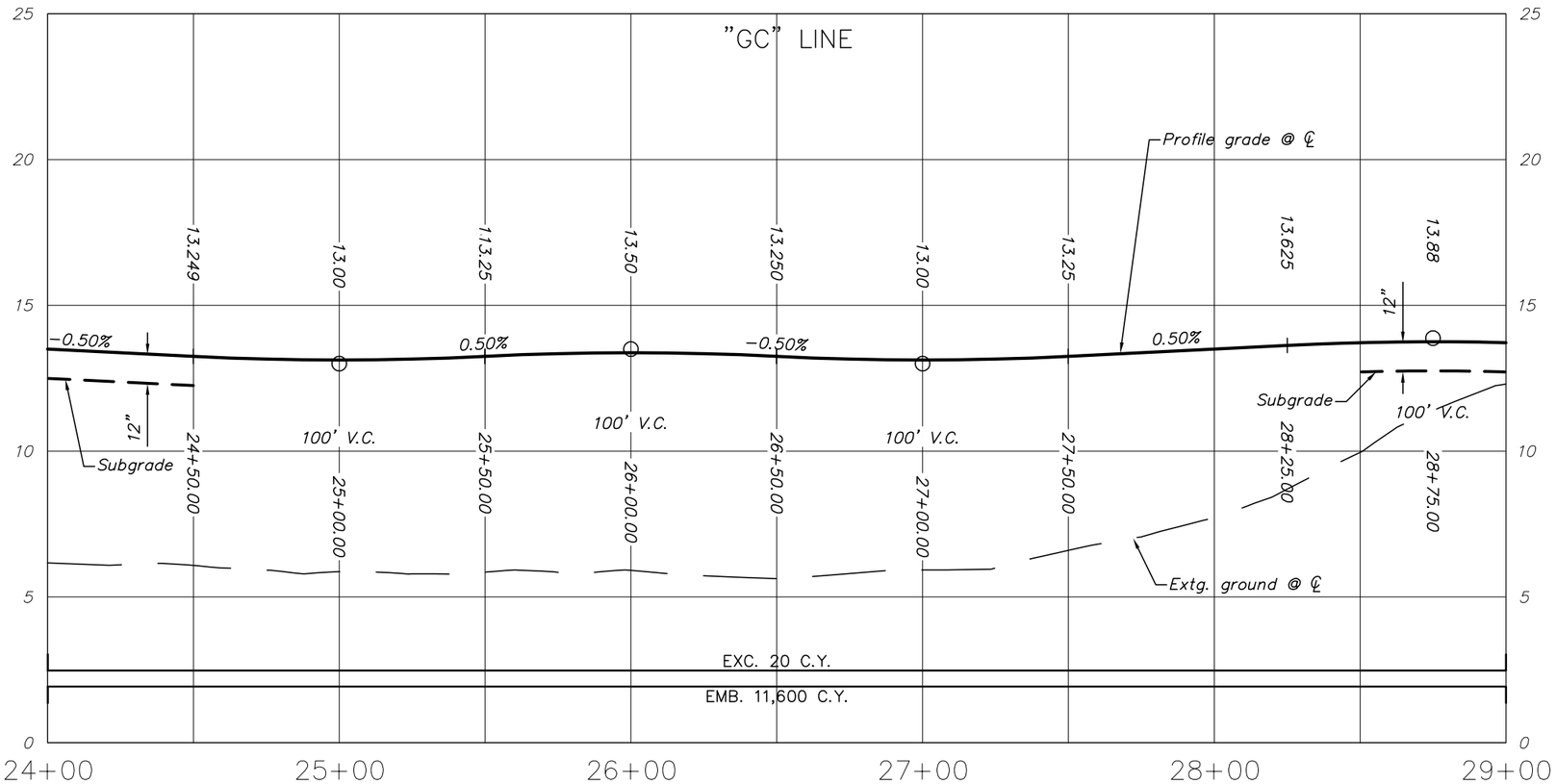
SHEET NO.
3A

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_Rdwy Sheets.dwg jnd Aug 29, 2014 9:55am

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



1. Const. Golf Course Lane
   (For details, see sheet 2)
2. Sta. "GC" 27+00, Lt.
   Const. outfall
   Inst. 12" sew. pipe − 32'
   Inst. class 50 riprap − 10 C.Y.
3. Sta. "GC" 25+00, Lt.
   Const. outfall
   Inst. 12" sew. pipe − 32'
   Inst. class 50 riprap − 10 C.Y.
   (For details, see sht. X)
4. Const. septic and drain fields, drainage ditches, and grading
   (For details, see sht. 2B−2)
5. See sht. 3 note 3
   Const. guardrail (Type 2A)
   Const anchor − 1 (Type 1)
   Bury end in slope
   (See drg. nos. RD400, RD405, RD410, RD415, RD435, RD450)



LEGEND
Cut slope line
Fill slope line

−DRAFT−
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FOR CONSTRUCTION

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

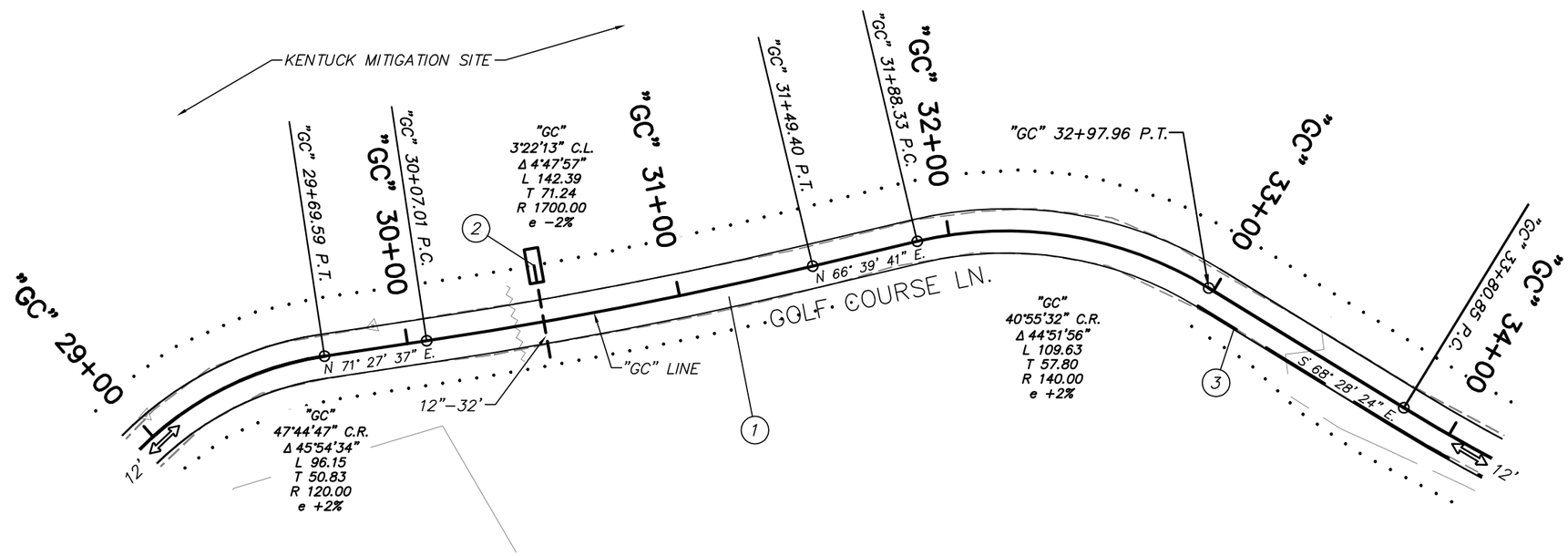
Reviewed By − G. Olen
Designed By − J. DeMello
Drafted By − C. Filer

GENERAL CONSTRUCTION

SHEET NO. 4

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_Rdwy Sheets.dwg jnd Aug 29, 2014 9:55am

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

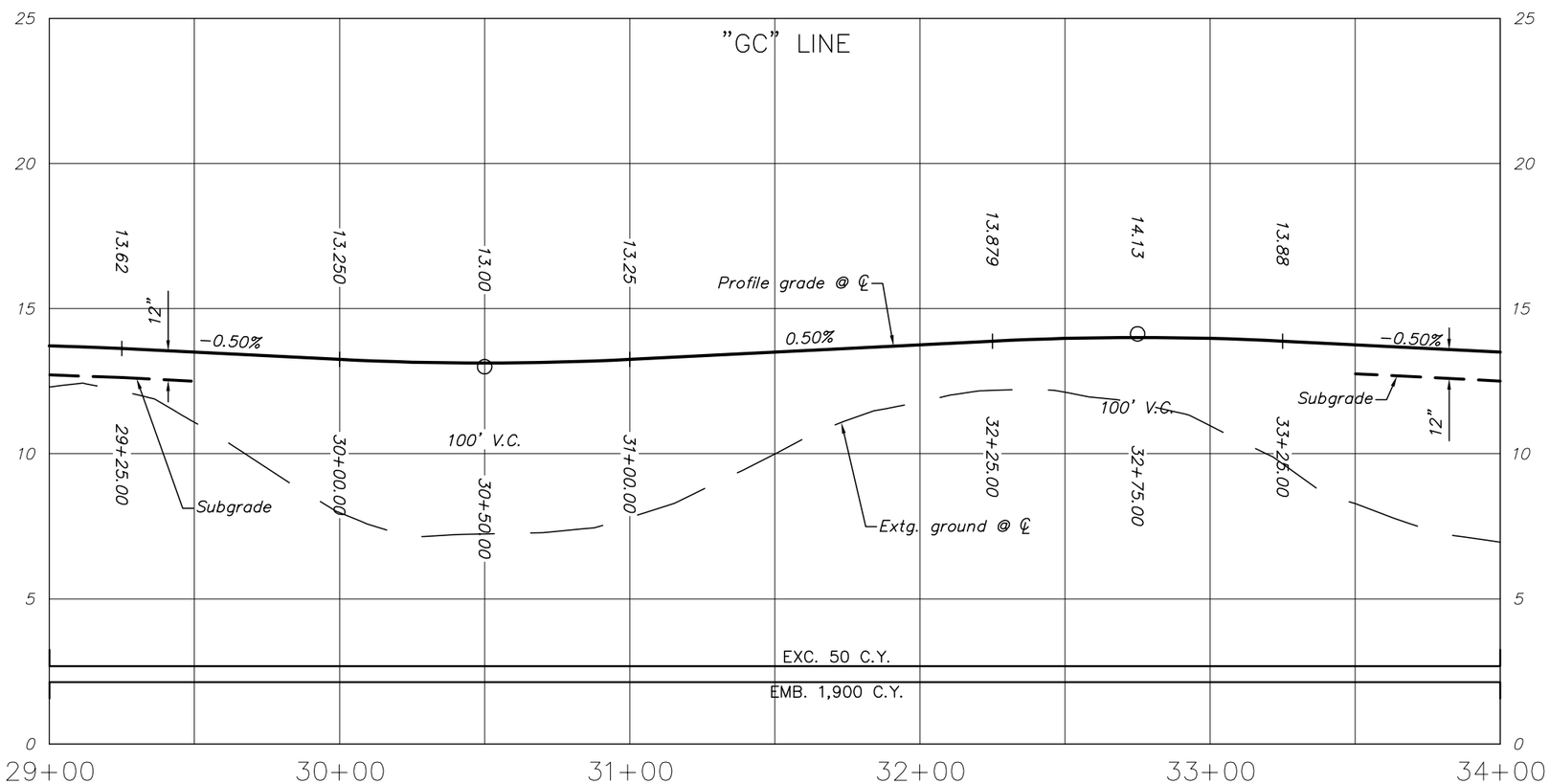


1 Const. Golf Course Lane
(For details, see sheet 2)

2 Sta. "GC" 30+50, Lt.
Const. outfall
Inst. 12" sew. pipe – 32'
Inst. class 50 riprap – 10 C.Y.

3 Const. asph. conc. drainage curb – 270'
(See drg. no. RD701)

N



LEGEND
Cut slope line
Fill slope line

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FOR CONSTRUCTION

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

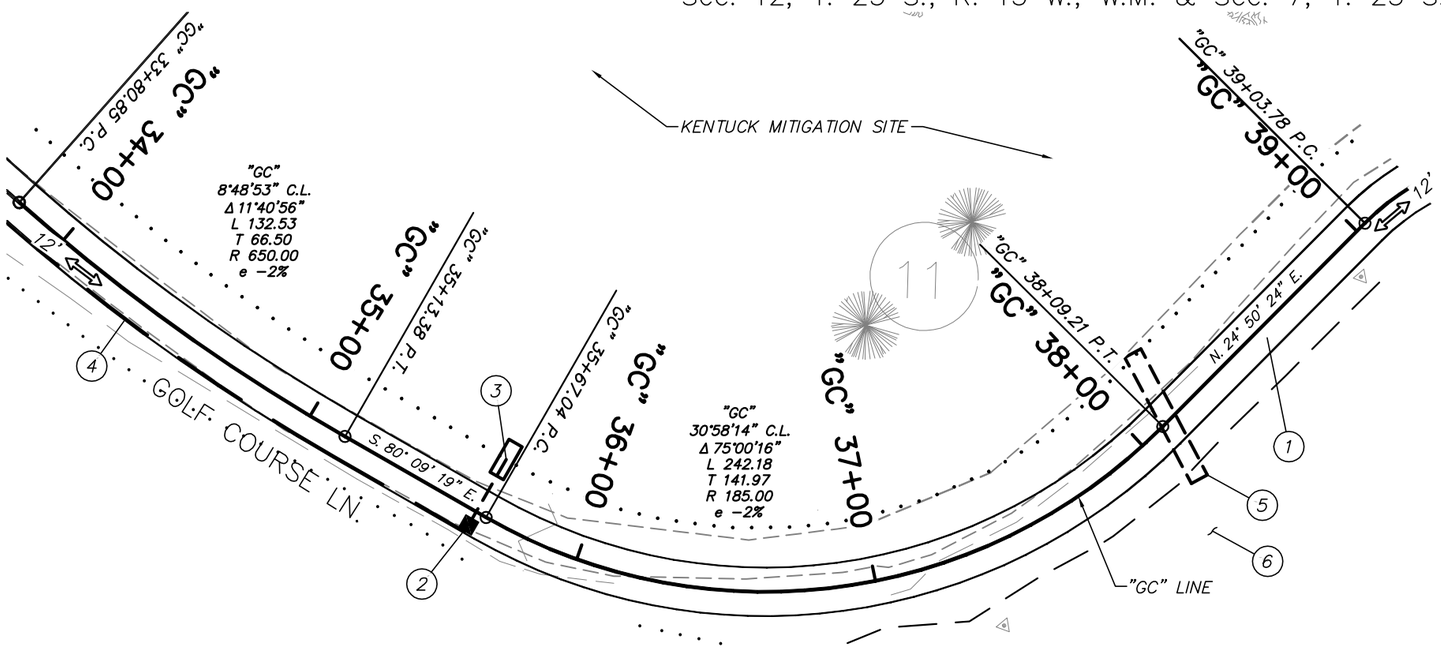
Reviewed By – G. Olen
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

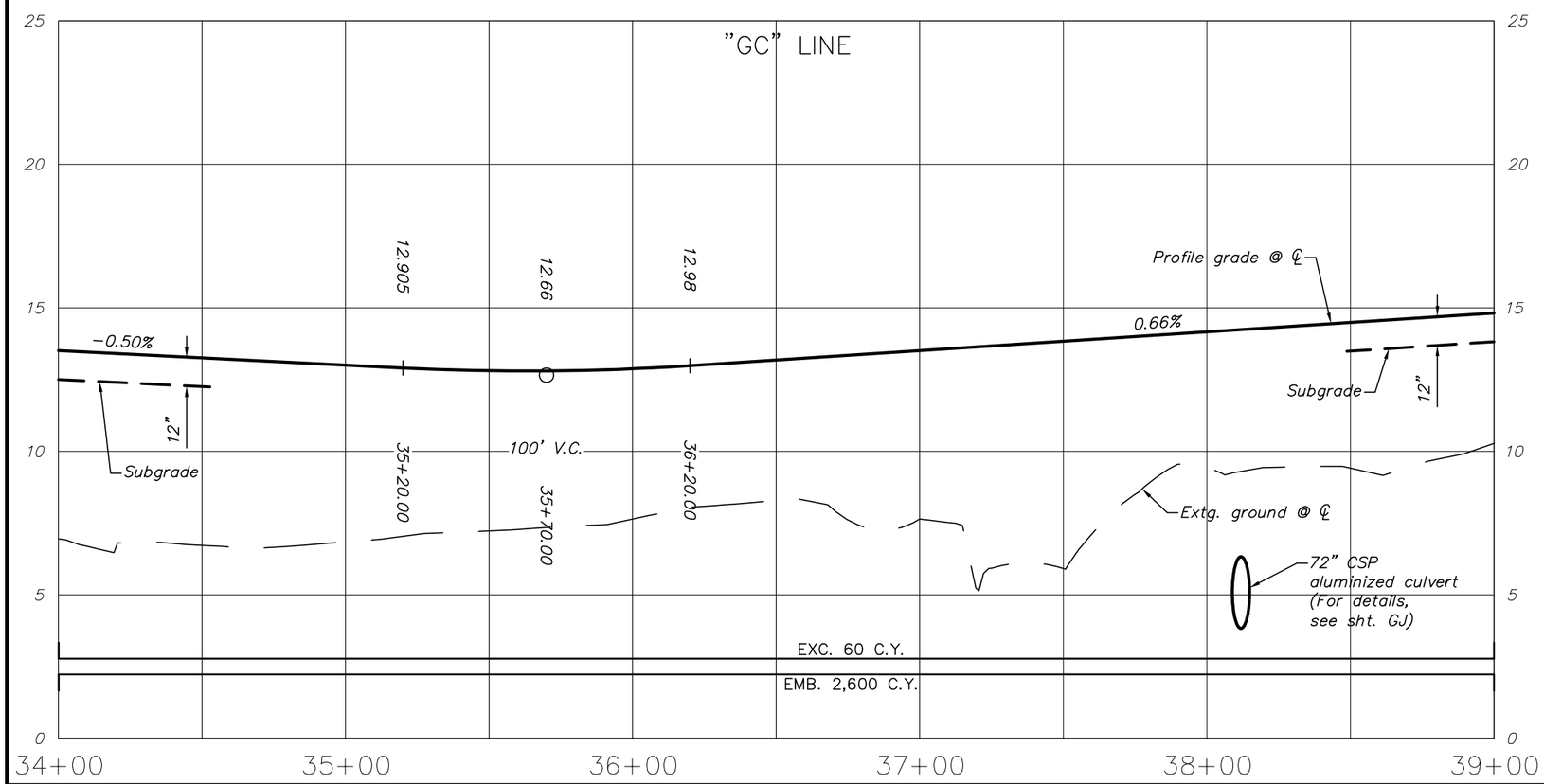
SHEET NO. 5

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_Rdwy Sheets.dwg jnd Aug 29, 2014 9:55am

Sec. 12, T. 25 S., R. 13 W., W.M. & Sec. 7, T. 25 S., R. 12 W., W.M.



1. Const. Golf Course Lane (For details, see sheet 2)
2. Sta. "GC" 35+63, Rt. Const. water quality inlet (For details, see sht. 2B)
3. Sta. "GC" 35+63, Lt. Const. outfall Inst. 12" sew. pipe – 25' Inst. class 50 riprap – 10 C.Y.
4. Const. asph. conc. drainage curb
5. 72" CSP aluminized culvert (For details, see sht. GJ)
6. Remove top 0.50' from drained irrigation pond site – 1,200 C.Y.



LEGEND
Cut slope line
Fill slope line

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

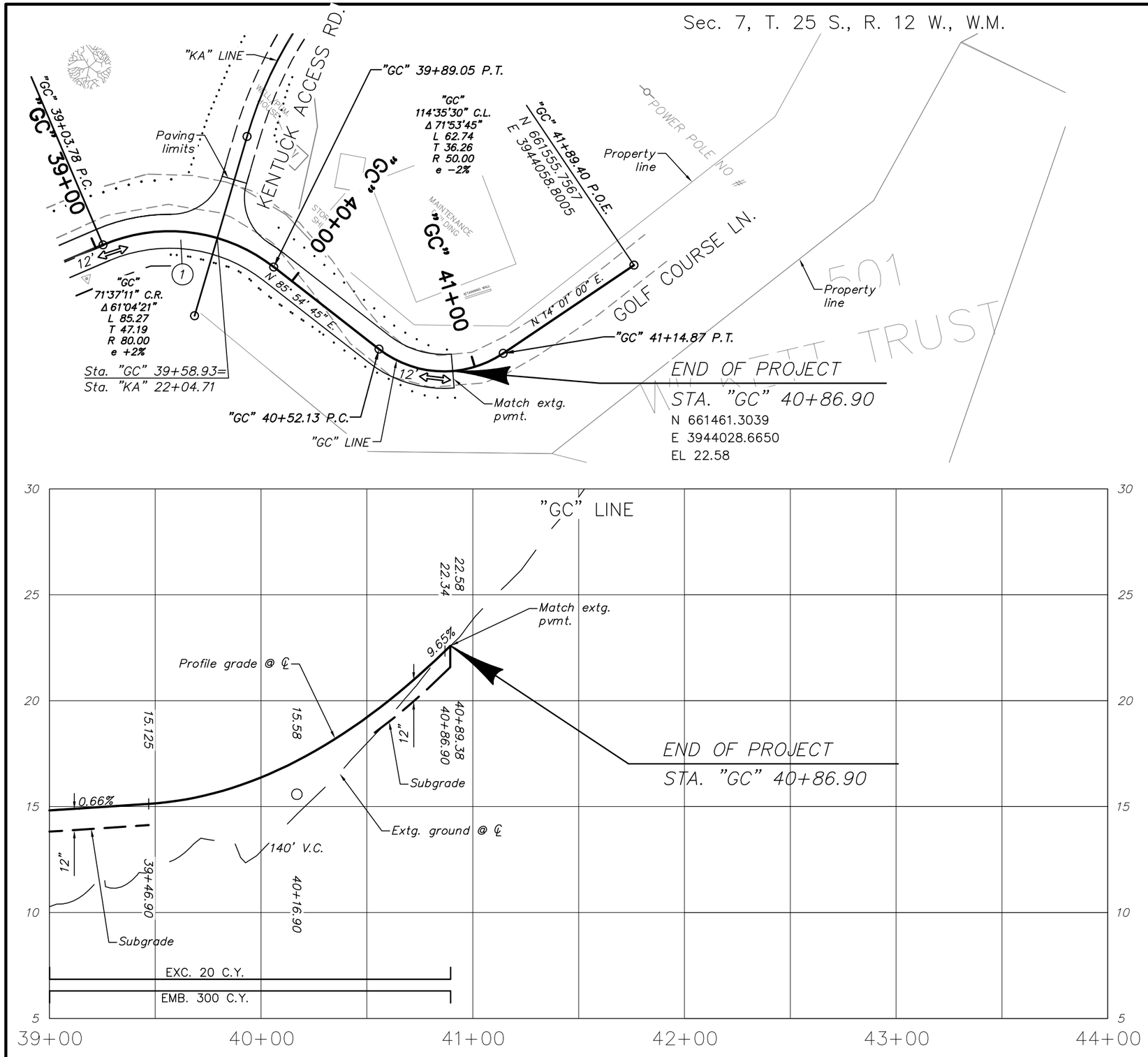
COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 6

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Golf Course Lane Sheets\Golf Course Lane_Rdwy Sheets.dwg jnd Aug 29, 2014 9:55am



(1) Const. Golf Course Lane
(For details, see sheet 2)

N

LEGEND
Cut slope line
Fill slope line

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 7

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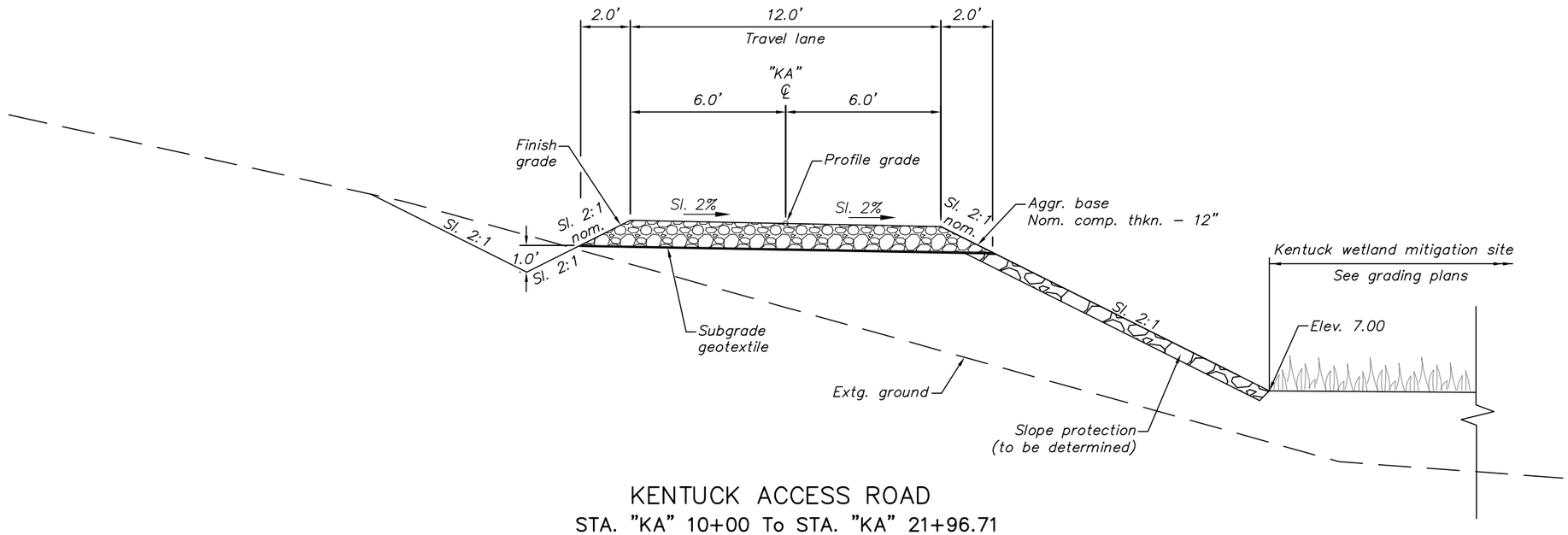

KENTUCK ACCESS ROAD
STA. "KA" 10+00 To STA. "KA" 21+96.71

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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK ACCESS

COOS COUNTY

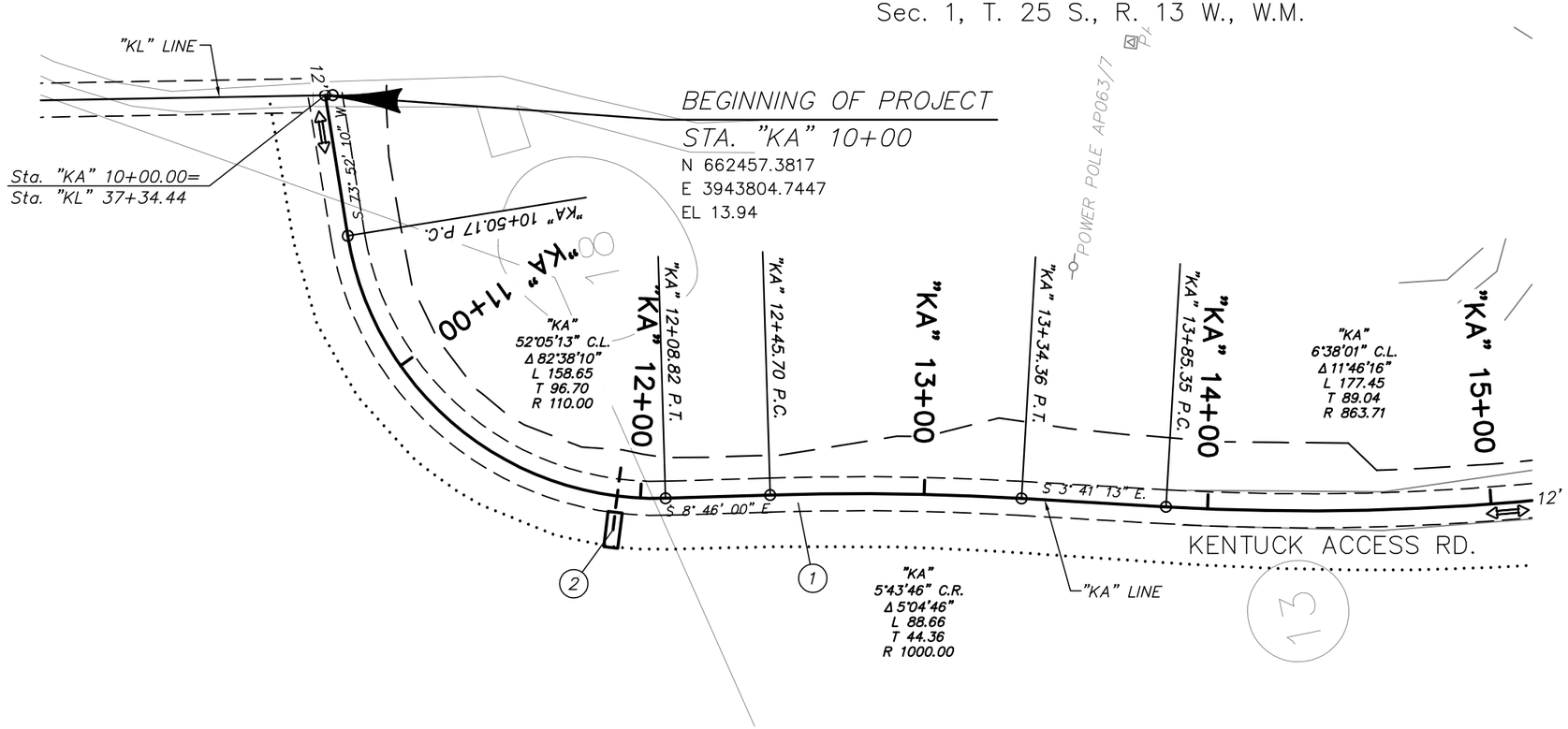
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

TYPICAL SECTION

SHEET NO.
2

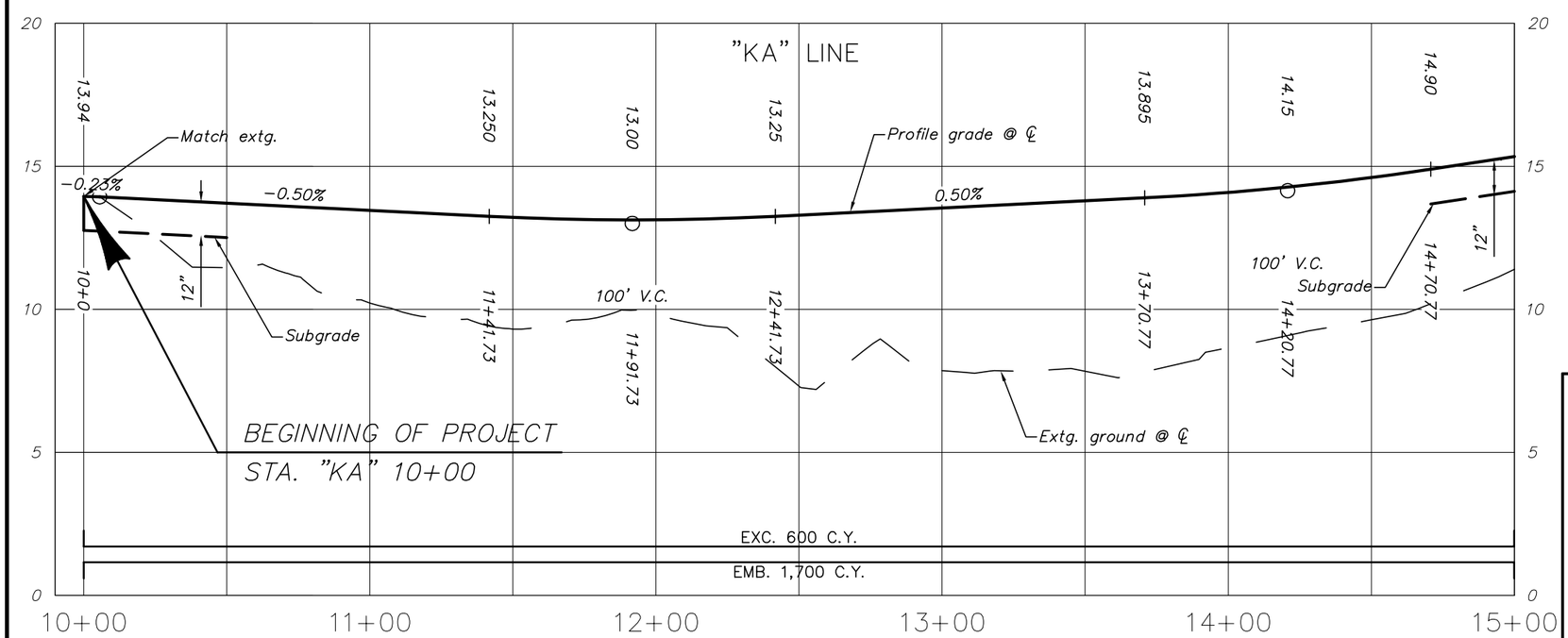
P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Kentuck Access Sheets\Kentuck Access_Typical Sections.dwg jnd Aug 29, 2014 9:57am

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



1 Const. 12' Access Road
(For details, see sheet 2)

2 Sta. "KA 11+92, Rt.
Const. outfall
Inst. 10" sew. pipe – 22'
Inst. class 50 riprap – 10 C.Y.



LEGEND
Cut slope line
Fill slope line

–DRAFT–
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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK ACCESS

COOS COUNTY

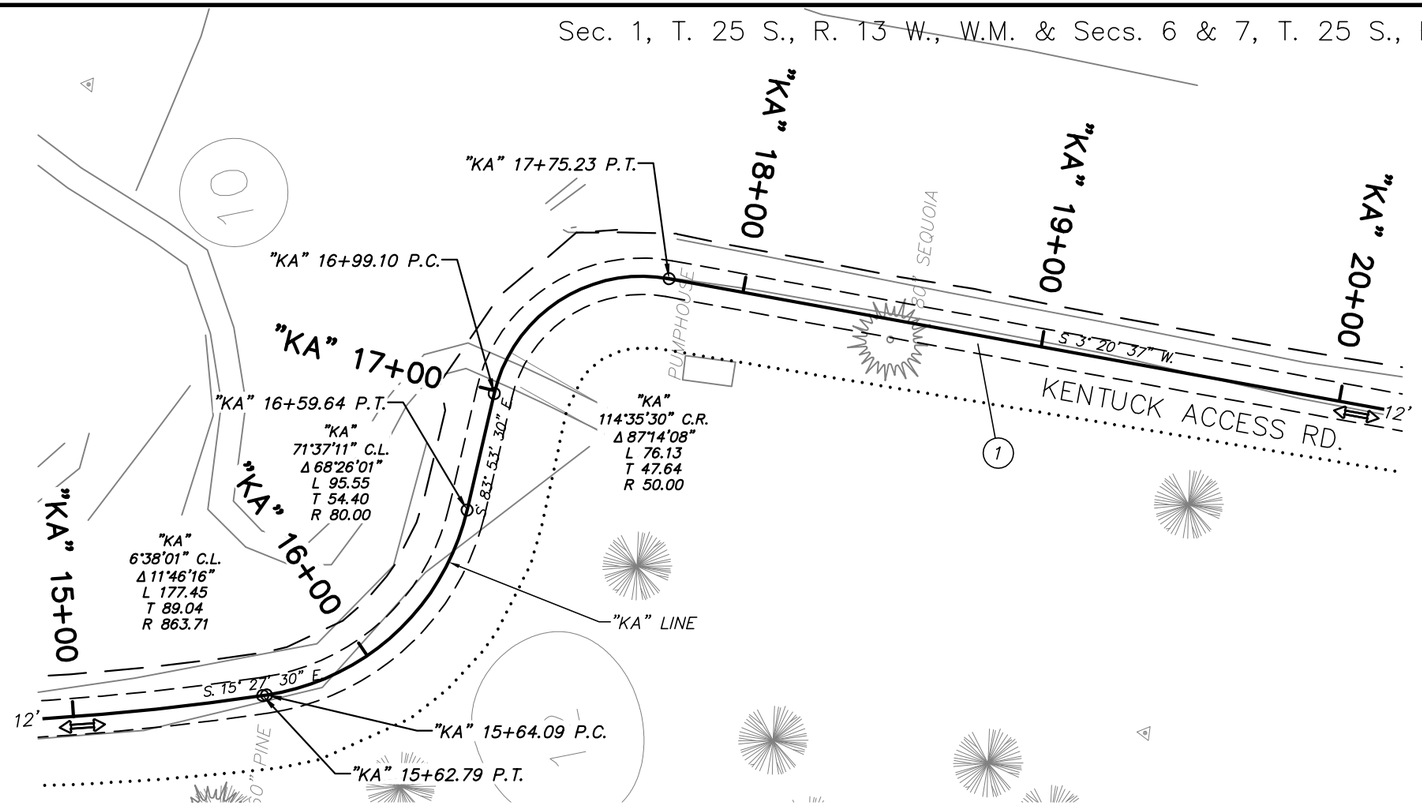
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

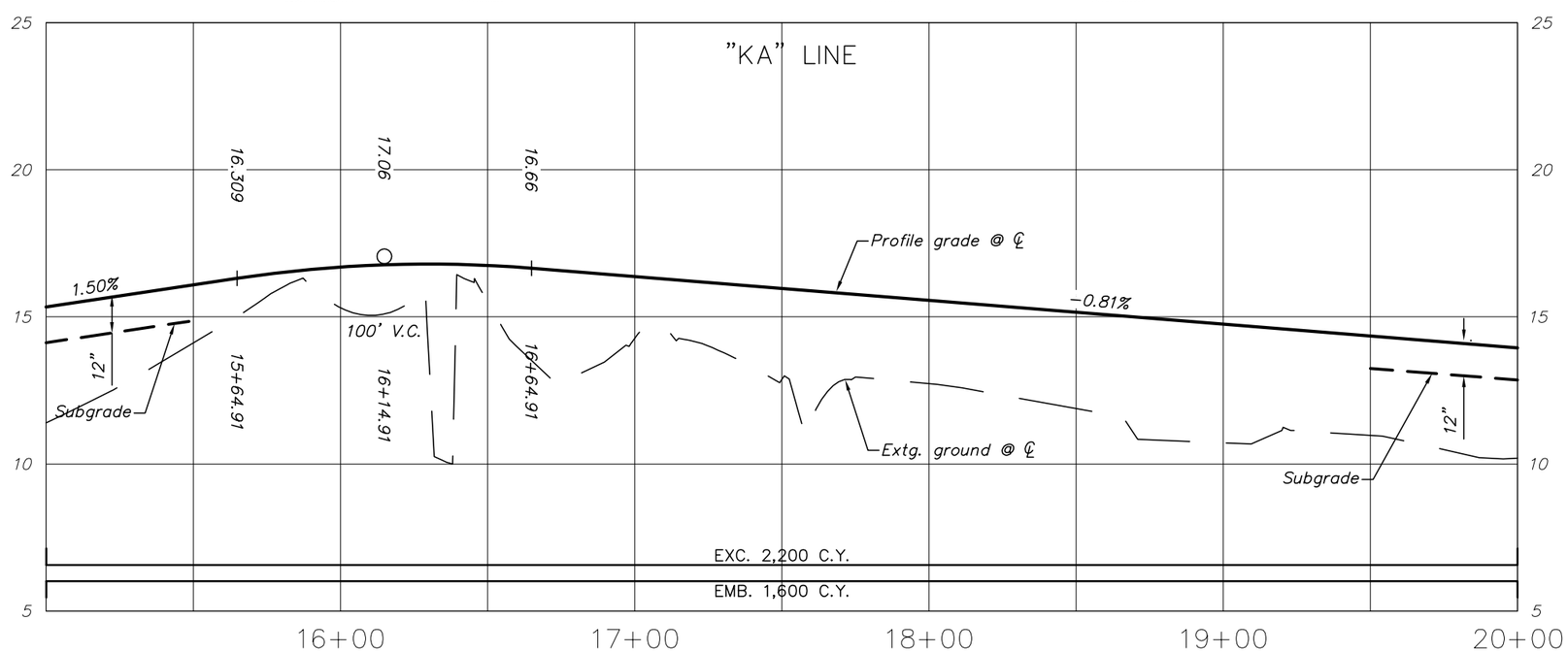
GENERAL CONSTRUCTION

SHEET NO. 3

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Kentuck Access Sheets\Kentuck Access_Rdwy Sheets.dwg jnd Aug 29, 2014 9:57am

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





LEGEND
Cut slope line
Fill slope line

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FOR CONSTRUCTION

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK ACCESS

COOS COUNTY

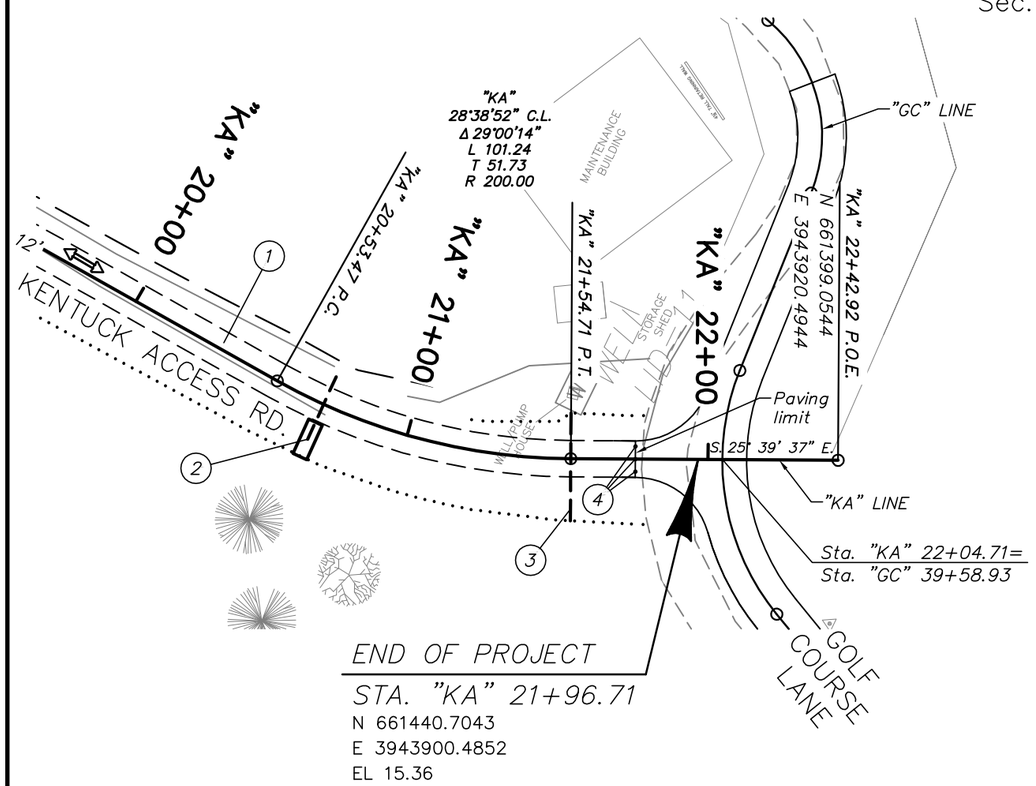
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

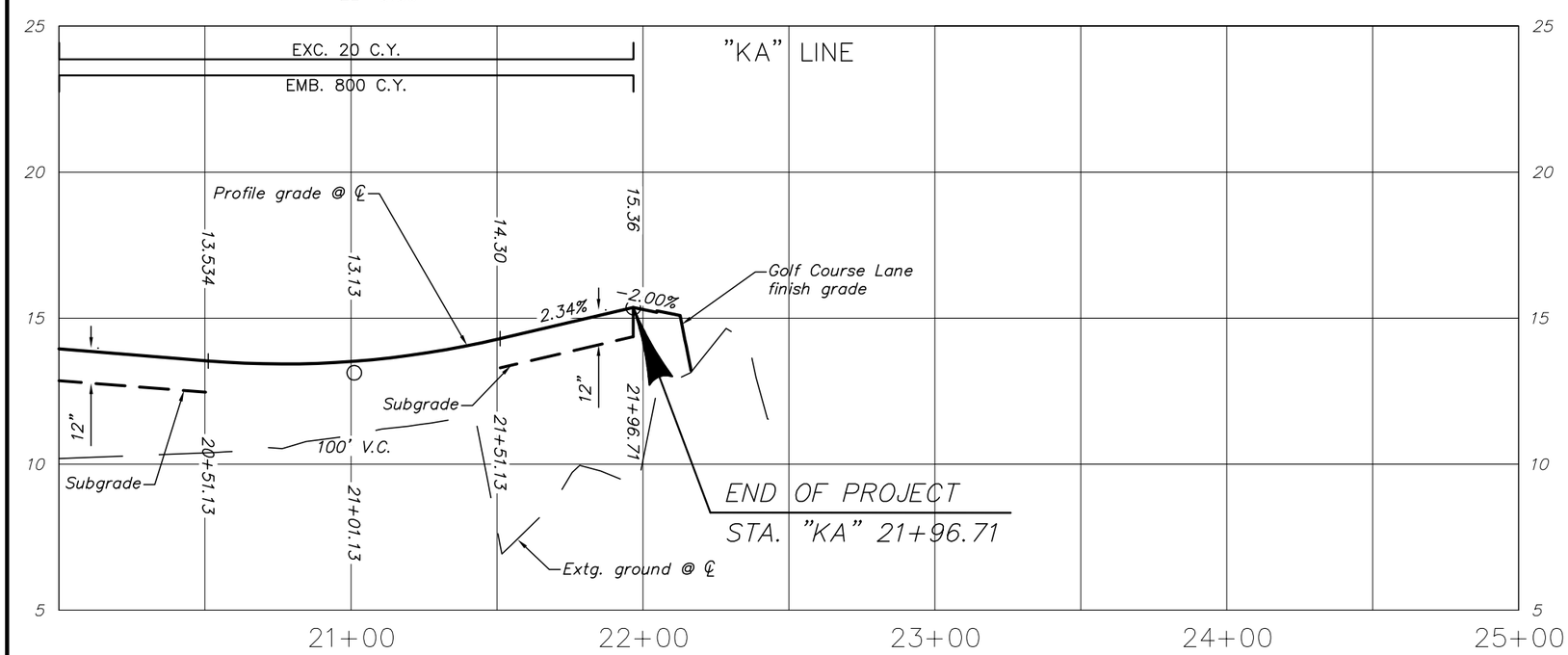
SHEET NO. 4

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Kentuck Access Sheets\Kentuck Access_Rdwy Sheets.dwg jnd Aug 29, 2014 9:57am

Sec. 7, T. 25 S., R. 12 W., W.M.



1. Const. 12' Access Road (For details, see sheet 2)
2. Sta. "KA 20+71, Rt.
   Const. outfall
   Inst. 10" sew. pipe – 23'
   Inst. class 50 riprap – 10 C.Y.
3. Sta. "KA" 21+55
   Inst. 12" culv. pipe – 36'
4. Inst. removable bollard – 3 (For details, see sht. 2B)



LEGEND
Cut slope line
Fill slope line

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
KENTUCK ACCESS

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 5

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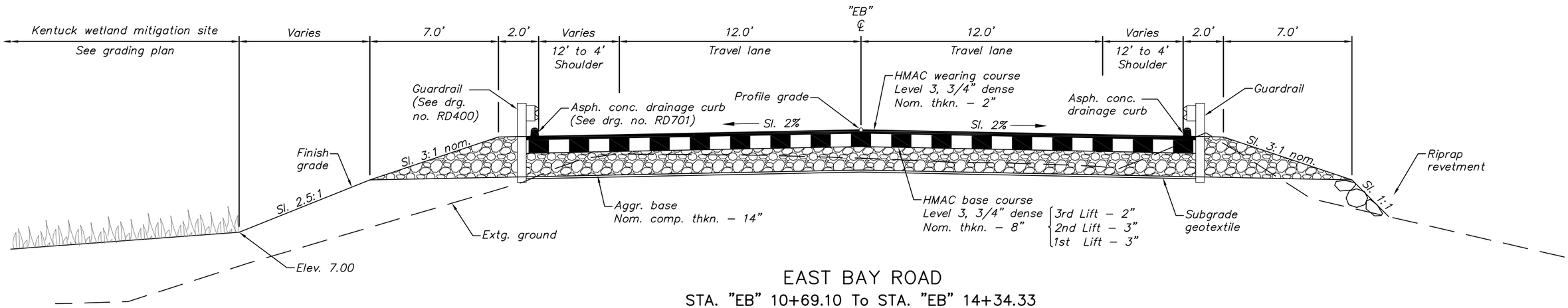
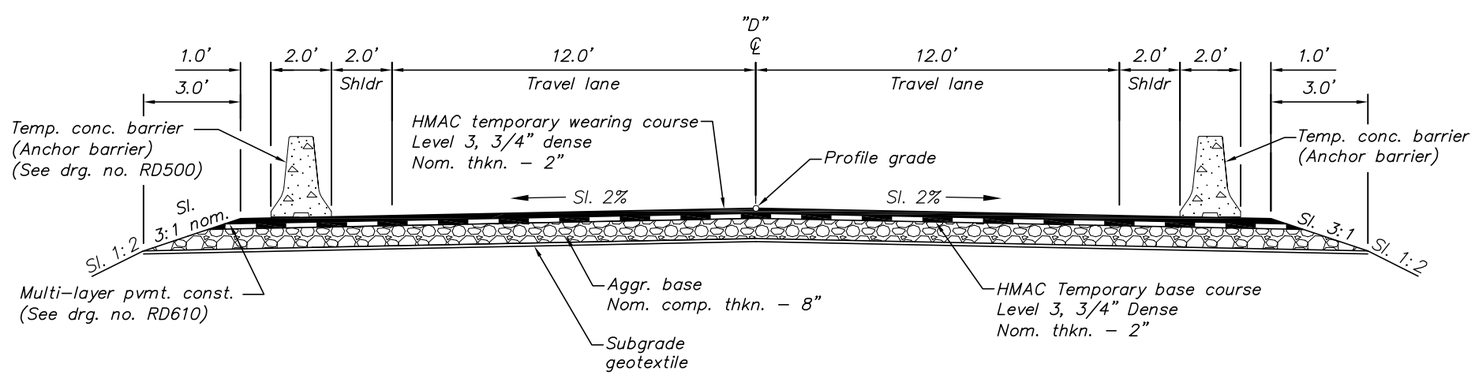


EAST BAY ROAD

STA. "EB" 10+69.10 To STA. "EB" 14+34.33
"EB" 14+34.33 To "EB" 14+87.74 (Structure)
"EB" 14+87.74 To "EB" 19+66.85



EAST BAY ROAD DETOUR

STA. "11+91.12" 10+69.10 To STA. "D" 17+94.55

NOTE:
1. Side–slopes are shown as horiz. to vert.

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DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
EAST BAY ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

TYPICAL SECTION

SHEET NO. 2

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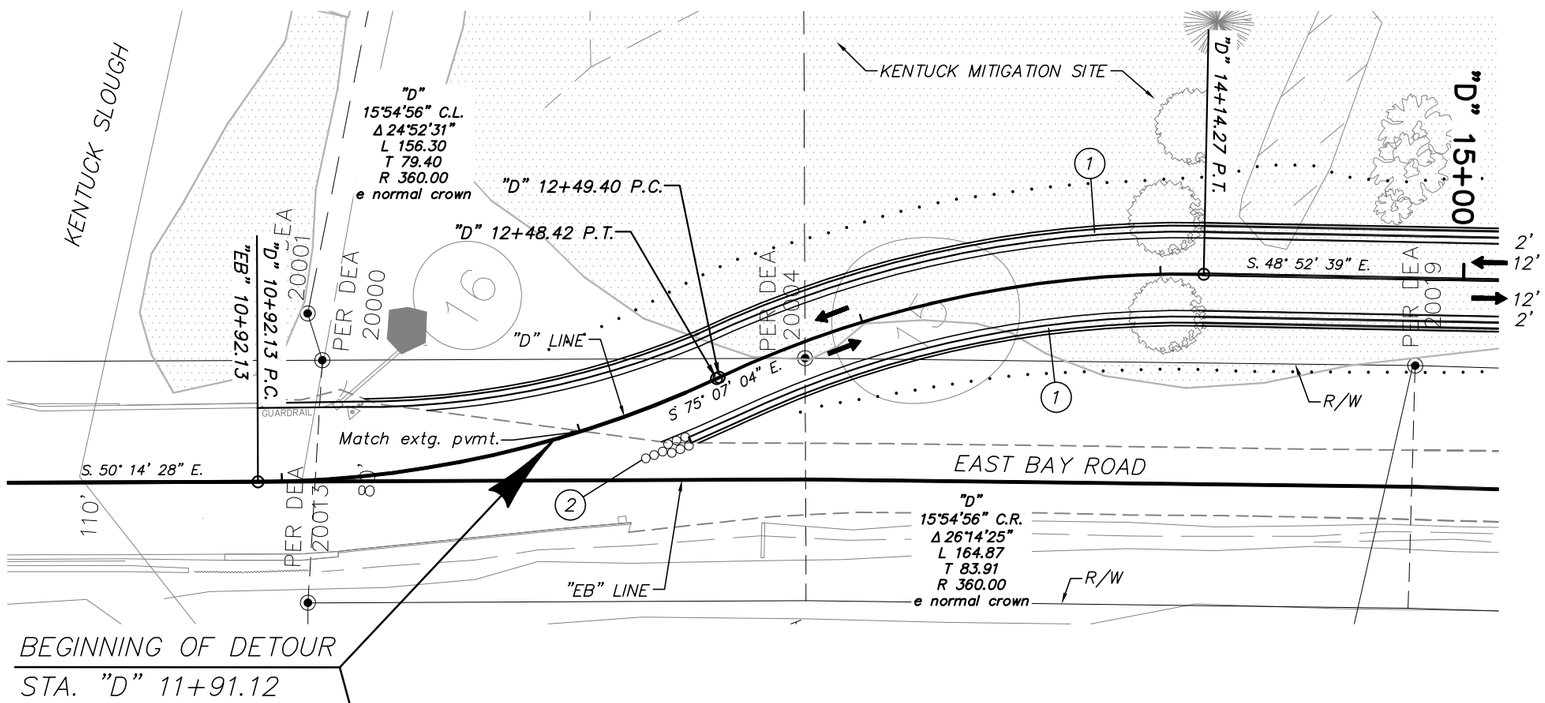
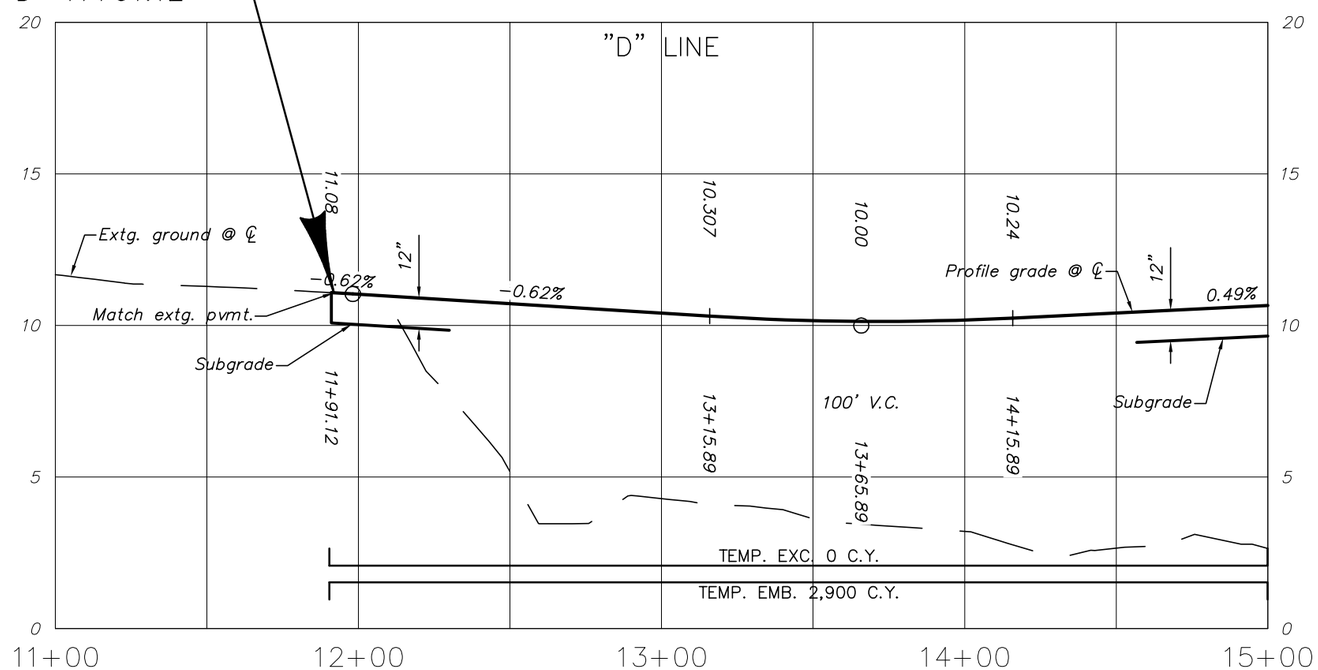
D E T O U R



BEGINNING OF DETOUR
STA. "D" 11+91.12



1. Const. temp. conc. barrier – 1155'
   (See sht. 2C–3 for details)
   (See drg. no. TM830)
2. Const. temp. impact attenuator
   (See drg. no. TM831)

LEGEND
Cut slope line
Fill slope line

–DRAFT–
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FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
EAST BAY ROAD

COOS COUNTY

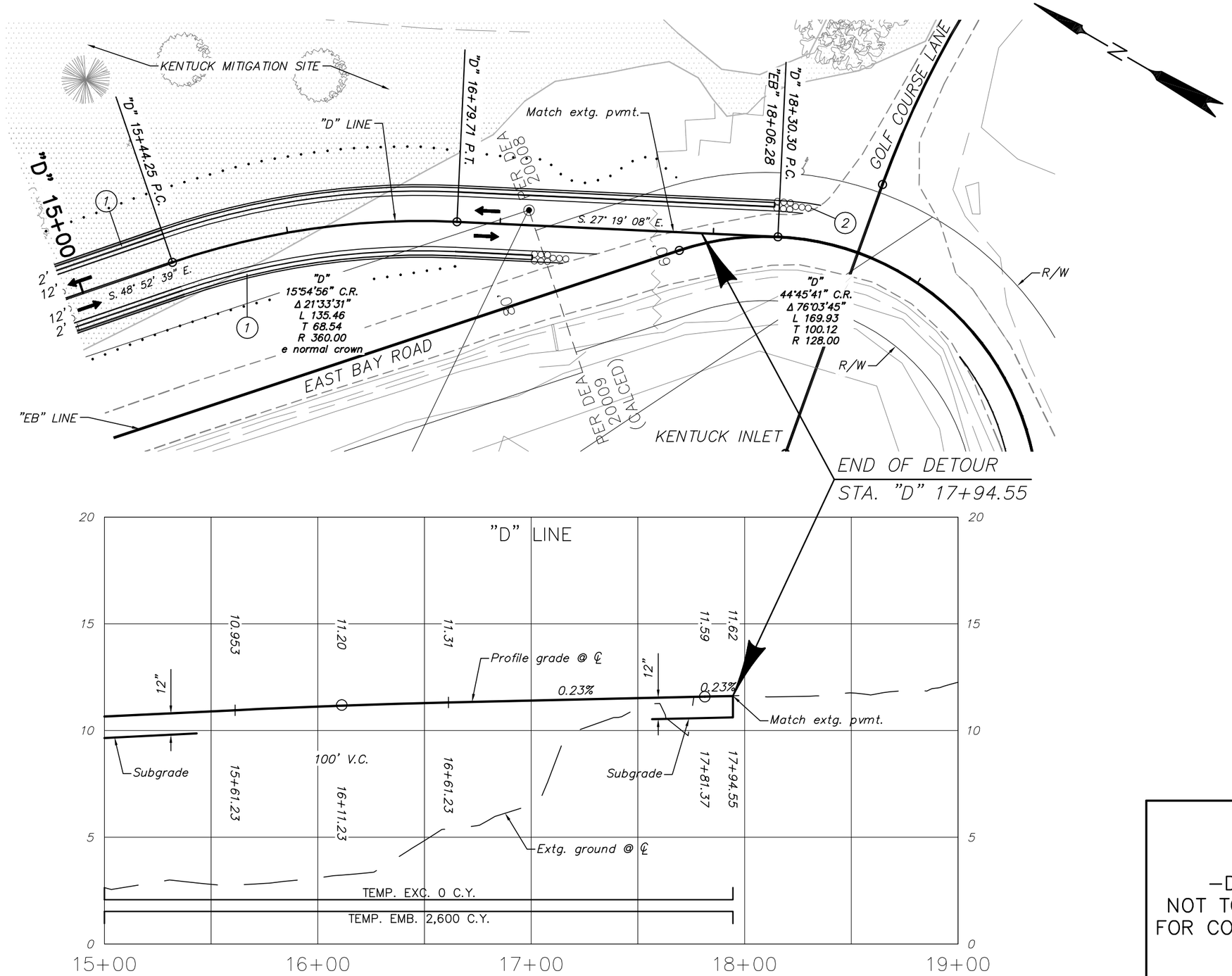
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

DETOUR PLAN

SHEET NO. 2C

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\East Bay Road Sheets\East Bay Road_Detour.dwg jnd Aug 29, 2014 9:50am

D E T O U R



1. Const. temp. conc. barrier – 1155' (See sht. 2C–3 for details)
2. Const. temp. impact attenuator (See drg. no. TM831)

LEGEND
Cut slope line
Fill slope line

–DRAFT–
NOT TO BE USED
FOR CONSTRUCTION

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
EAST BAY ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

DETOUR PLAN

SHEET NO. 2C–2

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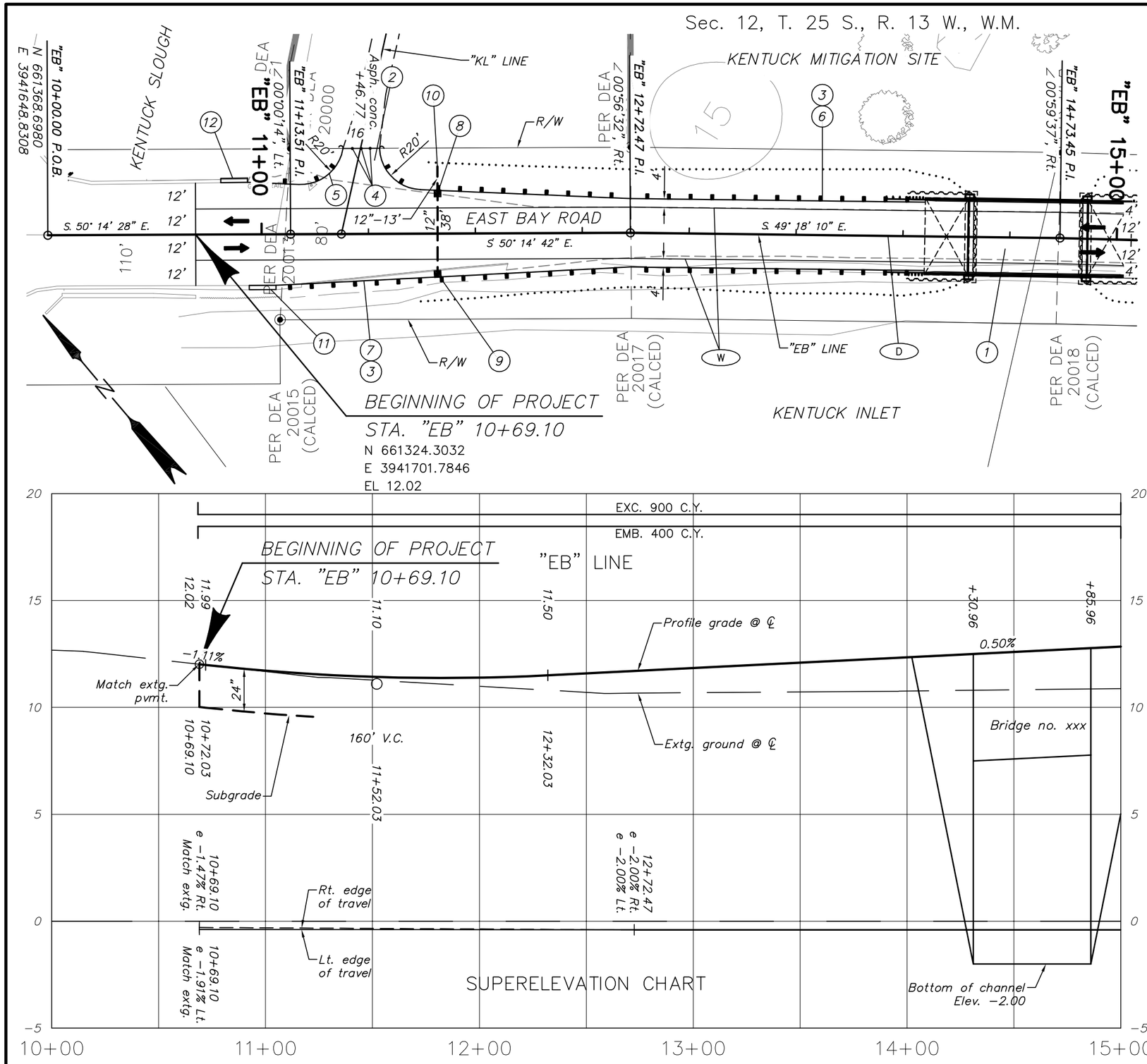

1. Structure no. xxx
   Const. structure – 55'
   Rdwy. width – 32'
   (For drg. nos., see sht. 1A)
2. Const. appr.
   (See drg. no. RD715)
3. Const. asp. conc. drainage curb
   (See drg. no. RD701)
4. Inst. removable bollard – 3
   (For details, see sht. 2B)
5. Sta. "EB" 10+94 to Sta. "EB" 11+38, Lt.
   Const. guardrail – 37.50' (Type 4)
   Const. guardrail transition
   Const anchor – 2 (Type 1 modified)
   Inst. end piece (Type B) – Thrie beam
   Const. guardrail to conc. barrier transition
   W=0, E=0
   (For details, see sht. 2B–2)
   (See drg. nos. RD400, RD405, RD410, RD415, RD450, and RD530)
6. Sta. "EB" 11+55 to Sta. "EB" 14+10, Lt.
   Const. guardrail – 253.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const anchor – 2 (Type 1 modified)
   Inst. end piece (Type B)
   W=0, E=0
   Const. Type "F" bridge rail to guardrail transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD440, & BR291)
7. Sta. "EB" 11+07 to Sta. "EB" 14+10, Rt.
   Const. guardrail – 278.5' (Type 2A)
   Const. guardrail – 25' (Type 3)
   Const. guardrail transition – 2
   Const. guardrail to conc. barrier transition
   W=0, E=0
   Const. Type "F" bridge rail to guardrail transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD440, & BR291)
8. Sta. "EB" 11+82, Lt.
   Const. water quality inlet
   Inst. 12" sew. pipe – 38'
   (For details, see sht. 2B–3)
9. Sta. "EB" 11+82, Rt.
   Const. water quality inlet
   (For details, see sht. 2B–3)
10. Sta. "EB" 11+82, 31' Rt.
    Const. outfall
    Inst. 12" sew. pipe – 13'
    Inst. class 50 riprap – 10 C.Y.
11. Sta. EB" 10+94 to Sta. "EB" 11+07, Rt.
    Remove extg. conc. shldr. barrier
    Const. conc. shldr. barrier – 12.5'
    Anchor barrier
    E=0
    (See drg. nos. RD500, RD516, RD530)
12. Sta. EB" 10+81 to Sta. "EB" 10+93, Lt.
    Remove extg. conc. shldr. barrier
    Const. conc. shldr. barrier – 12.5'
    Anchor barrier
    E=0

STRIPING LEGEND

- (D) Inst. double no–pass
- (S) Inst. 12" white stop bar
- (W) Inst. 4" white line

LEGEND

Cut slope line
Fill slope line

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EAST BAY ROAD

COOS COUNTY

Reviewed By – G. Oien
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GENERAL CONSTRUCTION

SHEET NO. 3

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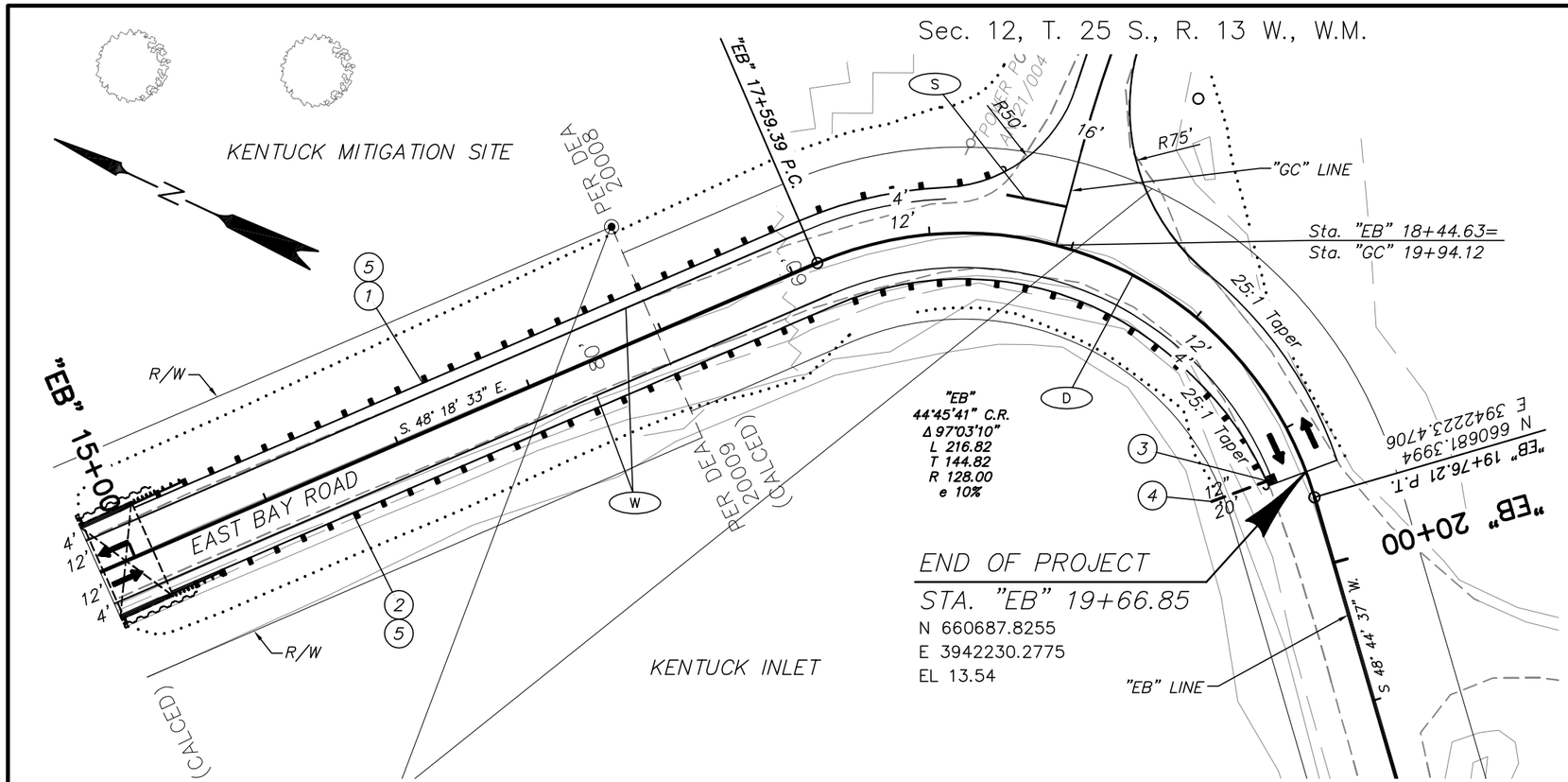
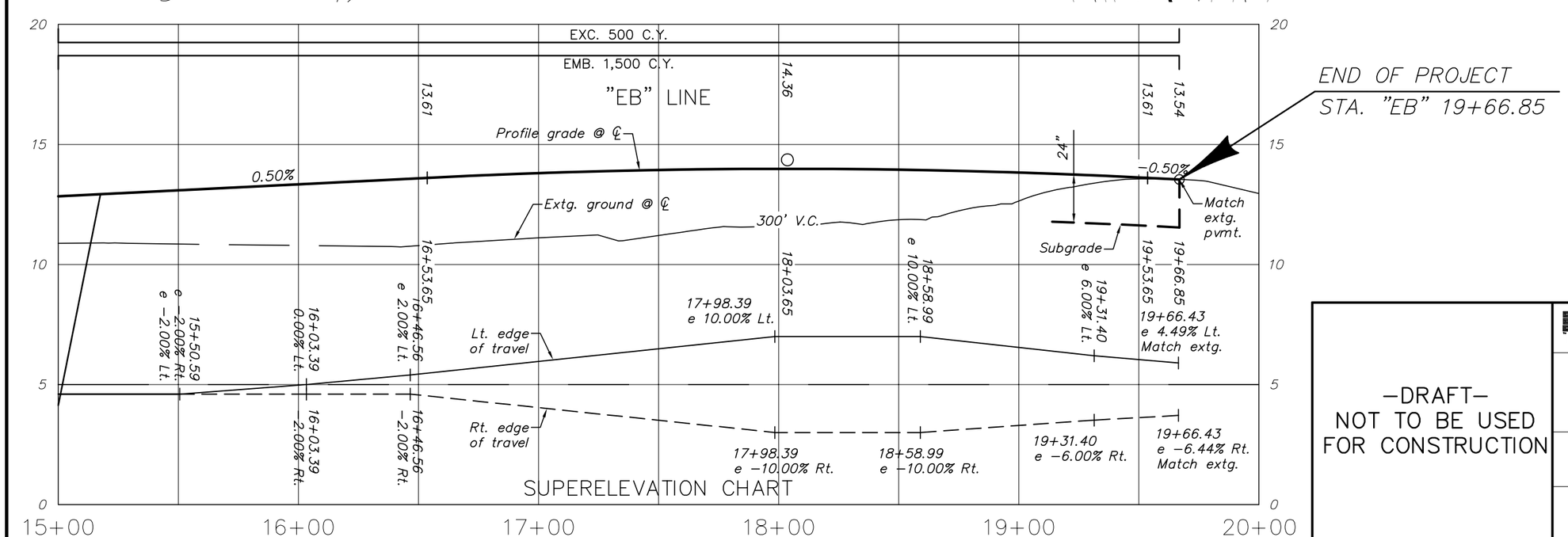


1. Sta. "EB" 15+07 to Sta. "EB" 18+24, Lt.
   Const. guardrail – 277' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const guardrail terminal, non–flared
   Test level – 3
   W=1', E=0
   Const. guardrail transition
   Const. Type "F" bridge rail to guardrail transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD420, RD440, & BR291)
2. Sta. "EB" 15+07 to Sta. "EB" 19+66, Rt.
   Const. guardrail – 384.5' (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail terminal, non–flared
   Test level – 3
   W=1', E=0
   Const. Type "F" bridge rail to guardrail transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD420, RD440, & BR291)
3. Sta. "EB" 19+65, Rt.
   Const. water quality inlet
   (For details, see sheet 2B–3)
4. Sta. "EB" 19+64, 34' Rt.
   Const. outfall
   Inst. 12" sew. pipe – 20'
   Inst. class 50 riprap – 10 C.Y.
5. Const. asph. conc. drainage curb

STRIPING LEGEND

- (D) Inst. double no–pass
- (S) Inst. 12" white stop bar
- (W) Inst. 4" white line



LEGEND

Cut slope line ——— ——— ———
Fill slope line · · · · · · · · · · · · · · · · ·

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2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

JORDAN COVE ENERGY PROJECT
EAST BAY ROAD

COOS COUNTY

Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J. DeMello

GENERAL CONSTRUCTION

SHEET NO. 4

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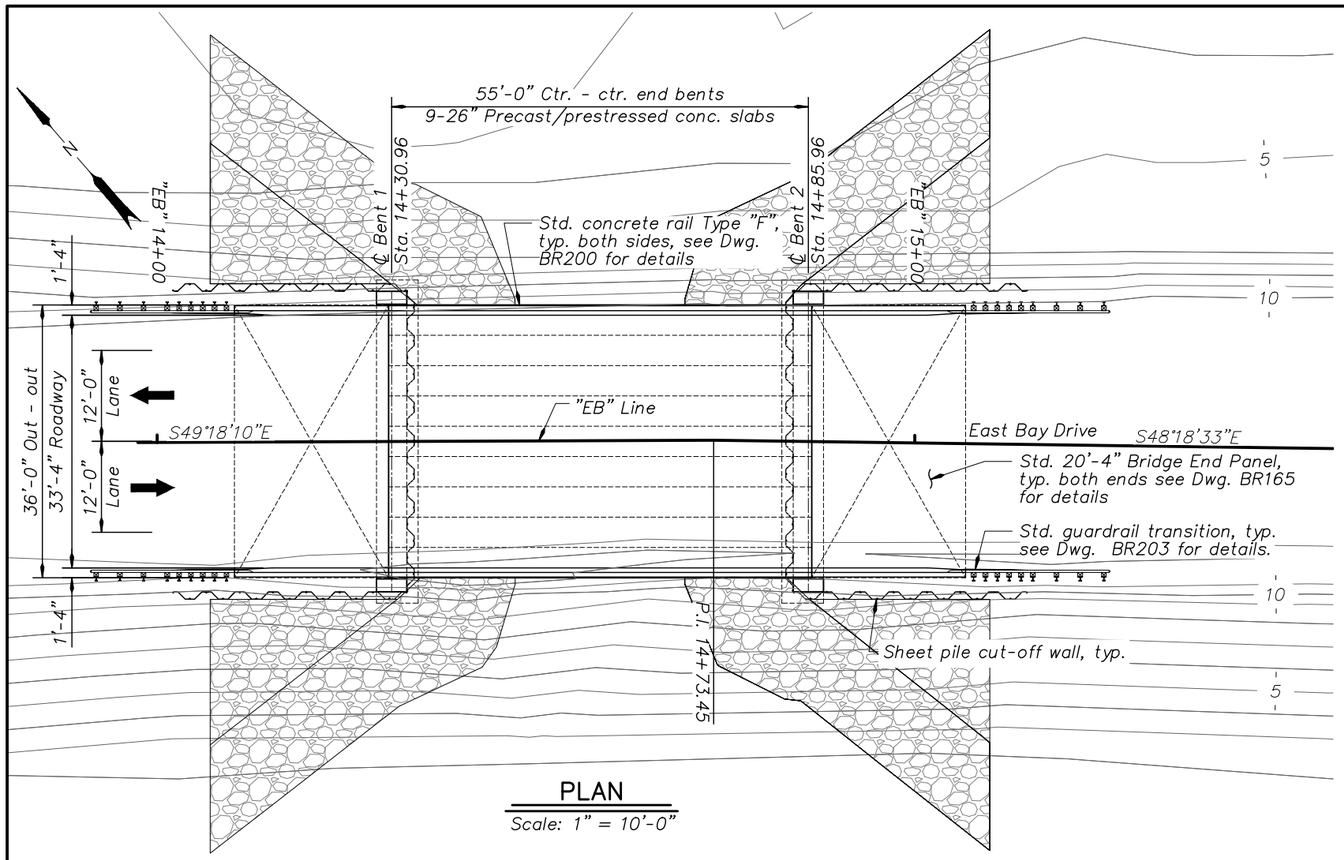
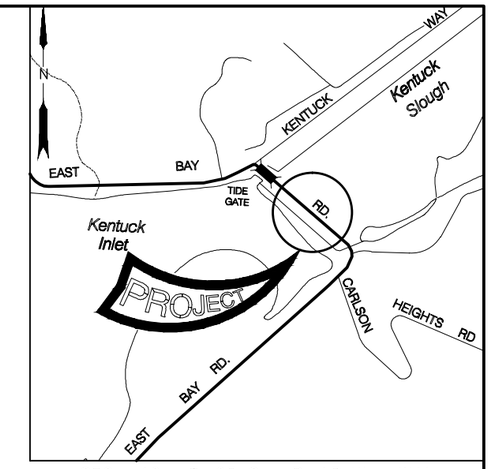


PLAN

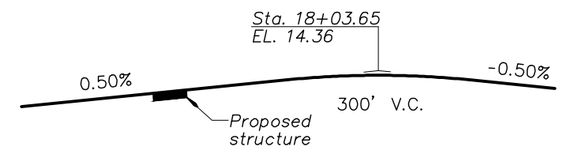
Scale: 1" = 10'-0"



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

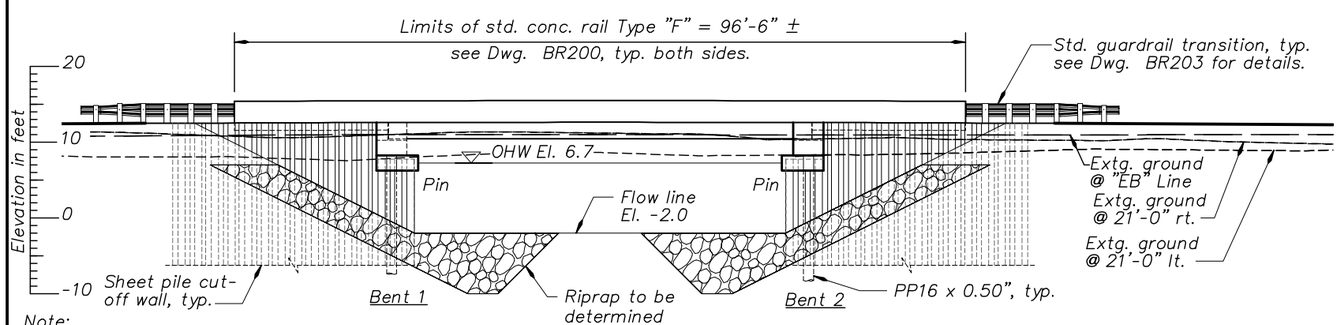
LOCATION MAP

No Scale



GRADELINE DIAGRAM

No Scale



Note:
Elevations shown are based on North American Vertical Datum, 1988.

