DAVID EVANS
AND ASSOCIATES INC.

October 10, 2014

Bob Lobdell, Resource Coordinator
Department of State Lands
775 Summer St. NE Ste. 100
Salem, Oregon 97301-1279

Eric Metz, Southern Region Manager Removal-Fill Program
Department of State Lands
775 Summer St. NE Ste. 100
Salem, Oregon 97301-1279

SUBJECT: DSL Removal-Fill Permit Application No. 54908-RF (Jordan Cove LNG Terminal Project) and No. 54909-RF (South Dunes Power Plant Project)

Dear Mr. Lobdell and Mr. Metz:

On behalf of Jordan Cove Energy Project, L.P., (JCEP LP) David Evans and Associates, Inc. (DEA) is supplementing Removal-Fill Permit applications for the proposed Jordan Cove LNG Terminal Project (LNG Terminal; 54908-RF) and the proposed South Dunes Power Plant Project (SDPP, 54909-RF).

Application No. 54908-RF was determined to be complete, by Department of State Lands (DSL) on April 18, 2014 pending land management signature and submittal of review fees. Application No. 54909-RF is under review by Oregon Department of Energy as part of the South Dunes Power Plant Application for Site Certificate; DEA understands the application is substantially complete. In the recent past, the design of project components has advanced and resulted in changes to impact calculations and the compensatory wetland mitigation plan, which are reflected in the attached supplements.

As with the previous application submittals, these two projects are inextricably connected, but separate applications are required because the SDPP is under Oregon Department of Energy jurisdiction. As such, both applications contain much of the same information, and reference the same supporting documents. Impacts to wetlands and waters specific to each application are uniquely identified in the JPA forms and in Appendix A.2 of the applications, and the site boundaries for both projects are clearly identified in the supporting documents and graphics.

Supplemental information from JCEP LP FERC Docket No. CP13-483 and Pacific Connector FERC Docket No. CP13-492 was provided to DSL on CD upon submittal of the original applications and is not included in this submittal.

Please feel free to call me if you have any questions regarding the application materials. I can be reached at (503) 499-0420 and via email at sps@deainc.com. Thank you for your involvement and feedback thus far. We look forward to continuing our collaborative approach in securing the project's authorizations.

Sincerely,

DAVID EVANS AND ASSOCIATES, INC.



Sean P. Sullivan
Senior Associated/Project Manager
File Name: Document2

INCUMBENCY CERTIFICATE

Jordan Cove Energy Project L.P. (entity name as recorded with the Secretary of State, Oregon)

I, Robert L. Braddock, do hereby certify that:

1. I am the duly elected and acting Vice President (position) of Jordan Cove Energy Project L.P. (entity name as recorded with the Secretary of State, Oregon), a Limitied Partnership (entity type) organized and existing in good standing under the laws of the State of Oregon (the "Entity"); and

2. I have the authority to submit, on behalf of the Entity, this application for a permit to conduct removal-fill within waters of the state (as evidenced by my signature on the application) and to commit the Entity to comply with all resulting permit conditions, including any mitigation obligations, resulting from the issuance of the permit.

Witness, my signature and the seal of the Entity this 9th day of September, 2013.

Robert L Braddock

Signature

Name: Robert L. Braddock

Title: Vice President

Jordan Cove LNG Terminal Project
South Dunes Power Plant Project
Removal/Fill Applications – Supplemental Information

October 2013
Revised January 2014
Revised March 2014
Revised October 2014

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TAB: A. JPA FORMS and APPENDICES

JORDAN COVE ENERGY PROJECT

OREGON DEPT. OF STATE LANDS

REMOVAL/FILL APPLICATION

OCTOBER 2013

REVISED JANUARY 2014

REVISED MARCH 2014

REVISED OCTOBER 2014

US Army Corps
Of Engineers (Portland District)

Joint Permit Application Form

DATE STAMP

JORDAN COVE LNG TERMINAL PROJECT

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
PO Box 4395, Unit 18
Portland, OR 97208-4395
(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 NA NA bobbraddock@attglobal.net
Authorized Agent Name and Address Check one Consultant ☒ Contractor ☐	Sean Sullivan David Evans and Assoc. 2100 SW River Parkway Portland, OR 97201	Business Phone # Home Phone # Fax # Email	503.499.0420 NA 503.223.2701 sps@deainc.com
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 Properties, LLC Joe McKeown	Business Phone # Home Phone # Fax # Email	 alpeirce@frontier.com

[1] If applicant is not the property owner, permission to conduct the work must be attached.

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

(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 Appendix A.1, Figures i-2.7, i-2.8		See Appendix A.1, 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.				

(3) Proposed Project Information

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

Brief Description: Construct an 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 cubic yards
	40,740	630									
	Impact Area in Acres	Dimensions (feet)									
	1.34 (temp. + perm.)	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)	
	0	0									
	Impact Area in Acres	Dimensions (feet)									
	0	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)	0
	0	630									
	Impact Area in Acres	Dimensions (feet)									
	0.27 (temporary only)	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)	
	0	0									
	Impact Area in Acres	Dimensions (feet)							n/a		
	0	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	If yes, please explain in the project description (in block 4)
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	

[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.***

(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.**

The information below has been derived from the Federal Energy Regulatory Commission [FERC] Resource Report 1 – General Project Description.

Purpose and Need

The proposed Project is a market-driven response to the availability of burgeoning and abundant natural gas supplies in the United States (U.S.) and Canada and rising and robust international demand for natural gas. Exports from the Project will promote healthy domestic and international natural gas markets and otherwise assist the Administration's efforts to expand exports, create jobs and stimulate the beleaguered U.S. economy.

Purpose

Specifically, the purpose of the Project is to meet each of the primary objectives listed below:

- Develop a liquefied natural gas (LNG) terminal facility on the U.S. Pacific Coast where natural gas from supply basins in Western Canada and the Northern Rockies in the U.S. can be delivered through new or existing natural gas pipeline system infrastructure, liquefied, and loaded onto LNG carriers for delivery to Asian and non-coterminous U.S. Pacific markets;
- Use a port location with a suitable and maintained depth for deep draft vessels;
- Use a port location with sufficiently sized developable land that meets the requirements for an LNG terminal facility; and
- Use a site location in a port that is consistent with existing industrial land uses, meets all applicable regulations, accommodates industry standard LNG carriers and minimizes community and environmental impacts.

Need

The Project is needed to link gas producers that have excess supplies, with markets in which they can sell to both foreign and domestic gas consumers that have increasing requirements. Recognizing that this need is a new development, JCEP commissioned Navigant Consulting, Inc. (Navigant) to analyze gas supply and demand outlooks. Navigant's report, titled Jordan Cove LNG Export Project Market Analysis Study and dated January 2012 (Navigant Study), is included with Resource Report 1 as Appendix B.1. After the January 2012 release by the U.S. Energy Information Administration (EIA) of a case study evaluating the impacts of LNG exports, Navigant at JCEP's request provided comments in a document titled Whitepaper: Analysis of the EIA Export Report 'Effect of Increased Natural Gas Exports on Domestic Energy Markets' Dated January 19, 2012 and dated February 2012 (Navigant Whitepaper). This analysis is included with FERC Resource Report 1 as Appendix C.1.

As related by the Navigant Study, the outlook on North American gas supplies has undergone a dramatic reversal since 2008 when the general consensus was that supplies would be insufficient to keep pace with growing demand and that foreign-sourced LNG would need to be imported. The Navigant Study identifies shale gas production growth as the biggest contributor to overall gas supply abundance in both the United States and Canada. The development and continuing improvement of hydraulic fracturing technology have led to increasingly efficient shale gas production and in turn a 28 percent increase in U.S. total gas production from 2005 (49.7 billion cubic feet per day (Bcf/d)) to 2011 (63.6 Bcf/d). Estimates of dry natural gas resources in the United States have likewise grown, reflecting significantly increased estimates of shale gas resources. The EIA's Annual Energy Outlook 2011 estimates shale gas and total gas reserves at 827 trillion cubic feet (Tcf) and 2543 Tcf, respectively, which constitute sufficient supply at current usage rates for about 94 years.

According to the Navigant Study, figures for both gas reserves and gas production are likely to continue to rise, again driven by shale gas. Navigant points to the high rate at which new shale resource plays are being identified, noting that "North America is clearly in the early phases of discovery for the resource" (Navigant, 2012a), and to the increases in the estimates made by other independent evaluators of gas resources in both the United States and Canada. Navigant states that it "expects this trend towards identifying a larger resource base to continue in the near term in both the U.S. and Canada" (Navigant, 2012a). Navigant also expects that gas production will continue to grow steadily throughout the Navigant Study's forecast period to 2045. Navigant's Spring 2011 Reference Case, on which the Navigant Study built, projects U.S. dry gas production to grow to 81.6 Bcf/d by 2045 and Navigant allows that "[p]roduction could go higher in response to demand from proposed LNG export terminals and/or independent increases in the robust supply resource base" (Navigant, 2012a). Indeed, the growth potential is enhanced by the fact that the reduced geologic risk and resulting reliability of shale gas discovery and production make it responsive to demand and by the fact that presence of natural gas liquids in some shale formations creates an added incentive for development.

As to the demand outlook, Navigant projects steady growth, led by electric generation demand, with modest contributions from industrial, residential, commercial and vehicle demand. It also projects that natural gas will remain competitive with oil and other fuels. Navigant concludes that, even as that domestic demand is projected to grow throughout the forecast period to 2045, North American gas resources, especially given the size of the shale gas resources in North America, are wholly adequate to satisfy domestic demand as well as the added demand of LNG exports by the Project even when other LNG exports are also assumed.

In the current and foreseeable environment, LNG exports are needed to enhance the development of a healthy natural gas market – one that achieves a balance of supply and demand. As stated by Navigant, "reliable demand is a key to underpinning reliable supply and a sustainable gas market" (Navigant, 2012a). Shale gas, for which the exploration risk is significantly reduced and the production process is significantly more manageable and dependable than for conventional gas, "has the potential to improve the phase alignment between supply and demand, which will in turn tend to lower price volatility" (Navigant, 2012b), a welcome prospect in the current market environment of oversupply and low prices.

Navigant finds it "increasingly evident that the slow development of new markets for natural gas is the only thing currently restricting even more gas resource development" (Navigant, 2012a). It also finds that "[t]he vast shale gas resource will support a much larger demand level than has heretofore been seen in North America, and at prices that are less volatile due to its production process characteristics" (Navigant, 2012b). For these reasons, Navigant concludes that "LNG exports, including those from the proposed Project, should be seen as instrumental in providing the increased demand to spur exploration and development of gas shale assets in North America for the long-term benefit of the country and others" (Navigant, 2012b). The importance of developing new markets is underscored by reports that the decline in the price of gas in the United States led producers, including for example Chesapeake Energy, ConocoPhillips and BG Group, to cut back their gas production. See Dan Milmo, BG cuts back on fracking for shale gas as prices slide, The Guardian, February 12, 2012; available at http://www.guardian.co.uk/business/2012/feb/09/bg-cuts-back-on-fracking-shale-gas-prices.

In addition, the Project is needed to serve current domestic needs. The growth in demand among natural gas customers in Oregon situated along the route of the new PCGP is not alone sufficient to justify the investment in a pipeline like the PCGP, but these customers, particularly those west of the Cascades, will stand to benefit from its construction in conjunction with the Project. The incremental capacity available on the PCGP will bring additional natural gas supplies to their otherwise isolated market area with concomitant beneficial price effects.

Likewise, the demand of isolated markets in Hawaii (where electricity is generated using primarily fuel oil and coal and consumers pay the highest price in the U.S. for electricity (EIA State Electricity Profiles; available at http://www.eia.gov/electricity/state/)) and the Cook Inlet region of Alaska (where there is dwindling deliverability of natural gas) is not alone sufficient to justify the Project, but the Project will be able to serve these needs by providing access to LNG. Indeed, JCEP has had ongoing discussions with utilities in both locales. More specifically, utilities in these states are looking for a West Coast terminal that would offer gas at prices indexed to a North American basis and be able to service the smaller ships appropriate to their demand quantities (which likely would not transit the more significant distances from terminals on the other U.S. coasts). The Project will be able to meet these needs.

Finally, if current natural gas market conditions shift and additional gas supplies are needed to serve demand in the contiguous United States, JCEP will be able to meet that demand by importing LNG and delivering revaporized gas into the domestic grid. JCEP has retained the capability within the LNG Terminal design to add import and regasification facilities if market conditions were to change in the future. The financial threshold to adjust to these new conditions will be much lower because the LNG Terminal and the PCGP infrastructure will already be in place. JCEP would thus be well positioned to continue to contribute to the development of a healthy gas market characterized by balanced supply and demand conditions.

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 Compensatory Wetland Mitigation Plan (Tab 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.

1. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP LP) is seeking Removal-Fill Permits from DSL to construct, operate, and maintain the Jordan Cove LNG Terminal Project (LNG Terminal) and the South Dunes Power Plant Project (SDPP) on the bay side of the North Spit of Coos Bay, Oregon. Herein, the LNG Terminal and SDPP are referenced as "the Project" because they are inextricably connected in terms of Purpose and Need, Description, Alternatives Analysis, construction, operation, and maintenance.

However, the Project requires two Removal/Fill applications because the SDPP is under Oregon Department of Energy jurisdiction, specifically the Energy Facility Siting Council (EFSC), which has a unique approval process that requires a separate application for projects in its jurisdiction. The LNG Terminal is not within EFSC jurisdiction and therefore will be permitted via standard Oregon Removal-Fill Law procedures. But for the jurisdictional requirements of EFSC, the LNG Terminal and SDPP would be submitted for Removal/Fill authorization in a single application. **This permit application is for the LNG Terminal; a separate application is being submitted concurrently for the SDPP.** As these two projects are inextricably connected, both the LNG Terminal application and the SDPP application contain much of the same information, appendices, and supporting documentation. Impacts to wetlands and waters specific to each application are uniquely identified in Appendix A.2.

Authorization required for the Pacific Connector Gas Pipeline Project (PCGP) will be addressed in a separate JPA submitted by Pacific Connector Gas Pipeline, L.P. (Pacific Connector).

Natural gas will be delivered to the Project site (via the gas pipeline, which will connect the LNG Terminal 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. Figure i-1, Project Vicinity, shows the LNG Terminal and appurtenant facilities, SDPP, and associated mitigation sites. It also identifies the area subject to EFSC jurisdiction, which is described as the "Site Boundary" in the EFSC lexicon.

Associated marine facilities include the access channel and a slip for which the Port has obtained authorization to construct, operate, and maintain (37712-RF). The Slip and Access Channel will connect the existing Coos Bay Navigation Channel and the LNG Terminal site at approximately Coos Bay Navigation Channel Mile 7.3. 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.

Impacts resulting from the Project have been minimized to the greatest extent practicable, as discussed in the enclosed application and various FERC Resource Reports, some of which are appended to this application. 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 (Appendix A.6 – Alternatives Analysis), which has been appended to this JPA for additional information on how the Project design was evaluated and selected as proposed. All figures and design sheets are included in Appendix A.1 to this application. Appendix A.2 provides a table of wetland, estuarine and aquatic resource impacts. Appendix A.3 provides more 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 LP (see Figure i-1, Project Vicinity).

1.2. Project Description

Because the Port already has authority to construct, operate, and maintain the Slip and Access Channel – where LNG vessels will enter the slip via the access channel, get loaded with LNG, and leave for export – this facility is discussed and shown in some figures and sheets to provide context for the surrounding project facilities and habitats. The Project is made up of the following components:

(1) **the LNG Barge Berth and Access Channel** – where fill will be placed to construct a barge berth and additional dredging beyond that authorized by Permit 37712-RF will occur to access the barge berth.
(2) **the 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;
(3) **the 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 Site for gas pipelines and transmission lines as well as transporting equipment and maintenance staff, etc.;
(4) **the Southwest Oregon Regional Safety Center (SORSC)** – which will provide emergency response services for the facility and the southern Oregon region;
(5) **the South Dunes Site –** which will contain a 420 megawatt (MW) power plant (i.e., SDPP) and related facilities to provide the energy required to cool and thereby liquefy the natural gas.
(6) **Industrial Wastewater Line and Water Line Relocation –** an industrial wastewater line and water line, which will need to be relocated for Project construction;
(7) **Trans Pacific Parkway and Highway 101 Intersection Improvements –** where Trans Pacific Parkway will 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**;**
(8) **North Point Workforce Housing Project Area (NPWHP)** – which will consist of temporary housing and amenities for approximately 2,000 workers during project construction; and
(9) **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.1, Figures, and described in further detail below. Figure i-2 shows the study area boundary and all delineated wetlands. Appendix A.2, Wetland and Waterways Impacts Table provides a summary of all of the freshwater wetland and estuarine impacts resulting from the Project. The table includes a summary of impacts specific to both the LNG Terminal and SDPP JPAs. JCEP LP 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.

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 authorized slip is expected to take approximately 42 months, as shown on the general schedule for the major project construction activities (see Appendix A.3, 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 all temporary facilities, staging, and laydown areas necessary for construction of the Project.

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 continued 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 through the spring of 2015. 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 ODFW approved in-water work window (see Section 1.3 for additional details).

In addition to the federal ESA, Oregon has its own ESA that requires state agencies to protect and promote the recovery of state-listed threatened and endangered species. One state-listed plant, the Point Reyes bird's-beak (*Cordylanthus maritimus ssp. Palustris*, state listed as endangered), has been detected within the Project area. The Point Reyes bird's-beak occurs along the shoreline of the South Dunes site and at the North Point Slough between the east and west portions of the NPWHP site. The relatively small population east of Wetland J and the railroad and the population between the east and west portions of the NPWHP site occur on non-state owned land. The other occurrences were detected on state land below the highest measured tide (HMT).

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

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

Hydrologic changes resulting from the Slip and Access Channel were documented previously and have been authorized. 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 F – Report on Turbidity Due to Dredging).

The relatively minor changes resulting from the tenant's improvements at the Barge Berth are considered to be minor or inconsequential relative to the previously authorized work and do not substantially change hydrologic regimes.

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 LP 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 A.4 – Bridge Design Standards and Criteria. Furthermore, the Mill Site/South Dunes Site will be raised to an approximate elevation of 36 feet, and at Ingram Yard (the LNG Liquefaction and Terminal Site) berms will be constructed around the terminal facilities to an approximate elevation of 36 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 collisions with the bridge.

2. Project Components

Figure i-4, LNG Project Footprint (see Appendix A.1), shows the area that will be both temporarily and permanently impacted by the Project. The following sections and attached Figures in Appendix A.1 provide more details. As previously mentioned, avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts.

2.1. Authorized Slip and Access Channel (Figure 1-1)

As mentioned previously, a Slip and Access Channel which will connect the existing navigation channel to the LNG terminal has been authorized per Permit No. 37712-RF. For context, the authorized Slip will be excavated behind a barrier berm and will be constructed using OPEN CELL® sheet pile walls. The authorized Access Channel will be dredged during the allowable in-water construction window between October 1 and February 15. 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.

Since the time of DSL authorization of the Port's Slip and Access Channel in December 2011, the Port has finalized an agreement with JCEP LP to be the primary tenant of the authorized Slip and Access Channel. As the tenant, JCEP LP requires some specific modifications to the Slip and Access Channel. Tenant-specific design changes related to the slip will not result in additional impacts to wetland or waters resources because the slip will be constructed entirely within upland. On the other hand, tenant-specific design changes in the access channel will change the extent and nature of the impacts currently authorized by 37712-RF. One such tenant improvement includes the placement of fill for the construction of a Barge Berth which will be used to offload heavy equipment, including dredges, and large modules for construction of the Project. Along the same lines, in order to obtain full access to the eastern most portion of the Barge Berth, additional dredging of the access channel is required in an area identified as the "Access Triangle" (see Figure 1-1, Slip and Access Channel Design Comparison).

If the Project (i.e., the LNG Terminal and SDPP) is authorized, the net effect will be a decrease in impacts to estuarine resources by the Port because an area currently authorized by 37712-RF for removal to dredge the Access Channel would instead be filled by JCEP LP to construct the Barge Berth. The temporary and permanent impacts resulting from the proposed fill to construct the Barge Berth are fully disclosed in and subject to the SDPP JPA, because the Barge Berth is considered a related and supporting facility for the SDPP by EFSC, and thus included in the EFSC Site Boundary. Assuming the Project is authorized (and the Port's impacts in the Access Channel are reduced) the Port would only undertake mitigation proportionate to its impacts. Mitigation area (e.g., Kentuck Golf Course) that would no longer be needed by the Port due to a reduction in impacts at the Access Channel would be made available to JCEP LP (with the understanding that JCEP LP must gain authorization from DSL for the proposed fill and mitigation). If the Project is not authorized, the Port would construct the Access Channel and required mitigation per 37712-RF.

The tenant's barge berth and additional dredging at the Access Triangle are described below in Section 2.2 LNG Liquefaction and Terminal Site.

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 done during the in-water work period. Details regarding disposal are described in further detail in Section 2.1.5 of the Project Description and in the Excavated and Dredged Material Management Plan (see Tab D).

2.1.1. 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 Marsh and the OPEN CELL® sheet pile wall on the west side of the slip.

Future maintenance dredging 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 the disposal is provided in the Excavated and Dredged Material Management Plan (refer to Tab D).

2.1.2. Wetland/Estuarine 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 Appendix A.2, Wetland and Waterway Impacts.

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 LP (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 and associated Access Triangle dredging will result in some impacts to estuarine resources (see Section 2.2.2.3 and Appendix A.2 for additional details).

2.2.1. LNG Liquefaction Site (Sheet 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 hydrophytic 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 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 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 LP 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 LP-owned land or easements granted by Roseburg Forest Products to JCEP LP 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 LP 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 Appendix A.2, Wetland and Waterway Impacts, 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 and Access Triangle (Sheet 2-3)

A barge berth will be constructed on the east side of the slip. The barge berth will be located above Mean Low Tide, elevation 0.36 feet NAVD88, and not on State-owned land. Tab H includes a figure showing the location of the barge berth relative to state ownership and a concurrence letter from DSL regarding elevation of the mean low tide line.

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. 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.

Refer to Section 2.1.1 regarding long-term maintenance dredging proposed as part of this application.

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 Figure 1-1A). 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 ¼ 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.

In order to obtain full access to the eastern most portion of the barge berth, additional dredging of the access channel is required. This area is identified as the Access Triangle and is immediately south and east of the Barge Berth. Dredging in this area will use the same construction and methods described for the authorized Slip and Access Channel dredging and will be consistent with the DMMP.

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 Access Triangle to accommodate water-based access along the face of the barge berth will occur using the same techniques, access, and staging as described therein. 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 and Access Triangle 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. Surfaces of the proposed Access Triangle 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 Triangle will be transported via the hydraulic dredge pipeline, located 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 and associated dredging of the Access Triangle (including impacts to existing intertidal strata below HMT) are provided in Appendix A.2, Wetland and Waterway Impacts. Barge Berth and Access Triangle 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 up to 150 feet wide (toe of slope to toe of slope). It is located entirely on existing JCEP LP 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 LP 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 an underground 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 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.2, Wetland and Waterway Impacts. 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.5, 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 fill and removal impacts. Construction logistics require this fill material to be in place for greater than 24 months, therefore, while these impacts are temporary in nature, they are recorded as permanent wetland impacts at Wetlands 2013-6 and 2012-2 in Appendix A.2 and subject compensatory wetland mitigation in Tab B. A new bridge bent will require permanent fill material in Wetland 2013-6. Removal fill quantities and acres of impacts are provided in Appendix A.2, Wetland and Waterway Impacts.

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

The east utility corridor and access road will require temporary fill to be in place for greater than 24 months. 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. However, because this fill material will be in place for more than 24 months they are considered permanent wetland impacts in Appendix A.2. 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. Removal fill quantities and acres of impacts are provided in Appendix A.2, Wetland and Waterway Impacts.

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 Appendix A.2, Wetland and Waterway Impacts for additional details.

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

JCEP LP 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 (Figure i-5). Impacts, if any, resulting from installation of the gas pipeline upstream of its connection to the metering station are subject to Application 54484-RF, submitted by Pacific Connector Gas Pipeline, L.P.

2.5.1.1. Site Preparation and Perimeter Access

Site preparation and ground improvements will be required under the planned slopes 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 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. 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). Wetlands F and G are non-jurisdictional. DSL has issued a concurrence letter to this effect for WD #2011-0065 dated June 21, 2011 (See Appendix C.1. While construction impacts are not proposed beyond the toe of slope, site preparation, ground improvements, and erosion and sediment 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 Appendix A.2, Wetland and Waterway Impacts. 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 A.5.

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 6 spans and will be approximately 225 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 will 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 Appendix A.2.

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, Figure 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 LP 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 LP 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.

2.6.3. Wetland Impacts

No wetlands will be impacted as a result of the industrial wastewater line or water line.

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 A.5, 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 Horsfall 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 Appendix A.2, Wetland and Waterway Impacts 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 A.5.

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 pile 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 Appendix A.2 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.1, 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 LP-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.1, 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 Appendix A.6 – Alternatives Analysis (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 LP 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 vegetate 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 approximately 5 feet 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).
4. BMPs will be installed around the additional temporary fill if turbidity exceeds permitted levels.
5. No Access Channel dredging will occur within 50 feet of the USACE-designated navigational channel.
6. 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 LP 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 LP 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 LP 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 LP 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 effect 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 LP 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.

Dredging

1. Dredging of the Access Triangle would be performed primarily with a cutter-head suction dredge to minimize turbidity and during the approved in-water work window. A clamshell dredge and supporting barges will be allowed when use of a hydraulic dredge is not feasible.
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 ships.
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 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 (see Tab G) 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.
3. 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.
4. 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.

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 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 attached Compensatory Wetland Mitigation Plan (see Tab B).

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 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 Appendix A.2, Wetland and Waterway Impacts.

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 non-jurisdictional wetlands (Wetlands F and G) 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 Appendix A.2, Wetland and Waterway Impacts.

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 East Access Road Bridge at Wetland 2013-6. 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 LP 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 attached 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.

Proposed mitigation will cover the permanent development impacts noted in the impacts table. Construction of the Kentuck Mitigation Site will result in an additional 3.11 acres of incidental wetland impacts, 0.59 acres of which were previously authorized by DSL permit 37712-RF. Configuration of the proposed slip and access channel authorized by DSL permit 37712-RF along with new estuarine impacts associated with this current permit application require an acreage adjustment (1.15 acres) when viewed relative to the current configuration. The incidental wetland impacts at the Kentuck Mitigation Site and the impact adjustment acreage will be mitigated for at the Kentuck Mitigation Site and have been fully accounted for in the Conceptual Wetland Mitigation Plan included with this application.

Kentuck design drawings are included in Appendix A.5.

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*)*			
West Bridge Mitigation Site (freshwater wetlands),East Bridge Mitigation Site (freshwater wetlands), West Jordan Cove Mitigation Site (freshwater wetlands), Coos Bay North Bend Airport (eelgrass), Kentuck Sough Golf Course (intertidal flats)	*Quarter/Quarter*	*Section*	*Township*	*Range*
	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
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

[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
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

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 # 37712-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, West Jordan Cove Mitigation Site)

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

*If yes, attach a concurrence letter. **

Concurrence Letters for the following wetland delineations are attached (see Tab C): 1) WD# 2010-0337; 2) WD# 2012-0313; 3) WD#2013-0116; 4) WD# 2013-0188; 5) WD# 2013-0193; 6) WD# 2013-0218 (revised);7) WD# 2013-0253; 8) WD# 2014-0090.

- ***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 E.

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 and is included in Tab E.

(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	8/6/09

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.***

(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 10-10-2014
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 herby 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	

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 10-10-2014	**Authorized Agent Signature**	Date 10-10-2014
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.***

SOUTH DUNES POWER PLANT PROJECT

OREGON DEPT. OF STATE LANDS

REMOVAL/FILL APPLICATION

OCTOBER 2013

REVISED JANUARY 2014

REVISED MARCH 2014

REVISED OCTOBER 2014

US Army Corps
Of Engineers (Portland District)

Joint Permit Application Form

DATE STAMP

SOUTH DUNES POWER PLANT PROJECT

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
PO Box 4395, Unit 18
Portland, OR 97208-4395
(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 NA NA bobbraddock@attglobal.net
Authorized Agent Name and Address Check one Consultant ☒ Contractor ☐	Sean Sullivan David Evans and Assoc. 2100 SW River Parkway Portland, OR 97201	Business Phone # Home Phone # Fax # Email	503.499.0420 NA 503.223.2701 sps@deainc.com
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	

[1] If applicant is not the property owner, permission to conduct the work must be attached.

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

(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 Appendix A.1, Figures i-2.7, i-2.8		See Appendix A.1, 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.				

(3) Proposed Project Information

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

Brief Description: Construct an 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 cubic yards
	121,611	3,851								
	Impact Area in Acres	Dimensions (feet)								
	6.52 (temp. + perm.)	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)	
	--	--								
	Impact Area in Acres	Dimensions (feet)								
	--	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)	Project results in net fill
	79,090	3,851								
	Impact Area in Acres	Dimensions (feet)								
	3.75 (temp. + perm.; overlaps w/ Fill)	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)	
	--	--								
	Impact Area in Acres	Dimensions (feet)						n/a		
	--	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? ☒

Small portions of the disposal site area are freshwater wetland and their fill is subject to this permit.	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	

[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.***

(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.**

The information below has been derived from the Federal Energy Regulatory Commission [FERC] Resource Report 1 – General Project Description.

Purpose and Need

The proposed Project is a market-driven response to the availability of burgeoning and abundant natural gas supplies in the United States (U.S.) and Canada and rising and robust international demand for natural gas. Exports from the Project will promote healthy domestic and international natural gas markets and otherwise assist the Administration's efforts to expand exports, create jobs and stimulate the beleaguered U.S. economy.

Purpose

Specifically, the purpose of the Project is to meet each of the primary objectives listed below:

- Develop a liquefied natural gas (LNG) terminal facility on the U.S. Pacific Coast where natural gas from supply basins in Western Canada and the Northern Rockies in the U.S. can be delivered through new or existing natural gas pipeline system infrastructure, liquefied, and loaded onto LNG carriers for delivery to Asian and non-coterminous U.S. Pacific markets;
- Use a port location with a suitable and maintained depth for deep draft vessels;
- Use a port location with sufficiently sized developable land that meets the requirements for an LNG terminal facility; and
- Use a site location in a port that is consistent with existing industrial land uses, meets all applicable regulations, accommodates industry standard LNG carriers and minimizes community and environmental impacts.

Need

The Project is needed to link gas producers that have excess supplies, with markets in which they can sell to both foreign and domestic gas consumers that have increasing requirements. Recognizing that this need is a new development, JCEP commissioned Navigant Consulting, Inc. (Navigant) to analyze gas supply and demand outlooks. Navigant's report, titled Jordan Cove LNG Export Project Market Analysis Study and dated January 2012 (Navigant Study), is included with Resource Report 1 as Appendix B.1. After the January 2012 release by the U.S. Energy Information Administration (EIA) of a case study evaluating the impacts of LNG exports, Navigant at JCEP's request provided comments in a document titled Whitepaper: Analysis of the EIA Export Report 'Effect of Increased Natural Gas Exports on Domestic Energy Markets' Dated January 19, 2012 and dated February 2012 (Navigant Whitepaper). This analysis is included with FERC Resource Report 1 as Appendix C.1.

As related by the Navigant Study, the outlook on North American gas supplies has undergone a dramatic reversal since 2008 when the general consensus was that supplies would be insufficient to keep pace with growing demand and that foreign-sourced LNG would need to be imported. The Navigant Study identifies shale gas production growth as the biggest contributor to overall gas supply abundance in both the United States and Canada. The development and continuing improvement of hydraulic fracturing technology have led to increasingly efficient shale gas production and in turn a 28 percent increase in U.S. total gas production from 2005 (49.7 billion cubic feet per day (Bcf/d)) to 2011 (63.6 Bcf/d). Estimates of dry natural gas resources in the United States have likewise grown, reflecting significantly increased estimates of shale gas resources. The EIA's Annual Energy Outlook 2011 estimates shale gas and total gas reserves at 827 trillion cubic feet (Tcf) and 2543 Tcf, respectively, which constitute sufficient supply at current usage rates for about 94 years.

According to the Navigant Study, figures for both gas reserves and gas production are likely to continue to rise, again driven by shale gas. Navigant points to the high rate at which new shale resource plays are being identified, noting that "North America is clearly in the early phases of discovery for the resource" (Navigant, 2012a), and to the increases in the estimates made by other independent evaluators of gas resources in both the United States and Canada. Navigant states that it "expects this trend towards identifying a larger resource base to continue in the near term in both the U.S. and Canada" (Navigant, 2012a). Navigant also expects that gas production will continue to grow steadily throughout the Navigant Study's forecast period to 2045. Navigant's Spring 2011 Reference Case, on which the Navigant Study built, projects U.S. dry gas production to grow to 81.6 Bcf/d by 2045 and Navigant allows that "[p]roduction could go higher in response to demand from proposed LNG export terminals and/or independent increases in the robust supply resource base" (Navigant, 2012a). Indeed, the growth potential is enhanced by the fact that the reduced geologic risk and resulting reliability of shale gas discovery and production make it responsive to demand and by the fact that presence of natural gas liquids in some shale formations creates an added incentive for development.

As to the demand outlook, Navigant projects steady growth, led by electric generation demand, with modest contributions from industrial, residential, commercial and vehicle demand. It also projects that natural gas will remain competitive with oil and other fuels. Navigant concludes that, even as that domestic demand is projected to grow throughout the forecast period to 2045, North American gas resources, especially given the size of the shale gas resources in North America, are wholly adequate to satisfy domestic demand as well as the added demand of LNG exports by the Project even when other LNG exports are also assumed.

In the current and foreseeable environment, LNG exports are needed to enhance the development of a healthy natural gas market – one that achieves a balance of supply and demand. As stated by Navigant, "reliable demand is a key to underpinning reliable supply and a sustainable gas market" (Navigant, 2012a). Shale gas, for which the exploration risk is significantly reduced and the production process is significantly more manageable and dependable than for conventional gas, "has the potential to improve the phase alignment between supply and demand, which will in turn tend to lower price volatility" (Navigant, 2012b), a welcome prospect in the current market environment of oversupply and low prices.

Navigant finds it "increasingly evident that the slow development of new markets for natural gas is the only thing currently restricting even more gas resource development" (Navigant, 2012a). It also finds that "[t]he vast shale gas resource will support a much larger demand level than has heretofore been seen in North America, and at prices that are less volatile due to its production process characteristics" (Navigant, 2012b). For these reasons, Navigant concludes that "LNG exports, including those from the proposed Project, should be seen as instrumental in providing the increased demand to spur exploration and development of gas shale assets in North America for the long-term benefit of the country and others" (Navigant, 2012b). The importance of developing new markets is underscored by reports that the decline in the price of gas in the United States led producers, including for example Chesapeake Energy, ConocoPhillips and BG Group, to cut back their gas production. See Dan Milmo, BG cuts back on fracking for shale gas as prices slide, The Guardian, February 12, 2012; available at http://www.guardian.co.uk/business/2012/feb/09/bg-cuts-back-on-fracking-shale-gas-prices.

In addition, the Project is needed to serve current domestic needs. The growth in demand among natural gas customers in Oregon situated along the route of the new PCGP is not alone sufficient to justify the investment in a pipeline like the PCGP, but these customers, particularly those west of the Cascades, will stand to benefit from its construction in conjunction with the Project. The incremental capacity available on the PCGP will bring additional natural gas supplies to their otherwise isolated market area with concomitant beneficial price effects.

Likewise, the demand of isolated markets in Hawaii (where electricity is generated using primarily fuel oil and coal and consumers pay the highest price in the U.S. for electricity (EIA State Electricity Profiles; available at http://www.eia.gov/electricity/state/)) and the Cook Inlet region of Alaska (where there is dwindling deliverability of natural gas) is not alone sufficient to justify the Project, but the Project will be able to serve these needs by providing access to LNG. Indeed, JCEP has had ongoing discussions with utilities in both locales. More specifically, utilities in these states are looking for a West Coast terminal that would offer gas at prices indexed to a North American basis and be able to service the smaller ships appropriate to their demand quantities (which likely would not transit the more significant distances from terminals on the other U.S. coasts). The Project will be able to meet these needs.

Finally, if current natural gas market conditions shift and additional gas supplies are needed to serve demand in the contiguous United States, JCEP will be able to meet that demand by importing LNG and delivering revaporized gas into the domestic grid. JCEP has retained the capability within the LNG Terminal design to add import and regasification facilities if market conditions were to change in the future. The financial threshold to adjust to these new conditions will be much lower because the LNG Terminal and the PCGP infrastructure will already be in place. JCEP would thus be well positioned to continue to contribute to the development of a healthy gas market characterized by balanced supply and demand conditions.

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 Compensatory Wetland Mitigation Plan (Tab 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.

1. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP LP) is seeking Removal-Fill Permits from DSL to construct, operate, and maintain the Jordan Cove LNG Terminal Project (LNG Terminal) and the South Dunes Power Plant Project (SDPP) on the bay side of the North Spit of Coos Bay, Oregon. Herein, the LNG Terminal and SDPP are referenced as "the Project" because they are inextricably connected in terms of Purpose and Need, Description, Alternatives Analysis, construction, operation, and maintenance.

However, the Project requires two Removal/Fill applications because the SDPP is under Oregon Department of Energy jurisdiction, specifically the Energy Facility Siting Council (EFSC), which has a unique approval process that requires a separate application for projects in its jurisdiction. The LNG Terminal is not within EFSC jurisdiction and therefore will be permitted via standard Oregon Removal-Fill Law procedures. But for the jurisdictional requirements of EFSC, the LNG Terminal and SDPP would be submitted for Removal/Fill authorization in a single application. **This permit application is for the SDPP; a separate application is being submitted concurrently for the LNG Terminal.** As these two projects are inextricably connected, both the LNG Terminal application and the SDPP application contain much of the same information, appendices, and supporting documentation. Impacts to wetlands and waters specific to each application are uniquely identified in Appendix A.2.

Authorization required for the Pacific Connector Gas Pipeline Project (PCGP) will be addressed in a separate JPA submitted by Pacific Connector Gas Pipeline, L.P. (Pacific Connector).

Natural gas will be delivered to the Project site (via the gas pipeline, which will connect the LNG Terminal 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. Figure i-1, Project Vicinity, shows the LNG Terminal and appurtenant facilities, SDPP, and associated mitigation sites. It also identifies the area subject to EFSC jurisdiction, which is described as the "Site Boundary" in the EFSC lexicon.

Associated marine facilities include the access channel and a slip for which the Port has obtained authorization to construct, operate, and maintain (37712-RF). The Slip and Access Channel will connect the existing Coos Bay Navigation Channel and the LNG Terminal site at approximately Coos Bay Navigation Channel Mile 7.3. 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.

Impacts resulting from the Project have been minimized to the greatest extent practicable, as discussed in the enclosed application and various FERC Resource Reports, some of which are appended to this application. 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 (Appendix A.6 – Alternatives Analysis), which has been appended to this JPA for additional information on how the Project design was evaluated and selected as proposed. All figures and design sheets are included in Appendix A.1 to this application. Appendix A.2 provides a table of wetland, estuarine and aquatic resource impacts. Appendix A.3 provides more 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 LP (see Figure i-1, Project Vicinity).

1.2. Project Description

Because the Port already has authority to construct, operate, and maintain the Slip and Access Channel – where LNG vessels will enter the slip via the access channel, get loaded with LNG, and leave for export – this facility is discussed and shown in some figures and sheets to provide context for the surrounding project facilities and habitats. The Project is made up of the following components:

(1) **the LNG Barge Berth and Access Channel** – where fill will be placed to construct a barge berth and additional dredging beyond that authorized by Permit 37712-RF will occur to access the barge berth.
(2) **the 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;
(3) **the 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 Site for gas pipelines and transmission lines as well as transporting equipment and maintenance staff, etc.;
(4) **the Southwest Oregon Regional Safety Center (SORSC)** – which will provide emergency response services for the facility and the southern Oregon region;
(5) **the South Dunes Site –** which will contain a 420 megawatt (MW) power plant (i.e., SDPP) and related facilities to provide the energy required to cool and thereby liquefy the natural gas.
(6) **Industrial Wastewater Line and Water Line Relocation –** an industrial wastewater line and water line, which will need to be relocated for Project construction;
(7) **Trans Pacific Parkway and Highway 101 Intersection Improvements –** where Trans Pacific Parkway will 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**;**
(8) **North Point Workforce Housing Project Area (NPWHP)** – which will consist of temporary housing and amenities for approximately 2,000 workers during project construction; and
(9) **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.1, Figures, and described in further detail below. Figure i-2 shows the study area boundary and all delineated wetlands. Appendix A.2, Wetland and Waterways Impacts Table provides a summary of all of the freshwater wetland and estuarine impacts resulting from the Project. The table includes a summary of impacts specific to both the LNG Terminal and SDPP JPAs. JCEP LP 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.

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 authorized slip is expected to take approximately 42 months, as shown on the general schedule for the major project construction activities (see Appendix A.3, 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 all temporary facilities, staging, and laydown areas necessary for construction of the Project.

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 continued 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 through the spring of 2015. 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 ODFW approved in-water work window (see Section 1.3 for additional details).

In addition to the federal ESA, Oregon has its own ESA that requires state agencies to protect and promote the recovery of state-listed threatened and endangered species. One state-listed plant, the Point Reyes bird's-beak (*Cordylanthus maritimus ssp. Palustris*, state listed as endangered), has been detected within the Project area. The Point Reyes bird's-beak occurs along the shoreline of the South Dunes site and at the North Point Slough between the east and west portions of the NPWHP site. The relatively small population east of Wetland J and the railroad and the population between the east and west portions of the NPWHP site occur on non-state owned land. The other occurrences were detected on state land below the highest measured tide (HMT).

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

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

Hydrologic changes resulting from the Slip and Access Channel were documented previously and have been authorized. 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 F – Report on Turbidity Due to Dredging).

The relatively minor changes resulting from the tenant's improvements at the Barge Berth are considered to be minor or inconsequential relative to the previously authorized work and do not substantially change hydrologic regimes.

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 LP 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 A.4 – Bridge Design Standards and Criteria. Furthermore, the Mill Site/South Dunes Site will be raised to an approximate elevation of 36 feet, and at Ingram Yard (the LNG Liquefaction and Terminal Site) berms will be constructed around the terminal facilities to an approximate elevation of 36 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 collisions with the bridge.

2. Project Components

Figure i-4, LNG Project Footprint (see Appendix A.1), shows the area that will be both temporarily and permanently impacted by the Project. The following sections and attached Figures in Appendix A.1 provide more details. As previously mentioned, avoidance and minimization measures are discussed in detail in Block 5, Measures to Minimize Impacts.

2.1. Authorized Slip and Access Channel (Figure 1-1)

As mentioned previously, a Slip and Access Channel which will connect the existing navigation channel to the LNG terminal has been authorized per Permit No. 37712-RF. For context, the authorized Slip will be excavated behind a barrier berm and will be constructed using OPEN CELL® sheet pile walls. The authorized Access Channel will be dredged during the allowable in-water construction window between October 1 and February 15. 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.

Since the time of DSL authorization of the Port's Slip and Access Channel in December 2011, the Port has finalized an agreement with JCEP LP to be the primary tenant of the authorized Slip and Access Channel. As the tenant, JCEP LP requires some specific modifications to the Slip and Access Channel. Tenant-specific design changes related to the slip will not result in additional impacts to wetland or waters resources because the slip will be constructed entirely within upland. On the other hand, tenant-specific design changes in the access channel will change the extent and nature of the impacts currently authorized by 37712-RF. One such tenant improvement includes the placement of fill for the construction of a Barge Berth which will be used to offload heavy equipment, including dredges, and large modules for construction of the Project. Along the same lines, in order to obtain full access to the eastern most portion of the Barge Berth, additional dredging of the access channel is required in an area identified as the "Access Triangle" (see Figure 1-1, Slip and Access Channel Design Comparison).

If the Project (i.e., the LNG Terminal and SDPP) is authorized, the net effect will be a decrease in impacts to estuarine resources by the Port because an area currently authorized by 37712-RF for removal to dredge the Access Channel would instead be filled by JCEP LP to construct the Barge Berth. The temporary and permanent impacts resulting from the proposed fill to construct the Barge Berth are fully disclosed in and subject to the SDPP JPA, because the Barge Berth is considered a related and supporting facility for the SDPP by EFSC, and thus included in the EFSC Site Boundary. Assuming the Project is authorized (and the Port's impacts in the Access Channel are reduced) the Port would only undertake mitigation proportionate to its impacts. Mitigation area (e.g., Kentuck Golf Course) that would no longer be needed by the Port due to a reduction in impacts at the Access Channel would be made available to JCEP LP (with the understanding that JCEP LP must gain authorization from DSL for the proposed fill and mitigation). If the Project is not authorized, the Port would construct the Access Channel and required mitigation per 37712-RF.

The tenant's barge berth and additional dredging at the Access Triangle are described below in Section 2.2 LNG Liquefaction and Terminal Site.

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 done during the in-water work period. Details regarding disposal are described in further detail in Section 2.1.5 of the Project Description and in the Excavated and Dredged Material Management Plan (see Tab D).

2.1.1. 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 Marsh and the OPEN CELL® sheet pile wall on the west side of the slip.

Future maintenance dredging 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 the disposal is provided in the Excavated and Dredged Material Management Plan (refer to Tab D).

2.1.2. Wetland/Estuarine 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 Appendix A.2, Wetland and Waterway Impacts.

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 LP (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 and associated Access Triangle dredging will result in some impacts to estuarine resources (see Section 2.2.2.3 and Appendix A.2 for additional details).

2.2.1. LNG Liquefaction Site (Sheet 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 hydrophytic 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 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 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 LP 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 LP-owned land or easements granted by Roseburg Forest Products to JCEP LP 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 LP 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 Appendix A.2, Wetland and Waterway Impacts, 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 and Access Triangle (Sheet 2-3)

A barge berth will be constructed on the east side of the slip. The barge berth will be located above Mean Low Tide, elevation 0.36 feet NAVD88, and not on State-owned land. Tab H includes a figure showing the location of the barge berth relative to state ownership and a concurrence letter from DSL regarding elevation of the mean low tide line.

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. 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.

Refer to Section 2.1.1 regarding long-term maintenance dredging proposed as part of this application.

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 Figure 1-1A). 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 ¼ 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.

In order to obtain full access to the eastern most portion of the barge berth, additional dredging of the access channel is required. This area is identified as the Access Triangle and is immediately south and east of the Barge Berth. Dredging in this area will use the same construction and methods described for the authorized Slip and Access Channel dredging and will be consistent with the DMMP.

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 Access Triangle to accommodate water-based access along the face of the barge berth will occur using the same techniques, access, and staging as described therein. 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 and Access Triangle 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. Surfaces of the proposed Access Triangle 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 Triangle will be transported via the hydraulic dredge pipeline, located 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 and associated dredging of the Access Triangle (including impacts to existing intertidal strata below HMT) are provided in Appendix A.2, Wetland and Waterway Impacts. Barge Berth and Access Triangle 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 up to 150 feet wide (toe of slope to toe of slope). It is located entirely on existing JCEP LP 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 LP 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 an underground 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 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.2, Wetland and Waterway Impacts. 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.5, 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 fill and removal impacts. Construction logistics require this fill material to be in place for greater than 24 months, therefore, while these impacts are temporary in nature, they are recorded as permanent wetland impacts at Wetlands 2013-6 and 2012-2 in Appendix A.2 and subject compensatory wetland mitigation in Tab B. A new bridge bent will require permanent fill material in Wetland 2013-6. Removal fill quantities and acres of impacts are provided in Appendix A.2, Wetland and Waterway Impacts.

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

The east utility corridor and access road will require temporary fill to be in place for greater than 24 months. 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. However, because this fill material will be in place for more than 24 months they are considered permanent wetland impacts in Appendix A.2. 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. Removal fill quantities and acres of impacts are provided in Appendix A.2, Wetland and Waterway Impacts.

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 Appendix A.2, Wetland and Waterway Impacts for additional details.

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

JCEP LP 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 (Figure i-5). Impacts, if any, resulting from installation of the gas pipeline upstream of its connection to the metering station are subject to Application 54484-RF, submitted by Pacific Connector Gas Pipeline, L.P.

2.5.1.1. Site Preparation and Perimeter Access

Site preparation and ground improvements will be required under the planned slopes 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 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. 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). Wetlands F and G are non-jurisdictional. DSL has issued a concurrence letter to this effect for WD #2011-0065 dated June 21, 2011 (See Appendix C.1. While construction impacts are not proposed beyond the toe of slope, site preparation, ground improvements, and erosion and sediment 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 Appendix A.2, Wetland and Waterway Impacts. 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 A.5.

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 6 spans and will be approximately 225 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 will 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 Appendix A.2.

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, Figure 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 LP 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 LP 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.

2.6.3. Wetland Impacts

No wetlands will be impacted as a result of the industrial wastewater line or water line.

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 A.5, 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 Horsfall 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 Appendix A.2, Wetland and Waterway Impacts 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 A.5.

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 pile 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 Appendix A.2 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.1, 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 LP-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.1, 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 Appendix A.6 – Alternatives Analysis (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 LP 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 vegetate 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 approximately 5 feet 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).
4. BMPs will be installed around the additional temporary fill if turbidity exceeds permitted levels.
5. No Access Channel dredging will occur within 50 feet of the USACE-designated navigational channel.
6. 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 LP 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 LP 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 LP 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 LP 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 effect 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 LP 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.

Dredging

1. Dredging of the Access Triangle would be performed primarily with a cutter-head suction dredge to minimize turbidity and during the approved in-water work window. A clamshell dredge and supporting barges will be allowed when use of a hydraulic dredge is not feasible.
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 ships.
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 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 (see Tab G) 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.
3. 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.
4. 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.

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 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 attached Compensatory Wetland Mitigation Plan (see Tab B).

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 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 Appendix A.2, Wetland and Waterway Impacts.

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 non-jurisdictional wetlands (Wetlands F and G) 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 Appendix A.2, Wetland and Waterway Impacts.

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 East Access Road Bridge at Wetland 2013-6. 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 LP 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 attached 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.

Proposed mitigation will cover the permanent development impacts noted in the impacts table. Construction of the Kentuck Mitigation Site will result in an additional 3.11 acres of incidental wetland impacts, 0.59 acres of which were previously authorized by DSL permit 37712-RF. Configuration of the proposed slip and access channel authorized by DSL permit 37712-RF along with new estuarine impacts associated with this current permit application require an acreage adjustment (1.15 acres) when viewed relative to the current configuration. The incidental wetland impacts at the Kentuck Mitigation Site and the impact adjustment acreage will be mitigated for at the Kentuck Mitigation Site and have been fully accounted for in the Conceptual Wetland Mitigation Plan included with this application.

Kentuck design drawings are included in Appendix A.5.

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*)*			
West Bridge Mitigation Site (freshwater wetlands),East Bridge Mitigation Site (freshwater wetlands), West Jordan Cove Mitigation Site (freshwater wetlands), Coos Bay North Bend Airport (eelgrass), Kentuck Sough Golf Course (intertidal flats)	*Quarter/Quarter*	*Section*	*Township*	*Range*
	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
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

[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
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

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 # 37712-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, West Jordan Cove Mitigation Site)

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

*If yes, attach a concurrence letter. **

Concurrence Letters for the following wetland delineations are attached (see Tab C): 1) WD# 2010-0337; 2) WD# 2012-0313; 3) WD#2013-0116; 4) WD# 2013-0188; 5) WD# 2013-0193; 6) WD# 2013-0218 (revised);7) WD# 2013-0253; 8) WD# 2014-0090.

- ***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 10-10-2014
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	

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 10-10-2014	**Authorized Agent Signature**	Date 10-10-2014
Robert L Braddock			

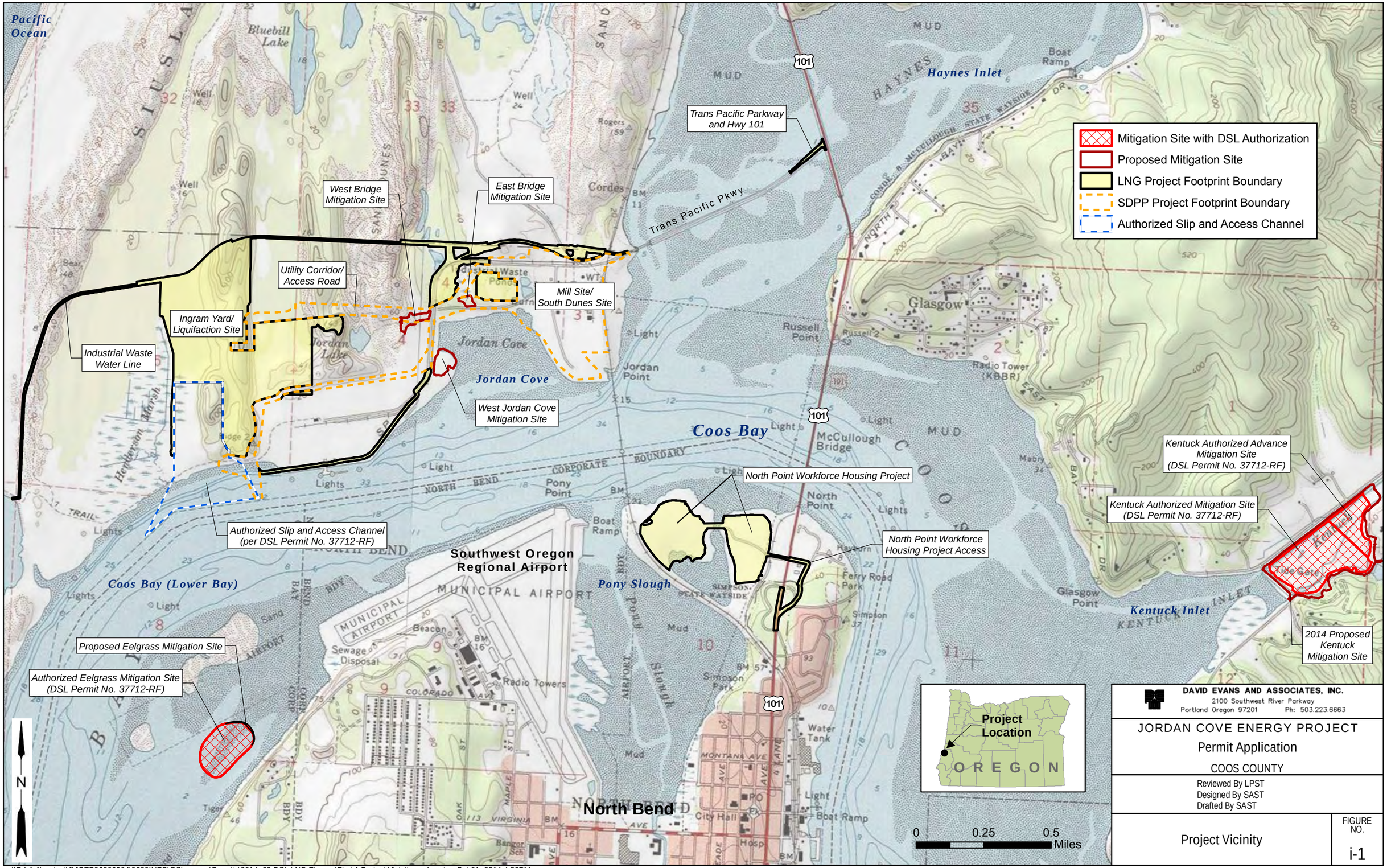
Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands 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
N/A	*N/A*
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.***

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
Figure	i-3	Temporary Facilities
Figure	i-4	LNG Project Footprint Boundary/Map Index
Figure	i-5	PCGP/Gas Metering Station Interface
Sheet	1-1A	Barge Berth and Access Triangle Relative to Authorized Slip and Access Channel
Sheet	1-1B	Slip and Access Channel Footprint Boundary
Figure	1-1C	LNG Berth Layout
Figure	1-1D	Conceptual Barth Berth Site Plan
Sheet	2-1	LNG Liquefaction Site and Terminal N. Footprint Wetland Impacts
Sheet	2-2	LNG Liquefaction Site and Terminal S. Footprint Wetland Impacts
Sheet	2-3	Barge Berth Detail
Sheet	3-1	Utility Corridor Footprint Wetland Impacts
Sheet	3-2A	Utility Corridor (West) Footprint Wetland Impacts
Sheet	3-2B	Utility Corridor (West) Cross Sections
Sheet	3-3A	Utility Corridor (East) Footprint Wetland Impacts
Sheet	3-3B	Utility Corridor (East) Cross Sections
Sheet	4-1	Southwest Oregon Regional Safety Center Wetland Impacts
Sheet	5-1	Mill Site/South Dunes Site Footprint Wetland Impacts
Sheet	5-2	Railroad Bridge Footprint Wetland Impacts
Sheet	6-1	Industrial Wastewater Line and Water Line Relocation
Sheet	7-1	Trans Pacific Parkway Footprint Wetland Impacts
Sheet	8-1	North Point Workforce Housing Project Footprint Wetland Impacts
Sheet	8-2	North Point Workforce Housing Project Bridge Footprint Wetland Impacts



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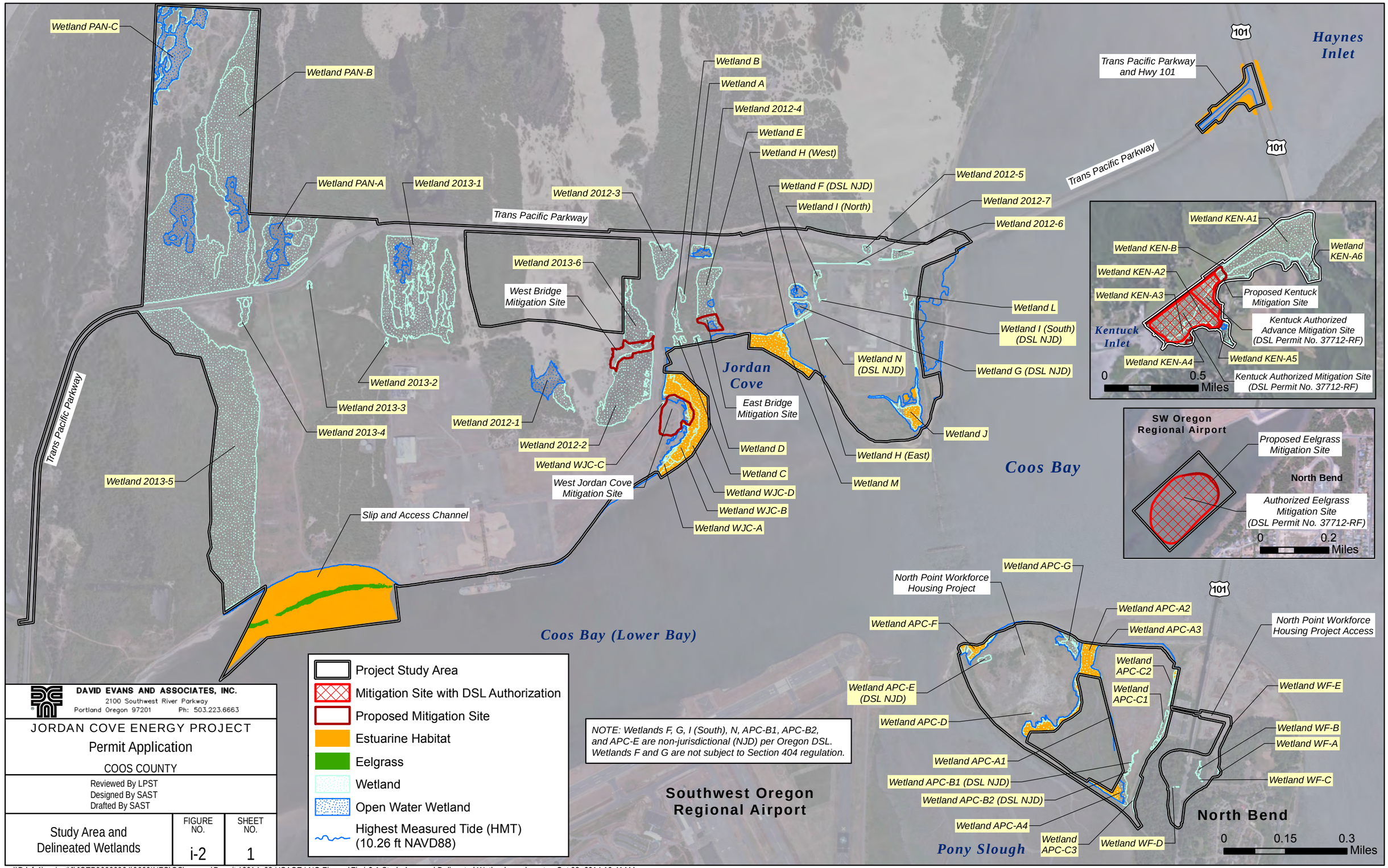
Project Vicinity

FIGURE NO.
i-1

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 DSL LNG Figures\Fig i-1 Project Vicinity.mxd sast Oct 01, 2014 4:30PM



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Study Area and Delineated Wetlands	FIGURE NO.	SHEET NO.
	i-2	1

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 USACE LNG Figures\Fig i-2-1 Study Area and Delineated Wetlands.mxd sast Oct 08, 2014 10:41AM

Pacific Ocean

Wetland PAN-C

Wetland PAN-B

Wetland PAN-A

Trans Pacific Pkwy



Project Study Area
Wetland
Open Water Wetland

N

0 250 500 Feet

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

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Trans Pacific Pkwy

Wetland 2012-3

Wetland 2012-4

Wetland 2012-5

Wetland 2012-6

Wetland 2012-7

Wetland I (North)

Wetland F (DSL NJD)

Wetland E

Wetland I (South) (DSL NJD)

Wetland A

Wetland G (DSL NJD)

Wetland L

Wetland B

Wetland H (East)

Jordan Cove Road

Wetland N (DSL NJD)

Wetland 2013-6

Wetland D

Wetland C

Wetland H (West)

Wetland M

Wetland WJC-D

Jordan Cove

Wetland J

Wetland 2012-2

Wetland WJC-C

Wetland WJC-B

Coos Bay

Wetland WJC-A

N

0 250 500 Feet

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.

Trans Pacific Parkway/ Highway 101 Intersection

101

Trans Pacific Pkwy

101

0 250 500 Feet

Project Study Area

Estuarine Habitat

Wetland

Open Water Wetland

Highest Measured Tide (HMT) (10.26 ft NAVD88)

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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

Trans Pacific Pkwy

Wetland PAN-B

Wetland PAN-A

Wetland 2013-3

Wetland 2013-4

Wetland 2013-2

Wetland 2013-1

Wetland 2013-5

Trans Pacific Pkwy

Wetland 2012-3

Wetland 2012-4

Wetland A

Wetland E

Wetland B

Wetland 2013-6

Jordan Cove Road

Wetland M

Wetland D

Wetland C

Jordan Cove

Wetland WJC-D

Wetland WJC-B

Wetland 2012-1

Wetland 2012-2

Wetland WJC-C

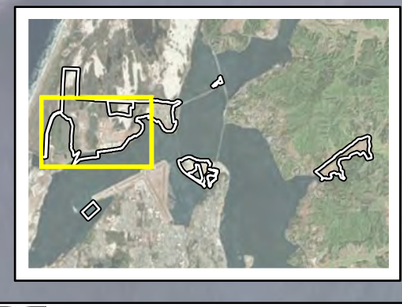
Wetland WJC-A

Project Study Area
Estuarine Habitat
Eelgrass
Wetland
Open Water Wetland
Highest Measured Tide (HMT)
(10.26 ft NAVD88)

N

0 500 1,000 Feet

Coos Bay



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Delineated Wetlands, Habitat, and Study Area Boundary	FIGURE NO. i-2	SHEET NO. 4

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Coos Bay

Pony Slough

Wetland APC-G

Wetland APC-A2

Wetland APC-F

Wetland APC-A3

Wetland APC-E (DSL NJD)

Wetland APC-C2

Wetland APC-D

Wetland APC-C1

Wetland WF-E

101

Wetland APC-A1

Wetland WF-B

Wetland APC-B1 (DSL NJD)

Wetland WF-A

Wetland APC-B2 (DSL NJD)

Wetland WF-C

Wetland APC-A4

Wetland WF-D

Wetland APC-C3

Project Study Area
Estuarine Habitat
Wetland
Open Water Wetland
Highest Measured Tide (HMT) (10.26 ft NAVD88)

NOTE: Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

N

0 250 500 Feet

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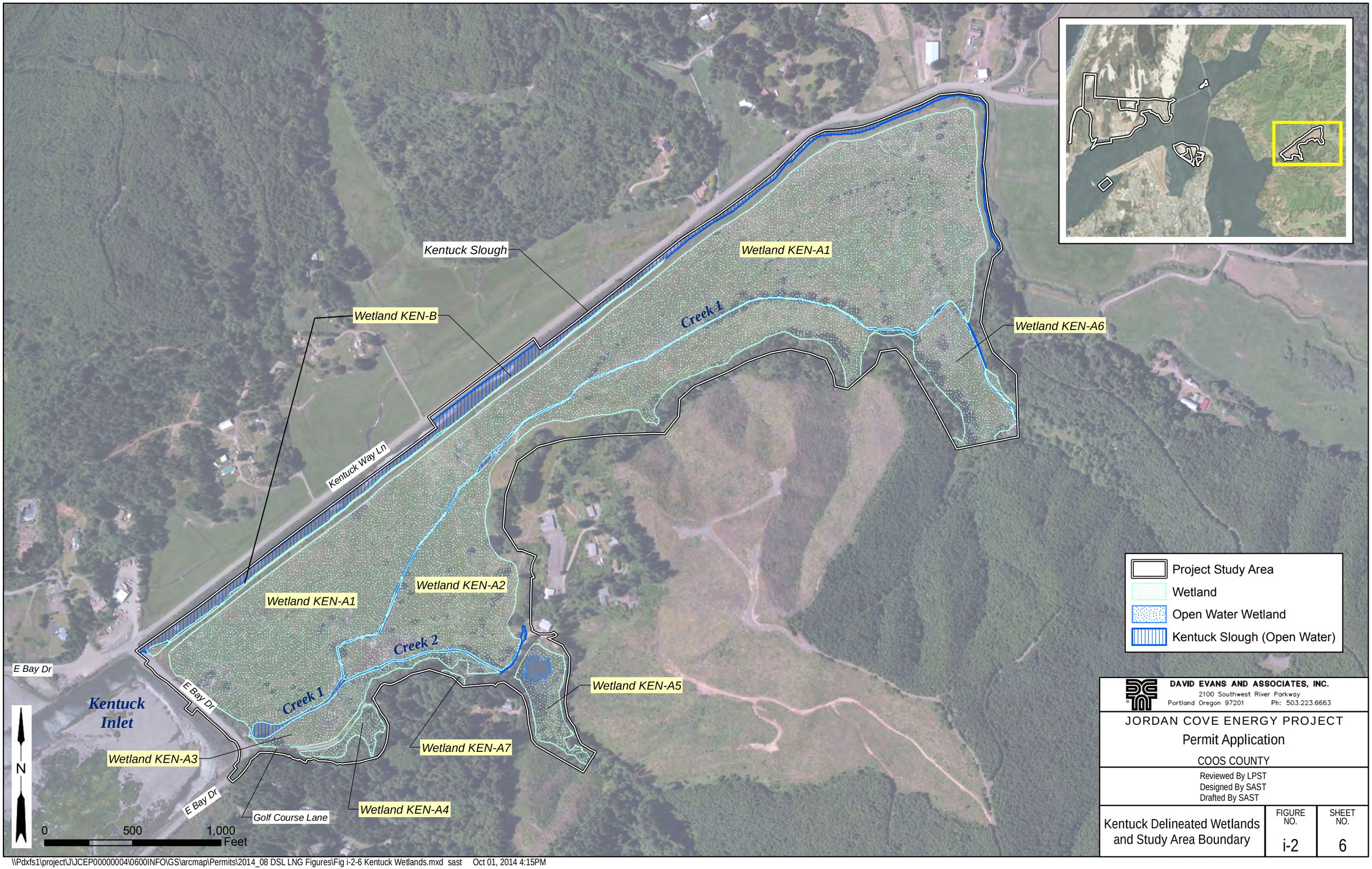
North Point Workforce Housing Project Delineated Wetlands and Study Area Boundary

FIGURE NO. i-2

SHEET NO. 5

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 DSL LNG Figures\Fig i-2-5 NPHWP Wetlands.mxd sast Sep 30, 2014 2:35PM



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

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\2014_08 DSL LNG Figures\Fig i-2-6 Kentuck Wetlands.mxd sast Oct 01, 2014 4:15PM

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.	25S13W00TL0010000
9	Oregon International Port of Coos Bay	25S13W05TL0030000
10	Fort Chicago Holdings II U.S., LLC.	25S13W05TL0020000
11	U.S.A. (B.L.M.)	25S13W04TL0020000
12	Fort Chicago Holdings II, U.S.,LLC.	25S13W04TL0010100
13	Oregon International Port of Coos Bay	25S13W00TL0020000
14	Fort Chicago Holdings II U.S., LLC.	25S13W05TL0010000
15	Roseburg Forest Products Co.	25S13W04TL0030000
16	Fort Chicago Holdings II U.S., LLC.	25S13W04TL0040000
17	Oregon International Port of Coos Bay	25S13W04TL0050000
18	Oregon International Port of Coos Bay	24S13W34DTL0060100
19	Coos County	24S13W34DTL0060200
20	Coos County	24S13W34DTL0060000
21	Julian, Jane L.	24S13W34DTL0020000
22	Coos County	24S13W34DTL0010000
23	Coos County	24S13W34DTL0060500
24	Coos County	24S13W34DTL0200100
25	Coos County	24S13W34DTL0260000

Tax Lot *
LNG Project Footprint Boundary
SDPP Project Footprint Boundary
Wetland
Impacted Wetland
Eelgrass Impacts
Permanent Estuarine Impact
Temporary Estuarine Impact
Open Water Wetland
Highest Measured Tide (HMT) (10.26 ft NAVD88)

Hwy 101 and Trans Pacific Parkway

Estuarine impacts occur below the HMT in this area

Trans Pacific Pkwy

N
0 300 Feet

Utility Corridor/Access Road

Mill Site/ South Dunes Site

Ingram Yard/ Liquefaction Site

Jordan Cove

Coos Bay

N
0 0.1 0.2 Miles

** Tax Lot Data Source: Coos County Web Map, August 2014 Assessment Data http://cooscounty.maps.arcgis.com/*

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

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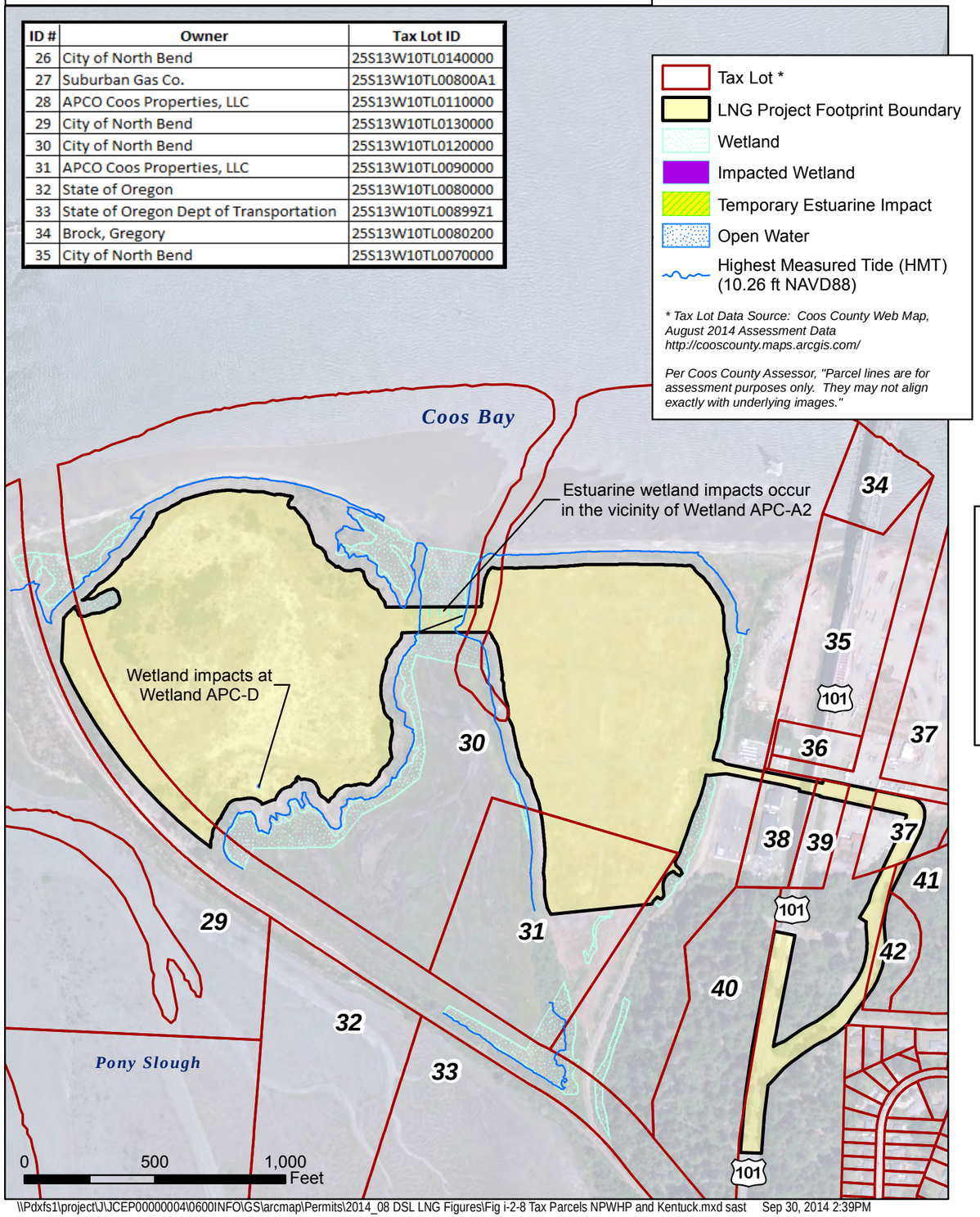
North Point Workforce Housing Project and Access

ID #	Owner	Tax Lot ID
26	City of North Bend	25S13W10TL0140000
27	Suburban Gas Co.	25S13W10TL00800A1
28	APCO Coos Properties, LLC	25S13W10TL0110000
29	City of North Bend	25S13W10TL0130000
30	City of North Bend	25S13W10TL0120000
31	APCO Coos Properties, LLC	25S13W10TL0090000
32	State of Oregon	25S13W10TL0080000
33	State of Oregon Dept of Transportation	25S13W10TL00899Z1
34	Brock, Gregory	25S13W10TL0080200
35	City of North Bend	25S13W10TL0070000



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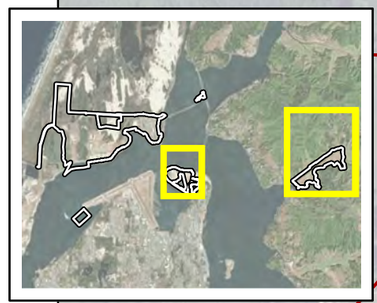
Kentuck Mitigation Site

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



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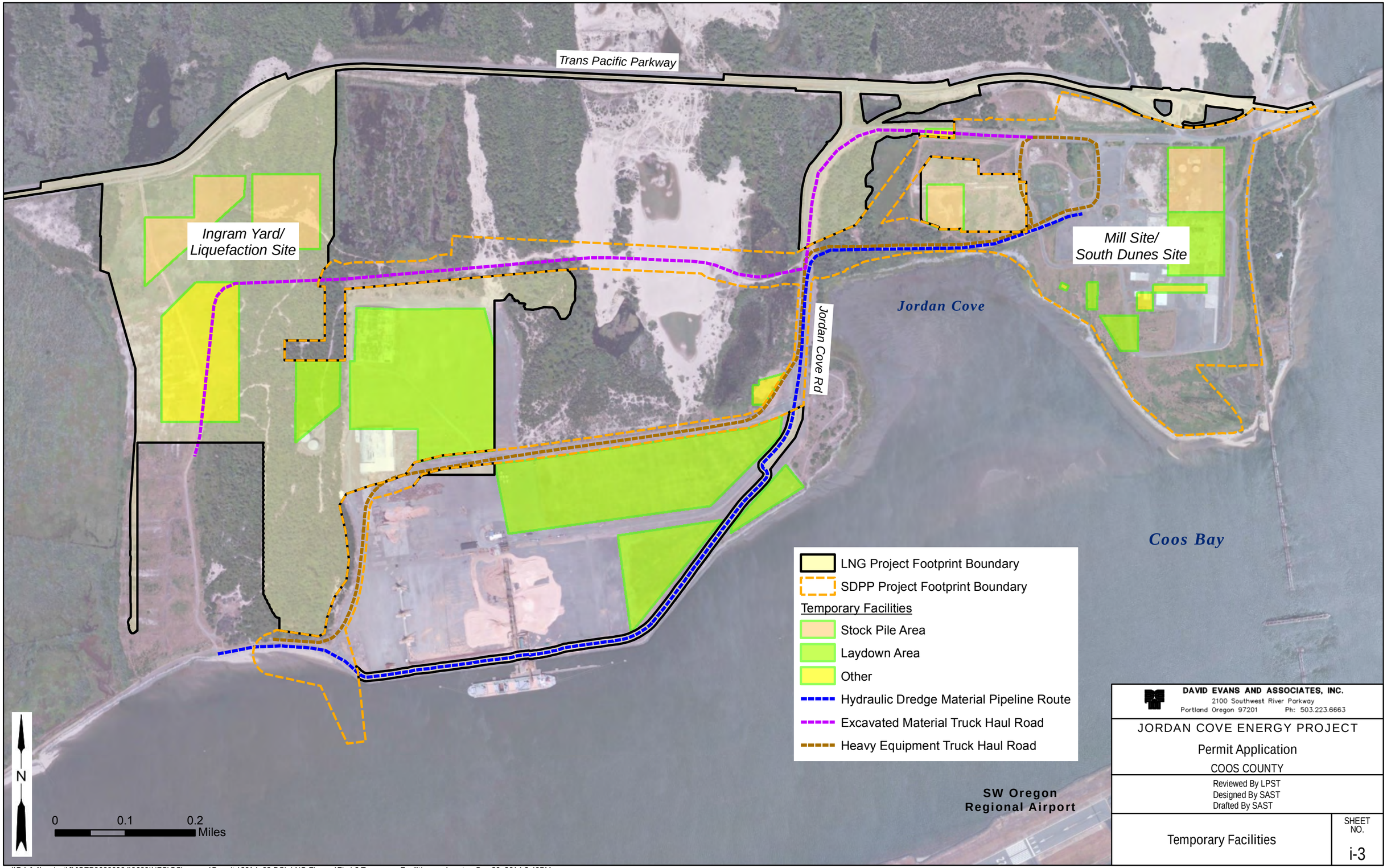
Drafted By SAST

Tax Lots

FIGURE NO. i-2

SHEET NO. 8



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Temporary Facilities

SHEET NO.
i-3

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N

Wetland PAN–B
Wetland PAN–A
Wetland 2013–3
Wetland 2012–4
Wetland F (DSL NJD)
Wetland G (DSL NJD)
Wetland 2012–7
Wetland I (North)
Wetland 2012–5
Wetland 2012–6
Railroad bridge
Wetland 2012–3
6
Trans Pacific Parkway
Wetland A
Wetland B
4
5
Wetland L
Wetland 2013–2
Wetland 2013–1
Wetland 2013–6
Wetland I (South) (DSL NJD)
Wetland H (East)
Wetland N (DSL NJD)
Wetland H (West)
Wetland M
3
West bridge utility corridor access road
Wetland E
Wetland D
Wetland C
East bridge utility corridor access road
Wetland 2013–4
2
Temp. facilities laydown area
1
Wetland WJC–C
Highest Measured Tide (HMT) Elevation 10.26'
Wetland 2012–1
Wetland 2012–2
Wetland J
Jordan Cove Road
FIGURE NO. 2–1
FIGURE NO. 3–1
FIGURE NO. 5–1
Wetland 2013–5
Wetland WJC–D
Wetland WJC–B
Wetland WJC–A
Henderson Property
Roseburg Forest Products
Barge Berth
Access Triangle
FIGURE NO. 2–2

LINETYPE LEGEND
- LNG Project Footprint Boundary
- SDPP Project Footprint Boundary
- HMT (10.26' NAVD88)
- Industrial Waste Water Line Relocation
- Excavated Material Truck Haul Road
- Heavy Equipment Truck Haul Road
- Hydraulic Dredge Material Pipeline Route
- Water Line Relocation

WETLAND IMPACT LEGEND
- Permanent wetland impact
- Temporary wetland impact
- Permanent estuarine impact
- Temporary estuarine impact
- Wetland
- Open water wetland

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.

KEY NOTE LEGEND
1. Hydraulic Dredge Corridor
2. LNG Liquefaction and Terminal Site
3. Utility Corridor / Access Road
4. Southwest Oregon Regional Safety Center (SORSC)
5. South Dunes Power Plant
6. Industrial Waste Water Line and Water Line Relocation
7. Highway 101 & Trans Pacific Parkway Intersection
8. North Point Workforce Housing Project

Wetland APC–F
Wetland APC–E (DSL NJD)
Wetland APC–G
Wetland APC–A3
North Point Workforce Housing Bridge
Wetland APC–C2
Wetland APC–D
8
Wetland APC–C1
Wetland WF–A
Wetland APC–A1
Wetland APC–A2
Wetland WF–B
Wetland APC–B1 (DSL NJD)
Wetland APC–B2 (DSL NJD)
Wetland WF–D
Wetland APC–C3
Wetland APC–A4
Wetland WF–C
Scale: 1" = 500'
NORTH POINT WORKFORCE HOUSING PROJECT

7
Trans Pacific Parkway
Highway 101
HWY 101/TRANS PACIFIC PARKWAY IMPROVEMENTS
Scale: 1" = 150'

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LNG Project Footprint Boundary/Map Index
Scale: 1" = 400'

SHEET NO. i–4

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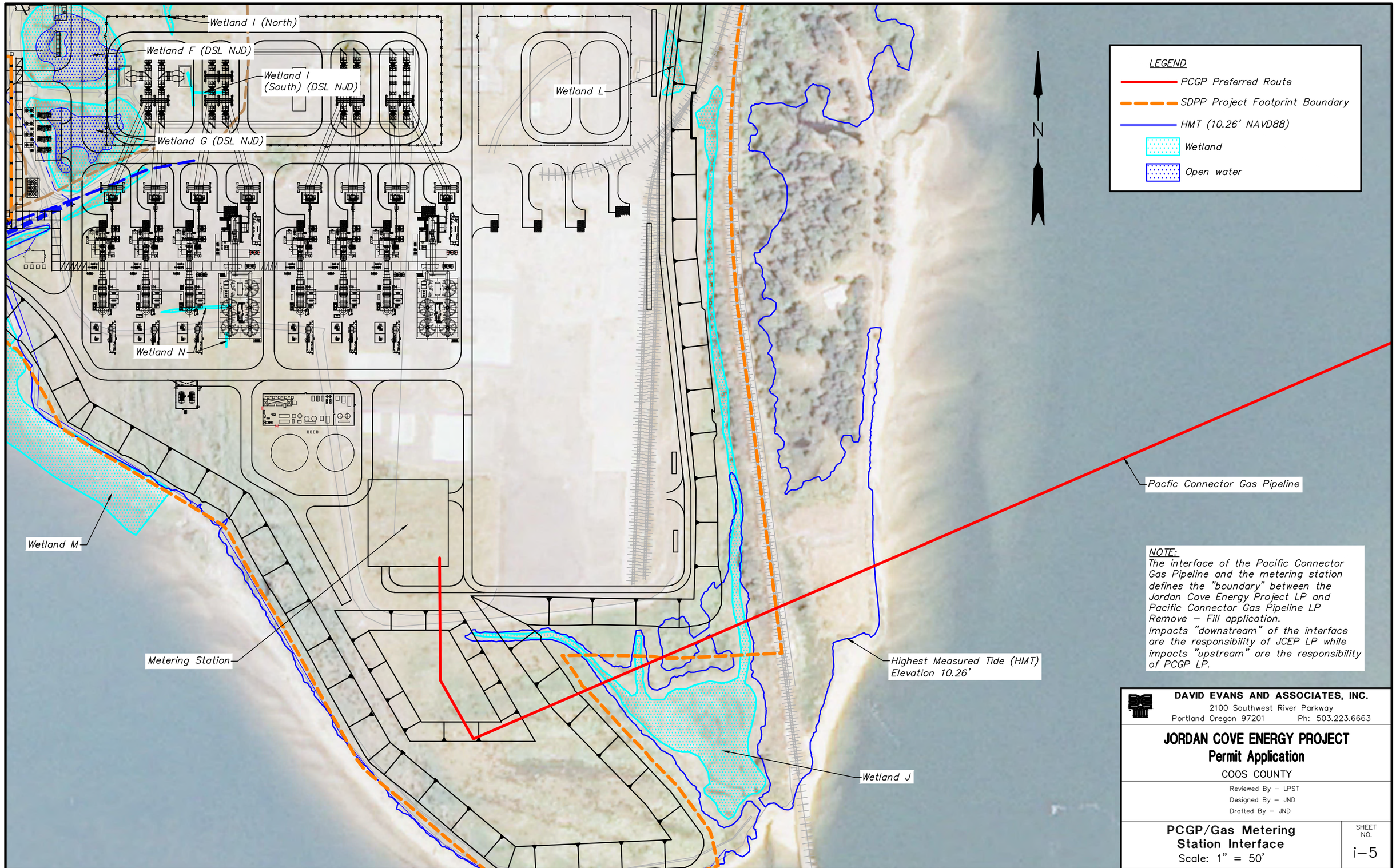

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PCGP/Gas Metering Station Interface
Scale: 1" = 50'

SHEET NO.
i–5

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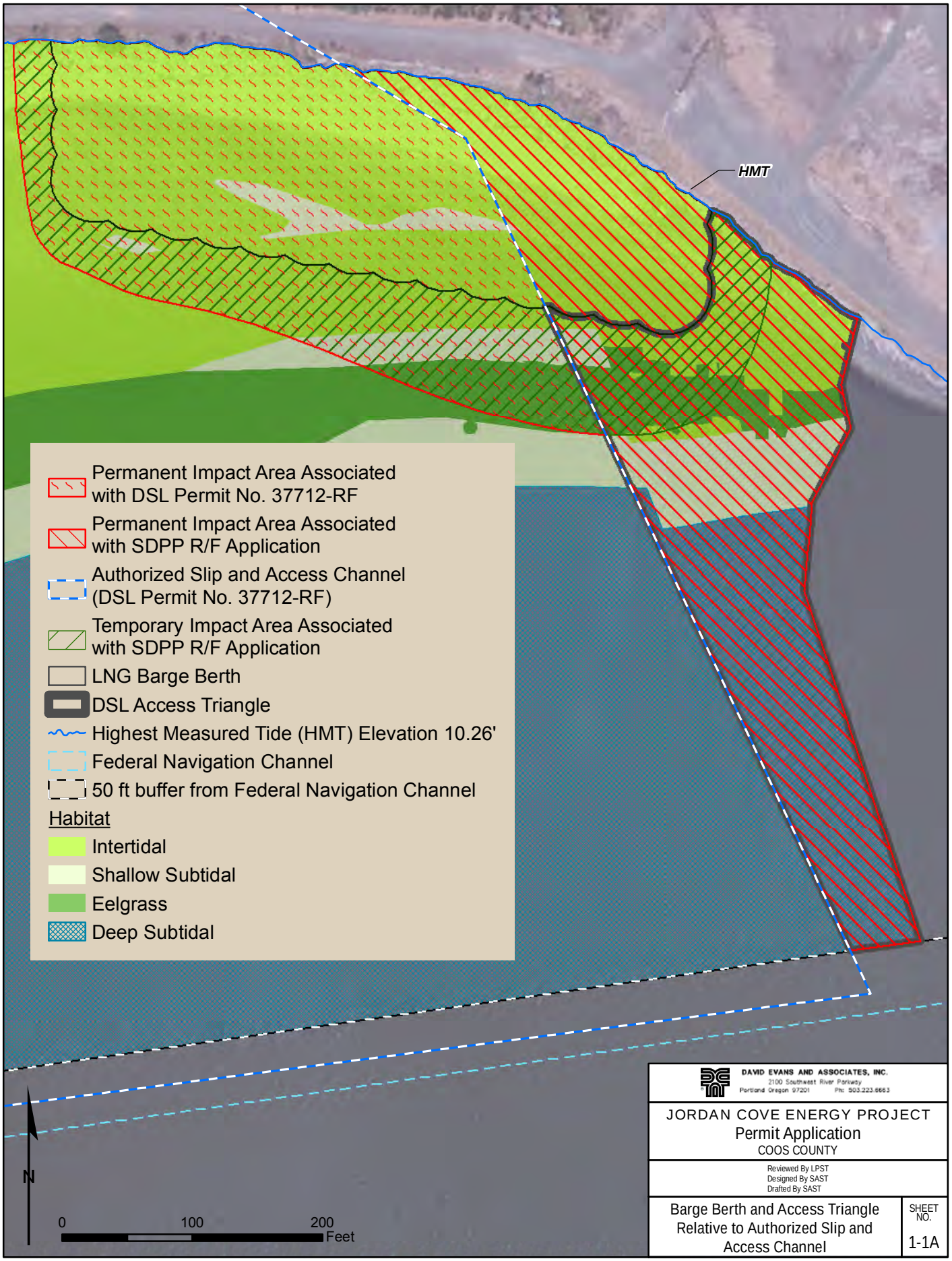

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Barge Berth and Access Triangle Relative to Authorized Slip and Access Channel

SHEET NO.
1-1A

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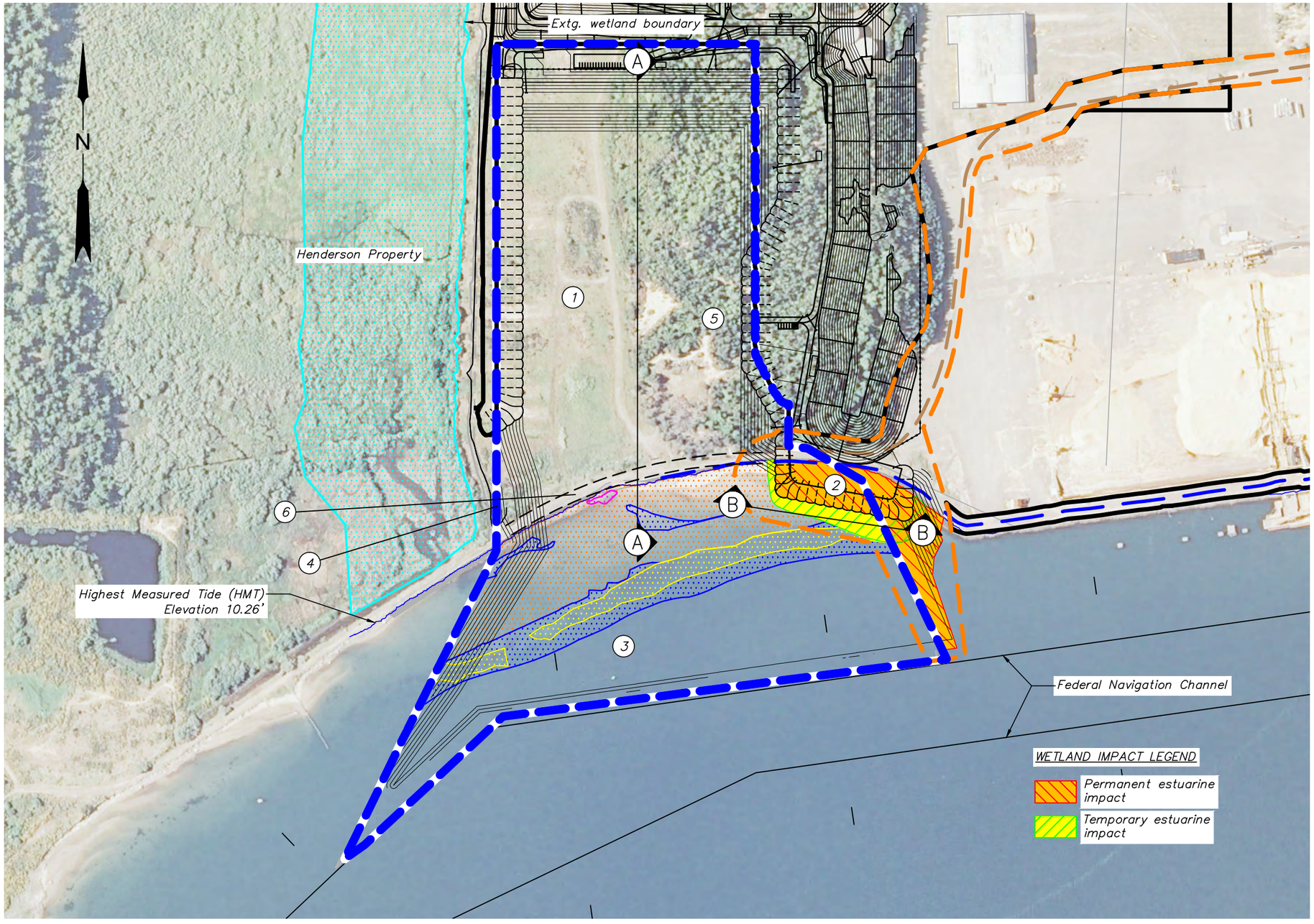

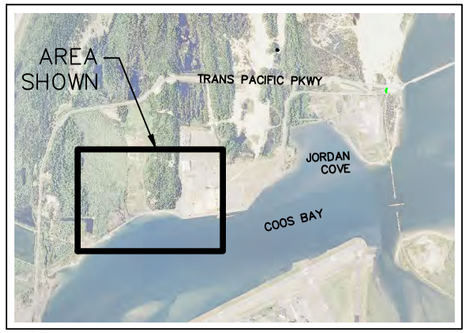

2 / 1-1 KEY MAP
SCALE: 1"=5000'

LEGEND

1. Slip
2. Barge berth
3. Access channel
4. Sheet pile wall
5. LNG vessel berth
6. Temporary sand barrier berm (40ft wide)

- SDPP Project Footprint Boundary
- LNG Project Footprint Boundary
- Authorized Slip and Access Channel Boundary (37712-RF)
- Proposed contour (1' interval)
- Heavy Equipment Truck Haul Road
- Hydraulic Transport Pipeline Route
- Inter-tidal area
- Shallow sub-tidal area
- Eel-grass habitat area
- Wetland
- Salt marsh

1 / 1-1B SLIP AND ACCESS CHANNEL PROJECT FOOTPRINT
SCALE: 1"=400'

0 200 400 800

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Slip and Access Channel Footprint Boundary

SHEET NO. 1-1B

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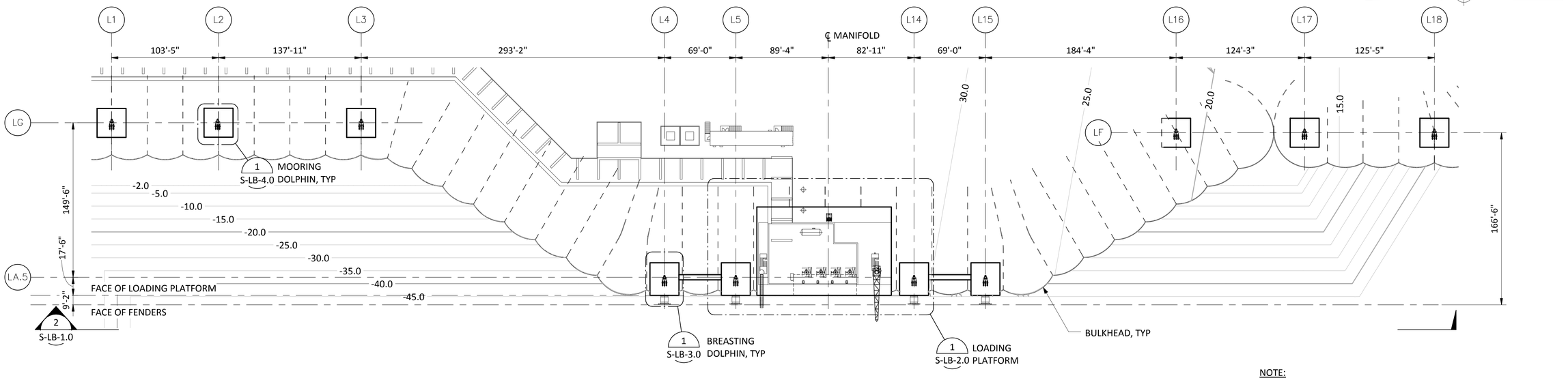
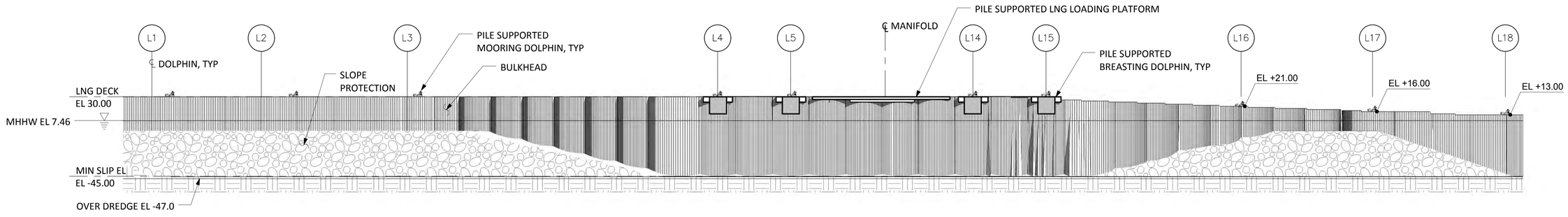


NOTE:
LNG EQUIPMENT SHOWN PER LAYOUT
PROVIDED BY B&U ON 4 JUNE 2014

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 Figure 1-1B

2 S-LB-1.0 ELEVATION - LNG BERTH

SCALE: 1" = 50'-0"

50' 0 50' 100'

SCALE: 1" = 50'-0"

Figure 1-1C

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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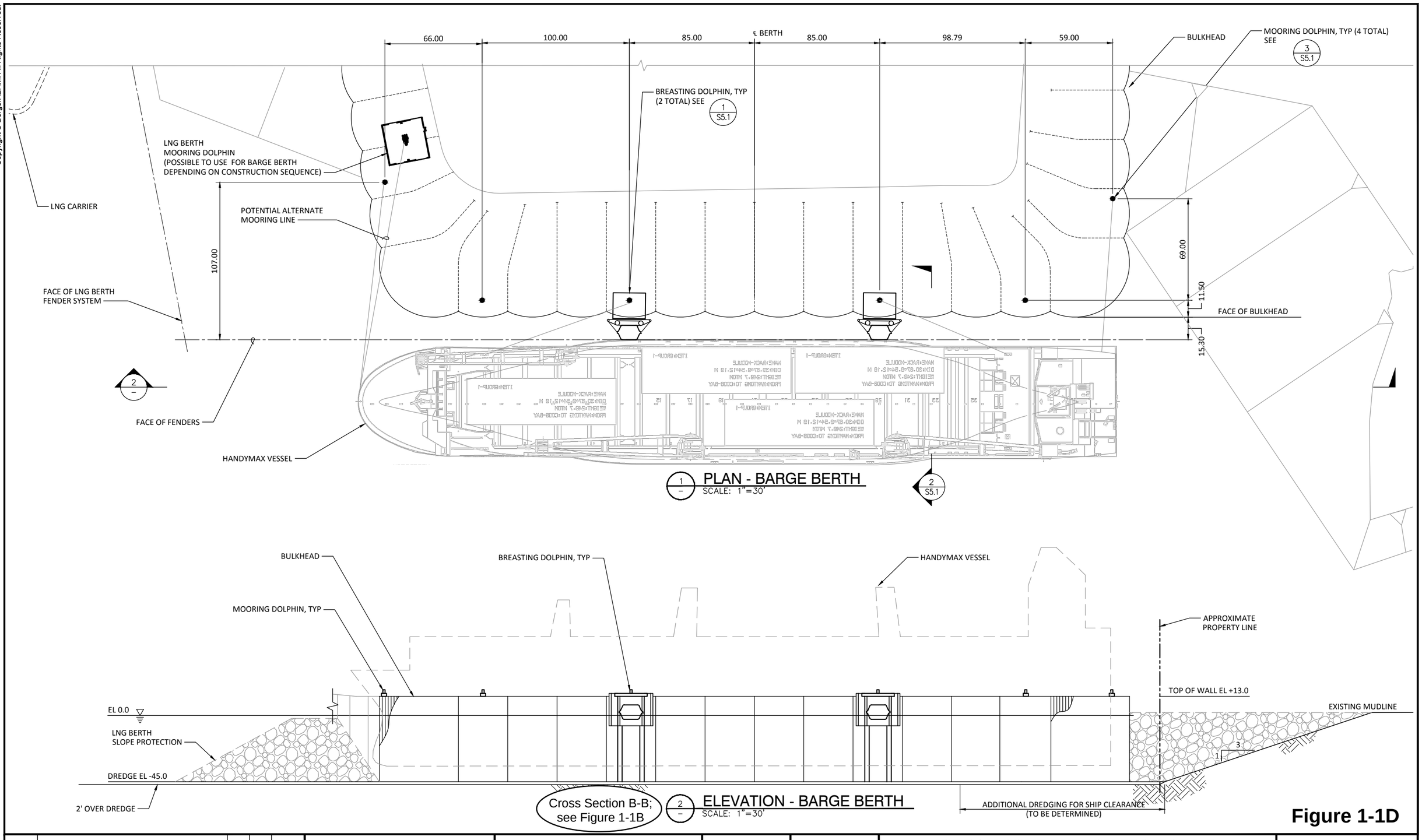

Figure 1-1D

MARK	REVISION DESCRIPTION	BY	APP.	DATE

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33301 9th Avenue South, Suite 300
Federal Way, Washington 98003-2600
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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 BERTH\S5-0.dwg

N

Wetland PAN–A

Wetland 2013–1

Trans Pacific Parkway

Wetland PAN–B

Wetland 2013–3

Wetland 2013–4

50' wetland buffer

Wetland 2013–2

Wetland 2013–5

Henderson Property

WETLAND IMPACT LEGEND

Permanent wetland impact

Temporary wetland impact

LEGEND

LNG Project Footprint Boundary

SDPP Project Footprint Boundary

Industrial Waste Water Line Relocation

Excavated Material Truck Haul Road

Wetland

Open water

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
N. Footprint Wetland Impacts
Scale: 1" = 150'

SHEET NO. 2–1

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N

Wetland extends beyond study area

Wetland 2013-5

Henderson Property

50' wetland buffer

Highest Measured Tide (HMT) Elevation 10.26'

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact
- Permanent estuarine impact
- Temporary estuarine impact

LEGEND

- LNG Project Footprint Boundary
- SDPP Project Footprint Boundary
- Industrial Waste Water Line Relocation
- Excavated Material Truck Haul Road
- Authorized Slip and Access Channel Boundary (37712-RF)
- Wetland
- Open water

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LNG Liquefaction Site and Terminal
S. Footprint Wetland Impacts
Scale: 1" = 150'

SHEET NO. 2-2

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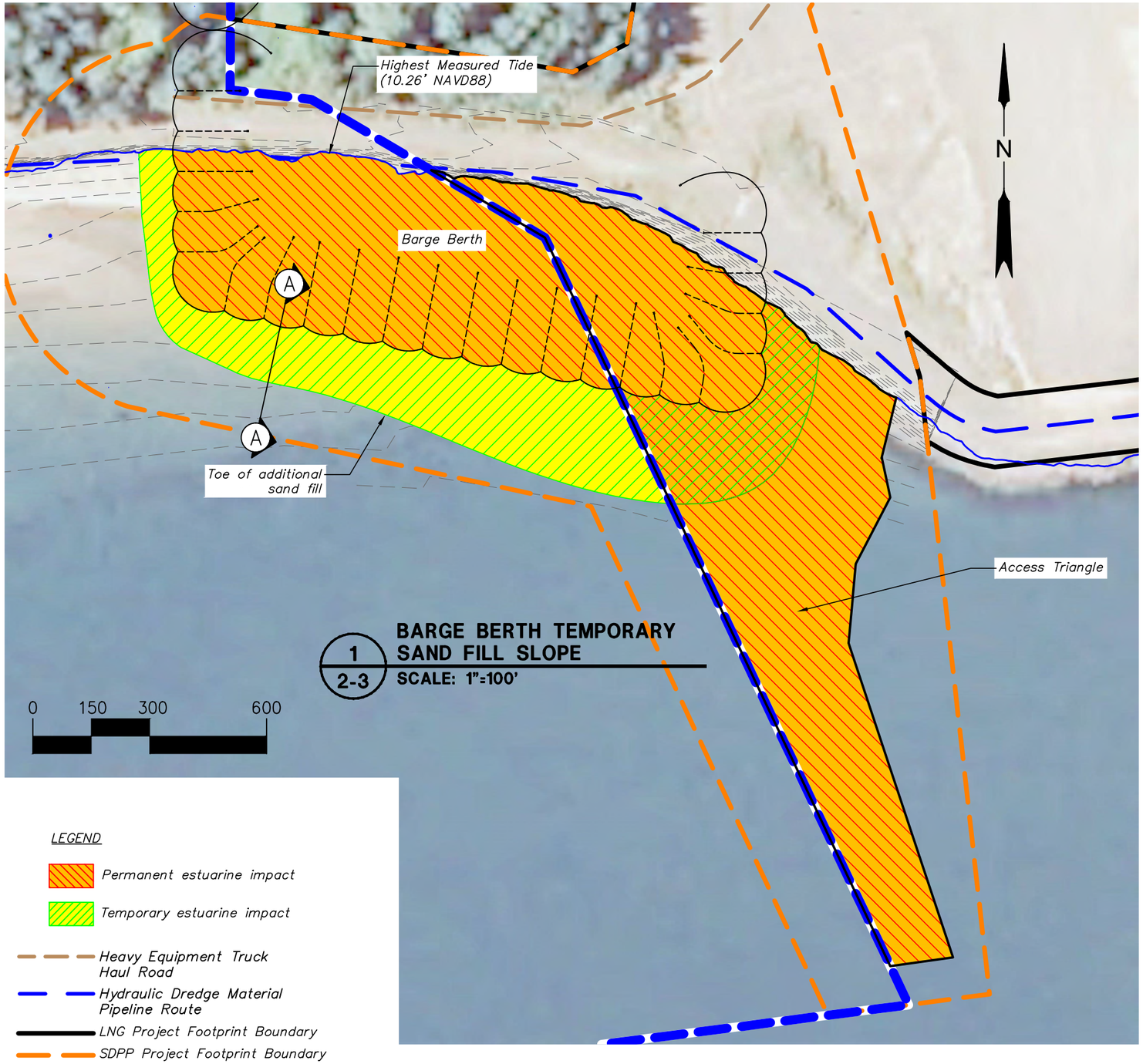
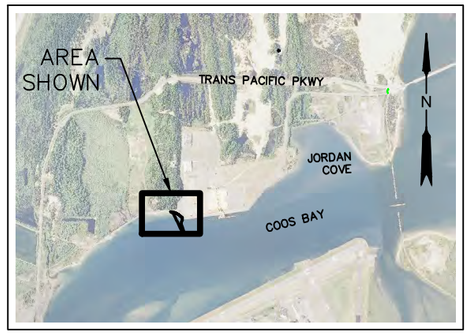


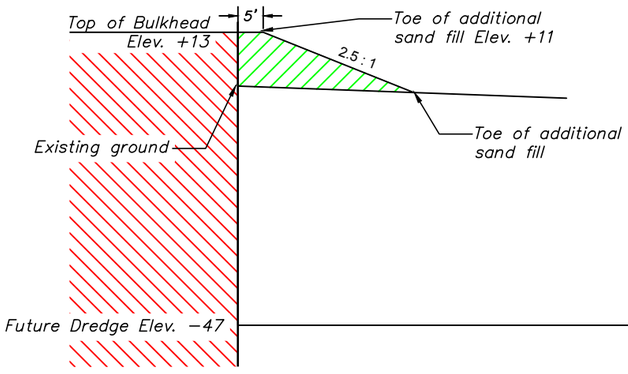
1 / 2-3 **BARGE BERTH TEMPORARY SAND FILL SLOPE**
SCALE: 1"=100'

LEGEND

- *Permanent estuarine impact*
- *Temporary estuarine impact*
- *Heavy Equipment Truck Haul Road*
- *Hydraulic Dredge Material Pipeline Route*
- *LNG Project Footprint Boundary*
- *SDPP Project Footprint Boundary*
- *HMT (10.26' NAVD88)*
- *Authorized Slip and Access Channel Boundary (37712-RF)*



2 / 2-3 **KEY MAP**
SCALE: 1"=5000'



3 / 2-3 **SECTION A-A**
SCALE:NTS

NOTE:
Bathymetry is inherently dynamic. Dimensions are based on the best available information at the time of submittal.

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Barge Berth Detail

SHEET NO. 2-3

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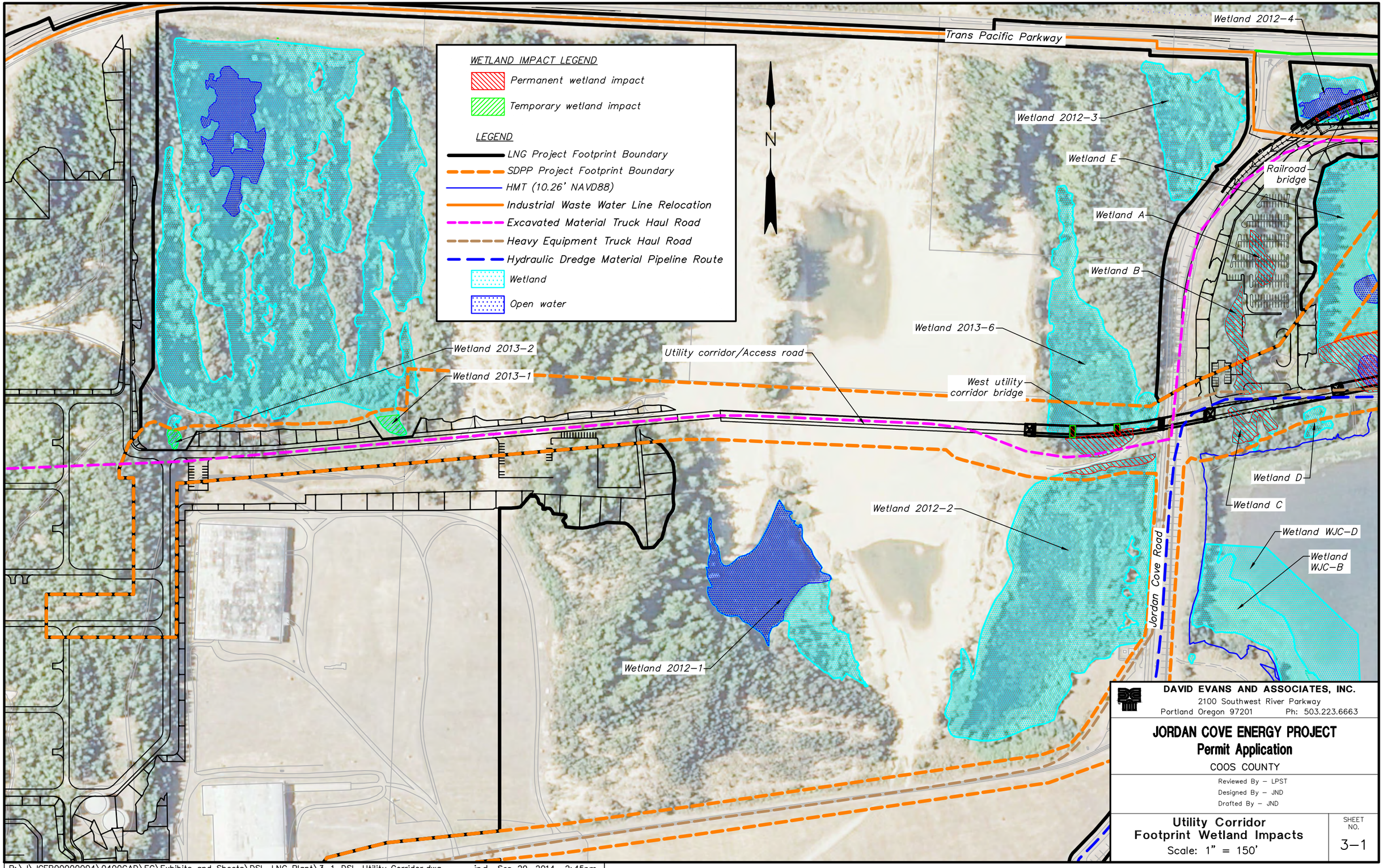

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COOS COUNTY

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Utility Corridor Footprint Wetland Impacts
Scale: 1" = 150'

SHEET NO. 3–1

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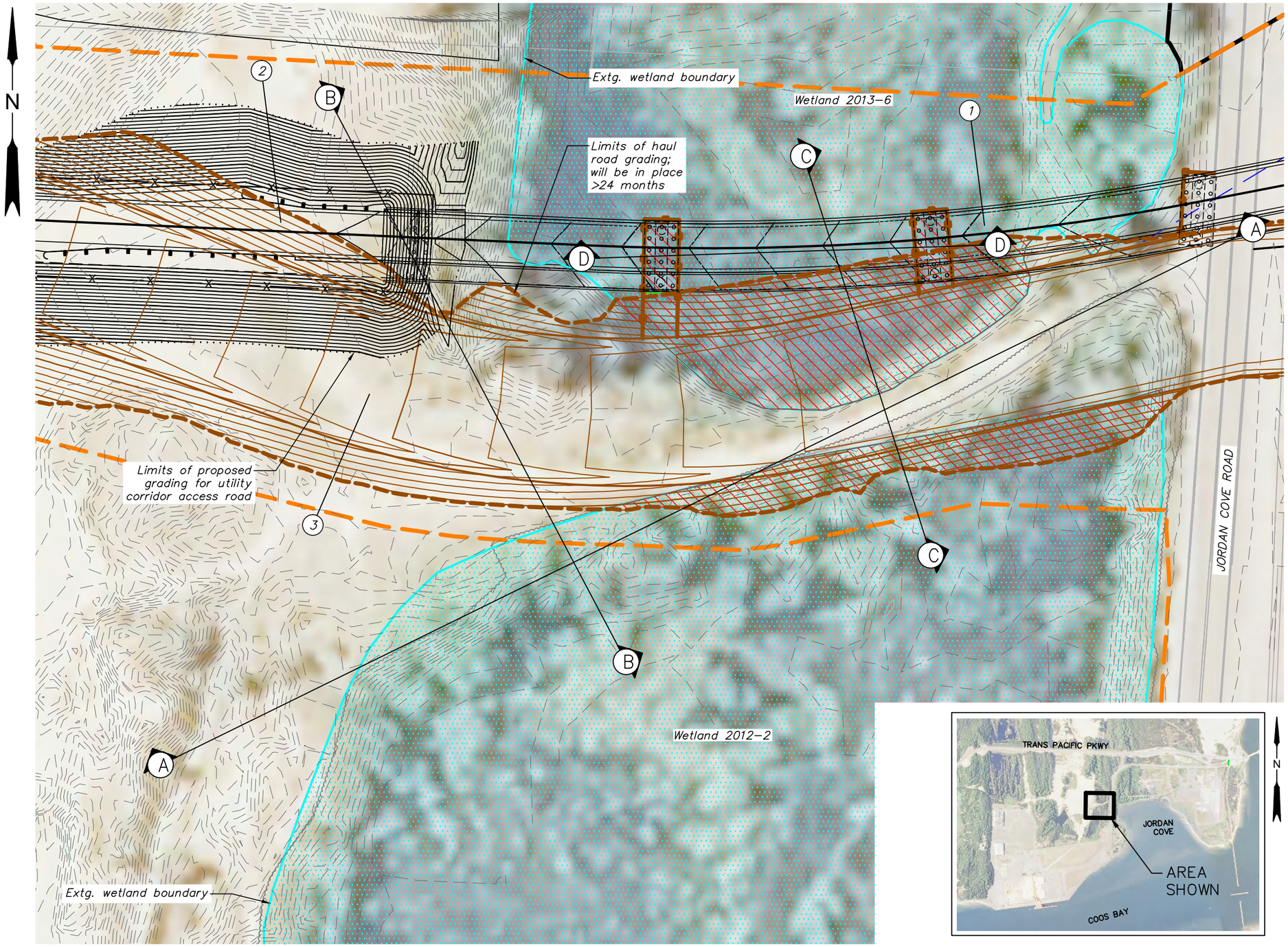

1 3-2A **UTILITY CORRIDOR (WEST) PROJECT FOOTPRINT**
SCALE: 1"=60'

2 3-2A **KEY MAP**
SCALE: 1"=3000'

LEGEND

1 Utility Corridor Bridge
2 Utlilty Corridor and Access Road
3 Excavated material truck haul road
LNG Project Footprint Boundary
SDPP Project Footprint Boundary
Existing contour (1' interval)
Proposed contour (1' interval)
Edge of haul road fill
Coffer dam
Wetland

WETLAND IMPACT LEGEND

Permanent wetland impact
Temporary wetland impact

0 30 60 120

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COOS COUNTY

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Utility Corridor (West) Footprint Wetland Impacts

SHEET NO. 3–2A

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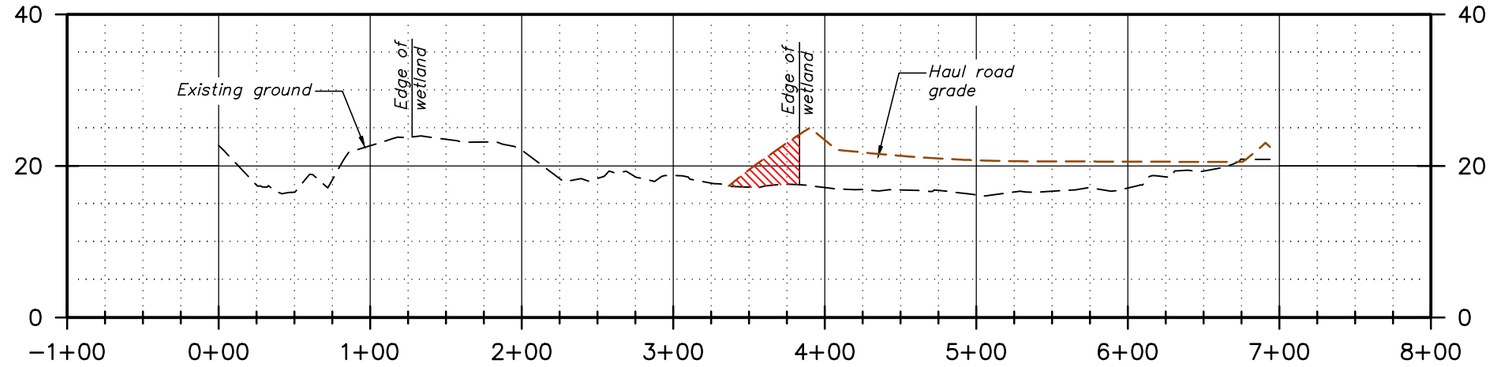
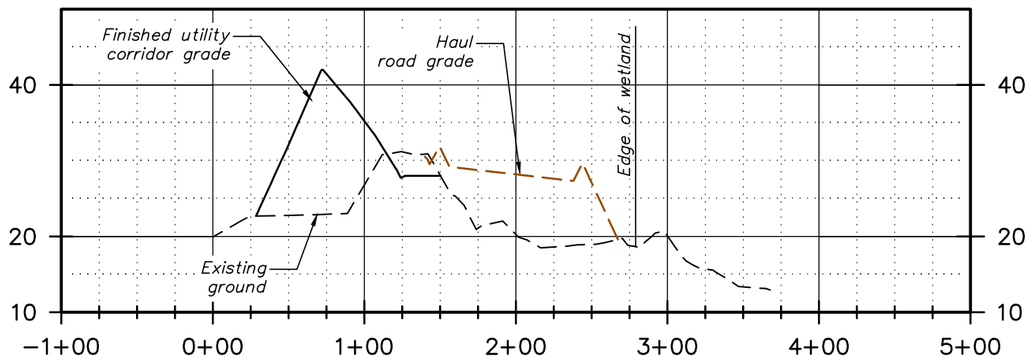
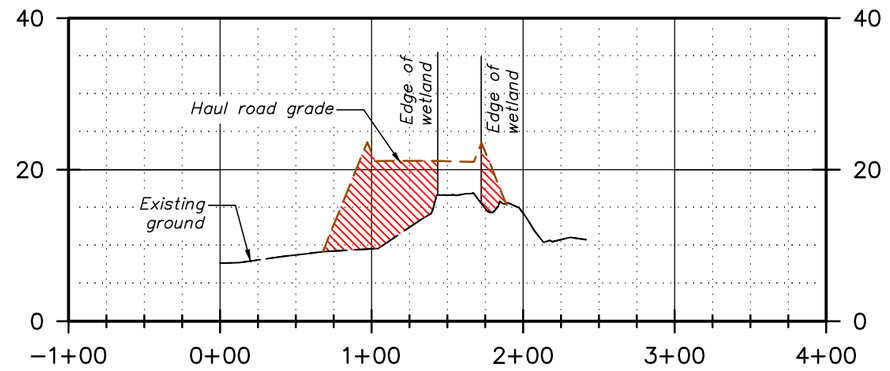


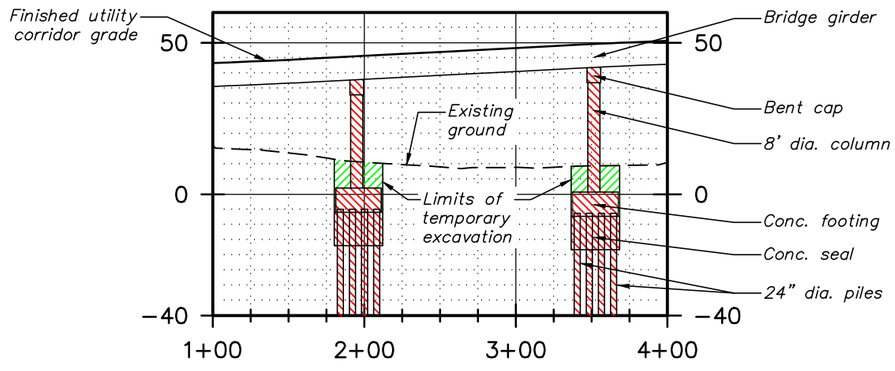
1 / 3-2B SECTION A-A
SCALE: H:1"=100' V:1"=20'



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

Fill associated with constructing the excavated material truck haul road (i.e., haul road) is temporary but will be in place >24 months and thus defined as permanent impact by State of Oregon.

WETLAND IMPACT LEGEND

- *Permanent wetland impact*
- *Temporary wetland impact*

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Permit Application
COOS COUNTY

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Designed By – JND
Drafted By – JND

Utility Corridor (West) Cross Sections

SHEET NO. 3–2B

N

Wetland B

Extg. wetland boundary

Wetland E

Limits of haul road grading

Wetland C

Wetland D

Highest Measured Tide (HMT) Elevation 10.26'

Extg. wetland boundary

JORDAN COVE ROAD

20.00

LEGEND

1. Utility Corridor Bridges
2. Utlilty Corridor and Access Road
3. Excavated material truck haul road
4. Sheet pile retaining wall
5. Southern Oregon Regional Safety Center (SORSC)

LNG Project Footprint Boundary

SDPP Project Footprint Boundary

Existing contour (1' interval)

Proposed contour (1' interval)

Coffer dam (temporary)

Edge of excavated material haul road fill

HMT (10.26' NAVD88)

Wetland

Open water

WETLAND IMPACT LEGEND

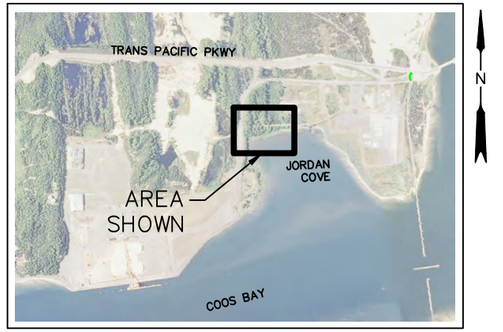
Permanent wetland impact

Temporary wetland impact

NOTE

Impacts to Wetland B are assigned to the LNG Terminal JPA because they could otherwise be avoided by the haul route by incorporation of a wall.

0 50 100 150



1 / 3-3A **UTILITY CORRIDOR (EAST) PROJECT FOOTPRINT**
SCALE: 1"=100'

2 / 3-3A **KEY MAP**
SCALE: 1"=3000'

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Drafted By – JND

Utility Corridor (East) Footprint Wetland Impacts

SHEET NO. 3–3A

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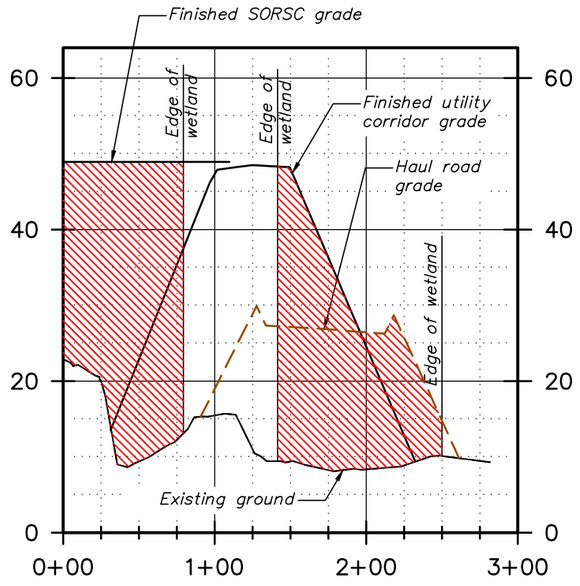
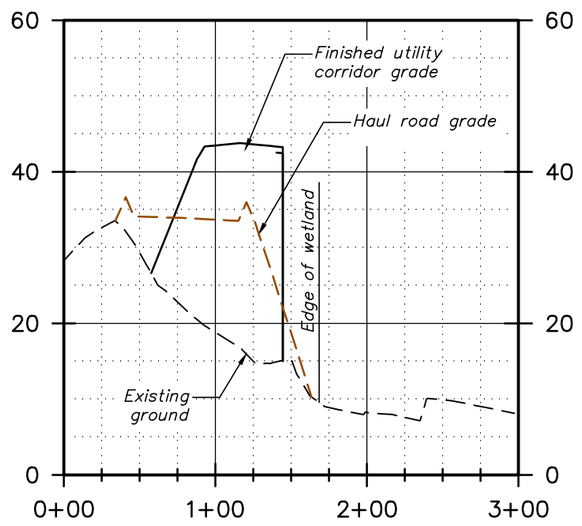


1 3-3B **SECTION A-A**
SCALE: H:1"=100' V:1"20'



2 3-3B **SECTION B-B**
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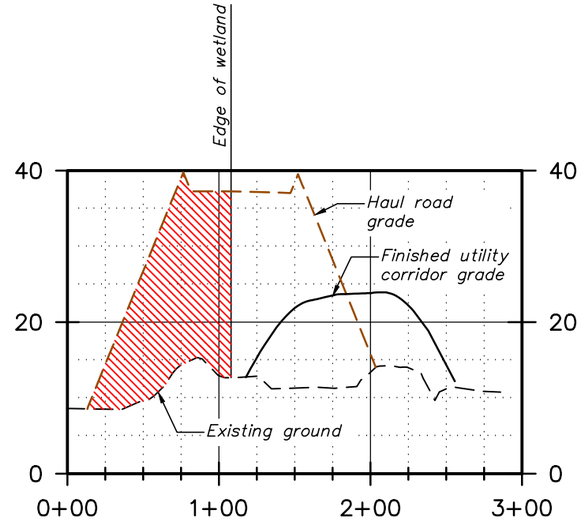
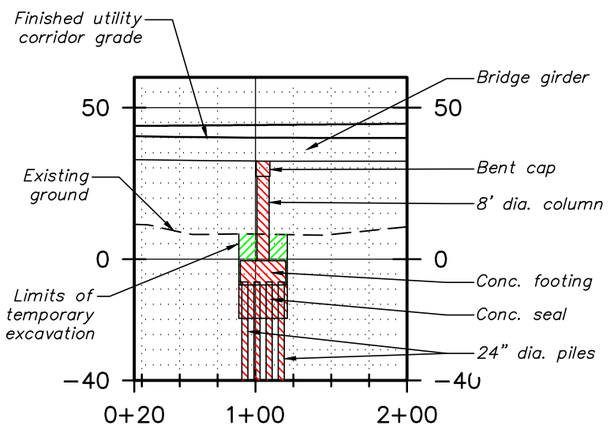


3 3-3B **SECTION C-C**
SCALE: H:1"=100' V:1"20'



4 3-3B **SECTION D-D**
SCALE: H:1"=100' V:1"20'

NOTE

Fill associated with constructing the excavated material truck haul road (i.e., haul road) is temporary but will be in place >24 months and thus defined as permanent impact by State of Oregon.

WETLAND IMPACT LEGEND

Permanent wetland impact

Temporary wetland impact

DAVID EVANS AND ASSOCIATES, INC.
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Permit Application
COOS COUNTY

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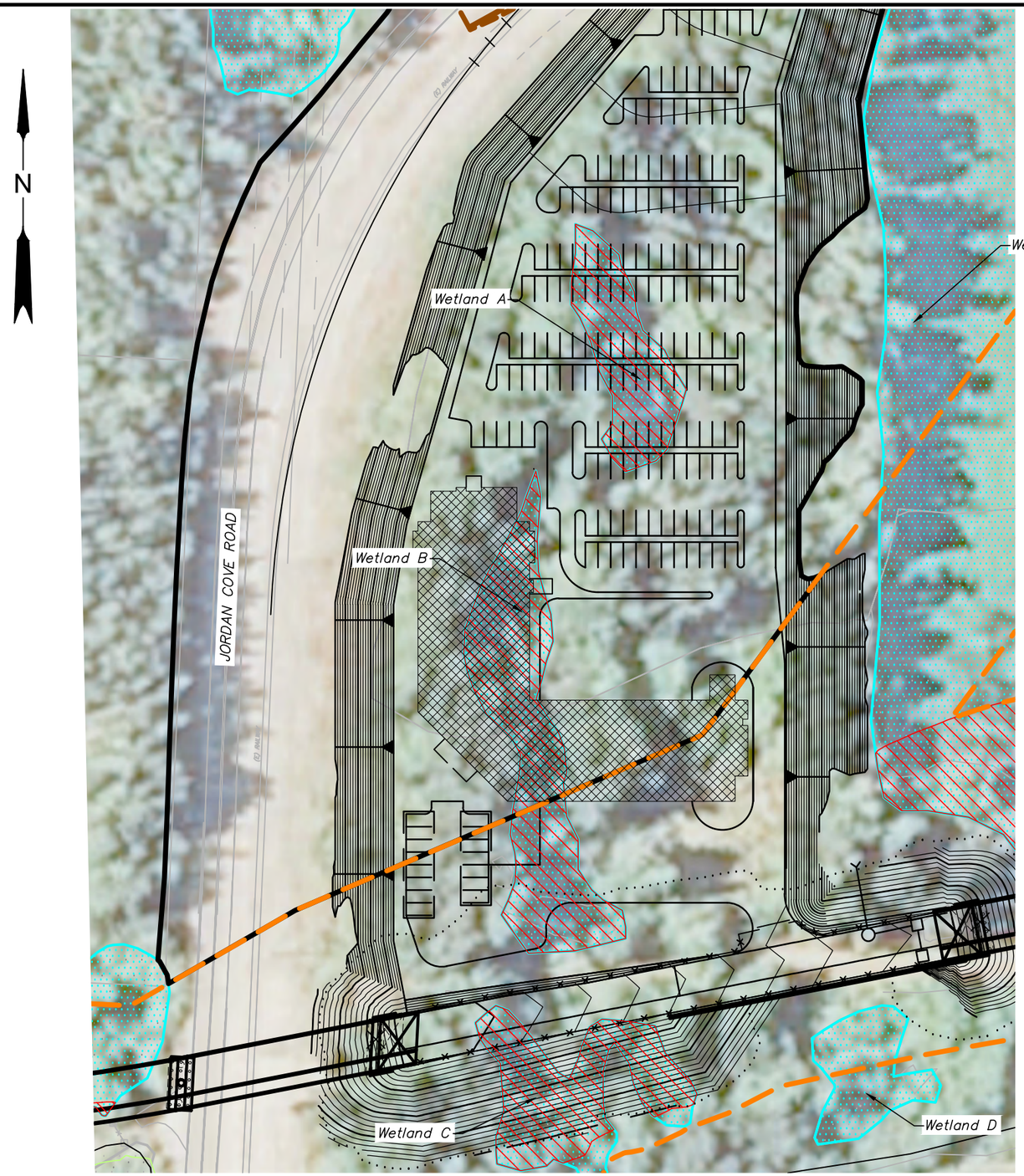
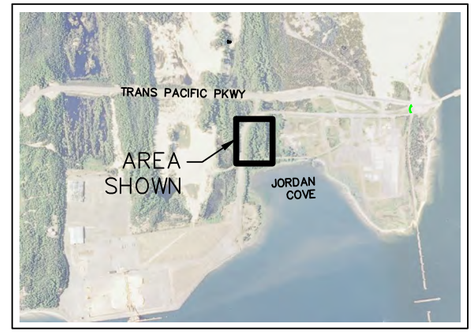
Designed By – JND
Drafted By – JND

Utility Corridor (East)
Cross Sections

SHEET NO.
3–3B



SORSC
PROJECT FOOTPRINT
1 / 4-1
SCALE: 1"=100'



KEY MAP
2 / 4-1
SCALE: 1"=3000'

LEGEND

- LNG Project Footprint Boundary
- SDPP Project Footprint Boundary
- Wetland
- Proposed contour (1' interval)

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

NOTE

Impacts to Wetland B are assigned to the LNG Terminal JPA because they could otherwise be avoided by the haul route by incorporation of a wall.