ELEVATION

Scale: 1" = 10'-0"

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ACCOMPANIED BY DWGS. B702 - B706, BR165, BR200, BR203, BR420, BR445	DRAFTER: Jim Culpepper DESIGNER: Laura Barker CHECKER: Anthony Calcagno REVIEWER: Terry Stones	FOR REVIEW EXPIRES:	SCALE WARNING If scale bar doesn't measure one inch then drawing is not to scale

DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. XXXXX	EAST BAY DRIVE BRIDGE JORDAN COVE ENERGY PROJECT KENTUCK MITIGATION SITE	SHEET 1 OF 6
DATE Month 2014		DRAWING NO.
CALC. BOOK -----	PLAN AND ELEVATION	B701

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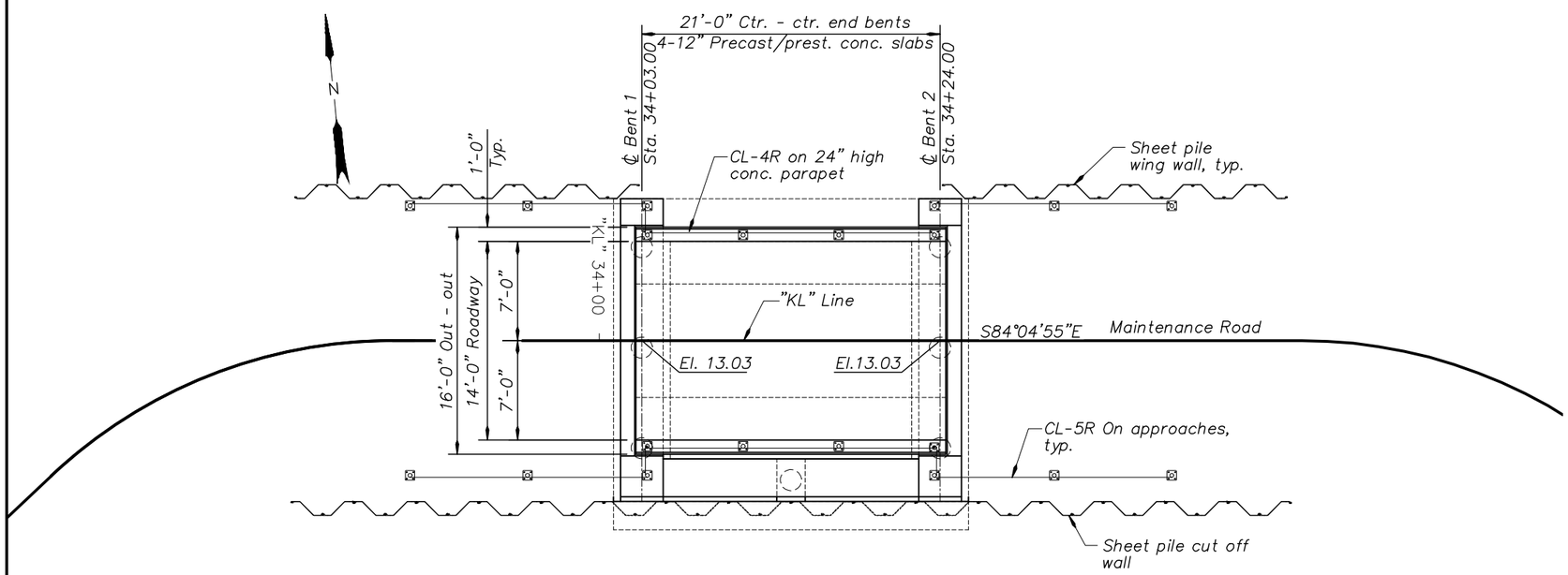
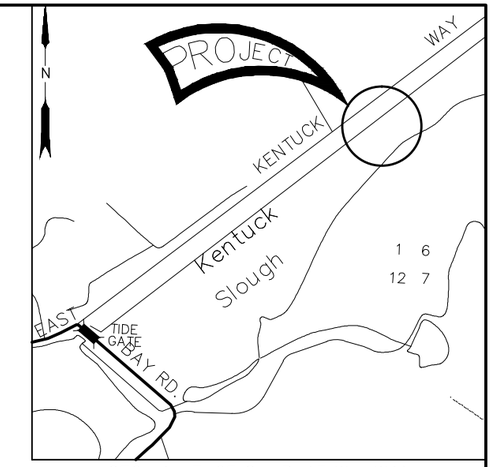


PLAN

Scale: 1" = 5'-0"



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

LOCATION MAP

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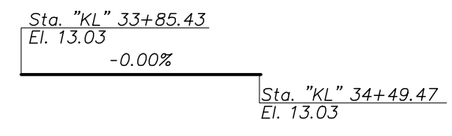
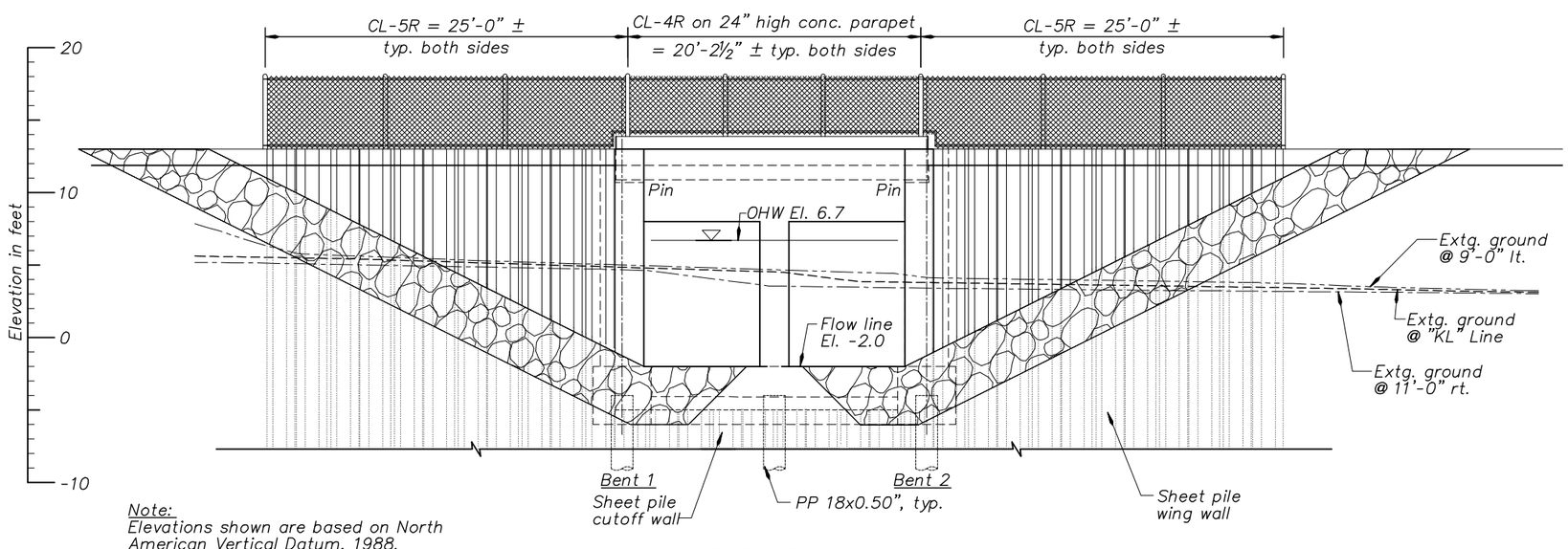


Note:
Gradeline is top of aggregate wearing surface at centerline maintenance road.

GRADELINE DIAGRAM

No Scale



Note:
Elevations shown are based on North American Vertical Datum, 1988.

ELEVATION

Scale: 1" = 5'-0"

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DATE	BY

REVIEW PLANS
Aug 29, 2014
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DO NOT USE FOR CONSTRUCTION

ACCOMPANIED BY DWGS. B802 - B805, BR240, BR400

DRAFTER: Jim Culpepper
DESIGNER: Jason Stroud
CHECKER: Anthony Calcagno
REVIEWER: Terry Stones

FOR REVIEW
EXPIRES:

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. XXXXX
DATE Month 2014
CALC. BOOK -----

KENTUCK SLOUGH DIKE BRIDGE
JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

PLAN AND ELEVATION

SHEET 1 OF 7
DRAWING NO. B801

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Rotation: 0° Scale: 1:1

Part A – Tab B: LNG Terminal Project; Compensatory Wetland Mitigation

Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

Overview

(Federal Permitting)

Prepared for:

125 Central Avenue, Suite 380

Coos Bay, OR 97420

Prepared by:

2100 SW River Parkway

Portland, OR 97201

October 2014

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CWM Part B – Estuarine Impacts and Mitigation

1. COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW

Jordan Cove Energy Project, L.P. (JCEP L.P.) is proposing a liquefied natural gas (LNG) Terminal Project (Part A of the permit application) and Slip and Access Channel Project (Part C of the permit application; together these are called the JCEP LNG Project, or the Project) which is situated along the North Spit of Coos Bay, Oregon. The Pacific Connector Gas Pipeline Project is Part B of the permit application but has a separate mitigation plan prepared by others. The Project will result in freshwater and estuarine wetland impacts. These resources provide important ecological functions and are regulated by state and federal agencies. Permanent impacts to these resources will therefore need to be mitigated.

This Compensatory Wetland Mitigation (CWM) Plan specifically covers the following proposed development features:

- JCEP L.P. facilities (responsibility of JCEP L.P.)
    - LNG terminal site (aka Ingram Yard)
    - South Dunes Power Plant site (aka Mill Site/South Dunes Site)
    - Utility corridor and access road, including bridges, between LNG terminal and power plant
    - Rail Spur Bridge
    - Barge berth
    - Slip and Access Channel
    - North Point Workforce Housing Project (NPWHP) at the APCO Coos Properties, LCC (APCO) property
    - Southwest Oregon Regional Safety Center (SORSC)
    - Trans Pacific Parkway/Highway 101 intersection improvements (TPP improvements)

The plan for wetland and estuarine mitigation activities for the various project-related components has been divided into two parts: The first covers all proposed freshwater resource impacts, and the second covers all proposed estuarine resource impacts. Table 1 provides a summary of the two mitigation plan parts along with the impacts covered by each. Each plan part goes into additional detail about impacts and mitigation components. Figure 1 provides a summary overview of impact and mitigation areas.

Table 1. Mitigation Plan Parts, Project Features, Impacts, and Mitigation Acreage Summary

Mitigation Plan Part	Project Features	Mitigation Methods	Resource IDs Impacted	Impact Acres	Mitigation Acreage
Part A - Freshwater Resource CWM	-power plant -LNG terminal -utility corridor -rail spur bridge -Workforce housing	Creation, Enhancement	***Wetlands A, B, C, E, H (East), I (North and South), J, L, N, APC-D, 2012-4, 2012-7, 2013-3, 2013-4, and 2013-6	2.01	3.21*
Part B - Estuarine Resource CWM	-barge berth -power plant -TPP improvements -access channel	Restoration, Enhancement	Access channel (Unvegetated mudflat, tide channel-mudflat, salt marsh, eelgrass) Wetland M (salt marsh), Wetland H (West)	19.97**	52.69*
Total				**21.98**	**55.90**

*Mitigation acreage noted is the minimum needed to meet suggested Oregon Department of State Lands mitigation ratios, as identified in mitigation success criteria. Proposed additional/excess credits include 0.86 credits associated with Part A and 0.53 credits associated with Part B. These additional credits are not included in the above table.See CWM Plan Parts A and B for additional details.

**Acreage includes approximately 3.11 acres of incidental freshwater wetland impacts at the Kentuck estuarine mitigation site that will be lost due to site construction features, including cross-dike, dike relocation, road improvements, etc.. Mitigation for these freshwater impacts will occur at a 3:1 ratio in the form of additional mudflat creation at the Kentuck site. Additional details are provided in “CWM Part B: Estuarine Impacts.”

***Although the Oregon Department of State Lands chose not to take jurisdiction over Wetlands I (South) and N, these wetlands are considered jurisdictional under Federal law and are therefore included in this mitigation plan.

2. CONSISTENCY WITH USACE MITIGATION REPORTING REQUIREMENTS

This CWM Plan has been prepared in accordance with U.S. Army Corps of Engineers (USACE) information requirements. A separate Clean Water Act 404(b)(1) guidelines document has been prepared and submitted to the USACE that describes wetland impact avoidance and minimizations measures. This CWM Plan focuses specifically on wetland mitigation for unavoidable permanent wetland impacts.

For consistency purposes, this proposed CWM Plan has been prepared in accordance with the Oregon Department of State Lands (DSL) wetland removal-fill rules. However, it is fully supportive of federal regulatory permitting requirements. Documentation of how this plan meets the information requirements of the USACE Portland District Mitigation Plan Template is provided below.

In Oregon, it is a long standing and common practice for the USACE regulatory program to utilize the states wetland mitigation ratios in preparation of CWM Plans. Therefore, DSL wetland mitigation ratios have been used to determine mitigation acreage.

3. USACE PORTLAND DISTRICT MITIGATION PLAN TEMPLATE

PART I. PROJECT INFORMATION

Project Name:	**JORDAN COVE ENERGY PROJECT (JCEP)**
NWP Permit No.:	
Project Location:	**Coos Bay north spit and estuary, Oregon**
Mitigation Site Location(s) (If different):	**Coos Bay north spit and estuary, Oregon**
Watershed(s):	**Coos Bay**
County or Counties:	**Coos County**

PART II. AVOIDANCE AND MINIMIZATION

II.1 Avoidance

Refer to Jordan Cove Energy Project 404(b)(1) Alternatives Analysis report (DEA 2014).

II.2 Minimization

Refer to Jordan Cove Energy Project 404(b)(1) Alternatives Analysis report (DEA 2014).

PART III. COMPENSATORY MITIGATION

III.1 Goals and Objectives

Refer to CWM Plan Part A: Freshwater Impacts: Section 1.2.

Refer to CWM Plan Part B: Estuarine Impacts Section: 1.2.

III.2 Site Selection

Refer to CWM Plan Part A: Freshwater Impacts: Section 3.

Refer to CWM Plan Part B: Estuarine Impacts: Section 3.

III.3 Easements or Encumbrances

Refer to CWM Plan Part A: Freshwater Impacts: Section 2.2.

Refer to CWM Plan Part B: Estuarine Impacts: Section 2.2.

III.4 Baseline Information

Refer to CWM Plan Part A: Freshwater Impacts: Section 4.

Refer to CWM Plan Part B: Estuarine Impacts: Section 4.

III.5 Mitigation Work Plan

Refer to CWM Plan Part A: Freshwater Impacts: Sections 1.3 and 6.

Refer to CWM Plan Part B: Estuarine Impacts: Section 1.3 and 6.

Additional design details to be provided to USACE as design efforts are furthered (i.e. eelgrass donor bed locations and collection criteria, etc.). Additional design efforts will be a refinement of the concepts and design plans provided in this CWM Plan.

III.6 Determination of Credits

In Oregon, it is a long standing and common practice for the USACE regulatory program to utilize the states wetland mitigation ratios in preparation of CWM Plans. Therefore, DSL wetland mitigation ratios have been used to determine mitigation acreage and credits throughout this CWM Plan.

Refer to CWM Plan Part A: Freshwater Impacts: Sections 1.1, 1.2, and 1.4.

Refer to CWM Plan Part B: Estuarine Impacts: Sections 1.1, 1.2, and 1.4.

III.7 Maintenance Plan

Refer to CWM Plan Part A: Freshwater Impacts: Sections3.3, 7.3, and 8.3.

Refer to CWM Plan Part B: Estuarine Impacts: Sections 3.3, 7.3, and 8.3.

III.8 Site Protection Instrument

Refer to CWM Plan Part A: Freshwater Impacts: Section 8.1

Refer to CWM Plan Part B: Estuarine Impacts and Mitigation: Section 8.1

III.9 Performance Standards

Refer to CWM Plan Part A Freshwater Impacts: Section 7.1.

Refer to CWM Plan Part B: Estuarine Impacts: Section 7.1.

III.10 Monitoring Requirements

Refer to CWM Plan Part A Freshwater Impacts: Section 7.1 and 7.2.

Refer to CWM Plan Part B: Estuarine Impacts: Section 7.1 and 7.2.

III.11 Long-term Management Plan

Refer to CWM Plan Part A: Freshwater Impacts: Section 8.

Refer to CWM Plan Part B: Estuarine Impacts: Section 8.

III.12 Adaptive Management Plan

Refer to CWM Plan Part A: Freshwater Impacts: Section 7.3

Refer to CWM Plan Part B: Estuarine Impacts: Section 7.3

III.13 Financial Assurances

Refer to CWM Plan Part A: Freshwater Impacts: Section 8.2

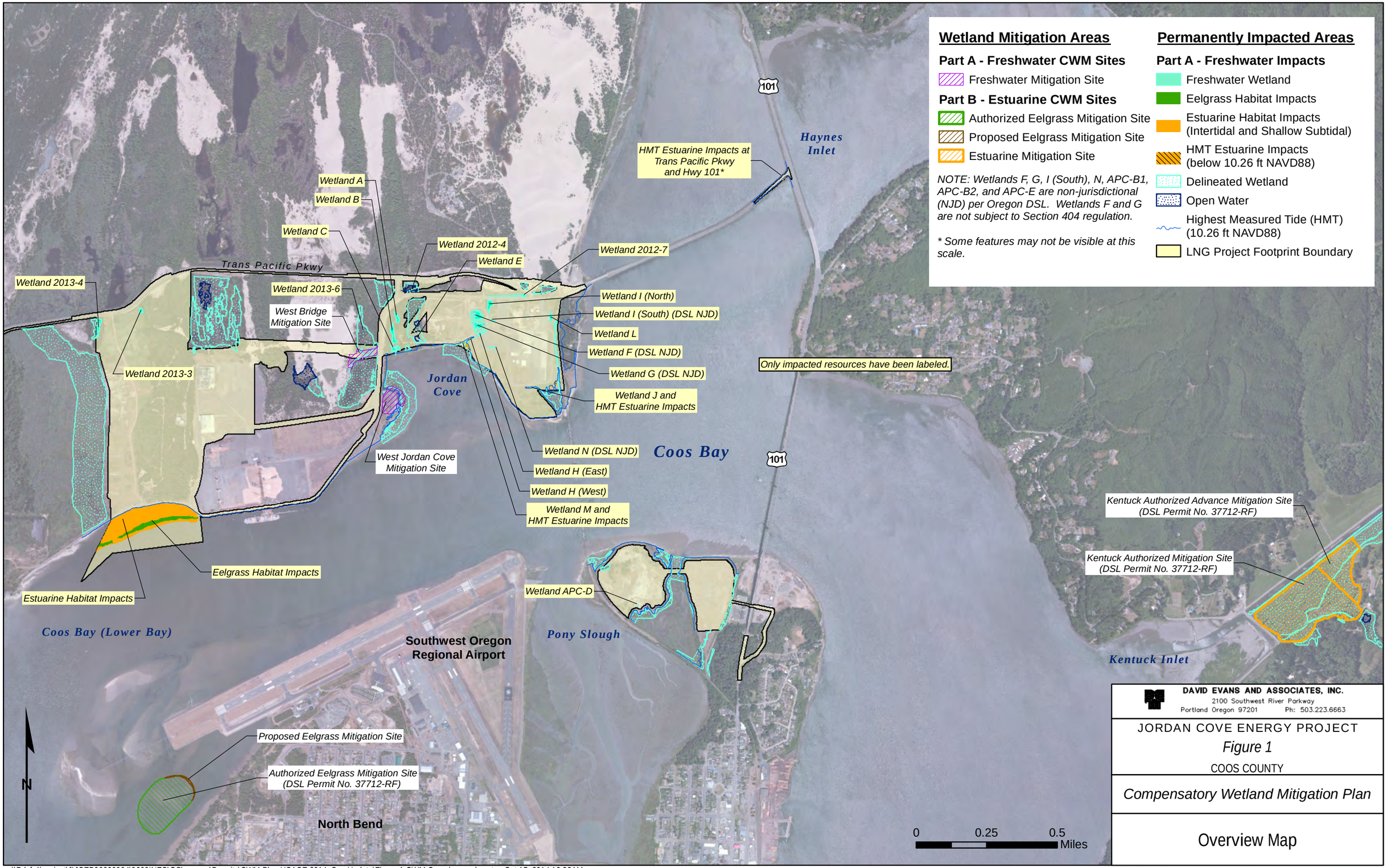
Refer to CWM Plan Part B: Estuarine Impacts: Section 8.2

PART IV. ATTACHMENTS

		Included
A.	**General Location Map** Refer to CWM Plan Part A: Freshwater Impacts: Appendix A. Refer to CWM Plan Part B: Estuarine Impacts Appendix A.	☒
B.	**Delineation of Waters of the U.S., Including Wetlands** Wetland delineations, including bulk upland excel spreadsheet, previously provided to USACE under separate transmittals.	☒
C.	**Site Photos** Site photos included as appendices within wetland delineation reports provided under separate transmittal. Additional photo documentation is available upon request.	☒
D.	**Design/Plan Figures** Refer to CWM Plan Part A: Freshwater Impacts: Appendix A. Refer to CWM Plan Part B: Estuarine Impacts Appendix B.	☒
E.	**Functional/Condition Assessment** Refer to CWM Plan Part A: Freshwater Impacts: Sections 1.3, 1.5, 5, and Appendix B. Refer to CWM Plan Part B: Estuarine Impacts Sections 1.3, 1.5, and 5.	☒
F.	**Credit/Debit Evaluation with Table** Refer to CWM Plan Part A: Freshwater Impacts: Section 1.4. Refer to CWM Plan Part B: Estuarine Impacts Section 1.4.	☒
G.	**Site Protection Instrument** Refer to CWM Plan Part A: Freshwater Impacts: Appendix C.	☒
H.	**Long-term Management Plan** A formal long-term management plan is anticipated to be prepared during spring of 2015 and will be provided to USACE upon completion. JCEP L.P. has entered negotiations with the Coos Watershed Association (CWA), a local non-profit organization established in 1993 meeting the requirements of ORS 271.715(3)(b) to provide long-term management and maintenance of all mitigation sites associated with the Jordan Cove Energy Project. CWA would also provide similar services during the permit monitoring period. JCEP L.P. would endow CWA to provide these services upon substantial completion of mitigation construction through the life of the Projects (estimated approximately 30 years post construction). If negotiations with CWA fail, JCEP L.P. would create and endow a third party entity meeting the requirements of ORS 271.715(3)(b) to provide management and maintenance services for the mitigation projects from substantial completion of mitigation construction through the life of the Projects.	☐

I. **Other: Eelgrass** ☒

Documentation of past eelgrass mapping efforts and mitigation siting report for the proposed eelgrass mitigation site was previously provided to USACE under separate transmittal.



\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\CWM Plan USACE 2014_Sep Update\Figure 1 CWM Overview.mxd sast Oct 15, 2014 10:22AM

Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

Part A: Freshwater Impacts

(Federal Permitting)

Prepared for

125 Central Avenue, Suite 380

Coos Bay, OR 97420

Prepared by

2100 SW River Parkway

Portland, Oregon 97201

October 2014

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1. COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW

1.1 INTRODUCTION

The Jordan Cove Energy Project, L.P. (JCEP L.P.) liquefied natural gas (LNG) Terminal Project (Part A of the permit application) and Slip and Access Channel Project (Part C of the permit application; together these are called the JCEP LNG Project, or the Project), situated along the North Spit of Coos Bay, Oregon, will result in freshwater wetland and estuarine resource impacts. These resources provide important ecological functions and are regulated by state and federal agencies. Permanent impacts to these resources will therefore need to be mitigated.

This Compensatory Wetland Mitigation (CWM) Plan Part A specifically covers permanent freshwater wetland impacts for the following proposed development features:

- LNG terminal site
- South Dunes Power Plan (aka Mill Site/South Dunes Site)
- Utility corridor and access road
- Rail Spur Bridge
- North Point Workforce Housing Project (NPWHP)
- Southwest Oregon Regional Safety Center (SORSC)

Total permanent freshwater wetland impacts are approximately 2.01 acres and will be offset by 4.49 acres (2.87 credits) of mitigation. This represents an excess of 0.86 credits above standard required Oregon Department of State Lands (DSL) ratios, which is intended to serve as a buffer should design modifications be required through the review process or should issues in meeting success criteria occur during the monitoring period. In Oregon, it is a long standing and common practice for the U.S. Army Corps of Engineers (USACE) regulatory program to utilize the states wetland mitigation ratios in preparation of CWM Plans. Mitigation goals and performance criteria have been written to specifically meet the minimum number of required credits (2.01 credits) based on DSL ratios, which amounts to 3.21 acres of mitigation.

Figure 1 of Appendix A shows the location of development areas, freshwater wetland impacts, and the proposed mitigation sites. Proposed mitigation would entail a combination of wetland creation and enhancement at two locations on the North Spit, in proximity to proposed impacts. The two site names are:

- West Jordan Cove Mitigation Site (tax ID #25S13W04TL0040000)
- West Bridge Mitigation Site (tax ID #25S13W04TL00101 and 25S13W04TL00300)

Temporary impacts to freshwater wetlands associated with a construction haul road that will run through the West Bridge Mitigation Site will require site restoration work (0.46 acres), which is not included in the impact and mitigation values noted above. The West Bridge Mitigation Site design and the site restoration work at this location are integrally linked. Therefore site restoration for temporary impacts in this location has been included in this CWM Plan, specifically within the mitigation site objectives. Temporary impacts and site restoration planning for other project areas will be addressed in a separate Site Restoration Plan.

For consistency purposes, this proposed CWM Plan has been prepared in accordance with the Oregon Department of State Lands (DSL) rules. However, it is fully supportive of federal regulatory permitting requirements. Documentation of how this plan meets the information requirements of the USACE Portland District Mitigation Plan Template is provided in the Overview portion of this CWM Plan.

1.2 ECOLOGICAL GOALS AND OBJECTIVES

The goals and objectives of this mitigation plan seek to offset the loss of acreage and functions provided by the wetland resources that would be impacted by the Project. Goals and objectives are provided below. Monitoring protocols associated with these goals are provided in Section 7 of this document. Site locations and design drawings are provided in Figures 1 through 4 (including multiple sheets) of Appendix A.

1.2.1 West Jordan Cove Mitigation Site

Mitigation Goal 1: Create 1.64 acres of salt marsh wetlands at the West Jordan Cove Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 1.1:** Create salt marsh wetland by excavating 1.64 acres of upland down to elevations suitable for supporting salt marsh (i.e., elevation of adjacent salt marsh). Average elevation will be between approximately 7 and 8 feet NAVD88 (North American Vertical Datum of 1988).
- **Objective 1.2:** Establish suitable hydrologic connection between created salt marsh and existing estuary. This will entail grading a fringe of existing salt marsh along the existing salt marsh/upland boundary to allow tidal connection between the estuary and the newly created salt marsh area. This will result in approximately 0.48 acres of temporary salt marsh vegetation loss that will be restored as described under Objective 1.3.
- **Objective 1.3:** Establishment and survival of a self-sustaining native salt marsh plant community similar to those in surrounding salt marsh. This will entail 1.64 and 0.48 acres of salt marsh community establishment within the creation area (Objective 1.1) and temporary disturbance area (Objective 1.2) respectively. A minimum of three different native salt marsh species shall occur within the mitigation site.
- **Objective 1.4:** The mitigation area (2.12 acres), including creation area and temporary disturbance area, will meet all three wetland parameters.

1.2.2 West Bridge Mitigation Site

Mitigation and Site Restoration Goal 2: Create, enhance, and restore (i.e., site restoration for temporary impacts) 1.19 acres, 0.38 acres, and 0.46 acre, respectively, of scrub-shrub and emergent wetlands at the West Bridge Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 2.1**: Create wetland by excavating 1.19 acres of upland sand dune down to elevations suitable for wetland establishment (i.e., elevation of adjacent wetlands).
- **Objective 2.2**: Enhance wetland by excavating 0.38 acres down to elevations that provide more consistent wetland hydrology conditions.
- **Objective 2.3**: Restore wetland (i.e., site restoration for temporary impacts) by excavating 0.46 acre of upland sandy fill material (i.e., Project-related construction haul road) down to elevations suitable for wetland establishment (i.e., elevation of adjacent wetlands).

- **Objective 2.4:** Within the mitigation and site restoration site, establishment and survival of robust, self-sustaining, and diverse native wetland plant communities similar to those in surrounding wetlands so that approximately 1.19 acres of the planted mitigation site and site restoration area consists of scrub-shrub communities and 0.84 acre consists of emergent communities.
- **Objective 2.5:** Improve habitat structure by placing large wood (downed logs) to serve as habitat and nurse log potential.
- **Objective 2.6:** The mitigation and site restoration areas (2.03 acres) will continue to meet all three wetland parameters (i.e., soils, vegetation, and hydrology), as defined in the *Corps of Engineers Wetland Delineation Manual*, 1987.

1.3 OVERVIEW OF CWM CONCEPT AND FUNCTIONS AND VALUES REPLACEMENT

The CWM will entail mitigation work at two distinct mitigation sites – West Jordan Cove Mitigation Site and West Bridge Mitigation Site.– which together address all wetland impacts defined in Section 1.4 of this plan. Location information is provided in Section 2 of this report. Functions will be replaced through in-kind and out-of-kind mitigation. The rational for out-of-kind mitigation is provided in Section 1.3.1 West Jordan Cove Mitigation Site. Additional discussion of functional replacement is provided in Section 5 of this report. An overview of the CWM concept at each proposed site is provided below.

1.3.1 West Jordan Cove Mitigation Site

The West Jordan Cove Mitigation Site primarily consists of upland that is vegetated with a mix of native and non-native shrubs and herbs. The mitigation goal for this site would be to convert upland habitat to salt marsh (i.e., wetland creation). This activity may be considered to be out of kind mitigation, as the impacted wetlands are freshwater wetlands. However, the freshwater impact wetlands occur on what is presumed to be fill placed over historic salt marsh (See Figure 4 of Appendix A, 1950's aerial photo). This, along with the considerable amount of salt marsh that has been lost historically throughout the estuary, provides the justification for using salt marsh creation as a suitable form of mitigation for freshwater wetland impacts.

Existing salt marsh occurs along the east side of the upland area, with mudflats east of the salt marsh. Salt marsh occurs between approximately elevation nine and five feet (NAVD 88). Mudflats generally occur below elevation five feet. Typical species found within the existing salt marsh include: tufted hairgrass (*Deschampsia cespitosa*), meadow barley (*Hordeum brachyantherum*), saltgrass (*Distichlis spicata*), Lyngbye's sedge (*Carex lyngbyei*), and pickleweed (*Salicornia virginica*). Point Reyes bird's-beak (*Cordylanthus maritimus*) has also been observed in the area. Existing conditions at the site are shown in Figure A2-1 of Appendix A.

The majority of the upland area would be excavated down to elevations seven and eight feet to match the elevation of robust salt marsh that occurs on-site (see Figures A2 of Appendix A). Impacts to existing wetland would be kept to the minimum practicable; however, some temporary impacts (i.e., grading) will be necessary in order to provide a suitable hydrologic connection between the created salt marsh and the adjacent estuary. The temporary impact would consist of grading the highest elevation of the existing salt marsh (i.e., along the upland/salt marsh edge) down to the same elevation as the created salt marsh area and adjacent existing robust salt marsh community.

Salt marsh vegetation is anticipated to establish by natural recruitment of tide born propagules. Experience of 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 (Personal communications, Craig Cornu. SSNER. 2014). Mr. Cornu 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 are typically outcompeted beginning within the third year post-implementation. Although natural recruitment is the proposed method of salt marsh plant establishment, supplemental planting will be provided if monitoring determines that natural recruitment by native species is occurring too slowly.

1.3.2 West Bridge Mitigation Site

The West Bridge Mitigation Site consists of wetland creation and restoration activities, which will happen in conjunction with one another as described below. These activities are shown in Figures A3-2 through A3-4 of Appendix A.

There is currently an upland sand berm (believed to be natural) located between two wetlands within the utility corridor that currently functions as an access road through the site, and is the alignment of the industrial waste water line that will be relocated as part of the Project. The two wetlands are identified as Wetlands 2012-2 and 2013-6 in the recently submitted wetland delineation report prepared by SHN Consulting Engineers and Geologists, Inc. (SHN). Mitigation efforts would remove the sand berm access road between the two wetlands, thus creating new wetland connecting the two existing wetlands. New ground surface elevations would match those of the existing wetlands. Removed material (i.e., sand) would be disposed of on-site, within the utility corridor. Therefore, no import or export of fill material is anticipated.

The recontoured mitigation area will be planted and seeded with a mix of native wetland shrub and emergent plant species similar to plant communities in adjacent and nearby wetlands. Nesting boxes, suitable for use by purple martin, will be installed. Excavated upland areas will also be re-vegetated with a native herbaceous plant community.

A temporary construction access haul road will be installed as part of construction of the Project. This road will result in impacts to Wetlands 2012-2 and 2013-6. Because the temporary road will be in place for more than two years, these impacts are considered to be permanent impacts by the State of Oregon. However, the USACE views these impacts as temporary. Site restoration efforts will remove the associated fill material once the road is no longer needed for construction (approximately two to three years after road installation), lowering elevations to roughly pre-construction conditions. Final elevations will be set to support a native wetland plant community.

Grading of the wetland mitigation and site restoration areas will occur concurrently. Planting of these areas will also occur concurrently during the first appropriate planting window upon acceptance of final grades.

1.4 SUMMARY OF IMPACT AND CWM ACREAGE/CREDITS

Table 1 provides a summary of permanent wetland impacts covered by this CWM Plan, all of which occur to freshwater wetlands. Table 2 provides a summary of mitigation acreage by type (i.e., enhancement and creation) at each site. As shown in these two tables, total permanent freshwater wetland impacts will be 2.01 acres and mitigation will total 4.49 acres (2.87 credits). This represents an excess of approximately 0.86 credits above standard required DSL ratios, which is intended to serve as a buffer should design modifications be required through the review process or should issues in meeting success criteria occur during the monitoring period. Mitigation goals and performance criteria have been written to specifically meet the minimum number of required credits (2.01 credits) based on DSL ratios.

Table 1. Permanent Freshwater Wetland Project Impacts[1]

Wetland ID	Cowardin Class	Hydrogeomorphic (HGM) Class	Impact Acres/Debits[1]
Wetland 2012-4 (1)	PEM	Depressional	0.008
Wetland 2012-7	PEM	Slope	0.200
Wetland 2013-3	PSS	Flat	0.100
Wetland 2013-4 (1)	PUB	Depressional	0.287
Wetland 2013-6 (2)	PEM	Flat	0.034
Wetland A	PFO	Depressional	0.202
Wetland APC-D	PEM	Depressional	0.005
Wetland B	PFO	Depressional	0.412
Wetland C (1)	PFO	Depressional	0.217
Wetland E (2)	PAB	Depressional	0.018
Wetland H (east)	PEM	Depressional	0.087
Wetland I (north)	PEM	Depressional	0.266
Wetland I (south)	PEM	Depressional	0.010
Wetland J	PEM	Depressional	0.033
Wetland L	PEM	Depressional	0.114
Wetland N	PEM	Depressional	0.019
Total			**2.01**

[1] Project impact acreages are the same as those provided in the October 2014 bulk upload Excel spreadsheet provided to the USACE.

[2] Temporary impacts to Wetland 2012-2 and Wetland 2013-6, which occur at the West Bridge site, will be approximately 0.46 acres in total. These impacts are not included in the above table. As previously noted, site restoration for these temporary impacts will occur in conjuction with mitigation work at the West Bridge Mitigation Site.

Table 2. Mitigation Sumary [1, 2]

Mitigation Site	Mitigation Type	Cowardin Class	HGM Class	Mitigation Acres[2]	Mitigation Credits[2]
West Jordan Cove	Creation	E2EM	Estuarine	2.92	1.95
			Subtotal	**2.92**	**1.95**
West Bridge[3]	Creation	PSS	Depressional	1.19	0.79
	Enhancement	PSS, PEM	Depressional	0.38	0.13
			Subtotal	**1.57**	**0.92**
Total				**4.49**	**2.87**

[1] See design sheets in Appendix A for detailed breakdown of site acreages.

[2] See mitigation goals and performance standards sections for acreages specifically called out as needing to be met to meet DSL mitigation ratios.

[3] Site restoration work for temporary impacts due to construction haul route at West Bridge site will be 0.47 acres, which is not included in the above table.

1.5 SUMMARY OF NET GAINS AND LOSSES OF FUNCTIONS AND VALUES

Table 3 provides a summary of functional change achieved at the proposed mitigation sites based on the Oregon Rapid Wetland Assessment Protocol (ORWAP).

Table 3: Summary of Net Function and Value Changes

GROUPED SERVICES		CWM SITE			Impact Sites	CWM minus Impact Site
		Existing	Predicted	Change	Predicted Loss	Net Change
Hydrologic	Function	0	2	2	4	-2
	Value	0	2	2	2	0
Water Quality Support	Function	1	7	6	10	-4
	Value	1	6	5	6	-1
Fish Support	Function	0	5	5	5	0
	Value	1	8	7	7	0
Aquatic Support	Function	1	8	7	8	-1
	Value	1	10	9	10	-1
Terrestrial Support	Function	0	7	6	7	-1
	Value	1	10	9	9	0
Average Net Functions and Values Change						**-1**

Based on *Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in the State and Federal Permit Programs* (DSL, USACE, and EPA 2010), impacts to functions and values are assumed to be adequately offset or replaced if the net function and value scores for a grouped service at the CWM sites are within one whole number of the grouped service scores at the impact sites. As seen in Table 3, this is the case for most grouped services. On average, as judged by ORWAP (which considers a change of +/- 1 to equal no net loss), there will be no net loss of overall functions and values. Additional detailed discussion of functions and values is provided in Section 5 Functions and Values.

Importantly, because mitigation proposes to result in a net increase in acreage of all impacted habitats and because mitigation habitats will function in an equivalent manner as those habitats being impacted, there will be a net gain in overall functions and values across the landscape once the sites achieve the performance standards outlined in this plan.

2. CWM SITE INFORMATION

2.1 CWM SITE OWNER NAME AND CONTACT INFORMATION

The West Bridge Mitigation Site is partially owned by Fort Chicago LNG II U.S. L.P. (a wholly owned and controlled subsidiary of JCEP L.P.'s parent company Veresen, Inc.) and partially owned by Roseburg Forest Products (RFP). JCEP L.P. holds an option to acquire the portion owned by RFP. The West Jordan Cove Mitigation Site is owned by Fort Chicago LNG II U.S. L.P.

Project contact information is provided below:

Attention: Bob Braddock,
Vice President-Project Manager
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, Oregon 97420
Phone: (541) 266-7510, (303) 748-3746 mobile

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

JCEP L.P. holds an option to acquire the portion of the West Bridge Mitigation Site that is currently owned by RFP. JCEP L.P. will acquire the RFP portion of the site, assuming the Project is authorized. Therefore, a legal agreement for the use and long-term protection of the West Bridge Mitigation Site is not proposed. JCEP L.P. owns the West Jordan Cove Mitigation Site.

2.3 LOCATION INFORMATION

The location of proposed mitigation sites and associated wetland impact areas are shown in Figure 1 of Appendix A.

2.3.1 West Jordan Cove Mitigation Site

The West Jordan Cove Mitigation Site is located along the west side of the geographic feature named Jordan Cove. It is situated east of where Jordan Cove Road enters the RFP wood chip facility property. The West Jordan Cove Mitigation Site is located in township 25 south, range 13 west, section 4, tax lot 40000.

2.3.2 West Bridge Mitigation Site

The West Bridge Mitigation Site is situated along the upper North Spit of Coos Bay, adjacent to the west side of Jordan Cove Road. The site is located in township 25 south, range 13 west, section 4, tax lot 101.

3. CWM SITE SELECTION AND DESIGN PRINCIPLES

3.1 REPLACEMENT

The proposed CWM will replace impacted functions and values through in-kind mitigation and out-of-kind mitigation (for historic loss of salt marsh), utilizing a combination of enhancement and creation. This will result in a net increase in wetland acreage and function compared to current conditions.

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

CWM will take place very close to the proposed impact sites, thereby providing local replacement of lost functions and values. Impact and mitigation sites are all located on the North Spit of Coos Bay.

3.3 CWM IS SELF-SUSTAINING AND MINIMIZES MAINTENANCE NEEDS

Each mitigation site has been designed to be self-sustaining. No site requires the use of water control structures to maintain wetland hydrology. At the West Bridge Mitigation Site hydrology will be provided by interception of the groundwater table, as is the case for adjacent existing wetlands. At the West Jordan Cove Mitigation Site hydrology will be provided by tidal inundation from Coos Bay. Extensive maintenance needs are not anticipated beyond the initial plant establishment period.

3.4 SITING CONSIDERATIONS FOR ECOLOGICAL SUITABILITY

Mitigation sites will be located in landscape settings that currently support wetlands and have connections to adjacent wetland and upland habitats.

3.5 MINIMIZES TEMPORAL LOSS

Project construction will take approximately 42 months. Construction of the West Jordan Cove Mitigation Site will begin early within the project construction window to minimize temporal loss. The West Bridge Site cannot begin until later in the overall construction, because these sites are located in the temporary haul route corridor, which will remain in place for two to three years.

4. CWM EXISTING SITE CONDITIONS (BASELINE INFORMATION)

4.1 WETLAND DELINEATION OR DETERMINATION

4.1.1 West Jordan Cove Mitigation Site

David Evans and Associates, Inc. (DEA) performed a wetland delineation for the West Jordan Cove Mitigation Site during January of 2014 (DEA 2014). The report received concurrence from DSL on August 12, 2014. The USACE provided preliminary approval of boundaries as part of aquatic resource bulk upload template provided by DEA (email communications from USACE, Tyler Krug, March 10, 2014).

4.1.2 West Bridge Mitigation Site

SHN prepared a wetland delineation reports that covers the area of the West Bridge Mitigation Site, including the site restoration area for temporary construction haul route related impacts, (DSL WD# 2012-0313 and #2013-0116. The reports received DSL concurrence on April 15 and November 8, 2013 respectively. The USACE provided preliminary approval of boundaries as part of aquatic resource bulk upload template provided by DEA (email communications from USACE, Tyler Krug, March 10, 2014).

4.2 HGM AND COWARDIN CLASSES/SUBCLASSES AT CWM SITE

4.2.1 West Jordan Cove Mitigation Site

The Cowardin class of wetlands at the West Jordan Cove Mitigation Site is palustrine scrub-shrub/emergent (PSS/EM) and estuarine, intertidal, emergent (E2EM). Currently, portions of the mitigation site are also upland. The HGM class is estuarine.

4.2.2 West Bridge Mitigation Site

The Cowardin classes of wetlands at the West Bridge Mitigation Site are palustrine emergent (PEM) and palustrine scrub-shrub (PSS). However, existing wetland at the CWM site will be converted to upland as a result of installation of the project haul road.

Currently, portions of the mitigation site are also upland. The HGM class is flat; however, it may also be viewed as a depressional wetland.

4.3 EXISTING AND PROPOSED HYDROLOGY

4.3.1 Existing Hydrology – All Mitigation Sites

4.3.1.1 West Bridge Mitigation Site

Wetlands adjacent to the proposed mitigation site receive hydrology from groundwater. Groundwater is released into the depressional wetlands, which results in surface ponding ranging from several inches to several feet deep.

Conditions at the West Bridge Mitigation Site are currently too dry to support a hydrophytic plant community (i.e., upland areas) or are marginally wet along the existing wetland boundary where enhancement activity will occur.

4.3.1.2 West Jordan Cove Mitigation Site

Hydrologic conditions at most of the proposed West Jordan Cove Mitigation Site are currently too dry to support hydrophytic plant communities. Hydrology in the adjacent salt marsh occurs in the form of once to twice daily inundation from the estuary.

4.3.2 Proposed Hydrology

4.3.2.1 West Bridge Mitigation Site

Site hydrology will be provided by groundwater as is the case for the existing adjacent wetlands. Recontouring of the West Bridge Mitigation Site will result in interception of the groundwater table at an elevation suitable to establish a hydrophytic plant community.

4.3.3 West Jordan Cove Mitigation Site

Site hydrology will be provided by tidal inundation, similar to adjacent salt marshes.

4.4 EXISTING PLANT COMMUNITY DISTRIBUTIONS AND ABUNDANCE OF EXOTIC SPECIES

4.4.1 West Jordan Cove Mitigation Site

Upland habitats are dominated by a mix of native and non-native trees, shrubs, and herbaceous species. The predominant habitat type is a weedy shrub dune habitat dominated by Scotch broom (*Cytisus scoparius*), common velvetgrass (*Holcus lanatus*), and European beachgrass (*Ammophila arenaria*). Scattered shorepine (*Pinus contortus*) and sitka spruce (*Picea sitchensis*) are also present.

Existing freshwater wetland plant communities are dominated by shore pine, Hooker willow (*Salix hookeriana*), and slough sedge (*Carex obnupta*).

Existing salt marsh is dominated by tufted hairgrass, meadow barley, saltgrass, Lyngbye’s sedge, and pickleweed. Point Reyes bird’s-beak has also been observed in the area.

Exotic species were not observed in wetland areas. Most of the shrub and herb species found within the uplands are exotic species (i.e., non-native species) common to the area.

4.4.2 West Bridge Mitigation Site

The upland sand berm/access road consists primarily of open sand areas. Where vegetation is present, it is similar to upland areas described for the West Jordan Cove Mitigation Site.

Existing adjacent wetland vegetation is dominated by Hooker willow and slough sedge, and salt rush. Exotic species were not observed in wetland areas.

4.5 SITE CONSTRAINTS OR LIMITATIONS

4.5.1 West Jordan Cove Mitigation Site

The West Jordan Cove Mitigation Site will need to limit disturbance to existing wetlands, as well as limit disturbance to population of Point Reyes Bird's-Beak, to the greatest extent practicable. However, some degree of temporary impact will be required in order to provide a suitable hydrologic connection between the estuary and proposed new salt marsh area. Protection of adjacent property and infrastructure from increased exposure to estuarine forces (i.e, wave action) will be important.

4.5.2 West Bridge Mitigation Site

Mitigation work at the West Bridge Mitigation Site cannot begin until the construction haul road is no longer needed and it is removed. It is estimated that the haul road could be in place for two to three years. New plantings will require protection against elk browsing.

5. FUNCTIONS AND VALUES ASSESSMENT

5.1 ASSESSMENT METHODS USED

ORWAP was used to perform the functional assessment for this mitigation plan. Based on agency guidance (USACE, EPA, and DSL 2010), compensatory mitigation evaluation has been based on the ORWAP grouped services, and all scores have been rounded to the nearest whole number.

5.2 FUNCTIONS AND VALUES ASSESSMENT

5.2.1 Impact Sites

A summary of group service function and value impacts is provided in Table 3, under the column heading "Impact Sites, Predicted Loss." These scores reflect an acreage weighted average of scores for each individual wetland, with acreage reflecting the portion of the wetlands to be impacted. Appendix B provides a summary spreadsheet including ORWAP scores for each individual wetland.

Most grouped services scored moderate to high for functions and values, with the exception of the hydrologic group service, which score relatively low. Impacted wetlands tend to be of moderate quality; however, ORWAP scoring includes considerable weighting to surrounding landscape conditions, which tended to raise scores across most of the group functions. That is, a considerable portion of the high scores are as much a function of what is located well outside of the wetland as they are a function of what occurs within the wetlands. Also, many of the impact wetlands are depressional wetlands with no surface outlet. ORWAP automatically prescribes the maximum functional score for water quality function for these types of wetlands. This results in an awkward comparison to mitigation sites that are not depressional, such as the out of kind West Jordan Cove Mitigation Site that resides in an estuarine hydrogeomorphic position.

Some factors leading to the moderate to high scores include a combination of high percent cover by native plant species relative to non-native species, presence of surface water with multiple depth classes, diverse habitat structure in some wetlands, and location within relatively undeveloped surroundings (i.e., presence of large areas of protected lands versus location in a highly urbanized setting). Factors limiting scores include generally disturbed upland buffers dominated by non-native species, adjacent roadways, and past and current industrial uses.

5.2.2 MITIGATION SITES PRE- AND POST-MITIGATION

5.2.2.1 West Jordan Cove Mitigation Site – Pre-Mitigation

The West Jordan Cove Mitigation Site consists of salt marsh creation. No wetland services are currently provided in the creation area at this site. Existing adjacent salt marsh does provide wetland services, which are similar to the services that would be provided at the salt marsh creation area post-mitigation. ORWAP group service function and value scores for these adjacent wetlands generally rated as moderate to high, with the exception of the hydrologic group service and water quality group functions, which scored relatively low.

Some factors leading to the moderate to high scores include the high organic matter export function, which helps drive the aquatic foodweb, and the high score for carbon sequestration function. Hydrologic function score was very low due to the estuarine nature of the site, which results in low opportunity for associated water storage and delay function.

5.2.2.2 West Jordan Cove Mitigation Site – Post-Mitigation

Post-mitigation wetland services will have functions and values similar to the existing adjacent salt marsh, as described above. Expansion of salt marsh through creation will result in a net uplift to surrounding estuarine resources.

5.2.2.3 West Bridge Mitigation Site – Pre-Mitigation

The West Bridge Mitigation Site consists of creation and enhancement activities. No wetland services are currently provided in the creation areas at this site. The main body of the existing adjacent wetlands do provide wetland services. ORWAP group service function and value scores for these adjacent wetlands generally rated as moderate to high, with the exception of the hydrologic group service, which scored relatively low. Importantly, wetland functions in the proposed mitigation enhancement areas is currently fairly marginal as these areas occur along the existing wetland boundary where wetland hydrology is marginal (i.e. just sufficient to meet wetland criteria).

Some factors leading to the moderate to high scores include a combination of dominance of native plant species with limited presence of non-native species, presence of surface water with multiple depth classes, and moderate habitat structure. Factors limiting the scores include adjacency to an industrial access road and upland buffers dominated by non-native species.

5.2.2.4 West Bridge Site – Post-Mitigation

Post-mitigation wetland services will have functions and values similar to the main body of the existing adjacent wetlands, as described above. Additional uplift will be achieved by expanding the overall wetland size and including habitat features, including large wood. Detailed scoring of the West Bridge site post-mitigation is provided in Appendix B.

6. MAPS, DRAWINGS, AND CONSTRUCTION SPECIFICATIONS

6.1 SCALED SITE PLAN AND CROSS SECTIONS

Scaled site plans and cross sections for each mitigation site are provided in Appendix A. It is not practicable to provide construction access, staging areas, and certain other detailed information at this time for all mitigation sites. The applicant anticipates that providing this information will be a permit condition of approval required by the agencies.

6.2 CONSTRUCTION SCHEDULE

Construction is anticipated to begin in the end of third quarter of 2014. Resource impacts resulting from construction will begin in the fourth quarter of 2014, concurrent with the in-water work window. Mitigation construction will occur prior to (when feasible) or concurrently with resource impacts. Planting would occur during the dormant season (approximately November 1 to March 15).

6.3 SCHEMATIC OF WATER CONTROL STRUCTURES

Water control structures will not be utilized for the proposed mitigation.

6.4 PLANTINGS LISTS BY HGM/COWARDIN CLASS

Planting lists by HGM and Cowardin class are provided in Appendix A. Proposed species are those typically observed in adjacent and nearby wetlands situated in similar landscape and hydrologic settings.

7. MONITORING PLAN

7.1 PERFORMANCE STANDARDS

Performance standards for each objective are presented below. Project objectives have been restated for the sake of convenience. Vegetation success criteria are based on the DSL routine performance standards for vegetation provided in (DSL 2009), with minor modifications to suit site conditions.

7.1.1 West Jordan Cove Mitigation Site

Mitigation Goal 1: Create 1.64 acres of salt marsh wetlands at the West Jordan Cove Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 1.1:** Create salt marsh wetland by excavating 1.64 acres of upland down to elevations suitable for supporting salt marsh (i.e., elevation of adjacent salt marsh). Average elevation will be between approximately 7 and 8 feet NAVD88 (North American Vertical Datum of 1988).

  Performance Standard*: An as-built survey will show that approximately 1.64 acres have been graded to match adjacent salt marsh elevations. Average elevation will be between approximately 7 and 8 feet (NAVD88).*

- **Objective 1.2:** Establish suitable hydrologic connection between created salt marsh and existing estuary. This will entail grading a fringe of existing salt marsh along the existing salt marsh/upland boundary to allow tidal connection between the estuary and the newly created salt marsh area. This will result in approximately 0.48 acres of temporary salt marsh vegetation loss that will be restored as described under Objective 1.3.

  Performance Standard*: An as-built survey will show that approximately 0.48 acres have been graded in order to provide suitable tidal connection to the creation area described in Objective 1.3.*

- **Objective 1.3:** Establishment and survival of a self-sustaining native salt marsh plant community similar to those in surrounding salt marsh. This will entail 1.64 and 0.48 acres of salt marsh community establishment within the creation area (Objective 1.1) and temporary disturbance area (Objective 1.2) respectively. A minimum of three different native salt marsh species shall occur within the mitigation site.

  Performance Standard: *Vegetation monitoring shall show that 2.12 acres of salt marsh dominated by native species has become established at the West Jordan Cove Mitigation site at the end of the five years monitoring period.*

  Performance Standard: *At the end of Year 5 [vegetation monitoring], the following percent cover objectives will be met, as determined through vegetation sample plots. Noxious weeds would include those species designated as "A" or "B" by the Oregon Department of Agriculture Noxious Weed Control Program, as well as non-native Spartina species.*

  1. *The cover of native herbaceous species is at least 80%.*
  2. *The cover of invasive species is no more than 20%.*
  3. *Bare substrate represents no more than 20% cover.*
  4. *By Year 3 and thereafter, there are at least three different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of the plots sampled.*
  5. *Prevalence Index total for all strata is less than 3.0.*

- **Objective 1.4:** The mitigation area (2.12 acres), including creation area and temporary disturbance area, will meet all three wetland parameters.

  Performance Standard: *The mitigation area (2.12 acres) will meet all three wetland parameters as determined by a "Lite" delineation during the spring of a year when precipitation has been near normal, after Year 4 and before submission of the final monitoring report.*

7.1.2 West Bridge Mitigation Site

Mitigation and Site Restoration Goal 2: Create, enhance, and restore (i.e. site restoration for temporary impacts) 1.19 acres, 0.38, and 0.46 acre, respectively, of scrub-shrub and emergent wetlands at the West Bridge Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 2.1:** Create wetland by excavating 1.19 acres of upland sand dune down to elevations suitable for wetland establishment (i.e., elevation of adjacent wetlands).

Performance Standard: *An as-built survey will show that approximately 1.19 acres have been graded to match adjacent wetland elevations.*

- **Objective 2.2:** Enhance wetland by excavating 0.38 acres down to elevations that provide more consistent wetland hydrology conditions.

Performance Standard: *An as-built survey will show that approximately 0.38 acre has been graded to match adjacent wetland elevations that support consistent wetland hydrology conditions.*

- **Objective 2.3**: Restore wetland (i.e. site restoration for temporary impacts) by excavating 0.46 acre of upland sandy fill material (i.e., Project-related construction haul road) down to elevations suitable for wetland establishment (i.e., elevation of adjacent wetlands).

  Performance Standard: *An as-built survey will show that approximately 0.46 acre has been graded to match adjacent wetland elevations.*

- **Objective 2.4:** Within the mitigation and site restoration sites, establishment and survival of robust, self-sustaining, and diverse native wetland plant communities similar to those in surrounding wetlands, so that approximately 1.19 acres of the planted mitigation site and site restoration area consists of scrub-shrub communities and 0.84 acre consists of emergent communities.

  Performance Standard: *At the end of Year 5 the following percent cover objectives will be met, as determined through vegetation sample plots. Noxious weeds would include those species designated as "A" or "B" by the Oregon Department of Agriculture Noxious Weed Control Program.*

  1. *The cover of native herbaceous species is at least 60%.*
  2. *The cover of invasive herbaceous species is no more than 10%. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%.*
  3. *The cover of invasive shrub or tree species is no more than 10%.*
  4. *Bare substrate represents no more than 20% cover.*
  5. *By Year 3 and thereafter, there are at least six different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of the plots sampled.*
  6. *Prevalence Index total for all strata is less than 3.0.*
  7. *The density of woody vegetation is 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% in the scrub-shrub community. 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.*

- **Objective 2.5:** Improve habitat structure by placing large wood (downed logs and snags) to serve as habitat and nurse log potential.

  Performance Standard: *A minimum of four pieces of wood will be installed on-site.*

- **Objective 2.6:** The mitigation site and site restoration area (2.03 acres) will continue to meet all three wetland parameters (i.e., soils, vegetation, and hydrology), as defined in the *Corps of Engineers Wetland Delineation Manual*, 1987.

  Performance Standard: *The mitigation site and site restoration area (2.03 acres) will meet all three wetland parameters as determined by a "Lite" delineation during spring of a year when precipitation has been near normal, after Year 4 and before submission of the final monitoring report.*

7.2 MONITORING PLAN

The purpose of the mitigation monitoring requirement is to provide information for the agency 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 L.P. will monitor the mitigation sites and provide a post-construction report and annual written monitoring report(s) to the agencies. Monitoring report(s) will include all data necessary to document compliance with goals, objectives, and performance standards associated with the CWM. This data may include photographs, topographic surveys, plant survival data, hydrologic data, and other information as required to demonstrate compliance.

The report(s) shall include the following sections:

a. Introduction
b. Goals, objectives, and performance standards
c. Methods
d. Results
e. Summary and recommendations
f. Figures
g. Appendices with data and photographs

7.2.1 Schedule

Monitoring shall be conducted for five years unless otherwise specified by the agencies.

7.2.2 Methods

Monitoring of grading and structural components (i.e., large wood installation) will occur during a post-construction site review and as-built survey for grading activities. This will occur shortly after completion of the proposed work. Site conditions will be documented with photographs and summarized in a report or technical memorandum (i.e., as-built report). Post-construction monitoring will occur for a period of five years.

Vegetation monitoring methods will be based on DSL Routine Monitoring Guidance for Vegetation (DSL 2009) or the most current DSL guidance document available when monitoring first starts. Methods are as follows: Monitoring at the mitigation site will begin in the first complete growing season upon installation of plant materials and seeding. Semi-annual visits (late spring and early fall) will occur in the first two monitoring years, and annual visits (early fall) will occur thereafter. Field measurements will be taken and compared against the performance standards to evaluate the success of the CWM.

7.2.3 Plot and Photo Documentation Locations

Sample plot and photo point locations are shown on the planting plan design sheet for each mitigation site, provided in Appendix A.

7.3 CONTINGENCY/ADAPTIVE MANAGEMENT PLAN

Contingency plans will be implemented should the performance standards not be met in any monitoring year. The nature of the contingency plan will depend on the problems that arise, as anticipated below.

7.3.1.1 Plant Establishment

In general, the contingency plan for low plant survival would be to first ascertain the reason for the mortality to the extent possible and then take actions appropriate to the cause of mortality. If certain species have high mortality, growing conditions including hydrology and exposure will be reviewed, and a better-adapted species could be identified and substituted. If excessive browsing or predation prevents meeting the performance standards, additional browse protection will be installed.

7.3.1.2 Weed Control

Weed control needs will be assessed during the annual monitoring. Weed control efforts will be triggered if percent cover by invasive species reaches 10% or possibly lower if the monitoring ecologist determines that control is necessary in order to achieve the success criteria by the end of the proposed monitoring period. Weed control may consist of a combination of hand pulling and spot application of herbicide suitable for use in/near aquatic resources.

8. LONG-TERM PROTECTION AND FINANCIAL SECURITY INSTRUMENTS

8.1 PROTECTION INSTRUMENT

JCEP L.P. will prepare a deed restriction to ensure protection of the mitigation sites. A sample deed restriction including language describing DSL and other agency access as appropriate for compliance monitoring is provided in Appendix C.

8.2 PROPOSED FINANCIAL SECURITY INSTRUMENT

JCEP L.P. will provide a surety bond for the purpose of guaranteeing CWM site performance. In addition, JCEP L.P. 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.

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

8.3.1 Anticipated Ownership

The West Jordan Cove Mitigation Site and West Bridge Mitigation Site will continue to be owned by Fort Chicago LNG II U.S. L.P., a wholly owned and controlled subsidiary of JCEP L.P.'s parent company, Veresen, Inc. JCEP L.P. will be responsible for the construction and long-term success of the mitigation sites.

8.3.2 Anticipated Long-term Maintenance Actions

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

- Invasive/noxious weed control
- Garbage/debris removal
- Installation of protective signage and/or other deterrents if vandalism or inappropriate activities occur
- Installation of new native plantings and/or habitat features

A long-term management plan, which incorporates principals of adaptive management, will be prepared as a permit condition of approval. The plan will discuss long term management goals, general monitoring and maintenance guidance, reporting requirements, and roles and responsibilities. In line with the principals 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 L.P. has entered negotiations with the Coos Watershed Association (CWA), a local non-profit organization established in 1993 meeting the requirements of ORS 271.715(3)(b) to provide long-term management and maintenance of all mitigation sites associated with the Jordan Cove Energy Project (including estuarine mitigation proposed at Kentuck Slough and freshwater mitigation proposed by Pacific Connector Gas Pipeline L.P. at Kentuck Slough). CWA would also provide similar services during the permit monitoring period. JCEP L.P. would endow CWA to provide these services upon substantial completion of mitigation construction through the life of the Projects (estimated approximately 30 years post construction). If negotiations with CWA fail, JCEP L.P. would create and endow a third party entity meeting the requirements of ORS 271.715(3)(b) to provide management and maintenance services for the mitigation projects from substantial completion of mitigation construction through the life of the Projects.

8.3.4 Anticipated Funding Source

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

9. PREPARERS AND CONTRIBUTORS

Ethan Rosenthal, DEA Ecologist, authored this report. Brynn Reimann, DEA Landscape Architect, and Justin DeMello, DEA Designer, developed site design drawings. Sean Sullivan, DEA Senior Project Manager, provided the quality review. Dawn Afman, DEA Project Assistant, prepared the report drafts. Sara Gilbert, DEA GIS Specialist, provided non-design graphics.

10. REFERENCES

David Evans and Associates, Inc. (DEA). 2014. Jordan Cove Energy Project wetland delineation report, West Jordan Cove Mitigation Site. March 2014.

DSL (Oregon Department of State Lands). 2012. Chapter 8: Compensatory Mitigation Planning for Wetlands and Tidal Waters.

DSL. 2009. Routine Monitoring Guidance for Vegetation. A Companion Document to the Compensatory Mitigation for Non-Tidal Wetlands and Tidal Waters and Compensatory Non-Wetland Mitigation. September 23, 2009. Interim review draft version 1.0.

DSL, USACE, and EPA. 2010. Guidance for using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in the State and Federal Permit Programs.

Oregon Department of Fish and Wildlife (ODFW). 2006. The Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon.

Personal Communications:

Cornu, Craig. South Slough National Estuarine Research Reserve (SSNER). Personal communication with Ethan Rosenthal (DEA Ecologist). February 24, 2014.

Krug, Tyler. U.S. Army Corps of Engineers (USACE). Email communications with Loren Stucker (DEA Biologist/Environmental Specialist), March 10, 2014.

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11. APPENDICES

APPENDIX A – FIGURES

Figure 1: Vicinity Maps of Impact and Mitigation Sites

Sheet 1 – Part A –Permanently Impacted Freshwater Wetlands

Sheet 2 – Part A – Freshwater CWM Sites

Figure 2: West Jordan Cove Mitigation Site Design Sheets

Sheet A2-1 – West Jordan Cove Mitigation Site Existing Conditions

Sheet A2-2A – West Jordan Cove Mitigation Site Plan

Sheet A2-2B – West Jordan Cove Mitigation Site Cross-Sections

Sheet A2-3 – West Jordan Cove Mitigation Site Planting List

Figure 3: West Bridge Mitigation Site Design Sheets

Sheet A3-1 – West Bridge Mitigation Site Existing Conditions

Sheet A3-1A – West Bridge Mitigation Site Intermediate Conditions

Sheet A3-2 – West Bridge Mitigation Site Conceptual Grading Plan

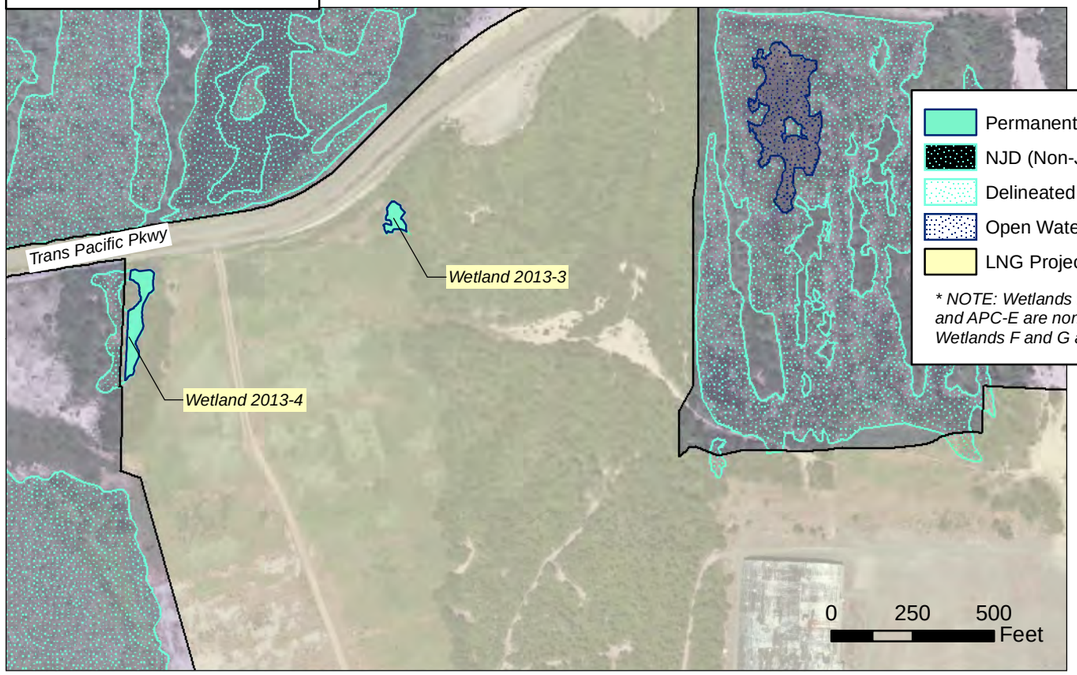
Sheet A3-3 – West Bridge Mitigation Site Cross-Sections

Sheet A3-4 – West Bridge Mitigation Site Conceptual Planting Plan

Sheet A3-5 – West Bridge Mitigation Planting List

Figure 4: 1950's Aerial Photograph of Jordan Cove

Wetlands 2013-3, -4

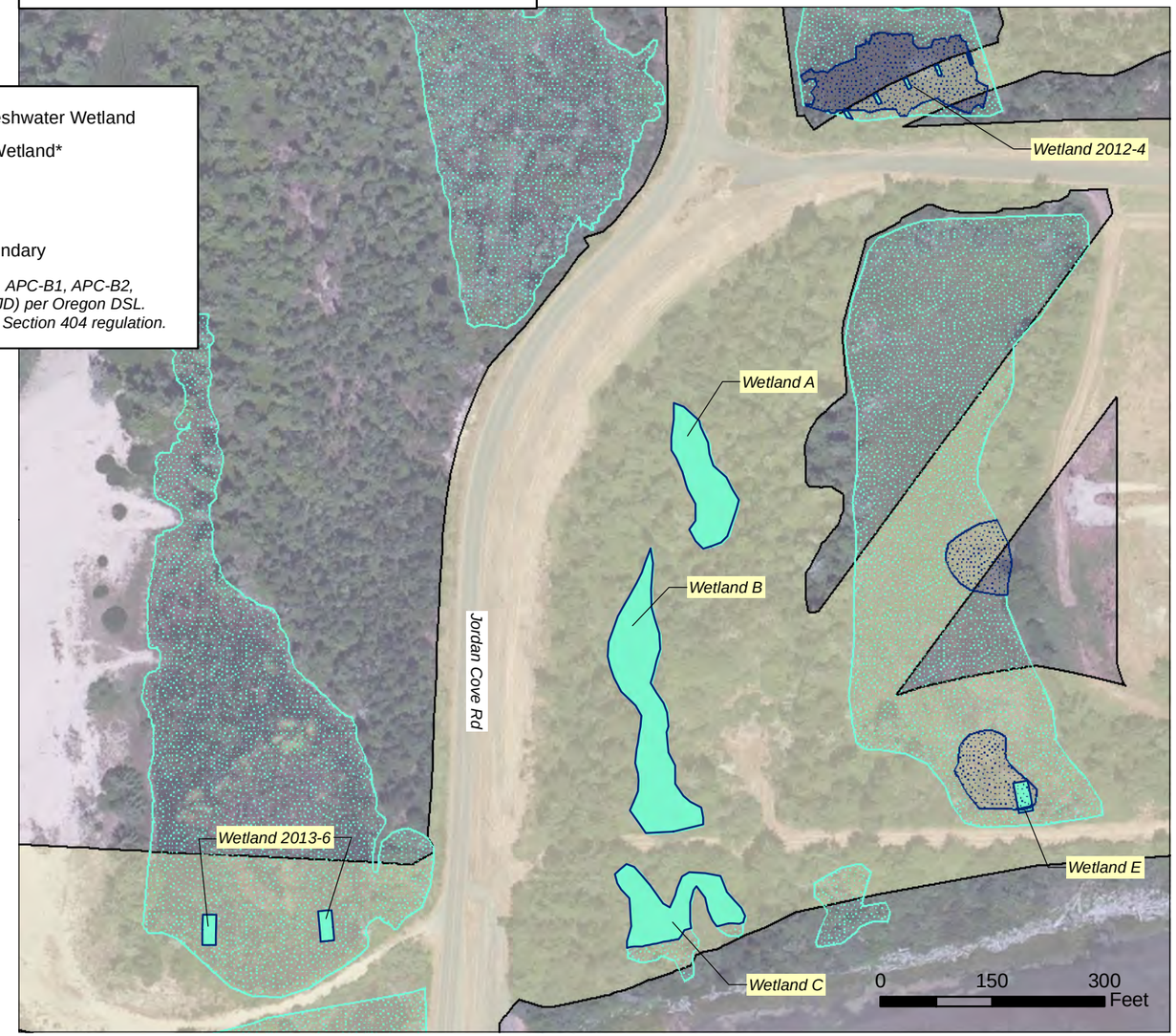


Permanently Impacted Freshwater Wetland
NJD (Non-Jurisdictional) Wetland*
Delineated Wetland
Open Water
LNG Project Footprint Boundary

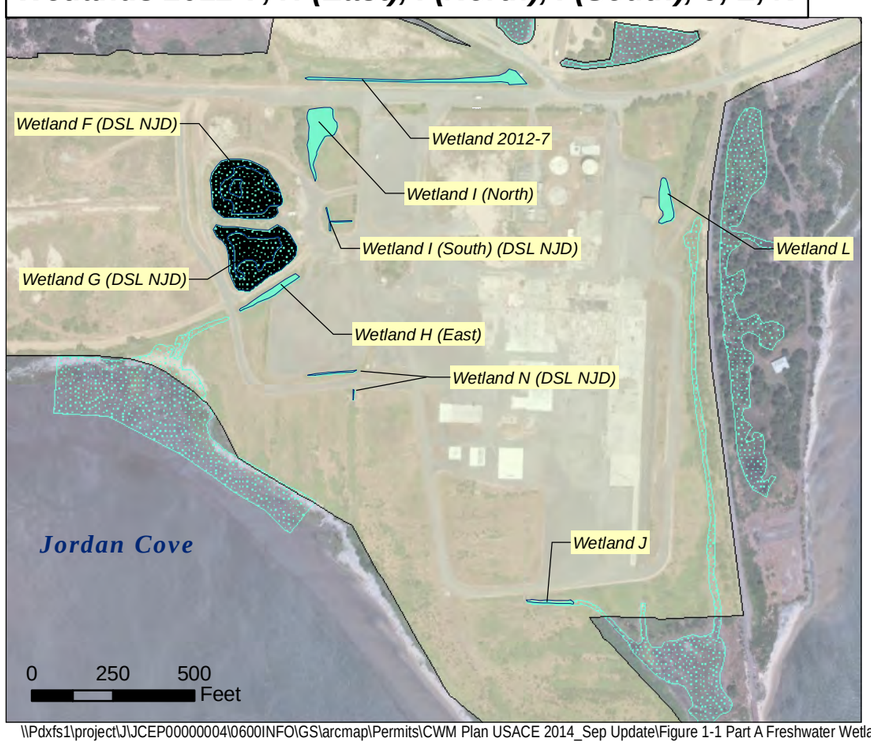
** NOTE: Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL. Wetlands F and G are not subject to Section 404 regulation.*

N

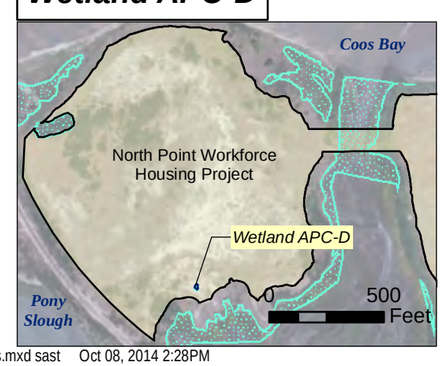
Wetlands 2012-4, 2013-6, A, B, C, E

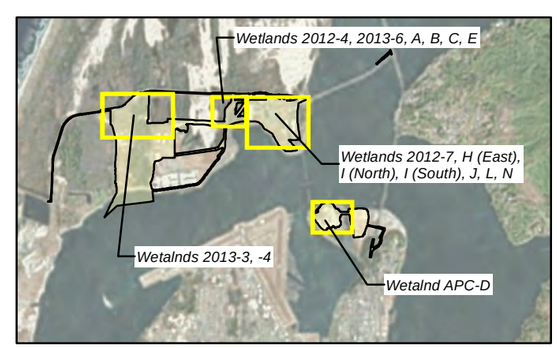


Wetlands 2012-7, H (East), I (North), I (South), J, L, N



Wetland APC-D





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JORDAN COVE ENERGY PROJECT

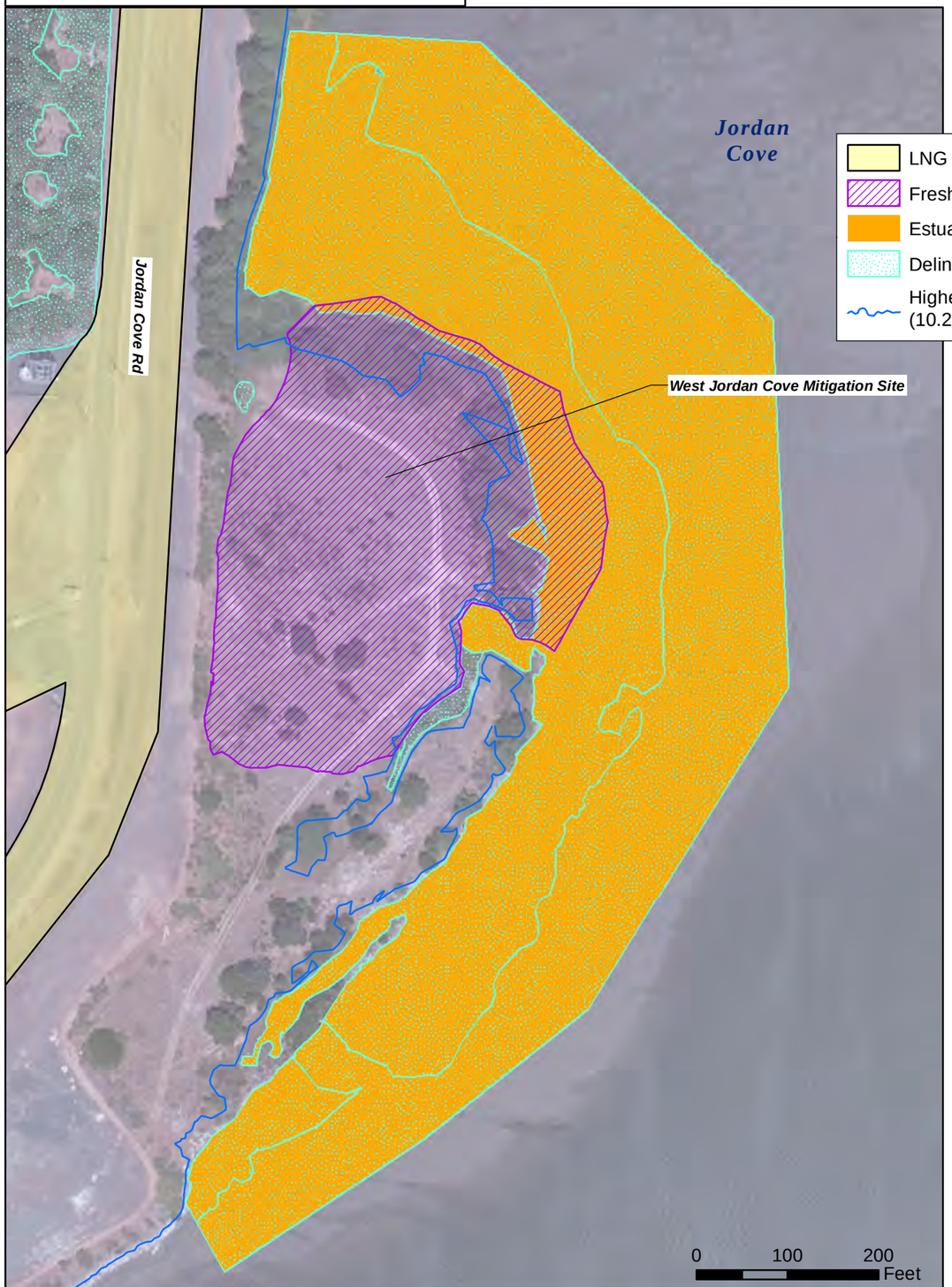
Figure 1, Sheet 1

COOS COUNTY

Compensatory Wetland Mitigation Plan

Part A - Permanently Impacted Freshwater Wetlands

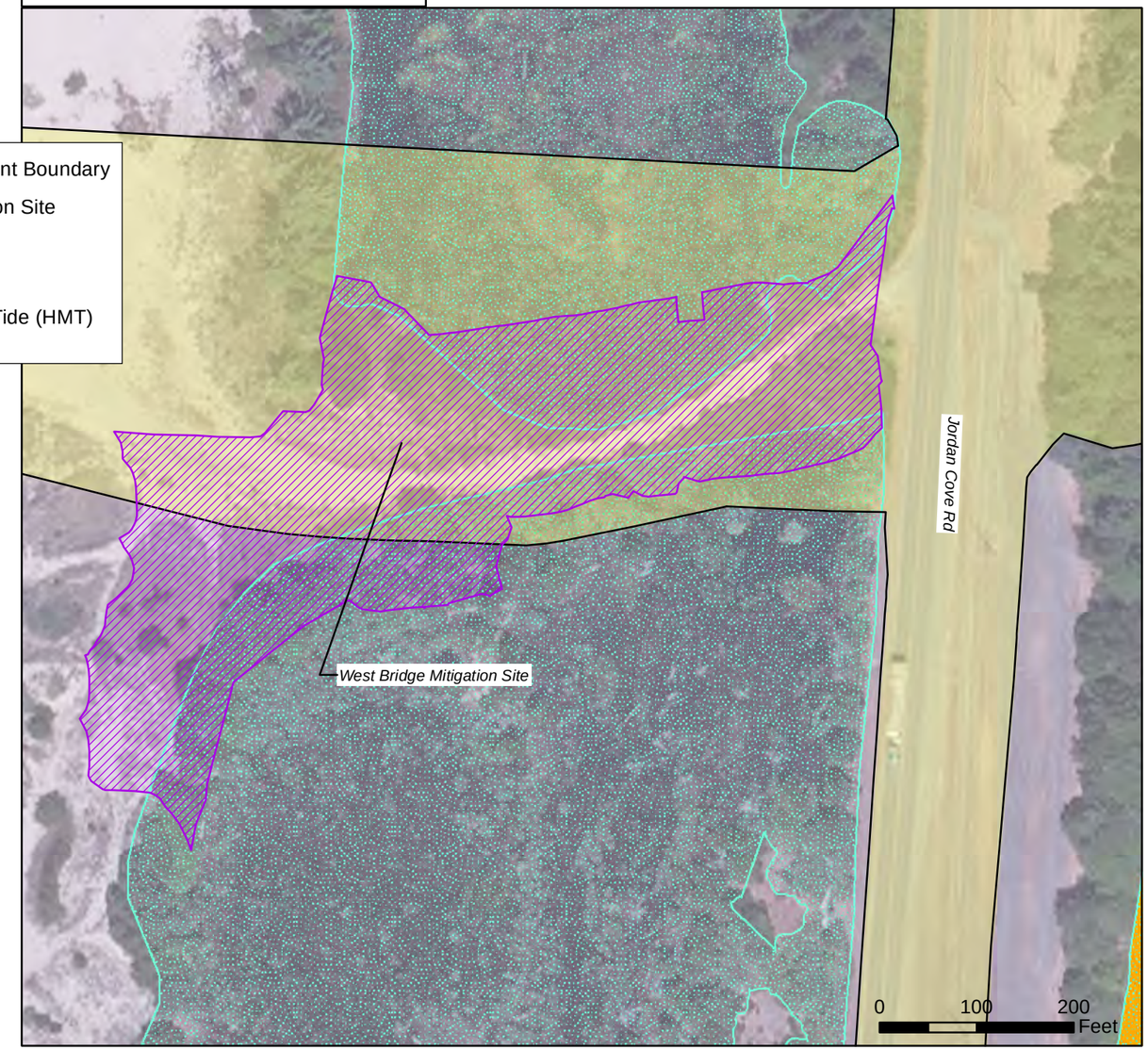
West Jordan Cove Mitigation Site

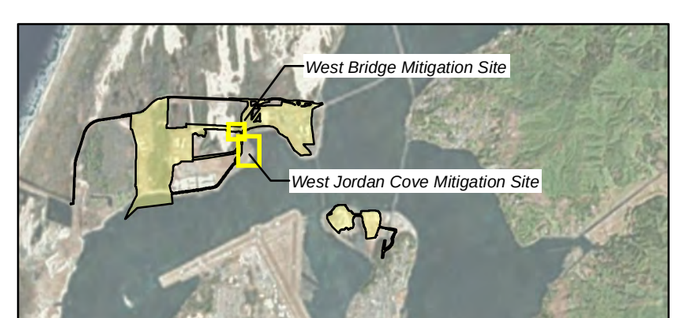


LNG Project Footprint Boundary
Freshwater Mitigation Site
Estuarine Habitat
Delineated Wetland
Highest Measured Tide (HMT) (10.26 ft NAVD88)

N

West Bridge Mitigation Site





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JORDAN COVE ENERGY PROJECT

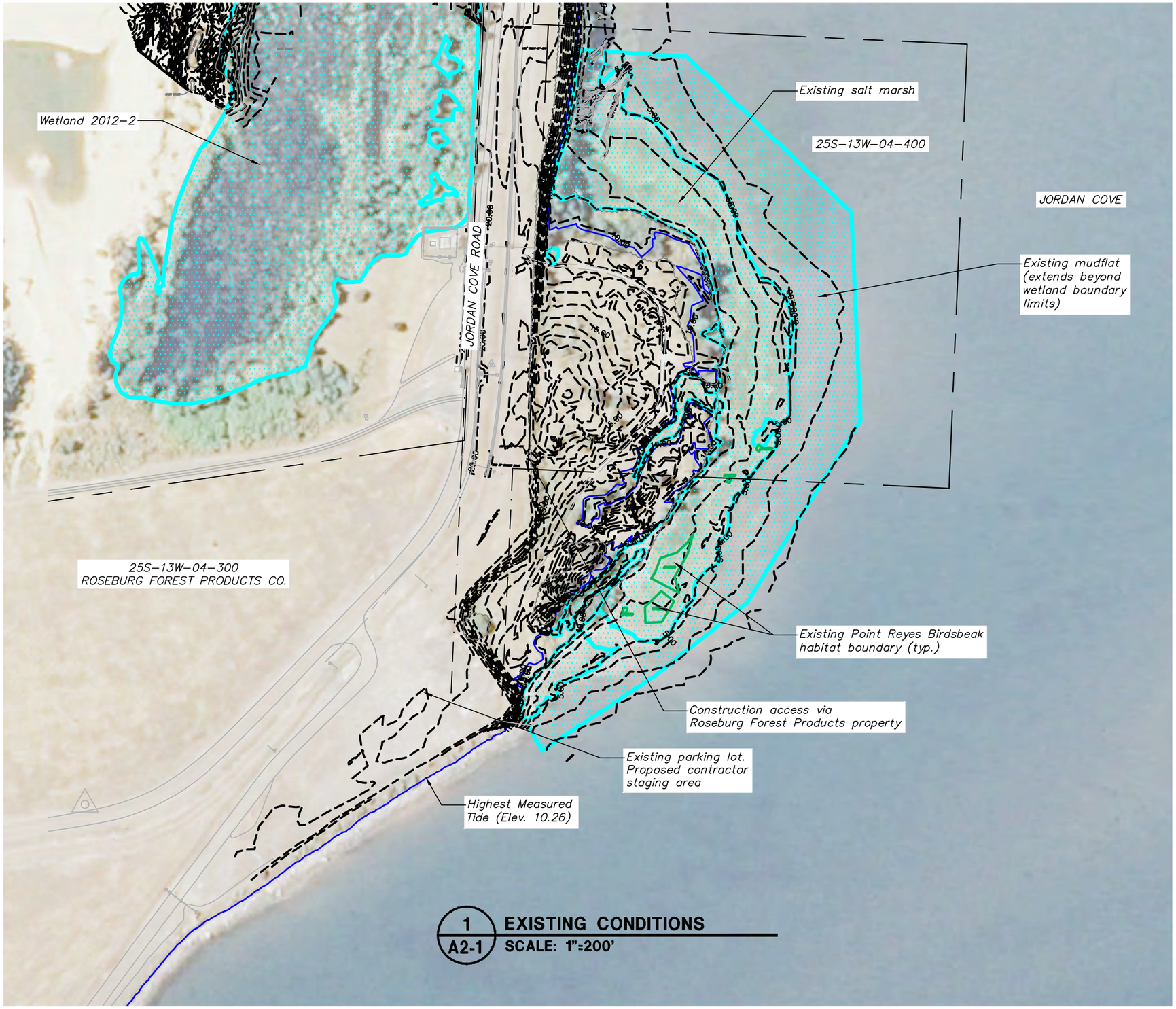
Figure 1, Sheet 2

COOS COUNTY

Compensatory Wetland Mitigation Plan

Part A - Freshwater CWM Sites

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\CWM Plan USACE 2014_Sep Update\Figure 1-2 Part A Freshwater CWM Sites.mxd sast Oct 15, 2014 10:05AM



1 / A2-1 **EXISTING CONDITIONS**
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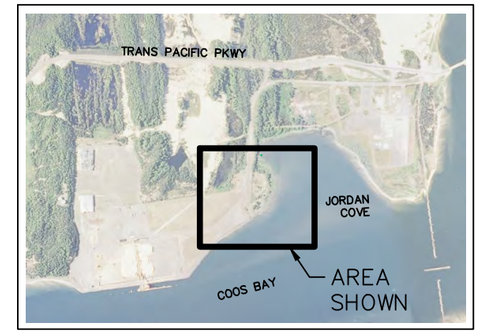

2 / A2-1 **KEY MAP**
SCALE: 1"=3000'

LEGEND:

- Highest Measured Tide (HMT)
- Wetland boundary
- Existing contour
- Property line

0 100 200 400

NOTES:

1. Contours and HMT shown are from professional land survey performed 2-17-14 through 2-24-14. (NAVD88)
2. Utility information not available.

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COOS COUNTY

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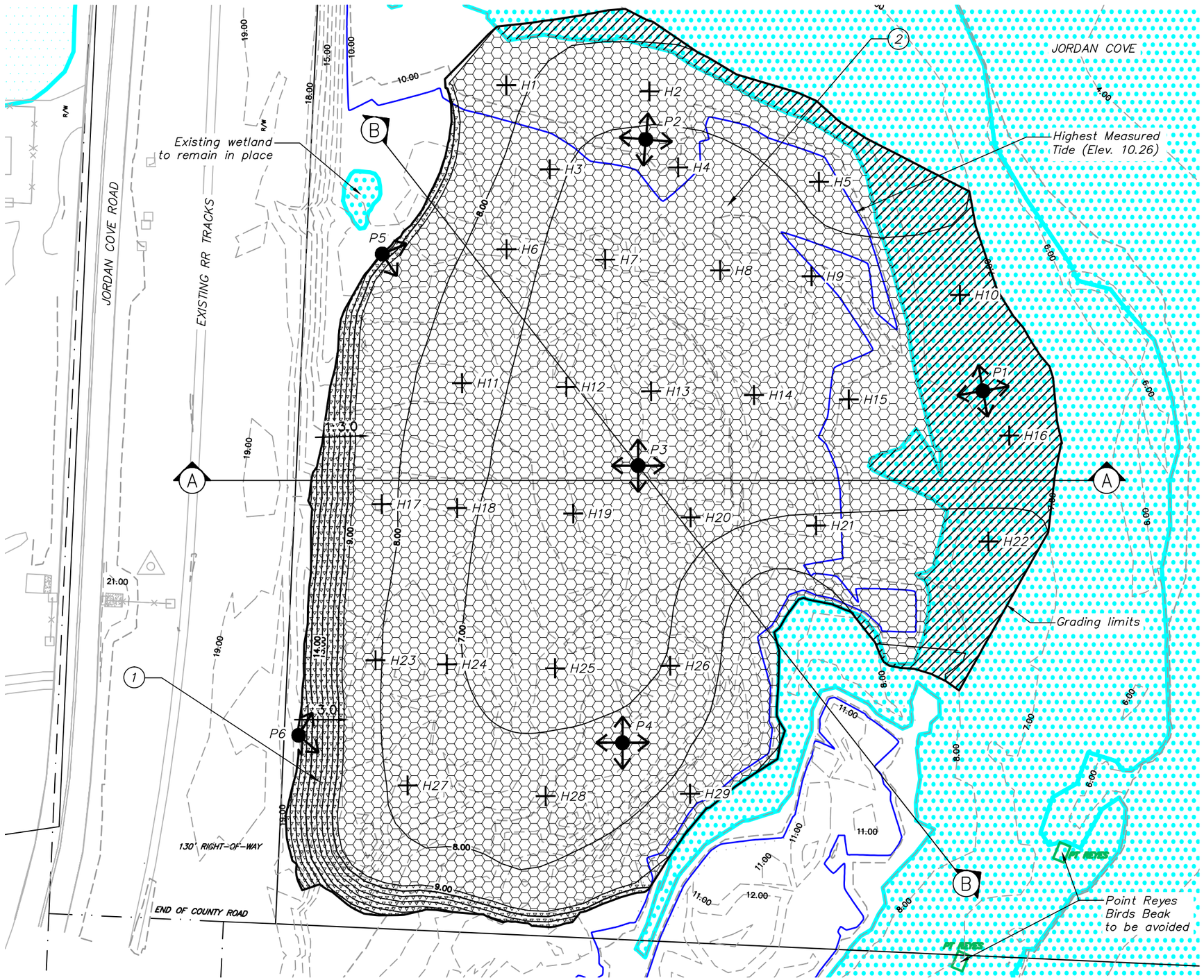
Designed By - JND
Drafted By - JND

WEST JORDAN COVE MITIGATION SITE - EXISTING CONDITIONS

SHEET NO. A2-1



1 A2-2A **MITIGATION PLAN**
SCALE: 1"=60'

CONSTRUCTION NOTES:

1. Install Upland Mix to slopes excavated during grading activities, above elev. 9 and extending to limits of disturbance
2. Salt Marsh Community to self establish. See Planting List for contingency plantings.

LEGEND:

- Created Salt Marsh Community extents (2.92 acres)
- Temporary disturbed Salt Marsh (0.48 acres)
- Upland Community extents (0.23 acres)

LEGEND:

- Wetland boundary
- Existing contour
- Property line
- Herbaceous Plot
- Photo Point and Direction

0 30 60 120

NOTES:

1. Contours and HMT shown are from professional land survey performed 2–17–14 through 2–24–14. (NAVD88)
2. Utility information not available.

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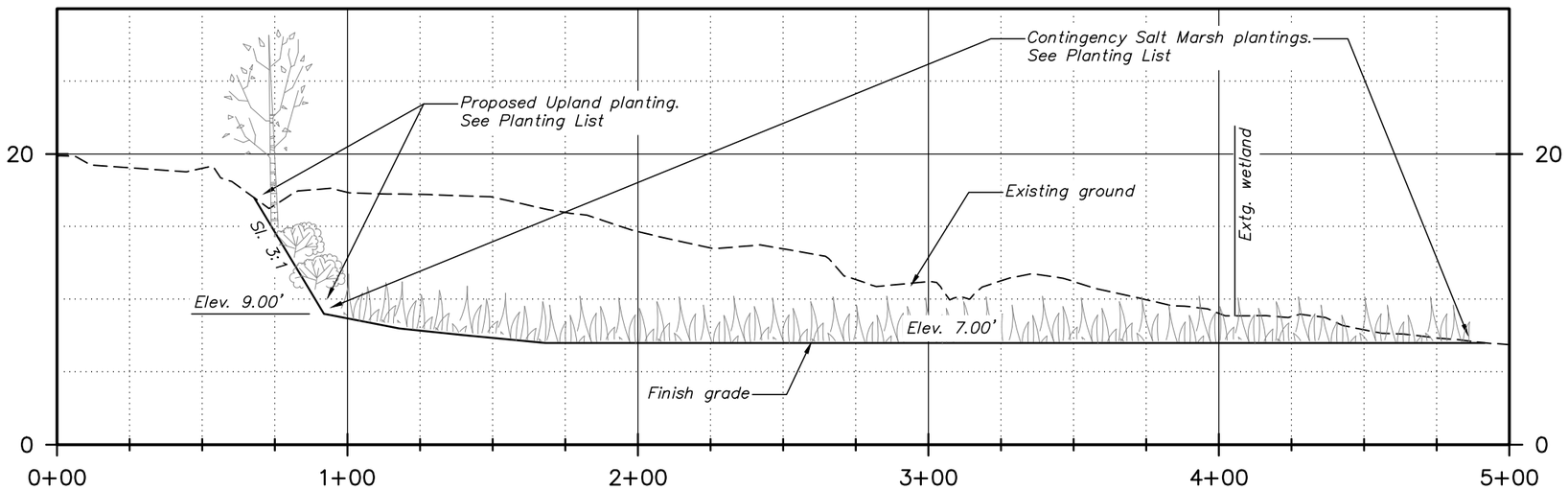
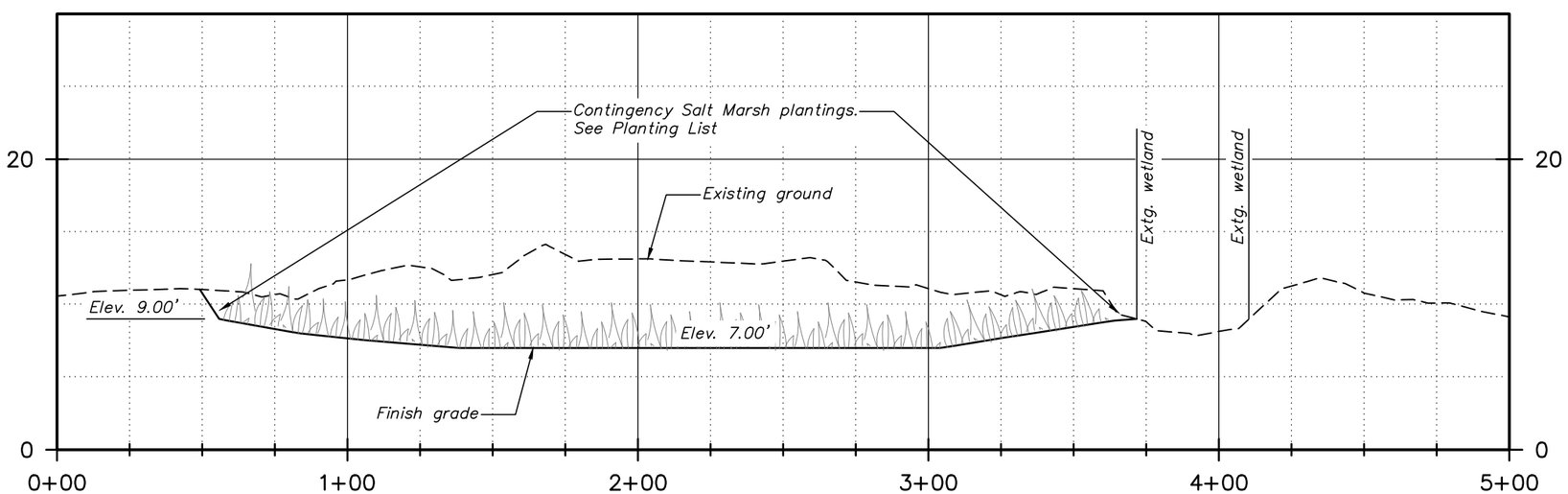
WEST JORDAN COVE MITIGATION SITE - PLAN

SHEET NO. A2–2A



1 / A2-2B **SECTION A-A**
SCALE: H: 1"=50' V: 1"=10'



2 / A2-2B **SECTION B-B**
SCALE: H: 1"=50' V: 1"=10'

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Drafted By – JND

WEST JORDAN COVE MITIGATION SITE - CROSS SECTIONS

SHEET NO. A2–2B

WEST JORDAN COVE MITIGATION SITE PLANTING LIST:

Botanical name	Common name	Indicator Status	Condition
Proposed Upland Plantings			
Pinus contorta	Shore pine	FAC	Bare root
Picea sitchensis	Sitka spruce	FAC	Bare root
Alnus rubra	Red alder	FAC	Bare root
Poa macrantha	Seashore bluegrass	FACU	Seed mix
Fragaria chiloensis	Beach strawberry	UPL	
Anaphalis margaritacea	Western pearly everlasting	UPL	
Lupinus littoralis	Seashore lupine	UPL	
Cardionema ramosissimum	Sandcarpet	UPL	
Leymus mallis	American dunegrass	UPL	

NOTE: Seed mix shall be applied to cover 100% of the upland planting area site. Contractor shall evenly mix and space woody species in quantities sufficient to meet the stem density criteria provided in the CWM plan.

Botanical name	Common name	Indicator Status	Condition
Contingency Salt Marsh Plantings			
Hordeum brachyantherum	Meadow barley	FACW	Seed mix
Deschampsia cespitosa	Tufted hairgrass	FACW	
Grindelia integrifolia	Gumweed	FACW	
Carex lyngbyei	Lyngby sedge	OBL	
Distichlis spicata	Salt grass	FACW	

NOTE: Salt marsh vegetation to establish via natural recruitment. Contingency plantings to occur if deemed necessary by end of second year of monitoring.

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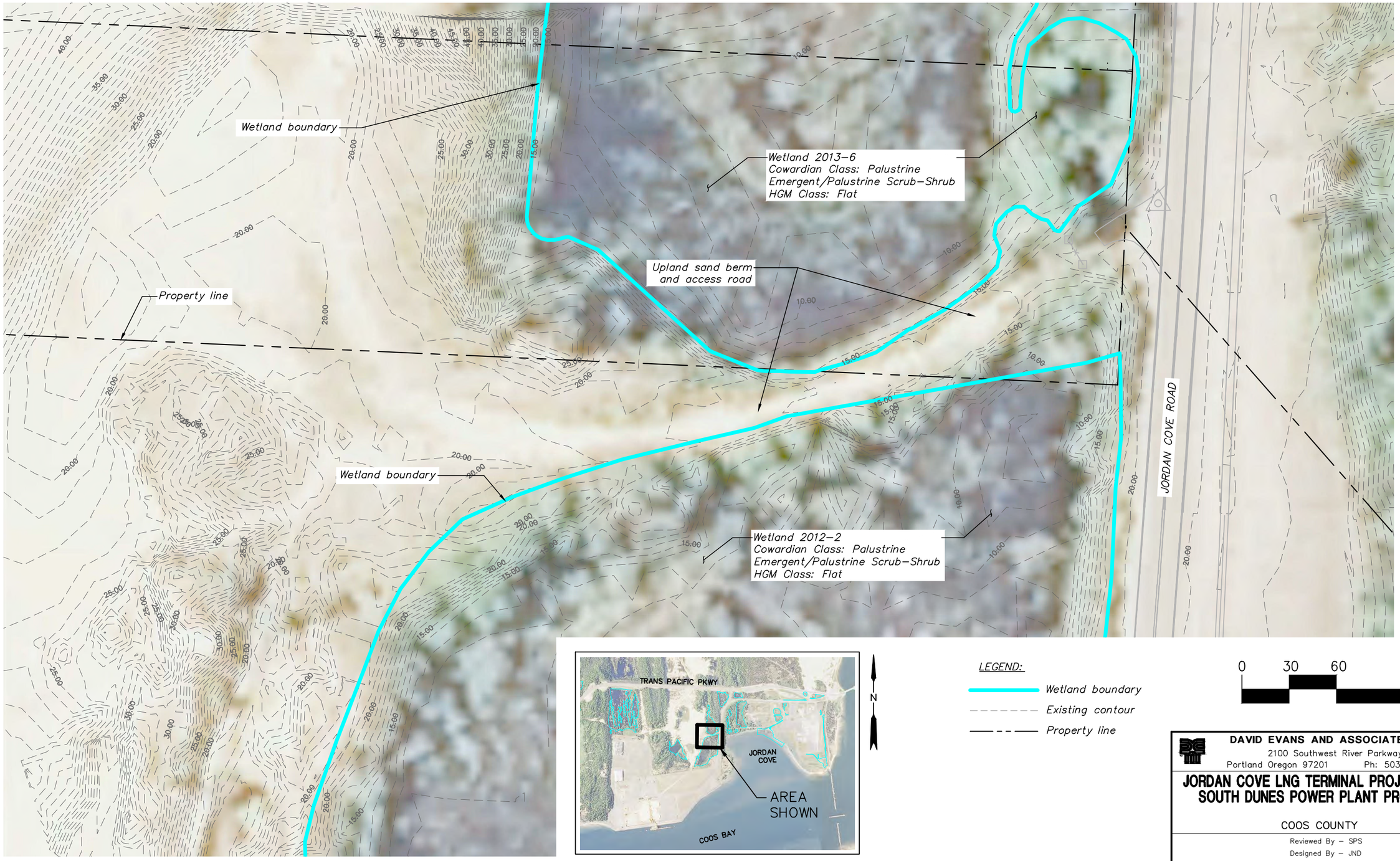
WEST JORDAN COVE MITIGATION SITE - PLANTING LIST

SHEET NO. A2–3



1 / A3-1 **EXISTING CONDITIONS**
SCALE: 1"=60'

2 / A3-1 **KEY MAP**
SCALE: 1"=3000'

LEGEND:
- Wetland boundary
- Existing contour
- Property line

0 30 60 120

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COOS COUNTY

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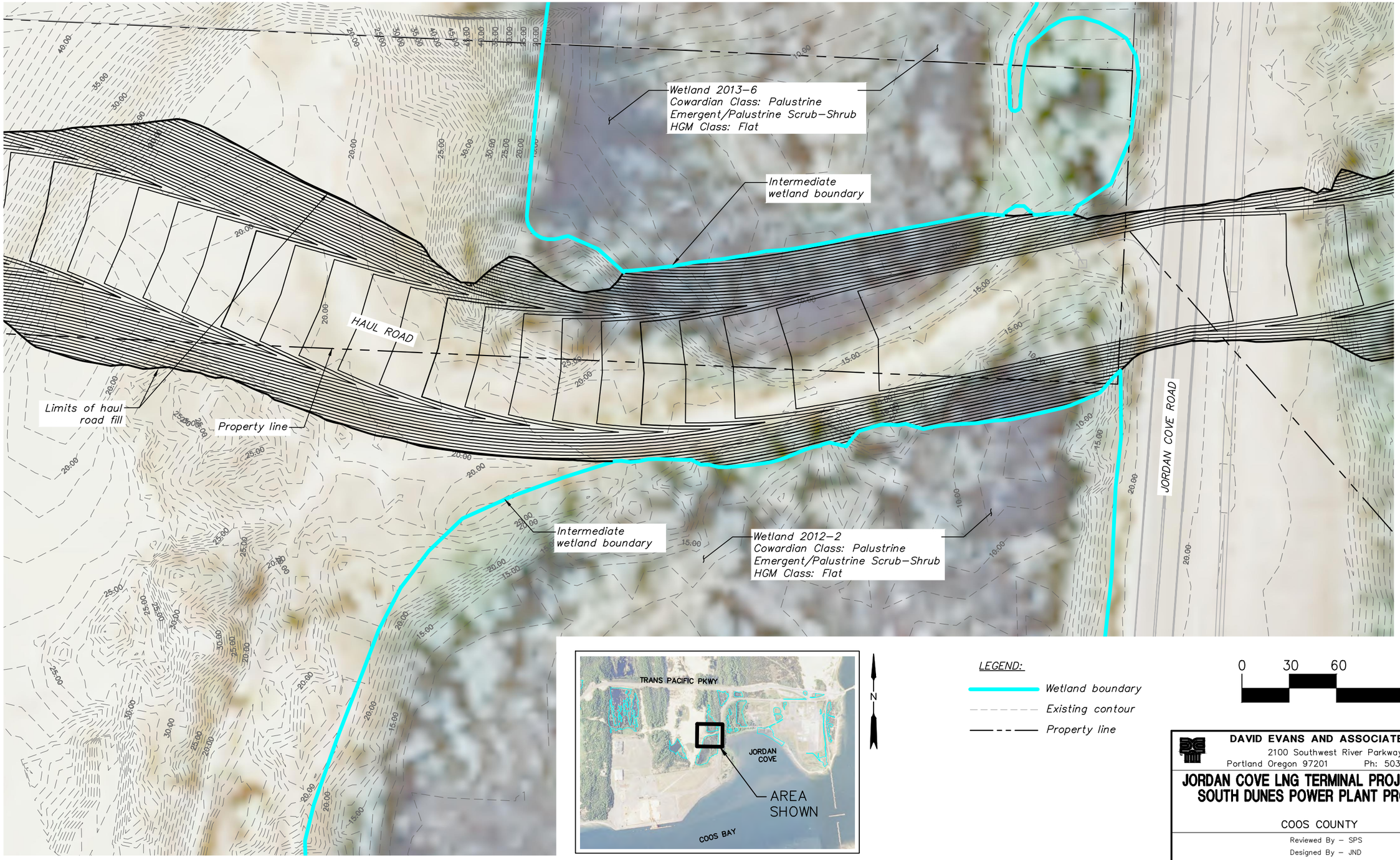
Designed By – JND
Drafted By – JND

WEST BRIDGE MITIGATION SITE EXISTING CONDITIONS

SHEET NO. A3-1



1 A3-1 **EXISTING CONDITIONS**
SCALE: 1"=60'

2 A3-1 **KEY MAP**
SCALE: 1"=3000'

LEGEND:
- Wetland boundary
- Existing contour
- Property line

0 30 60 120

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

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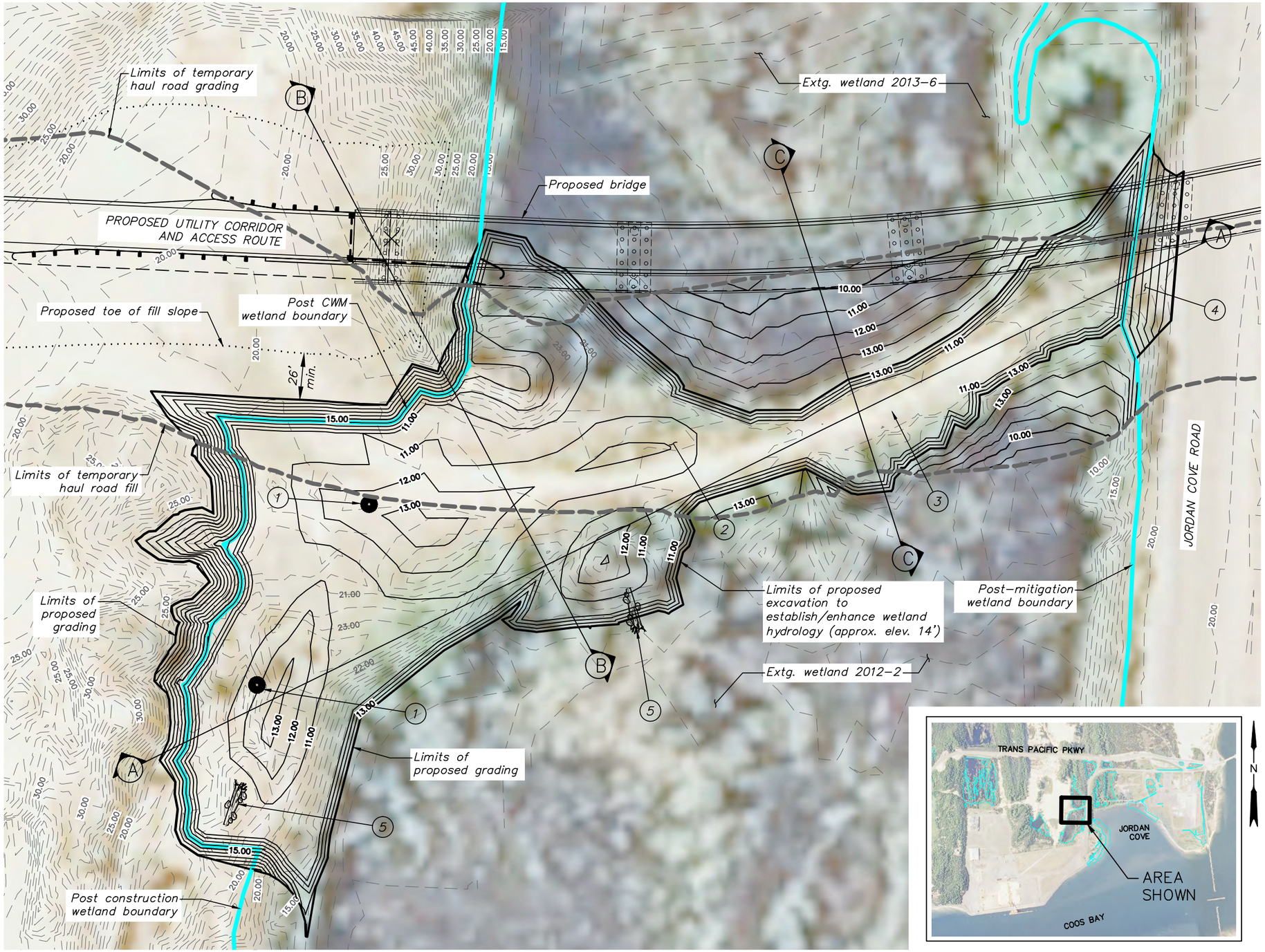
Designed By – JND
Drafted By – JND

WEST BRIDGE MITIGATION SITE INTERMEDIATE CONDITIONS

SHEET NO. A3-1A



1 / A3-2 CONCEPTUAL MITIGATION GRADING PLAN

SCALE: 1"=60'

2 / A3-2 KEY MAP

SCALE: 1"=3000'

CONSTRUCTION NOTES:

1. Install wildlife snag (2)
2. Excavate material between existing wetlands.
3. Remove vegetation as required to remove temporary haul road and berm as directed in the field.
4. Construct roadway fill slope.
5. Install large woody debris (2)

Wetland Mitigation Areas	Acres	Credits
Upland to Wetland (Creation)	1.19	0.79
Previously Wetland to Wetland (Restoration)	0.46	0.46
Current Wetland to Wetland (Enhancement)	0.38	0.13

LEGEND:

Existing contour (1' interval)

Proposed contour (1' interval)

0 30 60 120

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

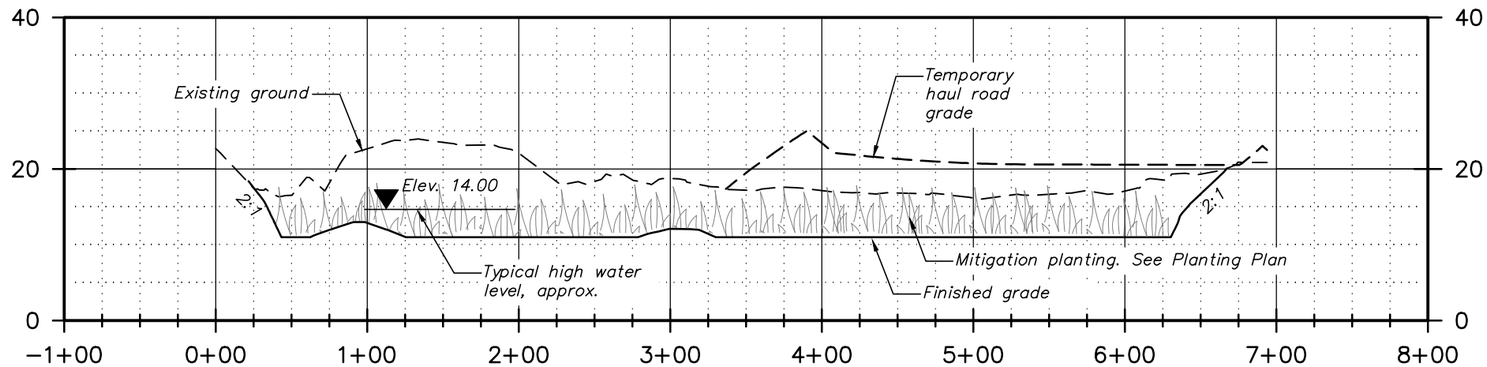
JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

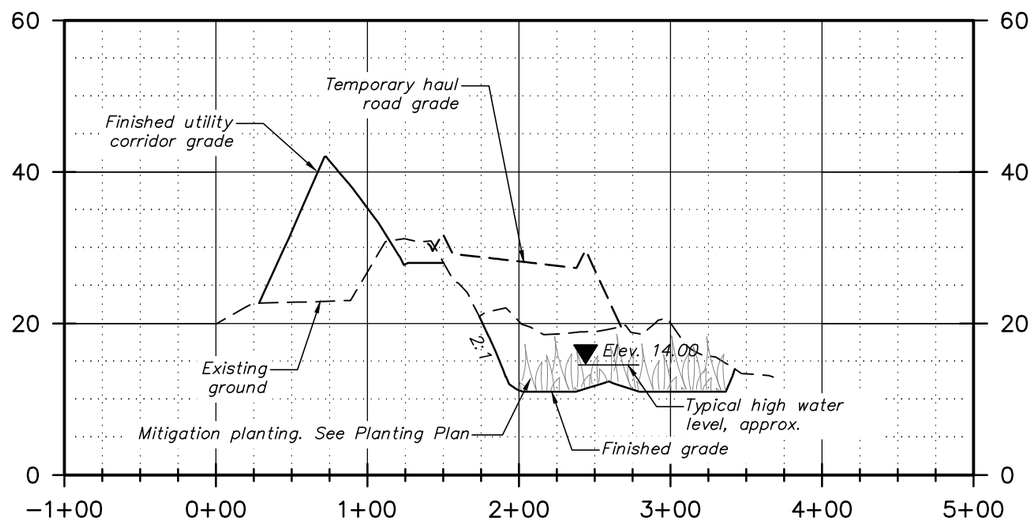
Reviewed By – SPS
Designed By – JND
Drafted By – JND

WEST BRIDGE MITIGATION CONCEPTUAL GRADING PLAN

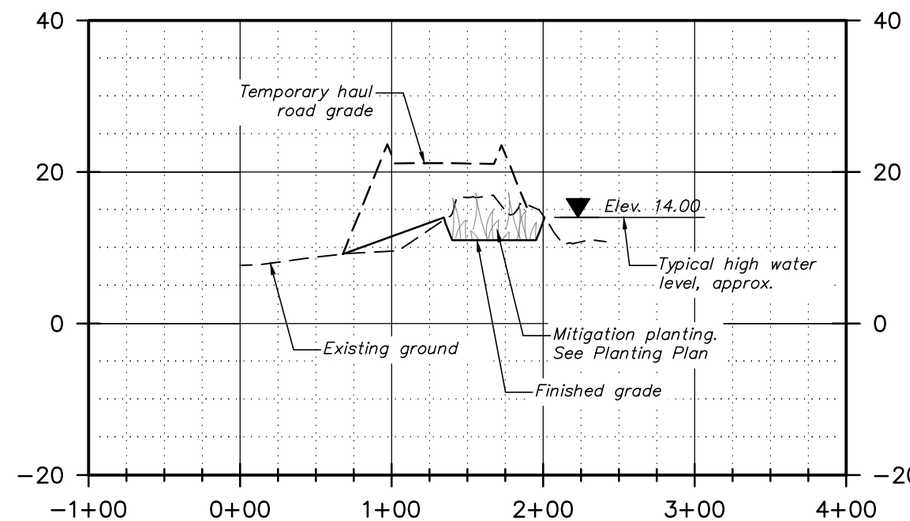
SHEET NO. A3–2



1 / A3-3 SECTION A-A
SCALE: H:1"=100' V:1"20'



2 / A3-3 SECTION B-B
SCALE: H:1"=100' V:1"20'



3 / A3-3 SECTION C-C
SCALE: H:1"=100' V:1"20'

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COOS COUNTY

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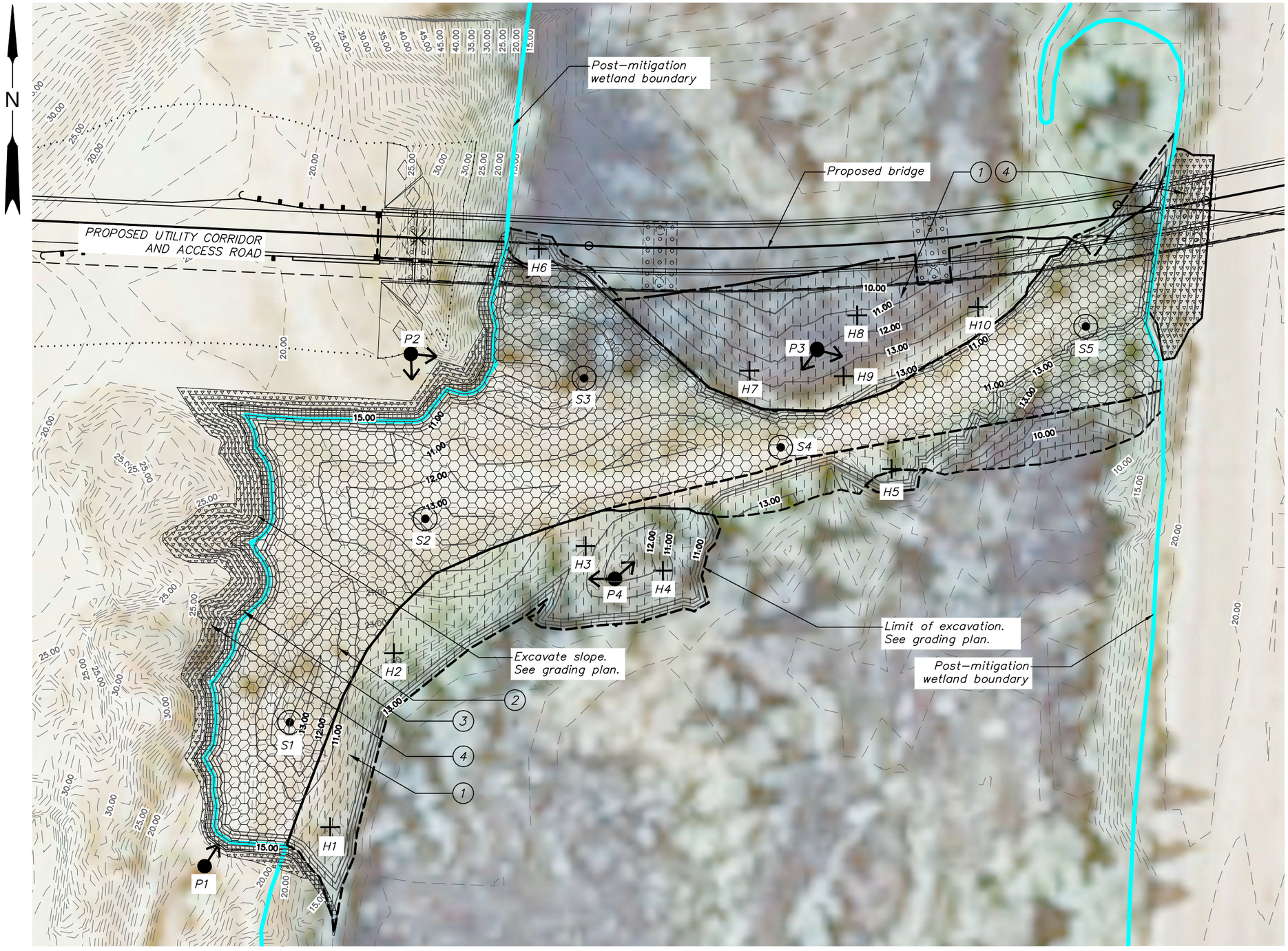
WEST BRIDGE MITIGATION GRADING CROSS SECTIONS

SHEET NO. A3–3



CONSTRUCTION NOTES:

1. Install Emergent Communtiy. See Planting List
2. Install Scrub–Shrub Community. See Planting List
3. Install Transitional Zone Mix along toe of slopes disturbed during grading activities
4. Install Upland Mix to slopes excavated during grading activities, above elev. 16 and extending to limits of disturbance

LEGEND:

- Palustrine Scrub–Shrub community extents (1.19 Ac)
- Palustrine Emergent Community extents (Totaling 0.84 Ac)
- Transitional Zone Mix
- Upland Mix

Monitoring Locations:

- Shrub + 2 Herbaceous Plots
- Herbaceous Plot
- Photo Point and Direction

Note: Minimum required plots and photo points are shown. Additional plots and photo points may be added and/or locations adjusted as identified in the field during monitoring.

0 30 60 120

1 / A3-4 **CONCEPTUAL PLANTING PLAN**
SCALE:1"=60'

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

Reviewed By – SPS
Designed By – BAR
Drafted By – BAR

WEST BRIDGE MITIGATION CONCEPTUAL PLANTING PLAN

SHEET NO. A3–4

WEST BRIDGE MITIGATION SITE PLANTING LIST:

Botanical name	Common name	Indicator Status	Condition
Palustrine Scrub–Shrub community (HGM class = depressional closed)			
Salix hookeriana	Hooker willow	FACW	Live stake
Myrica californica	California wax myrtle	FACW	Bare root or No. 1
Lonicera involucrata	Twinberry	FAC	Bare root
Spiraea douglasii	Douglas spiraea	FACW	Bare root
Palustrine Scrub–Shrub and Emergent Community (HGM class = depressional closed)			
Carex obnupta	Slough sedge	OBL	0.04 gal. tubeling
Carex obnupta	Slough sedge	OBL	Seed mix
Juncus falcatus	Sickle–leaved rush	FACW	
Juncus lesuerii	Salt rush	FACW	
Potentilla anserina	Silverweed cinquefoil	OBL	
Gentiana spectrum	King's gentian	OBL	
Transition zone			
Deschampsia cespitosa	Tufted hairgrass	FACW	0.04 gal. tubeling
Salix hookeriana	Hooker willow	FACW	Live stakes
Juncus lesueurii	Salt rush	FACW	Seed mix
Grindelia integrifolia	gumweed	FACW	
Deschampsia cespitosa	tufted hairgrass	FACW	
Trifolium wormskioldii	cows clover	FACW	
Upland Mix			
Poa macrantha	seashore bluegrass	FACU	Seed mix
Fragaria chiloensis	beach strawberry	UPL	
Anaphalis margaritacea	western pearly everlasting	UPL	
Lupinus littoralis	seashore lupine	UPL	
Cardionema ramosissimum	sandcarpet	UPL	
Leymus mollis	American dunegrass	UPL	

NOTE: Seed mix shall be applied to cover 100% of the CWM site. Contractor shall evenly mix and space woody species in quantities sufficient to meet the stem density criteria provided in the CWM plan.

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

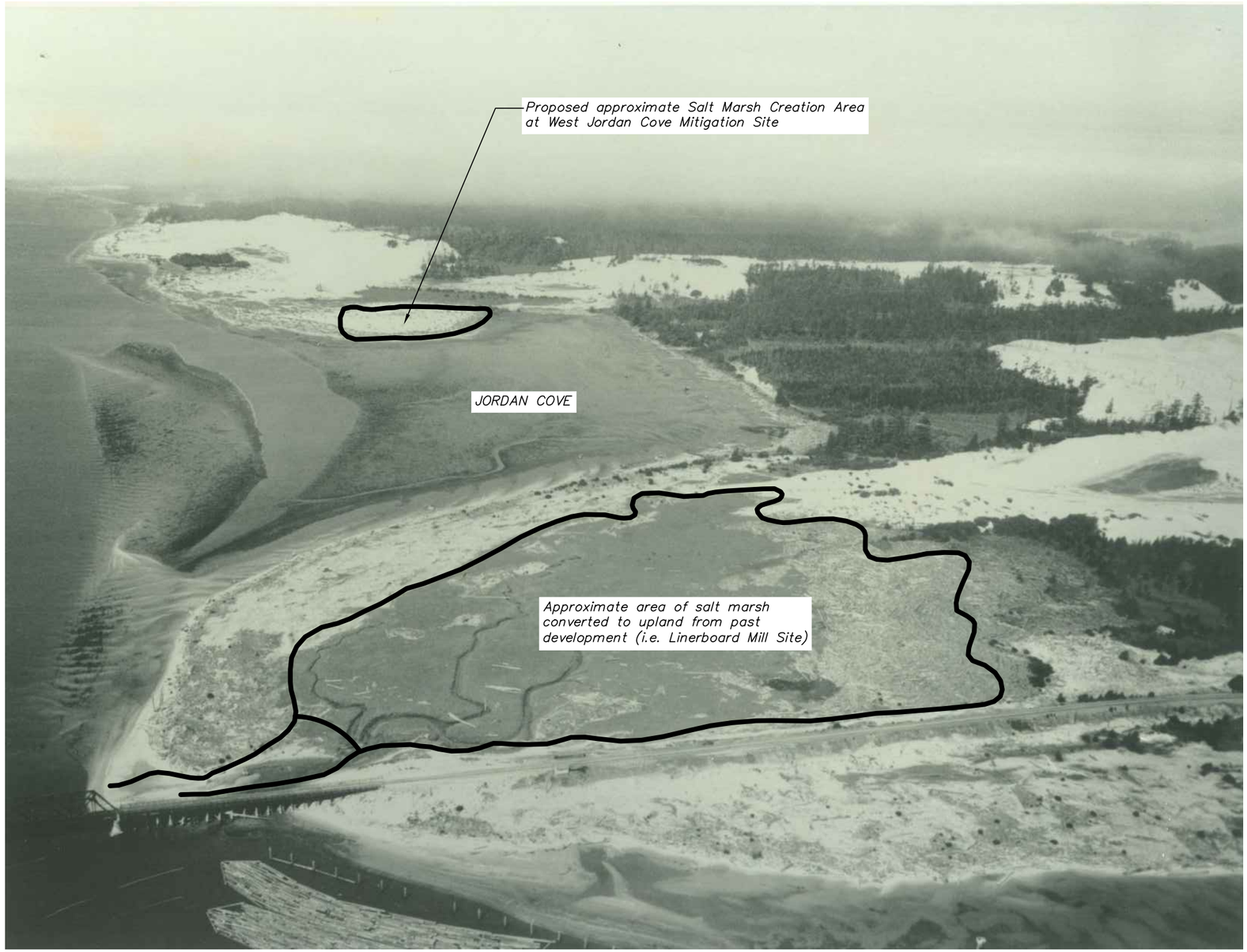
COOS COUNTY

Reviewed By – SPS
Designed By – BAR
Drafted By – BAR

WEST BRIDGE MITIGATION PLANTING LIST

SHEET NO. A3–5

N



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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

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Designed By – JND
Drafted By – JND

WEST JORDAN COVE MITIGATION SITE - AERIAL PHOTO FROM 1950'S

SHEET NO. FIG. 4

APPENDIX B – ORWAP FUNCTIONAL ASSESSMENT RESULTS FOR INDIVIDUAL SITES (IMPACT AND MITIGATION)

JCEP Freshwater Wetland Impacts

	Wetlands A, B, C(1), and 2012-4(1)		Wetland E(2)		Wetland 2013-3		Wetland 2013-4(1)		Wetlands 2013-6(2)		Wetlands 2012-7, H (East), I (North and South), J, L, and N	
SPECIFIC FUNCTIONS	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**
Water Storage & Delay (WS)	4.50	2.17	2.00	2.17	4.75	2.33	4.75	2.33	0.33	3.17		
Sediment Retention & Stabilization (SR)	10.00	5.00	10.00	5.13	10.00	5.31	10.00	5.35	6.67	4.64		
Phosphorus Retention (PR)	10.00	5.47	10.00	5.47	10.00	5.64	10.00	5.89	5.96	5.97		
Nitrate Removal & Retention (NR)	10.00	3.56	10.00	3.56	10.00	3.89	10.00	3.89	4.00	3.06		
Thermoregulation (T)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Carbon Sequestration (CS)	2.21		1.83		2.63		2.61		4.27			
Organic Matter Export (OE)	0.00		0.00		0.00		0.00		0.00			
Aquatic Invertebrate Habitat (INV)	7.37	7.49	5.49	6.96	6.82	7.25	7.08	7.27	7.00	6.00		
Anadromous Fish Habitat (FA)	0.00	5.50	0.00	4.37	0.00	4.64	0.00	5.74	0.00	4.63		
Non-anadromous Fish Habitat (FR)	4.03	6.67	6.96	6.67	1.17	6.67	3.16	6.67	4.17	6.67		
Amphibian & Reptile Habitat (AM)	7.49	4.00	3.00	4.00	7.25	4.00	7.27	4.00	5.21	4.00		
Waterbird Feeding Habitat (WBF)	5.50	10.00	4.37	10.00	4.64	10.00	5.74	10.00	4.63	10.00		
Waterbird Nesting Habitat (WBN)	0.00	6.67	4.49	6.67	0.00	6.67	0.00	6.67	0.00	6.67		
Songbird, Raptor, & Mammal Habitat (SBM)	6.38	7.33	3.06	7.33	6.00	7.33	6.10	7.33	4.54	7.33		
Pollinator Habitat (POL)	5.58	0.00	2.22	0.00	6.14	0.83	5.87	1.94	2.77	0.00		
Native Plant Diversity (PD)	4.85	10.00	4.89	10.00	5.30	6.67	5.12	6.67	5.32	10.00		

GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	4.50	2.17	2.00	2.17	4.75	2.33	4.75	2.33	0.33	3.17	4.50	2.00
Water Quality Group (WQ)	10.00	5.47	10.00	5.47	10.00	5.64	10.00	5.89	6.67	5.97	10.00	5.50
Carbon Sequestration (CS)	2.21		1.83		2.63		2.61		4.27		2.00	
Fish Support Group (FISH)	4.03	6.67	6.96	6.67	1.17	6.67	3.16	6.67	4.17	6.67	6.00	7.00
Aquatic Support Group (AQ)	7.49	10.00	5.49	10.00	7.25	10.00	7.27	10.00	7.00	10.00	9.00	10.00
Terrestrial Support Group (TERR)	6.38	10.00	4.89	10.00	6.14	7.33	6.10	7.33	5.32	10.00	7.50	10.00
Public Use & Recognition (PU)		0.48		0.48		1.19		0.00		0.00		10.00
Provisioning Services (PS)		0.00		0.00		0.00		0.00		0.00		0.00

Acres	0.839	0.02	0.10	0.287	0.034	0.729

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	4.46	2.16
Water Quality Group (WQ)	9.94	5.56
Carbon Sequestration (CS)	2.24	
Fish Support Group (FISH)	4.51	6.79
Aquatic Support Group (AQ)	7.97	10.00
Terrestrial Support Group (TERR)	6.70	9.49
Public Use & Recognition (PU)		3.89
Provisioning Services (PS)		0.00

Scores Rounded to Nearest Whole Number	
Group Scores (functions)	**Group Scores (values)**
4	2
10	6
2	
5	7
8	10
7	9
	4
	0

Mitigation Sites Existing Pre-Mitigation Wetland Functions

	West Bridge Creation		West Bridge Enhancement		West Jordan Cove Creation	
SPECIFIC FUNCTIONS	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**
Water Storage & Delay (WS)	0.00	0.00	0.33	3.17	0.00	0.00
Sediment Retention & Stabilization (SR)	0.00	0.00	6.67	4.64	0.00	0.00
Phosphorus Retention (PR)	0.00	0.00	5.96	5.97	0.00	0.00
Nitrate Removal & Retention (NR)	0.00	0.00	4.00	3.06	0.00	0.00
Thermoregulation (T)	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Sequestration (CS)	0.00		4.27		0.00	
Organic Matter Export (OE)	0.00		0.00		0.00	
Aquatic Invertebrate Habitat (INV)	0.00	0.00	7.00	6.00	0.00	0.00
Anadromous Fish Habitat (FA)	0.00	0.00	0.00	4.63	0.00	0.00
Non-anadromous Fish Habitat (FR)	0.00	0.00	4.17	6.67	0.00	0.00
Amphibian & Reptile Habitat (AM)	0.00	0.00	5.21	4.00	0.00	0.00
Waterbird Feeding Habitat (WBF)	0.00	0.00	4.63	10.00	0.00	0.00
Waterbird Nesting Habitat (WBN)	0.00	0.00	0.00	6.67	0.00	0.00
Songbird, Raptor, & Mammal Habitat (SBM)	0.00	0.00	4.54	7.33	0.00	0.00
Pollinator Habitat (POL)	0.00	0.00	2.77	0.00	0.00	0.00
Native Plant Diversity (PD)	0.00	0.00	5.32	10.00	0.00	0.00

GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	0.00	0.00	0.33	3.17	0.00	0.00
Water Quality Group (WQ)	0.00	0.00	6.67	5.97	0.00	0.00
Carbon Sequestration (CS)	0.00		4.27		0.00	
Fish Support Group (FISH)	0.00	0.00	4.17	6.67	0.00	0.00
Aquatic Support Group (AQ)	0.00	0.00	7.00	10.00	0.00	0.00
Terrestrial Support Group (TERR)	0.00	0.00	5.32	10.00	0.00	0.00
Public Use & Recognition (PU)		0.00		0.00		0.00
Provisioning Services (PS)		0.00		0.00		0.00

Acres	1.19	0.38	1.64

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	0.04	0.37
Water Quality Group (WQ)	0.79	0.71
Carbon Sequestration (CS)	0.51	
Fish Support Group (FISH)	0.49	0.79
Aquatic Support Group (AQ)	0.83	1.18
Terrestrial Support Group (TERR)	0.63	1.18
Public Use & Recognition (PU)		0.00
Provisioning Services (PS)		0.00

Scores Rounded to Nearest Whole Number	
Group Scores (functions)	**Group Scores (values)**
0	0
1	1
1	
0	1
1	1
1	1
	0
	0

Mitigation Sites Post Mitigation Wetland Functions

	West Bridge Creation and Enhancement		West Jordan Cove Creation	
SPECIFIC FUNCTIONS	**Relative Effectiveness of the Function**	**Relative Values of the Function**	**Relative Effectiveness of the Function**	**Relative Values of the Function**
Water Storage & Delay (WS)	3.25	3.17	0.00	1.50
Sediment Retention & Stabilization (SR)	10.00	4.83	3.23	5.09
Phosphorus Retention (PR)	10.00	5.97	0.79	5.03
Nitrate Removal & Retention (NR)	10.00	3.06	2.96	3.64
Thermoregulation (T)	0.00	0.00	0.00	6.67
Carbon Sequestration (CS)	2.06		7.81	
Organic Matter Export (OE)	0.00		8.41	
Aquatic Invertebrate Habitat (INV)	6.56	6.41	3.75	6.00
Anadromous Fish Habitat (FA)	0.00	5.50	3.80	10.00
Non-anadromous Fish Habitat (FR)	6.41	6.67	4.29	10.00
Amphibian & Reptile Habitat (AM)	4.16	4.00	0.00	7.33
Waterbird Feeding Habitat (WBF)	5.50	10.00	4.93	10.00
Waterbird Nesting Habitat (WBN)	6.19	6.67	0.00	5.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.47	7.33	4.75	7.33
Pollinator Habitat (POL)	5.74	0.00	5.16	5.00
Native Plant Diversity (PD)	7.42	10.00	6.13	10.00

GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	3.25	3.17	0.00	1.50
Water Quality Group (WQ)	10.00	5.97	3.23	6.67
Carbon Sequestration (CS)	2.06		7.81	
Fish Support Group (FISH)	6.41	6.67	4.29	10.00
Aquatic Support Group (AQ)	6.56	10.00	8.41	10.00
Terrestrial Support Group (TERR)	7.42	10.00	6.13	10.00
Public Use & Recognition (PU)		0.00		1.79
Provisioning Services (PS)		0.00		0.00

Acres	1.57	1.64

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	1.59	2.32
Water Quality Group (WQ)	6.54	6.33
Carbon Sequestration (CS)	5.00	
Fish Support Group (FISH)	5.33	8.37
Aquatic Support Group (AQ)	7.51	10.00
Terrestrial Support Group (TERR)	6.76	10.00
Public Use & Recognition (PU)		0.91
Provisioning Services (PS)		0.00

Scores Rounded to Nearest Whole Number	
Group Scores (functions)	**Group Scores (values)**
2	2
7	6
5	
5	8
8	10
7	10
	1
	0

APPENDIX C – DRAFT DEED RESTRICTIONS

After recording return to:	This space reserved for recorder's use.
Permit Holder: Jordan Cove Energy Project, L.P. 125 Central Avenue, Suite 380 Coos Bay, OR 97420 Attention: Bob Braddock	

DECLARATION OF COVENANTS, RESTRICTIONS, AND ACCESS EASEMENT FOR THE JORDAN COVE ENERGY PROJECT

DSL PERMIT NO. 54908-RF AND 54909-RF

DRAFT

THIS DECLARATION OF COVENANTS AND RESTRICTIONS (this "Declaration") is made this ____ day of _____, 2014, by the JORDAN COVE ENERGY PROJECT, L.P. (JCEP LP), a limited partnership of the State of Oregon ("Declarant").

RECITALS

WHEREAS, Declarant is developing a portion of its property for a liquefied natural gas export facility, power plant, and appurtenant facilities (the "Project").

WHEREAS, construction of the Project will result in approximately 5.89 acres of unavoidable impact to freshwater and estuarine wetlands.

WHEREAS, pursuant to Oregon Department of State Lands ("DSL") Permits No. 54908-RF and 54909-RF (the " Permits"), JCEP LP has been required to perform certain compensatory mitigation for impacts to wetlands resulting from the construction of the Project.

WHEREAS, a portion of the compensatory mitigation will be performed on property owned by Declarant (as more particularly depicted and described on Exhibit A attached hereto, the "Mitigation Site").

WHEREAS, Declarant desires and intends to provide for the perpetual protection and conservation of the wetland and/or waterway functions and values of the Property and for the management of the Property and improvements thereon, and to this end desires 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;

WHEREAS, the compensatory mitigation for impacts to wetlands resulting from the construction of the Project is described in that certain Compensatory Wetland Mitigation Plan prepared by David Evans and Associates, Inc. and dated January, 2014 (as it may be amended from time to time with the approval of DSL, the "Mitigation Plan").

WHEREAS, as a condition on issuance of the Permit, Declarant has been required to provide for the protection of the Mitigation Site.

WHEREAS, Declarant desires to provide for such protection by subjecting the Mitigation Sites to the covenants and restrictions set forth herein.

COVENANTS

NOW, THEREFORE, Declarant hereby declares and covenants that the Mitigation Site shall be held, sold and conveyed subject to the following covenants, which are intended to and shall run with the land, continue in perpetuity and shall be binding upon all parties having or acquiring any right, title or interest in the Mitigation Site and shall inure to the benefit of each owner and subsequent owners:

1. The Mitigation Site shall be used and managed for wetland mitigation purposes in accordance with the Permit.

2. There shall be no removal, destruction, cutting, trimming, mowing, alteration or spraying with biocides of any vegetation in the Mitigation Site, nor any disturbance or change in the natural habitat of the Mitigation Site. This provision shall not apply to the control, elimination, or management of nonnative, exotic, or invasive vegetation or any activities permitted or required under the Permit or the Mitigation Plan.

3. There shall be no agricultural, commercial, or industrial activity undertaken in the Mitigation Site; nor shall any right of passage across or upon the Mitigation Site be granted if that right of passage is used in conjunction with agricultural, commercial or industrial activity.

4. There shall be no filling, excavating, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock minerals or other materials, nor any dumping of ashes, trash, garbage, or of any other material, and no changing of the topography of the land in the Mitigation Site, except as provided in the Permit or the Mitigation Plan.

5. This Declaration shall not be interpreted as in any way conveying or granting to the public any right to enter or use the Mitigation Site.

6. An access easement granted by the US Forest Service shall be established for the purpose of success and compliance monitoring shall be maintained for the life of the project.

7. Declarant grants to the Department an easement and right of entry on the Property for the purpose of physically accessing the Property at all reasonable times to inspect the Property in order to monitor and to ascertain whether there has been compliance with this Declaration and the Removal-Fill Permit. In the event that the mitigation site lacks access via a public road or

DRAFT

other common area, Declarant grants to the Department an easement over and across any other property of Declarant, if any, the use of which is necessary to access the Property.

8. In the event of any conflict between the terms and conditions of this Declaration and the terms and conditions of the Permit, as it may be modified from time to time, the terms and conditions of the Permit shall control over this Declaration.

9. This Declaration is made for the benefit of the State of Oregon, acting by and through the DSL, and the US Army Corps of Engineers (the "USACE") only and it may only be enforced by DSL and the USACE. This Declaration may be modified or terminated by written agreement with DSL and the USACE. No other party or individual shall have any right to object to its modification or termination. The rights of DSL and the USACE hereunder may only be assigned to another agency of the State of Oregon or to another agency or division of the U.S. Federal Government.

IN WITNESS WHEREOF, the undersigned being Declarant herein, has executed this instrument this ___ day of _____, 201_.

DECLARANT

JORDAN COVE ENERGY PROJECT, L.P.,
a limited partnership of the State of Oregon

By: _____

Name: _____

Its: _____

DRAFT

STATE OF OREGON)
) ss.
County of _____)

The foregoing instrument was acknowledged before me this ___ day of_____, 201__ by _____, as _____ of JORDAN COVE ENERGY PROJECT, L.P., a limited partnership of the State of Oregon, on behalf of said partnership.

_____
Notary Public for Oregon

My commission expires:_____

EXHIBIT A

West Jordan Cove Wetland Mitigation Site: Description and Depiction of Mitigation Site

EXHIBIT B

East Bridge Wetland Mitigation Site: Description and Depiction of Mitigation Site

EXHIBIT C

West Bridge Wetland Mitigation Site: Description and Depiction of Mitigation Site

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Jordan Cove Energy Project

Compensatory Wetland Mitigation Plan

Part B: Estuarine Impacts

(Federal Permitting)

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1. COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW

1.1 INTRODUCTION

The Jordan Cove Energy Project, L.P. (JCEP L.P.) liquefied natural gas (LNG) Terminal Project (Part A of the permit application) and Slip and Access Channel Project (Part C of the permit application; together these are called the JCEP LNG Project, or the Project), , situated along the North Spit of Coos Bay, Oregon, will result in impacts to natural resources within the intertidal and shallow subtidal zone of Coos Bay (i.e., estuarine/tidal resources). These resources provide important ecological functions to the greater Coos Bay ecosystem and are regulated by state and federal agencies. Impacts to these resources will therefore need to be mitigated. Of particular concern are impacts to eelgrass beds, which occur in the shallow subtidal zone and lower elevation intertidal zone.

This Compensatory Wetland Mitigation (CWM) Plan Part B specifically covers permanent impacts and mitigation to estuarine resources. Freshwater impacts are covered within Part A. Development features that result in estuarine impacts and that are covered in this CWM Plan include:

- Trans Pacific Parkway/Highway 101 Intersection Improvements
- The Project's barge berth
- The Port's Slip and Access Channel
- Power plant (aka the Mill Site) estuarine impacts

Permanent estuarine impacts related to development features are approximately 16.86 acres. Permanent incidental mitigation site construction impacts will result in another approximately 3.11 acres of wetland impacts. Therefore, the total permanent impacts that will be mitigated for in this plan are 19.96 acres. These impacts will be offset by approximately 52.69 acres of estuarine mitigation, plus an additional 1.58 acres (0.53 credits based on 3:1 enhancement ratio) of contingency mitigation. In Oregon, it is a long standing and common practice for the U.S. Army Corps of Engineers (USACE) regulatory program to utilize the states wetland mitigation ratios in preparation of CWM Plans. Therefore, Oregon Department of State Lands (DSL) wetland mitigation ratios have been used to determine mitigation acreage. Figure 1 of Appendix A shows the location of proposed estuarine impacts and associated mitigation sites. The majority of estuarine impacts will occur at the Slip and Access Channel and adjacent barge berth, and include impacts to unvegetated mudflat, eelgrass, and a small patch of salt marsh. Additional smaller impacts to estuarine resources are proposed at the other development features listed above, and include impacts to salt marsh and unvegetated mudflat. Mitigation will occur at two locations within the Coos Bay estuary, as follows:

- Intertidal Flats Mitigation Site/Kentuck Slough Site (primarily unvegetated mudflat and tide channels, and some salt marsh)
- Eelgrass Mitigation Site (eelgrass only)

A significant portion of the mitigation proposed in this CWM Plan and associated development impacts have been approved by the Oregon Department of State Lands (DSL) under permit #37712-RF. This current plan has been developed to support the Clean Water Act Section 404 permitting with the U.S. Army Corps of Engineers (USACE). Minor differences between this current plan and what was authorized by DSL include:

- The DSL-authorized plan included a small impact to an isolated freshwater wetland on a parcel that is no longer included in the Project, and associated mitigation. This impact is no longer anticipated, and therefore this current plan does not include mitigation for this impact.
- This current plan includes very minor impacts to estuarine waters resulting from road improvements at the intersection of the Trans Pacific Parkway and Highway 101. DSL permit #37712-RF did not authorize these impacts, because they were not included in the permit application. However, the permit did authorize advance mitigation credits that should cover these impacts for the purpose of gaining state authorization. JCEP L.P. has prepared and submitted a separate Removal-Fill Permit application to DSL to authorize these impacts.
- The configuration of the slip entry way has changed slightly, because the slip design has been advanced since issuance of the DSL permit and authorized CWM plan. It should be noted that the slip configuration (including a barge berth to serve the JCEP LNG Terminal Project) included in this application best represents the current design.
- Minor estuarine impacts near Wetlands H, M, and J at the South Dunes Site resulting from fill placement were not accounted for in the state permit because they were not included in the permit application; the application to the state only addressed the Slip and Access Channel. However, the permit did authorize advance mitigation credits that should cover these impacts for the purpose of gaining state authorization. JCEP L.P. has prepared and submitted a separate Removal-Fill Permit application to DSL to authorize these impacts. These impacts are included in the application to USACE, and accounted for in this CWM Plan.

For consistency purposes, this proposed CWM Plan has been prepared in accordance with the Oregon Department of State Lands (DSL) rules. However, it is fully supportive of federal regulatory permitting requirements. Documentation of how this plan meets the information requirements of the USACE Portland District Mitigation Plan Template is provided in the Overview portion of this CWM Plan.

1.2 ECOLOGICAL GOALS AND OBJECTIVES

The goals and objectives of this mitigation plan seek to offset the loss of acreage and functions provided by the wetland and tidal water resources that would be impacted by the proposed Project. Specific goals and objectives for each proposed mitigation area are provided below, with additional detail provided in Section 7.1.

1.2.1 Eelgrass Mitigation Site

Mitigation Goal 1: Create 7.68 acres of eelgrass beds (i.e., based on an enhancement ratio of 3:1), whereby a minimum of 2.56 of these acres would be classified as medium- to high-density beds. To achieve this goal, the following objectives will be carried out:

- **Objective 1.1:** Recontour (excavate) an area of approximately 7.68 acres to provide suitable elevations for the establishment of eelgrass. Suitable elevations will be based on field observations of existing nearby robust eelgrass beds.
- **Objective 1.2:** Establish a minimum of 7.68 acres of eelgrass beds whereby a minimum of 2.56 acres would be classified as medium- to high-density eelgrass beds within the recontoured area described under Objective 1. Density classes are defined as follows: less than 10% cover equals an absence of eelgrass bed, low density equals approximately 10% to 39% cover, medium density equals approximately 40% to 79% cover, and high density equals approximately 80% cover or greater.

1.2.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

Mitigation Goal 2: Reestablish tidal flow to approximately 45.01 acres of historical intertidal habitats adjacent to Kentuck Slough. (Actual area as currently designed will be 46.59 acres, which results in additional contingency credits. Mitigation Goal 2 and associated Objectives are based on the minimum acreage needed to meet standard DSL mitigation ratios). To achieve this goal, the following objectives will be carried out:

- **Objective 2.1:** Construct a new bridge in East Bay Drive to allow tidal exchange between Kentuck Inlet and the "back nine" of Kentuck Golf Course.
- **Objective 2.2:** Construct a new cross dike between the front and back nine of Kentuck Golf Course, with a standard tidegate to drain the front nine to the back nine, and construct a fish-friendly tidegate array through the Kentuck Slough dike, allowing the majority of flow from Kentuck Slough to enter the back nine.
- **Objective 2.3:** Remove the culvert and tidegate located adjacent to the east side of East Bay Road near the southeast corner of the golf course site.
- **Objective 2.4:** Restore tidal connection to the irrigation pond creek system through installation of a fish passable culvert that meets ODFW fish passage criteria.
- **Objective 2.5:** Construct and/or enhance approximately 6,000 linear feet of tide channels.
- **Objective 2.6**: Establish an approximately 1.73 acre wetland bench along Kentuck Slough by relocating the existing levee southward.
- **Objective 2.7:** Establish an emergent to scrub-shrub, brackish to freshwater transitional plant community along the Kentuck Slough bench described in Objective 2.6.
- **Objective 2.8:** Establish a minimum of 0.18 acres of salt marsh habitat within the internal portion of the Kentuck Slough Site, with the remainder of the internal portion (43.10 acres) being mudflat and/or tide channel. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable.

1.3 OVERVIEW OF CWM CONCEPT AND FUNCTIONS AND VALUES REPLACEMENT

The CWM Plan will entail mitigation work at two distinct sites, with each site addressing a different mitigation need (see Figure 1). Location information is provided in Section 2 of this report. Functions will be replaced through in-kind mitigation for each resource type. Additional discussion of functional replacement is provided in Section 5 of this report. An overview of the CWM concept at each proposed site is provided below.

1.3.1 Eelgrass Mitigation Site

To mitigate for impacts to approximately 2.56 acres of eelgrass, JCEP L.P. proposes to create approximately 7.68 acres of new eelgrass habitat due south of the west end of the Coos Bay-North Bend Airport runway. The proposed mitigation site is located south of the airport's runway extension project, which took place in the 1980s. The airport conducted eelgrass mitigation in this general area, and it appears that the opportunity exists to add on to this mitigation work. The airport's mitigation site is located several hundred feet northwest of the end of the runway extension. The proposed mitigation site for the Project would be to the south of the end of the runway extension.

Based on documented evidence of eelgrass presence in Coos Bay, it is known that eelgrass tends to flourish between approximately -1.0 m to +1.0 m Mean Lower Low Water (MLLW) elevation (Thom et

al. 2003). This data is further supported by hydrographic survey work conducted by David Evans and Associates, Inc. (DEA) at the proposed mitigation site during the following time periods: August 2007, January 2014, and August 2014. These elevations provide guidance on elevations that will be needed at the proposed mitigation site to establish eelgrass.

The proposed design approach is to excavate/dredge high areas down to approximately -1.0 m to +1.0 m MLLW (see figure in Appendix B). The site will be allowed to stabilize for one winter storm cycle. The site will then be transplanted with nearby donor stock in subsequent years.

This was the approach used in eelgrass mitigation efforts associated with the Coos Bay-North Bend Airport runway extension project (McCollough pers. comm. 2006). The airport mitigation project was considered highly successful (Rumrill pers. comm. 2006). This former mitigation effort followed the technique described above, whereby excavation occurred in year one, the site was allowed to stabilize over one winter storm season, followed by test plots and monitoring in year two, and then the remainder of the site planted in year three. It is important to wait one winter season to determine that site recontouring remains relatively stable. Also, earthwork needs to take place during the in-water work period, which occurs between October 1 and February 15. This is past the preferred time for performing transplanting of eelgrass (i.e., the time of peek biomass, which occurs during late summer). For the airport mitigation project, plant stock from the impact site was not harvested for transplant; instead an adjacent donor site was used. The proposed Project would follow this same general sequencing and methodology.

1.3.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

The golf course site (back nine) will be enhanced to its full potential, given existing on-site and off-site constraints (i.e., other historical changes that cannot be altered at this point in time such as roads, existing levees, and drainage district requirements). Enhancement will include restoring historical drainage patterns to the extent practical given site constraints.

The mitigation concept involves re-establishing tidal connections between Kentuck Inlet and the golf course, to offset impacts to mudflat at the Slip and Access Channel (see figure in Appendix B). This connection would be achieved by constructing a new bridge in East Bay Drive to allow tidal exchange between Kentuck Inlet and the mitigation site. A new cross dike is proposed between the golf course's "back nine" (holes 10 to 18) and "front nine" (holes 1 to 9) to prevent flooding to adjacent upstream properties. The back nine, which is adjacent to Kentuck Inlet, will be subject to tidal exchange; the front nine, which is east and upstream of the back nine, will not. The proposed cross dike will feature a new tidegate array including a muted tidal regulated (MTR) gate for fish passage. Kentuck Slough would be substantially rerouted to flow through the new tidegate array, into the back nine, and through the new bridge into Kentuck Inlet. A flapgate tidegate will also be installed through the new cross dike to allow upstream areas, including the front nine, to drain. The existing dike between the golf course and Kentuck Slough will be repaired and/or augmented to protect upstream properties from potential increased flooding hazards and saltwater intrusion. The existing channel through the back nine (approximately 2,500 feet) will be enhanced and/or rerouted to connect the tidegate array and bridge. An existing approximately 5-foot-diameter culvert and flapgate through East Bay Drive near the golf course entrance will be removed. East Bay Drive and Golf Course Lane will also be improved as part of the mitigation 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.

Mitigation construction activities (e.g., dike repair/augmentation, new dike construction, road improvements) will result in incidental permanent wetland impacts within the mitigation site. These impacts are accounted for and the mitigation provided for in this plan.

Survey information confirms that elevations within the golf course are appropriate for establishing mudflat habitat. The primary salt marsh surface at the reference site (immediately downstream of East Bay Road) occurs between approximately elevations 5.5 and 8.5 feet NAVD88 (North American Vertical Datum of 1988). However, typical elevations within the golf course range between 2.0 and 4.0 feet NAVD88. These lower elevations in the former golf course preclude vegetation establishment, and therefore mudflat would be the predominant habitat type without intervention. Grades may be increased if practicable to foster additional salt marsh establishment along the edges of the mitigation site. Current design includes raising elevations within the site to better support establishment of salt marsh; however, this is reliant 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 required to offset salt marsh impacts, but with the understanding that additional salt marsh establishment and subsequent decrease in bare mudflat is a desirable outcome.

Elevations around the perimeter of the site should be conducive for high and low salt marsh communities. Salt marsh vegetation is anticipated to establish by natural recruitment of tide born propagules. Experience of 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 (Personal communications, Craig Cornu. SSNER. 2014). Mr. Cornu 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 are typically outcompeted beginning within the third year post-implementation. Although natural recruitment is the proposed method of salt marsh plant establishment, supplemental planting will be provided if monitoring determines that natural recruitment by native species is occurring too slowly.

The current design proposes rebuilding the existing Kentuck Slough levee roughly adjacent to the south side of the existing levee. This is due to the poor condition of the existing levee. Once the levee has been rebuilt, the old levee will be removed, thus restoring the area under the old levee back to wetland. This will result in a wetland bench along the slough channel. This bench lies within a transition zone between estuarine (e.g., brackish) and freshwater environments. The bench will be planted and seeded with typical high marsh herbaceous species that also occur in freshwater conditions (e.g., tufted hairgrass, meadow barley, salt grass, etc.). Shrub species such as Hooker willow and Douglas spirea will also be planted along the bench with the understanding that some will die off at the downstream end due to salinity.

A new culvert will be installed through the earthen dam associated with the irrigation pond, which will restore tidal connection and fish access to the drainage upstream of the dam.

In addition to dike 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.