0 50 100 200

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Portland Oregon 97201 Ph: 503.223.6663

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COOS COUNTY

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Drafted By – JND

Southwest Oregon Regional Safety Center Wetland Impacts

SHEET NO. 4–1

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Trans Pacific Parkway

Wetland 2012-4

Wetland 2012-5

Wetland 2012-6

Wetland 2012-7

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 H (West)

Wetland N (DSL NJD)

East Utility Corridor Bridge

Wetland D

Wetland M

Wetland C

Wetland WJC-C

Highest Measured Tide (HMT) Elevation 10.26'

Jordan Cove Road

Proposed Metering Station

Wetland J

Wetland WJC-D

Wetland WJC-B

N

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact
- Permanent estuarine impact
- Temporary estuarine impact

LEGEND

- LNG Project Footprint Boundary
- SDPP Project Footprint Boundary
- HMT (10.26' NAVD88)
- Industrial Waste Water Line Relocation
- Excavated Material Truck Haul Road
- Heavy Equipment Truck Haul Road
- Hydraulic Dredge Material Pipeline Route
- Water Line Relocation
- Wetland
- Open water

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COOS COUNTY

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Designed By – JND
Drafted By – JND

Mill Site / South Dunes Site Footprint Wetland Impacts

Scale: 1" = 150'

SHEET NO. 5-1

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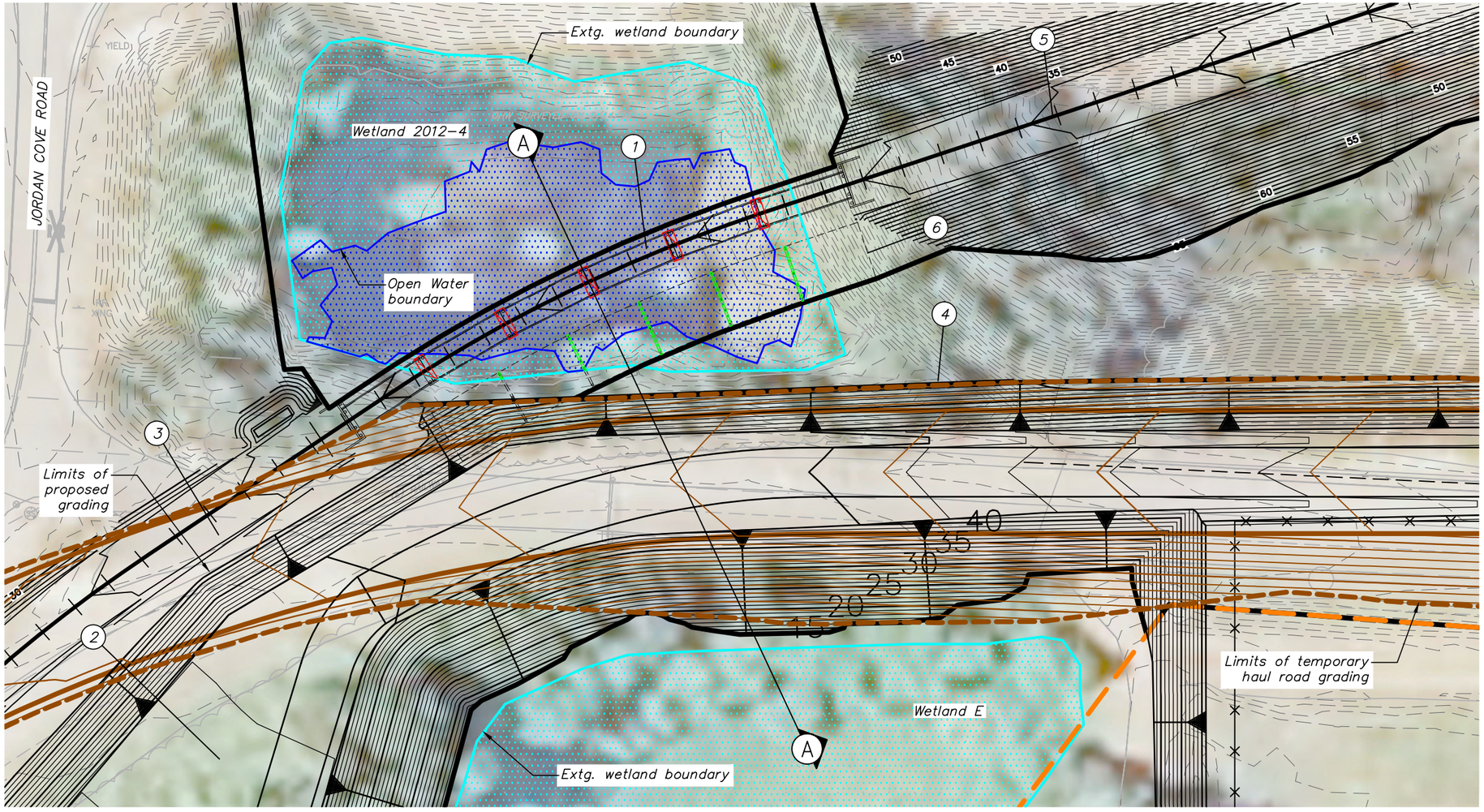


LEGEND

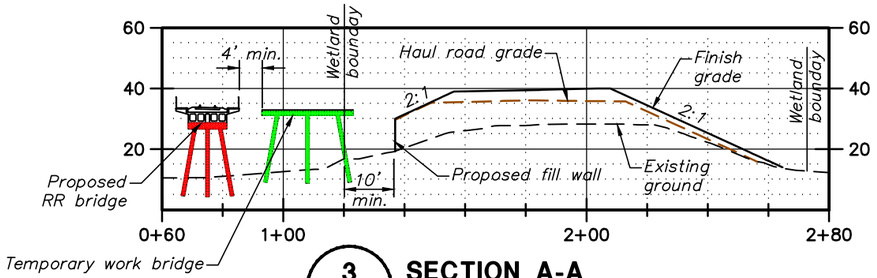
1. Railroad Bridge
2. SORSC Road
3. Excavated material truck haul road
4. Retaining wall
5. Railroad realignment
6. Temporary work bridge

- LNG Project Footprint Boundary
- SDPP 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

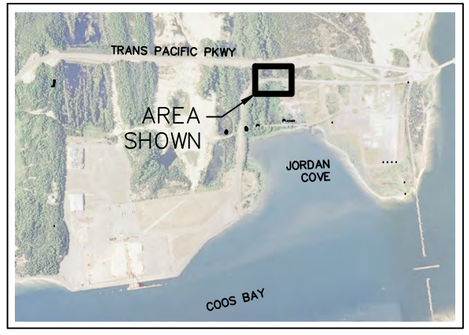
WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact

1 / 5-2 RAILROAD BRIDGE PROJECT FOOTPRINT
SCALE: 1"=60'



3 / 5-2 SECTION A-A
SCALE: 1"=50'



2 / 5-2 KEY MAP
SCALE: 1"=3000'

0 30 60 120

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Portland Oregon 97201 Ph: 503.223.6663

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Drafted By – JND

Railroad Bridge Footprint Wetland Impacts

SHEET NO. 5–2

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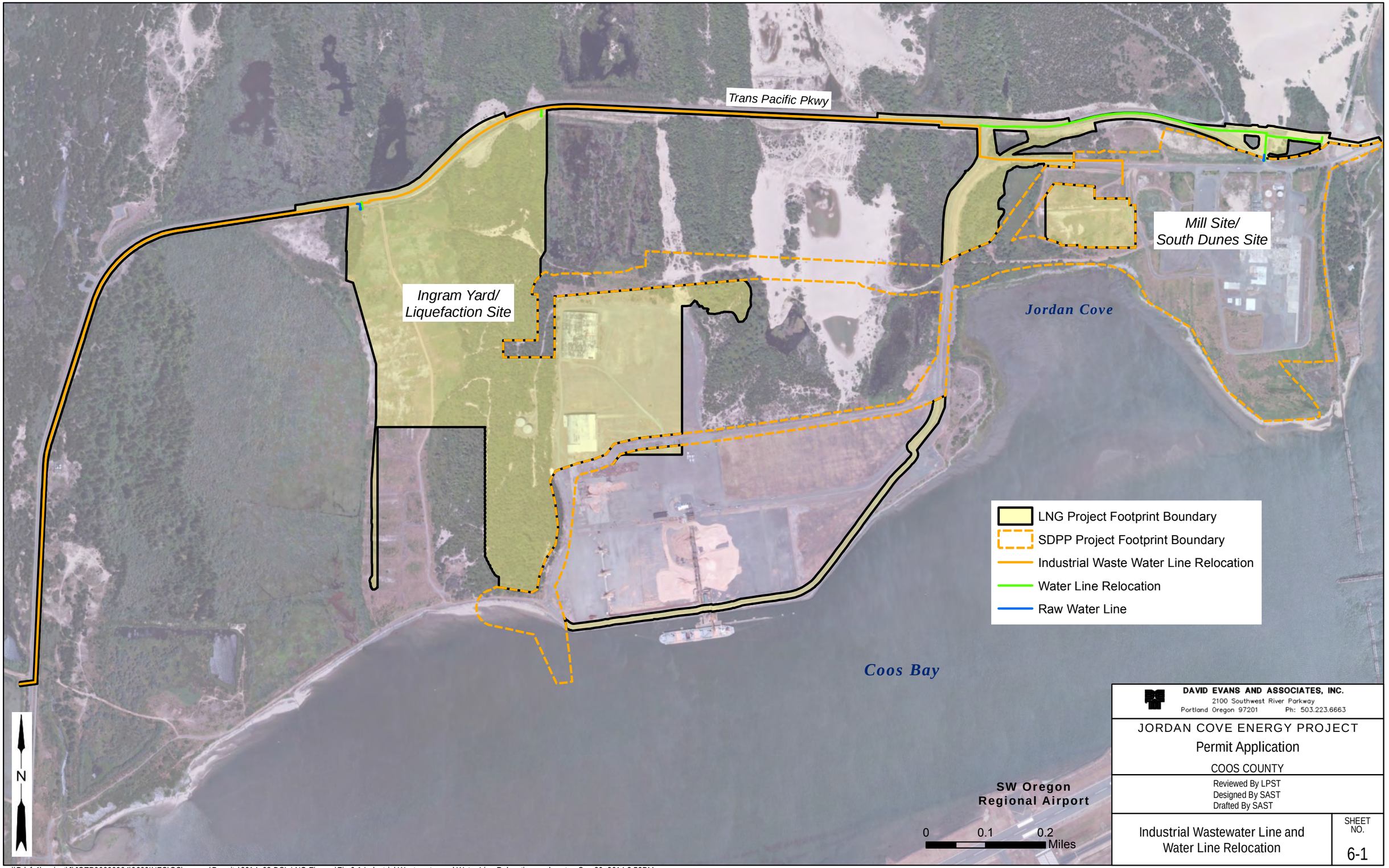

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Portland Oregon 97201 Ph: 503.223.6663

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

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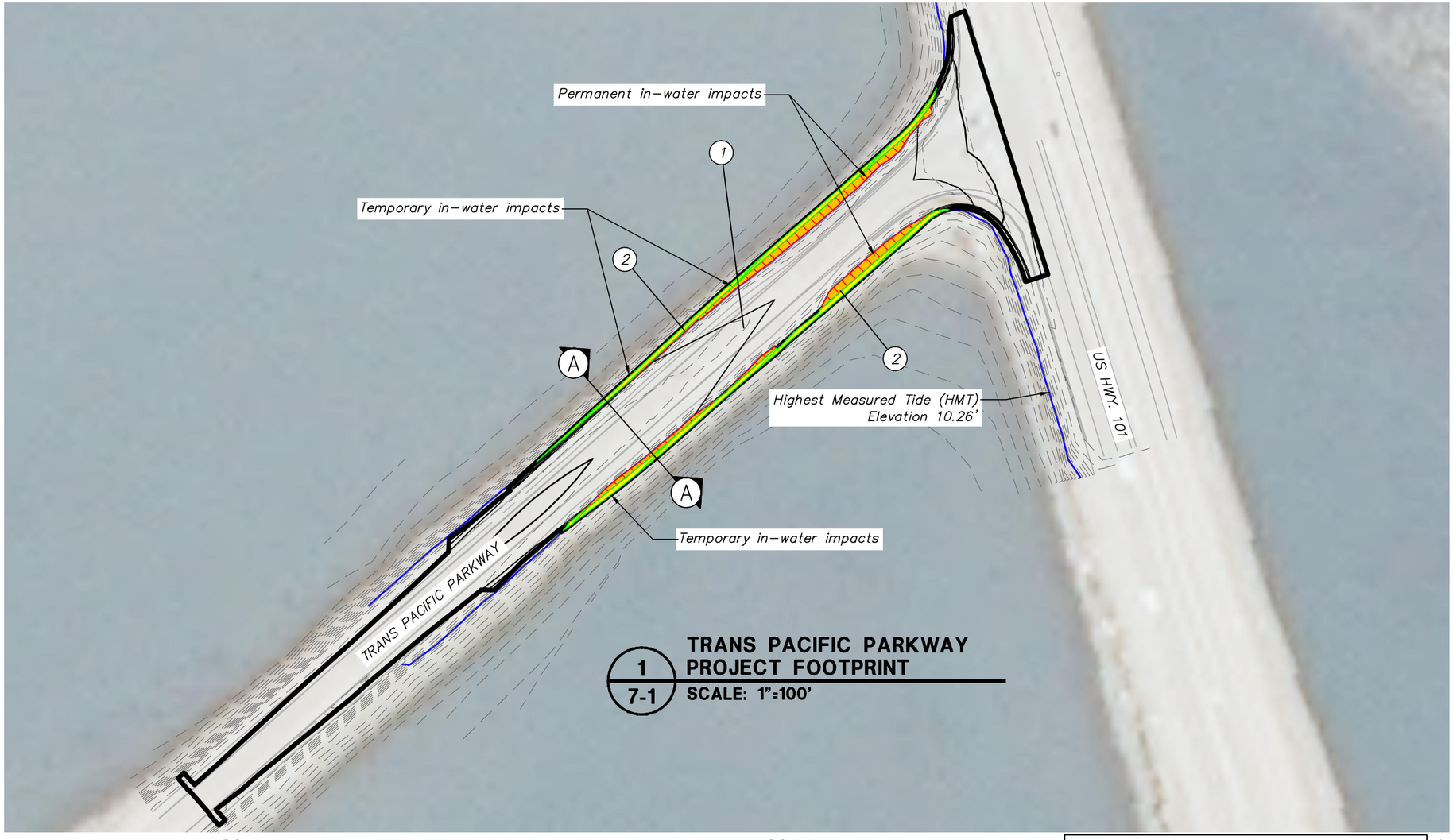
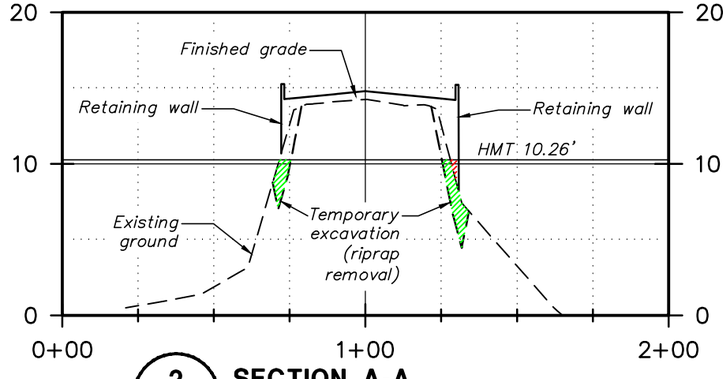


1 / 7-1 TRANS PACIFIC PARKWAY PROJECT FOOTPRINT
SCALE: 1"=100'



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
- LNG Project Footprint Boundary
- Existing contour (1' interval)
- Proposed contour (1' interval)
- HMT (10.26' NAVD88)

WETLAND IMPACT LEGEND

- Permanent wetland impact
- Temporary wetland impact
- Permanent estuarine impact
- Temporary estuarine impact

0 30 60 120

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JORDAN COVE ENERGY PROJECT
Permit Application
COOS COUNTY

Reviewed By – LPST
Designed By – JND
Drafted By – JND

Trans Pacific Parkway Footprint Wetland Impacts

SHEET NO. 7–1

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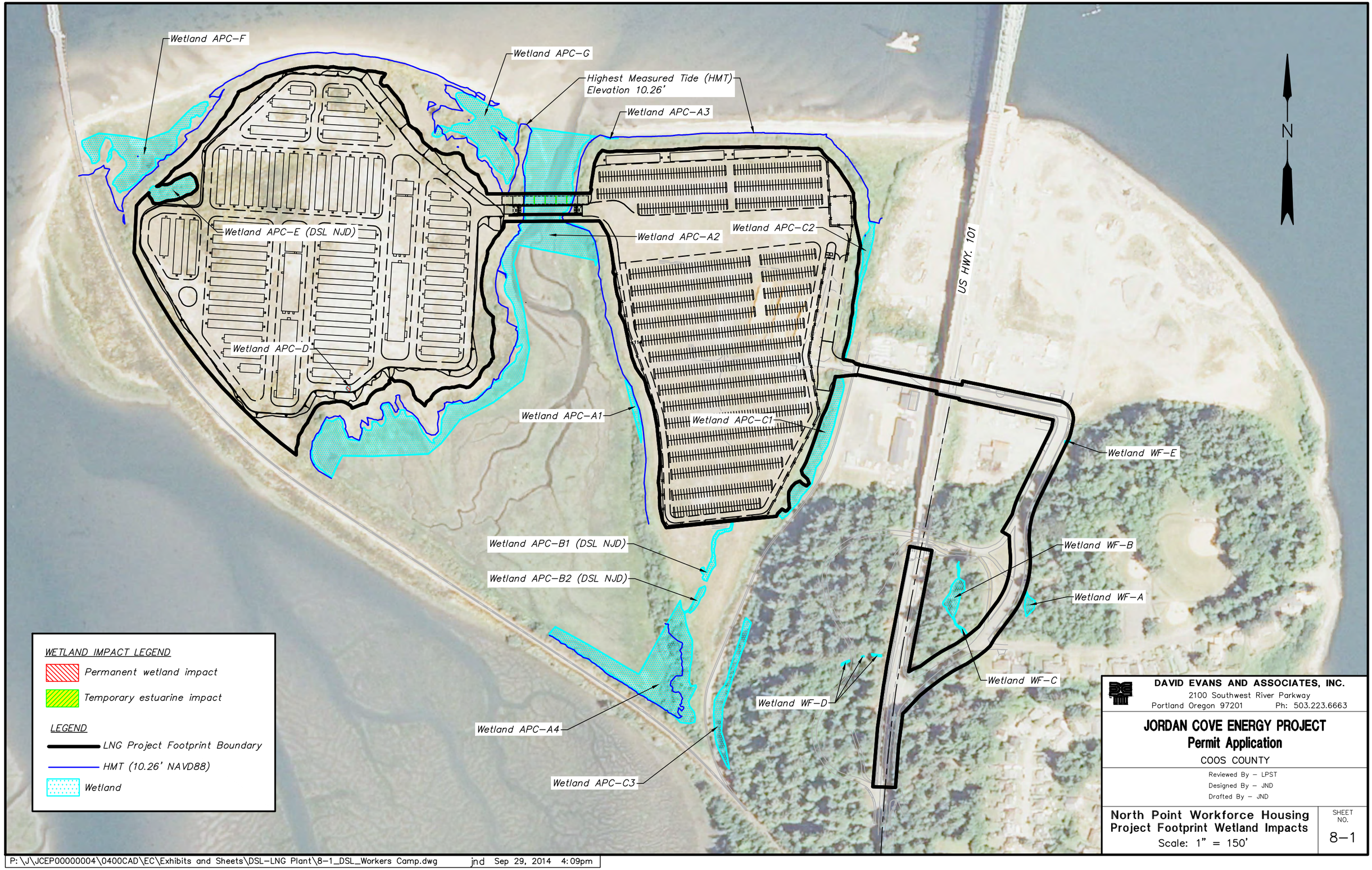

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North Point Workforce Housing
Project Footprint Wetland Impacts
Scale: 1" = 150'

SHEET NO. 8–1

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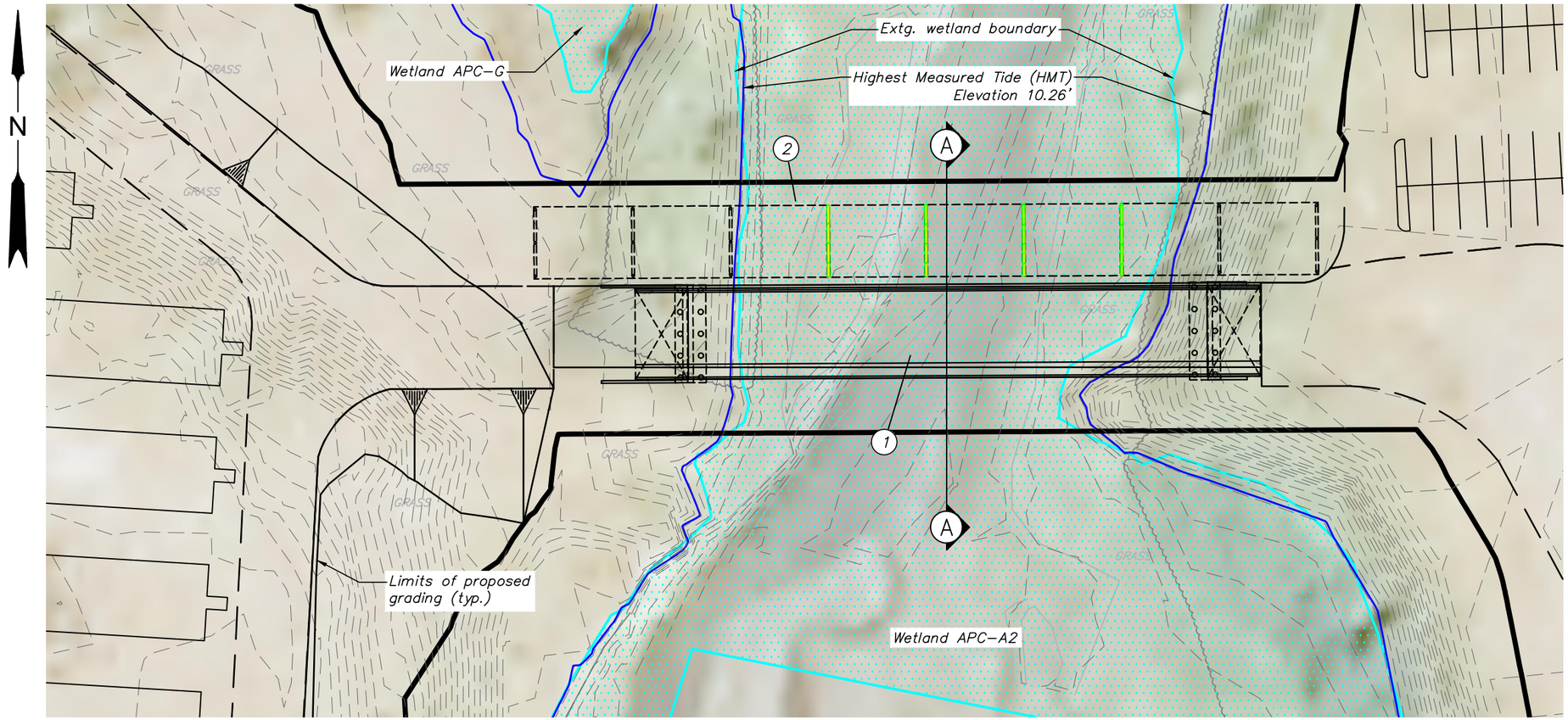
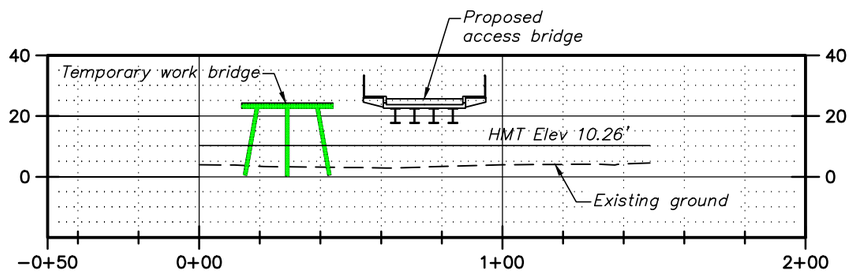
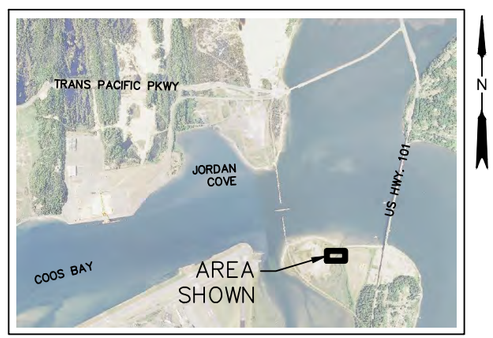


1 / 8-2 **NORTH POINT WORKFORCE HOUSING PROJECT BRIDGE PROJECT FOOTPRINT**
SCALE: 1"=50'



2 / 8-2 **SECTION A-A**
SCALE: 1"=50'



3 / 8-2 **KEY MAP**
SCALE: 1"=5000'

LEGEND

1 — Permanent access bridge
2 — Temporary work bridge
LNG Project Footprint Boundary
Existing contour (1' interval)
Wetland

WETLAND IMPACT LEGEND

Temporary estuarine impact

0 25 50 100

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JORDAN COVE ENERGY PROJECT
Permit Application
COOS COUNTY

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North Point Workforce Housing Project Bridge Footprint Wetland Impacts

SHEET NO. 8-2

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A.2. Wetland Impacts Table

Wetland and Waterway Impacts - Detailed by Estuarine and Freshwater Habitats

Wetland / Estuarine Resource Name	Wetland Delin. ID [1]	Project	Project Element	Sheet No. ID	Type of Wetland Impact	Cowardin/ HGM Classification [8]	Total Wetland Size (acres) [2]	DSL JURISDICTION: Temporary Wetland Impacts (acres) [2]	Temp Fill (CY) [9]	Temp Removal (CY) [9]	Permanent Wetland Impacts (acres) [2]	Permanent Fill (CY)	Permanent Removal (CY)	Type of Material	Impact Description
ESTUARINE															
Coos Bay @ Access Triangle, Intertidal, CB below el. 10.26' (HMT)	1, 2	SDPP	Access Channel	1-1	estuarine	E2US/ Estuarine	N/A	0	0	0	0.316	0	36,820	Sand	Permanent removal for access to barge berth.
Coos Bay @ Access Triangle, Deep Subtidal, CB below HMT	1	SDPP	Access Channel	1-1	estuarine	E1UB/ Estuarine	N/A	0	0	0	0.625	0	See above	Sand	Permanent removal for access to barge berth.
Coos Bay @ Access Triangle, Eelgrass, CB below HMT	1	SDPP	Access Channel	1-1	estuarine	E1AB, E2AB/ Estuarine	N/A	0	0	0	0.182	0	See above	Sand	Permanent removal for access to barge berth. Overlaps with 0.118 ac of temporary eelgrass impacts from barge berth construction fill.
Coos Bay @ Access Triangle, Shallow Subtidal, below HMT	1	SDPP	Access Channel	1-1	estuarine	E1UB/ Estuarine	N/A	0	0	0	0.241	0	See above	Sand	Permanent removal for access to barge berth.
Coos Bay @ Barge Berth, Intertidal, below HMT [10]	1, 2	SDPP	Barge Berth	1-1	estuarine	E2US/ Estuarine	N/A	*	3,589	*3,589*	1.616	21,666	0	Sand	Permanent fill for entire barge berth. Temporary impacted areas overlap with permanent impacts and are not tabulated.
Coos Bay @ Barge Berth, Shallow Subtidal, below HMT [10]	1	SDPP	Barge Berth	1-1	estuarine	E1UB/ Estuarine	N/A	*	See above	*See above*	0.074	See above	0	Sand	Permanent fill for barge berth; and temporary fill/removal for construction access/staging. Overlaps with temporary impacts of 0.019 ac for barge berth fill
Coos Bay adjacent to Wetland M, Intertidal, below HMT [3]	2	SDPP	Mill Site/South Dunes Site	5-1	estuarine	N/A / Estuarine	N/A	0.029	0	0	0.181	5,063	0	Sand	Impacts at Jordan Cove, Coos Bay, adjacent to Wetland M.
Coos Bay adjacent to Wetland J, below HMT [3]	2	SDPP	Mill Site/South Dunes Site	5-1	estuarine	N/A / Estuarine	N/A	0.272	0	0	0.141	3,339	0	Sand	Permanent impacts resulting from raising elevation at SDPP. Impacts exclude Wetland J.
Wetland H (West)	3	SDPP	Mill Site/South Dunes Site	5-1	estuarine	E2US/ Estuarine	0.06	0	0	0	0.062	3,596	0	Sand	Entire wetland impact.
Wetland M	3	SDPP	Mill Site/South Dunes Site	5-1	estuarine	E2EM and E2US/ Estuarine	3.77	0.087	0	0	0.212	5,025	0	Sand	Does not include impacts below HMT adjacent to Wetland M. Temporary disturbance includes ground improvements.
Wetland APC-A2 @ NPWHP, Intertidal, below HMT [4]	2	LNG Terminal	NPWHP	8-1, 8-2A	estuarine	E2EM/ Estuarine	N/A	0.003	175	*175*	0.000	0	0	Steel pile	Impacts due to ~15 steel temporary work bridge pile
Coos Bay @ TPP/Hwy 101, Intertidal, below HMT	2	LNG Terminal	TPParkway /Hwy 101	7-1	estuarine	E2RS/ Estuarine	N/A	0.056	*390*	390	0.054	404	0	Riprap	Temporary removal impacts to remove riprap to install sheet pile wall for widening.
TOTAL ESTUARINE							**3.83**	**0.45**	**4,154**	**4,154**	**3.70**	**39,093**	**36,820**		
Deep Subtidal only								**0.00**	**0**	**0**	**0.63**				
TOTAL ESTUARINE excluding Deep Subtidal [5]								**0.45**	**4,154**	**4,154**	**3.08**	**39,093**	**36,820**		Mitigation is not required by DSL for Deep Subtidal impacts
FRESHWATER															
2013-3	5	LNG Terminal	LNG Plant	2-1	freshwater	PSSC/ Flat	0.10	0	0	0	0.100	6,161	0	Sand	Entire wetland permanently impacted due to LNG site construction.
2013-4	5	LNG Terminal	LNG Plant	2-1	freshwater	PUBH/ Depressional	0.77	0.086	0	0	0.287	3,594	0	Sand	Partial wetland permanently impacted due to LNG site construction. Temporary disturbance does not require fill/removal.
2012-7	6	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Slope	0.20	0	0	0	0.200	6,683	0	Sand	Entire wetland impact. Rail line must be relocated as part of property transfer to JCEP.
Wetland F - Non-jurisdictional [6]	3	SDPP	Mill Site/South Dunes Site	5-1	N/A	PUBKx/ Depressional	0.88	0	0	0	N/A	58,758	0	Sand	NJD - refer to DSL concurrence letter WD #2011-0065.
Wetland G - Non-jurisdictional [6]	3	SDPP	Mill Site/South Dunes Site	5-1	N/A	PUBKx/ Depressional	0.87	0	0	0	N/A	57,084	0	Sand	NJD - refer to DSL concurrence letter WD #2011-0065.
Wetland H (East)	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Depressional	0.09	0	0	0	0.087	4,732	0	Sand	Entire wetland permanently impacted by fill material to raise elevation of SDPP.
Wetland I (North)	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Depressional	0.27	0	0	0	0.266	13,564	0	Sand	Entire wetland permanently impacted by fill material to raise elevation of SDPP.
Wetland I (South) - Non-jurisdictional [6]	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Depressional	0.01	0	0	0	N/A	503	0	Sand	NJD - refer to DSL concurrence letter WD#2013-0218.
Wetland J	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Slope	1.95	0.535	0	0	0.033	1,265	0	Sand	Wetland partially impacted by fill material to raise elevation of SDPP. Temporary impacts are due to ground improvements.
Wetland L	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/ Depressional	0.11	0	0	0	0.114	5,041	0	Sand	Entire wetland permanently impacted by fill material to raise elevation of SDPP.
Wetland N - Non-jurisdictional [6]	3	SDPP	Mill Site/South Dunes Site	5-1	freshwater	PEMA/Depressional	0.02	0	0	0	N/A	951	0	Sand	NJD - refer to DSL concurrence letter WD#2013-0218.
Wetland APC-D	4	LNG Terminal	NPWHP	8-1	freshwater	PEMA/ Depressional	0.01	0	0	0	0.005	212	0	Sand	Entire wetland permanently impacted due to workforce housing facilities.
2012-4	6	LNG Terminal	Rail Spur Bridge Re-Location	3-1, 5-2	freshwater	PEMA/ Depressional	0.85	0.002	65	*65*	0.008	270	0	Sand	Impacts due to bent placement for rail spur bridge and temporary work bridge. Permanent impacts include 0.006 open water.
2012-5	6	LNG Terminal	Entrance D	5-1	freshwater	PSSC/ Depressional	0.25	0.120	0	*0*	0	0	0	construction disturbance	TPP Entrance D: temorary impacts due to retaining wall construction to avoid permanent wetland impacts
Wetland A	3	LNG Terminal	SORSC	3-1, 4-1	freshwater	PFOC/ Depressional	0.20	0	0	0	0.202	9,766	0	Sand	Entire wetland permanently impacted due to SORSC
Wetland B	3	LNG Terminal	SORSC	3-1, 4-1	freshwater	PFOC/ Depressional	0.41	0	0	0	0.412	20,333	0	Sand	Entire wetland permanently impacted due to SORSC
2012-2 [7]	6	SDPP	Utility Corridor	3-1, 3-2A	freshwater	PSSC, PEMF/ Flat	10.14	0	0	0	0.150	1,113	0	Sand	Permanent impacts due to haul road.
Wetland C [7]	3	SDPP	Utility Corridor	3-1, 3-3A	freshwater	PFOC/ Depressional	0.29	0	0	0	0.256	8,254	0		Permanent impacts due to utility road and haul road.
Wetland E [7]	3	SDPP	Utility Corridor	3-1, 3-3A	freshwater	PABH, PUBH/ Depressional	4.11	0	40	*40*	0.976	37,944	*37,944*	Sand, bridge bent, cofferdam	Permanent impacts due to haul road fill material and permanent bridge bent. Impacts include 0.17 open water. Temporary volumes include cofferdam.
2013-1	5	SDPP	Utility Corridor	3-1	freshwater	PUBH, PSSC, PEMA/ Depressional	19.57	0.098	0	0	0	0	0	construction disturbance	Permanent wetland impacts will be avoided by constructing retaining walls; only disturbance during construction
2013-2	5	SDPP	Utility Corridor	3-1	freshwater	PUBH, PSSC, PEMA/ Depressional	0.08	0.048	0	0	0	0	0	construction disturbance	Permanent wetland impacts will be avoided by constructing retaining walls; only disturbance during construction
2013-6 [7]	5	SDPP	Utility Corridor	3-1, 3-2A	freshwater	PEMF/ Flat	3.77	0.004	222	*222*	0.346	4,326	*4,326*	sand, cofferdam	Temporary impacts for bridge construction (0.005). Permanent impacts due to haul road.
TOTAL FRESHWATER							**44.94**	**0.89**	**327**	**327**	**3.44**	**240,554**	**42270**		

Wetland and Waterway Impacts - Summary by Project

	Temporary Wetland Impacts (acres) [2]	Temp Fill (CY)	Temp Removal (CY)	Permanent Wetland Impacts (acres)	Permanent Fill (CY)	Permanent Removal (CY)
SOUTH DUNES POWER PLANT						
TOTAL ESTUARINE excluding Deep Subtidal	0.39	3589	3589	3.03	38,689	36,820
TOTAL FRESHWATER	0.69	262	262	2.43	82,922	42,270
TOTAL WETLANDS	1.07	3,851	3,851	5.45	121,611	79,090
LNG TERMINAL						
TOTAL ESTUARINE excluding Deep Subtidal	0.06	565	565	0.05	404	-
TOTAL FRESHWATER	0.21	65	65	1.01	40,336	-
TOTAL WETLANDS	0.27	630	630	1.07	40,740	-

FOOTNOTES:

[1] Wetland Delineation I.D.: 1= DEA, Habitat Mapping 2011; 2= SHN Survey of HMT (various dates); 3= WD# 2013-0218 (previously approved as WD# 2011-0065); 4= WD# 2013-0193; 5= WD# 2013-0116; 6 = WD# 2012-0313

[2] Wetland area includes open water areas at Wetlands E, F, G, and 2012-4. Total wetland size refers to the portion within the delineation study area. Highest Measured Tide (HMT) extends well beyond the study area, thus the size of HMT is noted as N/A.

[3] Areas included are in the vicinity of or surround, but do not include Wetlands M and J.

[4] Areas include steel pile only in Esturine Wetland APC-A2.

[5] Total Estuarine area does not include deep subtidal impacts (since no mitigation is proposed for this habitat type).

[6] Wetlands F, G, I (south) and N are non-jurisdictional; therefore, fill areas/volumes are not calculated as "impacts" in this table.

[7] A portion of these fill impacts are temporary impacts that are in place for longer than 24 months, and are therefore considered permanent impacts according to DSL. Impacts associated with the haul road will be rectified prior to project completion.

[8] Estuarine areas below HMT, but containing upland plant communities, have been noted as N/A (not applicable).

[9] Volumes for the original removal/fill activity are shown in non-italicized text. Italicized text indicates the volume of the removal/fill activity needed to rectify the original activity.

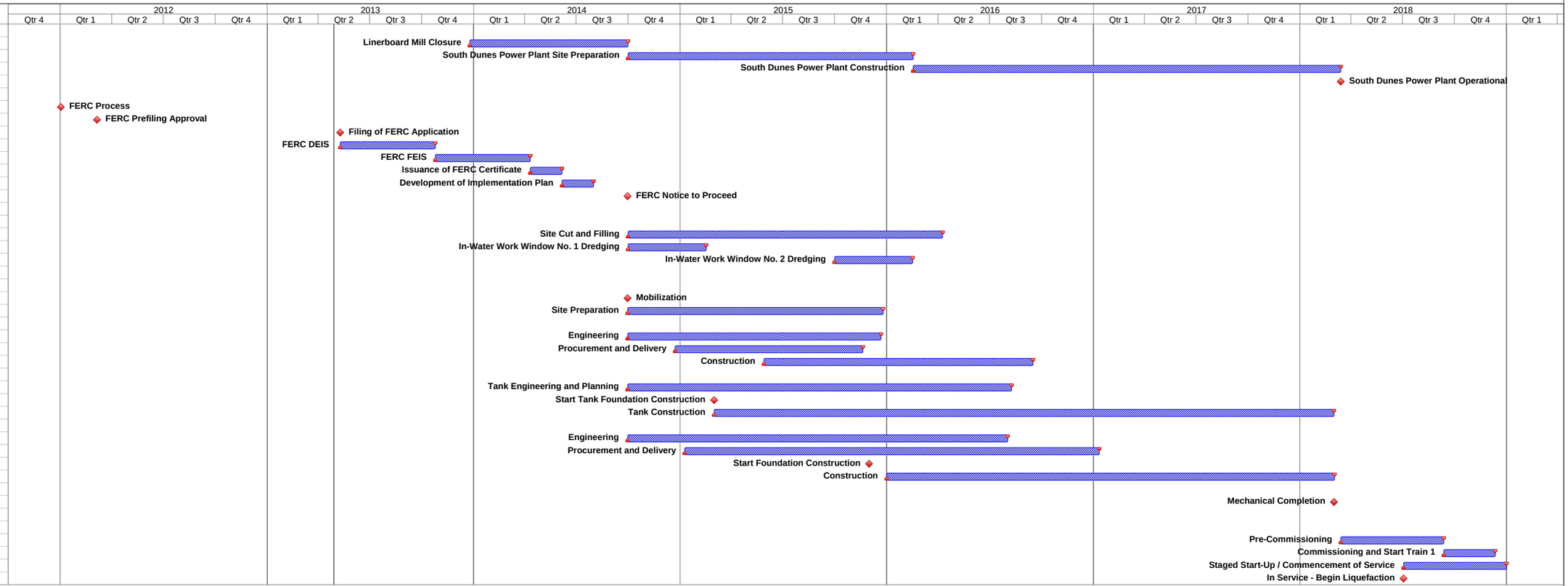
[10] Temporary impacts overlap with permanent impact; therefore temporary impact areas are not tabulated.

General Note: Wetlands that do not have temporary or permanent impacts are not listed on this table.

A.3. 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	

A.4. 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. <u>Design Specifications</u>:

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. <u>Design Loading and Load Combinations</u>:

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>:

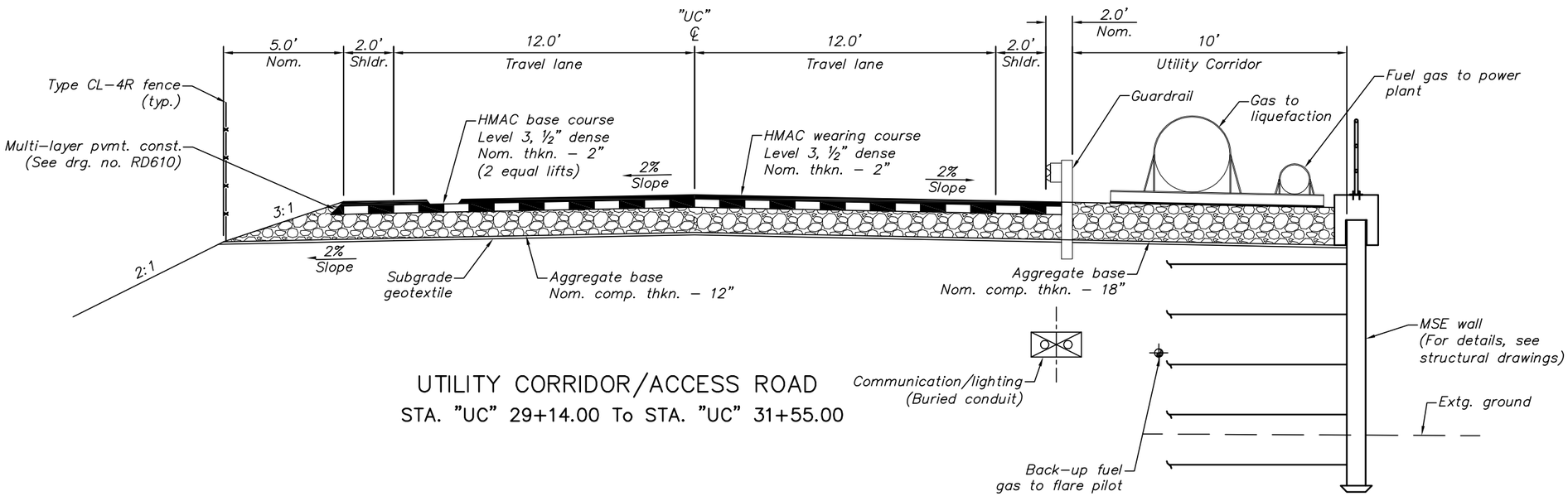
a. Concrete cover measured from the face of the concrete to the face of any reinforcement bar shall be:
   i. Precast members – prestressing tendons — 1.5”
   ii. Precast members – stirrups, ties, spirals — 1”
   iii. CIP Members - Principal Reinforcement — 2.5”
   iv. CIP Members - Stirrups, ties and spirals — 2”
   v. Footings cast against soil: — 3”

A.5. Bridge and Roadway Plans

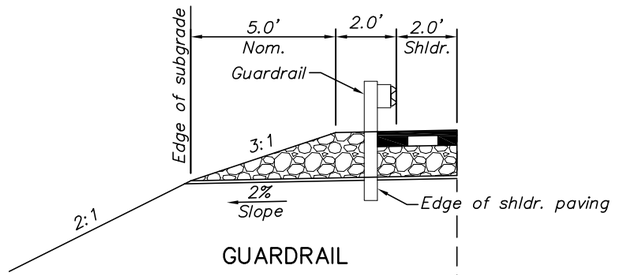
1 Typical Section, Utility Corridor / Access Road
2 Plan and Profile Sheet 3, Utility Road / Access Road
3 Plan and Profile Sheet 4, Utility Road / Access Road
4 Plan and Profile Sheet 5, Utility Road / Access Road
5 Plan and Profile Sheet 5A, Utility Road / Access Road
6 Plan and Profile Sheet 6, Utility 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

A.5. Bridge and Roadway Plans (List Continued)

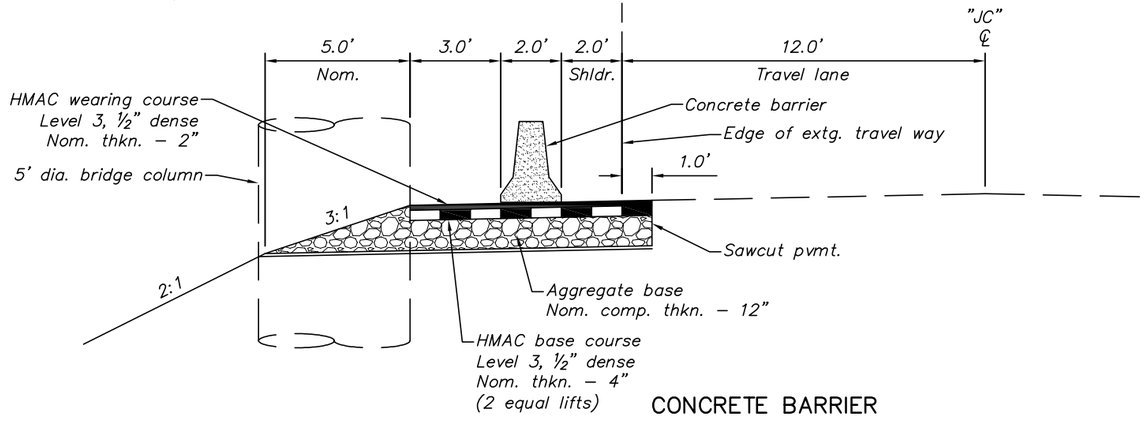
40 Typical Section, Kentuck Access
41 General Construction Sheet 3, Kentuck Access
42 General Construction Sheet 4, Kentuck Access
43 General Construction Sheet 5, Kentuck Access
44 Typical Section, East Bay Road
45 Detour Plan Sheet 2C, East Bay Road
46 Detour Plan Sheet 2C-2, East Bay Road
47 General 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.

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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 – T. Wheeler
Designed By – J. DeMello
Drafted By – J. DeMello

TYPICAL SECTION

SHEET NO. 2A

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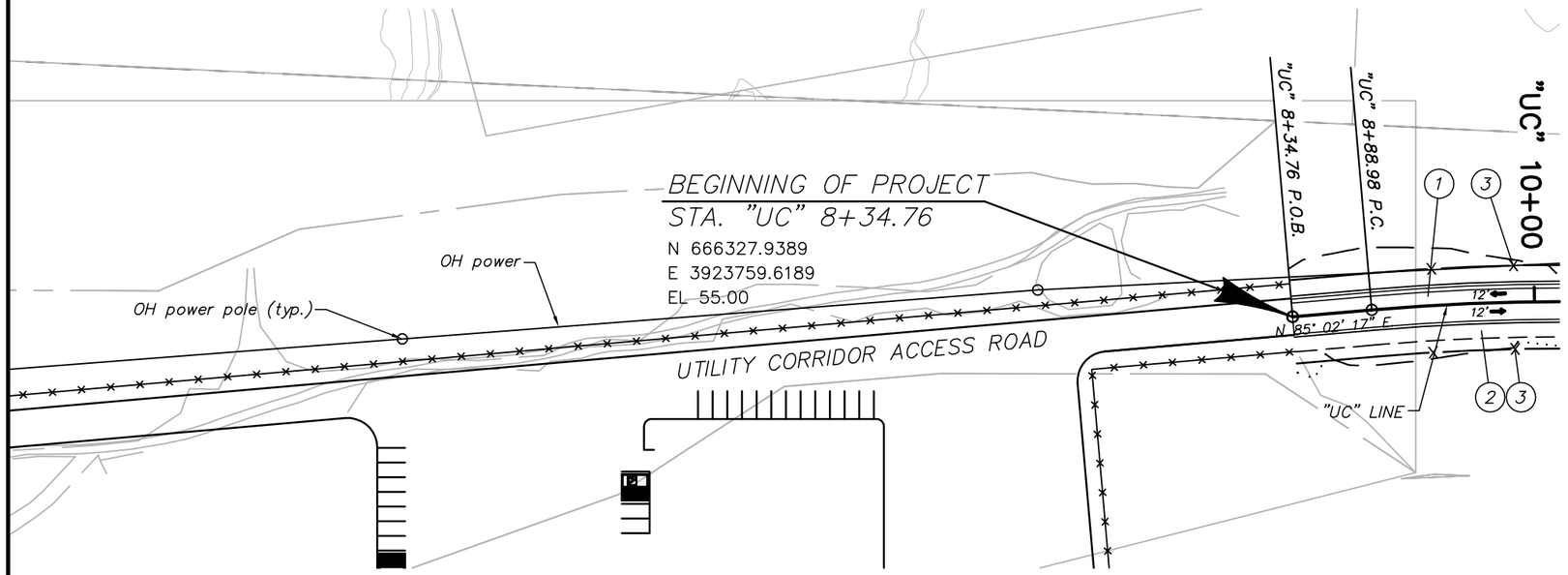

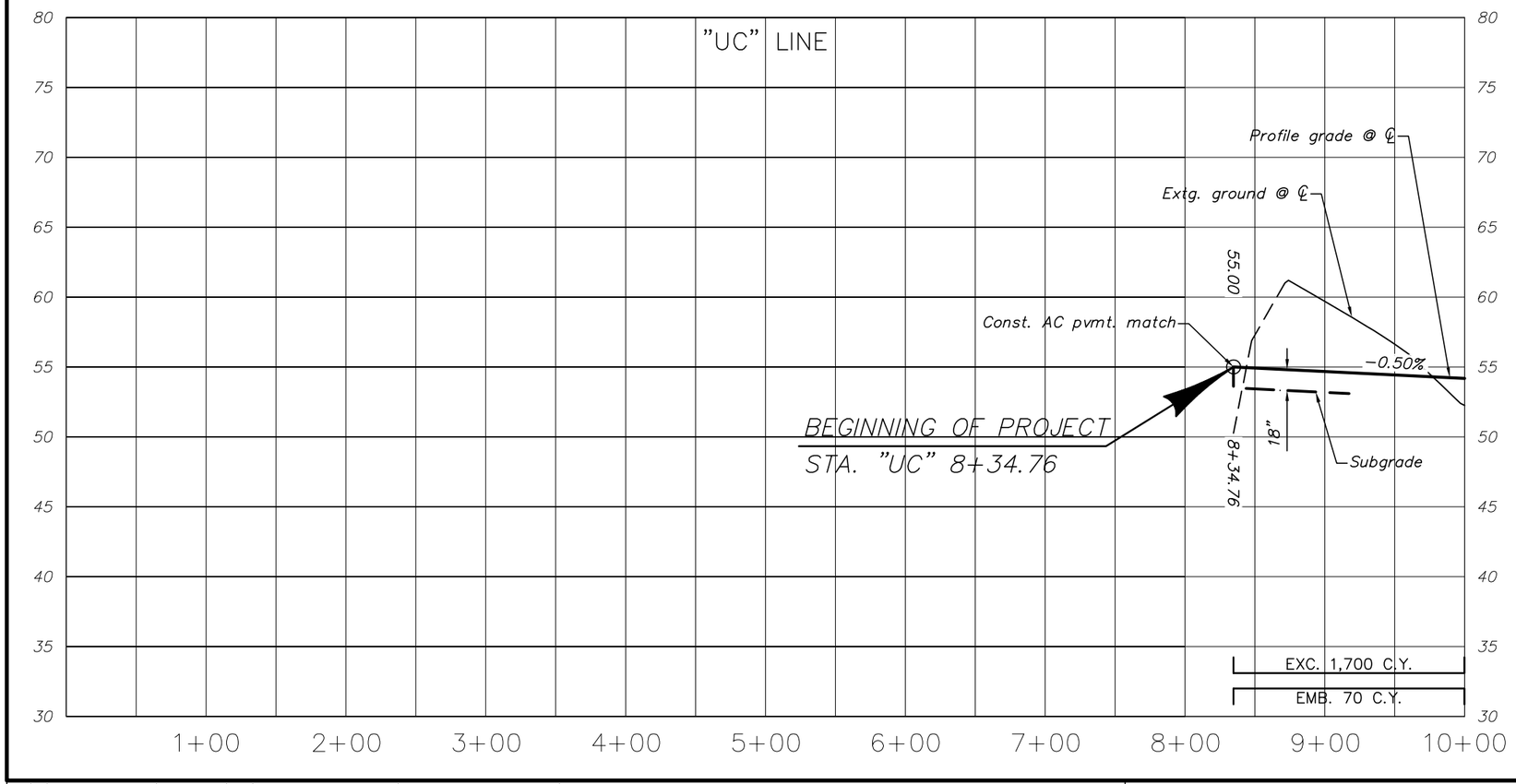

N

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

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Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 3

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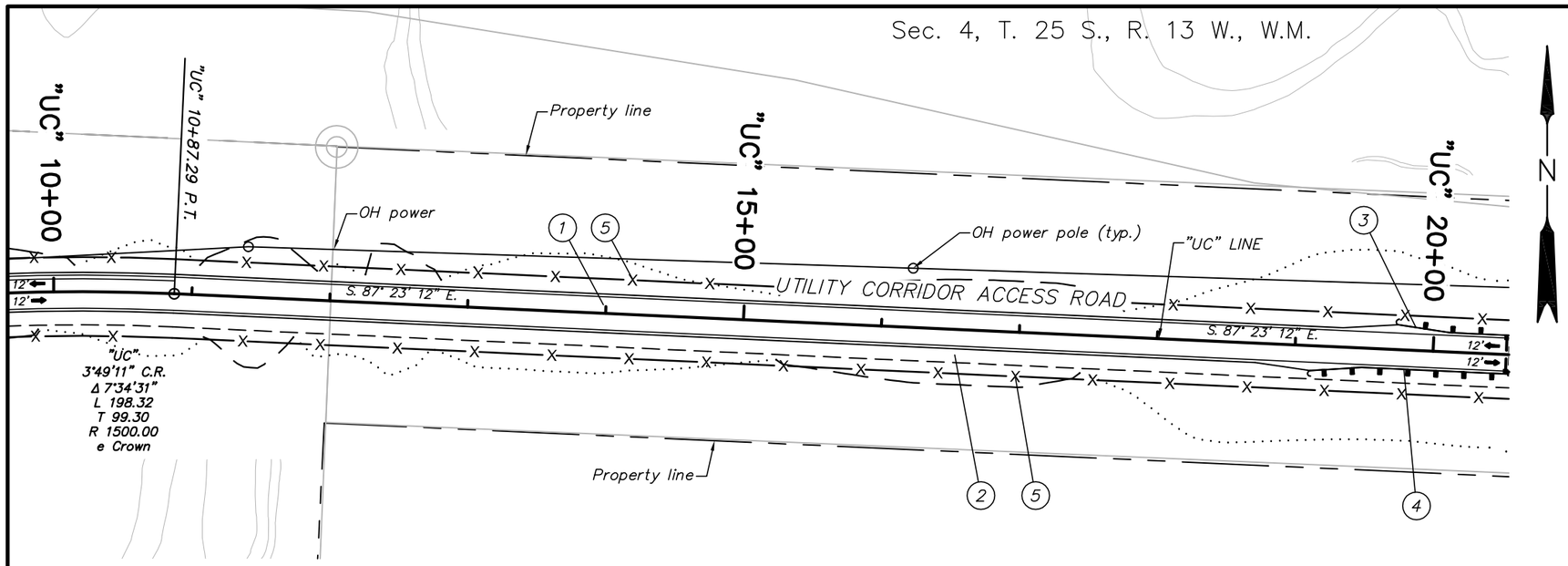

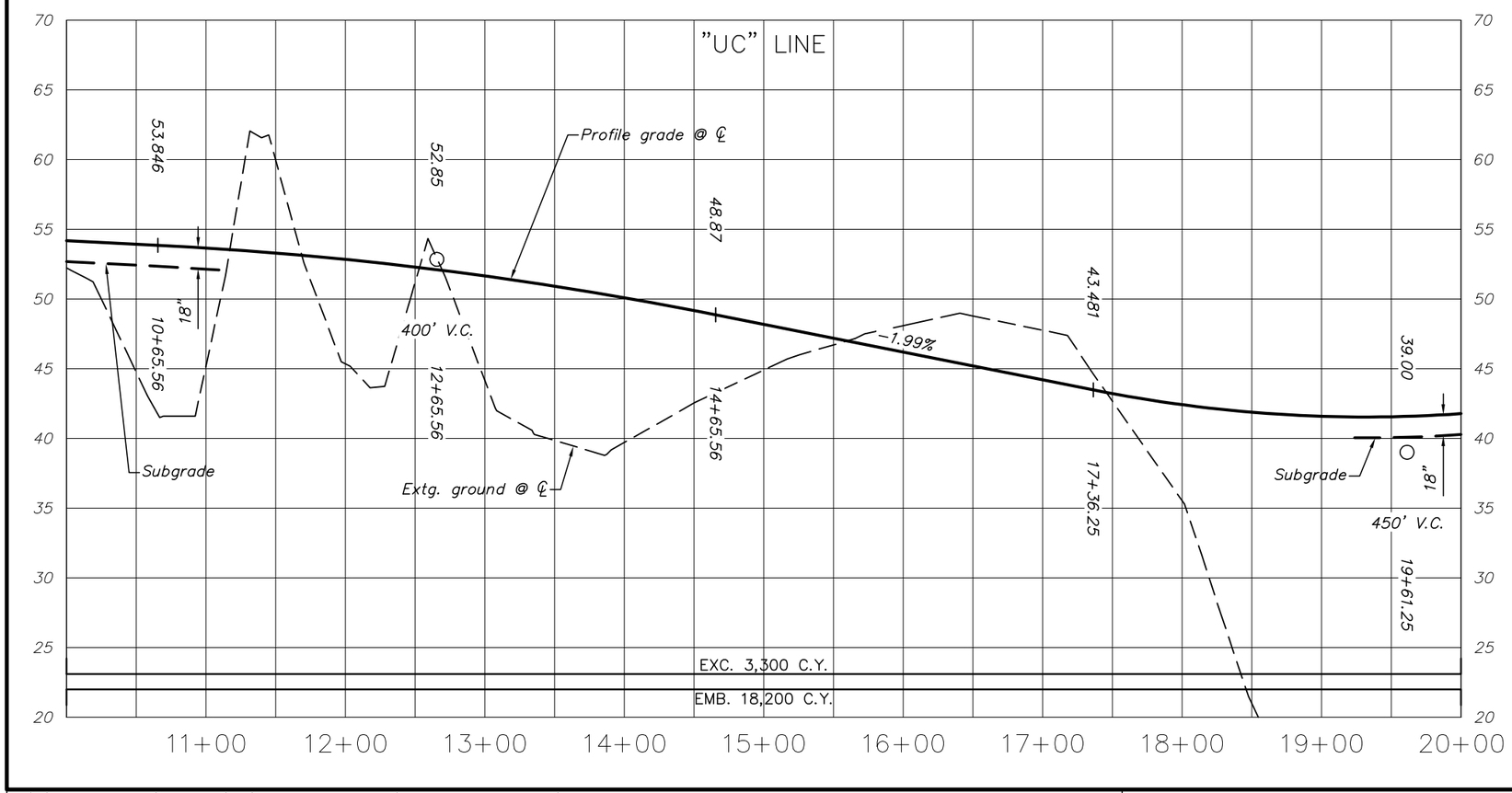

1. Const. Utility Corridor Access Road
   (For details, see sheets 2 & 2A)

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

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SHEET NO. 4

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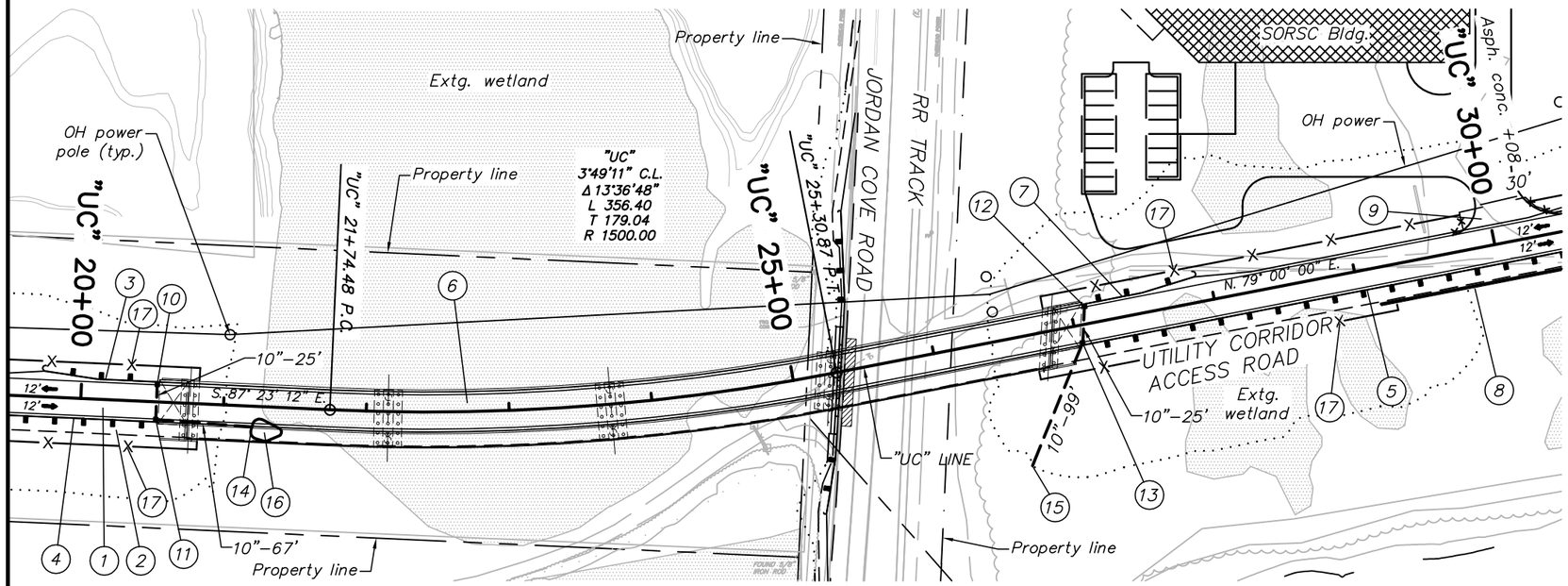

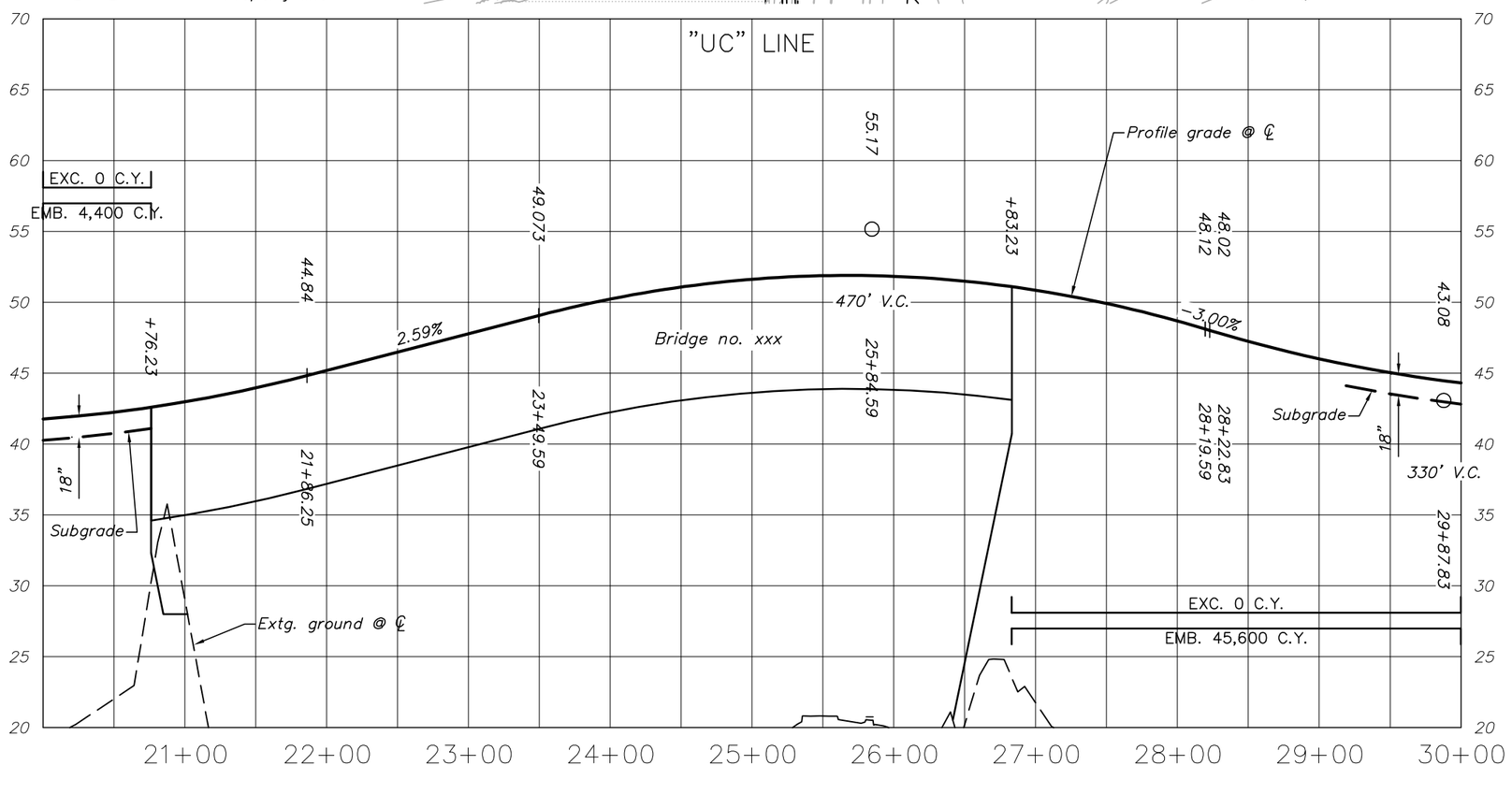

(1) Const. Utility Corridor Access Road
(For details, see sheets 2 & 2A)

(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

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Drafted By – J. DeMello

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SHEET NO. 5

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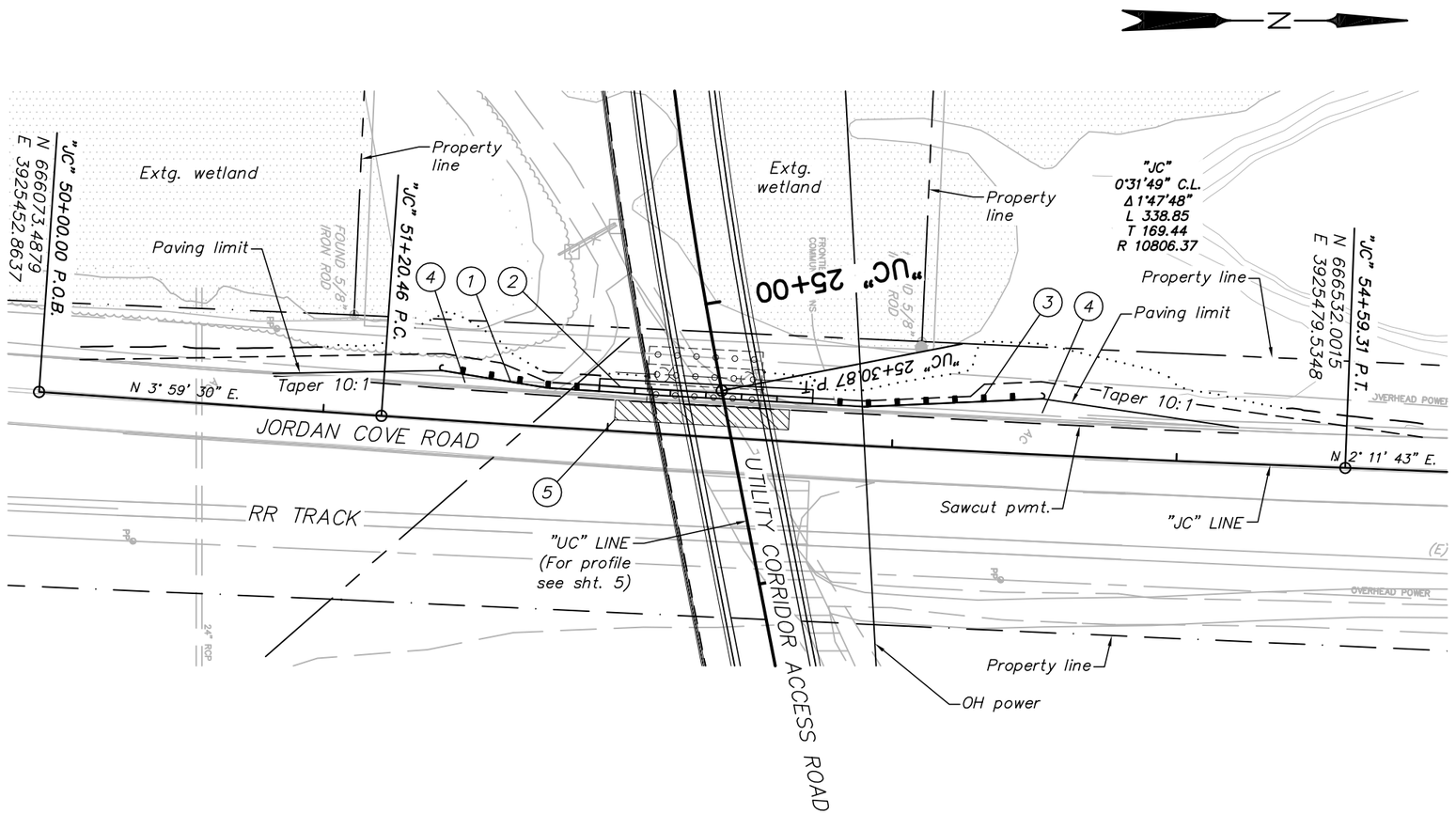

1. Sta. "JC" 51+40.65 to Sta. "JC" 51+96.20, Lt.
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. guardrail terminal, non–flared
   Test level – 2
   Const. guardrail to conc. barrier transition
   (See drg. nos. RD400, RD405, RD410, RD415, RD420, & RD530)

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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Drafted By – J. DeMello

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SHEET NO. 5A

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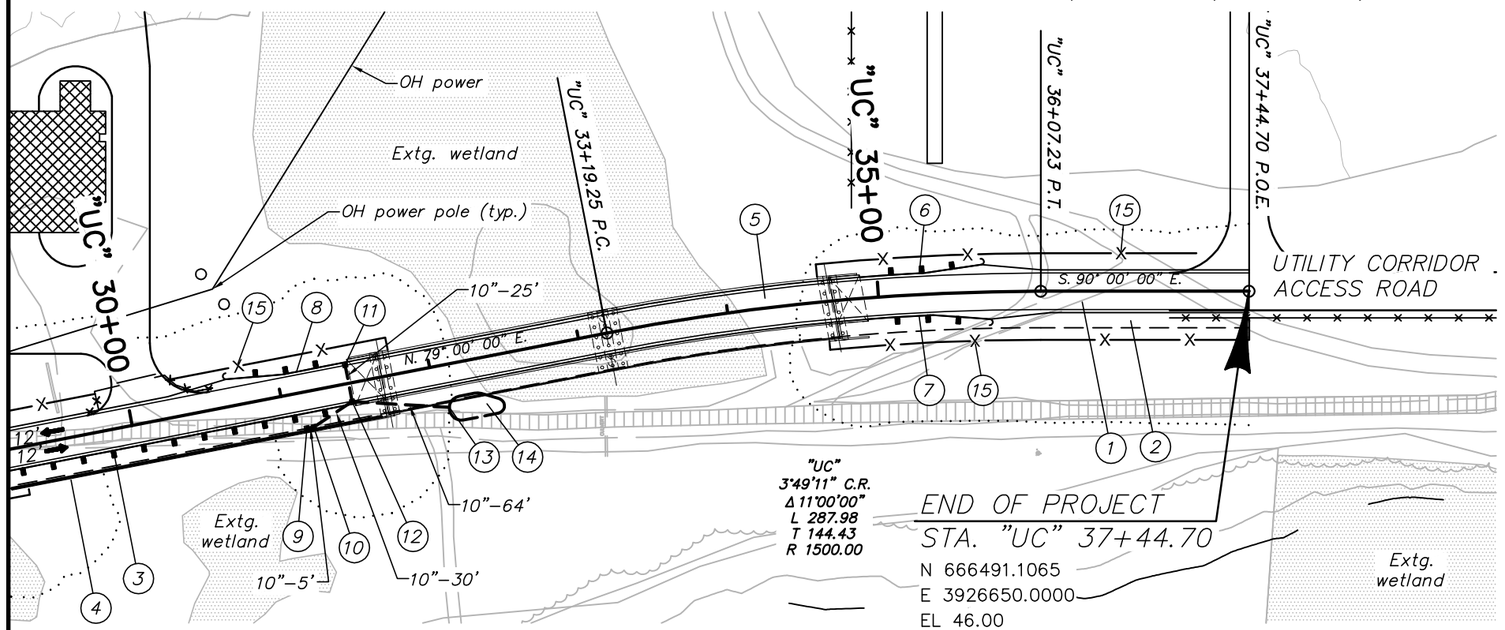

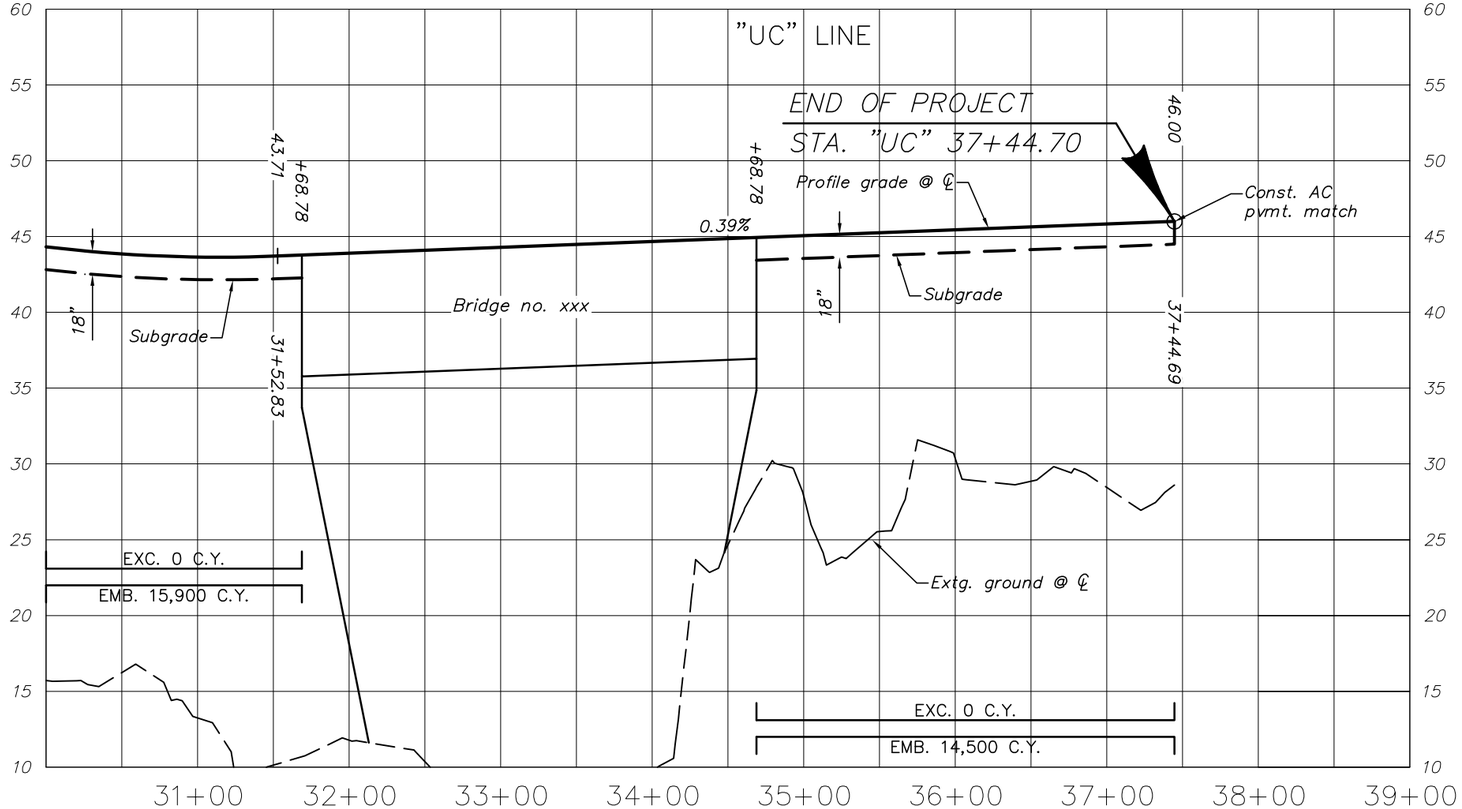

1. Const. Utility Corridor Access Road
   (For details, see sheets 2 & 2A)
2. Const. 10' Utility Corridor
   (For details, see sheets 2 & 2A)
3. See sht. 5, note 5
   Const. guardrail (Type 2A)
   Const. guardrail – 12.5' (Type 3)
   Const. guardrail transition
   Const. Type "F" bridge rail to guardrail 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

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JORDAN COVE ENERGY PROJECT
UTILITY CORRIDOR / ACCESS ROAD

COOS COUNTY

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Designed By – J. DeMello
Drafted By – J. DeMello

PLAN AND PROFILE

SHEET NO. 6

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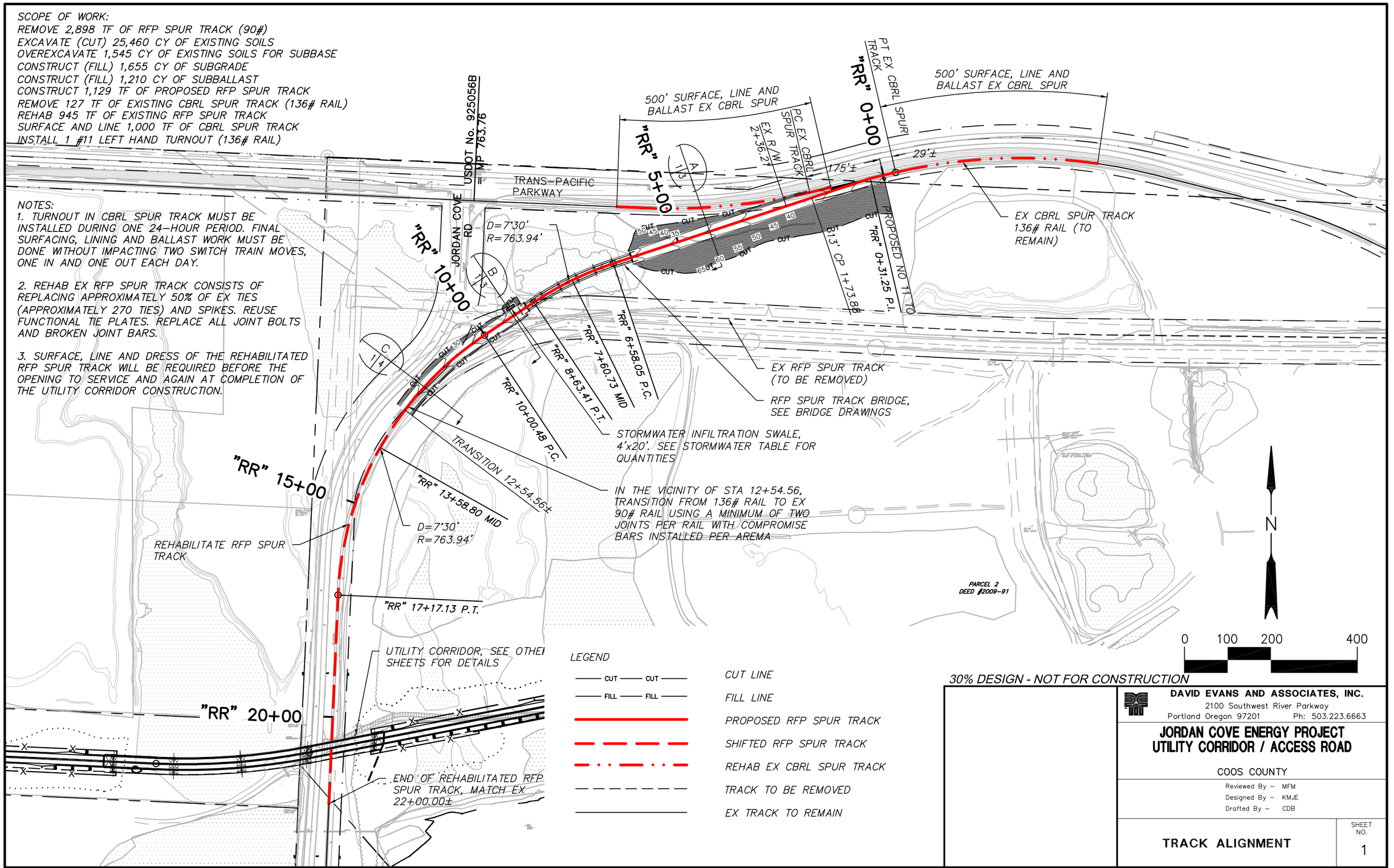
SCOPE OF WORK:
REMOVE 2,898 TF OF RFP SPUR TRACK (90#)
EXCAVATE (CUT) 25,460 CY OF EXISTING SOILS
OVEREXCAVATE 1,545 CY OF EXISTING SOILS FOR SUBBASE
CONSTRUCT (FILL) 1,655 CY OF SUBGRADE
CONSTRUCT (FILL) 1,210 CY OF SUBBALLAST
CONSTRUCT 1,129 TF OF PROPOSED RFP SPUR TRACK
REMOVE 127 TF OF EXISTING CBRL 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.



LEGEND

CUT — CUT	CUT LINE
FILL — FILL	FILL LINE
	PROPOSED RFP SPUR TRACK
	SHIFTED RFP SPUR TRACK
	REHAB EX CBRL SPUR TRACK
	TRACK TO BE REMOVED
	EX TRACK TO REMAIN

30% DESIGN - NOT FOR CONSTRUCTION

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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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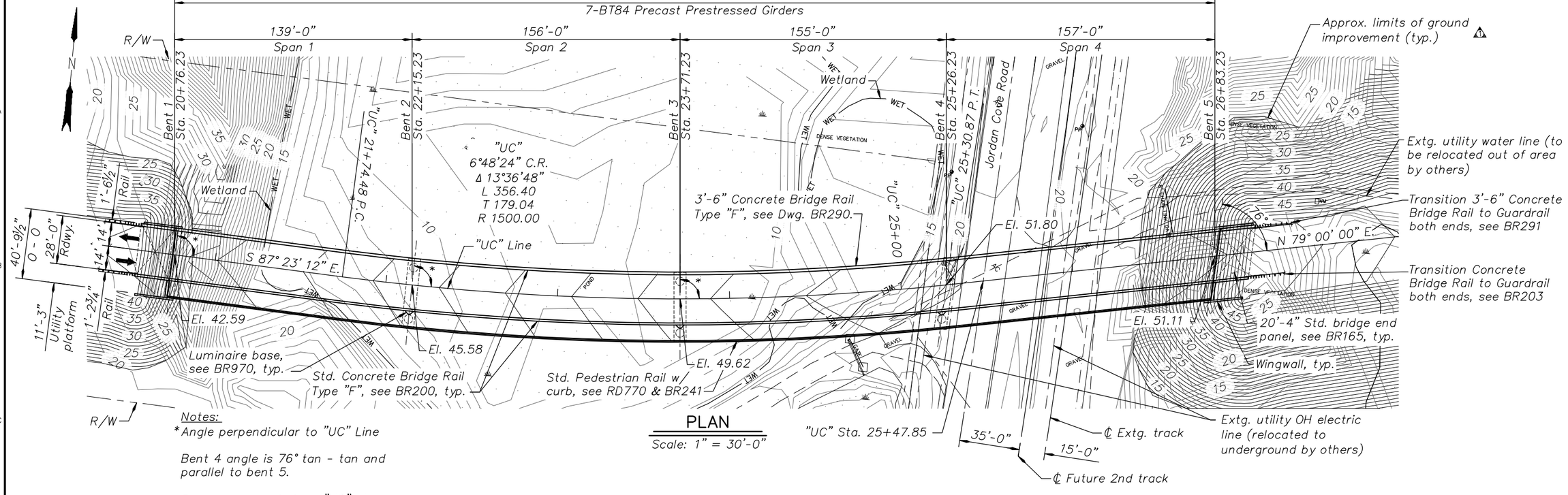
607'-0" Ctr. to ctr. end bents (measured along "UC" Line)
7-BT84 Precast Prestressed Girders

139'-0" Span 1 | 156'-0" Span 2 | 155'-0" Span 3 | 157'-0" Span 4



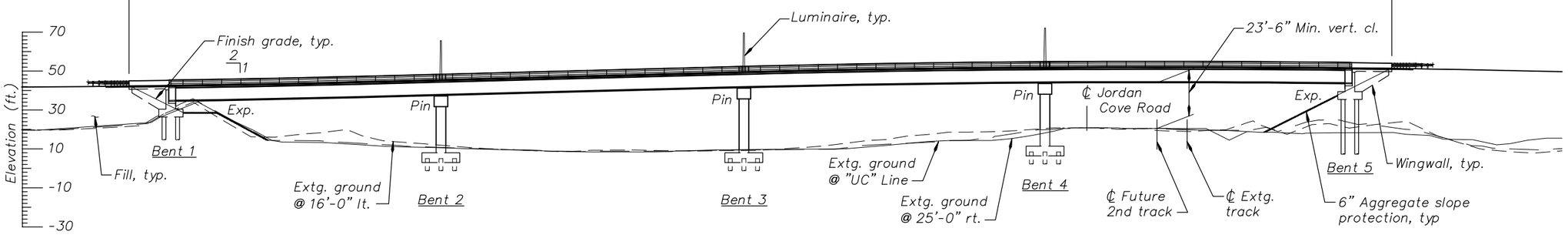
PLAN
Scale: 1" = 30'-0"

Notes:
*Angle perpendicular to "UC" Line

Bent 4 angle is 76° tan - tan and parallel to bent 5.

Spans measured along "UC" Line.

652'-5"± lt 3'-6" Concrete Bridge Rail Type 'F', see Std. Dwg. BR290
652'-10"± rt Std. Conc. Bridge Rail Type 'F', see Std. Dwg. BR200
610'-10"± rt Std. Pedestrian Handrail w/curb, see Std. Dwg. RD770 & BR241



DEVELOPED ELEVATION
Scale: 1" = 30'-0"

Notes:
Elevations are based on North American Vertical Datum 1988 (NAVD88).

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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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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR O'XING RR & JORDAN COVE RD
PLAN AND ELEVATION

PROJECT	DRAWING NUMBER	REV
142488–		–
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.

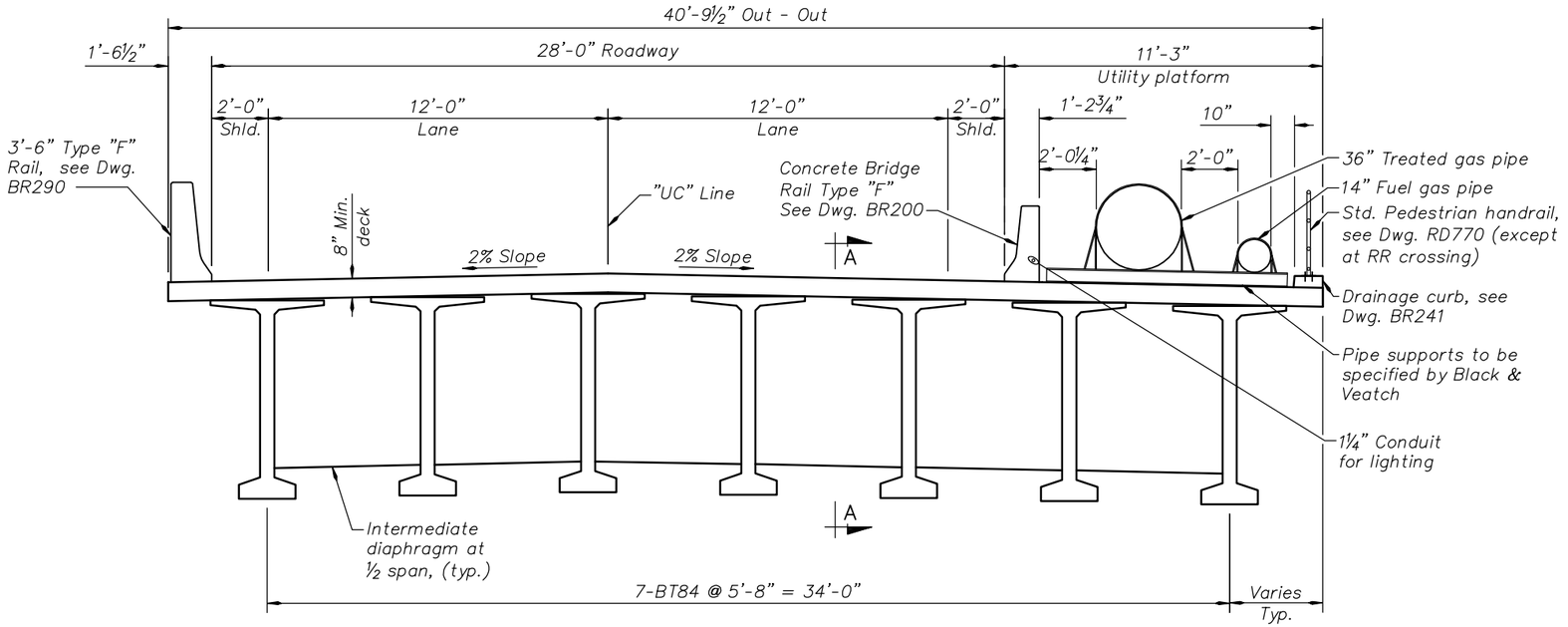
Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

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.

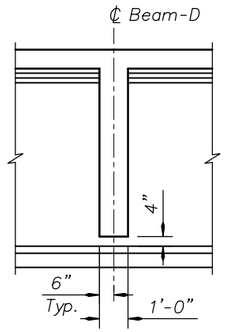
Provide Class 4000 - 1½" or 1", concrete for all footings.
Provide Class 4000 - 1½", 1", or ¾" concrete for all other concrete.

See Foundation Plan for foundation design notes.



TYPICAL DECK SECTION

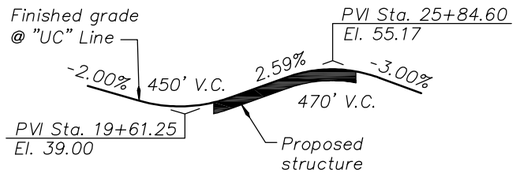
Scale: 3/8" = 1'-0"



Description	Reinforcing (lbs/CY)
Deck	225
Beam-D	200

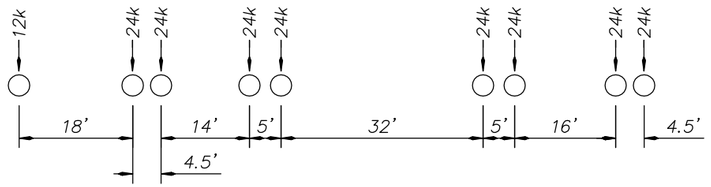
(BEAM-D) SECTION A-A

Scale: 3/8" = 1'-0"



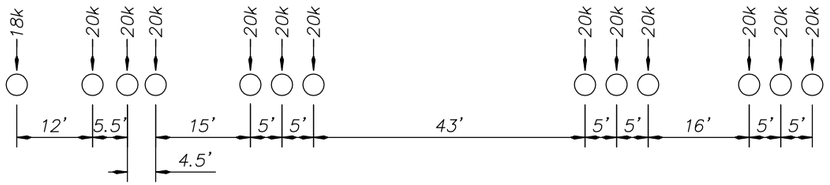
GRADELINE DIAGRAM

No Scale



OR-STP-5BW PERMIT TRUCK DIAGRAM

No Scale



OR-STP-4E PERMIT TRUCK 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	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B102	

ALAN MITCHELL ACAD G.204.0, SP2
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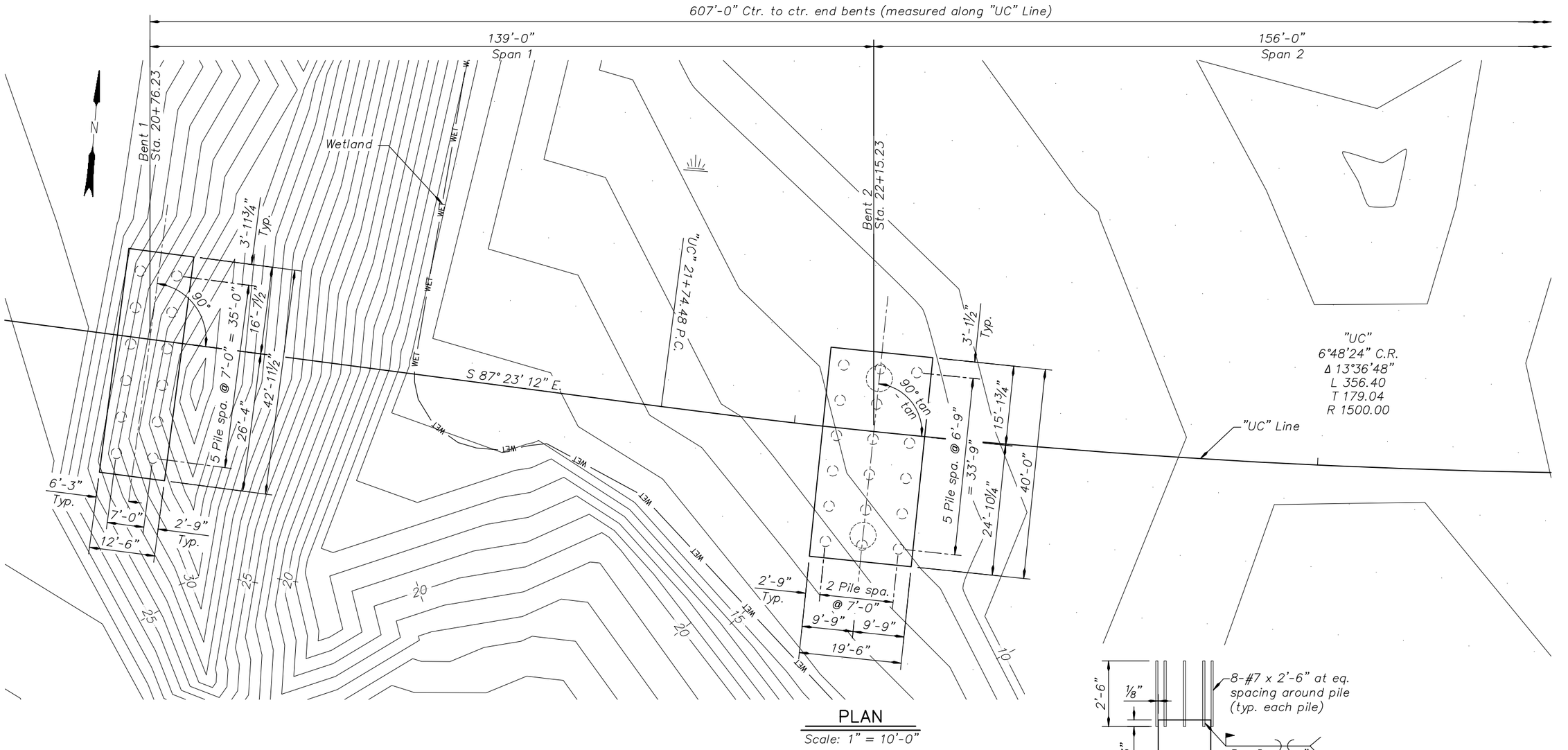
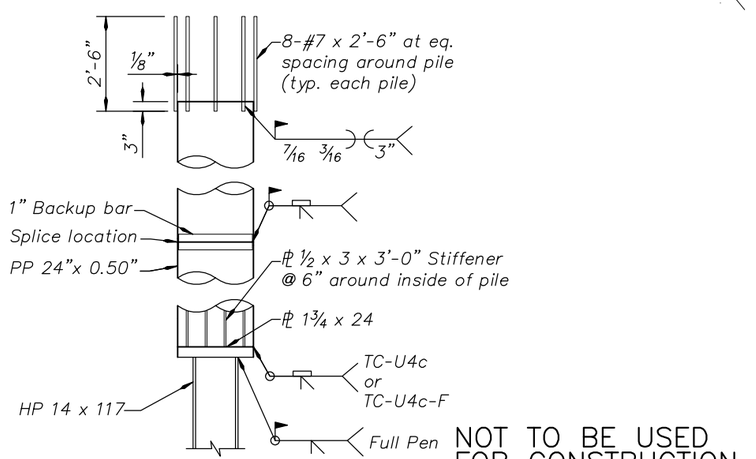


PLAN

Scale: 1" = 10'-0"



PILE DETAIL

No Scale

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. (Feet)	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	-

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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR O'XING RR & JORDAN COVE RD
FOUNDATION PLAN (1 OF 3)

PROJECT 142488– | DRAWING NUMBER B103 | REV –

CODE | AREA

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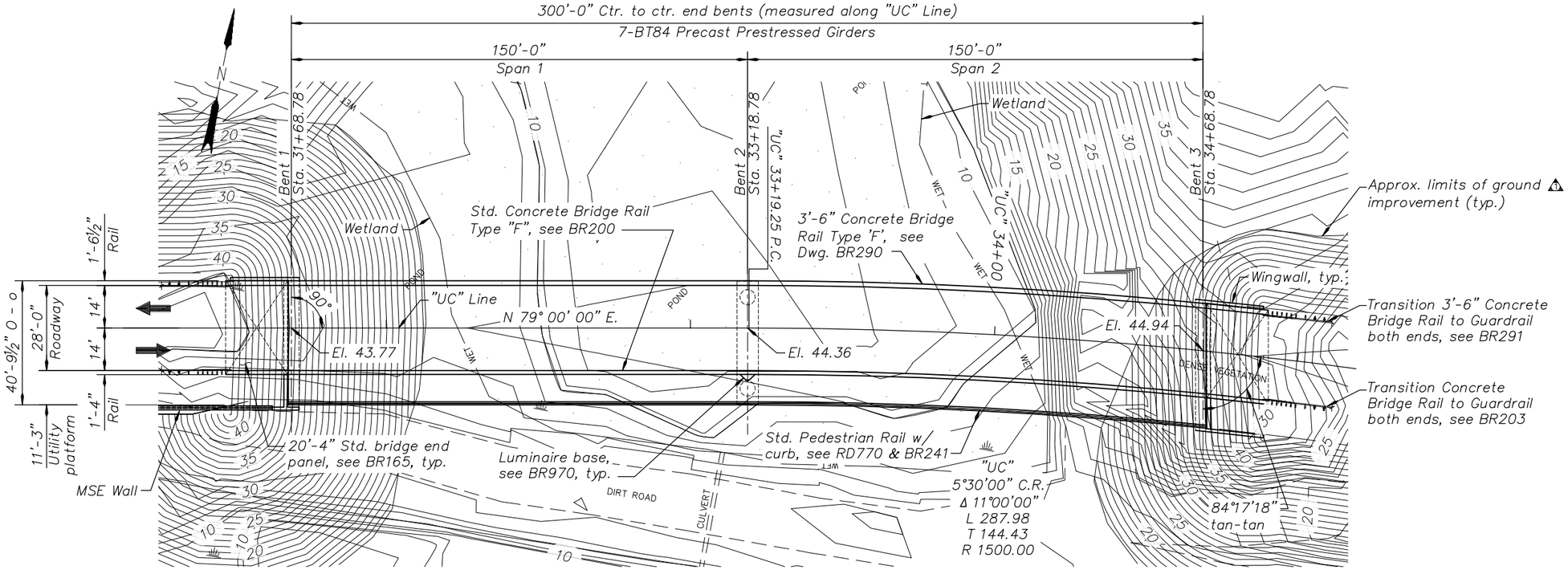
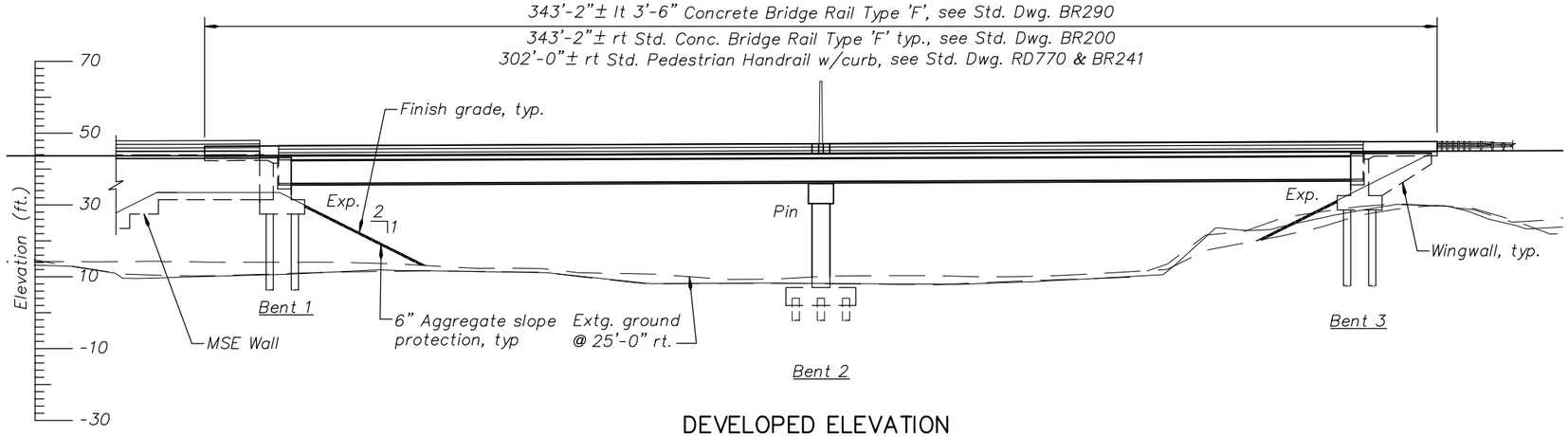


PLAN

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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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.
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UTILITY CORRIDOR OVER WETLAND
PLAN AND ELEVATION

PROJECT 142488– | DRAWING NUMBER B201 | REV –

CODE | AREA

ALAN MITCHELL ACAD G.204.0, SP2
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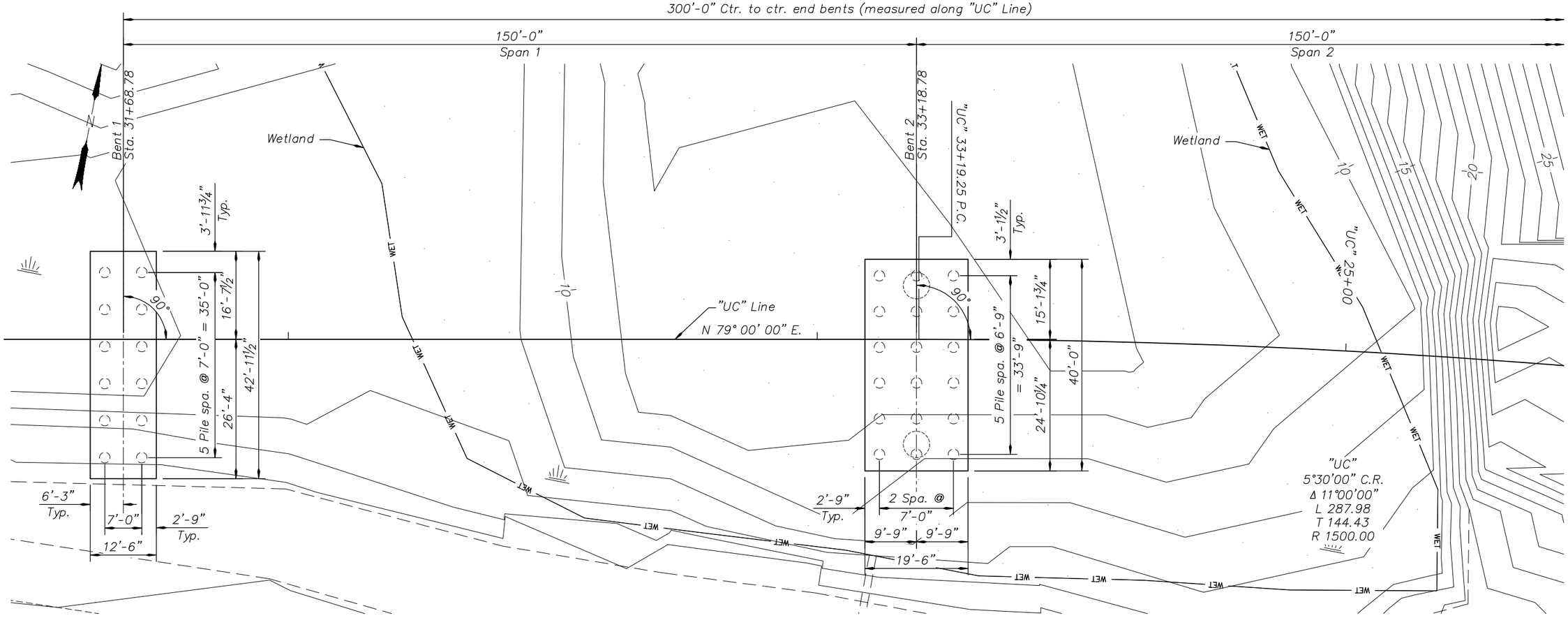


PLAN

Scale: 1" = 10'-0"

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	-

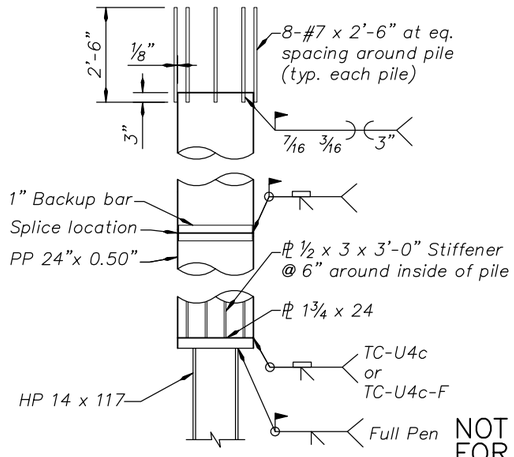
FOUNDATION DESIGN NOTES:

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.



PILE DETAIL

No Scale

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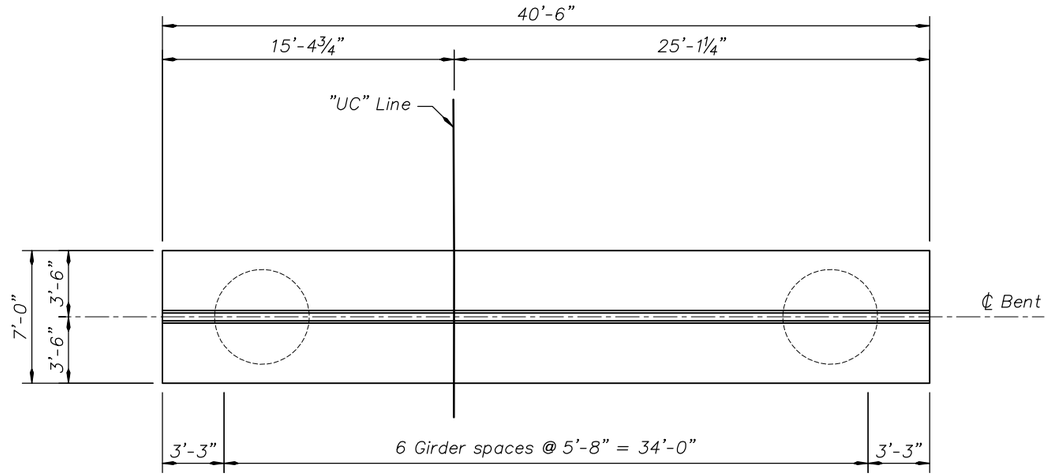
CHECKED	–	DATE	mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

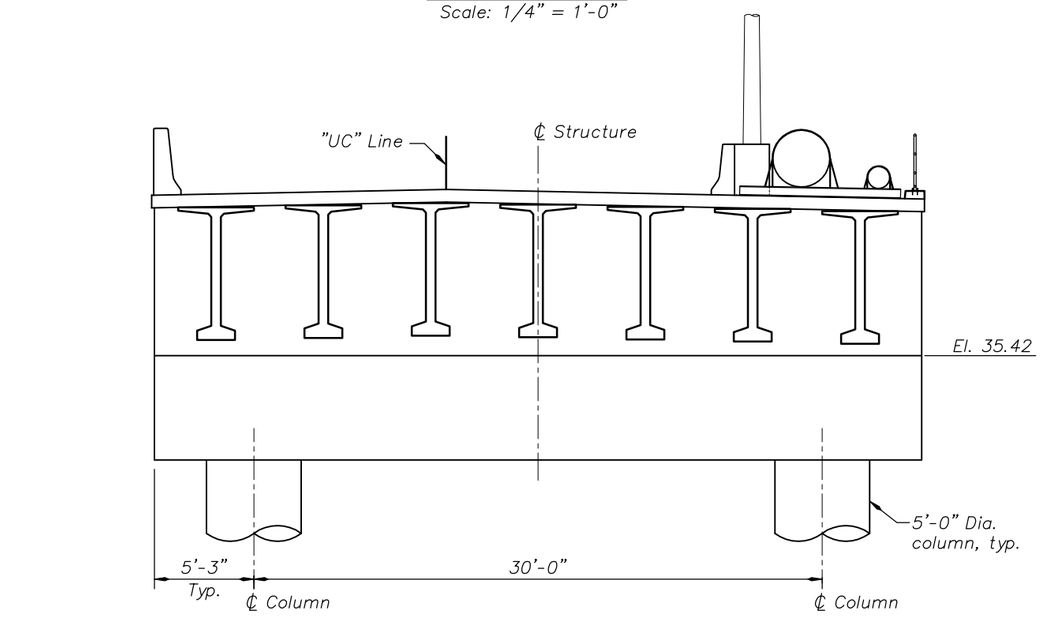
UTILITY CORRIDOR OVER WETLAND
FOUNDATION PLAN (1 OF 2)

PROJECT	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B203	



BENT 2 - PLAN

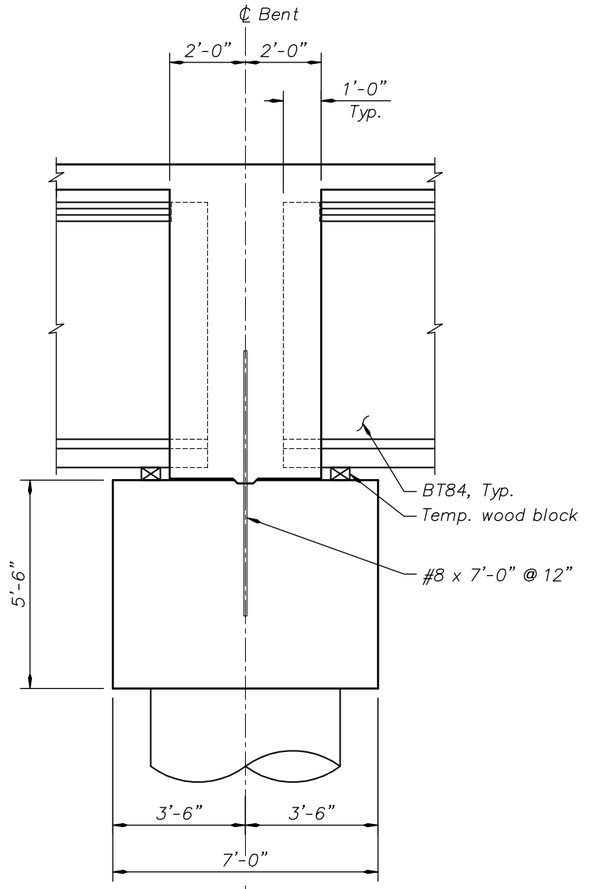
Scale: 1/4" = 1'-0"

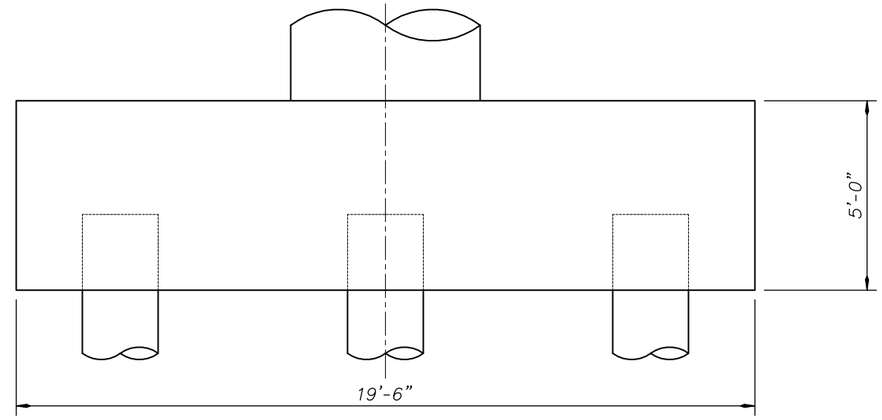


BENT 2 - ELEVATION

Scale: 1/4" = 1'-0"

Description	Reinforcing (lbs/CY)
Diaphragm	150
Cross Beam	325
Column	425 ⚠1
Pile cap	200





BENT 2 - SECTION

Scale: 1/2" = 1'-0"

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⚠1	07/23/2014	MODIFIED NOTE	ACM	DMJ			BSN

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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

UTILITY CORRIDOR OVER WETLAND
INTERIOR BENT PLAN AND ELEVATION

PROJECT	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B206	

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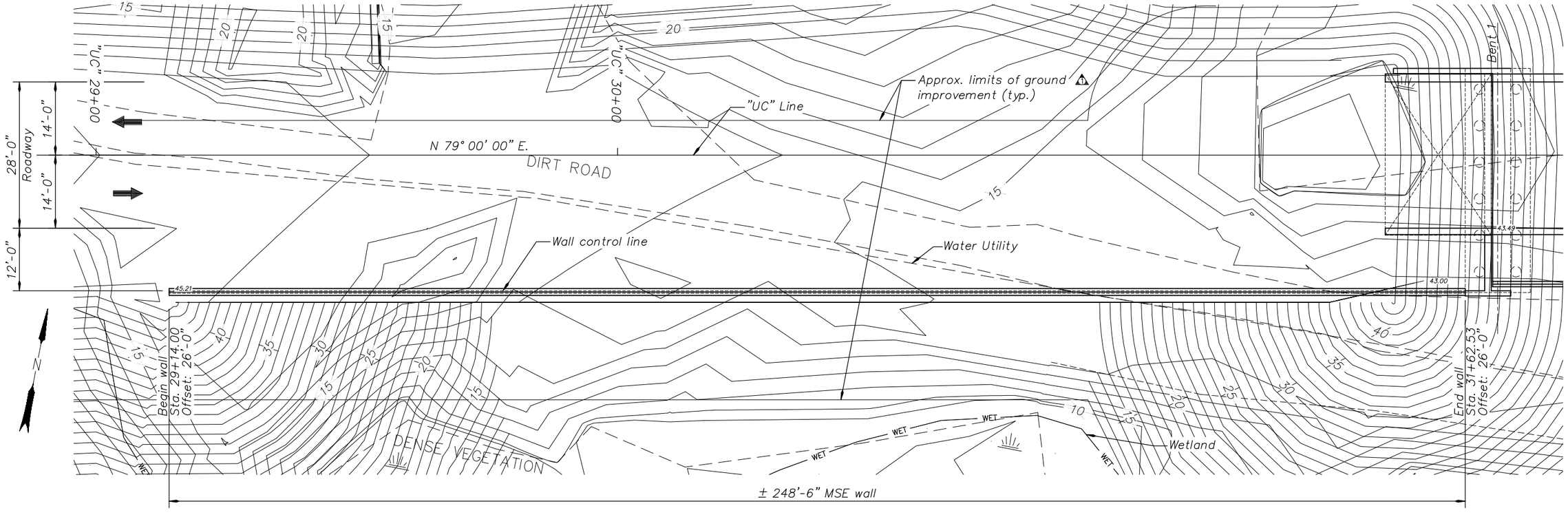
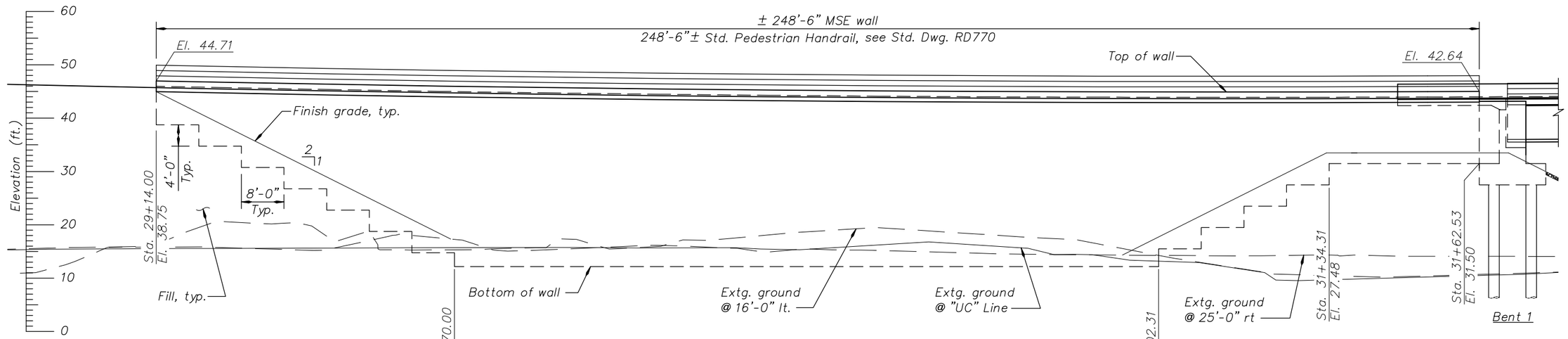


WALL - PLAN

Scale: 1" = 10'-0"



Notes:
Elevations are based on North American Vertical Datum 1988 (NAVD88).

WALL - ELEVATION

Scale: 1" = 10'-0"

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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	DRAWING NUMBER	REV
142488–		–
CODE	AREA	B301

ALAN MITCHELL ACAD G.204.0, SP2
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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).*

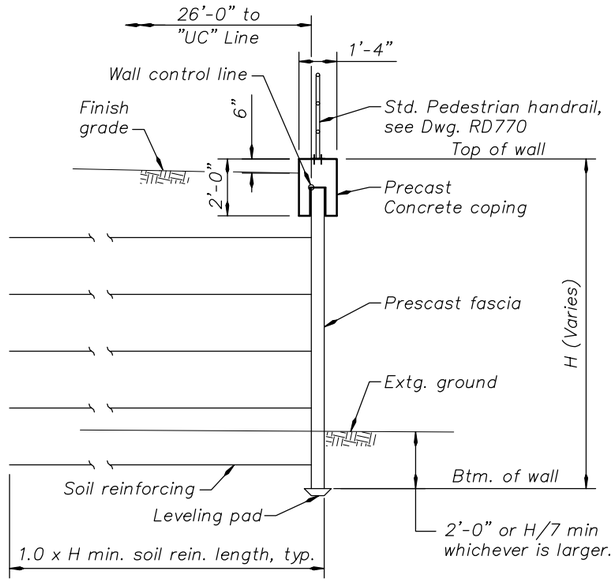
Unless otherwise noted, MSE wall analysis and design shall assume the following geotechnical properties for the reinforced MSE wall backfill:
- *Friction angle of backfill: $\varphi = 34°$*
- *Backfill cohesion: c = 0 psf*
- *Wet unit weight of backfill: wet = 130.0 pcf*
- *Active lateral earth pressure 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.

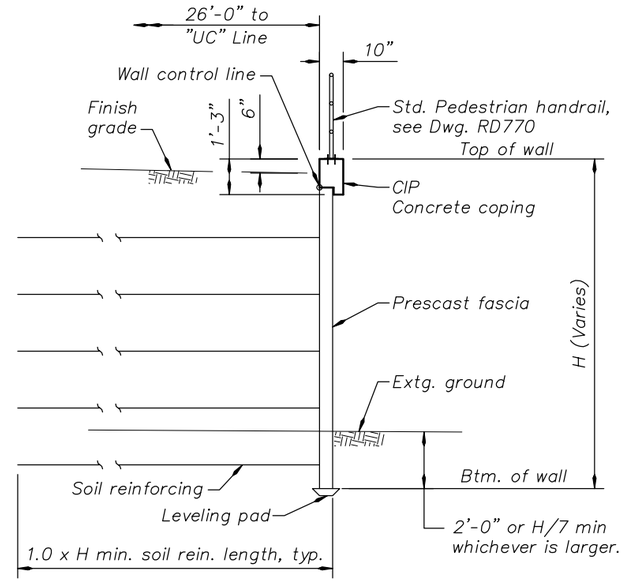
Design for tsunami loading was not considered.

Provide a ¾" chamfer on all exposed concrete edges unless noted otherwise.

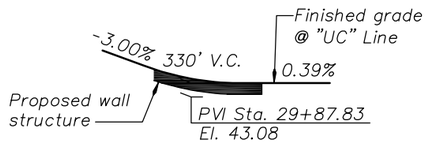
Provide Class 4000 - 1½", 1", or ¾" concrete for Cast-in-place coping.



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

NOT TO BE USED
FOR CONSTRUCTION
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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
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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	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B302	

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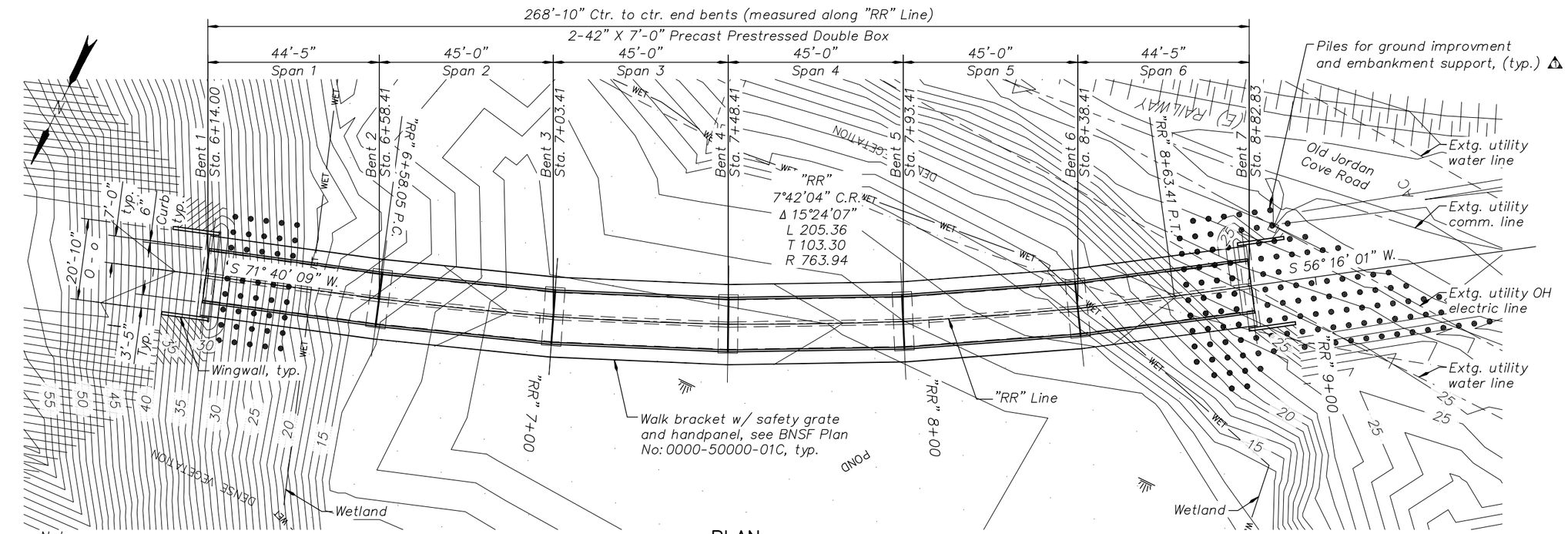
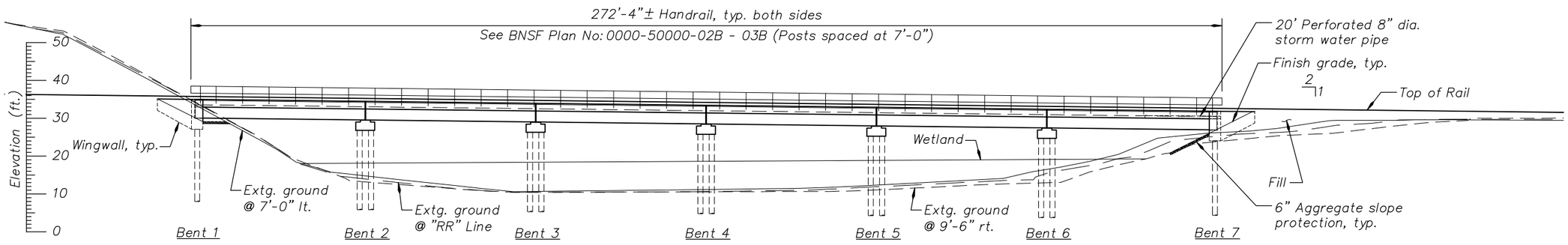


Note:
All Bents are perpendicular to "RR" line.