1.4 SUMMARY OF IMPACTS AND CWM ACREAGE/CREDITS

Table 1. Project Impacts

Wetland ID	Cowardin Class[1]	Hydrogeomorphic (HGM) Class	Impact Acres/Debits
Coos Bay Eelgrass @ S&A	E1/22AB	Estuarine	2.560
Coos Bay HMT @ Trans Pacific Parkway and Hwy101	E2RS	Estuarine	0.054
Coos Bay HMT @ Wetland J (1)	na	Estuarine	0.141
Coos Bay HMT @ Wetland M	na	Estuarine	0.181
Coos Bay Intertidal @ S&A	E2USN	Estuarine	8.495
Coos Bay Intertidal @ Barge Berth	E2USN	Estuarine	1.616
Coos Bay Salt Marsh @ S&A	E2EM	Estuarine	0.055
Coos Bay Shallow Subtidal @ Barge Berth	E1UB	Estuarine	0.074
Coos Bay Shallow Subtidal @ S&A	E1UB	Estuarine	3.409
Wetland H (west)	E2USN	Estuarine	0.062
Wetland M (1-mudflat)	E2USN	Estuarine	0.092
Wetland M (1-salt marsh)	E2EM	Estuarine	0.120
Subtotal Project Impacts[4]			**16.86**
Incidental Kentuck Construction Impacts[2]	PEM/PFO	Slope/flats	3.11
Total All Impacts to be Mitigated			**19.97**
Subtotals by Habitat Types			
Subtotal Mudflat (E1UB + E2US)[3]			17.23
Subtotal Salt Marsh (E2EM)			0.18
Subtotal Eelgrass (E1/E2AB)			2.56

[1] Cowardin classes: E1/E2AB = estuarine, subtidal/intertidal, aquatic bed (i.e. eelgrass); E2USN = estuarine, intertidal, unconsolidated shore, regularly flooded (i.e. mudflat); E1UB = estuarine, subtidal, uncosolidated bottom (i.e. mudflat); E2EM = estuarine, intertidal, emergent (i.e. salt marsh); E2RS = estuarine, intertidal, rocky shore; na = Cowardin class not applicable since area consists of upland vegetation, although area is below HMT.

[2] Incidental permanent impacts to wetlands that will occur as a result of constructing the Kentuck Mitigation Site.

[3] Includes incidental construction acreage. The minor impact to E2RS at TPP/Hwy 101 is also included.

Table 2. Mitigation Summary

Mitigation Site	Mitigation Type	Cowardin Class	HGM Class	Mitigation Acres[2]	Mitigation Credits[2]
Eelgrass	Enhancement	E1/2AB	Estuarine	7.68	2.56
			Subtotal	**7.68**	**2.56**
Kentuck Slough	Enhancement (internal area)	E1UB	Estuarine	42.98	14.33
	Restoration (internal area)	E1UB	Estuarine	1.70	1.70
	Restoration [3] (internal area)	E2EM	Estuarine	0.18	0.18
	Restoration (wetland bench)	E2EM/PSS	Estuarine/Riverine	1.73	1.73
			Subtotal	**46.59**	**17.94**
Total				**54.27**	**20.50**

[1] See design sheets in Appendix B for detailed breakdown of site acreages.

[2] Represents the total acreage/credits, as currently designed, that will be provided at the Kentuck Mitigation Site. Goals, objectives, and success criteria in this report are based on the minimum acreage/credits needed to meet DSL standard mitigation ratios. The Kentuck Mitigation Site as currently designed will provide an additional 0.53 contingency credits above the minimum credits required based on DSL ratios.

[3] Additional acreage of salt marsh is likely to form at site, with subsequent reduction in mudflat habitat.

1.5 SUMMARY OF NET GAINS AND LOSSES OF FUNCTIONS AND VALUES

Functional assessment methods are not available for the majority of wetland type/acreage that would be impacted by the Project (i.e., eelgrass flats and unvegetated mudflat). Therefore, a simple presentation of functional scores pre- and post-Project is not feasible. However, because the mitigation proposes to result in a net increase in acreage of all impacted habitats and because mitigation habitats will function in an equivalent manner as those being impacted, it is anticipated that there would be a net gain in overall functions and values.

2. CWM SITE INFORMATION

2.1 CWM SITE OWNER NAME AND CONTACT INFORMATION

The Intertidal Flats Mitigation Site (i.e., the Kentuck Slough Site) has been operated as a golf course until recently and is now owned by Fort Chicago LNG II U.S. L.P. (a wholly owned and controlled subsidiary of JCEP L.P.'s parent company, Veresen, Inc.).

Project contact information is provided below:

Attention: Bob Braddock, Vice President
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, Oregon 97420
Phone: (303) 748-3746

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

2.2.1 Eelgrass Mitigation Site

The proposed Eelgrass Mitigation Site is and will be owned by the State of Oregon. JCEP L.P. 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.

2.2.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

JCEP L.P. is an applicant; therefore, a legal agreement for the use and long-term protection of the site is not proposed.

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 Coos-Bay North Bend Airport 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 DSL.

2.3.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

Mitigation for unavoidable impacts to mudflat and salt marsh habitats at the development sites will be provided at the former Kentuck Slough golf course (Kentuck Slough Site), 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

3.1 REPLACEMENT

The proposed CWM will replace impacted functions and values through in-kind mitigation, at a 3:1 ratio, thereby enhancing, restoring, and creating the same types of habitats that are being impacted. Net acreage of these 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 PROVIDES LOCAL REPLACEMENT FOR LOCALLY IMPORTANT FUNCTIONS AND VALUES LOST, IF APPLICABLE

CWM 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 Coos Bay channel from the impact site. Mudflat mitigation will occur within the Coos Bay estuary system, 3 to 4 miles from the impact site.

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 Intertidal Flats Mitigation Site (Kentuck Slough Site/Kentuck Golf Course) requires a new tidegate structure to protect adjacent and upstream properties. Mitigation at the Kentuck Golf Course is not viable without this structure. However, the actual 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. This will result in removal of the existing culvert and tidegate that connects the golf course to the estuary.

3.4 SITING CONSIDERATIONS FOR ECOLOGICAL SUITABILITY

3.4.1 Eelgrass Mitigation Site

The proposed Eelgrass Mitigation Site was selected after a rigorous review of potential sites by DEA (DEA 2007). The review looked at eight sites throughout the bay and evaluated each site 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, and the presence of nearby eelgrass beds. The review also assessed land availability and constructability issues. Two sites with high potential for successful eelgrass mitigation were identified and then narrowed down to the chosen site based on input from resource and regulatory agency staff.

3.4.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

The proposed Intertidal Flats Mitigation Site was selected partly through the same investigation of eelgrass sites (DEA 2007). Originally a site on Isthmus Slough was chosen. However, because of agency input requesting a mitigation site closer to the impact site, the currently proposed Kentuck Slough Site was chosen. This site historically would have provided mudflat and low- and high-marsh habitats. Due to subsidence related to diking and draining activities, the site would now support primarily mudflat habitats.

3.5 MINIMIZES TEMPORAL LOSS

Mitigation work will be conducted during the same time as Project construction. Project construction will take approximately 42 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.

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. The site consists of an unvegetated sand flat below the average high tide elevation of Coos Bay and is surrounded by deeper water areas. Eelgrass borders portions of the edge of the island where elevations drop and water

circulation and other factors are conducive to eelgrass growth. The site is clearly an estuarine resource feature within DSL and USACE jurisdiction.

4.1.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

A wetland delineation report has been prepared for the Kentuck Slough Site (DEA 2009). The delineation report provides the following site description.

The approximately 128-acre golf course study site 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 would have 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 very recently) 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 5-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 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 fresh water 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 historic 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. The areas outside of the 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 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 may be classified as Estuarine Fringe, Embayment (EFE). Estuarine Fringe sites include sites 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 Intertidal Flats Mitigation Site (Kentuck Slough Site)

The golf course wetlands would be classified as a slope wetland under the Hydrogeomorphic (HGM) classification system, because groundwater provides the dominant source of hydrology; however, it could also be placed in the "flats" class due to the notable effect that direct precipitation can have on water levels in the site. Prior to diking, the wetland would have been classified as an estuarine wetland. Under the Cowardin classification system, this wetland would 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

4.3.1.1 Existing Hydrology

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

4.3.1.2 Proposed Hydrology

Coos Bay will provide the water source for the Eelgrass Mitigation Site. The site will be situated near the MLLW elevation, which will allow near permanent inundation of the site, except during very low tides. This is the natural hydrologic condition at which eelgrass flourishes within the bay.

4.3.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

4.3.2.1 Existing Hydrology

Hydrology within the golf course area is driven primarily by groundwater elevations and secondarily by direct precipitation. 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 (Wally Culp, [previous] golf course owner, 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 sub-surface flows come to the surface.

Shallow ponding was observed in many locations throughout the golf course, but was most pronounced in the western half. Ground topography throughout the golf course varies slightly, with roughly 2 to 3 feet of difference in relief from location to location. Drift lines were observed along the edges of the higher areas, which suggest that ponding was substantially greater before the site visit occurred. This ponding is likely the result of direct precipitation, which had not occurred for more than a week before the site visit.

Some flooding occurs from the surface drainages, particularly during high and in-coming 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; however, a pump at the southwest corner can be turned on to reduce such flooding.

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.

4.3.2.2 Proposed Hydrology

Tidal inundation from Coos Bay/Kentuck Inlet will provide the water source for the Intertidal Flats Mitigation Site. Normal tide cycles will substantially flood the property twice daily. The Kentuck Slough channel and two small tributaries will also provide water to the site.

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 floating macroalgae (i.e., seaweed) may pass through the site. Some of the deeper areas adjacent to the proposed site contain eelgrass beds (*Zostera marina*) and associated epiphytic macroalgae.

4.4.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

The approximately 100-acre historical flood terrace has been delineated as an emergent wetland (palustrine emergent Cowardin class) plant community dominated by maintained lawn grasses, with scattered native and ornamental tree plantings. The areas outside of the 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.

Maintained Lawn Community

The Maintained Lawn community was dominated by Kentucky bluegrass (*Poa pratensis*, FAC). This community occurred in the maintained flats portion of the golf course. Around the margins of this community, particularly adjacent to forested wetland areas, reed canarygrass (*Phalaris arundinacea*, FACW) was also identified as a dominant. This plant community was considered to be hydrophytic, because greater than 50% of the dominant plants with known indicator status were hydrophytic.

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

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

Weedy Upland

The Weedy Upland community was located primarily along the levee protecting the golf course from the Kentuck Slough channel. It was also occasionally found along semi-maintained areas along the toe of slopes along the south side of the golf course. The Weedy Upland community was 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) was also occasionally found in this community. This plant community was considered to be non-hydrophytic, because no greater than 50% of the dominant plants with known indicator status were hydrophytic.

Forested Wetland Community

The Forested Wetland community occurred at the base of hillside ravines along the south side of the golf course, where maintenance activities do not occur. Dominant vegetation consisted 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 was considered to be hydrophytic, because greater than 50% of the dominant plants with known indicator status were hydrophytic.

Forested Upland Community

The Forested Upland community occurred on the hillsides adjacent to the Forested Wetland communities and maintained portions of the golf course. Dominant vegetation consisted 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 was considered to be non-hydrophytic, because no greater than 50% of the dominant plants with known indicator status were hydrophytic.

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 included Lyngby sedge (*Carex lyngbyei*, OBL), with salt grass (*Distichlis spicata*, FACW) and (*Deschampsia caespitosa*, FACW) as common subdominants. This plant community was considered to be hydrophytic, because greater than 50% of the dominant plants with known indicator status were hydrophytic.

Reed Canarygrass Community

The Reed Canarygrass community is located towards the eastern end of Kentuck Slough (within the study area). 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 was considered to be hydrophytic, because greater than 50% of the dominant plants with known indicator status were 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 water craft.
- Dynamic site conditions are susceptible to force majeure (i.e., catastrophic events such as severe storm surge, tsunami, etc.).
- Impacts to adjacent eelgrass beds must be avoided.

4.5.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

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 cross dike construction and repair and/or enhancement of the existing dike are therefore required to ameliorate this risk. Dike 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.

4.6 ENHANCEMENT PROJECTS

4.6.1 Factors Leading to Degraded Condition

Enhancement will occur at the Intertidal Flats Mitigation Site. Before alteration, the area would have 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 Intertidal Flats Mitigation Site include the construction of dikes 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 How CWM Plan Will Reverse Degradation

The CWM Plan will reverse degradation by breaching the dike and restoring tidal hydrology to the historical estuarine wetland, removing golf course appurtenances, and providing for the re-establishment of mudflat and low- and high-marsh plant communities.

5. FUNCTIONS AND VALUES ASSESSMENT

5.1 ASSESSMENT METHODS USED

Formal functional assessment methods are not available for the wetland type/acreage that would be impacted by the Project (i.e., eelgrass flats and unvegetated mudflat). Therefore, a simple presentation of functional scores pre- and post-Project is not feasible. However, because the mitigation proposes to result in a net increase in acreage of all impacted habitats and because mitigation habitats will function in an equivalent manner as those being impacted, it is anticipated that there would be a net gain in overall functions and values.

Best professional judgment was used to evaluate functions and values at the impact and mitigation sites.

5.2 FUNCTIONS AND VALUES ASSESSMENT

Table 3 provides a summary of functions for each assessed site, including predicted functions post-mitigation. A more detailed discussion of functions at the impact sites and mitigation sites pre- and post-mitigation is provided thereafter.

Table 3. Summary of Functional Assessment Results

	Eelgrass	Intertidal Flats
Impact Sites	Fish migration, rearing, and feeding; cover for juvenile fish; primary production and food chain support; waterfowl and shorebird habitat; invertebrate habitat.	Fish migration, rearing, and feeding; primary production and food chain support; waterfowl and shorebird habitat; invertebrate habitat.
Mitigation Sites – Existing	Similar functions to impact site; however, functioning at lower level due to lack of eelgrass, which provides increased primary and secondary production and greater diversity of organisms. Mitigation site does not provide cover for juvenile fish.	Limited fish migration, rearing, and feeding; limited support of native plant communities; limited waterfowl habitat; native amphibian support.
Mitigation Sites – Post-restoration	Same as impact site.	Same as impact site. Will also result in important brackish water transition zone for out-migrating anadromous fish.

5.2.1 Impact Sites

5.2.1.1 Intertidal Mudflat, Salt Marsh, and Eelgrass Habitats

The unvegetated intertidal mudflat, eelgrass, and salt marsh habitats provide similar functions; however, the salt marsh and eelgrass habitats tend to provide these functions to a greater extent. Functions provided by sand flats and mudflats, including eelgrass flats, are described in the project Biological Evaluation/Biological Assessment (Ellis Ecological Services 2007), which has been provided to DSL and the USACE, with relevant excerpts provided below.

> 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 (http://www.inforain.org). 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 mitigation site are most likely to 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. Diatoms contribute significantly to estuarine primary production.

Mud and sand flats may 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 by providing 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. Intertidal flats also provide feeding areas for waterfowl, shorebirds, and raptor species such as osprey.

5.2.2 Mitigation Sites Pre- and Post-Mitigation

5.2.2.1 Eelgrass Mitigation Site Pre-Mitigation

The proposed mitigation site currently consists of a sand flat island situated near mean lower low tide elevation. The island is exposed during lower low tides. Deeper areas surrounding the island contain eelgrass beds. Functions provided by sand flats and mudflats are described above in Section 5.2.1.1. Generally speaking, functions provided occur at a lower level for bare sand flats than for areas with eelgrass beds. 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.

5.2.2.2 Eelgrass Mitigation Site Post-Mitigation

The same pre-mitigation functions 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.

5.2.2.3 Intertidal Flats Mitigation Site (Kentuck Slough Site) Pre-Mitigation

Functions provided at the proposed Intertidal Flats Mitigation Site are limited by the current use as a golf course. The vast majority of the site is actively maintained (i.e., mowed), which limits vegetation growth and associated functions such as primary production and wildlife habitat. The wetlands flood regularly during the winter months, providing flood storage function; however, the value of this function is limited by the fact that the golf course is located at the downstream end of Kentuck Slough, with tidal waters directly adjacent to the west end of the property. Therefore, this function does not prevent other properties from flooding. Furthermore, the levee along the north side of the golf course prevents high flows in Kentuck Slough from spilling over into the property. Waterfowl likely use portions of the property for feeding on the short grasses and in several of the small ponds; however, golf course activities hinder use of the site for breeding. Beaver activity was noted along the small creek channels that flow through the

golf course. These creeks are mapped by the Oregon Department of Fish and Wildlife (ODFW) as winter steelhead rearing and migration habitat. An 8- to 10-inch-long fish of unknown species was observed just upstream of the tidegated outlet culvert during the January 2009 site visit. Creek shading is poor, and there is minimal protective cover, such as large wood, within these creeks. Rough skin newts were observed in the creeks, revealing that the creeks are supportive of some species of native amphibians. Water quality functions are limited due to the regular maintenance activities, which likely include fertilizer application and some chemical spraying for weed control.

5.2.2.4 Intertidal Flats Mitigation Site (Kentuck Slough Site) Post-Mitigation

Functions provided at the proposed Intertidal Flats Mitigation Site will include those described for mudflats under Section 5.2.1.1 (i.e., similar functions as the proposed intertidal mudflat impact site). These would include: providing habitat to various shellfish species, and ghost shrimp and other invertebrates; migration, rearing, and feeding areas for fish; support of primary production and associated food chain support; and feeding areas for waterfowl, shorebirds, and raptor species such as osprey. Construction of the bridge, fish-friendly tidegate array, and enhanced channel will provide a larger and lengthened transition zone between freshwater and saline environments, which will be particularly beneficial to out-migrating anadromous fish.

6. MAPS, DRAWINGS, AND CONSTRUCTION SPECIFICATIONS

6.1 SCALED SITE PLAN AND CROSS SECTIONS

Scaled site plans and cross sections for each mitigation site are provided in Appendix B.

6.2 CONSTRUCTION SCHEDULE

Construction of the Project is anticipated to begin in the end of third quarter of 2014. Resource impacts resulting from construction will begin in the fourth quarter of 2014, concurrent with the in-water work window. Mitigation construction will occur prior to (when feasible) or concurrently with resource impacts. Planting will occur during the dormant season (approximately November 1 to March 15).

6.2.1 Eelgrass Mitigation Site

A proposed sequencing schedule is provided in Table 4. Mitigation construction is anticipated to begin in the fourth quarter of 2014. The schedule takes into account the following two key time periods that will affect mitigation activities:

- ODFW-approved in-water work period: October 1 through February 15.
- Optimal eelgrass transplanting period (i.e., time of peak biomass): summer.

6.2.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

Mitigation construction would begin in the fourth quarter of 2014 and considers the following schedule 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 5 for the sequencing schedule for the Intertidal Flats Mitigation Site.

Table 4. Proposed Mitigation Project Sequencing Schedule – Eelgrass Mitigation Site

Year	Mitigation Activities
1	**Summer:** Conduct bathymetric survey and eelgrass surveys to determine appropriate excavation elevations. Begin contracting process for eelgrass tranplanting contractor. **Fall:** During in-water work period, excavate mitigation site to appropriate elevations. Post-excavation bathymetric survey or cross-sections to be used in monitoring site stability. Review and select eelgrass transplanting contractor.
2	**Late Spring/Early Summer:** Survey cross-sections to monitor site stability after first winter storm season. **Summer:** First eelgrass collection and transplanting treatment (test plots). Monitor reference/donor site for baseline growth characteristics. 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.
3	**Late Spring/Early Summer:** Survey cross-sections to monitor site stability after second winter storm season. If site appears to be relatively stable, then 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 2. **Summer:** Second eelgrass collection and transplanting. Monitor reference/donor site and mitigation site. **Fall/Winter:** Evaluate mitigation work and determine whether any corrective measures are needed for next season.
4	**Late Summer:** Monitor reference/donor site and mitigation site (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 and determine if any corrective measures are needed for next season
5	**Summer:** Monitor reference/donor site and mitigation site (second year in which percent cover at mitigation site can apply to meeting performance standards, assuming additional planting is not proposed for this year). **Fall/Winter:** Evaluate mitigation work and determine whether any corrective measures are needed for next season. **If performance standards for Objective 2 have been met, then the mitigation project is considered a success and future monitoring is no longer required. If performance standards for Objective 2 have not been met, then additional monitoring is required**.
6 - 8	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 L.P. will consult with the agencies to determine future actions.

Table 5. Proposed Mitigation Project Sequencing Schedule – Intertidal Flats Mitigation Site (Kentuck Slough Site)

Year	Mitigation Activities
1	**Fall/Winter (beginning of estuary in-water work window):** Mobilize. Install erosion and sediment control measures. Construct East Bay Drive detour. Construct East Bay Drive bridge, including cofferdams to prevent tidal exchange into golf course. Construct East Bay Drive roadway improvements. Construct golf course access roadway improvements.
2	**Late Spring/Early Summer:** Repair/augment existing dike. Construct/enhance channel. Construct new cross dike and flapgate. **Summer (beginning of Kentuck Slough in-water work window):** Construct new tidegate structure with MTR gate in Kentuck Slough, including cofferdams. **Fall/Winter (beginning of estuary in-water work window):** Remove existing tidegate under East Bay Drive. Remove cofferdams. Site cleanup and demobilization.

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 Intertidal Flats Mitigation Site will feature new tidegates. A schematic of the MTR gate array is included in Appendix B.

6.4 PLANTINGS LISTS BY HGM/COWARDIN CLASS

Planting lists for the Eelgrass Mitigation Site and Intertidal Flats Mitigation Site are provided in Table 6. Plantings at the Intertidal Flats Mitigation Site (i.e., Kentuck Slough) will only occur in proposed salt marsh areas. Furthermore, as noted in Section 1.3.2, salt marsh vegetation is anticipated to establish by natural recruitment of tide born propagules. Although natural recruitment is the proposed method of salt marsh plant establishment, supplemental planting will be provided if monitoring determines that natural recruitment by native species is occurring too slowly. If salt marsh plantings are needed, plant species substitutions may occur based on species availability at the time of plant installation, but will be consistent with native species found in nearby Coos Bay Estuary salt marshes. No plantings will occur in proposed unvegetated mudflat portions of the site.

Table 6. Eelgrass Mitigation Site and Intertidal Flats Mitigation Site Planting Lists

Botanical Name	Common Name	Indicator Status
Eelgrass Mitigation Site Estuarine Fringe, Embayment (EFE)/estuarine, intertidal, unconsolidated shore, regularly flooded (E2USN)		
Zostera marina	Eelgrass	OBL
Intertidal Flats Mitigation Site (Supplemental Plantings) Estuarine Fringe, Embayment (EFE)/estuarine, intertidal, unconsolidated shore, regularly flooded (E2USN)		
Deschampsia cespitosa	Tufted hairgrass	FACW
Hordeum brachyantherum	Meadow barley	FACW
Carex lyngbei	Lyngby's sedge	OBL
Grindelia integrifolia	Gumweed	FACW
Distichlis spicata	Saltgrass	FACW
Scirpus americanus	American threesquare	OBL
Salicornia virginica	Pickleweed	OBL

7. MONITORING PLAN

7.1 PERFORMANCE STANDARDS

Performance standards for each objective are presented below. Project objectives have been restated for the sake of convenience.

7.1.1 Eelgrass Mitigation Site

Mitigation Goal 1: Create 7.68 acres of eelgrass beds (i.e., based on an enhancement ratio of 3:1), whereby a minimum of 2.56 of these acres would be classified as medium- to high-density beds. To achieve this goal, the following objectives will be carried out:

- **Objective 1.1:** Re-contour (excavate) an area of approximately 7.68 acres to provide suitable elevations for the establishment of eelgrass. Suitable elevations will be based on field observations of existing nearby robust eelgrass beds.

  Performance Standard: *A minimum of 7.68 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 likely to be met.*

- **Objective 1.2:** Establish a minimum of 7.68 acres of eelgrass beds whereby a minimum of 2.56 acres would be classified as medium to high density eelgrass beds within the re-contoured area described under Objective 1.

  Performance Standard: *Site mapping will delineate 7.68 acres of eelgrass beds, with a minimum of 2.56 of these acres falling within the medium to high density class. Density classes are defined as follows: less than 10% cover equals an absence of eelgrass bed, low density equals approximately 10% to 39% cover, and medium to high density equals approximately 40% cover or greater.*

  Because of the documented natural annual variability of eelgrass bed coverage that can occur, it is not necessary for the mitigation site to constantly maintain the minimum of 7.68 acres of eelgrass bed. The performance standards will have been met when the site contains a minimum of 7.68 acres of eelgrass beds for any two years, including non-consecutive years, after the last year in which planting occurred.

7.1.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

Mitigation Goal 2: Reestablish tidal flow to approximately 45.01 acres of historical intertidal habitats adjacent to Kentuck Slough. (Actual area as currently designed will be 46.59 acres, which results in additional contingency credits. Mitigation Goal 2 and associated Objectives are based on the minimum acreage needed to meet standard DSL mitigation ratios). To achieve this goal, the following objectives will be carried out:

- **Objective 2.1:** Construct a new bridge in East Bay Drive to allow tidal exchange between Kentuck Inlet and the "back nine" of Kentuck Golf Course.
- **Objective 2.2:** Construct a new cross dike between the front and back nine of Kentuck Golf Course, with a standard tidegate to drain the front nine to the back nine, and construct a fish-friendly tidegate array through the Kentuck Slough dike, allowing the majority of flow from Kentuck Slough to enter the back nine.
- **Objective 2.3:** Remove the culvert and tidegate located adjacent to the east side of East Bay Road near the southeast corner of the golf course site.
- **Objective 2.4:** Restore tidal connection to the irrigation pond creek system through installation of a fish passable culvert that meets ODFW fish passage criteria.
- **Objective 2.5:** Construct and/or enhance approximately 6,000 linear feet of tide channels.
- **Objective 2.6**: Establish an approximately 1.73 acre wetland bench along Kentuck Slough by relocating the existing levee southward.

  Performance Standard: *An as-built survey will show that the features noted in Objectives 2.1 through 2.6 have been constructed.*

- **Objective 2.7:** Establish an emergent to scrub-shrub, brackish to freshwater transitional plant community along the Kentuck Slough bench described in Objective 2.6.
- **Objective 2.8:** Establish a minimum of 0.18 acres of salt marsh habitat within the internal portion of the Kentuck Slough Site, with the remainder of the internal portion (43.10 acres) being mudflat and/or tide channel. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable.

Performance Standard: *Habitat mapping/monitoring will show the acreage of habitat types required by Objectives 2.7 and 2.8 have been met. The wetland bench area will contain approximately 1.73 acres of native plant community that transitions from salt marsh to freshwater scrub-shrub (from west to east).In the internal portion of the site, monitoring will show that a minimum of 0.18 acres of salt marsh has been established and 43.10 acres of mudflat established. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable.*

Performance Standard: *For Objectives 2.7 and 2.8, at the end of Year 5 [vegetation monitoring], the following percent cover objectives 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. Noxious weeds would include those species designated as "A" or "B" by the Oregon Department of Agriculture Noxious Weed Control Program, as well as non-native Spartina species.*

1. *The cover of native herbaceous species is at least 60%.*
2. *The cover of invasive herbaceous species is no more than 20%. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%.*
3. *The cover of invasive shrub or tree species is no more than 10%.*
4. *Bare substrate represents no more than 20% cover.*
5. *By Year 3 and thereafter, there are at least three different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of the plots sampled.[this time period may be extended in the salt marsh area to account for natural recruitment processes]*
6. *Prevalence Index total for all strata is less than 3.0.*
7. *The density of woody vegetation is 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% in the scrub-shrub community. 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 criteria is specific to portions of the wetland bench in which freshwater conditions predominate. Portions of the bench near the mouth of Kentuck Slough may experience brackish conditions unsuitable for establishment of woody vegetation. The woody vegetation criteria does not apply to internal portions of the Kentuck Mitigation Site.*

7.2 MONITORING PLAN

The purpose of the mitigation monitoring requirement is to provide information for USACE 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 L.P. will monitor the mitigation sites and provide a post-construction report and annual written monitoring report(s) to USACE. Monitoring report(s) 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 report(s) shall include the following sections:

a. Introduction
b. Goals, objectives, and performance standards
c. Methods
d. Results
e. Summary and recommendations
f. Figures
g. Appendices with data and photographs

7.2.1 Schedule

7.2.1.1 Eelgrass Mitigation Site

Monitoring will be conducted for a minimum of five years but may extend up to eight years if performance standards for Objective 2 are not met within the first five years, as described in Table 4.

7.2.1.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

Monitoring shall be conducted for five years unless otherwise specified by USACE.

7.2.2 Methods

7.2.2.1 Eelgrass Mitigation Site

Monitoring will occur using hydrographic survey methods. The proposed protocol is as follows, but may be modified based on site conditions, technical limitations, or other practicable reasons. Transects will be run across the mitigation site at 25-foot spacing using a single-beam echo sounder. Differential Global Positioning System (DGPS) will be used to track transect lines with submeter accuracy. This will equate to roughly 40 transects if the transects are run perpendicular to the approximately 1,000-foot-long site. Transect direction may require adjustment in the field due to prevailing wind and tidal conditions. Ultimately, full to near full coverage of the site will occur based on 25-foot spacing of transects.

Appropriate single-beam technology will be used that can map both the bottom elevation and submerged aquatic vegetation (i.e., eelgrass). Transects will extend beyond the mitigation site and into adjacent existing eelgrass beds. Additional transects will occur as needed to assess the health and recovery of eelgrass plant stock donor sites. A submerged camera or video tow will be used, as needed to confirm data recorded by the single-beam echo sounder; however, due to the shallow nature of the site, visual observation from the boat deck may be sufficient.

Data from the single-beam transects will be analyzed against the objectives and performance standards as follows:

Objective 1.1: Cross-section bathymetry will be reviewed against desired elevations for eelgrass establishment. Change in bathymetry from post-construction excavation/dredging (i.e., as-built survey) to shortly after the first storm season will be reviewed to assess site stability before eelgrass planting occurs. Bathymetry data will be collected and reviewed in future years as warranted.

Objective 1.2: Eelgrass presence will be mapped along each transect. Within the mitigation site, individual transects will be subdivided into 10-foot-long sample segments (the sample segments). Each sample segment will be classified into one of three cover classes: (1) no eelgrass; (2) low density eelgrass (i.e., 10% to 39% cover); or (3) medium to high density eelgrass (i.e., 40% cover or greater). A tally of all sample segments by cover class will be conducted. To meet the objective of achieving 7.68 acres of eelgrass whereby a minimum of 2.56 acres would be classified as medium to high density eelgrass beds, a minimum of 33% of all sample segments will have to be classified as medium to high density (based on 2.56 acres/7.68 acres), with the remainder of sample segments needing to be classified as low density eelgrass. A greater percentage of medium to high density eelgrass and associated lowered percentage of low density eelgrass is acceptable.

The duration of monitoring activities would be based on whether or not the Eelgrass Mitigation Site has met the performance standards. Specifically, monitoring would continue until performance standards for Objective 1.2 are met. This would require a minimum monitoring period of five years; however, it is anticipated that performance standards for Objective 1.2 would more likely be met in Years 6 or 7. If, by the end of Year 8, performance standards have still not been met, then JCEP L.P. will consult with the agencies to determine future actions.

7.2.2.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

To assess the likelihood of meeting mitigation site Goals and Objectives, the following monitoring efforts will be conducted. Monitoring at the Intertidal Flats Mitigation Site will consist of a post-construction site review to verify construction/removal of the specified bridge, dikes, tidegates, channel reconstruction/enhancement, and other earthwork. This will occur shortly after completion of the proposed work. Site conditions will be documented with photographs and summarized in a report or technical memorandum (i.e., as-built report). After construction, additional monitoring will occur for a period of five years. Monitoring for plant community establishment is proposed only in the minimum area needed to meet success criteria. Because much of the mitigation site will consist of unvegetated mudflat, vegetation monitoring will be focused solely on those areas that are likely to support salt marsh (i.e., suitable elevations) as well as the wetland bench.

Details of the monitoring plan are provided below:

1. **<u>Scour, erosion, and deposition monitoring of bridge, levee, access road, and Kentuck Slough.</u>**

   Purpose: Assess infrastructure stability and risk of failure and any sediment deposition concerns.

   a. Visual inspection (Year 1 [two visits]; annual visit Year 2 and Year 5).
   b. Visual inspection will also occur after the first extreme flood event.

2. **<u>Tidegate(s) performance monitoring.</u>**

   Purpose: Determine whether tidegates are performing as intended.

   a. Visual inspection of tidegate performance relative to design performance specifications (Year1 [two visits]; annual visit Year 2 and Year 5).
   b. Visual inspection will also occur after the first extreme flood event.

3. **Site/channel evolution monitoring.**

   Purpose: Determine whether channel development is occurring within expected ranges and whether there is a risk of channels extending unsafely into adjacent infrastructure. Greatest channel development/change is anticipated within the first year post-construction.

   a. As-built survey (Year 0).
   b. Visual inspection (Year 1 [two visits]; annual visit Year 2 and Year 5).
   c. Survey channel cross-sections* (Years 1, 2, 3, and 5).
   d. Survey upper extent of channels and center lines of newly forming channels* (Years 1, 2, 3, and 5).
   e. Visual inspection will also occur after the first extreme flood event.

   * Alternate methods may replace survey work of channel development if safety issues arise from conducting work on mudflats. The number of years of channel development monitoring may increase or decrease depending on findings (i.e., site stability is reached or excessive erosion concerns arise).

4. **Vegetation monitoring.**

   Purpose: Assess formation of salt marsh communities, particularly around perimeter of site where higher elevations are anticipated to be conducive to salt marsh establishment.

   a. Vegetation plots along the wetland bench and in higher elevation areas of the interior of the site (Years 1 through 5) (see Performance Criteria for additional details).
   b. Map extent of vegetated wetland/estuarine communities.

5. **Photo Documentation.**

   Purpose: Visually document site changes over time.

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

7.3 CONTINGENCY PLAN/ADAPTIVE MANAGEMENT PLAN

7.3.1 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 foreseeable problems that could occur. Actual contingency measures would be based on monitoring data and site circumstances as they occur 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 would take place from a nearby healthy donor bed.

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:

   A. 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.

   B. 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.

3. If inappropriate installation methods were used, then the site may be re-transplanted once the installation method issue has been rectified.
4. If installation methods were 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 re-grade the site, with acceptable adjustment so that elevations will be maintained naturally, then the site could be re-transplanted. Replanting would occur at least one year after regrading occurs.
5. If installation methods were 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 L.P. and the agencies would then discuss alternative mitigation strategies.

7.3.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

If the site does not meet the performance standards, including the identification of potential concerns to surrounding infrastructure, the potential cause(s) 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 L.P. has entered negotiations with the Coos Watershed Association (CWA), a local non-profit organization established in 1993 meeting 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 Jordan Cove Energy Project (including estuarine mitigation proposed at Kentuck Slough and authorized via Permit 37712-RF, and freshwater mitigation proposed by Pacific Connector Gas Pipeline L.P. at Kentuck Slough via Application 54484-RF). It is anticipated the CWA would hold the conservation easement from the State for the Eelgrass Mitigation Site proposed in Applications

54908-RF and 54909-RF, as well as the Eelgrass Mitigation Site authorized via Permit 37712-RF. Clauses necessary to protect the site will be written into the easement(s).

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. JCEP L.P. will bear responsibility for site maintenance and enforcement of the prohibition on anchoring.

8.1.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

A deed restriction has been prepared for the Kentuck Slough Site as part of Permit 37712-RF, which will be held by the Oregon International Port of Coos Bay (Port). This deed restriction includes the advance mitigation area from which JCEP L.P. will obtain mitigation credits. Although the deed restriction has been prepared, it has not been recorded yet, but this is planned to occur prior to construction of the Port's Slip and Access Project and would also occur prior to construction of the Projects (i.e., LNG and SDPP Projects).

8.2 PROPOSED FINANCIAL SECURITY INSTRUMENT

JCEP L.P. will provide a surety bond specifically for the purpose of guaranteeing CWM site performance. In addition, JCEP L.P. 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.

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 CWA. JCEP L.P. will own the Intertidal Flats Mitigation 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 may 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
- Dike 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, which incorporates principals of adaptive management, will be prepared as a permit condition of approval. The plan will discuss long term management goals, general monitoring and maintenance guidance, reporting requirements, and roles and responsibilities. In line with the principals 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 L.P. has entered negotiations with the Coos Watershed Association (CWA), a local non-profit organization established in 1993 meeting the requirements of ORS 271.715(3)(b) to provide long-term management and maintenance of all mitigation sites associated with the Jordan Cove Energy Project (including estuarine mitigation proposed at Kentuck Slough and authorized via Permit 37712-RF, and freshwater mitigation proposed by Pacific Connector Gas Pipeline L.P. at Kentuck Slough via Application 54484-RF). CWA would also provide similar services during the permit monitoring period. JCEP L.P. would endow CWA to provide these services upon substantial completion of mitigation construction through the life of the Projects (estimated approximately 30 years post construction). If negotiations with CWS fail, JCEP L.P. would create and endow a third party entity meeting the requirements of ORS 271.715(3)(b) to provide management and maintenance services for the mitigation projects from substantial completion of mitigation construction through the life of the Projects.

8.3.4 Anticipated Funding Source

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

9. PREPARERS AND CONTRIBUTORS

Ethan Rosenthal, DEA Ecologist, authored this report. Sean Sullivan, DEA Senior Project Manager, provided the quality review. Dawn Afman, DEA Project Assistant, prepared the report drafts. Melissa Foltz, Graphics Designer, provided graphics.

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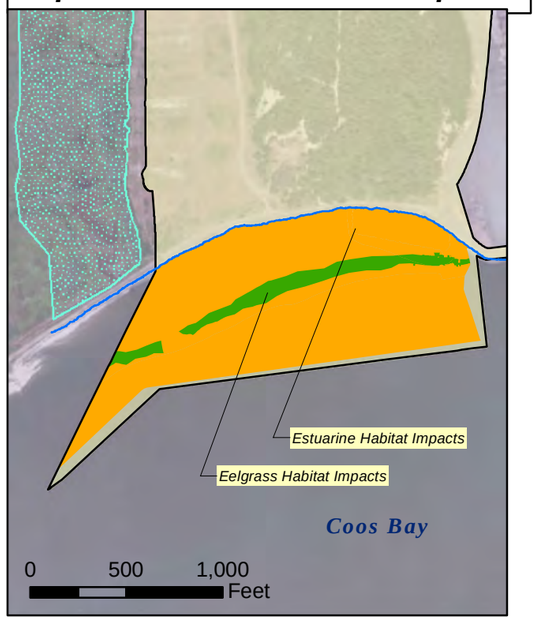
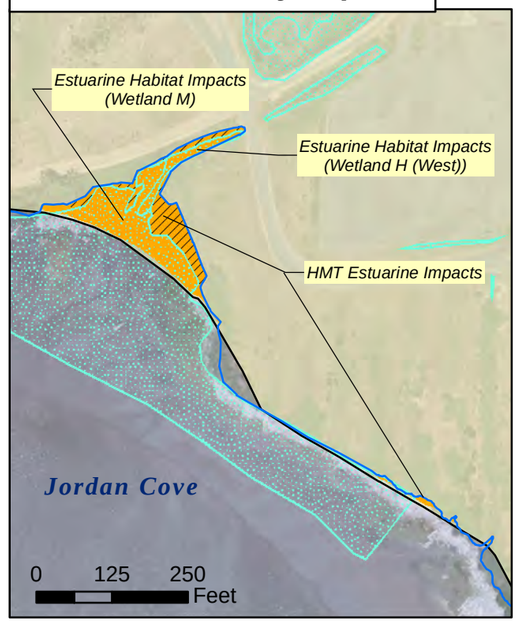
11. APPENDICES

APPENDIX A: FIGURE

Slip and Access Channel Impacts



Wetland M Vicinity Impacts



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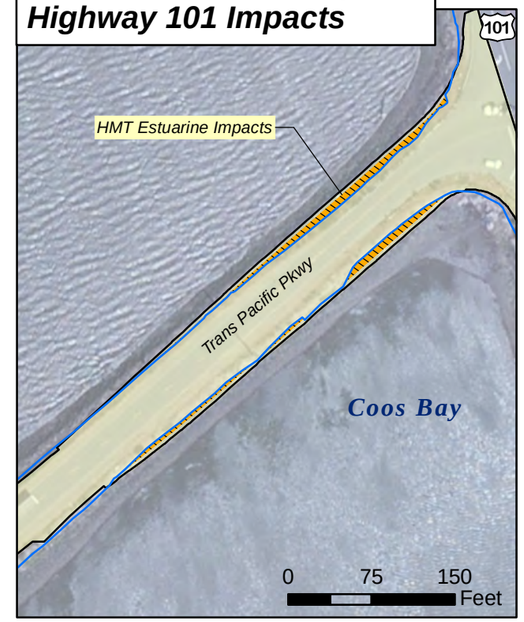

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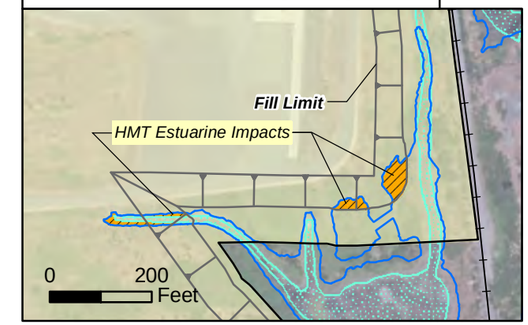


N

LNG Project Footprint Boundary

Estuarine Habitat Impacts (Intertidal and Shallow Subtidal)

HMT Estuarine Impacts (below 10.26 ft NAVD88)

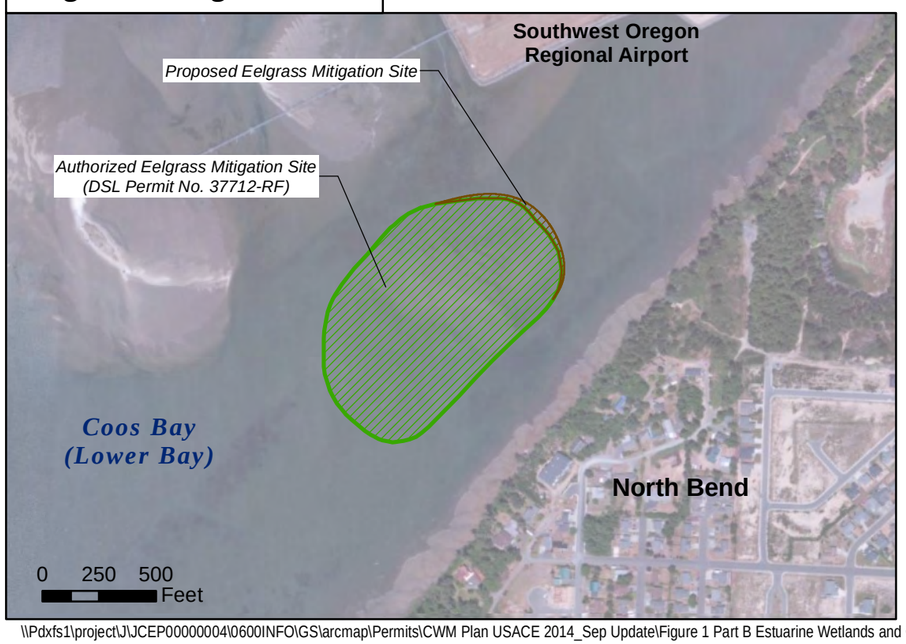
Eelgrass Habitat Impacts

Delineated Wetland

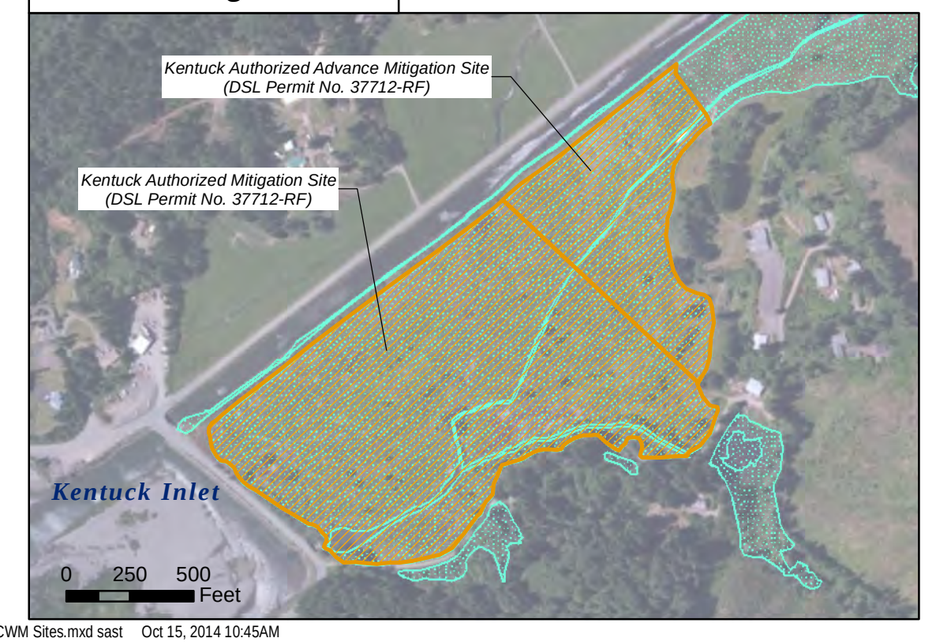
Open Water

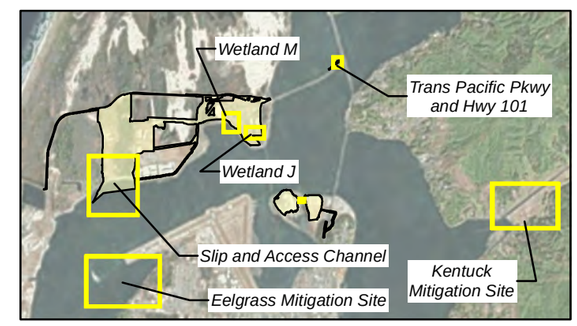
Highest Measured Tide (HMT) (10.26 ft NAVD88)

Eelgrass Mitigation Site



Kentuck Mitigation Site





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JORDAN COVE ENERGY PROJECT

Figure 1

COOS COUNTY

Compensatory Wetland Mitigation Plan

Part B - Permanent Estuarine Impact Areas and Estuarine CWM Sites

APPENDIX B: COMPENSATORY WETLAND MITIGATION DESIGN PLANS: EELGRASS INTERTIDAL FLATS

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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

Reviewed By –
Designed By –
Drafted By –

EXISTING CONDITIONS

SHEET NO. FIG 1

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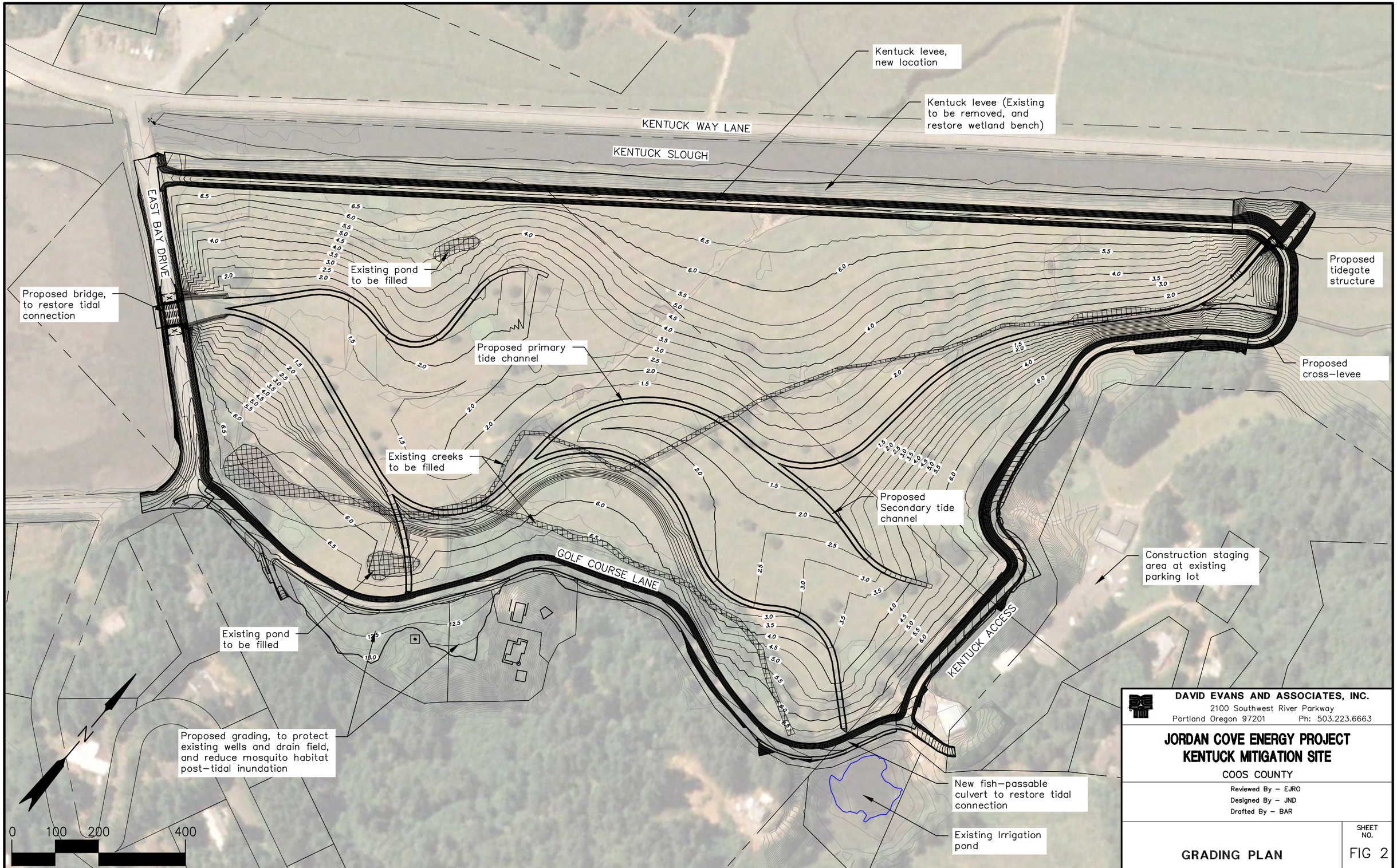

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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

Reviewed By – EJRO
Designed By – JND
Drafted By – BAR

GRADING PLAN

SHEET NO. FIG 2

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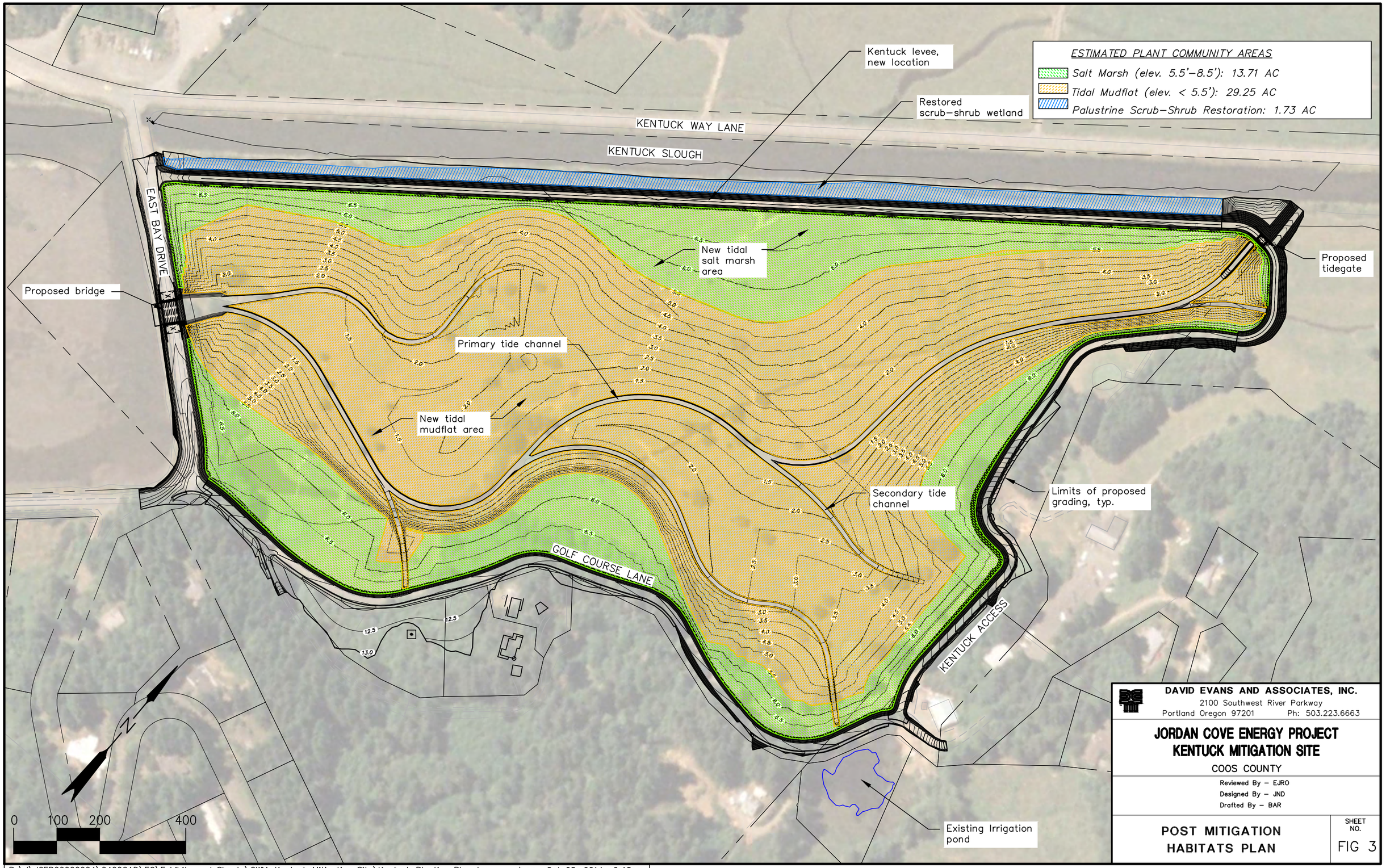

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KENTUCK MITIGATION SITE PLANTING LIST:

Botanical name	Common name	Indicator Status	Condition
Palustrine Scrub–Shrub community: Wetland bench			
Argentina egedii	Pacific silverweed	OBL	No. 1 container
Carex lyngbei	Lyngbye's sedge	OBL	No. 1 container
Carex obnupta	Slough sedge	FACW	Bare root
Deschampsia cespitosa	Tufted hairgrass	FACW	Bare root
Distichlis spicata	Salt grass	FACW	No. 1 container
Myrica californica	California wax myrtle	FACW	Bare root
Salix hookeriana	Hooker willow	OBL	Live stake
Lonicera involucrata	Twinberry	OBL	Bare root
Spiraea douglasii	Douglas spiraea	FACW	Bare root

NOTE: Proposed mudflat and salt marsh areas shall be left exposed to tidal influence to allow natural vegetation coverage to become established. Annual monitoring will occur for a minimum of 5 years following construction to ensure native vegetation coverage establishes to meet the requirements of the Compensatory Wetland Mitigation Plan, and project permits. Supplemental planting will occur as needed.

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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

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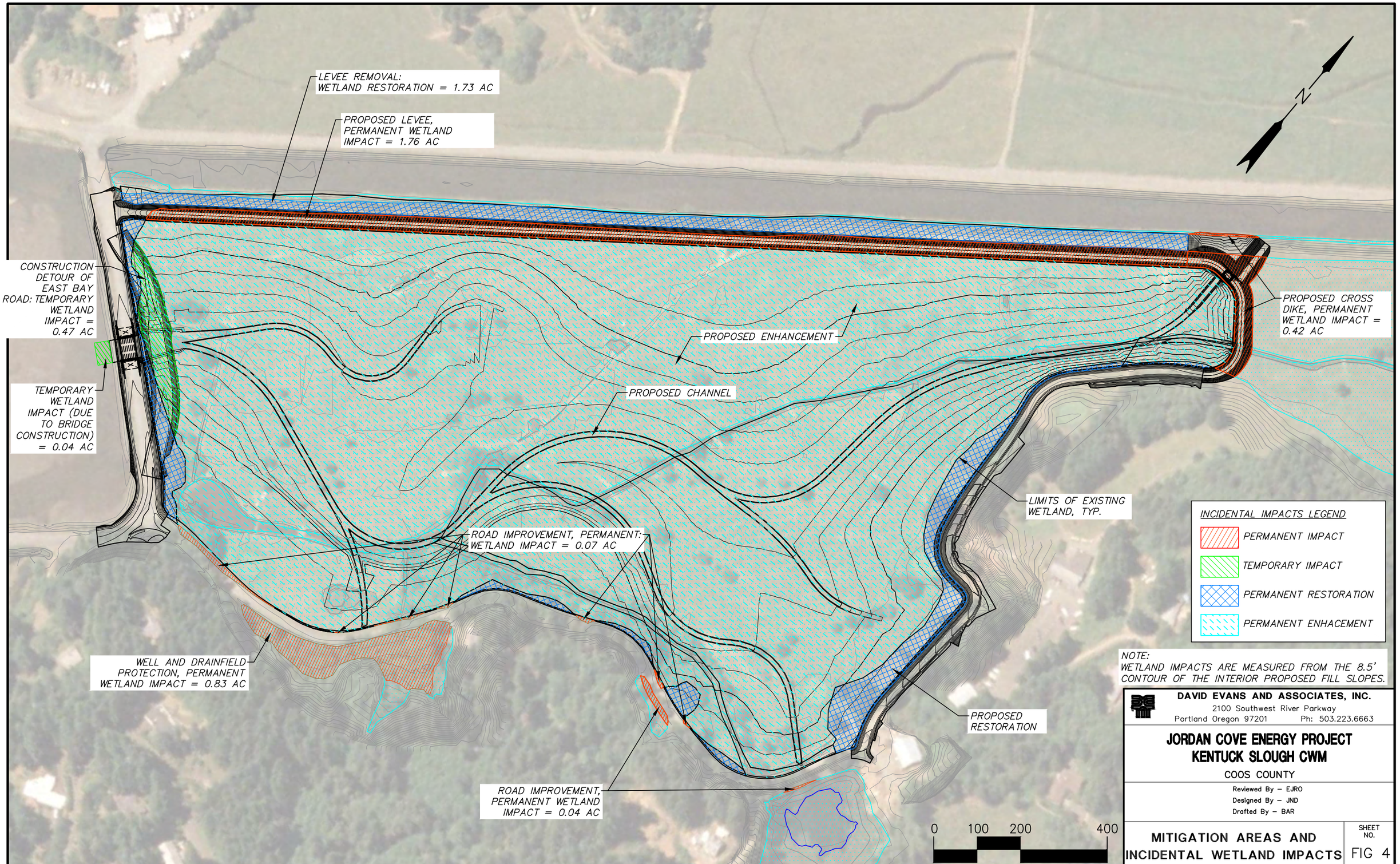
PLANTING SCHEDULE

SHEET NO.
FIG 3A



NOTE:
WETLAND IMPACTS ARE MEASURED FROM THE 8.5' CONTOUR OF THE INTERIOR PROPOSED FILL SLOPES.

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JORDAN COVE ENERGY PROJECT
KENTUCK SLOUGH CWM
COOS COUNTY

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Drafted By – BAR

MITIGATION AREAS AND INCIDENTAL WETLAND IMPACTS

SHEET NO. FIG 4

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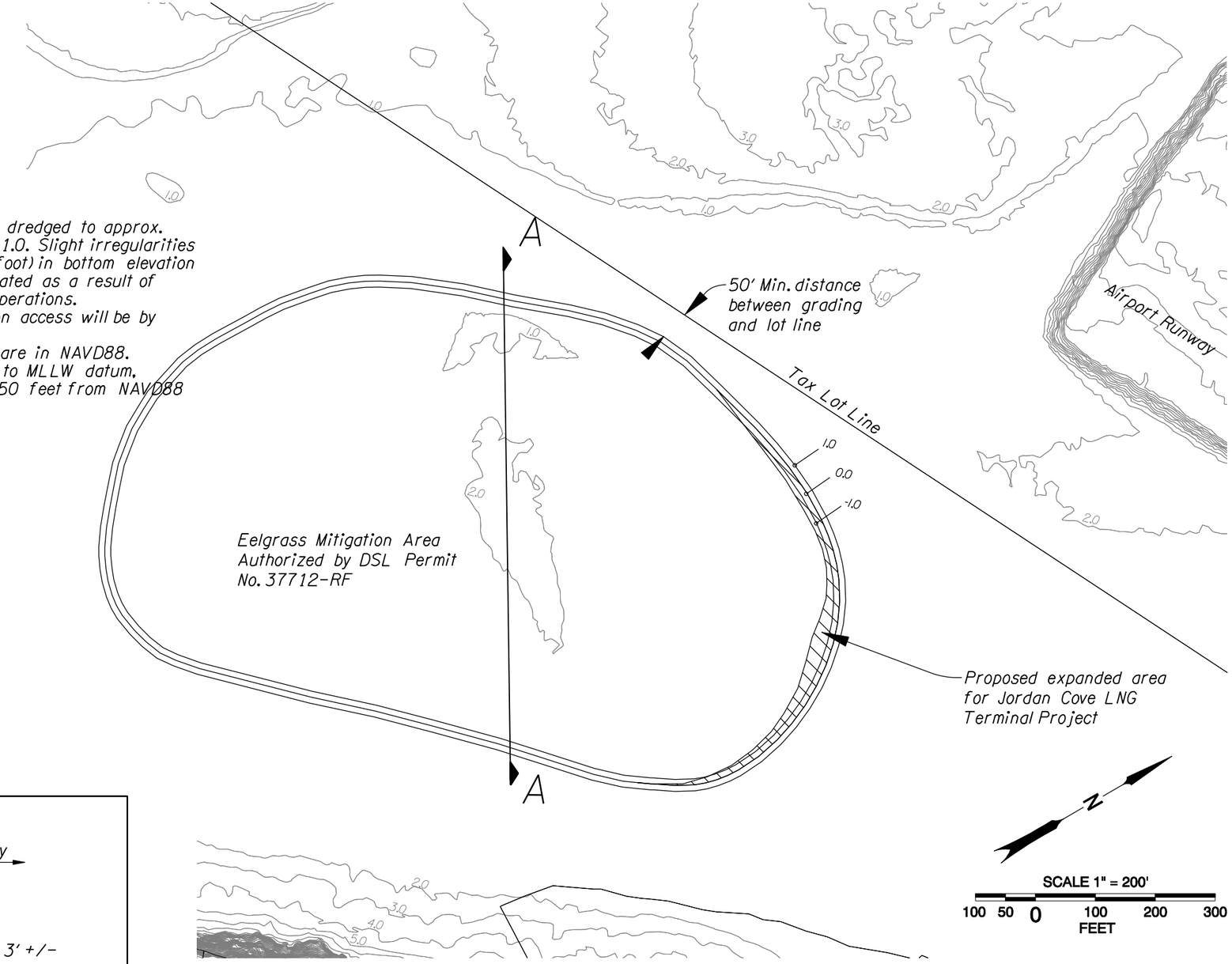
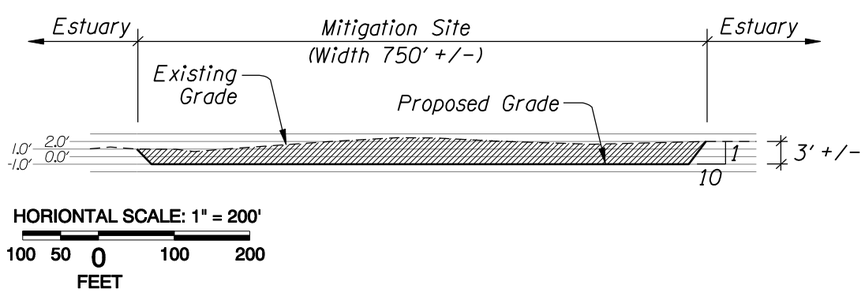
SITE CONTEXT
AERIAL PHOTO
(Google Earth 2005 - NTS)

Notes:
1. Site will be dredged to approx. elevation -1.0. Slight irregularities (+/- one foot) in bottom elevation are anticipated as a result of dredging operations.
2. Construction access will be by barge.
3. Elevations are in NAVD88. To convert to MLLW datum, subtract 0.50 feet from NAVD88 elevations.



GRADING PLAN



SECTION A-A

DAVID EVANS AND ASSOCIATES INC.
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JORDAN COVE LNG TERMINAL PROJECT
SOUTH DUNES POWER PLANT PROJECT

EELGRASS WETLAND MITIGATION

Part A – Tab C: LNG Terminal Project; Cultural Resource Report

Refer to FERC Resource Report 4 – Cultural Resources Report, Appendix B.4

Part A – Tab D: LNG Terminal Project; Excavated & Dredged Material Management Plan

<u>Refer to FERC Resource Report 7 – Soils, Appendix H-7</u>

Part A – Tab E: LNG Terminal Project; Stormwater

Refer to FERC Resource Report 2 – Water Use and Quality, Appendix I-2.

Refer to Pacific Connector's Joint Permit Application for additional information regarding Section 401 compliance

Part A – Tab F: LNG Terminal Project; Jordan Cove Energy – Wetlands F and G /Treatment Facilities Letter Perkins Coie March 29, 2013

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March 29, 2013

VIA EMAIL

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Re: Jordan Cove Energy - Wetlands F and G / Treatment Facilities

Dear All:

The purpose of this letter is to follow up on our recent discussions with Corps and DEQ representatives regarding DEQ's exclusive jurisdiction over closure activities at the Weyerhaeuser Mill Site. For the reasons discussed below, Jordan Cove Energy concurs with DEQ's position that, barring any expansion of the above-referenced wastewater treatment facility into surrounding jurisdictional waters and for purposes of closure of these treatment facilities, no permit is required under Section 404 of the Clean Water Act to fill the existing wastewater treatment facility's north and south settling basins.

As you are aware, the Mill Site property is listed in the DEQ cleanup, leaking underground storage tank, hazardous waste, solid waste, and water quality programs. Although portions of the property have been closed, others remain under DEQ regulatory oversight, including the North Spit industrial solid waste landfill (operated pursuant to Solid Waste Permit No. 1142) and the associated wastewater treatment system (operated pursuant to NPDES Permit No. 101499).

The NPDES permit for the wastewater treatment system remains active, and closure plans have been prepared pursuant to the requirements of the permit, which states in part:

> The permittee has entered into an agreement with the Department to evaluate the potential impacts of residual sludges in the north and south settling basins, the Deflation Plain (former lagoon), and the Aeration Stabilization Basin. Based on this evaluation, no later than one year from permit issuance the permittee shall provide the Department with closure proposals for the north and south settling basins, the Deflation Plain (former lagoon), and the Aeration Stabilization Basin, unless an alternative date is negotiated with the Department's Cleanup Section.

See NPDES Permit No. 101499, Schedule C.

Pursuant to our discussions with Bill Mason, DEQ's NPDES program permit manager for the facility, we understand that DEQ has taken the position that, unless a permittee plans to expand an existing wastewater treatment facility into jurisdictional waters or is seeking to establish a new facility in such waters, that facility remains under the exclusive jurisdiction of the delegated State water quality program for purposes of regulated closure. In the case of the Weyerhaeuser Mill Site, the wastewater treatment system currently consists of two gravity settling basins (north and south) an aeration stabilization basin and former wastewater lagoon, and an offshore outfall to the Pacific Ocean. *See* Conceptual Closure and Post Closure Plan, Weyerhaeuser NR Company North Bend Containerboard Mill North Spit Industrial Landfill, North Bend, Oregon (PES Environmental, Inc., October 26, 2012), at page 2.

Based on information provided by DEQ as well as information contained in the PES Closure Plan, it appears that the original wastewater treatment system, including the north and south settling basins, was constructed in 1961 specifically to treat facility wastewater. Wastewater and solids from facility operations were formerly discharged to the two settling basins. The basins are unlined, approximately 18-20 feet deep, and each covers an area of approximately one acre. Although the basins have been dredged at least once in the past, they currently contain approximately 3.1 million gallons of sludge in the north basin (up to 13 feet deep) and 2.8 million gallons of sludge in the south basin (up to 16 feet deep). Over time, the settling basins may have developed certain hydrologic characteristics that would qualify as jurisdictional wetlands; however, the basins were constructed and operated for the purpose of wastewater management and are now managed under DEQ's NPDES permitting authority. Thus, the settling basins must also be closed pursuant to DEQ's delegated authority under the Clean Water Act.

It is well established that waste treatment facilities subject to the Clean Water Act authorization and, more specifically, incorporated into an NPDES permit, are not waters of the United States subject to 404 regulation. Specifically, the Corps regulations defining the key term "waters of the United States" include the following express exclusion:

> "Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFW 423.11(m) which also meet the criteria of this definition) are not waters of the United States." *See* 33 CFR 328.3(a)(8).

Since wetlands F and G are, as noted above, subject to current NPDES authority under DEQ, these areas are not subject to 404 jurisdiction and, accordingly, no 404 authorization is required. *Northern California River Watch v. City of Healdsburg*, 496 F.3d 993 (9th Cir. 2007). For these reasons, we concur with DEQ's analysis regarding the exclusivity of NPDES authority over fill associated with closure of these facilities, and we urge you to request COE concurrence with this position at your earliest opportunity.

If you have any questions regarding this issue, feel free to contact me at your convenience.

Very truly yours,

Steven L. Pfeiffer

SLP:crl

cc: Bill Mason (via email)
Client (via email)

Part A – Tab G: LNG Terminal Project; Land Use Compatibility Statement (LUCS)

Oregon Department of Environmental Quality
LAND USE COMPATIBILITY STATEMENT (LUCS)

SECTION 1 - TO BE COMPLETED BY APPLICANT

A. Applicant Name: Jordan Cove Energy Project L.P.	B. Project Name: JCEP LNG Terminal Project
Contact Name: Robert L. Braddock	Physical Address: Jordan Cove Road
Mailing Address: 125 Central Avenue, Suite 380	City, State, Zip: Unincorporated Coos County, OR
City, State, Zip: Coos Bay, OR 97420	Tax Lot #: Not yet partitioned
Telephone: (541) 266-7510	Township: T25S Range: R13W Section: 5
Tax Account #:	Latitude: 43.434024 N
	Longitude: 124.243219 W

C. Describe the project, include the type of development, business, or facility and services or products provided (attach additional information if necessary):

Liquefied natural gas export terminal to receive, liquefy, temporarily store, and send out up to approximately six million metric tons per annum of LNG. The following liquefaction facilities are proposed for the Project:

- Four liquefaction trains, each with the capacity of 1.5 MMTPA;
- Two feed gas cleaning and dehydration trains with a combined natural gas throughput of approximately 1 Bscf/d;
- Refrigerant storage and resupply system;
- Aerial Cooling System (Fin-Fan) to reject heat removed during the LNG liquefaction process; and
- The South Dunes Power Plant, a nominal 420 megawatt (MW) natural gas fired combined-cycle electric power plant for the purpose of powering the natural gas liquefaction process systems, including the provision of process steam to power the integrated gas conditioning (processing) facility.

D. Check the type of DEQ permit(s) or approval(s) being applied for at this time.

- ☐ Air Quality Notice of Construction
- ☑ Air Contaminant Discharge Permit *(excludes portable facility permits)*
- ☑ Air Quality Title V Permit
- ☐ Air Quality Indirect Source Permit
- ☐ Parking/Traffic Circulation Plan
- ☐ Solid Waste Land Disposal Site Permit
- ☐ Solid Waste Treatment Facility Permit
- ☐ Solid Waste Compost Facility Registration or Permit
- ☐ Solid Waste Letter Authorization Permit
- ☐ Solid Waste Material Recovery Facility Permit
- ☐ Solid Waste Energy Recovery Facility Permit
- ☐ Solid Waste Transfer Station Permit
- ☐ Waste Tire Storage Site Permit
- ☐ Pollution Control Bond Request
- ☐ Hazardous Waste Treatment, Storage, or Disposal Permit
- ☐ Clean Water State Revolving Fund Loan Request
- ☐ Wastewater/Sewer Construction Plan/Specifications *(includes review of plan changes that require use of new land)*
- ☐ Water Quality NPDES Individual Permit
- ☐ Water Quality WPCF Individual Permit *(for onsite construction-installation permits use the DEQ Onsite LUCS form)*
- ☑ Water Quality NPDES Stormwater General Permit *(1200-A, 1200-C, 1200-CA, 1200-COLS, and 1200-Z)*
- ☐ Water Quality General Permit *(all general permits, except 600, 700-PM, 1700-A, and 1700-B when they are mobile.)*
- ☑ Water Quality 401 Certification for federal permit or license

E. This application is for: ☐ Permit Renewal ☑ New Permit ☐ Permit Modification ☐ Other:

SECTION 2 - TO BE COMPLETED BY CITY OR COUNTY PLANNING OFFICIAL

Instructions: Written findings of fact for all local decisions are required; written findings from previous actions are acceptable. For uses allowed outright by the acknowledged comprehensive plan, DEQ will accept written findings in the form of a reference to the specific plan policies, criteria, or standards that were relied upon in rendering the decision with an indication of why the decision is justified based on the plan policies, criteria, or standards.

A. The project proposal is located: ☐ Inside city limits ☐ Inside UGB ☑ Outside UGB

B. Name of the city or county that has land use jurisdiction *(the legal entity responsible for land use decisions for the subject property or land use)*:

Coos County

SECTION 2 TO BE COMPLETED BY CITY OR COUNTY PLANNING OFFICIAL

Applicant Name: Jordan Cove Energy Project, L.P.

Project Name: JCEP LNG Terminal Project

C. Is the activity or use allowed under Measure 49? [X] No, Measure 49 is not applicable [ ] Yes; if yes, then check one

[ ] Express; approved by DLCD order #:

[ ] Conditional; approved by DLCD order #:

[ ] Vested; approved by local government decision or court judgment docket or order #:

D. Is the activity or use compatible with your acknowledged comprehensive plan as required by OAR 660-031?
Please complete this form to address the activity or use for which the applicant is seeking approval (see 1.C on the previous page). If the activity or use is to occur in multiple phases, please ensure that your approval addresses the phases described in 1.C. For example, if the applicant's project is described in 1.C as a subdivision and the LUCS indicates that only clearing and grading are allowed outright but does not indicate whether the subdivision is approved, DEQ will delay permit issuance until approval for the subdivision is obtained from the local planning official.

[ ] The activity or use is not regulated by the acknowledged comprehensive plan; explain:

[ ] YES, the activity or use is pre-existing nonconforming use allowed outright by *(provide reference for local ordinance)*:

[X] YES, the activity or use is allowed outright by *(provide reference for local ordinance)*: Coos County Zoning & Land Development Ordinance (CCZLDO) Section 4.2.600 (Commercial - Industrial Zoning Districts), Table 4.2e, see additional comments below.

[ ] YES, the activity or use received preliminary approval that includes requirements to fully comply with local requirements; findings are attached.

[X] YES, the activity or use is allowed; findings are attached. See additional comments below.

[ ] NO, see 2.C above, activity or use allowed under Measure 49; findings are attached.

[ ] NO, *(complete below or attach findings for noncompliance and identify requirements the applicant must comply with before compatibility can be determined)*:

Relevant specific plan policies, criteria, or standards:

Provide the reasons for the decision:

Additional comments (attach additional information as needed): See copy of Table 4.2e attached regarding permitted (P) uses:
- The SDPP is a utility facility for generation of power for public sale.
- The gas conditioning facility is a mineral resource processing facility.

JCEP LNG Terminal - Approved by County as Industrial & Port Facilities use in zoning district 6-WD as approved by Order 07-11-289 PL dated December 5, 2007 and, further, by County Order No. 09-08-053 PL dated August 21, 2009 (copies attached).

Planning Official Signature: Jill Rolfe Title: Planning Director

Print Name: Jill Rolfe Telephone #: 541-396-7770 Date: 9/16/13

If necessary, depending upon city/county agreement on jurisdiction outside city limits but within UGB:

Planning Official Signature: Title:

Print Name: Telephone #: Date:

ORDINANCE NO. 1982

AN ORDINANCE AMENDING THE TEXT CHAPTERS 18.04 GENERAL PROVISIONS AND 18.44 M-H HEAVY INDUSTRIAL ZONE, TITLE 18 ZONING, NBCC

THE CITY OF NORTH BEND ORDAINS AS FOLLOWS:

Section 1. The City of North Bend finds as follows:

1. An application was submitted by Steve Donovan of SHN, Inc. on July 16, 2013 with the permission of APCO Coos Properties, LLC, an affected property owner. The proposed zoning text amendments are to amend the M-H Heavy Industrial Zone, Chapter 18.44, Conditional uses permitted, to list "temporary work force housing" as a conditional use, and amend Chapter 18.04 General Provisions to list definitions for "factory built housing" and "temporary workforce housing," in the North Bend City Code.

2. Notice of the proposed text amendments was mailed to the Oregon Department of Land Conservation and Development (DLCD) on July 31, 2013. No concerns or comments were received from DLCD.

3. Notice of the Planning Commission hearing was published in The World newspaper on September 3 and 10, 2013. Said notice identified the subject properties, applicable criteria, time, date and location of the public hearing and information concerning testimony and appeals.

4. A public hearing was held by the City Planning Commission on September 16, 2013. Two persons spoke in favor of the proposed amendments, and no one spoke in opposition. The Planning Commission made a unanimous recommendation to City Council for approval of the request as presented.

5. The Planning Commission adopted findings of fact in support of their decision at the same meeting on September 16, 2013.

6. Notice of the Planning Commission actions was sent to the applicant and parties who spoke during the hearing on September 18, 2013. The notice also contained notice of the City Council hearing to be held on Tuesday, October 8, 2013.

7. Notice of the City Council hearing was published in The World newspaper on September 24 and October 1, 2013. Said notice identified the subject properties, applicable criteria, time, date and location of the public hearing and information concerning testimony and appeals.

8. The City Council held a public hearing on October 8, 2013.

9. The City Council reviewed the record and testimony and voted to adopt the proposed text amendments as presented.

Section 2. The Council of the City of North Bend hereby declares that the text of Title 18 Zoning shall be amended as follows:

18.44.020 Conditional uses permitted.

In a M-H zone, the following uses and their accessory uses are permitted when authorized in accordance with Chapter 18.60 NBCC:

(1)Governmental structure or use.

(2)Junk yard, automobile wrecking yard.

(3)The retail sale of items manufactured, compounded, fabricated, processed or assembled on the premises.

(4)Areas for the accommodation of recreational vehicles and/or house trailers, commonly known as RV parks or travel parks. (Ord. 1798 § 2, 1993; Ord. 1592, 1979; Ord. 1192 § 60, 1962)

(5) Temporary work force housing, including but not limited to factory-built housing and related services.

18.04.030 Definitions.

In the following subsections are definitions of terms used in this title. If a term is not defined in this title, then it shall have the definition provided in the building code which is enforced within the city at the time that the definition becomes applicable. As used in this title, the masculine includes the feminine and neuter and the singular includes the plural.

(11) "Factory-built housing" is any structure designed for human occupancy other than a manufactured or mobile home, where the structure or any room of which is either entirely or substantially prefabricated or assembled at a place other than a building site.

(44) "Temporary work force housing" shall mean a place, area or piece of land where sleeping places or housing sites are provided by an employer for his or her employees or by another person, including a temporary work force operator who is providing such accommodations for major construction project employees, for emergency relief workers, or for temporary seasonal occupancy.

Passed and enacted by the Council of the City of North Bend October 8, 2013.

Rick Wetherell, Mayor

ATTEST

Joann Thompson, City Recorder

Part B: Pacific Connector Gas Pipeline; Project Attachments

<u>Provided by Others</u>

Part C: Slip and Access Channel Project; Attachments

Part C – Tab A.A: Slip and Access Channel Project; Figures

See Part A, Tab A.A (LNG Terminal Project Figures)

Part C – Tab A.B: Slip and Access Channel Project; Wetland Impacts Table

See Part A, Tab A.B (LNG Terminal Project Wetland Impacts Table)

Part C – Tab A.C: Slip and Access Channel Project; Construction Schedule

See Part A, Tab A.C (LNG Terminal Project Construction Schedule)

Part C, Tab B: Slip and Access Channel Project; Compensatory Wetland Mitigation Plan

See Part A, Tab A.B (LNG Terminal Project Compensatory Wetland Mitigation Plan)

Part C, Tab C: Slip and Access Channel Project; Cultural Resources Report

Refer to FERC Resource Report 4 – Cultural Resources Report, Appendix B.4

Part C, Tab D: Slip and Access Channel Project; Sediment Sampling and Analysis Report

Refer to FERC Resource Report 2 – Water Use and Quantity Report, Appendix B.2

Part C – Tab E: Slip and Access Project; Excavated & Dredged Material Management Plan

<u>Refer to FERC Resource Report 7 – Soils, Appendix H-7</u>

Part C – Tab F: Slip and Access Project; Environmental Protection Agency Designation of Site F

Ocean Dumping; De-Designation of Ocean Dredged Material Disposal Site and Designation of New Site Near Coos Bay, OR

Note: EPA no longer updates this information, but it may be useful as a reference or resource.

[Federal Register: May 11, 2006 (Volume 71, Number 91)]
[Rules and Regulations]
[Page 27396-27405]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr11my06-4]

ENVIRONMENTAL PROTECTION AGENCY
40 CFR Part 228
[FRL-8167-7]

Ocean Dumping; De-Designation of Ocean Dredged Material Disposal Site and Designation of New Site Near Coos Bay, OR

AGENCY: Environmental Protection Agency (EPA).
ACTION: Final rule.

SUMMARY: EPA is finalizing its proposal to de-designate an existing ocean dredged material disposal site and designate a new ocean dredged material disposal site located offshore of Coos Bay, Oregon. EPA's proposed rule was published March 31, 2000. The new site is needed for long-term use by authorized Coos Bay navigation projects and may be available for use by persons meeting the criteria for ocean disposal of dredged material. The de-designation of the existing site allows for its incorporation into the newly designated site. This will allow EPA to manage the entire new site to avoid adverse mounding conditions and will ensure site capacity is sufficient for total volumes of dredged material. The newly designated site is necessary for current and future dredged material ocean disposal needs and will be subject to ongoing monitoring and management to ensure continued protection of the marine environment so as to mitigate adverse impacts on the environment to the greatest extent practicable.

DATES: This final rule will be effective on June 12, 2006.

ADDRESSES: EPA has established a docket for this final action under Docket ID No. EPA-R10-OW-2006-0409. All documents in the docket are listed on the http://www.regulations.gov EXIT Disclaimer Web site. The documents are also available for inspection at the Region 10 Library, 10th Floor, 1200 Sixth Avenue, Seattle, Washington 98101. For access to the documents at the Region 10 Library, contact the Region 10 Library Reference Desk at (206) 553-1289, between 9 a.m. to 11:30 a.m. and 1 p.m. to 4 p.m., Monday through Friday, excluding legal holidays, for an appointment or contact John Malek, U.S. EPA, Region 10, 1200 Sixth Avenue, Mail Stop

ETPA-083, e-mail: malek.john@epa.gov, phone number (206) 553-1286.

FOR FURTHER INFORMATION CONTACT: John Malek, Ocean Dumping Coordinator, U.S. Environmental Protection Agency, Region 10 (ETPA-083), 1200 Sixth Avenue, Seattle, WA 98101-1128, telephone (206) 553-1286, e-mail: malek.john@epa.gov.

SUPPLEMENTARY INFORMATION:

1. Potentially Affected Persons

Persons potentially affected by this action include those who seek or might seek permits or approval by EPA to dispose of dredged material into ocean waters pursuant to the Marine Protection, Research, and Sanctuaries Act, as amended, 33 U.S.C. 1401 to 1414, (``MPRSA''). EPA's action would be relevant to persons, including organizations and government bodies seeking to dispose of dredged material in ocean waters offshore of Coos Bay, Oregon. Currently, the U.S. Army Corps of Engineers (Corps) and other persons with permits to use designated sites at Coos Bay would be most impacted by this final action. Potentially affected categories and persons include:

Category	Examples of potentially regulated persons
Federal Government.....	U.S. Army Corps of Engineers Civil Works Projects, and other Federal Agencies.
Industry and General Public..	Port Authorities, Marinas and Harbors, Shipyards and Marine Repair Facilities, Berth Owners.
State, local and tribal governments.	Governments owning and/or responsible for ports, harbors, and/or berths, Government agencies requiring disposal of dredged material associated with public works projects.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding persons likely to be affected by this action. For any questions regarding the applicability of this action to a particular person, please refer to the section of this action titled FOR FURTHER INFORMATION CONTACT.

2. Background

a. History of Disposal Site Designations Off of Coos Bay, OR

Pursuant to the MPRSA, the Administrator of EPA, as delegated to the Regional Administrator, designated three disposal sites (Site E, original Site F and Site H) off of Coos Bay, Oregon in 1986. The original Site F began to experience mounding that rendered it unable to accept the total volume of dredged material generated on an annual basis. In 1989, with EPA approval, the size of the original Site F was roughly doubled by the Corps exercising its Section 103 authority to select disposal sites under the MPRSA. In 1995, EPA approved a second Corps expansion of the original Site F. On March 31, 2000, EPA published in the Federal Register its proposal to de-designate the original Site F and designate a new Site F that consisted of the 103 configured Site F and the original Site F (65 FR 17240). A forty-five day public comment period, which closed on May 14, 2000, was provided. EPA did not receive comments from the public on the proposed rule. The coordinates of the proposed Site F (North American Datum 1983; NAD 83) were:

43[deg]22'58'' N, 124[deg]19'32'' W
43[deg]21'50'' N, 124[deg]20'29'' W
43[deg]22'52'' N, 124[deg]23'28'' W
43[deg]23'59'' N, 124[deg]22'31'' W

The proposed site was rectangular with an east-west side length dimension of 14,500 feet and a north-south side length dimension of 8,000 feet. Figure 1 is a diagram of the site EPA proposed in 2000.

Subsequent to EPA's proposed designation, the North Jetty at Coos Bay failed in December 2002, due in part to undermining. The Corps then examined the potential for augmenting transport of disposed material into the eddy created by the North Jetty itself. With EPA concurrence, the Corps began making selected disposals in the southeastern corner of the 103 Site F nearest the jetty. Monitoring indicated that some material was captured by the eddy and augmented the substrate that the jetty rests upon. This experience and the lessons learned during the designations of ocean dredged material disposal sites near the Mouth of the Columbia River in 2005, as well as increased public awareness of, and attention to, coastal erosion processes and opportunities to manage dredged material more beneficially led EPA to review its proposed site designation near Coos Bay. The result of this review is a minor change to the configuration of new Site F toward the North Jetty at the north side of the mouth of Coos Bay. This reconfiguration could potentially benefit the stabilization of the North Jetty and keep material in the littoral zone. This

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reconfiguration is expected to allow dredged material disposed in shallower portions of the new Site F to naturally disperse into the littoral zone without creation of mounding conditions that would contribute to adverse impacts to navigation, including adverse wave conditions.

b. Location and Configuration of New Site F

Figure 2 is a diagram of the new Site F as EPA is finalizing the site in today's rule. It also shows the other designated sites (E and H), the de-designated Site F, the 103 configured Site F and the proposed Site F. The shoremost side of the site has been extended approximately 600 feet as compared to the site when proposed and the southeastern corner has been located closer to the North Jetty at the mouth of Coos Bay. This has resulted in an overall increase to the site footprint of 399.8 acres bringing the total area of new Site F to 3,075.2 acres. This configuration will allow EPA to ensure that disposal of dredged material into the site will be managed to retain more of the material in the active littoral drift area to augment shoreline building processes. The relocation of the corner of the site closer to the jetty will allow dredged material to be more effectively placed to continue augmentation toward the nearshore and toward the North Jetty at the mouth of Coos Bay. This change, while minor, expands sediment management opportunities that are beneficial to the coastal environment in Coos Bay. The coordinates for the new Site F near Coos Bay (NAD 83) as finalized today are:

43[deg]22'54.8887'' N, 124[deg]19'28.9905'' W
43[deg]21'32.8735'' N, 124[deg]20'37.7373'' W
43[deg]22'51.4004'' N, 124[deg]23'32.4318'' W
43[deg]23'58.4014'' N, 124[deg]22'35.4308'' W

The new Site F is expected to accommodate the approximately 1.38 million cubic yards (mcy) of material dredged annually from the Coos Bay estuary by the Corps to maintain the existing Federal navigation channel. The nearshore boundary of the new site is within two thousand feet of the shoreline. Sediments disposed near this boundary are

considered to be in the active transport zone and are expected to disperse rapidly both onshore and alongshore. Limited onshore transport is expected because of the nature of prevailing currents and wave transport in the vicinity. Predicted material transport at the new site is southward in the summer months and northward during the remainder of the year.

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c. Management and Monitoring of New Site F

The newly designated Site F will receive sediments dredged by the Corps to maintain the federally authorized navigation project at Coos Bay, Oregon and will be available to current permittees and for use by others after obtaining the appropriate permits and approvals. Existing permits issued pursuant to subchapter H of Title 40 of the CFR will not need to be modified to use new Site F. The new Site F is designated with restrictions with which all persons must comply. All persons using the site are required to follow the final Site Management and Monitoring Plan (SMMP) which is effective as of the effective date of this action. The SMMP generally addresses managing new Site F to minimize and avoid mounding and to ensure that dredged materials

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disposed at the site are suitable for ocean disposal. The SMMP includes management and monitoring requirements for all of the designated sites near Coos Bay and addresses the timing of disposal into new Site F to minimize interference with commercial crabbing in the nearshore zone. Among other things, the SMMP sets out monitoring and management requirements to ensure that dredged material disposed at the site is suitable for disposal and will not lead to unacceptable impacts to human health or the environment during the dredging process, during transportation to the designated sites, during disposal or once disposed or at the disposal sites.

d. MPRSA

EPA finds that today's final action satisfies the site designation criteria of the MPRSA and the regulatory criteria of 40 CFR part 228. The assessment of the statutory criteria and general and specific regulatory criteria presented in the proposed rule has been examined in response to the slight reconfiguration of the new Site F. Moving the corner of the new Site F to the southeast and closer to the North Jetty based on EPA's increased understanding of coastal erosion issues will allow EPA to manage disposal at the new Site to retain material in the active littoral zone to augment shoreline building processes. This meets the statutory and regulatory criteria to use an appropriate location based on considerations affecting the public interest and to locate the site to minimize interference with other activities in the marine environment. New data collected since the proposed rule has been included in the discussion of the general and specific site designation criteria.

General Criteria (40 CFR 228.5)

1. Sites must be selected to minimize interference with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation (40 CFR 228.5(a)).

EPA's assessment of information available at the time of the proposed rule demonstrated that new Site F as proposed would cause only minimal interference with fisheries and shellfisheries and with navigation notwithstanding the location of the site in the Coos Bay navigation channel. This assessment has not changed with the minor reconfiguration of the site toward the North Jetty. Most of new Site F has been used over the past decade for dredged material disposal pursuant to section 103 authority exercised by the Corps with EPA concurrence and mariners in this area are accustomed to the site use. In addition, based on a conservation recommendation from the National Marine Fisheries Service (NMFS) resulting from an EPA consultation on essential fish habitat, EPA will impose use restrictions at the site to minimize the use of the site before June 1 of any year to essential work and will encourage staggering of disposal events when juvenile coho and Chinook salmon are holding in nearshore habitats.

2. Sites must be situated such that temporary perturbations to water quality or other environmental conditions during initial mixing caused by disposal operations would be reduced to normal ambient levels or undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery (40 CFR 228.5(b)).

EPA's analysis at the time of the proposed rule concluded that the new Site F would satisfy this criterion. EPA's understanding of the nearshore processes near the North Jetty indicates that this criterion will continue to be met with the reconfiguration of new Site F as finalized today. Although EPA expects some material disposed at new Site F to reach the base of the North Jetty, normal ambient levels and undetectable contaminant concentrations or effects would be expected before any material reached any beach, shoreline, marine sanctuary or known geographically limited fishery or shellfishery because of the existing high currents and wave energy.

3. If site designation studies show that any interim disposal sites do not meet the site selection criteria, use of such sites shall be terminated as soon as any alternate site can be designated (40 CFR 228.5(c)).

There are no interim disposal sites near Coos Bay as defined under the Ocean Dumping regulations. This criterion is not applicable to today's action de-designating existing Site F and designating new Site F.

4. The sizes of disposal sites will be limited in order to localize for identification and control any immediate adverse impacts, and to permit the implementation of effective monitoring and surveillance to prevent adverse long-range impacts. Size, configuration, and location are to be determined as part of the disposal site evaluation (40 CFR 228.5(d)).

EPA sized the proposed site to meet this criterion. The site, as finalized in today's action, continues to meet this criterion. The total area of new Site F is approximately 3,075.2 acres or 3.63 nm\2\. The site tends to be moderately dispersive in the nearshore area and tends to be less dispersive in other parts of the site. The overall stability of the site is a significant part of the justification for the size of the site. The original Site F experienced significant mounding and lead to the selection of the larger site designated today. Data collected by the Corps through bathymetric monitoring shows the spread and movement of material placed at original Site F and suggests that material from the original Site F did eventually disperse over the footprint of the 103-selected site. This data also indicates that effective monitoring and surveillance of the site has been performed for many years. The SMMP describes the plan for management and monitoring of the site.

5. EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites where historical disposal has occurred (40 CFR 228.5(e)).

EPA's evaluation at the time of the proposed rule concluded that long distances and travel times between the dredging locations near Coos Bay and the continental shelf posed significant environmental, operational, safety and environmental concerns, including risk of encounter with endangered species and increased air emissions. This conclusion is unchanged and new Site F, finalized by today's rule, is consistent with this criterion.

Specific Criteria (40 CFR 228.6)

1. Geographical Position, Depth of Water, Bottom Topography and Distance From Coast (40 CFR 228.6(a)(1))

Based on the data available at the time EPA proposed the designation of Site F and data available from bathymetric surveys conducted by the Corps, EPA has concluded that the geographical position, depth of water, bottom topography and distance from the coast of new Site F will avoid adverse effects to the marine environment. Near the North Jetty, the new site will allow for the placement of material that is expected to contribute material to the littoral zone and may help decrease erosion of the jetty. Throughout most of the shallow portions of the new site the area is dispersive. Based on EPA's understanding of currents at the site and their influence on the movement of material in the area this means there is a high likelihood that material will be transported to the adjacent seafloor. The site is located and sized to allow for long-term disposal without creation of adverse mounding conditions.

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2. Location in Relation to Breeding, Spawning, Nursery, Feeding, or Passage Areas of Living Resources in Adult or Juvenile Phases (40 CFR 228.6(a)(2))

New Site F is not located in breeding, spawning, nursery or feeding areas for adult or juvenile phases of living resources. The site is, or may be, a passage area for living resources during adult or juvenile phases. The National Marine Fisheries Service (NMFS), during consultations with EPA in 2005 and 2006 for endangered species and for essential fish habitat, requested that disposal at new Site F be restricted to stagger disposal events at the new site, particularly in the nearshore zone, to avoid continuous disposal while juveniles, including salmon and groundfish species, are outmigrating or holding in nearshore environments. EPA agreed to include staggered disposal in its final SMMP. This will benefit the juveniles of concern to NMFS and will also minimize any potential short-term localized effects to marine organisms in the immediate vicinity of disposal events by minimizing the creation of mounds at the site.

3. Location in Relation to Beaches and Other Amenity Areas (40 CFR 228.6(a)(3))

EPA's proposed rule concluded that the proposed site met this criterion and EPA's conclusion is not changed today notwithstanding the minor reconfiguration of the site toward the North Jetty. The site, although located in the navigation channel and close to the North Jetty is located to avoid adverse impacts to beaches and other amenity areas.

4. Types and Quantities of Wastes Proposed To Be Disposed of, and Proposed Methods of Release, Including Methods of Packing the Waste, if Any (40 CFR 228.6(a)(4))

The new Site F is being designated today for the disposal of dredged material. Disposal of other types of material will not be allowed at this site or at any of the ocean dredged material disposal sites at Coos Bay. Dredged material to be disposed at the new Site F will be predominantly sand and fine-grained material. Data collected subsequent to EPA's proposed rule included seventeen sediment samples collected from along the length of the federal navigation channel in

Coos Bay, Isthmus Slough, and Charleston Channel in 2004 (Coos Bay Sediment Quality Evaluation Report, March 2005). These samples were subjected to physical and chemical analyses, which included analyses for metals, total organic carbon, pesticides, polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and total and pore water organotin (TBT).

The physical analyses resulted in mean values of 1.6% gravel (0%-10.0% range), 69.6% sand (4.0%-98.8% range), and 28.8% silt/clay (1.2%-96.0% range) with 4.5% volatile solids (0.2%-16.7% range). The chemical analyses indicated low levels of chemicals in some of the samples. The results were compared with results from previous Corps sampling efforts in 1980, 1986, 1987, 1989, 1993, 1994, 1995, and 1998. All the data are consistent in showing that material below river mile (RM) 12 of the Coos Bay channel is typically sand, while material above RM 12 is typically silt. With only a few exceptions (where adjacent sources are obvious) the sand matrix is considered low risk for contamination. The silty areas of the estuary and river typically contain low levels of contaminants-of-concern that have remained unchanged for many years or appear to be improving slightly (i.e. concentrations are dropping). Materials to be disposed of at the site must be suitable for ocean disposal.

With respect to proposed methods of releasing material at the new site, material will be released just below the surface from dredges while the dredges are under power and slowly transit the site. This method of release is expected to minimize mounding at the site and to minimize impacts to the benthic community.

5. Feasibility of Surveillance and Monitoring (40 CFR 228.6(a)(5))

Monitoring and surveillance at new Site F is expected to be feasible. The site is accessible for bathymetric and side-scan sonar surveys. Most of the site has been successfully monitored by the Corps during the Corps's use of the 103 site. It is also expected to be feasible to monitor and survey the minor addition made to the site through the reconfiguration toward the North Jetty. The Corps has monitored the base of the jetty on a routine basis and during emergency repairs made in 2002 after a failure of the jetty. The final SMMP requires monitoring and surveillance of the new site. At a minimum, annual bathymetric surveys will be conducted at new Site F and more frequent surveys will be required in areas of the site that receive dredged material. Off-site beach monitoring will also be required. Routine monitoring will concentrate on determining how to ensure the distribution of material in the nearshore portions of the site to augment littoral processes and in the deeper portions of the site to avoid or minimize mounding.

6. Dispersal, Horizontal Transport and Vertical Mixing Characteristics of the Area, Including Prevailing Current Direction and Velocity, if Any (40 CFR 228.6(a)(6))

At the time EPA proposed the designation of the new site, EPA understood the dispersal patterns along the Oregon coast to generally flow parallel to the bathymetric contours of the bottom. Local wave and current strength and direction are impacted by the variability of the local winds, especially in shallower water. During summer months which make up the normal dredge and disposal season, material transport trends southward. The trend at other times of the year is north and northwest for currents and material transport. Re-suspension and transport of material disposed at the site would be expected to be at a maximum during winter months when winter storms occur and when no active disposal is taking place at the site. Throughout the year, material disposed in the nearshore and shallower portions of new Site F are expected to be redistributed by existing littoral processes.

Mounding at originally designated Site F led the Corps to exercise its authorities pursuant to Section 103 of the MPRSA to select a significant expansion of the site and to use modeling techniques to model placement of material within the site to avoid excessive mounding. The originally designated Site F was generally not used for

disposal after 1989. However, it was thought that material at that location was eroding toward the 103 selected Site F. For this reason, the original Site F, although proposed for de-designation as a stand-alone site, was to be incorporated into the new Site F. The movement of material was considered to be most dispersive in the shallower zones of the 103 site but material disposed in the deeper and less dynamic portions of the site are redistributed across the site. Eventually, the redistribution is expected to move the material disposed at the site to the north and east.

Subsequent to publication of the proposed Rule in 2000, the Corps continued to conduct annual bathymetric surveys at the 103 Site F and to share the data collected with EPA to assess capacity at the site for the coming year's anticipated dredging. This data tended to show that the mound at the 1986-designated Site F was slowly eroding to its present

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average at below minus 60 feet mean lower low water (MLLW). This indicates a minimum of 10 feet of material having eroded out of 1986-designated Site F. Dredged material was placed at various locations within the 103 Site F and monitored. Computer modeling of disposal operations was used to determine short-term and long-term sediment fate to design disposal units or cells. Bathymetric surveys during and following disposals were conducted. Initial work was focused on confirming accuracy of the models. Bathymetric changes measured by the monitoring compared well with the changes predicted by the model. For example, the model predicted a 2.9 foot change and monitoring measured the actual change at 3.0 feet. The model was used to predict disposal results in the nearshore area (i.e., along the innermost edge of the 103 Site F) and field monitoring was conducted to verify the modeled predictions. Placement height was managed to a maximum of 3 feet during initial disposal into 180 separate cells each sized as a 200 foot by 500 foot cell.

These bathymetric surveys show that the shallow water portion of the site has accumulated about 1 foot of material on the bottom, with small areas of accumulation of up to 5 feet. In the deeper portion of the 103 site, disposals were conducted to dispose of up to 24 feet of material at specific locations. Bathymetric monitoring indicates these thicker disposals had eroded down to 19 feet of accumulated material on the bottom. The surveys further show that this accumulated material is dispersing in a northeasterly direction.

7. Existence and Effects of Current and Previous Discharges and Dumping in the Area (Including Cumulative Effects) (40 CFR 228.6(a)(7))

Annually, approximately 1.3 million cubic yards (mcy) of material has been disposed of at the Coos Bay designated sites, Sites E, F and H, from dredging undertaken by the Corps to maintain the navigation channel. The Coos Bay sites were used consistently prior to their designations in 1986. Sites E and F were not used after the late eighties because of mounding concerns. As discussed above, the mounds at those sites have been eroding over time. Originally designated Site F was recently used by the Corps for the disposal of dredged material to maintain safe navigation in the navigation channel. This site, which is de-designated by today's rule as a stand-alone site, is incorporated into the footprint of the new Site F. EPA's evaluation of data and modeling results indicates that past disposal operations at these sites and current operations have not resulted in unacceptable environmental degradation. Adverse effects are not expected to result from the minor reconfiguration of the site toward the North Jetty. EPA expects that portion of the site to benefit the nearshore environment.

8. Interference With Shipping, Fishing, Recreation, Mineral Extraction, Desalination, Fish and Shellfish Culture, Areas of Special Scientific Importance and Other Legitimate Uses of the Ocean (40 CFR 228.6(a)(8))

The site is not expected to interfere with shipping, fishing, recreation or other legitimate uses of the ocean. Commercial crabbing,

which was referenced in EPA's proposed rule as an activity occurring in the nearshore, is not expected to be impacted by the minor reconfiguration of new Site F. Disposals at the new site will be managed through the SMMP to minimize interference with other legitimate uses of the ocean through careful timing and staggering of disposals in the nearshore portion of the new site.

9. The Existing Water Quality and Ecology of the Sites as Determined by Available Data or Trend Assessment of Baseline Surveys (40 CFR 228.6(a)(9))

At the time of EPA's proposed rule in 2000, EPA had not identified any adverse water quality impacts from ocean disposal of dredged material at originally designated Site F or at 103 selected Site F. In 2004, the Corps released a report titled ``Comparison of SPI Data and STFATE Simulation Results at Coos Bay, OR ODMDS Site `F','' which provided some verification of numerical models used to predict the behavior of disposed material on water quality and ecology of the site. The samples, i.e. sediment profile images, indicated some important characteristics about the native sediments and dredged sediments disposed of at the site. Native sediment in the shallow and intermediate water portions of the site did not show a layer of fine grained material at the sediment-water interface. This absence indicates that burrowing infauna were absent or extremely limited in the area. This finding was not unexpected because the intermediate/ shallow water locations within the site are heavily dominated by wave-current action which forces repeated and routine resuspension of sediment. The report found that ``the effects on initial disposal on benthic marine life in these areas are likely minimal.'' By contrast, the deeper portion of the site did indicate the presence of benthic infaunal activity. In addition to the sediment profile imaging (SPI), a plan-view video was also produced. Crabs, shrimp, and flatfish were all seen on the video; however, no inferences were made as to population. Biological activity and reworking of the surface sediments by natural forces was indicated in the imaging but it was not possible to penetrate the sandy substrate to measure the full thickness of the deposited material at the site.

10. Potentiality for the Development or Recruitment of Nuisance Species in the Disposal Site (40 CFR 228.6(a)(10))

In its proposed rule, EPA stated that nuisance species had not been observed at the existing Coos Bay sites in over ten years of monitoring and that EPA did not expect there to be a significant potential for the development or recruitment of nuisance species in the proposed site. That statement was based in part on the lack of organic material disposed at the site. Subsequent to EPA's proposed rule, however, circumstances at designated Site H have caused that site to be closed at present and the potential for organic material to be disposed of at new Site F has increased. Organic material is generally found above RM 12 in the Coos Bay Channel and is likelier than material below RM12 to be more attractive to nuisance species. While there is the potential for the development or recruitment of nuisance species where dredged material from above RM12 might be disposed of at the new Site F, this potential remains low. The SMMP will provide for monitoring of the new site to help ensure that nuisance species are not recruited to and do not develop at the new site.

11. Existence at or in Close Proximity to the Site of Any Significant Natural or Cultural Feature of Historical Importance (40 CFR 228.6(a)(11))

EPA stated in its proposed rule that no cultural features of historical importance had been identified at or near the proposed site. This continues to be the case. The new Site F is located over 7 statute miles southwest of the Oregon Dunes National Recreation Area, a significant natural feature, but is not considered to be in close proximity to that feature. The new site is located approximately 3 statute miles northeast of three Oregon state parks: Shore Acres State Park, Cape Arago State Park and Sunset Bay State Park. The new site is not considered to be in proximity to these areas. The national historic

landmark, located near Cape Arago State Park, over 4 statute miles south of the new site, is not within the proximity of

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the site. Impacts to significant natural or cultural features have not been identified.

e. National Environmental Policy Act (NEPA); Magnuson-Stevens Act (MSA); Coastal Zone Management Act (CZMA); Endangered Species Act (ESA)

1. NEPA

Section 102 of the National Environmental Policy Act of 1969, 42 U.S.C. 4321, et seq., (NEPA) requires that Federal agencies prepare an Environmental Impact Statement (EIS) on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. NEPA does not apply to EPA designations of ocean disposal sites under the MPRSA as EPA has made clear in EPA's ``Notice of Policy and Procedures for Voluntary Preparation of NEPA Documents,'' 63 FR 58045 (October 29, 1998). EPA did voluntarily cooperate with the U.S. Army Corps of Engineers (Corps) as a cooperating agency on the Feasibility Report on Navigation Improvements with Environmental Impact Statement (EIS) prepared in 1994. As discussed in the proposed rule, 63 FR 17240 (March 31, 2000), the EIS provided documentation to support the final designation of the proposed Site F. EPA did not see a need to supplement the EIS to address the minor reconfiguration of the new Site F which is finalized in today's designation.

2. MSA

In the fall of 2005, EPA consulted with the National Marine Fisheries Service (NMFS) concerning essential fish habitat. EPA prepared an essential fish habitat (EFH) assessment pursuant to section 305(b) of the Magnuson-Stevens Act, as amended (MSA), 16 U.S.C. 1855(b). NMFS reviewed EPA's action and issued six non-binding conservation recommendations. EPA accepted three of the recommendations. The three accepted by EPA included: Using the best relevant analytical methods in sampling and analysis plans included in the final SMMP; limiting site use before June 1 and staggering disposal events during nearshore holding and outmigration of juvenile salmon; and provisions to provide the results of bathymetric monitoring to NMFS. EPA incorporated these recommendations into the final SMMP.

EPA did not accept the remaining three recommendations. These recommendations asked EPA to develop and implement studies to collect information to better inform agencies on species presence and use in the disposal area, in areas that might be designated in the future, and for all existing ocean disposal sites in Oregon. EPA did not accept these recommendations because EPA did not find that the collection of information as recommended by NMFS constituted measures for ``avoiding, mitigating, or offsetting the impact'' of the Federal action on essential fish habitat.

3. CZMA

EPA consulted with the state of Oregon on coastal zone management issues. EPA prepared a consistency determination for the Oregon Ocean and Coastal Management Program (OCMP) to address consistency determinations required by the Coastal Zone Management Act, 16 U.S.C. 1446. The Oregon Department of Land Conservation and Development (DLCD) reviewed the consistency determination and concurred with EPA that the action is consistent with the OCMP to the maximum extent practicable basing its findings on the certification EPA provided.

4. ESA

EPA also consulted with NMFS and the U.S. Fish and Wildlife Service on its action to de-designate existing Site F and to designate new Site F finding that the action would not be likely to adversely affect aquatic or wildlife species listed as endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 to 1544, (ESA), or the critical

habitat of such species. EPA found that site designation does not have a direct impact on any of the identified ESA species but also found that indirect impacts had to be considered. These indirect impacts included a short-term increase in suspended solids and turbidity in the water column when dredged material was disposed at the new site and an accumulation of material on the ocean floor when material was disposed at the site. EPA concluded that while its action may affect ESA-listed species, the action would not be likely to adversely affect ESA-listed species.

The U.S. Fish and Wildlife Service concurred with EPA's conclusion based on its finding that ``abundant suitable foraging habitat throughout the area'' for birds of concern would be available during disposal activities, i.e. site use, and that minor behavioral changes, such as foraging in areas other than the designated site, would be temporary. NMFS concurred with EPA's findings for ESA-listed marine mammals, sea turtles, and southern Oregon/northern California coho salmon, finding that the new site was not designated as critical habitat for any of those species. NMFS did not agree with EPA's conclusions for Oregon Coast coho salmon and requested additional consultation. Subsequent to that request, NMFS announced that it was withdrawing its proposal to list Oregon Coast coho salmon as endangered. The ESA consultation concluded with the withdrawal of the NMFS proposal to list Oregon Coast coho salmon and NMFS addressed Oregon Coast coho salmon in the EFH consultation.

3. Response to Comment

No public comments on the proposed designation were received; however, a letter from the Oregon Department of Environmental Quality (ODEQ) pointed out the need for improved coordination procedures between the EPA, the Corps, ODEQ's central office and ODEQ's Coos Bay field office for dredging projects in the vicinity of Coos Bay. EPA generally supports improved coordination between federal and state agencies. Coordination will be a priority for EPA at the new site to ensure that disposal activities by the Corps and by local port authorities are aware of site restrictions and are adhering to the SMMP.

4. Statutory and Executive Order Reviews

This rule finalizes the de-designation of an existing ocean dredged material disposal site, existing Site F, and designates a new ocean dredged material disposal site, new Site F. This rule complies with applicable executive orders and statutory provisions as follows:

a. Executive Order 12866

Under Executive Order 12866 (58 FR 51735, October 4, 1993), the Agency must determine whether the regulatory action is ``significant'' and, therefore, subject to OMB review and the requirements of the Executive Order. The Order defines ``significant regulatory action'' as one that is likely to result in a rule that may: (1) Have an annual effect on the economy of $100 million or more, or adversely affect in a material way, the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or

the principles set forth in the Executive Order. It has been determined

that this final action, which simultaneously de-designates an existing ocean dredged material disposal site and designates a new site, Site F, is not a significant regulatory action under Executive Order 12866 and is therefore not subject to OMB review.

b. Paperwork Reduction Act

This action does not impose an information collection burden under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501, et seq., because this final action does not establish or modify any information or recordkeeping requirements for the regulated community.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

c. Regulatory Flexibility

The Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), 5 U.S.C. 601, et seq., generally requires federal agencies to prepare a final regulatory flexibility analysis whenever the agency promulgates a final rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions. For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business defined by the Small Business Administration's Size Regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. EPA has determined that this action will not have a significant economic impact on small entities because the final action regulates the location of sites to be used for the disposal of dredged materials in ocean waters. After considering the economic impacts of today's final action on small entities, I certify that this action will not have a significant impact on a substantial number of small entities directly regulated by this action.

d. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act (UMRA) of 1995 (Pub. L. 104-4) establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ``Federal mandates'' that may result in expenditures to State, local and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any year. Before promulgating an EPA rule for which a written statement is

needed, Section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why the alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements. Today's action contains no Federal mandates (under the regulatory provisions of Title II of the UMRA) for State, local or tribal governments or the private sector. It imposes no new enforceable duty on any State, local or tribal governments or the private sector. Similarly, EPA has also determined that this action contains no regulatory requirements that might significantly or uniquely affect small government entities. Thus, today's action is not subject to the requirements of sections 202 and 203 of the UMRA.

e. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801, et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this action and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the Federal Register. A major rule cannot take effect until 60 days after it is published in the Federal Register. This action is not a ``major rule'' as defined by 5 U.S.C. 804(2). This action will be effective June 12, 2006.

f. Executive Order 13132: Federalism

Executive Order 13132, entitled ``Federalism'' (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure ``meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ``Policies that have federalism implications'' are defined in the Executive Order to include regulations that have ``substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among various levels of government.'' This action does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among various levels of government, as specified in Executive Order 13132. This action addresses the designation and de-designation of sites near the mouth of Coos Bay, Oregon. Thus, Executive Order 13132 does not apply to this action.

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g. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order 13175, entitled ``Consultation and Coordination with Indian Tribal Governments'' (59 FR 22951, November 9, 2000), requires EPA to develop an accountable process to ensure ``meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.'' This action does not have tribal implications, as specified in Executive Order 13175. Thus, Executive Order 13175 does not apply to this action.

h. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

Executive Order 13045 applies to any rule that: (1) Is determined to be ``economically significant'' as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency. This action is not subject to Executive Order 13045 because it is not economically significant as defined in Executive Order 12866 and because the Agency does not have reason to believe the environmental health or safety risks addressed by this action present a disproportionate risk to children. The action concerns the designation and de-designation of ocean disposal sites and would only have the effect of providing designated locations to use for ocean disposal of dredged material pursuant to section 102(c) of the MPRSA.

i. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211, ``Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use'' (66 FR 28355, May 22, 2001) because it is not a ``significant regulatory action'' as defined under Executive Order 12866.

j. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (``NTTAA''), Public Law 104-113, section 12(d) (15 U.S.C. 272) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus bodies. The NTTAA directs EPA to provide to Congress, through the OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. Although EPA stated that the proposed action did not directly involve technical standards, the proposed action and today's final action include environmental monitoring and measurement as described in EPA's SMMP. EPA will not require the use of specific, prescribed analytic methods for monitoring and managing the designated sites. Rather, the Agency plans to allow the use of any method, whether it constitutes a voluntary consensus standard or not, that meets the monitoring and measurement criteria discussed in the final SMMP.

k. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low Income Populations

To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency must make achieving

environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands. Because this action addresses ocean disposal site designations (away from inhabited land areas), no significant adverse human health or environmental effects are anticipated. The action is not subject to Executive Order 12898 because there are no anticipated significant adverse human health or environmental effects.

List of Subjects in 40 CFR Part 228

Environmental protection, Water pollution control.

Authority: This action is issued under the authority of section 102 of the Marine Protection, Research, and Sanctuaries Act, as amended, 33 U.S.C. 1401, 1411, 1412.

Dated: April 28, 2006.
L. Michael Bogert,
Regional Administrator, Region 10.

? For the reasons set out in the preamble, Chapter I of title 40 is amended as set forth below:

PART 228--[AMENDED]

? 1. The authority citation for part 228 continues to read as follows:

Authority: 33 U.S.C. 1412 and 1418.

? 2. Section 228.15 is amended by revising paragraphs (n)(4)(i), (ii), (iii), (iv), (v), and (vi) to read as follows:

Sec. 228.15 Dumping sites designated on a final basis.

* * * * *

(n) * * *

(4) * * *

(i) Location: 43[deg]22'54.8887'' N, 124[deg]19'28.9905'' W; 43[deg]21'32.8735'' N, 124[deg]20'37.7373'' W; 43[deg]22'51.4004'' N, 124[deg]23'32.4318'' W; 43[deg]23'58.4014'' N, 124[deg]22'35.4308'' W (NAD 83).

(ii) Size: 4.45 kilometers long and 2.45 kilometers wide.

(iii) Depth: Ranges from 6 to 51 meters.

(iv) Primary Use: Dredged material determined to be suitable for ocean disposal.

(v) Period of Use: Continuing Use.

(vi) Restriction: Disposal shall be limited to dredged material determined to be suitable for unconfined disposal; Disposal shall be managed by the restrictions and requirements contained in the currently-approved Site Management and Monitoring Plan (SMMP); Monitoring, as specified in the SMMP, is required.

* * * * *

[FR Doc. 06-4286 Filed 5-10-06; 8:45 am]
BILLING CODE 6560-50-P

Part C – Tab G: Slip and Access Project; Sedimentation Study

JORDAN COVE LNG TERMINAL
COOS BAY, OREGON

SEDIMENTATION STUDY

Prepared for:

BLACK & VEATCH

and

Jordan Cove Energy Project, L.P.

Rev No	A	B	0	1	2
Issue Purpose	Issued for Client Approval	Revised Erosion Coefficient			
Date	04/25/2005	05/08/06			
By	OM	OM			
Checked	PA	PA			
Approved	MW	MW			
Owner Approval					

Prepared by:

MOFFATT & NICHOL

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1.0 EXECUTIVE SUMMARY

Moffatt & Nichol International (MNI) was contracted by Black & Veatch Corporation on behalf of Jordan Cove Energy Partners, L.P. to perform a hydrodynamic and sediment transport numerical modeling analysis to obtain an estimate of sedimentation rates at the proposed Jordan Cove Energy Project LNG terminal.

The proposed JCEP LNG receiving terminal is located in Coos Bay, Oregon west of the Roseburg Lumber Company. The terminal requires dredging of the berth and turning basin to a depth of 45 ft below North American Vertical Datum 1988 (NAVD88) adjacent to the Coos Bay Navigation Channel. The amount of sediment that will accumulate within these areas and the required dredging volumes to maintain the basin to the required depth is an important consideration for the project.

The proposed LNG terminal will create a relatively quiescent area vulnerable to sedimentation and will therefore require maintenance dredging. Volumetric sedimentation rates were calculated for a range of values of the suspended sediment concentration and settling velocities using the Mike21 hydrodynamic and sediment transport modeling system.

The expected volumetric sedimentation rate of cohesive sediments will be approximately 175,000 yd^3/year in the LNG/Port berth area and 39,000 yd^3/year in the maneuvering area based on the yearly average sediment concentration of 30 mg/l. The total volumetric sedimentation rate of non-cohesive sediment is expected to be insignificant.

Given the relatively small amount of suspended sediment data and high dependence of sedimentation rates from the concentration, it is recommended that longer term suspended sediment concentration measurements be collected especially during a winter season when sediment flow is typically at its highest levels .

2.0 INTRODUCTION

Moffatt & Nichol International (MNI) was contracted by Black & Veatch Corporation on behalf by Jordan Cove Energy Partners, L.P. to perform a hydrodynamics and sediment transport numerical modeling analysis used to obtain an estimate of sedimentation rates at the proposed Jordan Cove Energy Partners LNG terminal.

The proposed LNG receiving terminal is located in Coos Bay, Oregon west the Roseburg Lumber Company. The terminal requires dredging of the berth and turning basin to a depth of 45 ft below North American Vertical Datum 1988 (NAVD88) adjacent to the Coos Bay Navigation Channel. The amount of sediment that will accumulate within these areas and the required dredging volumes to maintain the basin to the required depth is an important consideration for the project.

3.0 SITE CONDITIONS

Site conditions relevant to sedimentation transport processes at the project location include tidal elevations, tidal currents, suspended sediment concentrations, sediment characteristics, and historical dredging volumes. Limited field measurements were obtained by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc. (PB&DEA) as a part of a hydrodynamic and water quality study near the proposed LNG terminal location during a spring tide on June 22–23, 2005. The data included measurements of currents with Acoustic Doppler Current Profiler (ADCP), water quality with Hydrolab *in situ* probe (model Quanta), and lab analysis of grab samples for total suspended solids (TSS), total dissolved solids, and turbidity. Site conditions are summarized in the following paragraphs.

3.1 Tidal Elevations

The Coos estuary is a drowned river mouth basin with an estimated surface water area of 10,973 acres at high tide and 5,810 acres at low tide. The estuary is relatively shallow, with an average depth of 7 feet below Mean Lower Low Water (MLLW) and broad expanses of tidal flats and mud are exposed at low tide.

The tides of Coos Bay are of the mixed semi-diurnal type with paired highs and lows of unequal duration and amplitude. The tidal range increases upstream to the city of Coos Bay and the time difference between peak tides at the entrance and Coos Bay is about 40-90 minutes. The head of tide is located at River Mile 27 on both the Millicoma and South Fork Coos Rivers.

Water level measurements from several stations in the bay are available (refer to Figure 4-1). Complete tide data are available online through a station maintained by NOS (National Ocean Service) in Charleston, OR (Station CHAO3-9432780, 43°20'42" N 124°19'18" W) which is located at the mouth of the channel. Other stations were operated for a short period of time to establish tidal datums. Table 3-1 summarizes tidal datums for several locations in the Coos Bay. The mean tide range at Charleston is approximately 5.7 ft. At the North Bend station it is approximately 6.5 ft.

Table 3-1: Tidal Datums (from NOAA CO-OPS)

Station	Charleston	Sitka Dock	Empire	North Bend	Isthmus Slough
Tidal epoch	1983–2001	1983–2001	1960–1978	1983–2001	1983–2001
Measurement time period	1983–2001	Sep–82	Nov–Dec 1976	Sep–82	Sep–82
Length of series	19 years	1 month	2 month	1 month	1 month
Control station	–	Charleston	Charleston	Charleston	Charleston
Relative to, ft	**NAVD88**				**MLLW**
Highest observed water level	10.68 1/26/1983		8.85 10/24/1976		
Mean higher high water (MHHW)	7.12	7.14	7.07	7.46	*8.74*
Mean high water (MHW)	6.46	6.47	6.41	6.81	*8.08*
Mean tide level (MTL)	3.61	3.58	3.55	3.58	*4.71*
Mean sea level (MSL)	3.58	3.59		3.70	*4.90*
National geodetic vertical datum 1929 (NGVD29)	0.00		3.49		
Mean low water (MLW)	0.77	0.70	0.69	0.36	*1.35*
North American vertical datum 1988 (NAVD88)	0.00	0.00	0.00	0.00	
Mean lower low water (MLLW)	–0.50	–0.58	–0.59	–0.97	*0*
Lowest observed water level	–3.58 6/1/1973		–2.39 11/21/1976		

3.2 Tidal currents

The following general information on currents was obtained from the Oregon Geographic Response Plan (Northwest Area Committee, 2004). Currents resulting from tidal action

range up to 6.0 feet per second at the entrance. In the shipping channel, currents range from 1 to 4 feet per second with the strongest currents occurring in the lower bay.

Tidal currents in the vicinity of the site were recorded by PB&DEA during a spring tide on June 23, 2005. The peak tidal current measured during ebb tide had higher velocities toward the southern side of transect where the mudline elevations begin to increase. Peak ebb tidal currents were about 3 to 4 ft/s in the vicinity of the project site during spring tide. Measurements along the channel showed currents in alignment with the Roseburg Lumber Company river frontage but transitioning rapidly to the north as the bathymetry opens northward near the project site. This turning of the velocity may indicate the presence of an eddy or at least a relatively slack water area west of the Roseburg Lumber Co. facility.

3.3 Salinity, Waves, and Wind

Salinity, waves, and wind were not considered in the present model.

3.4 River Discharges and Sediment Loads

Numerous rivers and smaller creeks—called sloughs—enter the Coos Bay system and drain area of approximately 606 sq. miles and discharge fresh water laden with suspended sediments. The largest of the streams are Coos River, North Slough, Isthmus Slough, South Slough, Kentuck Slough, Willanoh Slough, and Pony Creek, with the combined drainage area of 545 sq. miles (see Table 3-3). Coos River alone drains approximately 437 sq. miles and therefore has the most significant effect on sedimentation, especially in the upper part of the bay. The drainage areas were approximated with using the USGS online tool for watershed analysis Elevation Derivatives for National Applications (EDNA).

Within the Coos Bay watershed a number of stations for measurement of water levels and discharges were established by USGS and Oregon Department of Water Resources (ODWR). Time periods for the available data records vary and do not always overlap (see Table 3-2). However, statistical values for average annual or seasonal discharges for the stations can be computed, the contributing drainage areas (gauged areas) are much smaller than the total drainage area of the bay. This would require a method to extrapolate the data to be used for a larger watershed. Also, these stations did not have measurements for suspended sediment concentrations for estimation of the total sediment load or the amount of sediments carried by a stream in suspension or bedload.

Assuming that the stream discharge and sediment load depend mainly on the amount of precipitation, evaporation, and soil characteristics, data from closely located streams in the region may be used to estimate average quantities for an unmeasured stream. To check if the meteorological conditions, soil and land coverage characteristics do not differ much between streams in the area, the average discharges were compared to the drainage areas. In Figure 3-1, the gauged drainage areas are compared to the annual

average discharge for the streams which have a record of measured concentration of suspended solids. Relative locations of the stations are shown in Figure 3-3 with a list of station presented in Table A-1 (see Appendix A). It can be seen, that all streams can be divided into two groups—located in the near coast region and farther inland. The relationship can be approximated with expression

$$Q = 10^b A^a \tag{1}$$

where Q is the average discharge in ft^3/s, A is the drainage area in square miles, and a and b are the regression coefficients. It can be seen that the data points for the gauged streams near Coos Bay are approximated well with a line computed for the near coast stations. Only one outlier is the Pony Creek station where discharges were smaller than for the streams with similar drainage areas. This can be explained by an existing dam on the creek.

To investigate if there is a seasonal variability for discharges for the near coast streams, the average discharges were calculated for winter (November to April) and summer (May to October) periods based on the data from 54 stations. While the variability of coefficient a is very small (0.87–0.88), the coefficient b changes significantly (from 1.00 to 0.1), which results in a decrease in the average discharges up to approximately 8 times between winter and summer periods. In Figure 3-4, an example of measured discharge is shown for a station on Sixes River (USGS station 14327150). It can be seen that the flow during winter period was high compared to the summer months.

Based on the estimated drainage areas, the average seasonal and annual discharges for the Coos Bay streams were calculated. The results are shown in Table 3-3. The average winter discharge for Coos River was approximated as 1,983 ft^3/s, while during summer it was only 282 ft^3/s. The yearly average becomes 1,185 ft^3/s.

Similar analysis was done to estimate average sediment concentrations and sediment loads in the streams. A good correlation was found between measured almost instantaneous (averaged during minutes to hours) water discharges and suspended sediment concentrations and loads (refer to Figure 3-4). In Figure 3-5 and Figure 3-6, the measured discharges in ft^3/s are plotted versus the suspended sediment concentrations (g/l) and loads (metric tons/day) for the Sixes River station. The correlation coefficients indicate that there is a strong linear relationship between logarithms of the quantities. Therefore, the computed regression coefficients can be used to predict levels of concentration and sediment load in the stream.

To estimate the total sediment load and average suspended sediment concentrations from Coos River and other streams in Coos Bay, the coefficients were calculated as average of the coefficients computed for every station in the near coast region with available concentration measurements (total of 17 stations). The results were gathered into Table 3-3. The average annual load for Coos River becomes 740 metric tons/day with winter loads increasing to 3,272 tons/day. In order to justify these results, three closely located streams with similar drainage areas were considered. Table 3-4 shows the average

discharges, sediment concentrations and loads measured at Sixes, Siuslaw, and Alsea rivers. From the measurements, the average sediment loads vary between 442–1070 tons/day annually and 888–1959 tons/day in winter. The amount of sediments entering the bay during winter time is a reasonable estimate because of very high sediment load of Sixes River, which has a much smaller drainage area (116 versus 437 square miles of Coos River). During summer period the loads were much smaller and range from 3–18 tons/day for the considered streams. Therefore, it can be concluded that the winter sediment loads from Coos River dominate sedimentation in Coos Bay compared to other streams entering the bay with the total load of 1,000–3,300 metric tons per day.

Table 3-2: List of Stream Gauge Stations in the Coos Bay Watershed

Agency	Station number	Station location	Drain. area, sq mi	Begin	End
ODWR	14323200	TENMILE CREEK NR LAKESIDE	87.0	10/1/1957	10/31/1976
ODWR	14323500	TIOGA CREEK NR TIOGA	24.3	10/1/1982	9/30/1996
ODWR	14323997	PRIORLI CREEK NR DELLWOOD	n/a	10/1/1983	9/30/1996
ODWR	14324500	WEST FORK MILLICOMA R NR ALLEGANY	46.0	10/1/1954	11/30/1981
USGS	14324580	PONY CREEK AT COOS BAY	3.9	7/1/1975	9/30/2004
ODWR	14324583	WINCHESTER CREEK NR CHARLESTON	6.9	8/1/1991	9/30/1996
ODWR	14324585	UNNAMED TRIB TO WINCHESTER CR NR CHARLESTON	n/a	12/1/1991	5/31/1994

Table 3-3: Drainage Areas Approximated Average Seasonal and Annual Discharges, and Approximated Average Suspended Sediment Concentrations and Sediment Loads for Significant Streams Entering Coos Bay

Stream name	Drain. area, sq mi	Annual discharge., ft^3/s	Winter discharge., ft^3/s	Summer discharge., ft^3/s	Annual TSS, mg/l	Winter TSS, mg/l	Summer TSS, mg/l	Annual load, tons/day	Winter load, tons/day	Summer Load, tons/day
Coos River	437.1	1,184.9	1,982.8	281.9	148.2	358.1	12.7	740.0	3,272.0	11.7
Isthmus Slough	33.6	123.9	212.7	28.7	3.1	7.8	–	1.1	5.2	–
North Slough	40.9	147.4	252.6	34.3	4.2	10.5	–	1.8	8.5	–
South Slough	29.7	111.3	191.3	25.8	2.6	6.5	–	0.8	3.8	–
Pony Creek	3.9	18.5	32.5	4.2	2.1	2.1	–	–	–	–
Kentuck & Willanoh Sloughs	23.2	89.3	154.0	20.6	2.1	4.5	–	–	2.0	–
Total	**545.2**	**1,586.0**	**2,671.9**	**374.9**						

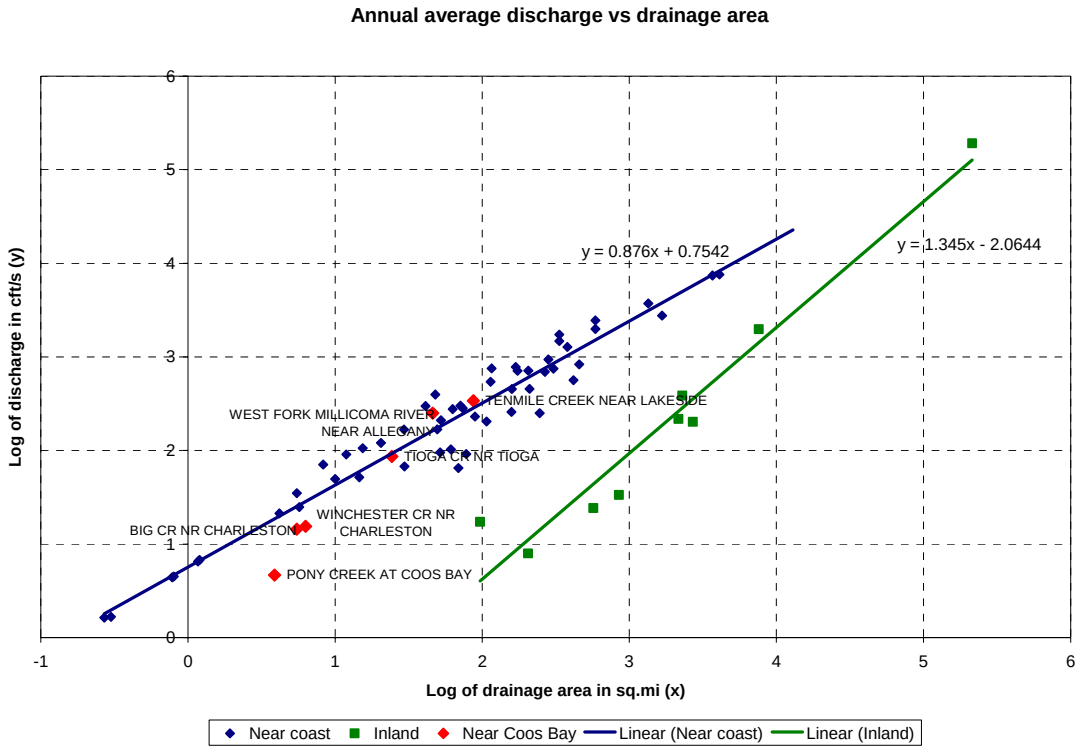

Figure 3-1: Relationship between Annual Average Discharge and Drainage Area for Selected near Coast and Inland Streams in Oregon

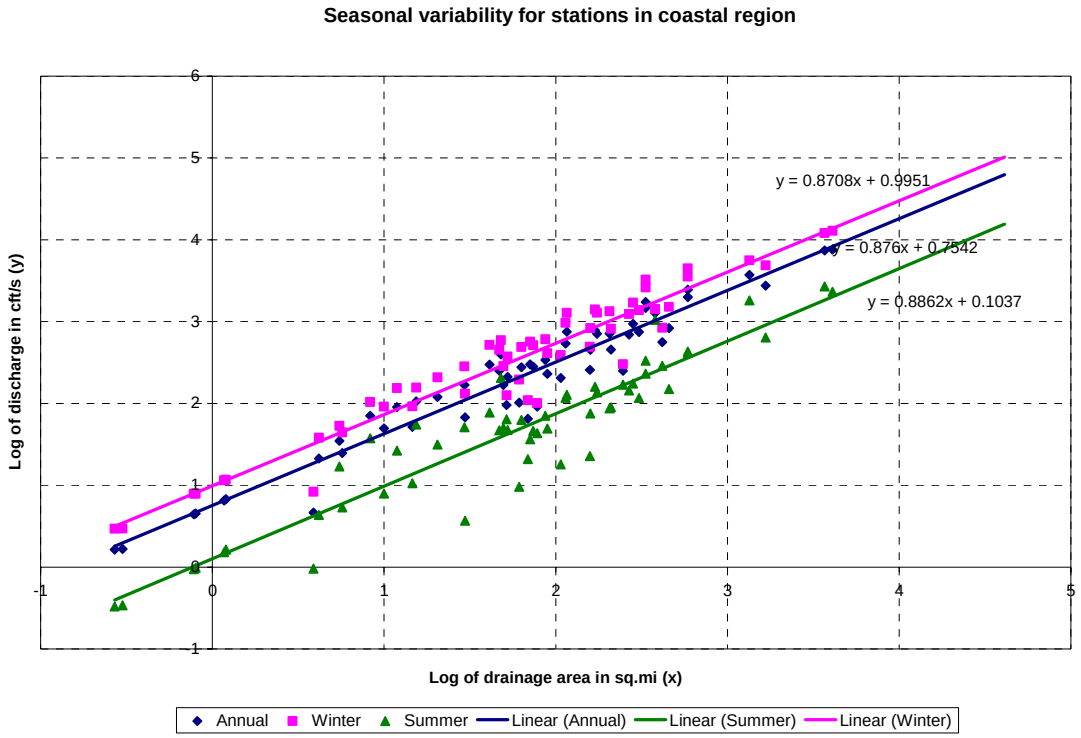

Figure 3-2: Seasonal Variability in Annual Average Discharge for the Streams in near Coastal Region

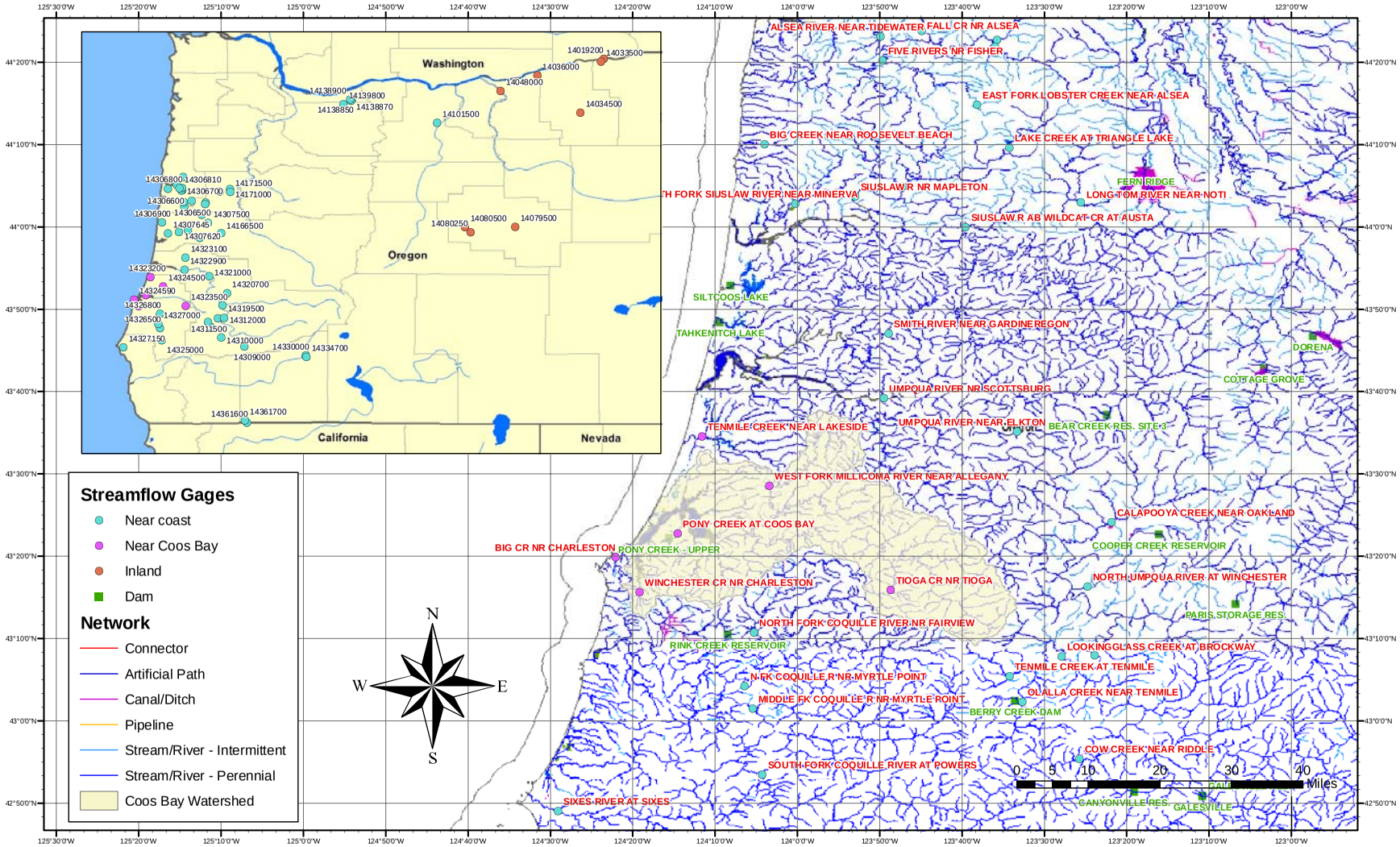

Figure 3-3: Gauged Water Streams in Coos Bay Area and Selected Stations with Available Measurements for Suspended Sediment Concentrations and Total Sediment Load

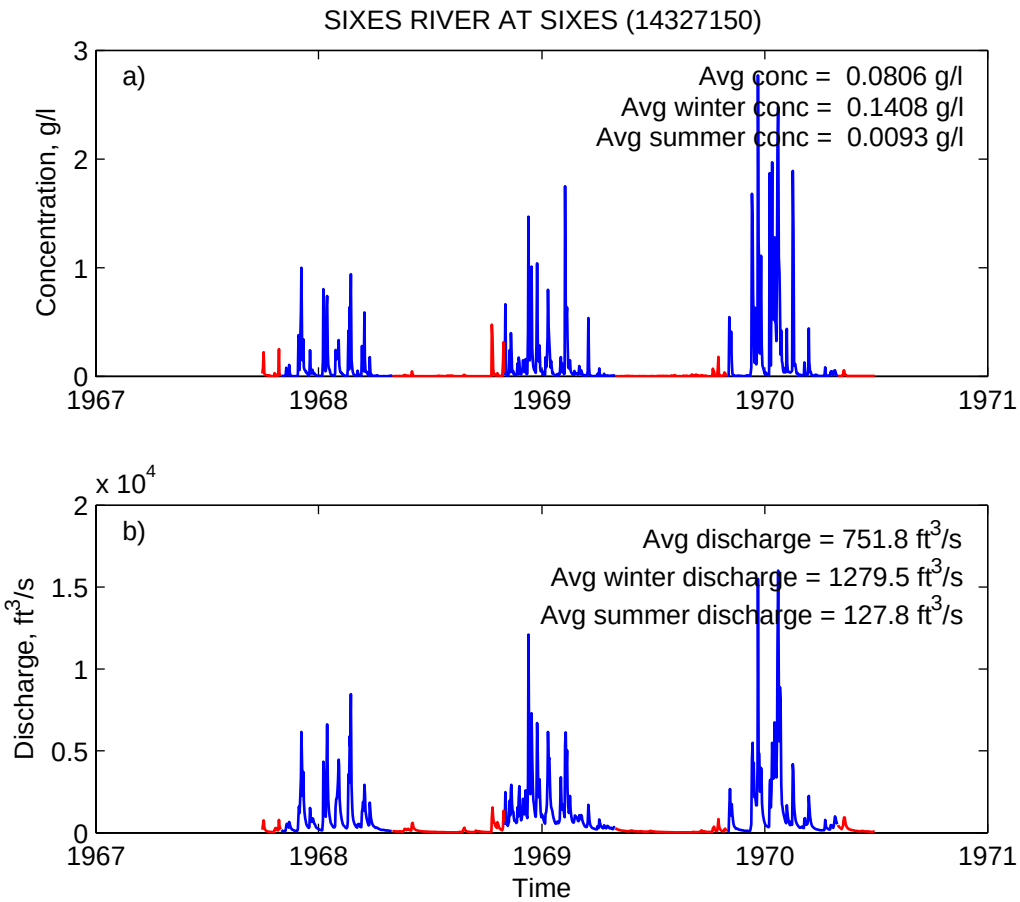

Figure 3-4: Time Series of Measured Water Discharge and Suspended Sediment Concentrations at USGS Station 14327150 on Sixes River

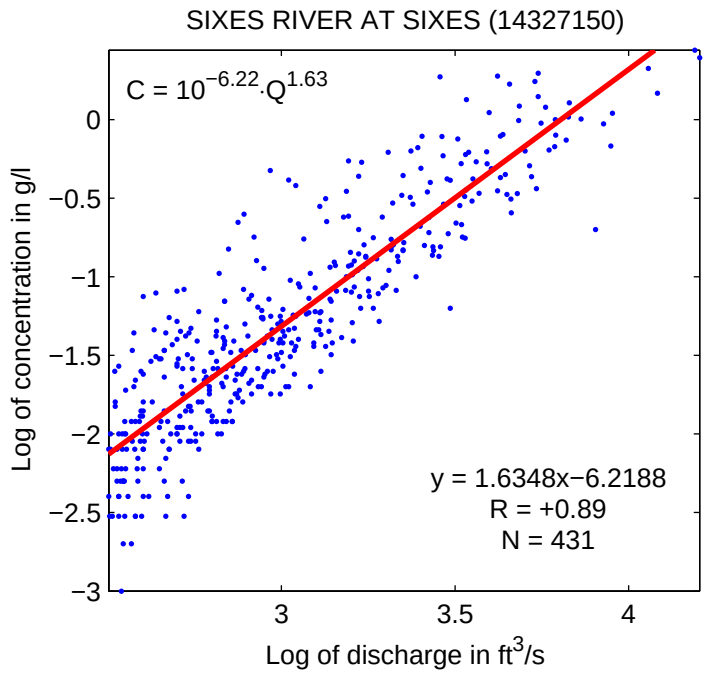

Figure 3-5: Relationship between Measured Instantaneous Water Discharge (*Q*) and Suspended Sediment Concentrations (*C*) at USGS Station 14327150 on Sixes River

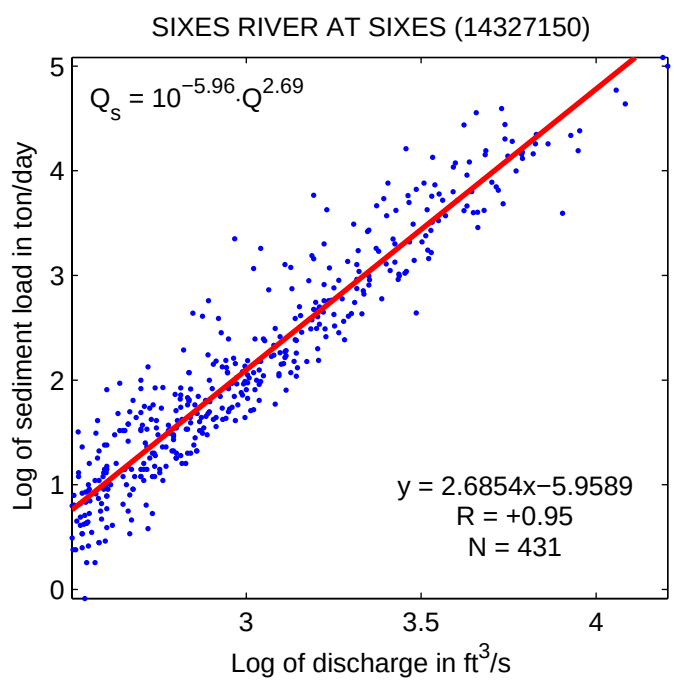

Figure 3-6: Relationship between Measured Instantaneous Water Discharge (*Q*) and Sediment Load (Q_s) at USGS Station 14327150 on Sixes River

Table 3-4: Measured Average Water Discharges, Sediment Concentrations, and Sediment Loads from Selected Station near Coos Bay Compared to Approximated Values for Coos River

Station ID	Alsea River	Siuslaw River	Sixes River	Coos River
Drainage area, sq.mi	334	588	116	**437**
Begin date	10/1/1939	10/1/1967	10/1/1967	**–**
End date	9/30/2004	9/30/2004	6/30/1970	**–**
Average discharge, ft³/s				
Annual	1,733	2,452	752	**1,185**
Winter	3,259	4,476	1,279	**1,983**
Summer	231	416	128	**282**
Suspended sediment concentration, mg/l				
Annual	20	18	81	**148**
Winter	36	31	141	**358**
Summer	4	6	9	**13**
Average sediment load, metric tons/day				
Annual	442	478	1,070	**740**
Winter	888	945	1,959	**3,272**
Summer	3	8	18	**12**

3.5 Suspended Sediment Concentrations

Variation of the suspended sediment concentration is one of the major parameters which govern the sedimentation rates in the bay. Therefore, knowledge of average values or ranges of concentration change is very important for accurate prediction of resulted sedimentation in the basin. Limited measurements of suspended sediment concentrations in Coos Bay were obtained by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc. as a part of hydrodynamic and water quality study near the proposed LNG terminal location (see Table 3-5). The average measured concentration was 14 mg/l with some special and temporal variability within 0–25 mg/l. Although the grab samples were taken from both bottom and surface layers, dependence of the TSS levels on depth was not determined. This may indicate that:

- The water column is well mixed;
- Fine sediments (such as silt and clay) are the primary sediments in suspension.

The average TSS concentrations can also be estimated based on the sediment load from Coos River. For winter months the average discharge from Coos River results in approximately 2.5×10^6 m^3 of water per tide cycle (assuming 1,982 ft^3/s) with the total sediment load of 1.7×10^6 kg/tide. The tidal prism of Coos Bay is approximately equal to 6.75×10^7 m^3. Assuming zero concentrations of suspended sediments in ocean water, the average concentration can be calculated as a ratio of sediment load to the total exchange volume. This results in the average concentration of 24 mg/l for winter months. After entering the bay, coarser sediments settle within the channel, while finer sediments remain in suspension for a longer period of time. Also, the deposited sediments can be picked up from the bottom during a subsequent tide and stay in suspension until settling. Therefore, some sediments are always in suspension. These sediments may increase the estimated concentrations by some value.

Table 3-5: Grab Samples and Measured Total Suspended Solids Obtained in Coos Bay during Hydrodynamic and Water Quality Study by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc.

Sample ID	Time, UTC	Location	Depth	TSS, mg/l
WQ3A	6/23/05 8:00 AM	3	Surface	8
WQ3D	6/23/05 8:15 AM	3	Bottom	10
WQ1F	6/23/05 9:02 AM	1	Surface	ND[1]
WQ2G	6/23/05 9:15 AM	2	Surface	ND
WQ2GB	6/23/05 9:23 AM	2	Bottom	ND
WQ9C	6/23/05 11:29 AM	9	Surface	16
WQ9D	6/23/05 1:17 PM	9	Surface	25
WQ6A	6/23/05 2:39 PM	6	Surface	5
WQ5A	6/23/05 2:48 PM	5	Surface	8
WQ4A	6/23/05 3:03 PM	4	Surface	19
WQ1K	6/23/05 3:19 PM	1	Surface	14
WQ1L	6/23/05 3:27 PM	1	Bottom	19
WQ2N	6/23/05 3:39 PM	2	Surface	12
WQ2O	6/23/05 3:45 PM	2	Bottom	15
WQ3E	6/23/05 3:46 PM	3	Surface	9
WQ3H	6/23/05 3:54 PM	3	Bottom	16
WQ7A	6/23/05 4:20 PM	7	Surface	23

[1] Not detected.

The TSS concentrations can also be estimated from turbidity measurements, although accuracy of the conversion can vary significantly. *In situ* turbidity measurements were obtained at the same time as the grab samples on June 23, 2005 by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc. Average of 51 samples resulted in 7.1 NTU.

A longer record of turbidity measurements for the period from April, 2002 to December, 2004 at the Charleston Bridge near Charleston is available as a part of NOAA NERRS project (NANOOS). From the data the monthly average turbidity levels were computed with results shown in Table 3-6. Average turbidity during summer period (May to October) was significantly lower than during winter. Also, during some individual events measured turbidity was recorded to be over 100–200 NTU.

To convert turbidity into TSS a model is required. Based on measurements from nine streams in King County, Washington Packman et al (1999) derived an empirical relationship between measured turbidity (in NTU) and TSS (in mg/l):

$$\ln(TSS) = 1.32 \cdot \ln(NTU) + c \qquad (2)$$

where ln() is the natural logarithm and constant c is not significantly different from zero.

To check validity of the expression, the data from PB measurements was used. Measured *in situ* turbidity was converted into TSS and plotted together with the measured TSS from the grab samples (see Figure 3-7). During low tide, the converted TSS was higher than the measured. A source of that may be in non-consistent sampling locations and depths, which also result in scatter in the data. However, overall converted and measured concentrations agree quite well, which makes the above expression a valid estimator.

Figure 3-7 also shows that the concentration levels during low tide were higher (5–37 mg/l) than at high tide (0–10 mg/l) with an approximate difference of 15–17 mg/l. This indicates that water in the upper part of the bay is more turbid than in the lower bay. It can be because of the difference between the suspended sediment concentrations in water entering the bay from the ocean compared to the water in the bay. One can expect that the difference can be more significant during winter months with higher sediment loads from Coos River and other streams.

Using the above expression, average concentrations were computed from the turbidity measurements at Charleston Bridge. The results are shown in Table 3-6. Average summer concentrations were estimated to be 10.1 mg/l, while during winter season average concentrations increase to 27.3 mg/l. The Charleston station is located close to the bay entrance. Therefore, the turbidity and TSS levels may be lower compared to the upper bay locations because of entrainment of water from the ocean.

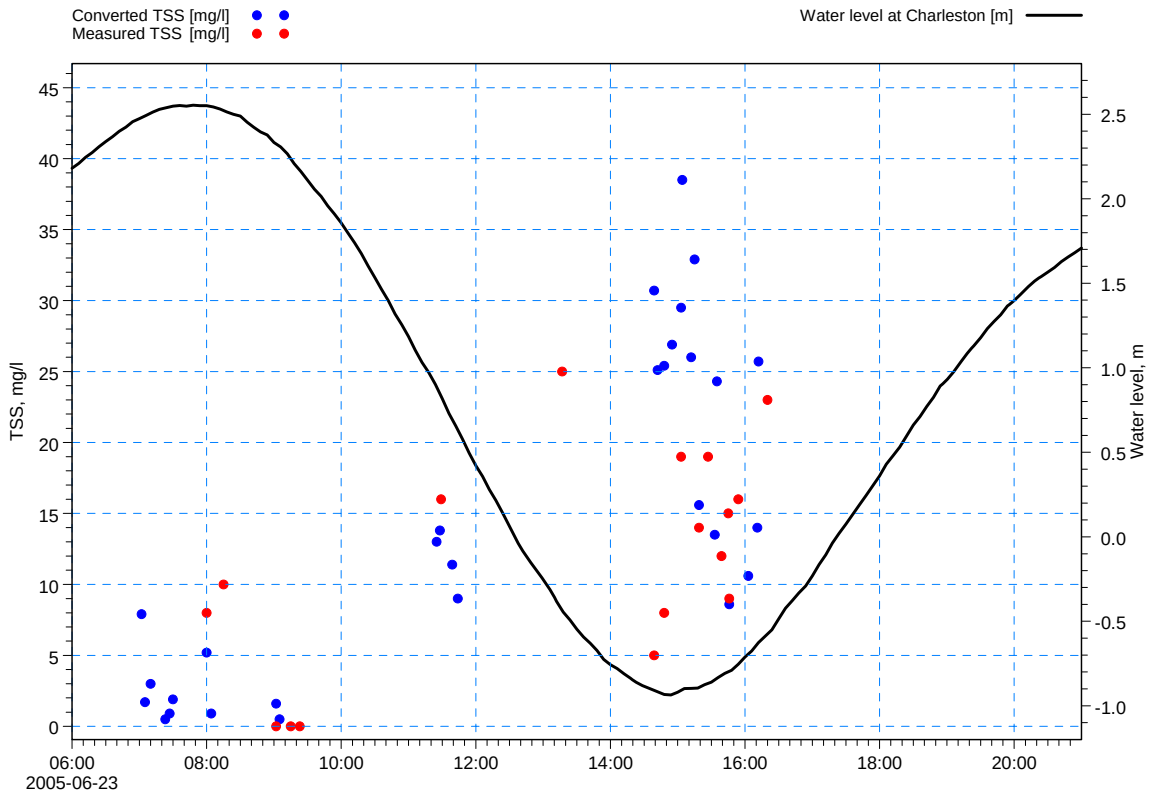

Figure 3-7: Converted versus Measured Suspended Sediment Concentrations from Water Quality Measurements by PB&DEA. Shown Water Levels above NAVD88

Table 3-6: Measured Turbidity and Estimated Total Suspended Solids at Charleston Bridge Station (NANOOS) for 2002–2004 Period

Summer			**Winter**		
Month	Turbidity, NTU	TSS, mg/l	Month	Turbidity, NTU	TSS, mg/l
May	9.3	19.0	January	5.7	9.9
June	7.2	13.5	February	11.3	24.6
July	5.8	10.3	March	11.9	26.4
August	4.7	7.7	April	9.2	18.7
September	3.8	5.8	November	18.1	45.7
October	3.7	5.7	December	15.0	35.7
Total	**5.8**	**10.1**	**Total**	**12.2**	**27.3**

The summary of sediment concentration data within Coos Bay is shown in Table 3-7. As it can be seen, the TSS levels vary seasonally and during each tidal cycle. One can also expect spatial variability along the bay. These values provide some information on concentrations in vicinity of the proposed site location; however, there is no available information on the TSS levels during winter time when the sedimentation rates are expected to be the highest.

Table 3-7: Summary on Available Data for Total Suspended Solids

Source	Location	Period	Range, mg/l
PB and DEA (grab samples)	Upper Jarvis Range	June 23, 2005	0–10 (high tide) 5–25 (low tide)
PB and DEA (turbidity)	Upper Jarvis Range	June 23, 2005	0–8 (high tide) 8–37 (low tide)
NANOOS (turbidity)	Charleston Bridge	Apr, 2002–Dec, 2004	6–19 (summer) 10–46 (winter)
Coos River (estimate)	Coos Bay	–	24 (annual)

3.6 Bottom Sediment Characteristics

An extensive sediment sample data collection was undertaken by SHN Consulting Engineers and Geologists, Inc (SHN) in Coos Bay. A total of 21 bottom grab samples were obtained from several locations within the ship channel and mud flats. The sampling locations are shown in Appendix B. The results of sediment size analysis are included in Appendix C with a summary presented in Table 3-8.

Among all samples, nineteen samples were loose sediments consisting of shell fragments, fine to medium sand, and some fine material such as silt, clay, and mud. Two samples, namely #3 and 4, contained sand stone, which is sand and shell fractions cemented together by mud particles (see Figure 3-8). Absence of loose material indicates presence of highly energetic flows at that part of the channel when any loose particles are transported away along the channel. In the lab, all samples were heated to remove moisture. During the operation, samples #3 and 4 were dispersed into fractions under the heat. The sieve analysis of these samples showed much higher content of fine particles than in other samples from the channel—38 and 50% of particles by weight passed sieve #200.

The sieve analysis also showed that the fine well sorted sand with average size D_{60} of 0.29 mm is the primary sediment in the channel. Samples from the channel contain only 1.8% of fines on average, while samples taken from the mud flats contain 21% of fines with the maximum of 49% in Jordan Cove. Jordan Cove is a natural embayment located east of Roseburg Lumber Co. property about 1.25 miles from the proposed LNG site. It is similar in shape and placement to the proposed basin. Therefore, the sedimentation

processes in the proposed LNG basin will be similar to that in Jordan Cove, namely the sedimentation with fines will prevail over the sedimentation with sand.

Settling velocity of the sand fractions is approximated at 40 mm/s based on the sediment size. Settling velocities for the mud particles were not measured and needs to be estimated. A range of velocities from 0.1 to 0.5 mm/s was used based on the sediments with similar properties. More precise values can be chosen after calibration of the numerical model.

Sample #3(field)

Sample #4 (field)

Sample #3 (lab)

Sample #4 (lab)

Figure 3-8: Conditions of Samples #3 and #4 after Extraction and in the Lab: Consolidated Sand, Mud, and Shells after Application of Heat Became Loose

Table 3-8: Summary of Sediment Size Distribution from Sieve Analysis (Shown Percent Passing) (from SHN, March 2006)

Num	Depth, ft	Sieve number and size, mm										D_{60}	D_{10}	C_u
		3/8" 9.53	#4 4.75	#10 2.00	#16 1.18	#30 0.600	#40 0.425	#50 0.300	#60 0.250	#100 0.150	#200 0.075			
1	54	–	–	100	100	100	88	36	21	1.7	1.0	0.36	0.19	1.9
2	45	–	–	100	100	96	47	12	6.8	1.2	0.8	0.47	0.28	1.7
3	45	–	100	99	98	98	97	95	93	58	38	0.16	–	–
4	44	100	93	91	90	87	77	64	62	58	50	0.20	–	–
5	16	–	–	100	100	100	96	61	37	3.4	2.1	0.30	0.17	1.8
6	52	–	–	100	100	97	60	12	7.0	1.6	0.8	0.43	0.28	1.5
7	34	–	–	100	100	100	100	74	39	2.2	1.0	0.28	0.17	1.6
8	5	–	–	100	100	99	96	67	51	32	22	0.28	–	–
9	47	–	–	100	100	99	89	33	19	1.7	1.4	0.36	0.20	1.8
10	50	–	–	99	99	98	87	31	19	4.9	4.5	0.36	0.19	2.0
11	30	–	–	100	99	99	97	75	59	34	28	0.25	–	–
12	7	–	–	100	100	100	96	59	40	3.7	1.9	0.30	0.17	1.8
13	7	–	–	100	100	100	98	84	72	51	49	0.19	–	–
14	6	–	–	100	100	100	97	66	47	18	9.4	0.28	0.08	3.5
15	49	–	–	100	100	100	97	42	24	1.8	1.0	0.34	0.19	1.8
16	19	–	–	98	97	97	90	43	27	3.2	1.9	0.35	0.18	1.9
17	11	–	–	100	100	100	99	96	89	49	23	0.18	–	–
18	20	–	–	93	91	89	89	84	74	14	10	0.23	0.08	3.0
19	50	–	–	79	76	74	72	62	50	19	14	0.29	–	–
20	20	–	–	100	100	100	100	87	69	8.2	3.2	0.24	0.15	1.5
21	48	–	–	100	100	99	99	81	54	17	14	0.26	–	–

3.7 Historical Shoaling Rates and Maintenance Dredging

The maintenance dredging records were obtained from Navigation Data Center (USGS, 2006). There are two main locations within the Coos Bay ship channel which require regular dredging—at the entrance and between river miles 12 and 15 near the Coos Bay Port. Shoaling at the bay entrance is the result of the inlet and jetties interrupting the along shore sand transport. The main source for sedimentation in the upper part of the bay is from Coos River as previously discussed. The dredged material is mainly fluidized mud[1].