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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BLACK & VEATCH CORPORATION

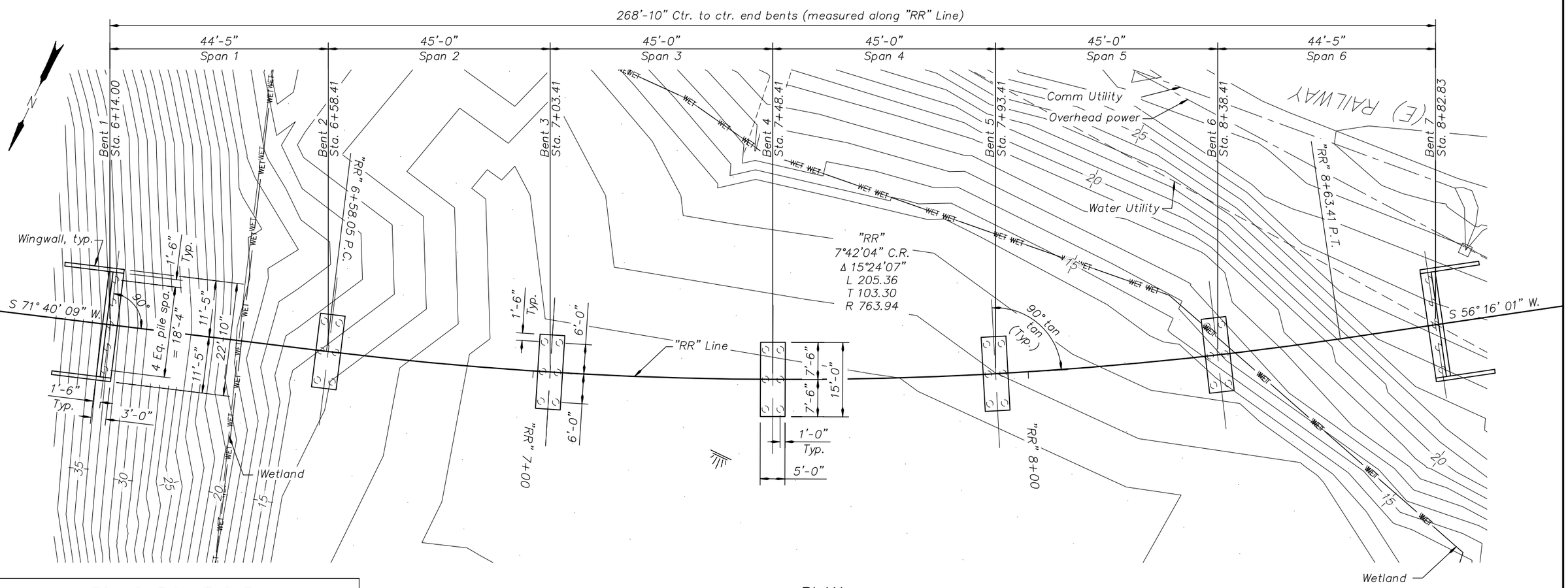
ENGINEER	–	DRAWN	ACM
CHECKED	–	DATE	mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

RAIL SPUR
PLAN AND ELEVATION

PROJECT	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B401	

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM



PLAN

Scale: 1" = 10'-0"

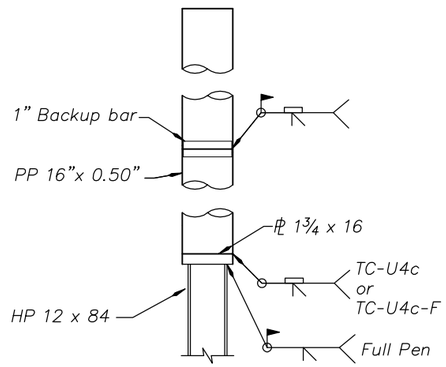
FOUNDATION TABLE			
Location	Type	Est. tip El. (Feet)	Cut-off / top El (Feet)
Bent 1	PP 16" x 0.5"	10.00	27.95
	HP12 x 84	-15.00	-
Bent 2	PP 16" x 0.5"	-20.00	26.79
	HP12 x 84	-45.00	-
Bent 3	PP 16" x 0.5"	-20.00	26.27
	HP12 x 84	-45.00	-
Bent 4	PP 16" x 0.5"	-20.00	25.75
	HP12 x 84	-45.00	-
Bent 5	PP 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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A1ASL015 D1 1=1
6/11/2014 10:42 AM

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
–	–	–	–	–	–	–	–

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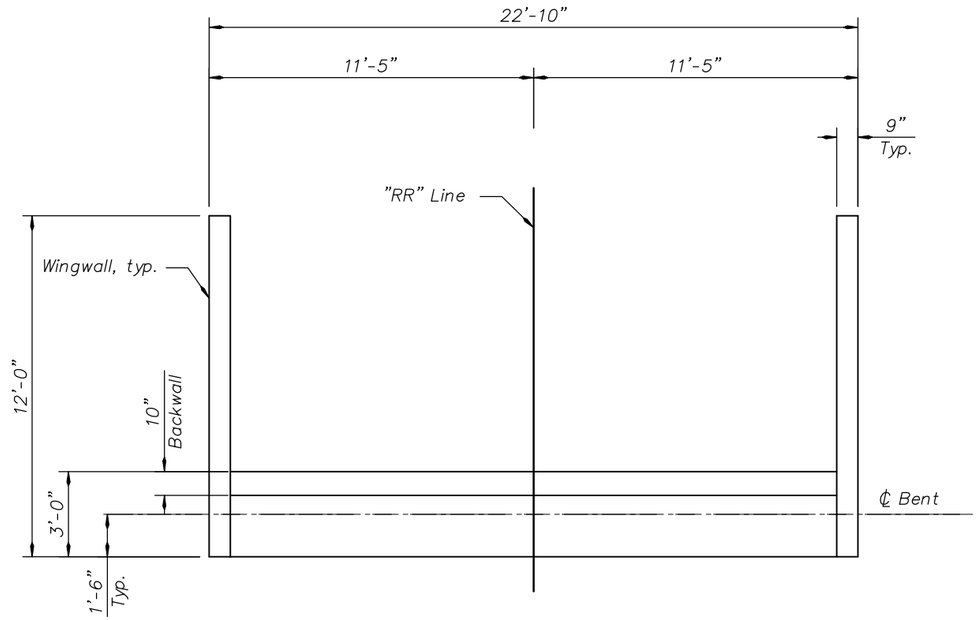
CHECKED	–	DATE	mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

RAIL SPUR
FOUNDATION PLAN

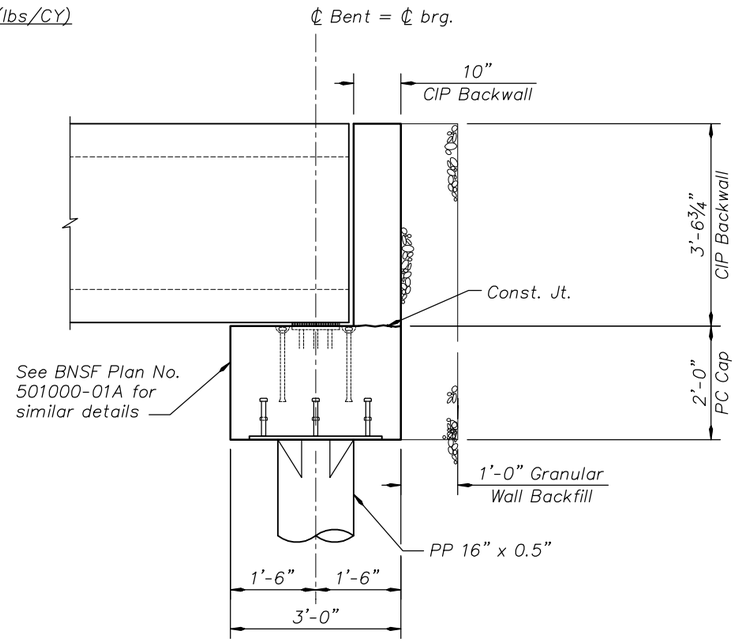
PROJECT	DRAWING NUMBER	REV
142488–		–
CODE	B403	
AREA		



BENT 7 - PLAN

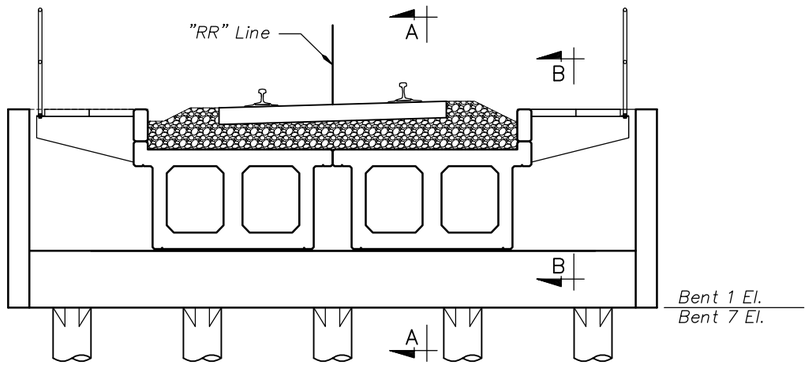
Scale: 3/8" = 1'-0"

Description	Reinforcing (lbs/CY)
Bent	200
Wing Wall	150



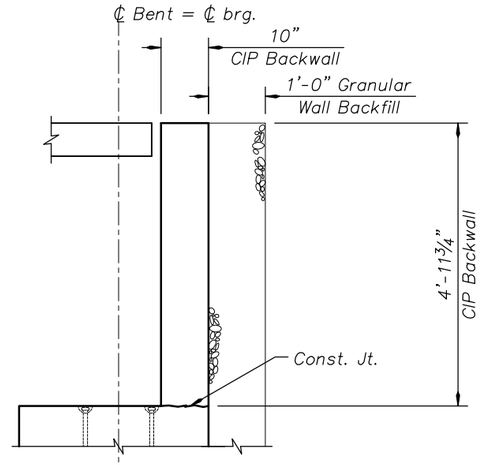
SECTION A-A

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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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
–	–	–	–	–	–	–	–

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BLACK & VEATCH CORPORATION

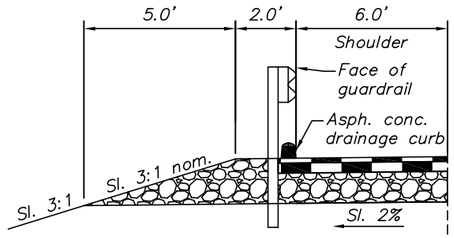
ENGINEER	DS	DRAWN	ACM
CHECKED	–	DATE	mm-dd-yy

JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

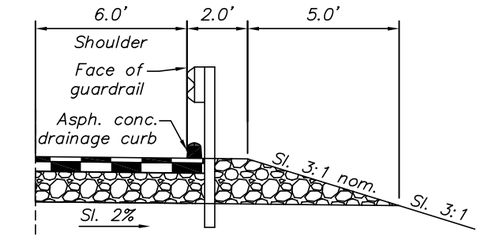
RAIL SPUR
BENT 7 PLAN AND ELEVATION

PROJECT	DRAWING NUMBER	REV
142488–		–
CODE		B404
AREA		

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
6/11/2014 10:42 AM



STA. "TPP" 11+44.84 To STA. "TPP" 12+12.38



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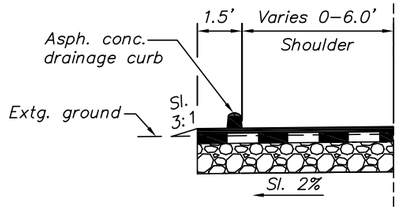
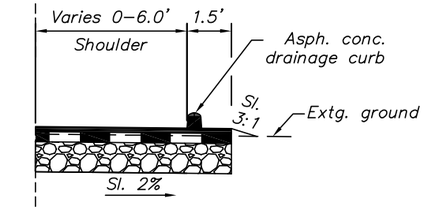
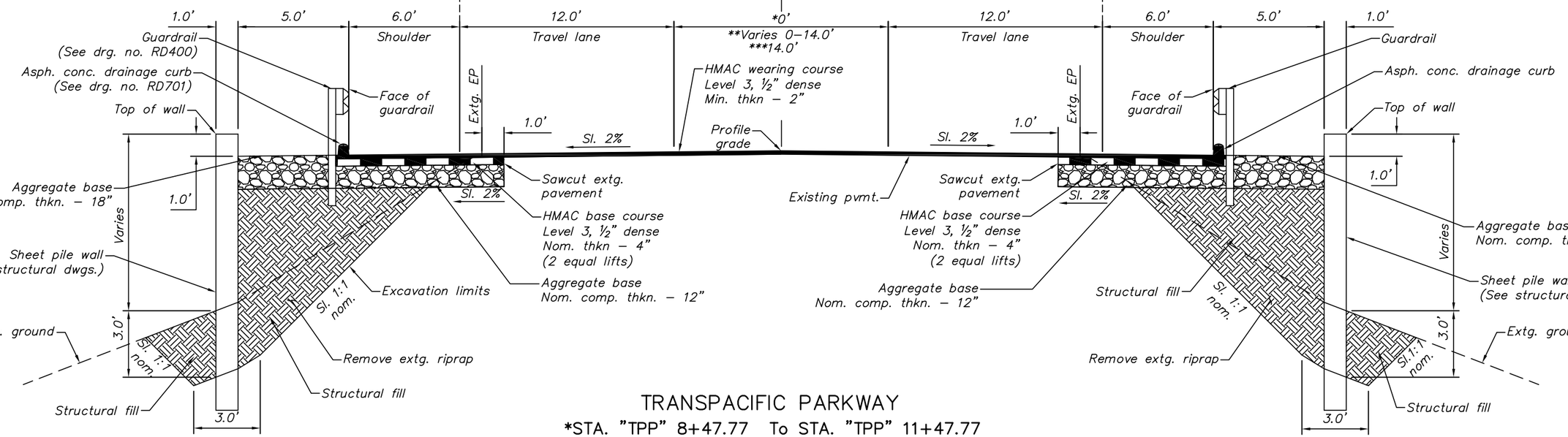


STA. "TPP" 8+47.77 To STA. "TPP" 11+44.84



STA. "TPP" 8+47.77 To STA. "TPP" 11+42.65



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

–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

TYPICAL SECTION

SHEET NO. 2

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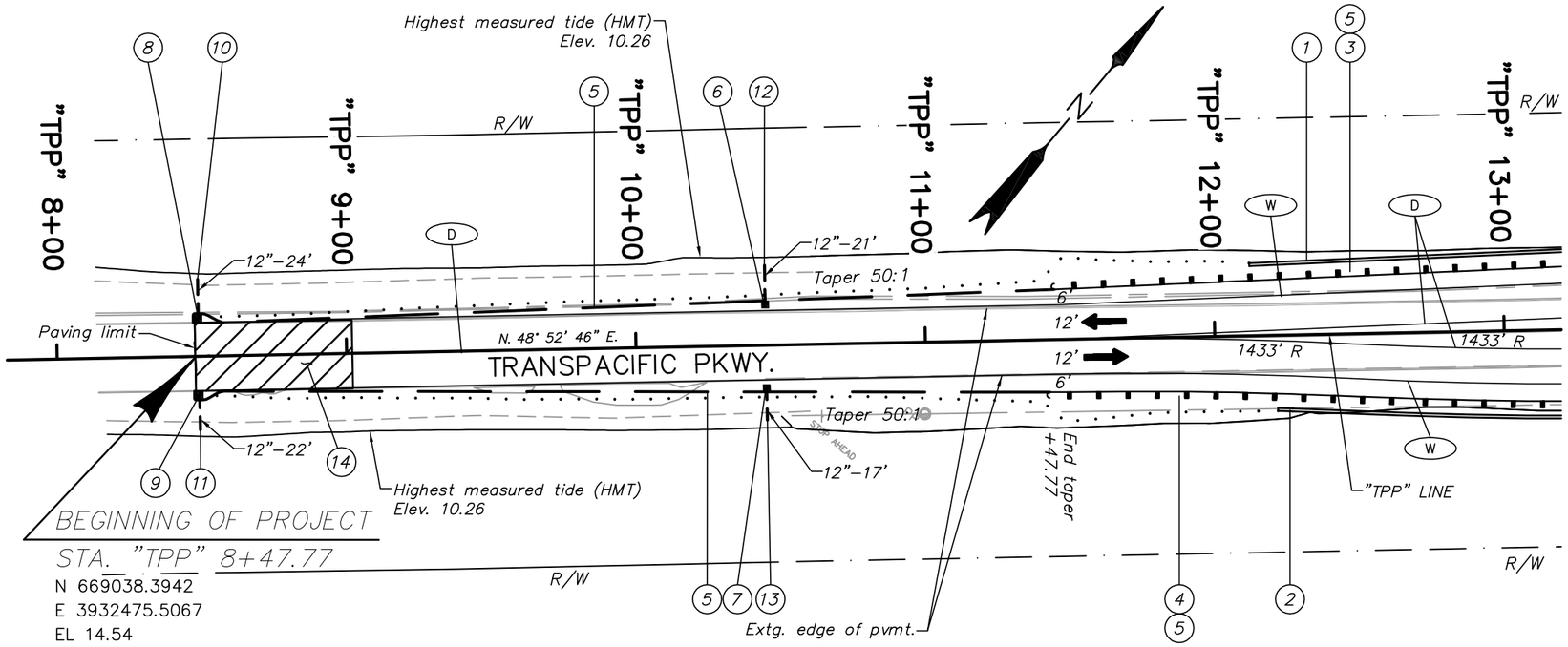
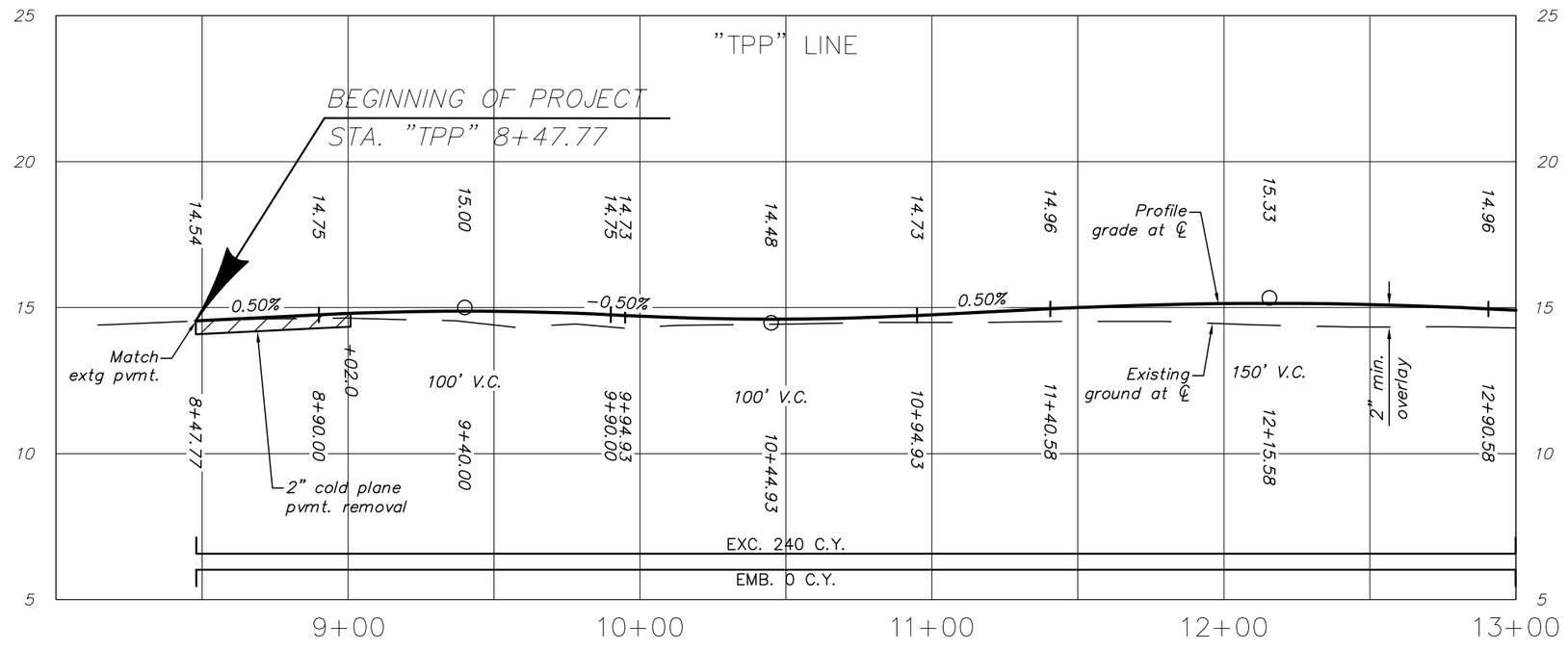
Sec. 34, T. 24 S., R. 13 W., W.M.





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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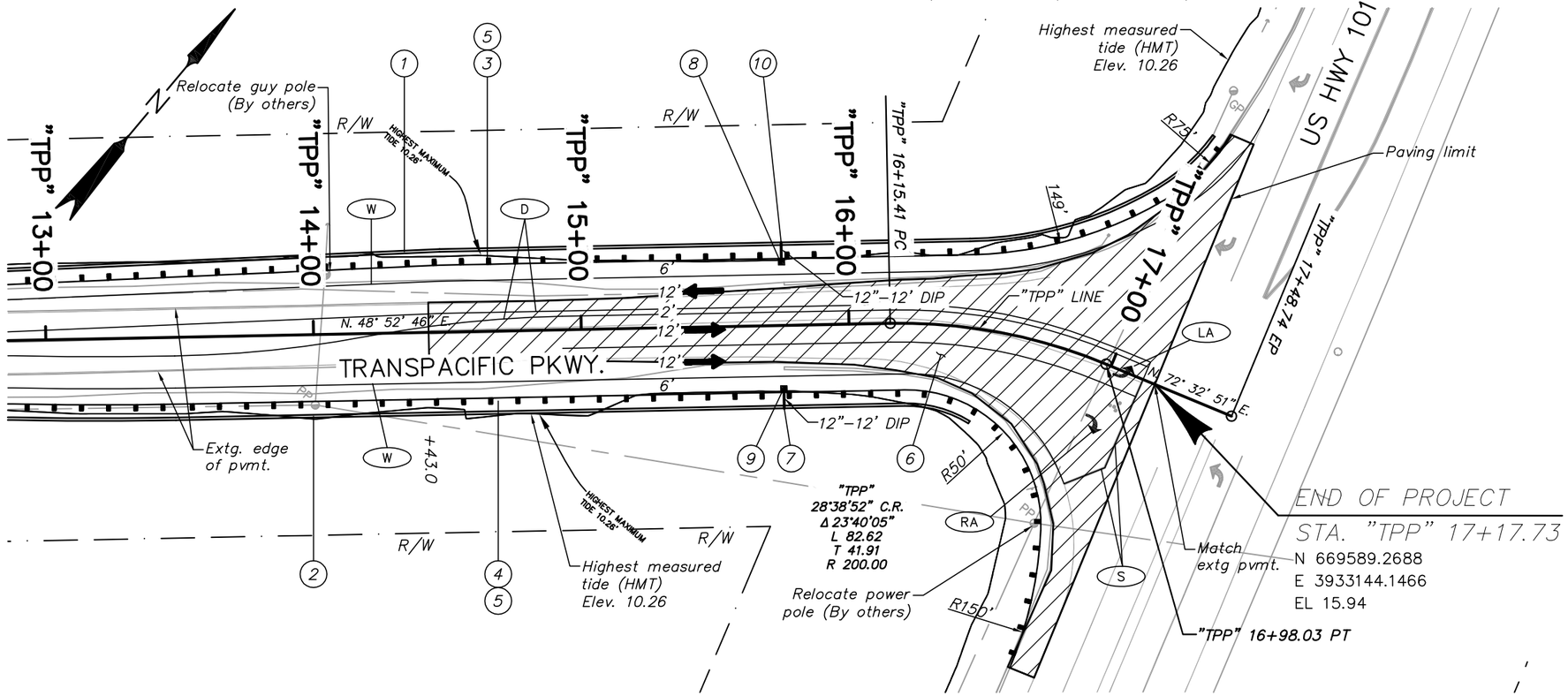
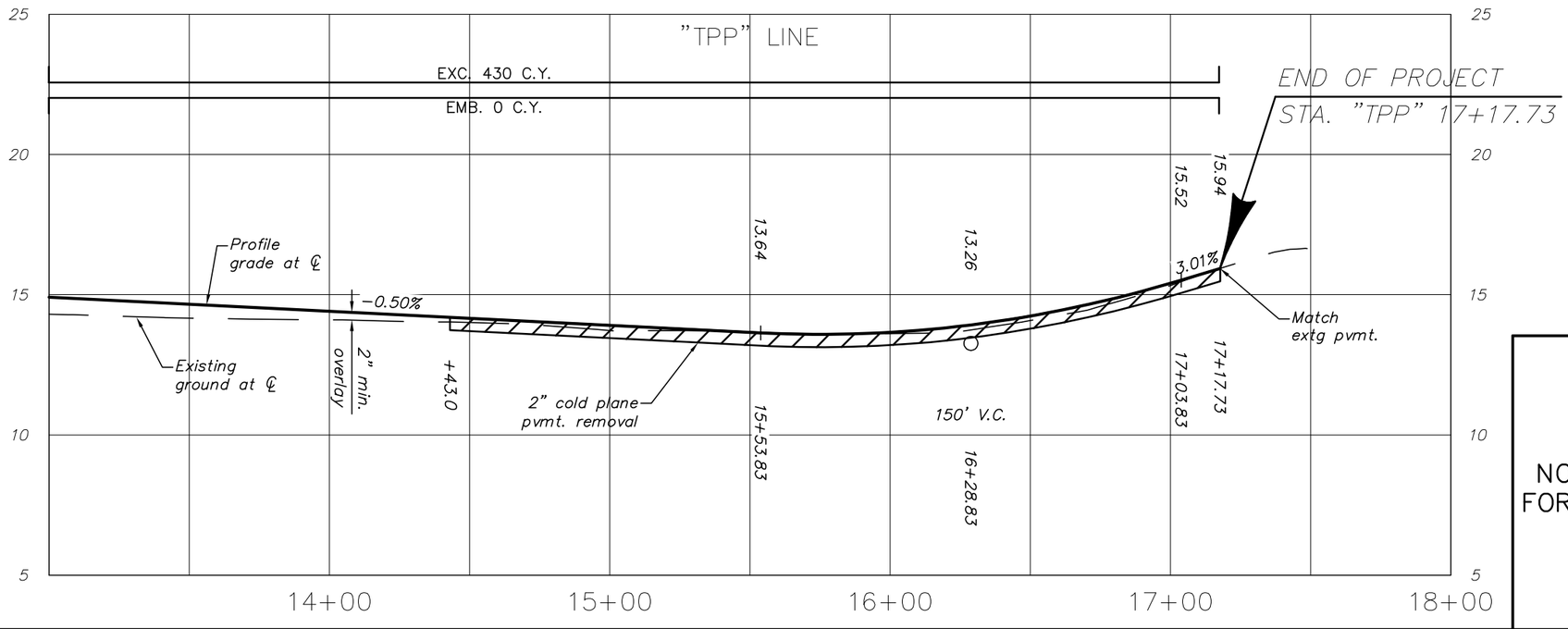
Sec. 34, T. 24 S., R. 13 W., W.M.





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)

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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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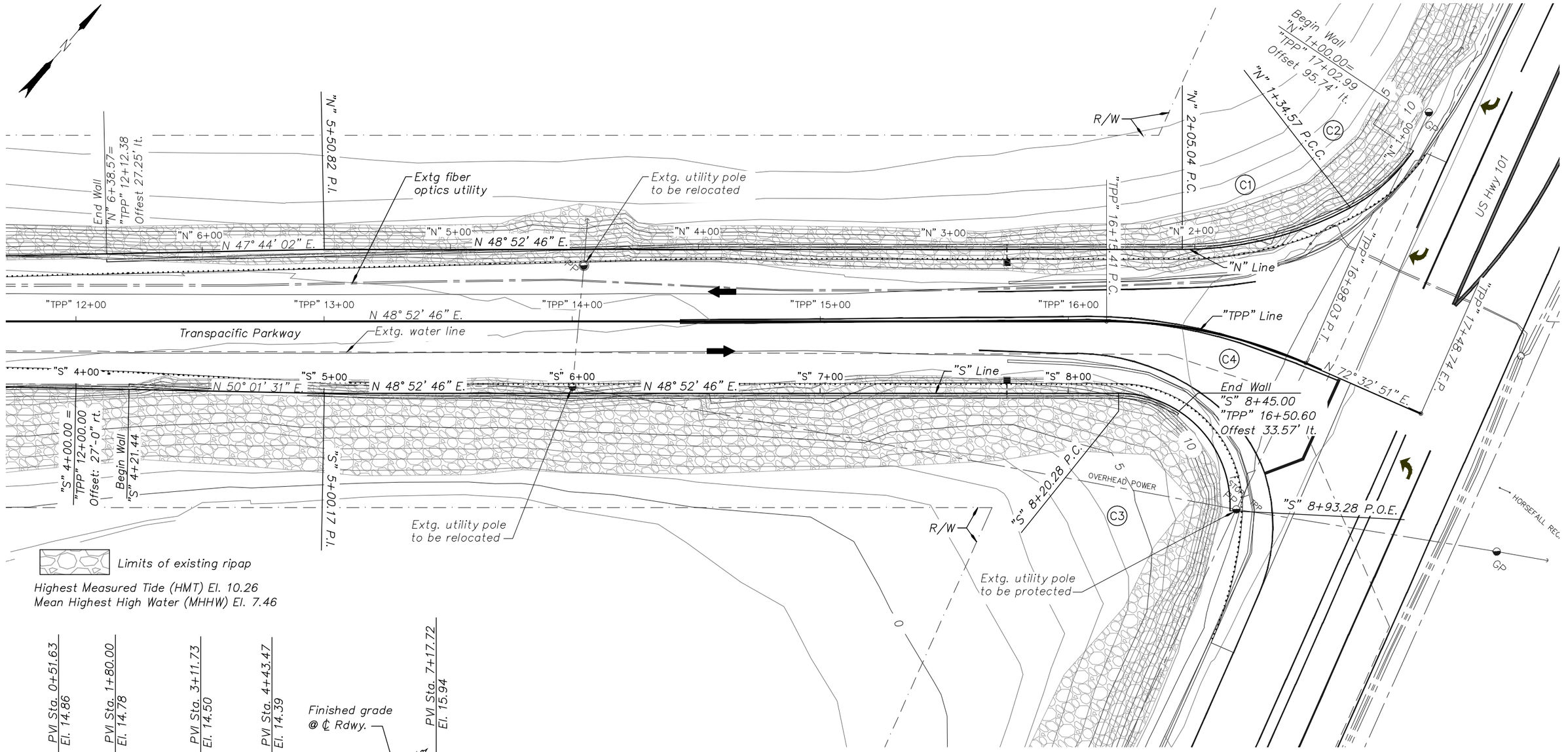


PLAN

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

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.

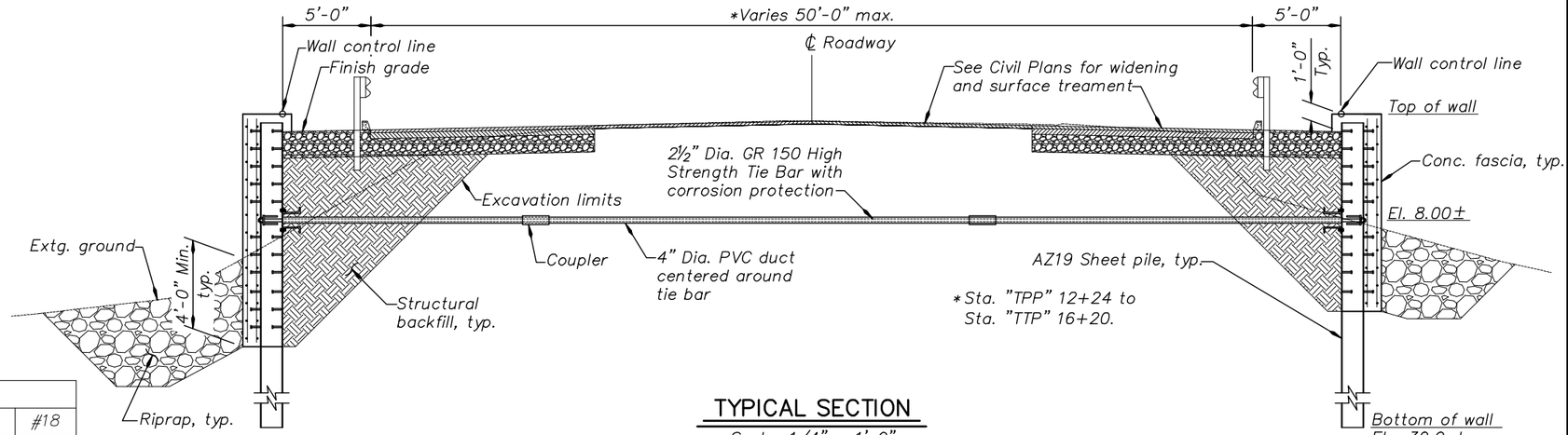
Tie back tendons to be High Strength GR150 ksi threaded bar with corrosion protection system.

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.

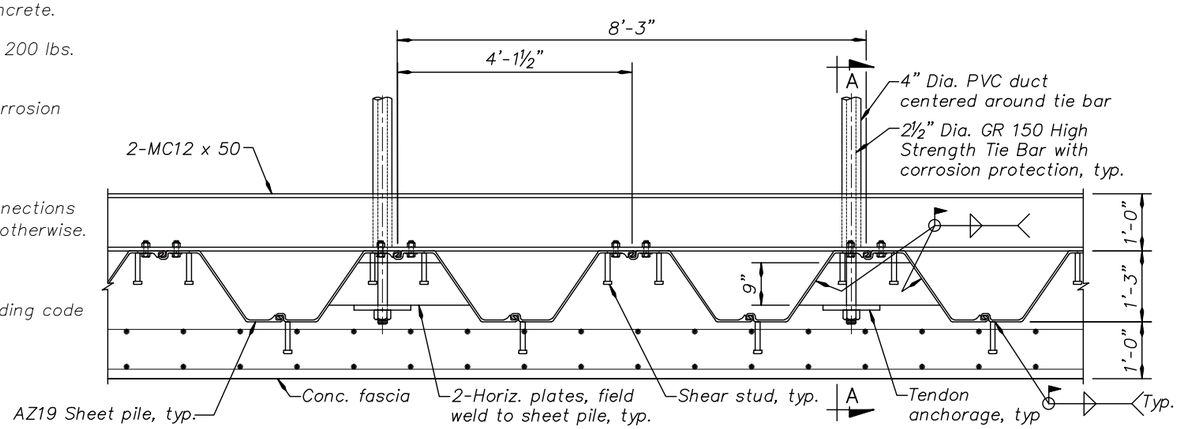
Shear connectors shall be ASTM A108 headed concrete anchor studs.

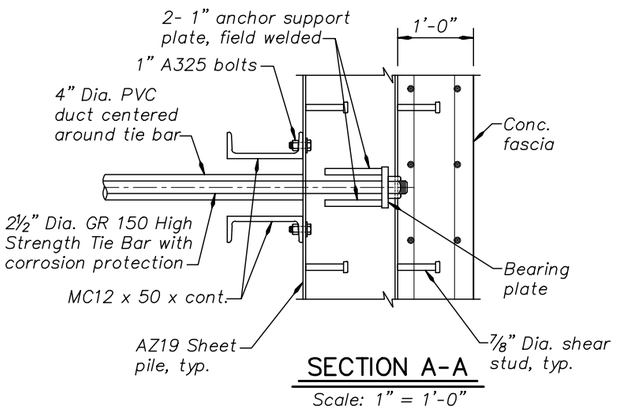
Produce welds according to the latest edition of AWS D1.5 bridge welding code



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

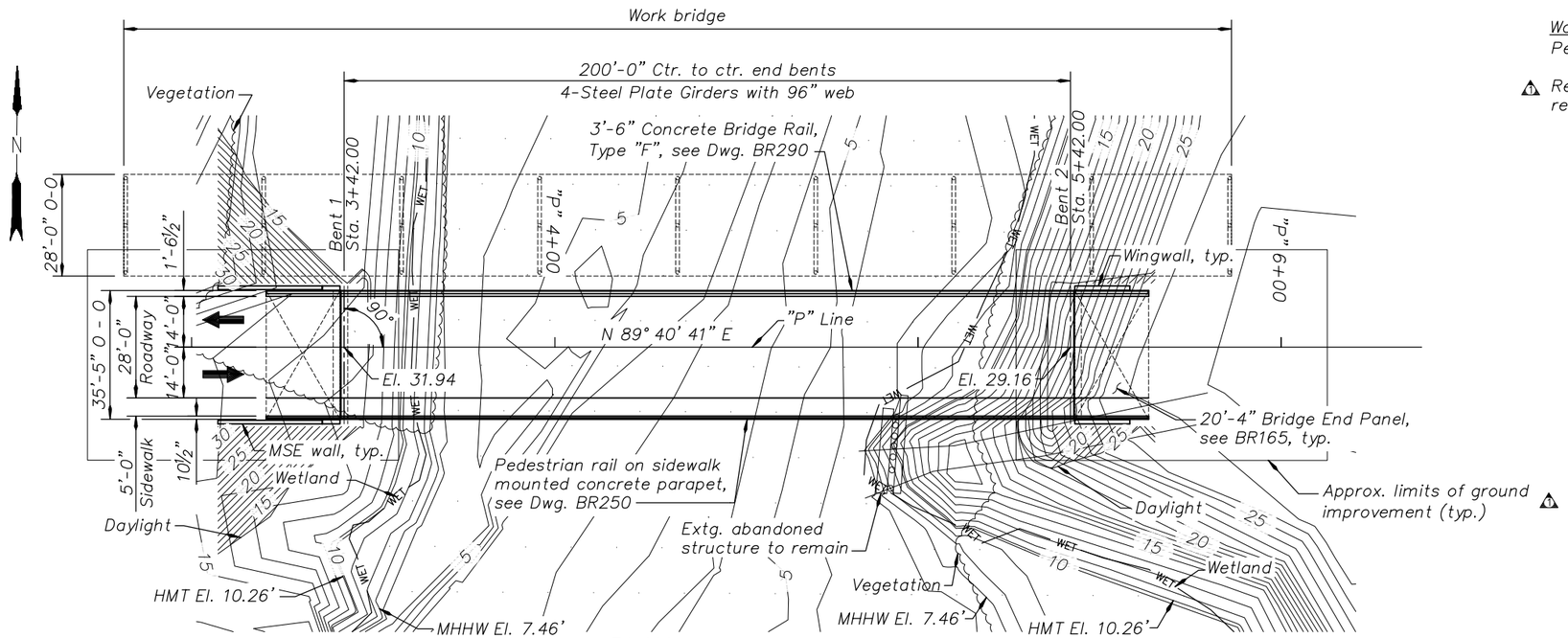
DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. xxxxx
DATE August 2014
CALC. BOOK -----

INTERSECTION RETAINING WALLS
JORDAN COVE ENERGY PROJECT
TRANSPACIFIC PARKWAY/US101 INTERSECTION

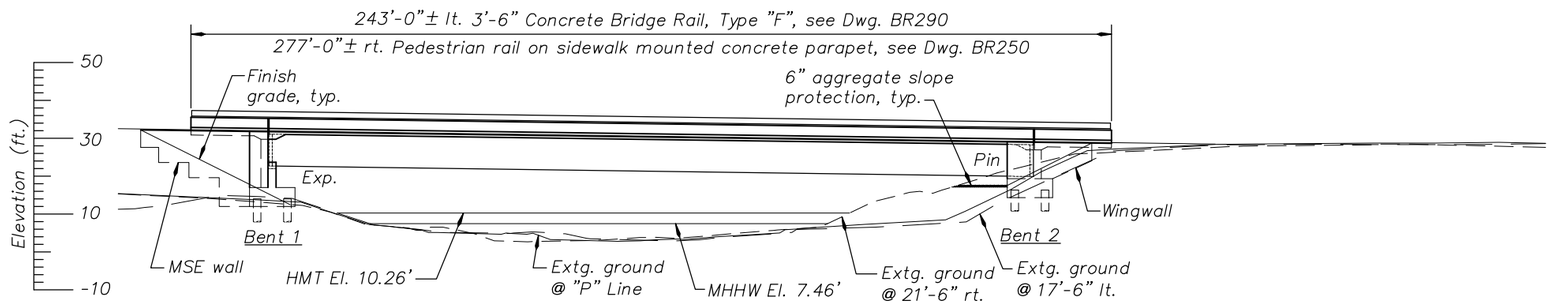
GENERAL NOTES AND DETAILS

SHEET 3 OF 3
DRAWING NO. B505



PLAN

Scale: 1" = 20'-0"



ELEVATION

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.*

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	DRAWING NUMBER	REV
142488–		–
CODE	B601	
AREA		

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.

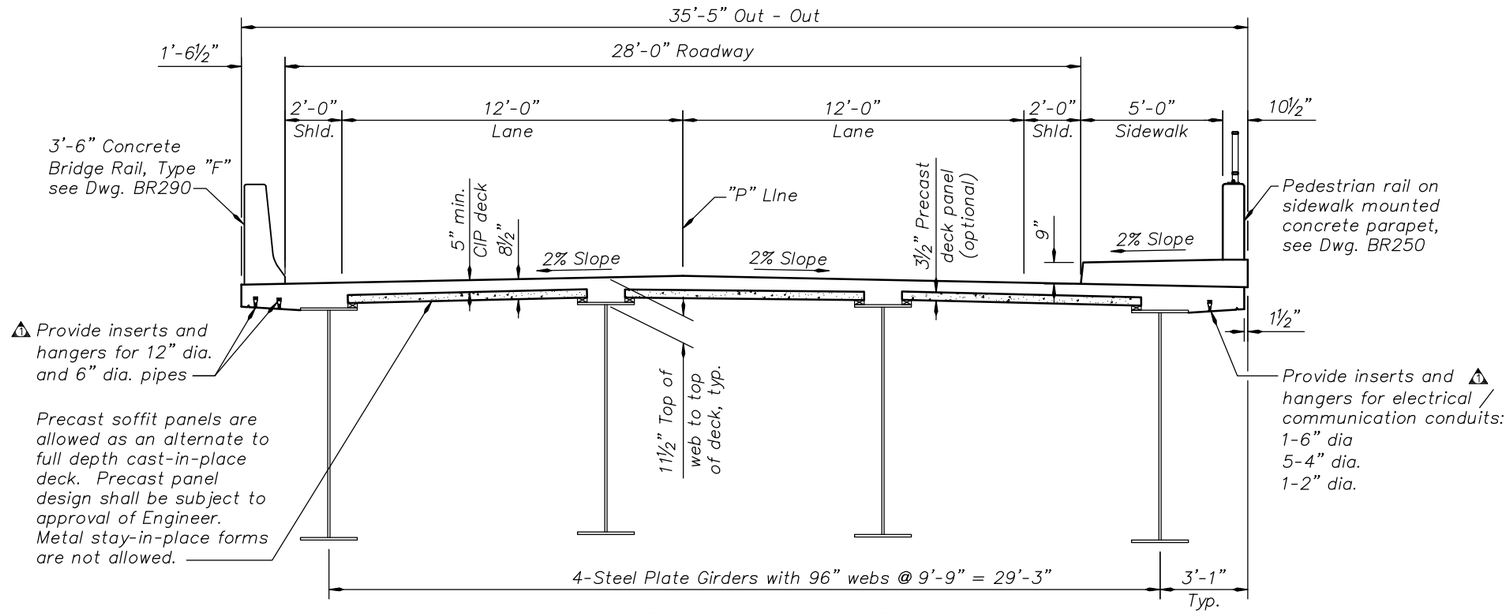
Provide Class HPC4000 - 1½", 1", or ¾" concrete in bridge deck and bridge end panels.

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

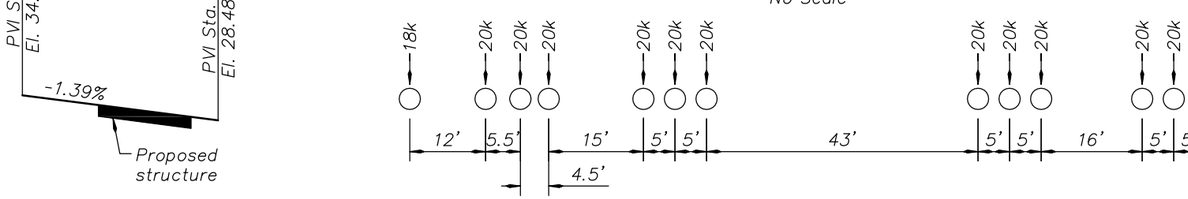
All high strength fasteners shall be galvanized and field painted in accordance with 00560.29(b)(1)b the Standard Specifications. Repair all damaged or defective coatings in accordance with 00594.60 of the Standard Specifications. ⚠1



TYPICAL DECK SECTION

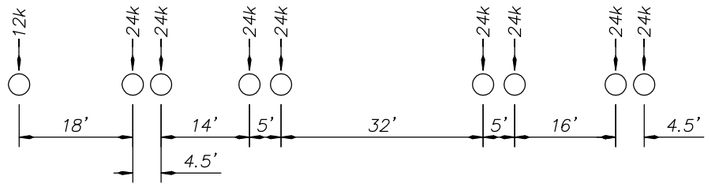
Scale: 3/8" = 1'-0"

Description	Reinforcing (lbs/CY)
Deck	225



GRADELINE DIAGRAM

No Scale



OR-STP-5BW PERMIT TRUCK 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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JORDAN COVE ENERGY PROJECT, L.P.
COOS BAY, OREGON

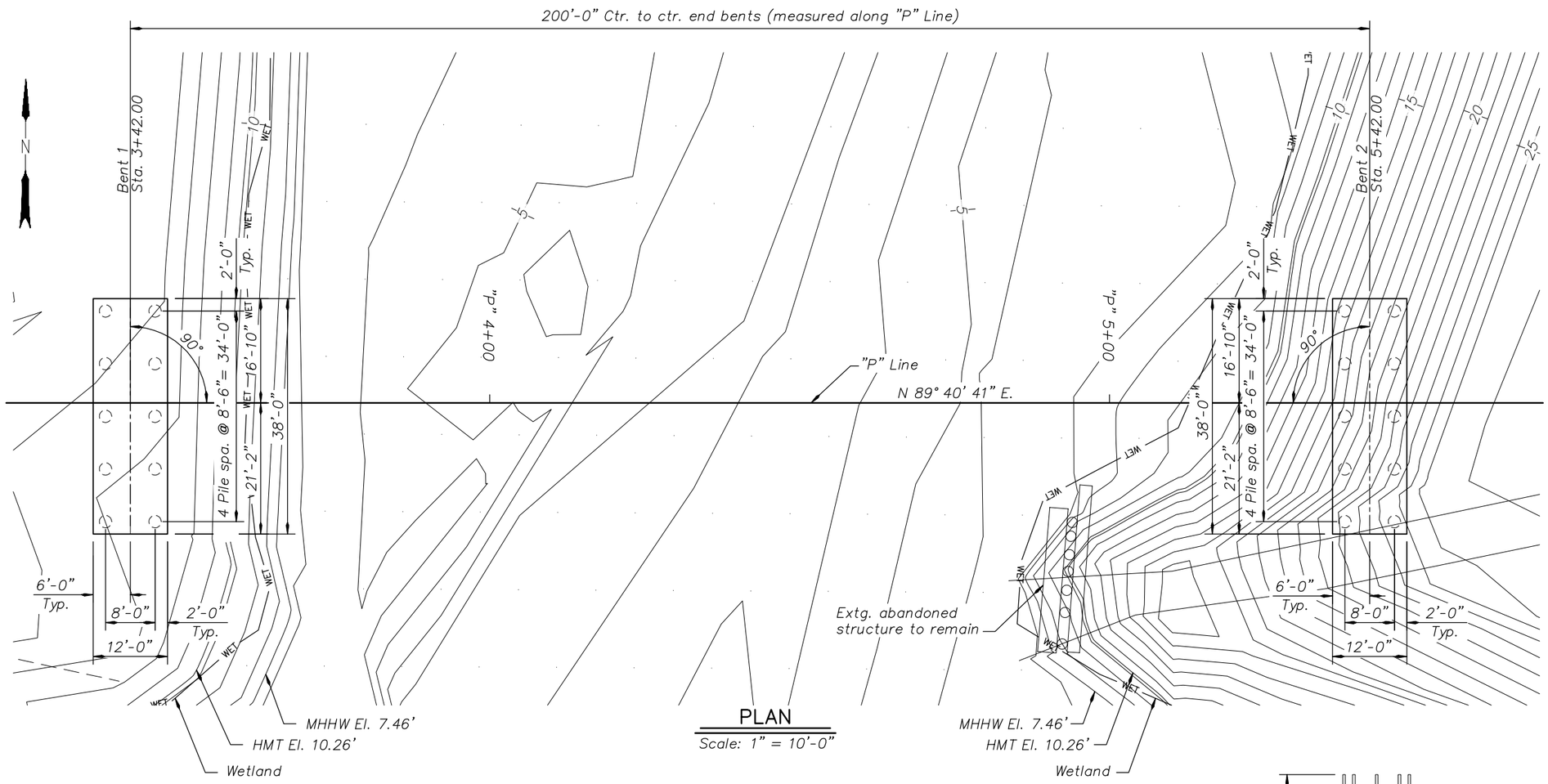
ENGINEER DMJ | DRAWN ACM | CHECKED – | DATE mm-dd-yy

NORTH POINT (PEIRCE)
GENERAL NOTES AND TYPICAL DECK SECTION

PROJECT 142488– | DRAWING NUMBER B602 | REV –

CODE | AREA

ALAN MITCHELL ACAD G.204.0, SP2
A1ASL015 D1 1=1
7/22/2014 3:20 PM



FOUNDATION TABLE			
Location	Type	Est. tip El. (Feet)	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	

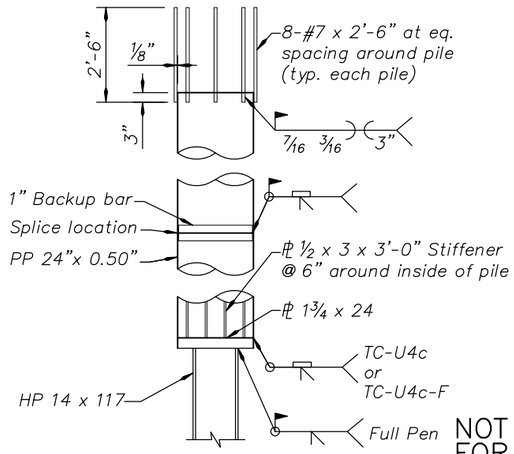
FOUNDATION DESIGN NOTES:

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- 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.



PILE DETAIL
No Scale

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6/11/2014 10:42 AM

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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	DRAWING NUMBER	REV
142488–		–
CODE		
AREA	B603	

EARTHWORK QUANTITIES (FOR INFORMATION ONLY)
Exc. 31,600 C.Y.
Emb. 104,300 C.Y.

KENTUCK LEVEE

EAST BAY DRIVE

GOLF COURSE LANE

KENTUCK ACCESS

DEAN & DEBRA WEBB
250LF COURSE LN
NORTH BEND, OR 97459

CHARLES KERWIN
94250 GOLF COURSE LN
NORTH BEND, OR 97459

N

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

Reviewed By –
Designed By –
Drafted By –

GRADING PLAN

SHEET NO. ––

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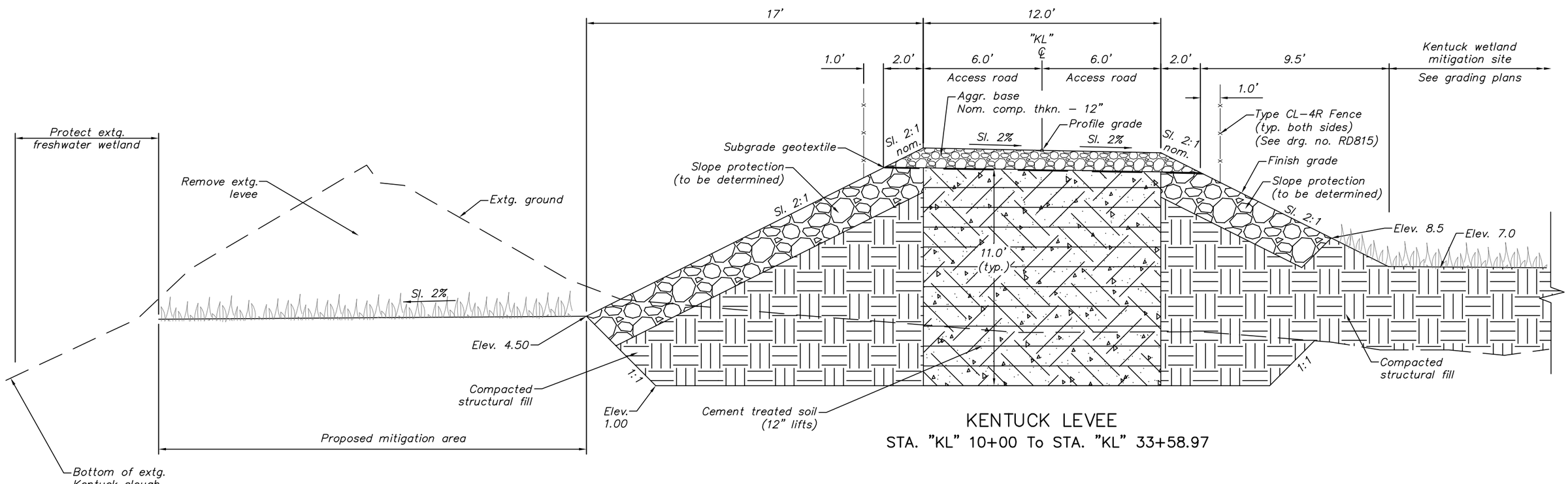
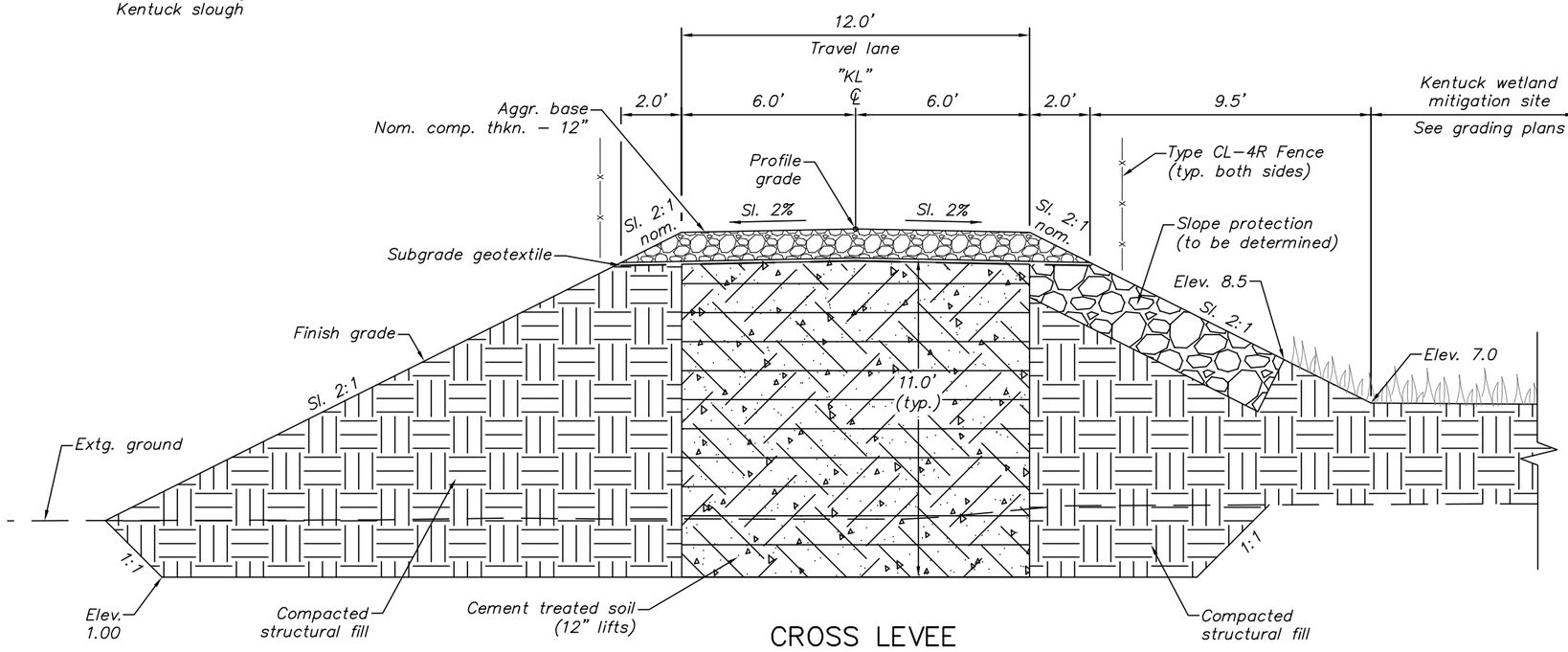


KENTUCK LEVEE

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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JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

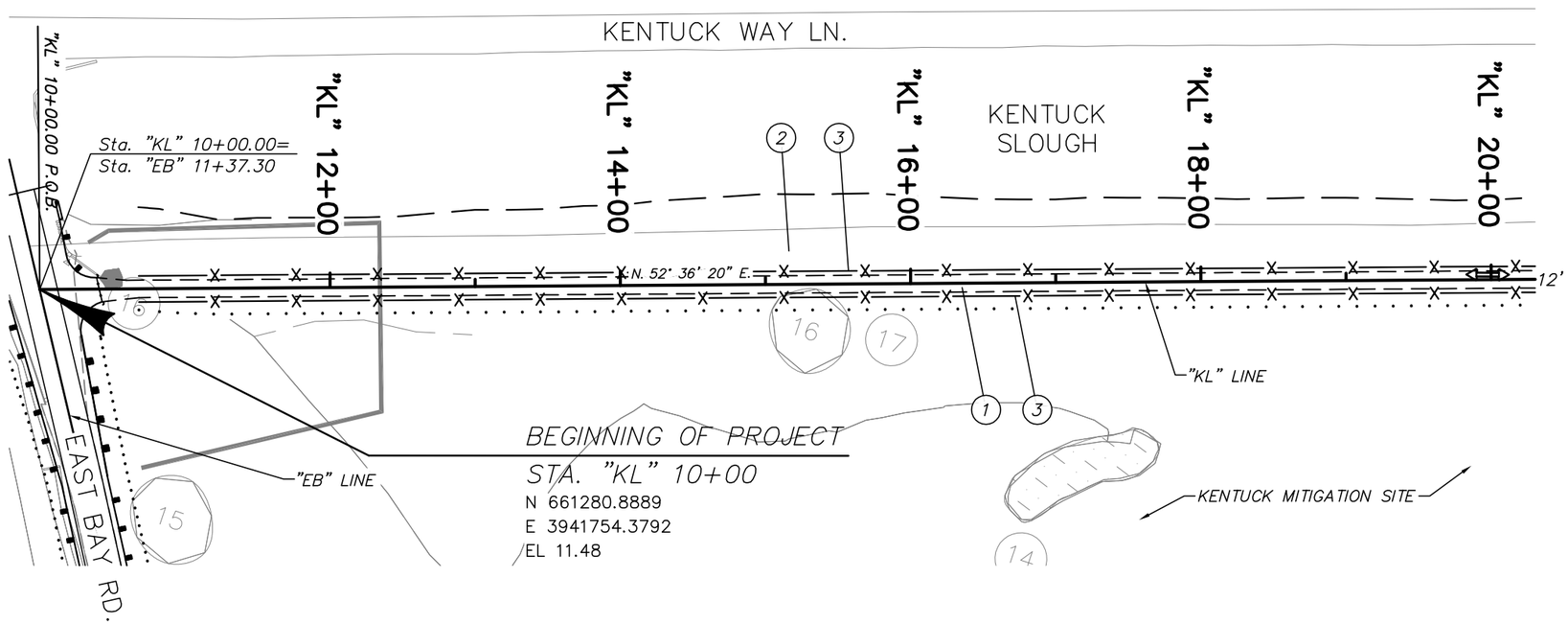
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – J DeMello

TYPICAL SECTION

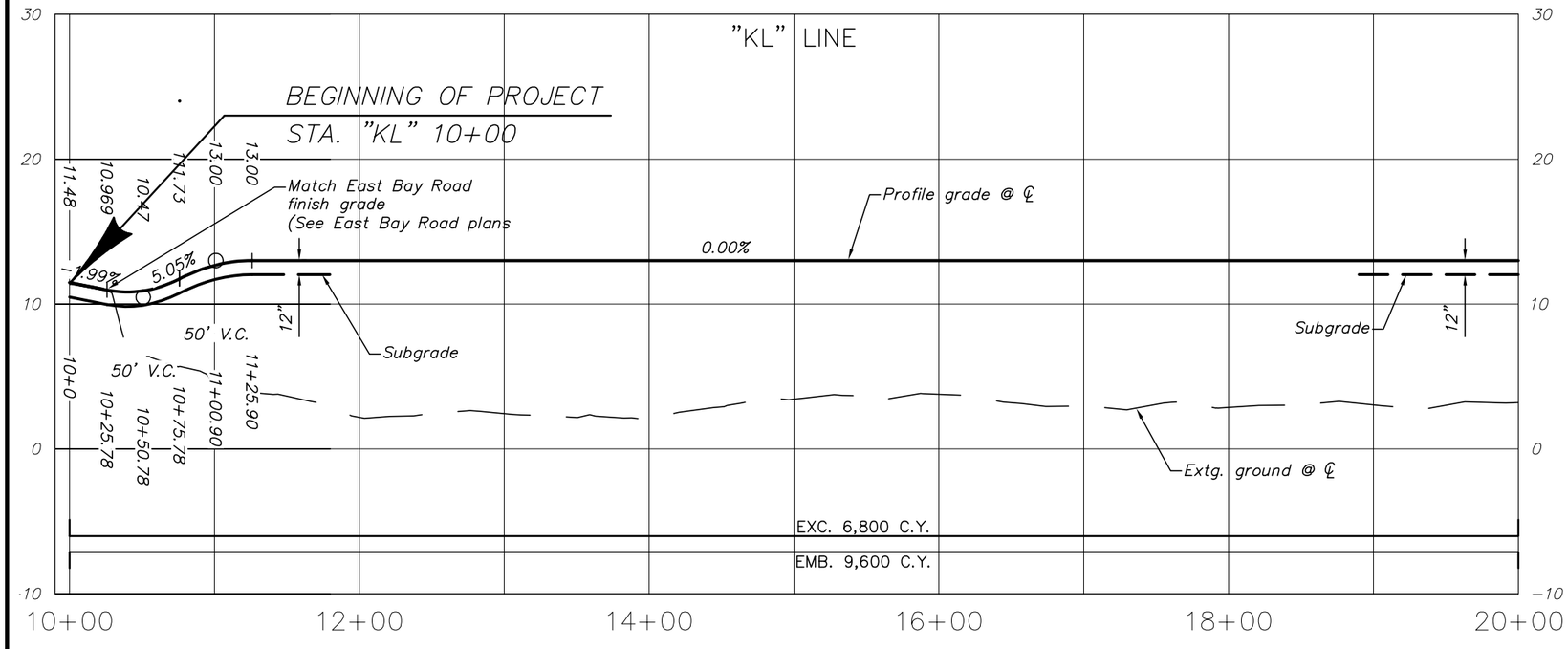
SHEET NO. 2

P:\J\JCEP00000004\0400CAD\EC\Exhibits and Sheets\Kentuck Levee Sheets\Kentuck Levee_Typical Sections.dwg jnd Aug 29, 2014 10:01am

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

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JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

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Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 3

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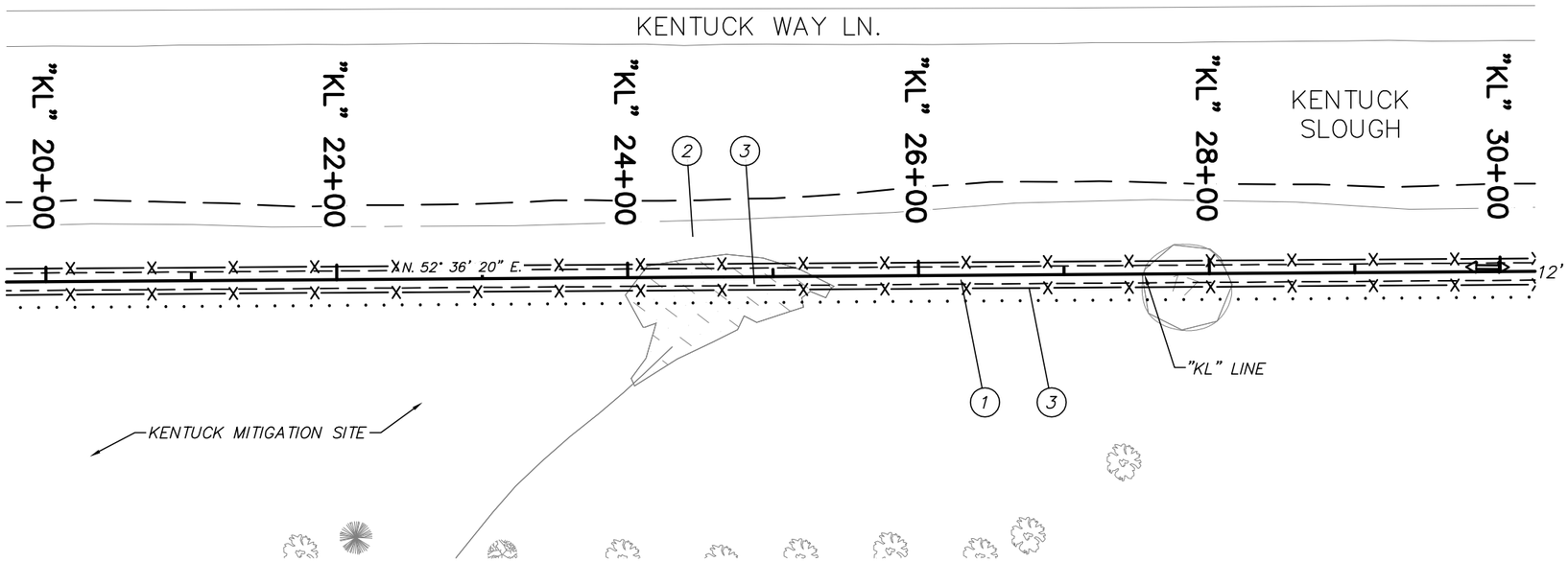
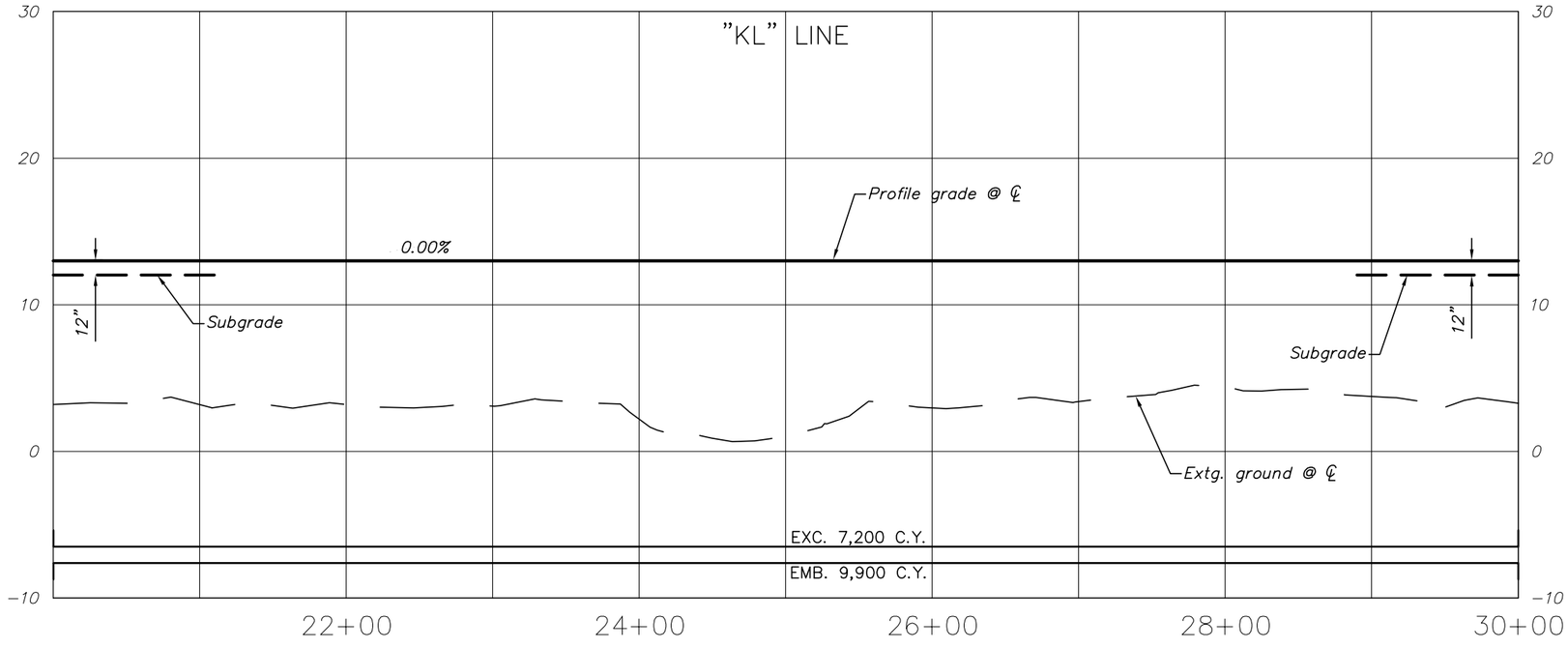


1. Const. levee and 12' access road (For details, see sheet 2)
2. Remove extg. levee (For details, see sheet 2)
3. Const. type CL-4R fence



LEGEND
Cut slope line — — —
Fill slope line . . . . . .

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JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

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Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 4

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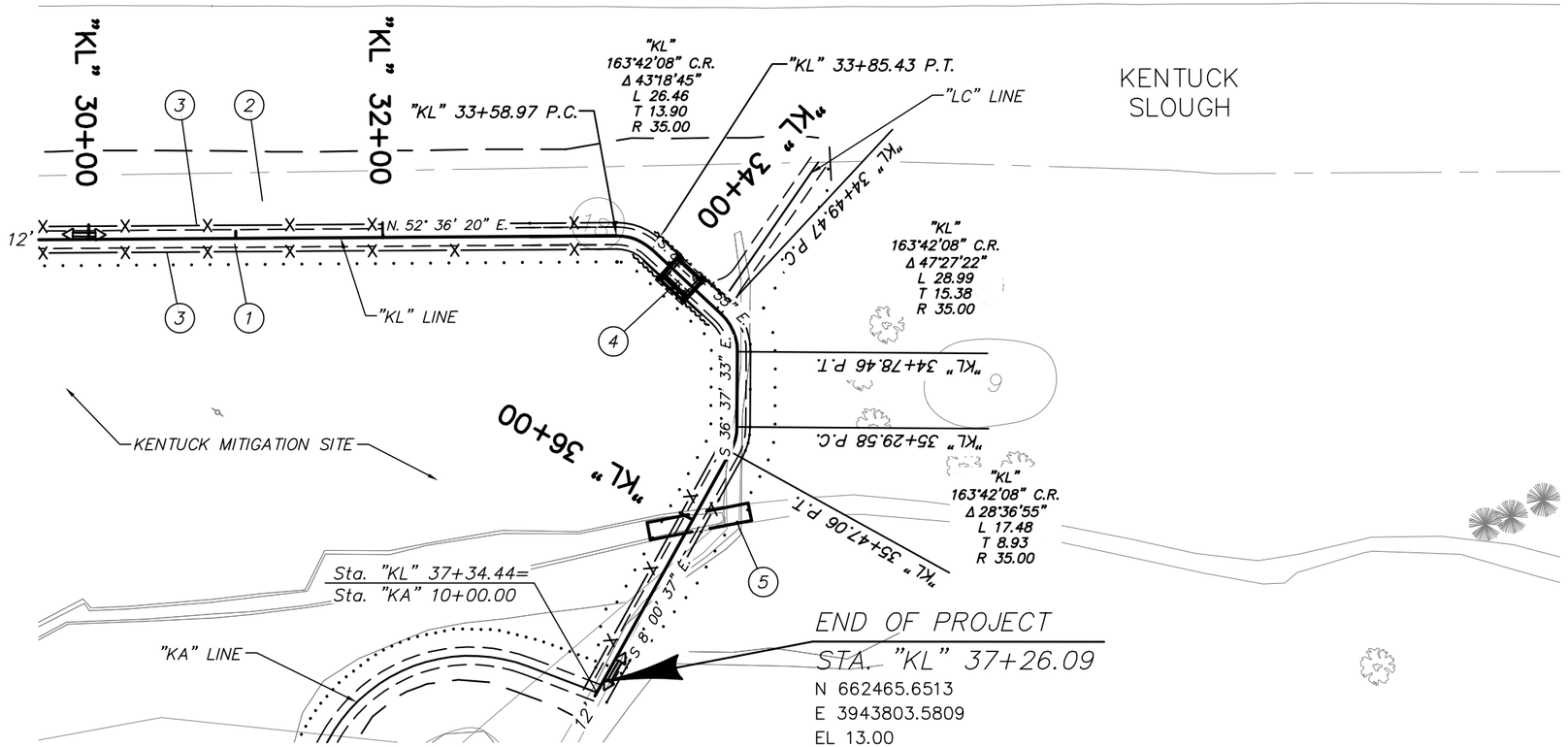
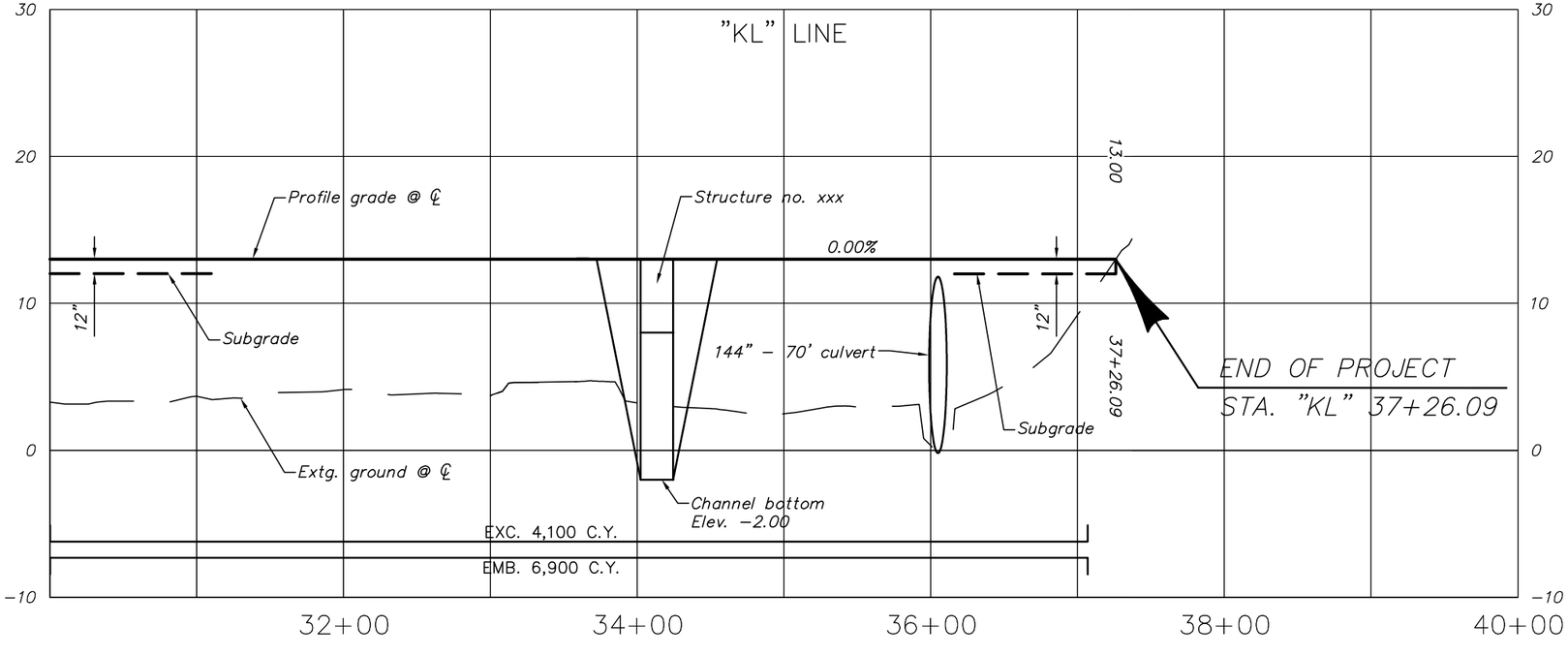
Sec. 1, T. 25 S., R. 13 W., W.M.

KENTUCK WAY LN.



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

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JORDAN COVE ENERGY PROJECT
KENTUCK LEVEE

COOS COUNTY

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Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 5

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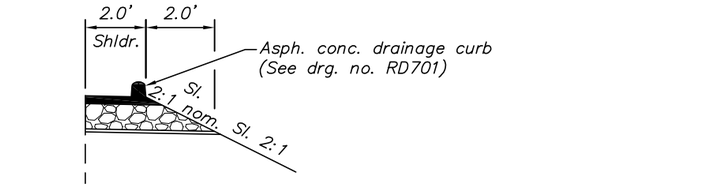

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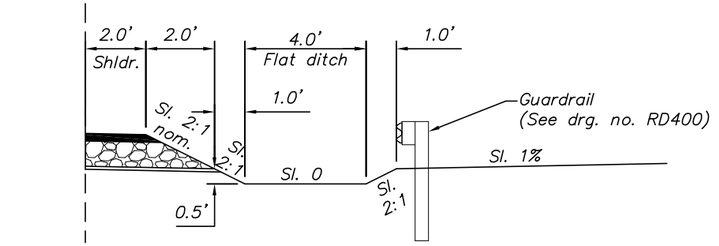

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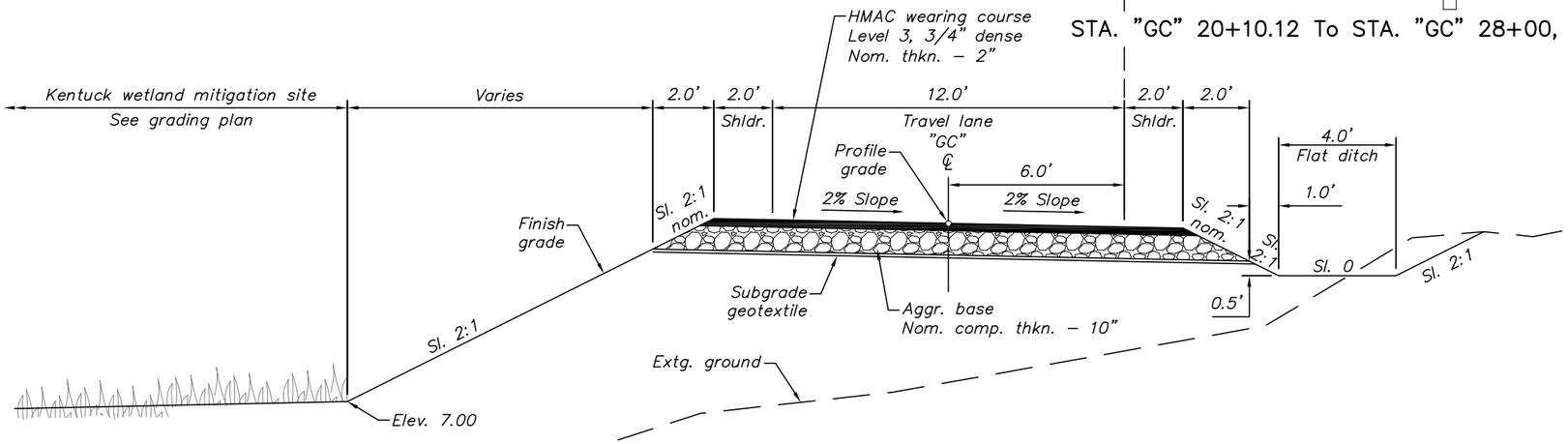

GOLF COURSE LANE

STA. "GC" 20+10.12 To STA. "GC" 33+00.00
"GC" 35+67.04 To "GC" 40+86.90

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2100 Southwest River Parkway
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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

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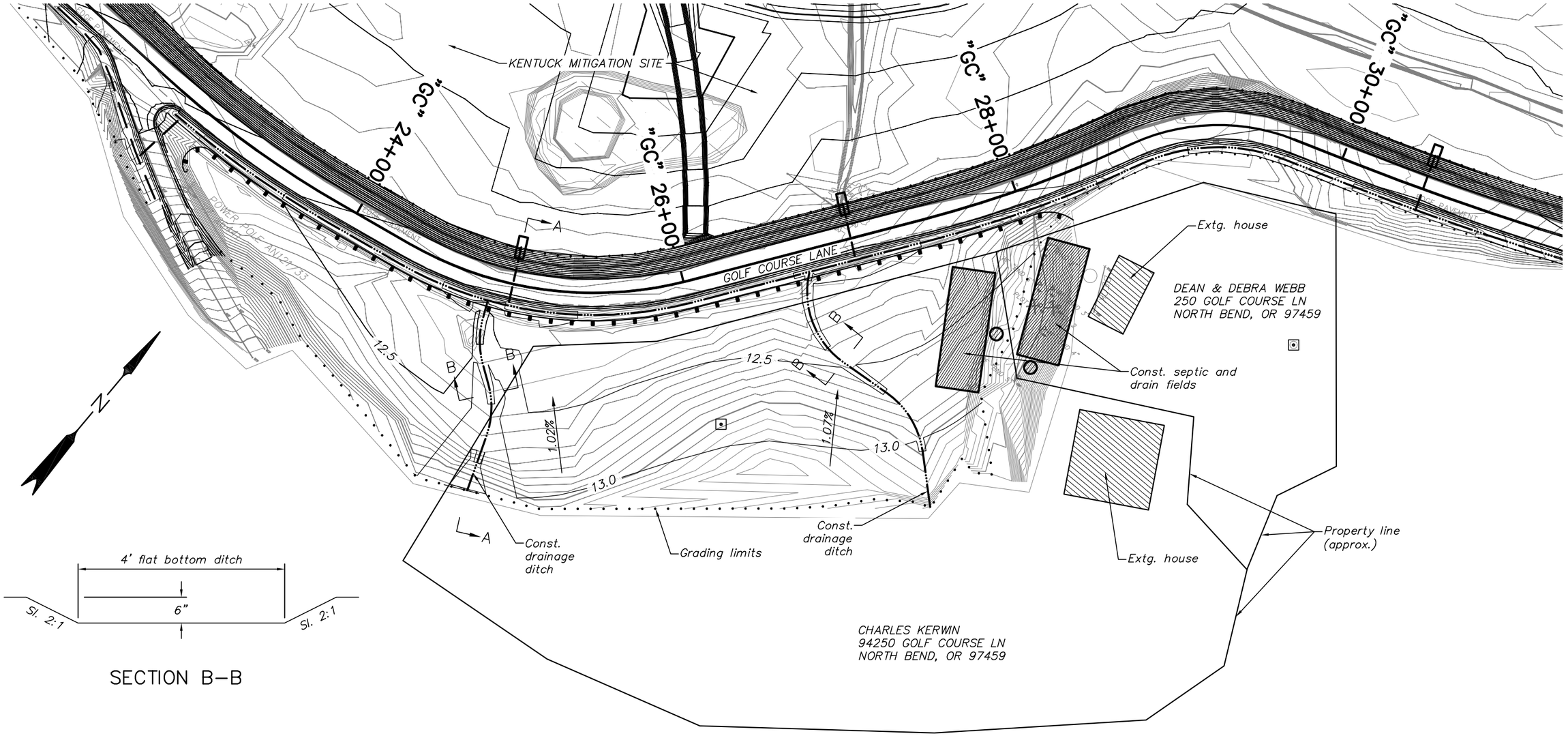
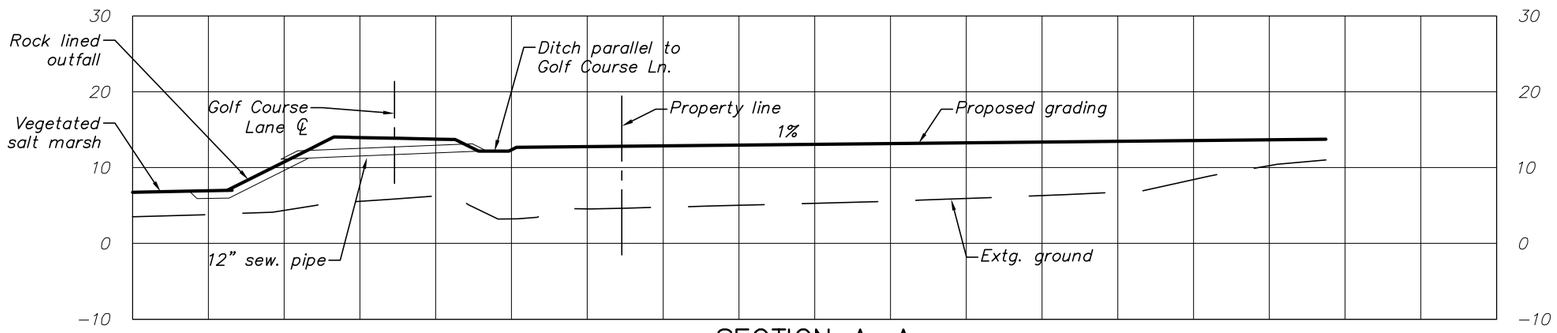


SECTION B–B



SECTION A–A

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JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

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Designed By –
Drafted By –

KERWIN & WEBB PROPERTIES
GRADING PLAN

SHEET NO.
2B–2

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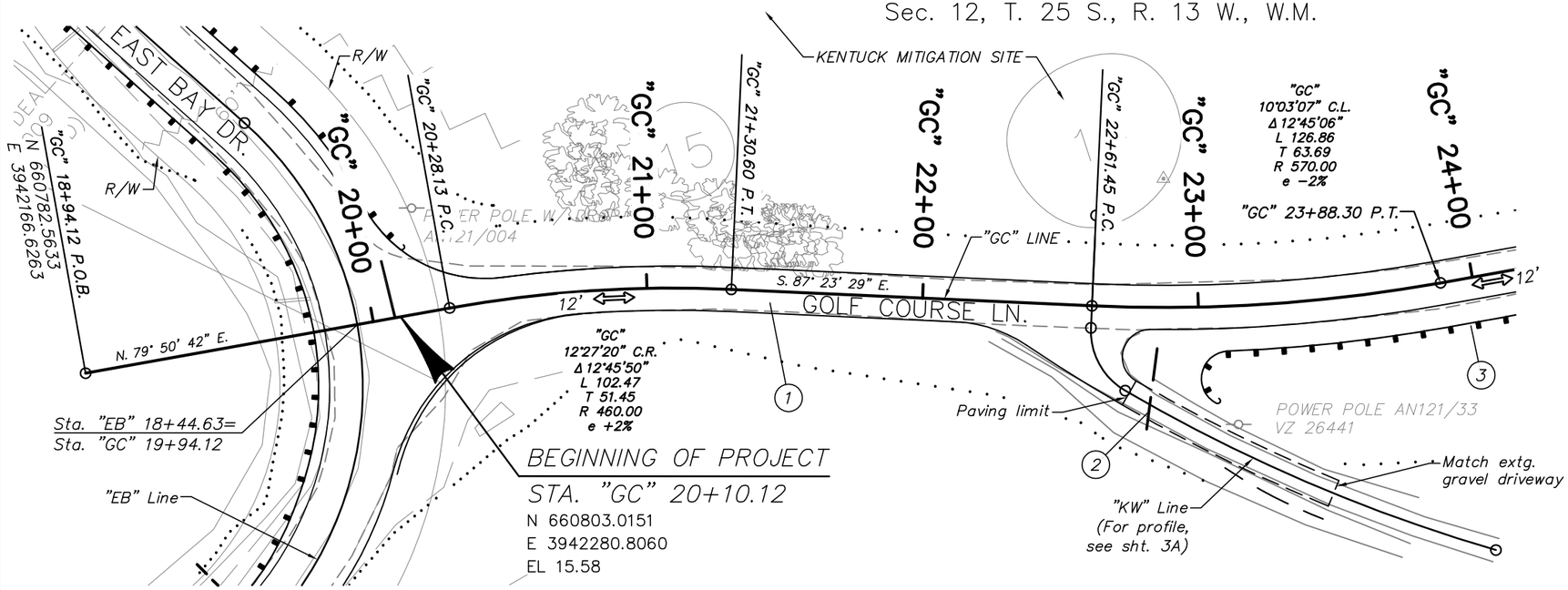
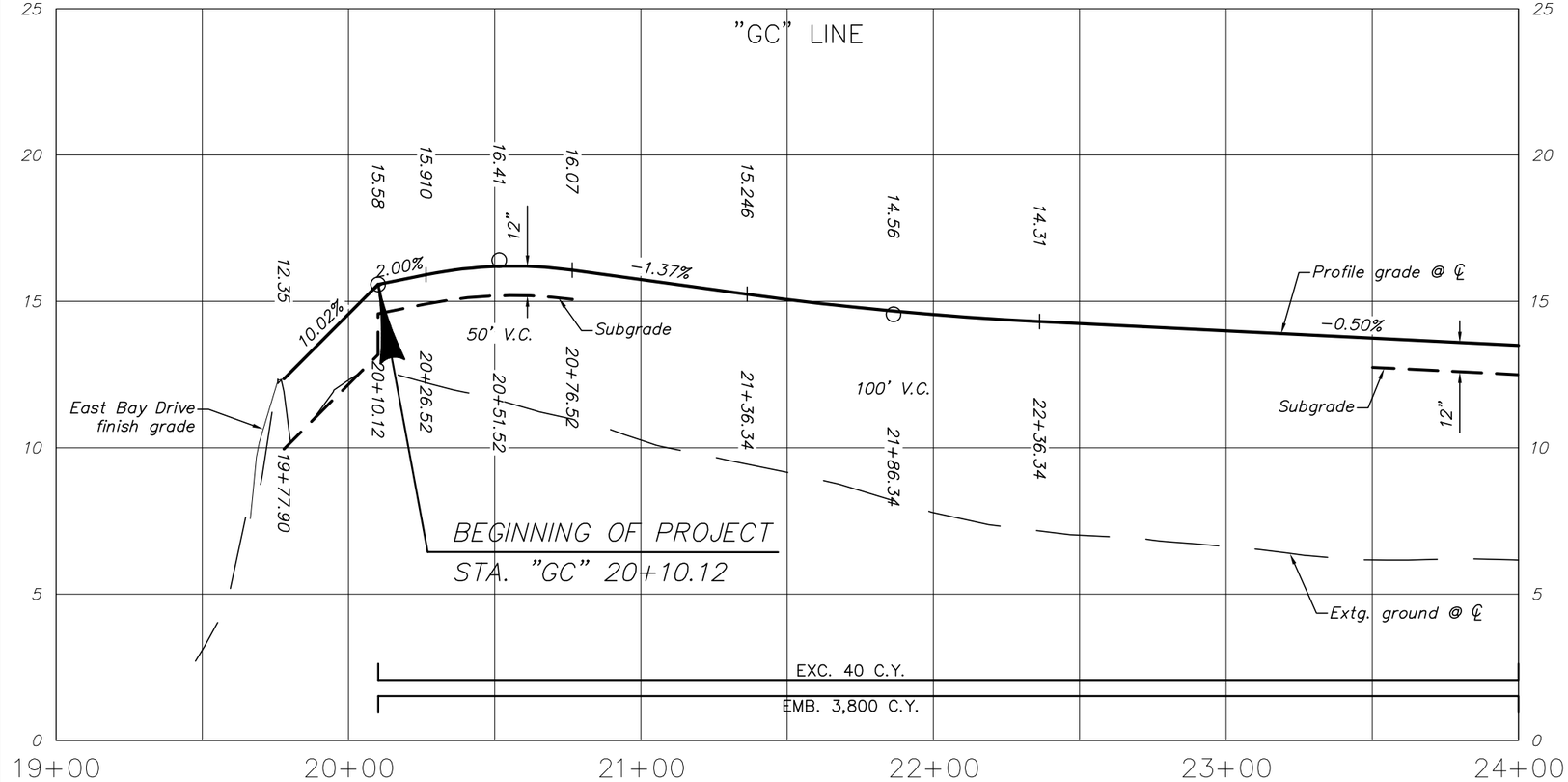


1. Const. Golf Course Lane
   (For details, see sheet 2)
2. Inst. 12" culv. pipe – 30'
3. Sta. "GC" 23+10 to Sta. "GC" 28+25, Rt.
   Const. guardrail – 566' (Type 2A)
   Inst. end piece – 1 (Type B)
   (See drg. nos. RD400, RD405, RD410, & RD415)

N



LEGEND
Cut slope line — — —
Fill slope line · · · · · · · ·

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2100 Southwest River Parkway
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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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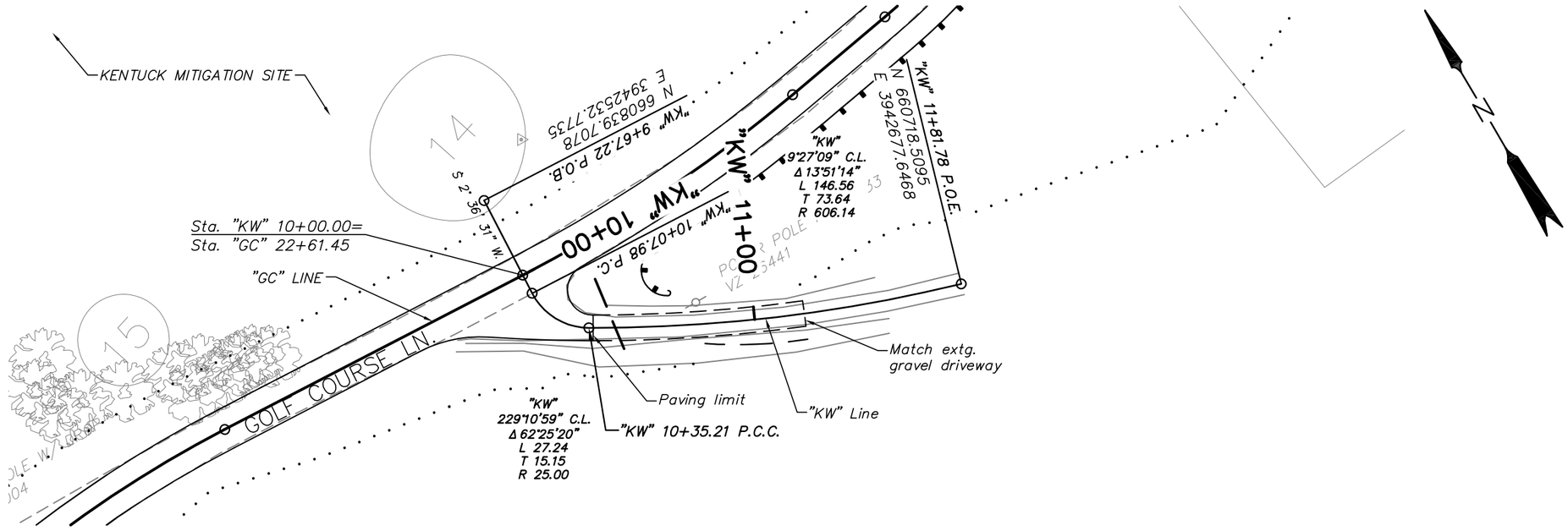

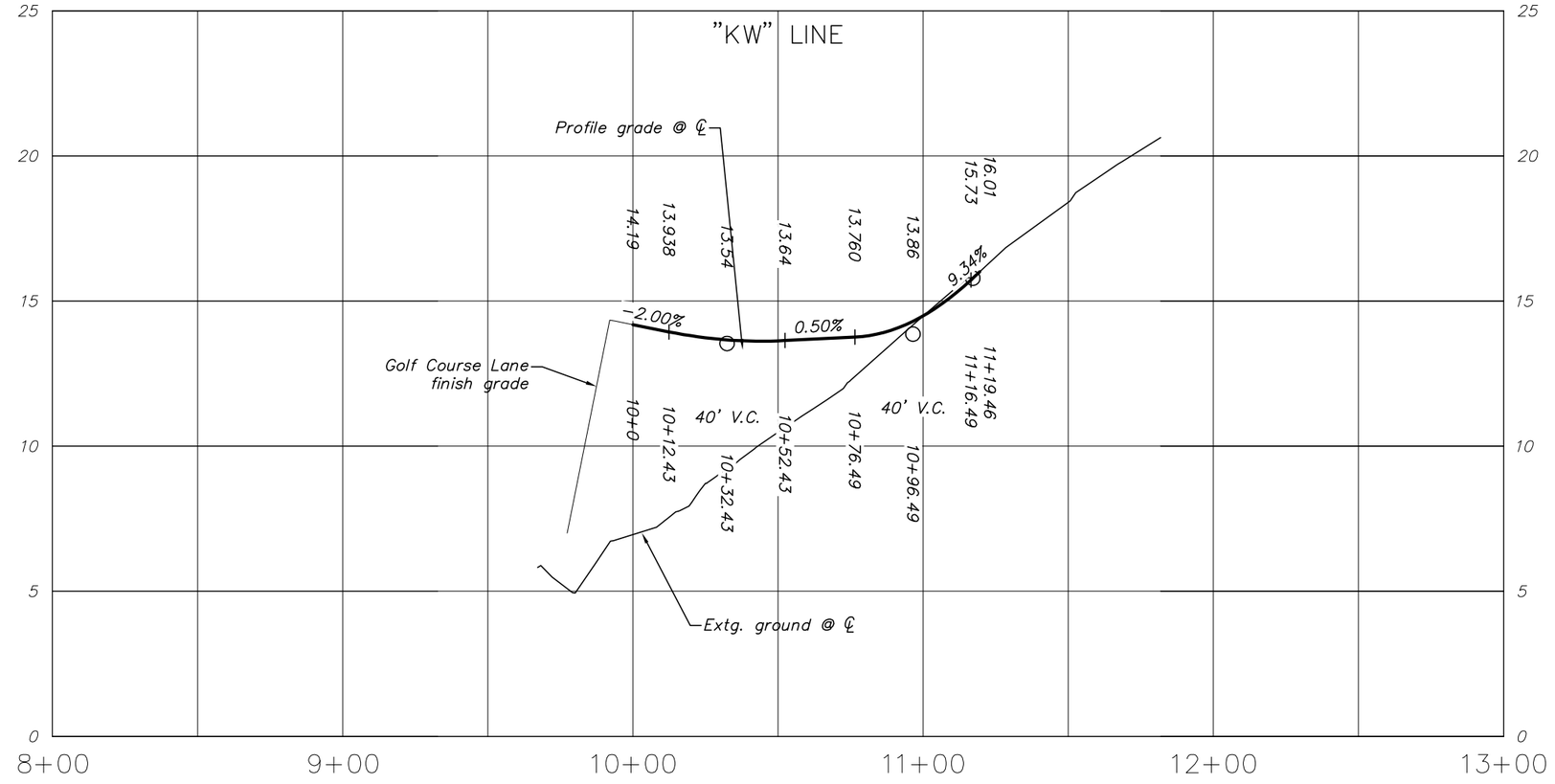

LEGEND

Cut slope line ——— ——— ———

Fill slope line . . . . . .

—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. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION
KERWIN & WEBB DRIVEWAY

SHEET NO. 3A

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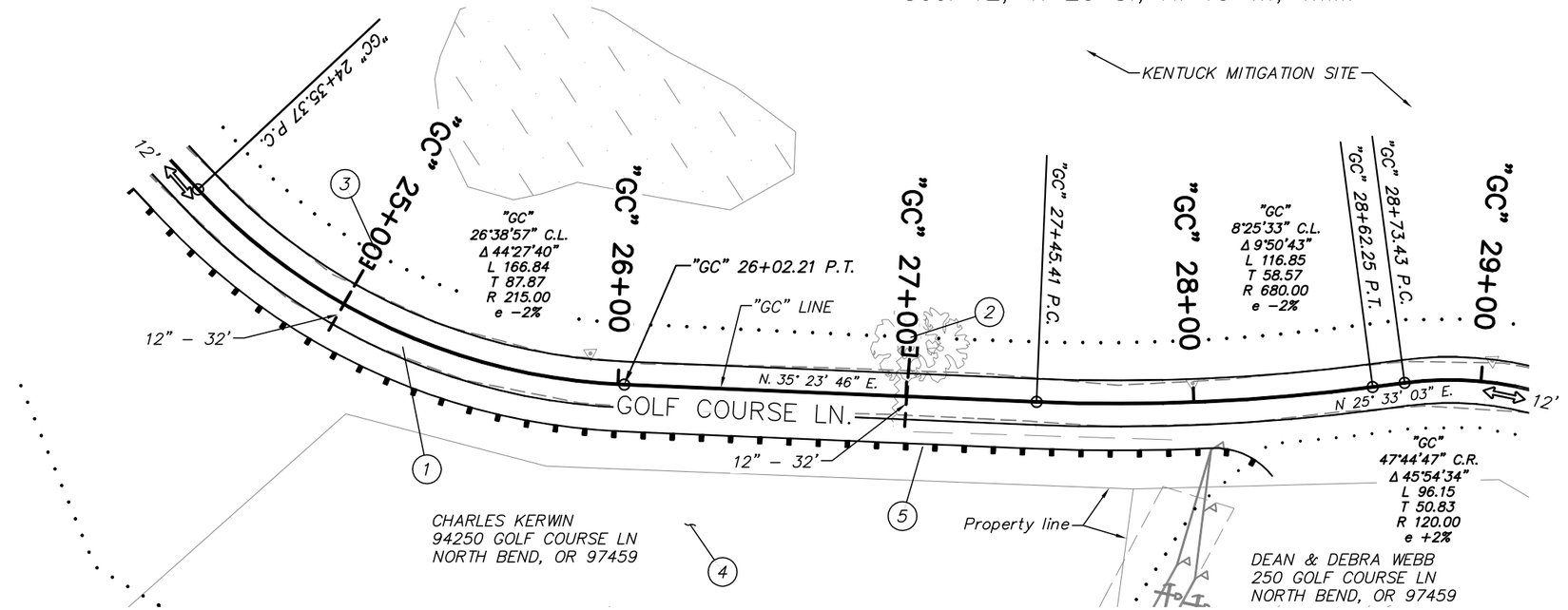
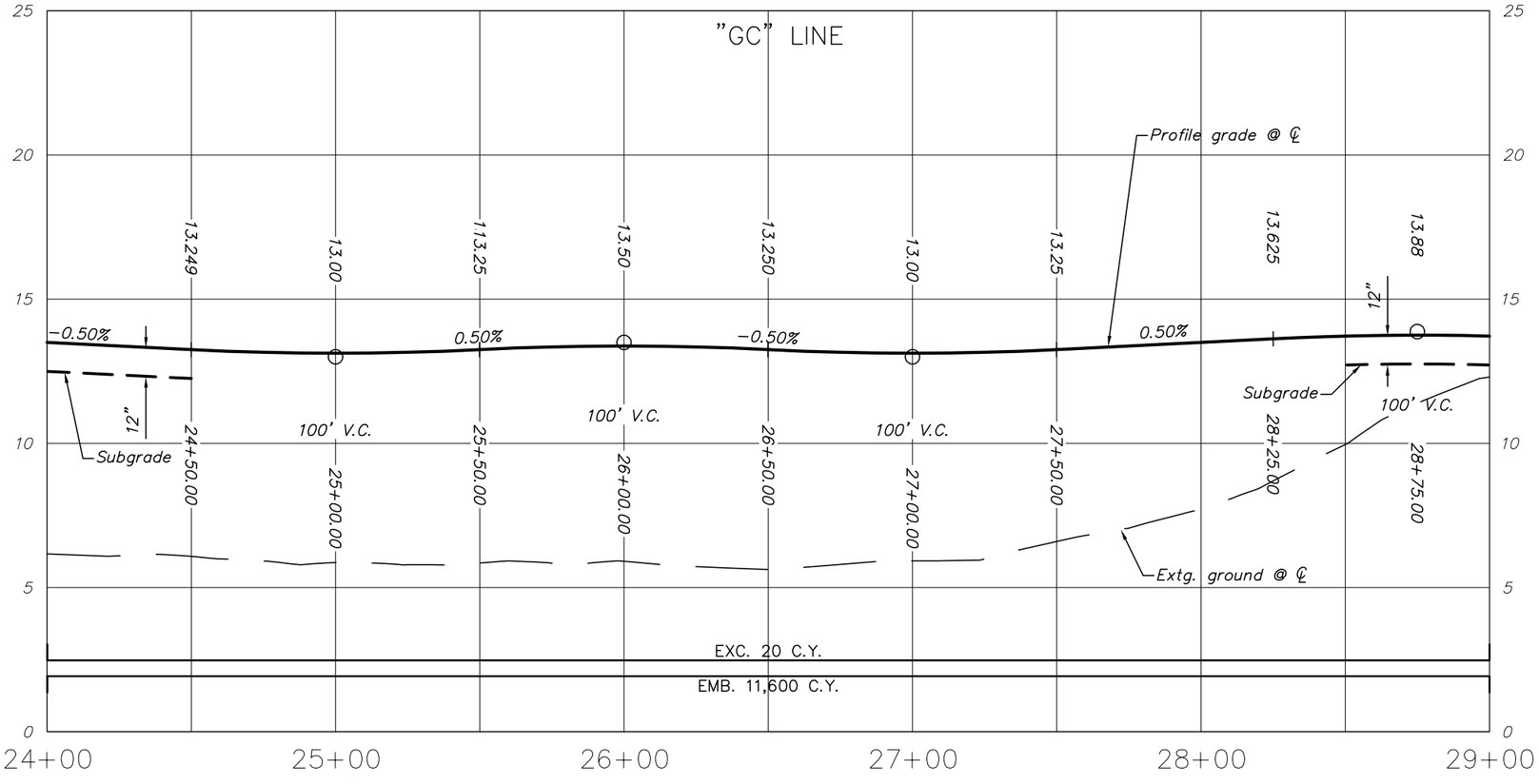
Sec. 12, T. 25 S., R. 13 W., W.M.





(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 . . . . . .

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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

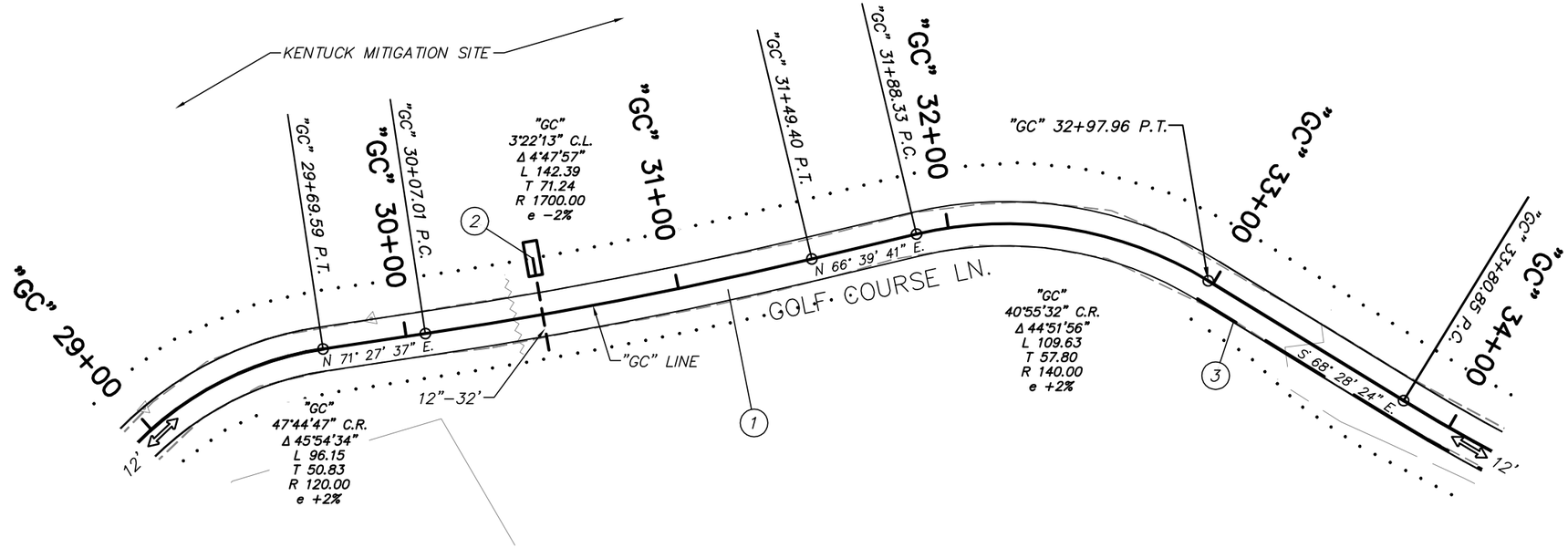
Reviewed By − G. Oien
Designed By − J. DeMello
Drafted By − C. Filer

GENERAL CONSTRUCTION

SHEET NO. 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.

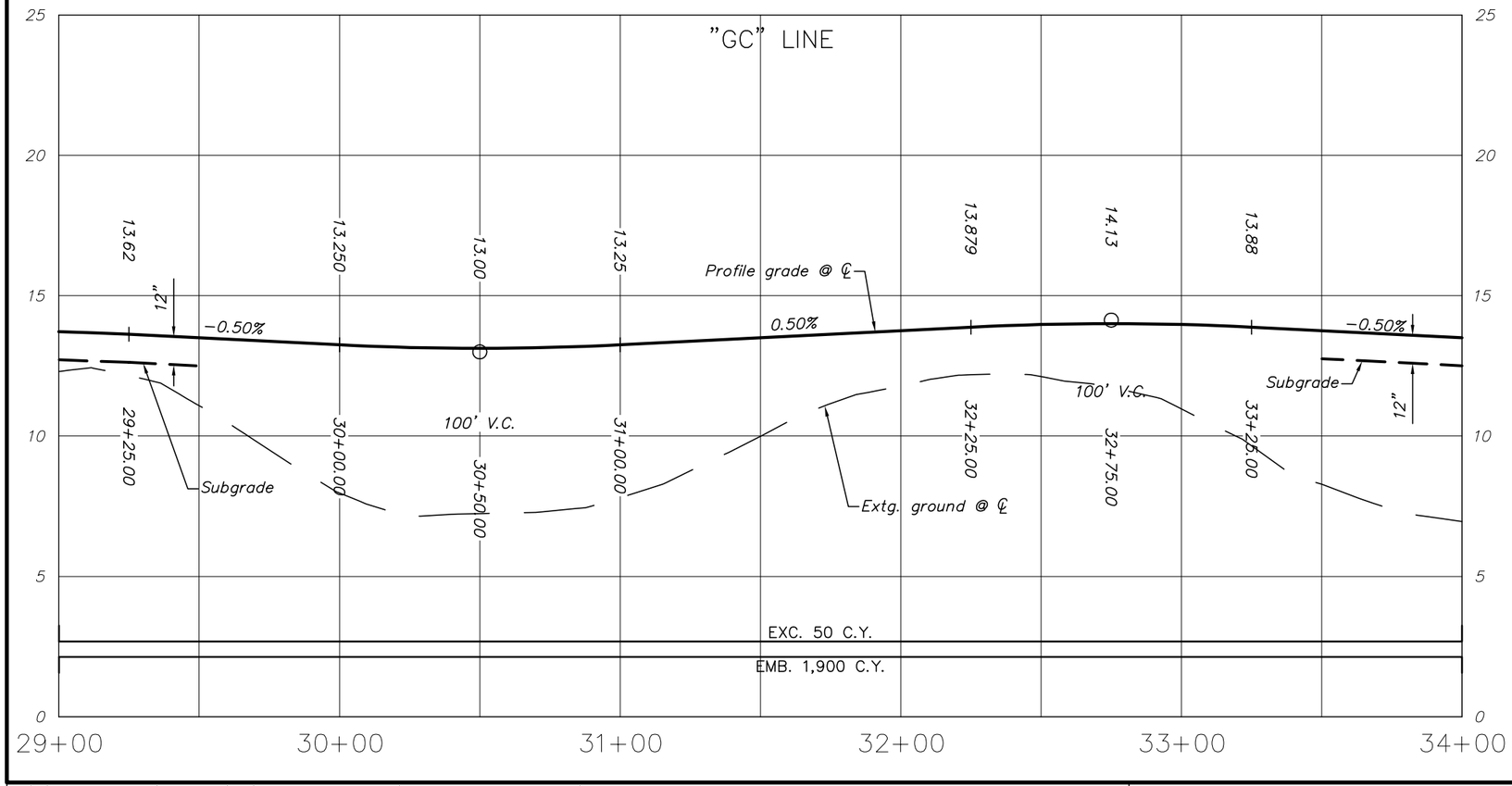


(1) Const. Golf Course Lane
(For details, see sheet 2)

(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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GOLF COURSE LANE

COOS COUNTY

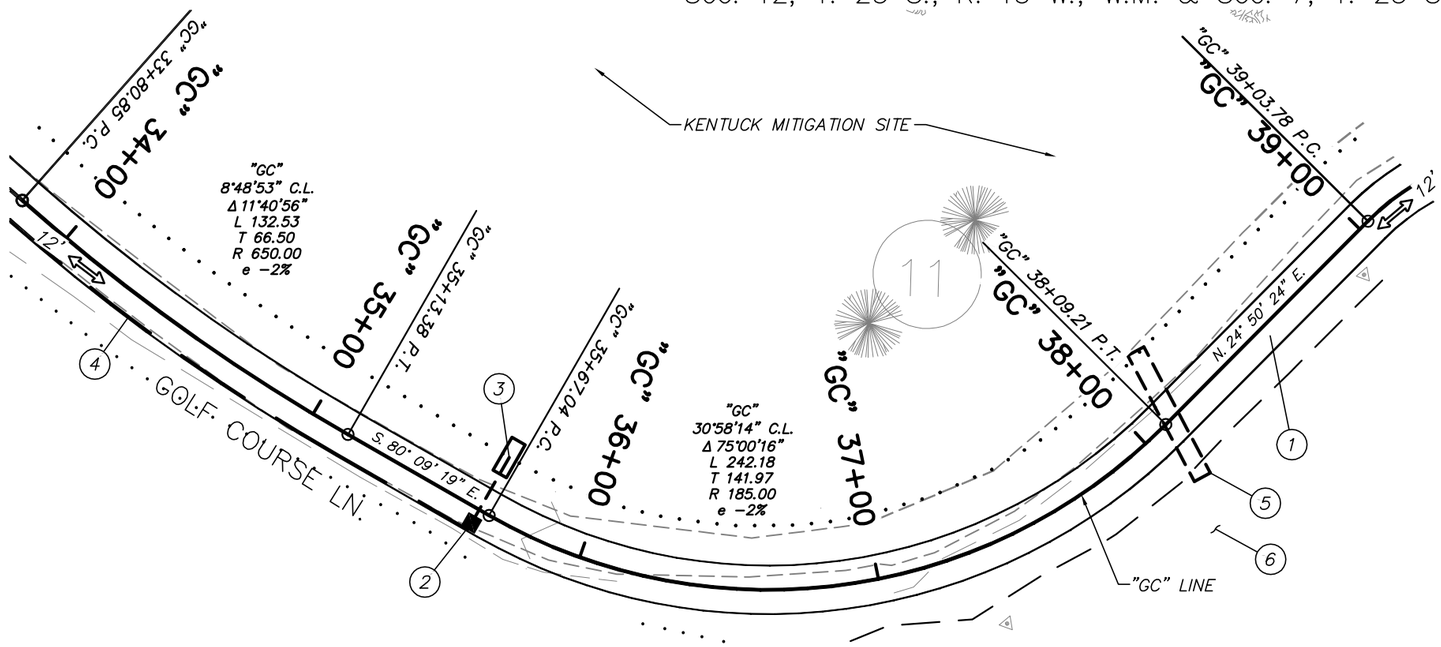
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

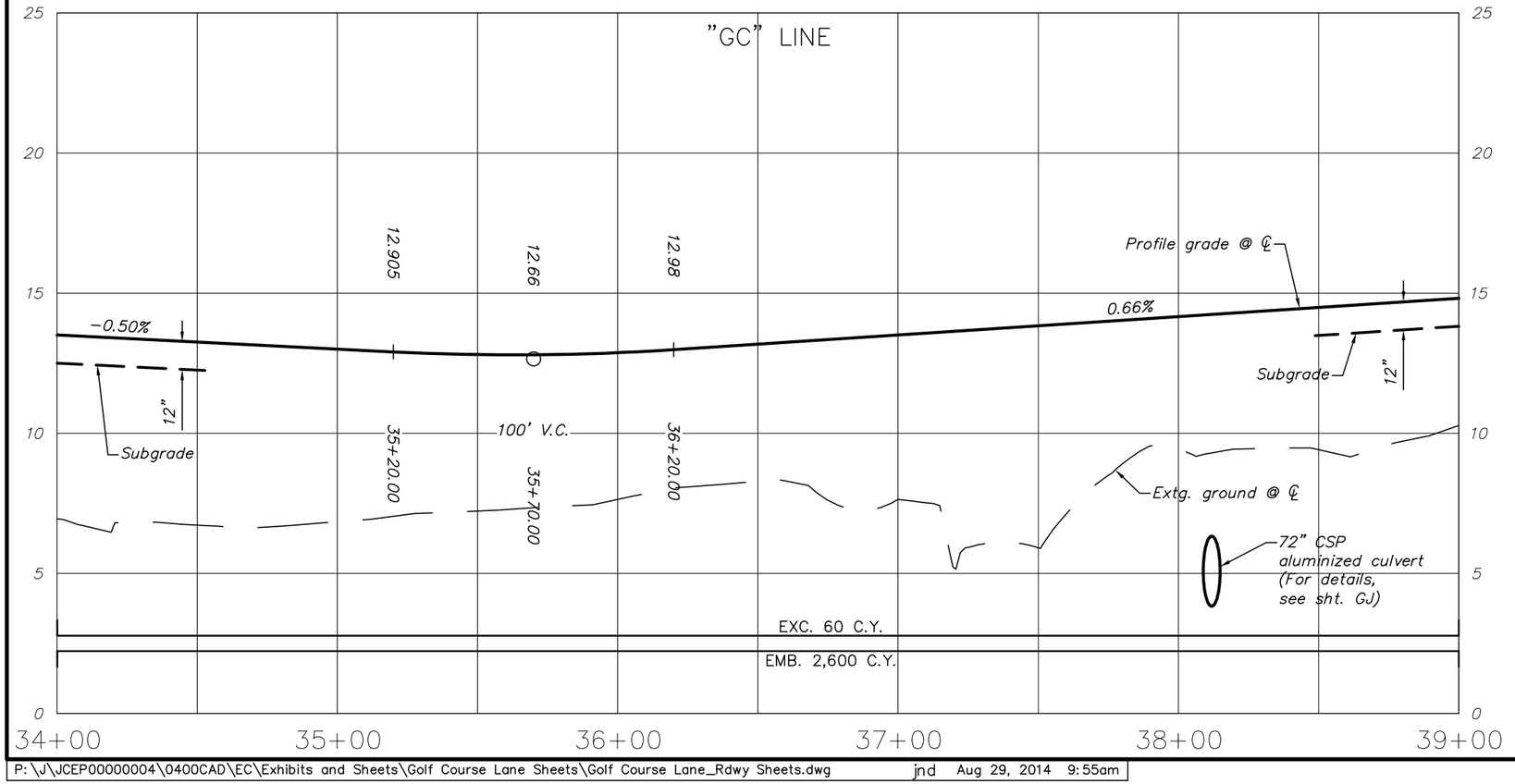
SHEET NO. 5

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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JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

Reviewed By – G. Oien
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GENERAL CONSTRUCTION

SHEET NO. 6

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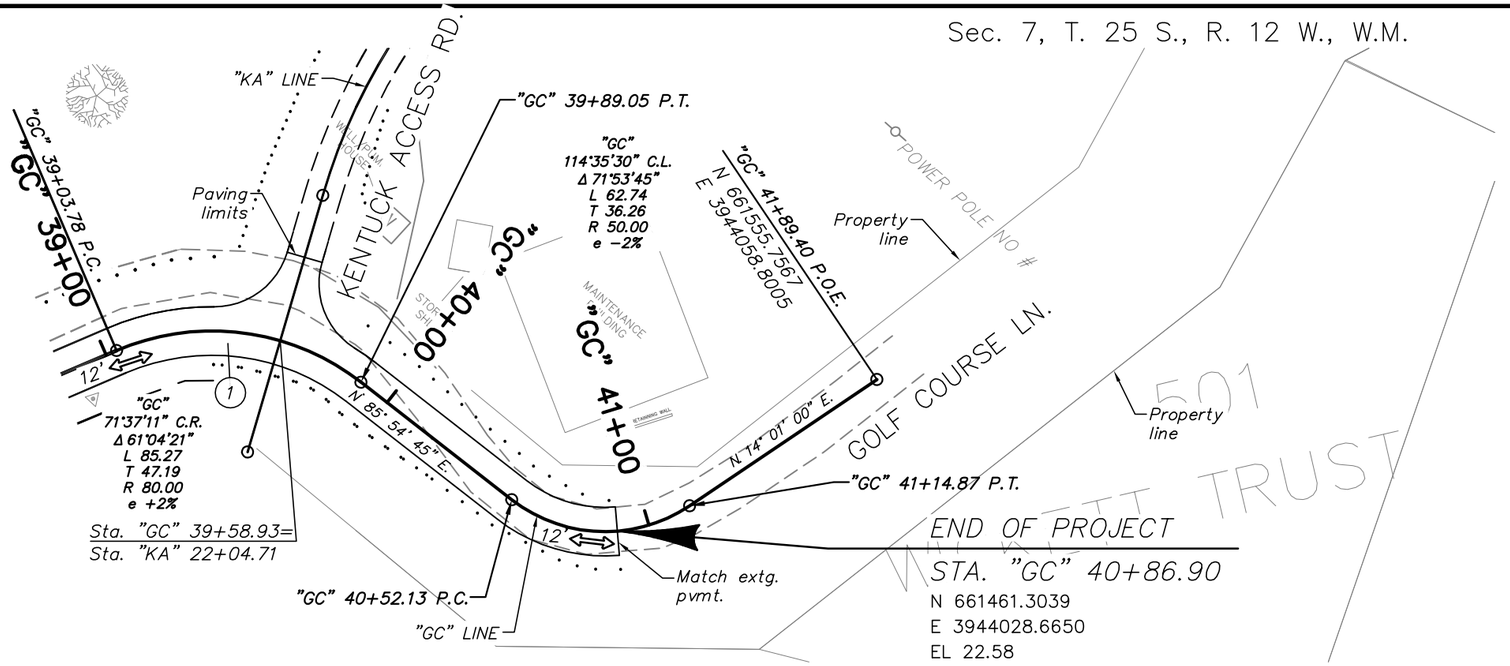
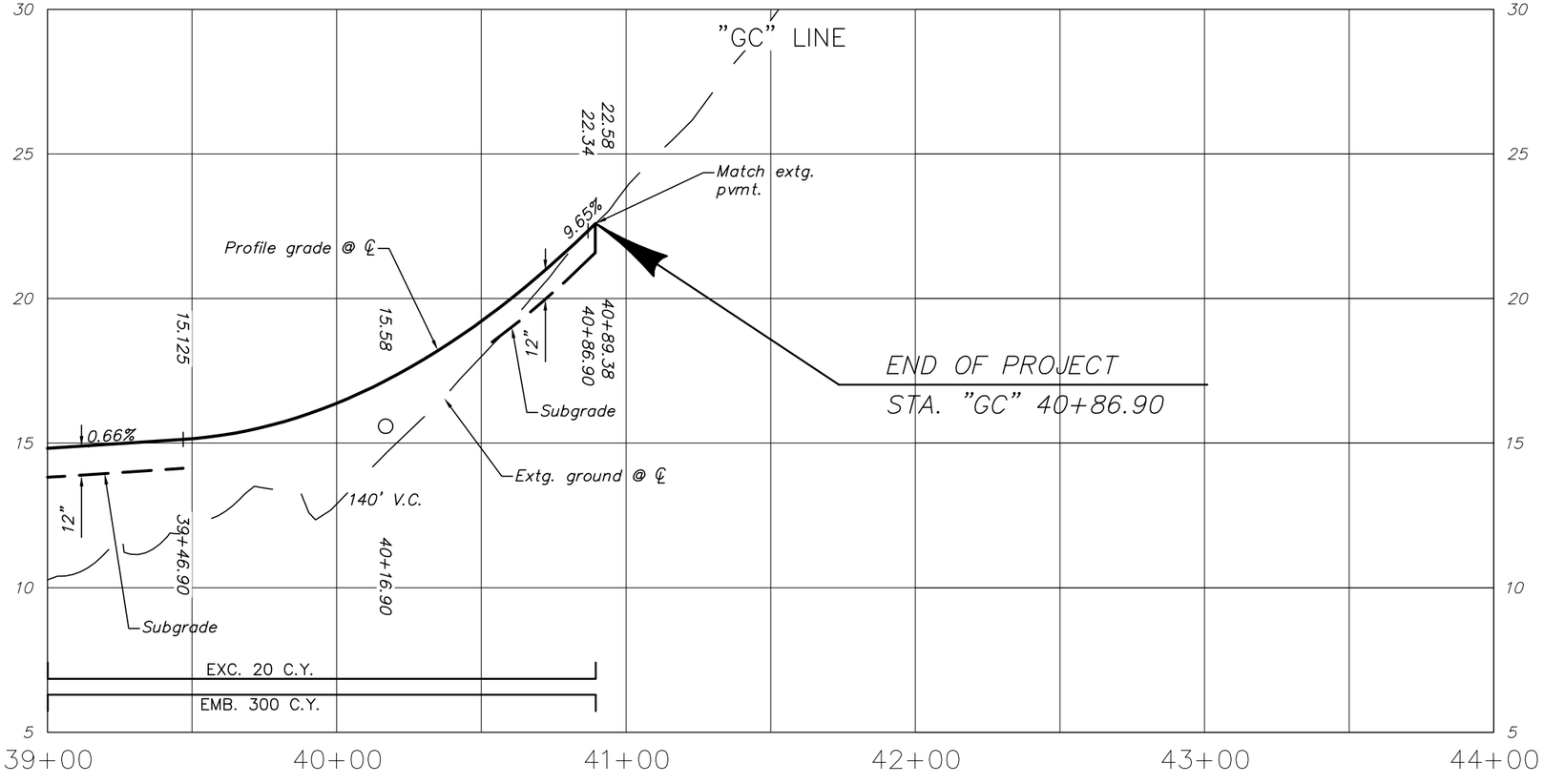
Sec. 7, T. 25 S., R. 12 W., W.M.



1 Const. Golf Course Lane
(For details, see sheet 2)



LEGEND
Cut slope line — — —
Fill slope line . . . . . .

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JORDAN COVE ENERGY PROJECT
GOLF COURSE LANE

COOS COUNTY

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GENERAL CONSTRUCTION

SHEET NO. 7

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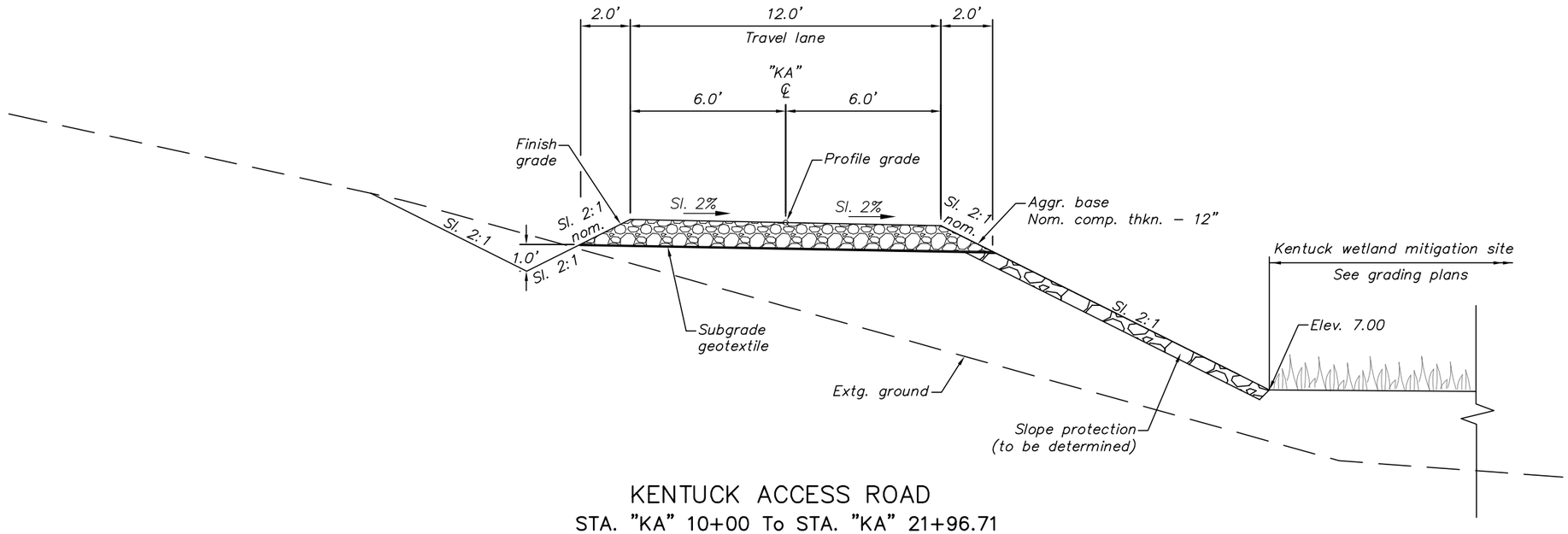

KENTUCK ACCESS ROAD
STA. "KA" 10+00 To STA. "KA" 21+96.71

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2100 Southwest River Parkway
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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

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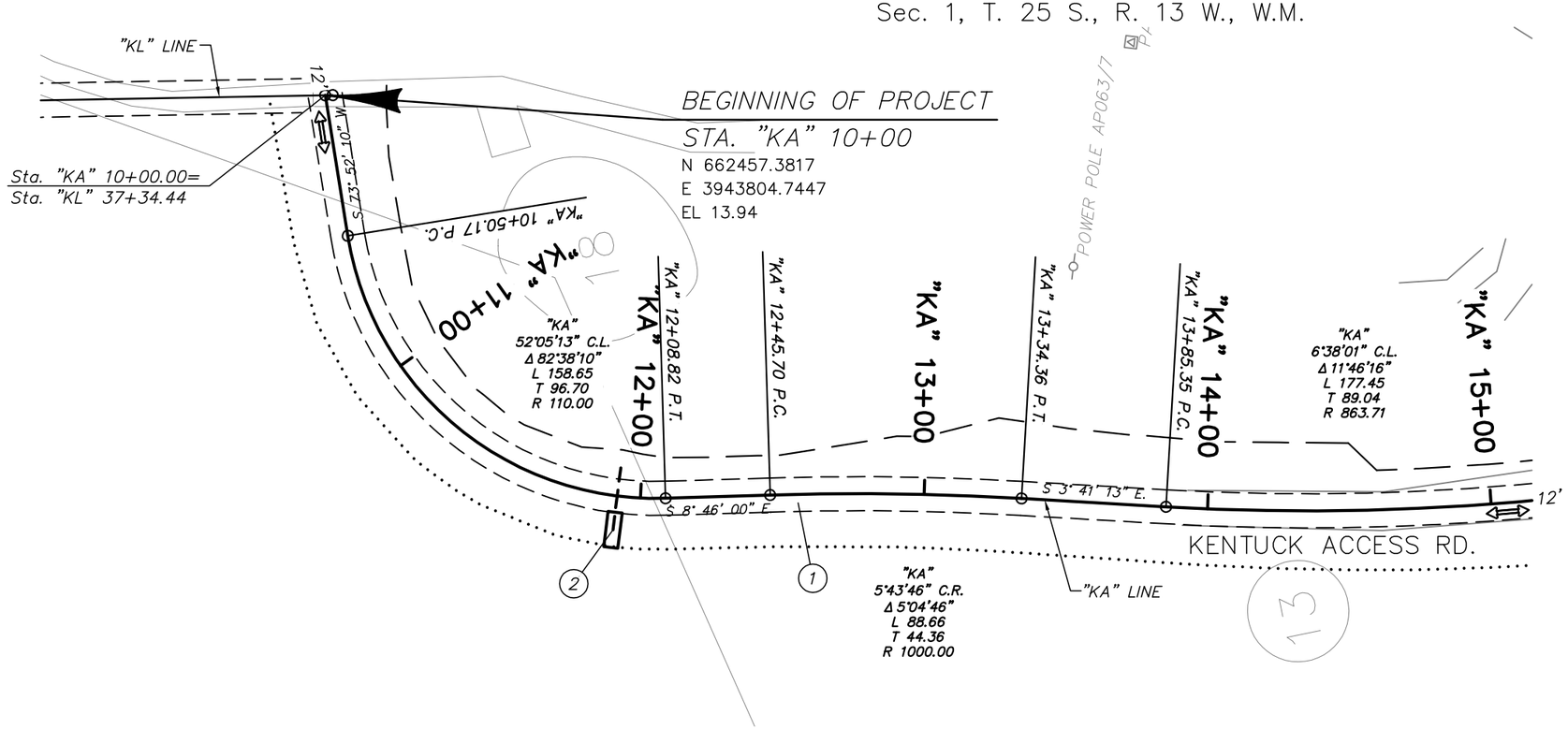
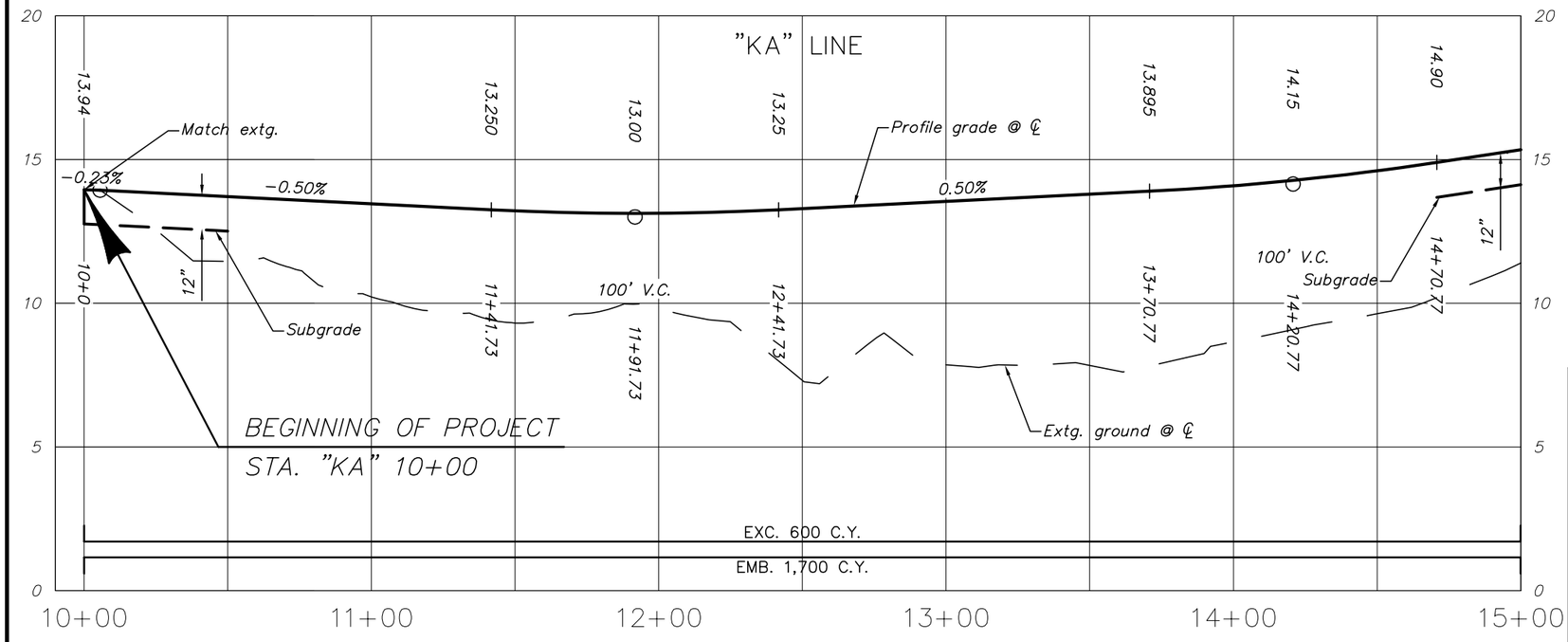
Sec. 1, T. 25 S., R. 13 W., W.M.





LEGEND
Cut slope line — — —
Fill slope line ·····

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JORDAN COVE ENERGY PROJECT
KENTUCK ACCESS

COOS COUNTY

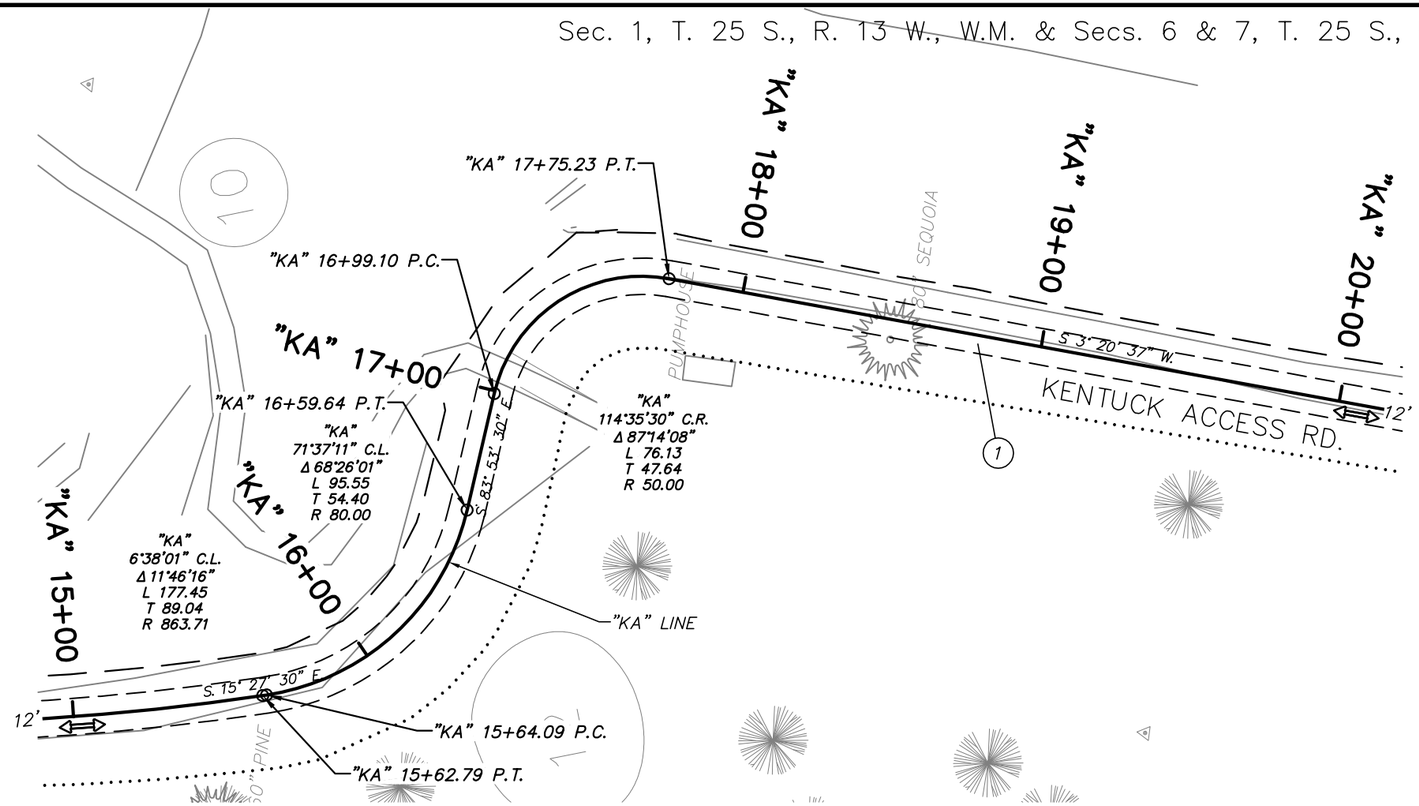
Reviewed By – G. Oien
Designed By – J. DeMello
Drafted By – C. Filer

GENERAL CONSTRUCTION

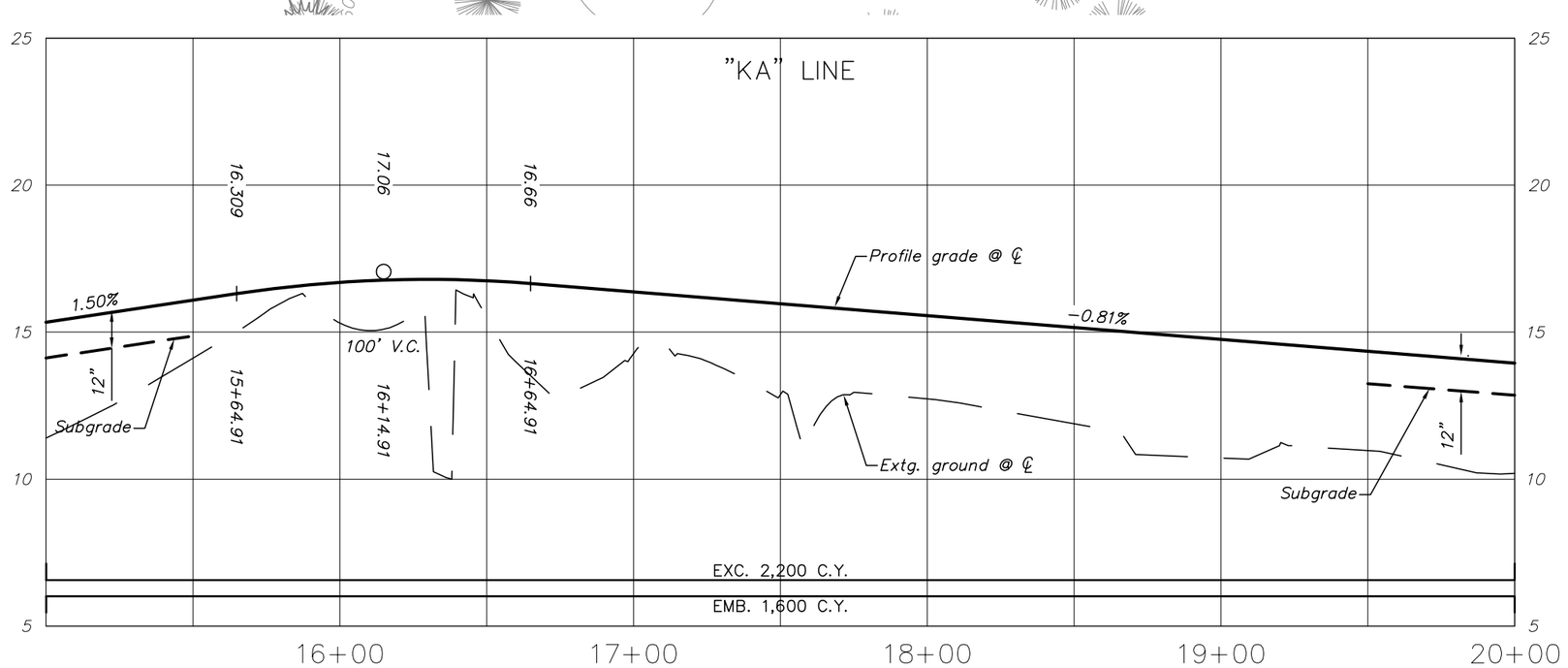
SHEET NO. 3

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.



(1) Const. 12' Access Road
(For details, see sheet 2)



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
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Drafted By – C. Filer

GENERAL CONSTRUCTION

SHEET NO. 4

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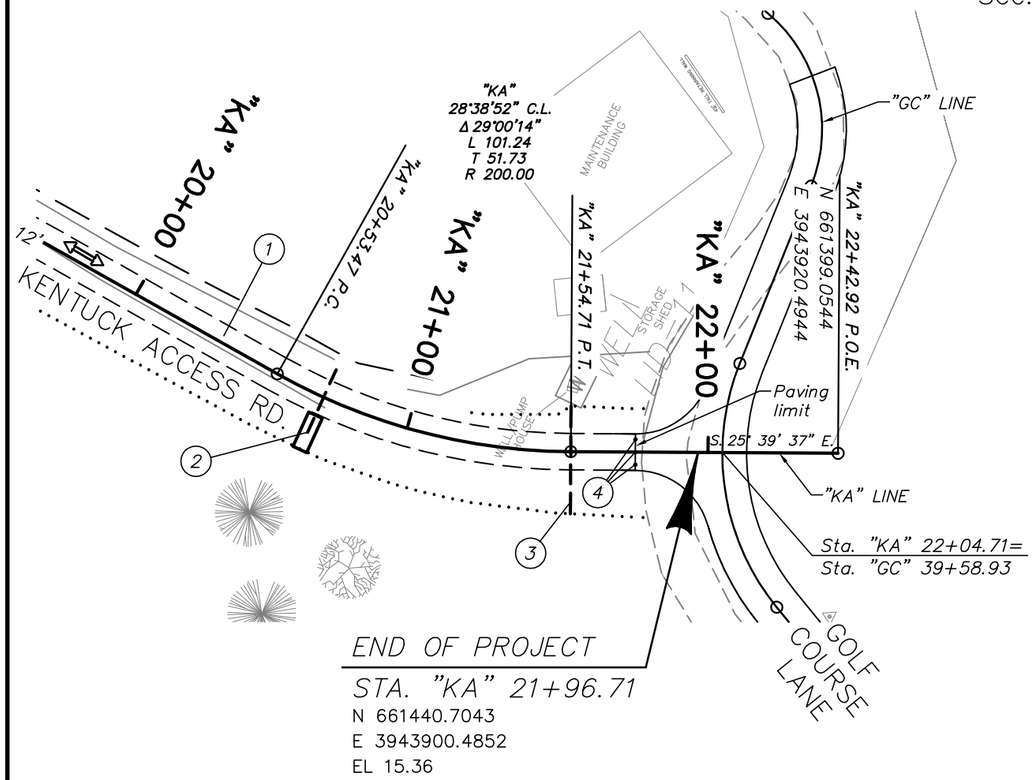
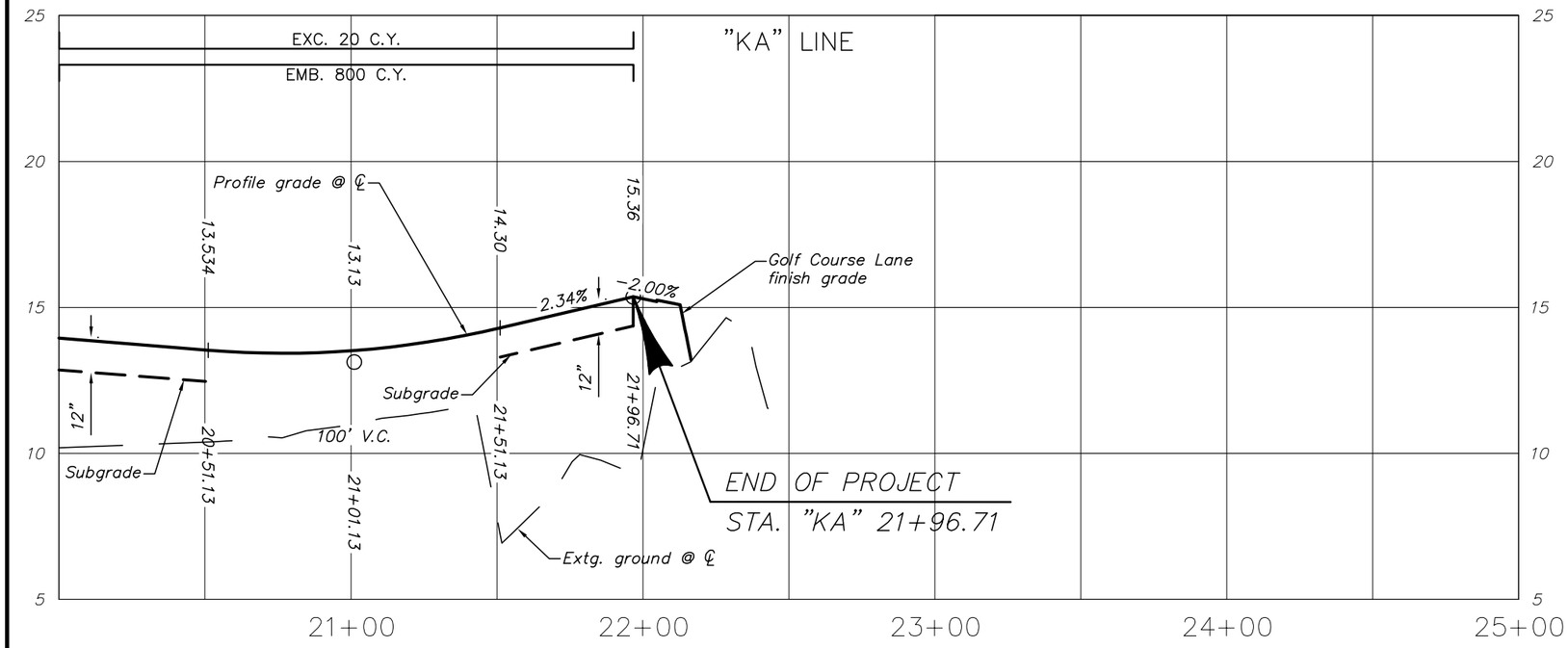
Sec. 7, T. 25 S., R. 12 W., W.M.



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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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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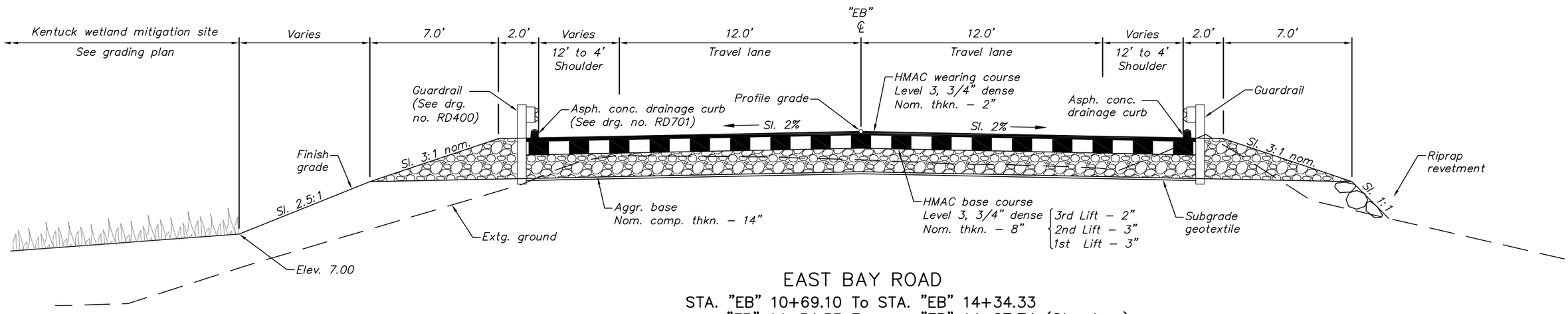
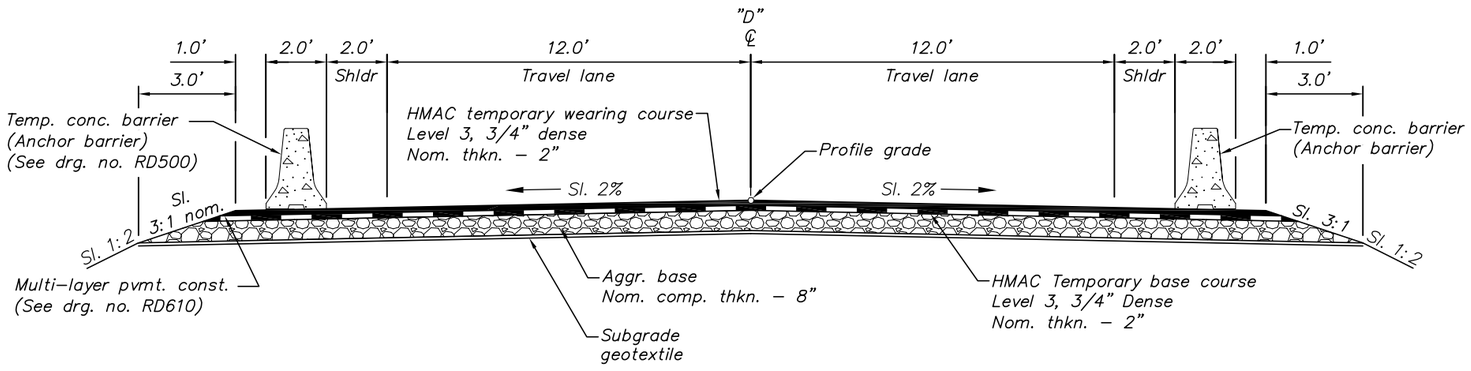


EAST BAY ROAD

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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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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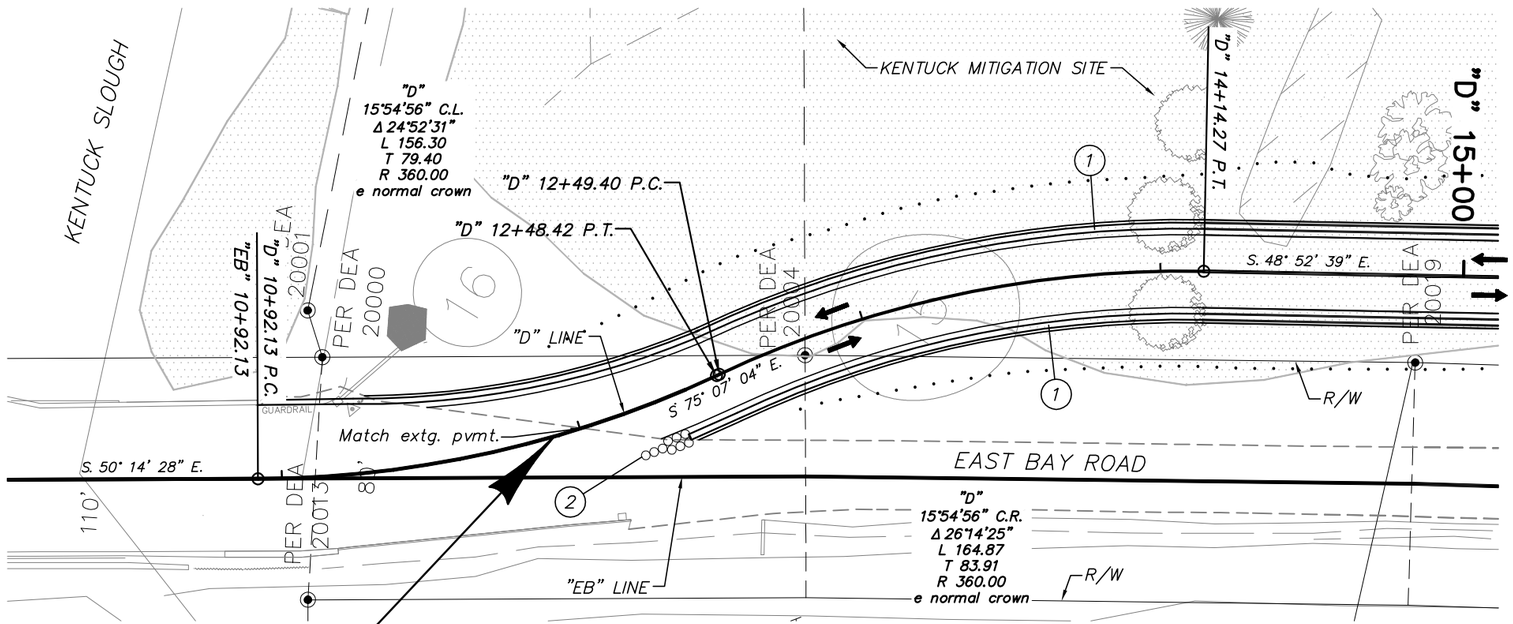
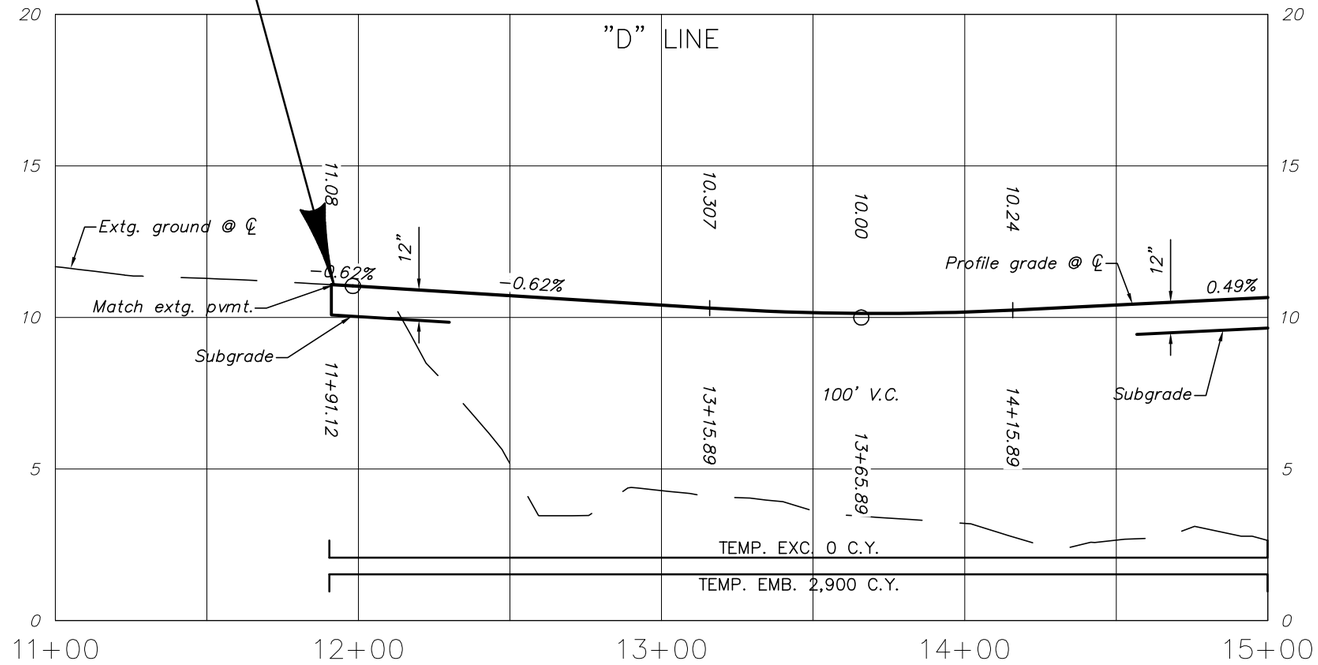
D E T O U R



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)

BEGINNING OF DETOUR
STA. "D" 11+91.12



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

DETOUR PLAN

SHEET NO. 2C

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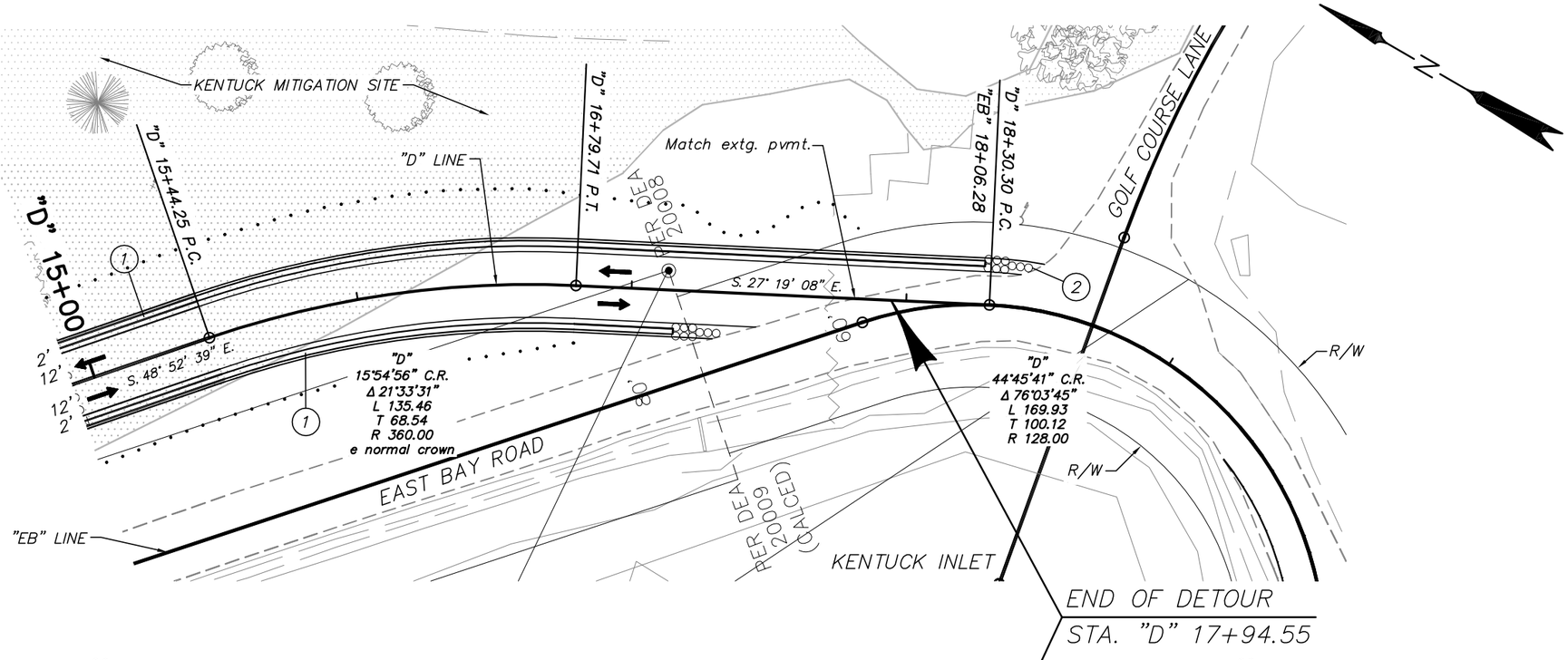
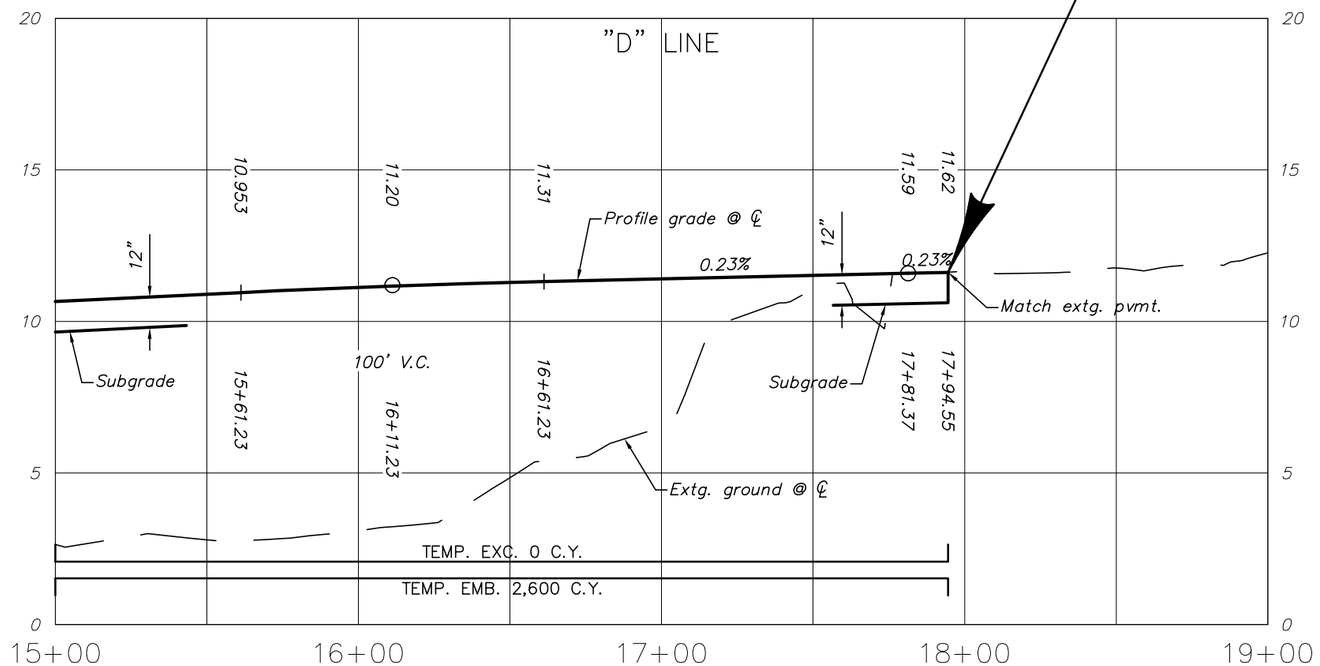
D E T O U R



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 . . . . . .

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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

DETOUR PLAN

SHEET NO. 2C–2

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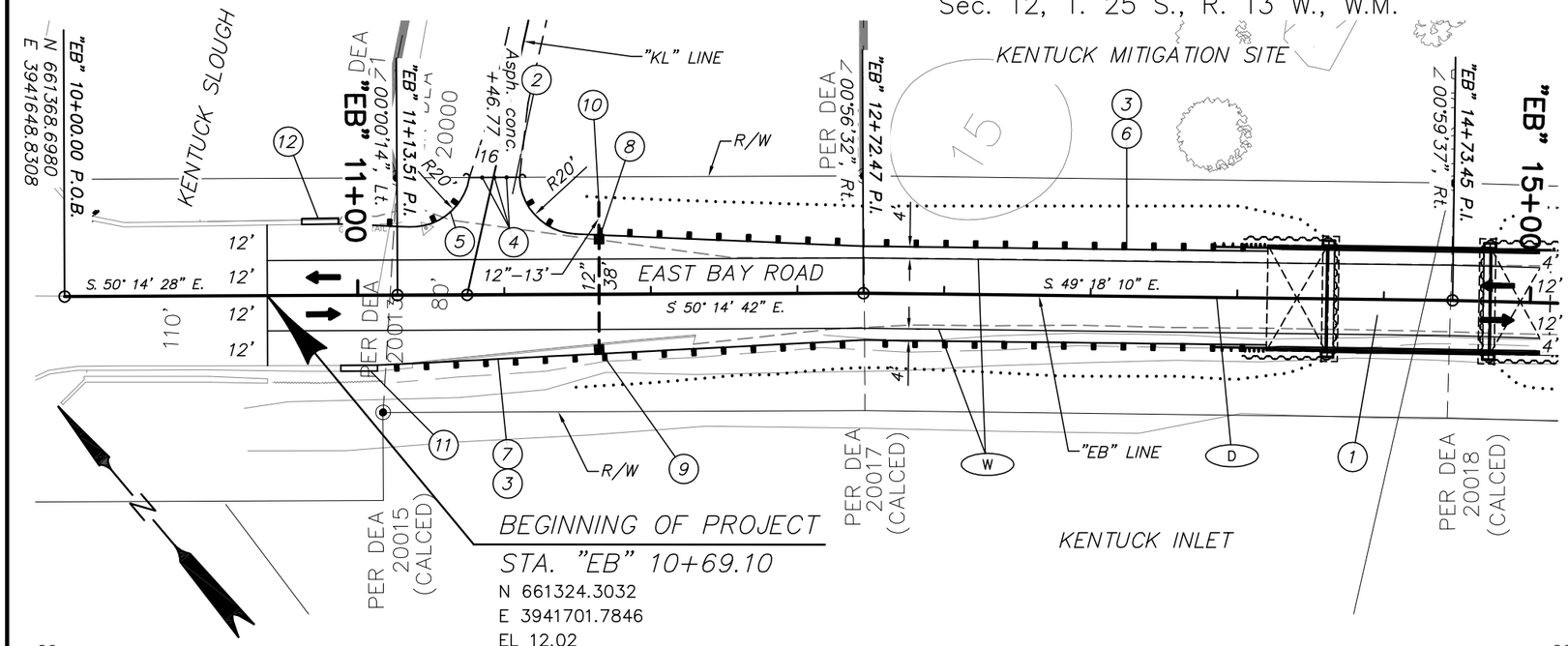

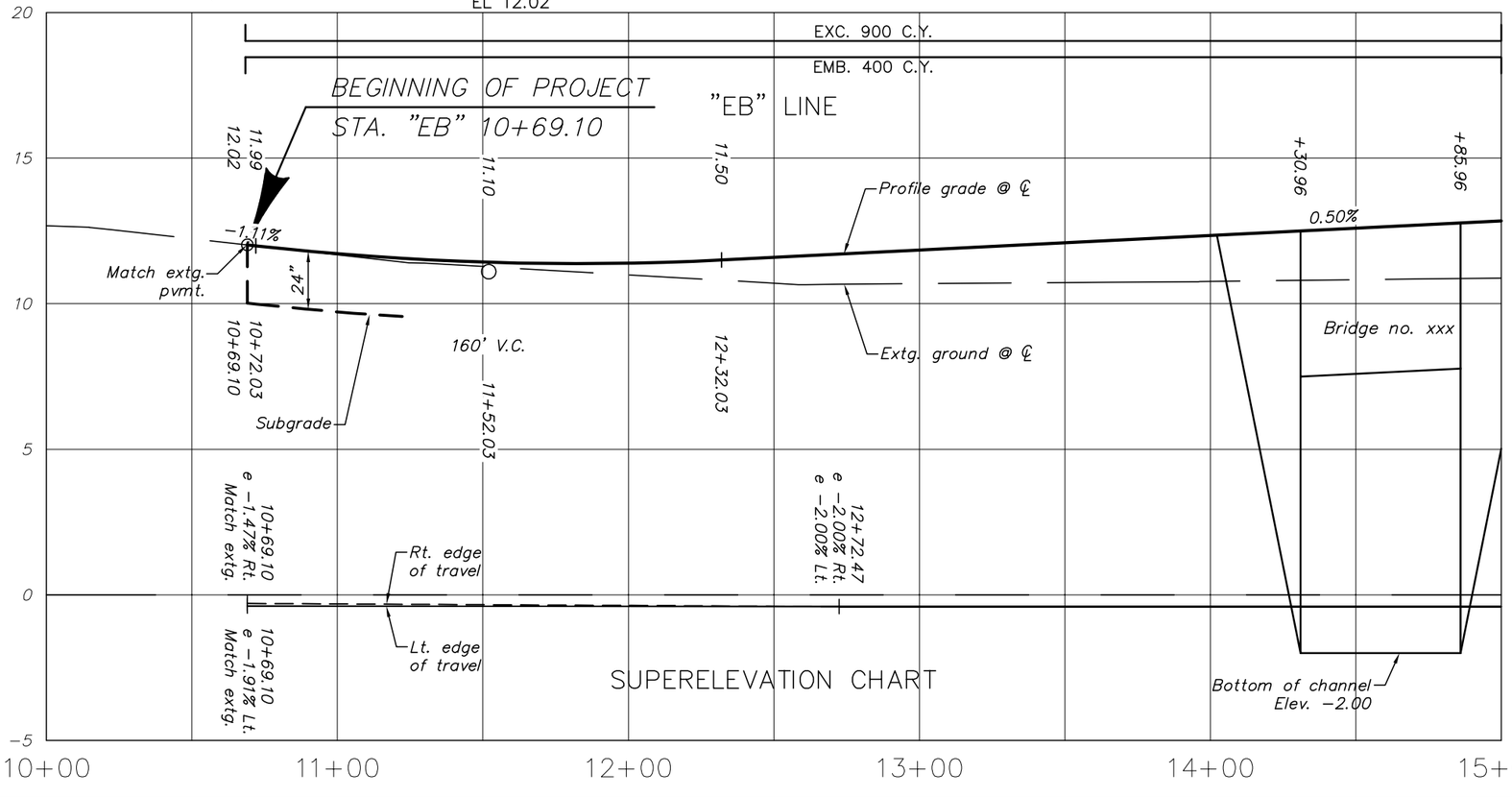

(1) *Structure no. xxx*
Const. structure – 55'
Rdwy. width – 32'
(For drg. nos., see sht. 1A)

(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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FOR CONSTRUCTION

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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. 3

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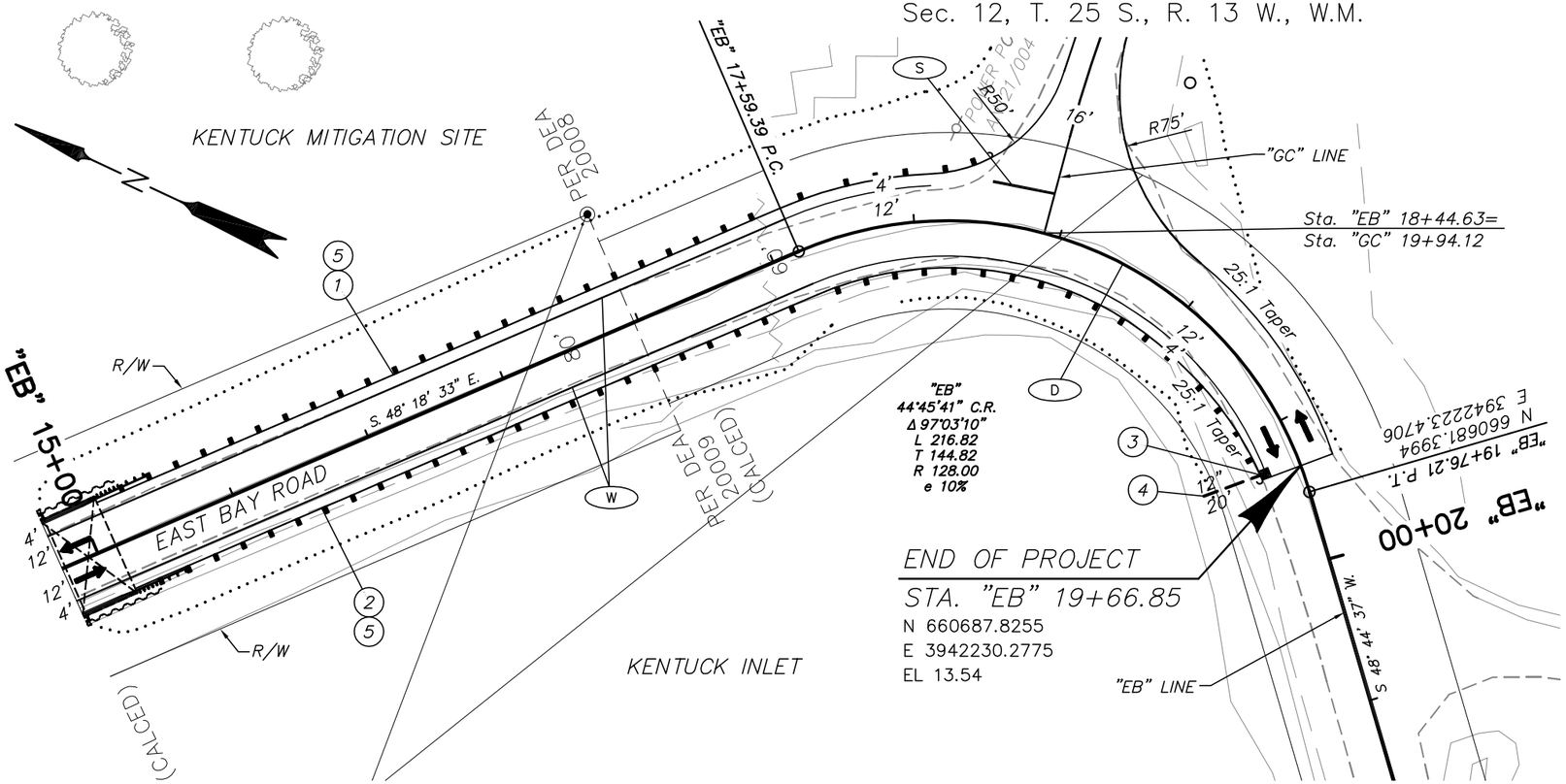
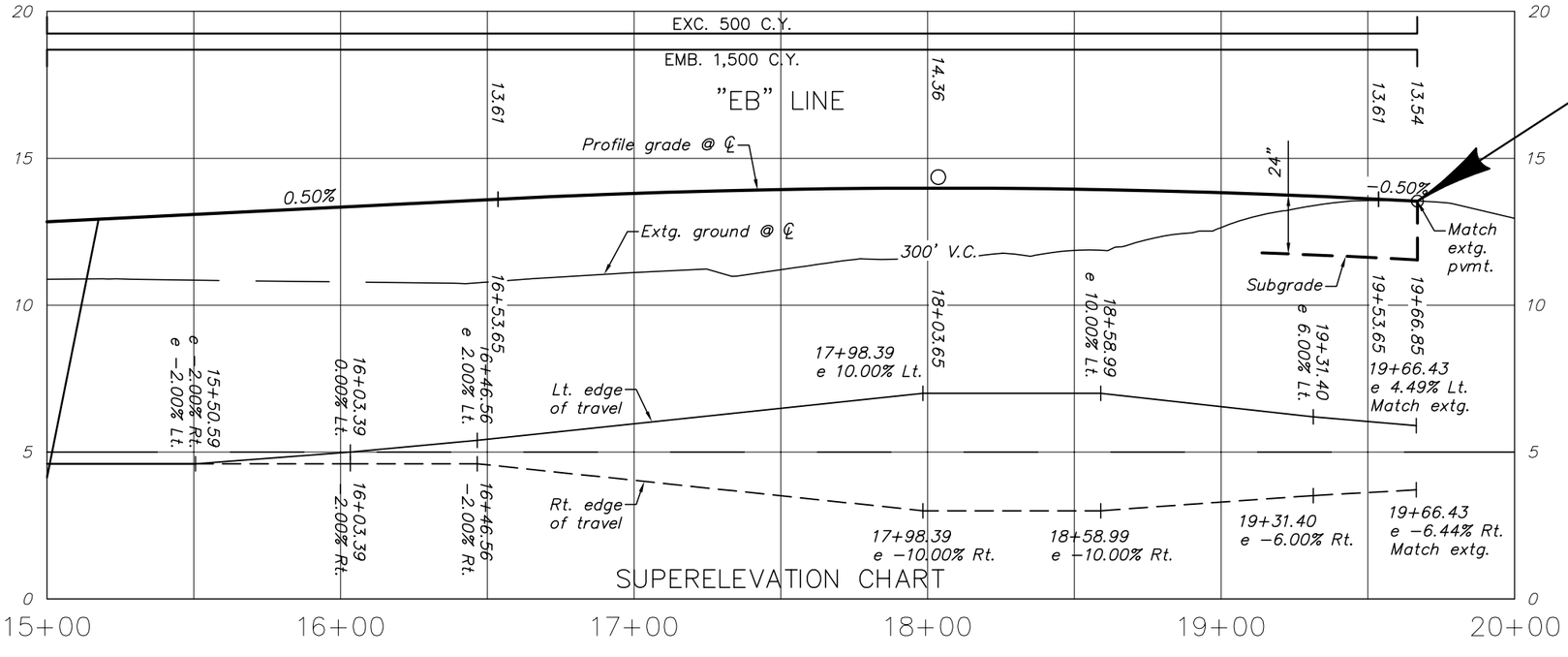
Sec. 12, T. 25 S., R. 13 W., W.M.



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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Portland Oregon 97201 Ph: 503.223.6663

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EAST BAY ROAD

COOS COUNTY

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GENERAL CONSTRUCTION

SHEET NO. 4

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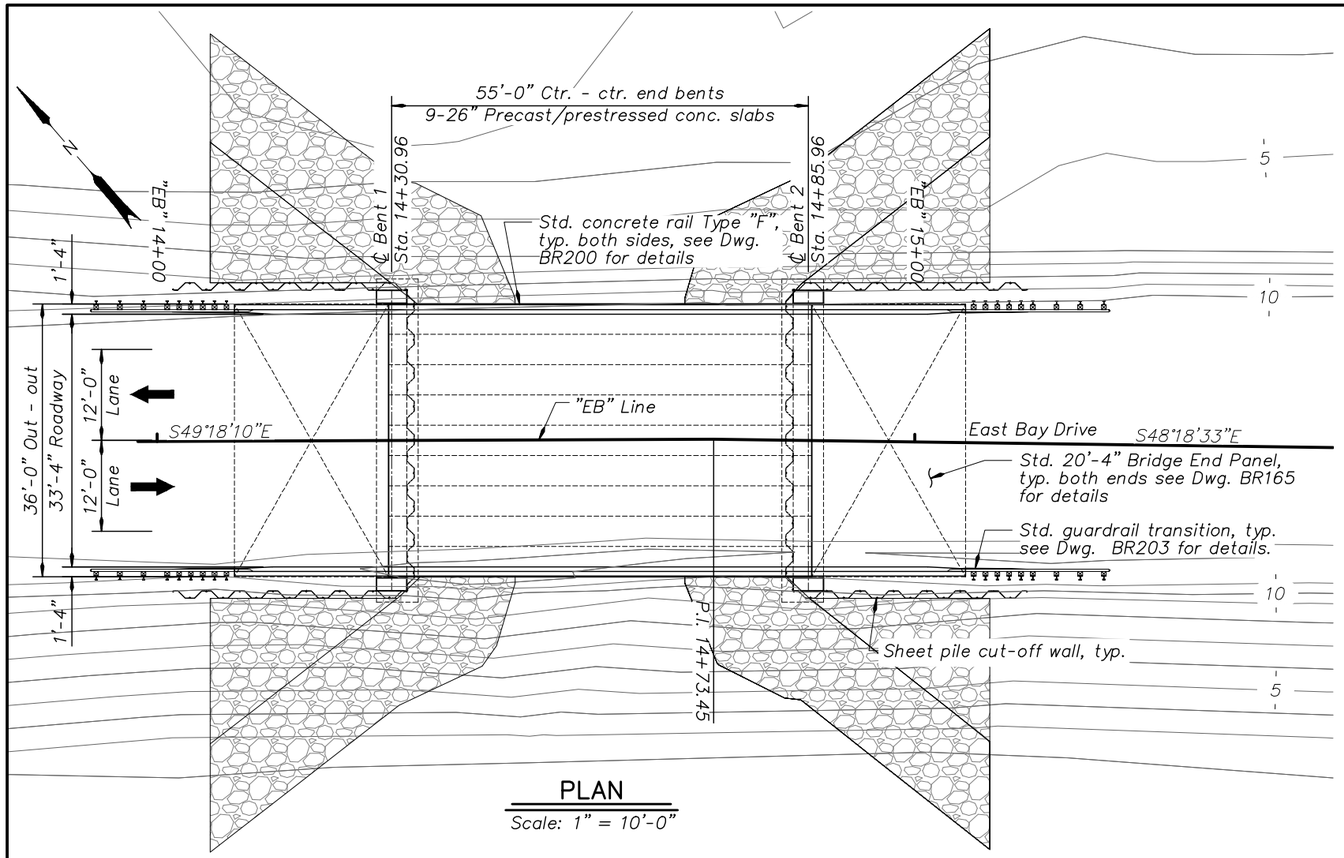

PLAN

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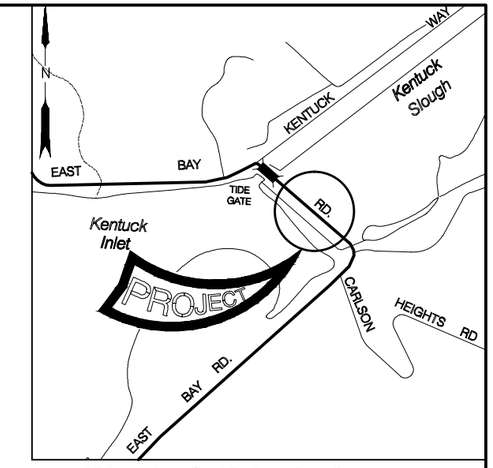

SEC. 12, T. 25 S., R. 13 W., W.M.

LOCATION MAP

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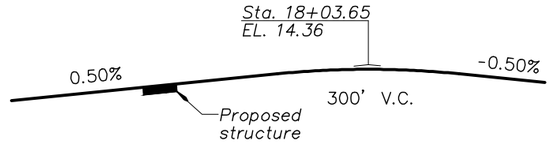

GRADELINE DIAGRAM

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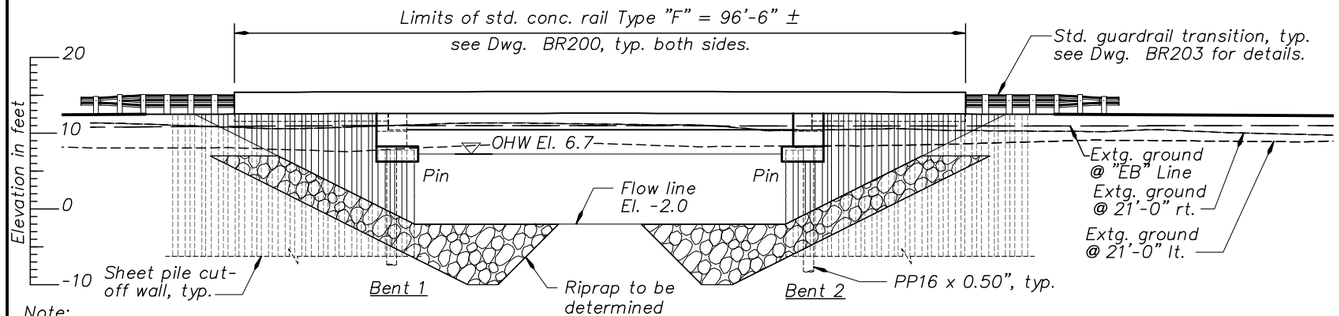

Note:
Elevations shown are based on North American Vertical Datum, 1988.

ELEVATION

Scale: 1" = 10'-0"

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DATE	BY	REVIEW PLANS Aug 29, 2014 DO NOT SCALE DO NOT USE FOR CONSTRUCTION

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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

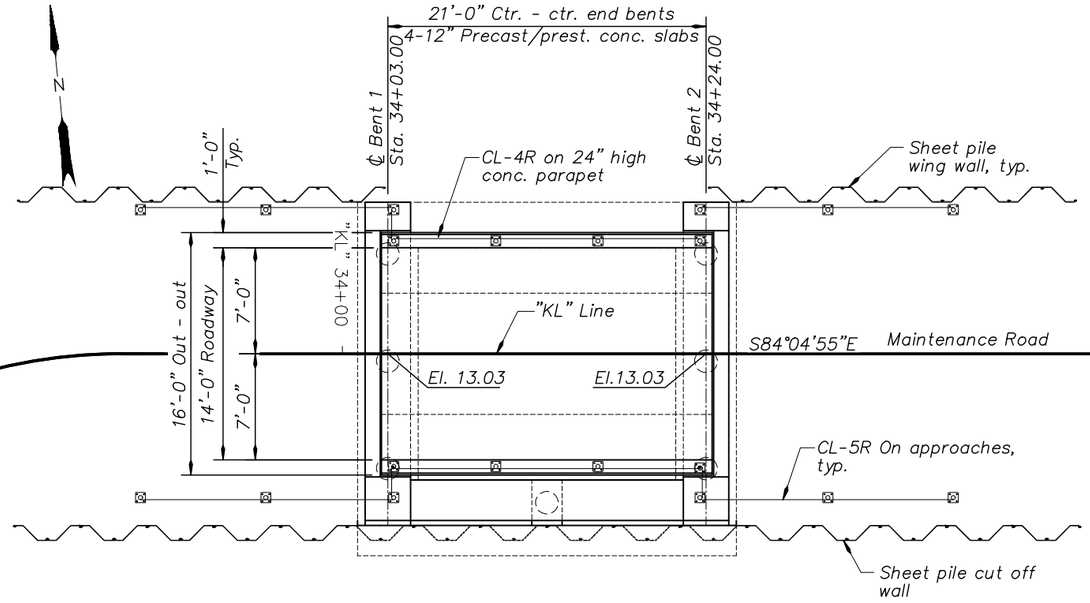
DAVID EVANS AND ASSOCIATES INC.
530 Center Street N.E., Suite 605
Salem Oregon 97301
Phone: 503.361.8635

STRUCTURE NO. XXXXX
DATE Month 2014
CALC. BOOK -----

EAST BAY DRIVE BRIDGE
JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

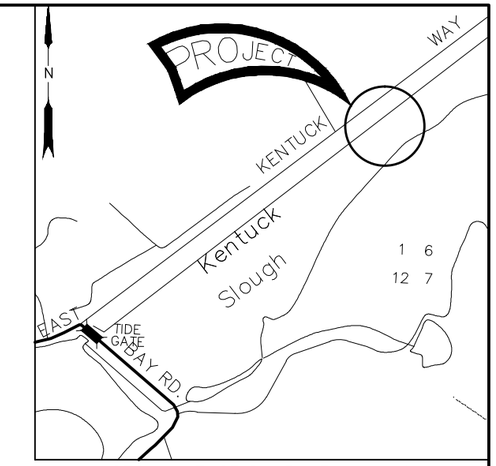
PLAN AND ELEVATION

SHEET 1 OF 6
DRAWING NO. B701



PLAN

Scale: 1" = 5'-0"



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

LOCATION MAP

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El. 13.03

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

GRADELINE DIAGRAM

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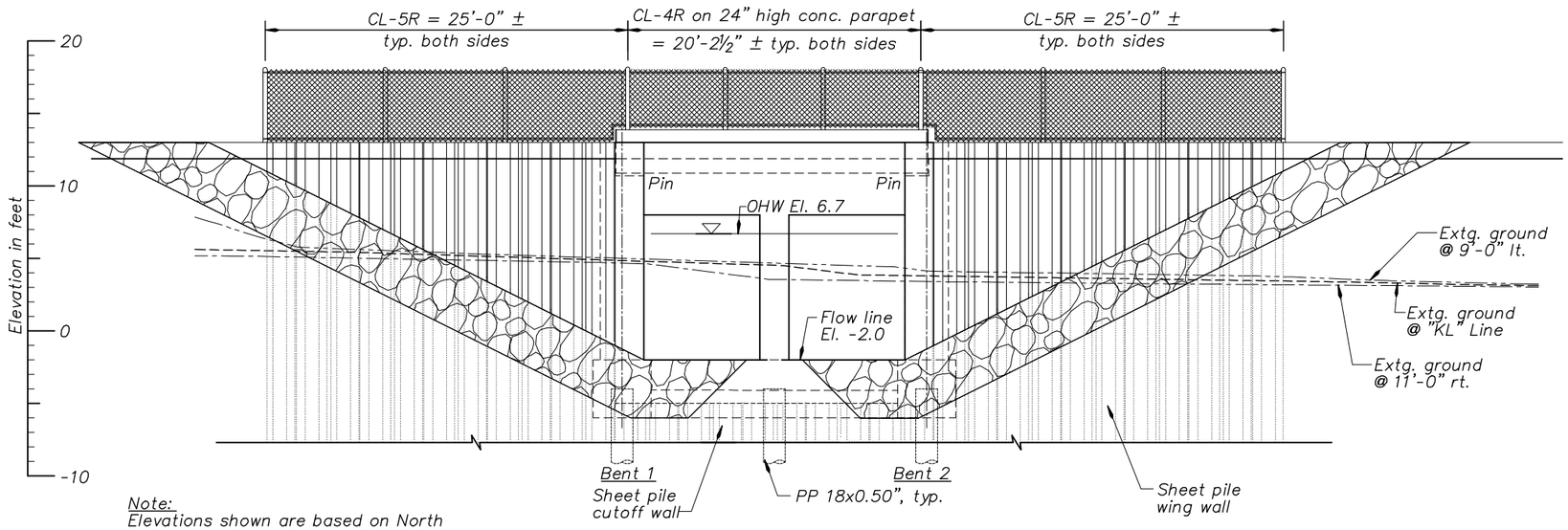

Note:
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ELEVATION

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DESIGNER: Jason Stroud
CHECKER: Anthony Calcagno
REVIEWER: Terry Stones

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EXPIRES:

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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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A.6. Alternatives Analysis (FERC Resource Report 10)

JCEP LNG TERMINAL PROJECT

Resource Report 10 – Alternatives

To Verify Compliance with this Minimum FERC Filing Requirement:	See the Following Resource Report Section:
Discuss the "no action" alternative and the potential for accomplishing the proposed objectives through the use of other systems and/or energy conservation. Provide an analysis of the relative environmental benefits and costs for each alternative. (§ 380.12(l)(1))	**Section 10.1** **Section 10.2**
Describe alternative routes or locations considered for each facility during the initial screening for the project. (i) For alternative routes considered in the initial screening for the project but eliminated, describe the environmental characteristics of each route or site, and the reasons for rejecting it. Identify the location of such alternatives on maps of sufficient scale to depict their location and relationship to the proposed action, and the relationship of the pipeline to existing rights-of-way. (ii) For alternative routes or locations considered for more in-depth consideration, describe the environmental characteristics of each route or site, and the reasons for rejecting it. Provide comparative tables showing the differences in environmental characteristics for the alternative and proposed actions. The location of any alternatives in this paragraph shall be provided on maps equivalent to those required in paragraph (c) (2) of this section. (§ 380.12(l)(2))	**Section 10.3** **Section 10.4** **Table 10.3-1** **Table 10.3-2** **Table 10.3-3**

RESOURCE REPORT 10
ALTERNATIVES

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RESOURCE REPORT 10
ALTERNATIVES

ACRONYMS

BC	British Columbia, Canada
Bcf	Billion Cubic Feet
Bcf/d	Billion Cubic Feet Per Day
BOG	Boil-off Gas
BPA	Bonneville Power Administration
Btu/hr/ft^2	British Thermal Units Per Hour Per Square Foot
CM	Channel Mile
CPUC	California Public Utilities Commission
DOE	U.S. Department of Energy
EFSC	Energy Facility Siting Council
FEED	Front-end Engineering and Design
FERC	Federal Energy Regulatory Commission
FLSO	Floating Liquefaction and Storage and Offloading System
FTA	Free Trade Agreement
HRSG	Heat Recovery Steam Generator
JCEP	Jordan Cove Energy Project, L.P.
LNG	Liquefied Natural Gas
m^3	Cubic Meter
m^3/hr	Cubic Meters Per Hour
MARAD	U.S. Maritime Administration
MLLW	Mean Lower Low Water
MMcf	Million Cubic Feet
MMTPA	Million Metric Tons Per Annum
MW	Megawatt
MWh	Megawatt Hour
NGA	Natural Gas Act
ODOE	Oregon Department of Energy
OPT	Ocean Power Technologies
PCGP	Pacific Connector Gas Pipeline
U.S.	United States
USACE	United States Army Corps of Engineers
yd^3	Cubic Yard

RESOURCE REPORT 10
ALTERNATIVES

10. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP) is requesting authorization from the Federal Energy Regulatory Commission (FERC) to site, construct, and operate a natural gas liquefaction and export facility (LNG Terminal or Project), located on the bay side of the North Spit of Coos Bay, Oregon. The Project will provide a facility capable of liquefying natural gas and storing the liquefied natural gas (LNG) for export. Once the Project facilities are completed and placed in service, natural gas will be delivered to the LNG Terminal via the proposed Pacific Connector Gas Pipeline (PCGP), which will connect the Project with existing interstate natural gas pipeline systems. The authorization required for the PCGP will be addressed in a separate application filed by PCGP pursuant to Section 7(c) of the Natural Gas Act (NGA).

Natural gas received at the LNG Terminal will be cooled into liquid form and stored in two 160,000 cubic meter (m^3) full-containment LNG storage tanks. The proposed Project facilities will have the capability to allow export of six million metric tons per annum (MMTPA). Approximately 90 LNG carriers per year will be required to transport the LNG to locations in the United States (U.S.) and around the world.

The following facilities will be constructed for the Project:

- 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 per hour (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.

The following facility, although not jurisdictional to FERC, will also be constructed to support the Project:

- The South Dunes Power Plant, a 420 megawatt (MW) natural gas fired combined-cycle electric power plant inclusive of heat recovery steam generator (HRSG) units for the purpose of powering the refrigeration systems in the natural gas liquefaction process and supplying steam to the conditioning units.

Purpose of Report

This Resource Report contains a discussion of, and an evaluation of, the comparative merits of the various alternatives to the Project that might achieve most of the Project objectives (see below). The range of alternatives includes no action or postponed action, using alternative LNG terminals at other locations in the U.S. and Canada, as well as alternative sites along the Pacific Northwest coast of the U.S. and within the Oregon International Port of Coos Bay (Port) for the liquefaction and exportation of a like quantity of LNG.

Agency Communications

The identification of alternatives incorporates comments received from agency and stakeholder consultations during the preliminary stages of Project development (see Section 1.8 in Resource Report 1 – General Project Description for the list of agencies and stakeholders consulted) as well as comments received during the public open house conducted by JCEP.

Report Organization

Resource Report 10 is divided into five main sections, plus a references section. Section 10.1 describes the no action or postponed action alternative, Section 10.2 the system alternatives, and Section 10.3 the onshore port alternatives, including a description of the Project site selection process. Section 10.4 provides a discussion of the process used to identify and select a site within the Port and Section 10.5 provides a discussion of alternative site configurations/layouts for the preferred site in the Port. Section 10.6 includes a discussion of electric power alternatives. Section 10.7 lists references used in the preparation of this Resource Report.

Project Objectives and Evaluation Criteria

The Project is designed to meet each of the primary objectives listed below. Accordingly, each of the alternatives was first evaluated against these Project objectives.

- Develop an LNG terminal facility on the U.S. Pacific Coast where natural gas from supply basins in Western Canada and the Northern Rockies in the U.S. can be delivered through new or existing natural gas pipeline system infrastructure, liquefied, and loaded onto LNG carriers for delivery to Asian and non-coterminous U.S. Pacific markets;
- Use a port location with a suitable and maintained depth for deep draft vessels;

- Use a port location with sufficiently sized developable land that meets the requirements for an LNG terminal facility; and
- Use a site location in a port that is consistent with existing industrial land uses, meets all applicable regulations, accommodates industry standard LNG carriers and minimizes community and environmental impacts.

Potential alternatives that reduce one or more potentially significant environmental impacts were developed. If an alternative attained most of the Project objectives, then other criteria, such as feasibility, were used to narrow the evaluation to a reasonable range of alternatives.

10.1 NO ACTION OR POSTPONED ACTION

The no action alternative would eliminate construction of the LNG Terminal at the site in the Port of Coos Bay. The principal purposes of the Project are to develop a West Coast LNG terminal to provide market outlets, through new and existing pipeline infrastructure, for the increasing gas supplies from both the western Canadian and the U.S. Rocky Mountain supply basins and to serve the growing demand for natural gas in international, and particularly Asian, markets, as well as U.S. domestic markets including Hawaii and Alaska. Further, the Project will be located partially within and directly adjacent to a previously disturbed site. Although the no action alternative would completely avoid the environmental impacts associated with the construction and operation of the Project facilities, it would not provide the desired market outlets for growing gas supplies or the ability to serve new domestic and international markets. The postponed action alternative would only defer construction-related effects to a future date, which could stimulate other proposals by other companies that could result in greater adverse environmental effects than those associated with the Project.

The no action or postponed action alternatives would not achieve the Project's purpose of linking gas producers that have excess supplies with markets in which they can sell to both foreign and domestic gas consumers that have increasing requirements. The development of vast shale gas resources in North America has led to an imbalance in which North American gas supplies exceed the domestic market demand for gas, leading to low gas prices which in turn lead to gas production cutbacks. LNG exports are needed to enhance the development of a healthy natural gas market – one that achieves a balance of supply and demand (see Section 1.1.1.2 in Resource Report 1 – General Project Description). In the absence of the Project, the additional market outlets to international customers, as well as to domestic customers in Alaska and Hawaii, will not be available and the opportunity to thereby strengthen the U.S. natural gas market will be foregone. Additional benefits of the Project that will be foregone include boosting the depressed local, state and regional economies, creating jobs, fostering growth in the upstream natural gas sectors, stimulating the U.S. economy, reducing the U.S. trade deficit, promoting international markets, encouraging liberalized trade, assisting other countries with the diversification of their supply base, and encouraging overseas switching from oil or coal to cleaner natural gas with its environmental benefits. In sum, neither the No Action nor the Postponed Action alternatives would achieve the Project objectives or result in a reduction of potential environmental impacts.

10.2 SYSTEM ALTERNATIVES

System alternatives to the Project using existing and proposed onshore and offshore LNG facilities are discussed in the following sections.

10.2.1 LNG Terminal System Alternatives

10.2.1.1 Existing LNG Export Terminals

There is only one existing LNG export terminal in North America, the Kenai LNG Plant located in Alaska. While it was scheduled to be shuttered, due to declining natural gas reserves and well-head deliverability in the Cook Inlet region, it is being operated by ConocoPhillips Natural Gas Corporation and Marathon Oil Company at the present time on a temporary, year-by-year basis. The Kenai LNG Plant exports LNG primarily to Japanese markets. Because of its remote location, it cannot access supplies from the western Canadian and the U.S. Rocky Mountain supply basins that would be exported by the Project. Moreover, it does not have sufficient capacity to serve the broader Asian markets to be served by the Project. In sum, the Kenai LNG Plant is not well-positioned to meet the stated objectives of the Project and cannot be considered a true system alternative.

10.2.1.2 LNG Export Terminal Projects In Development – East/Gulf Coasts

East Coast

There are two LNG export terminal projects in development along the East Coast:

Dominion Cove Point LNG - Dominion Cove Point LNG, LP (Dominion) has proposed to use its existing LNG terminal on the Chesapeake Bay in Lusby, Maryland for exports. It has received U.S. Department of Energy (DOE) approval to export LNG (1 billion cubic feet (Bcf) per day (Bcf/d)) to Free Trade Agreement (FTA) nations and has a pending application for authorization to export LNG (1 Bcf/d) to non-FTA nations. Dominion has completed the FERC pre-filing process and its FERC application for the liquefaction facilities was noticed by FERC on April 12, 2013. Dominion anticipates that its customers would access supplies primarily from the Marcellus Shale.

Southern LNG Company - Southern LNG Company, LLC (Southern LNG) has proposed to use its existing LNG terminal on Elba Island in Savannah, Georgia for exports. It has received DOE approval to export LNG (0.5 Bcf/d) to FTA nations and has a pending application for authorization to export LNG (0.5 Bcf/d) to non-FTA nations. On December 5, 2012 Southern LNG initiated the FERC pre-filing process and it has recently filed draft resource reports. The proposed in-service date of the liquefaction facilities is December 2016.

Due to their geographic locations relative to the Project, neither Dominion nor Southern LNG is strategically located, as the Project is, to provide market outlets for abundant gas supplies from both the western Canadian and the U.S. Rocky Mountain supply basins or to serve Asian markets and domestic markets in Hawaii and Alaska. Simply stated, these two East Coast projects cannot meet the Project's objectives and therefore they are not viable system alternatives to the Project.

Gulf Coast

There are a number of LNG export terminal projects that are being proposed or are under construction along the Gulf of Mexico. All these Gulf Coast projects anticipate that supplies will come from, *inter alia*, gas fields in the Permian, Anadarko and Hugoton basins and unconventional gas fields in the Barnett, Haynesville and Eagle Ford basins. While additional Gulf Cost projects continue to be proposed, the first fourteen projects to commence the regulatory processes are briefly described in the following paragraphs.

Sabine Pass – The Sabine Pass LNG terminal in Sabine, Louisiana commenced import operations in 2008; it has recently re-exported imported LNG. Sabine Pass Liquefaction, LLC (Sabine) proposes to use the existing infrastructure at the Sabine Pass terminal, including five storage tanks and two berths, and to add liquefaction facilities, including four modular LNG trains, each with a peak processing capacity of up to approximately 0.7 Bcf/d, to make the terminal bi-directional. Sabine received FERC authorization to construct and operate liquefaction and export facilities and construction is underway. Sabine has also received DOE approvals to export (2.2 Bcf/d) to both FTA and non-FTA nations. Of the proposed export projects currently in development, Sabine is the only one that has received FERC authorization for the necessary facilities and is the only export project that has received non-FTA nations authority. Sabine anticipates commencing export operations in 2015.

Freeport - The Freeport LNG terminal on Quintana Island near Freeport, Texas began operations as an import facility in 2008, and has re-exported imported LNG. Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC (together Freeport) are now proposing to add liquefaction infrastructure and use the single berth and two storage tanks at the existing terminal. Freeport LNG has completed the FERC pre-filing process and its FERC application for adding an export capacity of 1.9 Bcf/d, noticed by FERC on September 12, 2012, is currently pending. Freeport has received two separate DOE approvals to export (1.4 Bcf/d each) to FTA nations and has pending before DOE two separate applications to export (1.4 Bcf/d each) to non-FTA nations. Freeport anticipates commencing liquefaction and export operations in 2017.

Lake Charles – The Lake Charles terminal in Lake Charles, Louisiana began import operations in 1981. As expanded as of 2006, it has two berths and four storage tanks with a total capacity of 9 Bcf. Trunkline LNG, the terminal's owner, plans to install liquefaction facilities and operate the Lake Charles terminal as a bi-directional facility. It initiated the FERC pre-filing process in March 2012 and recently responded to scoping comments. Lake Charles Exports, LLC (Lake Charles) has received DOE approval to export (2.0 Bcf/d) to FTA nations and has pending before DOE an application to export (2.0 Bcf/d) to non-FTA nations. Lake Charles anticipates that export operations will begin in August 2018.

Cameron – The Cameron LNG terminal in Hackberry, Louisiana began operations as an import facility in 2008; it has re-exported imported LNG. Cameron LNG, LLC (Cameron) is now proposing that the terminal become a bi-directional facility by using the existing facilities, including two marine berths capable of accommodating Q-Flex sized LNG ships and four LNG storage tanks with a combined storage capacity of 640,000 m^3, and adding three liquefaction trains for a total export capability of 12 MMTPA. Cameron has completed the FERC pre-filing process and its application, noticed by FERC on December 26, 2012, is currently pending. Cameron has received DOE approval to export (1.7 Bcf/d) to FTA nations and has pending before DOE an application to export (1.7 Bcf/d) to non-FTA nations. Cameron anticipates commencing liquefaction and export operations using its first train in late 2016.

Gulf Coast LNG - Gulf Coast LNG proposes to export LNG from a natural gas liquefaction facility and LNG export terminal located at the Port of Brownsville in Brownsville, Texas. The project will have four liquefaction trains capable of liquefying up to 2.8 Bcf/d of natural gas, full containment tanks (number and size not specified), a marine berth, and a pipeline connecting the terminal to natural gas transportation lines. Gulf Coast has received DOE approval to export (2.8 Bcf/d) to FTA nations and has pending before DOE an application to export (2.8 Bcf/d) to non-FTA nations. Gulf Coast has not yet initiated the FERC pre-filing process. Gulf Coast anticipates that the project will be in-service by 2018.

Corpus Christi – Corpus Christi Liquefaction, LLC (Corpus Christi) proposes a project comprising a liquefaction and export plant and import facilities with regasification capabilities to be located at the site of the Corpus Christi LNG Import Terminal in Corpus Christi, Texas (which is no longer authorized, construction having been suspended in 2008). As proposed, the facility will have one berth, three storage tanks, two vaporization trains and three liquefaction trains. The liquefaction capacity would be 1.8 Bcf/d. Corpus Christi has completed the FERC pre-filing process and its application, noticed by FERC on September 14, 2012, is currently pending. Corpus Christi's affiliate, Cheniere Marketing, LLC, has received DOE approval to export LNG from the Corpus Christi terminal (2.1 Bcf/d) to FTA nations and has pending before DOE an application to export (2.1 Bcf/d) to non-FTA nations. Corpus Christi has an anticipated in-service date of December 2017.

Gulf LNG – The Gulf LNG Energy import terminal in Pascagoula, Mississippi was authorized by FERC in 2007 and commenced operations in 2011; the facility has a single berth and two storage tanks. Gulf LNG Liquefaction Company, LLC (Gulf LNG) is taking steps to add liquefaction facilities and export capacity to make the terminal bi-directional. Gulf LNG has received approval from DOE to export (1.5 Bcf/d) to FTA nations and has pending before DOE an application to export (1.5 Bcf/d) to non-FTA nations. Gulf LNG requested to initiate the FERC pre-filing process on December 5, 2012, but FERC declined to consider the request until Gulf LNG has complied with the procedures required by FERC's Regulations.

Lavaca Bay – Excelerate Liquefaction Solutions I, LLC (ELS) plans to construct, own, and operate two purpose built floating liquefaction and storage and offloading systems (FLSO) that would produce LNG. The FSLOs would be permanently moored at a shore side dock to be constructed in Port Lavaca located in Calhoun County, Texas. Each of the two FLSOs will have four liquefaction trains and storage for up to 250,000 m^3 of LNG. The FLSOs will each produce up to five MTPA. The project will require improvement dredging of the existing Matagorda Ship Channel to accommodate the delivery of the FLSOs and new dredging to create a berth for the FLSOs and a berth and turning basin for the LNG carriers. Lavaca Bay Pipeline System, LLC would construct and operate an approximate 27-mile-long 36-inch diameter natural gas pipeline, two compressor stations, metering, and appurtenant facilities to connect with nine interstate and intrastate pipelines. Lavaca Bay initiated the FERC pre-filing process in November 2012 and has recently filed draft resource reports. It has received approval from DOE to export (1.38 Bcf/d) to FTA nations and has pending before DOE an application to export (1.38 Bcf/d) to non-FTA nations. The proposed in-service date is December 2017.

Golden Pass – Golden Pass Products LLC is proposing to add liquefaction and export capabilities to its affiliated existing import terminal owned and operated by Golden Pass LNG Terminal LLC and located in Sabine Pass, Texas, utilizing the existing five tanks (with a combined storage capacity of 155,000 m^3), two berths and 70 miles of pipeline infrastructure. The project's send-out capacity would be 15.6 MMTPA. Golden Pass has received DOE approval to export (2.6 Bcf/d) to FTA nations and has pending before DOE an application to export (2.6 Bcf/d) to non-FTA nations. Golden Pass expects to initiate the FERC pre-filing process soon.

Main Pass –Main Pass Energy Hub LLC received DOE approval to export (3.22 Bcf/d) to FTA nations in January 2013. It has stated that it will apply at a later date for authorization to export to non-FTA nations. Main Pass proposes to export from existing and new facilities (including six FLSOs) that it intends to modify, build and operate at the MPEH Deepwater Port located in Federal waters in Main Pass Block 299, 16 miles offshore southeastern Louisiana, which was

approved in January 2007 by the U.S. Maritime Administration (MARAD) for importation and regasification. Main Pass has stated that upon receipt of DOE approval it will initiate the pre-filing process at MARAD for the export facilities.

CE FLNG – CE FLNG, LLC is planning a terminal in Plaquemines Parish, Louisiana that will consist of two FLSOs, each capable of producing 4 MMTPA of LNG and with a storage capacity of 250,000 m^3. CE FLNG has received approval from DOE to export (1.07 Bcf/d) to FTA nations and has pending before DOE an application to export (1.07 Bcf/d) to non-FTA nations. In April 2013 it initiated the pre-filing process at FERC.

Waller Point – Waller LNG Services, LLC (d/b/a Waller Point LNG) proposes to export LNG from the Waller Point LNG Terminal under development by its affiliate Waller Marine, Inc in Cameron Parish, Louisiana. That facility will have liquefaction trains capable of producing 1.25 MMTPA, storage capacity of 30,000 m^3, and berthing and other associated facilities. Waller Point has received approval from DOE to export (0.16 Bcf/d) to FTA nations; it has not applied (or stated that it will apply) for authority to export to non-FTA nations. Waller Point has stated that it will initiate the pre-filing process at FERC after receipt of its FTA authorization from DOE.

Pangea – Pangea LNG (North America) Holdings, LLC is developing the ST [South Texas] LNG Export Project near Ingleside, Texas at the Port of Corpus Christi consisting of land-based and floating components and to be constructed in two phases, each capable of producing 4 MMTPA of LNG and with a storage capacity of 250,000 m^3. Pangea has received approval from DOE to export (1.09 Bcf/d) to FTA nations; its application for DOE approval to export (1.09 Bcf/d) to non-FTA nations is pending. It has not yet initiated the pre-filing process at FERC.

Magnolia – Magnolia LNG, LLC is proposing an export terminal at the Port of Lake Charles in Louisiana consisting of two liquefaction trains, each capable of producing 2 MMTPA, a storage tank with a capacity of 200,000 m^3, and vessel loading facilities. Magnolia applied in December 2012 for DOE approval to export (0.54 Bcf/d) to FTA nations; it stated that, if and when it determines to pursue a second phase of its project encompassing exports to non-FTA nations, it will apply for the necessary DOE approval. It initiated the pre-filing process at FERC in March and has recently filed draft resource reports.

While some Gulf Coast projects are operational as import terminals or authorized to add liquefaction and export facilities, none of the projects in the Gulf Coast can substitute for the Project because of their geographic location relative to the Project. Exports from these locations all would have longer transit distances to the potential Asian LNG markets in the Pacific Rim and U.S. markets in Hawaii and Alaska. They would not provide the shortened transit to those markets that the Project will. Also none are strategically located, as the Project is, to provide market outlets for abundant gas supplies from both the western Canadian and the U.S. Rocky Mountain supply basins. Simply stated, they cannot meet the Project's objectives. Therefore they are not viable system alternatives to the Project.

10.2.1.3 LNG Export Terminal Projects In Development - West Coast

U.S. West Coast

There is only one LNG terminal project other than the Project in development along the Pacific Coast of the coterminous U.S. – Oregon LNG in Warrenton, Oregon. One additional project has been proposed – Alaska Gasline Port Authority in Valdez, Alaska. These two projects are briefly described below.

Oregon LNG – LNG Development Company, LLC d/b/a Oregon LNG is proposing to convert its pending import terminal project to a bi-directional facility. In July 2012 it initiated the FERC pre-filing process; it has received FERC's comments on its draft resource reports and is preparing to file its FERC application. Oregon LNG received DOE approval to export (1.25 Bcf/d) to FTA nations and has pending before DOE an application to export (1.25 Bcf/d) to non-FTA nations.. The Oregon LNG export facility will receive most of its natural gas from gas fields in British Columbia or Alberta. The Oregon LNG site is near the mouth of the Columbia River. The export project has been designed to include a marine loading terminal, two storage tanks, and facilities to support ship berthing and cargo loading. Oregon LNG anticipates commencing operation in 2017.

Oregon LNG may be considered a system alternative to the Project However, Oregon LNG's location in the lower Columbia River estuary is problematic when considering potential effects on numerous species of federally listed threatened and endangered fish. While Oregon LNG may be considered a viable alternative for LNG exports to Asian markets, its pipeline interconnections limit it to Canadian gas supplies and it would not be able to access the gas supplies from the U.S. Rocky Mountain supply basins that the Project will. Additionally, it is unlikely that Oregon LNG's project would be able to liquefy and export natural gas in the same time frame as the Project to meet anticipated market demands. For these reasons, Oregon LNG cannot meet significant Project objectives. Therefore it is not a viable system alternative to the Project.

Alaska Gasline Port Authority – AGPA, a political subdivision of the State of Alaska, filed in July 2012 for DOE approval to export (2.5 Bcf/d) to FTA nations. On March 7, 2012, DOE dismissed its application, stating that neither the availability of a pipeline to Valdez or a commitment from producers to supply North Slope gas had been demonstrated and further that AGPA had not settled on a location for its facility.

Even were AGPA able to proceed at DOE, the construction of an Alaskan pipeline remains a formidable challenge for AGPA's plans for exports. In addition, AGPA would not be able access the Canadian gas supplies that the Project will and, like Oregon LNG, would not be able to access the gas supplies from the U.S. Rocky Mountain supply basins that the Project will. Also like Oregon LNG, it is unlikely that AGPA 's project would be able to liquefy and export natural gas in the same time frame as the Project to meet anticipated market demands. For these reasons, AGPA cannot meet significant Project objectives. Therefore it is not a viable system alternative to the Project.

Canadian West Coast

The abundance of natural gas supplies in Alberta and British Columbia (BC), Canada, or more broadly from the Western Canadian Sedimentary Basin, has led to proposals for LNG export terminals on the Canadian West Coast. While trade press reports indicate that there may be as many as nine such proposals for the BC coast, only five projects have commenced the Canadian federal and provincial regulatory processes. Each of these five projects is briefly described in separate paragraphs below. Prospective investors in the other potential projects, at varying stages of early development and with insufficient details available for meaningful analysis as alternatives to the Project, include Imperial Oil Ltd. and its parent Exxon Mobil Corp., Nexen Inc. in a consortium with Japan's INPEX Corporation and China National Oil Corporation, AltaGas Ltd. and refiner Idemitsu Kosan Co., Ltd. of Tokyo, Korea's SK E&S and Woodside Petroleum of Australia. Separately, in September 2012, the provincial government of

British Colombia signed a deal with the Haisla First Nation giving it rights to buy or lease a coastal property near Kitimat and enabling it to negotiate with any of the potential LNG projects.

Kitimat LNG – Apache Canada Ltd. and Chevron Canada Ltd. plan an export terminal in Kitimat, BC, to be developed in two phases, each with one liquefaction train having an export capacity of five MMPTA. The terminal would take delivery of gas via a pipeline lateral of approximately 8.7 miles from the Pacific Trail Pipelines that will connect to Spectra Energy's existing Westcoast Pipeline system, which draws gas supplies from the Western Canadian Sedimentary Basin. In October 2011 Kitimat LNG received a 20-year license from the National Energy Board (NEB) covering both phases of the project; as of early 2010, it had received the necessary provincial and federal environmental approvals. Although the front-end engineering and design (FEED) has been undertaken, and Kitimat LNG is the only project that has advanced to site preparation, at present Kitimat LNG does not have a projected date for commencing operation. Kitimat LNG is ready to break ground once final commercial contracts are executed.

Douglas Channel LNG – The Douglas Channel Energy Partnership is developing a small-scale barge-based liquefaction project at the terminus of the existing Pacific Northern Gas (PNG) pipeline on Douglas Island near Kitimat, BC. The liquefaction plant is designed to produce approximately 0.90 MMTPA of LNG, with an initial production of approximately 0.70 MMTPA based on available pipeline capacity on PNG. The natural gas will be sourced from producers in British Columbia and Alberta and the project will make use of currently unused capacity on the existing PNG system. Commercial operation was anticipated in 2014, but construction has not yet commenced. In January 2013 Golar LNG Ltd, an LNG carrier operator, announced that it had agreed to buy all the project's output subject to a financing agreement with the project's partners being reached and the project's receipt of all needed permits for construction to begin. In February 2012 BC LNG Export Cooperative received a 20-year export license from the NEB to export (0.25 Bcf/d) from the facility. As a result of the new Canadian Environmental Assessment Act, 2012, the Canadian Environmental Assessment Agency (CEAA) determined that there is no longer a requirement to complete the environmental assessment of this project .

LNG Canada – Shell Canada Ltd., Korea Gas Corporation, Mitsubishi Corporation and PetroChina Company Limited are proposing to build an LNG export terminal on Prince Rupert Island near Kitimat, BC. The proposal is for a two-phase project, with two liquefaction trains, each with an export capacity of six MMTPA, in each phase. LNG Canada has selected TransCanada to develop a pipeline to serve the terminal. LNG Canada anticipates start-up at the end of the decade. On February 4, 2013 the NEB granted LNG Canada a 25-year export license. The CEAA is determining whether an environmental assessment is required for the designated project.

Pacific Northwest LNG –Progress Energy Canada Ltd., a subsidiary of PETRONAS, is developing an LNG export plant on Lelu Island near Port Edward, BC. Plans call for three liquefaction trains, two in the first phase and a third in the later phase, each of which will have an export capacity of six MMTPA. Natural gas will be transported to the site by the Prince Rupert Gas Transmission Project that will be built and operated by TransCanada Corporation under agreement with Progress. Currently the project is in the process of scoping the design of the facility (pre-FEED). The target date for commissioning is the Fourth Quarter 2018. In April 2013 the CEAA commenced the environmental assessment. No application has been made to the NEB.

Prince Rupert LNG – The BG Group PLC plans to build an LNG facility on 505 acres on Ridley Island at the Port of Prince Rupert, BC on federal land administered by the Port Authority. The facility, for which construction is anticipated to begin in 2016 with first shipments occurring in 2021, would initially have two liquefaction trains, with a third train planned, each train with an export capacity of seven MMTPA. BG Group has partnered with Spectra Energy Corp. to develop plans to build a 525-mile pipeline from northeastern BC to Ridley Island. On May 6, 2013, the Canadian Environmental Assessment Agency issued a notice seeking public comment on the need to do an environmental assessment. No application has been made to the NEB.

Although the Canadian West Coast LNG export projects (other than Douglas Channel LNG, which is on a significantly smaller scale and hence not a reasonable substitute for the Project) may be considered alternatives to the Project in terms of the Asian markets to be served, they are unlikely to serve the domestic markets in Hawaii and Alaska. Moreover, none will provide market outlets for the gas supplies from the U.S. Rocky Mountain supply basins as the Project will. Thus, the Canadian West Coast projects cannot meet these significant Project objectives.

In addition, for the Canadian West Coast LNG projects to go forward, significant pipeline infrastructure would need to be built through difficult terrain between the Western Canada supply basins and the British Columbia Coast, traversing lands that are also sensitive from environmental and First Nations perspectives. These among other formidable obstacles are recognized in a December 2012 study conducted by FACTS Global Energy entitled Liquefied Natural Gas for Hawaii: Policy, Economic, and Technical Questions (at p. 66) (FACTS Study). The FACTS Study states that each of the British Columbian LNG projects "faces common challenges: namely, the sheer remoteness of the shale plays; the potentially high break-even costs for producing the gas; a comparative lack of gas delivery infrastructure; and of course, high development costs." Moreover, according to the FACTS Study, these costs and competition from U.S. developers "remain significant barriers to entry" for the Canadian LNG projects. As explained therein, due to these costs "virtually all Canadian LNG export consortia have resolved to index LNG sales to crude oil," there is a "significant disconnect between world oil prices and hub-indexed gas prices in North America and northwestern Europe," and "Far East LNG buyers are agitating for the inclusion of hub indexation on future LNG supply contracts, rather than 100% crude oil indexation," with the consequence that the "US LNG Sellers' willingness to adopt Henry Hub indexation for LNG sales" "renders [US LNG] very attractive to prospective buyers" and "has helped stall marketing initiatives for more advanced Canadian players like Kitimat LNG."

The development of LNG Canada, Pacific Northwest LNG and Prince Rupert LNG, as well as the projects envisioned by other developers, is substantially behind that of the Project. In particular, the environmental review process for each of these projects has only just begun. The only other Project alternative, Kitimat LNG, is also likely to be behind the Project. While it may appear to be more advanced from the development and regulatory perspectives, it is lagging from the commercial perspective.

For these reasons and others, the Project is better positioned to meet the anticipated market demands in a timely manner. Given the better availability of details for this BC project, however, further analysis of Kitimat LNG is provided below.

Kitimat LNG has completed front end engineering and design work for the terminal and associated 289-mile pipeline and has made some sustained marketing efforts to attract potential customers. Kitimat LNG also has received approval from the Canadian National Energy Board

to export LNG, which may be an advantage to U.S. LNG projects given the uncertainty surrounding DOE's addressing LNG exports to nations that do not have a free trade agreement with the U.S.

Neither Kitimat nor the Project is being proposed at an existing LNG import terminal with existing infrastructure that can be used for export while minimizing potentially adverse environmental effects associated with the construction of new facilities. Nevertheless, because the Project site incorporates site areas that have been previously developed or disturbed by past activities and that are not pristine, it compares favorably to the Kitimat LNG Project site, which is a pristine forested area bordered by an active salmon stream, Bish Creek. In short, the Kitimat Project is a pure greenfield project in comparison with the JCEP's use of brownfield areas to comprise the Project site. In addition, although project descriptions of Kitimat LNG on public websites do not give specific construction details, a comparison of aerial images shows that the Kitimat site is completely forested and will require far more clearing and grubbing than the Project site. Finally, for its site Kitimat LNG had to make agreements with the Haisla Nation and have the federal government legally designate as an industrial park the Indian Reservation #6 on Bish Cove. In contrast, JCEP is developing a site that has been previously slated for industrial port-related development.

The Project site also compares favorably from a marine perspective. The Project site is adjacent to an active berth where deep draft vessels call on a routine basis. The Kitimat Project site has no shipping infrastructure in the immediate vicinity, although it is accessible to an active shipping route into and out of the Town of Kitimat. In contrast to the protected slip at the Project site, the artist rendering on the Kitimat LNG website shows that at its site the LNG carrier berth will be positioned out in the bay and connected to the shore by a trestle. Hence there is a greater chance for LNG spills to enter the waterbody from transfer piping at the Kitimat LNG site than at the Project site. Also the off-shore berth at the Kitimat LNG site does not afford the same level of protection to an LNG carrier from allisions with other vessels as would be afforded to a carrier berthed in the slip at the Project site. Although having an LNG carrier berthed outside of a slip means that it would not be as essential at the Kitimat LNG site as at the Project site to have a tug assist for a carrier to get headed in the outbound direction in the channel, it is assumed that tug assists will still be required at Kitimat LNG.

Thus, from the environmental and engineering standpoints, Kitimat LNG is not a viable system alternative to the Project. In addition, from the Project objective, competitiveness and timeliness standpoints, the Canadian West Coast projects are not viable system alternatives to the Project.

10.2.2 Existing LNG Peak Shaving Plants

Peak shaving facilities, in which gas can be stored for emergency purposes and dispatched when demand is high, typically will take natural gas from a pipeline system, liquefy it over a long period (on the order of 150 days), store it on-site in an LNG storage tank, and then vaporize the LNG when peak demands need to be met (generally on the order of 10 days or less). Although peak shaving is expensive, it is far cheaper for consumers than having to pay for setting aside pipeline capacity that would only be needed for peak demand periods. There are two such facilities in relatively close proximity to the Project site, both owned by Northwest Natural, that may appear to be suitable system alternatives to the Project. Brief descriptions of these facilities are provided below.

Newport, Oregon - Located approximately 80 miles to the north of the Project site on a point of industrial land that juts out into Yaquina Bay, the Newport facility has a 48,000 m^3 tank and a

storage capacity equivalent to 1.0 Bcf. The Port of Newport, which supports a variety of shipping terminals for both commercial and sport boats, owns and leases land in the area of the Newport facility. The Port does not have the capability to handle deep draft LNG carriers that would be needed to ship LNG from a potential export terminal located at this site. Nor is there sufficient land area available at this location to accommodate an LNG terminal with the required exclusion zones.

Portland, Oregon - Located approximately 217 miles to the north of the Project site on a 40 acre site in the Portland Harbor industrial area, which is home to manufacturers, metalworking companies, and petroleum product facilities and approximately five miles from downtown Portland, the Portland facility has a 28,000 m^3 tank with a storage capacity equivalent to 600 million cubic feet (MMcf). The site is not accessible to deep draft LNG carriers that would be needed to ship LNG from a potential export terminal located at this site. Nor is there sufficient land area available at this location to accommodate an LNG terminal with the required exclusion zones.

These peak shaving facilities are not suitable system alternative to the Project because the units are not: designed to provide a sufficient quantity of LNG for export; accessible to deep draft LNG carriers; and, on sites that have sufficient area available for expansion to an LNG export terminal. Furthermore, development of the required land area and the necessary infrastructure would likely have an equal or greater environmental impact than that associated with the Project.

10.3 ONSHORE PORT ALTERNATIVES

10.3.1 Study Area Definition

The international market for exports of LNG from the United States is particularly strong in Asia. The Study Area for the Project thus focused on the U.S. West Coast because: (1) there is no existing LNG terminal on the West Coast of the lower-48 United States; (2) an LNG export terminal sited on the U.S. West Coast will provide shorter, more direct routes to these Asian markets (as well as the isolated markets of Hawaii and Alaska) than terminals located on the U.S. East or Gulf Coasts; and, (3) an LNG export terminal sited on the U.S. West Coast will offer gas producers and suppliers in both the U.S. Rocky Mountain states and Canada direct access to these Asian (and offshore domestic) markets. JCEP concluded that the Pacific Northwest and Northern California are best suited in each of these regards and, accordingly, JCEP included within the boundaries of the Study Area, the Pacific Coastline along the States of Washington and Oregon and the northern third of the State of California.

10.3.2 Identification of Potential Ports within the Study Area

Ports that might have the potential for accommodating an LNG terminal in the Study Area were inventoried with no attempt to screen for suitability so as not to overlook any potentially suitable port. A total of seven ports were identified in California, 14 in Oregon, and 17 in Washington, with Stockton, California representing the southernmost port and Bellingham, Washington representing the northernmost port along the Pacific Coastline within the Study Area. A list of these potential ports is presented in Table 10.3-1; a map that identifies these candidate ports is presented as Figure 10.3-1. The Coast Pilot 7 was used as the source of information of potential ports. All ports found in the Coast Pilot 7, with the exception of those that were strictly for recreational boating, were included in the listing of potential ports. Table 10.3-1 includes for each of the potential ports information from Coast Pilot 7 and other available sources on the following port criteria: the length of the waterway; Federal channel depth; currents in the

channel; average tidal range; potential transit navigation restrictions; U.S. Fish and Wildlife Service critical habitat; wild and scenic rivers; tribal lands; recreational use; and commercial use. Information on other possible criteria, including tribal fishing areas, known available land and cultural resources, was not readily available. JCEP did not commit resources to further investigation of these latter criteria because, as set forth in Sections 10.3.4 and 10.3.5 below, other criteria were determinative in the identification and comparison of candidate ports.

10.3.3 Major Natural Gas Pipeline Infrastructure within the Study Area

JCEP deemed it critical to identify the existing major natural gas transmission lines to ensure that, for any particular candidate port, there would be a path for the gas resources. For JCEP, a key element of the project design was interconnection of the terminal by pipeline to existing FERC or California Public Utilities Commission (CPUC) regulated natural gas transmission systems in the Pacific Northwest and Northern California because the ability to interconnect with existing infrastructure to the greatest extent possible will result in the lowest overall cost structure for moving LNG to markets and will open the Project's export markets to a maximum number of North American gas producers. A map of the major FERC and CPUC Regulated Transmission Pipelines in the Study Area is presented as Figure 10.3-2.

10.3.4 Identification of Candidate Ports in Study Area

To begin to identify ports that would warrant further evaluation, the overall list of potential ports was first screened utilizing the criterion of Federal Project channel depth. JCEP established a minimum port channel depth of 36 feet (11 meters) mean lower low water (MLLW) and eliminated from the list of potential ports those not meeting this criterion. A summary of application of this criterion to each of the potential ports is presented in Table 10.3-2.

Among others, the Winchester Bay/Umpqua River-Gardiner/Reedsport port area (referenced in Tables 10.3-1 and 10.3-2 and hereafter as Umpqua River/Gardiner) was eliminated based on the channel depth criterion; it provides an excellent illustration why the depth criterion was pre-eminent in eliminating many ports. Because Umpqua River/Gardiner has a channel to an existing industrial site formerly used by the International Paper Mill and a lumber mill (the paper mill ceased operation in 1999 and the buildings were demolished in 2006), this port may appear to be a viable alternative warranting additional evaluation. Based on information provided on NOAA Nautical Chart 18584, the channel at the Umpqua River/Gardiner is approximately 200 feet wide and MLLW depths at its middle range from 26 feet at the entrance to 22 feet at the demolished mill site, whereas the Coos Bay Navigation Channel width is 300 feet and it has depths that range from 50 feet at the entrance to 44 feet at the Project site. For Umpqua River/Gardiner, the transit distance from the entrance channel to the mill site is approximately 12 miles compared to the Coos Bay transit distance from the "K" buoy to the LNG Terminal berth of approximately 8 miles.

Thus the width of the Umpqua River/Gardiner channel would have to be enlarged from 200 feet to 300 feet and its depth increased from 26 feet to 44 feet to make it comparable to the existing Coos Bay Navigation Channel. To increase the existing 200-foot-wide channel depth from 26 to 44 feet would require approximately 8.4 million cubic yards (yd^3) of dredging and to increase the 200-foot width to 300 feet at a depth of 44 feet would require approximately 10.2 million yd^3 of dredging for a total of 18.6 million yd^3.

Additional dredging would be required to construct an LNG carrier berth and create a turning basin. When the mill operated, barges were used to deliver fuel oil to a wharf, which Google Earth images show extends approximately 500 feet from the shore side across tidal mud flats.

Assuming a 2,000 foot diameter turning basin with a depth of 44 feet (to be consistent with the other depths estimated), and taking into account the 200-foot-wide channel through the turning basin (previously addressed), a minimum of approximately 4.74 million yd^3 would have to be dredged to create the turning basin and berth area. Thus a grand total of 23.34 million yd^3 would have to be dredged at Umpqua River/Gardiner.

Upland disposal of this material would require approximately 1,880 acres (taking into account some additional area required for decanting the dredge slurry) filled to a height of approximately 10 feet. The approximate dredging cost would be $93.36 million using the low end of the range of hydraulic dredging costs ($4 - $8 per yd^3). Upland disposal costs for 1,880 acres (assuming use of existing disturbed industrial land at the mill site) would be approximately $92.5 million using $50,000 per acre land cost. The total dredging and upland disposal cost would be approximately $185.86 million. In addition, there is an environmental cost because the required dredging in the Umpqua River would be four times that of the approximately 5.6 million yd^3 of dredging required at Coos Bay. The likelihood of getting a dredging project of the magnitude approved for a single user would be highly remote. In sum, the permitting and construction costs associated with developing a channel to the demolished paper mill site eliminated Umpqua River/Gardiner from further consideration.

The following ports remained as potential ports following the initial screening based on channel depth:

- Washington Ports
  - Port Angeles
  - Port Townsend
  - Grays Harbor
  - Aberdeen
  - Skamokawa
  - Longview
  - Kalama
  - Vancouver
- Oregon Ports
  - Portland
  - St. Helens
  - Port Westward
  - Wauna
  - Astoria
  - Coos Bay
- California Ports
  - Humboldt

- Stockton

JCEP next screened the above list of potential ports utilizing two suitability criteria to eliminate from further evaluation potential ports not meeting either of the two criteria. These suitability criteria are:

- High Population Density – JCEP determined that sites for an LNG terminal within or directly adjacent to densely populated areas were less favorable than sites that were removed from such areas.
- Transit Navigation Restrictions – The presence of transit navigation restrictions (such as shoaling, swift currents, bridges, power lines, existing high levels of ship traffic, and other berths) on the LNG vessel transit route to a proposed site was deemed a basis for elimination of the potential port from the list of candidate ports.

A summary of application of each of these criteria to each of the potential ports is presented in Table 10.3-2. On the basis of applying the above discriminators to the list of potential ports, the following candidate ports were identified as the candidate ports:

- Grays Harbor, Washington;
- Port Westward, Oregon;
- Wauna, Oregon;
- Astoria, Oregon; and
- Coos Bay, Oregon.

A map showing the short list of candidate ports in the Study Area, with the existing natural gas transmission pipeline infrastructure superimposed, is presented as Figure 10.3-3.

10.3.5 Comparison of Candidate Ports

After paring the original 41 potential ports down to a total of five candidate ports, JCEP applied a scoring system to evaluate the qualitative characteristics of the sites. For example, while it may be perfectly acceptable to have LNG vessels transit beneath highway bridges, it is more desirable to have a vessel transit route without bridges or other obstructions. The basis for the score values in the scoring system are presented in Appendix A.10. The following port characteristics were scored for each candidate port:

- Population Density Near Site – The location of an LNG terminal or any major industrial facility within a populated area is not a favorable siting criteria. Consequently, the distance from and relative densities of populated areas within the vicinity of industrial sites can be used to differentiate between potential site locations.
- Population Density Along LNG Vessel Transit Route - The LNG carrier transit route from the LNG terminal to the open sea will likely pass populated areas. The number of areas passed, the distance of the areas from the center of the channel, and the density of the populated areas passed can be used to differentiate port locations for an LNG terminal.
- LNG Ship Transit Distance - The distance, hence the duration of the LNG carrier transit from the LNG terminal to the open sea, given the potential safety and security zones around the carrier and the geometry of the channel could potentially limit other uses of

the channel. Ports with relatively short duration transits from potential LNG terminal sites would be more favorable than those requiring lengthy transits.

- Compatibility with Existing Port Users – Ports that already have deep draft industrial traffic would be more favorable than those ports that are used primarily for shallow draft commercial or recreational boating, provided that the current level of deep draft ships combined with additional deep draft ships would not tax the existing port resources (tugs, pilots, etc.).
- Impact on Recreational Waterway Users – Most ports will have a recreational fleet component. What differentiates one port from another is the size and location of the recreational fleet relative to the potential LNG terminal site and ship transit route. This will determine how much of a potential effect the introduction of additional deep draft ship traffic will have on the recreational users of the waterway. Ports with recreational fleets nearby the port entrance, which would minimize potential interaction with deep draft ship transit, would be preferable to those where the recreational fleet would have longer interaction with the deep draft ships in the channel or where the fleet is berthed upstream of the LNG terminal location and would have to pass the terminal while in transit to the open ocean.
- Impact on Commercial Fishing – Most ports will have a commercial fishing fleet component. What differentiates one port from another is the size and location of the commercial fishing fleet relative to the potential LNG terminal site and ship transit route. This will determine how much of a potential effect the introduction of LNG carrier traffic will have on the commercial fishing users of the waterway. Ports with commercial fishing fleets nearby the port entrance, which would minimize potential interaction with deep draft ship transit, would be preferable to those where the commercial fishing fleet would have longer interaction with the deep draft ship in the channel or where the fleet is berthed upstream of the LNG terminal location and would have to pass the terminal while in transit to the open ocean.
- Existing Deep Draft Vessel Traffic - Ports with a history of handling deep draft vessel traffic and where the traffic level is declining rather than increasing would be preferable to those ports with limited history of deep draft vessel traffic or with current traffic levels consistent with port resources. Ports able to readily accommodate the addition of the additional deep draft ship calls (90 proposed for the Project) are preferable as the deep draft ship traffic in these ports will readily fit into the ship movement pattern without significant disruption of existing and anticipated future commercial vessel traffic.
- Compatibility with Land Use/Zoning – Ports that have industrial areas, existing brownfield sites, or areas that have already been designated as marine dependent industrial under current Estuary Management Plans would be viewed as preferable.
- Land Ownership –Land ownership within a port that is entirely controlled by private industrial land owners with parcels owned by each of these companies of sufficient size to site an LNG terminal without securing property from adjacent landowners were considered preferable. The consolidation of land ownership into one or at most two private industrial property owners simplifies the acquisition of a developable site. Ports in which property would need to be acquired from multiple land owners in order to establish a suitably sized parcel for use as the Project site were considered less favorable.

- Environmentally Sensitive Areas - Two components are involved in the application of this criteria, the general surroundings of the port and transit route from the port and the types of sites (brownfield versus greenfield) within the port. The ports with fewer environmentally sensitive areas (parks, recreation areas, wetlands, shell fish beds, sea grass beds, etc.) and more potential brownfield sites were considered preferable.

10.3.6 Identification of Preferred Port

Based upon the application of the foregoing qualitative criteria, the Coos Bay candidate port was determined to be preferable over the candidate ports along the Columbia River and in Grays Harbor. The Coos Bay candidate port received a score of 38, while the Columbia River candidate ports scores ranged from 22 to 28 and the Grays Harbor candidate port received a score of 32 (Table 10.3-3).

The Coos Bay candidate port has no residences within one mile of the sites considered. For all sites considered on the Columbia River there did not appear to be significant populations within one mile of the candidate sites except for the Wauna site which appeared to have a few residences located on Puget Island that might be located within one mile of a terminal. There did not appear to be a significant difference in the population density in the vicinity of the candidate port sites. All sites were located in areas of low population density.

The route of vessel transit for Coos Bay is sparsely populated; during outbound transit, there are no residences on the entire length of shoreline on the starboard side and limited low density population on the port side. Population concentrations along the route to Columbia River candidate sites are generally sparse except along the passage past the towns of Astoria and Warrenton.

The location of some of the Columbia River port sites is more than 40 nautical miles up the Columbia River, requiring extended LNG carrier transits. The travel distance from the "K" Sea Buoy to the prospective Coos Bay site is approximately eight nautical miles (six nautical miles inland from the jetties). The total transit time of the LNG carrier from Pilot boarding to Pilot debarkation at the LNG berth is estimated to be less than one and one half hours per transit for Coos Bay. The transit time would be significantly longer for the candidate sites on the Columbia River.

The current major port users at Coos Bay are involved with the export of timber and wood chips. The largest user of the deep draft capabilities of the Port of Coos Bay is Roseburg Forest Products Co. Ships calling on Roseburg Forest Products Co. accounted for 62 of the 100 deep draft vessel calls to the Port of Coos Bay over the two-year period 2010 and 2011. Roseburg Forest Products Co. has been supportive of the Project since its inception and has entered into an option agreement with JCEP to provide land that would be used for a portion of the LNG Terminal**.** The other Port users have been supportive of the Project as it would increase the tonnage moved in Coos Bay, thereby helping to maintain the Port's status in securing semi-annual dredging from the U.S. Army Corps of Engineers (USACE). Without additional tonnage the Port is at severe risk of losing access to these dredging funds.

The Coos Bay area has a long history as a natural resource based economy, with a present industrial base comprised of fisheries and lumber processing. The introduction of an LNG terminal is consistent with current industrial operations and complements the stated objectives of the Oregon International Port of Coos Bay. Additionally, a White Paper entitled "*Economy and Transportation Issues, Coos County, Oregon*" prepared for the South Coast Development Council by ECONorthwest dated October 2003 identified the need for the area to attract new

marine dependent industry. The White Paper identified the need to build a new terminal in the lower bay (North Spit) to replace outdated terminal capacity in the upper bay. Furthermore the report noted "Currently, there is a coalition of marine business owners, members of area labor groups, the Oregon International Port of Coos Bay staff, and private business owners that have united to look for a way to approach a logical and effective enhancement of the area's marine trade." JCEP did not find this clarity of long term industrial goals in evidence when investigating any of the other candidate ports.

The recreational fleet comprises the majority of boat traffic in and out of Coos Bay. The recreational fleet is predominantly berthed at the Charleston Marina, immediately inside the entrance to the Port. Movement of an LNG carrier from the Coos Bay candidate site will have minimal disruption to the recreational boat traffic since the transit time from the mouth of the Charleston Marina to the exit jetties is estimated to be less than 15 minutes. The extended transit distance for LNG carriers from the Columbia River candidate ports will have the potential to disrupt recreational fishermen and other boaters due to the greater transit times involved.

The commercial fishing fleet is also berthed at Charleston Marina, immediately inside the entrance to the Port of Coos Bay. Movement of an LNG carrier will have minimal disruption to the commercial fishing boat traffic since the transit time from the mouth of the Charleston Marina to the exit jetties is estimated to be less than 15 minutes. The extended transit distance for LNG carriers from the Columbia River candidate ports will have the potential to disrupt commercial fishermen simply because of the greater transit times involved.

Coos Bay has a history of handling deep draft vessel traffic, handling as many as 250 deep draft vessels as recently as 1990. The decline in the fisheries and timber economic base resulted in a decline of deep draft vessel calls to fewer than 39 during 2010. The additional LNG carrier calls (90 proposed for the Project) will readily fit into the ship movement pattern without significant disruption of existing and anticipated future commercial vessel traffic. The higher levels of existing deep draft vessel traffic on the Columbia River made the Coos Bay candidate port preferable for this factor.

The LNG terminal site locations identified in the Coos Bay candidate port were all zoned marine dependent industrial, as defined in the Coos Bay Estuary Management Plan. In all cases the sites had been previously used for industrial service (brownfield sites). Some of the potential LNG terminal site locations at the Columbia River and Grays Harbor candidate ports had been utilized for industrial uses, but initial site investigations revealed that none of the available sites was of sufficient size to accommodate the location of an LNG terminal without seeking a change in land use designation.

The land ownership within the Coos Bay candidate port is entirely controlled by private industrial land owners (Weyerhaeuser Company and Roseburg Forest Products). The parcels owned by each of these companies were large enough to site an LNG terminal without securing property from adjacent landowners. Initial investigations into locations at the Columbia River and Grays Harbor candidate ports revealed that sufficiently sized parcels would be available at Wauna and Astoria but not at Port Westward and that some consolidation of parcels could be required at Grays Harbor.

Initial investigations of land parcels available at each of the candidate port areas revealed that each of the candidate ports would likely have combinations of greenfield and brownfield areas that could be combined for a suitable site. This criteria proved to be non-differentiating between the candidate ports.

10.4 ALTERNATIVE SITE LOCATIONS IN COOS BAY

A 200 acre minimum parcel size was used in the screening process for identifying the preferred site for an LNG terminal within Coos Bay. While this was an arbitrary number, it reflects JCEP's recognition that the minimum amount of real estate estimated to be required at the screening level is normally many multiples greater than the theoretical minimum parcel size. The perfect parcel geometry would be a circle for one tank or a figure eight for two tanks. These property boundary geometries are dictated by the required thermal radiation and vapor exclusion zones mandated in NFPA 59A. Seldom, if ever, could a parcel of this geometry be purchased without having to purchase additional property.

The 200 acre minimum parcel size was arrived at by JCEP as follows. For a nominal tank diameter of 267 feet, as proposed here, the minimum area required to contain the 1,600 British thermal units per hour per square foot (Btu/hr/ft^2) zone would be a circle approximately 960 feet in diameter, requiring approximately 17 acres per tank. The land required to accommodate the flare without impacting surface use is approximately seven acres, a fire water pond about 5 acres, containment trenches with vapor exclusion zone another five acres. The upland facilities, including the liquefaction facilities, require at least 15 acres with another eight acres for office space, shops, parking and minimal storage areas plus meter runs. If a slip is to be built, an additional 35 acres is required. The total of this minimum acreage amounts to just over 100 acres. In the screening process JCEP used a multiplier of 2.0 to account for shape factor, the inability to secure the perfect parcel and the need to purchase parcels that may be available and where the owner is unwilling to make a hash of his property by only selling the proposed LNG terminal what it wants. Hence a minimum 200–acre parcel size was used as a site screening criterion.

Most of the industrial land located in Coos Bay is located in the upper bay. Access to the upper bay would require the LNG vessels to transit through the swinging railroad bridge that crosses Coos Bay at Channel Mile (CM) 9. The swinging railroad bridge cannot accommodate LNG vessels, due to limited bridge width. As a consequence the only sites deemed suitable were those located in the lower bay. The navigation restrictions to the upper bay were taken into consideration during the selection and evaluation of candidate ports.

The lower bay is defined as the portion of Coos Bay that lies to the west of the swinging railroad bridge located at approximately CM 9. The east shoreline of the lower bay is comprised of the Cities of North Bend and Coos Bay. There is no significant parcel of industrial real estate located on the east shore of Coos Bay. The west shore of the lower bay is comprised of the North Spit. The majority of the North Spit property that abuts Coos Bay is zoned marine dependent industrial in the Coos Bay Estuary Management Plan. The remaining property abutting the lower bay is owned by the U.S. Bureau of Land Management and is designated for recreational use. The southernmost two miles of North Spit shoreline running from the north jetty entrance of Coos Bay to CM 5 encompasses the majority of the BLM holdings on the North Spit. The BLM also operates a boat launch at approximately CM 6. All of the remaining developable property abutting Coos Bay on the North Spit is held by Roseburg Forest Products, Weyerhaeuser Company and the Oregon International Port of Coos Bay. Only four industrial sites were identified as potentially suitable for an LNG terminal site. These four locations (Figure 10.4-1) include the following:

- Parcel A - Port Industrial Park – This parcel comprising less than 100 acres was eliminated because of limited parcel size. A portion of this parcel was sold to Southport Lumber which constructed a small dimension lumber mill on the site in 2005.

Concurrent with this development, the Oregon International Port of Coos Bay constructed a new railroad spur that runs parallel to the Trans-Pacific Parkway on the North Spit to serve the Southport Lumber Mill. The lumber mill and railroad spur were both placed in service in mid-2005.

- Parcel B - Weyerhaeuser Company Site, Linerboard Mill -The Weyerhaeuser Linerboard Mill site was eliminated because its proximity to the swinging railroad bridge would preclude LNG vessel berthing at the site. Although this parcel was deemed unsuitable for use as an LNG terminal site, it was identified as a desirable location for the siting of the South Dunes Power Plant, the source of electricity that would power the liquefaction facilities.
- Parcel C - Roseburg Forest Products Co. Site - The Roseburg Forest Products Co. site does not have sufficient real estate to accommodate two 160,000 m^3 full containment LNG storage tanks, while maintaining thermal and vapor exclusion zones within the site property. Initial modeling runs indicated that while two tanks could be physically located within the Roseburg parcel, the vapor dispersion zone required to establish property lines for ownership and control would extend beyond the parcel that JCEP had the right to control. In effect, the parcel available was insufficient to hold two LNG tanks and conform to the property set-back requirements established under NFPA 59A.
- Parcel D - Weyerhaeuser Company Site, Henderson Ranch – The Henderson Ranch site, located immediately to the west of the Roseburg Forest Products Co. site was viewed as the preferred location due to its size, distance from nearest residence (over 1.1 miles) and topography. The most visible feature of an LNG facility will be the LNG storage tanks. The location of the Henderson Ranch site, flanked on the east by two large and heavily wooded sand dunes rising to a canopy elevation of nearly 200 feet, provided a location where the high visibility tanks could be screened from public view to a large extent. Additionally, the presence of the Roseburg Forest Products wood chip export facility immediately to the southeast of the proposed LNG tank location would provide additional screening of the tanks from the view of most residents living in North Bend and Coos Bay.

As a result of the evaluation of all of these sites, the Weyerhaeuser Henderson Ranch property was determined to be the only suitable site in Coos Bay (Figure 10.4-2).

10.5 ALTERNATIVE SITE CONFIGURATIONS/LAYOUTS

10.5.1 Project Design Concept

Market demand for exported LNG requires the construction of 320,000 m^3 of LNG storage capacity at the LNG Terminal site in order to provide a sufficient LNG inventory buffer to schedule the loading of 148,000 m^3 LNG carriers. As there is no single full containment tank designed to hold this volume of LNG the design basis required the development of a two tank site layout to accommodate the 320,000 m^3 of storage capacity.

JCEP was approached by the Port to consider the possibility that a slip would be consistent with the goals of both the Port and JCEP. The Port had been attempting to consolidate commercial maritime industry to the industrial park located on the lower bay (below the railroad bridge) in an effort to reduce both ship traffic and dredging requirements in the upper bay. The slip concept appealed to JCEP because it would allow LNG carriers to be berthed away from the main navigation channel, thereby reducing potential allisions. The slip development concept

proposed by the Port was incorporated into the terminal design concept. JCEP and the Port identified a site for a single slip in the lower bay providing flexibility for uses by the LNG Terminal (accommodating both LNG carriers and associated tugs) and potential future development by the Port (see Section 1.1.2.5 of Resource Report 1), thereby minimizing wetland and waterway impacts. The LNG Terminal will be the tenant for the slip, and, as such, responsible for conducting the environmental impact analysis related to construction of the slip.

10.5.2 Site Configurations

JCEP evaluated a number of alternative LNG terminal configurations and ship berthing options prior to settling on the final design for the LNG Terminal. The primary focus of the evaluation process was to minimize visual and environmental effects, while at the same time creating a safe facility with the least amount of land disturbance.

The site configuration of the Henderson Ranch site provided a limited number of alternative tank configurations that would conform to NFPA 59A thermal radiation and vapor dispersion exclusion zone requirements. JCEP's project design concept was that the location of the thermal radiation and vapor dispersion exclusion zones would not compromise the use of the existing buildings located on the Roseburg property. In order to ensure this design concept, the eastern property line for the LNG Terminal site was established as a 100 foot westerly offset from the western edge of the existing Roseburg buildings. This eastern property boundary then set the eastern edge that the thermal radiation and vapor dispersion exclusion zones could not exceed per the requirements of NFPA 59A.

With the eastern property boundary set and the maximum LNG storage tank volume and number of tanks established, the facility design alternatives evaluation then focused upon the LNG storage tank aspect ratio. The Project design concept was to construct a tank with minimal visibility. This design concept can best be accomplished by reducing overall tank height and increasing the diameter to height ratio, while still being constrained by the requirement that the maximum individual LNG tank would have a volume of 160,000 m^3. The possibility also existed that rather than employing two tanks to contain the necessary volumes, the 320,000 m^3 of storage could be spread between three or more tanks. This would have the potential to lower the overall height of each of the tanks, but would require an additional tank(s) and additional land area, with the trade-offs in this instance being both economic and aesthetic. The most economically efficient liquids storage methodology is established by basic solid geometric principles. The larger the tank, the smaller the tank materials required per volume contained (larger tanks use less materials per unit of volume than smaller tanks). Additionally, given the NFPA 59A thermal radiation and vapor dispersion exclusion zone distances, the use of fewer tanks would result in the smallest land area impact.

Shorter tank heights, which required larger tank diameters, were evaluated to reduce visual impact, but were deemed infeasible since larger tank diameters than those proposed began to strain the limits of proven construction techniques, while at the same time creating thermal exclusion and vapor dispersion exclusion zones that extended beyond the site property boundaries. An alternative of burying the tanks was also rigorously evaluated. While burying tanks is an established technique in other parts of the world, local soils and geologic conditions determine the feasibility of such an approach. In the case of the LNG Terminal site, the geotechnical investigation (Geotechnical Survey Report is provided in an Appendix to Resource Report 13), performed to identify surface and subsurface soils conditions, established the water table to be approximately 10 feet below the existing project site datum. With the thickness of the tank foundation slab established by design specifications at approximately five feet, any

burying of the tank below the present design configuration would cause the foundation, at a minimum, to be located below the water table. In turn, this raises serious engineering design and environmental problems. The ground water would need to be continually pumped from the subsurface area in the vicinity of the LNG tanks to avoid the potential for contact with the underground tank heat coils, resulting in potential disruptions to ground water flow, as well as, an additional water discharge from the Project. The high heat transfer coefficient of water would result in an excessive amount of power being used to energize the heat coils. The mobility of the water would greatly exacerbate this problem because as the water was warmed it would flow away from the coils due to the natural groundwater migration pattern in this area. The warmed water would then be replaced by cold water resulting in still greater power consumption requirements.

Additionally, there was a significant concern for structural stability in the event of a Cascadia Subduction Zone seismic event. Subsidence of the entire coastal area would result in the water table rising relative to the LNG tank bottom. This apparent raising of the water table would have the effect of creating buoyancy to the tank. The concern was that a buried tank would have the potential for upward force vectors applied to the tank due to water buoyancy, creating the potential for the tank to actually float. There was no design that would be adequate to address this risk, so the configuration of a buried tank was rejected. Burying the tanks as much as possible to reduce visual impact was therefore deemed infeasible.

The potential orientations of the LNG storage tanks on the Henderson Ranch site were developed on the basis of avoiding wetlands on the property, minimizing disturbance to existing land forms, balancing the amount of cut and fill requirements such that no additional fill would be required, minimizing the length of cryogenic piping, maintaining the thermal and vapor exclusion zones within the site property, providing a site elevation for the facility components that would be above predicted tsunami water levels, providing sufficient area to construct an impoundment that would contain the entire contents of one LNG storage tank, and maintaining as much visual screening as possible. The location of the Henderson Marsh along the entire western side of the site and the wetlands in the north eastern corner of the site property, the existing Roseburg facilities and ongoing operations along the eastern side of the site, combined with the only likely location of the slip, largely dictated the primary north south axis on which the facility components could be oriented. Movement of the LNG tanks to the east or west was therefore constrained by property boundaries. Movement of the tanks to the south was limited by the required NFPA 59A distances from the slip. Although the tanks could be located slightly more northerly than presently planned, doing so would extend the length of the cryogenic pipelines that connect the LNG tanks to the ship berth. Additionally, moving the tanks to a more northerly location would result in the encroachment of thermal exclusion and vapor dispersion exclusion zones on the Trans-Pacific Parkway and the adjacent railroad line. Off-site visibility of the LNG tanks would also not be materially altered by this subtle relocation.

For all the above reasons there is little flexibility for locating the LNG tanks in any other location on the Project site than the configuration shown.

The locations of the emergency flare, site access roads, and feed gas pipeline (PCGP) were also selected on the basis of avoiding wetlands and minimizing disturbance to existing landforms. The site access road was oriented to follow the natural gas pipeline from the site in an easterly direction through a previously disturbed area.

10.6 ELECTRIC POWER ALTERNATIVES

10.6.1 Existing Electric Power Infrastructure

During the feasibility phase for the Project a thorough assessment of the electric power infrastructure of Coos Bay and the broader Southwest Oregon region identified instability and fragility of the existing power transmission grid. Identification of these power deficiencies goes back to work performed by Bonneville Power Administration (BPA) as early as 1999 when Nucor Steel was evaluating Coos Bay as a prospective site for an electric furnace steel mini-mill. The BPA study ("The Southern Oregon Coast Transmission Reinforcement Project") pin-pointed the stress imposed on the transmission grid in meeting residential and commercial power demand attributable solely to modest population growth. Since this study was performed, demand has in fact continued to grow at the anticipated moderate pace. However, loss of industrial load in the area has provided a short term reprieve from making the necessary transmission system upgrades.

BPA is the sole source of wholesale power to the region's various electric cooperatives and, despite the modest growth in demand, power supply problems in the area persist due to declining hydropower generation as well as BPA's need to reallocate power resources. In addition to the transmission grid deficiencies, JCEP's initial investigations also identified the need of these public utility district's to diversify from this historical dependence on BPA and gain access to other sources of power.

The results of both JCEP's assessment and the BPA Study indicated that the LNG Terminal would need to self-generate power in order to achieve high operational reliability. The South Dunes Power Plant will provide this reliable source of power not available off of the grid. The LNG Terminal will ould, however, also be connected to the local distribution company, PacifiCorp, to provide power during those times that the South Dunes Power Plant is shut down and the liquefaction process is not operating.

10.6.2 Renewable Energy

The electric power to be generated by the South Dunes Power Plant, which is natural gas-fueled, can be compared to other alternative means of generating electricity, specifically renewable sources such as wind, solar, and tidal power. The issues of the adequacy of the existing electric transmission grid to deliver the power generated by these renewal sources to the Oregon coast site of the Project remain as a number of the wind and solar projects are located in the eastern part of the state. Not withstanding the current location of wind farms, Principle Power under a grant from the DOE is proposing to anchor wind turbine platforms 3 miles offshore of Coos Bay.

10.6.2.1 Wind

According to the State of Oregon 2013-15 Biennial Energy Plan, by 2012 wind energy production in Oregon made up nearly six percent of Oregon's total net generation and over 75 percent of the total "non-hydroelectric" sources of renewable energy. More than 4,000 MW of large-scale wind farms are in different phases of the Energy Facility Siting Council (EFSC) process (notice of intent, application for a site certificate) at the start of 2013.

Most of Oregon's large-scale wind development takes place primarily in the central and eastern Columbia River area and in northeastern Oregon. At present the EFSC is reviewing site certificate applications for:

- 500 Megawatts (MW) of wind generation known as Baseline Wind in Gilliam County;
- 399 MW of wind generation called the Saddle Butte Wind Park in Gilliam and Morrow counties;
- 300 MW of wind generation called Antelope Ridge in Union County (on hold pending big game studies); and
- 500 MW of wind generation called the Brush Canyon Wind Facility in Wasco and Sherman counties.

Principle Power, under a $4 million grant from the DOE is proposing to anchor five, 6 MW semi-submersible wind turbine modules approximately 3 miles off the coast of Coos Bay in 1,000 feet of water. It plans to launch the turbine modules from the Port of Coos Bay. The grant is to fund design, engineering and permitting support for the project. The grant is one of seven announced in the U.S. and up to three of the projects will be awarded a grant of up to $47 million to go into commercial production by 2017. JCEP has agreed to purchase the 30 MW of power generated by the wind project and will use the power to offset the power required for generation from the South Dunes Power Plant. The use of the power generated from the wind project will eliminate the need for the wind project to be connected to the electric grid. Even if 30 MW of wind power is available, the Project will still need an additional 390 MW to achieve the 420 MW generation capacity required to maintain reliable LNG production. This would require an additional 65 modules of the currently proposed MW capacity. The power generated by the South Dunes Power Plant will also be needed to maintain a source of reliable power for the liquefaction process when the wind project or other wind projects are not operating.

The Biennial Energy Plan published by the Oregon Department of Energy (ODOE) in January 2005 (Oregon Department of Energy, 2005a) states “Wind machines generate, on average, about one third of the maximum output or capacity.” If this “de-rating” of output is applied to the existing and proposed wind capacity of 4,000 MW, the projected Oregon wind farm power output is equivalent to about 1,320 MW of sustained output. This 1.320 MW would be sufficient to provide an alternative source of power to the Project assuming that the wind projects are approved and in service at the time that the Project would require the power and that the power can be provided as reliably as required by the Project.

Wind farms, however, are not without impacts. A recent study prepared by the BPA indicated that wind generation suffers from what is defined as a “clustering effect”. This clustering effect means that all the wind machines tend to be on at approximately the same time. This synchronicity of generation also applies to the non-generation state, resulting in spikes in supply or troughs in production that have no relationship with demand. This clustering also means that power transmission lines in the vicinity of a wind farm may experience congestion. Transmission capacity between the eastern Oregon (where all the wind farms are located) and western Oregon (where the demand is located) remains the main barrier for further large-scale development of wind in Oregon.

California, by contrast, leads the nation in the amount of electricity generated by wind. Recent growth of the industry, however, has been limited by concerns about the visual impact of wind farms as well as the effect of the wind turbines on bird and bat populations. As a consequence, after very rapid growth during the 1980’s wind power generation has grown at a rate of about 1.5 percent per year since 1990, to reach an annual output of nearly 3.9 million megawatt hours (MWh) in 2003 (Energy Information Administration, 2003).

10.6.2.2 Solar

According to the ODOE, solar energy is Oregon's largest renewable energy resource. Northwestern Oregon receives roughly the same annual solar resources as the U.S. and Europe. The eastern and southern parts of Oregon receive roughly the same annual solar resource as that of northern Florida. However, solar energy has never provided a measurable portion of energy on a commercial scale in the Pacific Northwest that could support the centers of population (Seattle and Portland) during the high energy demand winter season. The bulk of solar power installations in Oregon are geared to residential or individual building use and not as a commercial base load installation, in comparison to projects proposed or under review in California. The nature of the types of solar power in use in Oregon is demonstrated by the fact that residents in Oregon have installed more than 17,600 solar water heating systems in the last 25 years and more than 300 solar electric systems in the state.

One type of commercial solar powered electricity production in California involves the use of solar parabolic trough technology which uses arrays of parabolic mirrors to collect heat energy from the sun and refocus the radiation on a receiver tube located at the focal point of the parabola. A heat transfer fluid is heated to high temperature as it circulates through the receiver tubes. The heated transfer fluid is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The high pressure steam is then used to spin a conventional steam turbine generator. This project, the Palen Solar Power Project, will generate 500 MW with two identical solar plants of 250 MW.

Commercial solar projects require large land areas. As an example of the scale of land area required for these commercial types of solar plants, the Hidden Hills Solar Electric Generating System, currently under review by the California Energy Commission, will be located in Inyo County adjacent to the Nevada border. The project will consist of two solar fields, each generating approximately 270 MW gross, 250 MW net, with one plant occupying 1,483 acres (2.3 square miles) and the other 1,510 acres (2.4 square miles). Each plant will use heliostats, which are elevated mirrors guided by a tracking system mounted on a pylon. The purpose of this is to focus the rays of the sun on a solar receiving steam generator atop a solar power tower near the center of each solar field. The design incorporates a 750-foot solar power tower that allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. The desired goal of the technology is to reduce mirror shading and allow more heliostats to be placed per acre.

Due to the lack of suitable land areas and reliable solar radiation in the areas near the Project, solar powered electric generation on the magnitude required for the Project does not seem plausible. The eastern part of the state has the land area and the solar resources likely to support a project with the electric generating capacity equivalent to the South Dunes Power Plant, but the electric transmission system is not adequate to ensure that solar generated electricity can be provided reliably to the Project. Like most renewable sources of electric generation, conventional electric generation is needed as a backup when there are insufficient solar resources, in the case of solar generation.

If history is any guide, the application of solar energy in Oregon in the near-term will be limited to specialty applications until such time that the installed cost of solar electric systems becomes more competitive with conventional alternatives. Solar energy in the near-term in Oregon does not appear capable of providing the 420 MW generation capacity required to maintain reliable LNG production.

10.6.2.3 Tidal

Generation of electricity through conversion of ocean current, swell, wave action, tidal gradients, and thermal gradients is being successfully demonstrated around the world. Wave densities in Oregon are estimated to be capable of producing between five and 15 megawatts per mile of coastline. In 2010, a settlement was reached with Ocean Power Technologies (OPT) for the Reedsport project. Stakeholders, along with state and federal agencies, approved resource study plans and conditional placement of 10 wave energy power buoys off the mouth of the Umpqua River, approximately 2.5 miles from shore. According to the ODOE 2013-15 Biennial Energy Plan, OPT plans to deploy the first federally licensed commercial wave energy device in the spring of 2013. The project will consist of 10 power buoy units with a total production up to 1.5 MW with the potential to scale up to a total of 50 MW with additional power buoy units. The project has received its FERC license, but the date of a full 50 MW build out has not been determined.

OPT is also proposing to develop a utility-scale, commercial wave park in North America at Coos Bay. The planned size of this park is up to 100 MW, and it is expected to be the largest wave energy project in the world when it is completed. The wave park will be located approximately 2.7 miles off the coast of Oregon, west of the towns of Coos Bay and North Bend. The Coos Bay OPT Wave Park will utilize OPT's next generation PB500 PowerBuoys®. The wave park will consist of up to 200 PowerBuoys, 20 undersea substations, and a sub-marine cable to deliver the electricity generated from this wave park into the grid served by the Pacific Northwest power grid.

With the OPT planned projects, Oregon has built a regulatory pathway for the next generation of marine energy developments. In January 2013, the Oregon Land Conservation and Development Commission set the course for future wave energy development in waters of the state by adopting an amendment to the Territorial Sea Plan. This document identified four Renewable Energy Suitability Study areas. Even if each of these four areas in addition to the one currently planned for development were used and the maximum of 50 MW of electric generation was installed at each area, and adding to that the 100 MW planned in the future off the coast of Coos Bay, the total (350 MW) would still be less than the 420 MW generation capacity required to maintain reliable LNG production. In the future this technology may provide a sufficient amount of power to offset some of the power produced at the South Dunes Power Plant, but factoring in reliability issues, this technology could not completely replace that generated by the combined cycle combustion turbines, at an equivalent price point.