The dredging cycle between river miles 10–15 is every two years with average dredged volumes of about 600,000 cubic yards per operation (see Table 3-9). Estimated sedimentation rates (accumulation rates) based on the channel width of 400 ft vary between 0.6 and 1.9 ft/year with the mean of 1.2 ft/year.

Table 3-9: Dredging Records for Coos Bay Channel between River Miles 10–15

Year	Ranges, river mile	Volume, yd^3	Width, ft	Number of years	Rate, ft/year
1991	12–15	757,200	400	2	**1.61**
1993	10–15	448,597	400	2	**0.57**
1995	12–15	545,909	400	2	**1.16**
1997	12–15	662,040	400	2	**1.41**
1999	12–15	870,437	400	2	**1.85**
Total		**3,284,183**		**10**	**1.23**

Dredging at the Roseburg berth pocket located close to the proposed site is conducted every two years. Typical dredge volumes are 15,000 to 20,000 cubic yards. Berth pocket is 100 by 1,400 feet. The resulting sedimentation rates are 1.3–1.7 ft/year.

[1] Personal communication with the Coos Bay Pilots.

4.0 MODEL DEVELOPMENT

4.1 Mike21 Modeling System

The numerical model presented in this study has been developed using the general Mike21 modeling system. Three modules within this system have been used in this study: the hydrodynamic (HD), non-cohesive sediment transport (ST) and mud transport (MT) modules.

The hydrodynamic module simulates two-dimensional depth averaged unsteady flow and transport phenomena resulting from tidal and meteorological forcing. This model can be used to predict the flow in shallow seas, coastal areas, estuaries, lagoons, rivers and lakes. It also accounts for the wetting and drying areas which is especially important to be considered in Coos Bay. This model provides an accurate enough solution as required for this study.

Transport of suspended sediment is calculated in the sediment transport module by solving the advection-diffusion (mass-balance) equation for the suspended sediment. The local flow velocities and eddy diffusivities are based on the results of the hydrodynamic computations. Computationally, the transport of sediment is computed in exactly the same way as the transport of any other conservative constituent, such as salinity and heat. However, there are a number of important differences between sediment and other constituents, including the exchange of sediment between the bed and the flow and the settling velocity of sediment under the action of gravity. These additional processes for sediment are obviously of critical importance. In addition, if a net flux of sediment from the bed to the flow, or vice versa, occurs then the resulting change in the bathymetry should influence subsequent hydrodynamic calculations. The formulation of several of these processes are sediment-type specific, this especially applies for sand and mud. The sediment transport computation of Mike21 allows the combined use of cohesive and non-cohesive sediment.

4.2 Model Grid and Bathymetry

The model utilizes a rectangular grid with square cells. For the hydrodynamic model, a large grid was build which included entire Coos Bay with main rivers and tributaries to ensure accurate prediction of currents and water levels inside the bay. The grid extends from the entrance jetties to Haynes Inlet to Coos River and Isthmus Slough and included South Slough. The cell size is 20 by 20 meters, which is sufficient to accurately resolve a 300 foot channel and smaller streams. A smaller grid was also used for the sediment transport models. It included an area around the proposed LNG site. This grid was a part of the larger grid. The grid coverage is shown in Figure 4-1.

The model bathymetry has been created using NOAA Nautical Chart for Coos Bay (Chart number 18587). In addition, US Corps of Engineers (USACE) August–October, 2005 surveys at the Navigational Channel were used. The bathymetry data from NOAA

and USACE were originally referenced to the Mean Lower Low Water (MLLW) and were converted into North American Vertical Datum 1998 (NAVD88) with a linear model. The model used several available benchmarks at Charleston, Empire, R/R Bridge, North Bend, and C of E Dock (see Figure 4-1).

4.3 Hydrodynamic Boundary Conditions

The hydrodynamic model was forced with water levels measured at Charleston and applied at the bay entrance. The model assumed no fresh water inflow, no wind, and no salinity component. Then the predicted water levels and currents were used to force the sediment transport model on the smaller domain.

4.4 Model Verification

To ensure accurate prediction of hydrodynamics in the bay, calculated with the model water levels and currents were compared to the available measurements.

*4.4.1 **Water Levels***

The water level measurements were available at Charleston, Sitka Dock, North Bend, and Isthmus Slough stations for the entire month of September, 1982. Forcing the model with water level measured at Charleston, computed and measured elevations can be compared at other locations. Figure 4-2 shows a two day simulation results and measured data. The model calculations started on September 1, 1982 with a one day of “spin up” time. Good agreements between calculated and measured data are shown: the model predicts propagation of tidal wave in the bay well capturing changes in both amplitude and phase. A longer simulation was also performed (not shown) that also showed good agreement between calculated and measured data.

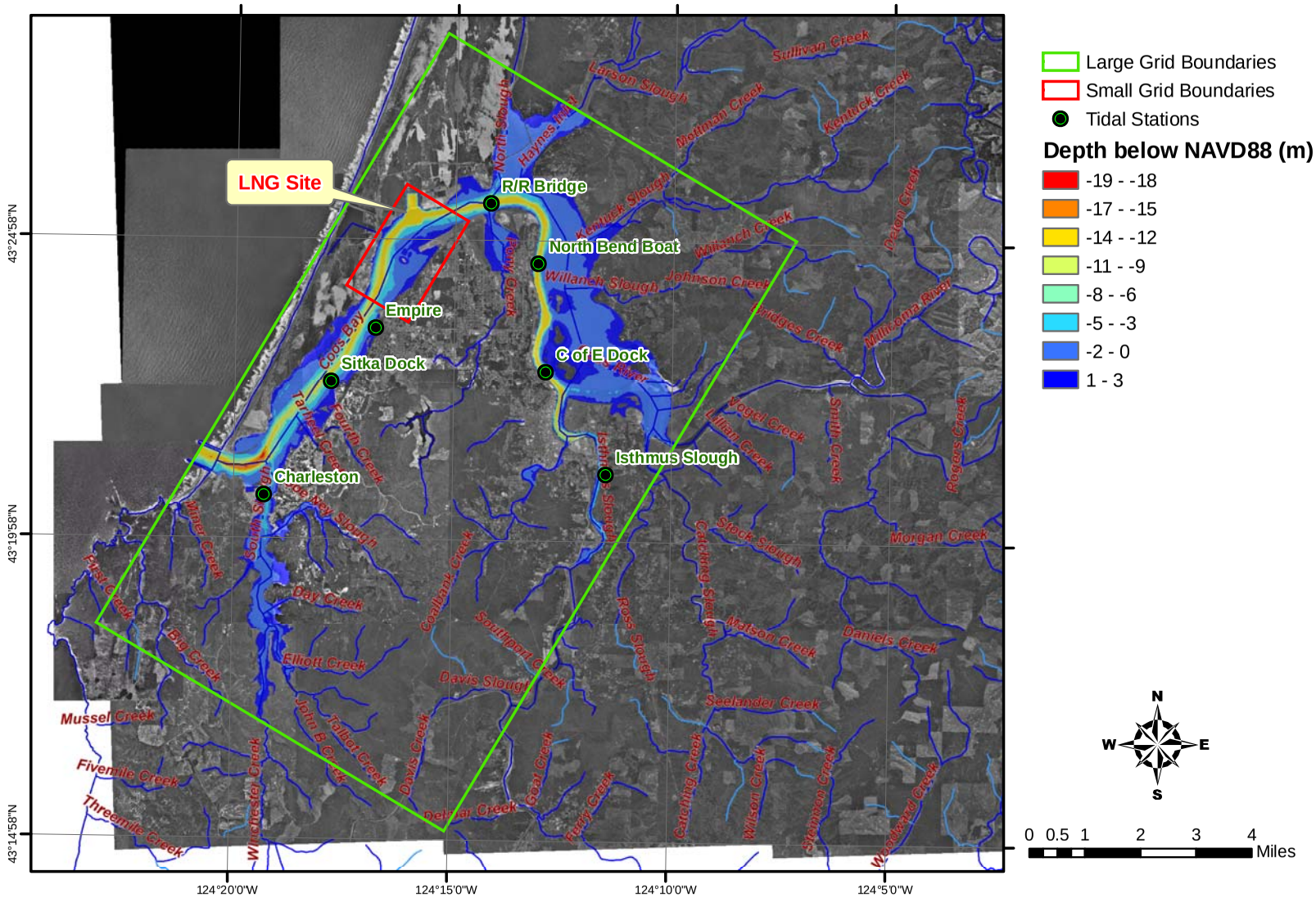

Figure 4-1: Boundary of Computational Domain and Bathymetry for Mike21 Simulations. Locations of Available Tidal Stations in Coos Bay, OR

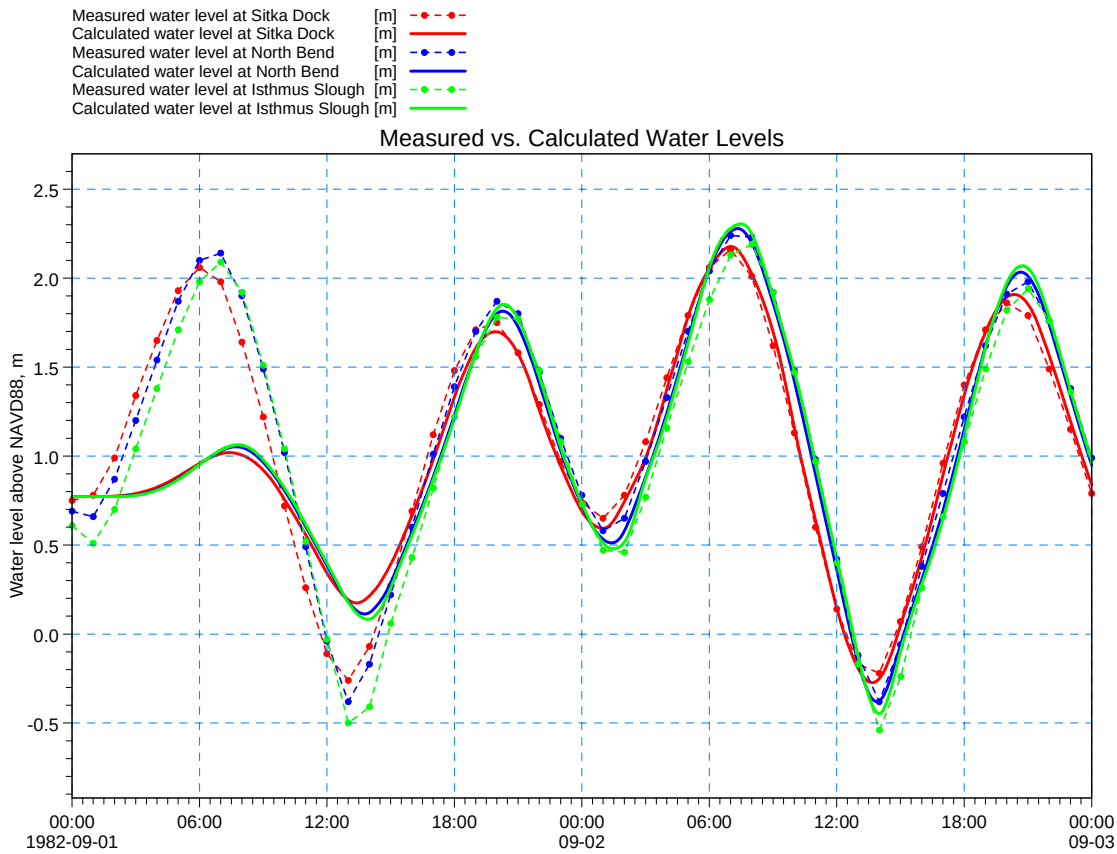

Figure 4-2: Comparison of Calculated and Measured Water Levels at Sitka Dock, North Bend, and Isthmus Slough Station

4.4.2 Flow Velocity and Discharge

Measurements with Acoustic Doppler Current Profiler (ADCP) by PB&DEA of currents during a spring tide on June 23, 2005 were compared to the model predicted results for the same period of time. The PB&DEA current measurements were taken along the three transects (reference "A", "C", and "D") in vicinity of Roseburg Lumber Co. and the proposed LNG site. The transects extended between the banks of the bay and covered the Navigation Channel and the mud flat located to the north from the North Bend Airport property. Figure 4-3 shows measured and computed water discharges. A good agreement was found for the data during flood tide. However, measured discharge during ebb tide was approximately 700 m^3/s higher than the computed number. This could be the result of not including a fresh water inflow from Coos River. The weather records showed a rain on June 18 at North Bend Airport (0.04 in) and Roseburg Airport (0.07 in) located east of Coos Bay, which with a few days of delay (usually 3–5 days) may be the cause of increased outflow.

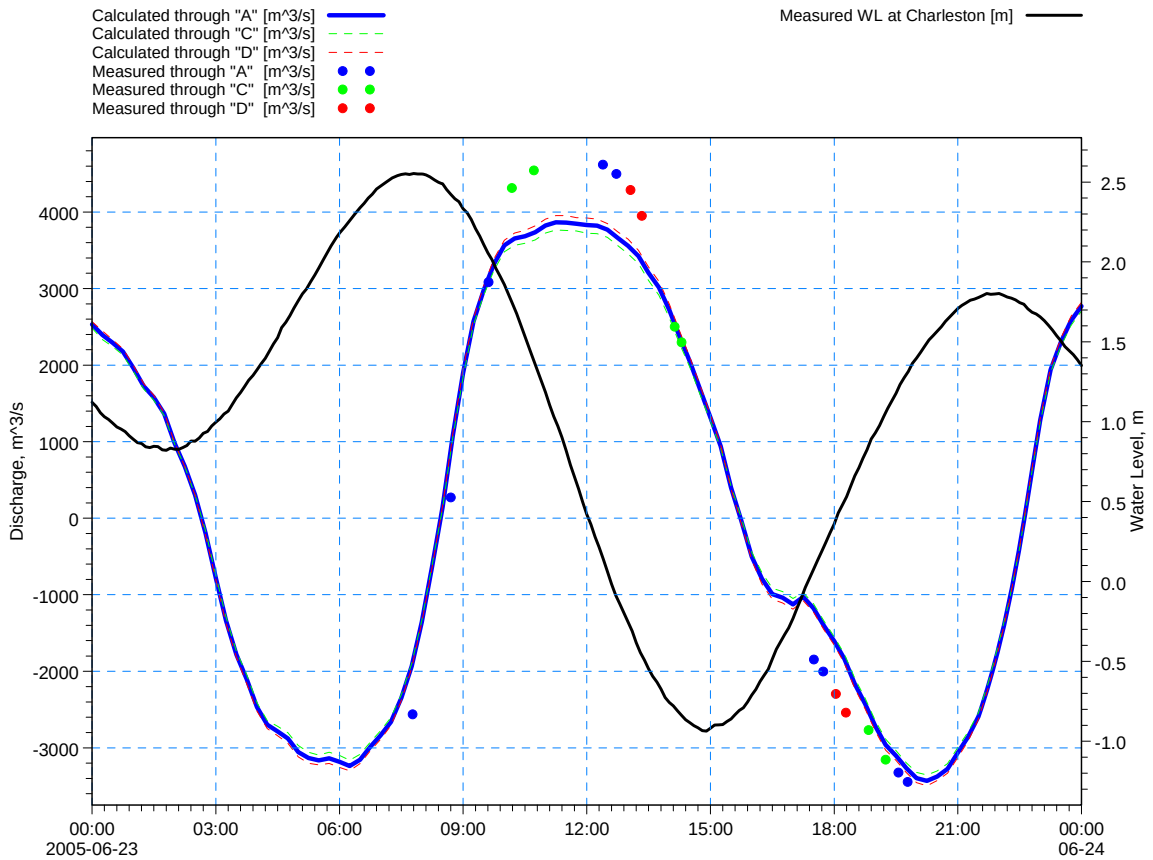

Figure 4-3: Comparison between Calculated and Measured Water Discharges. Shown Water Levels above NAVD88

The measured and computed discharge areas were also compared. Since the model accounts for wetting and drying, erroneous model parameters may result in incorrectly predicted flows. In Figure 4-4, the comparison between areas is presented. Computed values agree well with the measured data considering scatter among the measured values.

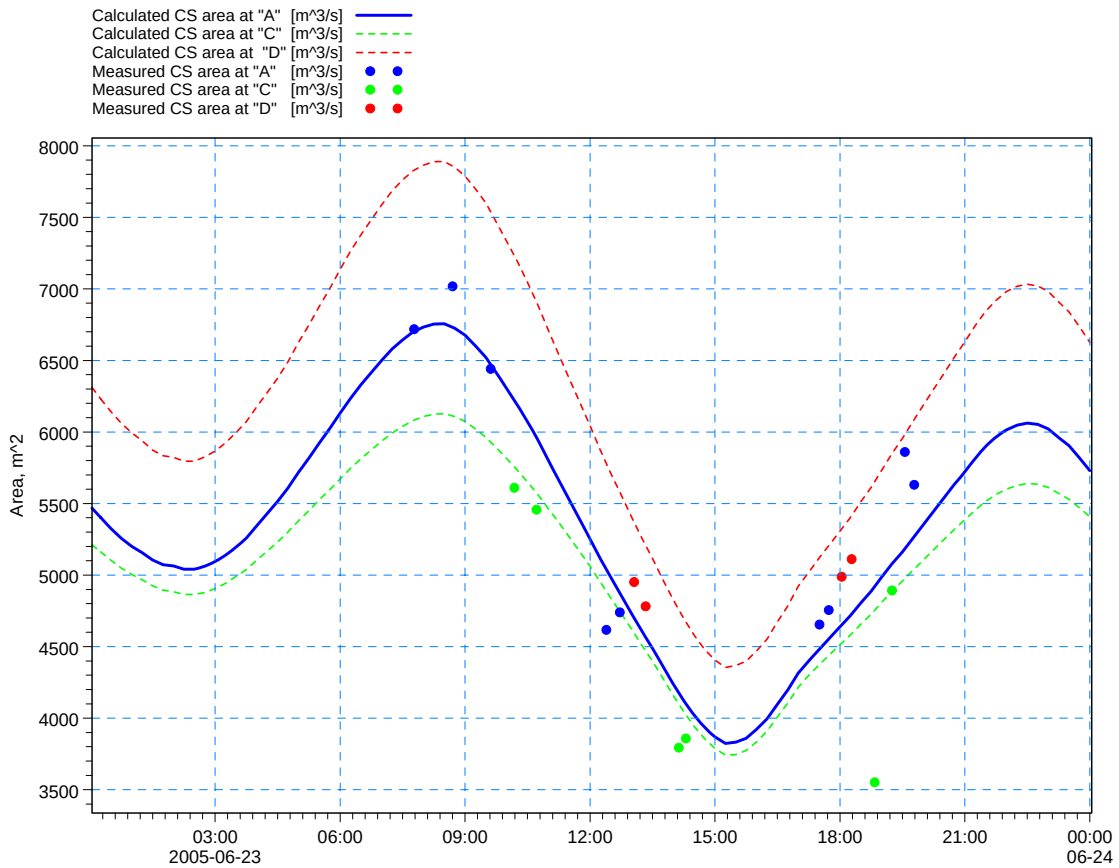

Figure 4-4: Comparison between Calculated and Measured Transect Areas

5.0 SIMULATED ALTERNATIVE

The proposed LNG terminal involves construction of a harbor basin and a maneuvering area. Figure 5-1 presents the proposed LNG basin as simulated in the model. The excavated basin has dimensions of 800 ft wide and approximately 1400 ft long between the toes with side slopes of 4:1. The depth inside the maneuvering area and basin is 45 ft below NAVD88.

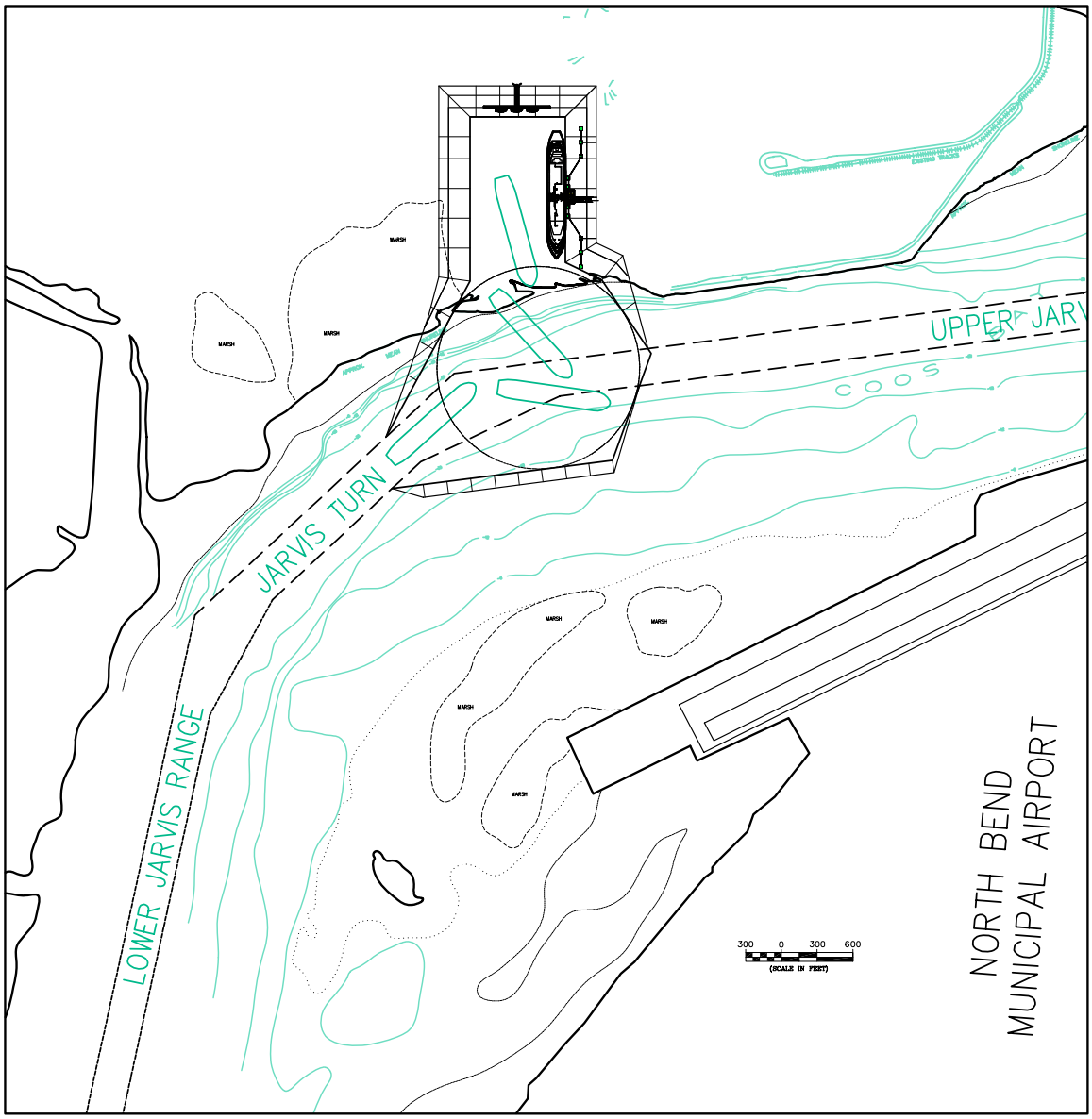

Figure 5-1: LNG Terminal: Simulated Berth Layout

6.0 SEDIMENTATION MODELING METHODOLOGY AND RESULTS

Annual sedimentation rates were extrapolated from simulation representative of tidal cycles during a period of fifteen days in January 2005. This extrapolation is valid because the morphological changes predicted for one year are not large enough to significantly modify the flow patterns within the basin. Considering time constrains for computation, the fifteen day period was found perfectly valid to simulate average conditions for long term predictions which are the main goal of this modeling exercise. The length of simulations was verified from additional longer term calculations (results not shown), which did not revealed deviations in values for predicted quantities. This period was considered acceptable as a representative period because it includes the typical tidal variability in this area (see Figure 6-1). Note, that the simulated period does not include any storm event.

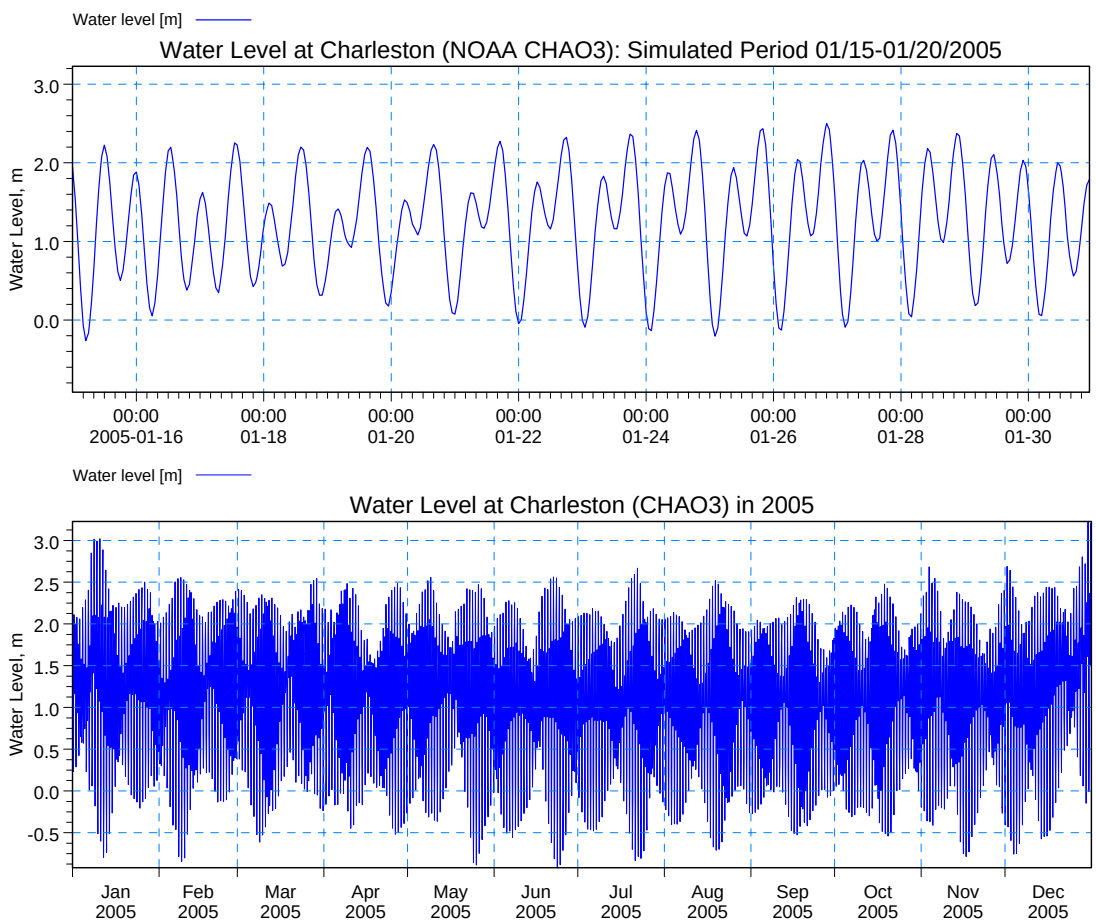

Figure 6-1: Water Level Measured at Charleston (NOAA CHAO3 Station) During Simulated Period and Entire Year of 2005

The following limitations did not allow MNI to setup and validate a model on the large grid (see Figure 4-1):

- Insufficient information on properties of bottom layer in the bay;
- Absence of information on sediment discharge into the bay from rivers and sloughs;
- Absence of information on sediment characteristics in water column;
- Limited information on present deposition and erosion rates within the bay.

Because the main purpose of present study is to provide an estimate for sedimentation rates within a limited area in the bay, the sedimentation in the basin and maneuvering area was modeled over a smaller domain (see Figure 4-1). Several different values of boundary concentration and settling velocities were simulated to capture the variability of suspended sediment concentrations in the project vicinity (see Table 6-2). Based on the background information, the concentration of 30 mg/l would be considered as the representative yearly average value. The values of 15 and 45 mg/l are more representative of expected summer and winter conditions, therefore the model development can be simplified by setting appropriate boundary conditions compared to modeling of all the sedimentation processes within the entire bay.

Table 6-1: Mike21 MT Module Input Parameters

Parameter	Recommended range of values by DHI (2005), unless noted	Value	References and comments
Settling velocity	Varies widely	0.3 mm/s	Adjusted as calibration parameter within recommended range
Critical shear stress for deposition	0.05 to 0.10 N/m^2	0.05 N/m2	From van Rijn (1993) based on work by Mehta and Parthenaides (1984)
Bed density	Medium consolidated mud (1 month) 250–400 kg/m^3	320 kg/m3	van Rijn (1993)
Bed roughness	0.001 m	0.001 m	Bedforms become dominant
Erosion coefficient	0.000005–0.00001 $kg/m^2/s$	0.000005 $kg/m^2/s$	No erosion of original bed, erosion of freshly deposited sediments only
Critical shear stress for erosion	Mobile fluid Mud 0.05–0.1 N/m^2 Partly Consolidated Mud 0.2–0.4 N/m^2	0.07 N/m^2	Model default value

Parameter	Recommended range of values by DHI (2005), unless noted	Value	References and comments
Power of erosion coefficient	4.2–25.6	4.2	

Several different values of boundary concentration and settling velocities were simulated to capture the variability of suspended sediment concentrations in the project vicinity (see Table 6-2). Based on the background information (Table 3-7), the concentration of 30 mg/l can be considered as the representative yearly average value. Other scenarios were also considered to simulate summer (with TSS of 15 mg/l) and winter (with TSS of 45 mg/l) conditions. Because of insufficient information on variability of TSS during winter period near the LNG site location, the value of 45 mg/l was considered as a reasonable upper range approximate. Also to simulate a difference between flood tide and ebb tide conditions, a difference in TSS of 10–15 mg/l between west and east boundaries was applied. Other used parameters are gathered into Table 6-1.

Flow patterns within and around the basin are important estimate of its sediment trapping efficiency. The numerical model applied to this study considers the spatial variability of the hydrodynamic variables, and therefore predicts different accumulation rates throughout the basin. Figure 6-2 presents simulated current patterns in the project area during typical ebb and flood tides. The model shows that after construction and at both stages of the tide an eddy is formed in the basin creating a quiescent area where suspended sediment will tend to deposit.

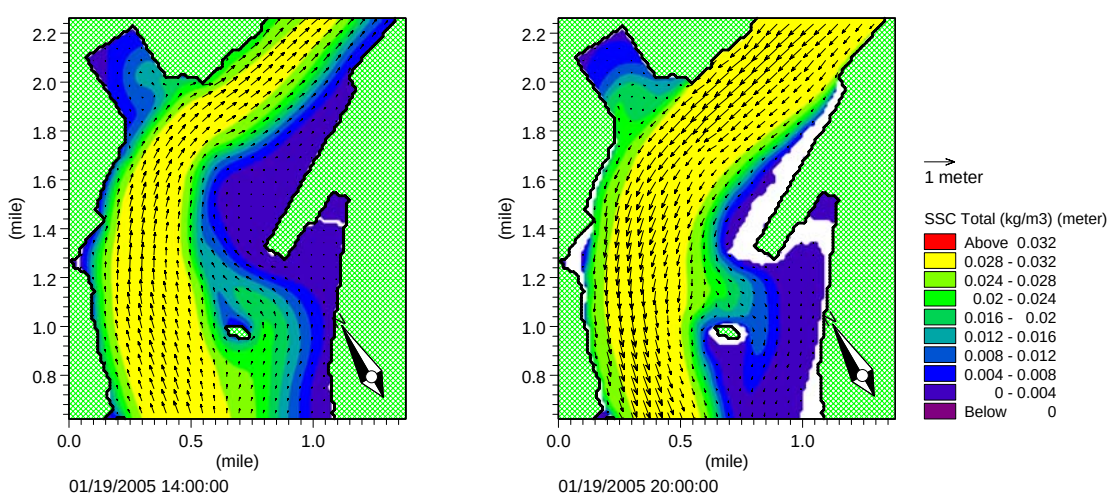

Figure 6-2: Model Prediction for Mud Transport: Instantaneous Distribution of Suspended Sediment Concentration During Flood and Ebb Tides with Maximum Ambient Concentration of 30 mg/l and Settling Velocity of 0.3 mm/s

6.1 Sedimentation due to Cohesive Sediments

The results from modeling of cohesive sediment transport (such as mud) are presented in the following figures with summary in Table 6-2. Figure 3-1 shows the total bed thickness change after a fifteen day simulation. The sediments mainly accumulate in the basin with some sedimentation in the maneuvering area. Particular distribution of sediments in the basin depends on settling velocity: for a lower velocity the sediments accumulate deeper inside. In the maneuvering area, accumulation occurs in the pockets on sides of the Navigation Channel.

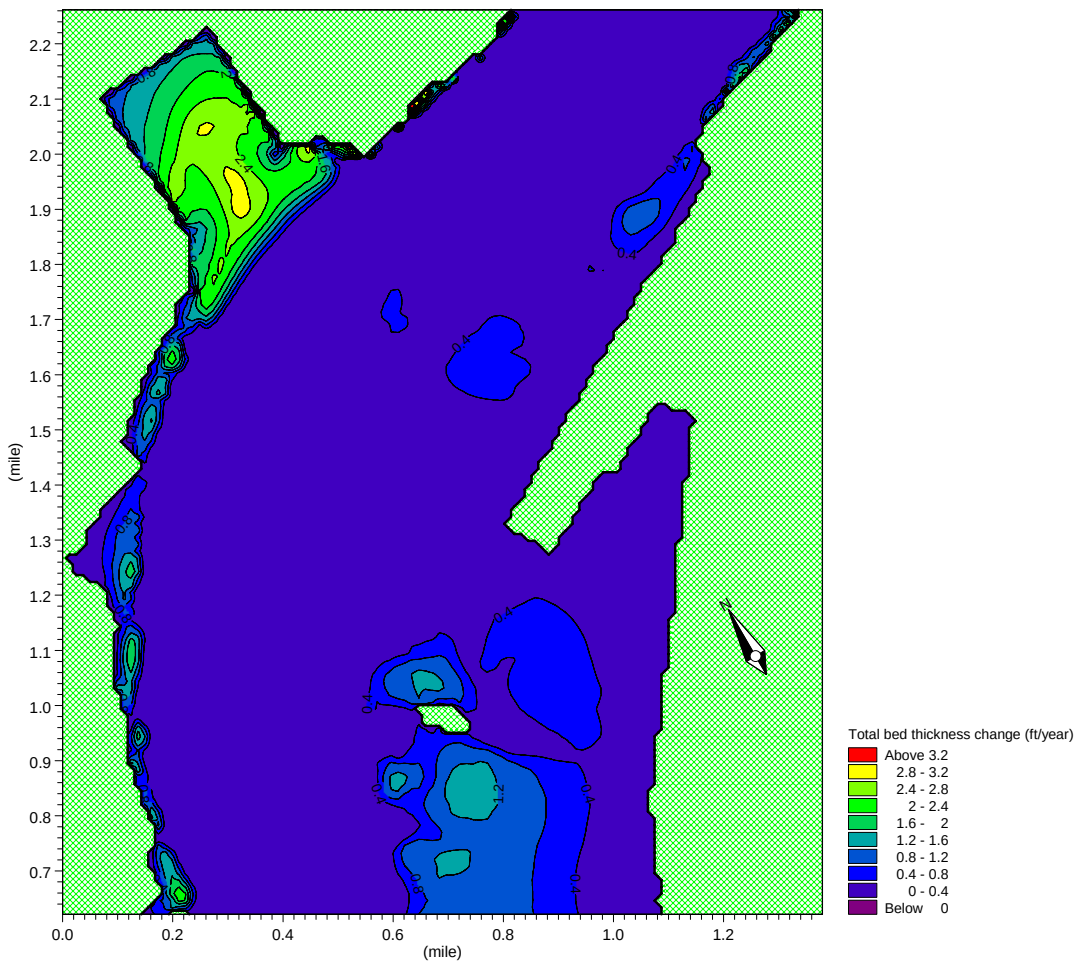

Figure 6-3: Model Prediction for Mud Transport: Total Bed Thickness Change with Maximum Ambient Concentration of 30 mg/l and Settling Velocity of 0.3 mm/s

Average sedimentation rates in the basin and maneuvering area were extrapolated from fifteen day simulations. The results are shown in Figure 6-4 and Figure 6-5. The resulted rates for 45 mg/l were approximately 3–5 times higher than for 15 mg/l. For 30 mg/l applied at both boundaries the resulted rates were approximately 2.0 ft/year in the basing and 0.5 ft/year in the maneuvering area. The value of 1,200 kg/m^3 was assumed for the bulk density of deposited mud. The simulation with uneven concentrations on boundaries

(10–15 mg/l lower on southern boundary) showed slightly lower accumulation rates. Also, lower or higher rates were found with lower and higher settling velocities. In the basin, the sedimentation rates found to be linearly related to the ambient concentration. In maneuvering area, the rates were better approximated with exponential curve and also depend on parameters of erosion (critical shear stress for erosion, erosion coefficient, and power of erosion).

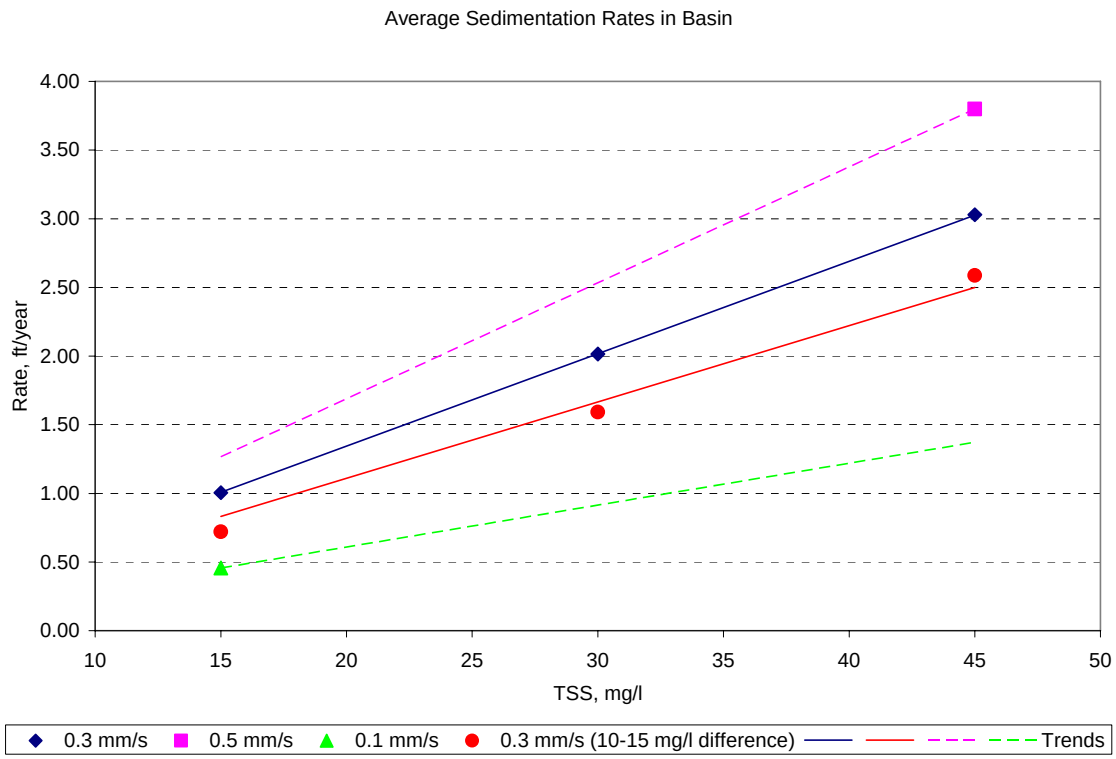

Figure 6-4: Model Prediction for Mud Transport: Average Sedimentation Rates in the Basin

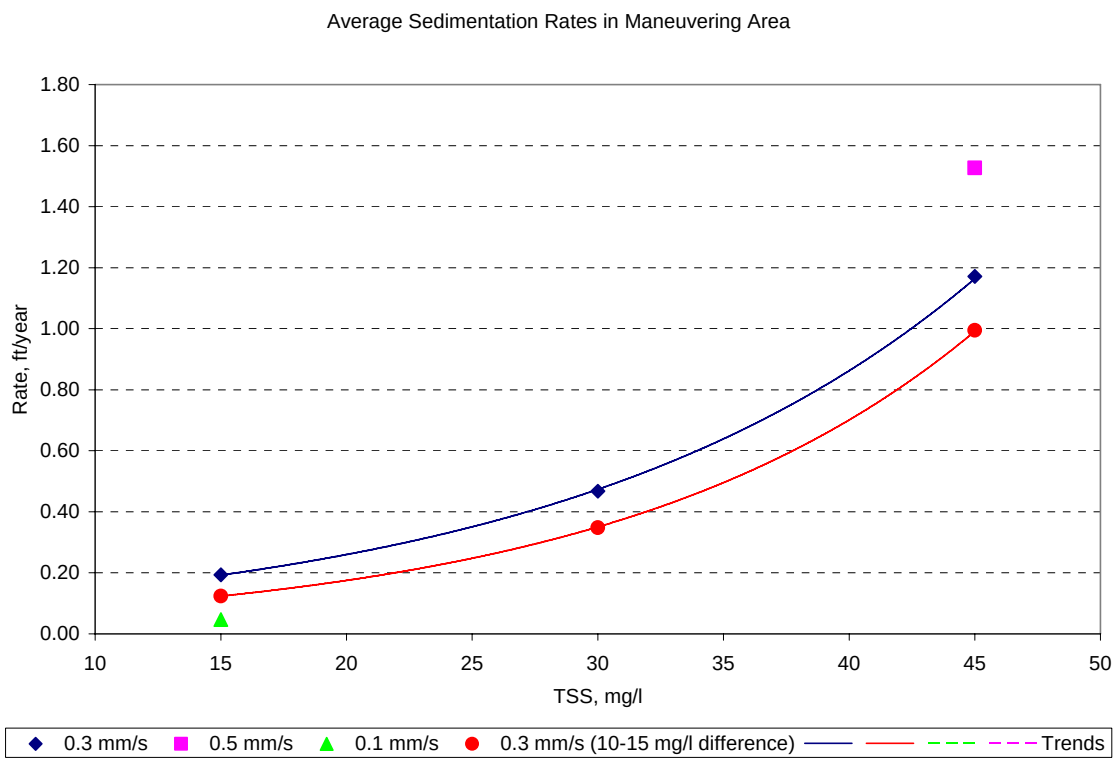

Figure 6-5: Model Prediction for Mud Transport: Average Sedimentation Rates in the Maneuvering Area

Table 6-2: Resulted Sedimentation Rates and Total Dredging Volumes

Concentration, mg/l		Settling velocity, mm/s	Volume, yd^3	Rate, ft/year	Volume, yd^3	Rate, ft/year
East BC	*West BC*		*Basin*		*Maneuvering area*	
15	15	0.3	88,000	1.00	16,000	0.19
30	30	0.3	175,000	2.00	39,000	0.47
45	45	0.3	264,000	3.03	97,000	1.17
15	15	0.1	40,000	0.46	4,000	0.05
45	45	0.5	331,000	3.80	127,000	1.53
30	45	0.3	226,000	2.59	83,000	0.99
15	30	0.3	139,000	1.59	29,000	0.35
5	15	0.3	63,000	0.72	10,000	0.12

6.2 Sedimentation due to Sand

The sand transport was calculated for a period of 30 days. The sediment properties were chosen to be representative for the channel bottom—a D_{50} of 0.25 mm grain size and 40 mm/s settling velocity. Figure 6-6 presents the 30 day average sediment fluxes and change in bed elevation. The accumulation rates are very small, being on the order of 1,625 kg/year in the basin and maneuvering area.

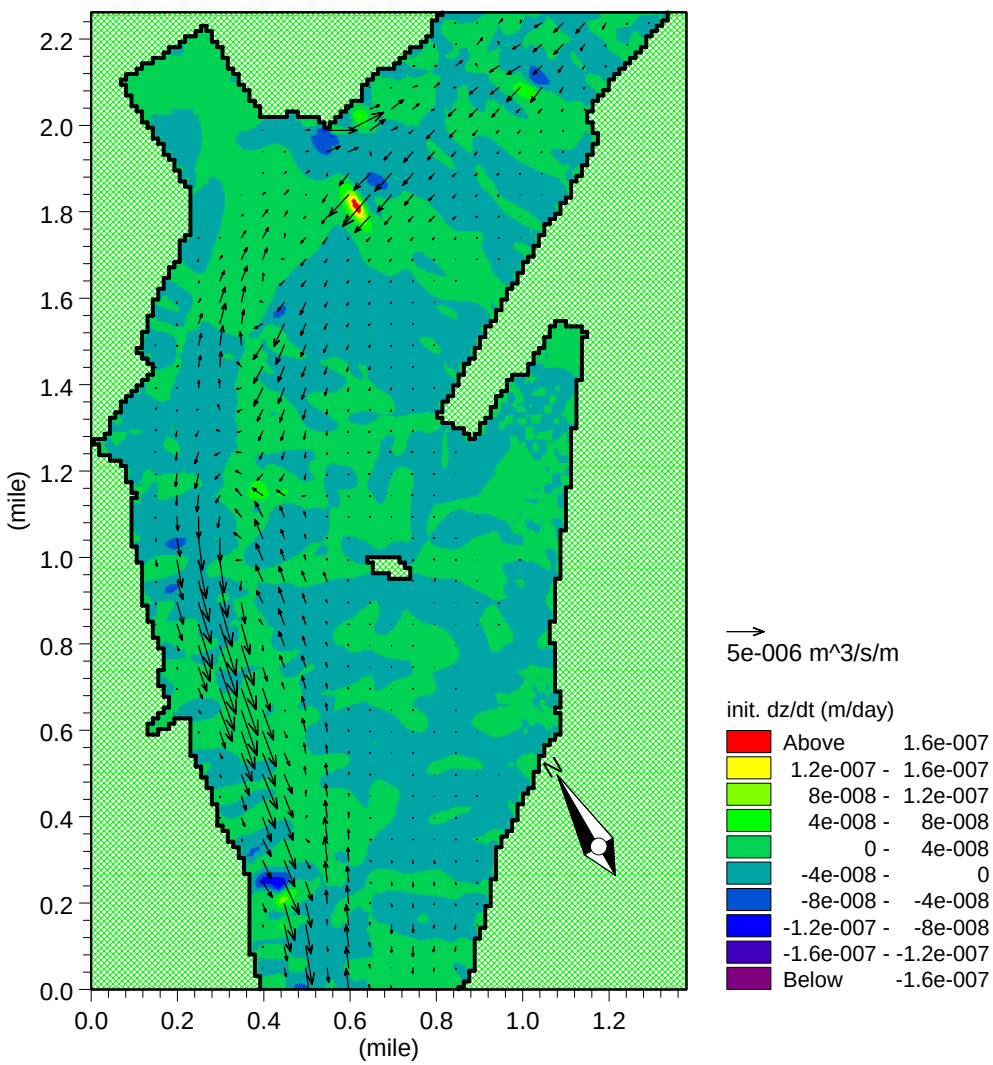

Figure 6-6: Model Prediction for Sand Transport: Bed Elevation Change and Average Sediment Fluxes after 30 Day Simulation Period

7.0 CONCLUSIONS AND RECOMMENDATIONS

This report presents estimates of sedimentation rates for the proposed Jordan Cove LNG terminal. The proposed LNG terminal will create a relatively quiescent area vulnerable to sedimentation and will therefore require maintenance dredging. Volumetric sedimentation rates where calculated for a range of values of the suspended sediment concentration and settling velocities using the Mike21 hydrodynamics and sediment transport modeling system.

The expected volumetric sedimentation rate of cohesive sediment will be approximately 175.000 yd^3/year in the basin and 39,000 yd^3/year in the maneuvering area based on the yearly average concentration of 30 mg/l. The total volumetric sedimentation rate non-cohesive sediment is expected to be insignificant.

Given the relatively small amount of suspended sediment data and high dependence of sedimentation rates from the concentration, it would be recommended to obtain a longer term suspended sediment concentration measurements especially during a winter season.

8.0 REFERENCES

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APPENDIX A

LIST OF USGS STREAM GAUGES USED IN DISCHARGE AND SEDIMENT LOAD ANALYSIS

Table A-1: List of USGS Stream Gages with Average Annual, Winter (November–April), and Summer (May–October) Values Used in Discharge and Sediment Load Analysis

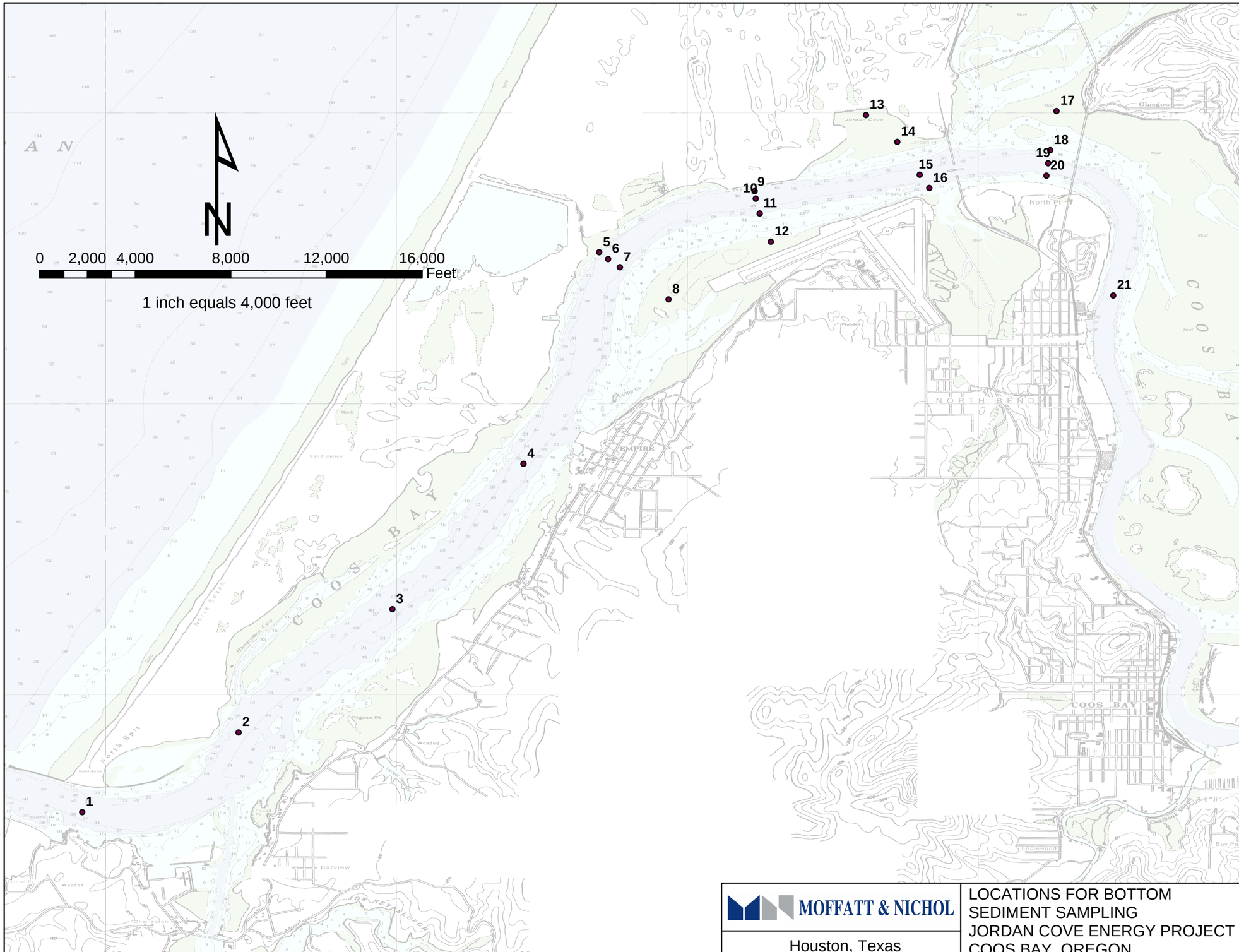
#	Station ID	Station name and location	Drainage area, sq.mi	Annual discharge, ft³/s	Winter discharge, ft³/s	Summer discharge, ft³/s	Annual load, ton/day	Winter load, ton/day	Summer load, ton/day	Date begin	Date end
1	13227000	BULLY CREEK NEAR VALE	570.0	24.2	34.6	12.0	110.3	194.8	10.8	10/1/1933	9/30/1962
2	14019200	COLUMBIA RIVER AT MCNARY DAM NEAR UMATILLA	214,000.0	191,484.2	116,454.1	232,389.2	8,733.8	2,522.8	12,119.9	10/1/1950	9/30/1981
3	14033500	UMATILLA R NR UMATILLA	2,290.0	387.1	670.8	88.9	1,212.5	2,255.9	116.2	11/1/1903	9/30/2004
4	14034500	WILLOW CREEK AT HEPPNER	96.8	17.3	24.5	9.5	48.4	88.5	4.8	10/1/1951	9/30/2004
5	14036000	WILLOW CREEK NR ARLINGTON	850.0	33.5	52.4	11.0	1,075.7	939.8	1,237.4	10/1/1960	9/30/1979
6	14048000	JOHN DAY R AT MCDONALD FERRY	7,580.0	1,976.4	2,486.7	1,439.9	5,474.5	9,956.0	762.3	12/1/1904	9/30/2004
7	14079500	CROOKED RIVER AT POST	2,160.0	216.3	361.6	70.2	88.5	174.9	1.7	10/1/1940	1/12/1977
8	14080250	BEAR CREEK NEAR PRINEVILLE	205.0	7.9	12.1	3.8	111.1	162.9	60.2	10/1/1975	10/5/1981
9	14080500	CROOKED R NR PRINEVILLE	2,700.0	202.5	339.0	66.6	129.8	256.1	4.2	10/1/1941	9/30/1991
10	14101500	WHITE RIVER BELOW TYGH VALLEY	417.0	562.6	840.3	289.5	570.6	1,127.2	23.1	10/1/1917	9/30/1990
11	14138850	BULL RUN R NR MULTNOMAH FALLS	47.9	396.7	590.9	205.5	10.3	19.4	1.3	7/22/1966	9/30/2004
12	14138870	FIR CREEK NEAR BRIGHTWOOD	5.5	35.0	53.2	17.0	0.4	0.7	0.1	10/1/1975	9/30/2004
13	14138900	NO FK BULL RUN R NEAR MULTNOMAH FALLS	8.3	70.6	104.3	37.6	1.7	3.3	0.2	8/1/1965	9/30/2004
14	14139800	SOUTH FORK BULL RUN RIVER NEAR BULL RUN	15.4	105.7	156.5	55.5	1.6	2.9	0.3	10/1/1974	9/30/2004
15	14166500	LONG TOM RIVER NEAR NOTI	89.3	230.4	411.5	49.4				10/1/1935	9/30/2004
16	14170500	ROCK CREEK NEAR PHILOMATH	14.6	51.6	92.5	10.6				10/1/1945	9/30/1979
17	14171000	MARYS RIVER NEAR PHILOMATH	159.0	453.0	830.6	75.3				10/1/1940	9/30/2004
18	14171500	MUDDY CREEK NEAR CORVALLIS	107.0	204.6	391.2	18.0				10/1/1963	9/30/1968
19	14306030	YAQUINA RIVER NEAR CHITWOOD	71.0	300.5	568.7	36.6	64.7	130.0	0.6	10/1/1972	9/30/1991
20	14306036	MILL CREEK NEAR TOLEDO	4.2	21.3	38.2	4.3				10/1/1960	9/30/1973
21	14306040	N FK BEAVER CR NR SEAL ROCK	10.0	49.7	91.5	7.9				7/1/1965	9/30/1967
22	14306100	N FK ALSEA R AT ALSEA	63.0	276.6	490.1	63.2				10/1/1957	9/30/1989
23	14306200	S FK ALSEA R NR ALSEA	49.5	168.2	286.2	50.2				10/1/1960	9/30/1963
24	14306300	FALL CR NR ALSEA	29.4	167.6	284.2	51.0				10/1/1960	9/30/1963
25	14306340	EAST FORK LOBSTER CREEK NEAR ALSEA	5.7	24.9	44.4	5.3				7/1/1983	9/30/2004

#	Station ID	Station name and location	Drainage area, sq.mi	Annual discharge, ft³/s	Winter discharge, ft³/s	Summer discharge, ft³/s	Annual load, ton/day	Winter load, ton/day	Summer load, ton/day	Date begin	Date end
26	14306400	FIVE RIVERS NR FISHER	114.0	541.0	964.5	117.6				10/1/1960	9/30/1990
27	14306500	ALSEA RIVER NEAR TIDEWATER	334.0	1,732.7	3,259.4	230.9	441.8	888.2	2.6	10/1/1939	9/30/2004
28	14306600	DRIFT CREEK NEAR SALADO	20.5	120.4	209.2	31.6				9/1/1958	9/30/1970
29	14306700	NEEDLE BRANCH NEAR SALADO	0.3	1.7	3.0	0.3	0.2	0.4	0.0	9/25/1958	9/30/1973
30	14306800	FLYNN CREEK NEAR SALADO	0.8	4.5	7.9	1.0	0.6	1.1	0.0	9/1/1958	9/30/1973
31	14306810	DEER CREEK NEAR SALADO	1.2	6.8	11.7	1.6	1.0	1.9	0.0	9/1/1958	9/30/1973
32	14306900	BIG CREEK NEAR ROOSEVELT BEACH	11.9	90.5	154.4	26.5				10/1/1972	9/30/1991
33	14307000	SIUSLAW R AB WILDCAT CR AT AUSTA	267.0	692.6	1,240.9	144.3				10/1/1931	9/30/1940
34	14307500	LAKE CREEK AT TRIANGLE LAKE	52.5	210.9	374.2	47.6				10/1/1931	9/30/1955
35	14307580	LAKE CREEK NEAR DEADWOOD	174.0	709.8	1,282.7	136.8				10/1/1967	9/30/1989
36	14307620	SIUSLAW R NR MAPLETON	588.0	2,452.0	4,475.5	415.9	477.6	944.5	7.8	10/1/1967	9/30/2004
37	14307645	NORTH FORK SIUSLAW RIVER NEAR MINERVA	41.2	298.1	518.7	77.5				10/1/1967	9/30/1985
38	14309000	COW CREEK NR AZALEA	78.0	91.5	101.3	43.4	21.2	25.5	0.3	4/1/1926	9/30/2004
39	14310000	COW CREEK NEAR RIDDLE	456.0	832.5	1,515.4	149.7				10/1/1954	9/30/2004
40	14311200	OLALLA CREEK NEAR TENMILE	61.3	102.6	195.6	9.6				10/1/1956	9/30/1973
41	14311300	TENMILE CREEK AT TENMILE	29.6	67.6	131.5	3.7				10/1/1967	9/30/1973
42	14311500	LOOKINGGLASS CREEK AT BROCKWAY	158.0	258.3	493.7	22.8				10/1/1955	9/30/2000
43	14312000	SOUTH UMPQUA RIVER NEAR BROCKWAY	1,670.0	2,758.9	4,876.1	641.8				12/1/1905	9/30/2004
44	14319500	NORTH UMPQUA RIVER AT WINCHESTER	1,344.0	3,716.6	5,614.4	1,818.7				10/1/1908	9/30/2004
45	14320700	CALAPOOYA CREEK NEAR OAKLAND	210.0	454.2	818.5	89.8				10/1/1955	9/30/2001
46	14321000	UMPQUA RIVER NEAR ELKTON	3,683.0	7,406.0	12,125.2	2,686.2				10/1/1905	9/30/2004
47	14322900	UMPQUA RIVER NR SCOTTSBURG	4,095.0	7,587.5	12,855.4	2,319.6				8/1/1966	6/30/1969
48	14323100	SMITH RIVER NEAR GARDINEREGON	206.0	712.6	1,338.0	87.2				10/1/1965	6/30/1973
49	14323200	TENMILE CREEK NEAR LAKESIDE	87.0	339.8	608.8	70.8				10/1/1957	9/30/1976
50	14323500	TIOGA CR NR TIOGA	24.3	86.1	155.3	17.8				10/01/82	09/01/96
51	14324500	WEST FORK MILLICOMA RIVER NEAR ALLEGANY	46.0	250.2	453.5	46.9				10/1/1954	9/30/1981

#	Station ID	Station name and location	Drainage area, sq.mi	Annual discharge, ft³/s	Winter discharge, ft³/s	Summer discharge, ft³/s	Annual load, ton/day	Winter load, ton/day	Summer load, ton/day	Date begin	Date end
52	14324580	PONY CREEK AT COOS BAY	3.9	4.7	8.4	1.0				7/1/1975	9/30/2004
53	14324583	WINCHESTER CR NR CHARLESTON	6.3	15.4	24.8	5.2				08/01/91	09/01/96
54	14324590	BIG CR NR CHARLESTON	5.5	14.4	25.5	3.5				10/1/1982	9/30/1996
55	14325000	SOUTH FORK COQUILLE RIVER AT POWERS	169.0	781.3	1,403.1	159.5				10/1/1916	9/30/2004
56	14326500	MIDDLE FK COQUILLE R NR MYRTLE POINT	305.0	747.8	1,379.2	116.4				10/1/1930	9/30/1946
57	14326800	NORTH FORK COQUILLE RIVER NR FAIRVIEW	73.9	281.8	517.5	46.0				10/1/1963	9/30/1981
58	14327000	N FK COQUILLE R NR MYRTLE POINT	282.0	939.0	1,703.5	174.5				12/1/1928	9/30/1968
59	14327150	SIXES RIVER AT SIXES	116.0	751.8	1,279.5	127.8	1,069.7	1,959.2	17.7	10/1/1967	6/30/1970
60	14330000	ROGUE RIVER BL PROSPECT	379.0	1,275.7	1,420.0	1,051.5	66.9	98.5	17.9	10/1/1913	9/30/2004
61	14334700	S FK ROGUE R SOUTH OF PROSPECT	246.0	249.9	301.7	169.5	26.2	41.7	2.2	10/1/1968	9/30/1992
62	14361600	ELLIOTT CREEK NEAR COPPER	51.8	95.4	125.7	64.2	42.0	80.6	2.3	10/1/1977	9/30/1987
63	14361700	CARBERRY CREEK NEAR COPPER	68.9	64.8	109.4	20.9	1.7	3.3	0.1	1/1/1978	9/30/1987

APPENDIX B

REQUEST FOR BOTTOM SEDIMENT SAMPLES



Legend

Locations:

Num, Lat, Lon

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- 4, 43.3931, -124.285
- 5, 43.4173, -124.277
- 6, 43.4166, -124.276
- 7, 43.4156, -124.274
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- 14, 43.4300, -124.243
- 15, 43.4262, -124.240
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- 18, 43.4290, -124.225
- 19, 43.4275, -124.225
- 20, 43.4261, -124.225
- 21, 43.4124, -124.218

MOFFATT & NICHOL Houston, Texas	LOCATIONS FOR BOTTOM SEDIMENT SAMPLING JORDAN COVE ENERGY PROJECT COOS BAY, OREGON	DOCUMENT NO.	5797SP0010	
		DATE: 12/16/2005	BY: OM CKD:	REV. A

APPENDIX C

SAMPLE COLLECTION AND TESTING RESULTS BY SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.

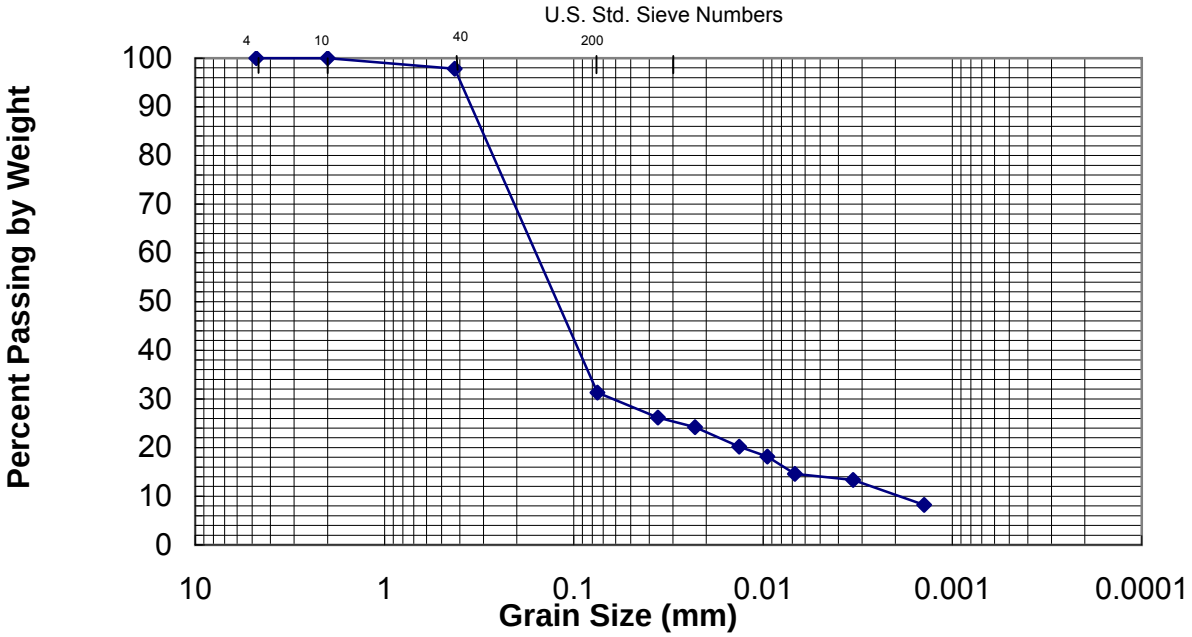
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: Jordan Cove
SAMPLE ID: #11

PROJECT NUMBER: 005625
LAB SAMPLE #: 6-084

SIEVE	#4	#10	#40	#200							
SIEVE SIZE (mm)	4.75	2.00	0.425	0.075	0.0359	0.0229	0.0134	0.0095	0.0068	0.0034	0.0014
PERCENT PASSING	100.0	100.0	97.8	31.3	26.2	24.2	20.2	18.2	14.6	13.4	8.2

Gradation Test Results



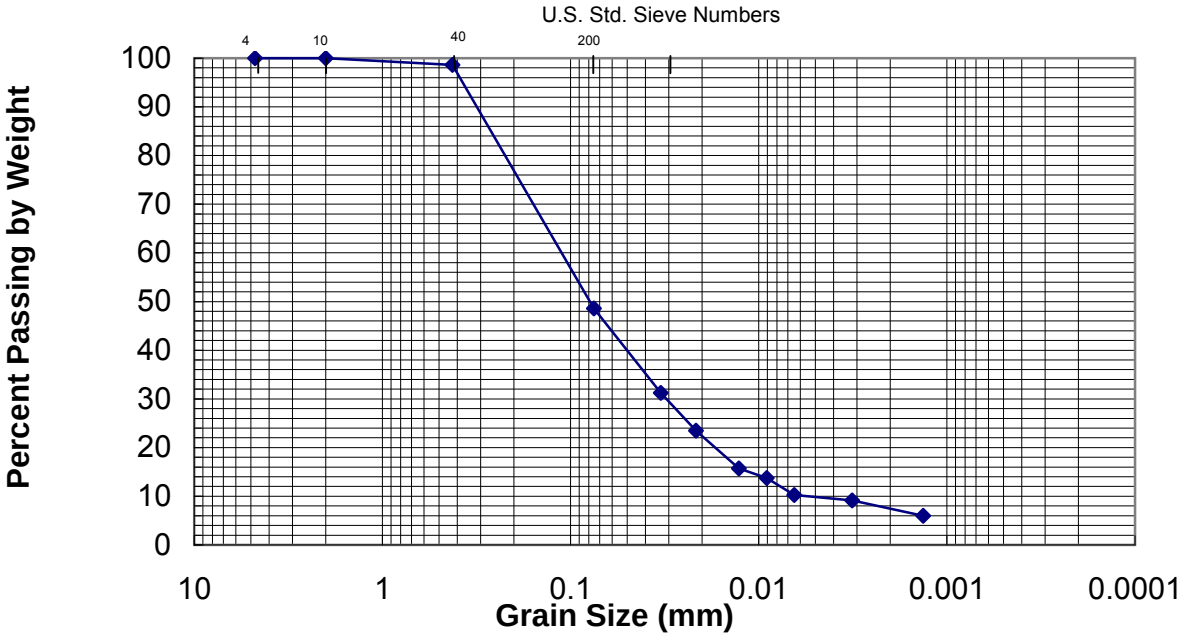
GVL	SAND			SILT or CLAY
Fine	Coarse	Medium	Fine	

CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: Jordan Cove
PROJECT NUMBER: 005625
SAMPLE ID: # 13
LAB SAMPLE #: 6-086

SIEVE	#4	#10	#40	#200							
SIEVE SIZE (mm)	4.75	2.00	0.425	0.075	0.0332	0.0215	0.0127	0.0091	0.0065	0.0032	0.0013
PERCENT PASSING	100.0	100.0	98.6	48.6	31.2	23.5	15.7	13.8	10.3	9.1	6.0

Gradation Test Results



GVL	SAND			SILT or CLAY
Fine	Coarse	Medium	Fine	

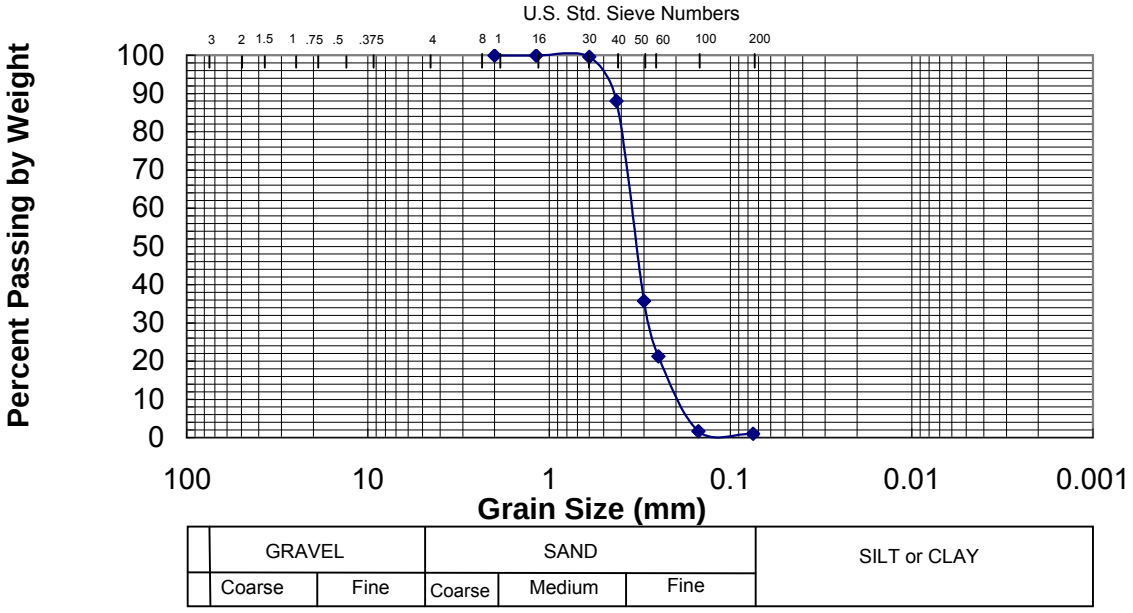
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#1**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-074**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**88**	**36**	**21**	**1.7**	**1.0**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

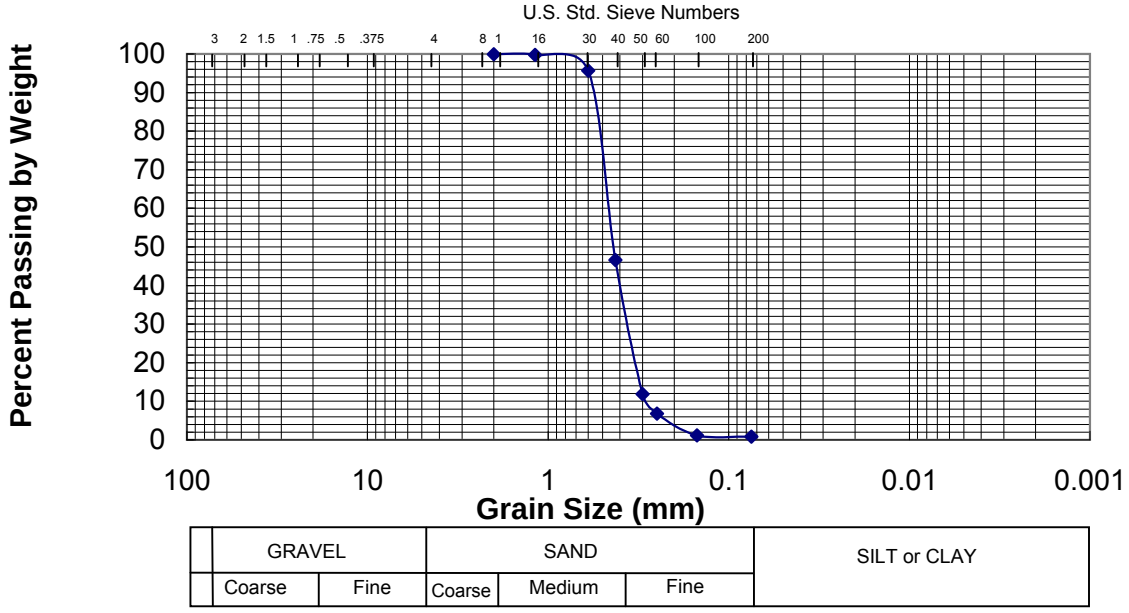
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#2**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-075**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**96**	**47**	**12**	**7**	**1.2**	**0.8**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

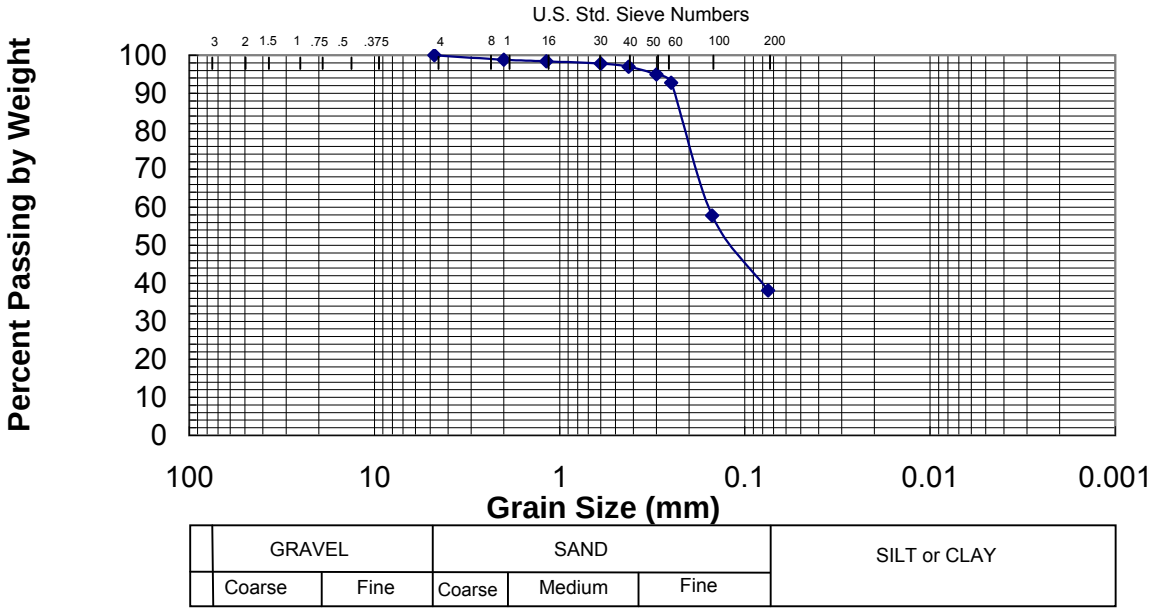
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#3**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-076**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING									**100**		**99**	**98**	**98**	**97**	**95**	**93**	**58**	**38**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Note: Significant portion of fine material is represented as a clast in the field.

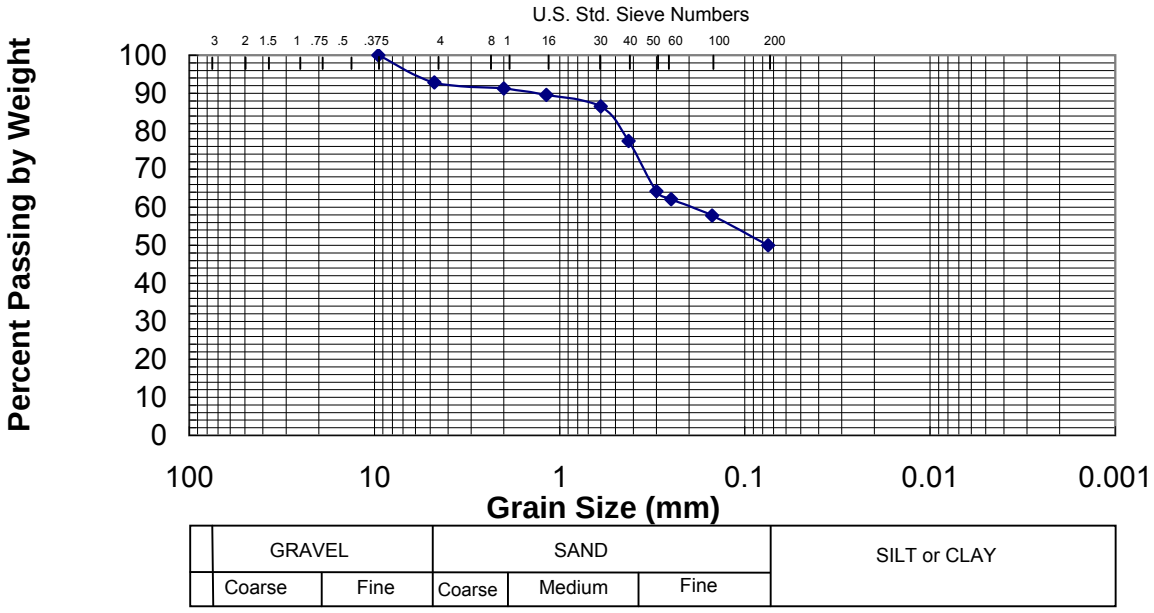
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#4**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-077**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING								**100**	**93**		**91**	**90**	**87**	**77**	**64**	**62**	**58**	**50**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Note: Significant portion of fine material is represented as a clast in the field.

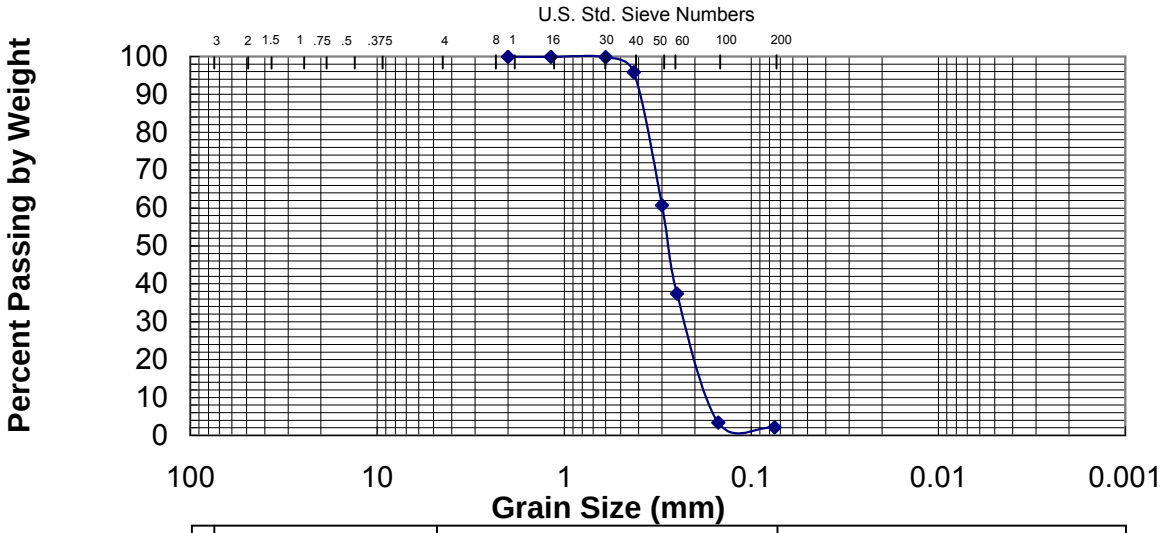
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#5**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-078**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**96**	**61**	**37**	**3.4**	**2.1**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

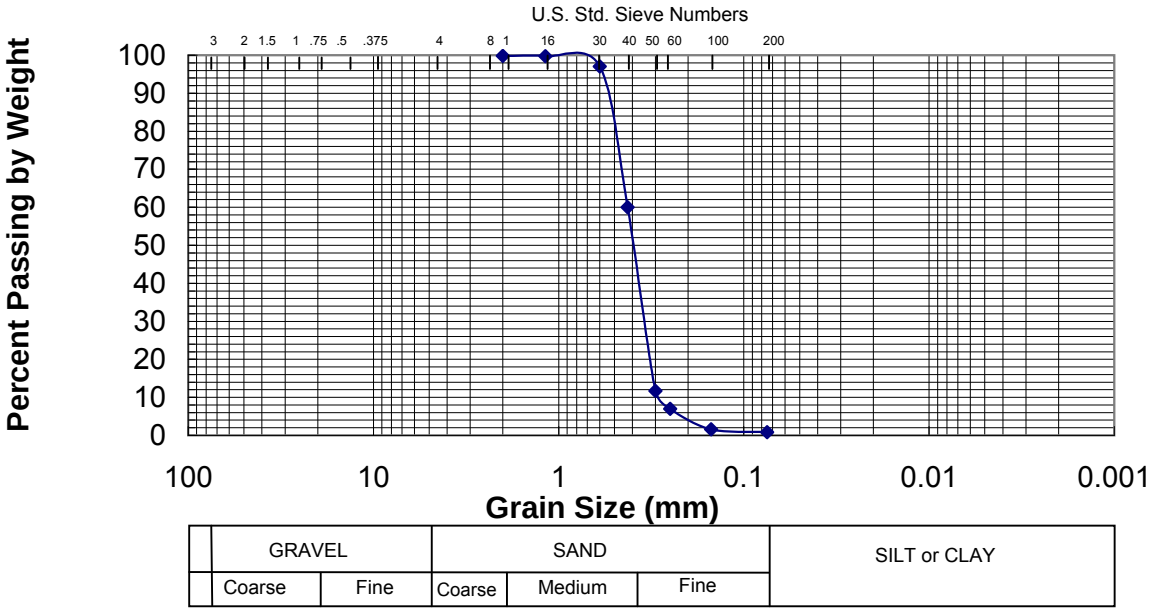
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#6**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-079**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**97**	**60**	**12**	**7.0**	**1.6**	**0.8**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

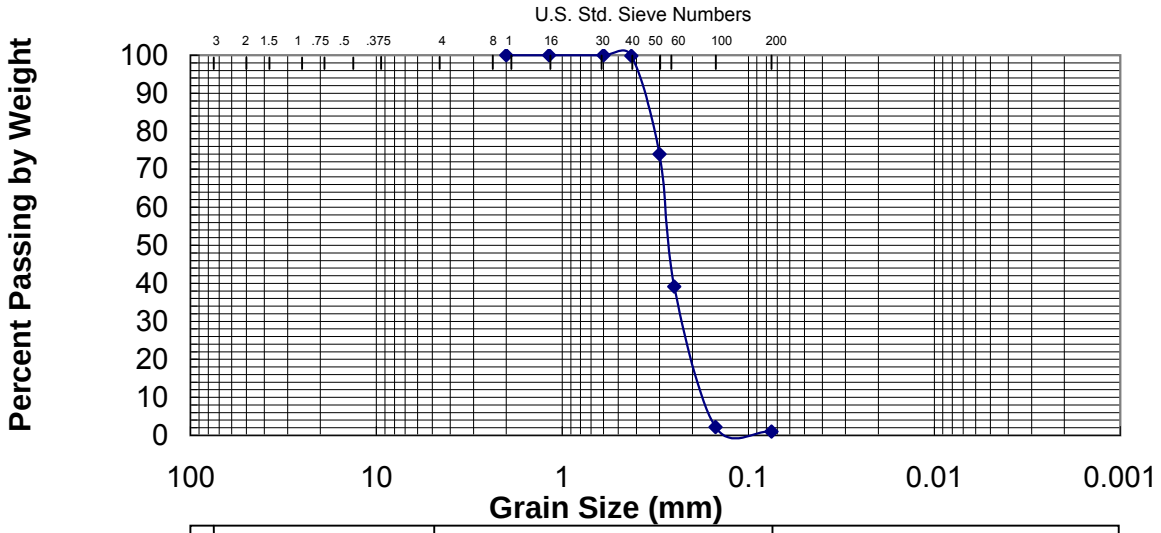
CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#7**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-080**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**100**	**74**	**39**	**2.2**	**1.0**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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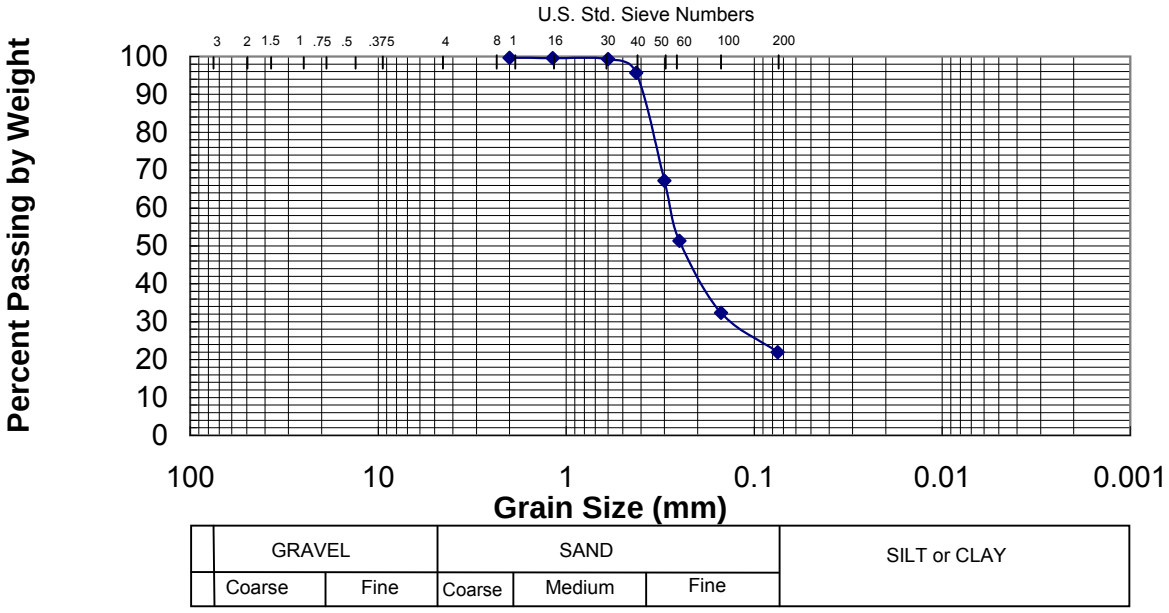
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#8**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-081**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**99**	**96**	**67**	**51**	**32**	**22**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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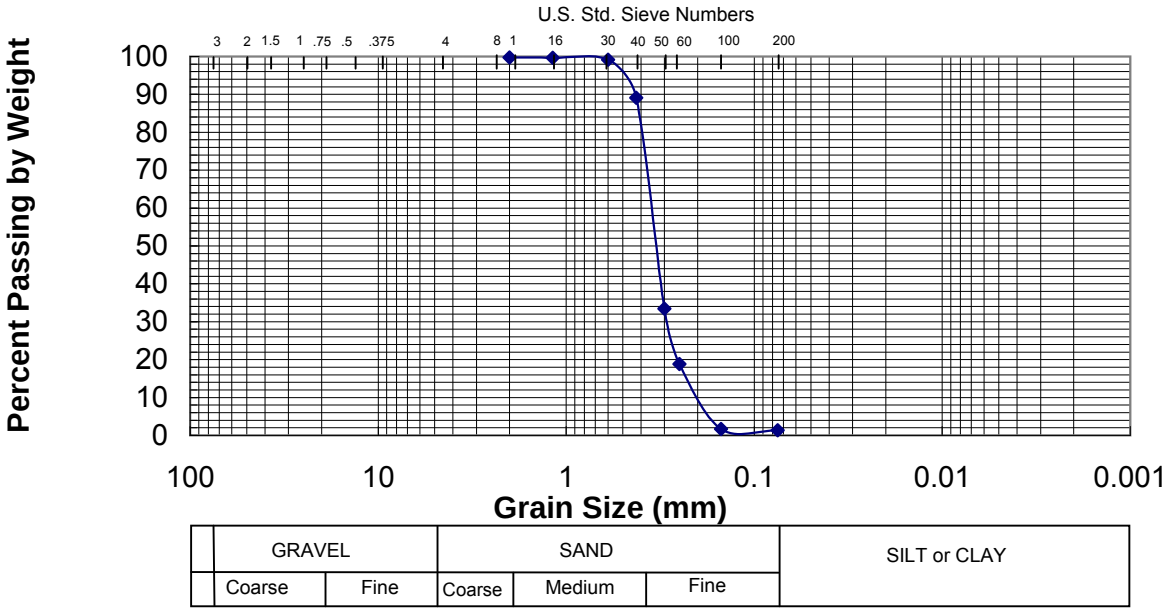
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#9**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-082**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**99**	**89**	**33**	**19**	**1.7**	**1.4**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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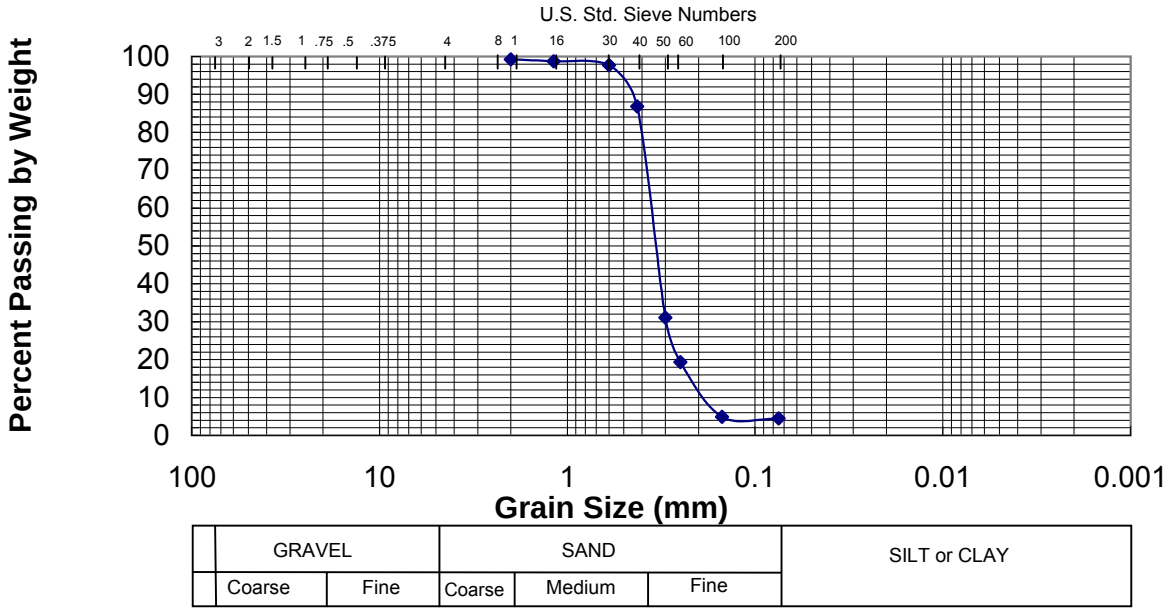
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#10**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-083**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**99**	**99**	**98**	**87**	**31**	**19**	**4.9**	**4.5**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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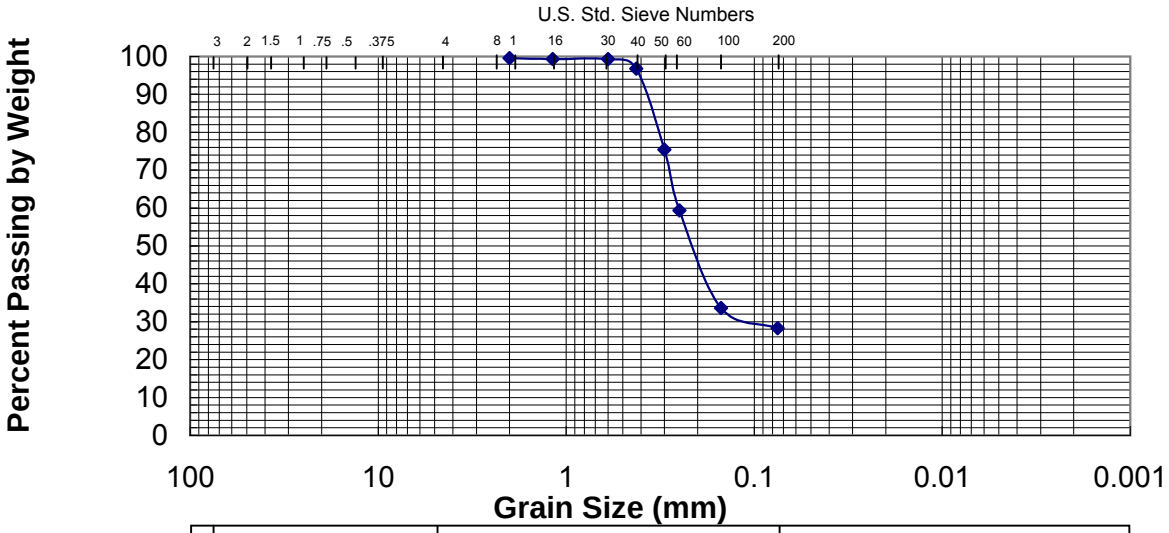
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#11**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-084**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**99**	**99**	**97**	**75**	**59**	**34**	**28**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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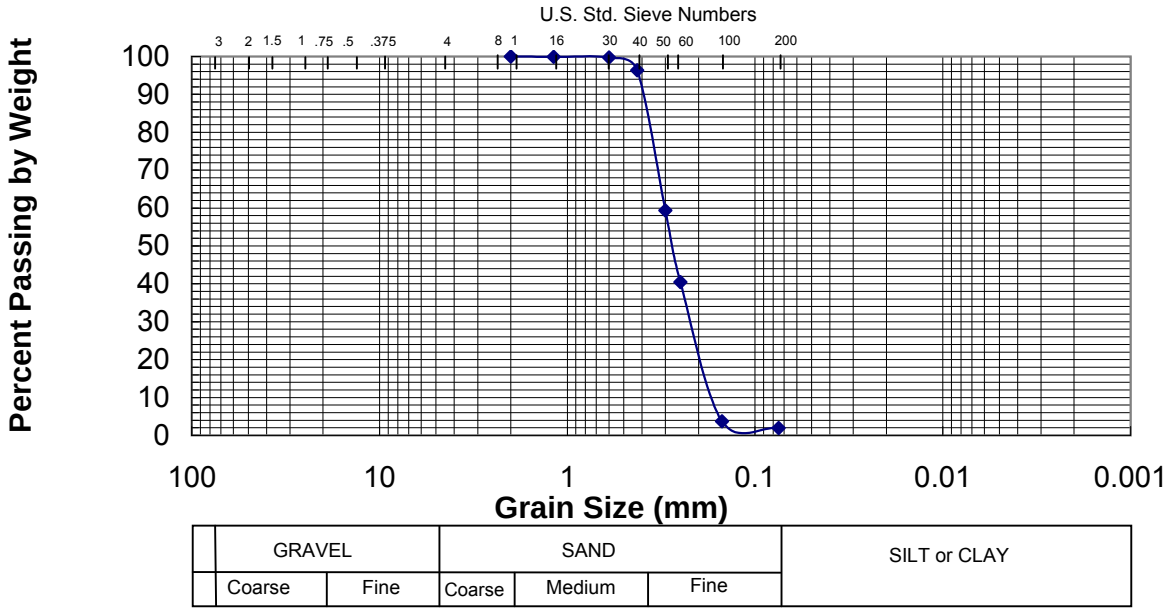
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#12**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-085**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**96**	**59**	**40**	**4**	**2**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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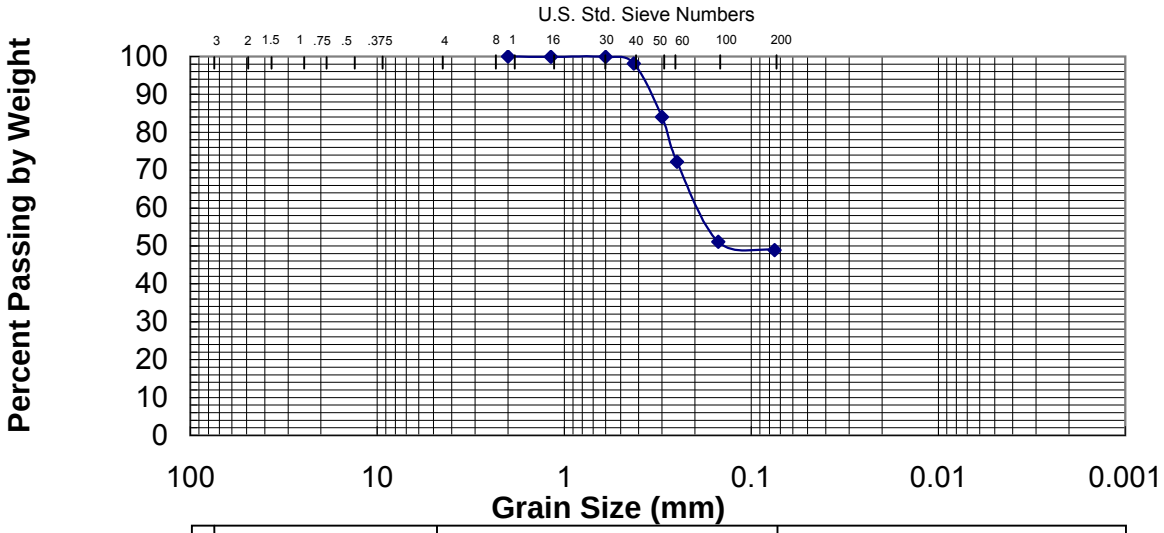
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#13**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-086**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**98**	**84**	**72**	**51**	**49**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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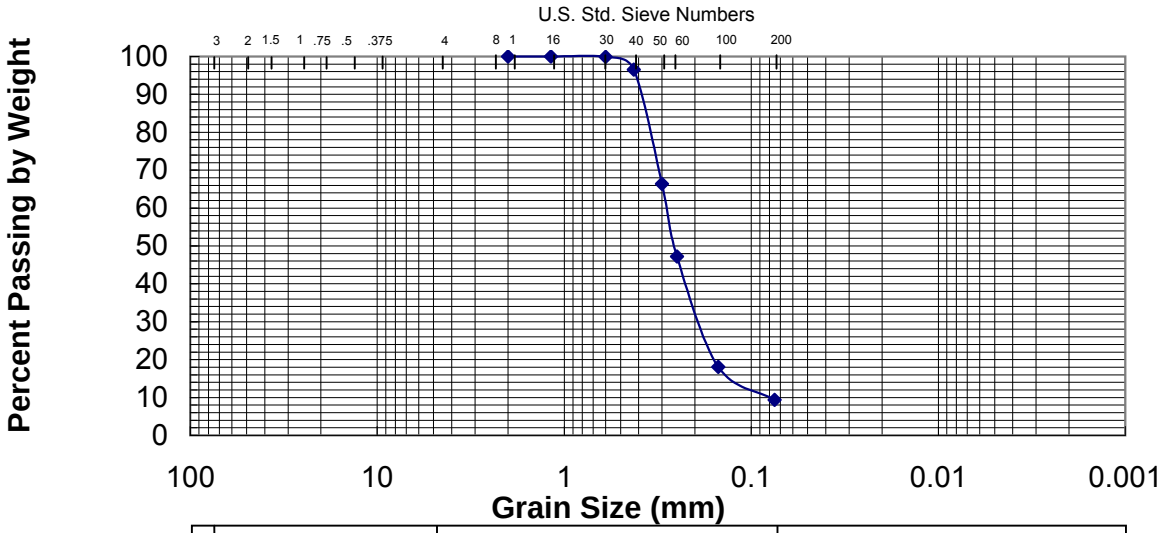
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#14**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-087**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**97**	**66**	**47**	**18**	**9.4**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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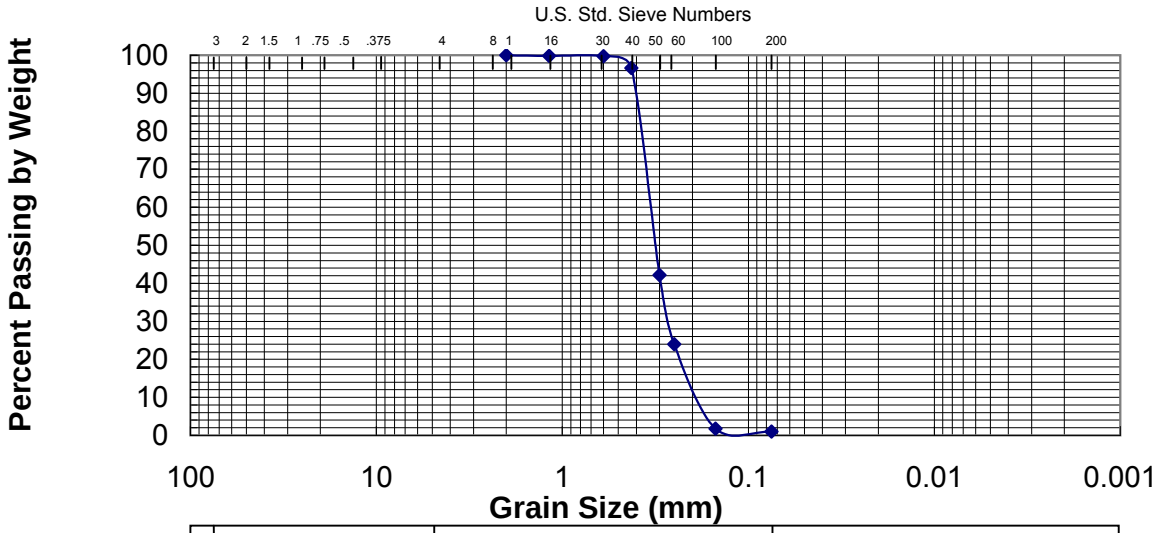
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#15**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-088**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**97**	**42**	**24**	**1.8**	**1.0**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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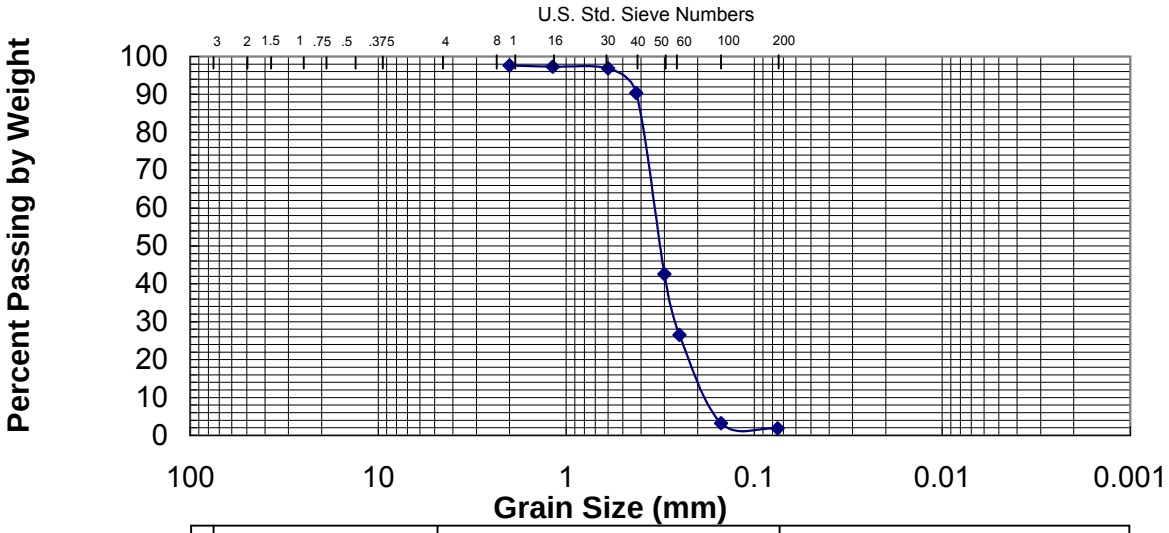
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#16**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-089**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**98**	**97**	**97**	**90**	**43**	**27**	**3.2**	**1.9**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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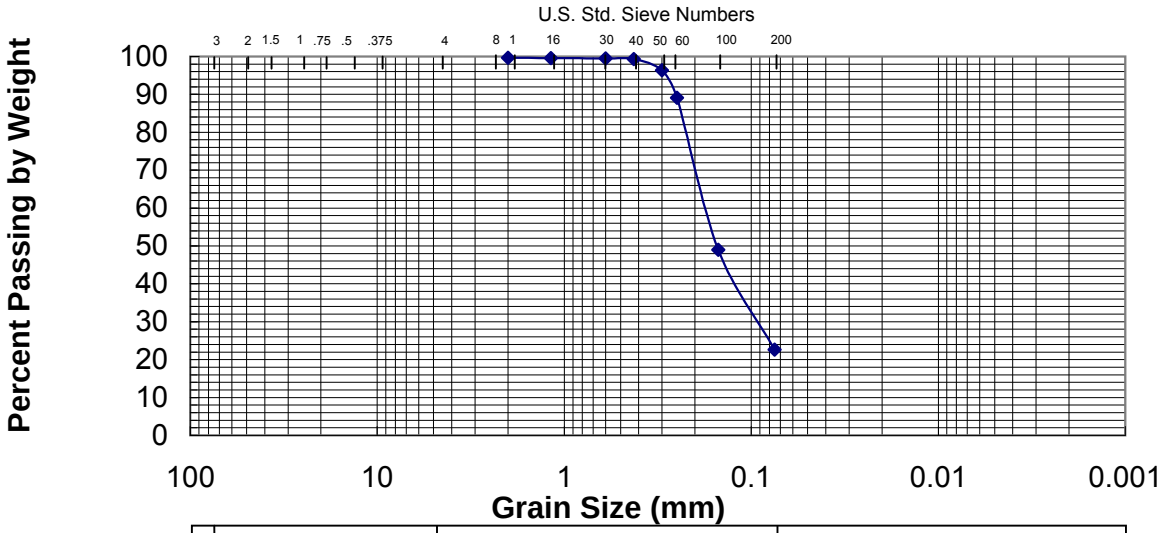
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#17**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-090**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**99**	**96**	**89**	**49**	**23**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

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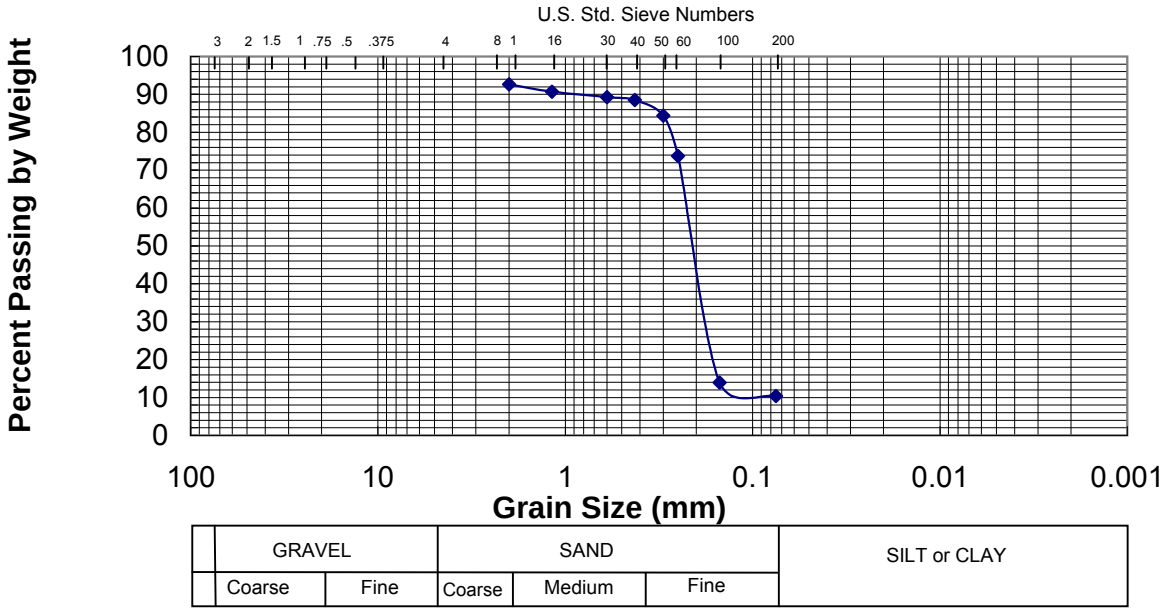
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#18**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-091**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**93**	**91**	**89**	**89**	**84**	**74**	**14**	**10**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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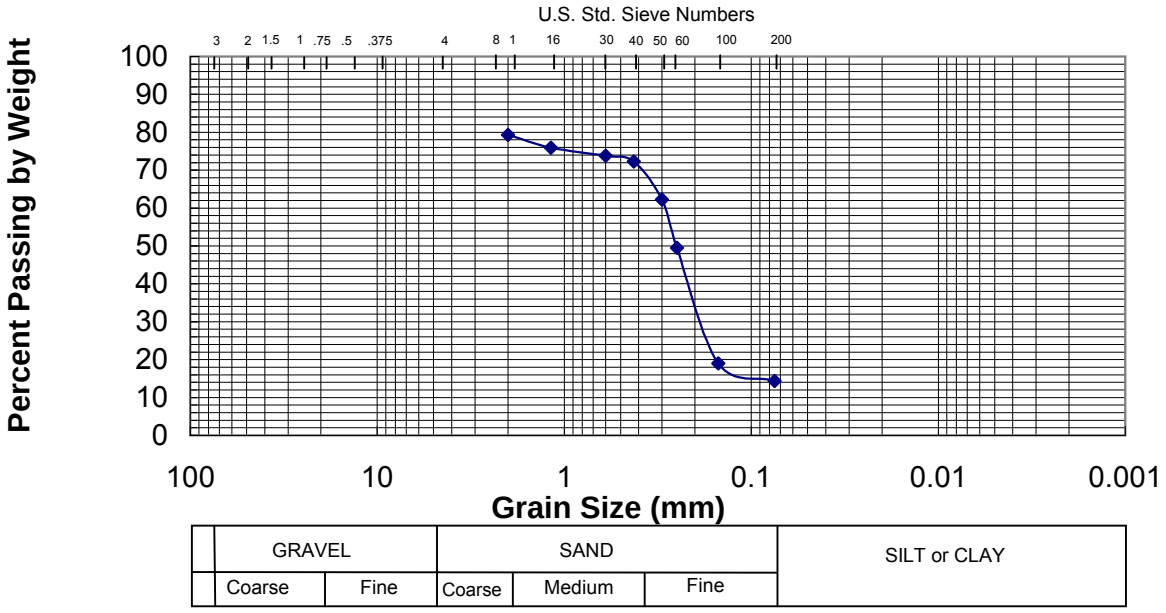
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#19**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-092**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**79**	**76**	**74**	**72**	**62**	**50**	**19**	**14**
SPEC REQUIRED																		

Gradation Test Results



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

Note: Material retained on #10 is all shell material.

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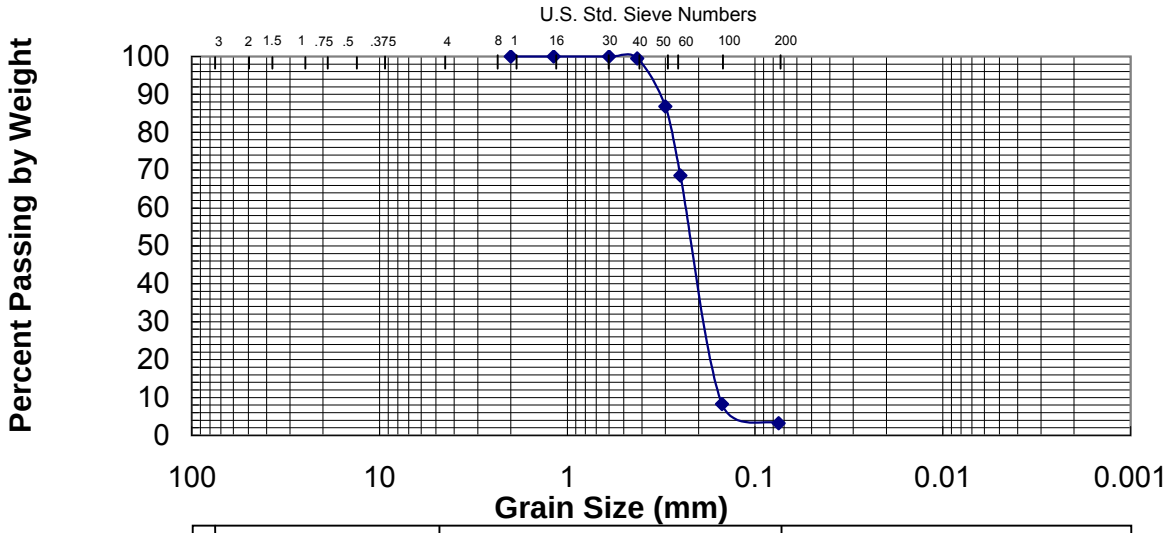
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#20**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-093**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**100**	**100**	**87**	**69**	**8.2**	**3.2**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

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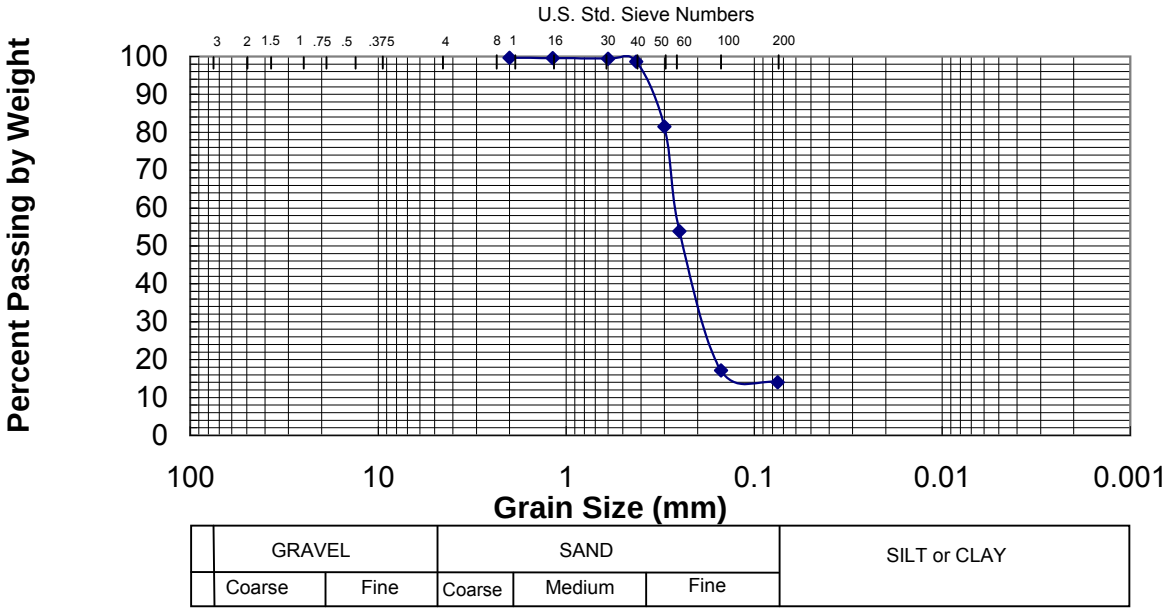
PROJECT NAME: **Jordan Cove**
SAMPLE ID: **#21**
DATE TESTED: **3/2/06**

PROJECT NUMBER: **005265**
Lab Sample#: **6-094**

SIEVE	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#30	#40	#50	#60	#100	#200
SIEVE SIZE (mm)	76.2	63.5	50.8	38.1	25.4	19.1	12.7	9.53	4.75	2.36	2.00	1.18	0.600	0.425	0.300	0.250	0.150	0.075
PERCENT PASSING											**100**	**100**	**99**	**99**	**81**	**54**	**17**	**14**
SPEC REQUIRED																		

Gradation Test Results



	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Part C – Tab H: Slip and Access Project; Report on Turbidity Due to Dredging

JORDAN COVE LNG TERMINAL
COOS BAY, OREGON

REPORT ON TURBIDITY DUE TO DREDGING

Prepared for:

BLACK & VEATCH

and

Jordan Cove Energy Project, L.P.

Rev No	A	B	0	1	2
Issue Purpose	Issued for Client Approval	Added Maintenance Dredging Information			
Date	04/12/2006	05/05/2006			
By	OM/LAW	OM/LAW			
Checked	MW	MW			
Approved		WGS			

Prepared by:

MOFFATT & NICHOL

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1.0 EXECUTIVE SUMMARY

Turbidity was modeled for the new construction and maintenance dredging operations based on the anticipated geotechnical and environmental conditions for this project using the United States Army Corps of Engineers (USACE) DREDGE model and two dimensional numerical model Mike21 (developed by Danish Hydraulic Institute).

Re-suspension of sediments during dredging operations can be a significant source of turbidity; however, through proper operational controls and potentially the use of physical barriers, this source can be controlled.

Turbidity generation is a factor of the dredge type, dredging practices, sediment characteristics, and environmental conditions at the site (e.g., currents).

From the results of the DREDGE model for the open "clamshell" dredge, during construction stage the maximum modeled suspended sediment concentrations (primarily sand) were less than 6,000 mg/l at the dredge location rapidly decreasing with distance to less than 50 mg/l at 200 m (approximately 660 feet). For the hydraulic cutterhead dredge the TSS levels were significantly lower with maximum of 500 mg/l in the vicinity of the dredge. The TSS concentrations reduce rapidly to maximum of 14 mg/l by a distance of 60 meters (200 ft).

During the maintenance dredging period, the dredged material is expected to be primarily fines (mud, clay, silt). Concentration predicted with the DREDGE model for the open "clamshell" dredge were lower than during the construction stage with the maximum of 830 mg/l in vicinity of the dredge and decreasing to 125 mg/l at 200 m (approximately 660 feet).

The results from the Mike21 simulations show that distribution of the generated plume depends on location of the dredge in the channel and basin area. For dredging with an open "clamshell" dredge in the channel the generated sediment plume (concentration higher than 150 mg/l) can move up to 1.2–1.9 miles from the dredging location at highest ebb or flood currents; however, the duration of such entrainment is limited by not more than a two hour period and the time average concentrations do not exceed natural ambient concentrations (10–30 mg/l) outside the dredging area.

During maintenance dredging with an open "clamshell" dredge, the maximum concentrations in the generated plume do not exceed 50 mg/l.

Based on these results it is not anticipated that turbidity generation at the dredging site will be a significant issue.

2.0 INTRODUCTION

Turbidity as a general term refers to suspension of sediment or other particles in water. Turbidity as a measurement is a description of water clarity based on light transmittance and/or scattering that is easily measured in the field. Turbidity measurements are typically reported in nephelometric turbidity units (NTU), with a value of approximately 5 NTU being easily detectable visually. A related water quality parameter often used in lieu of turbidity is total suspended solids (TSS) which is a mass concentration description measurable in a laboratory. The relationship between turbidity and TSS varies with water and sediment characteristics. Turbidity is generally a more useful tool for construction management because it can be monitored in the field; however, many regulatory agencies use TSS for regulations due to its more definable nature. Approximate correlations between turbidity and TSS can be made for use in the field.

Generation of turbidity during dredging operations can occur at both the dredging location and disposal location. This report addresses turbidity generation at the dredging location. Turbidity generation is a factor of the type of dredge, dredging practices, sediment characteristics, and environmental conditions at the site (e.g., currents).

Numerous types of dredges are in common use around the world with each type having different turbidity generation characteristics. For purposes of this report, turbidity generation due to dredging will be limited to hydraulic cutterhead suction dredges and mechanical open “clamshell” dredges, typically as shown in Figure 2-1 and Figure 2-2. This equipment is most likely to be used for the Jordan Cove LNG terminal construction and maintenance. Cutterhead suction dredges use a cutterhead to loosen soils that are then pulled into the suction side of a pipeline and transported to a disposal area. Open “clamshell” dredges consists of a crane derrick mounted on a barge and equipped with a “clamshell” bucket.

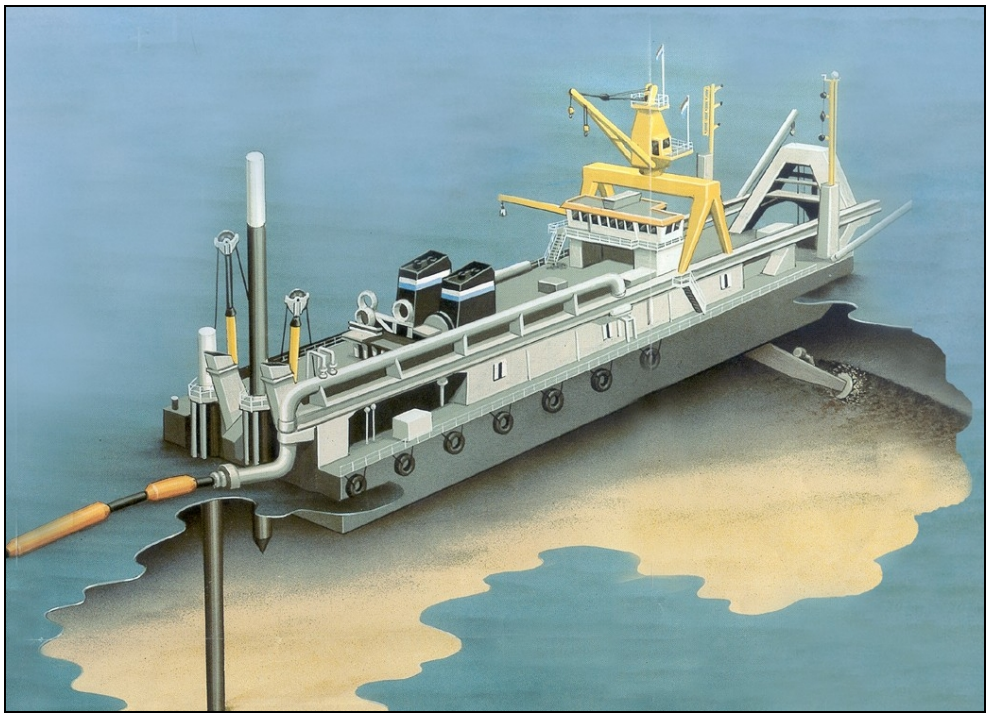

Figure 2-1: Hydraulic Cutterhead Suction Dredge (from Oilfield Publications Limited, n.d.)

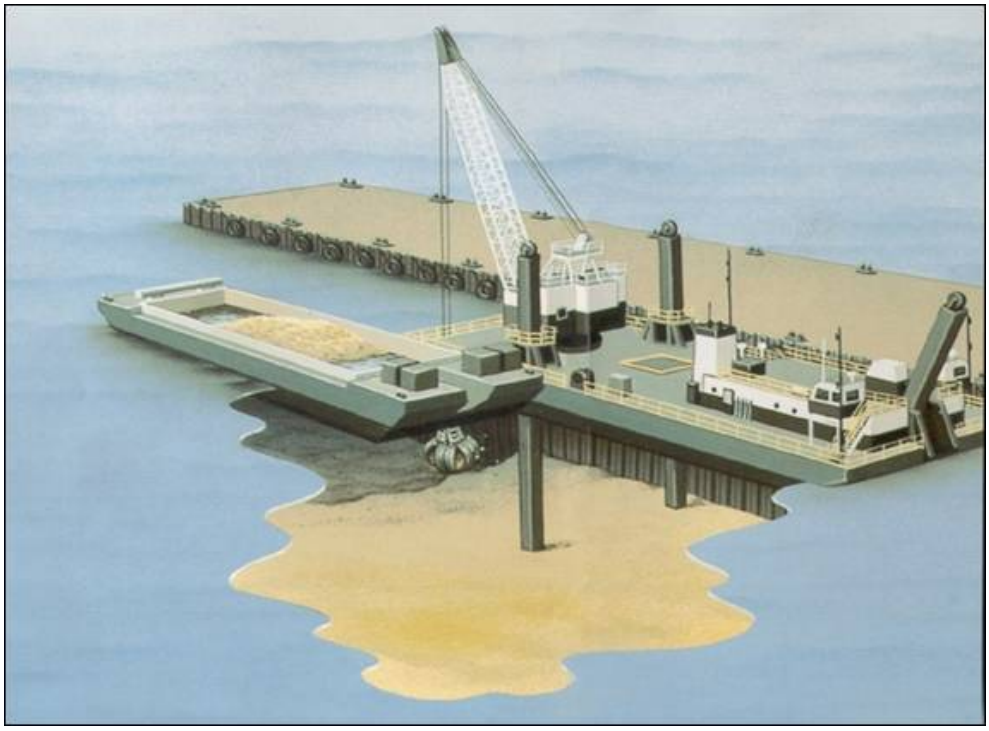

Figure 2-2: Mechanical Open "Clamshell" Dredge (from Oilfield Publications Limited, n.d.)

Both hydraulic and mechanical dredges were proposed to be use in dredging operations. The preliminary characteristics of cutterhead (hydraulic) and open "clamshell" (mechanical) dredges are presented in Table 2-1 and Table 2-2 respectively.

Table 2-1: Characteristics of Hydraulic Cutterhead Dredge

Parameter	Value	
Cutterhead diameter	7 ft	2.13 m
Cutterhead length	5 ft	1.52 m
Thickness of cut	4 ft	1.22m
Swing velocity at cutter	45 ft/min	0.23 m/s

Table 2-2: Characteristics of Mechanical Open "Clamshell" Dredge

Parameter	Value	
Bucket size	12 yd^3	9.2 m^3
Cycle time	80 sec	

2.1 Sediment Characteristics and Environmental Parameters

Sediment characteristics are a key factor in turbidity generation. In general, clean, coarse sands settle quickly and generate little turbidity. In contrast, loose silts (typical of maintenance dredging) are easily suspended and do not settle easily leading to higher turbidity generation. Resuspension of clays is more complicated due to the cohesion between soil particles. Stiff clays can sometimes be cut by the cutterhead in relatively large pieces minimizing resuspension; however, clay particles which are resuspended generally do not settle out of the water column.

Parameters of the sediments to be dredged during construction of the project are much different from the material to be removed during maintenance. For construction, information on sediment characteristics was obtained from the geotechnical analysis for the proposed site location. A sieve analysis was performed for several soil samples extracted from the depths between 20 to 175 feet. The analysis showed presence of well sorted fine sand (averaging approximately 95%) and fines (<5%) at depths 20–35 feet. The median sediment size was 0.3 mm. Only approximately 5% of sediments by weight passed sieve 200, which are silt and clay particles with sizes less than 0.075 mm. Analysis of the bottom surface samples taken from the ship channel close to the site location showed presence of 1–2.1% fines by weight.

During maintenance, primarily fine sediments (silt, clay, etc.) are expected to be dredged in the basin. The distribution of sediment sizes can vary significantly, but in the present study it was conservatively approximated to be 10% sand and 90% fines.

Environmental characteristics also play a part in turbidity generation and dispersion. Water characteristics, particularly salinity and density gradients, can affect the resuspension rate and ability of particles to remain suspended. The largest environmental factor in resuspension is currents. Currents can both aid resuspension by acting directly on the newly dredged faces and greatly affect the dispersion of the resuspended sediments. Suspended sediments are both advected along with the current and spread laterally across the current due to diffusion.

In the present analysis, only the effects of currents and diffusion were considered. Currents of 0.1, 0.2, and 1.0 m/s (0.2, 0.4, and 1.9 knots) with corresponding diffusion coefficients were modeled. These values represent typical flow velocities in the slip (0.1 and 0.2 m/s) and in the channel where dredging is required. Salinity, wind, waves and other environmental parameters were not included.

2.2 Natural Turbidity Levels

Limited measurements of suspended sediment concentrations in Coos Bay were obtained by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc. as a part of hydrodynamic and water quality study near the proposed LNG terminal location. The average measured concentration was 14 mg/l with some spatial variability. The range of measured concentration was within 0–25 mg/l.

A longer record of turbidity measurements (April, 2002 to December, 2004) at the Charleston Bridge near Charleston is available as a part of NOAA NERRS project (NANOOS, 2006). From the NANOOS data the monthly average turbidity levels were computed. The results are shown in Table 2-3. Average turbidity during summer period (May to October) was significantly lower than during winter. Also, during some individual events measured turbidity was recorded to be over 100–200 NTU.

To convert turbidity into TSS a model is required. Based on measurements from nine streams in King County, Washington Packman et al (1999) derived an empirical relationship between measured turbidity (in NTU) and TSS (in mg/l):

$$\ln(TSS) = 1.32 \cdot \ln(NTU) + c \qquad (1)$$

where ln() is the natural logarithm and constant c is not significantly different from zero.

Using the above expression, average concentrations were computed from the turbidity measurements at Charleston Bridge. The results are shown in Table 2-3. Average summer concentrations were estimated to be 10.1 mg/l, while during winter season concentrations increase to 27.3 mg/l. The Charleston Bridge station is located closer to the bay entrance

than the proposed site location. Therefore, the turbidity and TSS levels may be less compared to the upper bay locations because of entrainment of water from the ocean.

During individual events with high turbidity, the maximum TSS levels in order of 100–500mg/l can be expected. However, the expression for converting turbidity into TSS may not be applicable for calculation of extreme values of TSS.

Table 2-3: Measured Turbidity and Estimated Total Suspended Solids at Charleston Bridge Station (NANOOS) for 2002–2004 Period

Summer			**Winter**		
Month	Turbidity, NTU	TSS, mg/l	Month	Turbidity, NTU	TSS, mg/l
May	9.3	19.0	January	5.7	9.9
June	7.2	13.5	February	11.3	24.6
July	5.8	10.3	March	11.9	26.4
August	4.7	7.7	April	9.2	18.7
September	3.8	5.8	November	18.1	45.7
October	3.7	5.7	December	15.0	35.7
Total	**5.8**	**10.1**	**Total**	**12.2**	**27.3**

2.3 Turbidity Estimation Methodology

The USACE has developed an analytical model, named DREDGE, for evaluating turbidity generation for cutterhead suction dredges and open “clamshell” dredges. The model is based on empirical data and a simplified advection and diffusion model. The DREDGE model is appropriate for planning of dredging operations; however, site specific environmental and sediment characteristics may not be accurately represented by the model.

The DREDGE model was applied to the Jordan Cove LNG dredging project assuming typical parameters for dredges and assumptions on the soil and other environmental factors at the site. The model was run at the dredge level of the area. Currents of 0.1, 0.2, and 1 m/s were assumed and the dredged material was assumed to be fine sand with approximately 5% silt and clay. Conservative values were used for the turbidity generation parameters.

The diffusion was defined with two parameters. The horizontal and vertical diffusion coefficients were estimated based on analytical expressions for constrained channel (Fisher et al., 1979).

The plume distribution was also modeled with Mike21 hydrodynamic and sediment transport model developed by Danish Hydraulic Institute (DHI). The Mike21 model used the “near-field” turbidity generation output from the DREDGE model as an input.

3.0 TURBIDITY GENERATION

3.1 Turbidity Generation by Hydraulic Dredge during Construction

Sediment resuspension, and thus turbidity generation, at the cutterhead varies according to characteristics of the dredge, the dredging practices, soil characteristics, and environmental factors.

Cutterhead dredges use a rotating cutter to loosen soil particles. The cutterhead is mounted on a ladder at the front end of the dredge which is lowered to face of the soil to be dredged. Once loosened by the cutterhead the particles are then pulled into the suction side of a pipe and through large centrifugal pump(s) which pump the material through a pipeline to a disposal location. The dredge has two spuds, movable piles at the stern, which hold the dredge in place during the cutting action. Two anchors are placed to the side of the dredge and are used to swing the dredge from side to side with the spud as a pivot point. In this way the cutterhead is moved across the area to be dredged. The spuds are raised and lowered alternately to “walk” the dredge forward. Many newer and larger dredges use spuds mounted on carriages that allow the dredge to advance without changing spuds as often providing greater efficiency to the operation.

In addition to soil characteristics, resuspension at the cutterhead is dependent on dredging practices including the cutterhead size, type, and rotation speed, the swing rate of the dredge, the face of the soil to be cut, the pumping rate and pipe inlet size, and ladder inclination.

Intensity of the source of suspended material at cutterhead was estimated by a method derived by Nakai (1978). The method utilizes an experimentally determined parameters based on a number of available observations. For a cutterhead dredge the intensity was approximated to be 2.5 kg/s.

The “far-field” distribution of suspended sediments was calculated using a model by Kuo et al. (1985). The results of the calculations are presented in following figures.

Figure 3-1 shows a two dimensional plan view of the results for TSS at the bottom of the dredge cut with the downstream and lateral distances being distances away from the cutterhead for a 0.1 m/s current. The estimated TSS concentrations along a center line (0 m lateral distance) are shown versus distance from the cutterhead.

Figure 3-2 and Figure 3-3 show TSS results for 0.2 and 1.0 m/s currents.

The estimated TSS concentrations were the largest at the level of cutterhead (at 0 m). The TSS levels were estimated to be up to near 500 mg/L for a 0.2 m/s current in vicinity of the cutterhead, but they rapidly decrease to less than 1 mg/l at 25 m (approximately 80 ft) from the cutterhead.

For currents of 0.1 and 1.0 m/s the TSS levels at the cutterhead were smaller. The TSS decreases to 14 mg/l at 60 m (200 ft) distance from the cutterhead with 1.0 m/s current.

Figure 3-4 presents the TSS distribution at 6 m level above the cutterhead location for the worst considered case (a 1.0 m/s current) for which the largest plume is generated. The level of TSS is insignificant at that level and above. At higher elevations the estimated TSS levels were very small and therefore not shown.

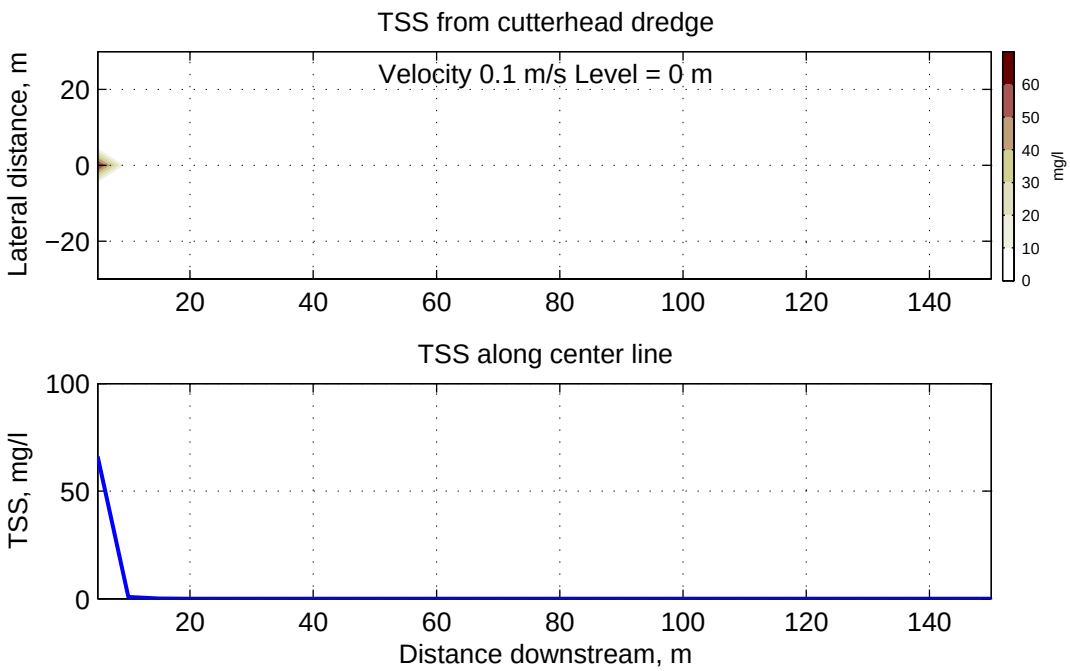

Figure 3-1: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.1 m/s (0.2 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

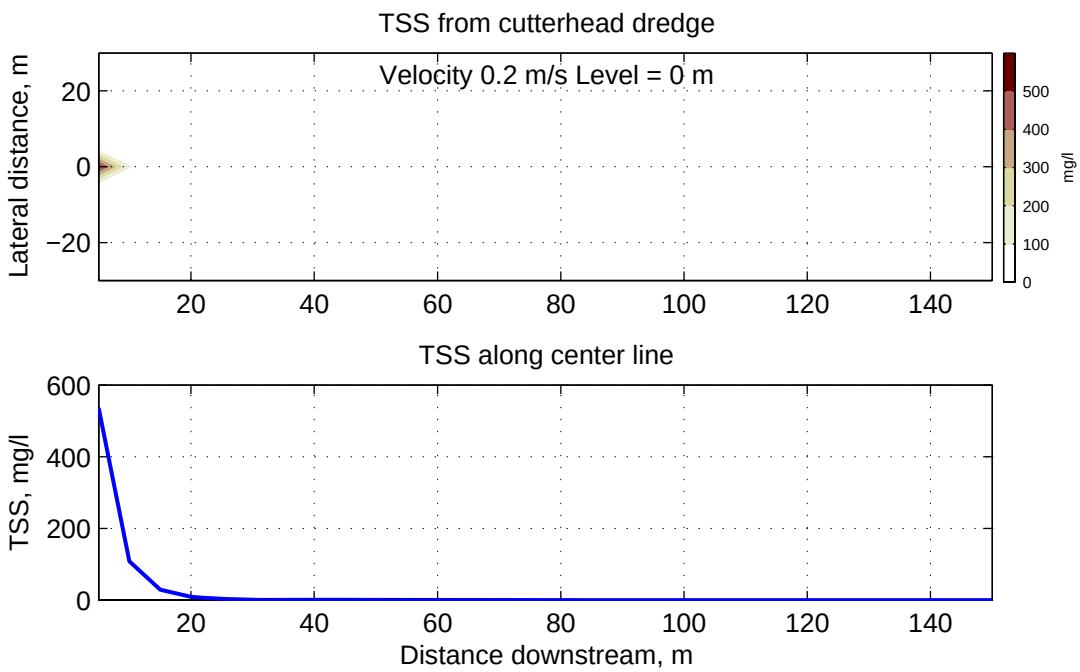

Figure 3-2: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.2 m/s (0.4 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

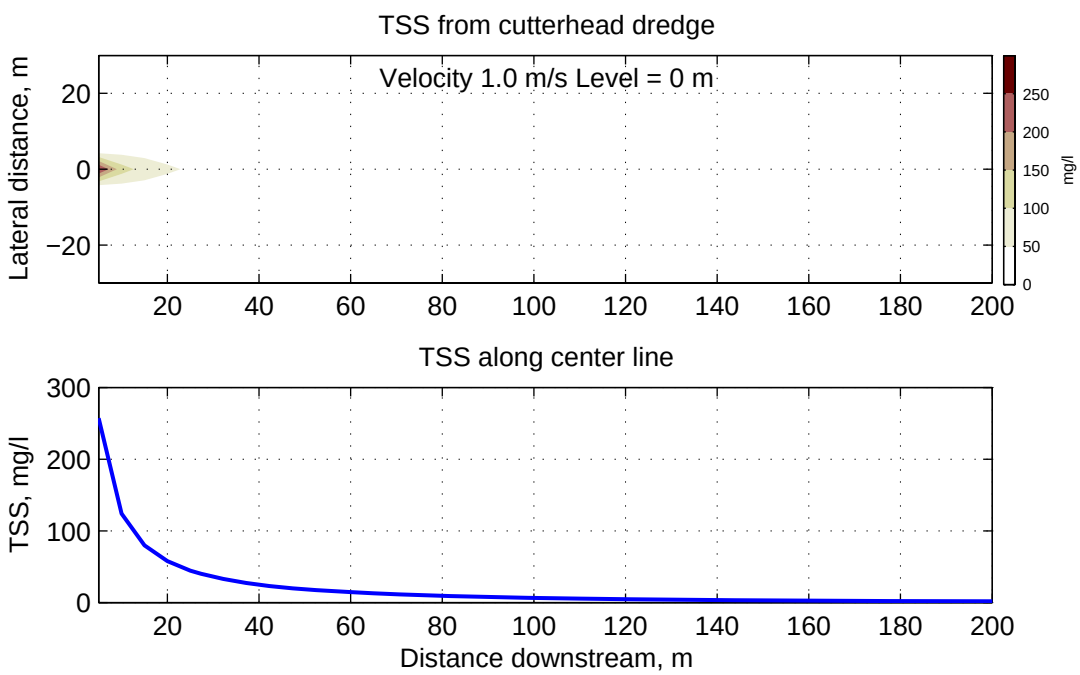

Figure 3-3: Results for Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of Cutterhead during Construction Dredging

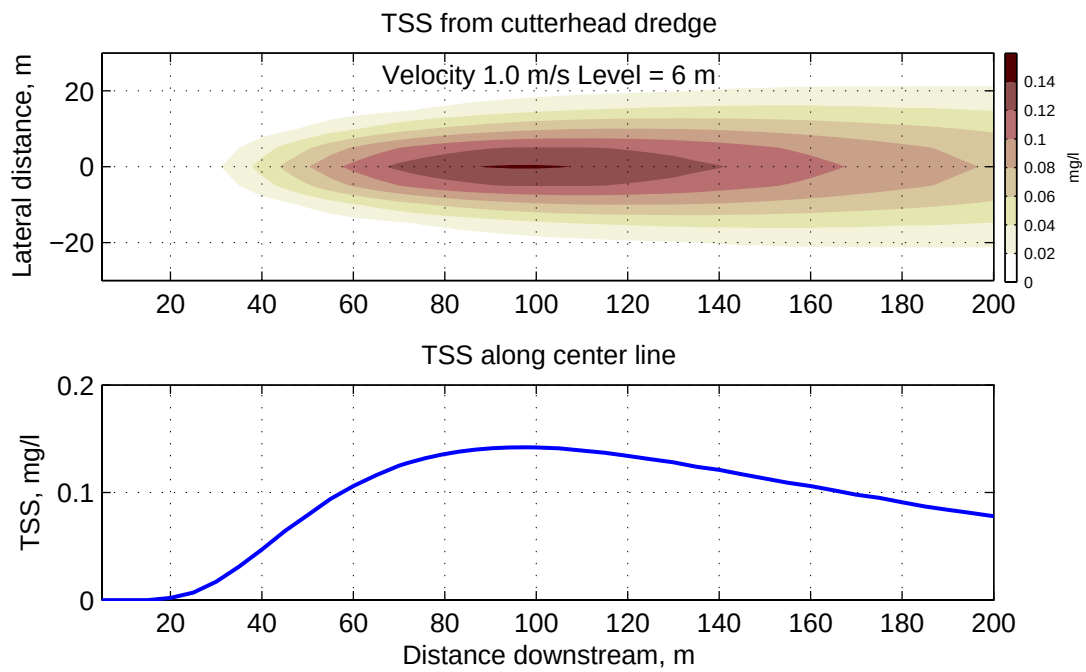

Figure 3-4: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

3.2 Turbidity Generation by Mechanical Dredge during Construction

Mechanical open "clamshell" dredges have several advantages over the earlier described hydraulic dredges such as cost of operation and availability. This type of dredge can produce more or less turbidity during dredging operations depending on sediment characteristics, type of bucket, operational practice, etc. The turbidity from a "clamshell" dredge is modeled as generated by a line source extending between the bottom and the water surface.

Similar parameters were used to estimate TSS distributions at different distances from the dredge. The maximum source intensity was estimated to be 40 kg of sediments per second, which is 16 times higher than for the hydraulic dredge.

Figure 3-5 and Figure 3-6 show TSS distributions for 0.1 and 1.0 m/s currents. For lower flow velocities most of the sediments settle close to the dredge location. Higher sediment concentrations near the dredge rapidly decrease with distance and at 200 meters the TSS levels do not exceed 30 mg/l. For a 1.0 m/s current the plume extends to a greater distance, but also rapidly decreases in intensity by 200 m resulting in 50 mg/l concentration.

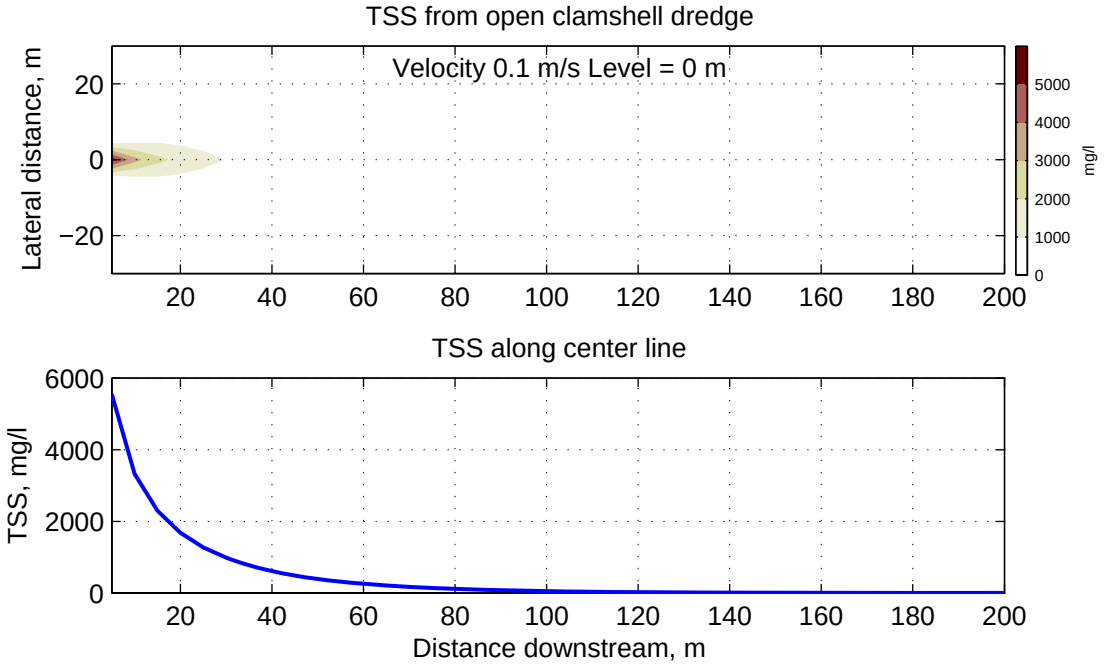

Figure 3-5: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Construction Dredging

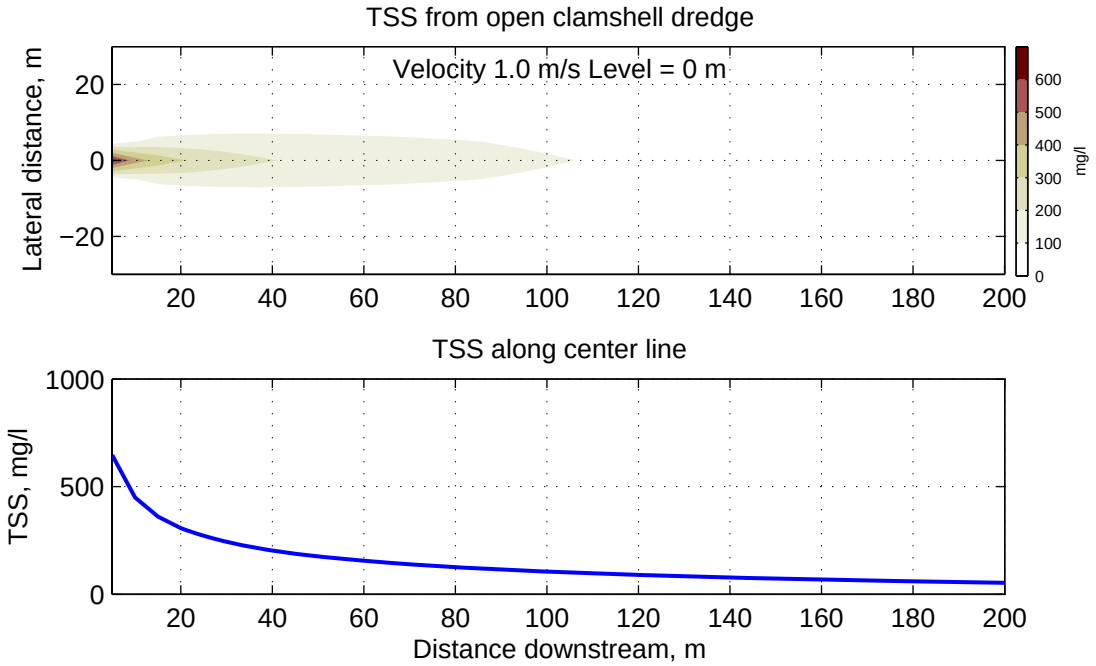

Figure 3-6: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Construction Dredging

3.3 Turbidity Generation by Mechanical Dredge during Maintenance

For maintenance of the LNG basin and turning basin it is anticipated that only a mechanical open "clamshell" dredge will be used. Assuming similar parameters for the dredge as used for construction, the source strength from dredging the fine material (clay, silt) was estimated with the DREDGE model to be 5 kg/s. The resulted plume distribution with 0.1 and 1.0 m/s (0.2 and 1.9 knots) currents are shown in Figure 3-7 and Figure 3-8. For a 0.1 m/s current concentration in vicinity of the dredge exceeds 800 mg/l and drops rapidly to 100 mg/l at 200 m. In case of high current velocity, the concentrations do not exceed 90 mg/l near the dredge and decreases to 25 mg/l at 100 m.

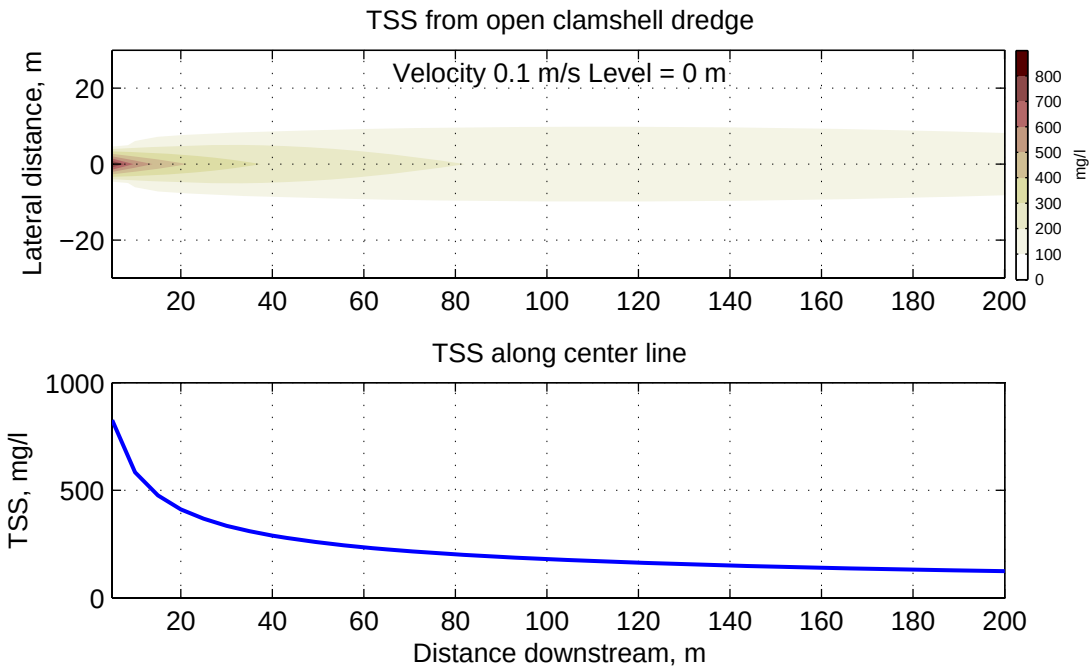

Figure 3-7: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Maintenance Dredging

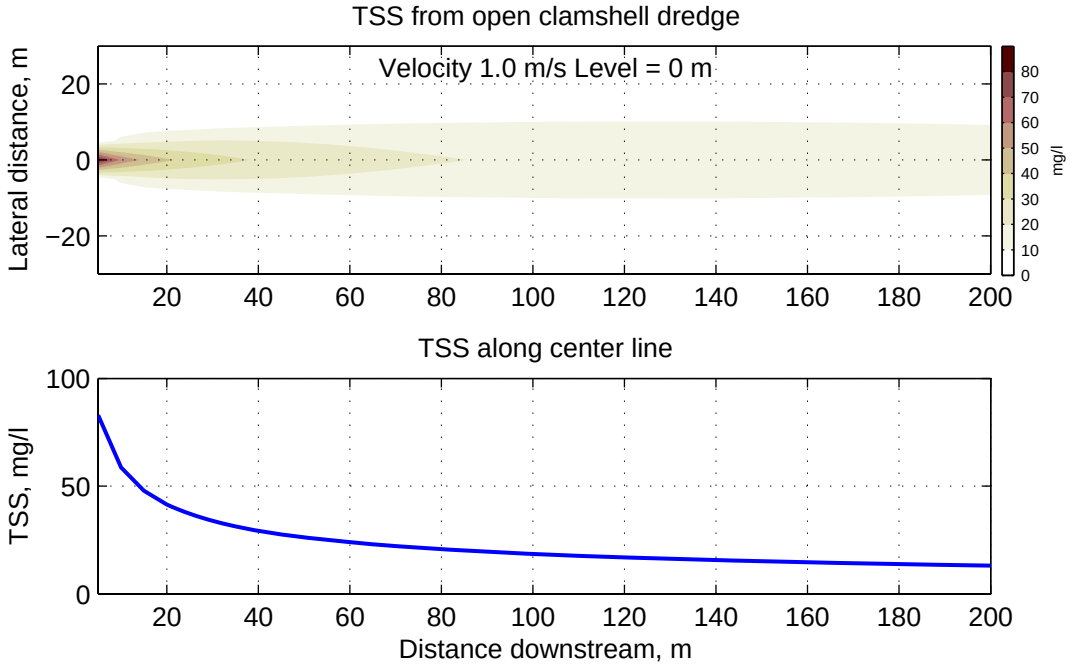

Figure 3-8: Suspended Sediment Concentrations DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Maintenance Dredging

3.4 Spatial Distribution of Plume at Site Location

The DREDGE model provides preliminary results for the turbidity analysis. The model provides the distribution of plume for a case of steady current over the uniform depth. This case presents a simplified situation. In a more complex environment with changing channel configuration and presence of tidal currents, distribution of the generated plume can vary with tidal phase as well as a dredging location.

To better understand how the dredging operations can affect turbidity levels in the Coos Bay Navigational Channel, the two dimensional numerical model Mike21 (developed by Danish Hydraulic Institute) was utilized. The model incorporates hydrodynamic calculations together with a sediment transport module to produce time variable estimates for the current speed and direction and suspended sediment concentrations. The domain for calculations included the entire Coos Bay channel and South Slough. Presently existing bathymetry from recent USACE surveys were incorporated with the proposed LNG berth and maneuvering area as inputs into the model. For the hydrodynamic calculations the tidal levels measured at Charleston were applied at the entrance jetties. When the water level change at the entrance a wave is generated that travels inside the bay producing associated currents. The gravity and bed friction are the main forces which govern the current speed and water level inside the bay.

Under the forces produced by moving water, sediment particles are moved either in suspension or within a thin layer above the bottom. Both mechanisms are considered by the model, which gives a realistic estimation for sediment migration within the domain.

Characteristics of the sediment transport depend very much on the sediment size. The model includes modules for sand and very fine particles that in general are referred to as “mud”. To differentiate between sand and mud particles the sediments were divided into two fractions, sand and mud (fines), with 95% of sand particles and 5% of fines for construction and 10% of sand and 90% of fines for maintenance. The median size of sand was estimated as 0.3 mm with settling velocity of 4 cm/s. For the fines values of 0.3–0.5 mm/s for the settling velocity were used. Strength of the turbidity source was estimated with DREDGE model for different conditions of construction and maintenance dredging (see Table 3-1). Other parameters such as dispersion coefficients, friction factors, erosion coefficients, etc. were set to reasonable values estimated for other similar situations.

Table 3-1: Parameters for Estimating Turbidity Source Strength for Dredges Planned for Use during Construction and Maintenance

Stage	Dredge type	Sediments	Parameters	Source strength
Construction	Mechanical "clamshell"	Sand 95% Fines[1] 5%	D_{50} = 0.3 mm w_s [2]= 5 mm/s TGU[3]=17.6 kg/m^3	40 kg/s
Construction	Hydraulic cutterhead	Sand 95% Fines 5%	D_{50} = 0.3mm w_s = 5 mm/s TGU=0.3 kg/m^3	2.5 kg/s
Maintenance	Mechanical "clamshell"	Sand 10% Fines 90%	w_s = 3 mm/s TGU=40 kg/m^3	5 kg/s

To include dredging operations into the model a source with a specified discharge was added. To minimize the number of simulations only the most conservative cases were considered. From the turbidity generation model discharge from the open "clamshell" dredge was approximated to be 40 kg/s during construction, which was approximately 16 times greater than from the hydraulic dredge. An equivalent source was input into the model. Three different locations for the source were considered: inside the basin, at the basin entrance, and in the channel. The maximum and average suspended concentrations were then derived from time variable concentration field. The maximum concentration level defines a level reached at least once during the simulation period. The average concentrations were calculated as regular time average values. The simulation time was equal to one day (24 hours) and included two typical tidal cycles.

The results of the simulations for dredging during construction are shown in figures 3-9 through 3-11. Because a grid size of 20×20 meters was used in the model, the initial concentrations in vicinity of the source were lower than predicted with the DREDGE model which has much higher resolution. Areas corresponding to different levels of maximum concentration show the maximum extent of generated plumes reaches 2–3 km (1.2–1.9 miles). However, because of time variable currents the plume never had the shown shapes: at slack tide a cloud of suspended sediments was generated at the dredge location and with increasing of velocities this cloud was transported along the channel either upstream in a flood tide or downstream in an ebb tide. Therefore, the shown maximum concentrations existed for a short period of time (less than two hours) outside the dredging area.