10.7 REFERENCES

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TABLES

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
WASHINGTON PORTS											
Cherry Point	~125 assuming use of channel between Cypress and Blakely Islands and through the Straits of Juan du Fuca	NI	Station: Puffin Island Light, 4.8 miles north of at 48˚49.33'N 122˚48.5'W Avg. Flood Speed: 0.5 kts at 325˚ Avg. Ebb Speed: 0.8kts at 210˚	NOAA Station: 9449424 Mean Tide Range: 5.71 Great Diurnal Tide Range: 9.15 MHHW: 15.49 MHW: 14.66 MLW: 8.95 MLLW: 6.34	2,400 angular approach trestle, 1,000 feet of berthing space at the face, with reported depths of 65 feet alongside. Facility used for receipt of crude oil, shipment of petroleum products and bunkering vessels.	Killer Whale (*Orcinus orca*) Chinook Slamon(*Oncorhynchus [=Salmo] tshawytscha*) Bull Trout (*Salvelinus confluentes*)	None		Nearby marinas: -Sandy Point Marina -Blaine Harbor with 600 boat slips.		Much of the coastal land south of Birch Bay is Zoned for High Impact Industrial Use (Whatcom County Planning and Devolopment Services http://www.co.whatcom.wa.us/pds/gis/gismaps/zoning.jsp accessed January 2013)
Port Gamble	~120 through Straits of Juan du Fuca	23	Station: Port Gamble Bay, 0.5 mile N of entrance at 47˚51.87'N 122˚34.63'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable Station: Port Gamble Bay entrance at 47˚51.27'N 122˚34.63'W Avg. Flood Speed: 0.9 kts at 185˚ Avg. Ebb Speed: 0.7kts at 0˚ Station: Port Gamble Bay at 47˚50'N 122˚34.53'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable	NI	Entrance channel is constricted by shoals on either side	Killer Whale (*Orcinus orca*) Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*)	None		Nearby Marinas: -Twin Spits Marina Parks and reacreation areas: -Birch Bay State Park		
Bellingham	~125 assuming use of channel between Cypress and Blakely Islands and through the Straits of Juan du Fuca	30 in Whatcom Creek Waterway Outer and Middle Reaches, 18 through the Inner Reach, 26 in Squalicum Creek Waterway and 18 in I and J Street Waterway.	Station: Hale Passage, 0.5 mile SE of Lummi Point at 48˚43.88'N 122˚40.67'W Avg. Flood Speed: 1.1 kts at 350˚ Ebb Speed: 1kts at 145˚ Station: Eliza Island, 0.5 mile southeast of at 48˚39'N 122˚34'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable	Mean range is 5.2 and diurnal range of 8.6. A range of 14 may occur at the time of max tides.	NI	Killer Whale (*Orcinus orca*) Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)	None	Lummi Reservation across Bellingham bay from port.	Nearby marinas: -Seaview North Boatyard (boat slips and haul out service) -Squalicum Harbor (home to >1,400 commercial and recreational vessels including a large charter boat fleet) Approaches into Bellingham Port are near Zuanich Point Park		
Anacortes	~110 throught the Straits of Juan du Fuca	Centerline controlling depth 11.4 in the entrance channel, depths of 8 to 11 in the basin with lessor depths along the east edge and vicinity of the breakwaters	Station: Guemes Channel, west entrance at 48˚31.27'N 122˚39.13'W Flood Speed: 0.9 kts at 95˚ Ebb Speed: 2.1kts at 255˚ Station: Guemes Island, 0.5 mile east of at 48˚32'N 122˚34'W Flood Speed: Weak and Variable Ebb Speed: Weak and Variable	Mean range is 4.8 and a diurnal range of 8.2.	NI	Killer Whale (*Orcinus orca*) Chinook Slamon(*Oncorhynchus [=Salmo] tshawytscha*) Bull Trout (*Salvelinus confluentes*)	None	Swinomish Reservation southeast of Anacortes	Nearby Marinas: -Anchor Cove Marina -Anacortes Marina (466 slips, no transient moorage) -Fidalgo Yacht Club -Fidalgo Marina -Cap Sante Boat Haven	Anacortes Ferry Dock supporting ferry service to San Juan Islands and British Columbia	
Port Angeles	~70 through the Straits of Juan du Fuca	Greatest on north shore and decrease from 180 to 80 in the middle of the harbor	Station: Port Angeles at 48˚8'N 123˚25'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable Station: Ediz Hook Light, 1.4 miles southeast of at 48˚7'N 123˚24'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable Station: Ediz Hook Light, 1.2 miles north of at 48˚10'N 123˚25'W Avg. Flood Speed: 0.8 kts at 80˚ Avg. Ebb Speed: 1.1kts at 295˚ Station: Ediz Hook Light, 5.3 miles ENE of at 48˚11'N 123˚17'W Avg. Flood Speed: 1 kts at 55˚ Avg. Ebb Speed: 2 kts at 215˚	NOAA Station: 9444090 Mean Tide Range: 4.6 Great Diurnal Tide Range: 7.06 MHHW: 37.38 MHW: 36.83 MLW: 32.24 MLLW: 30.21	NI	Killer Whale (*Orcinus orca*) Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Marbled Murrelet (*Brachyramphus marmoratus*)	None	Elwha Klallam reservation within 5 miles of Port Angeles	Nearby Marinas: Port of Port Angeles Near Ediz Hook Reservation for Native Birds		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Port Townsend	~95 through the Straits of Juan du Fuca	Inside Point Hudson, depths range from 30 to 120	Station: Admiralty Head, 0.5 mile west of at 48˚9'N 122˚42'WAvg. Flood Speed: 2.1 kts at 145˚Avg. Ebb Speed: 3.1kts at 25˚Station: Point Wilson, 0.8 mile east of at 48˚9'N 122˚44'WAvg. Flood Speed: 2.5 kts at 165˚Avg. Ebb Speed: 2.6kts at 280˚	Mean range is 5.2 and diurnal range is 8.4.	NI	Killer Whale (*Orcinus orca*)Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)Chum Salmon (*Oncorhynchus [=Salmo] keta*)	None		Nearby Marinas:-Port of Townsend (home to 475 commercial and recreational vessels, provides >6,000 transient moorings per year)-Point Hudson Marina (32 slips and 800' of docks)Approaches to Port Townsend may pass closely to:-Fort Worden State Park-Fort Townsend State Park-Fort Flagler State Park-Fort Casey State Park		No Heavy Industrial Zone (City of Port Townsend Zoning Map 1997)
Everett	~130 through the Straits of Juan du Fuca	22 or more at the main wharves in Port Gardner	Station: Port Susan at 48˚6'N 122˚22'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable Station: Foulweather Bluff at 47˚57.25'N 122˚34.75'W Avg. Flood Speed: 1.5 kts at 115˚ Avg. Ebb Speed: 1.8 kts at 335˚	Mean range is 7.4 with a diurnal range of 11.1.	NI	Killer Whale (*Orcinus orca*) Chinook Slamon(*Oncorhynchus [=Salmo] tshawytscha*) Bull Trout (*Salvelinus confluentes*)	None	Tulalip Reservation adjacent to Everett.	Nearby Marinas: -Port of Everett Marina (>2,300 slips, commercial boat docking) -Dagmar's Marina (Dry moorage facility on Snohomish River) -Seacrest Marina Approaches to Everett may pass closely to: -Jetty Island Park		
Port of Edmonds	~125 through the Straits of Juan du Fuca	11 with depth to 13 alongside the piers	Station: Edmonds, 2.7 miles WSW of at 47˚48.38'N 122˚26.67'W Avg. Flood Speed: 0.2 kts at 170˚ Avg. Ebb Speed: 0.5 kts at 0˚	NI	Edmonds-Kingston Ferry route	Killer Whale (*Orcinus orca*) Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)	None		Nearby Marinas: -Port of Edmonds Marina (665 wet slips, 225 dry moorages) Approaches to Edmonds may pass closely to: -Marina Beach Park -Brackett's Landing North Park -Brackett's Landing Soutn Park	Edmonds Ferry Dock supporting ferry across Puget sound between Edmonds, WA and Kingston, WA	
Seattle	~145 throug the Straits of Juan du Fuca	34 or more to Seattle waterfront in Elliott Bay. 34 in East and West Waterways. Duwamish Waterway provides a 30 foot channel from the south end of West Waterway to 1st avenue south bridge, 20 for about 0.65 mile to 8th Avenue South, 15 to a point about 1.2 miles south of the 14th Avenue South Bridge.	Station: Elliott Bay entrance at 47˚36.72'N 122˚24.43'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable	Mean range of 7.7 and a diurnal range of 11.4. A range of about 18 may occur at maximum tides.	No bridges in the Seattle waterfront in Elliott Bay and none over the East and West Waterways	Killer Whale (*Orcinus orca*) Chinook Slamon(*Oncorhynchus [=Salmo] tshawytscha*) Bull Trout (*Salvelinus confluentes*)	None	Suquamish Reservation directly across narrow section of Puget Sound from Seattle.	>40 public and private marinas on Puget Sound, Lake Union and Lake Washington. Approaches to Seattle may pass closely to: -Myrtle Edwards Park	Victoria Ferry Dock and Seattle Pier 50 supportin ferry service to various points throughout Puget Sound	
Tacoma	~165 through Straits of Juan du Fuca	29 in Thea Foss Waterway to the South 11th Street Bridge, 22 for 0.2 miles, and 19 to the head of the Federal Project. Blair and Hylebos Waterways are maintained as Federal Projects. 30 depth in Hylebos Waterway and 30 and 35 in the Blair Waterway.	Tidal currents in the harbor have little velocity, except in Hylebos Waterway were velocities up to 2 knts have been reported.	Mean range is 8.1 and a diurnal range is 11.1. A range of 19 may occur at the time of maximum tides.	Two bridges over the waterway, South 11th Street vertical lift bridge, 0.5 mile from the entrance has a clearance of 64 feet down and 139 feet up. A fixed highway bridge near the head of the waterway has a clearance of 28 feet (36 feet at the center). 11th Street Bridge over Hylebos Waterway has a clearance of 21 feet.	Killer Whale (*Orcinus orca*) Chinook Slamon(*Oncorhynchus [=Salmo] tshawytscha*) Bull Trout (*Salvelinus confluentes*)	None	Puyallup reservation adjacent to Tacoma	Nearby Marinas: -Dock Street Marina -Delin Docks Marina -Foss Landing Marina (slips for boats up to 75' and slips and dry moorage for boats up to 38') -Chinook Landing Marina -Tyee Marina (750 slips for boats up to 60') -Hylebos Marina Approaches to Tacoma may pass closely to: -Point Defiance Park -Marine Park	Point Defiance - Tahlequah Ferry	
Olympia	~200 through Strais of Juan du Fuca	30 from deepwater in Budd Inlet to a 30-foot turning basin off the west side of the port terminal neat the head of West Bay. Channel with depth of 13 leads SE from the 30-foot outer channel to a mooring basin on the east side of the peninsula at the head of East Bay.	Station: Olympia, Budd Inlet at 47˚5'N 122˚55'W Avg. Flood Speed: Weak and Variable Avg. Ebb Speed: Weak and Variable	Mean range is 10.5 at Olympia and the diurnal range is 14.4.	Olympia Shoal 0.4 miles off the west shore, 3 miles inside the entrance.	Killer Whale (*Orcinus orca*) Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)	None		Nearby Marinas: -Swantown Marina (733 permanent and guest slips for vessels up to 120') -Fiddlehead Marina -Olympia Yacht Club Approaches to Olympia may pass closely to: -West Bay Park -Priest Point Park		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Grays Harbor/Aberdeen	<15	36 to about Cow Point, 30 to Cosmopolis, about 9 miles above the bay entrance.	Station: Grays Harbor Entrance, 0.2 mile south of north jetty at 46˚55.58'N 124˚9.68'W Avg. Flood Speed: 2.5 kts at 70˚ Avg. Ebb Speed: 1.7 kts at 243˚Station: Grays HarborEntrance, Point Chehalis Range at 46˚54.5'N 124˚9.33'W Avg. Flood Speed: 1.7 kts at 92˚ Avg. Ebb Speed: 3.1 kts at 268˚Station: Grays Harbor Entrance, 0.6 mile WNW of Westport at 46˚54.88'N 124˚7.5'W Avg. Flood Speed: 2.2 kts at 44˚ Avg. Ebb Speed: 1.9 kts at 238˚Station: Grays Harbor Entrance at 46˚55.35'N 124˚7.98'W Avg. Flood Speed: 1.9 kts at 61˚ Avg. Ebb Speed: 2.8 kts at 242˚Station: Grays Harbor Entrance, 1.1 miles NW of Westport at 46˚55'N 124˚8'W Avg. Flood Speed: 1.8 kts at 78˚ Avg. Ebb Speed: 2.5 kts at 233˚Station: Grays Harbor Channel, 1.5 miles north of Westport at 46˚56'N 124˚6'W Avg. Flood Speed: 1.4 kts at 36˚ Avg. Ebb Speed: 1.8 kts at 226˚Station: Grays Harbor Channel, 2.1 miles NNE of Westport at 46˚56'N 124˚5'W Avg. Flood Speed: 1.2 kts at 21˚ Avg. Ebb Speed: 1.3 kts at 249˚Station: Westport, channel 0.4 mile NE of at 46˚54.85'N 124˚6.5'W Avg. Flood Speed: 1.9 kts at 113˚ Avg. Ebb Speed: 1.9 kts at 310˚	Mean range at Aberdeen is 7.9 and the diurnal range is 10.1.	Main channel of the Chehalis River is crossed by US 101 drawbridge at Aberdeen. Bridge has a clearance of 35 feet. A fixed bridge with a clearance o 29 feet is at South Montesano.	Western Snowy Plover (*Charadrius alexandrinus nivosus*)Bull Trout (*Salvelinus confluentes*)	None		Entrance to Grays Harbor has Ohyut National Wildlife Refuge north side and Westhaven State Park and Westport Light State Park on south side.		
Willapa Harbor	<20 miles from Raymond, WA (largest town on Willapa River) to Pacific Ocean	26 over the bar, 24 from deep water in Willapa Bay to just above both forks to the Willapa River at Raymond	2.5 knts at entrance, currents of 4 to 6 knts occur at times. In channel at South Bend, velocity is about 1.2 knts on the flood and 1.4 knts on the ebb.	Mean range is 7.8 and the diurnal range is 9.8. A range of 14 may occur at the time of maximum tides.	No bridges over the main channel. At the Narrows, one mile below the Port of Willapa Harbor wharf, power cables with clearance of 165 feet cross the river.	Western Snowy Plover (*Charadrius alexandrinus nivosus*) Marbled Murrelet (*Brachyramphus marmoratus*)	None	Shoalwater Bay Reservation near mouth of harbor.	Leadbetter Point State Park is on South side of bay entrance. Other Coastal Parks/Recreation areas on Willapa Bay include: -Willapa National Wildlife Refuge -Bush Pioneer County Park		
Skamokawa	~30 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	Station: Woody Island Channel at 46˚14.37'N 123˚40.4'W Avg. Flood Speed: 1 kts at 118˚ Avg. Ebb Speed: 0.9 kts at 298˚ Station: Woody Island Channel (off Seal Island) at 46˚13.05'N 123˚37.75'W Avg. Flood Speed: 0.5 kts at 81˚ Avg. Ebb Speed: 1.2 kts at 247˚	NOAA Station: 9440569 Mean Tide Range: 6.12 Great Diurnal Tide Range: 7.56 MHHW: 7.94 MHW: 7.3 MLW: 1.18 MLLW: 0.38	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -Elochman Slough Marina Parks and recreation areas between the mouth of Columbia River and Skamakawa include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park		
Longview	~60 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	Station: Walker Island, south of at 46˚8.47'N 123˚2.75'W Avg. Flood Speed: 0.4 kts at 148˚ Avg. Ebb Speed: 1.2 kts at 330˚	NOAA Station: 9440422Mean Tide Range: 3.78Great Diurnal Tide Range: 4.61MHHW: 6.99MHW: 6.51MLW: 2.74MLLW: 2.38	Astoria Bridge, 208' Vertical, 1,070 HorizontalLongview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)Chum Salmon (*Oncorhynchus [=Salmo] keta*)Steelhead (*Oncorhynchus [=Salmo] mykiss*)Bull Trout (*Salvelinus confluentes*)Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas:-City of Ranier MarinaParks and recreation areas between the mouth of the Columbia River and Longview include: -Lewis and Clark National Historic Park-Fort Stevens State Park-Lewis and Clark National Wildlife Refuge-Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Kalama	~70 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	NI	NI	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Parks and recreation areas between the mouth of the Columbia River and Kalama include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park -Laurel Beach County Park -Prescott Beach County Park		70 acres heavy industrial land with 600' wharf on deep draft Columbia River.
Vancouver	~100 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	NI	NI	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -McCuddy's Hayden Island Marina (200 slips) -North Hayden Marina -Salpare Bay Marina (Slips for boats upt 100') -Tomahawk Bay Marina Parks and recreation areas between the mouth of the Columbia River and Vancouver include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park -Laurel Beach County Park -Prescott Beach County Park -Sand Island Marine Park -Columbia View Park -Ridgefield National Wildliefe Refuge -Shillapoo Wildlife Recreation Area -Kelley Point Park		
OREGON PORTS											
Portland	~110 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	NI	Mean range of 1.8 and diurnal range is 2.4.	Astoria Bridge, 208' Vertical, 1,070 HorizontalLongview Bridge, 198' Vertical, 1,085 HorizontalMinimum clearance of drawbridges is 26 feet at the Glisan Street vertical lift highway and railroad bridge, raised clearance of both decks of the bridge is 161 feet and of the lower deck alone 71 feet. The minimum fixed span clearance is 120 for the central 100 feet at the Ross Island highway bridge. The Marquam fixed highway bridge, midway between the Hawthorne and Ross Island bridges has a clearance of 120 feet for a center 220-foot width.	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*)Chum Salmon (*Oncorhynchus [=Salmo] keta*)Steelhead (*Oncorhynchus [=Salmo] mykiss*)Bull Trout (*Salvelinus confluentes*)Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas:-McCuddy's Hayden Island Marina (200 slips)-North Hayden Marina-Salpare Bay Marina (Slips for boats upt 100')-Tomahawk Bay MarinaParks and recreation areas between the mouth of the Columbia River and Portland include: -Lewis and Clark National Historic Park-Fort Stevens State Park-Lewis and Clark National Wildlife Refuge-Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park-Laurel Beach County Park-Prescott Beach County Park-Sand Island Marine Park-Columbia View Park-Ridgefield National Wildliefe Refuge-Shillapoo Wildlife Recreation Area-Kelley Point Park		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
St. Helens	~85 to mouth of Columbia River	55 - for five miles, 40 - for 100 miles	NI	NOAA Station: 9439201 Mean Tide Range: 2.6 Great Diurnal Tide Range: 3.33 MHHW: 5.1 MHW: 4.6 MLW: 2.01 MLLW: 1.77	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -Sand Island Marina Park Docks -St. Helens Marina -Yachts Landing Marina Parks and recreation areas between the mouth of the Columbia River and St. Helens include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park -Laurel Beach County Park -Prescott Beach County Park -Sand Island Marine Park		
Port Westward	~50 to mouth of Columbia	55 - for five miles, 40 - for 100 miles	NI	NI	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Parks and recreation areas between the mouth of Columbia River and Port Westward include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park		
Wauna	~40 to mouth of Columbia	55 - for five miles, 40 - for 100 miles	Station: Clifton Channel at 46˚13.07'N 123˚27.92'W Avg. Flood Speed: 0.5 kts at 118˚ Avg. Ebb Speed: 1.1 kts at 301˚	NOAA Station: 9439099 Mean Tide Range: 5.77 Great Diurnal Tide Range: 7.06 MHHW: 7.91 MHW: 7.31 MLW: 1.54 MLLW: 0.85	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Steelhead (*Oncorhynchus [=Salmo] mykiss*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -Elochman Slough Marina Parks and recreation areas between the mouth of Columbia River and Wauna include: -Lewis and Clark National Historic Park -Fort Stevens State Park -Lewis and Clark National Wildlife Refuge -Columbian White-Tailed Deer National Wildlife Refuge -Skamakawa Visa Park		
Astoria	~12 to mouth of Columbia	55 - for five miles, 40 - for 100 miles	1-3 above Astoria	Mean range is 6.6 and diurnal range is 8.4. A range of 12 may occur at the time of maximum tides.	Astoria Bridge, 208' Vertical, 1,070 Horizontal Longview Bridge, 198' Vertical, 1,085 Horizontal	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Chum Salmon (*Oncorhynchus [=Salmo] keta*) Bull Trout (*Salvelinus confluentes*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -Port of Astoria West Basin (slips for boats 20 - 100') -Port of Astoria East Basin (slips for boats 20 - 100') -Hammond Marina Parks and recreation area between mouth of Columbia River and Astoria include: -Lewis and Clark National Historic Park -Fort Stevens State Park		
Tillamook Bay	~8	18 in entrance channel to a point where the channel turns southeast, 15 to Garibaldi Light 19, 9 along the north edge of the turning basin, 1-3 in turning basin, 10 in access channel to mooring basin with 6-9 in the basin. Project for turning basin is inactive and not maintained for several years.	Station: Tillamook Bay entrance at 45˚33.73'N 123˚56.3'W Avg. Flood Speed: 3 kts at 141˚ Avg. Ebb Speed: 2.6 kts at 305˚	NI	Fixed highway bridge with aclearance of 15 feet crosses the Tillamook River about 0.7 miles above the mouth	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*) Marbled Murrelet (*Brachyramphus marmoratus*) Western Snowy Plover (*Charadrius alexandrinus nivosus*)	None		Nearby Marinas: -Garibaldi Marina Parks and Recreation areas on Tillamook Bay Include: -Tillamook State Forest -Barview County Park -Bayocean Peninisula County Park		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Depoe Bay	<1	7-8 in the basin	NI	NI	Fixed concrete arch bridge over the entrance, width of 30 feet is less than the clearance of 42 feet	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*)	None		Nearby Marinas: -Depoe Bay Boat Harbor Parks and recreation areas on Depoe Bay include: -Depoe Bay State Wayside		
Yaquina Bay/Newport, Toledo	~13 from Toledo to Pacific ~3 from Newport to Pacific	40 at entrance, 30 from the first turn in the channel to and in the turning basin at McLean Point, 18 to Yaquina, 10 feet at Toledo	2.4 knts on flood and 2.3 on ebb. Near Newport docks the velocity is about 0.5 knts. Off Yaquina and one mile south of Toledo the velocity is 1.4 knts	6, diurnal range of 8 feet	Fixed highway bridge across the channel 1.3 miles above the entrance with a clearance of 129 feet	Coho Salmon (Oncorhynchus [=Salmo] kisutch)	None		Nearby Marinas: -Port of Newport Marina (both commercial and recreational vessels) -Embarcedaro Resort and Marina (233 slips for 20 - 40' boats)		
Siuslaw River/Florence	<5	16-18 in entrance channel to highway bridge at Florence, 16 in turning basin and 12 to Cushman	NI	NI	Bascule highway bridge with a clearance of 17 feet crosses the river from Florence to Glenada. Overhead power cable with a clearance of 23 feet crosses the river about 150 yards east of the bridge. Another power cable with a clearance of 88 feet crosses the river about one mile above the bridge	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*) Western Snowy Plover (*Charadrius alexandrinus nivosus*)	None	Significant Native American Community near river mouth based on 2000 Census tracts identified as "American Indian"	Nearby Marinas: -Port of Siuslaw Parks and recreation areas on Siuslaw River include: -Siuslaw National Forest -Harbor Vista County Park -South Jetty County Park -Joaquin Miller State Park		
Umpqua River/Gardiner	~ 10 miles from Reedsport to mouth of Umpqua River	26 in entrance channel, 22 feet to Gardiner and Reedsport	Station: Umpqua River entrance at 43˚40.7'N 124˚11.6'W Avg. Flood Speed: 0.8 kts at 10˚ Avg. Ebb Speed: 1 kts at 190˚	NI	US Route 101 bridge at upper end of turning basin has a swing span with a clearance of 36 feet. West of bridge is a power cable with a clearance of 152 feet. Railroad bridge 500 yards above the highway bridge has a swing span an a clearance of 16 feet.	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*) Western Snowy Plover (*Charadrius alexandrinus nivosus*) Pacific Eulachon (*Thaleichthys pacificus*)	None		Nearby Marinas: -Salmon Harbor Marina Oregon Dunes National Recreation area on both sides of Umpqua River mouth Other parks and recreation areas incluide: -Oak Rock County Park -Windy Cove County Park -Salmon Harbor County Park		
Coos Bay	<13	47-37 across the bar, 37 feet through North Bend and Coos Bay to the mouth of Isthmus Slough, 37 feet to a point 1.1 miles above the mouth of Isthmus slough, 22 feet to Millington, 14.7 miles above the entrance to the bay. Turning basins at North Bend and Coos Bay have 37 feet	Average 2 knts, greatest observed was 3 knts, during long runouts an ebb current of 5 knts has been observed	Mean range of 5.6 and diurnal range of 7.3. A range of 12 may occur a the time of maximum tides.	Rail road bridge7.5 miles above the entrance, vertical clearance of 12 feet. Fixed highway bridge, 8.1 miles above the entrance, 123 feet clearance. Power cable300 feet west of the bridge has a clearance of 167 feet.	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*) Western Snowy Plover (*Charadrius alexandrinus nivosus*)	None	Significant Native American Community near bay entrance based on 2000 Census tracts identified as "American Indian". Coos Lower Umpqua And Siuslaw Indian Reservation	Nearby Marinas: Charleston Marina		
Coquille River	~21 miles from the town of Coquille to mouth of Coquille River, <1 from Brandon to mouth of river	13 feet from entrance to Bandon, depth of 6 feet above Bandon to Coquille, 21 miles above the entrance	Station: Coquille River entrance at 43˚7.3'N 124˚25.18'W Avg. Flood Speed: 1.4 kts at 91˚ Avg. Ebb Speed: 1.2 kts at 290˚	NI	Highway bridge 3 miles above the entrance, lift span of 28 feet down and 74 feet up. In 2003 lift span was inoperable and in the closed position. An overhead cable east of the bridge has a clearance of 72 feet. Power cables cross the river between Prosper and Coquille with the least clearance of 68 feet	Coho Salmon (*Oncorhynchus [=Salmo] kisutch*)	None		Nearby Marinas: -Port of Bandon Parks and recreation areas on Coquille River include: -Bandon Marsh National Wildlife Refuge -Bullard's Beach State Park		
Port Orford	<1 from harbors to open ocean	Anchorage in center of Port Orford 30-60 feet	Station: Cape Blanco at 42˚50'N 124˚35'W Avg. Flood Speed: 1.1 kts at 10˚ Avg. Ebb Speed: 1.1 kts at 190˚	NOAA Station: 9431647 Mean Tide Range: 5.21 Great Diurnal Tide Range: 7.28 MHHW: 30.33 MHW: 29.62 MLW: 24.41 MLLW: 23.05	NI	Stellar sea-lion(*Eumatopias jubatus*) Western Snowy Plover (*Charadrius alexandrinus nivosus*)	Port Orford ~ 3 miles from mouth of Elk River. Approaches may bring LNG marine traffic closer.		Nearby Marinas: -Port Orford Anchorage Parks and recreation areas: -Port Orford Head State Park -Battle Rock Way Side Park -Humbug Mountain State Parkd		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Port of Gold Beach/Rogue River	<1	13 from the ocean along the north jetty to a point about 0.4 miles above the ends of the jetties. Dredged channel continues ENE further up river, then turns sharply SSE from the river and leads between two stone jetties to a boat basin at the Port of Gold Beach, controlling depth is 8 feet.	Station: Cape Sebastian at 42°20'N 124°26'W Avg. Flood Speed: 1.1 kts at 355° Avg. Ebb Speed: 1.1 kts at 175°	NI	Channel subject to severe shoaling Concrete arch highway bridge across Rogue River 0.8 miles above the mouth has a fixed span with a clearance of 30 feet. Overhead power cable with a clearance of 77 feet crosses the river 0.2 miles east of the highway bridge	Stellar sea-lion(*Eumatopias jubatus*)	None		Nearby Marinas: -Gold Beach Small Craft Harbor Parks and recreation areas: -South Beach Park -Buena Vista State Park -Siskiyou-Rogue River National Forest		
Port of Brookings/ Chetco River	<1	10 feet in entrance channel to turning basin, 7-11 foot depths in basin	NI	NI	Overhead power cable crossing the river 0.6 miles above the jetties, clearance of 46 feet; Highway bridge with clearance of 59 feet	None	None		Parks and recreation areas: -Chetco Point Park		
CALIFORNIA PORTS											
Crescent City Harbor	<2	13.8 feet in the left half of the outer harbor channel and 11 feet in the right half of the outer harbor channel to the basin of north of Whaler Island. 8.7 feet in inner small craft basin	Station: St. George Reef at 41°49'N 124°20'W Avg. Flood Speed: 1 kts at 5° Avg. Ebb Speed: 1 kts at 185°	NOAA Station: 9419750Mean Tide Range: 4.99Great Diurnal Tide Range: 6.87MHHW: 10.56MHW: 9.92MLW: 4.93MLLW: 3.69	Many rocks and shoals in the approach to harbor	Western Snowy Plover (*Charadrius alexandrinus nivosus*) Marbled Murrelet (*Brachyramphus marmoratus*) Tidewater goby (*Eucyclogobius newberryi*)	None	Yurok Reservation approximately 15 miles south of Crescent City	Nearby Marinas: -Cresecent City Harbor Parks and recreation areas: -Beach Front Park -Del Norte Coast Redwoods State Park		
Humboldt Bay/Eureka	<8 from Eureka to open water Pacific Ocean	48 feet over the bar and in the entrance channel; 38 feet in North Bay Channel to Eureka; 38 feet in the Eureka Channel outer reach; and 26 feet in the inner reach. Samoa Channel (including the turning basin is 38 feet and in Fields Landing Channel leading to South Bay (including the turning basin) is 26 feet	Average of 2 knts in main channel, does not exceed 3 knts. Between jetties, average is 2 knts with a max of 4 knts. During storm conditions can reach 5.5 knots	Mean range is 4.8 feet Diurnal range is 6.7 feet Range of 11 feet may occur at max tides	Fixed Highway Bridge, with	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha)* Steelhead (Oncorhynchus [=Salmo] mykiss) Western Snowy Plover (*Charadrius alexandrinus nivosus*) Stellar sea-lion(Eumatopias jubatus) Marbled Murrelet (*Brachyramphus marmoratus)* Tidewater goby (*Eucyclogobius newberryi*)	None		Nearby Marinas: -Eureka Public Marina -Woodley Island Marina Parks and recreation areas: -Humboldt Bay National Wildlife Refuge		
Tomales Bay	<15	3-10	6 knts at spring tide	NI	NI	Steelhead (Oncorhynchus [=Salmo] mykiss) Western Snowy Plover (*Charadrius alexandrinus nivosus)* Yellow larkspur *(*Delphinium luteum*)* Tidewater goby (*Eucyclogobius newberryi*) California red-legged frog (*Rana darytonii*)	None		Nearby Marinas: -Marshall Anchorage Parks and recreation areas: -Tomales Bay State Park -Tomales Bay Ecological Reserve -Point Reyes National Seashore		
Bodega Harbor	<3	12 - protected by entrance jetties	NI	NI	Turning basin inside entrance to harbor at the north end, depths 12 feet in western half and 12 - 4.2 feet in eastern half	Steelhead (Oncorhynchus [=Salmo] mykiss) Yellow larkspur *(*Delphinium luteum*)* Tidewater goby (*Eucyclogobius newberryi*) California red-legged frog (*Rana darytonii*)	None		Nearby Marinas: -Spud Point Marina -Porto Bodega Marina -Mason's Marina Parks and recreation areas: -Doran County Park		

TABLE 10.3-1

Summary of Potential Ports

Port	Length of Waterway [1] (miles)	Federal Channel Depth [2] (feet)	Current [2],[3] (knots)	Average Tidal Range [3],[4] (feet)	Transit Navigation Restrictions [3]	USFWS Critical Habitat [5]	Wild and Scenic Rivers [6]	Tribal Lands [7]	Recreational Use [8]	Commercial Use	Known Available Land
Noyo Anchorage	<2	21-39 in anchorage, dredged channel 6.7 feet at mid channel, 10 feet in Noyo Basin	Station: Point Cabrillo at 39˚21'N 123˚50'W Avg. Flood Speed: 1 kts at 345˚ Avg. Ebb Speed: 1 kts at 165˚	NI	Fixed highway bridge, 80 feet clearance, 300 east of mouth, replacement bridge under construction in March 2000, 99 foot clearance, 0.2 miles from the mouth	Chinook Salmon(*Oncorhynchus [=Salmo] tshawytscha*) Tidewater goby (*Eucyclogobius newberryi*)	None		Nearby Marinas: -Noyo Mooring Basin -Dolphin Isles Marina (150 slips)		
Stockton	~ 60 miles to San Fransisco Bay	35 at MLLW, 37 at avg low tide, 40 at avg high tide	Station: Vulcan Island, 0.5 mile east of at 37˚59.12'N 121˚23.45'W Avg. Flood Speed: 0.7 kts at 135˚ Avg. Ebb Speed: 0.4 kts at 315˚	NI	Carquinez Strait 134' Vertical, 998 Horizontal; S. Pacific Railroad (6.5 miles from Carquinez Bridge) 70' Vertical closed, 135˚ Vertical open, 291˚ Horizontal; Fixed Span Bridge (22 miles from S. Pacific Bridge) 135˚ Vertical, 291 Horizontal 75 nautical miles from San Francisco	Steelhead (Oncorhynchus [=Salmo] mykiss) Delta smelt (Hypmesus transpacificus)	None		~15 Marinas between Stockton and San Francisco Bay Parks and recreation areas between Stockton and San Fransico Bay Include: -Crockett Hills Regional Park -Benicia State Recreation Area -Carquinez Strait Region Shoreline -Grizzly Island Wildlife Area -Point Edith Wildlife Area -Brown Island Regional Shoreline -Sherman Island Waterfowl Management Area -Sandy Beach Park -Antioch Dunes National Wildlife Refuge -Mandeville Tip County Park -South Spud Island Recreation Area -Buckly Cove Park		
Sacramento	~85 miles to San Francisco Bay	30	NI	NI	135 feet Rail bridge at Antioch, CA (Air Draft) 79 nautical miles from San Francisco	Steelhead (Oncorhynchus [=Salmo] mykiss) Delta smelt (Hypmesus transpacificus) Valley elderberry longhorn beetle (Desmocerus californicus dimorphus)	American (Lower) River		~25 - 30 Marinas between Sacremento and San Francisco Bay Parks and recreation areas between Stockton and San Fransico Bay Include: -Crockett Hills Regional Park -Benicia State Recreation Area -Carquinez Strait Region Shoreline -Grizzly Island Wildlife Area -Point Edith Wildlife Area -Brown Island Regional Shoreline -Sherman Island Waterfowl Management Area -Sandy Beach Park -American River Parkway -Discovey Park -Sutter's Landing Regional Park -Yolo Bypass Wildlife Area -Brannan Island State Recreation Area		

NI No information was available
[1] Approximate distance from port to open water Pacific Ocean
[2] Data from nearby stations with NOAA predicted tidal currents for 2013.
[3] NOAA Coast Pilot 7, 2013 (45th edition)
[4] Observed tidal data,where available, and NOAA tidal predictions (All tide levels reference to station datum unless otherwise specified).
[5] USFWS critical habitat for threatened and endagered species. http://criticalhabitat.fws.gov/crithab/
[6] Designated under Wild and Scenic River Act of 1968. http://www.rivers.gov/rivers/index.php
[7] Washington data from GIS datalayer from WA Department of Ecology: http://www.ecy.wa.gov/services/gis/data/polsub/tribal.htm.
Oregon Data from GIS data layer from Oregon Geospatial Data Library: http://spatialdata.oregonexplorer.info/geoportal/catalog/main/home.page. Census Blocks in 2000 Census defined as "American Indian"
California and additional Oregon data from GIS datalayer from National Atlas: http://nationalatlas.gov/atlasftp.html
[8] Marina data from http://marinas.com

TABLE 10.3-2

Summary of Preliminary Screening of Potential Ports

Port	Injunctive Exclusions (tanker traffic or LNG terminals allowed in port)	Federal Channel Depth Meets or Exceeds 36 feet (11 meters)	High Population Density (sites are separated from high population areas)	Transit Navigation Restrictions (LNG ship transit route to potential site location avoids navigation hazards)
WASHINGTON PORTS				
Cherry Point	No	NI	No	NI
Port Gamble	No	No	No	No
Bellingham	No	No	No	NI
Anacortes	No	No	No	NI
Port Angeles	Yes	Yes	No	NI
Port Townsend	No	Yes	No	NI
Everett	No	No	No	NI
Port of Edmonds	No	No	No	No
Seattle	No	No	No	Yes
Tacoma	No	No	No	No
Olympia	No	No	No	No
Grays Harbor	Yes	Yes	Yes	Yes
Willapa Harbor	Yes	No	No	Yes
Aberdeen	Yes	Yes	No	No
Skamokawa	Yes	Yes	No	No
Longview	Yes	Yes	No	No

TABLE 10.3-2

Summary of Preliminary Screening of Potential Ports

Port	Injunctive Exclusions (tanker traffic or LNG terminals allowed in port)	Federal Channel Depth Meets or Exceeds 36 feet (11 meters)	High Population Density (sites are separated from high population areas)	Transit Navigation Restrictions (LNG ship transit route to potential site location avoids navigation hazards)
Kalama	Yes	Yes	No	No
Vancouver	Yes	Yes	No	No
OREGON PORTS				
Portland	Yes	Yes	No	No
St. Helens	Yes	Yes	No	No
Port Westward	Yes	Yes	Yes	Yes [(1)]
Wauna	Yes	Yes	Yes	Yes[1]
Astoria	Yes	Yes	Yes [(2)]	Yes
Tillamook Bay	Yes	No	Yes	No
Depoe Bay	Yes	No	No	No
Yaquina Bay/Newport, Toledo	Yes	No	No	No
Siuslaw River/Florence	Yes	No	No	No
Umpqua River/Gardiner	Yes	No	No	No
Coos Bay	Yes	Yes	Yes	Yes
Coquille River	Yes	No	No	Yes
Port Orford	Yes	No	No	Yes
Port of Gold Beach/Rouge River	Yes	No	No	No
Port of Brookings/Chetco River	Yes	No	No	No

TABLE 10.3-2

Summary of Preliminary Screening of Potential Ports

Port	Injunctive Exclusions (tanker traffic or LNG terminals allowed in port)	Federal Channel Depth Meets or Exceeds 36 feet (11 meters)	High Population Density (sites are separated from high population areas)	Transit Navigation Restrictions (LNG ship transit route to potential site location avoids navigation hazards)
CALIFORNIA PORTS				
Crescent City Harbor	Yes	No	No	No
Humboldt	Yes	Yes	No	Yes
Tomales Bay	Yes	No	No	NI
Bodega Harbor	Yes	No	No	NI
Noyo Anchorage	Yes	No	No	No
Stockton	Yes	No	No	No
Sacramento	Yes	No	No	No

NI - No information was available

(1) LNG ship transit route passes under one bridge, but bridge spans are sufficient for safe passage.

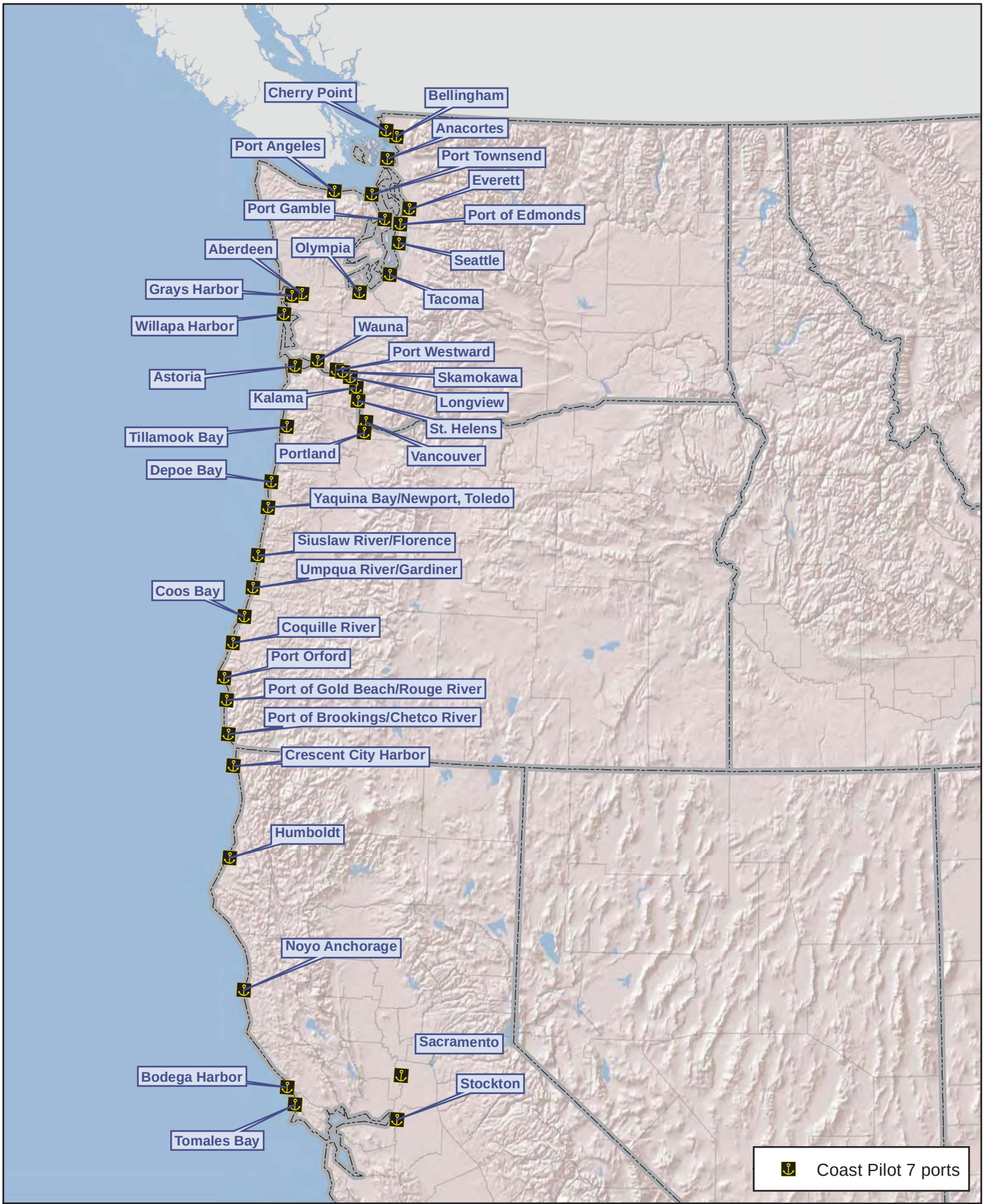
(2) Populated areas in port, but port encompasses sufficient area to allow for LNG terminal site remote from populated areas.

TABLE 10.3-3

Scoring Summary of Candidate Ports

	Candidate Ports				
Criteria	**Coos Bay**	**Grays Harbor**	**Port Westward**	**Wauna**	**Astoria**
Population Density Near Site	3	1	3	3	1
Population Density Along LNG Ship Transit Route	3	3	1	1	1
LNG Ship Transit Distance	5	3	3	3	5
Compatibility With Existing Port Users	5	5	3	3	3
Impact on Recreational Waterway Users	3	3	3	3	3
Impact on Commercial Fishing	3	3	3	3	3
Existing Deep Draft Vessel Traffic	5	5	1	1	3
Compatibility With Land Use/ Zoning	3	3	1	1	1
Land Ownership	5	3	1	5	5
Environmentally Sensitive Areas	3	3	3	3	3
TOTAL	38	32	22	26	28

FIGURES



Jordan Cove Energy Project, L.P.

Figure 10.3-1
Potential Ports in the Study Area
JCEP LNG Terminal Project

1:6,000,000
0 25 50 100 mi
N

Sources:
ESRI, Jordan Cove Energy Project, L.P.

Created by: TRC 1/17/2013



CH N:\GIS\TRC Atlanta\Jordan Cove Resource Report\JCEP LNG Terminal Project\mxd\Figure 10-3-2 Major FERC and CPUC Regulated Transmission Pipelines in the Study Area.mxd

Jordan Cove Energy Project, L.P.

Figure 10.3-2 Major FERC and CPUC Regulated Transmission Pipelines in the Study Area
JCEP LNG Terminal Project

0 30 60 120 mi

1:6,000,000

N

source: ESRI, TRC



CH N:\GIS\TRC Atlanta\Jordan Cove Resource Report\JCEP LNG Terminal Project\mxd\Figure 10-3-3 Short List of Candidate Ports in Study Area.mxd

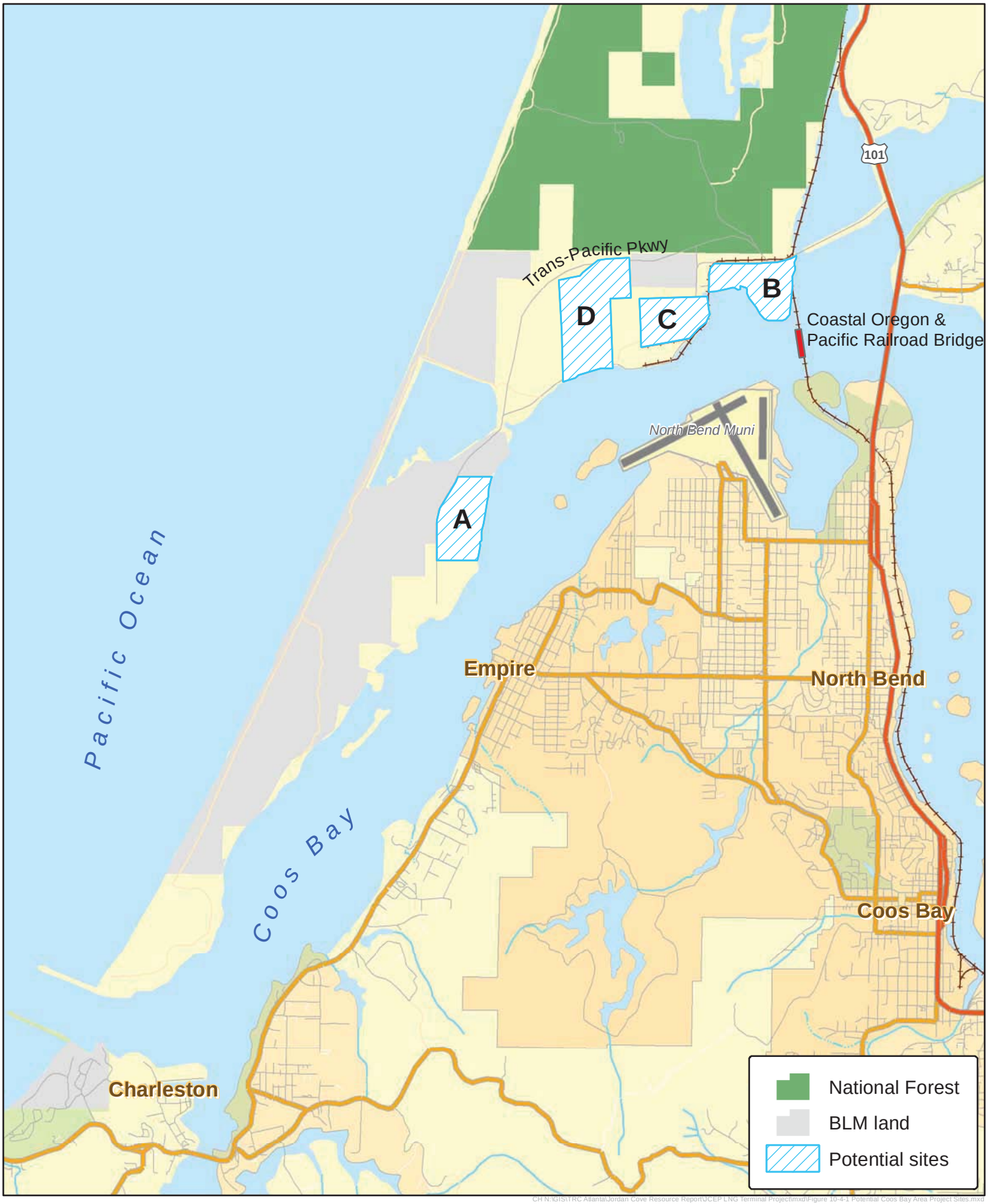
Jordan Cove Energy Project, L.P.

Figure 10.3-3
Short List of Candidate Ports in the Study Area
JCEP LNG Terminal Project

0 30 60 120 mi

1:6,000,000

source: ESRI, TRC

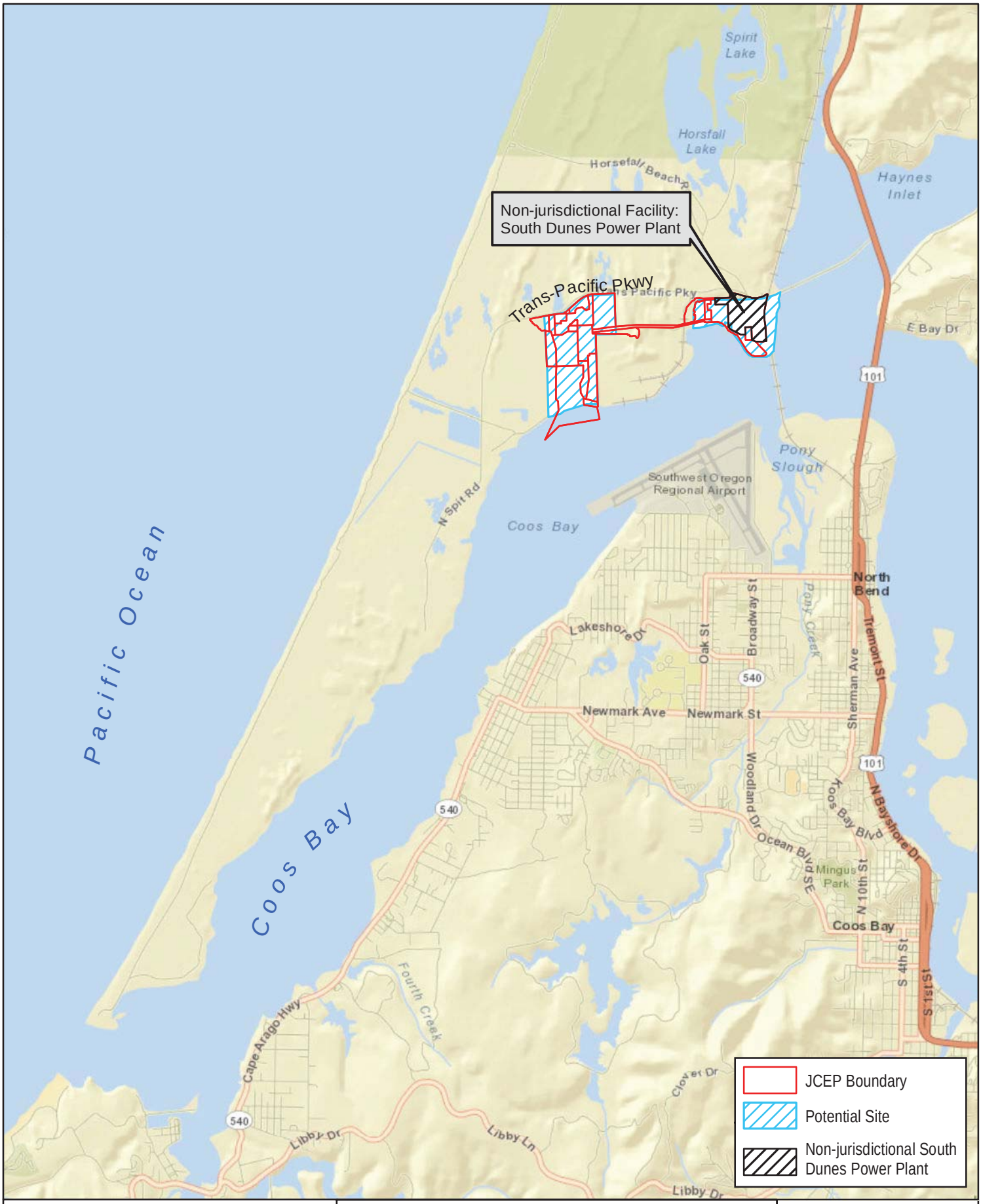


CH N:\GIS\TRC Atlanta\Jordan Cove Resource Report\JCEP LNG Terminal Project\mxd\Figure 10.4-1 Potential Coos Bay Area Project Sites.mxd

Jordan Cove Energy Project, L.P.

Figure 10.4-1
Potential Coos Bay Area Project Sites
JCEP LNG Terminal Project

0 0.25 0.5 1 mi
1:60,000
N
S
source: ESRI, Oregon DAS



Jordan Cove Energy Project, L.P.

Figure 10.4-2
JCEP LNG Terminal Project Site
JCEP LNG Terminal Project

1:60,000
0 0.25 0.5 1 mi

Sources:
ESRI, Jordan Cove Energy Project, L.P.
Created by: TRC 5/10/2013

APPENDIX A.10
Candidate Port Scoring Basis Summary Tables

Appendix A.10
Candidate Port Scoring Basis Summary Tables

Population Density Near Site	
Score	Scoring Criteria
1	Populated areas directly adjacent to site
3	Populated areas one mile from site
5	Populated areas greater than 15 miles from site

Population Density Along LNG Ship Transit Route	
Score	Scoring Criteria
1	Populated areas along LNG ship transit route within Zone 1 (0.3 mile or less)
3	Populated areas along LNG ship transit route within Zone 2 (greater than 0.3 mile, but less than one mile)
5	Populated areas along LNG ship transit route within Zone 3 (greater than one mile but equal to or less than 2.2 miles)

LNG Ship Transit Distance	
Score	Scoring Criteria
1	Distance from sea buoy to site greater than 100 nm
3	Distance from sea buoy to site greater than 10 nm but less than 100
5	Distance from sea buoy to site equal to or less than 10 nm

Compatibility With Exiting Port Users	
Score	Scoring Criteria
1	Ports are primarily recreational, no deep draft vessel traffic
3	Ports are primarily commercial with deep draft traffic
5	Ports have additional capacity for deep draft traffic

Impact on Recreational Waterway Users	
Score	Scoring Criteria
1	Recreational traffic more than 75% of waterway traffic
3	Recreational traffic more than 20% but less than 75% of waterway traffic
5	Recreational traffic less than 20% of waterway traffic

Impact on Commercial Fishing	
Score	Scoring Criteria
1	Commercial fishing fleet separated from access to fishing areas
3	Fishing fleet downstream of LNG terminal site
5	No commercial fishing fleet in waterway

Existing Deep Draft Vessel Traffic	
Score	Scoring Criteria
1	Waterway has no additional capacity for deep draft vessels
3	Waterway has capability to accommodate up to a 50% increase in deep draft vessels
5	Waterway can accommodate greater than 50% increase in deep draft vessels

Compatibility with Land Use/Zoning	
Score	Scoring Criteria
1	Site does not comply with CZM or Estuary Management Plan requirements
3	Site requires variance or special use modification to CZM or Estuary Management Plan requirements
5	Site is in complete compliance with CZM or Estuary Management Plan requirements

Land Ownership	
Score	Scoring Criteria
1	Parcels of sufficient size not available
3	Combination of parcels required to achieve sufficient size
5	Parcels of sufficient size available

Environmentally Sensitive Areas	
Score	Scoring Criteria
1	Available site areas are all greenfield
3	Available site areas are combination of greenfield and brownfield
5	Available site areas are all brownfield

APPENDIX B.10
Navigation Database Development - Final Report

Jordan Cove Energy Project
Navigation Database Development

Final Report



October 27, 2006

Prepared for:

TRC Companies, Inc.
3772 Pleasantdale Road
Atlanta, GA 30340

Prepared By:

Parsons Brinckerhoff, Quade & Douglas, Inc.
400 SW Sixth Avenue, Suite 802
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Jordan Cove Energy Project
Navigation Database Development

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Appendix A: Acoustic Doppler Current Profiler Survey Results

Jordan Cove Energy Project
Navigation Database Development

Purpose and Scope of Work

This report has been prepared by PB Ports & Marine, a division of Parsons Brinckerhoff Quade & Douglas, Inc. (PB), at the request of TRC Companies, Inc. to prepare a navigation database for the development of a proposed liquefied natural gas (LNG) import terminal at Coos Bay. The purpose of the database development is to document existing and newly acquired data relevant to navigation associated with the proposed project site and vicinity. PB's scope of work for development of the database is as listed below.

1. Analyze Tide Data – PB will obtain tide data from the NOAA tide gauge located near Charleston, OR. The data will be statistically analyzed for mean, extremes, standard deviation, and trends.

2. Collect and Analyze Wave and Tsunami Data – PB will obtain wave data from NOAA buoys 46002, 46015, 46050 and 46229. The data will be statistically analyzed for operational conditions and extreme events. The Wave Information System developed by the U.S. Army Corps of Engineers will be utilized primarily for wave direction information in the vicinity of the mouth of Coos Bay. In addition, data from the recently installed buoy near the mouth of Coos Bay (No. 46229) will also be used to assess the nearshore directionality of wind waves and swell. Published analyses regarding extreme waves on the Oregon Coastline will be reviewed and summarized (e.g. "Analyses of Extreme Waves and Water Levels on the Pacific Northwest Coast", Komar and Allan, 2000). Existing available information regarding tsunami predictions for Coos Bay will be collected and analyzed.

3. Collect and Analyze Hydraulic and Hydrology Data – PB will obtain tributary stream flow data. GIS and NOAA data will be utilized to determine estuary tidal prism volume. The data will be statistically analyzed for mean, extremes, standard deviation, and trends.

4. Deploy Current Meter, Water Quality Meter and Analyze Data – Not included. PB will perform this work under its separate Task Order Agreement with Energy Projects Development, LLC.

5. Collect and Analyze Fog/Visibility Data – PB will purchase fog and visibility data from the Coos Bay Airport. The data will be statistically analyzed for mean, extremes, standard deviation, seasonality and trends.

6. Map Channel Bottom, Width and Depth – PB will obtain recent digital hydrographic cross line survey data from the Portland District, Corps of Engineers. The data will be used to create a digital terrain model of the channel. Effective channel width versus depth will be determined from the data.

7. Coordinate & Communicate on Environmental Issues – PB will provide 40 hours of coordination and communication time with TRC, its subcontractors and Energy Projects

Development, LLC regarding environmental data collection and related environmental issues on the project.

8. Report – PB will provide a letter report outlining sources of data, methodology and results for Tasks 1-6 above.

As the project develops other analyses and uses of this data will occur and therefore, as outlined above any exhaustive analysis of the data is not within the scope of this report. Each primary data type is discussed below and presented using tools such as histograms, percent occurrence, etc.

Terminal Site Location

The proposed Jordan Cove LNG terminal site is located at the downstream (west) end of the Roseburg Forest Products property at approximately Mile 7.5 of the Coos Bay navigation channel. The site is situated just above the Jarvis Turn at the downstream end of Upper Jarvis Range as shown in Figure 1.

In the project vicinity, Coos Bay is long, relatively narrow and riverine in nature, fed by the Coos River and several sloughs in the Upper Bay. The overall harbor width in the vicinity of the site (shore to shore) ranges from 2,500' to the north, to 3,800' immediately off shore and to the south. The width of the harbor that is in deeper water not subject to potential shallow water habitat issues (20' below Mean Lower Low Water [MLLW] or deeper) is approximately 1,000' throughout the area. About one mile downstream, deeper water extends approximately 1,400 feet across the channel width.

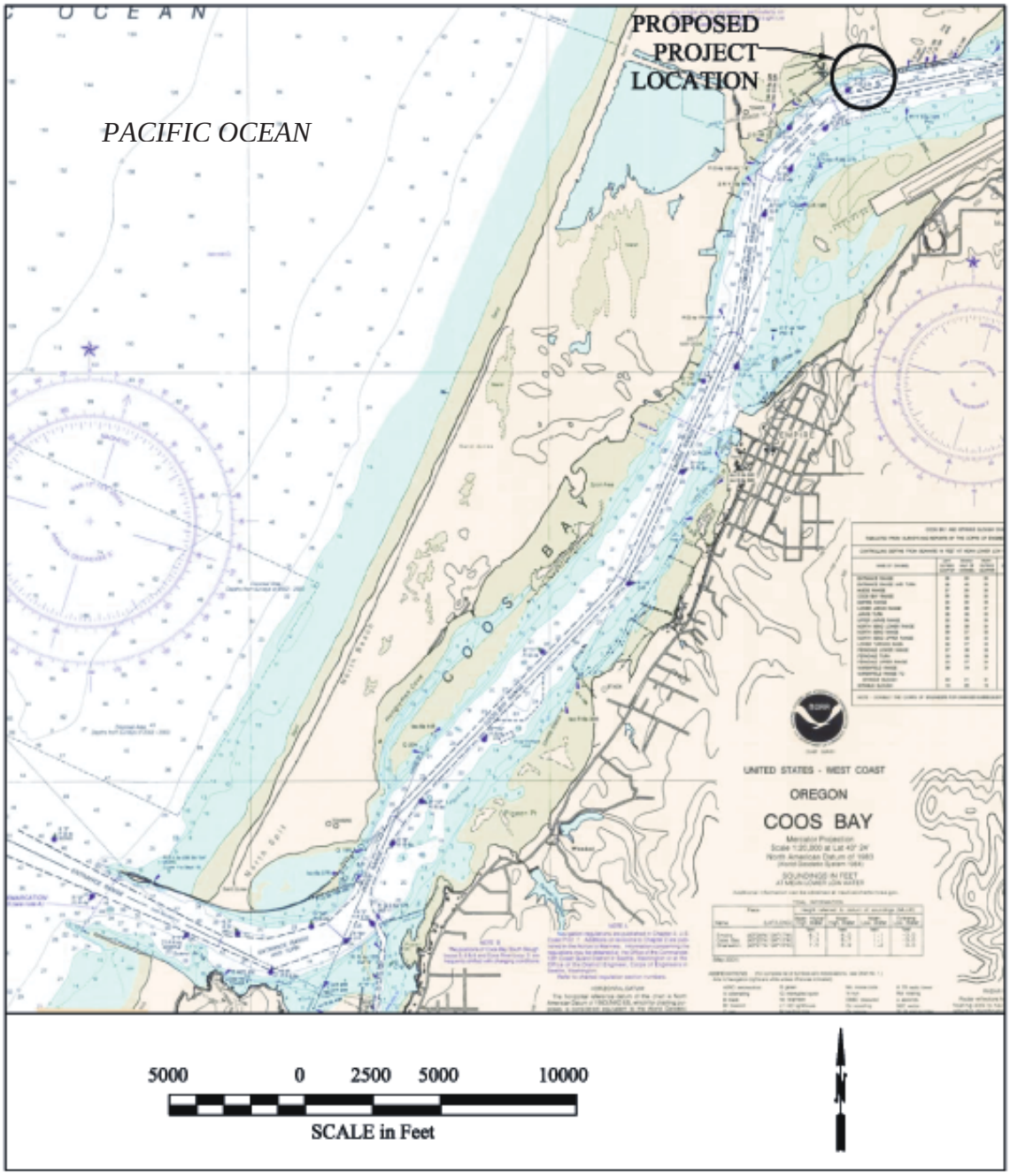
Navigation Channel

The Coos Bay navigation channel involves an entrance channel from the open sea that is protected by two jetties, an approximately 90° turn to the north immediately inside the jetties, and the inside channel. The Federally authorized navigation channel dimensions are provided below in Table 1.

Table 1. Authorized navigation channel dimensions.

	Width (feet)	Authorized Depth (feet, MLLW)	Length (miles)
Entrance Range	700-1,150	47	1.5
Turn & Interior Channel to the Site	300	37	7.5

Figure 1: Vicinity Map



Channel Bottom Mapping for Width and Depth

Channel condition surveys were obtained from the U.S. Army Corps of Engineers (USACE) from the open sea entrance for approximately 10 miles through the North Bend Turn located east of the proposed project site. A summary of these hydrographic surveys is included below in Table 2.

Table 2. Hydrographic survey location, type and date

Name of Survey	Type	River Mile	Date
Entrance Ranges	Channel Line	0 to 1.5	7/7/2005
Coos Bay Ranges	Channel Line	1 to 3.5	6/13/2005
Coos Bay Ranges	Cross-line	1 to 3.5	12/01/2004
Coos Bay & Empire Ranges	Channel Line	3.5 to 5.5	7/18/2005
Coos Bay & Empire Ranges	Cross-line	3.5 to 5.5	11/24/2004
Jarvis Ranges	Channel Line	5.5 to 8	7/18/2005
Jarvis Ranges	Cross-line	5.5 to 8	02/04/2004
North Bend Turn	Channel Line	8 to 10	7/20/2005
North Bend Turn	Cross-line	8 to 10	02/03/2005

These surveys were used to create a digital terrain map of the navigation channel. Contours were calculated from the map and plotted in Figures 2 through 5 to show channel conditions with respect to actual depth and width at the time the surveys were performed. The navigation channel limits are shown along with contours at depths of 33 feet, 35 feet and 37 feet based on the MLLW datum. This illustrates the navigation width available at various depths from the mouth to the project site. The dredged channel sides tend to be relatively steep and therefore, along much of the navigation channel there is not much increase in available width between the 37 foot depth and the 33 foot depth. Figure 6 is provided to illustrate the difference between the cross line and channel line surveys and serves as an illustration of the hydrographic survey soundings density utilized to create the contours shown in Figures 2 through 5. Some of the variability in the contours is attributable to the distance between the cross line surveys. Over most of the channel length 37 feet is available over the full width of the navigation channel. The most notable exceptions being in the northern portion of Figure 6 near River Mile 2.6 and in the Turning Basin at River Mile 5.8.

While the inside channel depth maintained by the USACE is 37 feet MLLW, the dredging contracts typically allow for a two-foot over-dredge (or advance maintenance) allowance when maintaining the channel. Thus, the USACE will pay the dredge contractor to dredge to 39 feet in order to ensure that 37 feet of depth is maintained between maintenance dredging projects. However the USACE is not obligated to maintain the channel to 39 feet and depths greater than 37 feet are not assured.

Form of Data: Digital Terrain Mapping in "Land Desktop" format. USACE hydrographic surveys are available in graphical files such as TIFF or PDF images and as text files (i.e. x, y, and z data format).

Figure 2: Channel Condition from the Entrance to River Mile 1

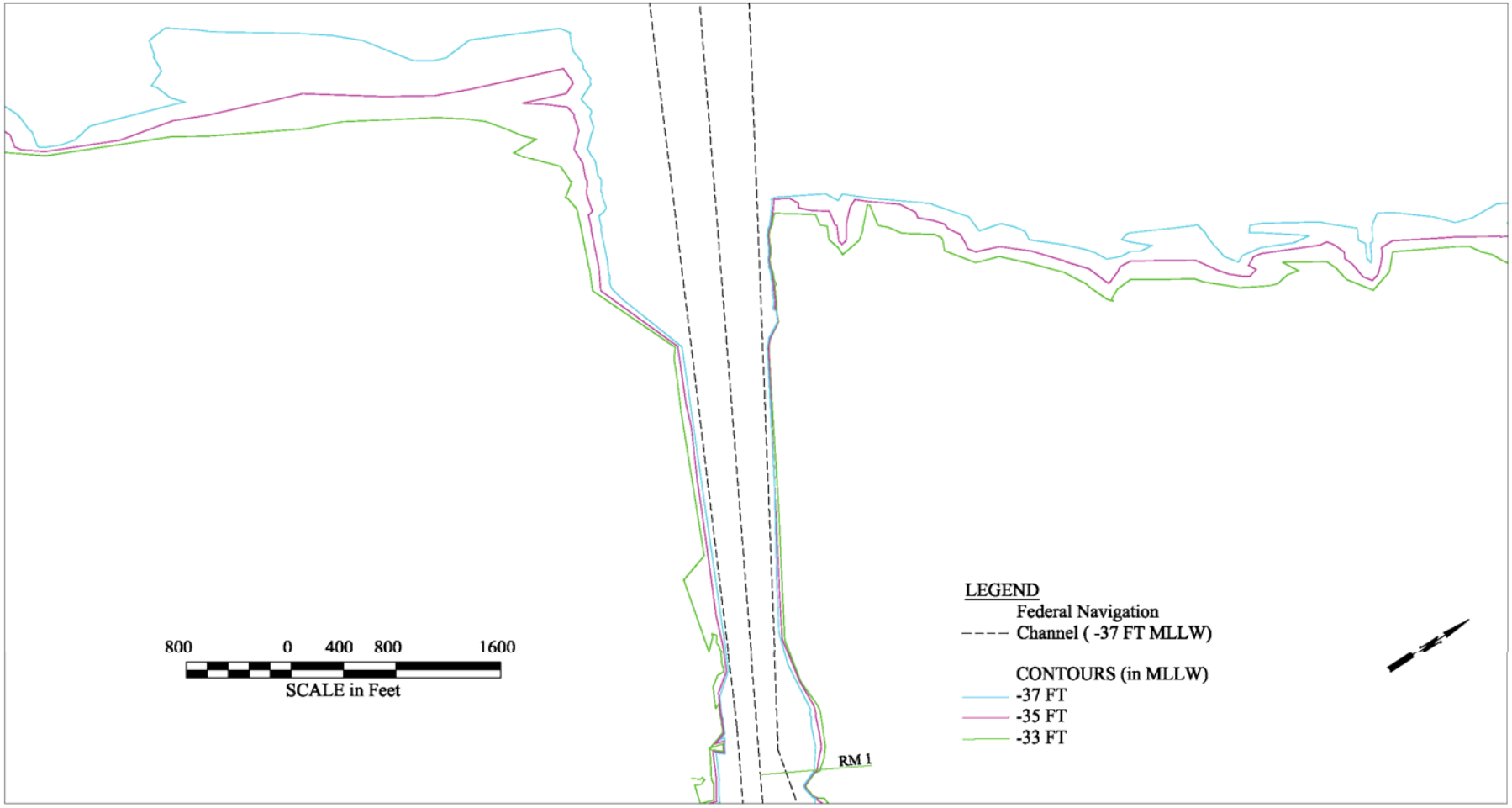


Figure 3: Channel Condition from River Mile 1 to River Mile 3.5

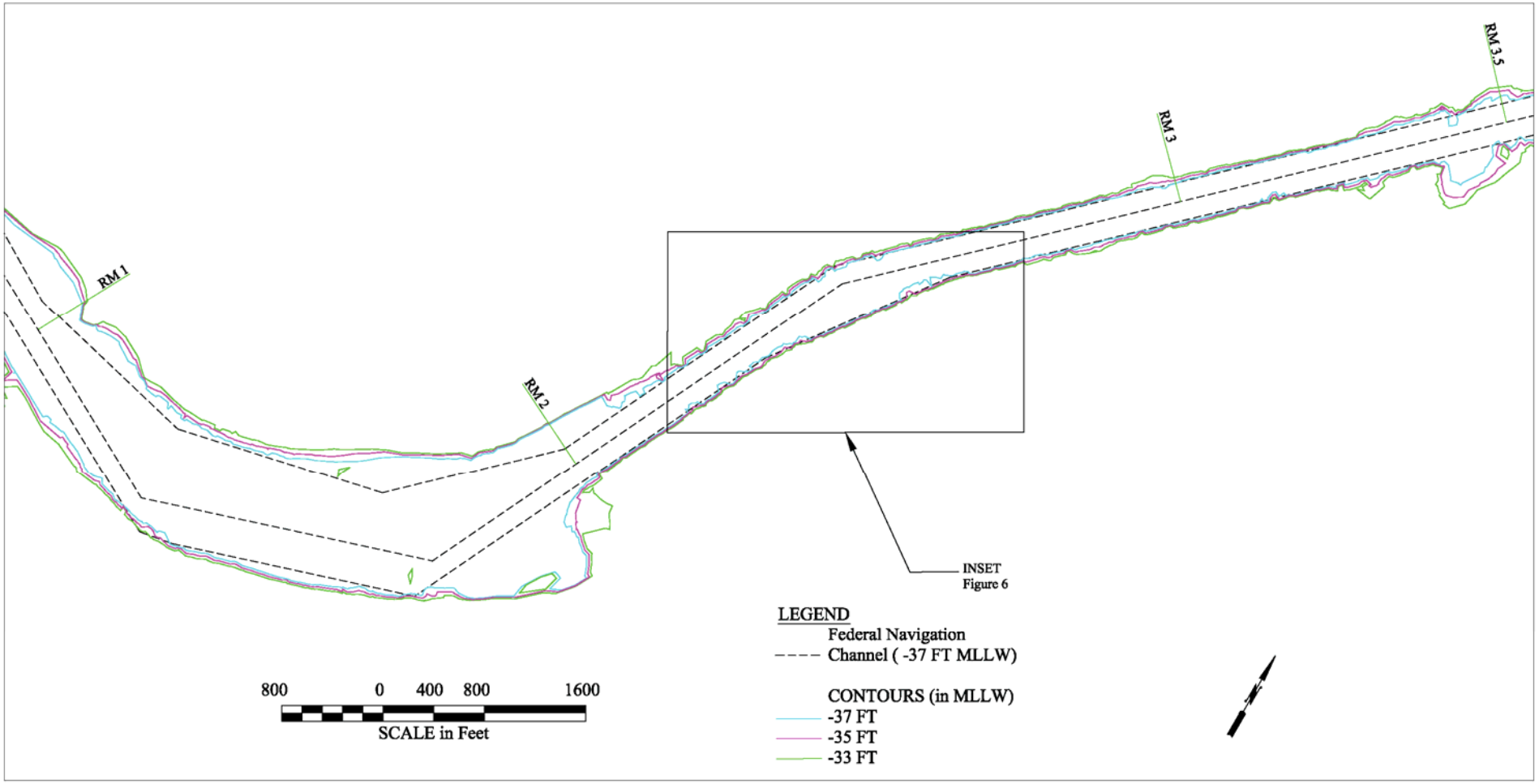


Figure 4: Channel Condition from the River Mile 3.5 to River Mile 6

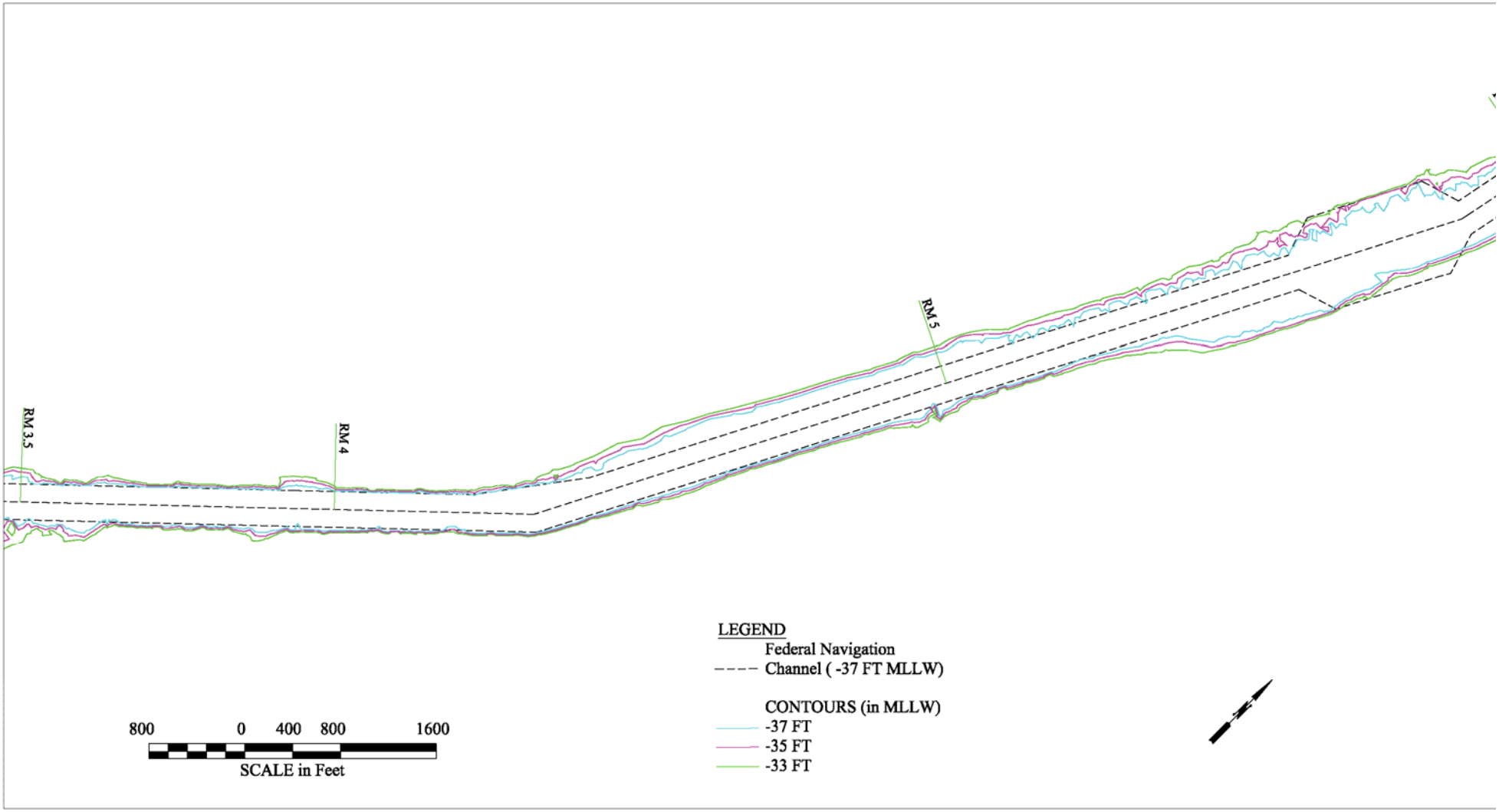


Figure 5: Channel Condition from River Mile 6 to River Mile 8

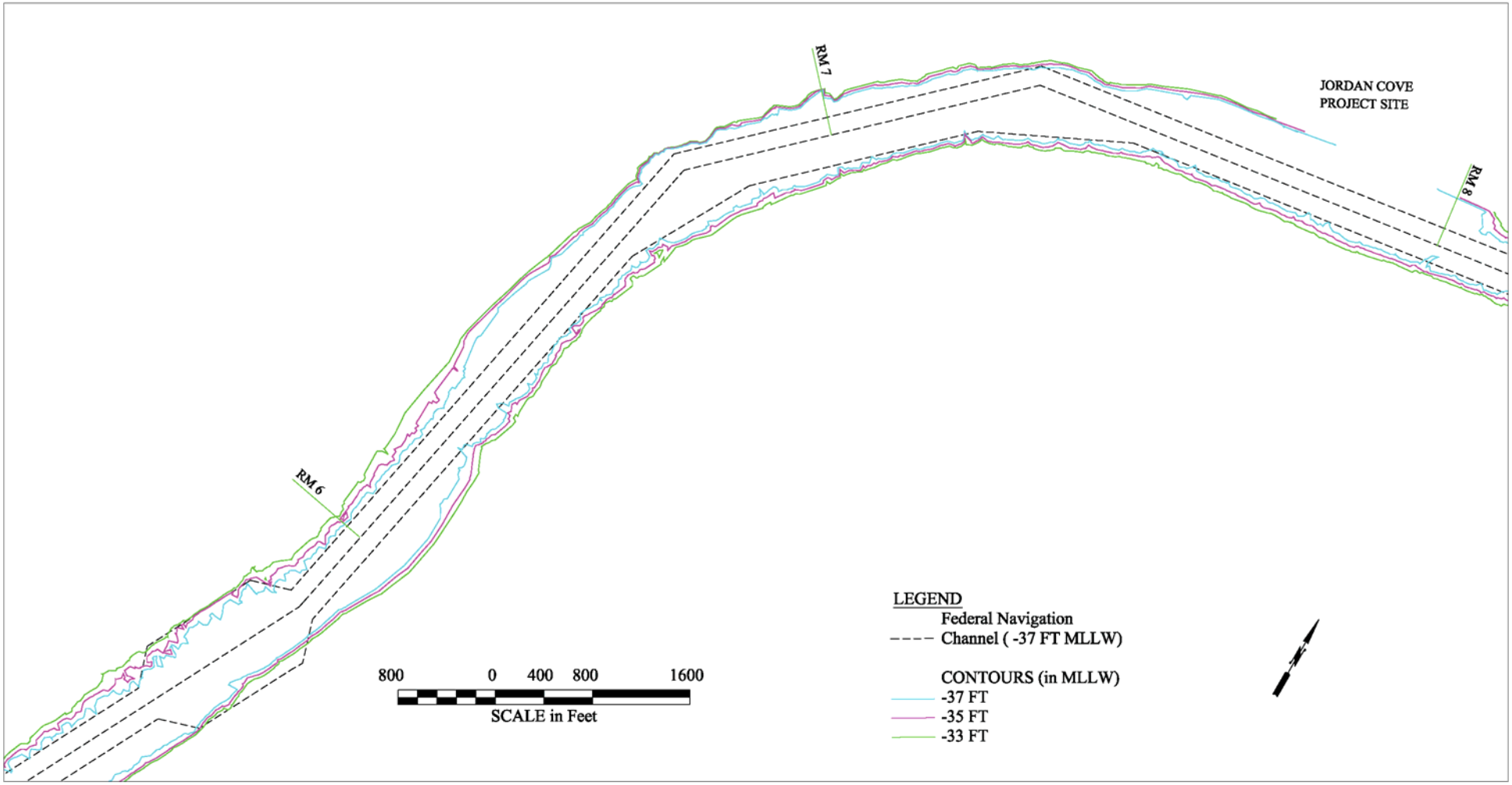
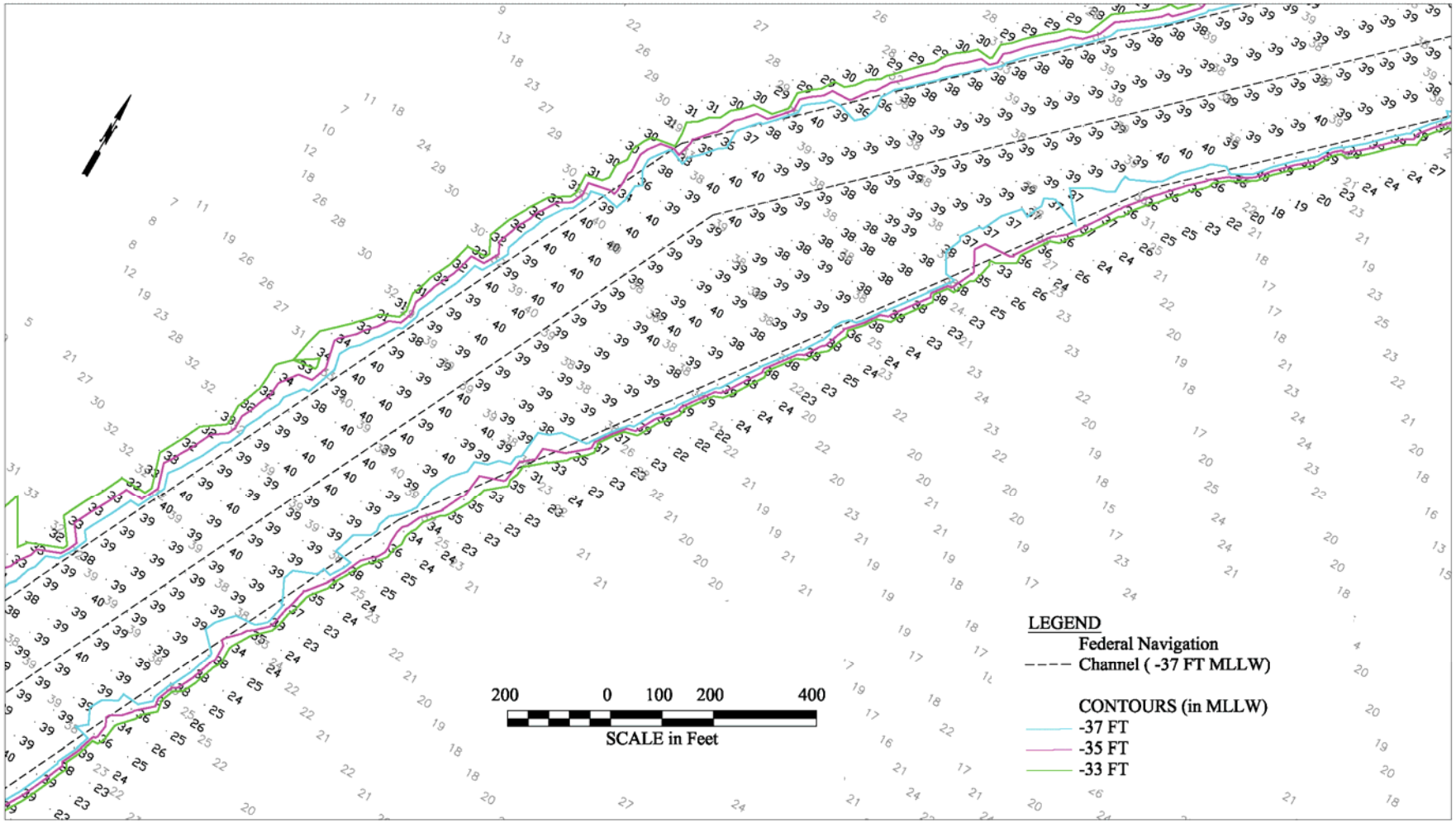


Figure 6: Channel Condition at River Mile 2.5 with Channel & Cross Line Surveys

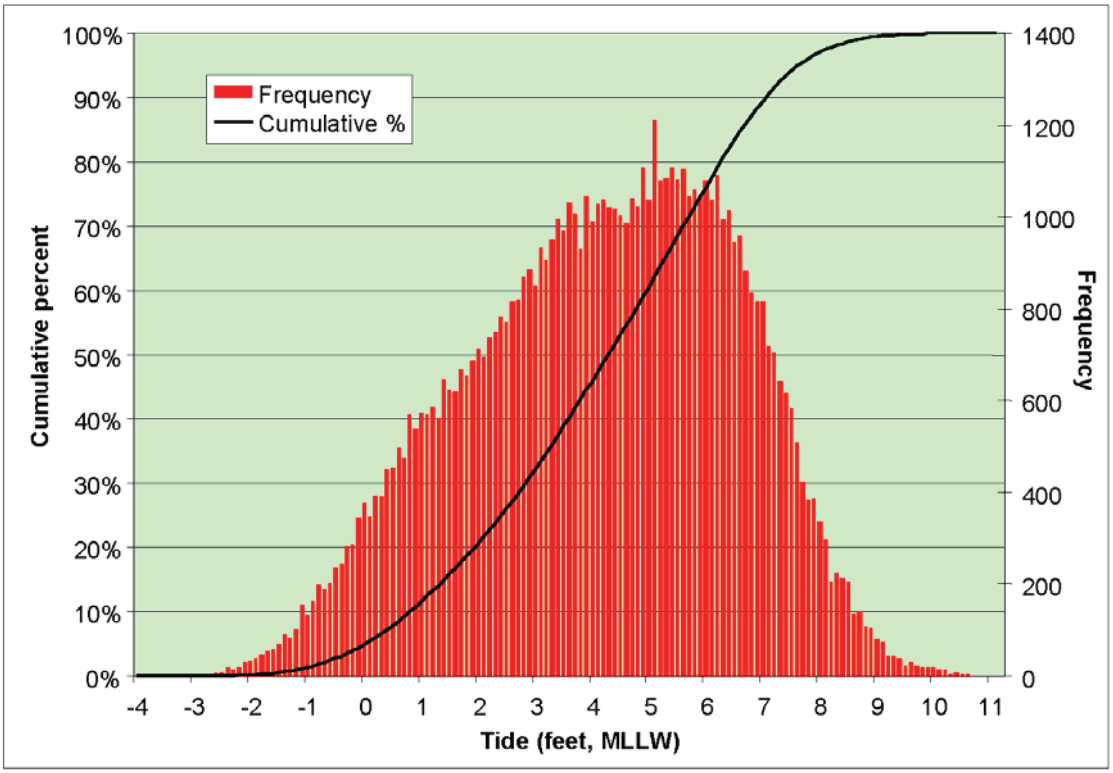


Tides

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.

Complete tide data are available online through a station maintained by NOS (National Ocean Service) at Charleston, OR (station CHAO3-9432780, 43°20'42" N 124°19'18" W) which is located at the mouth of the channel. The tidal range between MLLW and mean higher high water (MHHW) is 7.5 feet near the open sea channel entrance at Charleston and 6.7 feet approximately 2 miles south of the project site in Empire. The lowest high tides are 4.2 to 5 feet above MLLW. Extreme low and high water is 3.0 feet below and 10.5 feet above MLLW, respectively. Figure 7 shows a histogram of tidal elevations and a cumulative curve representing the percentage of time tides are lower than a particular elevation. Based on the cumulative curve the tides are above +6 feet MLLW about 75% of the time and above +7 feet MLLW about 10% of the time.

Figure 7: Histogram of Measured Tides at Charleston (1996-2004)



In the Coos Bay area sea level rise appears to be less than the rate of rise in land elevations, due to tectonic processes, resulting in a net reduction in water level relative to the land (Komar and Allan, 2000). The resulting long term trend was calculated to be approximately 0.04 inches (1 mm) per year.

Form of Data: Digital text files with time series of measured tides.

Hydraulics and Hydrology

Physical Features – The Coos estuary is a drowned river mouth basin with an estimated area of 12,380 acres. Coos Bay is the second largest estuary in Oregon. The estuary is relatively shallow, with an average depth of 7 feet below MLLW and broad expanses of tideflats and mud are exposed at low tide. This shallow depth allows for the thorough mixing of fresh and saltwater for most of the year. Due to the seasonally high volumes of fresh water, however, the estuary becomes partially stratified in the winter, especially where deeper channels have been dredged for shipping.

Hydrology – Coos Bay is a highly complex system composed of numerous sloughs and bays and some thirty tributaries. The bay drains a total area of 605 square miles and yields 2.2 million acre feet of fresh water annually. Freshwater flow into the Coos estuary averages 5500 cfs during winter rains (January to April) and drops to 90 cfs from May through December. The major rivers emptying into the estuary are the Coos and the Millicoma, which supply 66% of the freshwater entering the system. Numerous smaller tributaries also enter the estuary, often through long, shallow inlets, called "sloughs." These sloughs typically receive fresh water slowly and in small amounts, usually from several streams which may have only intermittent flow. Table 3 lists the available stream gauge data for tributaries within the Coos Bay water shed.

Personnel with the Oregon Institute of Marine Biology are developing a QUALW2 (2-D) model of the South Slough (Rumrill, 2005). It is adapted from another QUAL-W2 model developed by Prof. Scott Wells and a graduate student at Portland State University. The model is forced by tides as predicted at Charleston as well and tributary inflow. There are no currently operating tributary gauges. Precipitation/runoff information is being developed for use as an input as well. The model will be used primarily for prediction of salinity and temperature.

Table 3. List of stream gauge data within the Coos Bay Watershed.

Agency	Gauge #	Description	Begin Date	End Date
ODWR	14323500	TIOGA CREEEK NEAR TIOGA, OR.	10/1/1982	9/30/1996
ODWR	14323997	PRIORLI CREEK NEAR DELLWOOD, OR.	10/1/1983	9/30/1996
USGS	14324500	WEST FORK MILLICOMA RIVER NEAR ALLEGANY, OREG.	10/1/1954	9/30/1981
USGS	14324520	DAGETT CREEK NEAR ALLEGANY,OREG.	1/17/1971	3/8/1977
USGS	14324580	PONY CREEK AT COOS BAY, OR	7/1/1975	9/30/2004
ODWR	14324590	BIG CREEK NEAR CHARLESTON, OR	10/1/1982	9/30/1996
ODWR	14324583	WINCHESTER CR NR CHARLESTON, OR	8/1/1991	9/30/1996
ODWR	14324585	UNNAMED TRIB TO WINCHESTER CR NR CHARLESTON, OR	12/1/1991	5/1/1994

Form of Data: Digital text files available through the USGS and the ODWR.

Currents and Water Quality

The following general information on currents was obtained from the Oregon Geographic Response Plan (Northwest Area Committee, 2004). Predicted 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. Maximum ebb current velocities are somewhat greater than maximum flood current velocities particularly during the winter months when river runoff is high. Strong tidal flows are found at the entrances to all the bays and sloughs in the estuary particularly South Slough, North Slough, and Haynes Inlet where currents typically range from 1 to 3 feet per second.

Personnel at Oregon Health Sciences University applied a hybrid 3-D circulation model called ELCIRC to Coos Bay (Turner, 2005). Model forecasts of salinity in the bay can be viewed on the following web site: http://www.nanoos.org.

In order to obtain site specific information a field effort was planned and conducted by Parson Brinckerhoff in collaboration with David Evans & Associates, Inc. The objective of the field effort was to document site conditions with respect to water quality and currents during spring tide conditions. Measurements were collected within the vicinity of the project site as shown in Figure 8. Appendix A contains the report discussing the current meter

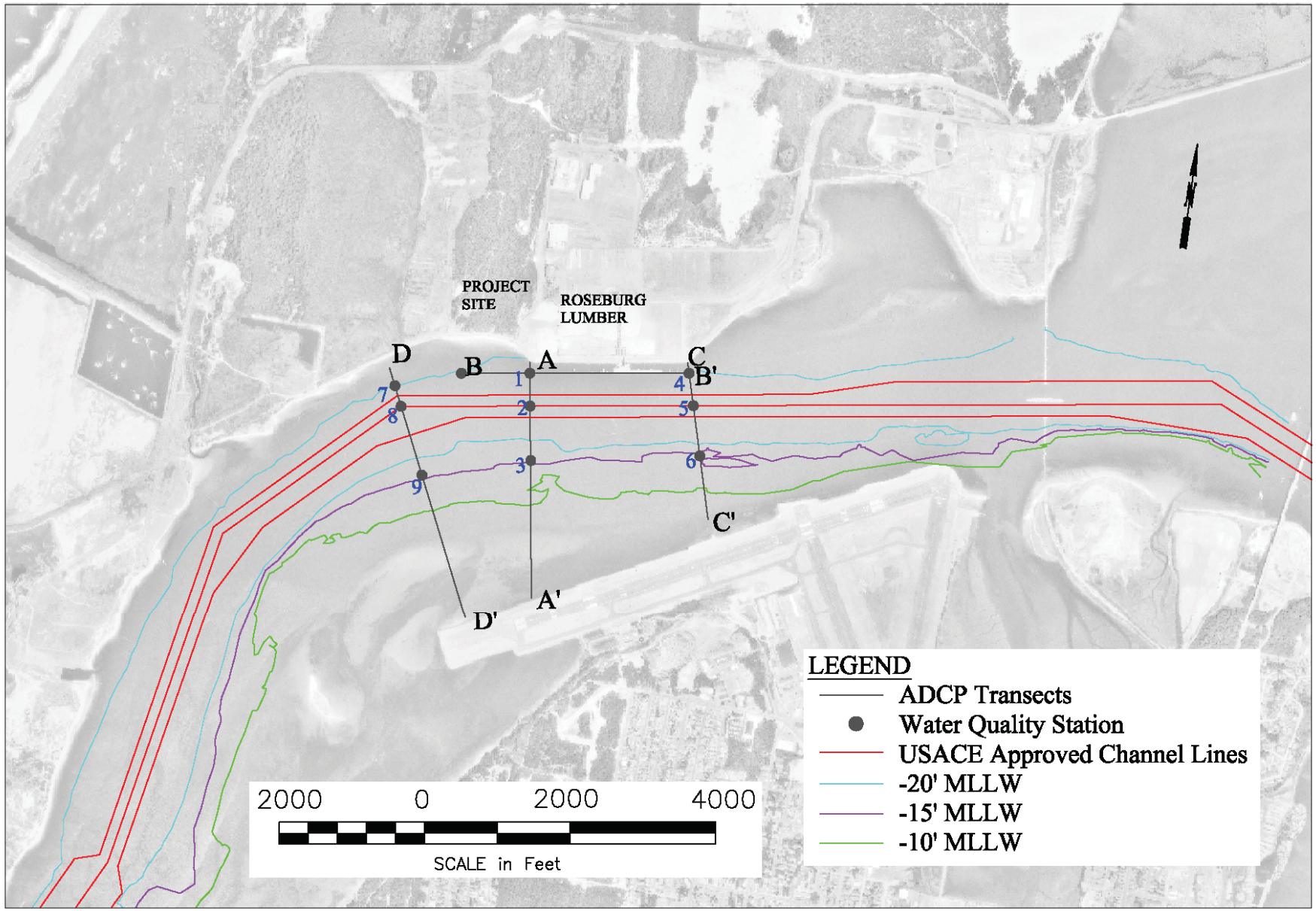
measurements. The peak tidal current measured during ebb tide illustrate higher velocities toward the southern side of transect A-A' (Figure 8) where the mudline elevations begin to increase. Peak ebb tidal currents appear to be about 3 fps to 4 fps in the vicinity of the project site during spring tide. Velocity measurements along transect B-B' illustrate 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.

The water quality data was collected using two methods. Deployment of a grab sampler was used to collect water samples that were shipped to a laboratory for turbidity, total suspended solids and total dissolved solids analysis. Seventeen grab samples were collected and analyzed. In addition, a Hydrolab (now part of Hach Company) in-situ probe (Model: Quanta) was used to monitor water temperature, conductivity, dissolved oxygen, turbidity, etc. The measurements using the in-situ probe and results from the laboratory analysis of the grab samples are included in Table 4.

The water quality measurement results appear to be consistent with conditions measured in the south slough which begins at Charleston and extends southward (i.e. the nearest location of estuarine water quality measurements: http://www.nanoos.org). Features such as turbidity fluctuations with tides and super saturated dissolved oxygen levels are evident in both data sets.

Form of Data: Digital files of water quality parameters and laboratory reports containing grab sample analysis results. Current data is in a digital form specific to the ADCP processing software and in a report format (hard copy and PDF).

Figure 8: ADCP Transects & Water Quality Stations



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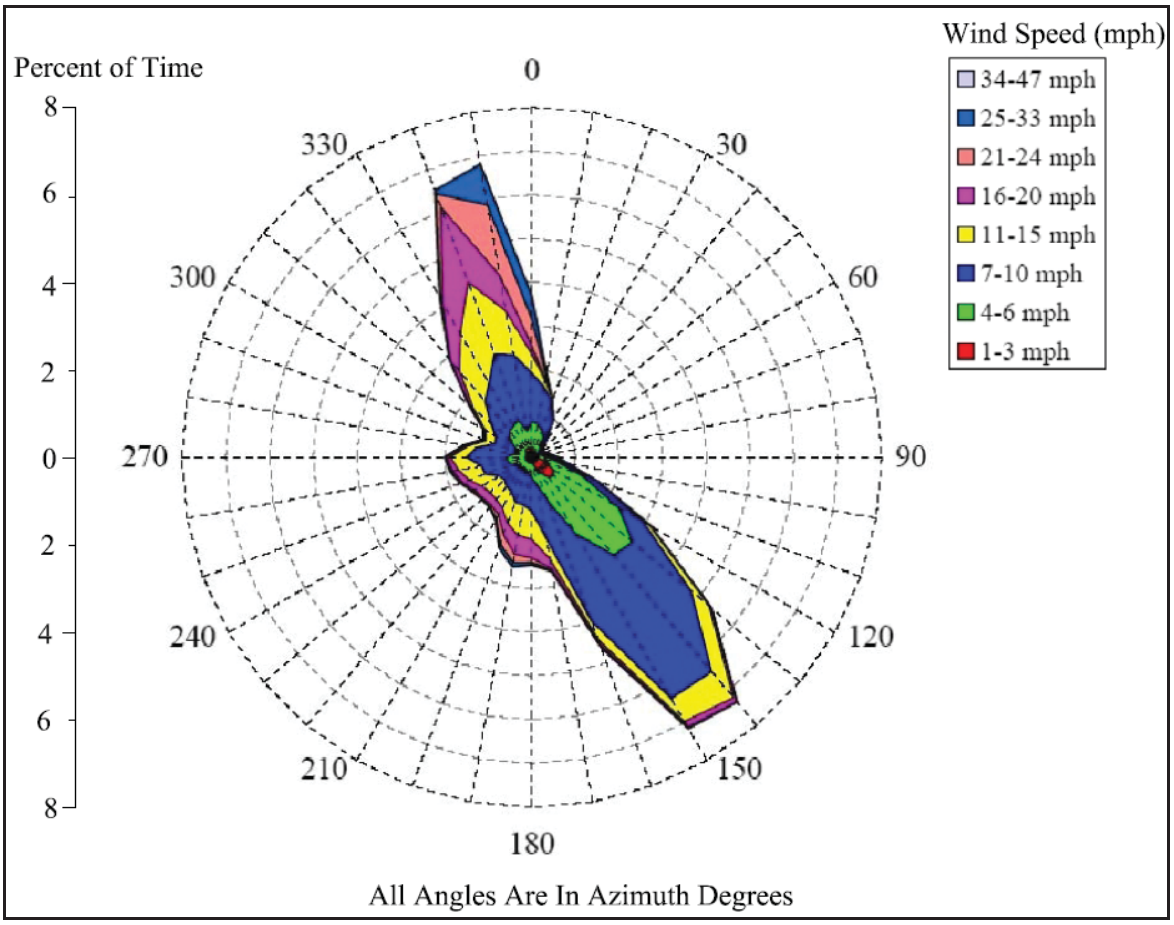
Wind

Complete climate data such as wind speeds and directions have been obtained from the NDBC (National Data Buoy Center) at Cape Arago, OR (Station CAR03) and the North Bend Airport (Station KOTH). Prevailing winds are out of the south 37% of the time and the north 31% of the time. Winds exceeding 15 knots are from the south 11% of the time and from the north 2% of the time. East-west cross winds occur about 25% of the time and rarely exceed 15 knots. A wind rose based on data from the North Bend Airport is shown in Figure 9.

Figure 9: Wind Rose Based on North Bend Airport Data (1996-2004)



Form of Data: Digital file with time series of directional winds.

Wind Waves

Long term wave data from an ocean buoy approximately 300 miles off shore (buoy No. 46002) is available in addition to hindcast studies (USACE [1987] and USACE [1989]) and other buoys with fewer years of record. Statistics of significant wave height vs. peak wave period are shown in Table 5 for buoy No. 46002 which does not measure directional wave information. However, the Wave Information Study for Phase III (USACE, 1989) reports 20 year time series of directional wave parameters including significant wave height and peak period. The Phase III data is reported for nearshore locations in depths of 10 m. Station 47 is located north of the mouth just offshore of the north spit. Wave parameters are shown on a statistical basis for Station 47 in Figures 6 through 8. The Coastal Data Information Program – a joint program of the Corps of Engineers, Scripps Institute of Oceanography and UC San Diego – deployed a wave buoy (No. 46229) in March 2005, from which data such as wave energy and wave direction can be obtained. The buoy is located approximately 20 miles offshore from the mouth of the channel. While data from this buoy will be helpful, it is too new (no winter storm season measurements yet) and too far off shore to fully characterize the wave environment at the entrance. Data from buoy 46229 is summarized in Tables 9 through 11. The waves observed at buoy 46229 have had a maximum significant wave height of 21' (6.5m) with a mean significant wave height of 6.5' (2.0 m) for the months of March through September 2005.

The pilots (White, 2005) indicate wave heights of 18'-21' can be experienced at the entrance; however due to the relative infrequency of pilot operations, more complete anecdotal wave information is not available. However, the maximum wave heights reported in WIS III are not inconsistent with the qualitative observations of the pilots.

Seasonal variations of deepwater wave conditions were analyzed (Komar and Allan, 2000) for several buoys off the Pacific Coast including Buoy 46002. The average monthly peak spectral wave period Tp ranges from a minimum of 9 seconds from June through August to a maximum of 12 seconds from December through February. Average monthly significant wave heights range from a minimum of about 1.8 meters from June through August to a maximum of about 3.5 meters from December through February. Thus, the results for percent of time presented in Tables 5 through 11 should be viewed in light of the significant seasonality of the wave climate. The very long period swell in excess of 18 seconds tends to arrive from westerly and southwesterly directions but these very long period waves also tend to be associated with significant wave heights in the range of only about 2 m to 3 m. The highest wave heights are due to winter storms that are most prevalent from October through March with maximum recorded wave heights at buoy No. 46002 of about 15 m and an average of the yearly maximums equal to about 8 m.

The prevailing wind directions as shown in Figure 9 are aligned with the axis of the navigation channel between the channel entrance and the project site.

There was no data available from buoys deployed within the bay in the vicinity of the navigation channel. A computer model analysis of wind wave generation and transformation along the navigation channel would provide predictions of this wave climate but was beyond the scope of this study. This analysis may be necessary in the future when performing the Waterway Suitability Assessment for the project. Another potential approach

to address this data need would be through discussions with the local tug operators and pilots to determine if locally generated wind waves present a potential constraint to navigation operations. According to the pilots (White, 2005), waves are minor within the navigation channel near the proposed site. Whether or not this constraint warrants further consideration depends on the frequency of occurrence. If conditions do occur that restrict operations at a frequency that warrants further investigation then an analysis of wave conditions coupled with response of the tugs could be used to identify the frequency and duration of conditions constraining navigability.

Form of Data: Digital data files with time series of wave parameters and statistical summaries.

Tsunamis

The project site is located in an area subject to tsunami hazard as discussed in Priest et al. (2002). In the event of a Cascadia subduction zone earthquake tsunamis associated with a magnitude 8.6 (Model 2Cs) and 9.1 earthquakes (Models 1A and 1A-Asperity) were analyzed (Priest et al. (1997)) for resulting tsunami generation and propagation including the Coos Bay area. The water side facilities including the vessel will be subject to tsunami related water level variations and currents. Other effects may include debris impact, scour and sedimentation. Tsunami induced water level changes and currents at a location approximately 0.5 mi downstream of the project site were reported in Priest et al. (2002) associated with the three fault rupture models mentioned above. For the 1A-Asperity Model water level changes range from approximately +8.5 ft to -6 ft and current ranged from 3 knots upstream and 8 knots seaward. For the other tsunami cases, water level variations and currents were less than those predicted with the 1A-Asperity Model. Several contacts were made to try to obtain the detailed model output from the Tsunami modeling work however, to date, no additional information was provided.

Form of Data: Technical Reports with graphs of time series including water levels and currents.

Visibility

The pilots (White, 2005) indicate that fog is infrequent and that when fog impairs navigation it usually delays ships for only 6-12 hours.

Data was obtained from the Western Regional Climate Center for the North Bend Airport, OR station. Data was obtained from 1/1/1992 through 6/30/2005, however, the data reporting was rather sporadic from 1/1/1992 through 6/30/1996. Consequently, complete data on a calendar year basis was available for 1997 through 2004.

Data is reported at ten minutes to one hour or more intervals. The visibility is reported as a distance in statute miles.

The data was statistically analyzed using histograms for visibility limitation distances of 0.25, 0.5, 1, 1.5, and 2.0 statute miles. Each reported value was utilized in the analysis. For

example 2004 included 25,083 data points which is approximately a 20 minute data interval. The annual percent of time is reported in Table 12 for the various distances for individual calendar years 1997 though 2004 and for the entire period.

Table 12. Visibility at North Bend Airport, annual percent of time.

Year	Visibility Limitation Distance in Miles				
	0.25	**0.5**	**1.0**	**1.5**	**2.0**
1997	0.97%	1.46%	2.22%	2.61%	3.44%
1998	1.15%	1.69%	2.46%	3.34%	4.75%
1999	1.21%	1.62%	4.21%	7.16%	11.42%
2000	1.83%	2.83%	4.32%	5.96%	8.28%
2001	0.94%	1.54%	2.23%	2.79%	3.79%
2002	1.43%	2.20%	3.17%	4.00%	5.07%
2003	0.83%	1.30%	2.02%	2.58%	3.45%
2004	1.65%	2.33%	3.40%	4.24%	5.55%
1997-2004	1.25%	1.88%	2.98%	4.02%	5.60%

Since values for calendar year 2004 was similar to the entire 1997-2004 period, 2004 was chosen as a representative year and was further analyzed on a quarterly/seasonal basis. The quarters were January through March, April through June, July through September, and October through December. The seasonal percent of time for the various visibility limitation distances is presented in Table 13. The seasonality of reduced visibility is evident in Table 13 as shown by the October through December season representing about half the annual percentage while April through June consistently has the least visibility restriction.

Form of Data: Digital text files with time series of visibility.

Table 13. Seasonal visibility at North Bend Airport, seasonal percent of time, calendar year 2004.

Season	Visibility Limitation Distance in Miles				
	0.25	0.5	1.0	1.5	2.0
Jan-Mar	0.3%	0.53%	0.65%	0.79%	1.07%
Apr-Jun	0.14%	0.22%	0.35%	0.48%	0.63%
Jul-Sep	0.36%	0.56%	0.92%	1.08%	1.32%
Oct-Dec	0.82%	1.03%	1.48%	1.90%	2.54%
2004	1.65%	2.33%	3.40%	4.24%	5.55%

Summary

The channel appears to be well maintained (per the latest available channel condition surveys) between the mouth and the project site. Due to the relatively steep side slopes where the channel is maintained there is not much additional channel width between depths of 37 feet and 33 feet, MLLW.

Tides at Coos Bay are the mixed semi-diurnal type with paired highs and lows of unequal duration and amplitude. Mean tide range is about 6.7 feet downstream of the project site at Empire. Tides are above +6 ft MLLW 25% of the time and +7 ft MLLW 10% of the time. Tides near the project site lag those measured at Charleston by about 45 minutes (+/-) and therefore provide some opportunity to “ride the tide” during inbound navigation when the vessels are laden. Sea level rise appears to be slower than tectonic induced elevation increases in the land in the vicinity of Coos Bay.

Peak ebb tidal currents at the project site are larger than peak flood currents and based on field measurements appear to be about 3 fps to 4 fps in the vicinity of the project site during spring tide.

Water quality measurements appear to be consistent with conditions measured in the south slough (i.e. the nearest location of estuarine water quality measurements) with features such as rapid turbidity fluctuations and super saturated dissolved oxygen, etc.

Winds are primarily from the north and south about 75% of the time. These primary wind directions are approximately aligned with the channel linking the project site and the mouth.

Ocean wave conditions show a definite seasonality with winter storms between October through March contributing to the highest wave conditions. Very long period swell occurs occasionally with wave periods larger than 18 seconds and significant wave heights exceeding 2 m.

Tsunamis calculated from models of potential rupture scenarios for a Cascadia subduction zone event show water level changes of +8.5 ft to – 6 ft and currents up to 8 knots at a station about 0.5 miles downstream of the site.

Visibility normally does not inhibit navigation longer than about 6 to 12 hours according to the pilots (White, 2005). An analysis of available visibility data indicates visibility is limited to 1.5 miles or less 4% of the time and less than 0.25 miles about 1% of the time. Visibility restrictions were shown to be seasonal as well with the October through December season representing about half the yearly percentage. April through June has the least visibility restriction.

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Table 4. Water quality measurements (in-situ) and laboratory analysis of grab samples.

Location (Sta. No.) per Figure 8.	Sample No.	Date	Time	Type	Temp. (C)	pH	Specific Conductance (mS/cm)	Salinity (PSS)	Dissolved Oxygen (%-Sat.)	Dissolved Oxygen (mg/L)	Depth (m)	Turbidity (NTU)	Total Dissolved Solids (g/L)	Total Suspended Solids (mg/L)
1	8	23-Jun-05	0:02:00	in-situ	15.6	8.1	47.4	30.4	118	8.1	12.2	4.8		
1	9	23-Jun-05	0:05:33	in-situ	15.6	8.1	47.4	30.4	118	8.0	11.3	1.5		
1	10	23-Jun-05	0:08:43	in-situ	15.6	8.2	47.5	30.4	116	7.9	8.0	1.7		
1	11	23-Jun-05	0:10:16	in-situ	15.6	8.2	47.4	30.4	117	8.0	5.1	2.3		
1	12	23-Jun-05	0:10:43	in-situ	15.6	8.2	47.4	30.4	116	7.9	5.2	1.4		
1	13	23-Jun-05	0:12:11	in-situ	15.7	8.2	47.0	30.1	116	7.9	1.9	1.1		
2	15	23-Jun-05	0:23:01	in-situ	15.6	8.2	47.4	30.4	115	7.8	1.5	0.6		
2	16	23-Jun-05	0:23:34	in-situ	15.5	8.2	47.5	30.4	115	7.8	2.6	0.8		
2	17	23-Jun-05	0:24:59	in-situ	15.5	8.2	47.5	30.4	115	7.8	2.0	0.8		
2	18	23-Jun-05	0:27:55	in-situ	15.5	8.2	47.6	30.5	114	7.8	5.1	0.9		
2	19	23-Jun-05	0:29:03	in-situ	15.5	8.2	47.6	30.5	115	7.8	7.5	1.1		
2	20	23-Jun-05	0:30:35	in-situ	15.5	8.2	47.6	30.5	114	7.8	10.0	1.6		
2	21	23-Jun-05	0:32:53	in-situ	15.5	8.2	47.6	30.5	115	7.8	10.7	5.8		
3	22	23-Jun-05	1:00:46	in-situ	16.1	8.0	46.0	29.4	113	7.7	2.1	3.5		
3	WQ3A	23-Jun-05	1:00:46	grab sample							Surface	1.8	31.3	8
3	23	23-Jun-05	1:04:54	in-situ	15.5	8.2	47.6	30.5	114	7.8	3.0	0.9		
3	24	23-Jun-05	1:06:38	in-situ	15.0	8.2	48.1	30.8	113	7.8	4.8	1.2		
3	WQ3D	23-Jun-05	1:15:00	grab sample							Bottom	1.1	31.7	10
1	25	23-Jun-05	2:02:21	in-situ	15.3	8.2	47.1	30.1	120	8.2	2.1	1.4		
1	WQ1F	23-Jun-05	2:02:21	grab sample							Surface	0.6	31	ND
1	26	23-Jun-05	2:05:44	in-situ	14.4	8.2	48.5	31.1	114	7.9	10.2	0.6		
2	WQ2G	23-Jun-05	2:15:00	grab sample							Surface	1.3	31.1	ND
2	WQ2GB	23-Jun-05	2:23:00	grab sample							Bottom	0.5	33.7	ND
9	27	23-Jun-05	4:25:40	in-situ	16.2	8.1	44.7	28.5	113	7.8	2.1	7.0		
9	28	23-Jun-05	4:28:08	in-situ	16.1	8.2	44.8	28.5	113	7.7	3.7	7.3		
9	WQ9C	23-Jun-05	4:29:00	grab sample							Surface	0.7	30.9	16
8	29	23-Jun-05	4:39:20	in-situ	16.6	8.1	43.4	27.6	110	7.5	2.2	6.3		
8	30	23-Jun-05	4:41:20	in-situ	16.3	8.2	44.6	28.4	109	7.4	5.0	5.0		
8	31	23-Jun-05	4:44:08	in-situ	16.2	8.2	45.1	28.8	111	7.6	7.4	5.3		
8	32	23-Jun-05	4:46:29	in-situ	16.2	8.2	44.6	28.4	110	7.5	9.3	7.4		
9	WQ9D	23-Jun-05	6:17:00	grab sample							Surface	3.5	29.4	25
6	33	23-Jun-05	7:39:26	in-situ	17.2	7.9	39.3	24.7	119	8.2	2.0	13.4		
6	WQ6A	23-Jun-05	7:39:26	grab sample							Surface	1.5	29.8	5
6	34	23-Jun-05	7:42:28	in-situ	17.0	7.9	39.9	25.1	102	7.0	2.2	11.5		
5	35	23-Jun-05	7:48:08	in-situ	17.5	7.9	38.3	24.1	97	6.6	2.7	11.6		
5	WQ5A	23-Jun-05	7:48:08	grab sample							Surface	0.8	28.6	8
5	36	23-Jun-05	7:50:16	in-situ	17.4	7.9	38.5	24.2	99	6.7	7.6	17.6		
5	37	23-Jun-05	7:52:01	in-situ	17.4	7.9	38.4	24.1	99	6.7	6.2	18.4		

Table 4. Continued.

Location (Sta. No.) per Figure 8.	Sample No.	Date	Time	Type	Temp. (C)	pH	Specific Conductance (mS/cm)	Salinity (PSS)	Dissolved Oxygen (%-Sat.)	Dissolved Oxygen (mg/L)	Depth (m)	Turbidity (NTU)	Total Dissolved Solids (g/L)	Total Suspended Solids (mg/L)
5	38	23-Jun-05	7:55:19	in-situ	17.4	7.9	38.4	24.1	99	6.8	4.3	12.1		
4	39	23-Jun-05	8:03:26	in-situ	17.5	7.9	38.0	23.8	104	7.0	2.0	13.0		
4	WQ4A	23-Jun-05	8:03:26	grab sample							Surface	2.1	31.2	19
4	40	23-Jun-05	8:04:40	in-situ	17.4	7.9	38.7	24.3	93	6.4	5.1	15.9		
4	41	23-Jun-05	8:05:45	in-situ	17.5	7.9	38.2	24.0	92	6.3	3.5	18.0		
1	42	23-Jun-05	8:12:20	in-situ	17.5	7.9	38.4	24.1	98	6.7	2.1	11.8		
1	43	23-Jun-05	8:13:41	in-situ	17.4	7.9	38.6	24.3	94	6.4	8.3	16.5		
1	44	23-Jun-05	8:15:02	in-situ	17.5	7.9	38.4	24.1	94	6.4	5.0	14.1		
1	45	23-Jun-05	8:19:04	in-situ	17.5	7.9	38.2	24.0	96	6.5	1.5	8.0		
1	WQ1K	23-Jun-05	8:19:04	grab sample							Surface	2.6	25.7	14
1	WQ1L	23-Jun-05	8:27:00	grab sample							Bottom	5.4	25.1	19
2	48	23-Jun-05	8:33:34	in-situ	17.5	7.9	38.2	24.0	99	6.8	2.6	7.2		
2	49	23-Jun-05	8:34:05	in-situ	17.4	7.9	38.7	24.3	98	6.7	4.5	8.2		
2	50	23-Jun-05	8:35:07	in-situ	17.3	8.0	39.0	24.5	99	6.8	6.7	11.2		
2	51	23-Jun-05	8:36:02	in-situ	17.3	8.0	38.9	24.5	99	6.7	5.8	9.6		
2	52	23-Jun-05	8:39:24	in-situ	17.5	7.9	38.0	23.8	98	6.7	1.3	6.5		
2	WQ2N	23-Jun-05	8:39:24	grab sample							Surface	4.3	24.9	12
2	WQ2O	23-Jun-05	8:45:00	grab sample							Bottom	3.8	26.5	15
3	53	23-Jun-05	8:46:43	in-situ	17.2	8.0	39.7	25.0	101	6.9	1.3	5.1		
3	WQ3E	23-Jun-05	8:46:43	grab sample							Surface	3.5	26.1	9
3	54	23-Jun-05	8:47:55	in-situ	17.0	8.0	40.4	25.5	100	6.8	2.5	6.7		
3	55	23-Jun-05	8:48:57	in-situ	17.1	8.0	40.0	25.2	101	6.9	2.6	8.6		
3	WQ3H	23-Jun-05		grab sample							Bottom	4.1	27.7	16
9	56	23-Jun-05	9:03:21	in-situ	17.4	8.0	39.1	24.6	103	7.1	2.0	6.0		
9	57	23-Jun-05	9:04:06	in-situ	17.4	8.0	39.2	24.7	102	7.0	1.4	5.2		
8	58	23-Jun-05	9:11:26	in-situ	17.5	7.9	38.6	24.3	99	6.8	1.3	7.4		
8	59	23-Jun-05	9:12:45	in-situ	17.2	8.0	39.6	24.9	99	6.8	8.4	11.7		
8	60	23-Jun-05	9:13:58	in-situ	17.3	8.0	39.1	24.6	97	6.6	5.9	9.1		
8	61	23-Jun-05	9:15:07	in-situ	17.4	7.9	38.8	24.4	96	6.6	3.8	7.5		
7	WQ7A	23-Jun-05	9:20:00	grab sample							Surface	1.0	26.8	23

Table 5. Wave height vs. wave period measured at buoy No. 46002 between 1977-2004. Values are percent of time or (number of occurrences).

		T_p (s)														
Hs (ft)	**Hs (m)**	**0-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**7-8**	**8-9**	**9-10**	**10-11**	**11-12**	**12-13**	**13-14**	**14-15**	**Total**
0-3.3	**0-1**	0	0.02	3.02	11.90	7.93	4.58	1.77	1.26	0.94	0.69	0.66	0.00	1.16	0	**33.9**
3.3-6.6	**1-2**	0	0	0.11	7.00	8.74	6.24	3.41	1.96	1.53	1.51	1.47	0.01	0.83	0	**32.8**
6.6-9.8	**2-3**	0	0	(1)	0.24	4.17	4.77	2.94	1.51	1.07	0.98	1.19	0.01	1.01	(1)	**17.9**
9.8-13	**3-4**	0	0	0	0	0.47	2.47	2.26	1.13	0.61	0.59	0.71	0.02	0.67	0	**8.9**
13-16	**4-5**	0	0	0	0	(3)	0.52	1.20	0.77	0.40	0.25	0.32	(3)	0.44	0	**3.9**
16-20	**5-6**	0	0	0	0	0	0.03	0.43	0.42	0.25	0.13	0.14	(3)	0.17	0	**1.6**
20-23	**6-7**	0	0	0	0	0	0	0.07	0.21	0.12	0.05	0.05	(3)	0.08	0	**0.6**
23-26	**7-8**	0	0	0	0	0	0	(6)	0.08	0.07	0.03	0.03	(1)	0.04	0	**0.2**
26-30	**8-9**	0	0	0	0	0	0	0	0.01	0.04	0.02	0.01	(2)	0.02	0	**0.1**
30-33	**9-10**	0	0	0	0	0	0	0	0	0.02	0.01	0.00	0	0.01	0	**0.0**
33-36	**10-11**	0	0	0	0	0	0	0	0	(3)	0.01	(2)	0	(2)	0	**0.0**
36-39	**11-12**	0	0	0	0	0	0	0	0	0	(4)	(4)	0	0	0	**0.0**
39-43	**12-13**	0	0	0	0	0	0	0	0	0	0	(4)	0	0	0	**0.0**
43-46	**13-14**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**
46-49	**14-15**	0	0	0	0	0	0	0	0	0	0	0	(1)	0	0	**0.0**
	Total	**0.0**	**0.0**	**3.1**	**19.1**	**21.3**	**18.6**	**12.1**	**7.4**	**5.1**	**4.3**	**4.6**	**0.0**	**4.4**	**0.0**	**100**

Total number of occurrences = 171161

Table 6. Wave height vs. wave period reported by WIS III station 47 between 1956-1975. Values are percent of time or (number of occurrences).

		Tp (s)										
Hs (ft)	**Hs (m)**	**0-3.4**	**3.5-5.4**	**5.5-7.4**	**7.5-9.4**	**9.5-11.4**	**11.5-13.4**	**13.5-15.4**	**15.5-17.4**	**17.5-19.4**	**>19.4**	**Total**
0-3.3	**0-1**	0	1.47	5.23	13.13	11.55	1.53	0.27	0.05	0	0.03	**33.3**
3.3-6.6	**1-2**	0	0	1.44	2.96	14.39	6.88	1.61	0.09	0	(2)	**27.4**
6.6-9.8	**2-3**	0	0	(3)	0.81	5.02	10.20	4.53	0.31	0	(4)	**20.9**
9.8-13	**3-4**	0	0	0	0.09	1.13	4.55	5.43	0.44	0	(5)	**11.6**
13-16	**4-5**	0	0	0	0	0.13	0.70	3.50	0.65	0	0	**5.0**
16-20	**5-6**	0	0	0	0	0	0.10	0.97	0.74	0	0	**1.8**
20-23	**6-7**	0	0	0	0	0	0	0.02	0.03	0	0	**0.0**
23-26	**7-8**	0	0	0	0	0	0	0	0	0	0	**0**
	Total	**0.0**	**1.5**	**6.7**	**17.0**	**32.2**	**24.0**	**16.3**	**2.3**	**0**	**0.0**	**100**

Total number of occurrences = 58440

Table 7. Wave height vs. wave direction reported by WIS III station 47 between 1956-1975. Values are percent of time or (number of occurrences).

		Hs (ft)								
		0-3.3	3.3-6.6	6.6-9.8	9.8-13	13-16	16-20	20-23	23-26	
		Hs (m)								
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	Total
Direction of Waves	S	(4)	0	0	0	0	0	0	0	**0.0**
	SSW	0.06	0.04	0	0	0	0	0	0	**0.1**
	SW	0.48	0.83	1.09	0.76	0.22	0.04	(3)	0	**3.4**
	WSW	12.87	15.29	14.91	9.39	4.44	1.72	0.04	0	**58.7**
	W	14.87	10.09	4.85	1.49	0.33	0.06	0	0	**31.7**
	WNW	4.57	1.13	(8)	0	0	0	0	0	**5.7**
	NW	0.40	0	0	0	0	0	0	0	**0.4**
	NNW	0	0	0	0	0	0	0	0	**0.0**
	Total	**33.3**	**27.4**	**20.9**	**11.6**	**5.0**	**1.8**	**0.0**	**0.0**	**100**

Total number of occurrences = 58440

Table 8. Wave period vs. wave direction reported by WIS III station 47 between 1956-1975. Values are percent of time or (number of occurrences).

		Tp (s)										
		0-3.4	**3.5-5.4**	**5.5-7.4**	**7.5-9.4**	**9.5-11.4**	**11.5-13.4**	**13.5-15.4**	**15.5-17.4**	**17.5-19.4**	**>19.4**	**Total**
Direction of Waves	**S**	0	(1)	(3)	0	0	0	0	0	0	0	**0.0**
	SSW	0	(3)	0.02	0.06	0	0	0	0	0	0	**0.1**
	SW	0	0.02	0.20	0.94	1.47	0.61	0.18	0	0	0	**3.4**
	WSW	0	0.03	0.48	6.50	17.54	17.06	14.71	2.30	0	0.04	**58.7**
	W	0	0.08	1.52	9.14	13.20	6.29	1.44	0	0	(5)	**31.7**
	WNW	0	1.12	4.26	0.33	0	0	0	0	0	0	**5.7**
	NW	0	0.21	0.18	0	0	0	0	0	0	0	**0.4**
	NNW	0	0	0	0	0	0	0	0	0	0	**0.0**
	Total	**0.0**	**1.5**	**6.6**	**17.0**	**32.2**	**24.0**	**16.3**	**2.3**	**0.0**	**0.0**	**100**

Total number of occurrences = 58440

Table 9. Wave height vs. wave period measured at buoy No. 46229 between March - September 2005. Values are percent of time or (number of occurrences).

Hs (ft)	Hs (m)	Tp (s)																			Total
		0-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	
0-3.3	0-1	0	0.08	1.01	3.80	7.18	14.73	7.81	11.08	4.08	2.68	1.42	1.54	2.27	2.01	1.66	0	0.54	0	0.21	**62.1**
3.3-6.6	1-2	0	0	0.08	1.38	1.79	4.66	3.95	5.11	3.15	2.07	0.86	0.57	0.38	0.34	0.10	0	0.18	0	0	**24.6**
6.6-9.8	2-3	0	0	0	0.01	0.30	0.75	0.61	1.17	1.16	1.61	0.88	0.97	0.68	0.33	0	0	0	0	0	**8.5**
9.8-13	3-4	0	0	0	0	0	0.13	0.28	0.70	0.36	0.37	0.35	0.50	0.48	0.24	0.05	0	0	0	0	**3.5**
13-16	4-5	0	0	0	0	0	0.01	0.05	0.39	0.22	0.14	0.10	0.21	0.12	0.03	0	0	0	0	0	**1.3**
16-20	5-6	0	0	0	0	0	0	0	0.02	0.05	0.02	0.01	0	0.01	0	0	0	0	0	0	**0.1**
20-23	6-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
23-26	7-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0.1**	**1.1**	**5.2**	**9.3**	**20.3**	**12.7**	**18.5**	**9.0**	**6.9**	**3.6**	**3.8**	**3.9**	**2.9**	**1.8**	**0**	**0.7**	**0**	**0.2**	**100**

Total number of occurrences = 9220

Table 10. Wave height vs. wave direction measured at buoy No. 46229 between Mar-Sep 2005. Values are percent of time or (number of occurrences).

		Hs (ft)								Total
		0-3.3	3.3-6.6	6.6-9.8	9.8-13	13-16	16-20	20-23	23-26	
		Hs (m)								
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	
Direction of Waves	N	0.30	0.26	0	0	0	0	0	0	**0.6**
	SSE	0.26	0.09	0.07	0.07	0.01	0	0	0	**0.5**
	S	3.48	0.74	0.70	0.76	0.40	0.04	0	0	**6.1**
	SSW	2.68	0.62	0.66	0.35	0.27	0.05	0	0	**4.6**
	SW	1.88	0.57	0.67	0.33	0.09	0	0	0	**3.5**
	WSW	9.71	2.62	1.74	0.75	0.25	0.02	0	0	**15.1**
	W	18.59	7.47	3.25	0.75	0.11	0	0	0	**30.2**
	WNW	13.52	4.93	0.65	0.47	0.14	0	0	0	**19.7**
	NW	10.68	6.28	0.67	0	0	0	0	0	**17.6**
	NNW	0.98	1.02	0.04	0	0	0	0	0	**2.0**
	Total	**62.1**	**24.6**	**8.5**	**3.5**	**1.3**	**0.1**	**0.0**	**0.0**	**100**

Total number of occurrences = 9220

Table 11. Wave period vs. wave direction measured at buoy No. 46229 between Mar-Sep 2005. Values are percent of time or (number of occurrences).

		Tp (s)																			Total
		0-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	
Direction of Waves	**N**	0	0	0.09	0.43	0.03	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.6**
	SSE	0	0	0.13	0.12	0.07	0.05	0.03	0.09	0	0	0	0	0	0	0	0	0	0	0	**0.5**
	S	0	0.02	0.20	0.80	0.89	0.65	0.44	0.73	0.25	0.01	0	0.13	0.55	0.63	0.53	0	0.16	0	0.13	**6.1**
	SSW	0	0.05	0.16	0.17	0.43	0.59	0.30	0.69	0.42	0.09	0.01	0.07	0.40	0.49	0.48	0	0.20	0	0.08	**4.6**
	SW	0	0	0	0.02	0.16	0.43	0.56	1.36	0.44	0.22	0.09	0.03	0.13	0.04	0.04	0	0.00	0	0	**3.5**
	WSW	0	0	0.01	0.04	0.38	1.53	1.66	2.97	2.11	2.01	1.12	1.21	1.14	0.59	0.22	0	0.10	0	0	**15.1**
	W	0	0	0	0.17	0.47	3.20	3.07	7.44	4.25	4.00	2.25	2.05	1.53	1.04	0.46	0	0.25	0	0	**30.2**
	WNW	0	0	0.01	0.53	1.97	6.31	4.06	4.18	1.36	0.41	0.15	0.29	0.18	0.15	0.09	0	0.02	0	0	**19.7**
	NW	0	0	0.23	1.95	4.53	7.01	2.56	1.03	0.17	0.15	0	0	0	0	0	0	0	0	0	**17.6**
	NNW	0	0	0.26	0.93	0.34	0.50	0.01	0	0	0	0	0	0	0	0	0	0	0	0	**2.0**
	Total	**0.0**	**0.1**	**1.1**	**5.2**	**9.3**	**20.3**	**12.7**	**18.5**	**9.0**	**6.9**	**3.6**	**3.8**	**3.9**	**2.9**	**1.8**	**0.0**	**0.7**	**0.0**	**0.2**	**100**

Total number of occurrences = 9220

TAB: B. COMPENSATORY WETLAND MITIGATION PLAN

Jordan Cove LNG Terminal Project
South Dunes Power Plant Project

Compensatory Wetland Mitigation Plan

Overview

Prepared for:

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October 2014

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1. COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW

This Compensatory Wetland Mitigation (CWM) Plan covers impacts associated with the Jordan Cove Liquefied Natural Gas (LNG) Terminal Project (LNG Terminal) and the South Dunes Power Plant Project (SDPP), collectively referred to as the "Projects." The Projects, which are located along the North Spit of Coos Bay, Oregon, will be carried out by Jordan Cove Energy Project, L.P. (JCEP L.P.). The Projects 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.