[1] With sediment size less than 74μm (passing sieve 200)
[2] Settling velocity for fines
[3] Turbidity Generating Unit (Nakai, 1978)

The time average concentrations are also shown. As it can be seen, most of the time the mean concentrations did not exceed concentration of 20 mg/l outside the dredging location, which is in the range of natural turbidity level of 5–45 mg/l (NANOOS).

Similarly, the results for plume generated during maintenance dredging are shown in Figure 3-12. The maximum concentrations from three locations of the dredge (inside the basin, at the entrance and in maneuvering area) are shown simultaneously. The concentrations within the plume were lower (25–50 mg/l) than in case of construction because of higher content of fine sediments.

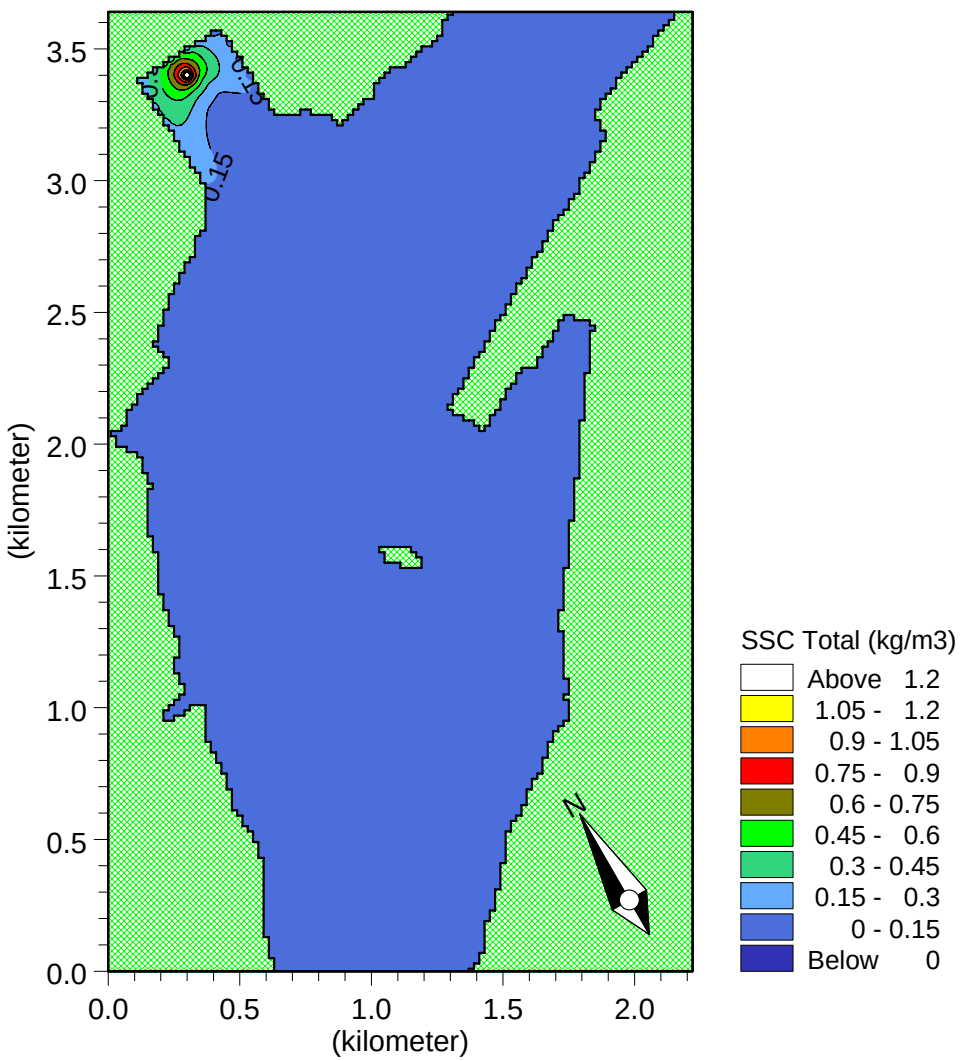

Figure 3-9: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging Inside Basin (1 kg/m^3 = 1,000 mg/l)

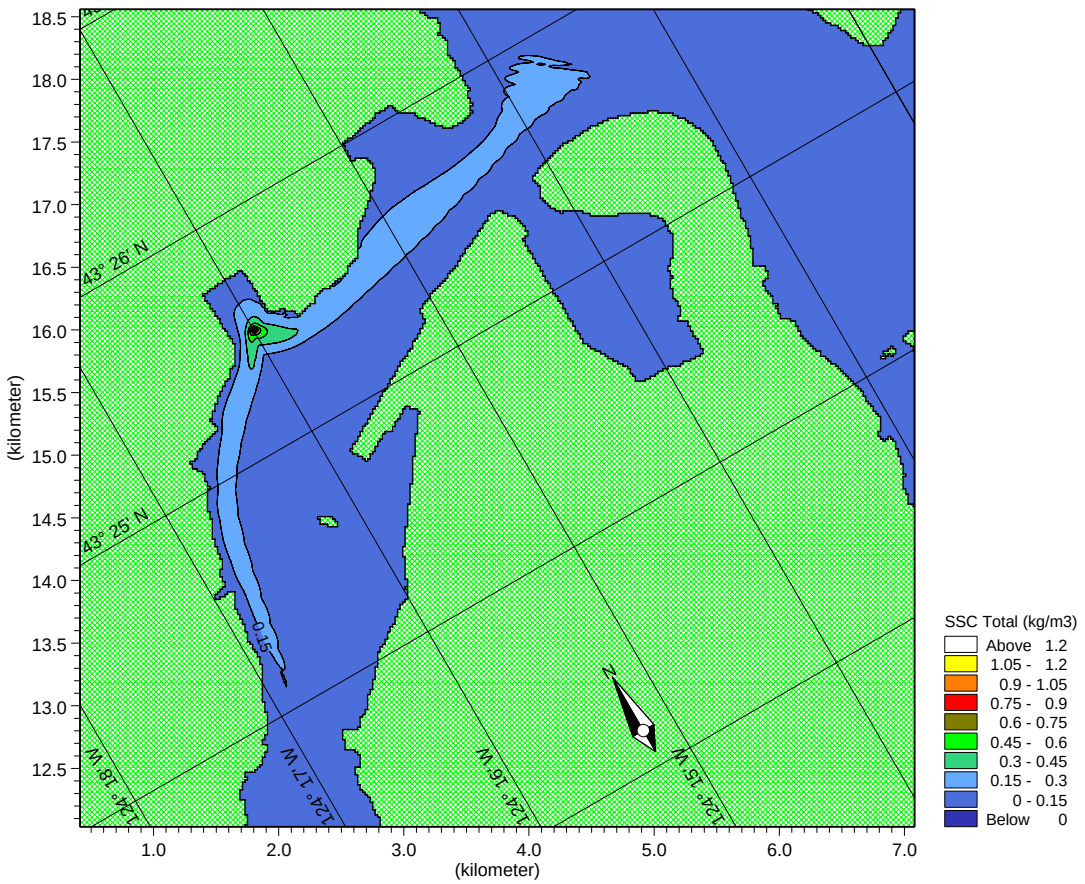

Figure 3-10: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging at Basin Entrance (1 kg/m^3 = 1,000 mg/l)

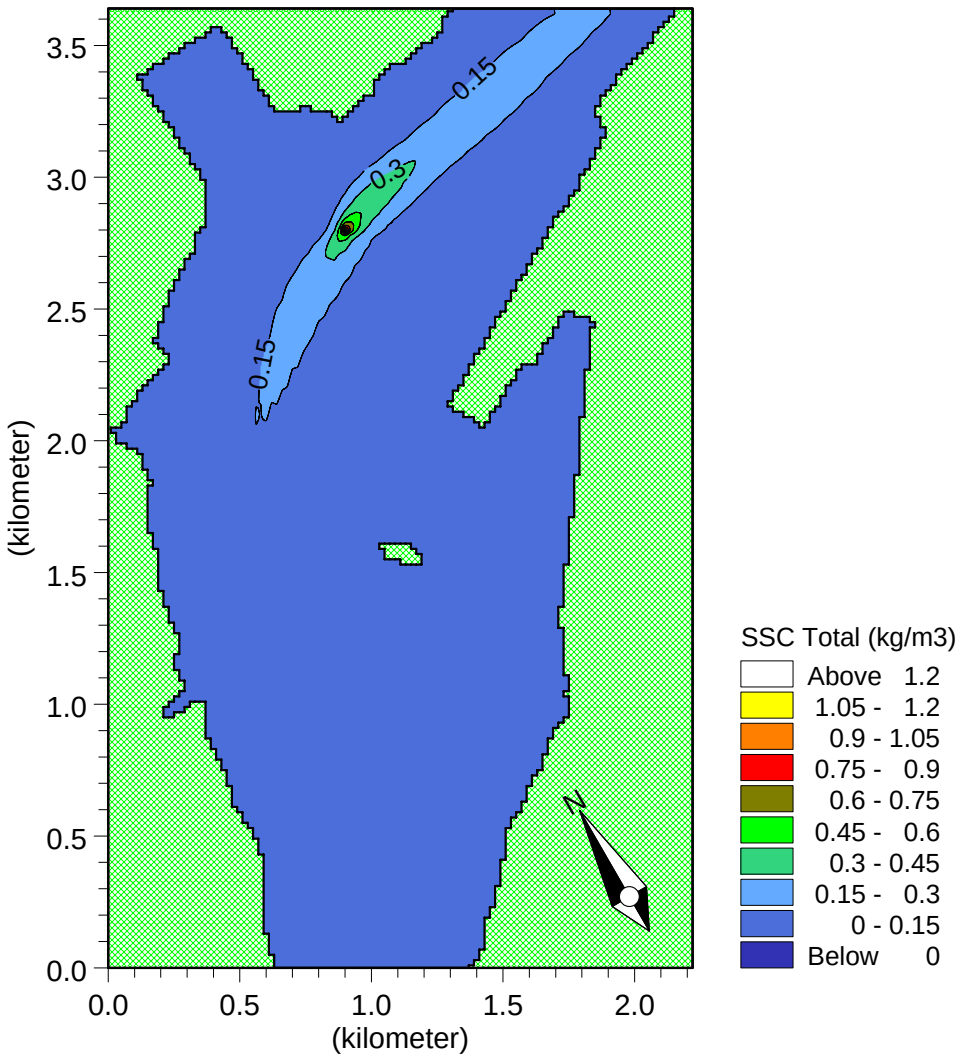

Figure 3-11: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging in the Channel (1 kg/m^3 = 1,000 mg/l)

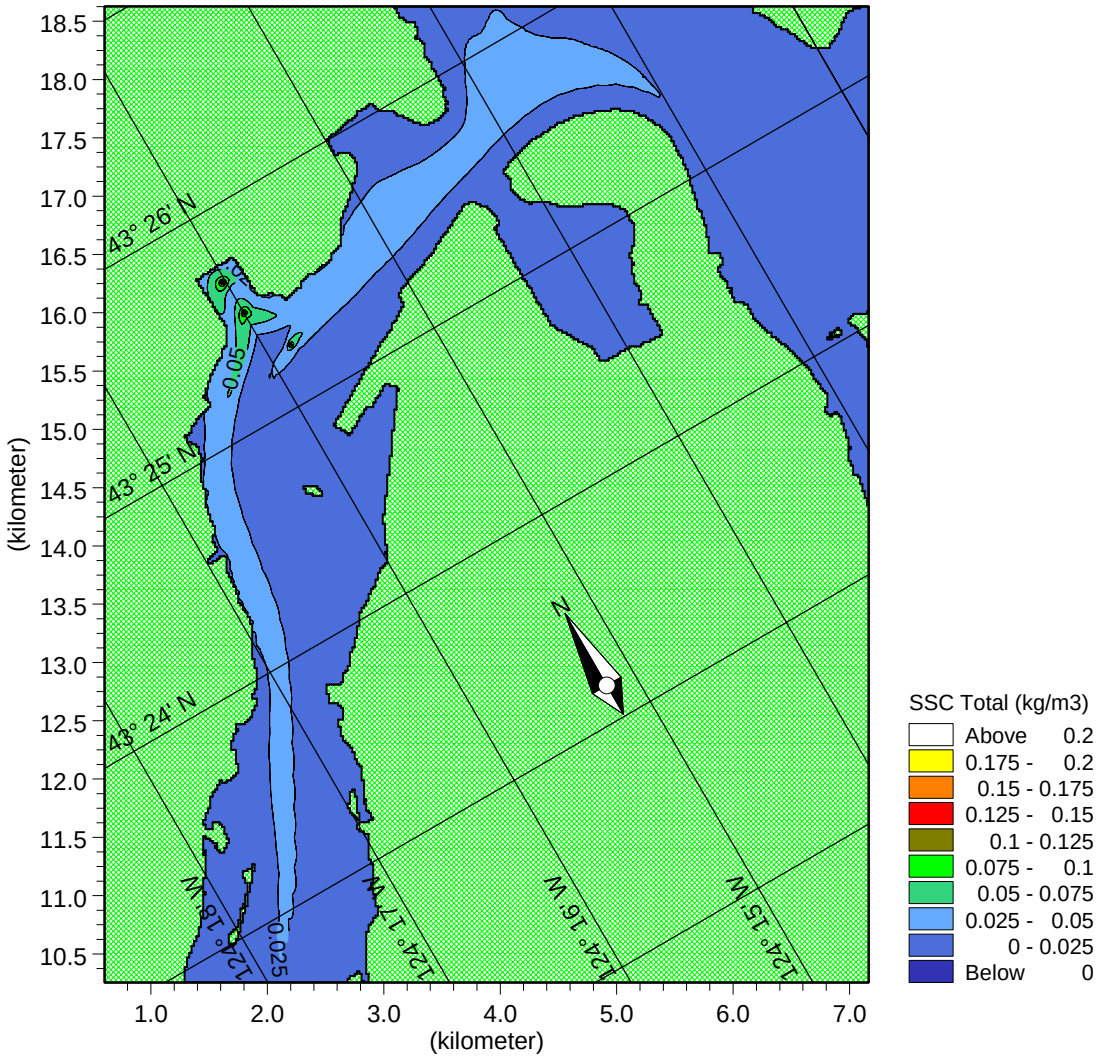

Figure 3-12: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Maintenance Dredging (1 kg/m^3 = 1,000 mg/l)

4.0 TURBIDITY MONITORING AND CONTROL MEASURES

Turbidity is generally monitored in the dredging area at a variety of locations and depths. Background turbidity is also frequently monitored at a site away from the dredge. Grab samples of water can also be obtained and sent to an analytical laboratory to determine TSS. Turbidity monitors are generally in communication with the dredge in order to allow operational changes if high turbidity levels are observed.

Several types of measures can be used to limit sediment resuspension at the cutterhead. These controls can be broken down into operational controls and physical barriers. Operational controls include cessation of dredging, decreasing cutterhead speed, increasing suction flow rate and using a different size or type of dredge. Physical barriers are typically silt curtains, which are geotextile fabric suspended vertically in the water with floats and is anchored. The curtains typically only extend to within 2 ft of the bottom, but may be limited to 10 to 12 feet water depths if currents are present. Silt curtains can partially contain the suspended sediment; however, they may be impracticable in deeper water, in tight working areas, and areas where moderate currents exist.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Turbidity was modeled for the dredging operations (during construction and maintenance) for the geotechnical and environmental conditions anticipated for this project using the USACE DREDGE model and a two dimensional numerical model Mike21 developed by the Danish Hydraulics Institute.

From the results of the DREDGE model for the open "clamshell" dredge, during construction stage the maximum modeled suspended sediment concentrations (primarily sand) were less than 6,000 mg/l at the dredge location rapidly decreasing with distance to less than 50 mg/l at 200 m (approximately 660 feet). For the hydraulic cutterhead dredge the TSS levels were significantly lower with maximum of 500 mg/l in the vicinity of the dredge. The TSS concentrations reduce rapidly to maximum of 14 mg/l by a distance of 60 meters (200 ft).

During maintenance, the dredged material is expected to be primarily fines (mud, clay, silt). Concentration predicted with the DREDGE model for the open "clamshell" dredge were lower than during the construction stage with the maximum of 830 mg/l in vicinity of the dredge and decreasing to 125 mg/l at 200 m (approximately 660 feet).

The results from the Mike21 simulations show that distribution of the generated plume depends on location of the dredge machine in the channel and basin area. For dredging with an open "clamshell" dredge in the channel the generated sediment plume (concentration higher than 150 mg/l) can move up to 1.2–1.9 miles from the dredging location at highest ebb or flood currents; however, the duration of such entrainment is limited by not more than a two hour period and the time average concentrations do not exceed natural ambient concentrations (10–30 mg/l) outside the dredging area.

During maintenance dredging with an open "clamshell" dredge, the maximum concentrations in the generated plume do not exceed 50 mg/l.

Resuspension of sediments during dredging operations can be a significant source of turbidity; however, through proper operational controls and potentially the use of physical barriers, this source can be controlled.

The actual TSS distributions may vary significantly due to site specific currents, bottom geometry, and density profile of the water column. These can be modeled in greater details with a two dimensional numerical model. Initial estimations also can be provided by a screening tool DREDGE. With the conservative values entered into the DREDGE model these results are likewise believed to be conservative estimates (e.g., higher TSS levels than expected in the field).

Based on these result it is not anticipated that turbidity generation at the dredging site will be a significant environmental concern.

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March 13, 2013

Sean P. Sullivan, L.A.
David Evans and Associates, Inc.
2100 SW River Parkway
Portland, OR 97201

Subject: Port of Coos Bay Slip and Access Channel Turbidity Report Addendum

Dear Mr. Sullivan:

The purpose of this addendum letter is to review the anticipated turbidity due to construction and maintenance dredging operations at the proposed Port of Coos Bay (POCB) Slip and Access Channel.

Turbidity was originally analyzed in 2006, with details and conclusions provided in the document "Jordan Cove LNG Terminal: Coos Bay, Oregon; Report on Turbidity Due to Dredging" prepared by Moffatt & Nichol for Black & Veatch and Jordan Cove Energy Project, L.P. on May 5, 2006.

Turbidity Report Summary

The turbidity was modeled using the United States Army Corps of Engineers (USACE) DREDGE model and the two dimensional numerical model MIKE-21. During construction dredging, the dredge material is expected to be primarily sand. During maintenance dredging, the dredged material is expected to be primarily fines (mud, clay, silt).

The DREDGE model provides suspended sediment concentrations (SSC) near the dredging operations. Table 1 summarizes the results for the various dredge methods.

Table 1: DREDGE Model Summary

	Max SSC at Dredge Location	SSC in the Surrounding Area
Construction Dredging		
Mechanical Clamshell	6,000 mg/l	50 mg/l at 200 meters
Hydraulic Cutterhead	500 mg/l	14 mg/l at 60 meters
Maintenance Dredging		
Mechanical Clamshell	830 mg/l	125 mg/l at 200 meters

The MIKE-21 model evaluates spreading of the dredge plume throughout the estuary. The results show that distribution of the generated plume depends on location of the dredge in the channel and basin area. For construction dredging with an open clamshell dredge in the channel, the generated sediment plume (concentration higher than 150 mg/l) can move up to 1.2–1.9 miles from the dredging location at highest ebb or flood currents. However, the duration of such entrainment is limited to a two hour period and the time average concentrations do not exceed natural ambient concentrations (10–30 mg/l) outside the dredging area. During maintenance dredging with an open clamshell dredge, the maximum concentrations in the generated plume do not exceed 50 mg/l.

Based on these results, the 2006 report concluded that turbidity generation resulting from construction and maintenance dredging will likely not be significant.

Project Changes

Since 2006, the proposed slip size and dredging quantities have been reduced.

- Construction dredging was estimated at between 1.8 and 3.3 million cubic yards in 2006. This estimate has been tightened to 1.85 million cubic yards, at the low end of the original range.
- Maintenance dredging was estimated at up to 350,000 cubic yards every 2 years in 2006. The slip size has been reduced and the estimate has been tightened to less than 40,000 cubic yards every 3 years.

The methods for dredging the slip and access channel have not changed since 2006, and additional geotechnical information has not changed the anticipated dredge material qualities.

We conclude that the turbidity resulting from construction and maintenance dredging will be similar to that anticipated in the 2006 Turbidity Report. For maintenance dredging, the turbidity effects will occur less frequently and for a shorter period than was anticipated in 2006. Consequently, the previous conclusion – that turbidity generation resulting from construction and maintenance dredging will likely not be significant – remains valid.

We appreciate the opportunity to review the earlier work in light of changed project conditions. Please contact me at (206) 622-0222 or stonkin@moffattnichol.com if you have any questions.

Sincerely,

MOFFATT & NICHOL

Susan Tonkin, PhD, PE
Senior Coastal Engineer

JORDAN COVE LNG TERMINAL
COOS BAY, OREGON

REPORT ON TURBIDITY DUE TO DREDGING

Prepared for:

BLACK & VEATCH

and

Jordan Cove Energy Project, L.P.

Rev No	A	B	0	1	2
Issue Purpose	Issued for Client Approval	Added Maintenance Dredging Information			
Date	04/12/2006	05/05/2006			
By	OM/LAW	OM/LAW			
Checked	MW	MW			
Approved		WGS			

Prepared by:

MOFFATT & NICHOL

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1.0 EXECUTIVE SUMMARY

Turbidity was modeled for the new construction and maintenance dredging operations based on the anticipated geotechnical and environmental conditions for this project using the United States Army Corps of Engineers (USACE) DREDGE model and two dimensional numerical model Mike21 (developed by Danish Hydraulic Institute).

Re-suspension of sediments during dredging operations can be a significant source of turbidity; however, through proper operational controls and potentially the use of physical barriers, this source can be controlled.

Turbidity generation is a factor of the dredge type, dredging practices, sediment characteristics, and environmental conditions at the site (e.g., currents).

From the results of the DREDGE model for the open "clamshell" dredge, during construction stage the maximum modeled suspended sediment concentrations (primarily sand) were less than 6,000 mg/l at the dredge location rapidly decreasing with distance to less than 50 mg/l at 200 m (approximately 660 feet). For the hydraulic cutterhead dredge the TSS levels were significantly lower with maximum of 500 mg/l in the vicinity of the dredge. The TSS concentrations reduce rapidly to maximum of 14 mg/l by a distance of 60 meters (200 ft).

During the maintenance dredging period, the dredged material is expected to be primarily fines (mud, clay, silt). Concentration predicted with the DREDGE model for the open "clamshell" dredge were lower than during the construction stage with the maximum of 830 mg/l in vicinity of the dredge and decreasing to 125 mg/l at 200 m (approximately 660 feet).

The results from the Mike21 simulations show that distribution of the generated plume depends on location of the dredge in the channel and basin area. For dredging with an open "clamshell" dredge in the channel the generated sediment plume (concentration higher than 150 mg/l) can move up to 1.2–1.9 miles from the dredging location at highest ebb or flood currents; however, the duration of such entrainment is limited by not more than a two hour period and the time average concentrations do not exceed natural ambient concentrations (10–30 mg/l) outside the dredging area.

During maintenance dredging with an open "clamshell" dredge, the maximum concentrations in the generated plume do not exceed 50 mg/l.

Based on these results it is not anticipated that turbidity generation at the dredging site will be a significant issue.

2.0 INTRODUCTION

Turbidity as a general term refers to suspension of sediment or other particles in water. Turbidity as a measurement is a description of water clarity based on light transmittance and/or scattering that is easily measured in the field. Turbidity measurements are typically reported in nephelometric turbidity units (NTU), with a value of approximately 5 NTU being easily detectable visually. A related water quality parameter often used in lieu of turbidity is total suspended solids (TSS) which is a mass concentration description measurable in a laboratory. The relationship between turbidity and TSS varies with water and sediment characteristics. Turbidity is generally a more useful tool for construction management because it can be monitored in the field; however, many regulatory agencies use TSS for regulations due to its more definable nature. Approximate correlations between turbidity and TSS can be made for use in the field.

Generation of turbidity during dredging operations can occur at both the dredging location and disposal location. This report addresses turbidity generation at the dredging location. Turbidity generation is a factor of the type of dredge, dredging practices, sediment characteristics, and environmental conditions at the site (e.g., currents).

Numerous types of dredges are in common use around the world with each type having different turbidity generation characteristics. For purposes of this report, turbidity generation due to dredging will be limited to hydraulic cutterhead suction dredges and mechanical open “clamshell” dredges, typically as shown in Figure 2-1 and Figure 2-2. This equipment is most likely to be used for the Jordan Cove LNG terminal construction and maintenance. Cutterhead suction dredges use a cutterhead to loosen soils that are then pulled into the suction side of a pipeline and transported to a disposal area. Open “clamshell” dredges consists of a crane derrick mounted on a barge and equipped with a “clamshell” bucket.

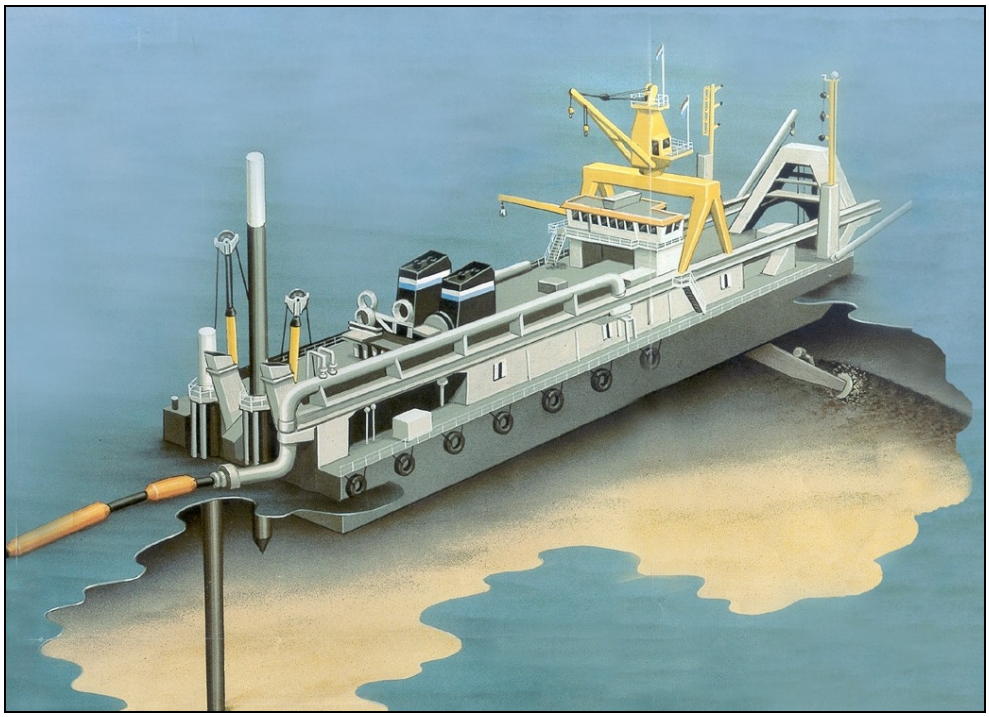

Figure 2-1: Hydraulic Cutterhead Suction Dredge (from Oilfield Publications Limited, n.d.)

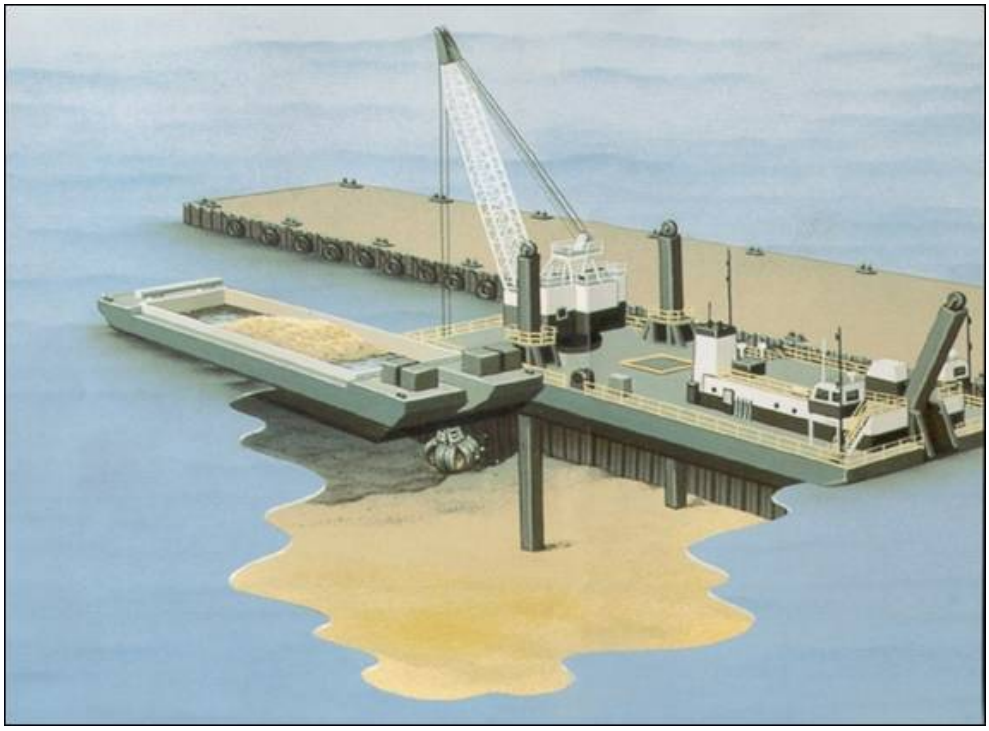

Figure 2-2: Mechanical Open "Clamshell" Dredge (from Oilfield Publications Limited, n.d.)

Both hydraulic and mechanical dredges were proposed to be use in dredging operations. The preliminary characteristics of cutterhead (hydraulic) and open "clamshell" (mechanical) dredges are presented in Table 2-1 and Table 2-2 respectively.

Table 2-1: Characteristics of Hydraulic Cutterhead Dredge

Parameter	Value	
Cutterhead diameter	7 ft	2.13 m
Cutterhead length	5 ft	1.52 m
Thickness of cut	4 ft	1.22m
Swing velocity at cutter	45 ft/min	0.23 m/s

Table 2-2: Characteristics of Mechanical Open "Clamshell" Dredge

Parameter	Value	
Bucket size	12 yd^3	9.2 m^3
Cycle time	80 sec	

2.1 Sediment Characteristics and Environmental Parameters

Sediment characteristics are a key factor in turbidity generation. In general, clean, coarse sands settle quickly and generate little turbidity. In contrast, loose silts (typical of maintenance dredging) are easily suspended and do not settle easily leading to higher turbidity generation. Resuspension of clays is more complicated due to the cohesion between soil particles. Stiff clays can sometimes be cut by the cutterhead in relatively large pieces minimizing resuspension; however, clay particles which are resuspended generally do not settle out of the water column.

Parameters of the sediments to be dredged during construction of the project are much different from the material to be removed during maintenance. For construction, information on sediment characteristics was obtained from the geotechnical analysis for the proposed site location. A sieve analysis was performed for several soil samples extracted from the depths between 20 to 175 feet. The analysis showed presence of well sorted fine sand (averaging approximately 95%) and fines (<5%) at depths 20–35 feet. The median sediment size was 0.3 mm. Only approximately 5% of sediments by weight passed sieve 200, which are silt and clay particles with sizes less than 0.075 mm. Analysis of the bottom surface samples taken from the ship channel close to the site location showed presence of 1–2.1% fines by weight.

During maintenance, primarily fine sediments (silt, clay, etc.) are expected to be dredged in the basin. The distribution of sediment sizes can vary significantly, but in the present study it was conservatively approximated to be 10% sand and 90% fines.

Environmental characteristics also play a part in turbidity generation and dispersion. Water characteristics, particularly salinity and density gradients, can affect the resuspension rate and ability of particles to remain suspended. The largest environmental factor in resuspension is currents. Currents can both aid resuspension by acting directly on the newly dredged faces and greatly affect the dispersion of the resuspended sediments. Suspended sediments are both advected along with the current and spread laterally across the current due to diffusion.

In the present analysis, only the effects of currents and diffusion were considered. Currents of 0.1, 0.2, and 1.0 m/s (0.2, 0.4, and 1.9 knots) with corresponding diffusion coefficients were modeled. These values represent typical flow velocities in the slip (0.1 and 0.2 m/s) and in the channel where dredging is required. Salinity, wind, waves and other environmental parameters were not included.

2.2 Natural Turbidity Levels

Limited measurements of suspended sediment concentrations in Coos Bay were obtained by Parsons Brinckerhoff in collaboration with David Evans & Associates, Inc. as a part of hydrodynamic and water quality study near the proposed LNG terminal location. The average measured concentration was 14 mg/l with some spatial variability. The range of measured concentration was within 0–25 mg/l.

A longer record of turbidity measurements (April, 2002 to December, 2004) at the Charleston Bridge near Charleston is available as a part of NOAA NERRS project (NANOOS, 2006). From the NANOOS data the monthly average turbidity levels were computed. The results are shown in Table 2-3. Average turbidity during summer period (May to October) was significantly lower than during winter. Also, during some individual events measured turbidity was recorded to be over 100–200 NTU.

To convert turbidity into TSS a model is required. Based on measurements from nine streams in King County, Washington Packman et al (1999) derived an empirical relationship between measured turbidity (in NTU) and TSS (in mg/l):

$$\ln(TSS) = 1.32 \cdot \ln(NTU) + c \qquad (1)$$

where ln() is the natural logarithm and constant c is not significantly different from zero.

Using the above expression, average concentrations were computed from the turbidity measurements at Charleston Bridge. The results are shown in Table 2-3. Average summer concentrations were estimated to be 10.1 mg/l, while during winter season concentrations increase to 27.3 mg/l. The Charleston Bridge station is located closer to the bay entrance

than the proposed site location. Therefore, the turbidity and TSS levels may be less compared to the upper bay locations because of entrainment of water from the ocean.

During individual events with high turbidity, the maximum TSS levels in order of 100–500mg/l can be expected. However, the expression for converting turbidity into TSS may not be applicable for calculation of extreme values of TSS.

Table 2-3: Measured Turbidity and Estimated Total Suspended Solids at Charleston Bridge Station (NANOOS) for 2002–2004 Period

Summer			**Winter**		
Month	Turbidity, NTU	TSS, mg/l	Month	Turbidity, NTU	TSS, mg/l
May	9.3	19.0	January	5.7	9.9
June	7.2	13.5	February	11.3	24.6
July	5.8	10.3	March	11.9	26.4
August	4.7	7.7	April	9.2	18.7
September	3.8	5.8	November	18.1	45.7
October	3.7	5.7	December	15.0	35.7
Total	**5.8**	**10.1**	**Total**	**12.2**	**27.3**

2.3 Turbidity Estimation Methodology

The USACE has developed an analytical model, named DREDGE, for evaluating turbidity generation for cutterhead suction dredges and open “clamshell” dredges. The model is based on empirical data and a simplified advection and diffusion model. The DREDGE model is appropriate for planning of dredging operations; however, site specific environmental and sediment characteristics may not be accurately represented by the model.

The DREDGE model was applied to the Jordan Cove LNG dredging project assuming typical parameters for dredges and assumptions on the soil and other environmental factors at the site. The model was run at the dredge level of the area. Currents of 0.1, 0.2, and 1 m/s were assumed and the dredged material was assumed to be fine sand with approximately 5% silt and clay. Conservative values were used for the turbidity generation parameters.

The diffusion was defined with two parameters. The horizontal and vertical diffusion coefficients were estimated based on analytical expressions for constrained channel (Fisher et al., 1979).

The plume distribution was also modeled with Mike21 hydrodynamic and sediment transport model developed by Danish Hydraulic Institute (DHI). The Mike21 model used the “near-field” turbidity generation output from the DREDGE model as an input.

3.0 TURBIDITY GENERATION

3.1 Turbidity Generation by Hydraulic Dredge during Construction

Sediment resuspension, and thus turbidity generation, at the cutterhead varies according to characteristics of the dredge, the dredging practices, soil characteristics, and environmental factors.

Cutterhead dredges use a rotating cutter to loosen soil particles. The cutterhead is mounted on a ladder at the front end of the dredge which is lowered to face of the soil to be dredged. Once loosened by the cutterhead the particles are then pulled into the suction side of a pipe and through large centrifugal pump(s) which pump the material through a pipeline to a disposal location. The dredge has two spuds, movable piles at the stern, which hold the dredge in place during the cutting action. Two anchors are placed to the side of the dredge and are used to swing the dredge from side to side with the spud as a pivot point. In this way the cutterhead is moved across the area to be dredged. The spuds are raised and lowered alternately to “walk” the dredge forward. Many newer and larger dredges use spuds mounted on carriages that allow the dredge to advance without changing spuds as often providing greater efficiency to the operation.

In addition to soil characteristics, resuspension at the cutterhead is dependent on dredging practices including the cutterhead size, type, and rotation speed, the swing rate of the dredge, the face of the soil to be cut, the pumping rate and pipe inlet size, and ladder inclination.

Intensity of the source of suspended material at cutterhead was estimated by a method derived by Nakai (1978). The method utilizes an experimentally determined parameters based on a number of available observations. For a cutterhead dredge the intensity was approximated to be 2.5 kg/s.

The “far-field” distribution of suspended sediments was calculated using a model by Kuo et al. (1985). The results of the calculations are presented in following figures.

Figure 3-1 shows a two dimensional plan view of the results for TSS at the bottom of the dredge cut with the downstream and lateral distances being distances away from the cutterhead for a 0.1 m/s current. The estimated TSS concentrations along a center line (0 m lateral distance) are shown versus distance from the cutterhead.

Figure 3-2 and Figure 3-3 show TSS results for 0.2 and 1.0 m/s currents.

The estimated TSS concentrations were the largest at the level of cutterhead (at 0 m). The TSS levels were estimated to be up to near 500 mg/L for a 0.2 m/s current in vicinity of the cutterhead, but they rapidly decrease to less than 1 mg/l at 25 m (approximately 80 ft) from the cutterhead.

For currents of 0.1 and 1.0 m/s the TSS levels at the cutterhead were smaller. The TSS decreases to 14 mg/l at 60 m (200 ft) distance from the cutterhead with 1.0 m/s current.

Figure 3-4 presents the TSS distribution at 6 m level above the cutterhead location for the worst considered case (a 1.0 m/s current) for which the largest plume is generated. The level of TSS is insignificant at that level and above. At higher elevations the estimated TSS levels were very small and therefore not shown.

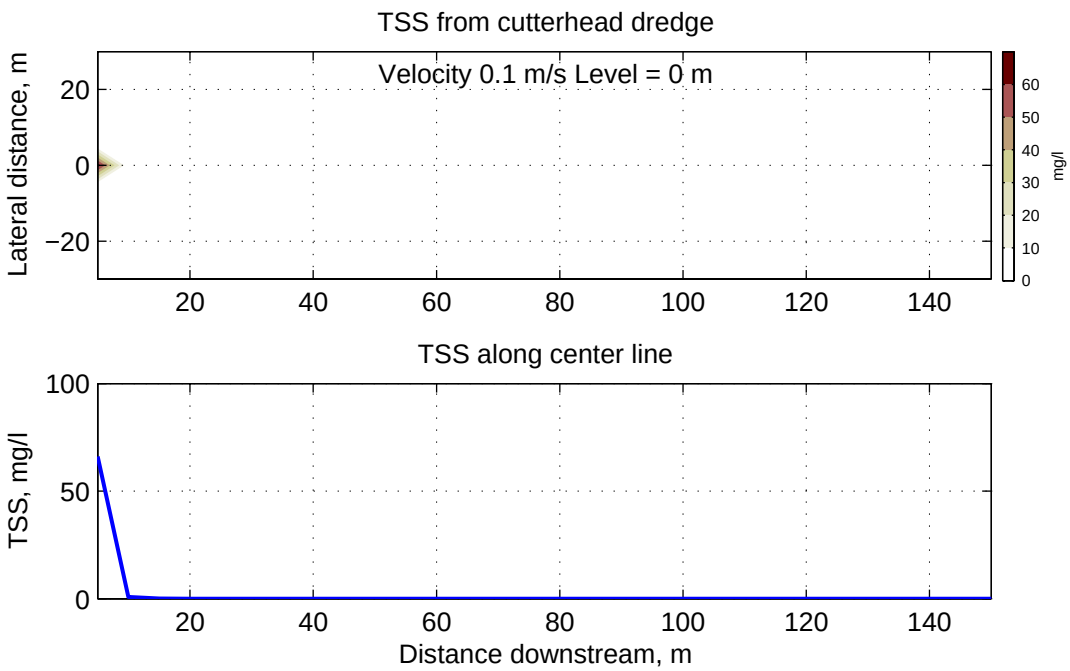

Figure 3-1: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.1 m/s (0.2 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

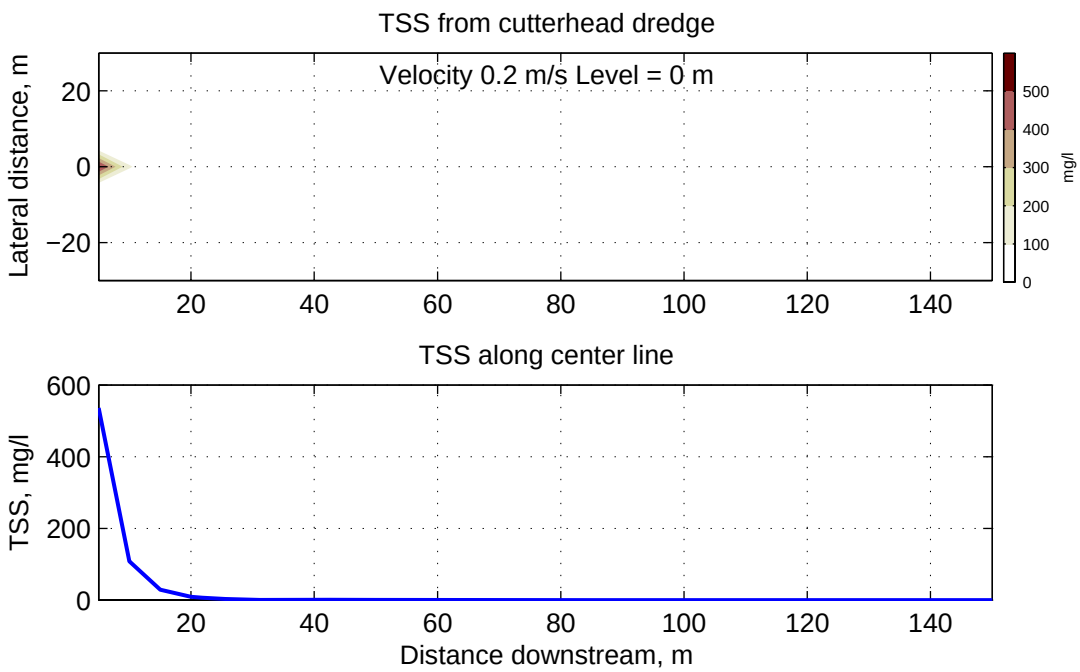

Figure 3-2: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.2 m/s (0.4 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

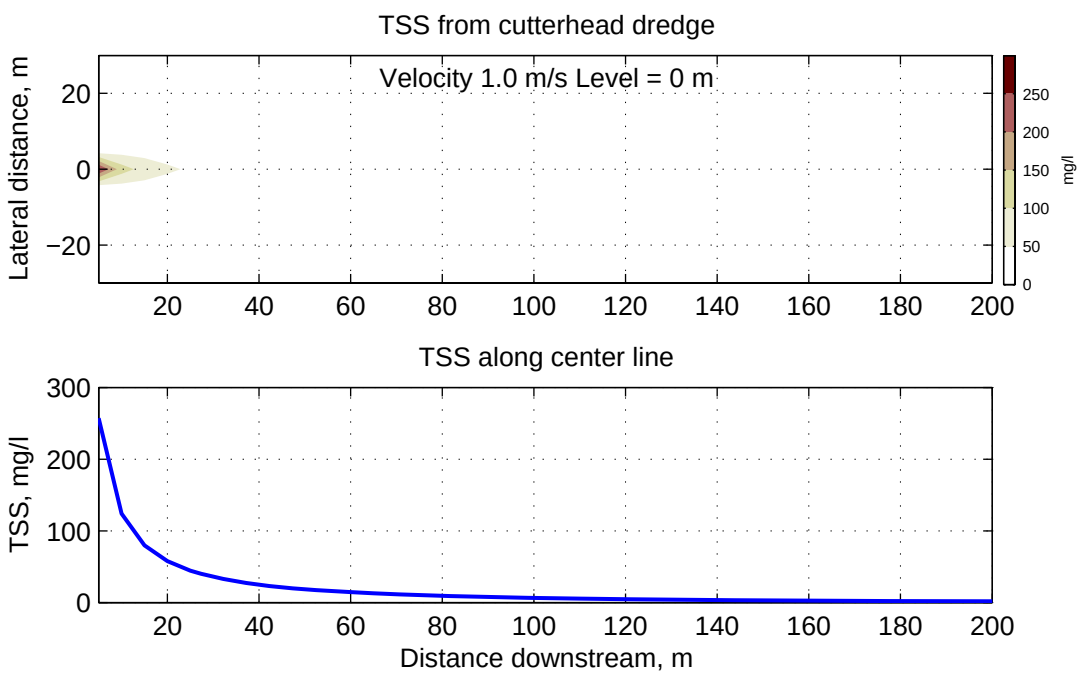

Figure 3-3: Results for Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of Cutterhead during Construction Dredging

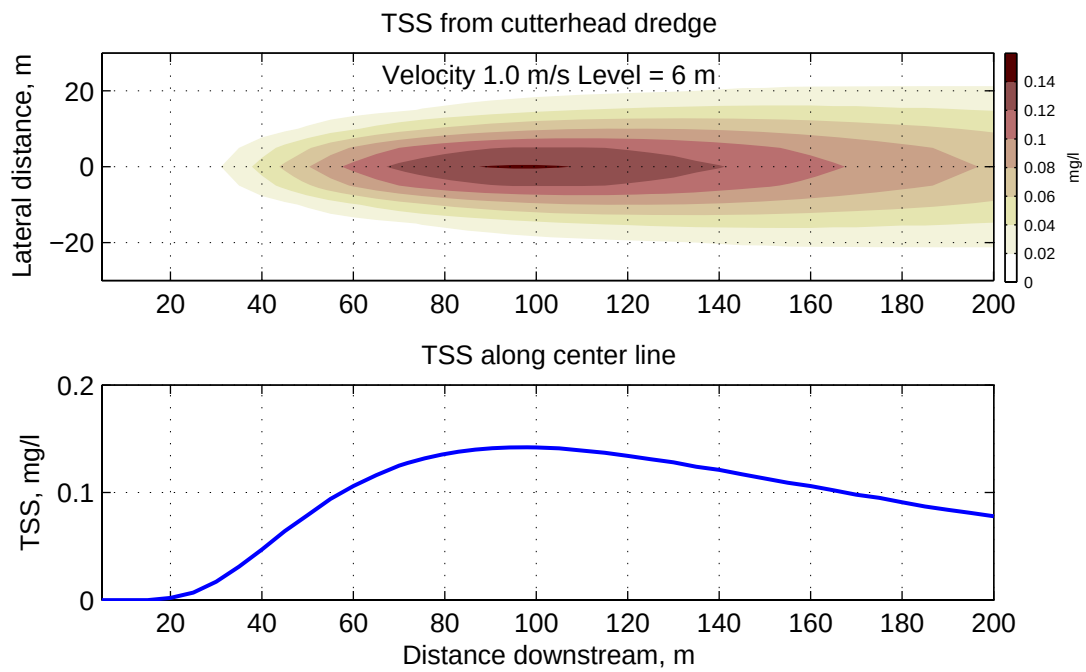

Figure 3-4: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

3.2 Turbidity Generation by Mechanical Dredge during Construction

Mechanical open "clamshell" dredges have several advantages over the earlier described hydraulic dredges such as cost of operation and availability. This type of dredge can produce more or less turbidity during dredging operations depending on sediment characteristics, type of bucket, operational practice, etc. The turbidity from a "clamshell" dredge is modeled as generated by a line source extending between the bottom and the water surface.

Similar parameters were used to estimate TSS distributions at different distances from the dredge. The maximum source intensity was estimated to be 40 kg of sediments per second, which is 16 times higher than for the hydraulic dredge.

Figure 3-5 and Figure 3-6 show TSS distributions for 0.1 and 1.0 m/s currents. For lower flow velocities most of the sediments settle close to the dredge location. Higher sediment concentrations near the dredge rapidly decrease with distance and at 200 meters the TSS levels do not exceed 30 mg/l. For a 1.0 m/s current the plume extends to a greater distance, but also rapidly decreases in intensity by 200 m resulting in 50 mg/l concentration.

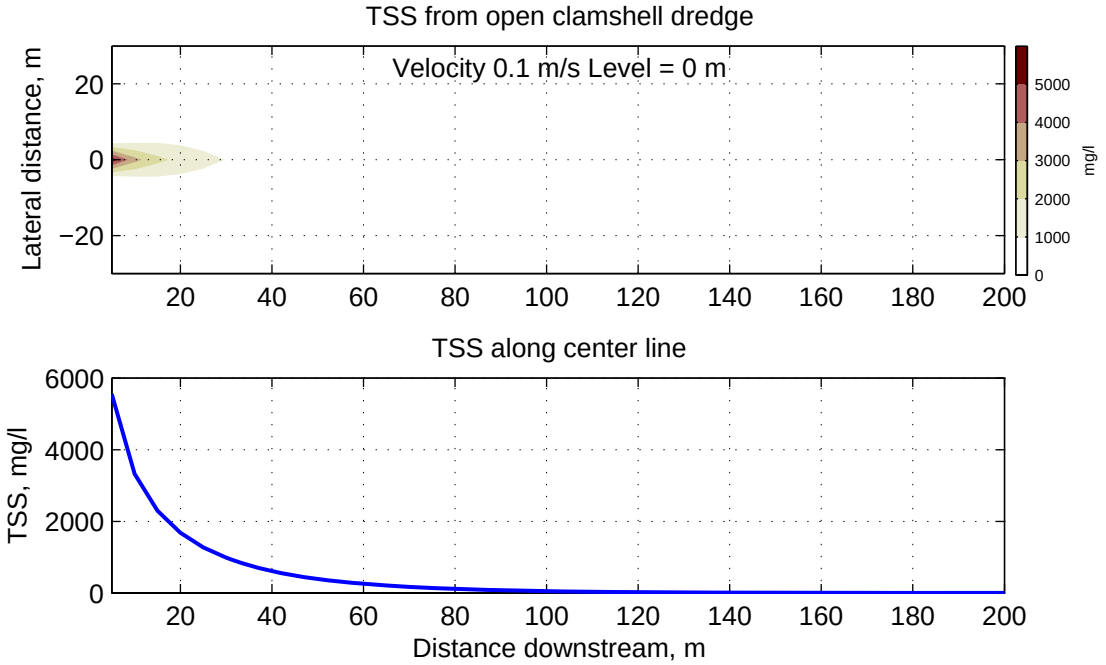

Figure 3-5: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Construction Dredging

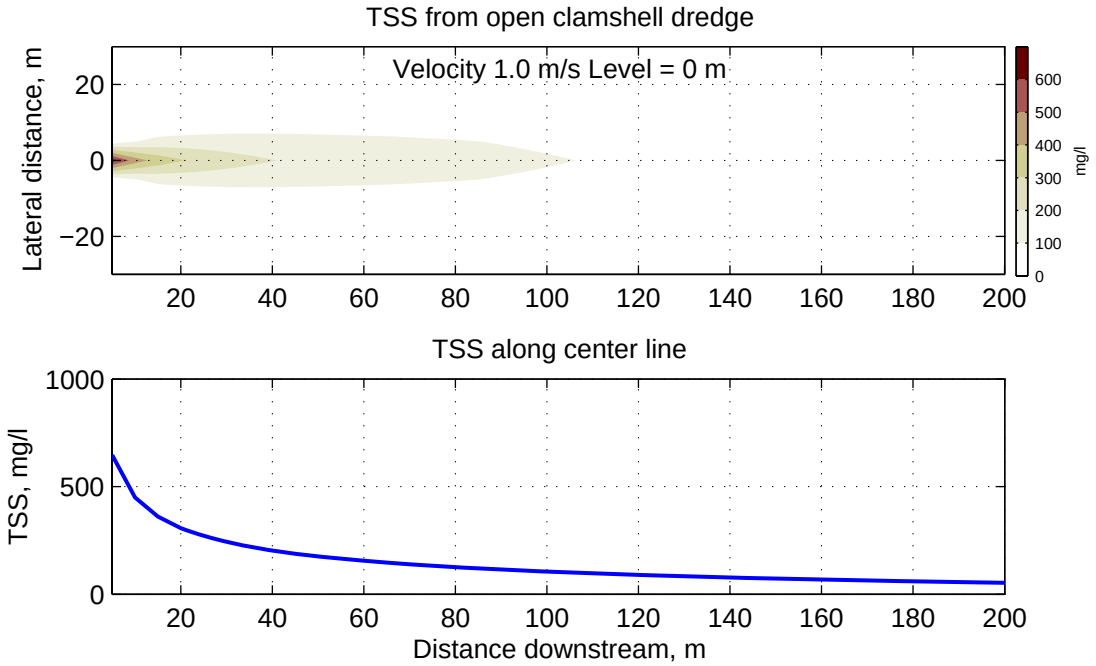

Figure 3-6: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Construction Dredging

3.3 Turbidity Generation by Mechanical Dredge during Maintenance

For maintenance of the LNG basin and turning basin it is anticipated that only a mechanical open "clamshell" dredge will be used. Assuming similar parameters for the dredge as used for construction, the source strength from dredging the fine material (clay, silt) was estimated with the DREDGE model to be 5 kg/s. The resulted plume distribution with 0.1 and 1.0 m/s (0.2 and 1.9 knots) currents are shown in Figure 3-7 and Figure 3-8. For a 0.1 m/s current concentration in vicinity of the dredge exceeds 800 mg/l and drops rapidly to 100 mg/l at 200 m. In case of high current velocity, the concentrations do not exceed 90 mg/l near the dredge and decreases to 25 mg/l at 100 m.

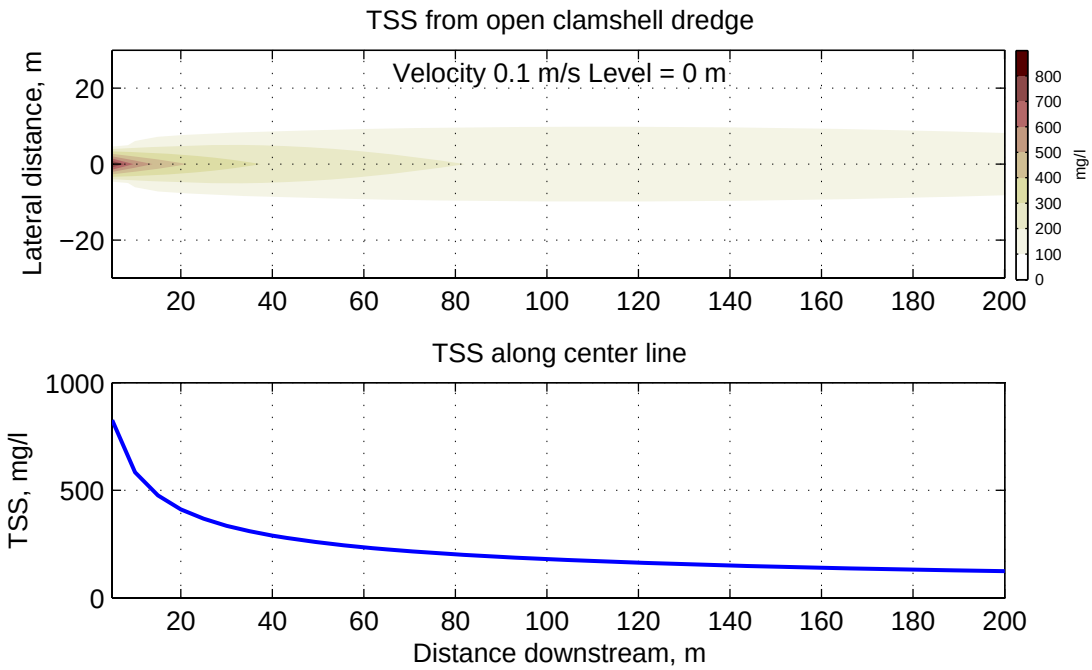

Figure 3-7: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Maintenance Dredging

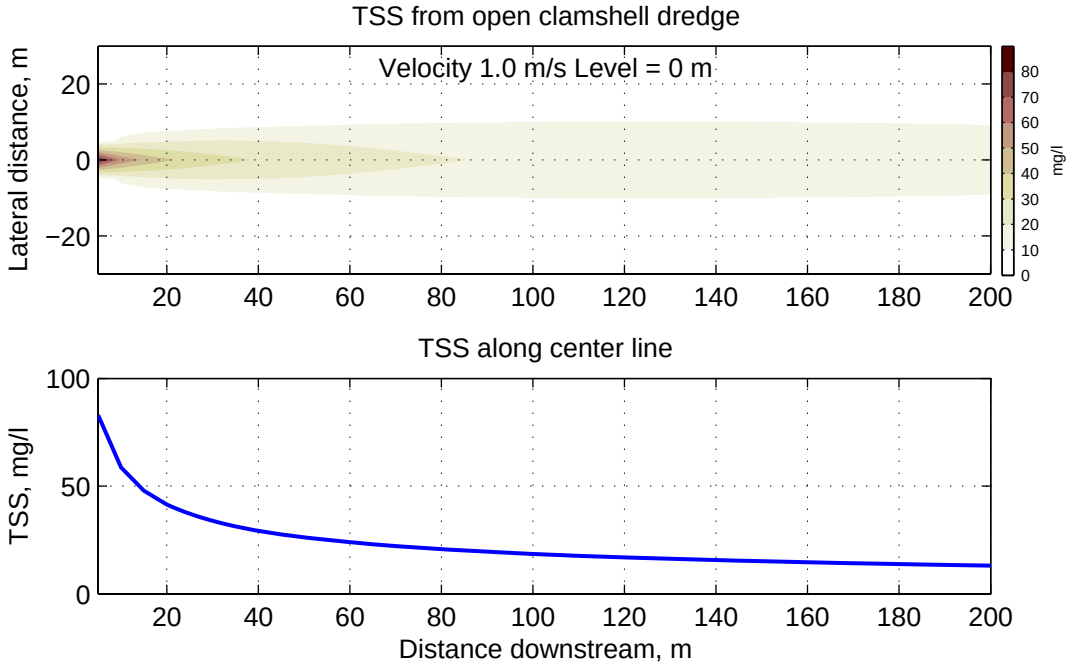

Figure 3-8: Suspended Sediment Concentrations DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Maintenance Dredging

3.4 Spatial Distribution of Plume at Site Location

The DREDGE model provides preliminary results for the turbidity analysis. The model provides the distribution of plume for a case of steady current over the uniform depth. This case presents a simplified situation. In a more complex environment with changing channel configuration and presence of tidal currents, distribution of the generated plume can vary with tidal phase as well as a dredging location.

To better understand how the dredging operations can affect turbidity levels in the Coos Bay Navigational Channel, the two dimensional numerical model Mike21 (developed by Danish Hydraulic Institute) was utilized. The model incorporates hydrodynamic calculations together with a sediment transport module to produce time variable estimates for the current speed and direction and suspended sediment concentrations. The domain for calculations included the entire Coos Bay channel and South Slough. Presently existing bathymetry from recent USACE surveys were incorporated with the proposed LNG berth and maneuvering area as inputs into the model. For the hydrodynamic calculations the tidal levels measured at Charleston were applied at the entrance jetties. When the water level change at the entrance a wave is generated that travels inside the bay producing associated currents. The gravity and bed friction are the main forces which govern the current speed and water level inside the bay.

Under the forces produced by moving water, sediment particles are moved either in suspension or within a thin layer above the bottom. Both mechanisms are considered by the model, which gives a realistic estimation for sediment migration within the domain.

Characteristics of the sediment transport depend very much on the sediment size. The model includes modules for sand and very fine particles that in general are referred to as “mud”. To differentiate between sand and mud particles the sediments were divided into two fractions, sand and mud (fines), with 95% of sand particles and 5% of fines for construction and 10% of sand and 90% of fines for maintenance. The median size of sand was estimated as 0.3 mm with settling velocity of 4 cm/s. For the fines values of 0.3–0.5 mm/s for the settling velocity were used. Strength of the turbidity source was estimated with DREDGE model for different conditions of construction and maintenance dredging (see Table 3-1). Other parameters such as dispersion coefficients, friction factors, erosion coefficients, etc. were set to reasonable values estimated for other similar situations.

Table 3-1: Parameters for Estimating Turbidity Source Strength for Dredges Planned for Use during Construction and Maintenance

Stage	Dredge type	Sediments	Parameters	Source strength
Construction	Mechanical "clamshell"	Sand 95% Fines[1] 5%	D_{50} = 0.3 mm w_s [2]= 5 mm/s TGU[3]=17.6 kg/m^3	40 kg/s
Construction	Hydraulic cutterhead	Sand 95% Fines 5%	D_{50} = 0.3mm w_s = 5 mm/s TGU=0.3 kg/m^3	2.5 kg/s
Maintenance	Mechanical "clamshell"	Sand 10% Fines 90%	w_s = 3 mm/s TGU=40 kg/m^3	5 kg/s

To include dredging operations into the model a source with a specified discharge was added. To minimize the number of simulations only the most conservative cases were considered. From the turbidity generation model discharge from the open "clamshell" dredge was approximated to be 40 kg/s during construction, which was approximately 16 times greater than from the hydraulic dredge. An equivalent source was input into the model. Three different locations for the source were considered: inside the basin, at the basin entrance, and in the channel. The maximum and average suspended concentrations were then derived from time variable concentration field. The maximum concentration level defines a level reached at least once during the simulation period. The average concentrations were calculated as regular time average values. The simulation time was equal to one day (24 hours) and included two typical tidal cycles.

The results of the simulations for dredging during construction are shown in figures 3-9 through 3-11. Because a grid size of 20×20 meters was used in the model, the initial concentrations in vicinity of the source were lower than predicted with the DREDGE model which has much higher resolution. Areas corresponding to different levels of maximum concentration show the maximum extent of generated plumes reaches 2–3 km (1.2–1.9 miles). However, because of time variable currents the plume never had the shown shapes: at slack tide a cloud of suspended sediments was generated at the dredge location and with increasing of velocities this cloud was transported along the channel either upstream in a flood tide or downstream in an ebb tide. Therefore, the shown maximum concentrations existed for a short period of time (less than two hours) outside the dredging area.

[1] With sediment size less than 74μm (passing sieve 200)
[2] Settling velocity for fines
[3] Turbidity Generating Unit (Nakai, 1978)

The time average concentrations are also shown. As it can be seen, most of the time the mean concentrations did not exceed concentration of 20 mg/l outside the dredging location, which is in the range of natural turbidity level of 5–45 mg/l (NANOOS).

Similarly, the results for plume generated during maintenance dredging are shown in Figure 3-12. The maximum concentrations from three locations of the dredge (inside the basin, at the entrance and in maneuvering area) are shown simultaneously. The concentrations within the plume were lower (25–50 mg/l) than in case of construction because of higher content of fine sediments.

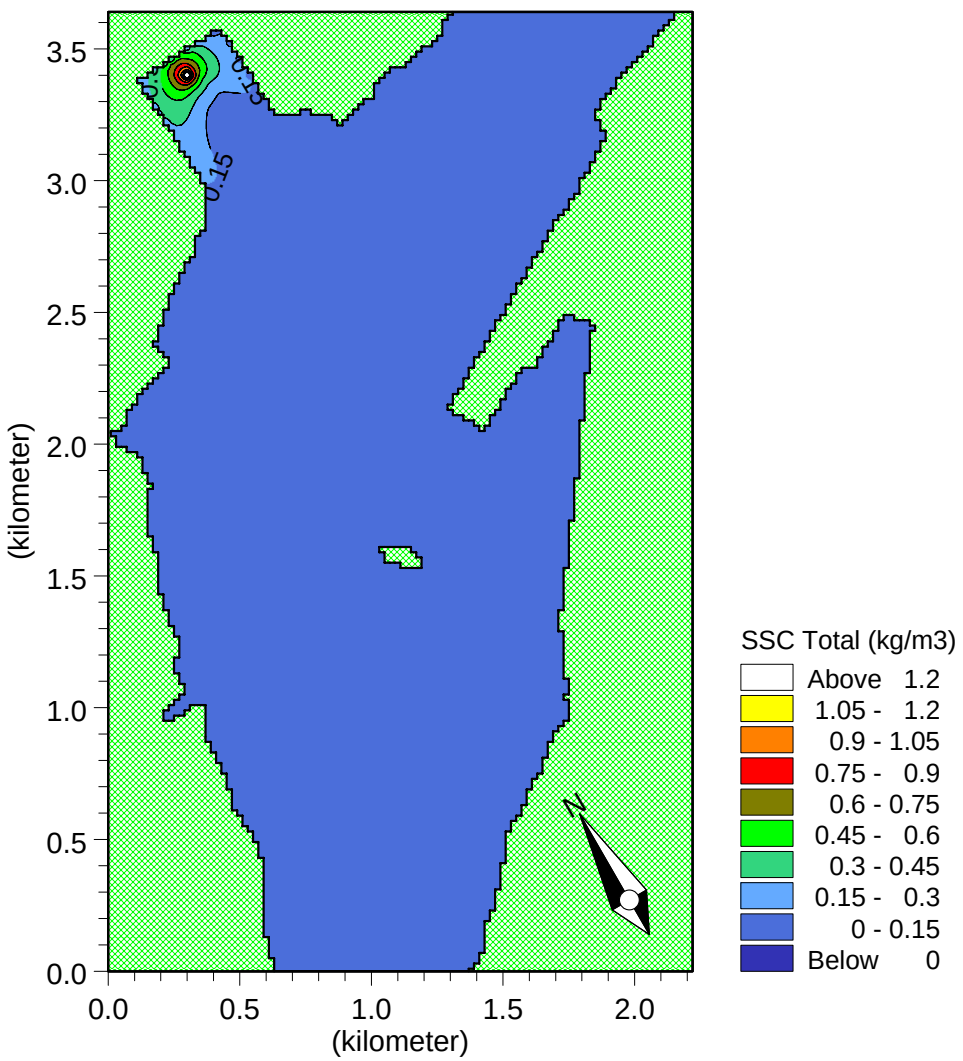

Figure 3-9: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging Inside Basin (1 kg/m^3 = 1,000 mg/l)

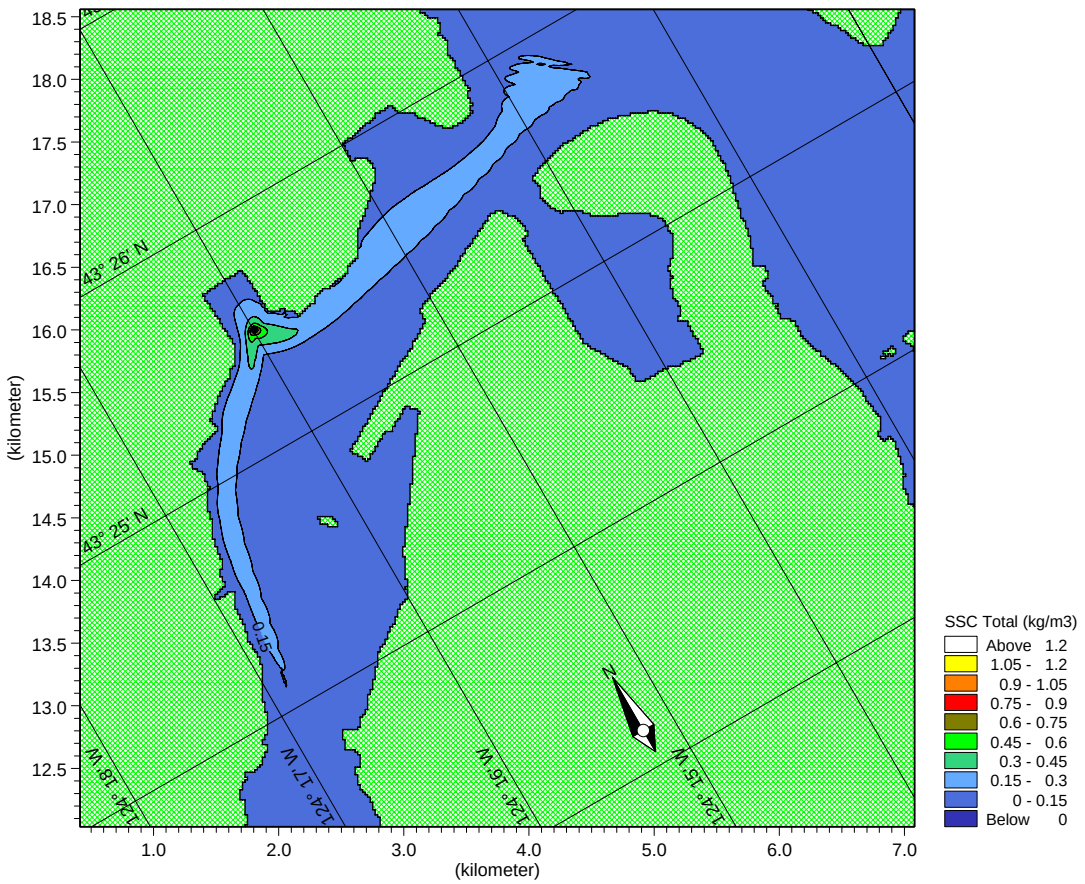

Figure 3-10: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging at Basin Entrance (1 kg/m^3 = 1,000 mg/l)

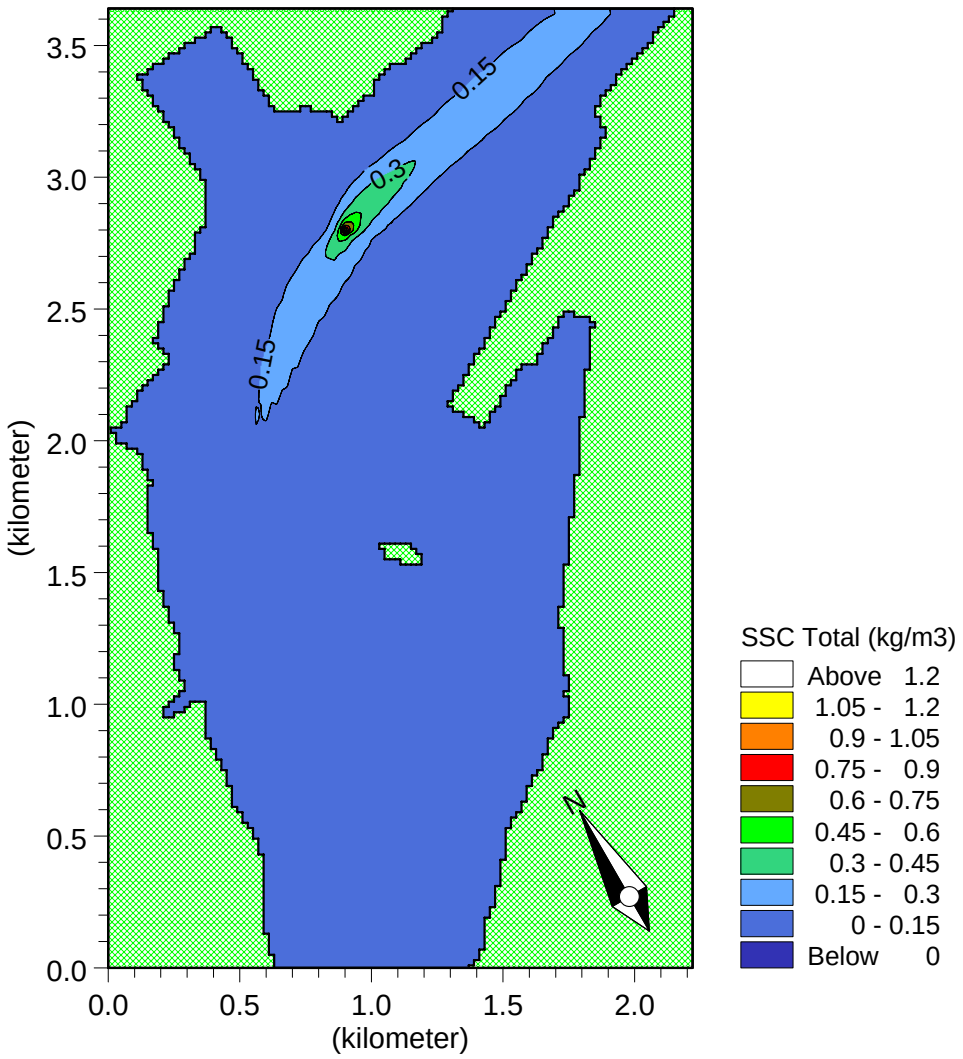

Figure 3-11: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging in the Channel (1 kg/m^3 = 1,000 mg/l)

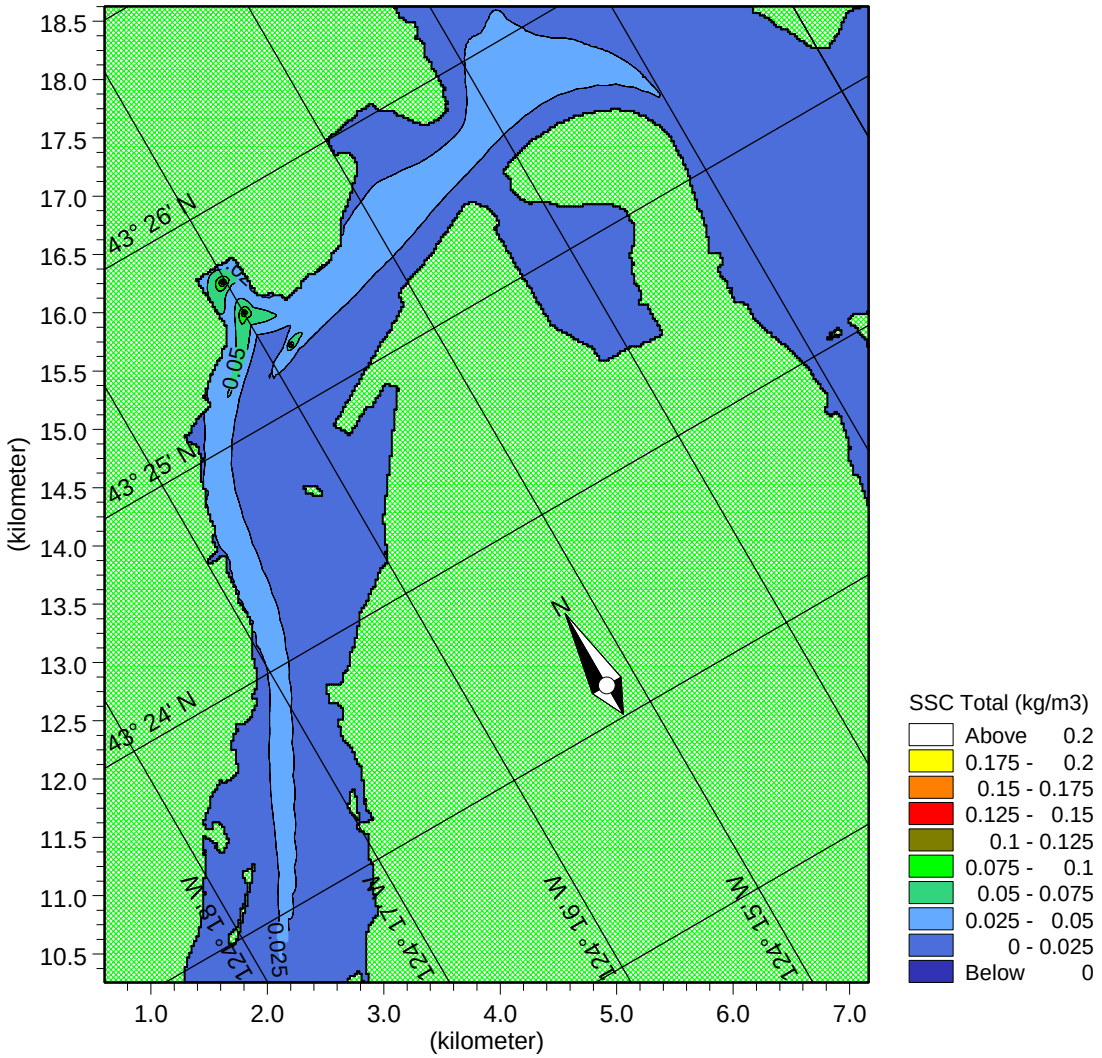

Figure 3-12: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Maintenance Dredging (1 kg/m^3 = 1,000 mg/l)

4.0 TURBIDITY MONITORING AND CONTROL MEASURES

Turbidity is generally monitored in the dredging area at a variety of locations and depths. Background turbidity is also frequently monitored at a site away from the dredge. Grab samples of water can also be obtained and sent to an analytical laboratory to determine TSS. Turbidity monitors are generally in communication with the dredge in order to allow operational changes if high turbidity levels are observed.

Several types of measures can be used to limit sediment resuspension at the cutterhead. These controls can be broken down into operational controls and physical barriers. Operational controls include cessation of dredging, decreasing cutterhead speed, increasing suction flow rate and using a different size or type of dredge. Physical barriers are typically silt curtains, which are geotextile fabric suspended vertically in the water with floats and is anchored. The curtains typically only extend to within 2 ft of the bottom, but may be limited to 10 to 12 feet water depths if currents are present. Silt curtains can partially contain the suspended sediment; however, they may be impracticable in deeper water, in tight working areas, and areas where moderate currents exist.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Turbidity was modeled for the dredging operations (during construction and maintenance) for the geotechnical and environmental conditions anticipated for this project using the USACE DREDGE model and a two dimensional numerical model Mike21 developed by the Danish Hydraulics Institute.

From the results of the DREDGE model for the open "clamshell" dredge, during construction stage the maximum modeled suspended sediment concentrations (primarily sand) were less than 6,000 mg/l at the dredge location rapidly decreasing with distance to less than 50 mg/l at 200 m (approximately 660 feet). For the hydraulic cutterhead dredge the TSS levels were significantly lower with maximum of 500 mg/l in the vicinity of the dredge. The TSS concentrations reduce rapidly to maximum of 14 mg/l by a distance of 60 meters (200 ft).

During maintenance, the dredged material is expected to be primarily fines (mud, clay, silt). Concentration predicted with the DREDGE model for the open "clamshell" dredge were lower than during the construction stage with the maximum of 830 mg/l in vicinity of the dredge and decreasing to 125 mg/l at 200 m (approximately 660 feet).

The results from the Mike21 simulations show that distribution of the generated plume depends on location of the dredge machine in the channel and basin area. For dredging with an open "clamshell" dredge in the channel the generated sediment plume (concentration higher than 150 mg/l) can move up to 1.2–1.9 miles from the dredging location at highest ebb or flood currents; however, the duration of such entrainment is limited by not more than a two hour period and the time average concentrations do not exceed natural ambient concentrations (10–30 mg/l) outside the dredging area.

During maintenance dredging with an open "clamshell" dredge, the maximum concentrations in the generated plume do not exceed 50 mg/l.

Resuspension of sediments during dredging operations can be a significant source of turbidity; however, through proper operational controls and potentially the use of physical barriers, this source can be controlled.

The actual TSS distributions may vary significantly due to site specific currents, bottom geometry, and density profile of the water column. These can be modeled in greater details with a two dimensional numerical model. Initial estimations also can be provided by a screening tool DREDGE. With the conservative values entered into the DREDGE model these results are likewise believed to be conservative estimates (e.g., higher TSS levels than expected in the field).

Based on these result it is not anticipated that turbidity generation at the dredging site will be a significant environmental concern.

6.0 REFERENCES

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Part C – Tab I: Slip and Access Project; Stormwater

Refer to FERC Resource Report 2 – Water Use and Quality, Appendix I-2.

Part C – Tab J: Slip and Access Project; Land Use Compatibility Statement

See Part A, Tab G: LNG Terminal Project; Land Use Compatibility Statement