At the state level and as it relates to wetlands, the Projects are being permitted under two different permitting processes. The SDPP is being permitted via the State of Oregon Energy Facility Siting Certificate (EFSC) process, while the LNG Terminal related wetland impacts are being permitted directly via the Oregon Department of State Lands (DSL) Removal-Fill permitting process. Although separate processes, both Projects require compliance with Oregon Removal-Fill law and review by DSL.

This Compensatory Wetland Mitigation (CWM) Plan covers impacts associated with both Projects and therefore serves both permitting processes described above. In this manner, mitigation is provided in a more holistic manner than if broken up into pieces. This CWM specifically covers the following proposed development features/locations that result in wetland impacts:

- LNG Plant
- Rail Spur Bridge Re-Location
- Southwest Oregon Regional Safety Center (SORSC)
- Utility Corridor
- LNG Access Channel
- Barge Berth
- Mill Site/South Dunes Power Plant (SDPP)
- North Point Workforce Housing Project (NPWHP)
- Transpacific Parkway/Highway 101 Intersection (TPP)

Impact details are provided in the Project permit applications. A summary of impacts for the Project, broken out by sub-project (SDPP and LNG Terminal) and primary resource type (estuarine and freshwater) is provided in Table 1.

Table 1 Summary of Impacts by Project and Primary Resource Type

	Permanent Impacts (acres)[2]
South Dunes Power Plant Project	
Total Estuarine[1]	3.03
Total Freshwater	2.43
LNG Terminal Project	
Total Estuarine[1]	0.05
Total Freshwater	1.01
Total for the Projects	
Total Estuarine[1]	3.08
Total Freshwater	3.44

[1] Total estuarine impacts excludes deep subtidal impacts, since no mitigation is proposed for this habitat type.

[2] Incidental impacts at Kentuck Mitigation Site are not included in this table, but have been accounted for in the Part B Estuarine CWM Plan and in the mitigation requirements shown in Table 2 of this overview. Impacts shown in this table match the summary table provided in the DSL JPA impacts table.

The plan for wetland and estuarine mitigation activities for the Project has been divided into two parts: The first, Part A, covers all proposed freshwater resource impacts, and the second, Part B, covers all proposed estuarine resource impacts. Table 2 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.

This proposed CWM Plan has been prepared in accordance with the DSL rules. It is also supportive of EFSC requirements, along with federal and local regulatory permitting requirements.

Table 2. Mitigation Plan Parts, Project Features, Impacts, and Mitigation Acreage Summary

Mitigation Plan Part	Project Element	Mitigation Methods	Resource IDs Impacted[1]	Impact Acres[2]	Mitigation Acreage[3]
Part A - Freshwater Resource CWM	LNG Terminal Mill Site/SDPP NPWHP Rail Spur Bridge Re-Location SORSC Utility Corridor	Restoration, Creation, Enhancement	2013-3, 2013-4, 2012-7, Wetland H (East), Wetland I (North), Wetland J, Wetland L, Wetland APC-D, 2012-4, Wetland A, Wetland B, 2012-2, Wetland C, Wetland E, and 2013-6	3.44	4.65
Part B - Estuarine Resource CWM	LNG Access Channel Barge Berth Mill Site/South Dunes Site TPP	Enhancement	Access triangle intertidal, eelgrass, and shallow subtidal Barge shallow subtidal Mill-Dunes intertidal below HMT adjacent to Wetlands J and M Wetlands M and H (West) TPP intertidal below HMT	3.08	13.03
			Total	**6.52**	**17.68**

[1] Resource IDs follow general naming conventions provided in permit application impact table.

[2] Refers to permanent impacts. Excludes deep subtidal estuarine impacts for which mitigation is not being proposed. Incidental impacts at Kentuck Mitigation Site not included in these impacts.

3 Mitigation acreage for Part B-Estuarine Resource CWM includes acreage to cover incidental impacts at Kentuck Slough. See Part B CWM plan for details.

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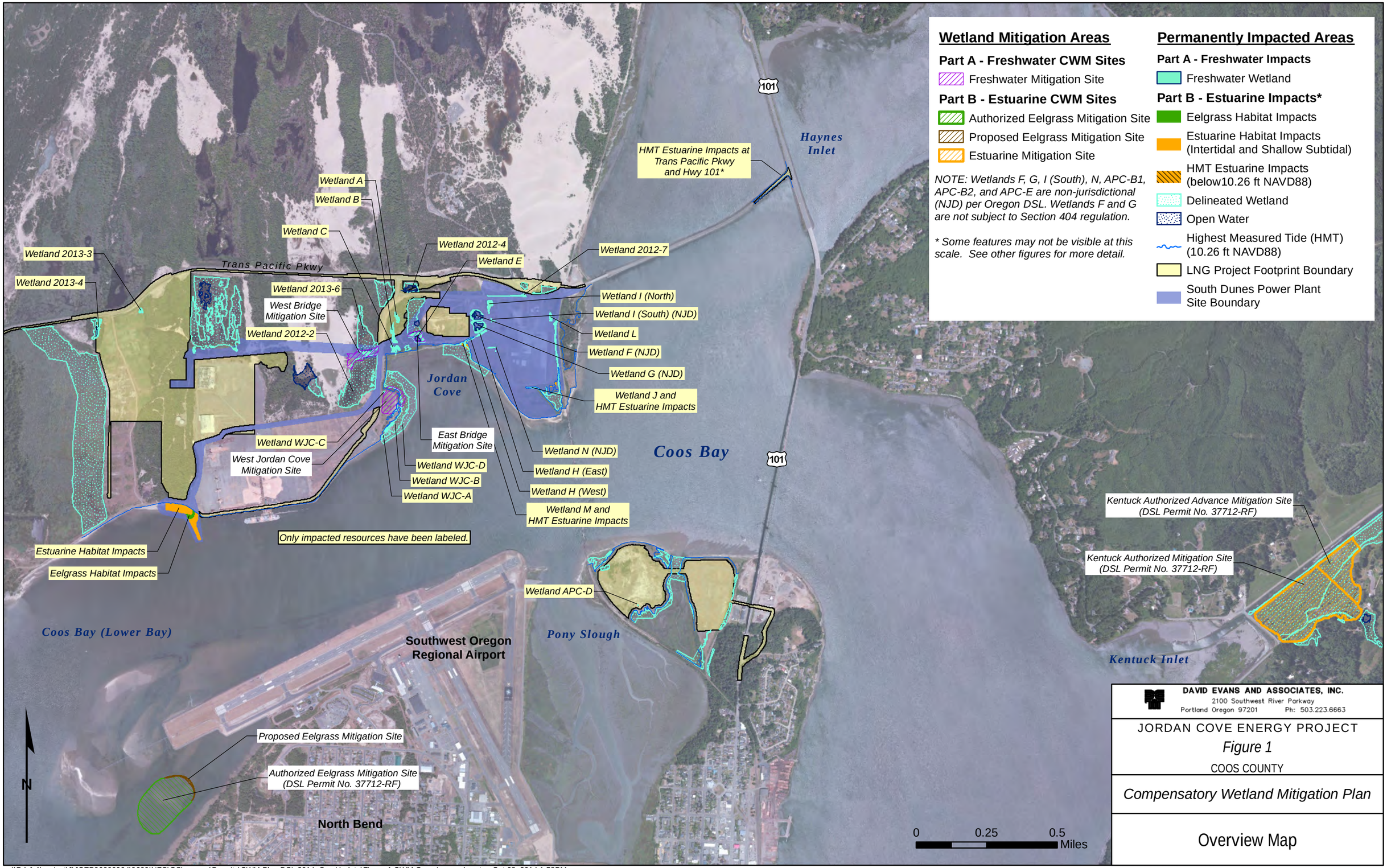

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JORDAN COVE ENERGY PROJECT

Figure 1

COOS COUNTY

Compensatory Wetland Mitigation Plan

Overview Map

Jordan Cove LNG Terminal Project
South Dunes Power Plant Project

Compensatory Wetland Mitigation Plan

Part A: Freshwater Impacts

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1. COMPENSATORY WETLAND MITIGATION PLAN OVERVIEW

1.1 INTRODUCTION

The Jordan Cove LNG Terminal Project (LNG Terminal) and South Dunes Power Plant Project (SDPP) (collectively referred to as the Projects), 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 freshwater impacts for the following proposed development features:

- LNG plant
- Mill Site/South Dunes Site
- North Point Workforce Housing Project (NRWHP)
- Rail Spur Bridge Re-Location
- Southwest Oregon Regional Safety Center (SORSC)
- Utility Corridor

Total freshwater wetland impacts are approximately 3.44 acres and will be offset by 5.91 acres (4.29 credits) of mitigation. This represents an excess of 0.85 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 (3.44 credits) based on DSL ratios, which amounts to 4.65 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 restoration, creation, and enhancement at three locations on the North Spit, in proximity to proposed impacts. The three site names are:

- West Jordan Cove Mitigation Site (tax ID #25S13W04TL0040000)
- West Bridge Mitigation Site (tax ID #25S13W04TL00101 and 25S13W04TL00300)
- East Bridge Mitigation Site (tax ID #25S13W04TL0010000)

This proposed CWM Plan has been prepared in accordance with the Oregon Department of State Lands (DSL) rules. It is also supportive of State Energy Facility Siting Council (EFSC) requirements, along with federal and local regulatory permitting requirements.

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 1.67 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 1.67 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 1.67 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 (2.15 acres), including creation area and temporary disturbance area, will meet all three wetland parameters.

1.2.2 West Bridge Mitigation Site

Mitigation Goal 2: Create, enhance, and restore 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 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:** 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 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 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.

1.2.3 East Bridge Mitigation Site

Mitigation Goal 3: Restore 0.96 acres of palustrine aquatic bed and palustrine unconsolidated bottom wetland at the East Bridge Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 3.1**: Restore wetland by excavating 0.96 acres of upland sandy fill material (i.e., project-related construction haul road) down to pre-haul road elevations.
- **Objective 3.2:** Establishment and survival of self-sustaining wetland plant community dominated by yellow pond lily (*Nuphar polysepalum*), approximately 0.81 acres. Approximately 0.15 acres of the site may remain as open water, which is consistent with pre-project conditions.
- **Objective 3.3:** Improve habitat structure by placing large wood (downed logs) to serve as habitat.
- **Objective 3.4:** The mitigation area (0.96 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 three distinct mitigation sites – West Jordan Cove, West Bridge, and East Bridge Mitigation Sites – 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 5 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. Mitigation 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 an emergent wetland plant community.

Grading of the wetland creation and restoration areas will occur concurrently. Planting of these areas will also occur concurrently during the first appropriate planting window upon acceptance of final grades.

1.3.3 East Bridge Mitigation Site

The East Bridge Mitigation Site consists of wetland restoration activities. These activities are shown in the A4 Series of Figures in Appendix A.

A temporary construction access haul road will be installed as part of construction of the Project. This road will result in impacts to Wetland E. 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. Mitigation 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 pre-haul road construction conditions.

Current pre-haul road conditions support a palustrine aquatic bed wetland plant community dominated by yellow pond lily (*Nuphar polysepalum*), as well as an area of open water. Post-haul road mitigation conditions will seek to restore the yellow pond lily community, with a minor component of open water. Planting of the site will occur during the first appropriate planting window upon acceptance of final restored grades.

1.4 SUMMARY OF IMPACT AND CWM ACREAGE/CREDITS

Table 1 provides a summary of 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, creation, restoration) at each site. As shown in these two tables, total wetland impacts will be 3.44 acres and mitigation will total 5.91 acres (4.29 credits). This represents an excess of 0.85 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 (3.44 credits) based on DSL ratios.

Table 1. Project Impacts

Wetland ID	Cowardin Class	Hydrogeomorphic (HGM) Class	Impact Acres/Debits
2013-3	PSSC	Flat	0.100
2013-4	PUBH	Depressional	0.287
2012-7	PEMA	Slope	0.200
Wetland H (east)	PEMA	Depressional	0.087
Wetland I (north)	PEMA	Depressional	0.266
Wetland J	PEMA	Slope	0.033
Wetland L	PEMA	Depressional	0.114
Wetland APC-D	PEMA	Depressional	0.005
2012-4	PEMA	Depressional	0.008
Wetland A	PFOC	Depressional	0.202
Wetland B	PFOC	Depressional	0.412
2012-2	PSSC, PEMF	Flat	0.150
Wetland C	PFOC	Depressional	0.256

Wetland ID	Cowardin Class	Hydrogeomorphic (HGM) Class	Impact Acres/Debits
Wetland E	PABH, PUBH	Depressional	0.976
2013-6	PEMF	Flat	0.346
Total			**3.44**

Table 2. Mitigation Summary [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	Creation	PSS	Depressional	1.19	0.79
	Enhancement	PSS, PEM	Depressional	0.38	0.13
	Restoration	PEM	Depressional	0.46	0.46
			Subtotal	**2.03**	**1.38**
East Bridge	Restoration	PABH, PUBH	Depressional	0.96	0.96
			Subtotal	**0.96**	**0.96**
Total				**5.91**	**4.29**

[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.

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	1	1	3	-2
	Value	0	2	2	2	0
Water Quality Support	Function	0	7	7	10	-3
	Value	0	6	6	6	0
Fish Support	Function	0	5	5	5	0
	Value	0	8	8	7	1
Aquatic Support	Function	0	7	7	7	0
	Value	1	10	9	10	-1

GROUPED SERVICES		CWM SITE			Impact Sites	CWM minus Impact Site
		Existing	Predicted	Change	Predicted Loss	Net Change
Terrestrial Support	Function	0	6	6	6	0
	Value	1	10	9	10	-1
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 East Bridge Mitigation Site and 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 East Bridge Mitigation Site and 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.

2.3.3 East Bridge Mitigation Site

The East Bridge Mitigation Site is situated along the upper North Spit of Coos Bay, due east of Jordan Cove Road. The site is located in township 25 south, range 13 west, section 4, tax lot 10000.

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, creation, and restoration. 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 and East Bridge Mitigation Sites 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 and East Bridge Mitigation Sites 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.

4.1.2 West Bridge Mitigation Site

SHN prepared a wetland delineation reports that cover the area of the West Bridge Mitigation Site (DSL WD# 2012-0313 and #2013-0116. The reports received DSL concurrence on April 15 and November 8, 2013 respectively.

4.1.3 East Bridge Mitigation Site

DEA prepared a wetland delineation report for the Mill Site, which included the East Bridge Mitigation Site (DSL WD#2013-0218). The report received DSL concurrence on February 13, 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.

4.2.3 East Bridge Mitigation Site

The Cowardin classes of existing wetland at the East Bridge Mitigation Site are palustrine aquatic bed permanently flooded (PABH) and palustrine unconsolidated bottom permanently flooded (PUBH). The HGM class is depressional. However, existing wetland at the CWM site will be converted to upland as a result of installation of the project haul road.

4.3 EXISTING AND PROPOSED HYDROLOGY

4.3.1 Existing Hydrology – All Mitigation Sites

4.3.1.1 East and West Bridge Mitigation Sites

Wetlands adjacent to the proposed mitigation sites 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 will be made too dry due to installation of the construction haul road. Conditions at the East Bridge site will also be made too dry to support wetland conditions due to installation of the construction haul road.

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 East and West Bridge Mitigation Sites

Site hydrology will be provided by groundwater as is the case for the existing adjacent wetlands. Recontouring of the West Bridge and East Bridge mitigation sites 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.

4.4.3 East Bridge Mitigation Site

Existing wetland vegetation is dominated by yellow pond lily. Invasive submerged aquatics such as species of water milfoil (*Myriophyllum* sp.) may be present.

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.

4.5.3 East Bridge Mitigation Site

Mitigation work at the East 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. If non-native invasive submerged aquatics are present in Wetland E outside of the mitigation site, it will be infeasible to prevent these species from entering the mitigation site and limiting their presence.

4.6 RESTORATION PROJECTS

4.6.1 Data Supporting Existence of Former Wetland and Current Non-wetland Status

Restoration will occur at the West Bridge and East Bridge Mitigation Sites at locations that are currently wetland. These areas will be filled to construct a construction haul road needed to move large volumes of sand, modular equipment, and infrastructure components from the LNG terminal site (Ingram Yard) to the Mill Site/South Dunes Site. Because this road will be in place for more than two years, it is considered to be a permanent impact. The Project will remove this permanent impact once the haul road is no longer needed, thus restoring the areas to wetland.

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 restoration activities. No wetland services are currently provided in the creation areas at this site. As a point of clarification, wetland services are currently provided in the restoration areas, but these wetlands will be impacted by the construction of a temporary haul route that will be in place for two to three years. Because of the duration of the temporary impact, these impacts are being permitted as permanent, and then the restoration of these same wetlands is being proposed as mitigation. Thus, at the time mitigation construction begins in the restoration areas, these areas will be upland, and will provide no wetland services. However, adjacent existing 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.

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 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.

5.2.2.5 East Bridge Mitigation Site – Pre-Mitigation

The East Bridge Mitigation Site consists of restoration activities. As a point of clarification, wetland services are currently provided in the restoration areas, but these wetlands will be impacted by the construction of a temporary haul route that will be in place for two to three years. Because of the duration of the temporary impact, these impacts are being permitted as permanent, and then the restoration of these same wetlands is being proposed as mitigation. Thus, at the time mitigation construction begins in the restoration areas, these areas will be upland, and will provide no wetland services. However, adjacent existing 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.

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 industrial areas.

5.2.2.6 East Bridge Site – Post-Mitigation

Post-mitigation wetland services will have functions and values similar to the existing adjacent wetlands, as described above. Additional uplift will be achieved by including habitat features, specifically large wood. Scoring of the East Bridge site post-mitigation is assumed to be the same as the site during pre-project conditions.

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 1.67 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 1.67 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 1.67 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 1.67 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 2.15 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 (2.15 acres), including creation area and temporary disturbance area, will meet all three wetland parameters.

  Performance Standard: *The mitigation area (2.15 acres) will meet all three wetland parameters as determine 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 Goal 1: Create, enhance, and restore 1.19 acres, 0.38 acres, and 0.46 acres, 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 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:** 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 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 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 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.*

7.1.3 East Bridge Mitigation Site

Mitigation Goal 3: Restore 0.96 acres of palustrine aquatic bed and palustrine unconsolidated bottom wetland at the East Bridge Mitigation Site. To achieve this goal, the following objectives will be carried out:

- **Objective 3.1**: Restore wetland by excavating 0.96 acres of upland sandy fill material (i.e., project-related construction haul road) down to pre-haul road elevations.

  Performance Standard: *An as-built survey will show that approximately 0.96 acres have been graded to match pre-haul road elevations.*

- **Objective 3.2:** Establishment and survival of self-sustaining wetland plant community dominated by yellow pond lily (*Nuphar polysepalum*), approximately 0.81 acres. Approximately 0.15 acres of the site may remain as open water, which is consistent with pre-project conditions.

  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, excluding any submerged aquatic invasives found in adjacent portions of Wetland E.*

1. *The cover of native herbaceous species [in the vegetated portions of the site, approximately 0.81 acres] is at least 60%.*
2. *The cover of invasive herbaceous species is no more than 20%.*
3. *The cover of invasive shrub or tree species is no more than 10%.*
4. *Prevalence Index total for all strata is less than 3.0.*

- **Objective 3.3:** Improve habitat structure by placing large wood (downed logs) to serve as habitat.

  Performance Standard: *A minimum of four pieces of wood will be installed on-site.*

- **Objective 3.4:** The mitigation area 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 area 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 aagencies.

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.

Control of invasive submerged aquatic plant species such as water milfoil (*Myriophyllum* sp.) is not proposed due to the likely presence of these species in portions of the wetland located outside of the mitigation site foot print.

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 specifically for the purpose of guaranteeing CWM site performance. The bond amount will be based on guidelines in Oregon Administrative Rule (OAR) 141-085-700(6). Because there is not a mitigation bank within a service area covering the project's removal-fill site, JCEP L.P. will post a bond amount equal to the current cost of payment in-lieu mitigation, and based on the project's amount of removal-fill acreage. Based on the most recent published DSL calculation (July 1, 2013), the rate of payment for Payment In-lieu mitigation is $75,000 per acre. The project proposes to permanently impact 10.19 acres of estuarine and freshwater wetlands; therefore, the proposed bond amount is estimated to be$764,250.

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, East Bridge 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 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 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.

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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.

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Personal Communications:

Cornu, Craig. South Slough National Estuarine Research Reserve (SSNER). Personal communication with Ethan Rosenthal (DEA Ecologist). February 24, 2014.

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

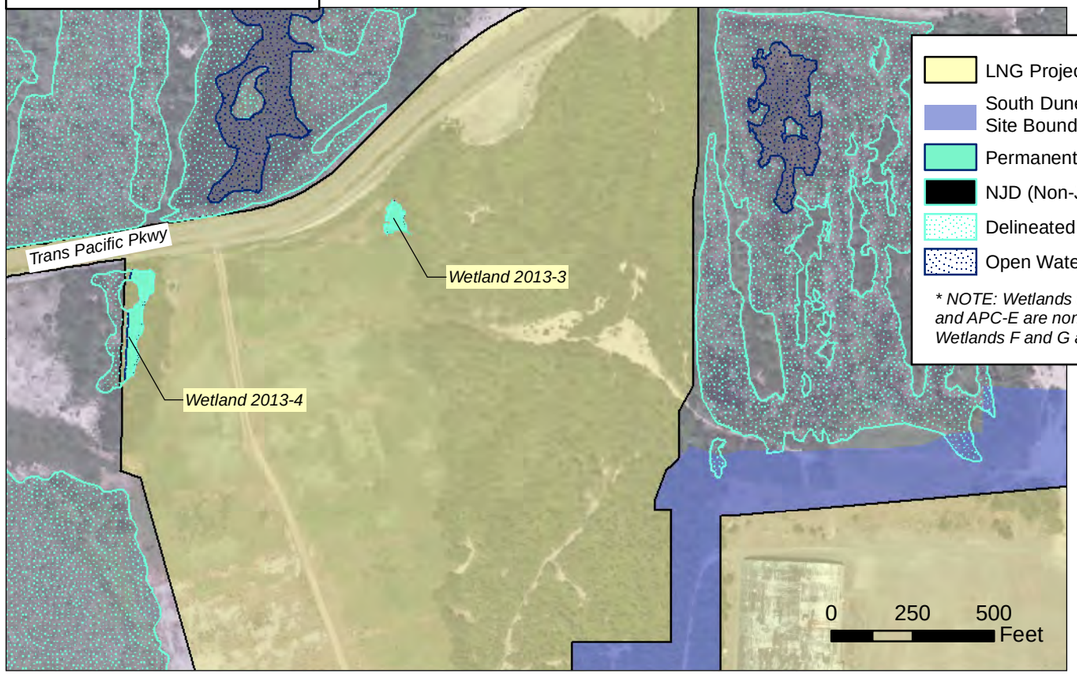
Figure 2: West Jordan Cove Mitigation Site Design Sheets
- Sheet A2-1 – West Jordan Cove Mitigation Site Existing Conditions
- Sheet A2-2A – West Jordan Cove Mitigation Site Plan
- Sheet A2-2B – West Jordan Cove Mitigation Site Cross-Sections
- Sheet A2-3 – West Jordan Cove Mitigation Site Planting List

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: East Bridge Mitigation Site Design Sheets
- Sheet A4-1 – East Bridge Mitigation Site Existing Conditions
- Sheet A4-2 – East Bridge Mitigation Site Intermediate Conditions
- Sheet A4-3 – East Bridge Mitigation Conceptual Grading and Planting Plan
- Sheet A4-4 – East Bridge Mitigation Grading Cross-Sections

Figure 5: 1950’s Aerial Photograph of Jordan Cove

Wetlands 2013-3, -4



LNG Project Footprint Boundary

South Dunes Power Plant Site Boundary

Permanently Impacted Freshwater Wetland

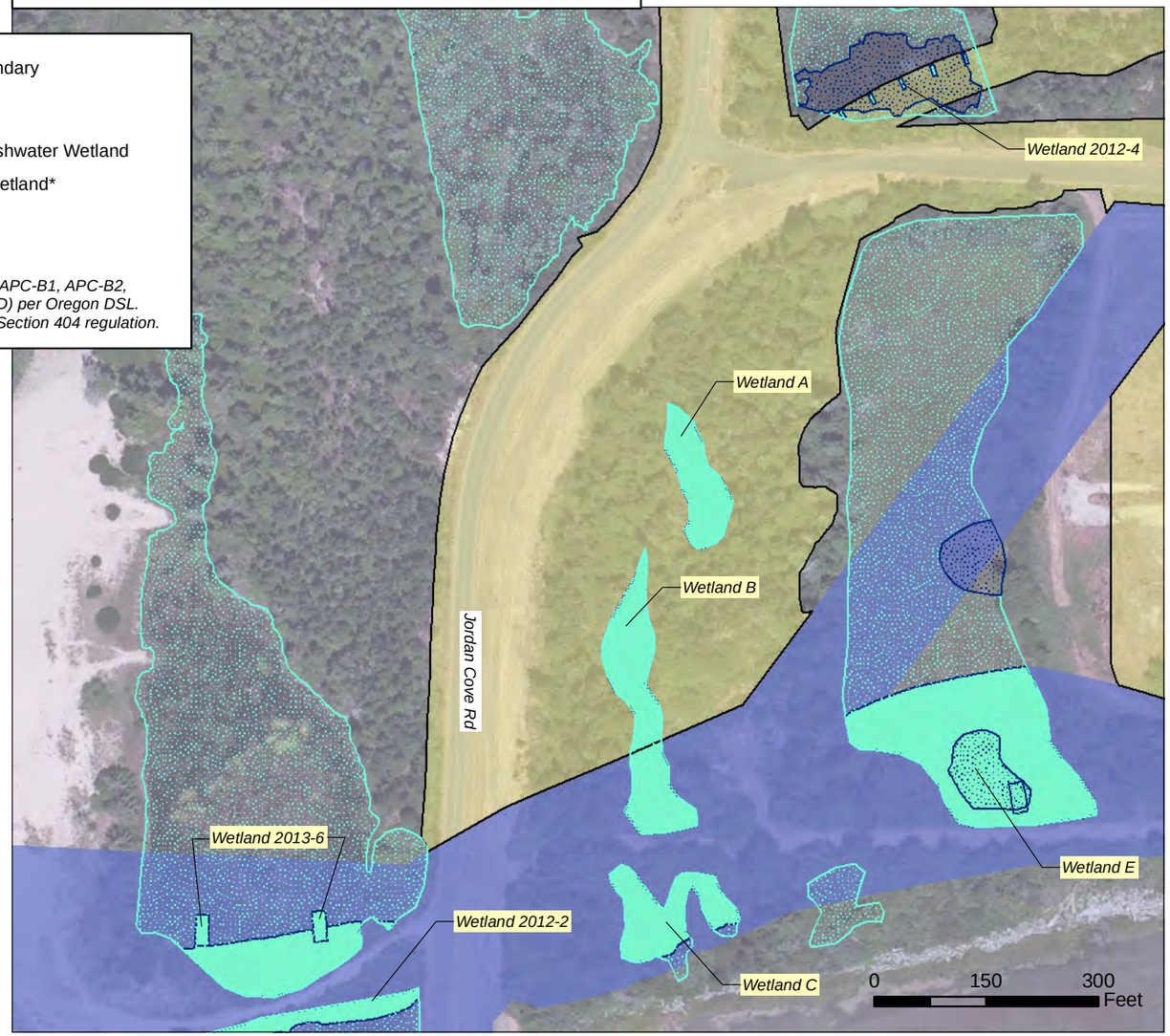
NJD (Non-Jurisdictional) Wetland*

Delineated Wetland

Open Water

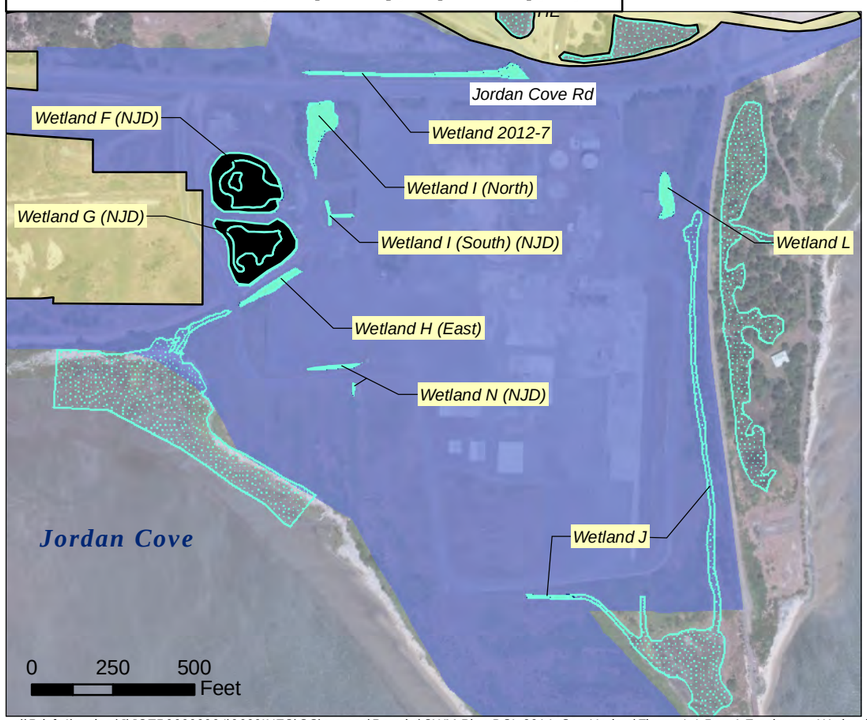
** NOTE: Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL. Wetlands F and G are not subject to Section 404 regulation.*

Wetlands 2012-2, 2012-4, 2013-6, A, B, C, E

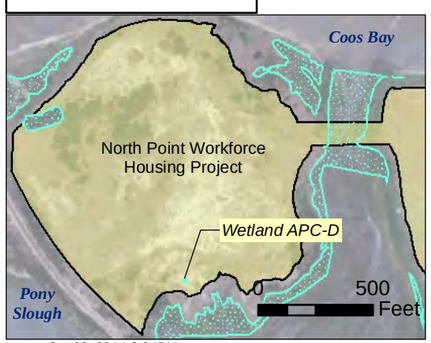


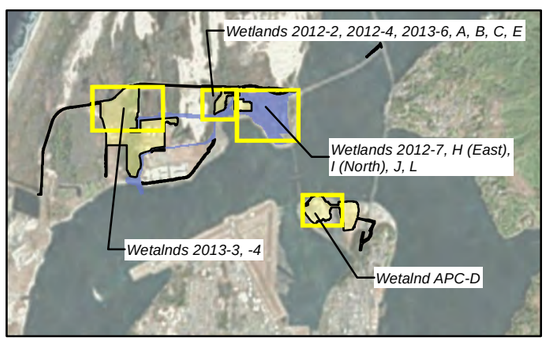
N

Wetlands 2012-7, H (East), I (North), J, L



Wetland APC-D





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JORDAN COVE LNG TERMINAL PROJECT

Figure 1, Sheet 1

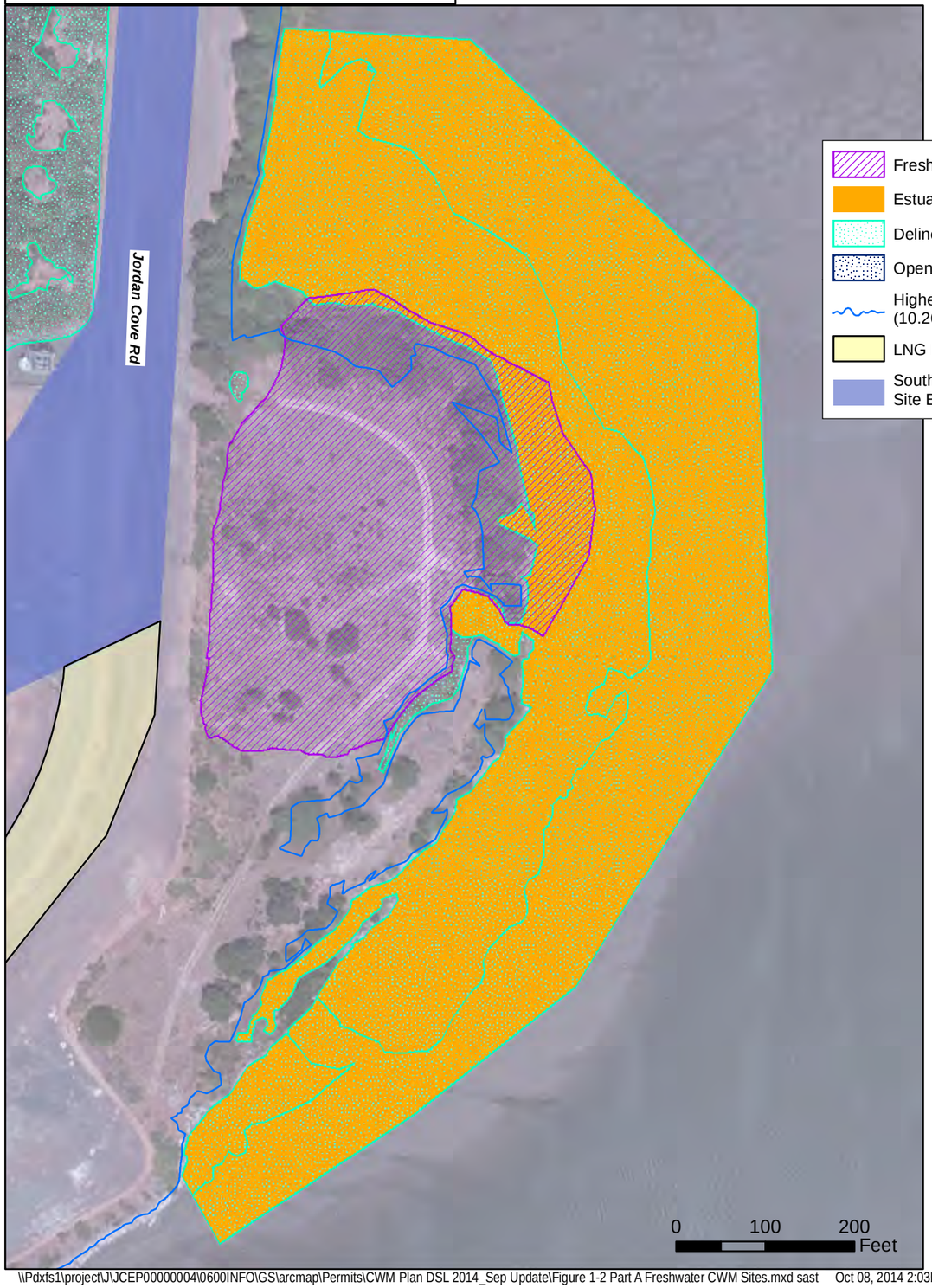
COOS COUNTY

Compensatory Wetland Mitigation Plan

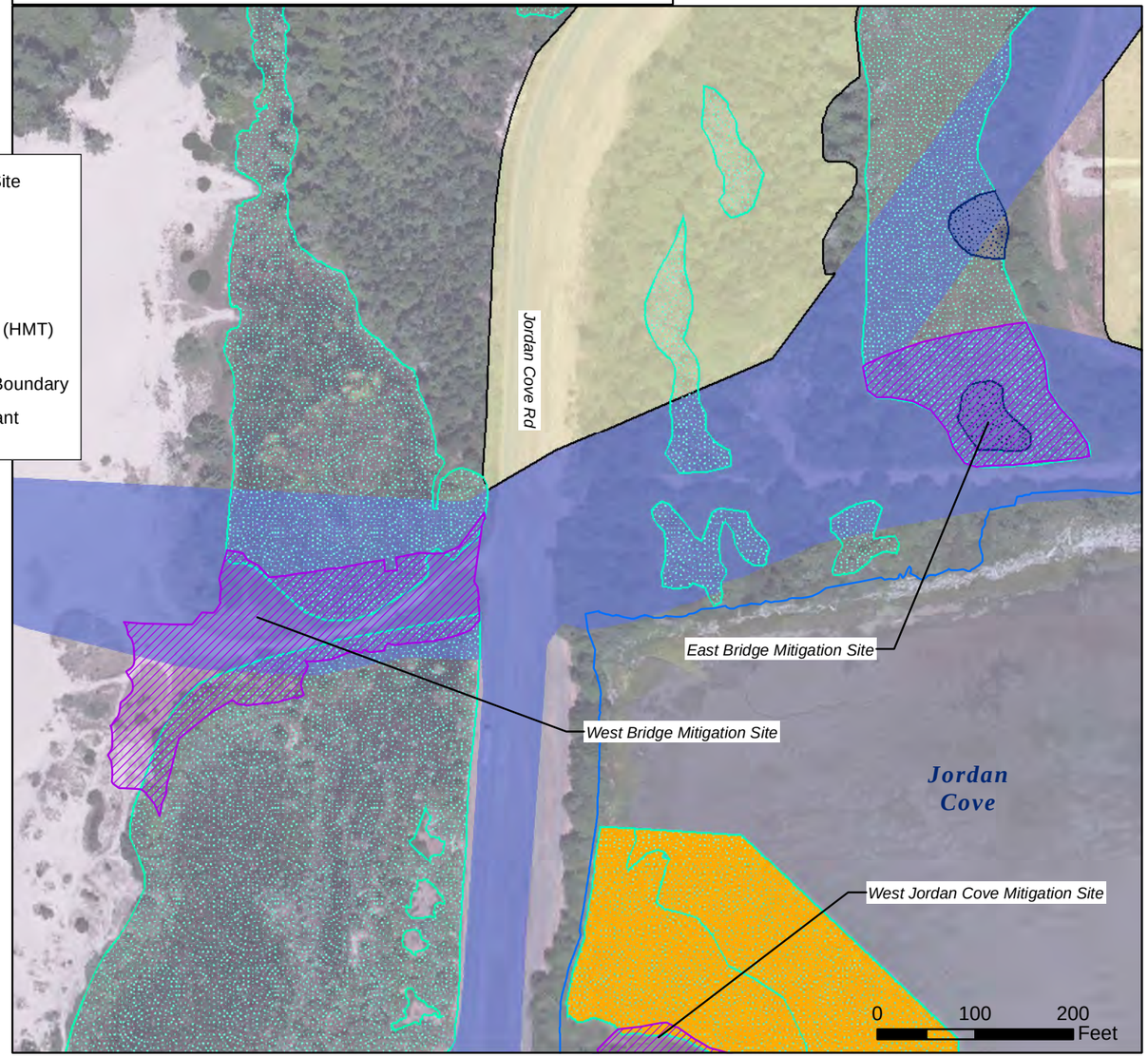
Part A - Permanently Impacted Freshwater Wetlands

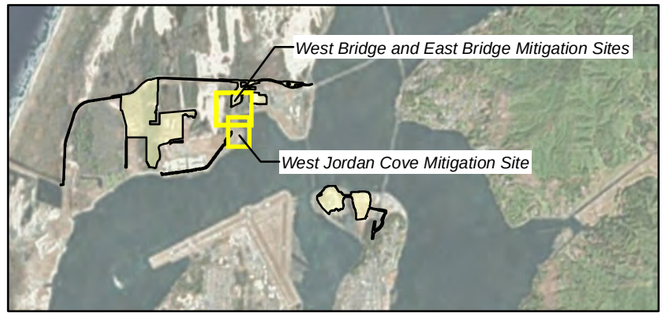
\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\CWM Plan DSL 2014_Sep Update\Figure 1-1 Part A Freshwater Wetlands.mxd sast Oct 08, 2014 2:04PM

West Jordan Cove Mitigation Site



West Bridge and East Bridge Mitigation Sites





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JORDAN COVE LNG TERMINAL 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 DSL 2014_Sep Update\Figure 1-2 Part A Freshwater CWM Sites.mxd sast Oct 08, 2014 2:03PM

N

Wetland 2012–2

Existing salt marsh

25S–13W–04–400

JORDAN COVE

JORDAN COVE ROAD

Existing mudflat (extends beyond wetland boundary limits)

25S–13W–04–300
ROSEBURG FOREST PRODUCTS CO.

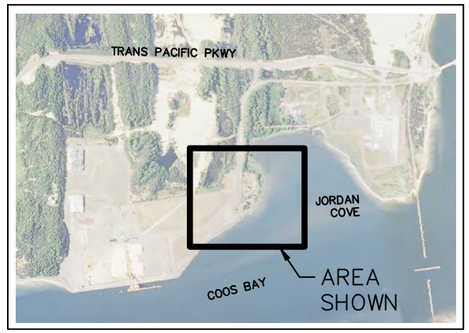
Existing Point Reyes Birdsbeak habitat boundary (typ.)

Construction access via Roseburg Forest Products property

Existing parking lot. Proposed contractor staging area

Highest Measured Tide (Elev. 10.26)

1 / A2-1 EXISTING CONDITIONS
SCALE: 1"=200'



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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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 - EXISTING CONDITIONS

SHEET NO. A2–1

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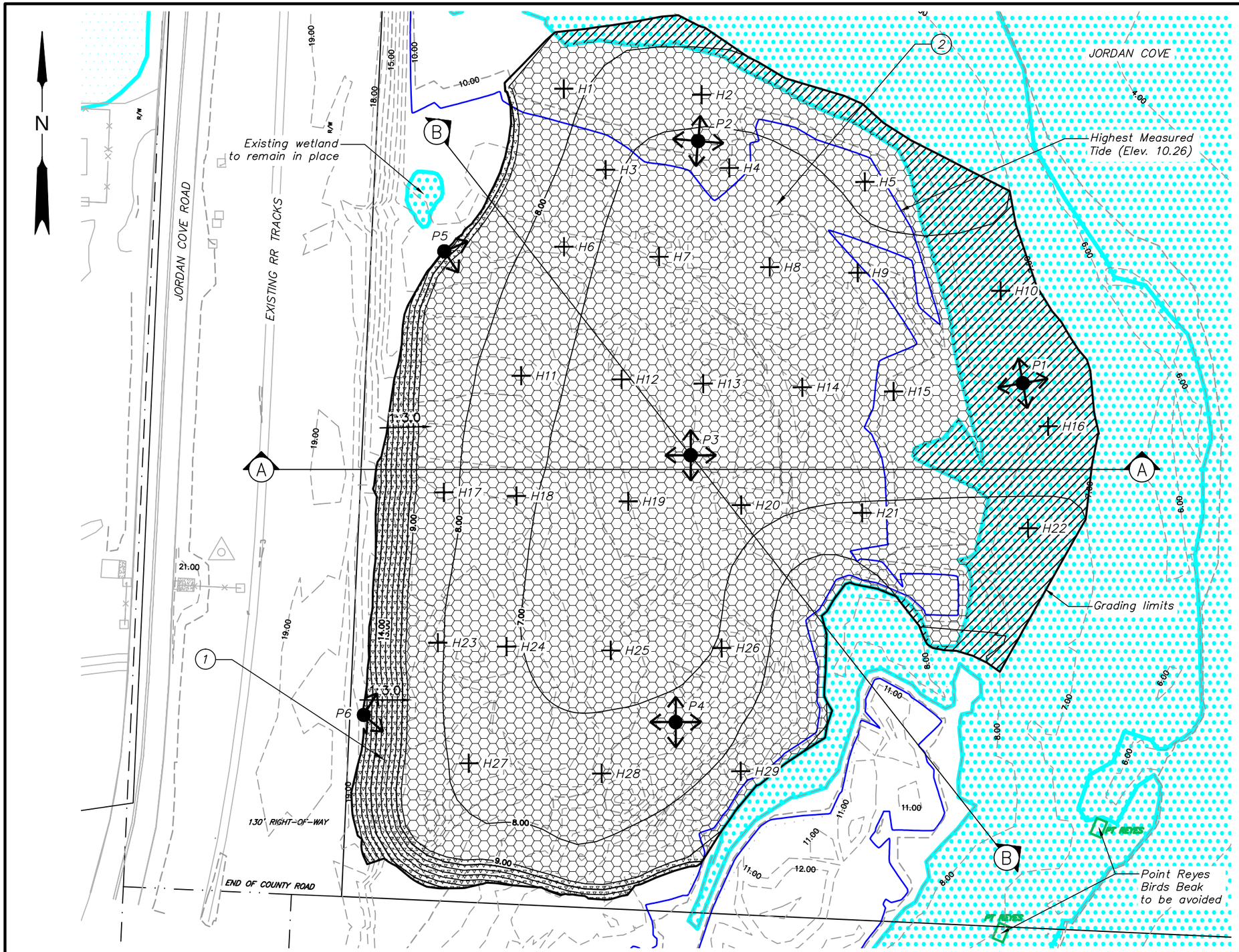

1 A2-2A **MITIGATION PLAN**
SCALE: 1"=60'

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

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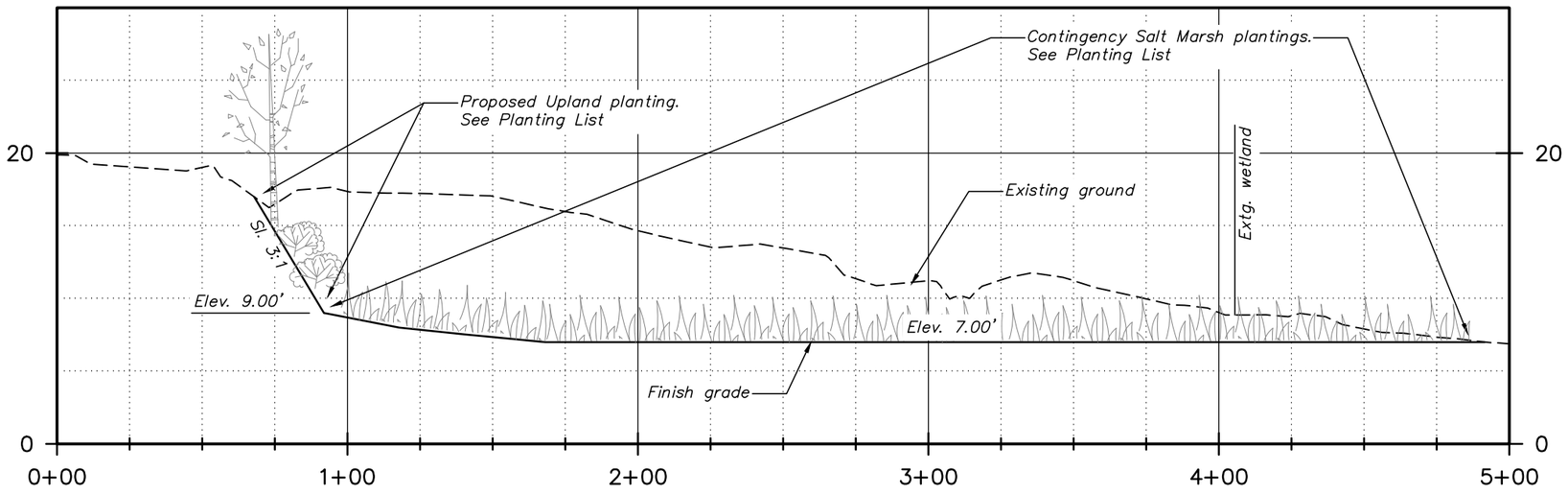
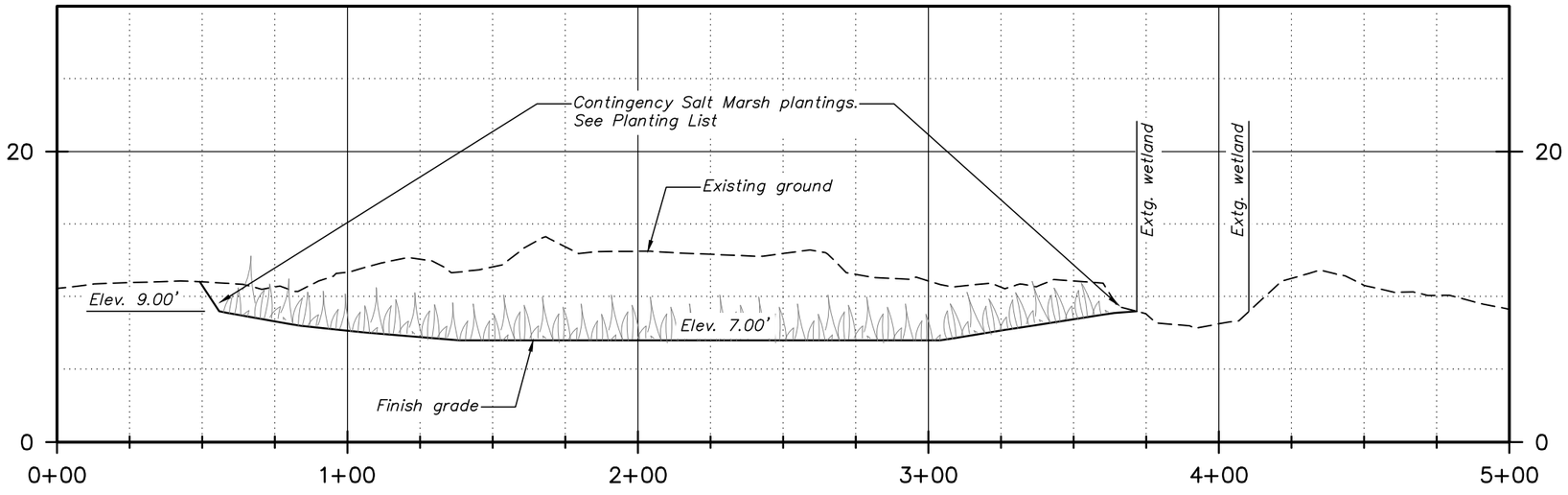


1 / A2-2B **SECTION A-A**

SCALE: H: 1"=50' V: 1"=10'



2 / A2-2B **SECTION B-B**

SCALE: H: 1"=50' V: 1"=10'

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COOS COUNTY

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WEST JORDAN COVE MITIGATION SITE - CROSS SECTIONS

SHEET NO. A2–2B

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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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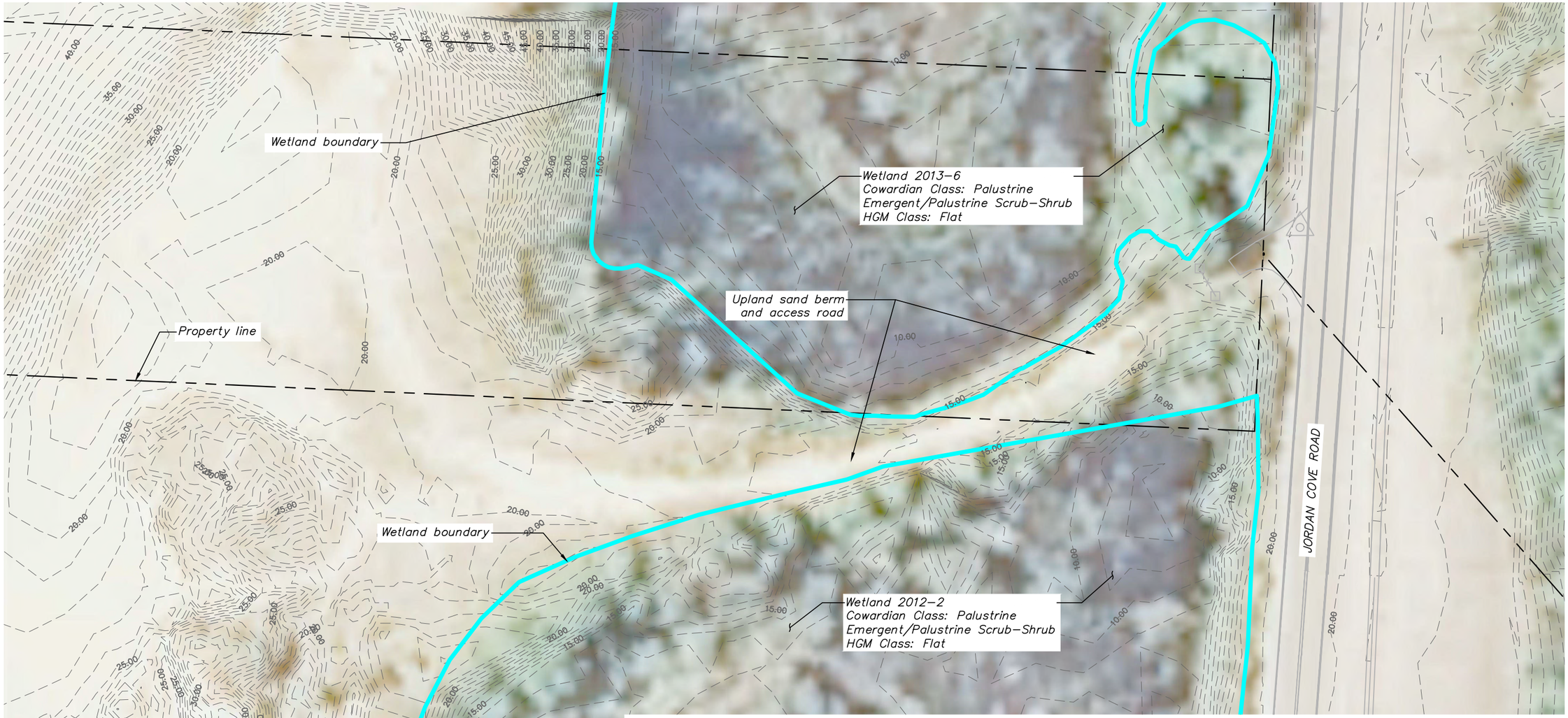
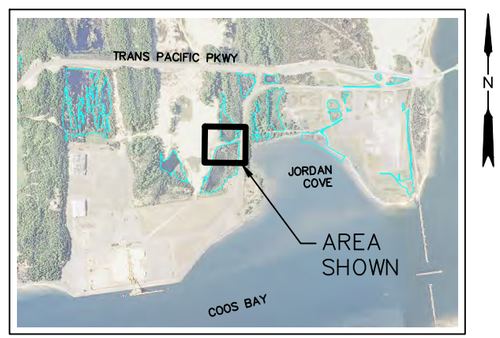
WEST JORDAN COVE MITIGATION SITE - PLANTING LIST

SHEET NO. A2–3





LEGEND:

- Wetland boundary
- Existing contour
- Property line

0 30 60 120

1 / A3-1 **EXISTING CONDITIONS**
SCALE: 1"=60'

2 / A3-1 **KEY MAP**
SCALE: 1"=3000'

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

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Drafted By – JND

WEST BRIDGE MITIGATION SITE
EXISTING CONDITIONS

SHEET NO. A3–1

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Wetland 2013–6
Cowardian Class: Palustrine
Emergent/Palustrine Scrub–Shrub
HGM Class: Flat

Intermediate
wetland boundary

HAUL ROAD

Limits of haul
road fill

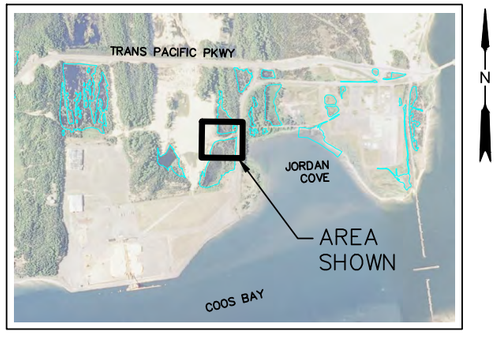
Property line

Intermediate
wetland boundary

Wetland 2012–2
Cowardian Class: Palustrine
Emergent/Palustrine Scrub–Shrub
HGM Class: Flat

JORDAN COVE ROAD

N



LEGEND:

- Wetland boundary
- Existing contour
- Property line

0 30 60 120

1 A3-1 EXISTING CONDITIONS
SCALE: 1"=60'

2 A3-1 KEY MAP
SCALE: 1"=3000'

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WEST BRIDGE MITIGATION SITE
INTERMEDIATE CONDITIONS

SHEET NO. A3–1A

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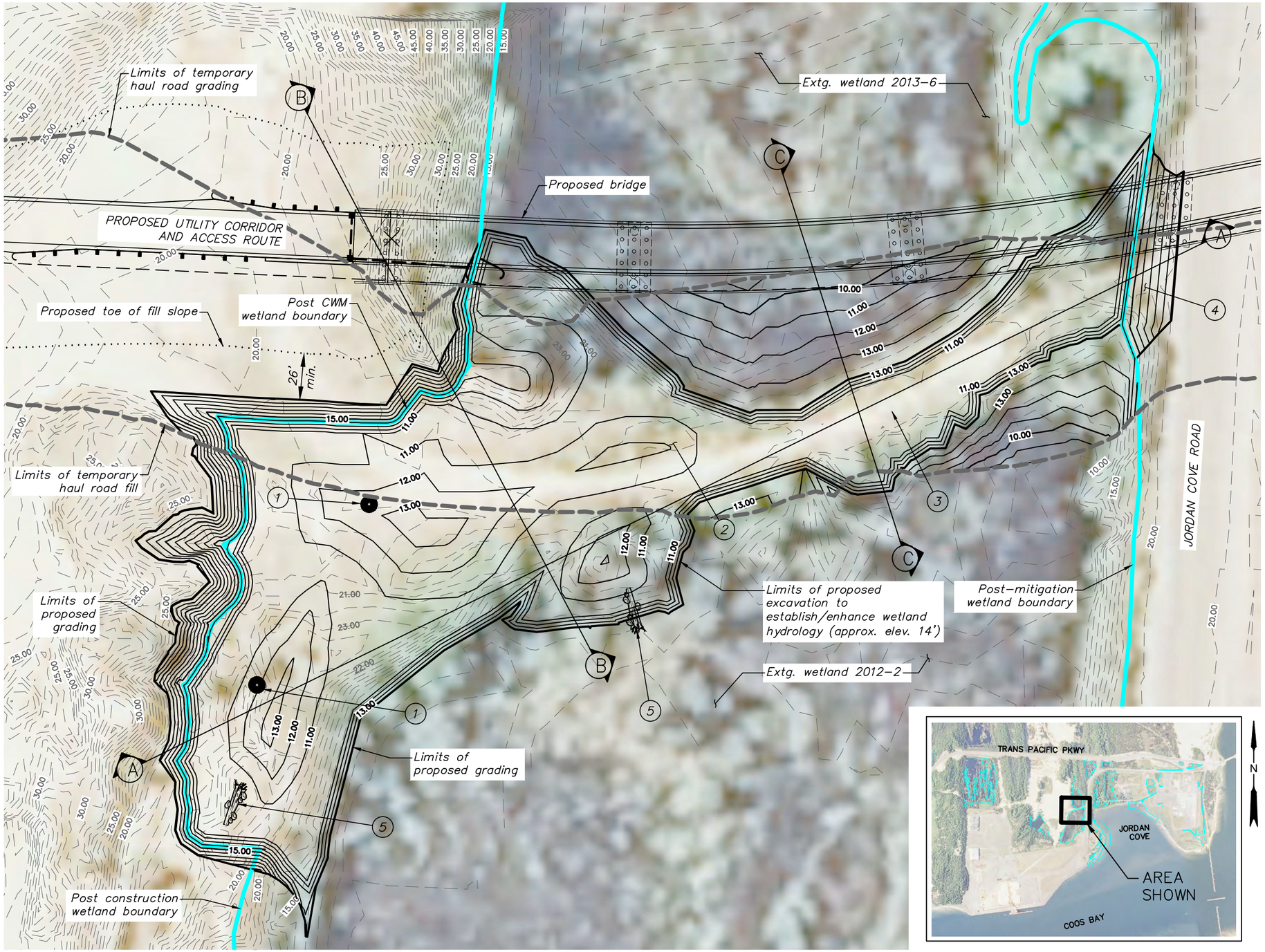

CONSTRUCTION NOTES:

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

1 / A3-2 **CONCEPTUAL MITIGATION GRADING PLAN**
SCALE: 1"=60'

2 / A3-2 **KEY MAP**
SCALE: 1"=3000'

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

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WEST BRIDGE MITIGATION CONCEPTUAL GRADING PLAN

SHEET NO. A3–2

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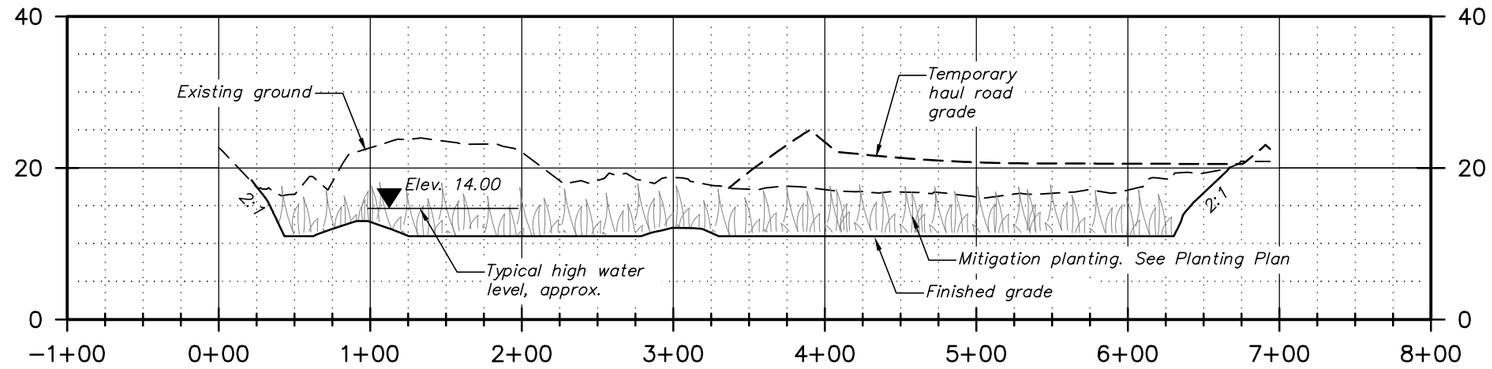
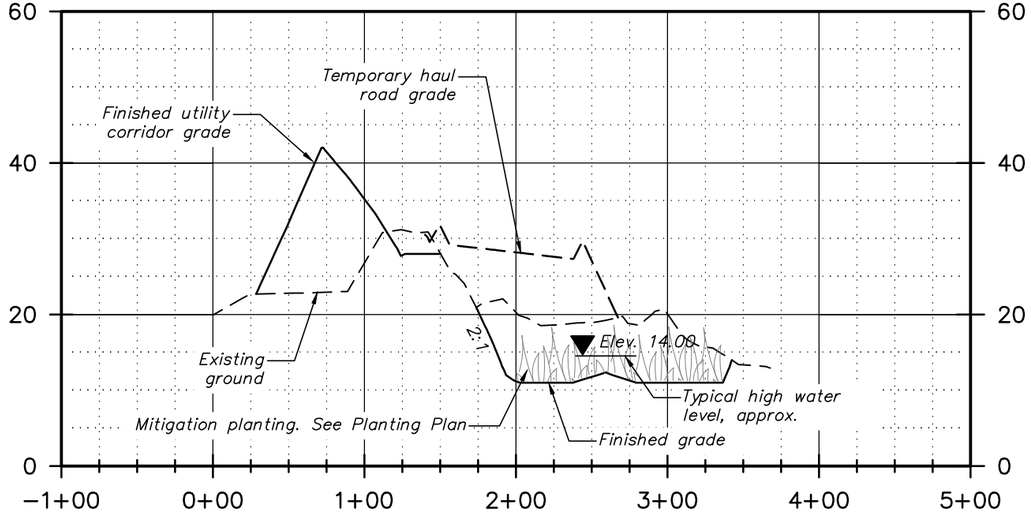
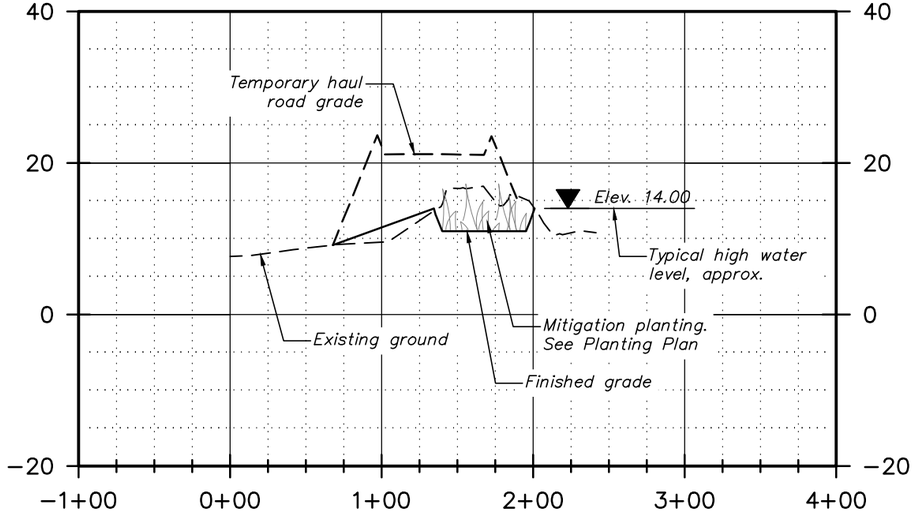


1 / A3-3 SECTION A-A
SCALE: H:1"=100' V:1"20'



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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WEST BRIDGE MITIGATION GRADING CROSS SECTIONS

SHEET NO. A3–3

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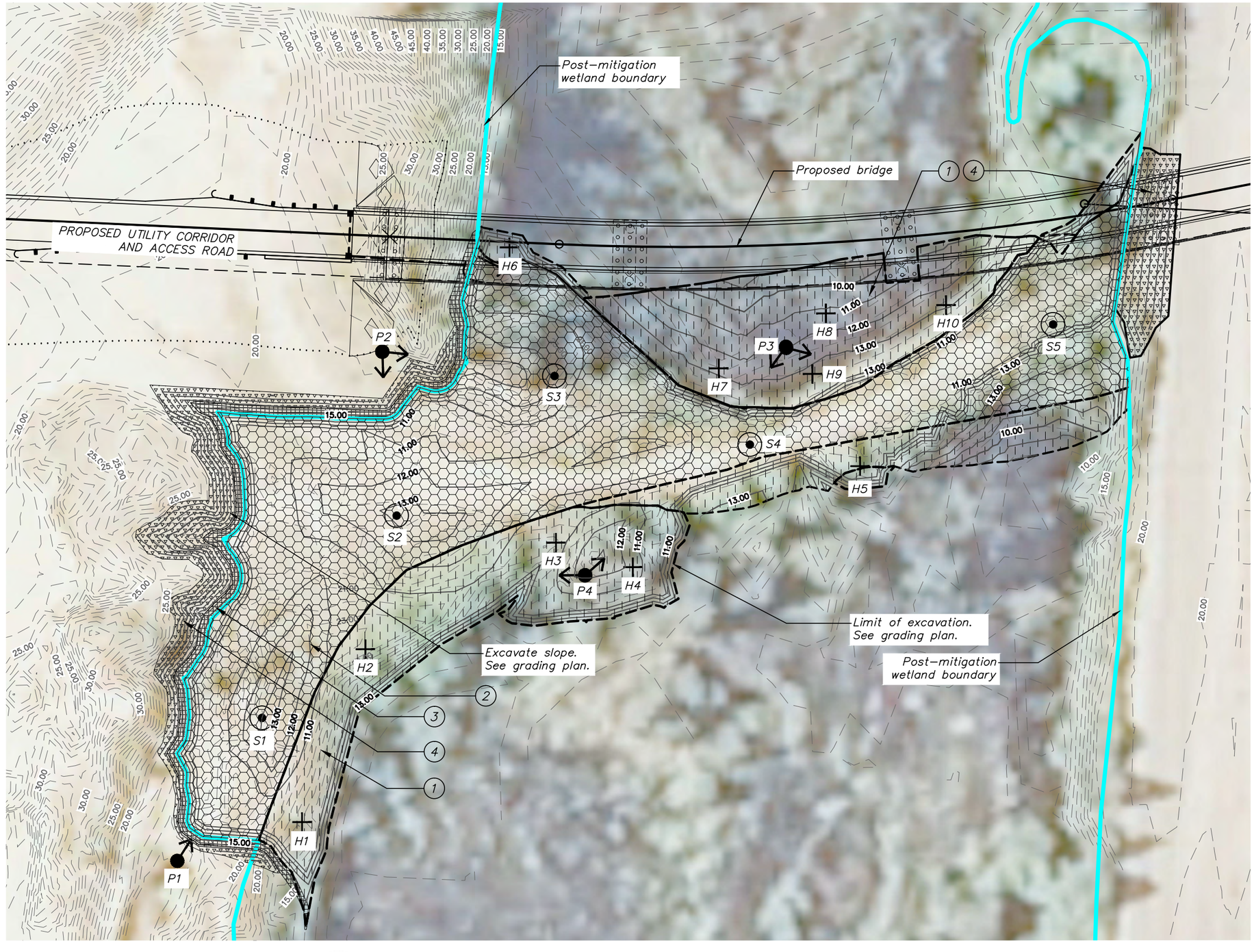

CONSTRUCTION NOTES:

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

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WEST BRIDGE MITIGATION CONCEPTUAL PLANTING PLAN

SHEET NO. A3–4

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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

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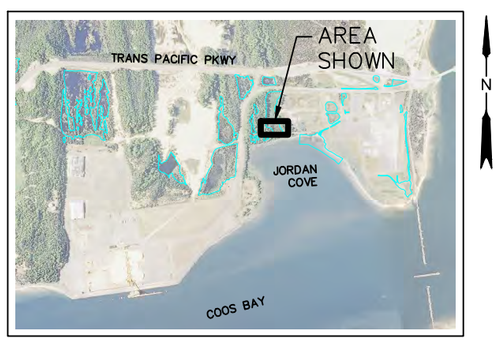
Designed By – BAR
Drafted By – BAR

WEST BRIDGE MITIGATION PLANTING LIST

SHEET NO. A3–5





2 / A4-1 KEY MAP
SCALE: 1"=3000'

1 / A4-1 EXISTING CONDITIONS
SCALE: 1"=30'

0 20 40 80

LEGEND:

- *Wetland boundary*
- *Existing contour*
- *Property line*

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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

EAST BRIDGE MITIGATION SITE EXISTING CONDITIONS

SHEET NO. A4–1

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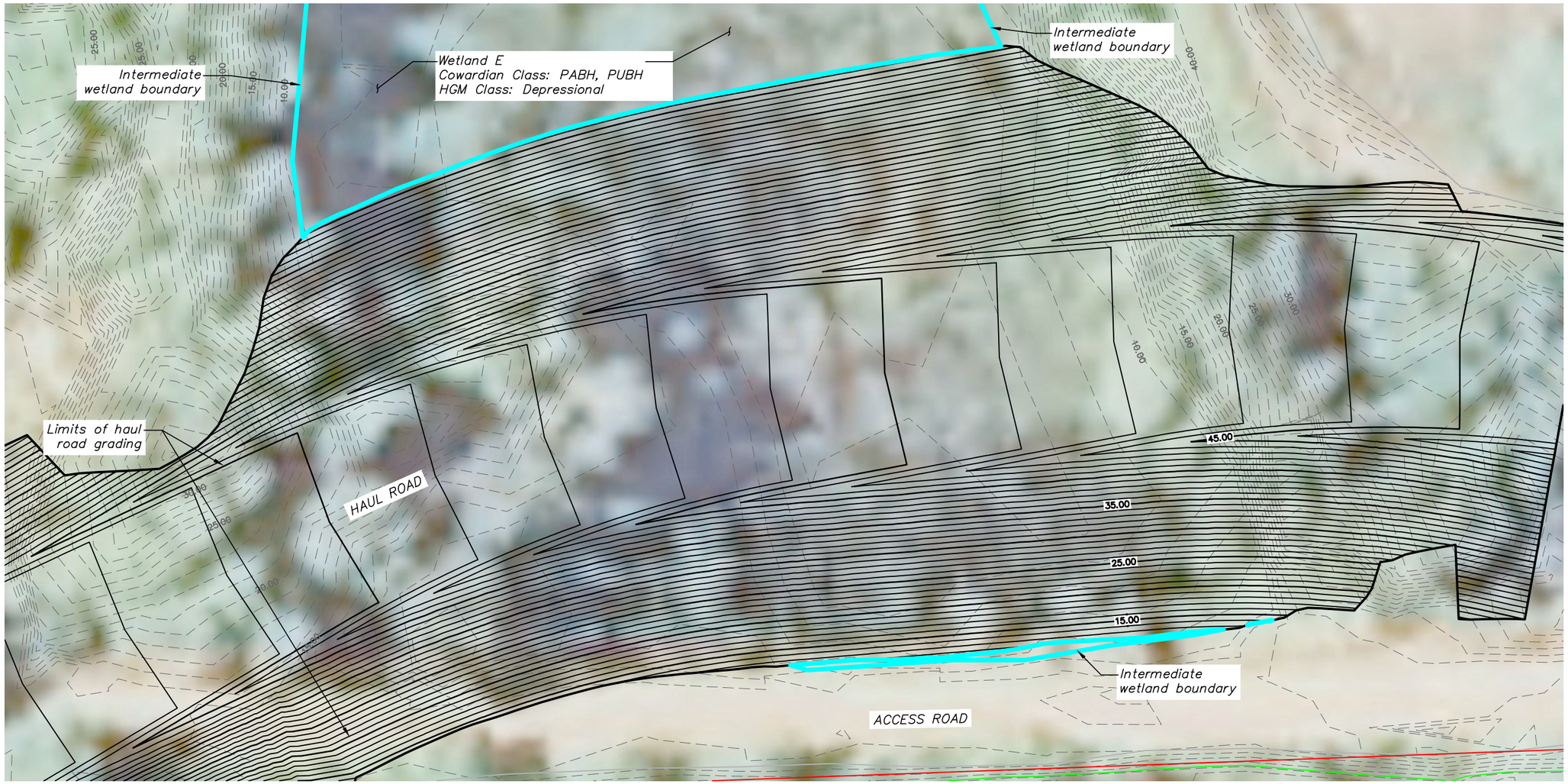

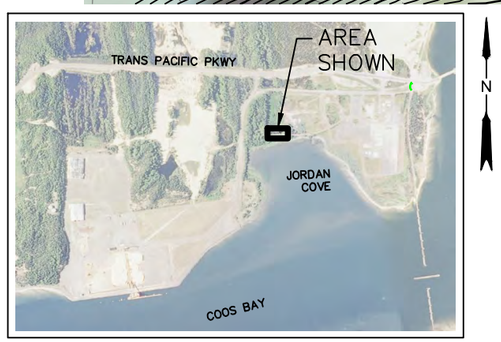

2 / A4-2 KEY MAP
SCALE: 1"=3000'

1 / A4-2 INTERMEDIATE CONDITIONS
SCALE: 1"=40'

0 20 40 80

LEGEND:

- *Wetland boundary*
- *Existing contour*
- *Property line*
- *Intermediate contour*

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

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Drafted By – JND

EAST BRIDGE MITIGATION SITE INTERMEDIATE CONDITIONS

SHEET NO. A4–2

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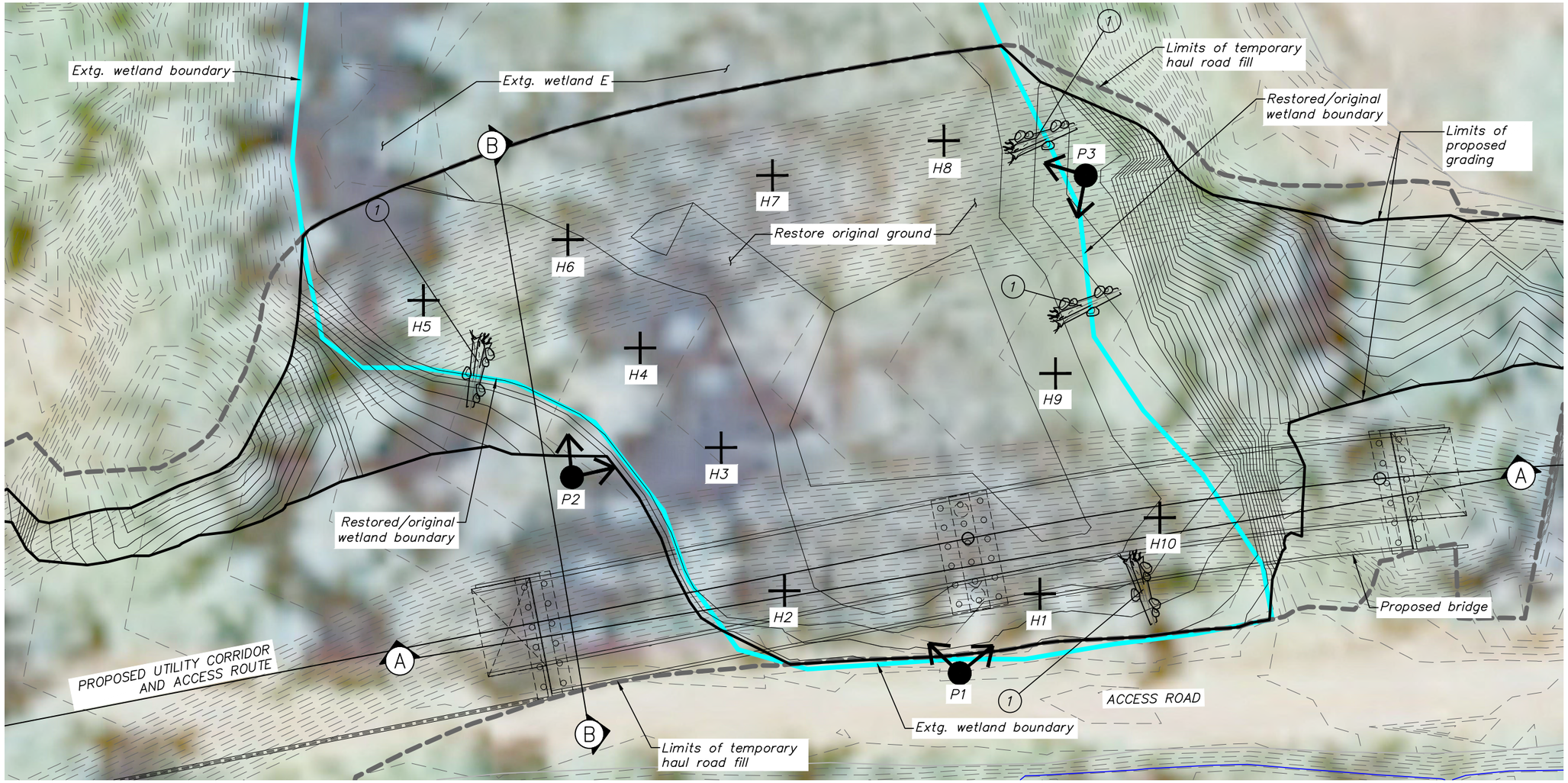

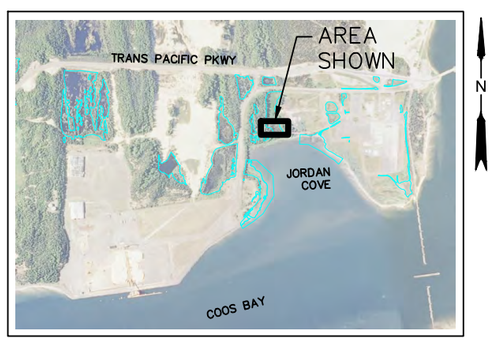

2 / A4-3 KEY MAP
SCALE: 1"=3000'

1 / A4-3 CONCEPTUAL MITIGATION GRADING AND PLANTING PLAN
SCALE: 1"=40'

0 20 40 80

CONSTRUCTION NOTES:

(1) Install large woody debris (4)

PLANTING PLAN:

0.79 acres of site to be planted with yellow pond lily (nuphar polsepalum)

Remaining deepest portion of site to remain as open water

LEGEND:

— — — — Intermediate contour (1' interval)

———— Proposed/restored contour (1' interval)

Monitoring Plots:

+ Herbaceous Plot

Photo Point and direction

Note: Minimum required plots and photo points are shown. Additional plots and photo points will be added and/or locations adjusted as identified in the field during monitoring.

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

EAST BRIDGE MITIGATION CONCEPTUAL GRADING & PLANTING PLAN

SHEET NO. A4–3

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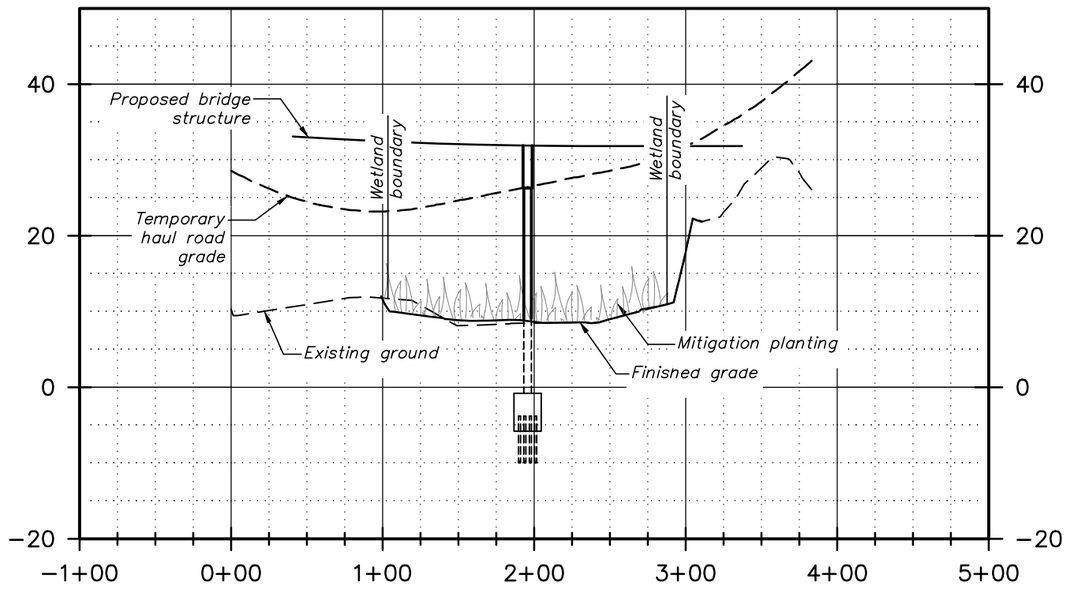
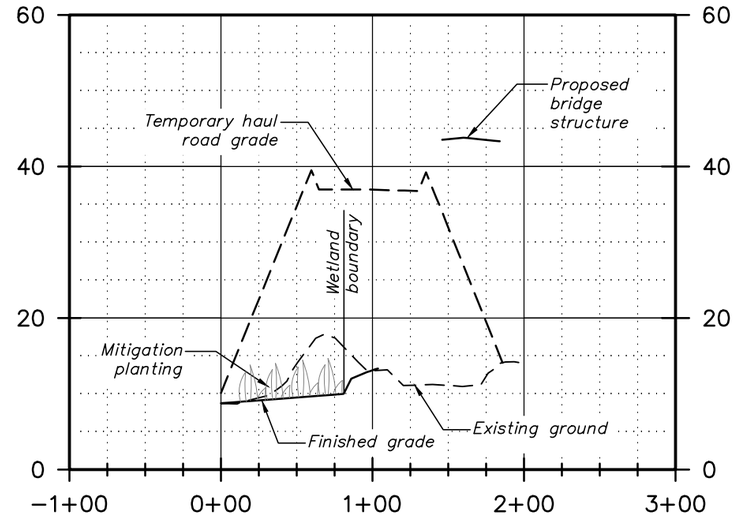


1 A4-4 **SECTION A-A**
SCALE: H:1"=100' V:1"20'



2 A4-4 **SECTION B-B**
SCALE: H:1"=100' V:1"20'

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COOS COUNTY

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Drafted By – JND

EAST BRIDGE MITIGATION GRADING CROSS SECTIONS

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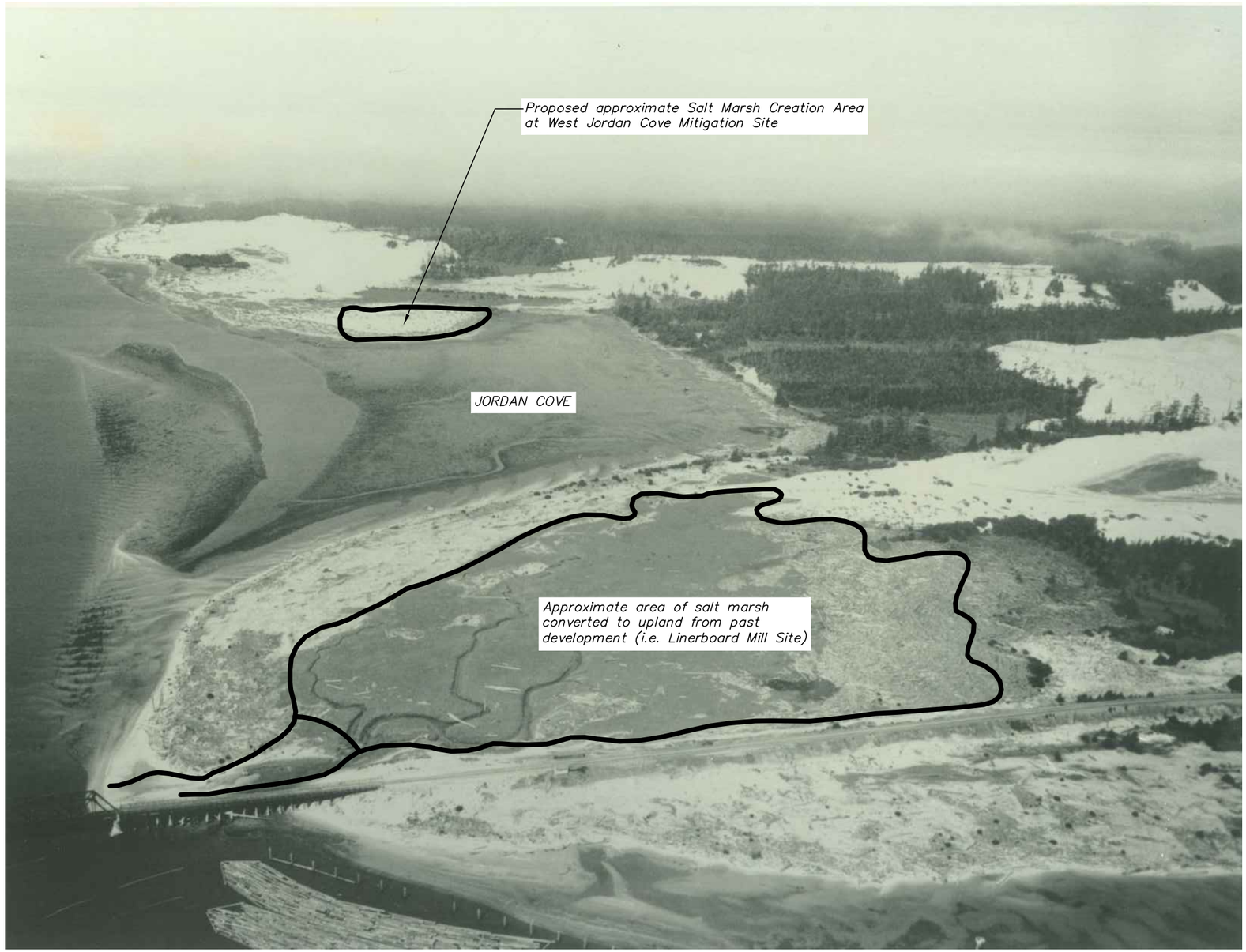

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JORDAN COVE LNG TERMINAL PROJECT AND SOUTH DUNES POWER PLANT PROJECT

COOS COUNTY

Reviewed By – SPS
Designed By – JND
Drafted By – JND

WEST JORDAN COVE MITIGATION SITE - AERIAL PHOTO FROM 1950'S

SHEET NO.
FIG. 5

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APPENDIX B – ORWAP FUNCTIONAL ASSESSMENT RESULTS FOR INDIVIDUAL SITES (IMPACT AND MITIGATION)

Impacted Wetland Functions

SPECIFIC FUNCTIONS	Wetlands A, B, C, and 2012-4		Wetland E		Wetland 2013-3		Wetland 2013-4		Wetlands 2013-6 and 2012-2		Wetlands 2012-7, H (East), I (North), J, and L	
	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	0.88		0.98		0.10		0.29		0.50		0.70	

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)
Hydrologic Function (WS)	3.21	2.30
Water Quality Group (WQ)	9.52	5.59
Carbon Sequestration (CS)	2.40	
Fish Support Group (FISH)	5.13	6.73
Aquatic Support Group (AQ)	7.13	10.00
Terrestrial Support Group (TERR)	6.00	9.70
Public Use & Recognition (PU)		2.32
Provisioning Services (PS)		0.00

Scores Rounded to Nearest Whole Number	
Group Scores (functions)	Group Scores (values)
3	2
10	6
2	
5	7
7	10
6	10
	2
	0

Existing Pre-Mitigation Site Wetland Functions

	West Bridge Creation		West Bridge Restoration		West Bridge Enhancement		East Bridge Restoration		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**	**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	0.00	0.00	0.33	3.17	0.00	0.00	0.00	0.00
Sediment Retention & Stabilization (SR)	0.00	0.00	0.00	0.00	6.67	4.64	0.00	0.00	0.00	0.00
Phosphorus Retention (PR)	0.00	0.00	0.00	0.00	5.96	5.97	0.00	0.00	0.00	0.00
Nitrate Removal & Retention (NR)	0.00	0.00	0.00	0.00	4.00	3.06	0.00	0.00	0.00	0.00
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)	0.00		0.00		4.27		0.00		0.00	
Organic Matter Export (OE)	0.00		0.00		0.00		0.00		0.00	
Aquatic Invertebrate Habitat (INV)	0.00	0.00	0.00	0.00	7.00	6.00	0.00	0.00	0.00	0.00
Anadromous Fish Habitat (FA)	0.00	0.00	0.00	0.00	0.00	4.63	0.00	0.00	0.00	0.00
Non-anadromous Fish Habitat (FR)	0.00	0.00	0.00	0.00	4.17	6.67	0.00	0.00	0.00	0.00
Amphibian & Reptile Habitat (AM)	0.00	0.00	0.00	0.00	5.21	4.00	0.00	0.00	0.00	0.00
Waterbird Feeding Habitat (WBF)	0.00	0.00	0.00	0.00	4.63	10.00	0.00	0.00	0.00	0.00
Waterbird Nesting Habitat (WBN)	0.00	0.00	0.00	0.00	0.00	6.67	0.00	0.00	0.00	0.00
Songbird, Raptor, & Mammal Habitat (SBM)	0.00	0.00	0.00	0.00	4.54	7.33	0.00	0.00	0.00	0.00
Pollinator Habitat (POL)	0.00	0.00	0.00	0.00	2.77	0.00	0.00	0.00	0.00	0.00
Native Plant Diversity (PD)	0.00	0.00	0.00	0.00	5.32	10.00	0.00	0.00	0.00	0.00

GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	0.00	0.00	0.00	0.00	0.33	3.17	0.00	0.00	0.00	0.00
Water Quality Group (WQ)	0.00	0.00	0.00	0.00	6.67	5.97	0.00	0.00	0.00	0.00
Carbon Sequestration (CS)	0.00		0.00		4.27		0.00		0.00	
Fish Support Group (FISH)	0.00	0.00	0.00	0.00	4.17	6.67	0.00	0.00	0.00	0.00
Aquatic Support Group (AQ)	0.00	0.00	0.00	0.00	7.00	10.00	0.00	0.00	0.00	0.00
Terrestrial Support Group (TERR)	0.00	0.00	0.00	0.00	5.32	10.00	0.00	0.00	0.00	0.00
Public Use & Recognition (PU)		0.00		0.00		0.00		0.00		0.00
Provisioning Services (PS)		0.00		0.00		0.00		0.00		0.00

Acres	1.19	0.46	0.38	0.96	2.92

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	0.02	0.20
Water Quality Group (WQ)	0.43	0.38
Carbon Sequestration (CS)	0.27	
Fish Support Group (FISH)	0.27	0.43
Aquatic Support Group (AQ)	0.45	0.64
Terrestrial Support Group (TERR)	0.34	0.64
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
0	0
0	
0	0
0	1
0	1
	0
	0

Post Mitigation Wetland Functions

	West Bridge Creation, Enhancement, and Restoration		East Bridge Restoration		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)	3.25	3.17	2.00	2.17	0.00	1.50
Sediment Retention & Stabilization (SR)	10.00	4.83	10.00	5.13	3.23	5.09
Phosphorus Retention (PR)	10.00	5.97	10.00	5.47	0.79	5.03
Nitrate Removal & Retention (NR)	10.00	3.06	10.00	3.56	2.96	3.64
Thermoregulation (T)	0.00	0.00	0.00	0.00	0.00	6.67
Carbon Sequestration (CS)	2.06		1.83		7.81	
Organic Matter Export (OE)	0.00		0.00		8.41	
Aquatic Invertebrate Habitat (INV)	6.56	6.41	5.49	6.96	3.75	6.00
Anadromous Fish Habitat (FA)	0.00	5.50	0.00	4.37	3.80	10.00
Non-anadromous Fish Habitat (FR)	6.41	6.67	6.96	6.67	4.29	10.00
Amphibian & Reptile Habitat (AM)	4.16	4.00	3.00	4.00	0.00	7.33
Waterbird Feeding Habitat (WBF)	5.50	10.00	4.37	10.00	4.93	10.00
Waterbird Nesting Habitat (WBN)	6.19	6.67	4.49	6.67	0.00	5.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.47	7.33	3.06	7.33	4.75	7.33
Pollinator Habitat (POL)	5.74	0.00	2.22	0.00	5.16	5.00
Native Plant Diversity (PD)	7.42	10.00	4.89	10.00	6.13	10.00

GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	3.25	3.17	2.00	2.17	0.00	1.50
Water Quality Group (WQ)	10.00	5.97	10.00	5.47	3.23	6.67
Carbon Sequestration (CS)	2.06		1.83		7.81	
Fish Support Group (FISH)	6.41	6.67	6.96	6.67	4.29	10.00
Aquatic Support Group (AQ)	6.56	10.00	5.49	10.00	8.41	10.00
Terrestrial Support Group (TERR)	7.42	10.00	4.89	10.00	6.13	10.00
Public Use & Recognition (PU)		0.00		0.48		1.79
Provisioning Services (PS)		0.00		0.00		0.00

Acres	2.03	0.96	2.92

Acreage Weighted Average Scores for All Wetlands Combined		
GROUPED FUNCTIONS	**Group Scores (functions)**	**Group Scores (values)**
Hydrologic Function (WS)	1.44	2.18
Water Quality Group (WQ)	6.65	6.23
Carbon Sequestration (CS)	4.87	
Fish Support Group (FISH)	5.45	8.31
Aquatic Support Group (AQ)	7.30	10.00
Terrestrial Support Group (TERR)	6.37	10.00
Public Use & Recognition (PU)		0.96
Provisioning Services (PS)		0.00

Scores Rounded to Nearest Whole Number	
Group Scores (functions)	**Group Scores (values)**
1	2
7	6
5	
5	8
7	10
6	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

DRAFT

Jordan Cove LNG Terminal Project
South Dunes Power Plant Project

Compensatory Wetland Mitigation Plan

Part B: Estuarine Impacts and Mitigation

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 LNG Terminal Project (LNG Terminal) and South Dunes Power Plant (SDPP) (collectively referred to as the "Projects") 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.

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 (see permit application for detailed description of these features):

- Barge Berth
- Access Channel
- Mill Site/South Dunes Site
- Trans Pacific Parkway/Highway 101 Intersection Improvements
- Incidental impacts associated with Kentuck Mitigation Site construction not covered by DSL Permit 37712-RF

Total estuarine impacts, excluding deep subtidal habitat, are approximately 6.75 acres (includes incidental impacts at Kentuck Mitigation Site and adjustment for project overlap, see Table 1) and will be offset by 13.03 acres of mitigation (see Table 2). 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 proposed Barge Berth, Access Channel, and the Mill Site/South Dunes Site and include impacts to unvegetated mudflat, eelgrass (*Zostera marina*), and salt marsh. Additional smaller impacts to estuarine resources are proposed at the Trans Pacific Parkway/Highway 101 Intersection Improvements (riprap below highest measured tide elevation). 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)

The above mitigation sites and the mitigation concepts proposed in this CWM Plan are related to mitigation previously approved by the Oregon Department of State Lands (DSL) under Permit 37712-RF. Specifically, this current CWM Plan will use "advance mitigation" credits approved at the Intertidal Flats Mitigation Site/Kentuck Slough Site. This current CWM Plan will also expand the area of the approved eelgrass mitigation site.

This proposed CWM Plan has been prepared in accordance with the DSL rules. It is also supportive of State Energy Facility Siting Council (EFSC) requirements, along with federal and local regulatory permitting requirements.

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 Projects. Specific goals and objectives for each proposed mitigation area are provided below, with additional detail provided in Section 7.1.

Because this CWM Plan ties into previously authorized CWM sites associated with Permit 37712-RF, goals and objectives are the same as provided in the issued permit, with the exception of acreage amounts specific to this current permit application and CWM plan as described below.

1.2.1 Eelgrass Mitigation Site

(NOTE: Total eelgrass impacts addressed in this plan plus those permitted under Permit 37712-RF will be 2.56 acres based on the latest project configurations and the combined mitigation site will be 7.68 acres.)

Mitigation Goal 1: Create 0.54 acres of eelgrass beds (i.e., based on an enhancement ratio of 3:1) overlapping with the authorized eelgrass mitigation site included in Permit 37712-RF, whereby a minimum of 0.18 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 0.54 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 0.54 acres of eelgrass beds whereby a minimum of 0.18 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)

(NOTE: Design work for the Kentuck Slough Site has been refined based on agency comments since issuance of Permit 37712-RF. This has led to changes in credits provided by the overall site, including the advance mitigation area. See Section 1.3.2 for a discussion of changes, Appendix A Figure 2 for a break-down of credits apportioned to each project, and Appendix B for revised site drawings.)

Mitigation Goal 2: Establish 12.49 acres of tidally influenced habitats at the Kentuck Slough Site Permit 37712-RF Advance Mitigation Area and adjacent area not included in Permit 37712-RF.

To achieve this goal, the following objectives will be carried out:

- **Objective 2.1:** Establish a minimum of 0.12 acres of salt marsh habitat within the internal portion of the Kentuck Slough Site, with the remainder of the internal portion (10.64 acres) being mudflat and/or tide channel. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable,
- **Objective 2.2**: Establish an approximately 1.73 acre wetland bench along Kentuck Slough by relocating the existing levee southward.

- **Objective 2.3:** Establish an emergent to scrub-shrub, brackish to freshwater transitional plant community along the Kentuck Slough bench described in Objective 2.2.
- **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.

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 of Appendix A). 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

(NOTE: Total eelgrass impacts addressed in this plan plus those permitted under Permit 37712-RF will be 2.56 acres based on the latest project configurations and the combined mitigation site will be 7.68 acres.)

To mitigate for impacts to eelgrass, JCEP L.P. proposes to create new eelgrass habitat adjacent to the authorized eelgrass mitigation site associated with Permit 37712-RF. 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, or other suitable sources, 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)

(NOTE: Design work for the Kentuck Slough Site has been refined based on agency comments since issuance of Permit 37712-RF. This has led to changes in credits provided by the overall site, including the advance mitigation area. The latest designs for the entire site are provided in Appendix B, including accounting of overall mitigation site credits. Based on these design revisions mitigation acreage is currently 46.59 acres (17.94 credits) –42.98 acres of enhancement and 3.61 acres of restoration. Mitigation site improvements such as levee relocation, cross-dike placement, roadway upgrades, etc. will result in 3.11 acres of permanent incidental wetland impacts, of which 0.59 acres was previously included in Permit 37712-RF. Mitigation site improvement incidental impacts will be mitigated for at the Kentuck Slough Site.

Permit 37712-RF authorizes 10.47 acres of mudflat impact plus, as mentioned above, an additional 0.59 acres of incidental emergent wetland impacts resulting from improvements needed at the mitigation site. Required mitigation for these impacts is 33.18 acres. Permit 37712-RF also authorized 10.42 acres of advanced mitigation acreage.

Impacts authorized by Permit 37712-RF and those included in this current CWM Plan and associated permit applications will be fully offset by the 46.59 acres (17.94 credits), which includes 0.31 credits of contingency mitigation, included in the revised plan drawings provided in Appendix B.)

Authorized mitigation associated with Permit 37712-RF will restore tidal connection to the west end of the Kentuck Slough Site, including the area authorized for advance mitigation. The following additional activities are proposed for the Kentuck Slough Site advance mitigation area. Historic diking and flood control efforts have led to considerable subsidence at the Kentuck Site. Survey information confirms that elevations within the former 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 former 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. However, elevations around the perimeter of the site should be conducive for salt marsh communities. This is particularly the case in the advance mitigation areas, where a narrow bench occurs at elevations supportive of future salt marsh. 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.

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 drainage upstream of the dam.

The proposed mitigation effort will also 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 @ Access Triangle, Intertidal, CB below el. 10.26' (HMT)	E2US	Estuarine	0.316
Coos Bay @ Access Triangle, Eelgrass, CB below HMT[2]	E1/E2AB	Estuarine	0.182
Coos Bay @ Access Triangle, Shallow Subtidal, below HMT	E1UB	Estuarine	0.241
Coos Bay @ Barge Berth, Intertidal, below HMT	E2US	Estuarine	1.616
Coos Bay @ Barge Berth, Shallow Subtidal, below HMT	E1UB	Estuarine	0.074
Coos Bay adjacent to Wetland M, Intertidal, below HMT	n/a	Estuarine	0.181
Coos Bay adjacent to Wetland J, below HMT	n/a	Estuarine	0.141
Wetland H (West)	E2US	Estuarine	0.062
Wetland M (1-mudflat)	E2US	Estuarine	0.092
Wetland M (1-salt marsh)	E2EM	Estuarine	0.120
Coos Bay @ TPP/Hwy 101, Intertidal, below HMT	E2RS	Estuarine	0.054
Subtotal Project Impacts[4]			**3.08**
Incidental Kentuck Construction Impacts not covered by Permit 37712-RF	PEM/PFO	Slope/flats	2.520
Adjustment for overlap with Permit 37712-RF[3]	E1UB/E2US	Estuarine	1.150

Wetland ID	Cowardin Class[1]	Hydrogeomorphic (HGM) Class	Impact Acres/Debits
Subtotal Additional Impacts			**3.67**
Total All Impacts to be Mitigated			**6.75**
Subtotals by Habitat Types			
Subtotal Mudflat (E1UB + E2US)[4]			6.45
Subtotal Salt Marsh (E2EM)			0.12
Subtotal Eelgrass (E1/E2AB)			0.18

[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) n/a = Cowardin class not applicable since area consists of upland vegetation, although area is below HMT.

[2] Total eelgrass impacts addressed in this plan plus those permitted under Permit 37712-RF will be 2.56 acres based on the latest project configurations and the combined mitigation site will be 7.68 acres.

[3] Adjustment for overlap with Permit 37712-RF resulting from JCEP tenant improvements. Cowardin and HGM classes assigned to mudflat habitats.

[4] Subtotal Project Impacts equals total estuarine impacts excluding deep subtidal provided in the DSL JPA impacts table (October 2014).

[5] Includes adjustment of overlap and incidental construction acreages. The minor impact to E2RS at TPP/Hwy 101 is also included.

Table 2. Mitigation Sumary [1, 2, 3]

Mitigation Site	Mitigation Type	Cowardin Class	HGM Class	Mitigation Acres[2]	Mitigation Credits[2]
Eelgrass	Enhancement	E1/2AB	Estuarine	0.54	0.18
			Subtotal	**0.54**	**0.18**
Kentuck Slough	Enhancement (internal area)	E1UB	Estuarine	8.88	2.96
	Restoration (internal area)	E1UB	Estuarine	1.76	1.76
	Restoration [3] (internal area)	E2EM	Estuarine	0.12	0.12
	Restoration (wetland bench)	E2EM/PSS	Estuarine/Riverine	1.73	1.73
			Subtotal	**12.49**	**6.57**
Total				**13.03**	**6.75**

[1] See design sheets in Appendix B for detailed breakdown of site acreages.

[2] Represents the minimum acreage/credits needed to meet DSL standards. The entire Kentuck Mitigation Site as currently designed will provide an additional 0.31 contingency credits.

[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.). The eelgrass mitigation site is owned by the State of Oregon, as administered by the Oregon Department of State Lands, Land Management Division.

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
Mobile: (303) 748-3746

Attention: Jim Grimes,
Coos County Coordinator
Oregon Department of State Lands,
Land Management Division
775 Summer St. NE Suite 100
Salem, OR 97301-1279
Phone: (503) 986-5233

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. 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).

2.2.2 Intertidal Flats Mitigation Site (Kentuck Slough Site)

JCEP L.P. is the 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/former Kentuck Golf Course) requires a new tidegate structure to protect adjacent and upstream properties. Mitigation at the former 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 former golf course to the estuary.

3.4 SITING CONSIDERATIONS FOR ECOLOGICAL SUITABILITY

3.4.1 Eelgrass Mitigation Site

The proposed eelgrass mitigation site is situated adjacent to the authorized eelgrass mitigation site for Permit 37712-RF. The authorized 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 because it is part of the advance mitigation area previously authorized by Permit 37712-RF intended to provide mudflat and salt marsh habitat.

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 U.S. Army Corps of Engineers (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 former 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 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 former 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 former 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 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 former 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 former 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 former golf course, but was most pronounced in the western half. Ground topography throughout the former 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 former 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 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 former 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 former 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 former 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 former 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 former 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 former 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 occurres on the hillsides adjacent to the Forested Wetland communities and maintained portions of the former 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)

The following potential site constraints were identified in the CWM plan authorized by Permit 37712-RF:

- "Opening the site 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." ("in this plan" refers to the CWM plan authorized by Permit 37712-RF)
- "Portions of East Bay Drive and the former 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." ("in this plan" refers to the CWM plan authorized by Permit 37712-RF)
- "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 salt 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., primarily 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 grazing pasture and former use as a golf course. The vast majority of the site is regularly grazed, 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 site 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 former 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, former golf course activities hinder use of the site for breeding. Beaver activity was noted along the small creek channels that flow through the former 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. Restoration of tidal connection authorized by mitigation associated with Permit 37712-RF 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)(Schedule is for entire site authorized by Permit 37712-RF)

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 former golf course. Construct East Bay Drive roadway improvements. Construct former 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 as authorized and described in Permit 37712-RF.

6.4 PLANTING 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 and only if it is determined during site monitoring that natural recruitment is not occurring as desired (i.e., within timeframe to meet performance standards). Plant species substitutions may occur at the Intertidal Flats Mitigation Site 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 HGM =Estuarine Cowardin = E2USN		
Zostera marina	Eelgrass	OBL
Intertidal Flats Mitigation Site HGM =Estuarine Cowardin = E2EM		
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

(NOTE: Total eelgrass impacts addressed in this plan plus those permitted under Permit 37712-RF will be 2.56 acres based on the latest project configurations and the combined mitigation site will be 7.68 acres.)

- **Objective 1.1:** Recontour (excavate) an area of approximately 0.54 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 0.54 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 0.54 acres of eelgrass beds whereby a minimum of 0.18 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.

Performance Standard: *Site mapping will delineate 0.54acres of eelgrass beds, with a minimum of 0.18 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 0.54 acres of eelgrass bed. The performance standards will have been met when the site contains a minimum of 0.54 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: Establish 12.49 acres of tidally influenced habitats at the Kentuck Slough Site Permit 37712-RF Advance Mitigation Area and adjacent area not included in Permit 37712-RF.

To achieve this goal, the following objectives will be carried out:

- **Objective 2.1:** Establish a minimum of 0.12 acres of salt marsh habitat within the internal portion of the Kentuck Slough Site, with the remainder of the internal portion (10.64 acres) being mudflat and/or tide channel. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable,

  Performance Standard: *See Objective 2.3 for habitat/vegetation monitoring criteria.*

- **Objective 2.2**: 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 a 1.73 acre bench has been established adjacent to Kentuck Slough.*

- **Objective 2.3:** Establish an emergent to scrub-shrub, brackish to freshwater transitional plant community along the Kentuck Slough bench described in Objective 2.2.

  Performance Standard: *In the internal portion of the site, monitoring will show that a minimum of 0.12 acres of salt marsh has been established and 10.64 acres of mudflat established. A greater amount of salt marsh, with subsequent reduction in mudflat is acceptable. 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).*

  Performance Standard: *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.*

- **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.

  Performance Standard: *An as-built survey will show that a culvert that meets ODFW fish passage criteria has been installed in the face of the existing irrigation dam/proposed realigned section of Golf Course Lane.*

7.2 MONITORING PLAN

The purpose of the mitigation monitoring requirement is to provide information for DSL 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 DSL. Official vegetation monitoring period should start upon the first sign of natural recruitment of salt marsh species or within the third growing season post-tidal reconnection, whichever is sooner.

7.2.2 Methods

7.2.2.1 Eelgrass Mitigation Site

The following monitoring work will likely occur concurrently with eelgrass mitigation monitoring for Permit 37712-RF and will utilize the same methods. The following methods are as described in the CWM plan for Permit 37712-RF. Transects described below will be extended into the area described in this current mitigation plan.

"Monitoring will occur using hydrographic survey methods. Specifically, 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 0.54 acres of eelgrass whereby a minimum of 0.18 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 0.18 acres/0.54 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)

Monitoring of the intertidal flats mitigation site specific to this current CWM plan will occur in conjunction with CWM monitoring authorized by Permit 37712-RF. Monitoring efforts specific to this current plan are focused on the establishment of salt marsh and the wetland bench. Post-construction monitoring will occur for a period of five years. Vegetation monitoring may wait several years post-construction to allow soils to adjust to the new saline environment and for native recruitment of salt marsh species to begin (see Section 7.2.1.2 Intertidal Flats Mitigation Site (Kentuck Slough Site). Monitoring visits will occur at least once per year during the five year monitoring period and will occur during the summer to early fall months.

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, with minor modifications as needed to account for the site being salt marsh and not a freshwater wetland. Sample plots and photo stations will be established during the first year of monitoring and will be set up to appropriately monitor the site relative to the performance standards.

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 is 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). The additional mitigation area adjacent to those included in Permit 37712-RF will also be included in the deed restriction.

Documentation shall be recorded no later than the end of the first year of project construction.

8.2 PROPOSED FINANCIAL SECURITY INSTRUMENT

JCEP L.P. will provide a surety bond specifically for the purpose of guaranteeing CWM site performance. The bond amount will be based on guidelines in Oregon Administrative Rule (OAR) 141-085-700(6). Because there is not a mitigation bank within a service area covering the project's removal-fill site, JCEP shall post a bond amount equal to the current cost of payment in-lieu mitigation, and based on the project's amount of removal-fill acreage. Based on the most recent published DSL calculation (July 1, 2013), the rate of payment for Payment In-lieu mitigation is $75,000 per acre. The project proposes to permanently impact 10.19 acres of estuarine and freshwater wetlands; therefore, the proposed bond amount is estimated to be$764,250.

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. Sara Gilbert, DEA GIS Specialist, and Justin Demello, DEA CAD Technician, provided graphics.

10. REFERENCES

Adamus, P.R. 2001. Guidebook for hydrogeomorphic (HGM)-based assessment of Oregon wetland and riparian sites: statewide classification and profiles. Oregon Department of State Lands, Salem, Oregon.

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Culp, Wally. Former Kentuck Golf Course owner. Personal communication. 2009.

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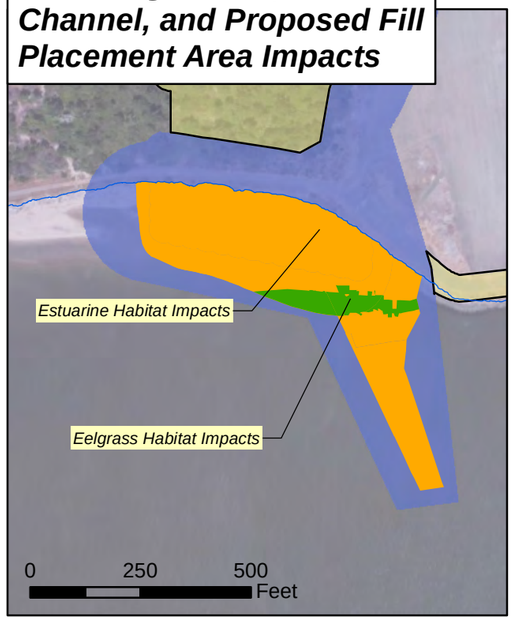
Rumrill, Steve. South Slough National Estuarine Research Reserve. Personal communication. 2006.

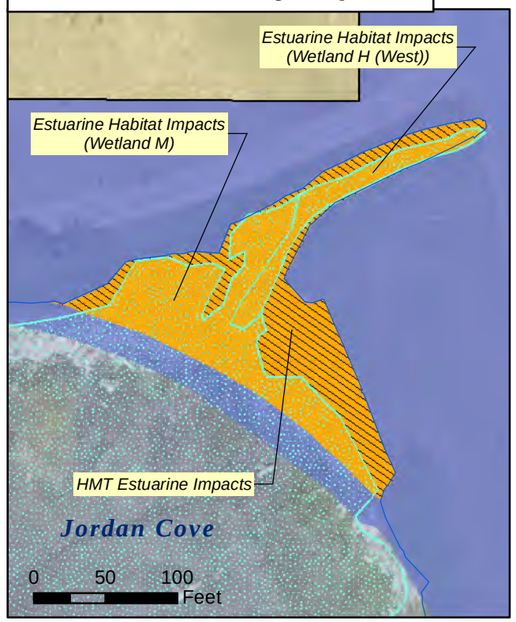
11. APPENDICES

APPENDIX A – FIGURE

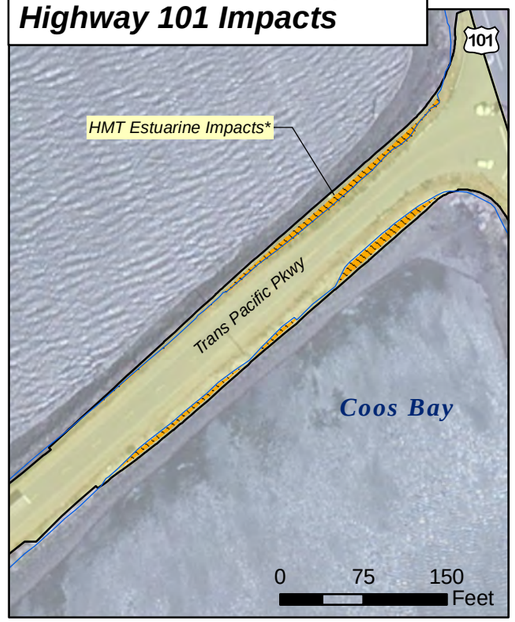
LNG Barge Berth, Access Channel, and Proposed Fill Placement Area Impacts



Wetland M Vicinity Impacts



Trans Pacific Parkway and Highway 101 Impacts



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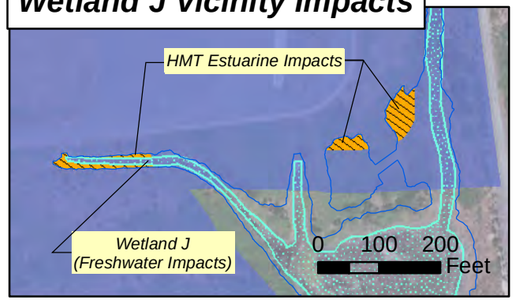
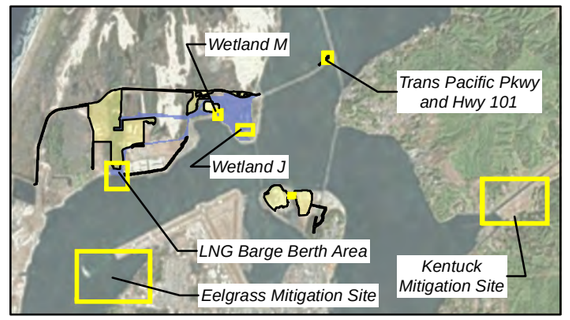
Wetland J Vicinity Impacts





Eelgrass Habitat Impacts

Estuarine Habitat Impacts (Intertidal and Shallow Subtidal)

HMT Estuarine Impacts (below 10.26 ft NAVD88)

Highest Measured Tide (HMT) (10.26 ft NAVD88)

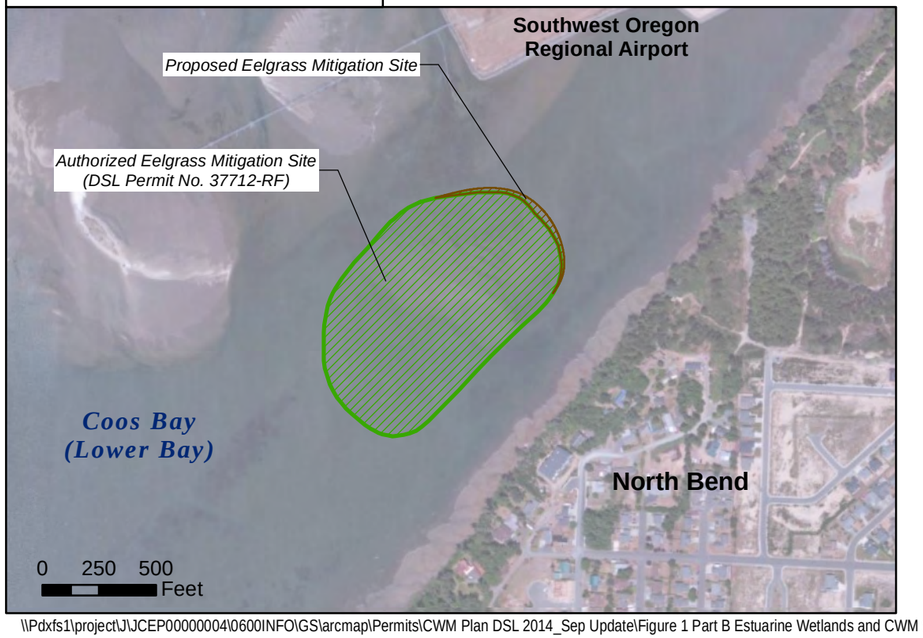
Delineated Wetland

Open Water

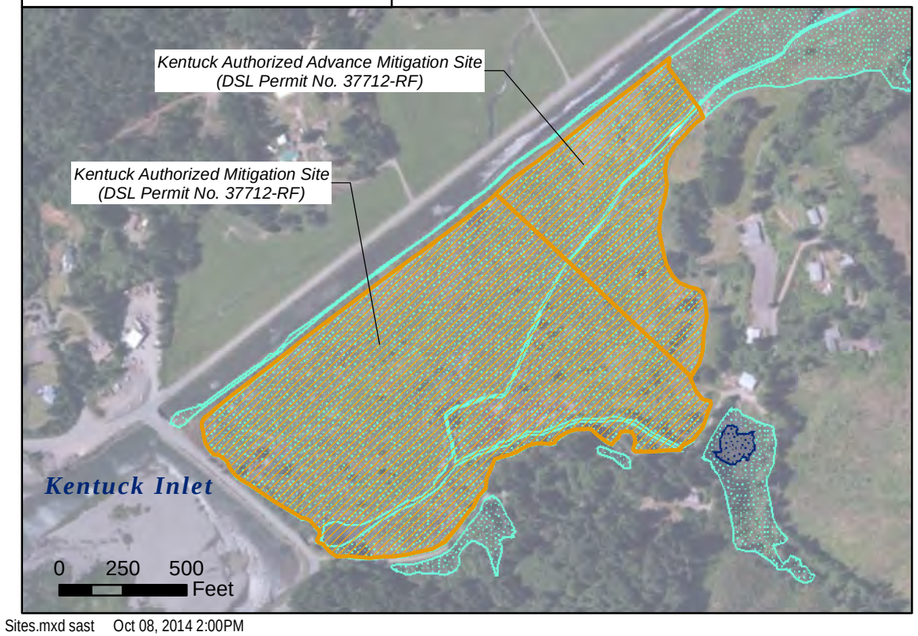
LNG Project Footprint Boundary

South Dunes Power Plant Site Boundary

Eelgrass Mitigation Site



Kentuck Mitigation Site



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JORDAN COVE LNG TERMINAL PROJECT

Figure 1

COOS COUNTY

Compensatory Wetland Mitigation Plan

Part B - Permanent Estuarine Impact Areas and Estuarine CWM Sites

\\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Permits\CWM Plan DSL 2014_Sep Update\Figure 1 Part B Estuarine Wetlands and CWM Sites.mxd sast Oct 08, 2014 2:00PM

APPENDIX B – COMPENSATORY WETLAND MITIGATION DESIGN PLANS:

EELGRASS

Kentuck Mitigation Site

KENTUCK WAY LANE

KENTUCK SLOUGH

KENTUCK LEVEE

EAST BAY DRIVE

Reference marsh area

Existing culvert and tidegate

Existing wetland

Open creek

Open creek

GOLF COURSE LANE

KENTUCK ACCESS

Parking area

Irrigation Pond Earthen Dam

Irrigation Pond

N

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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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Kentuck levee, new location

Kentuck levee (Existing to be removed, and restore wetland bench)

KENTUCK WAY LANE

KENTUCK SLOUGH

EAST BAY DRIVE

Proposed bridge, to restore tidal connection

Existing pond to be filled

Proposed primary tide channel

Proposed tidegate structure

Proposed cross–levee

Existing creeks to be filled

Proposed Secondary tide channel

GOLF COURSE LANE

Construction staging area at existing parking lot

KENTUCK ACCESS

Existing pond to be filled

Proposed grading, to protect existing wells and drain field, and reduce mosquito habitat post–tidal inundation

New fish–passable culvert to restore tidal connection

Existing Irrigation pond

N

0 100 200 400

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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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ESTIMATED PLANT COMMUNITY AREAS

- *Salt Marsh (elev. 5.5'–8.5'): 13.71 AC*
- *Tidal Mudflat (elev. < 5.5'): 29.25 AC*
- *Palustrine Scrub–Shrub Restoration: 1.73 AC*

KENTUCK WAY LANE

KENTUCK SLOUGH

EAST BAY DRIVE

GOLF COURSE LANE

KENTUCK ACCESS

Kentuck levee, new location

Restored scrub–shrub wetland

New tidal salt marsh area

Proposed tidegate

Proposed bridge

Primary tide channel

New tidal mudflat area

Secondary tide channel

Limits of proposed grading, typ.

Existing Irrigation pond

N

0 100 200 400

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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

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Drafted By – BAR

POST MITIGATION HABITATS PLAN

SHEET NO. FIG 3

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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Designed By – JND
Drafted By – BAR

PLANTING SCHEDULE

SHEET NO.
FIG 3A

LEVEE REMOVAL:
WETLAND RESTORATION = 1.73 AC

PROPOSED LEVEE,
PERMANENT WETLAND
IMPACT = 1.76 AC

CONSTRUCTION
DETOUR OF
EAST BAY
ROAD: TEMPORARY
WETLAND
IMPACT =
0.47 AC

TEMPORARY
WETLAND
IMPACT (DUE
TO BRIDGE
CONSTRUCTION)
= 0.04 AC

PROPOSED ENHANCEMENT

PROPOSED CHANNEL

PROPOSED CROSS
DIKE, PERMANENT
WETLAND IMPACT =
0.42 AC

LIMITS OF EXISTING
WETLAND, TYP.

ROAD IMPROVEMENT, PERMANENT:
WETLAND IMPACT = 0.07 AC

WELL AND DRAINFIELD
PROTECTION, PERMANENT
WETLAND IMPACT = 0.83 AC

ROAD IMPROVEMENT,
PERMANENT WETLAND
IMPACT = 0.04 AC

PROPOSED
RESTORATION

N

INCIDENTAL IMPACTS LEGEND

- PERMANENT IMPACT
- TEMPORARY IMPACT
- PERMANENT RESTORATION
- PERMANENT ENHACEMENT

NOTE:
WETLAND IMPACTS ARE MEASURED FROM THE 8.5' CONTOUR OF THE INTERIOR PROPOSED FILL SLOPES.

0 100 200 400

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JORDAN COVE ENERGY PROJECT
KENTUCK SLOUGH CWM

COOS COUNTY

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Designed By – JND
Drafted By – BAR

MITIGATION AREAS AND INCIDENTAL WETLAND IMPACTS

SHEET NO. FIG 4

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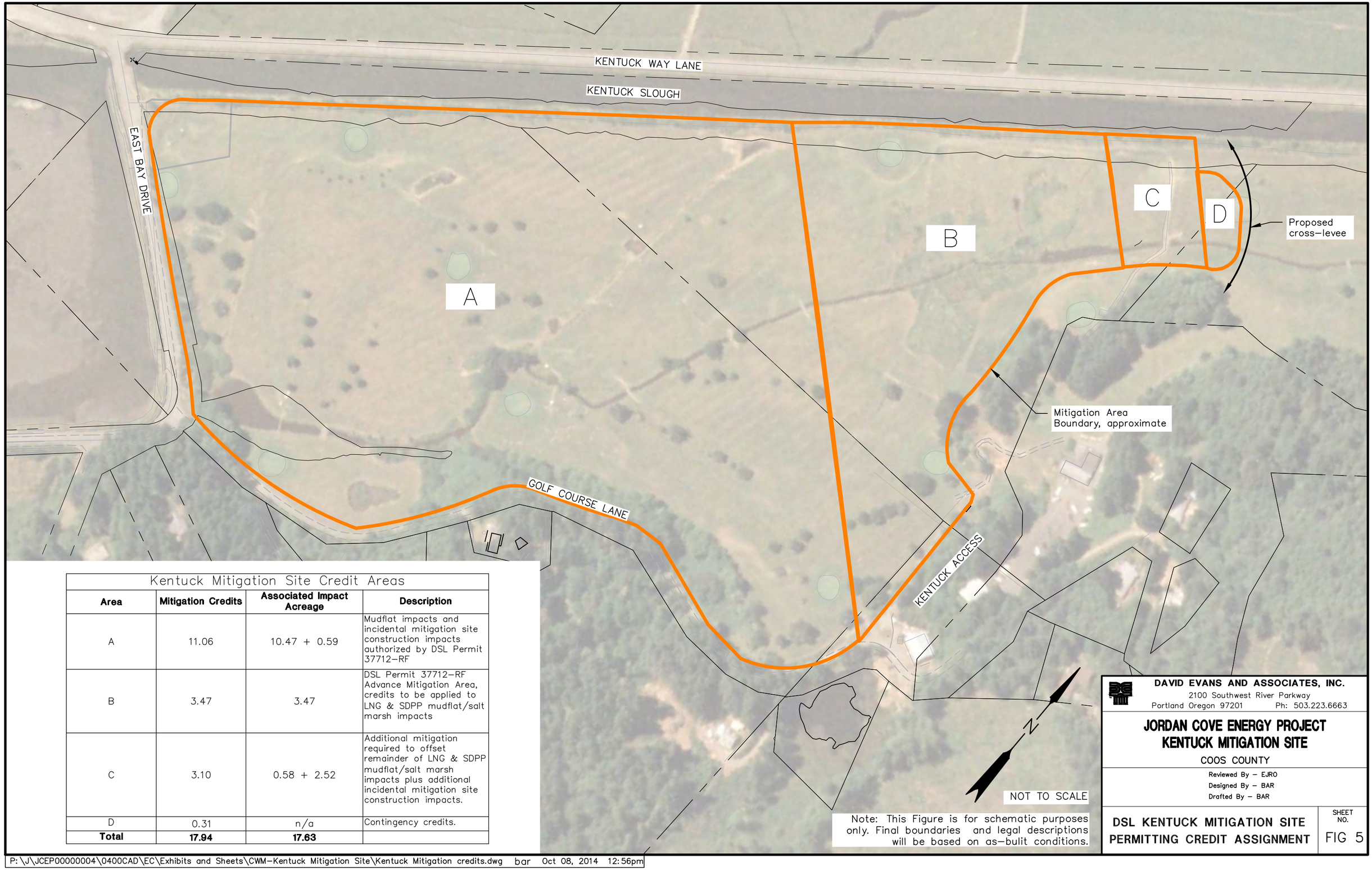

Kentuck Mitigation Site Credit Areas

Area	Mitigation Credits	Associated Impact Acreage	Description
A	11.06	10.47 + 0.59	Mudflat impacts and incidental mitigation site construction impacts authorized by DSL Permit 37712–RF
B	3.47	3.47	DSL Permit 37712–RF Advance Mitigation Area, credits to be applied to LNG & SDPP mudflat/salt marsh impacts
C	3.10	0.58 + 2.52	Additional mitigation required to offset remainder of LNG & SDPP mudflat/salt marsh impacts plus additional incidental mitigation site construction impacts.
D	0.31	n/a	Contingency credits.
Total	**17.94**	**17.63**	

Note: This Figure is for schematic purposes only. Final boundaries and legal descriptions will be based on as–bulit conditions.

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JORDAN COVE ENERGY PROJECT
KENTUCK MITIGATION SITE

COOS COUNTY

Reviewed By – EJRO
Designed By – BAR
Drafted By – BAR

DSL KENTUCK MITIGATION SITE PERMITTING CREDIT ASSIGNMENT

SHEET NO. FIG 5

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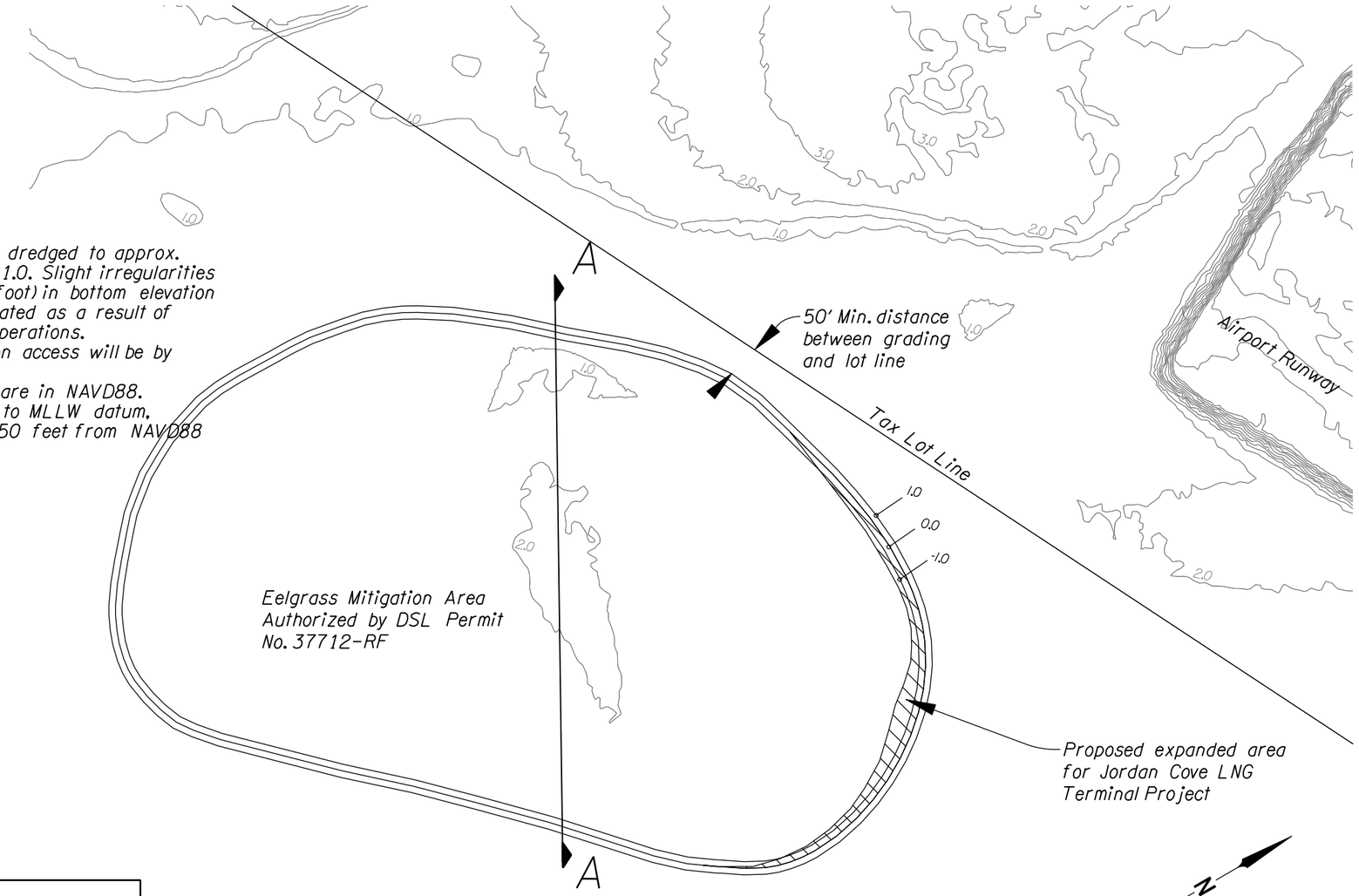
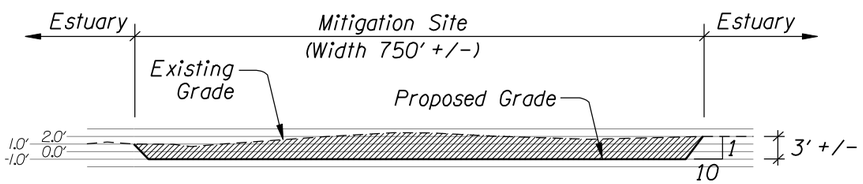
SITE CONTEXT
AERIAL PHOTO
(Google Earth 2005 - NTS)

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

TAB: C. WETLAND DELINEATION CONCURRENCE LETTERS

C.1. Oregon DSL Wetland Delineation Concurrence Letter WD #2010-0337

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

June 10, 2011

Rick Orton
Gertrude Wickett Trust
95297 Mattson Lane
Coos Bay, OR 97420

Re: Wetland Delineation Report for Coos County; T25S R12W & 13W Sec. 6, 7 (R12W), Tax Lots 100, 799; Sec. 1, 12 (R13W), Tax Lots 100, 400; WD #2010-0337; App. #37712

Dear Mr. Orton:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lots described above. Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 4 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map. Within the study area, two wetlands (totaling approximately 99.7 acres) and three waterways—Kentuck Slough, and two creeks within wetland A—were identified. The wetland and the waterways are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetland or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined)

However, all three waterways are essential salmonid streams; therefore, fill or removal of any amount of material within the OHWL and hydrologically-connected wetlands (wetland A and B) may require a state permit.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in

jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by
Janet C. Morlan, PWS
Wetlands Program Manager

Enclosures

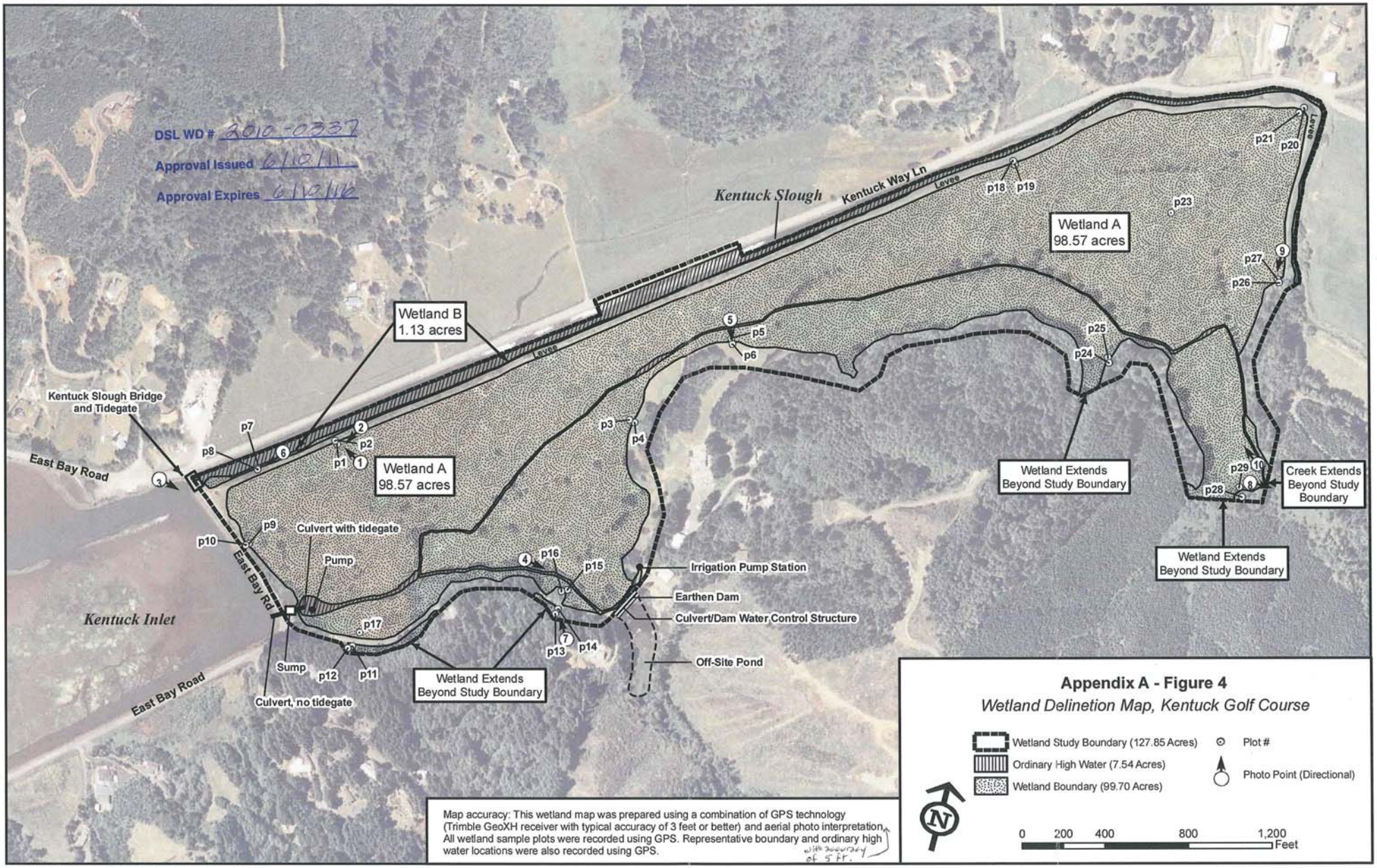
ec: Ethan Rosenthal, David Evans and Associates, Inc.
Coos County Planning Department
Benny Dean, Corps of Engineers, Eugene office
Gloria Kiryuta, DSL



USGS Quadrangle: North Bend, OR 1971

Appendix A - Figure 1
Vicinity

Scale - 1 : 36,000 *(Original Scale - 1 : 24,000)*



Appendix A - Figure 4

Wetland Delinetion Map, Kentuck Golf Course

Wetland Study Boundary (127.85 Acres)
Ordinary High Water (7.54 Acres)
Wetland Boundary (99.70 Acres)
Plot #
Photo Point (Directional)

0 200 400 800 1,200 Feet

Map accuracy: This wetland map was prepared using a combination of GPS technology (Trimble GeoXH receiver with typical accuracy of 3 feet or better) and aerial photo interpretation. All wetland sample plots were recorded using GPS. Representative boundary and ordinary high water locations were also recorded using GPS. with accuracy of 5 ft.

File: P:\AJCEP\00000002\0600\NFO\GIS\KentuckGolfCourse_WetDelin_12-22-10.mxd
Printing Date: Wednesday, December 22, 2010 8:33 AM

C.2. Oregon DSL Wetland Delineation Concurrence Letter WD #2012-0313

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

RECEIVED
APR 25 2013
BY:

April 15, 2013

SHN Consulting Engineers & Geologists
Attn: Steven K. Donovan
275 Market Ave.
Coos Bay, OR 97420

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

Re: Wetland Delineation Report for Jordan Cove Energy Facility, Coos County; T 25S R 13W Sections 2, 3, 4 & 5; T 24S R 13W S 34; multiple tax lots within each section; WD # 2012-0313

Dear Mr. Donovan:

The Department of State Lands has reviewed the wetland delineation report prepared by SHN Consulting Engineers and Geologists, Inc. for the site referenced above. Please note that the study area includes only portions of tax lots within the site (please see the attached map). Based upon the information presented in the report, a site visit on January 10, 2013, and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figures 6-12 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map. Within the study area, seven wetlands (totaling approximately 15.01 acres), Jordan Lake, a pond, and an undetermined area of estuarine habitat below the highest measured tide (HMT) were identified. The wetlands, lake, pond, and estuarine habitat are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands or below the ordinary high water line (OHWL) of a lake, pond, or waterway. However, the Coos Bay estuary is designated essential salmonid habitat; therefore, fill or removal of any amount of material below the HMT line may require a state permit. The elevation of HMT along the Coos Bay estuary in Empire is 10.0 feet above MLLW and 10.26 feet above NAVD88.

In addition, this area of Coos River is a state-owned waterway; any activity encroaching within the submerged and submersible land below the line of mean low tide may require a lease, registration, or easement to occupy state-owned land. Please contact Jim Grimes at 503-986-5233 for more information.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We

recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

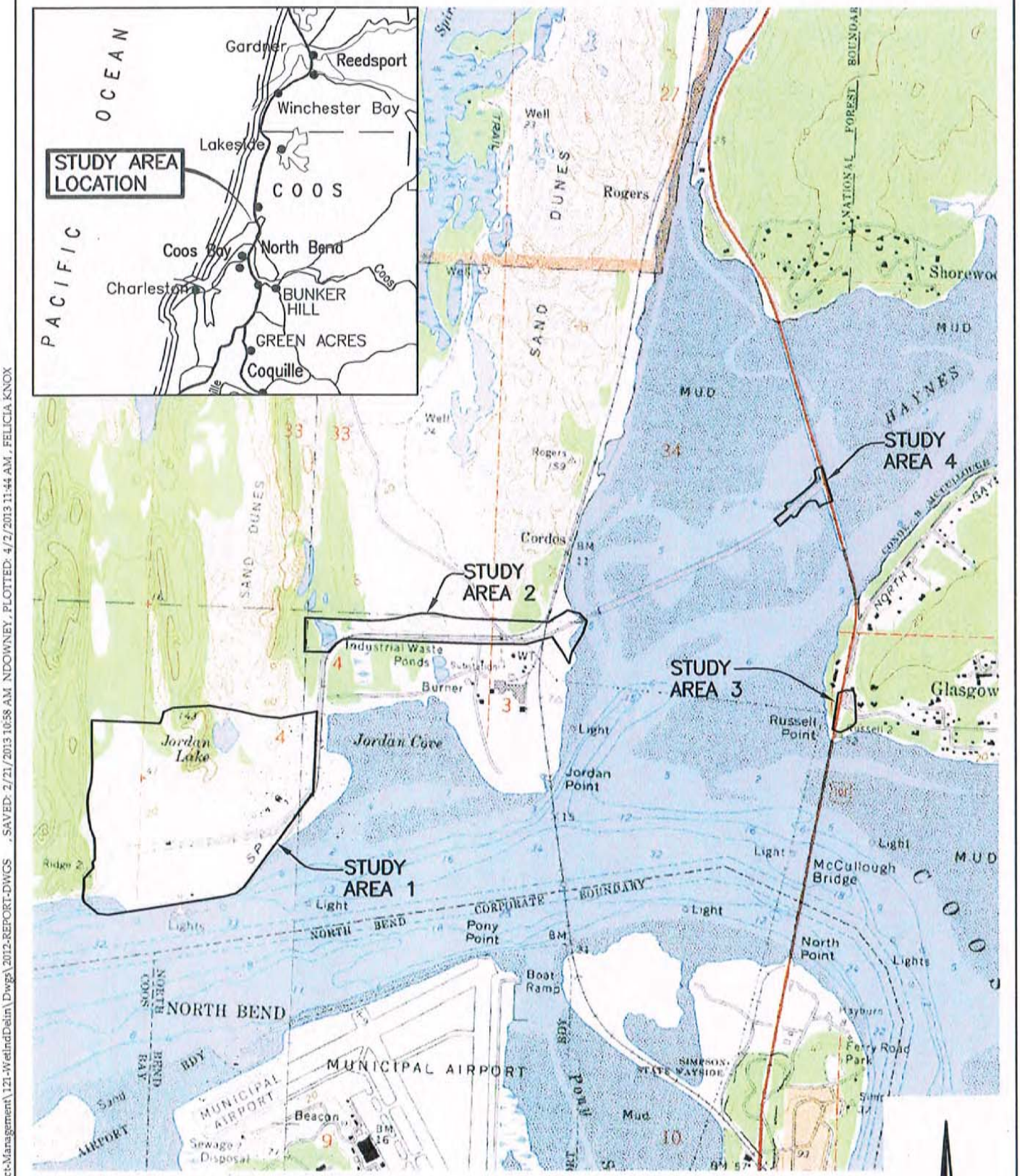
Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

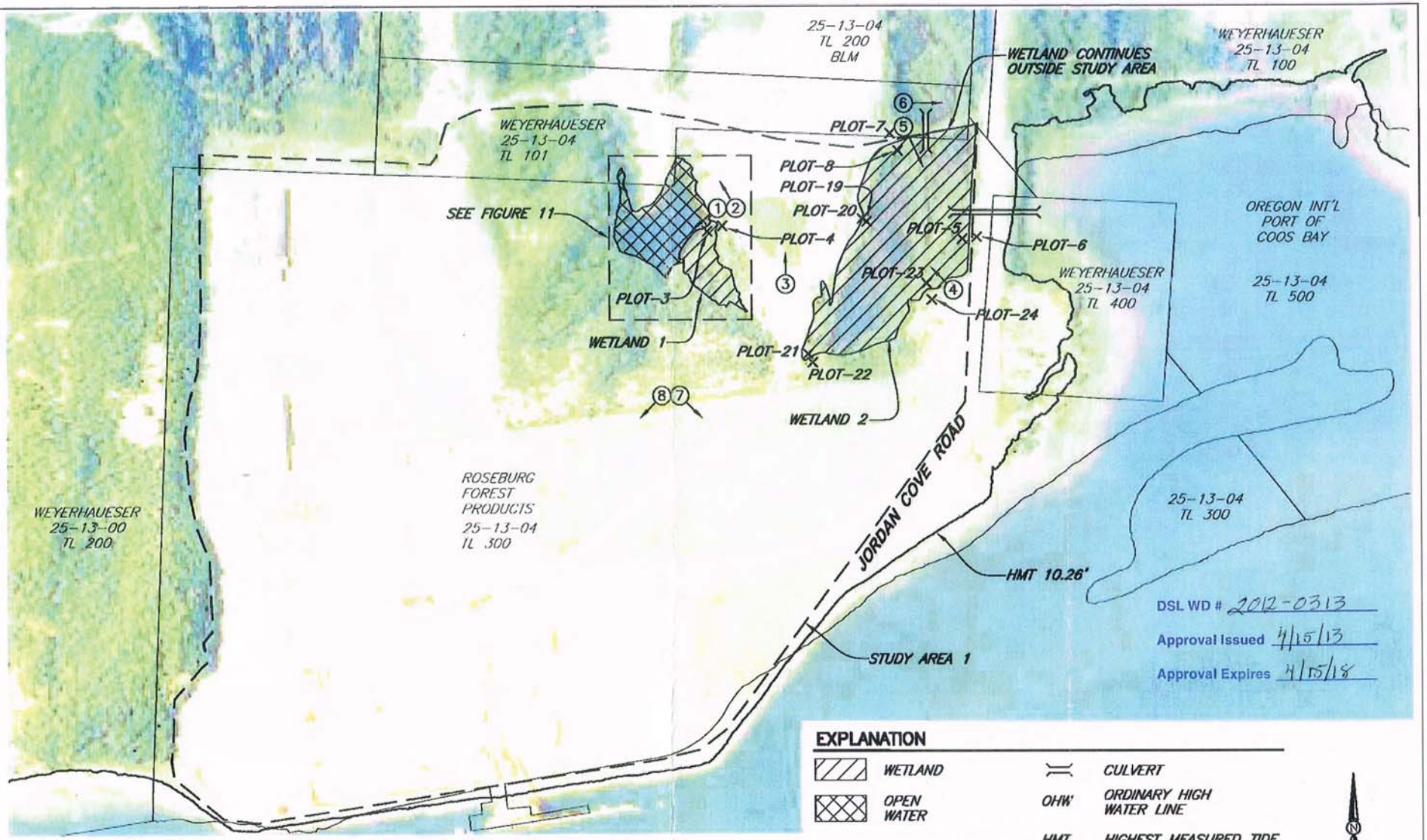
Enclosures

ec: Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL



SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon		Site Location Map SHN 611048.121
	April 2013	611048-LCTN	Figure 2

\\192.168.2.5\projects\2011\611048-Project-Management\121-Wetlnd Delin\Dwgs\2012-REPORT-DWGS , SAVED: 2/21/2013 10:58 AM, NDOWNEY, PLOTTED: 4/2/2013 11:44 AM, FELICIA KNOX



EXPLANATION

- WETLAND
- OPEN WATER
- PLOT-5 — TEST PIT LOCATION AND DESIGNATION
- CULVERT
- OHW — ORDINARY HIGH WATER LINE
- HMT — HIGHEST MEASURED TIDE
- ① — PHOTO POINTS AND DIRECTION

N

0 400'

1"=400'

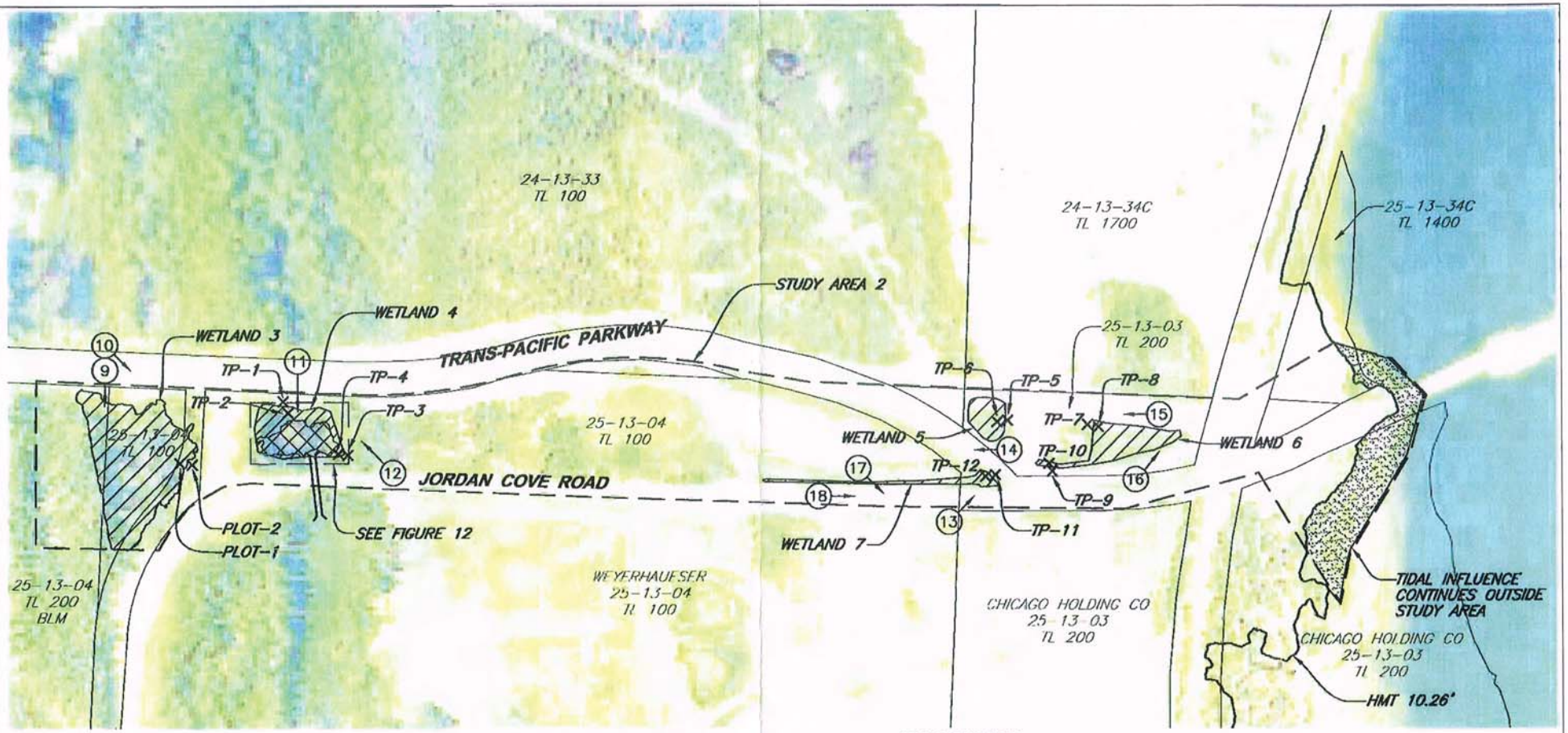
SOURCE: NAIP IMAGERY, NOVEMBER 2011

NOTE: LOCATIONS OF PARCEL BOUNDARIES ARE APPROXIMATED FROM ONLINE COOS COUNTY ASSESSOR MAPS. LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET. TIDAL INFLUENCE BASED ON ESTABLISHED HMT LINE FOR "EMPIRE" TIDAL STATION.

SHN Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon		Wetland Map Study Area 1 SHN 611048.121
March 2013	611048-121-WETL	Figure 6

\\Zlaq\projects\CAD-FILES\CoosBay\2011\611048\dwgs_SAVED: 3/25/2013 2:41 PM NDOWNEY, PLOTTED: 3/25/2013 2:45 PM, NATHAN DOWNEY



SOURCE: NAIP IMAGERY, NOVEMBER 2011

NOTE: LOCATIONS OF PARCEL BOUNDARIES ARE APPROXIMATED FROM ONLINE COOS COUNTY ASSESSOR MAPS. LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET EXCEPT FOR PLOT-1, WHICH WAS MAPPED USING MEASUREMENTS FROM PERMANENT FEATURES ON AERIAL PHOTOS TO AN ACCURACY OF ±5 FEET. TIDAL INFLUENCE BASED ON ESTABLISHED HMT LINE FOR "EMPIRE" TIDAL STATION.

DSL WD # 2012-0313
Approval Issued 4/15/13
Approval Expires 4/15/18

EXPLANATION

- WETLANDS
- OPEN WATER
- TIDAL INFLUENCE
- PLOT-5 — TEST PIT LOCATION AND DESIGNATION
- CULVERT
- HMT — HIGHEST MEASURED TIDE
- (16) — PHOTO POINTS AND DIRECTION

N
0 300'
1"=300'

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon		Wetland Map Study Area 2 SHN 611048.121
	March 2013	611048-121-WETL	Figure 7

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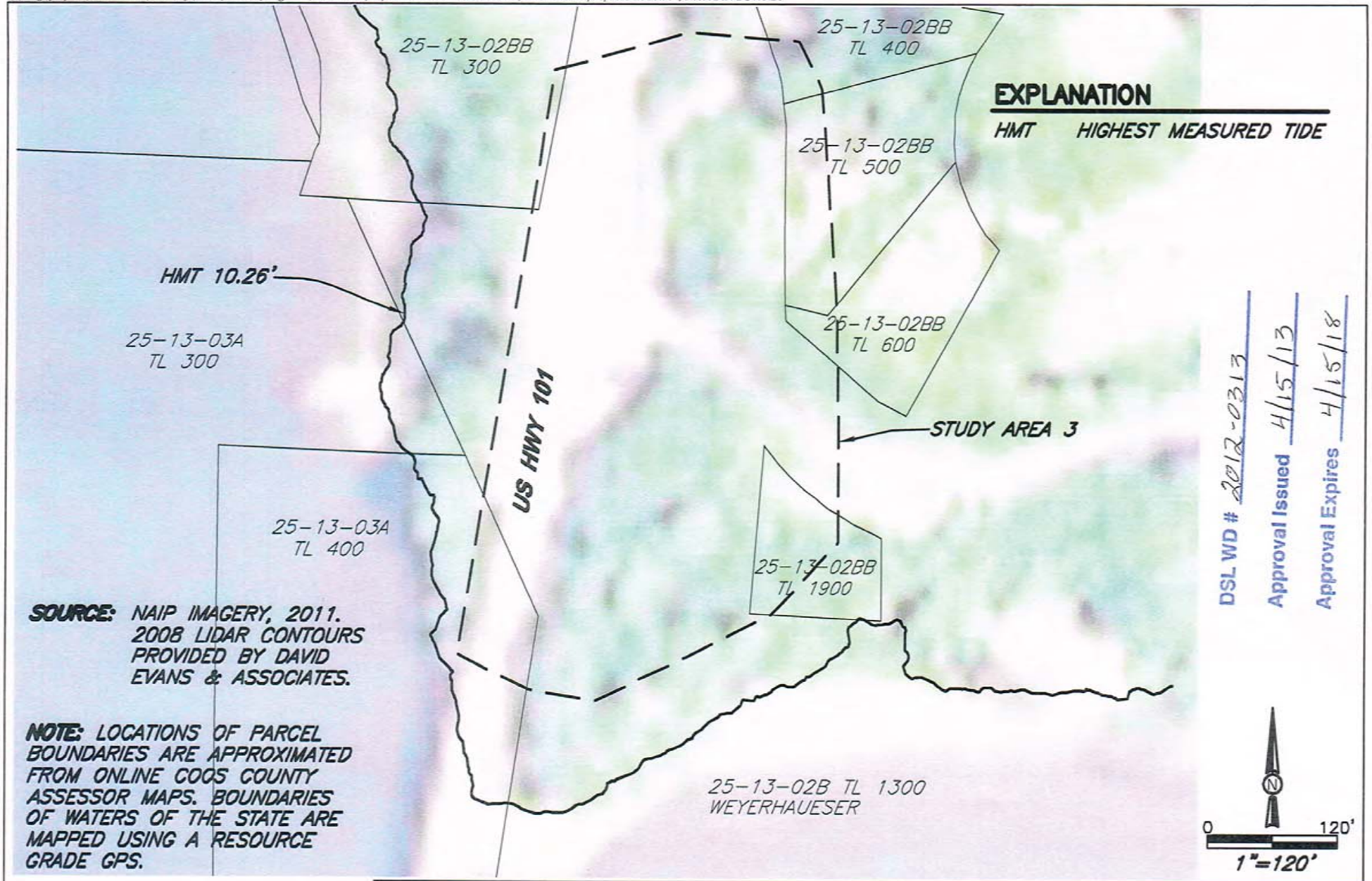
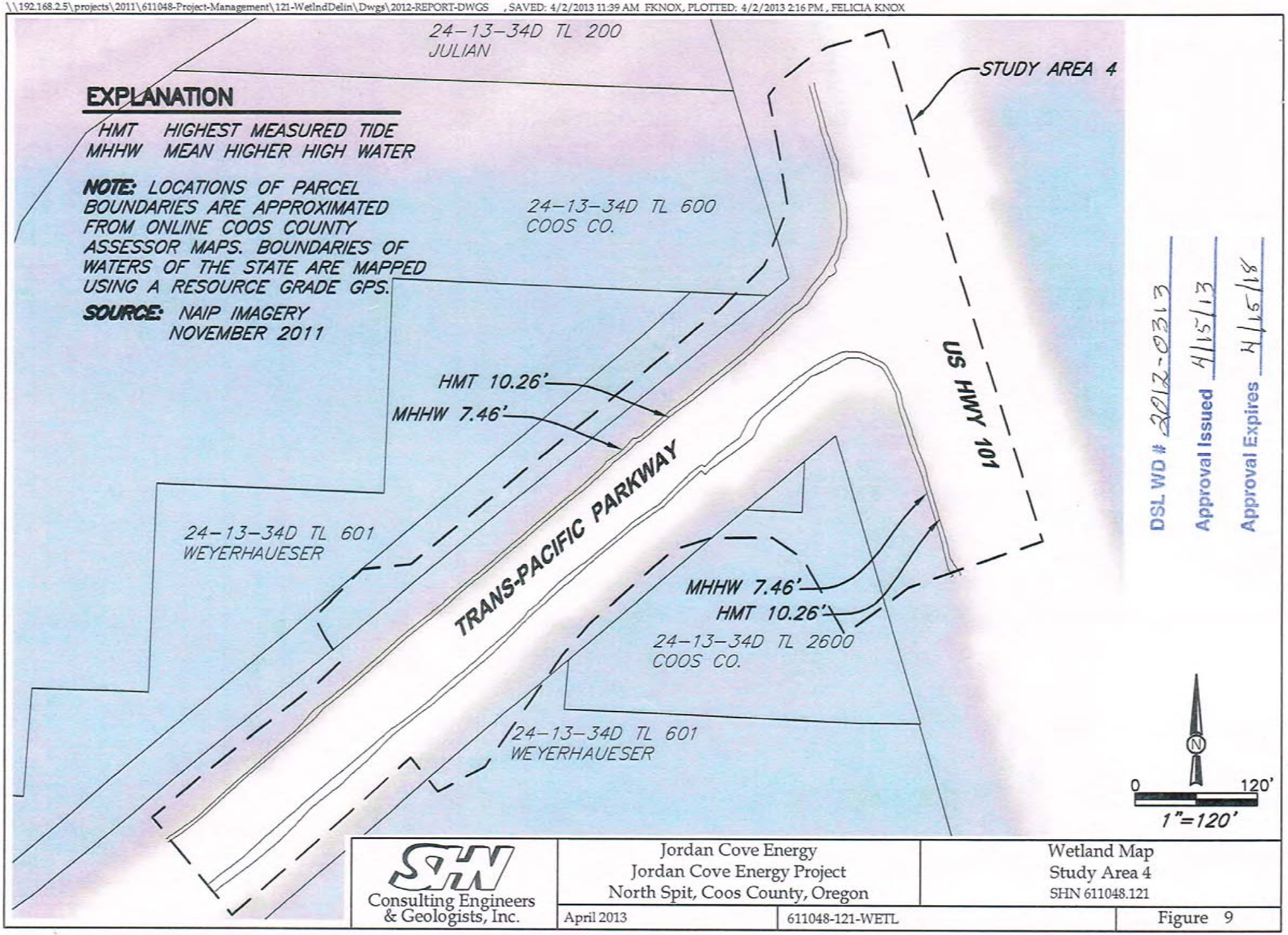
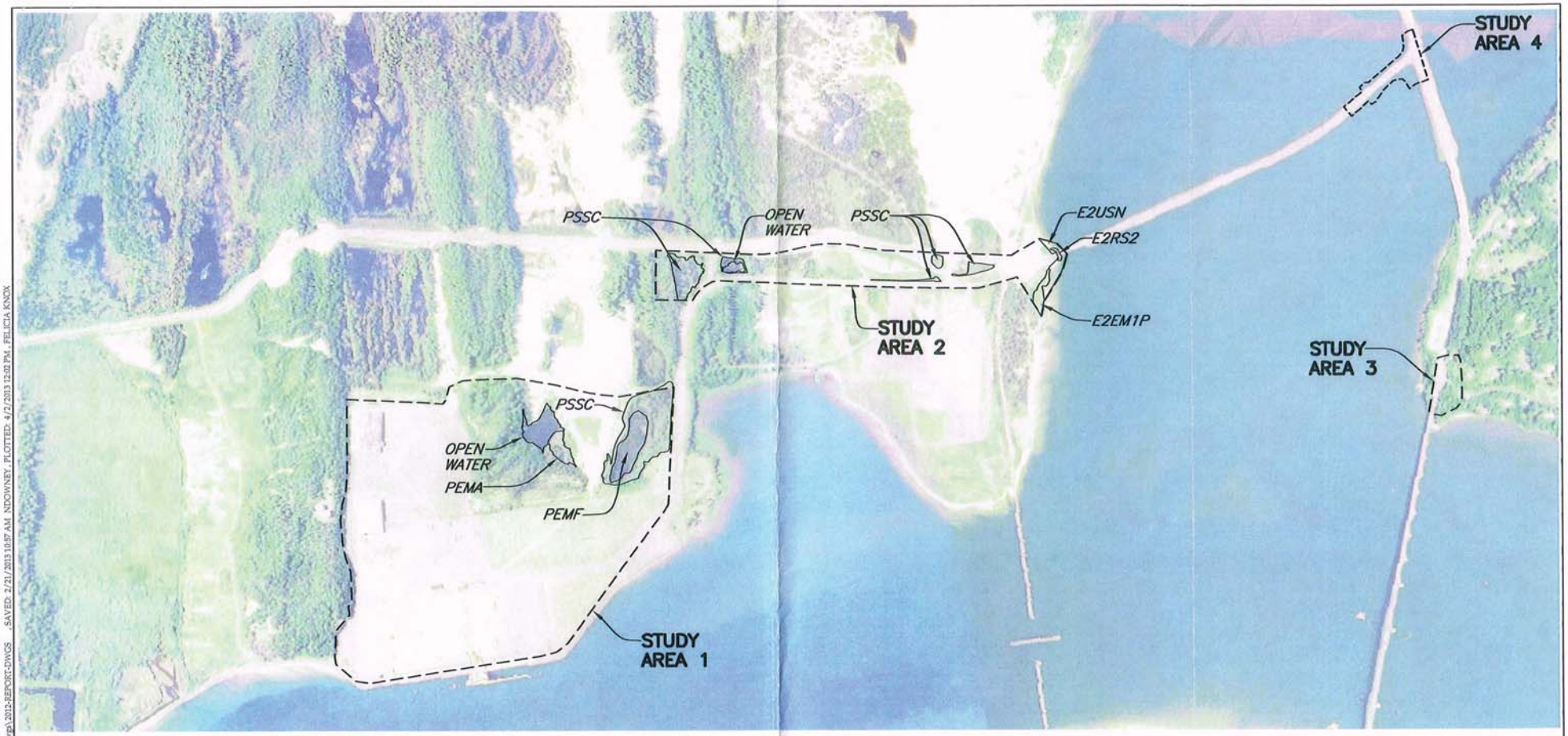


SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Wetland Map Study Area 3 SHN 611048.121	
	January 2013	611048-121-WETL	Figure 8

\\192.168.2.5\projects\2011\611048-Project-Management\121-WetlndDelin\Dwgs\2012-REPORT-DWGS , SAVED: 4/2/2013 11:39 AM FKNOX, PLOTTED: 4/2/2013 2:16 PM , FELICIA KNOX



SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon		Wetland Map Study Area 4 SHN 611048.121
	April 2013	611048-121-WETL	Figure 9



EXPLANATION

———	WETLAND BOUNDARY
PSSC	PALUSTRINE SCRUB–SHRUB, SEASONALLY FLOODED
PEMF	PALUSTRINE EMERGENT, SEMIPERMANENTLY FLOODED
PEMA	PALUSTRINE EMERGENT TEMPORARILY FLOODED
PUBH	PALUSTRINE UNCONSOLIDATED BOTTOM PERMANENTLY FLOODED
E2EM1P	ESTUARINE, INTERTIDAL, EMERGENT, PERSISTENT IRREGULARLY FLOODED
E2USN	ESTUARINE INTERTIDAL, UNCONSOLIDATED SHORE, REGULARLY FLOODED
E2RS2	ESTUARINE, INTERTIDAL, ROCKY SHORE, RUBBLE

DSL WD # 2012-0313

Approval Issued 4/15/13

Approval Expires 4/15/18

N

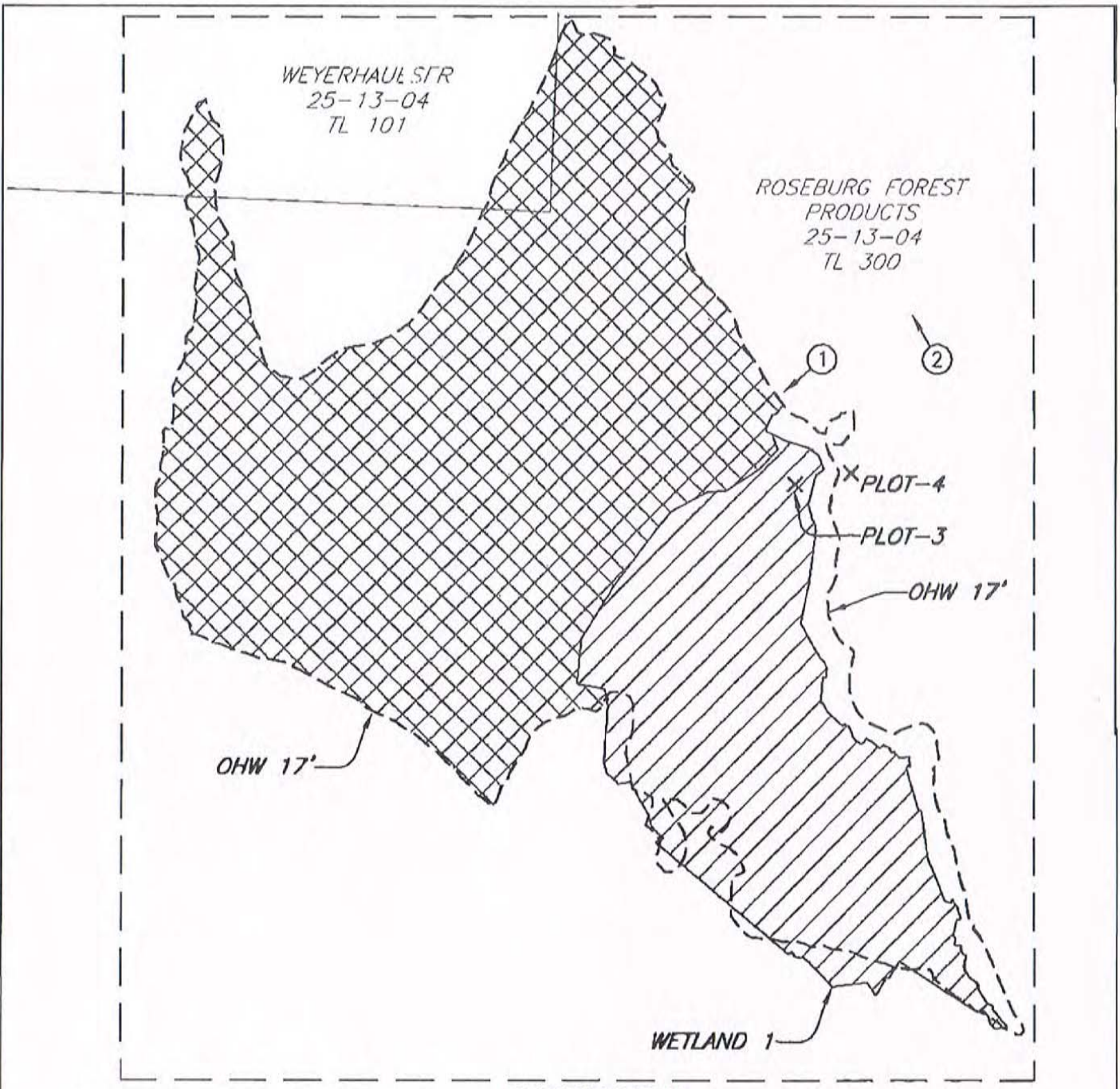
0 1,000'

1"=1,000'

SOURCE: NAIP IMAGERY, NOVEMBER 2011

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area Wetlands SHN 611048.121
	April 2013 / 611048-121-WETL-STUDY	Figure 10

\\192.168.2.5\projects\2011\611048-Project-Management\121-Wetland Delin\Dwgs\2012-REPORT-DWGS .SAVED 2/21/2013 10:57 AM NDOWNEY, PLOTTED 4/2/2013 12:02 PM, FELICIA KNOX



DSL WD # 2012-0313

Approval Issued 4/15/13

Approval Expires 4/15/18

NOTE: LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET.

EXPLANATION

- WETLAND
- OPEN WATER
- × PLOT-5 — TEST PIT LOCATION AND DESIGNATION
- --OHW-- — ORDINARY HIGH WATER LINE
- (1)→ — PHOTO POINTS AND DIRECTION
- — — — MATCH LINE

N

0 100

1"=100'

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Other Waters Map Study Area 1 SHN 611048.121	
	February 2013	611048-121-OW-MAP	Figure 11

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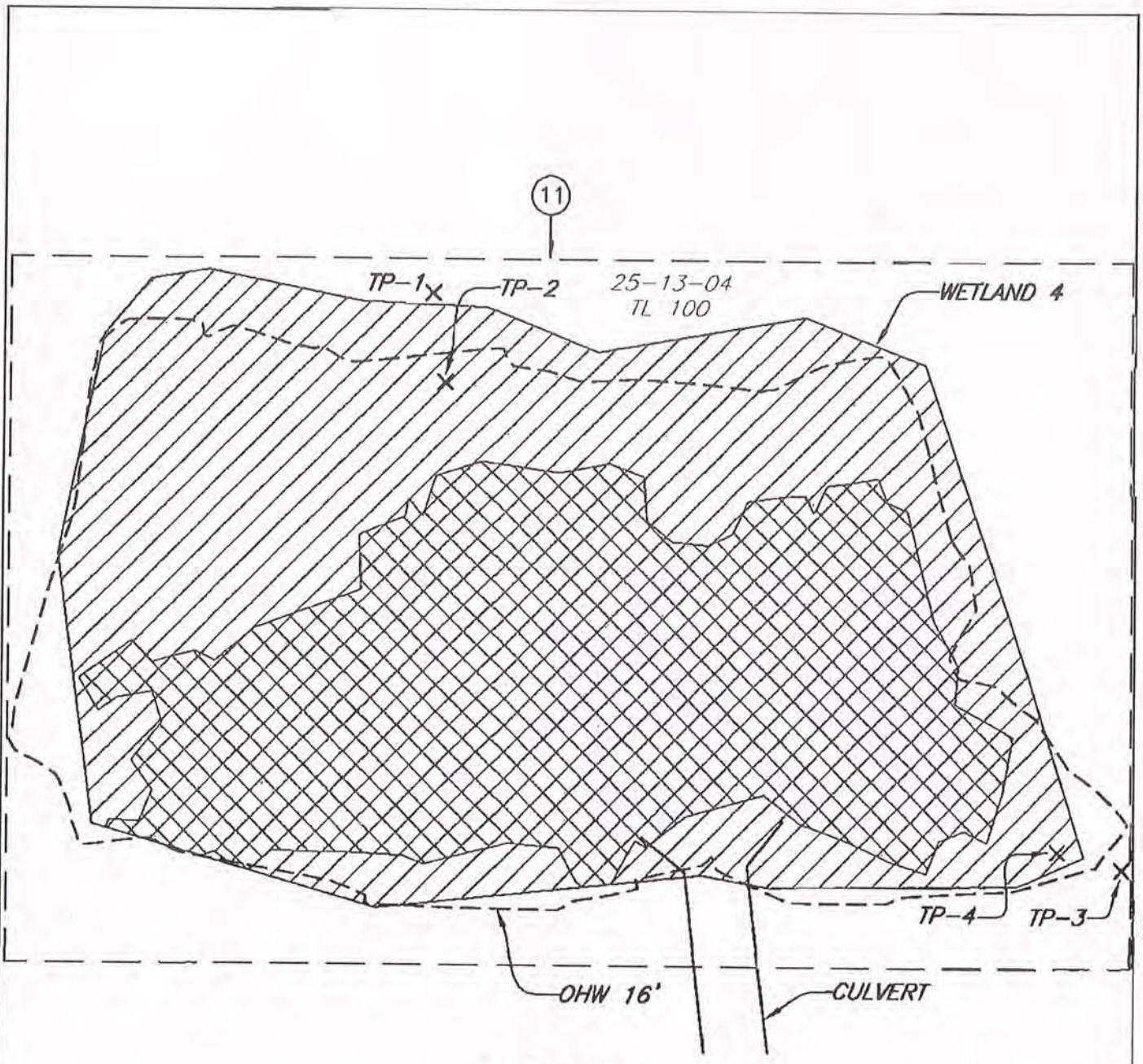

EXPLANATION

NOTE: LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET.

DSL WD # 2012-0313

Approval Issued 4/15/13

Approval Expires 4/15/18

- WETLAND
- OPEN WATER
- X PLOT-5 — TEST PIT LOCATION AND DESIGNATION
- --OHW-- — ORDINARY HIGH WATER LINE
- (1) — PHOTO POINTS AND DIRECTION
- — — — MATCH LINE

N

0 40

1"=40'

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Other Waters Map Study Area 2 SHN 611048.121
	March 2013	611048-121-OW-MAP	Figure 12

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C.3. Oregon DSL Wetland Delineation Concurrence Letter WD #2013-0116

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

November 8, 2013

Robert L. Braddock
Jordan Cove Energy Project L.P.
125 Central Avenue, Suite 380
Coos Bay, OR 97420

Re: Wetland Delineation Report for Jordan Cove Energy Facility, Coos County; T24S/25S R13W, Sec. 33, 3, 4, and 5; Eight Partial Tax Lots and Road Right-Of-Ways; WD #2013-0116

Dear Mr. Braddock:

The Department of State Lands has reviewed the wetland delineation report prepared by SHN Consulting Engineers & Geologists, Inc. for the site referenced above. Please note that the study area includes only portions of tax lots (see the attached maps). Based upon the information presented in the report, a site visit on January 10, 2013 to part of the site (conducted for WD2012-0313), and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figures 6-11 of the report. Please replace all copies of the preliminary wetland maps with these final Department-approved maps. Within the study area, six wetlands (totaling approximately 72.79 acres), including an undetermined area of estuarine habitat, were identified. The wetlands are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands. However, the Coos Bay estuary and hydrologically-connected wetlands (wetland 5) are designated essential salmonid habitat; therefore, fill or removal of any amount of material within the wetland or within Highest Measured Tide (HMT) may require a state permit. The elevation of HMT along the Coos Bay estuary in Empire is 10.0 feet above MLLW (10.26 feet above NAVD88).

In addition, this area of the Coos Bay is a state-owned waterway; any use that occurs on or above the submerged and submersible land below the line of mean low tide may require a lease, registration, or easement. Please contact Jim Grimes at 503-986-5233 for more information.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

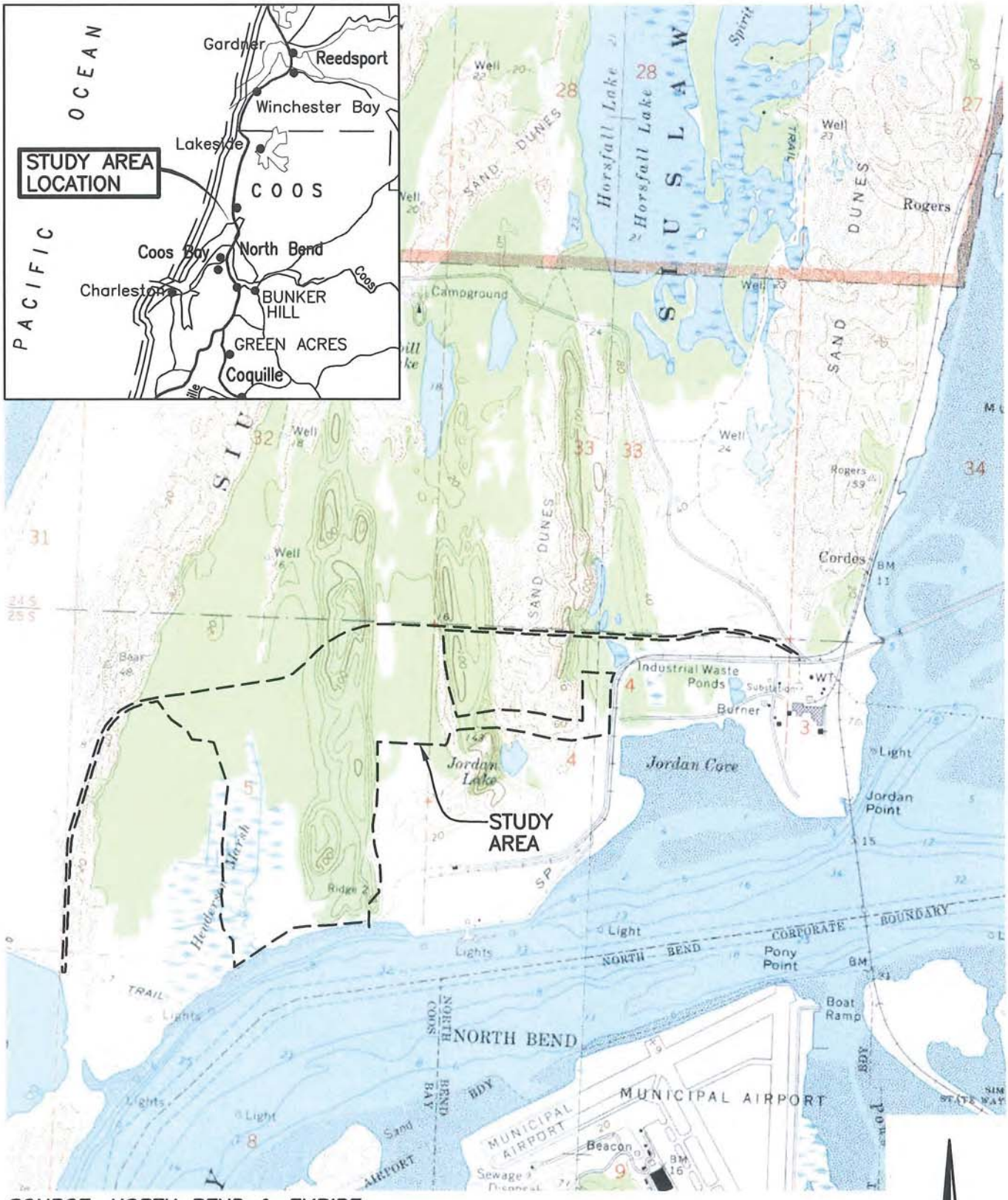
Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

Enclosures

ec: Steve Donavan, SHN Consulting Engineers & Geologists, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL



SOURCE: NORTH BEND & EMPIRE USGS 7.5 MINUTE QUADRANGLES

1"=2,000'±

Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Site Location Map SHN 611048.134
	March 2013 / 611048-134-LCTN-2013	Figure 1

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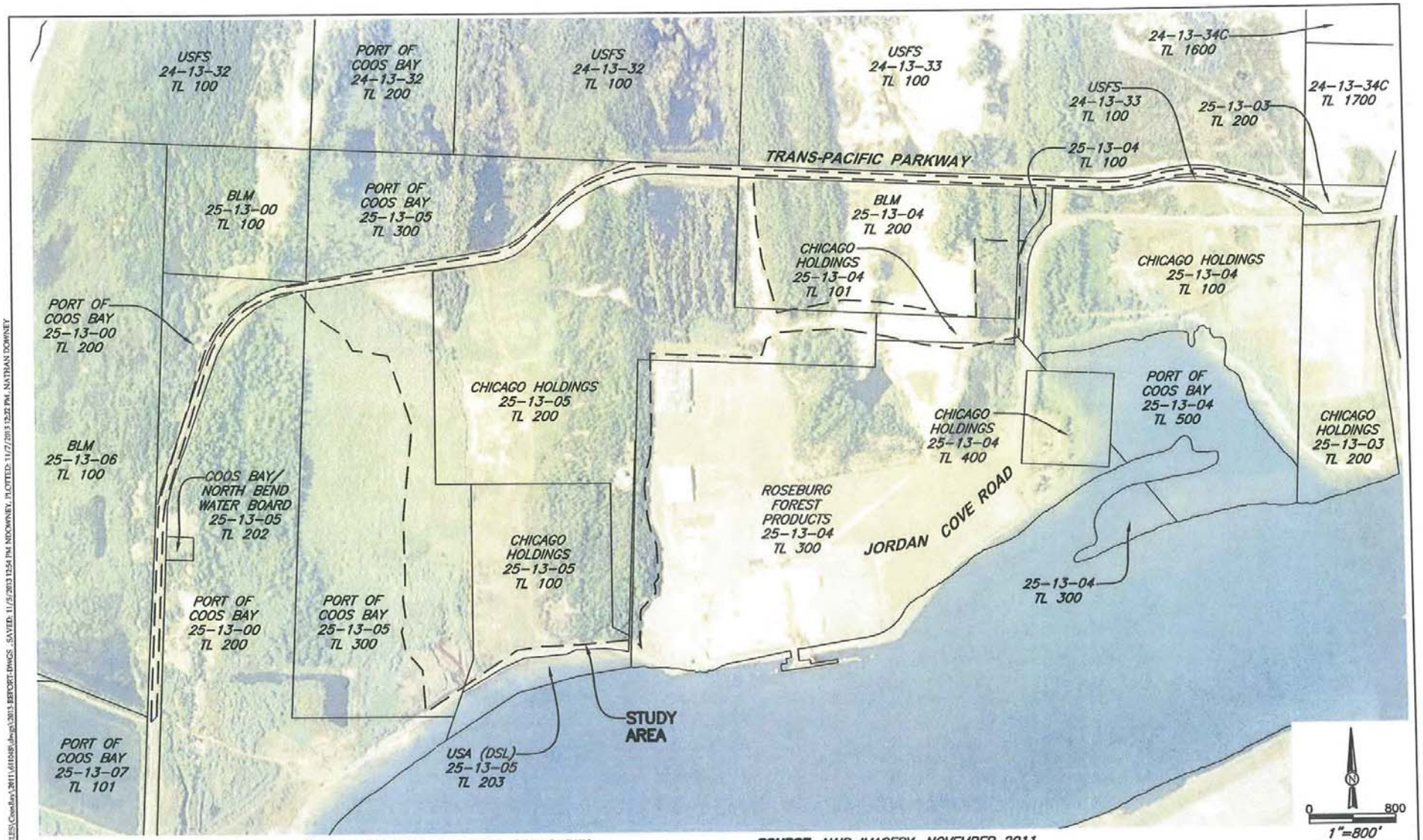
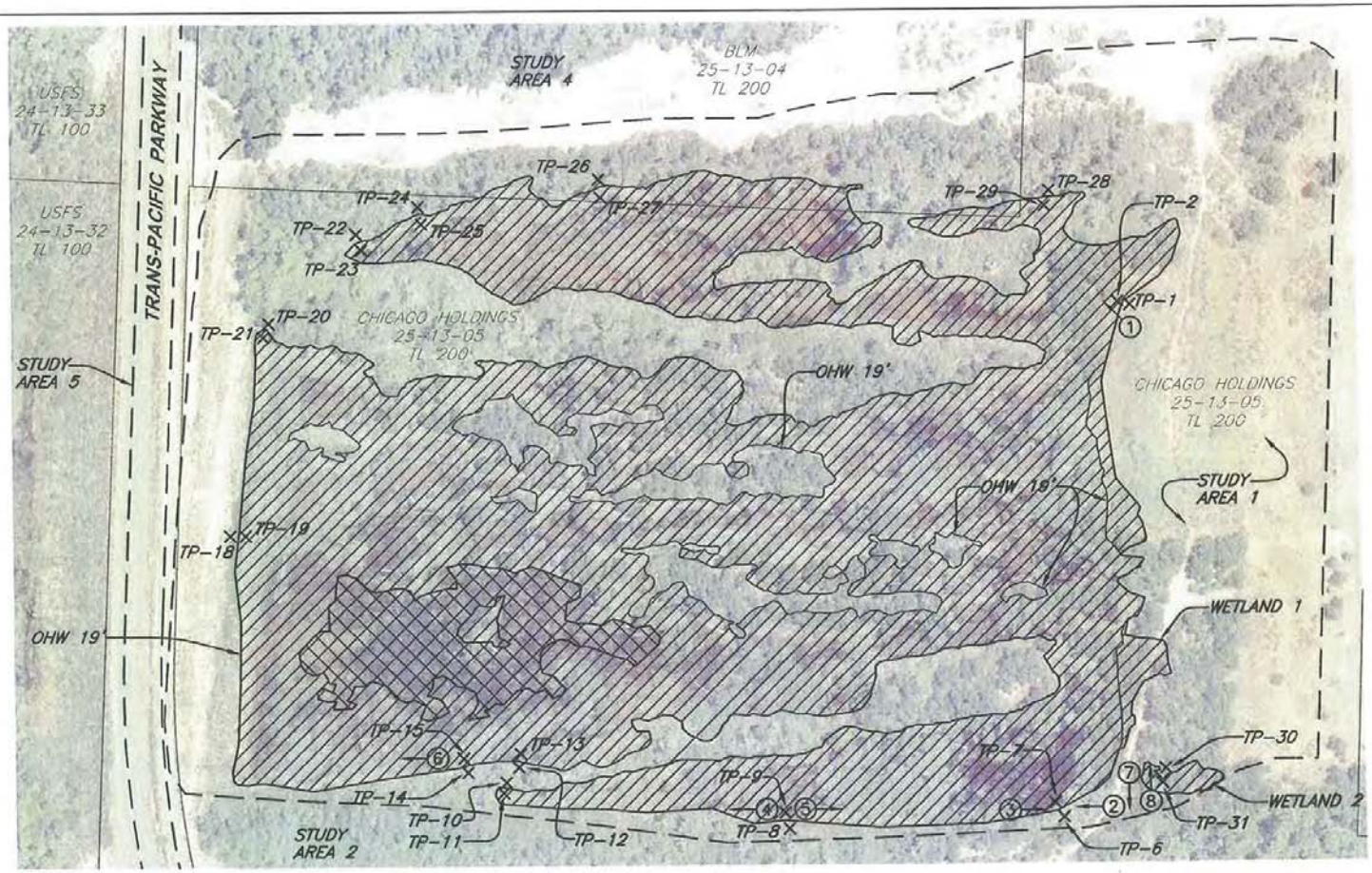


NOTE: LOCATIONS OF PARCEL BOUNDARIES ARE APPROXIMATED FROM ONLINE COOS COUNTY ASSESSOR MAPS

SOURCE: NAIP IMAGERY, NOVEMBER 2011

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Tax Lot Map SHN 611048.134
	November 2013 / 611048-134-TAX-MAP-2013	Figure 3

\\Zfnas\projects\CAD-FILES\CoosBay\2011\611048\dwg\2013 REPORT-DWGS, SAVED: 11/5/2013 12:54 PM, NDOWNEY, PLOTTED: 11/7/2013 12:22 PM, NATHAN DOWNEY



DSL WD # 2013-0116
Approval Issued 11/8/13
Approval Expires 11/8/18

SOURCE: BING MAPS, 2013

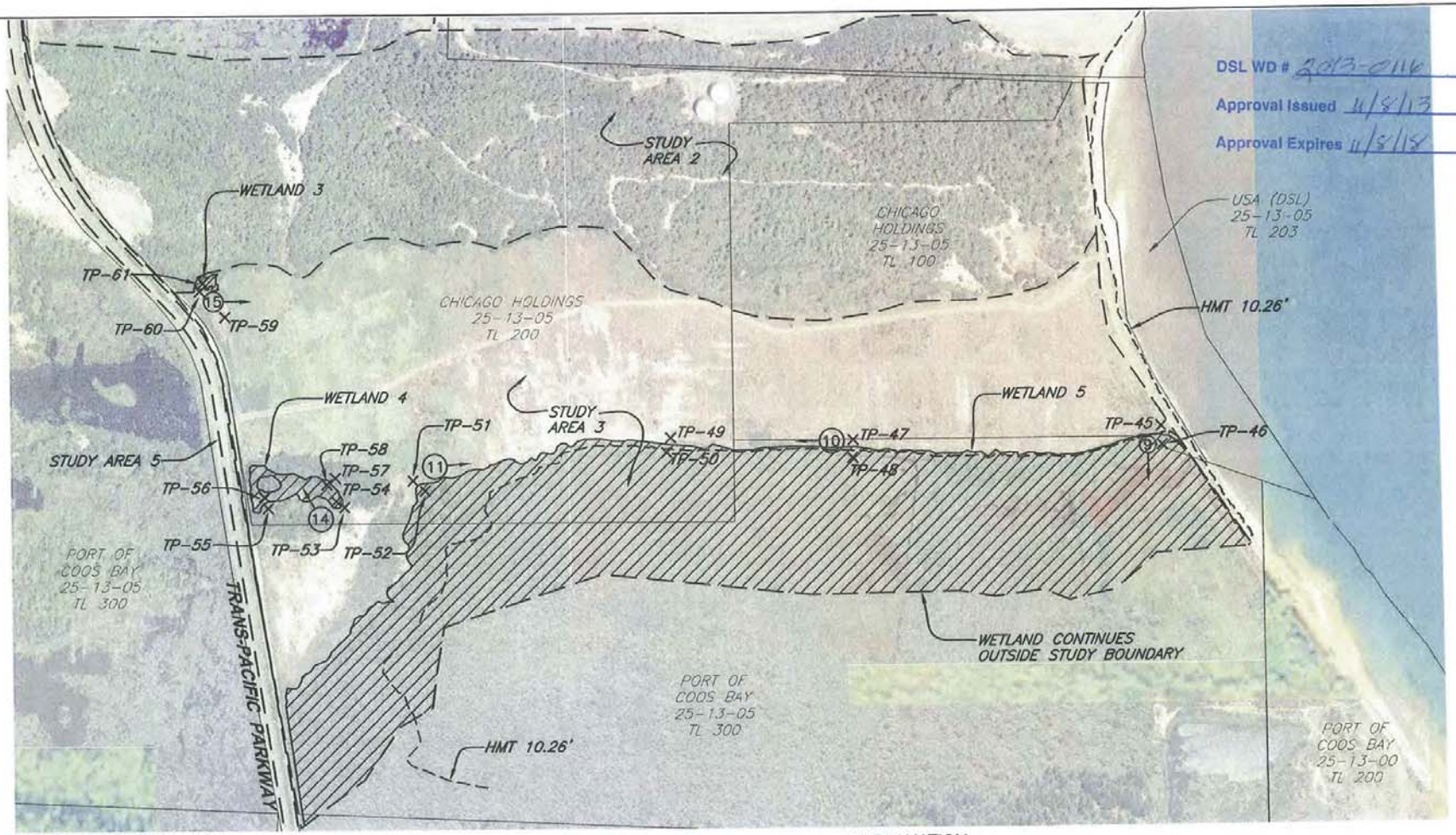
NOTE:
WETLAND 1: DUE TO THE SIZE OF THE SITE AND INABILITY TO REACH SITES SURROUNDED BY OPEN WATER AND BECAUSE GPS POSITIONS WERE NOT ALWAYS OBTAINABLE (DUE TO DENSE TREE CANOPY), THE CENTRAL PORTIONS OF THE WETLAND BOUNDARY WERE DIGITIZED BASED ON A COMBINATION OF AERIAL PHOTO INTERPRETATION, LIDAR CONTOUR DATA, AND AVAILABLE GPS POINT DATA. IT WAS DETERMINED THAT THE NORTHERN, EASTERN AND WESTERN BOUNDARIES CORRESPONDED TO THE ORDINARY HIGH WATER LINE (OHW) AT 19 FEET. THE SOUTHERN WETLAND BOUNDARY LINE WAS OBSERVED OUTSIDE OF THE OHW LINE. THIS WAS VERIFIED BY OBSERVING HYDROLOGY INDICATORS (WATER TABLE AND SATURATION) IN A SERIES OF PITS DUG ALONG THE EDGE OF THE WETLAND BOUNDARY. ACCURACY OF ALL BOUNDARIES AND TEST PIT LOCATIONS IS ESTIMATED AT ±5 FEET.

WETLAND 2: LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS OR SURVEY EQUIPMENT TO ACCURACY OF ±3 FEET.

0 160

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area 1 SHN 611048.134
	November 2013 / 611048-134-2013-WETL	Figure 6

V:\Zing\projects\CAD-FILES\CoosBay\2011\611048\dwg\2013-REPORT-SWGS_SAVED: 11/6/2013 12:37 PM NDOWNEY, PLOTTED: 11/7/2013 12:24 PM, NATHAN DOWNEY



SOURCE: BING MAPS, 2013

NOTE: LOCATIONS OF PARCEL BOUNDARIES ARE APPROXIMATED FROM ONLINE COOS COUNTY ASSESSOR MAPS. TIDAL INFLUENCE BASED ON ESTABLISHED HMT LINE FOR "EMPIRE" TIDAL STATION.

WETLANDS 3 & 4: LOCATIONS OF TEST PITS AND BOUNDARIES OF WATERS OF THE STATE ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET.

WETLAND 5: LOCATIONS OF TEST PITS ARE MAPPED USING A RESOURCE GRADE GPS OR SURVEY EQUIPMENT TO ACCURACY OF ±3 FEET. THIS WETLAND BOUNDARY WAS MAPPED USING THE ASSOCIATED 14 FOOT ELEVATION LIDAR CONTOUR FIELD VERIFIED BY TEST PITS. TEST PIT LOCATIONS AND WETLAND BOUNDARY ARE ESTIMATED TO BE ACCURATE TO ±3 FEET.

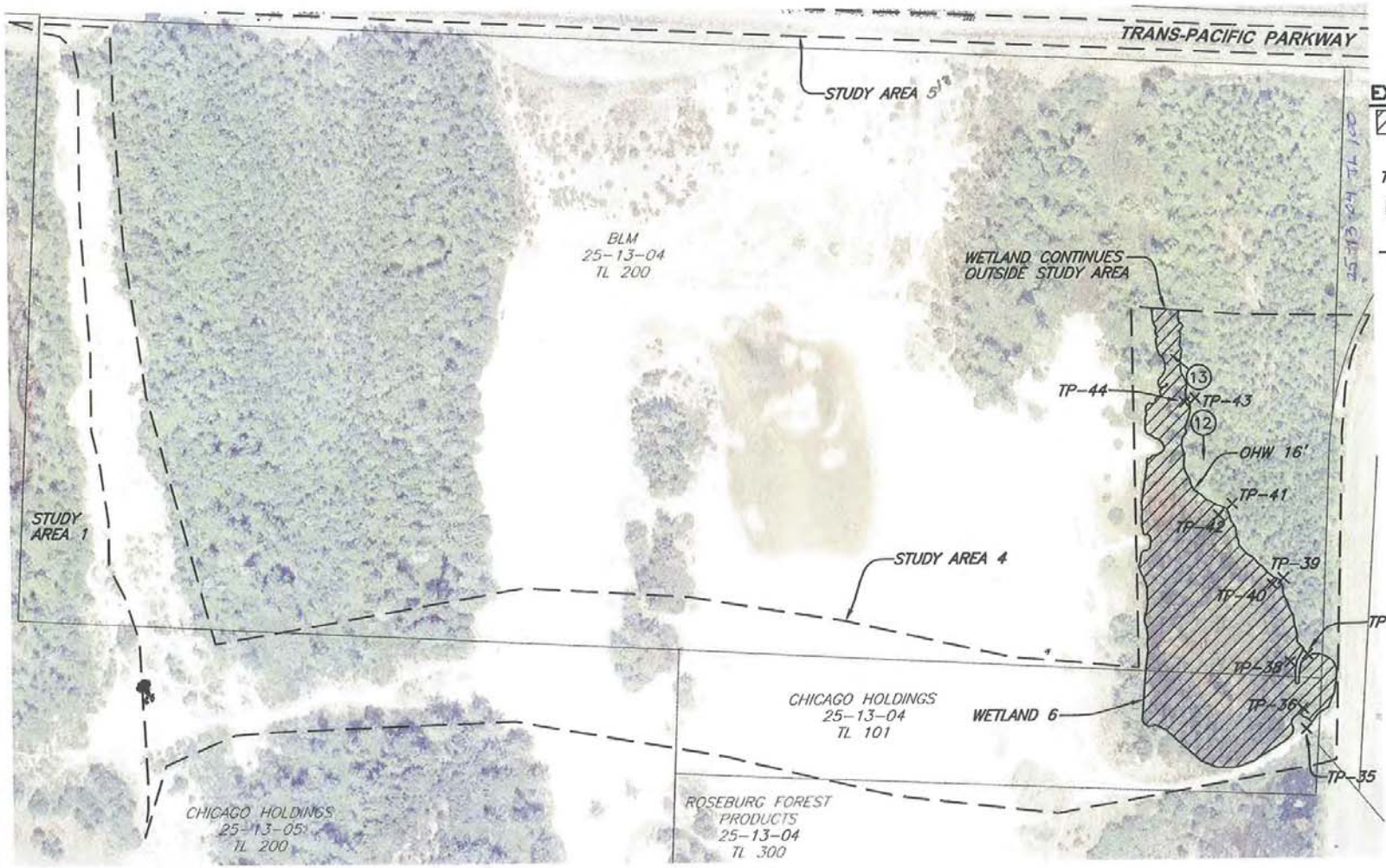
EXPLANATION

- WETLAND
- × TP-49 — TEST PIT LOCATION AND DESIGNATION
- (10) — PHOTO POINTS AND DIRECTION
- STUDY AREA BOUNDARY
- --HMT-- HIGHEST MEASURED TIDE

0 400

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area 2 & 3 SHN 611048.134
	March 2013 | 611048-134-2013-WETL-FIG7	Figure 7

\\Zing\projects\CAD-FILES\Coos Bay\2011\611048\dwgs\2013-REPORT-DWGS , SAVED: 11/6/2013 1:03 PM NDOWNEY, PLOTTED: 11/7/2013 12:26 PM, NATHAN DOWNEY

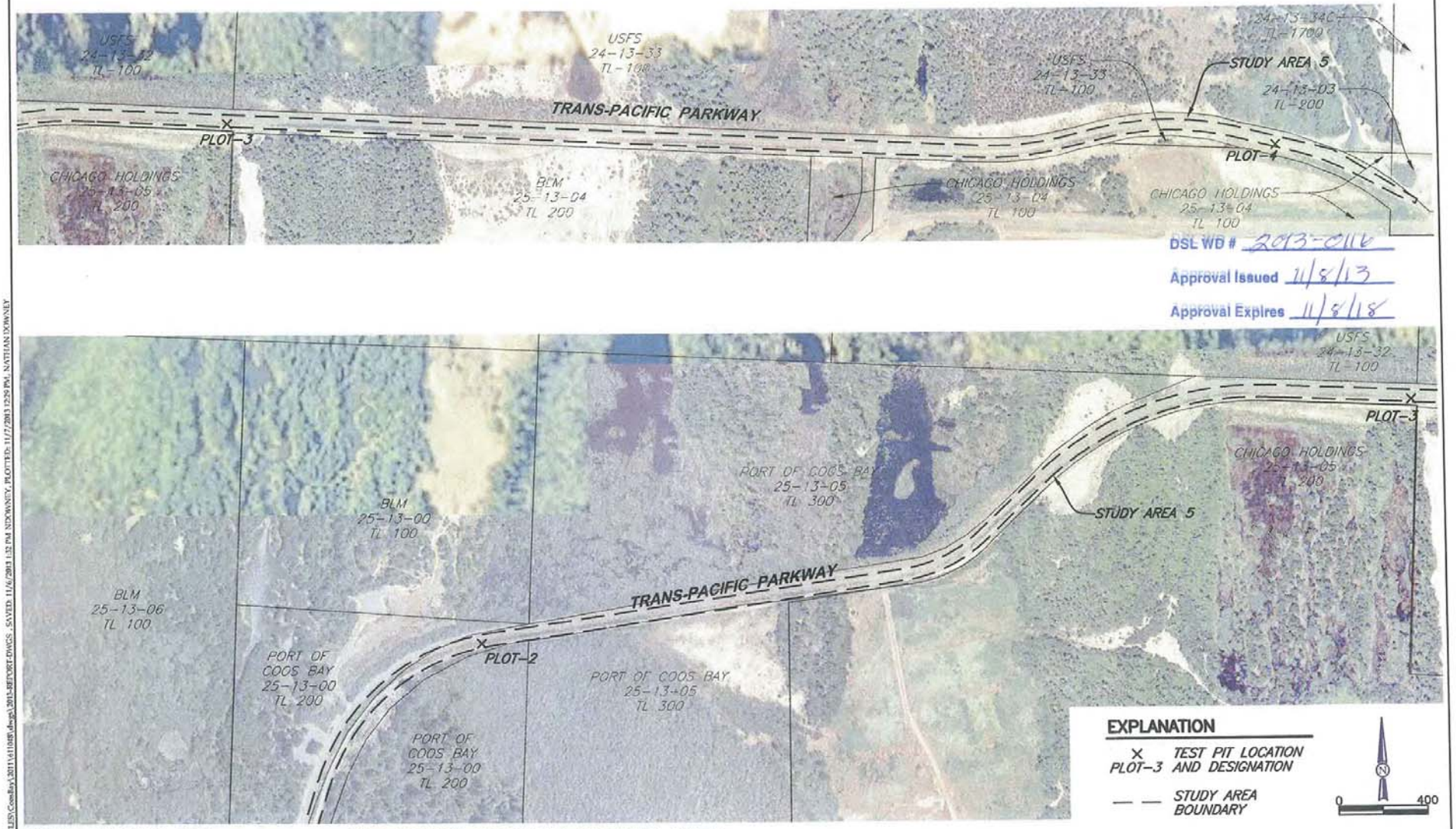


SOURCE: BING MAPS, 2013

NOTE: LOCATIONS OF TEST PITS ARE MAPPED USING A RESOURCE GRADE GPS OR SURVEY EQUIPMENT TO ACCURACY OF ±3 FEET. THE WETLAND BOUNDARY CORRESPONDED TO THE 16 FOOT CONTOUR LINE, WHICH WAS FIELD VERIFIED BY OBSERVING HYDROLOGY INDICATORS (WATER TABLE AND SATURATION) IN A SERIES OF PITS DUG ALONG THE EDGE OF THE WETLAND BOUNDARY. WETLAND BOUNDARY WAS MAPPED USING THE 16 FOOT ELEVATION LIDAR CONTOUR, ESTIMATED TO ACCURACY OF ±3 FEET.

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area 4 SHN 611048.134
	November 2013 / 611048-134-2013-WETL	Figure 8

\\Zion\projects\CAD-FILES\Coos Bay\2011\611048\dwgs\2013-REPORT-DWGS, SAVED: 11/6/2013 12:32 PM, NDOWNEY, PLOTTED: 11/7/2013 12:25 PM, NATHAN DOWNEY



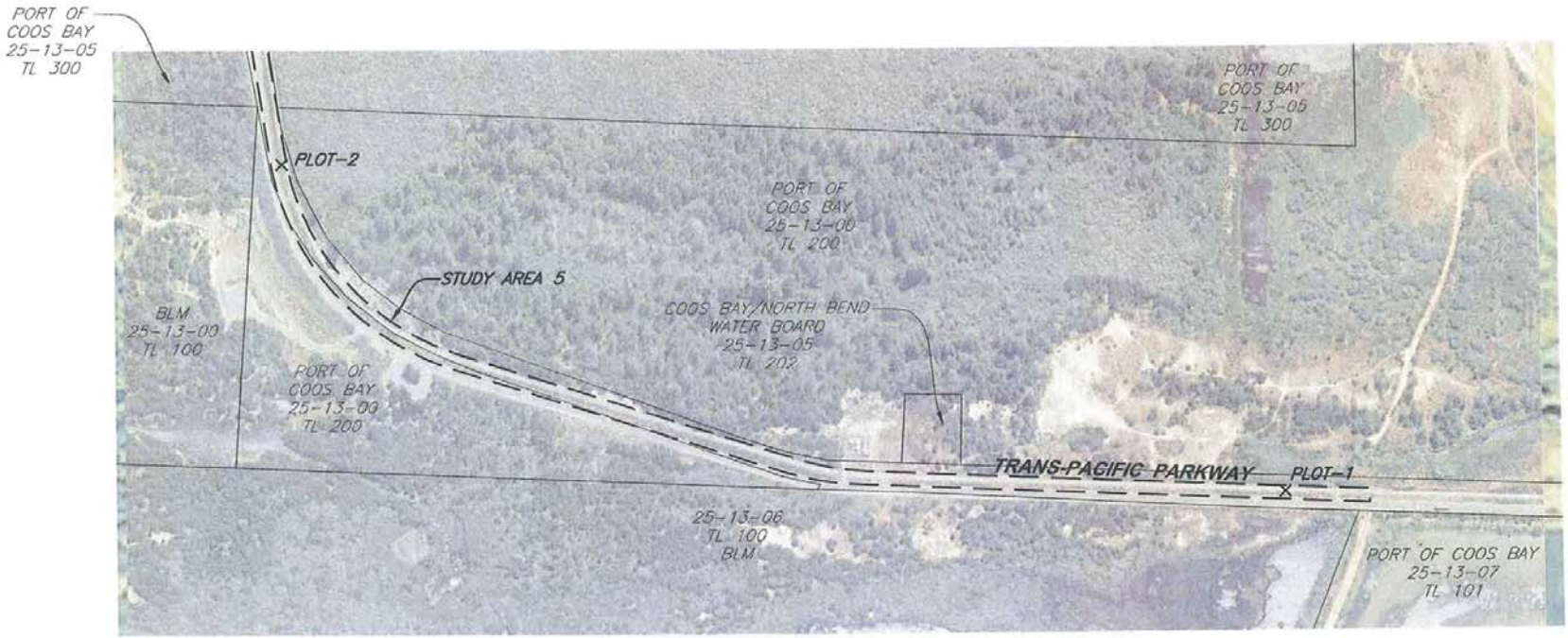
SOURCE: BING MAPS, 2013

NOTE: LOCATIONS OF TEST PITS ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET.

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area 5 SHN 611048.134
	November 2013 / 611048-134-2013-WETLFIG-9	Figure 9

V:\Zing\projects\CAD-FILES\CoosBay\2011\611048\dwgs\2013-BEFORE-DWGS , SAVED: 11/6/2013 1:32 PM, NDOWNEY, PLOTTED: 11/7/2013 12:26 PM, NATHAN DOWNEY

DSL WD # 2013-0116
Approval Issued 11/8/13
Approval Expires 11/8/18



SOURCE: BING MAPS, 2013

NOTE: LOCATIONS OF TEST PITS ARE MAPPED USING A RESOURCE GRADE GPS TO ACCURACY OF ±3 FEET.

EXPLANATION

× PLOT-2 — TEST PIT LOCATION AND DESIGNATION

— — STUDY AREA BOUNDARY

N

0 400

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Jordan Cove Energy Project North Spit, Coos County, Oregon	Study Area 5 (Continued) SHN 611048.134
	November 2013 / 611048-134-2013-WETLFIG-9	Figure 10

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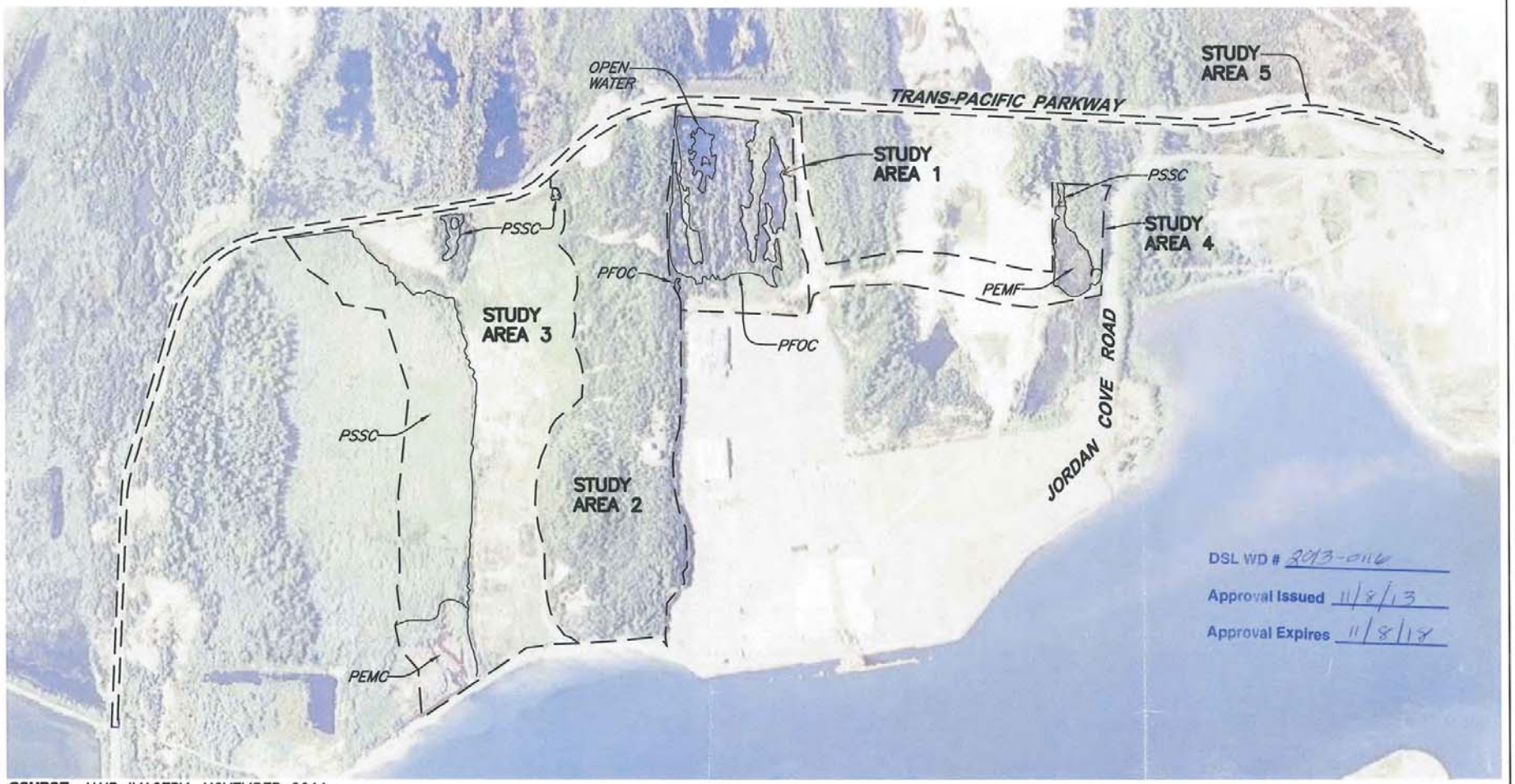

SOURCE: NAIP IMAGERY, NOVEMBER 2011

EXPLANATION

———	WETLAND BOUNDARY
PSSC	PALUSTRINE SCRUB-SHRUB, SEASONALLY FLOODED
PEMF	PALUSTRINE EMERGENT, SEMIPERMANENTLY FLOODED
PEMC	PALUSTRINE EMERGENT, SEASONALLY FLOODED
PFOC	PALUSTRINE FORESTED, SEASONALLY FLOODED

0 800

SHN Consulting Engineers & Geologists, Inc.

Jordan Cove Energy
Jordan Cove Energy Project
North Spit, Coos County, Oregon

Study Area Wetlands
SHN 611048.134

March 2013 | 611048-134-WETL-STUDY-2013 | Figure 11

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WETLAND DELINEATION / DETERMINATION REPORT COVER FORM

This form must be included with any wetland delineation report submitted to the Department of State Lands for review and approval. A wetland delineation report submittal is not "complete" unless the fully completed and signed report cover form and the required fee are submitted. Attach the form to the front of an unbound report and submit to: **Oregon Department of State Lands, 775 Summer Street NE, Suite 100, Salem, OR 97301-1279**
Mail a copy of the completed form with payment of the required report review fee to: **Oregon Department of State Lands, P.O. Box 4395, Unit 18, Portland, OR 97208-4395.**
For new credit card payment option, see DSL web site.

RECEIVED
APR 02 2013
DEPARTMENT OF STATE LANDS

☒ Applicant ☐ Owner Name, Firm and Address: **Robert L. Braddock** **Jordan Cove Energy Project L.P.** **125 Central Avenue, Suite 380** **Coos Bay, OR 97420**	Business phone # **541-266-7510** Mobile phone # (optional) FAX # E-mail: **bobbraddock@attglobal.net**
☒ Authorized Legal Agent, Name and Address: **SHN Consulting Engineers & Geologists, Inc.** **Steve Donovan** **275 Market Avenue** **Coos Bay, OR 97420**	Business phone # **541-266-9890** FAX # **541-266-9496** Mobile phone # **541-297-8321** E-mail: **sdonovan@shn-engr.com**

I either own the property described below or I have legal authority to allow access to the property. I authorize the Department to access the property for the purpose of confirming the information in the report, after prior notification to the primary contact.
Typed/Printed Name: **Steven K. Donovan** Signature: [redacted]
Date: Special instructions regarding site access:

Project and Site Information (for latitude & longitude, use centroid of site or start & end points of linear project)

Project Name: **Jordan Cove Energy Facility**	Latitude: **43.43** Longitude: **-124.25**
Proposed Use: **Industrial**	Tax Map # **25-13, 24-13**
Project Street Address (or other descriptive location): **Along Trans-Pacific Parkway and west of Jordan Cove Road**	Township **25S, 24S** Range **13 W** Section **3,4,5, 8; 33** QQ Tax Lot (s) **25-13-05-200, 25-13-04-200, 25-13-05-100, 25-13-04-300, 25-13-05-300, 25-13-04-101, and 25-13-04-100.**
City: **North Spit** County: **Coos**	Waterway: River Mile: NWI Quad(s): **North Bend, Empire**

Wetland Delineation Information

Wetland Consultant Name, Firm and Address: **SHN Consulting Engineers & Geologists, Inc.** **275 Market Avenue** **Coos Bay, OR 97420**	Phone # **541-266-9890** Mobile phone # **541-297-8321** FAX # **541-266-9496** E-mail: **sdonovan@shn-engr.com**
The information and conclusions on this form and in the attached report are true and correct to the best of my knowledge. Consultant Signature: [redacted]	Date:
Primary Contact for report review and site access is ☐ Consultant ☐ Applicant/Owner ☒ Authorized Agent	
Wetland/Waters Present? ☒ Yes ☐ No	Study Area size: **295.96 acres** Total Wetland Acreage: **72.79**

Check Box Below if Applicable:	**Fees:**
☐ R-F permit application submitted	☐ Fee payment submitted $ _____
☐ Mitigation bank site	☐ Fee ($100) for resubmittal of rejected report
☐ Wetland restoration/enhancement project (not mitigation)	Name of Payor:
☐ Industrial Land Certification Program Site	Reviewed as non-EFSC

Other Information:	Y	N	
Has previous delineation/application been made on parcel?	☒	☐	If known, previous DSL # **WD # 2006-0366**
Does LWI, if any, show wetland or waters on parcel?	☐	☒	

For Office Use Only

DSL Reviewer: LM Fee Paid Date: ___/___/___ DSL WD # 2013-0116
Date Delineation Received: 4 / 2 / 13 DSL Project # _____ DSL Site # _____
Scanned: ☒ Final Scan: ☐ DSL WN # _____ DSL App. # _____

C.4. Oregon DSL Wetland Delineation Concurrence Letter WD #2013-0188

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

October 24, 2013

Bob Braddock
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, OR 97420

Re: Wetland Delineation Report for Panhandle Site, Coos County; T24S R13W Sec. 32, Tax Lot 20000; T25S R13W Sec. 5, Tax Lot 30000; WD #2013-0188

Dear Mr. Braddock:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 5 (sheets 1-4) of the report. Please replace all copies of the preliminary wetland maps with these final Department-approved maps. Within the study area, approximately 65.73 acres of wetland and four excavated ponds totaling 14.23 acres (open water areas largely surrounded by wetland) were identified. The wetlands and the open water areas are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetland or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined).

The reported delineation accuracy of 10 feet for wetlands A and B (including open water portions) does not meet the agency's standard of 1 m. Please note that this may affect the amount of mitigation required to offset any wetland impacts during the project.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

Enclosures

ec: Ethan Rosenthal, David Evans and Associates, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL



Figure 1

Panhandle Site Vicinity Map

N

0 1 2 Miles

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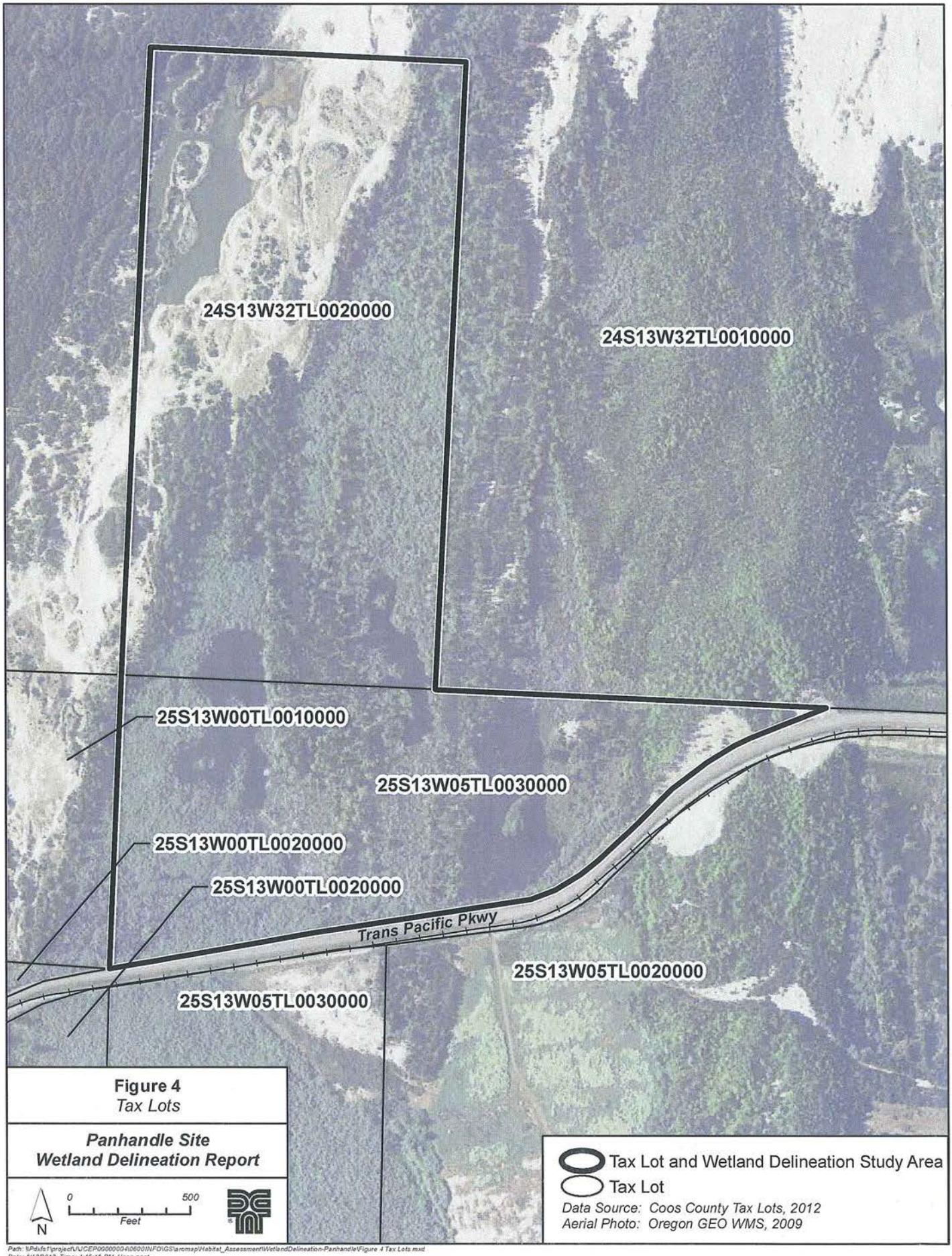

Figure 4
Tax Lots

Panhandle Site
Wetland Delineation Report

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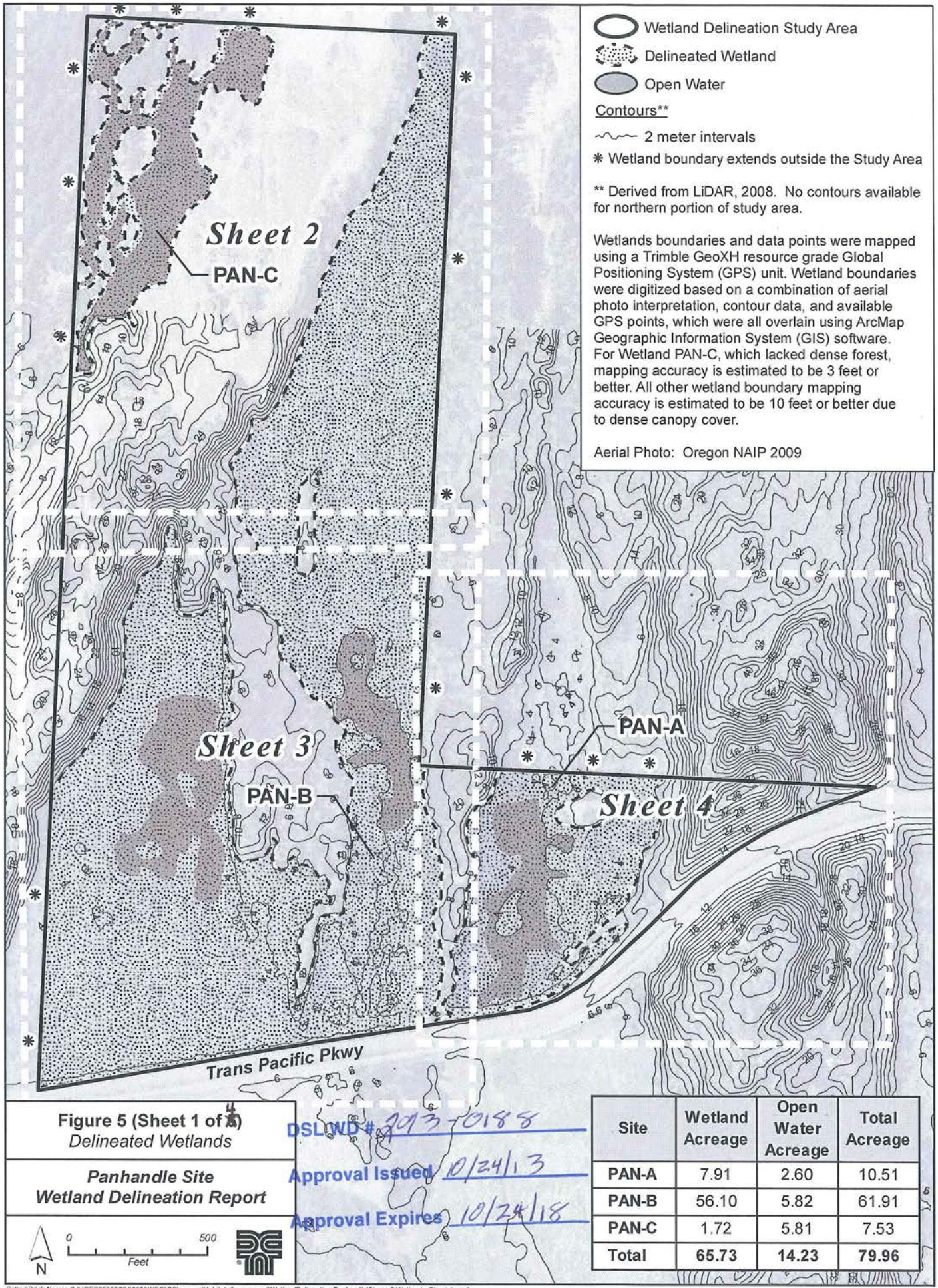

Figure 5 (Sheet 1 of 4)
Delineated Wetlands

Panhandle Site
Wetland Delineation Report

DSL WD # 2013-0188
Approval Issued 10/24/13
Approval Expires 10/24/18

Site	Wetland Acreage	Open Water Acreage	Total Acreage
PAN-A	7.91	2.60	10.51
PAN-B	56.10	5.82	61.91
PAN-C	1.72	5.81	7.53
Total	**65.73**	**14.23**	**79.96**

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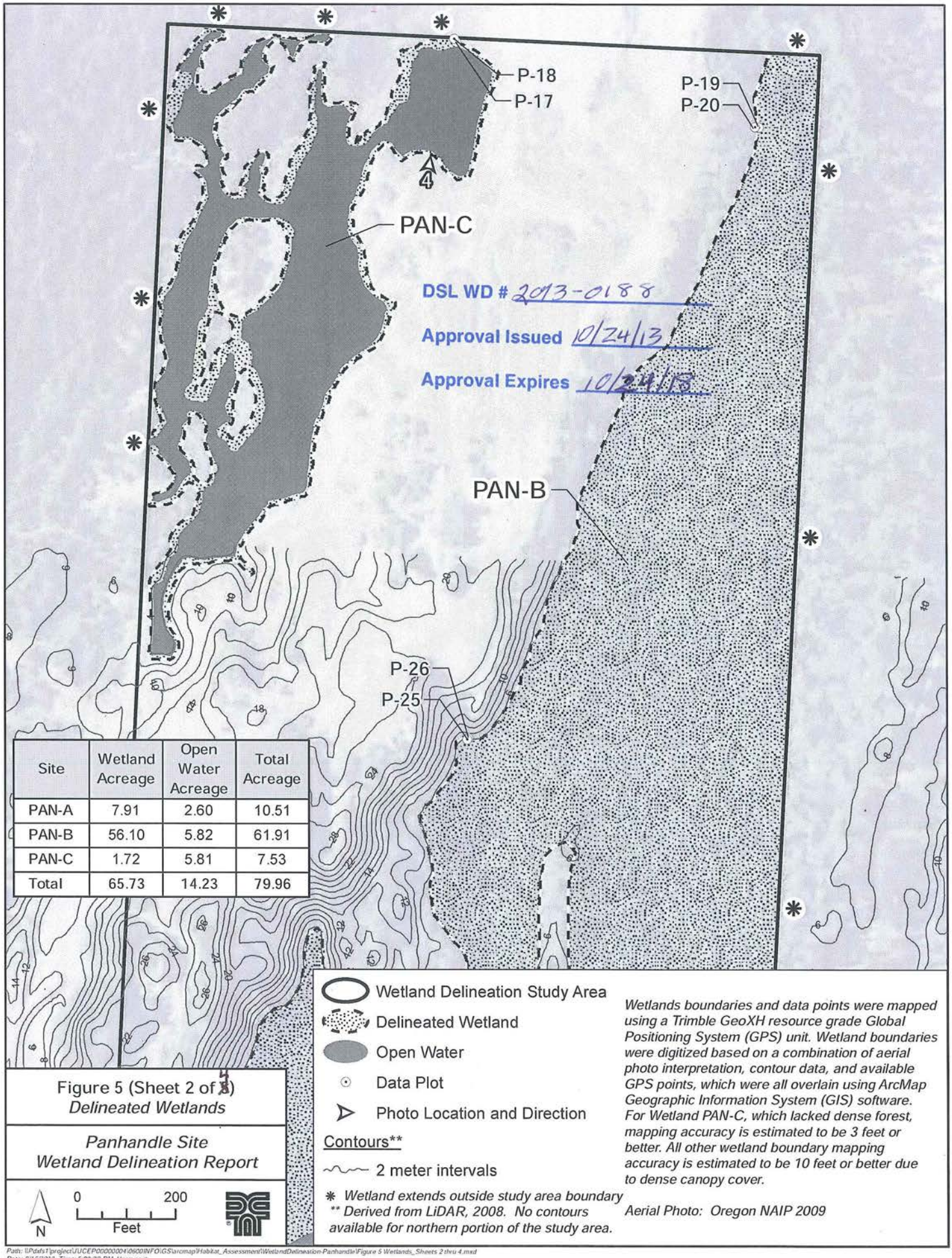

Site	Wetland Acreage	Open Water Acreage	Total Acreage
PAN-A	7.91	2.60	10.51
PAN-B	56.10	5.82	61.91
PAN-C	1.72	5.81	7.53
Total	65.73	14.23	79.96

Wetland Delineation Study Area
Delineated Wetland
Open Water
Data Plot
Photo Location and Direction

Contours**
2 meter intervals

* Wetland extends outside study area boundary
** Derived from LiDAR, 2008. No contours available for northern portion of the study area.

Wetlands boundaries and data points were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. Wetland boundaries were digitized based on a combination of aerial photo interpretation, contour data, and available GPS points, which were all overlain using ArcMap Geographic Information System (GIS) software. For Wetland PAN-C, which lacked dense forest, mapping accuracy is estimated to be 3 feet or better. All other wetland boundary mapping accuracy is estimated to be 10 feet or better due to dense canopy cover.

Aerial Photo: Oregon NAIP 2009

Figure 5 (Sheet 2 of 3)
Delineated Wetlands

Panhandle Site
Wetland Delineation Report

N
0 200
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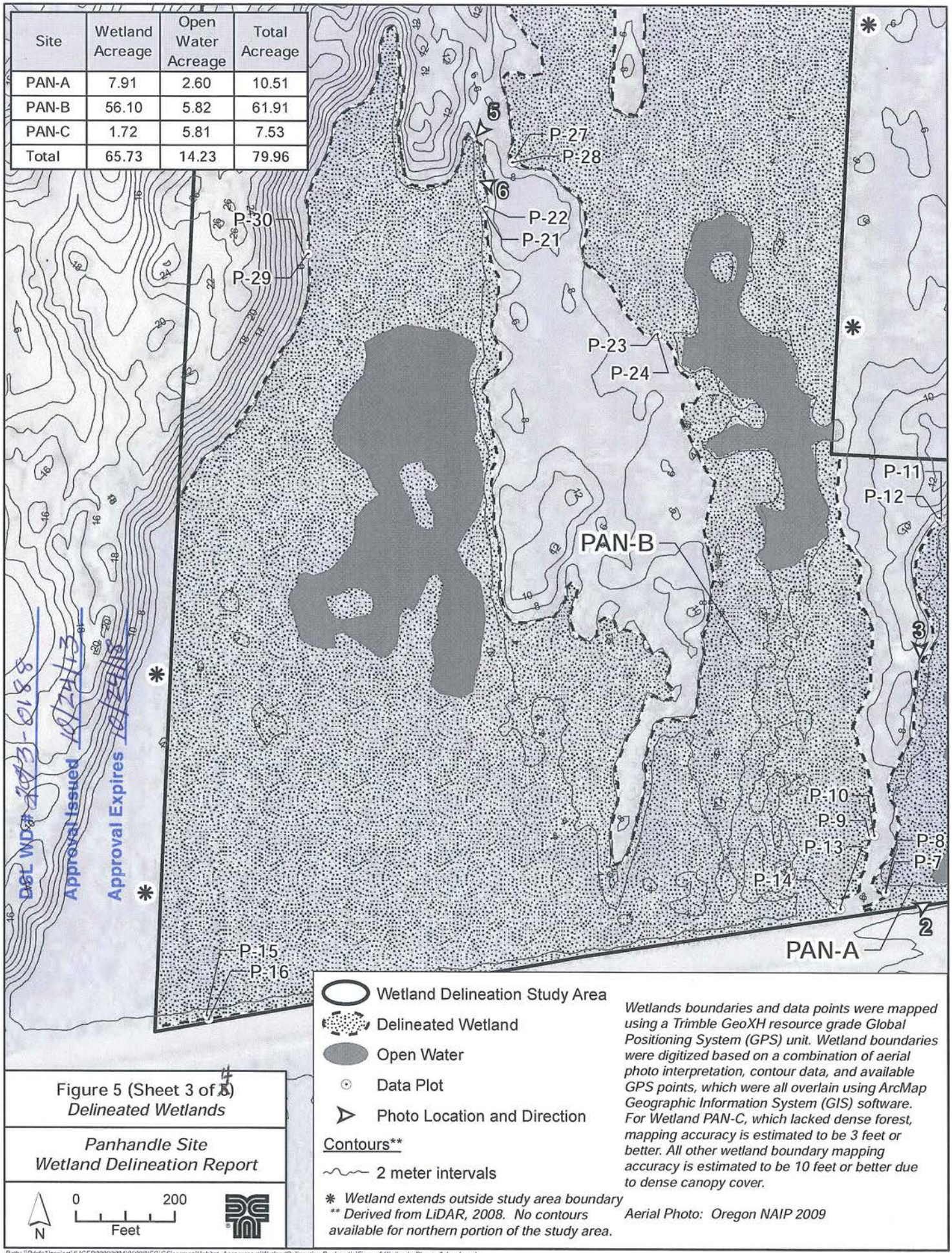

Site	Wetland Acreage	Open Water Acreage	Total Acreage
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PAN-C	1.72	5.81	7.53
Total	65.73	14.23	79.96

Figure 5 (Sheet 3 of 3)
Delineated Wetlands

Panhandle Site
Wetland Delineation Report

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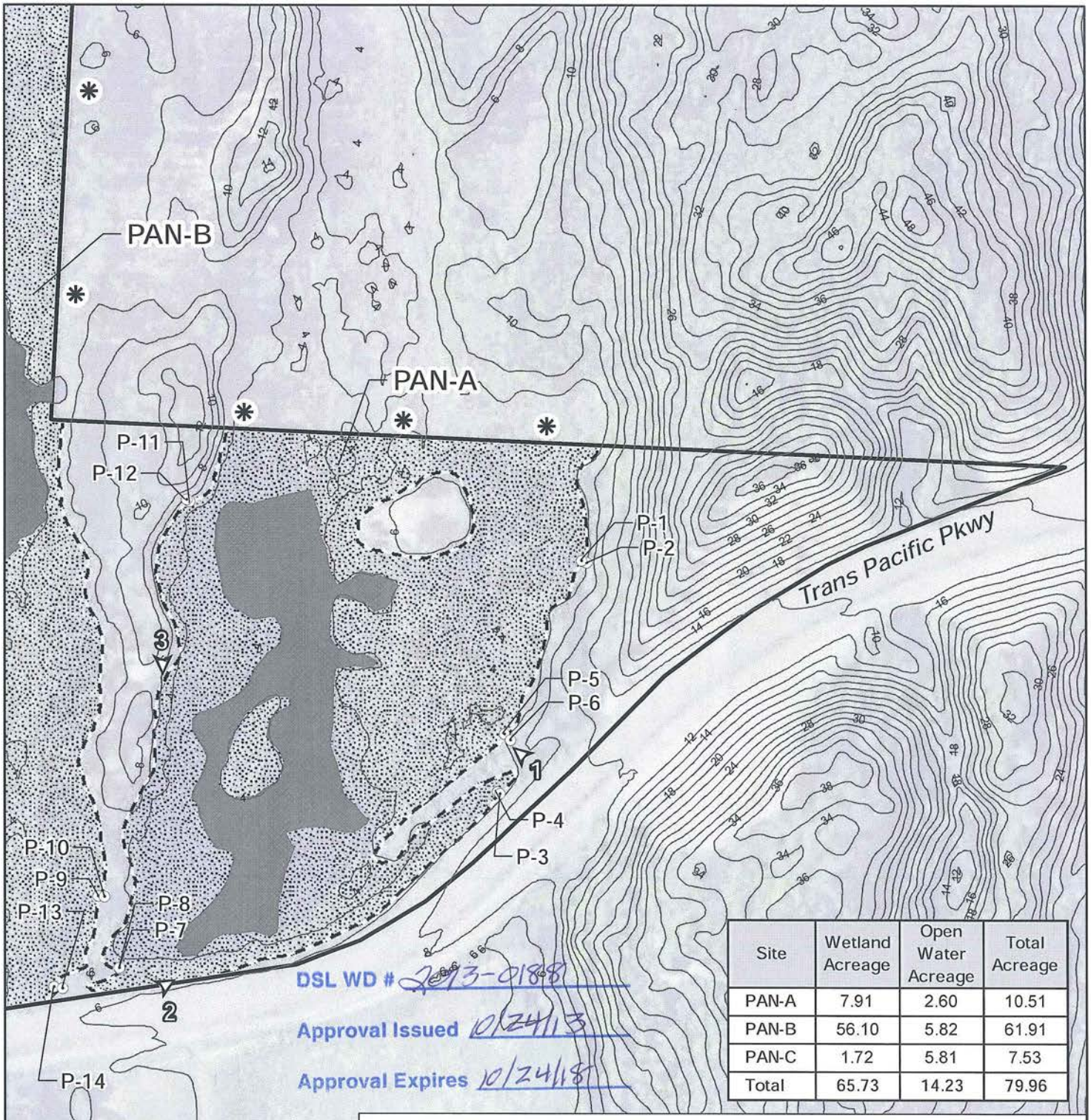

Site	Wetland Acreage	Open Water Acreage	Total Acreage
PAN-A	7.91	2.60	10.51
PAN-B	56.10	5.82	61.91
PAN-C	1.72	5.81	7.53
Total	65.73	14.23	79.96

Wetland Delineation Study Area
Delineated Wetland
Open Water
Data Plot
Photo Location and Direction

Contours**
2 meter intervals

* Wetland extends outside study area boundary
** Derived from LiDAR, 2008. No contours available for northern portion of the study area.

Wetlands boundaries and data points were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. Wetland boundaries were digitized based on a combination of aerial photo interpretation, contour data, and available GPS points, which were all overlain using ArcMap Geographic Information System (GIS) software. For Wetland PAN-C, which lacked dense forest, mapping accuracy is estimated to be 3 feet or better. All other wetland boundary mapping accuracy is estimated to be 10 feet or better due to dense canopy cover.

Aerial Photo: Oregon NAIP 2009

N
0 200
Feet

Figure 5 (Sheet 4 of 4)
Delineated Wetlands

Panhandle Site
Wetland Delineation Report

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C.5. Oregon DSL Wetland Delineation Concurrence Letter WD #2013-0193

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

January 23, 2014

Joe McKeown
APCO Coos Properties, LLC
P.O. Box 300
Coos Bay, OR 97420

Re: Wetland Delineation Report for APCO Construction Staging, Coos County; T25S R13W Sec. 10, Tax Lots 800A1, 1000; WD #2013-0193

Dear Mr. McKeown:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lots described above (see the attached maps). Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 5, sheets 1-4 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map.

Within the study area, the Coos Bay estuary, 13 wetlands totaling 8.33 acres, and an undetermined area of estuarine habitat were identified. The estuary, estuarine habitat below highest measured tide (HMT), and wetlands A1-A4, C1-C3, D, F, and G are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands. However, the Coos Bay estuary and all hydrological-connected wetlands are designated essential salmonid habitat; therefore, fill or removal of any amount of material within wetlands A1-A4, C1-C3, F, and G or within the HMT boundary in other portions of the site may require a state permit. The elevation of HMT along the Coos Bay estuary in Empire is 10.00 feet above MLLW (10.26 feet above NAVD88). Wetlands B1, B2, and E are created on top of old fill material and are not state jurisdictional.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by

Bill Ryan
Assistant Director

Enclosures

ec: Ethan Rosenthal, David Evans & Associates, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL

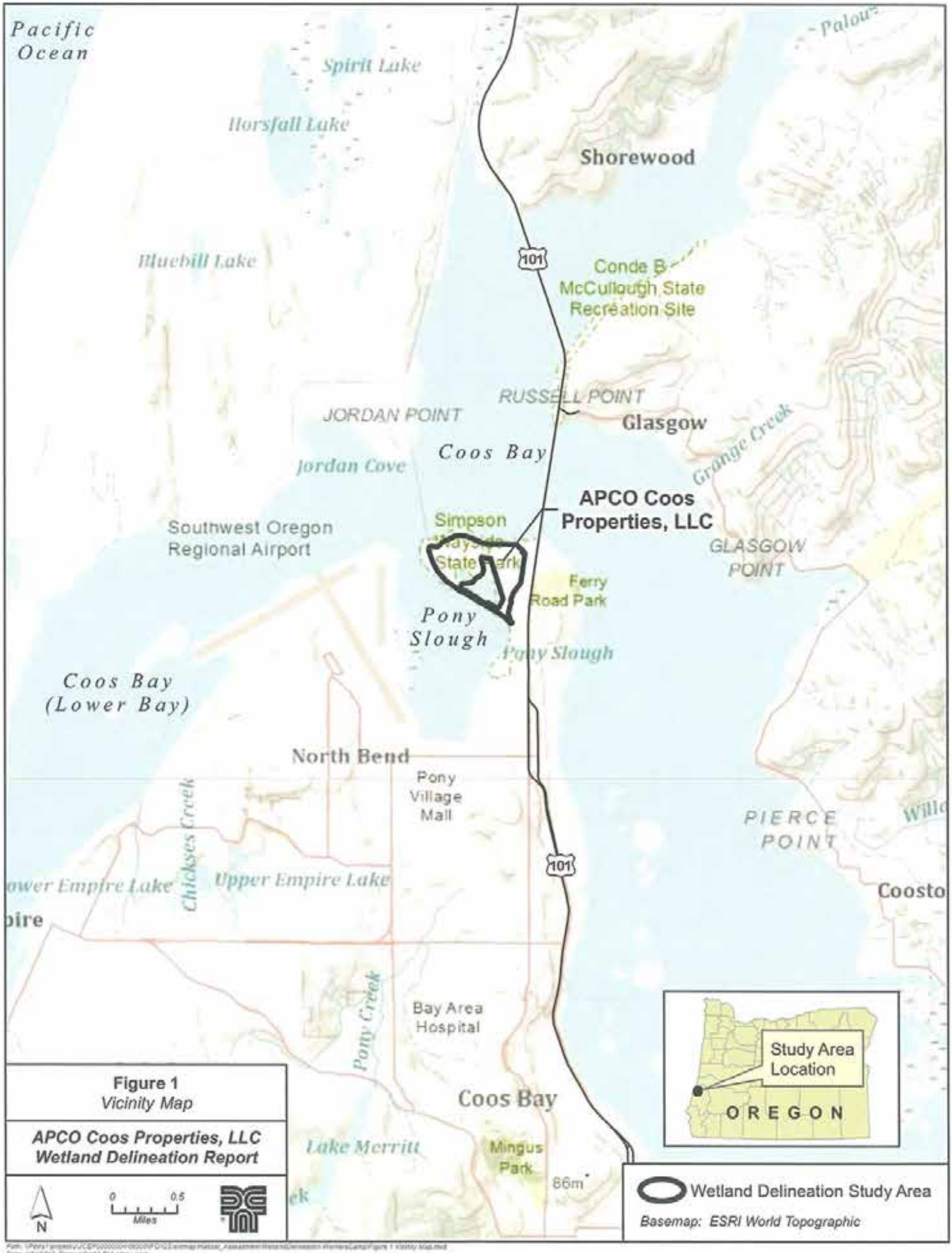


Figure 1
Vicinity Map

APCO Coos Properties, LLC
Wetland Delineation Report

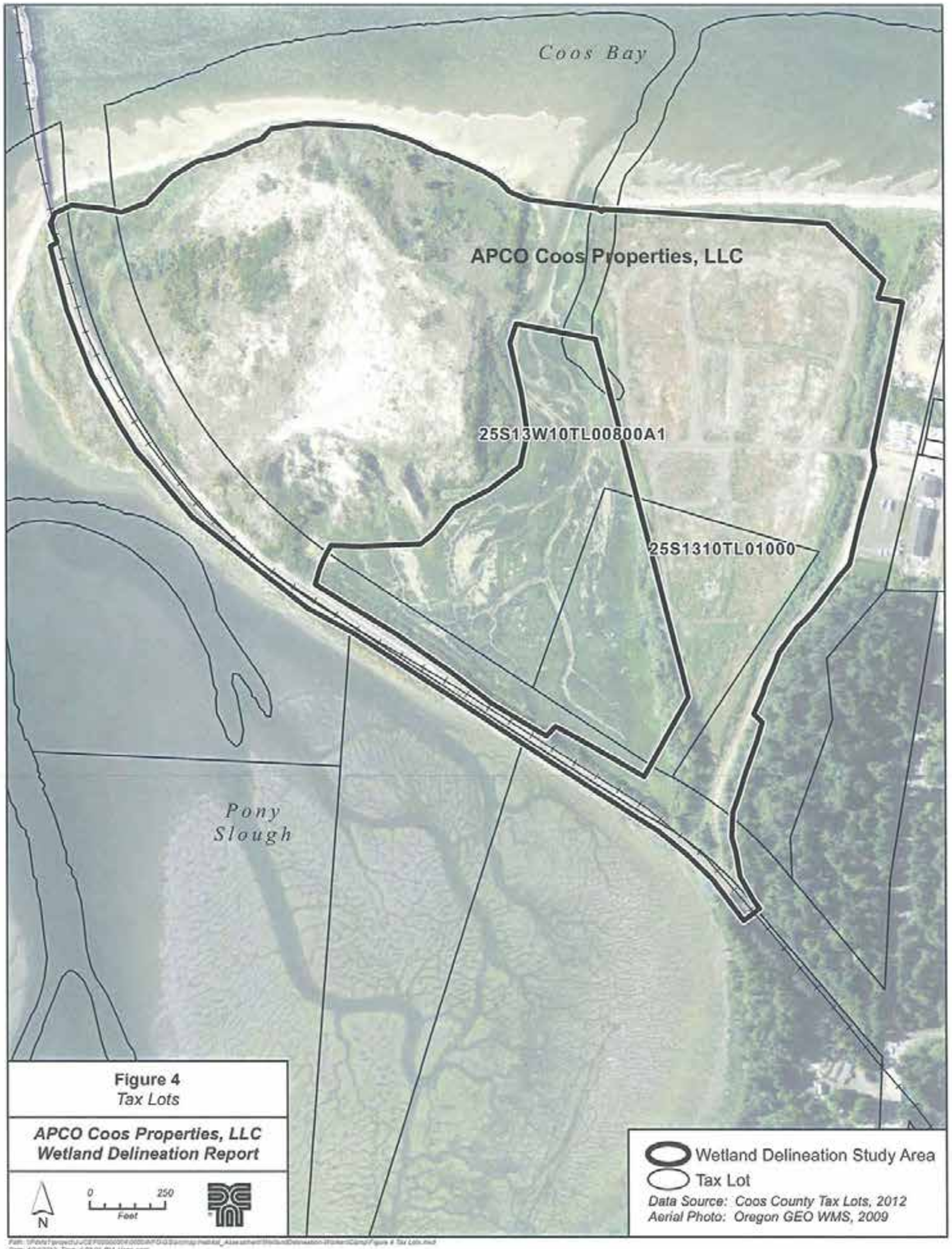
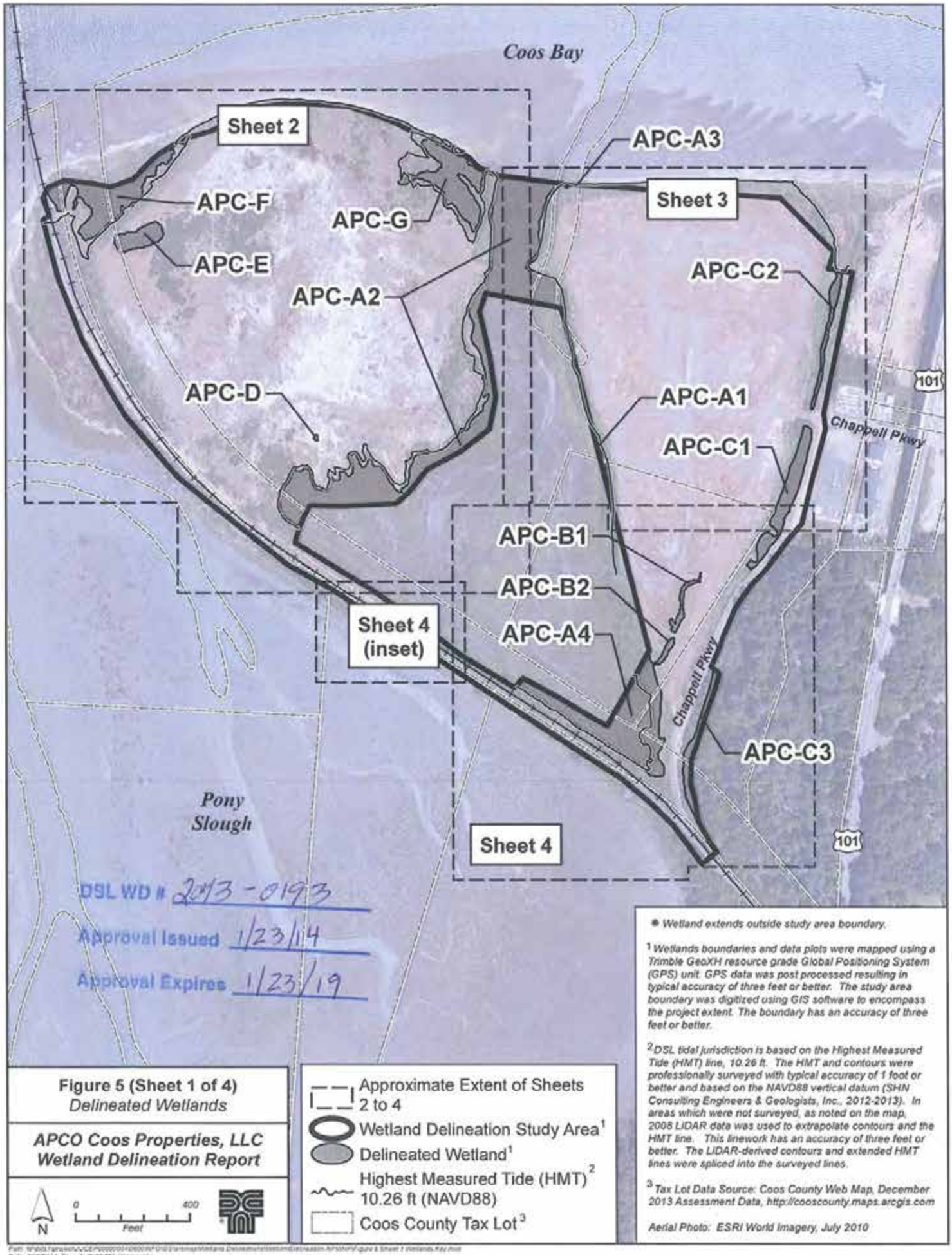


Figure 4
Tax Lots

APCO Coos Properties, LLC
Wetland Delineation Report


Coos Bay
Sheet 2
APC-A3
Sheet 3
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APC-G
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APC-C1
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(inset)
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Chappell Pkwy
APC-C3
Pony
Slough
Sheet 4
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DSL WD # 2013-0193
Approval Issued 1/23/14
Approval Expires 1/23/19
Figure 5 (Sheet 1 of 4)
Delineated Wetlands
APCO Coos Properties, LLC
Wetland Delineation Report
N
0
400
Feet
Approximate Extent of Sheets 2 to 4
Wetland Delineation Study Area[1]
Delineated Wetland[1]
Highest Measured Tide (HMT)[2] 10.26 ft (NAVD88)
Coos County Tax Lot[3]
* Wetland extends outside study area boundary.
[1] Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.
[2] DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. The HMT and contours were professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum (SHN Consulting Engineers & Geologists, Inc., 2012-2013). In areas which were not surveyed, as noted on the map, 2008 LiDAR data was used to extrapolate contours and the HMT line. This linework has an accuracy of three feet or better. The LiDAR-derived contours and extended HMT lines were spliced into the surveyed lines.
[3] Tax Lot Data Source: Coos County Web Map, December 2013 Assessment Data, http://cooscounty.maps.arcgis.com
Aerial Photo: ESRI World Imagery, July 2010

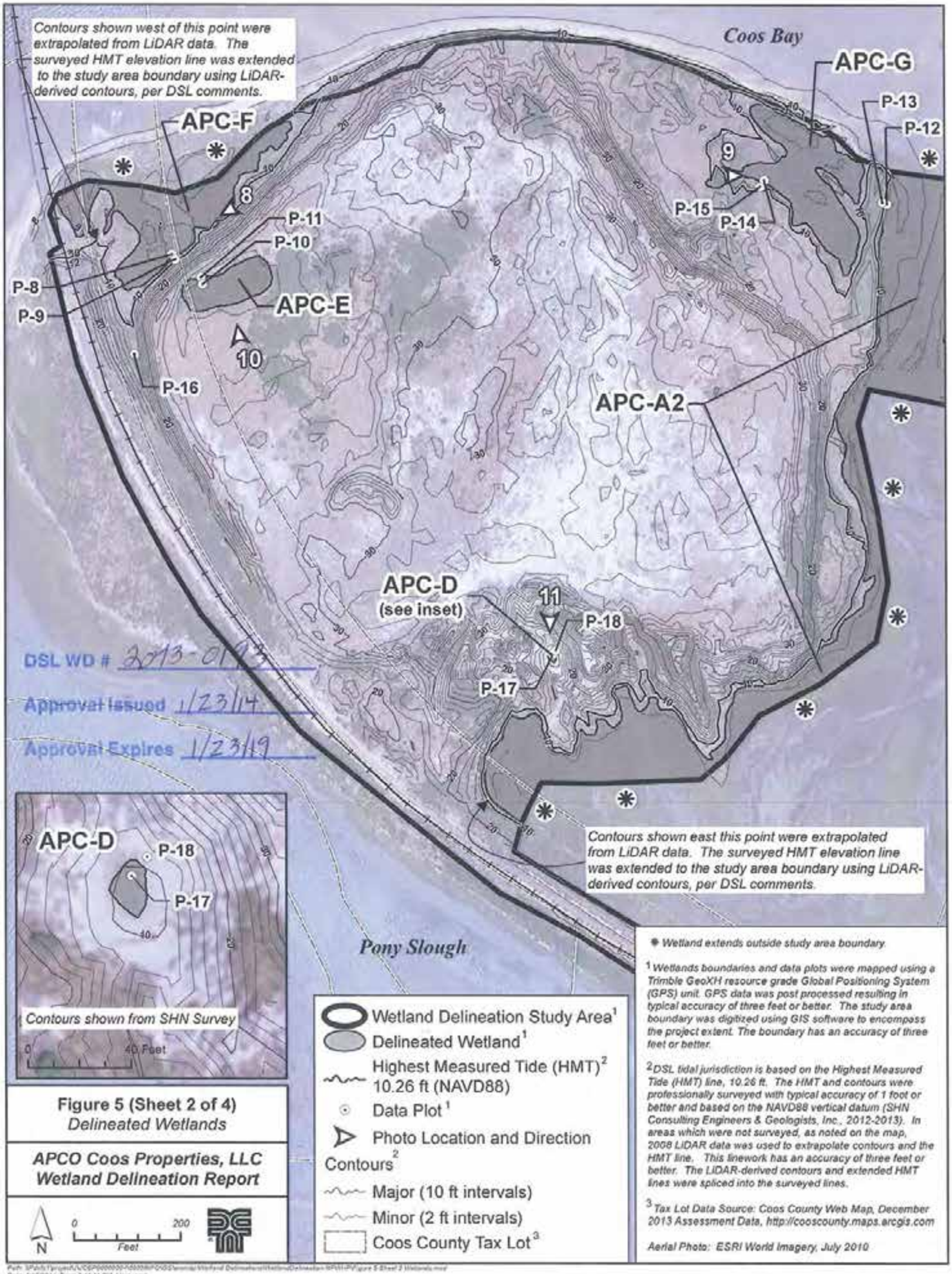

Figure 5 (Sheet 2 of 4)
Delineated Wetlands

APCO Coos Properties, LLC
Wetland Delineation Report

Wetland Delineation Study Area[1]
Delineated Wetland[1]
Highest Measured Tide (HMT)[2] 10.26 ft (NAVD88)
Data Plot[1]
Photo Location and Direction
Contours[2]
Major (10 ft intervals)
Minor (2 ft intervals)
Coos County Tax Lot[3]

* *Wetland extends outside study area boundary*

[1] *Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.*

[2] *DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. The HMT and contours were professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum (SHN Consulting Engineers & Geologists, Inc., 2012-2013). In areas which were not surveyed, as noted on the map, 2008 LiDAR data was used to extrapolate contours and the HMT line. This linework has an accuracy of three feet or better. The LiDAR-derived contours and extended HMT lines were spliced into the surveyed lines.*

[3] *Tax Lot Data Source: Coos County Web Map, December 2013 Assessment Data, http://cooscounty.maps.arcgis.com*

Aerial Photo: ESRI World Imagery, July 2010

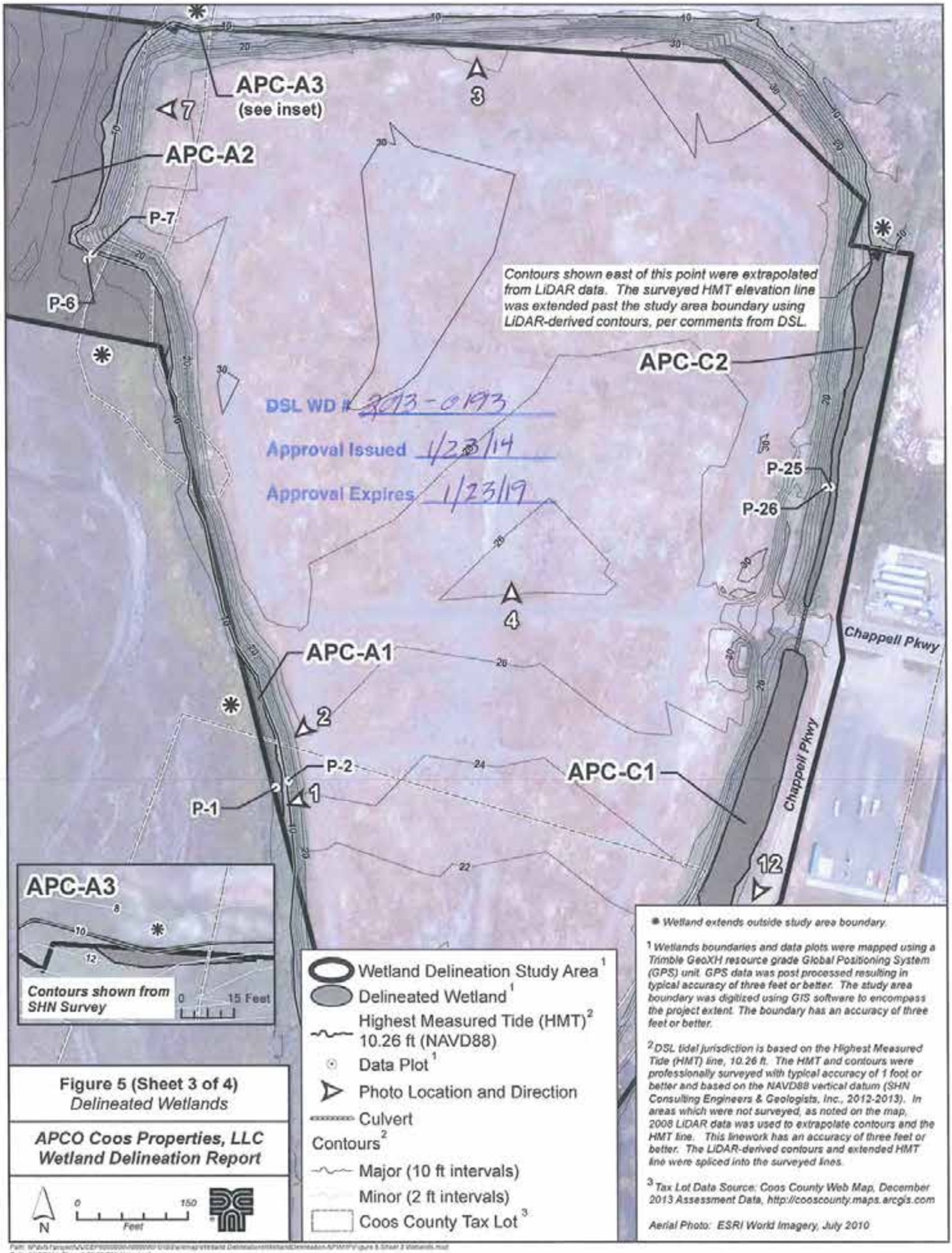

Figure 5 (Sheet 3 of 4)
Delineated Wetlands

APCO Coos Properties, LLC
Wetland Delineation Report

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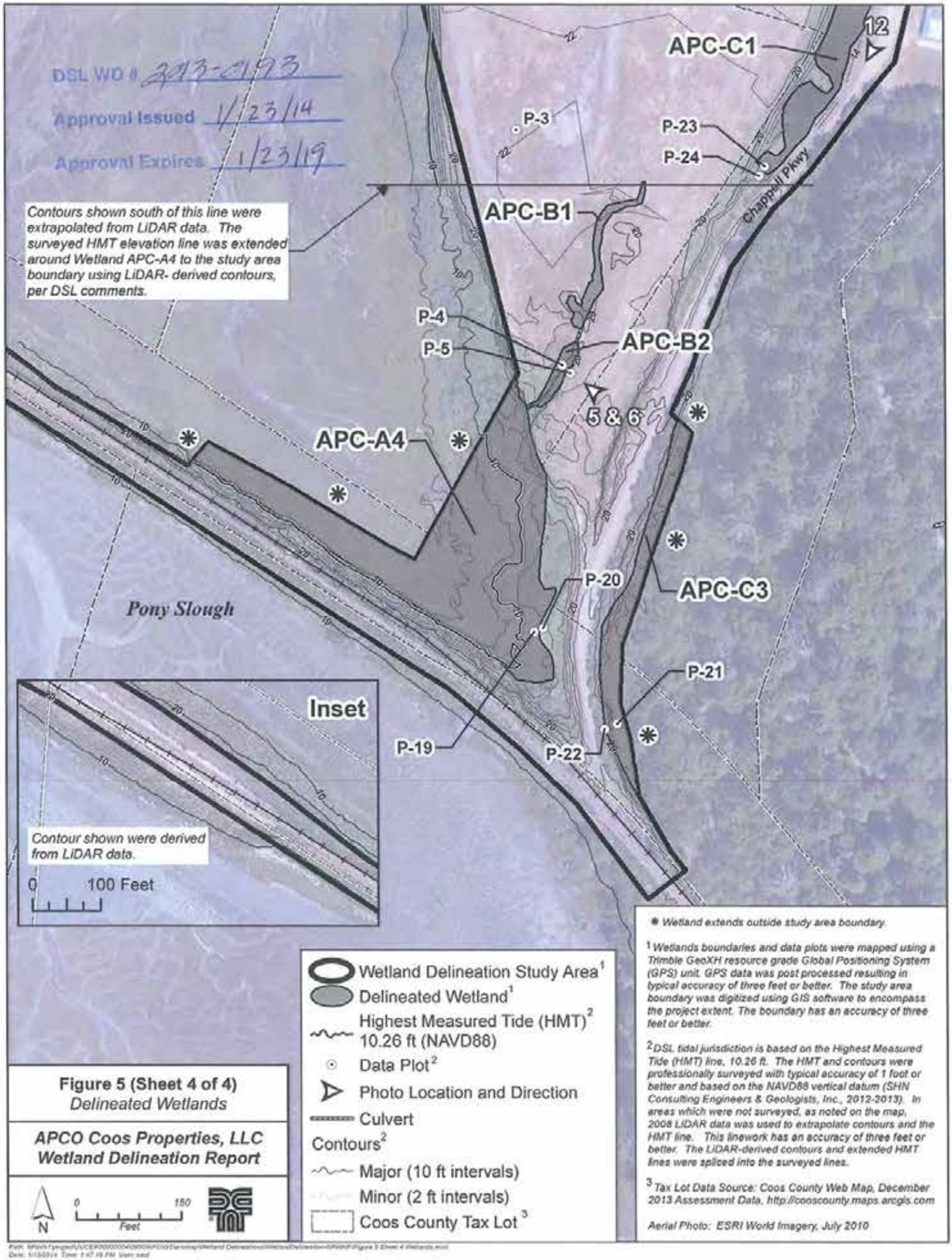

Figure 5 (Sheet 4 of 4)
Delineated Wetlands

APCO Coos Properties, LLC Wetland Delineation Report

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Date: 1/13/2014 Time: 1:47:18 PM User: eed

WETLAND DELINEATION / DETERMINATION REPORT COVER FORM

This form must be included with any wetland delineation report submitted to the Department of State Lands for review and approval. A wetland delineation report submittal is not "complete" unless the fully completed and signed report cover form and the required fee are submitted. Attach this form to the front of an unbound report or include a hard copy of the completed form with a CD/DVD that includes a single PDF file of the report cover form and report (minimum 300 dpi resolution) and submit to: **Oregon Department of State Lands, 775 Summer Street NE, Suite 100, Salem, OR 97301-1279.** A single PDF attachment of the completed cover from and report may be e-mailed to **Wetland_Delineation@dsl.state.or.us**. For submittal of PDF files larger than 10 MB, e-mail instructions on how to access the file from your ftp or other file sharing website. Fees can be paid by check or credit card. Make the check payable to the Oregon Department of State Lands. To pay the fee by credit card, call 503-986-5200.

RECEIVED
JUN 14 2013
DEPARTMENT OF STATE LANDS

☒ Applicant ☐ Owner Name, Firm and Address:
Attn: Bob Braddock, Vice President-Project Manager
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, OR 97420

Business phone # **541-266-7510**
Mobile phone # (optional)
E-mail: **bobbraddock@attglobal.net**

☒ Authorized Legal Agent, Name and Address:
Joe McKeown
APCO Coos Properties, LLC
PO Box 300
Coos Bay, OR 97420

Business phone #
Mobile phone #
E-mail:

I either own the property described below or I have legal authority to allow access to the property. I authorize the Department to access the property for the purpose of confirming the information in the report, after prior notification to the primary contact.
Typed/Printed Name: **Joe McKeown** Signature: [redacted]
Date: Special instructions regarding site access:

Project and Site Information (using decimal degree format for lat/long., enter centroid of site or start & end points of linear project)

Project Name: **APCO Coos Properties, LLC**	**Latitude: 43.42183** **Longitude: -124.22648**
Proposed Use: **Construction staging**	Tax Map # **25S13W10TL00800A1, 25S1310TL01000**
Project Street Address (or other descriptive location): **SW quadrant of the Coos Bay Hwy 101 bridge**	Township **25S** Range **13W** Section **10** QQ Tax Lot(s) **00800A1, 01000**
City: **near North Bend** County: **Coos**	Waterway: **near Coos Bay** River Mile: **na** NWI Quad(s): **Empire** ESH

Wetland Delineation Information

Wetland Consultant Name, Firm and Address:
Attn: Ethan Rosenthal
David Evans and Associates, Inc.
2100 SW River Parkway
Portland, OR 97201

Phone # **503-499-0572**
Mobile phone #
E-mail: **ejro@deainc.com**

The information and conclusions on this form and in the attached report are true and correct to the best of my knowledge.
Consultant Signature: [redacted] Date: **5-6-13**

Primary Contact for report review and site access is ☒ Consultant ☐ Applicant/Owner ☐ Authorized Agent

Wetland/Waters Present? ☒ Yes ☐ No | Study Area size: **76.93 acres** Total Wetland Acreage: **8.33 acres**

Check Box Below if Applicable:

- ☐ R-F permit application submitted
- ☐ Mitigation bank site
- ☐ Wetland restoration/enhancement project (not mitigation)
- ☐ Industrial Land Certification Program Site
- ☐ Reissuance of a recently expired delineation
  Previous DSL # Expiration date ____

Fees:

- ☐ Fee payment submitted **$ 388**
- ☐ Fee ($100) for resubmittal of rejected report
- ☐ No fee for request for reissuance of an expired report

Other Information:

	Y	N	
Has previous delineation/application been made on parcel?	☐	☒	If known, previous DSL #
Does LWI, if any, show wetland or waters on parcel?	☒	☐	

For Office Use Only KV

DSL Reviewer: LM Fee Paid Date: ___/___/___ DSL WD # 2013-0193
Date Delineation Received: 6 / 14 / 13 DSL Project # ____ DSL Site # ____
Scanned: ☒ Final Scan: ☐ DSL WN # ____ DSL App. # ____

C.6. Oregon DSL Wetland Delineation Concurrence Letter WD #2013-0218

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

February 13, 2014

Bob Braddock
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, OR 97420

Re: Wetland Delineation Report for Jordan Cove LNG Terminal, Coos County; T25S R13W Sec. 3, Tax Lot 20000; Sec. 4, Tax Lots10000, 20000, 50000; WD #2013-0218

Dear Mr. Braddock:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lots described above (see the attached map). Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 6, sheets 1-4 of the report. Please replace all copies of the preliminary wetland maps with these final Department-approved maps. Within the study area, the Coos Bay estuary, 14 wetlands (totaling approximately 13.18 acres), one ditch, and an undetermined area of estuarine habitat below the highest measured tide (HMT) were identified. The estuary, estuarine habitat, and all wetlands except F, G, I-south, and N are subject to the permit requirements of the state Removal-Fill Law. The Coos Bay estuary and all hydrologically-connected wetlands—wetlands M, H, and J—are designated essential salmonid habitat; therefore, fill or removal of any amount of material within these wetlands or within the HMT may require a state permit. The elevation of HMT along the Coos Bay estuary in Empire is 10.0 feet above MLLW, or 10.26 feet above NAVD88. Wetlands F, G, I-south, and N and the ditch south of wetland N are created in upland fill material and are not state regulated.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you

work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

Enclosures

ec: Ethan Rosenthal, David Evans and Associates, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL



Figure 1

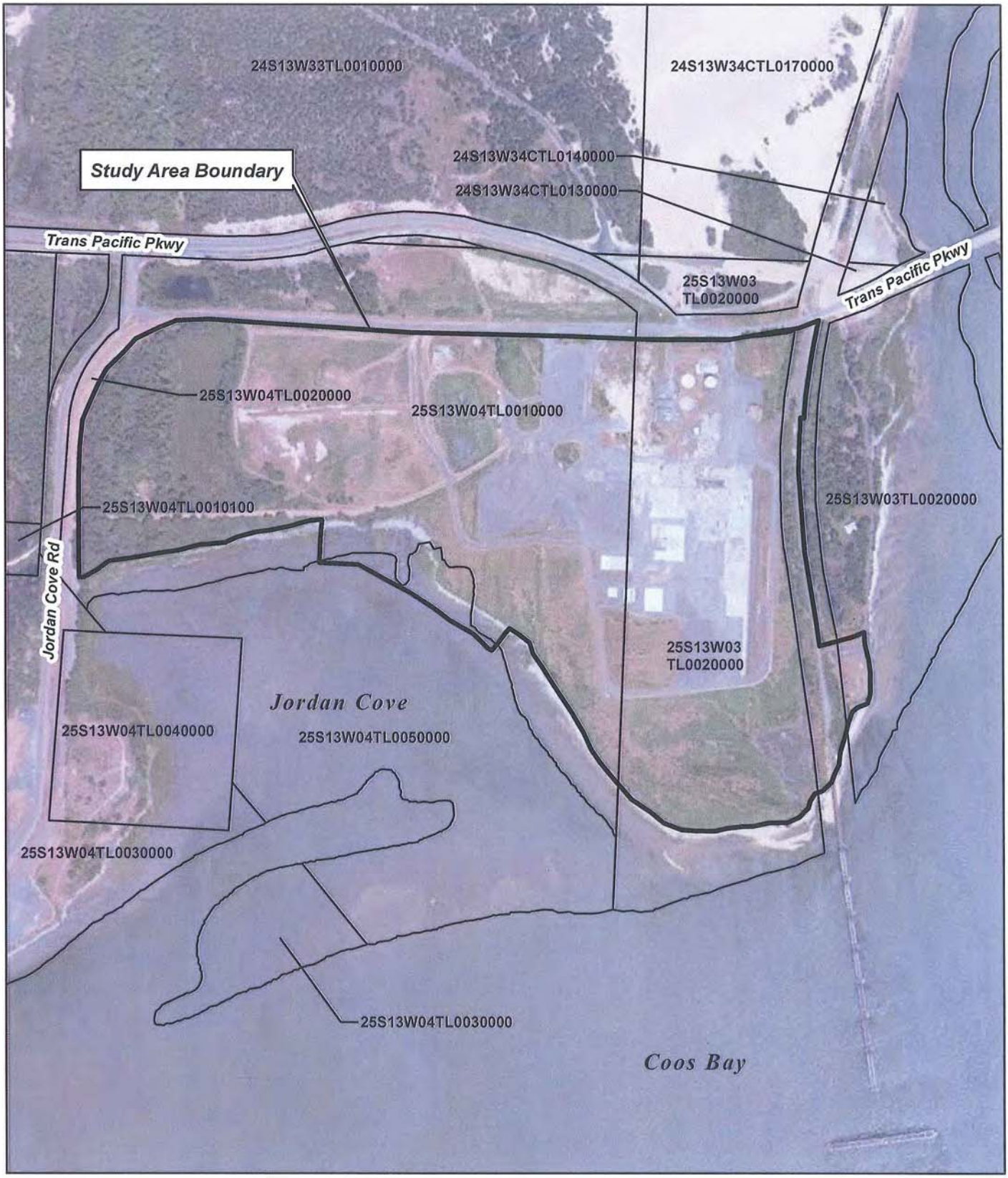
Project Location

N

0 1 2 Miles

Date: 7/8/2013 2:32:06 PM sast

Path: \\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Habitat_Assessment\WetlandDelineation-LinerboardRewrite_2013_07\Fig 1 Vicinity Map.mxd



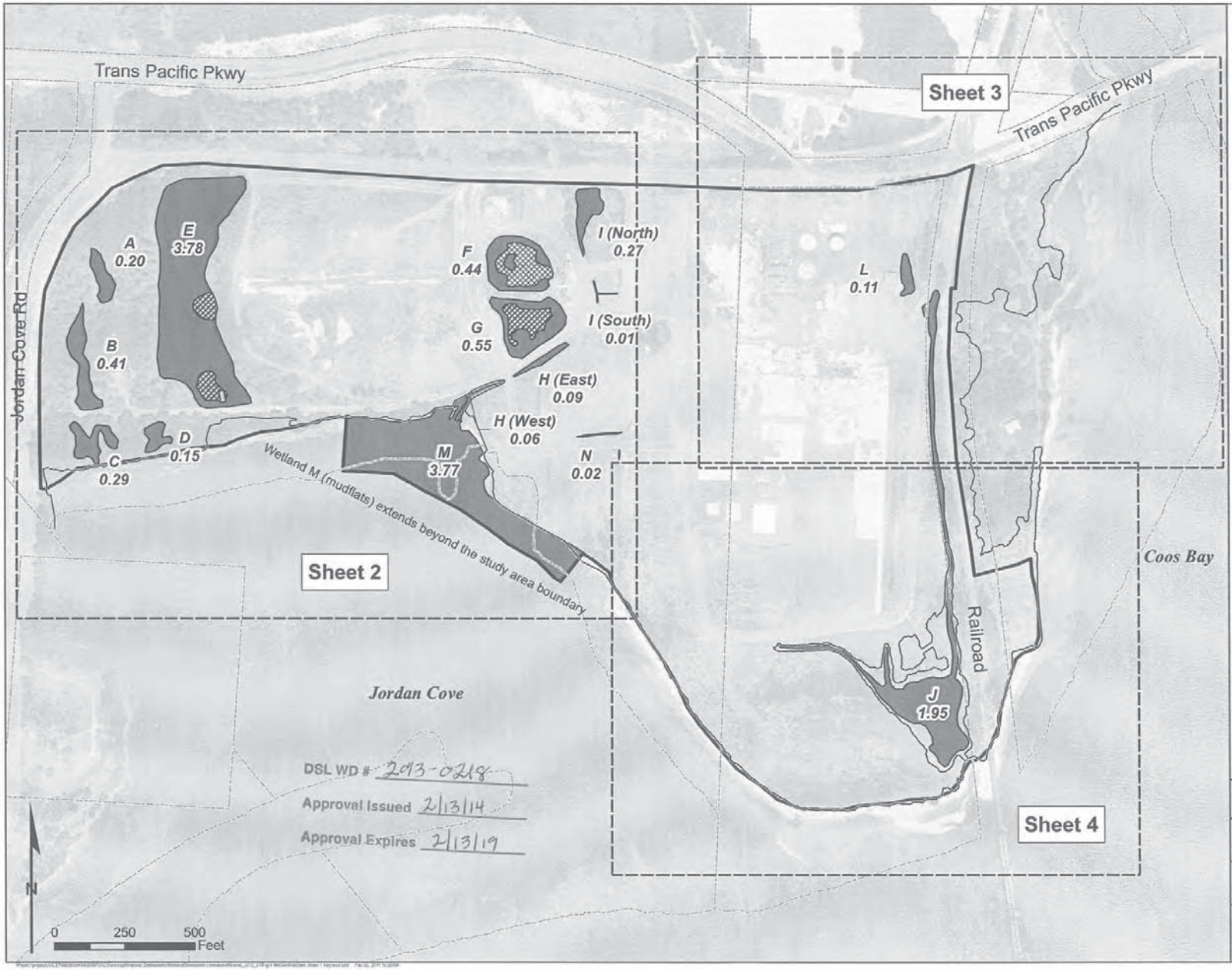
Tax Lots: Coos County Assessor, November 2013

Figure 2
Tax Lots

N

0 0.1 0.2 Mile

Date: 12/5/2013 3:19:02 PM sast
Path: \\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Habitat_Assessment\WetlandDelineation-LinerboardRewrite_2013_07\Fig 2 Taxlots.mxd





Approximate Extent of Sheets 2 to 4

Wetland Delineation Study Area

Delineated Wetland

Open Water

Highest Measured Tide (HMT)* 10.26 ft (NAVD88)

Coos County Tax Lot

Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.

*DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. HMT was professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum. The shoreline was not surveyed southeast of Wetland J and in the northeast portion of the study area. In these areas, LiDAR (point cloud data) was used to extrapolate the HMT elevation line which was then spliced into the surveyed lines. In the area adjacent to Wetlands C and D, the surveyed lines were modified to follow the shoreline, per comments from DSL approval of WD# 2011-006. The non-surveyed HMT line has an estimated accuracy of three feet or better.

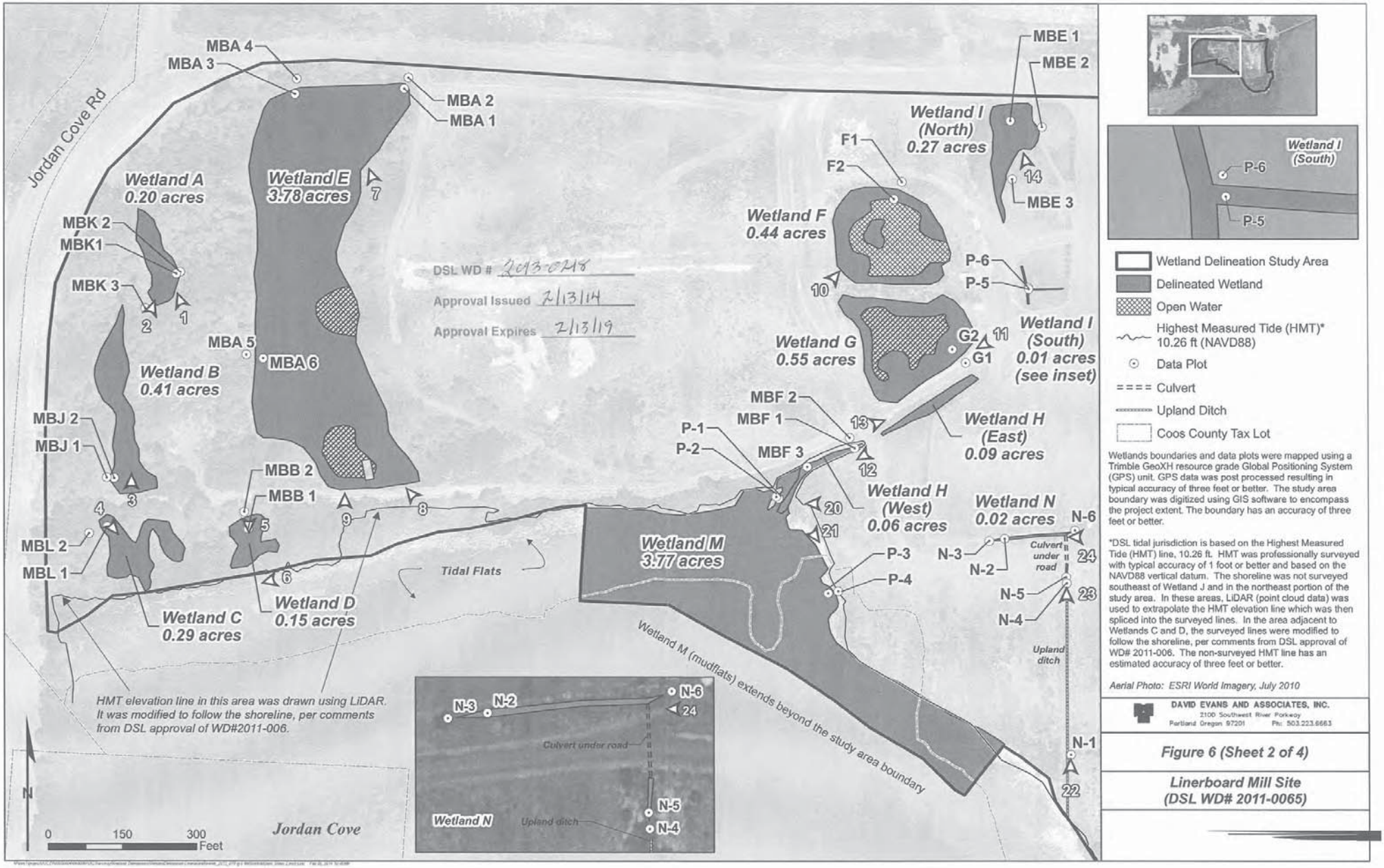
Aerial Photo: ESRI World Imagery, July 2010

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

Figure 6 (Sheet 1 of 4)

Linerboard Mill Site
(DSL WD# 2011-0065)

Wetland Delineation



Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.

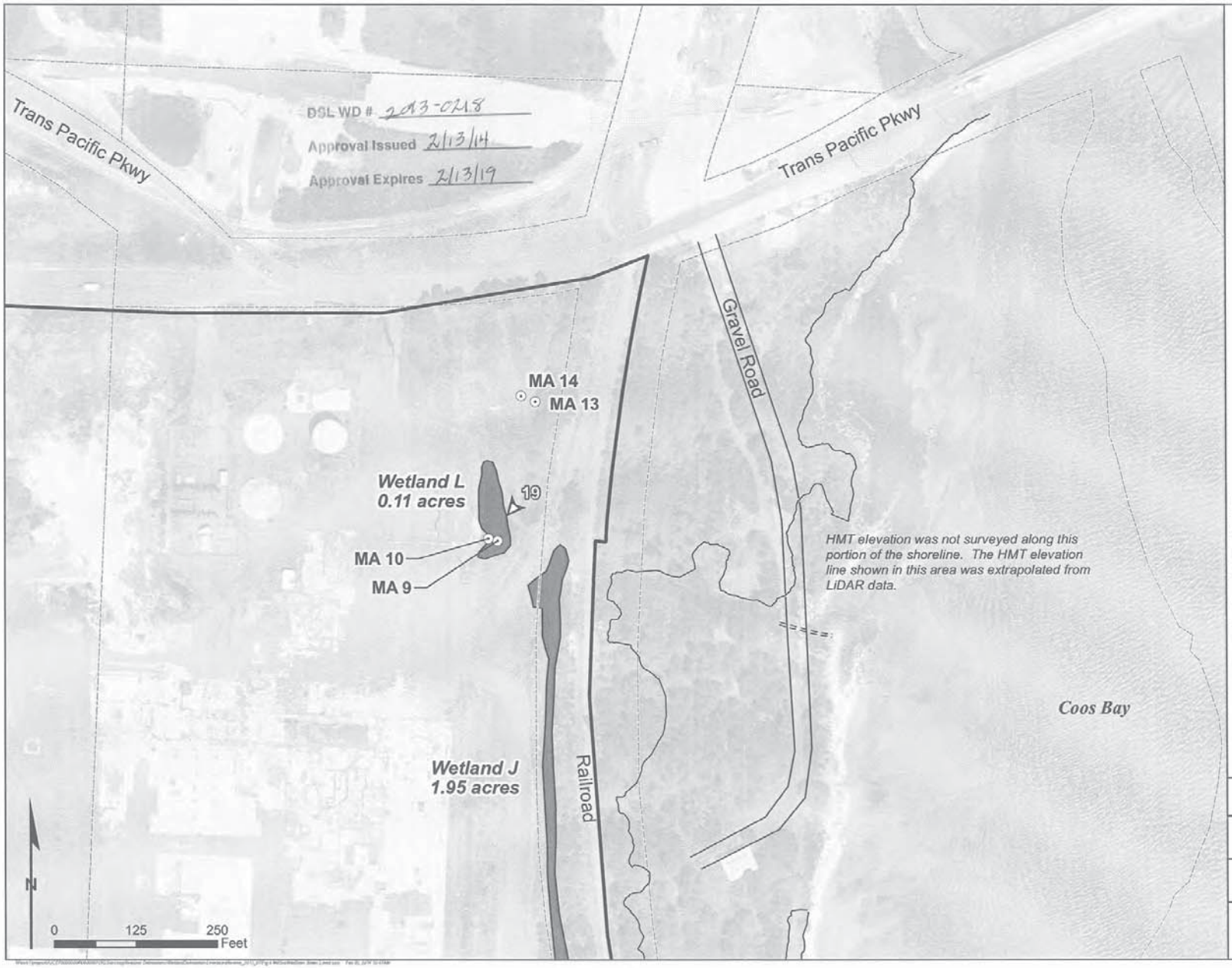
*DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. HMT was professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum. The shoreline was not surveyed southeast of Wetland J and in the northeast portion of the study area. In these areas, LiDAR (point cloud data) was used to extrapolate the HMT elevation line which was then spliced into the surveyed lines. In the area adjacent to Wetlands C and D, the surveyed lines were modified to follow the shoreline, per comments from DSL approval of WD# 2011-006. The non-surveyed HMT line has an estimated accuracy of three feet or better.

Aerial Photo: ESRI World Imagery, July 2010

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

Figure 6 (Sheet 2 of 4)

Linerboard Mill Site (DSL WD# 2011-0065)





- Delineated Wetland
- Open Water
- Highest Measured Tide (HMT)* 10.26 ft (NAVD88)
- Data Plot
- Photo Location and Direction
- Culvert
- Gravel Road
- Coos County Tax Lot

Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.

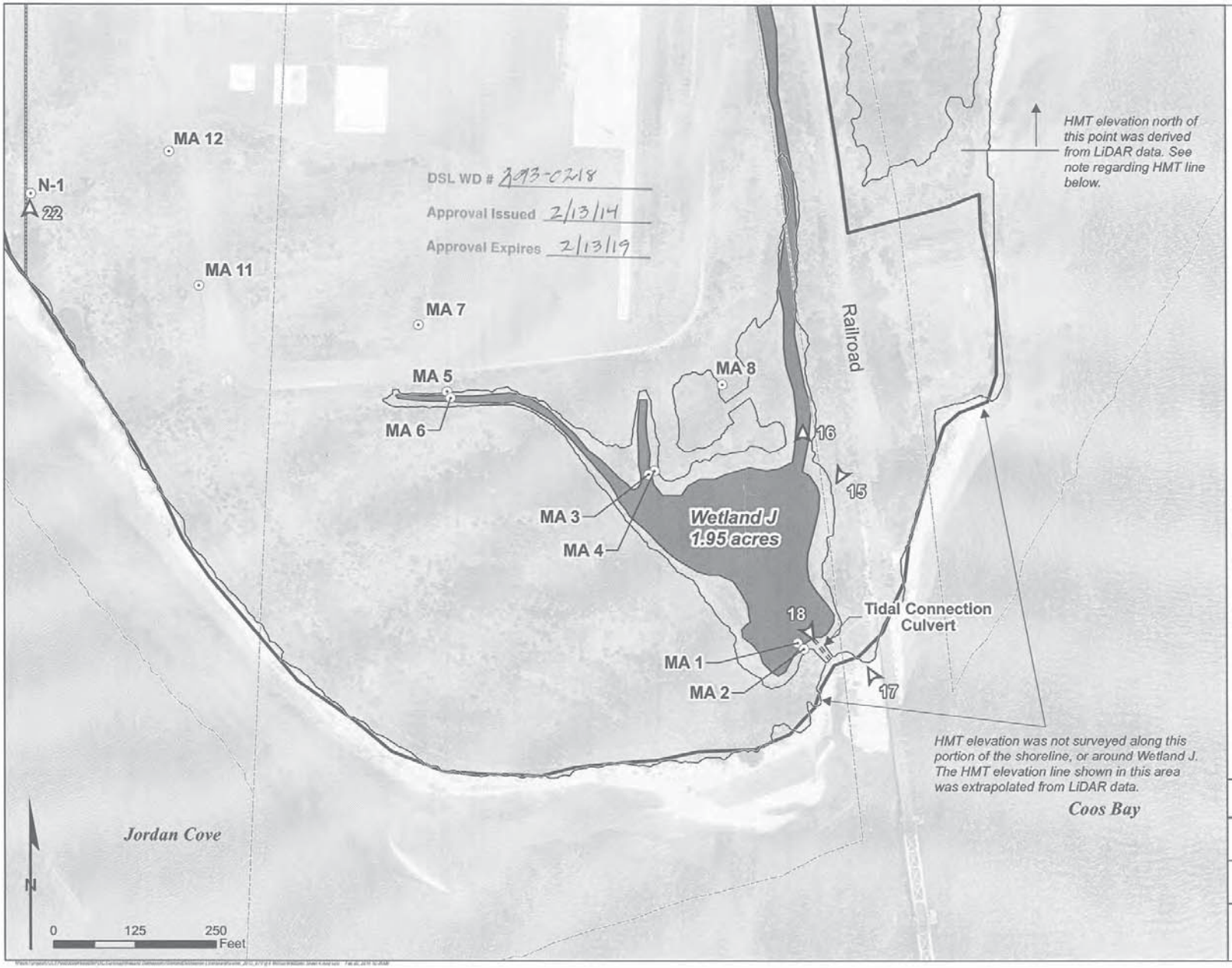
*DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. HMT was professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum. The shoreline was not surveyed southeast of Wetland J and in the northeast portion of the study area. In these areas, LiDAR (point cloud data) was used to extrapolate the HMT elevation line which was then spliced into the surveyed lines. In the area adjacent to Wetlands C and D, the surveyed lines were modified to follow the shoreline, per comments from DSL approval of WD# 2011-006. The non-surveyed HMT line has an estimated accuracy of three feet or better.

Aerial Photo: ESRI World Imagery, July 2010

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

Figure 6 (Sheet 3 of 4)

Linerboard Mill Site
(DSL WD# 2011-0065)





Wetland Delineation Study Area
Delineated Wetland
Open Water
Highest Measured Tide (HMT)* 10.26 ft (NAVD88)
Data Plot
Culvert
Upland Ditch
Coos County Tax Lot

Wetlands boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.

*DSL tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. HMT was professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum. The shoreline was not surveyed southeast of Wetland J and in the northeast portion of the study area. In these areas, LiDAR (point cloud data) was used to extrapolate the HMT elevation line which was then spliced into the surveyed lines. In the area adjacent to Wetlands C and D, the surveyed lines were modified to follow the shoreline, per comments from DSL approval of WD# 2011-006. The non-surveyed HMT line has an estimated accuracy of three feet or better.

Aerial Photo: ESRI World Imagery, July 2010

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

Figure 6 (Sheet 4 of 4)

Linerboard Mill Site
(DSL WD# 2011-0065)

C.7. Oregon DSL Wetland Delineation Concurrence Letter WD #2014-0253

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

February 13, 2014

Knife River Corporation
Attn: Richard E. Skinner
3055 Ocean Boulevard
Coos Bay, OR 97420

Re: Wetland Delineation Report for North Point Workforce Housing Access, Coos County; T25S R13W Sec. 10, Tax Lots 800A01, 80200, 80300, 10000, 20000, 30000, 70000, Highway 101 R.O.W; WD #2013-0253

Dear Mr. Skinner:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lots described above (see the attached map). Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 5 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map. Within the study area, five wetlands (totaling approximately 0.18 acres) were identified. The wetlands are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity, or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

Enclosures

ec: Loren Stucker, David Evans and Associates, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers, Eugene office
Bob Lobdell, DSL

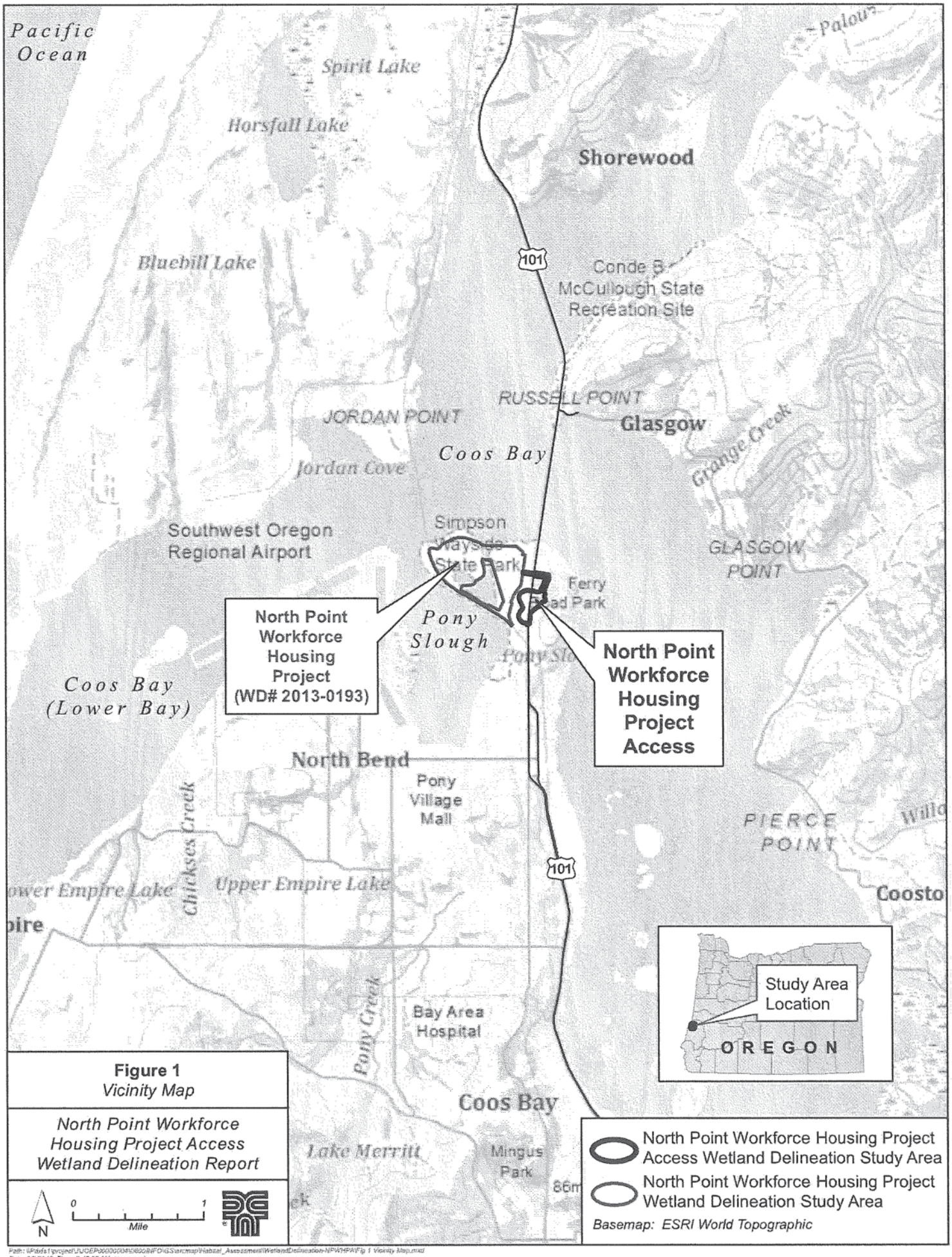


Figure 1
Vicinity Map

North Point Workforce Housing Project Access Wetland Delineation Report

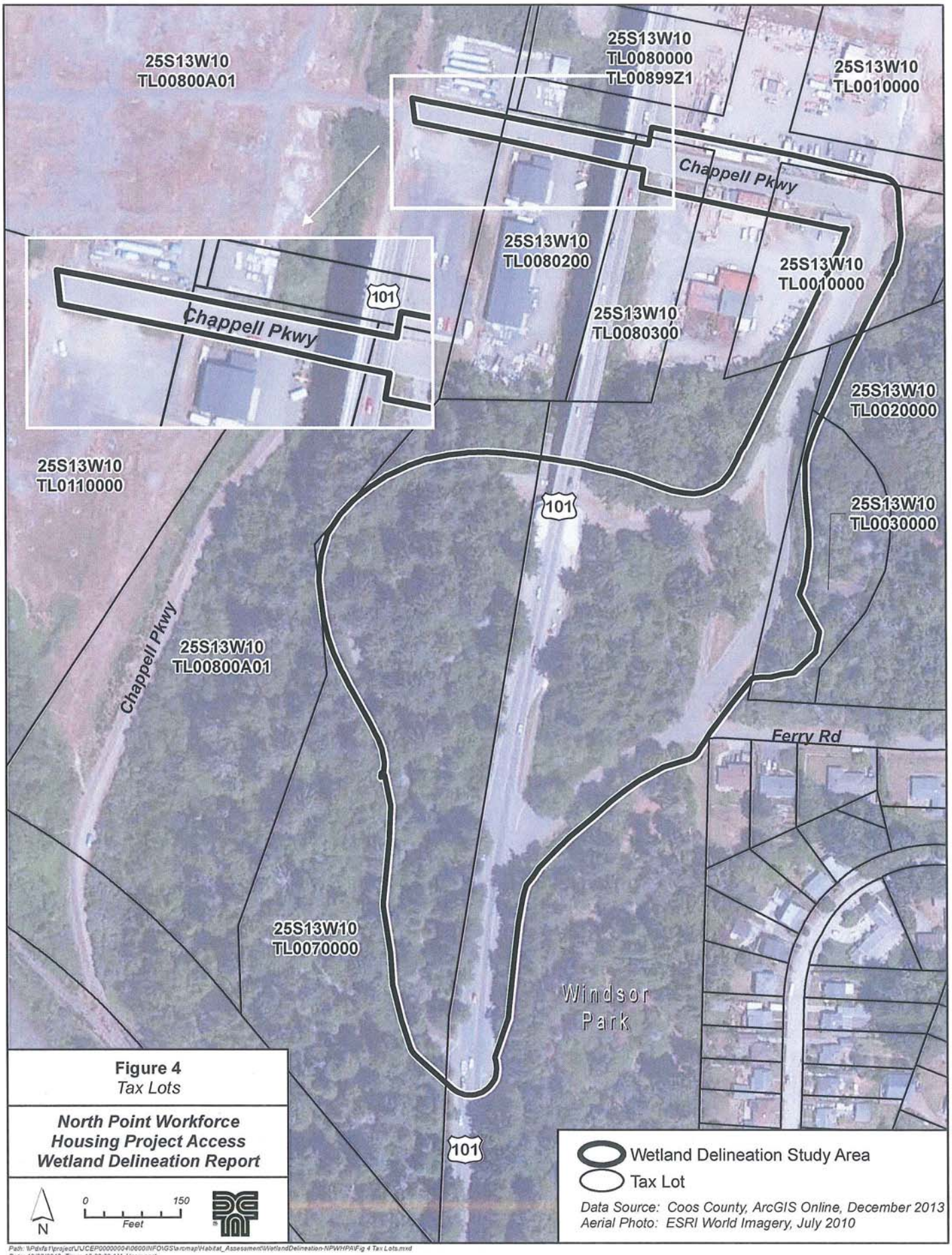


Figure 4
Tax Lots

North Point Workforce Housing Project Access Wetland Delineation Report

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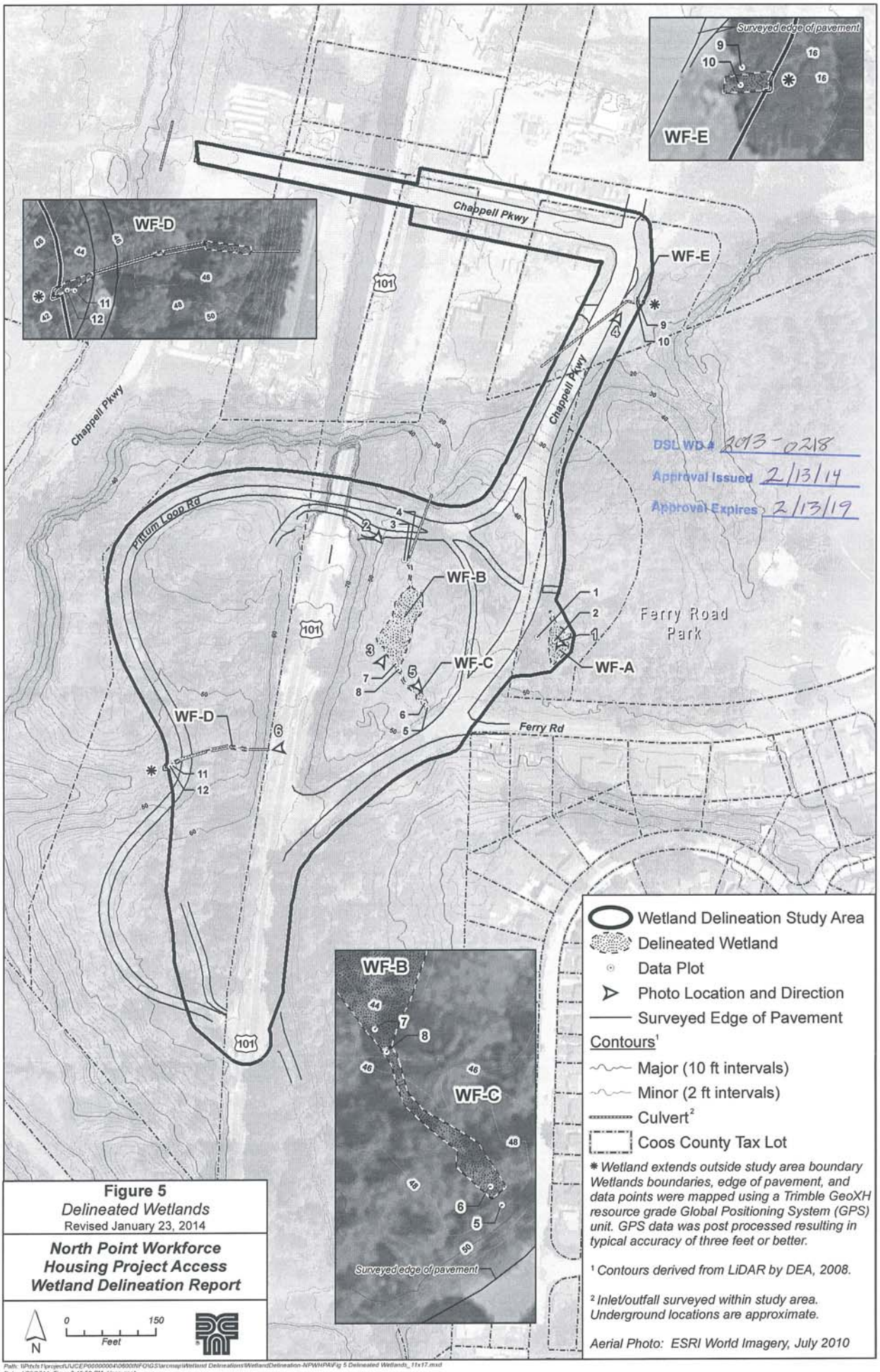

Figure 5
Delineated Wetlands
Revised January 23, 2014

North Point Workforce Housing Project Access Wetland Delineation Report

Path: \\Phds1\project\U\UCEP0000004\0600\NFOGS\arcmap\Wetland Delineations\Wetland\Delineation-NPWHPA\Fig 5 Delineated Wetlands_11x17.mxd
Date: 1/23/2014 Time: 3:46:59 PM User: sast

C.8. Oregon DSL Wetland Delineation Concurrence Letter WD #2014-0090

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

August 12, 2014

Bob Braddock
Jordan Cove Energy Project, L.P.
125 Central Avenue, Suite 380
Coos Bay, OR 97420

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

Re: Wetland Delineation Report for Jordan Cove LNG Terminal Project Wetland Mitigation, Coos County; T25S R13W Sec. 4, Tax Lots 30000 and 40000; WD #2014-0090

Dear Mr. Braddock:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lots described above (see the attached map). Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 5 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map.

Within the study area, the Coos Bay estuary, 4.26 acres of wetlands, and an undetermined area of estuarine habitat below Highest Measured Tide (HMT) were identified. All wetlands (including Wetland C) and all areas below HMT are subject to the permit requirements of the state Removal-Fill Law. The Coos Bay estuary and all hydrologically-connected wetlands (Wetlands A and B) are designated essential salmonid habitat; therefore, fill or removal of any amount of material may require a state permit. The elevation of HMT along the Coos Bay estuary in Empire is 10.26 feet above the NAVD88 datum.

This area of the Coos River is a state-owned waterway; any activity encroaching within the submerged and submersible land below the line of ordinary high water may require a lease, registration, or easement to occupy state-owned land. Please contact Jim Grimes at 503-986-5233 for more information.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5300 if you have any questions.

Sincerely,

Lynne McAllister
Wetland Specialist

Approved by

Kathy Verble, CPSS
Acting Wetlands Program Manager

Enclosures

ec: Ethan Rosenthal, David Evans and Associates, Inc.
Coos County Planning Department
Tyler Krug, Corps of Engineers
Bob Lobdell, DSL



Path: \\Pdxfs1\project\JJCEP00000004\0600INFO\GIS\arcmap\Wetland Delineations\WetlandDelineation-West Jordan Cove Mitigation Site\Figure 1 Vicinity Map.mxd
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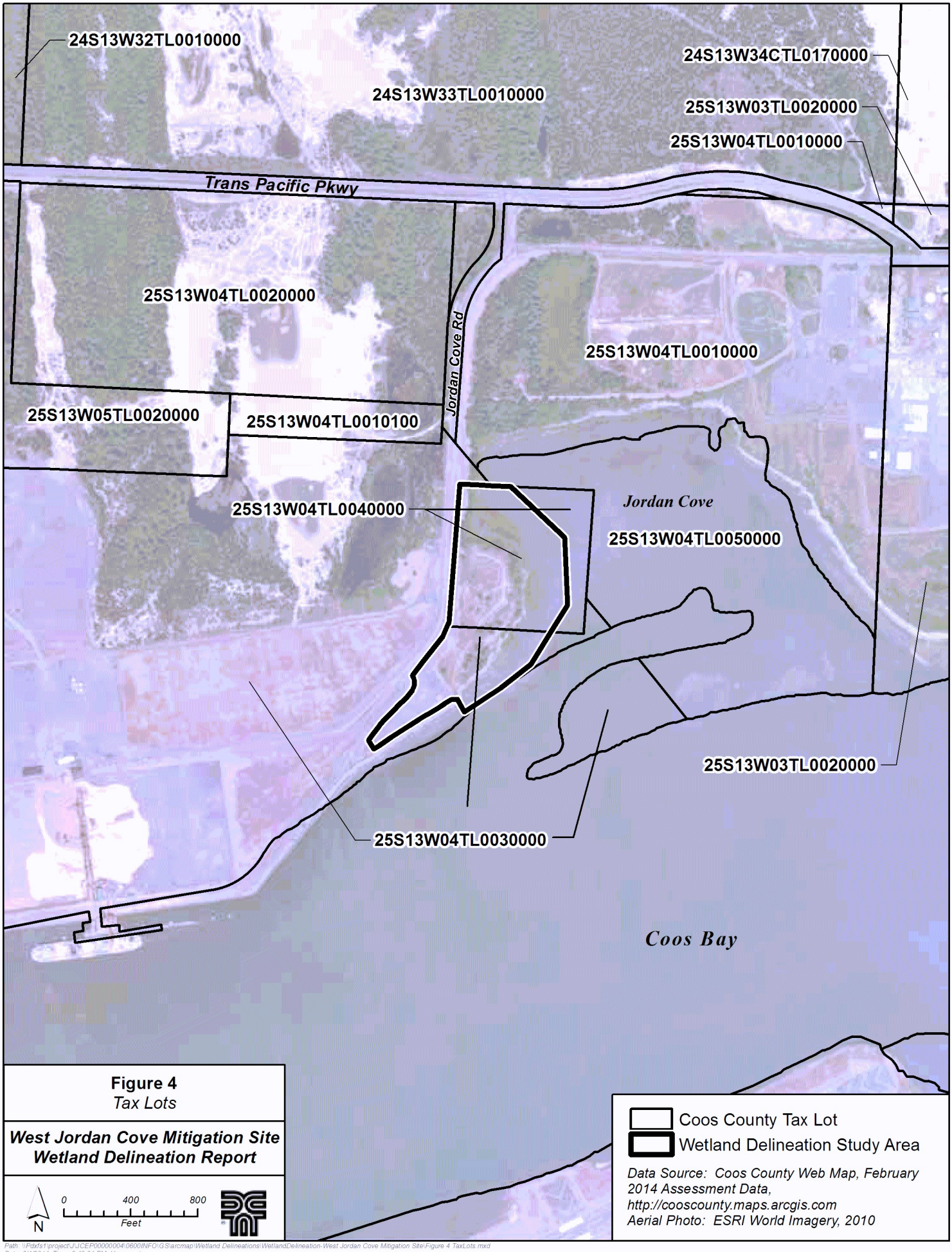

Figure 4
Tax Lots

West Jordan Cove Mitigation Site
Wetland Delineation Report

N
0 400 800
Feet

Coos County Tax Lot
Wetland Delineation Study Area

Data Source: Coos County Web Map, February 2014 Assessment Data, http://cooscounty.maps.arcgis.com
Aerial Photo: ESRI World Imagery, 2010

Path: \\Pdxfs1\project\JJCEP00000004\0600INFO\GS\arcmap\Wetland Delineations\WetlandDelineation-West Jordan Cove Mitigation Site\Figure 4 TaxLots.mxd
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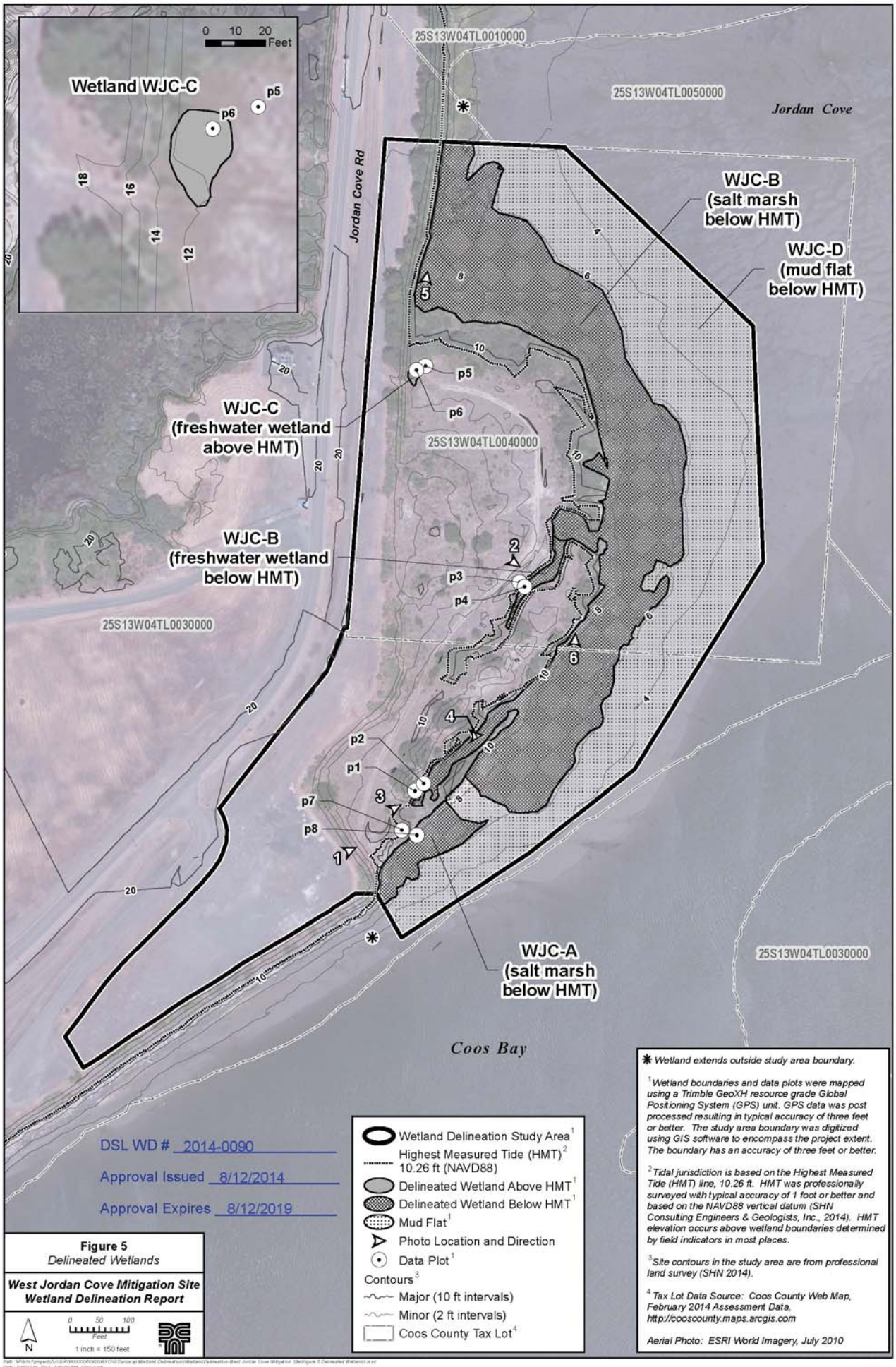
0 10 20 Feet
Wetland WJC-C
p5
p6
18
16
14
12
20
25S13W04TL0010000
25S13W04TL0050000
Jordan Cove
Jordan Cove Rd
WJC-B
(salt marsh
below HMT)
WJC-D
(mud flat
below HMT)
WJC-C
(freshwater wetland
above HMT)
25S13W04TL0040000
WJC-B
(freshwater wetland
below HMT)
25S13W04TL0030000
WJC-A
(salt marsh
below HMT)
Coos Bay
p1
p2
p3
p4
p7
p8
1
2
3
4
5
6
DSL WD # 2014-0090
Approval Issued 8/12/2014
Approval Expires 8/12/2019
Wetland Delineation Study Area[1]
Highest Measured Tide (HMT)[2]
10.26 ft (NAVD88)
Delineated Wetland Above HMT[1]
Delineated Wetland Below HMT[1]
Mud Flat[1]
Photo Location and Direction
Data Plot[1]
Contours[3]
Major (10 ft intervals)
Minor (2 ft intervals)
Coos County Tax Lot[4]
✱ Wetland extends outside study area boundary.
[1] Wetland boundaries and data plots were mapped using a Trimble GeoXH resource grade Global Positioning System (GPS) unit. GPS data was post processed resulting in typical accuracy of three feet or better. The study area boundary was digitized using GIS software to encompass the project extent. The boundary has an accuracy of three feet or better.
[2] Tidal jurisdiction is based on the Highest Measured Tide (HMT) line, 10.26 ft. HMT was professionally surveyed with typical accuracy of 1 foot or better and based on the NAVD88 vertical datum (SHN Consulting Engineers & Geologists, Inc., 2014). HMT elevation occurs above wetland boundaries determined by field indicators in most places.
[3] Site contours in the study area are from professional land survey (SHN 2014).
[4] Tax Lot Data Source: Coos County Web Map, February 2014 Assessment Data, http://cooscounty.maps.arcgis.com
Aerial Photo: ESRI World Imagery, July 2010
Figure 5
Delineated Wetlands
West Jordan Cove Mitigation Site
Wetland Delineation Report
N
0 50 100 Feet
1 inch = 150 feet

TAB: D. EXCAVATED AND DREDGED MATERIAL MANAGEMENT PLAN

OREGON INTERNATIONAL PORT OF COOS BAY

SLIP AND ACCESS CHANNEL

EXCAVATED & DREDGED MATERIAL MANAGEMENT PLAN

Prepared for:

OREGON INTERNATIONAL Port of Coos Bay

Rev No	0	1	2	3	4
Issue Purpose	Project Name Revision	Revised	Revised Placement Site	Revised Phasing	Revised
Date	1/9/07	8/14/07	1/23/08	3/4/08	5/8/13
By	MUL	MUL	SPT	MS	BJH
Checked	LW	TM	TM	SPT	SPT
Approved	MW	MW	MW	MW	TM

Prepared by:

moffatt & nichol

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LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

ac	Acre(s)
AOA	Airport Operating Area
ASTM	American Society of Testing and Materials
BLM	Bureau of Land Management
CDF	Confined Disposal Facility
CHE	Coast & Harbor Engineering
CPT	Cone Penetration Test
CWA	Clean Water Act
cy	Cubic yard(s)
CZMA	Coastal Zone Management Act
DEA	David Evans and Associates, Inc.
D_{50}	Median grain size
DMEF	Dredged Material Evaluation Framework
EDMMP	Excavated & Dredged Material Management Plan
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
ft	Feet
GPM	Gallons per minute
in	Inches
JCE	Jordan Cove Energy
JCEP	Jordan Cove Energy Project
IWP	Industrial Waste Pond
LF	Lineal foot
LIDAR	Light Detection And Ranging
LNG	Liquefied Natural Gas
mcy	Million cubic yards
mi	Mile(s)
MLLW	Mean Lower Low Water
mm	Millimeter
MN	Moffatt & Nichol
MPRSA	Marine Protection, Research, and Sanctuaries Act
MSL	Mean Sea Level
N	Standard penetration number

NAVD88	North American Vertical Datum 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODLCD	Oregon Department of Land Conservation and Development
ODMDS	Ocean Dredged Material Disposal Site
ODSL	Oregon Department of State Lands
OPRD	Oregon Parks and Recreation Department
POCB	Oregon International Port of Coos Bay, or Port of Coos Bay
REIL	Runway End Indicator Lighting
RM	River mile
SAP	Sampling and Analysis Plan
SHN	SHN Consulting Engineers & Geologists, Inc.
SWORA	Southwest Oregon Regional Airport
TVS	Total Volatile Solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
σ	Standard deviation

1.0 EXECUTIVE SUMMARY

This Excavated and Dredged Material Management Plan (EDMMP) has been prepared to provide information pertaining to the excavation and dredging management of material associated with the Oregon International Port of Coos Bay's Slip and Access Channel near the Jarvis Turn in the federal navigation channel. The document includes a discussion of the purpose of the excavation and dredging; a regulatory overview; sediment characterization; an overview of available dredging and dredged material management technologies; and identification and evaluation of alternatives for the management of construction and maintenance excavated and dredged material.

Purpose and Project Overview

The purpose of the proposed excavation and dredging activities is to support the construction of a new terminal in Coos Bay, Oregon. An area of dry land will be excavated and dredged to form a slip able to accommodate a berth for a post-panamax vessel, herein referred to as the Port of Coos Bay (POCB) Slip. The minimum water depth within the POCB Slip and Access Channel is -45.0 feet (ft) NAVD88 and dredging volumes include 2 ft of over depth dredging.

Construction of the POCB Slip and Access Channel includes the excavation and dredging of approximately 5.65 million cubic yards (mcy) of material, as outlined in Table 1-1. Dredging activities in the POCB Slip and Access Channel and transfer of material to be stockpiled at the placement sites will be performed in three phases: the *Upland Phase,* the *In-Water Phase 1,* and the *In-Water Phase 2*.

- The *Upland Phase* will involve completing a portion of the POCB Slip dredging activities while the slip is completely isolated from Coos Bay. This will be accomplished by retaining a natural earthen berm (approximately 40 feet wide at the crest) to provide a physical partition between Coos Bay and the *Upland Phase* construction activities. The berm will have sufficient size and height to prevent breaching by high sea water levels or ship wakes. During the *Upland Phase*, approximately 1.63 mcy will be excavated using scrapers and excavators and an additional 2.18 mcy will be hydraulically dredged from within the isolated dredge launch pond. The production rate for this phase is limited by the requirement that the dredging equipment fit inside the dredge launch pond.

- The In-*Water Phase 1* will include the dredging of 1.35 mcy of material to form an access channel adjacent to the Coos Bay Navigation Channel. The *In-Water Phase 1* will be conducted during the in-water work window between October 1st and February 15th.

- The *In-Water Phase 2* will include removal of the natural earthen berm, approximately 500,000 cy of material. The *In-Water Phase 2* will be conducted during a second in-water work window following *In-Water Phase 1*. Dredging will be conducted from both the Coos Bay side and the dredge launch pond side

of the berm to reduce the duration for breaching and removing the natural earthen berm. Removing the berm will open the POCB Slip to Coos Bay. Final dredging to contour the Access Channel will complete the construction dredging activities. Dredging from the Coos Bay side may have a larger production rate compared to the dredge launch pond side because there are fewer limitations on equipment size.

Table 1-1: Excavation/Dredge Volumes – Construction

Area	Construction Phase	Volume (mcy)
Upland Phase		
POCB Slip	Land-Based Excavation (For placement at the Mill Site and the Slip West Stockpile Site)	1.63
POCB Slip	Dredging in Launch Pond (For placement at the Mill Site and Ingram Yard)	2.18
In-Water Phase 1		
Access Channel	Dredging from Bay (For placement at the Mill Site)	1.35
In-Water Phase 2		
POCB Slip	Dredging Natural Earthen Berm (For placement at Ingram Yard)	0.50
	TOTAL	**5.65***
* Note: Total volume may not sum exactly due to rounding		

Periodic maintenance dredging will be required after construction of the slip is complete. The material to be dredged during the construction phase of the project consists primarily of densely packed fine-grained sand with traces of silt. In contrast, maintenance material will consist primarily of silt and clay material with some sand. The predicted average shoaling rate for the POCB Slip and Access Channel are 0.16 ft/yr and 0.56 ft/yr, respectively. This yields to approximately 8,500 cy/yr and 29,200 cy/yr, respectively.

The estimated frequency and volume of maintenance dredging is 3 years (1 time every 3 years) and a volume of 115,000 cy per dredging event for the initial 10 years after construction is complete. After the initial 10 years, the estimated frequency and volume of maintenance dredging is 5 years (1 time every 5 years) and a volume of approximately 115,000 to 160,000 cy per dredging event (Table 1-2). The volume of maintenance material to be dredged from the federal navigation channel is not included in this estimate. The portion of the Access Channel within the federal navigation channel will be maintained to the federally authorized depth by the US Army Corps of Engineers.

Table 1-2: Dredge Volumes – Maintenance Dredging

Area	Shoaling Rate (ft/yr)	Shoaled Volume (cy/yr)	Dredge Volume – Initial 10 Years (cy/3-Year Cycle)	Dredge Volume – After Initial 10 Years (cy/5-Year Cycle)
POCB Slip	0.16	8,500	115,000	115,000 – 160,000
Access Channel	0.56	29,200		

Dredged Material Management Alternatives

Twenty-two dredged material management alternatives were identified and evaluated using a three-tier screening process. These disposal sites included conventional open-water disposal, confined placement, and beneficial use. The screening criteria determined (I) is the alternative available for the project, (II) does the alternative meet the capacity requirements of the EDMMP, and (III) is the alternative technically, logistically, and environmentally feasible.

Based on the three-tier screening process, six sites were considered feasible for construction and/or maintenance dredged material. These sites are: ODMDS Site F (Open-Water Placement), Mill Site (Beneficial Use), Ingram Yard (Beneficial Use), North Spit Tsunami Protection Levee (Beneficial Use), Port Stockpile Site (Beneficial Use), and Slip West Stockpile Site (Beneficial Use). ODMDS Site F is also feasible for receiving maintenance dredged material. The locations of these six sites are shown in Figure 5-3.

Table 1-3 summarizes the six feasible alternatives for placement of construction and maintenance excavated/dredged material. The capacities provided in the table for the ODMDS Site F and the Port Site are based on the dredge volume required to construct the slip and/or access channel; actual capacities for these two sites may be much larger. The capacities provided for the remaining four placement sites represent the maximum capacity of the site based on site constraints, or the calculated fill quantity requirements to elevate the placement site to the finished grades discussed in Section 5. The duration column represents the time required to exhume the specified capacity at an assumed production rate.

Table 1-3: Feasible Construction & Maintenance Excavation/Dredging Placement Alternatives

Placement Alternative	Type	Dredge Method	Capacity (cy)	Duration (months)
Feasible Construction Placement Alternatives				
ODMDS Site F	Open-Water Placement	Mechanical Dredged	1,350,000	7.5
Mill Site	Beneficial Use	Excavated	1,617,000	10.7
Mill Site	Beneficial Use	Hydraulic Dredge	2,150,000	4.7
Ingram Yard	Beneficial Use	Hydraulic Dredge	1,880,000	4.3
North Spit Tsunami Protection Levee	Beneficial Use	Excavated	2,300,000	15.0
Port Site	Beneficial Use	Hydraulic Dredge	4,000,000	7.5
Slip West Stockpile Site	Beneficial Use	Excavated	13,000	0.1
Feasible Maintenance Placement Alternatives				
ODMDS Site F	Open-Water Placement	Mechanical Dredged	37,700	<1.0

Preferred Alternative and Schedule

The preferred material management alternative for the POCB Slip and Access Channel EDMMP is the placement of excavated and dredged material at the Mill Site, the Slip West Stockpile Site, and Ingram Yard. These sites were chosen based on:

- The beneficial use of material;
- Proximity to the excavation/dredging site;
- Ability to meet scheduling constraints;
- Ability to meet excavated and dredged material capacity requirements; and
- The fill material required to raise site elevations for the proposed adjacent site developments.

Table 1-4 outlines the preferred material management alternative for project construction and the estimated durations to exhume the specified capacity at an assumed production rate. Figure 1-1 provides a conceptual level construction schedule for the preferred material management alternative.

Table 1-4: Preferred Material Management Alternative for Construction Activities

Placement Site	Upland Phase *(Excavation)*	Upland Phase *(Dredging)*	In-Water Phase 1 *(Dredging)*	In-Water Phase 2 *(Dredging)*	Total
Mill Site ***(Beneficial Use)***					
Volume (mcy)	1.62	0.8	1.35	-	3.77
Duration** (Months)	10.7	2.2	2.5	-	15.4
Ingram Yard ***(Beneficial Use)***					
Volume (mcy)	-	1.38	-	0.5	1.88
Duration (Months)	-	3.8	-	0.5	4.3
Slip West Stockpile Site ***(Beneficial Use)***					
Volume (mcy)	0.01	-	-	-	0.01
Duration (Months)	0.1	-	-	-	0.1
Total Volume* (mcy)	1.63	2.18	1.35	0.50	**5.65**
Total Duration (Months)**	10.8	6.0	2.5	0.5	**16.5**

* Total volume does not sum due to rounding.
** Total duration values do not sum due to overlap of construction activities; See Figure 1-1.

Maintenance dredged material would be placed offshore in ODMDS Site F. ODMDS Site F is in close proximity to the entrance to Coos Bay and has sufficient capacity to accommodate all maintenance material that will be dredged for well over the first 50 years after construction is complete. Additionally, placement in ODMDS Site F allows maintenance dredging to be conducted using a clamshell dredge. This type of dredge is already in use for maintenance dredging at various locations along the channel.

Data Gaps

Several data gaps have been identified that must be completed during final design. Geotechnical investigation of the placement areas is required to confirm they have sufficient bearing capacity for the containment berms and the future site developments. Further geotechnical investigation of the excavated and dredged material is required to determine the dewatering rates of the hydraulically dredged material and existing soils, and verify the feasibility of the assumed containment berm side slopes and crest heights. Additionally, the sheet pile wall will need to be designed to accommodate the surcharge loads from stockpiled material at the Slip West Stockpile site. Finally, the construction schedule must be refined to account for weather delays and the possibility of an earlier start to the dredging window following further discussions and negotiations with ODFW, NMFS, and USFWS.

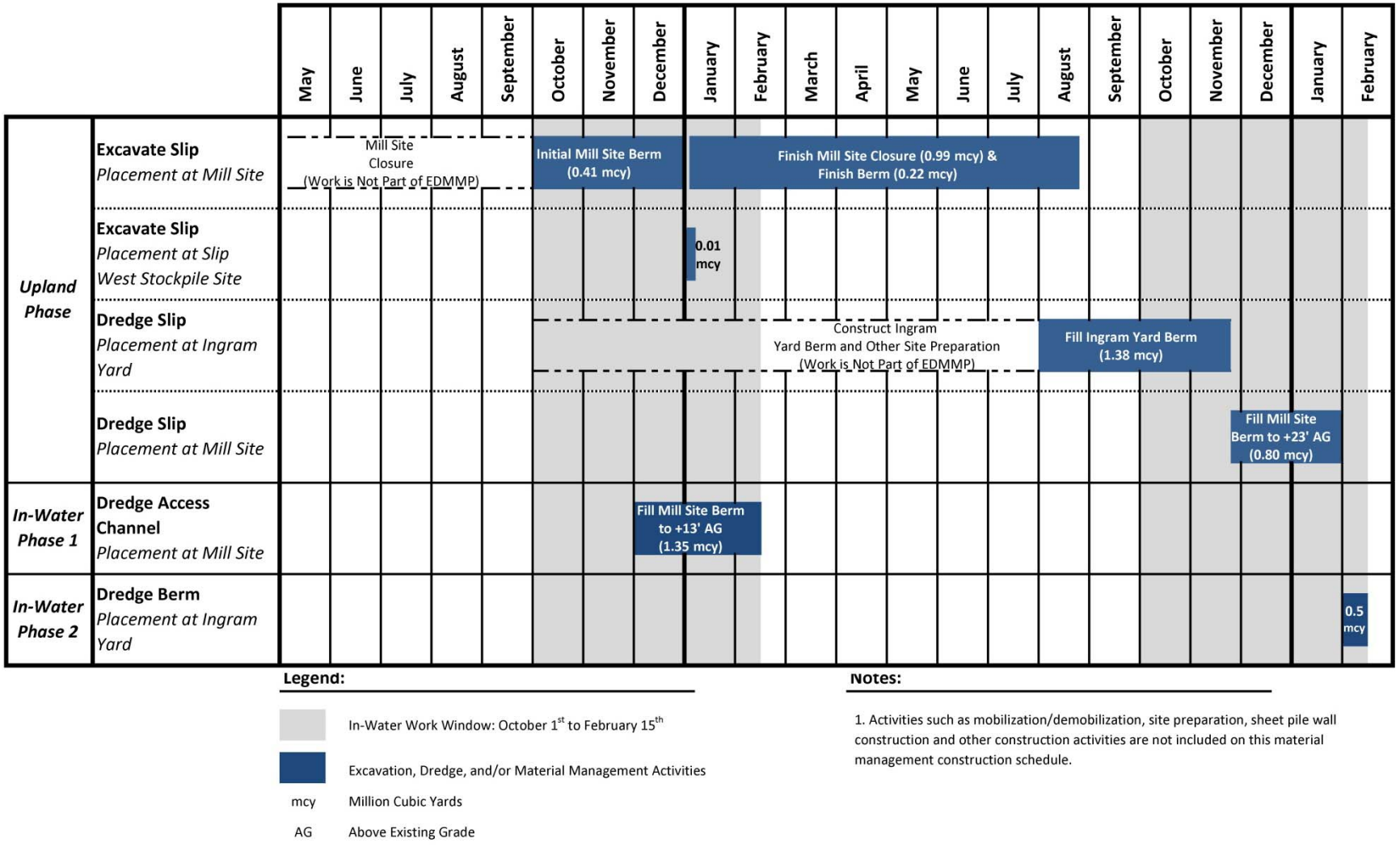


Figure 1-1: Preferred Material Management Construction Schedule

2.0 INTRODUCTION

2.1 Background

Coos Bay is located along the southern Pacific coast of Oregon, approximately 100 miles (mi) north of the California border. The Oregon International Port of Coos Bay, herein referred to as the POCB, is the largest port between San Francisco and the Columbia River. Historically, logging, shipping, and agriculture have been the foundation of the region's economy. However, waning of wood products harvest and manufacture has encouraged the POCB to diversify its economic base.

The POCB proposes to develop property that lies to the north of the Southwest Oregon Regional Airport (SWORA) and is accessible to the open Pacific Ocean by a maintained shipping channel. Development will require the excavation and dredging of 5.65 mcy of material, including the dry excavation of 1.63 mcy and hydraulic dredging of 2.68 mcy from an existing area of dry land to form the POCB Slip, and additional dredging of 1.35 mcy to construct an access channel to connect the slip to the shipping channel. Periodic maintenance dredging will be required to maintain the minimum depths of the slip and access channel.

This report addresses physical and environmental conditions associated with excavation and dredging activities, as well as the need for the project, a description of the dredging methods, characterization of the excavated and dredged material, and evaluation of suitable placement alternatives.

2.2 Objective and Scope

The objective of this report is to prepare an Excavated and Dredged Material Management Plan (EDMMP) that will allow excavation and dredging of the POCB Slip and Access Channel and associated maintenance dredging to be performed in an efficient, environmentally sound, and logistically feasible manner. The scope of the POCB Slip and Access Channel EDMMP includes a characterization of the excavated and dredged sediments, review of available dredging and material transport technologies, and identification and evaluation of potential material placement and beneficial use alternatives.

2.3 Report Organization

The EDMMP is organized into the following sections:

Section 1 – Executive Summary, Summary of EDMMP, including conclusions and recommendations.

Section 2 – Introduction, Background information on the Project.

Section 3 – Regulatory Overview, Description of the federal and state regulations to be considered in order to obtain permits for dredging and placement of dredged material.

Section 4 – Project Description and Excavation and Dredging Requirements, Project description; excavated and dredged material characterization based on previous reports and results of geotechnical investigation; excavation and dredging requirements; and description of available dredging and dredged material management technologies.

Section 5 – Description and Evaluation of Alternatives, Description of the decision process, assumptions, and evaluation criteria used to screen potential dredged material management alternatives. This section identifies and describes those alternatives found to be feasible.

Section 6 – Sites Considered and Eliminated from Further Consideration, Evaluation and explanation of the placement alternatives found to be infeasible.

Section 7 – Summary and Recommendations, Summary of EDMMP, discussion of alternatives found to be feasible in Section 5 and recommendation of a preferred alternative for management of the material for the POCB Slip and Access Channel, and identification of data gaps.

3.0 REGULATORY OVERVIEW

Regulation of dredging and dredged material placement is complex, with responsibility shared between federal and state entities. The regulatory overview provided in this section is taken primarily from the U.S. Army Corps of Engineers (USACE)/U.S. Environmental Protection Agency (USEPA) *Dredged Material Evaluation Framework: Lower Columbia River Management Area* (USACE/USEPA, 1998). At the federal level, the USACE and USEPA share the responsibility for regulating the dredging and discharge of dredged material. At the state level, regulation is carried out by the Department of Environmental Quality (ODEQ), Department of State Lands (ODSL), and the Department of Land Conservation and Development (ODLCD) are also involved.

3.1 Federal Regulations Overview

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the transportation and placement of dredged material to the ocean. It overlaps with the Clean Water Act (CWA), formerly the Federal Water Pollution Control Act Amendments of 1972, where jurisdiction is defined by 40 CFR 230.2(b) and 33 CFR 336.0(b) and is a function of disposal. Material dredged, transported, and placed within the territorial sea (within 3-miles of land), for purposes of disposal, is regulated under MPRSA. If the material is placed within the territorial sea for purposes other than disposal, such as beach nourishment, island creation, and aquatic habitat enhancement, the activity is regulated as fill placement under the CWA. The CWA regulates the placement of dredged and fill material in waters of the United States (all waters landward of the territorial sea, including wetlands).

All proposed dredged material placement activities regulated by the MPRSA or CWA must also comply with applicable requirements and regulations of the National Environmental Policy Act (NEPA), and a number of other federal laws and Executive Orders involving the discharge of dredged material. NEPA serves as an umbrella authority which assures all applicable environmental requirements are complied with for federal dredging projects.

3.1.1 Marine Protection, Research, and Sanctuaries Act of 1972

The MPRSA of 1972, as amended (Public Law 92-532), specifies that all proposed operations involving the transportation and disposal of dredged material into the ocean have to be evaluated to determine the potential environmental impact of such activities. Section 102 of the MPRSA requires USEPA, in consultation with the USACE, to develop environmental criteria that must be complied with before any proposed ocean-disposal activity is allowed to proceed. The criteria call for no unacceptable adverse effects. In addition, USEPA has authority under Section 102 to designate ocean disposal sites. The USACE is required to use such sites for ocean disposal to the extent feasible. Section 103 of the MPRSA appoints the USACE with specific responsibility for authorizing the ocean disposal of dredged material, subject to USEPA review [40 CFR 220-228]. In evaluating

proposed ocean disposal activities, the USACE is required to apply the criteria developed by USEPA relating to the effects of the proposed disposal activity and also consider navigation, economic, and industrial development, and foreign and domestic commerce, as well as the availability of alternatives to ocean disposal. If the USEPA determines that the criteria are not met, disposal may not occur without a waiver of the criteria by USEPA [40 CFR 225.2(e)]. However, where use of a USEPA-designated site is not feasible or a site has not been designated, Section 103 authorizes USACE to select an ocean disposal site. In exercising this authority, the USACE utilizes USEPA site selection criteria [40 CFR 228], and the site selection is subject to USEPA agreement.

3.1.2 Rivers and Harbors Act Section 10/Clean Water Act Section 404

The USACE administers a regulatory program under Section 10 of the Rivers and Harbors Act of 1899, which requires approval by the Secretary of the Army for any work in navigable waters. For purposes of Section 10, "navigable waters" are defined as those U.S. waters below the mean high water mark, and those used or usable for interstate or foreign commerce. A Section 10 permit is required for any dredging activity in navigable waters regardless of final placement or disposal of the dredged material. The USACE additionally has the primary responsibility for the CWA Section 404 regulatory permit program. Section 404 of the CWA requires USEPA, in conjunction with the USACE, to impose guidelines for the discharge of dredged or fill material into waters of the U.S. to ensure that such discharge will not result in adverse or unacceptable environmental impacts. According to Section 404, "waters of the U.S." extends to all waters, including lakes, streams, mudflats, sloughs, wetlands, and wetlands adjacent to these waters. The guidelines specify four conditions for the selection of any aquatic site for the disposal of dredged or fill material [Section 404(b)(1) Final Rule 40 CFR 230]:

- There must be no other practicable alternatives available that would have less adverse impact on the aquatic environment;

- The disposal must not result in violations of applicable state water quality standards, toxic effluent standards, marine sanctuary requirements, or requirements of the Endangered Species Act;

- The disposal must not cause or contribute to significant degradation of the waters of the U.S.; and

- The permit applicant must show that all appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic environment.

USEPA is ultimately responsible for general environmental oversight under Section 404 and retains permit veto power [Section 404(c)].

Together these permits are known as Section 10/404 and may be processed concurrently when both dredging and disposal/fill are necessary. However, a dredging project with no return flow to the waters of the United States requires only a Section 10 permit.

3.1.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is a national policy for the protection of the environment, which is designed to prevent or eliminate damage to the environment and support the health and welfare of the public. NEPA establishes a process of environmental review and public notification for federal planning and decision making. In order to implement a federal project, federal agencies must develop an environmental impact statement or environmental assessment that considers potential environmental impacts, unavoidable impacts, adverse environmental effects, and project alternatives.

3.1.4 Endangered Species Act of 1973

Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires federal agencies to ensure their actions do not jeopardize federally endangered or threatened species or their critical habitats. If a project could affect an endangered species, coordination with the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS) is required.

3.2 Oregon State Regulations

3.2.1 Federal Coastal Zone Management Act of 1972

The Federal Coastal Zone Management Act (CZMA) of 1972 and its amendments [Public Law 92-583] declared a national interest in the effective management, beneficial use, protection, and development of the coastal zone. The CZMA grants state and local governments the primary responsibility for planning and regulation of land and water uses in the coastal zone. Federal projects within the coastal zone, including dredging and dredged material placement activities, must be consistent to the maximum extent practical with the approved state programs. For nonfederal projects, a required USACE permit cannot be issued until the ODLCD has concurred that the project is in compliance with the approved coastal zone management plan.

3.2.2 Section 401 Certification Program

Section 401 of the Federal CWA provides the USEPA authority (or USEPA may designate authority to a state agency) to certify project compliance with applicable State water quality standards. For non-federal projects, Section 401 certification is a precondition to compliance with Section 404 guidelines and is required before receiving a Section 404 permit for placement of dredged or fill material in an aquatic or nearshore environment, or when dredged material is to be hydraulically placed in an upland environment where return flows may affect waters of the United States. In Oregon, the

ODEQ is the agency responsible for certifying under Section 401 that a proposed discharge will comply with Oregon water quality standards. Under the Section 401 certification program, the ODEQ certifies and may use any requirement or policy of state law that protects aquatic habitat to condition the Section 401 certification. In situations where the state has no jurisdiction (i.e., tribal lands and military installations), USEPA provides Section 401 certification.

3.2.3 Removal/Fill Permit

The ODSL issues a permit for any activity that proposes removal, fill or alterations equal to or exceeding 50 cy of material within the beds or banks of the waters of the state of Oregon, and for any amount of removal, filling or alteration in State Scenic Waterways and essential Indigenous Salmonid streams.

3.2.4 Ocean Shore Alteration Permit

This is a permit for the alteration, improvement, or development on the ocean shore, administered by the Oregon Parks and Recreation Department (OPRD). Ocean shore includes the area between extreme low tide and statutory vegetation line or line of established upland vegetation, whichever is further inland. Some examples are shoreline protection structures, stairways, placement of dredged material and sand dune management.

4.0 PROJECT DESCRIPTION AND EXCAVATION AND DREDGING REQUIREMENTS

4.1 Description of the POCB Slip and Access Channel

The POCB proposes to develop a parcel of property located to the north of the SWORA. A project location map is shown in Figure 4-1. The site is situated on the north side of the Coos Bay channel at approximately River Mile (RM) 8 off the Jarvis Turn. The property is bounded to the north by the Trans-Pacific Parkway and an adjacent railroad track, to the west by Henderson Marsh, and to the east by a wood chip export facility operated by the Roseburg Forest Products Company.

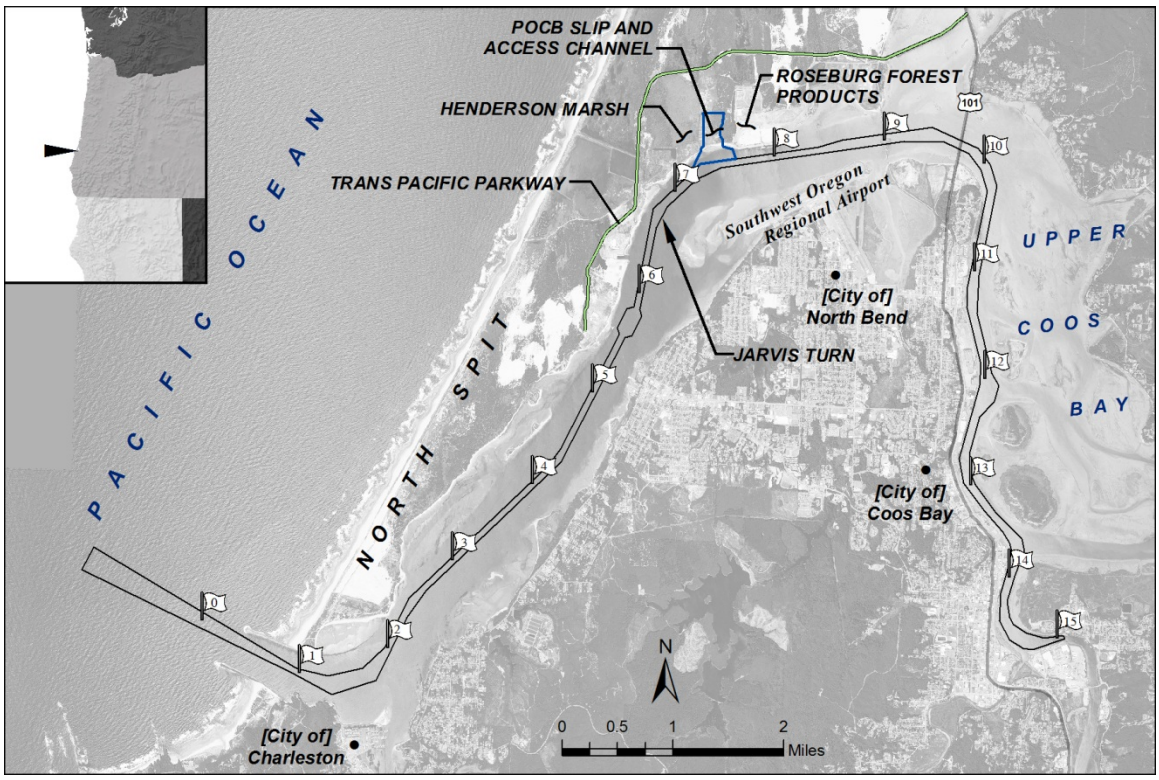


Figure 4-1: Project Location Map (Image Source: USDA, 2012)

The proposed POCB Slip will be excavated and dredged into existing dry land. The inside dimensions of the POCB Slip measure approximately 925 ft along the top of slope of the north boundary and 800 ft when measuring across from the west berth. The west and east top of slope boundaries of the slip are approximately 1,545 ft and 1,580 ft long, respectively. The slip will be formed with a combination of sheet pile walls and 2.5H:1V sloped sides. The POCB Slip maintained water depth will be -45 ft NAVD88. The POCB Slip will have the capacity to berth Post-Panamax ships on the east berth.

The POCB Slip and Access Channel will have access to the open Pacific Ocean by the maintained Coos Bay Navigational Channel. The maintained Coos Bay Navigation

Channel depth is -37 ft MLLW (-37.97 ft NAVD88) to the project site. An access channel will be dredged adjacent to the POCB Slip to assist with turning maneuvers. Figure 4-2 illustrates the layout of the POCB Slip and Access Channel. The blue outline shown in the figure represents the approximate limit of excavation and dredging.

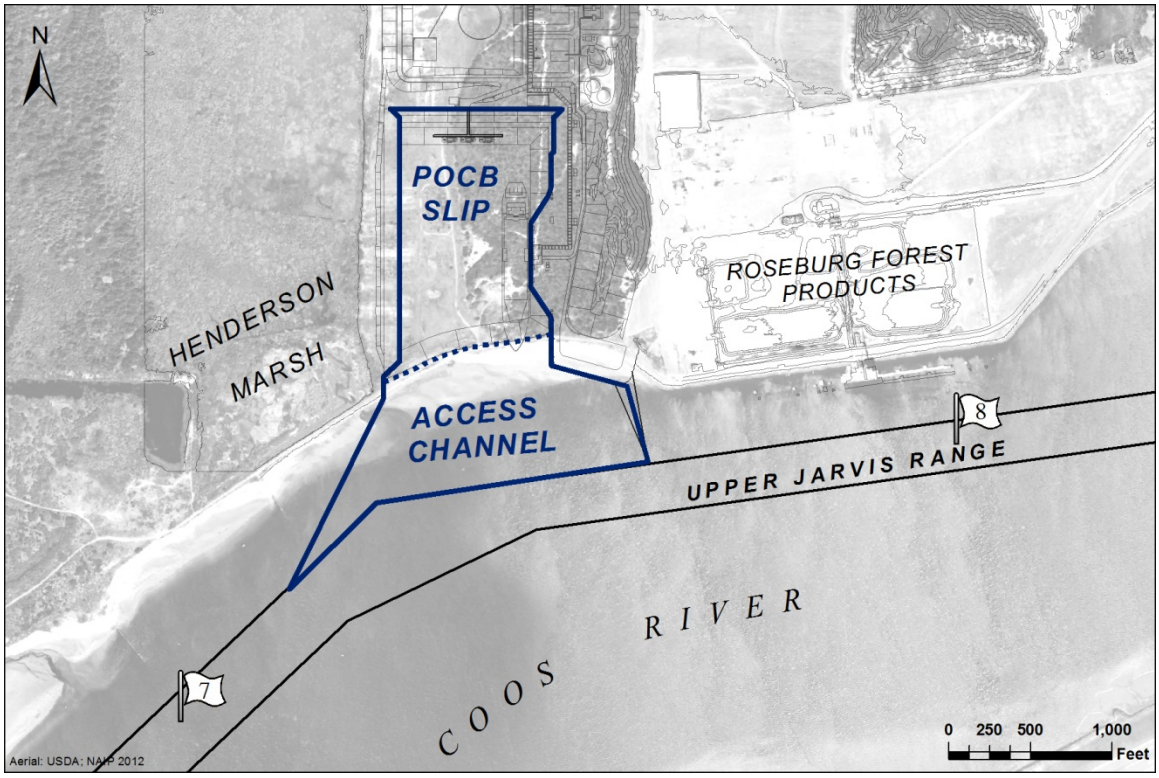


Figure 4-2: POCB Slip and Access Channel (Image Source: USDA, 2012)

Table 4-1 provides the relationships between NAVD88 and other water level datums for the POCB Slip and Access Channel (SHN, Technical Memorandum, December 6, 2012).

Table 4-1: Water Levels at Project Site

Datum	Ft (NAVD88)
Highest Measured Tide	10.26
Mean Higher High Water (MHHW)	7.46
Mean High Water (MHW)	6.81
Mean Sea Level (MSL)	3.70
Mean Tide Level	3.58
Mean Low Water (MLW)	0.36
North American Vertical Datum-1988 (NAVD)	0.00
Mean Lower Low Water (MLLW)	-0.97

4.2 Material Characteristics

Historical boring logs in the vicinity of the POCB Slip and Access Channel were evaluated to provide a preliminary dredged sediment characterization. The available historic subsurface exploration was performed by GRI for Nucor Steel in 1997. Additional subsurface exploration was performed for the POCB Slip project by GRI in 2005 and 2007. Also, sediment sampling and analysis was completed for the POCB Slip project by SHN Consulting Engineers & Geologists, Inc. (SHN) in 2006. A collection of the historic and project geotechnical sampling locations relevant to the POCB Slip are shown in Figure 4-3. The findings of each subsurface exploration effort are summarized in the following subsections.

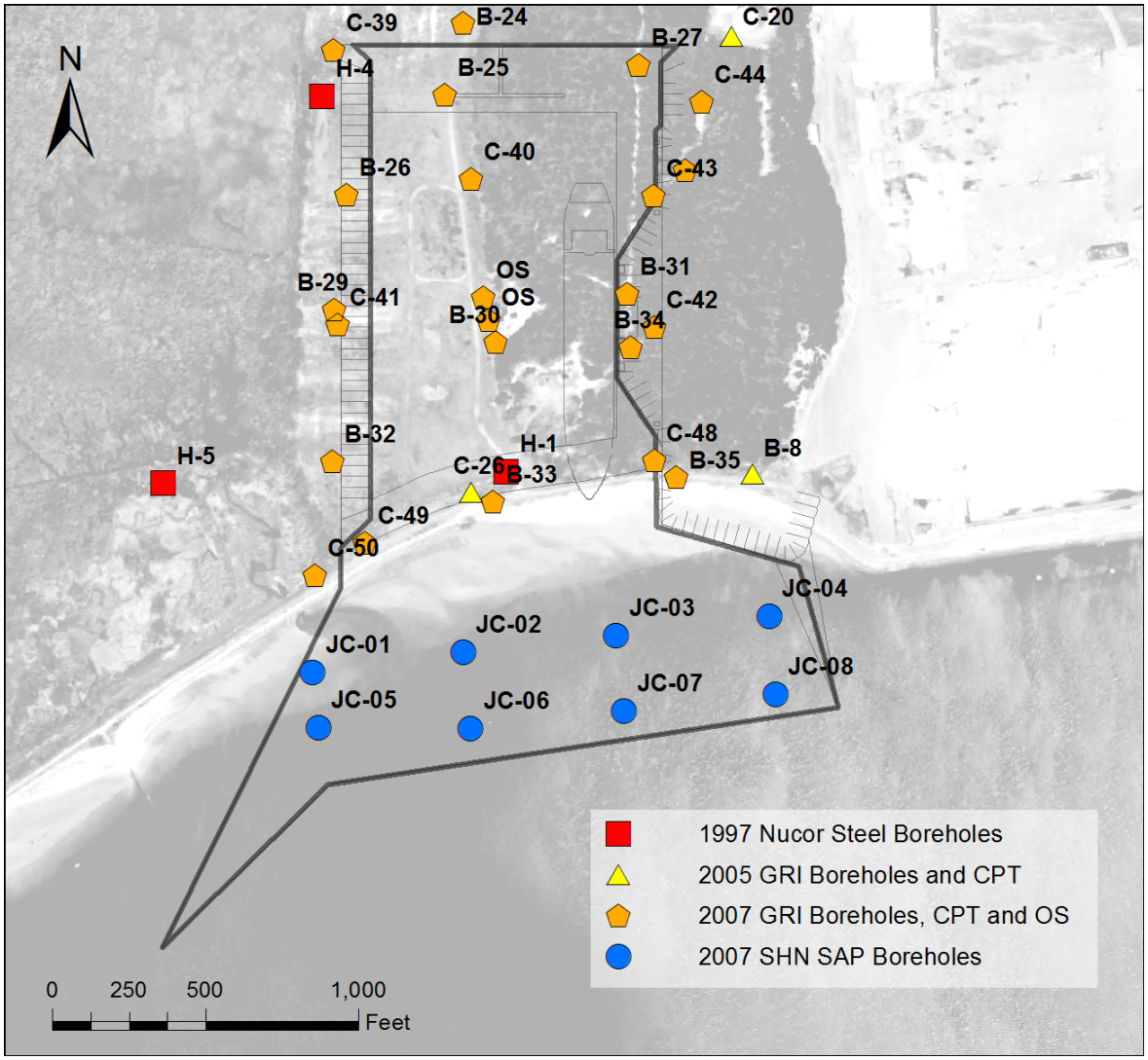


Figure 4-3: Historic and Project Geotechnical Sampling Locations (Image Source: USDA, 2012)

4.2.1 Soil Data Collected for Nucor Steel in 1997

Subsurface exploration was performed by GRI in November 1997 for Nucor Steel. The full text of the geotechnical investigation report prepared by GRI is available under a separate document titled "Preliminary Geotechnical investigation, Proposed Steel Mill, Coos Bay, Oregon" (GRI, 1997). Boring logs and grain size analyses are located in Appendix A. Two soil borings (H1, H4) were identified in or close to the proposed POCB Slip and their locations are shown in Figure 4-3.

Boring H1 was 70.5-ft with an approximate surface elevation of 20 ft NAVD88. The first 14 ft below the ground surface was fill material consisting of very dense brown sand. The material is fine grained with some gravel and trace silt. The amount of gravel decreases with depth, with zero gravel below 12 ft. The water table was located approximately 11ft below the ground surface (+9 ft NAVD88). From 14 to 25 ft the material consists of medium dense brown sand that is fine grained with traces of silt. A thin layer of frequent organics, possibly peat, was found between 14 and 15 ft. The material consists of very dense brown sand below 25 ft and turns gray below 35 ft. The moisture content of the boring was consistent with values of 17-25%.

Two grain size analyses were conducted for H1 as given in Table 4-2. At 15 ft, the median grain size (D_{50}) was 0.25 mm and described as gray fine sand. The standard deviation (σ) of the sample was 0.06. The D_{50} at 45 ft was 0.23 mm and the σ was 0.07. The sample was also described as gray fine sand.

Boring H4 was 70.3-ft and the surface elevation was less than 20 ft NAVD88. The first 12 ft below the ground surface is fill material consisting of loose to medium dense brown sand. The material is fine grained with scattered shell fragments to 10 ft and trace silt. The water table was not indicated on the boring log. From 12 to 20 ft, the material consists of dense brown sand that is fine grained with traces of silt. A thin layer of heavily rooted and frequent organics, possibly peat, was found between 12 and 13 ft. The material consists of very dense sand below 20 ft (6 m) and turns gray below 40 ft. The moisture content of the boring was consistent with values of 18-25%.

Table 4-2: Sediment Properties, 1997 Sediment Sampling

Boring No.	Sample No.	Depth (ft)	D50 (mm)	Standard Deviation (σ)	Description
H1	S-3	15	0.25	0.06	Gray sand, fine grained with trace silt
H1	S-8	45	0.23	0.07	Gray sand, fine grained with trace silt
H4	S-2	10	0.25	0.06	Gray sand, fine grained with trace silt
H4	S-9	45	0.24	0.06	Gray sand, fine grained with trace silt

Two grain size analyses were conducted for H4 as given in Table 4-2. At 10 ft, the median grain size (D_{50}) was 0.25 mm and described as gray fine sand. The standard deviation (σ) of the sample was 0.06. The D_{50} at 45 ft was 0.24 mm and the σ was 0.06. This sample was also described as gray fine sand.

4.2.2 Soil Data Collected for the Project in 2005

Subsurface exploration was performed for the Project by GRI under separate contract in 2005. The exploration included the collection of soil borings and cone penetration test (CPT) probes in the Roseburg facility. The location of the borings and CPT probes are shown in Figure 4-3; boring logs and CPT analyses are located in Appendix A. The full text of the geotechnical investigation report prepared by GRI is available under a separate document titled "Draft - Preliminary Geotechnical investigation, Jordan Cove Task Order No.2, Jordan Cove LNG Facility, North Bend, Oregon" (GRI, 2005).

One boring, B-8, and two CPT probes, CPT-20 and CPT-26, are located in or close to the POCB Slip. Results of the sediment properties are given in Table 4-3. Boring B-8 indicates medium dense to very dense brown sand to a depth of 20 ft below the ground surface and turns gray below 20 ft. The material consists of very dense gray sand from 25 ft to the depth of the sample. The median moisture content is 20%. Probe CPT-20 consists of primarily sand to silty sand. Probe CPT-26 consists of sand to silty sand from 5 ft to 18 ft, with the sediment changing to sand below 18 ft.

Table 4-3: Sediment Properties, 2005 GRI Sediment Sampling

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)	STD Penetration Resistance (Tons/sf)	Description
B-8	S-1	5	20	0.25	Medium dense to very dense brown sand, fine grained with trace silt, scattered pieces of wood
B-8	S-2	10	18	.55	Medium dense to very dense brown sand, fine grained with trace silt, scattered pieces of wood
B-8	S-15	70	25	1.0	Very dense gray sand, fine grained with trace silt
Probe No.	**Depth (ft)**		**Soil Behavior Type**		
CPT-20	5.0 – 73.8		Sand to silty sand (See probes in Appendix A for details)		
CPT-26	5.0 – 45.6		Sand to silty sand from 5.0 ft to 18 ft; Sand from 18.0 ft to 45.6 ft (See probes in Appendix A for details)		

4.2.3 Soil Data Collected for the Project in 2007

Subsurface exploration was performed for the Project by GRI under a separate contract in June and July 2007. The exploration included the collection of soil borings and cone penetration test (CPT) probes, together with a vibrating-wire piezometer and two observation standpipes to measure fluctuations in the water table. Results of the sediment properties are given in Table 4-4. Locations of the borings and CPT probes are given in Figure 4-3, and logs of the borings are provided in Appendix A. The full text of the data report prepared by GRI is available under a separate document titled "Data Report for Phase II Geotechnical Investigation: Jordan Cove LNG Facility, North Bend, Oregon" (GRI, 2007). The report was revised on November 29, 2012 to reflect the most current plans for development.

Consistent with the earlier explorations, the boring logs show that the site is mantled with relatively clean, fine-grained sand. The sand is believed to be underlain by weathered sandstone; however, sand extended to the maximum depth of all the explorations (the borings were advanced to depths of about 70 to 160 ft). The transition between fill in the upper 10 to 15 ft of the sand deposit on the flatter portions of the site to the underlying dune sand was indiscernible based on visual observations in many of the explorations.

The sand typically contains a trace of silt and is brown near the ground surface and transitions to gray below depths of 10 to 20 ft. Zones with silt contents varying from some silt to silty were interpreted in several of the CPT explorations (although GRI noted that CPT explorations have tended to overestimate silt content in similar locations). The largest silty layer was noted in CPT-50 between a depth of about 2 and 10 ft. Silty to organic lenses with thicknesses typically ranging from 6 inches to 2 ft were noted in many of the CPT probes at depths of about 8 to 15 ft, and organic lenses were noted at a similar depth in several of the borings. GRI interpreted these layers as the ground surface prior to fill placement. Standard penetration test N-values indicate the relative density of the sand is typically dense to very dense, but varies from loose to very dense. The N-values ranged from 5 to refusal, defined as more than 50 blows for 6 inches of sampler penetration.

A vibrating-wire piezometer was installed at a depth of 45 ft in boring B-30, and two observation standpipes were installed approximately 25 and 50 ft north of boring B-30. These instruments were installed to allow for monitoring of the groundwater table and associated tide-induced groundwater fluctuations at the site along with a previously installed vibrating-wire piezometer in boring B-8 (north of the POCB Slip). Initial results showed groundwater fluctuations from +9 ft to +13 ft NAVD88, about 0.5 ft lower at boring B-30 (within the POCB Slip) compared to B-8 (north of the POCB Slip).

Laboratory testing of samples obtained from the borings was limited to natural moisture content, grain size (by washed sieve methods), and other physical characteristics. All soil samples were granular, therefore no additional testing was considered necessary.

Table 4-4: Sediment Properties, 2007 Sediment Sampling

Boring No.	Sample No.	Depth (ft)	% Passing No. 200 Sieve	Classification
B-25	S-3	15	1.3	SAND, fine grained
B-25	S-6	30	1.3	SAND, fine grained, trace silt
B-26	S-4	20	2.8	SAND, fine grained, trace silt
B-27	S-18	90	4.0	SAND, fine grained, trace silt
B-30	S-13	20	4.0	SAND, fine grained, trace silt
B-35	S-4	20	1.7	SAND, fine grained
B35	S-10	50	3.0	SAND, fine grained, trace silt

4.2.4 Sediment Sampling and Analysis Program

A comprehensive sediment sampling and analysis plan (SAP) was completed for the Project by SHN in October 2006 to characterize dredged sediments within the access channel for physical and chemical parameters. The full text of the SAP report is available under a separate document titled "Sediment Sampling and Analysis Report, Oregon Marine Gateway Terminal, Coos Bay, Oregon" (SHN, 2007).

The SAP was developed in accordance with the *Dredged Material Evaluation Framework: Lower Columbia River Management Area* (DMEF) (USACE/USEPA, 1998) and *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)* (USACE/USEPA, 1991). Based on the DMEF, the SAP followed a tiered evaluation approach:

- TIER IIA – All samples collected and submitted for laboratory analyses will be analyzed for grain size and Total Volatile Solids (TVS). If the results of the grain size analysis indicate sand content is greater than 80% and TVS is less than 5%, the proposed dredged material qualifies for unconfined aquatic disposal based on exclusionary status.

- TIER IIB – If the sediment sample fails either the grain size or TVS test, the sediment will be tested for the remaining conventional chemical parameters Total Organic Carbon, sulfides, and ammonia, and Chemicals of Concern. If the results of the sediment testing do not exceed screening level guidelines, the proposed dredged material qualifies for unconfined aquatic disposal.

- TIER III – If the analytical results of the sediment testing exceed screening criteria guidelines, the sediment must undergo appropriate biological tests. If the sediment passes the biological testing guidelines, the proposed dredged material qualifies for unconfined aquatic disposal. Sediment that fails the biological test is determined to be unsuitable for unconfined aquatic disposal.

- TIER IV – A Tier IV evaluation can occur if either a) the results of the Tier III bioaccumulation tests are indeterminate, or b) the sediments contain chemicals that do not have threshold sediment quality values for which the routine biological tests are appropriate.

Eight soil borings, identified in Figure 4-3, were drilled to a depth range of approximately 8 to 33.5 ft below the sediment surface. Each boring was continuously cored in 4 ft sections from the existing sediment surface to the designed dredge depth or until refusal was encountered. The sediment samples were analyzed for the following parameters:

- Grain size distribution in accordance with ASTM D422, and

- Total Volatile Solids (TVS) in accordance with USEPA Method No. 160.4M.

The results of the grain size distribution indicated the average percent of sand present in sediment samples was approximately 99.85%. None of the sediment samples analyzed for grain size distribution contained a sand content less than 80%. The sand consists of almost entirely of densely packed, fine to medium sized sand. Trace amounts of fines were present in surface sands and two boring locations (JC-03 and JC-04) contained a thin layer of fine grained sediment (silt and clay) on the surface (2-3 inches thick). The material appears to be homogeneous native sands and no areas of visibly contaminated sediments were present.

The results of TVS analysis indicated the average percent of TVS present was approximately 0.71%. None of the sediment samples analyzed for TVS contained greater than 5% TVS. The highest reported TVS result was in sample JC-03/04-A, at 2.74%. This TVS result was likely due to the thin layer of fine-grained material present in this area. Based on the results of the sediment sample analysis, and the DMEF guidelines for the Tiered Evaluation Process, no further testing of sediment samples was conducted.

4.3 Excavation and Dredging Requirements

4.3.1 Excavation and Dredge Areas and Quantities

4.3.1.1 POCB Slip and Access Channel

The proposed POCB Slip will be excavated and dredged into existing dry land. The proposed layout of the POCB Slip and Access Channel are shown in Figure 4-2. The inside dimensions of the POCB Slip measure approximately 925 ft along the top of slope of the north boundary and 800 ft when measuring across from the west berth. The west and east top of slope boundaries of the slip are approximately 1,545 ft and 1,580 ft long, respectively. The slip will be formed with a combination of sheet pile walls and 2.5H:1V sloped sides. The POCB Slip top of slope will be +30 ft NAVD88 and the maintained water depth will be -45 ft NAVD88. The total volume of material to be removed from the

POCB Slip is 4.31 mcy, of which 1.63 mcy will be excavated using land-based scrapers and excavators and 2.68 mcy will be dredged using standard dredging equipment.

An access channel will be dredged adjacent to the slip to assist with turning maneuvers, as shown in Figure 4-2. The Access Channel borders the north of the maintained channel at Jarvis Turn and Upper Jarvis Range. The side slopes are 3:1 and the minimum depth of the access channel is -45 ft NAVD88. The Access Channel will require 1.35 mcy of material to be dredged, which includes 2 feet of over depth dredging.

The total quantity of material to be excavated and dredged from the POCB Slip and the Access Channel is approximately 5.65 mcy. A summary of the excavation and dredging quantities is given in Table 4-5. Management of dredged material is discussed in Sections 5 and 7.

Table 4-5: Excavation/Dredge Volume - Construction

Area	Construction Phase	Volume (mcy)
Upland Phase		
POCB Slip	Land-Based Excavation (For placement at the Mill Site and the Slip West Stockpile Site)	1.63
POCB Slip	Dredging in Launch Pond (For placement at the Mill Site and Ingram Yard)	2.18
In-Water Phase 1		
Access Channel	Dredging from Bay (For placement at the Mill Site)	1.35
In-Water Phase 2		
POCB Slip	Dredging Natural Earthen Berm (For placement at Ingram Yard)	0.50
	TOTAL	**5.65***
* Note: Total volume may not sum exactly due to rounding		

4.3.1.2 Upland Phase – Dry Excavation in POCB Slip

Preliminary excavation will be completed using conventional scrapers and excavators to excavate approximately 1.63 mcy. Scrapers will remove material to an elevation near the water table (+10 ft NAVD88), and excavators will remove the remainder of this initial 1.63 mcy. The initial 1.63 mcy will include a dredge launch pond, approximately 300 feet long by 200 feet wide by 10 feet deep to an elevation of approximately 0 ft NAVD88. Scrapers or dump trucks will transport this material to the recommended placement site(s).

4.3.1.3 Upland Phase – POCB Slip Launch Pond Dredging

Dredging equipment will be placed in the dredge launch pond, discussed in Section 4.3.1.2, to remove approximately 2.18 mcy of additional material from the slip. The dredging equipment will hydraulically convey the dredged material in slurry form to the recommended placement site(s). Decant water will be pumped back to the dredge launch pond. The slurry and the decant water will both be freshwater. The production rate for this phase is limited by the requirement that the dredging equipment fit inside the dredge launch pond. This work can be performed year-round because the dredge launch pond is physically isolated from Coos Bay. This will be accomplished by retaining a natural earthen berm (approximately 40 feet wide at the crest) to provide a physical partition between Coos Bay and the *Upland Phase* construction activities. The berm will have sufficient size and height to prevent breaching by high sea water levels or ship wakes.

4.3.1.4 In-Water Phase 1

The *In-Water Phase 1* will include the dredging of the 1.35 mcy of material to be removed to form the Access Channel and stockpiled at the placement site(s). The *In-Water Phase 1* will be conducted during the in-water work window between October 1st and February 15th.

Slurry dredged from Coos Bay and the decant water will be salt water and will be transported to the placement site(s) by pipeline. Return water may be discharged directly to Coos Bay through a separate pipeline. Silt curtains will be used to decrease turbidity impacts to Coos Bay from the return water.

4.3.1.5 In-Water Phase 2

The *In-Water Phase 2* will include removal of the natural earthen berm, approximately 500,000 cy of material. The *In-Water Phase 2* will be conducted during the in-water work window between October 1st and February 15th. Dredging will be conducted from both the Coos Bay side and the dredge launch pond side of the berm to reduce the duration for breaching and removing the natural earthen berm. Removing the berm will open the POCB Slip to Coos Bay. Final dredging to contour the Access Channel will complete the construction dredging activities. Dredging from the Coos Bay side may have a larger production rate compared to the dredge launch pond side of the berm because there are fewer limitations on equipment size.

Slurry dredged from the Coos Bay side and the decant water will be salt water and will be transported to the placement site(s) by pipeline. Return water may flow through a separate pipeline into the POCB Slip, or may be discharged directly to Coos Bay. In either case, silt curtains will be used to decrease turbidity impacts to Coos Bay from the return water.

4.3.1.6 Maintenance Dredging

The volume of shoaled material maintenance dredging in the POCB Slip and Access Channel was estimated by Moffatt & Nichol (MN) in 2006. The estimated shoaling rates were based on the analysis of dredging records in the vicinity of the POCB Slip and on hydrodynamic and sediment transport modeling using MIKE21. The sedimentation rates for the POCB Slip and Access Channel were estimated to be up to 2.00 ft/yr and 0.5 ft/yr, respectively. The average yearly volume of sediment in the slip and access channel were estimated to be 175,000 cy/yr and 39,000 cy/yr, respectively. Based on the 2006 MN analysis, a two-year maintenance dredging cycle was recommended. The full text of the sedimentation study report prepared by MN is available under a separate document titled "Oregon International Port of Coos Bay, Pacific Gateway Marine Terminal: Sedimentation Study" (MN, 2006).

The estimated volume of shoaled material maintenance dredging was updated by Coast & Harbor Engineering (CHE) in 2011 based on revised plans and more detailed geomorphological information. The full text of the sedimentation draft report prepared by CHE is available under a separate document titled "Jordan Cove Terminal and Access Channel Sedimentation and Maintenance Dredging Requirements. Technical Report – Draft; Volume 3" (CHE, 2011). Sedimentation rates in the vicinity of the POCB Slip and access channel were estimated using a combination of three methods: prototype analysis, empirical methods, and numerical modeling. Based on an evaluation of the three estimates, the design sedimentation rates for the revised POCB Slip and the Access Channel configurations were estimated to be 0.16 ft/yr and 0.56 ft/yr, respectively; this translates to approximately 8,500 cy/yr and 29,200 cy/yr, respectively.

Sedimentation and maintenance dredging requirements were shown to likely decrease in the access channel over time due to natural stabilization and adjustment processes. Due to the decreasing rate of sedimentation, CHE recommended a three-year maintenance dredge cycle for the initial 10 years and a five-year maintenance dredge cycle after the initial 10 years. Table 4-6 summarizes the relationship between time and the predicted volumes of annual sedimentation in the POCB Slip and Access Channel, the recommended maintenance dredge cycle, and the approximate volume of dredged material per maintenance dredge event.

Table 4-6: Predicted Volumes of Annual Sedimentation and Dredge Cycles

Time Range	POCB Slip (cy/yr)	Access Channel (cy/yr)	Total (cy/yr)	Dredge Cycle	Dredge Volume Per Cycle (cy)
0 – 10 Years	8,500	29,200	37,700	3 Years	~115,000
10 – 25 Years	8,500	26,100	34,600	5 Years	~115,000 – 160,000
25 – 50 Years	8,500	21,900	30,400	5 Years	
Greater Than 50 Years	8,500	14,800	23,300	5 Years	

The total anticipated volume of maintenance material that will be dredged over a 50-year period is 1.66 mcy. Table 4-7 provides an estimate of the accumulated volume of maintenance dredge material at 10-years, 25-years, and 50-years. This is a substantial reduction in volume from the 2006 estimate of up to 3.5 mcy at 20 years.

Table 4-7: Accumulated Maintenance Dredge Volumes

Dredge Location	Year	Accumulated Volume (cy)
POCB Slip and Access Channel	10 Years	~380,000
	25 Years	~900,000
	50 Years	~1,660,000

Management of maintenance dredged material from the POCB Slip and Access Channel (excluding the federal navigation channel) is discussed in Sections 5 through 6. ***The volume of maintenance material to be dredged from the federal navigation channel is not included in the above estimate.*** Maintenance and management of material dredged from the federal navigation channel will continue to be provided by the USACE.

4.3.2 Dredging Methods

There are two general types of dredging methods: mechanical dredging and hydraulic dredging. The methods vary by the process by which material is loosened from its in-situ state and transported from the seafloor to the water surface. The type of dredging equipment that is used will affect the characteristics of the dredged material. Differences in dredged material characteristics as well as logistical considerations relevant to the use of mechanical and hydraulic dredges are described in the following subsections.

4.3.2.1 Mechanical Dredging

Mechanical dredging excavates in-situ sediments with a grab or bucket. The most common type of mechanical dredge is the clamshell dredge, which is named for the type of bucket used in the operation and shown in Figure 4-4. The dredging process consists of lowering the bucket to the seafloor, closing the bucket and raising it back to the water surface, and depositing the dredged material into a scow or, if appropriate, directly into an adjoining placement site. The efficiency and capacity of this type of dredging is determined by the capacity of the bucket, which varies between 1.5 and 25 cy; scow capacity, which typically varies from 3,000 to 7,200 cy; the number of available scows; and sediment characteristics.



Figure 4-4: Clamshell Dredge (Oilfield Publications Limited, n.d.)

Mechanical dredges are often used in tightly confined areas, such as harbors, around docks and piers, and in relatively protected channels. By using numerous scows with one dredge, mechanical dredging can proceed continuously. As one scow is being filled, another can be towed to the placement site.

4.3.2.2 Hydraulic Dredging

In hydraulic dredging, material is loosened from its in-situ state and lifted in suspension through a pipe system connected to a centrifugal pump. Hydraulic dredging is most efficient when working with fine materials and sands since they are easily held in suspension. Coarser materials, including gravel, may be hydraulically dredged; however, these materials require a greater demand of pump power and can cause excessive wear on pumps and pipes. The two main types of hydraulic dredges are cutter suction (pipeline) and hopper dredges.

Cutter Suction (Pipeline) Dredge

A cutter suction dredge is a hydraulic dredge that uses a rotating cutting apparatus around the intake of a suction pipe, called a cutterhead, to break up or loosen bottom material, as shown in Figure 4-5. A large centrifugal pump removes the material from the bottom of the channel and pumps the sediment-water slurry through a discharge pipeline. Cutter suction dredges are generally rated based on the size of the discharge pipe, which ranges from 6 to 30 inches. Smaller dredges are used for smaller, shallower dredge cut and larger dredges have higher production rates and are typically more cost effective for large projects.

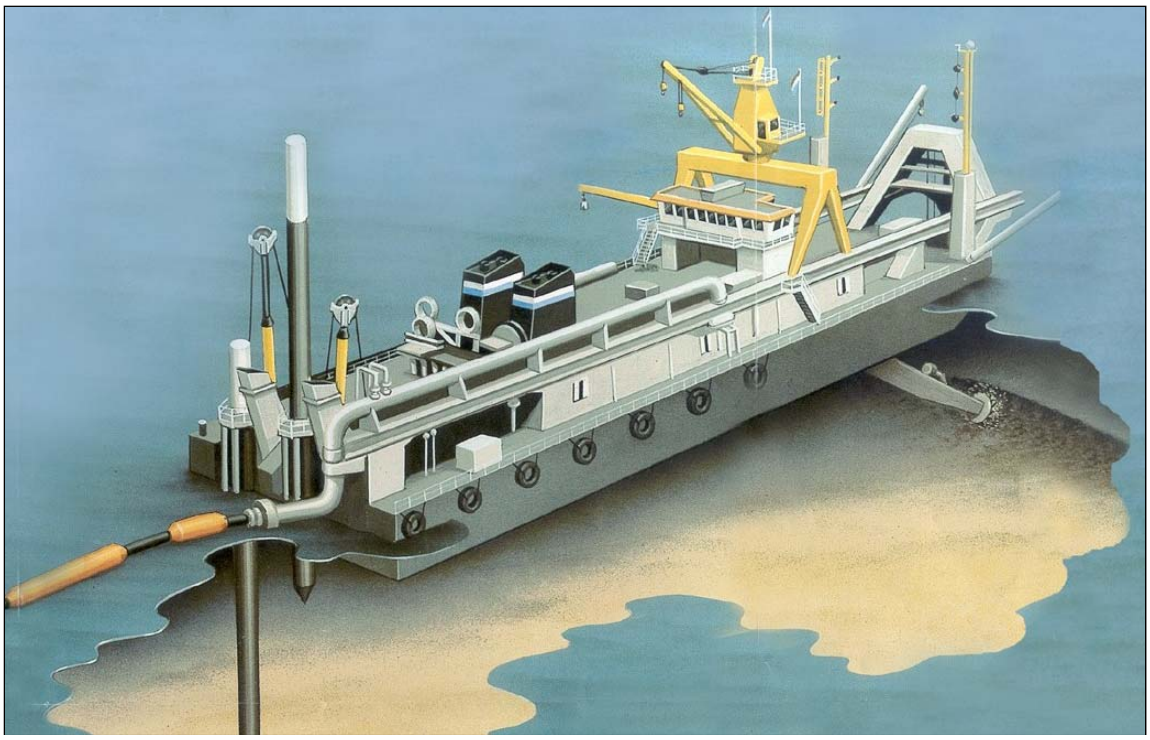


Figure 4-5: Cutter Suction Hydraulic Dredge (Oilfield Publications Limited, n.d.)

A typical 30-inch dredge has a production rate of up to 20,000 to 30,000 cy per day, depending on sediment characteristics and placement method. Pipeline dredges are often operated on a 24-hour, 7-day week basis, but downtime due to maintenance and other factors is often 25% or more.

Material dredged by a cutter suction dredge is directly placed into the placement area by the discharge pipeline or less frequently can be pumped into scows which are then transported to the placement site and emptied via mechanical or hydraulic means. Discharge pipelines are usually floated on the water surface, but may be placed on land, submerged on the seabed, or buried. In a typical application, dredged material is pumped up to 25,000 ft. The addition of booster pumps, located on land, jack-up type rigs, or on moored barges, increases the distance to 50,000 ft or greater.

Cutter suction dredges operate continuously, and are cost effective if the placement site is in relative close proximity to the dredge area. However, booster pumps increase pumping cost and can decrease productivity. Cutter suction dredges are also not recommended for areas with heavy debris that can clog pumps and impair efficiency.

Hopper Dredge

Hopper dredges have the shape of a conventional ship hull and are equipped with either single or twin trailing suction pipes, as shown in Figure 4-6. A hopper dredge operates

much like a floating vacuum cleaner in that material is lifted through the trailing suction pipes by one or more pumps and then the mixture of water and solids is stored in a hopper contained within the hull of the dredger. This type of dredge is often used for rougher, open waters where mechanical and hydraulic/pipeline dredges cannot operate effectively. A hopper dredge operates best by skimming layers of material in long, narrow runs and is primarily used in open water, such as rivers, canals, and open sea. This type of dredge is unable to get into corners, difficult to maneuver in confined spaces, unsuitable for use in shallow water, and is not effective on hard materials such as stiff clays. A hopper dredge can move quickly to a placement area under its own power, but the operation loses efficiency as the transport distance increases.



Figure 4-6: Typical Hopper Dredge (Oilfield Publications Limited, n.d.)

Once the hopper is full, material may be discharged onto an open-water placement site by opening the hopper doors located in the bottom of the ship's hull or fluidized by jets and hydraulically pumped from the hopper. For bottom dumping, the entire contents of the hopper can be emptied in a matter of minutes. Upon discharge from the hopper dredge, the dredged material falls through the water column as a well-defined jet of high-density fluid. The descent and deposition of the slurry mixture is dependent on the material's physical characteristics. Hydraulic pump out can take up to 30-60 minutes and discharge slurry is similar in density to cutter-head slurry.

Dredging of the POCB Slip or Access Channel with a hopper dredge is not recommended for the POCB Slip and Access Channel EDMMP. A hopper dredge is not efficient when operating within a confined space such as the POCB Slip or small maneuvering area of the access channel.

4.3.3 Dredged Material Rehandling

Rehandling is the process of loading, transporting, and offloading dredged material. The process is highly dependent on the type of dredging method employed and the location of the placement area. Rehandling is often the most important factor in determining the economic feasibility of a dredging project since costs increase with the number of times dredged material is rehandled.

Dredged material rehandling should be evaluated in the early stages of the planning process using the following criteria:

- Available Means of Rehandling;
- Nature of Material (Wet/Dry);
- Annual Volume of Dredged Material;
- Duration of Project;
- Estimated Cost of Available Transport Modes; and
- Technical, Environmental, Legal, and Federal Agency Regulations (Herbich, 2000).

Transport methods applicable to the POCB Slip and Access Channel EDMMP include pipeline, barge, and truck haul. Logistical considerations for each method are given in Table 4-8.

Hydraulic pipeline is the practical method of transport for dredge material in slurry form and is generally economical for distances up to three to five miles. Material transported by pipeline can be discharged directly into a placement area. However, consideration must be given to the high water content associated with this method as it generates a greater volume required for storage or placement. If the ultimate end use of the material is for beneficial use, pipeline transport increases dewatering time required for many beneficial use applications.

Transport by barge is economical for mechanical dredging operations since it is generally performed using familiar and available equipment. Material transported by barge generally consists of a low slurry content that may be placed directly into the placement area or loaded onto trucks for final transport to the placement area (Herbich, 2000).

Truck haul is generally utilized when the placement area is located at an upland site and is practical for materials with low water content. However, truck haul begins to lose economic efficiency as the transport distance and/or dredged material volume increases.

Table 4-8: Design Considerations of Various Transport Methods (Herbich, 2000)

Transport Method	Design Considerations
Hydraulic Pipeline	• Dewatering requirements before a beneficial use application may be a cost burden and may require treatment of decanted water. • Building codes, easement acquisition, utility relocation, climatological factors, and urban area disruption from construction may be obstacles. • Confinement berms must be provided and could be a significant cost item. • Right-of-way acquisition. • Federal, state, and local regulations and requirements.
Barge	• Thorough information must be obtained about the waterway: navigation depth, allowable speed, locks, traffic density and patterns, etc. • Often, regulations exist concerning cleanup responsibilities with associated fines for spills in inland waters • Climatic conditions may affect operational schedule
Truck	• State highway and safety regulations cover a variety of elements (gross weight of trucks, weight per axle, etc.) • Emission and noise standards • Local ordinances designating truck routes • Traffic control of truck operations during adverse weather • Weight limits on bridges and roadways

Several dredging scenarios involving various dredging, transport, and placement methods were considered for construction and maintenance dredging of the POCB Slip: (1) mechanical dredging and mechanical offloading upland; (2) mechanical dredging and hydraulic offloading upland; (3) mechanical dredging and in-water disposal; (4) hydraulic dredging and pipeline transport to placement area; and (5) hydraulic dredging and in-water disposal.

Of these dredging and rehandling scenarios, (1) mechanical dredging and mechanical offloading upland, (3) mechanical dredging and in-water disposal, and (4) hydraulic dredging and pipeline transport to placement area are the most practical based on characteristics of the dredged sediment, the dredged volume, and the logistics of the feasible dredged material management alternatives. A more detailed description of the rehandling scenario for feasible alternatives is presented in Section 5.0.

4.4 General Description of Dredged Material Management Alternatives

The dredged material management alternatives evaluated for the POCB Slip and Access Channel EDMMP include open-water placement, confined placement, and beneficial use. A description of each management method is described in the following subsections.

4.4.1 Open-water Placement

4.4.1.1 Conventional Open-water Disposal

Open-water disposal is the discharge of dredged material in oceans, rivers, lakes, or estuaries by means of a pipeline or release from a hopper dredge or barge, as shown in Figure 4-7. The discharged material settles through the water column and deposits on the bottom of the placement site. The physical behavior of open-water placement, and thus its potential environmental impact, depends on the type of dredging and discharge operation used, physical characteristics of the material, and the hydrodynamics of the placement site. Several specialized practices have been developed to minimize environmental effects of open-water placement and include submerged discharge, lateral containment, thin-layer placement, capping and modifications of time, location, and volume (USEPA, 1992).

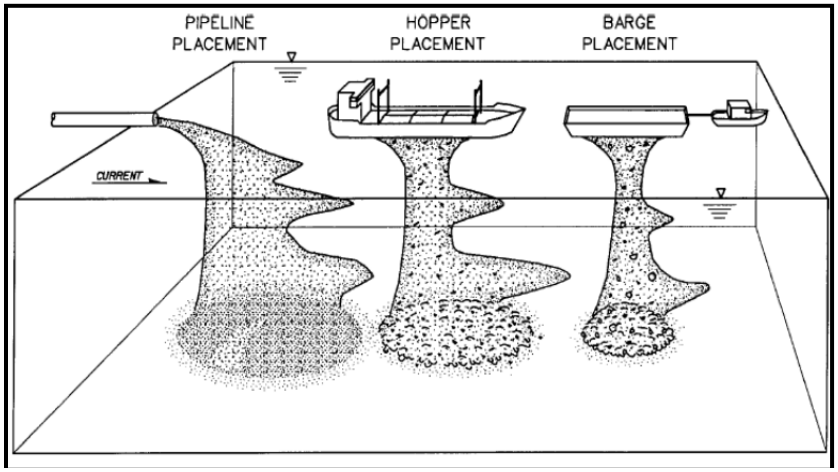


Figure 4-7: Schematic of Open-water Placement Methods (USEPA, 1992)

Open-water placement must comply with applicable state and federal regulations. Such regulations include, but are not limited to the MPRSA (ocean disposal); CWA, Section 404 (navigable water placement), and NEPA. In all instances, applicable state and federal regulations must be followed and appropriate permits must be obtained.

The cost associated with open-water placement is a function of the type of dredging equipment, the capacity of the dredge, the nature of the material, and the distance to the placement site. Additional costs may be necessary if special practices are required to limit environmental impacts and/or the material is contaminated.

4.4.2 Confined Placement

A confined disposal facility (CDF) is an engineered structure for containment of dredged material. CDFs are bound by confinement berms or structures to enclose the disposal area, thereby isolating the dredged material from its surrounding environment. CDFs

serve as a dewatering facility where dredged material may be placed temporarily or permanently. The three typical types of CDFs are upland, nearshore, and island, as shown in Figure 4-8. An upland CDF consists of a fully diked facility located above the water line and out of wetland areas. A nearshore CDF has at least one or more sides adjacent to the shoreline. An island CDF is a fully diked facility surrounded entirely by water.

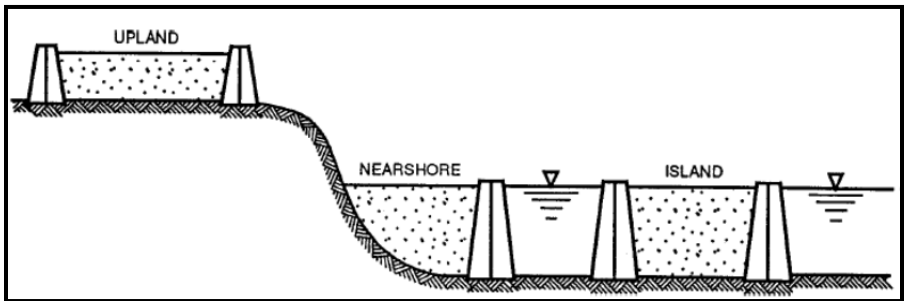


Figure 4-8: Diagram of Upland, Nearshore, and Island CDFs (USEPA, 1992)

CDFs may be used for coarse and fine-grained material. The material is placed into the CDF either hydraulically or mechanically. Placing the material directly into the CDF from the dredging site through pipelines is the most economical method. The dredged material consists of a high percentage of water when it is pumped into the facility. Depending on the placement method and material characteristics, slurry material initially deposited in the CDF may occupy from 1.2 times (mechanical placement) to 5 – 10 times (hydraulic placement) its original volume due to water content. Design of the CDF must account for this additional volume during the decanting and drying phase. Following placement, the finer sediments are allowed to consolidate, settle, and dewater. Water evaporates or percolates through the berms or into the ground. CDFs that use weirs to enable surface water to exit the facility must be designed with sufficient retention times to ensure adequate sediment settling will occur. For coarser grained materials such as sand, the dewatering time is much shorter.

Dredged material placement within a CDF has several benefits. CDFs can substantially reduce the amount of dredged material re-entering the environment when properly designed, operated, and maintained. CDFs can provide either a temporary or permanent storage location for dredged material that will naturally vegetate if left undisturbed. Finally, CDFs can be used as processing and/or blending areas for beneficial use activities.

The size, design, and cost of a CDF are site specific. Factors considered in the design of a new CDF include: location, physical nature of sediments to be placed (e.g., grain size, organic content, etc.), physical nature of the project footprint, chemical nature of sediments (contaminated vs. clean), volume of sediments to be stored, placement method, and the length of time material will be stored at the facility. Depending on the design, operation and maintenance costs of the CDF will vary.

4.4.3 Beneficial Use

Beneficial use includes a wide variety of opportunities to utilize dredged material for a productive purpose. The objective of beneficial use of dredged material is to make the traditional placement of dredged material unnecessary or reduce the required volume of disposal. The USACE recommended categories of beneficial uses (USACE, 1987) are as follows:

- Habitat restoration/enhancement (wetland, upland, island, and aquatic);
- Beach nourishment;
- Aquaculture;
- Parks and recreation (commercial and non-commercial);
- Agriculture/horticulture/forestry;
- Mine and quarry reclamation;
- Landfill cover for solid waste management;
- Shoreline stabilization;
- Industrial and commercial use;
- Material transfer (fill, levees, roads, etc.); and
- Construction material.

Factors to be considered in the evaluation of beneficial use alternatives include the identification of local needs and opportunities for beneficial use, sediment compatibility, distance from the dredging or dewatering site to the beneficial use location, site accessibility, handling requirements, and capacity of the beneficial use alternative. Potential beneficial use options for the POCB Slip and Access Channel EDMMP include habitat restoration/enhancement, beach nourishment, shoreline stabilization, industrial and commercial use, and material transfer.

4.4.3.1 Habitat Restoration/Enhancement

An upland habitat is one in which the vegetation is not normally subjected to inundations. Upland habitats provide refuge for a broad category of terrestrial communities and range from bare ground to mature forest. Dredged material may be used to create upland habitat either through relocation of dewatered material to the proposed upland site, or by the conversion of a dredged material CDF that is either no longer used or has long periods between maintenance dredged material placement to an upland habitat site. The site may be allowed to naturally re-vegetate, or may be planted with desirable plants, in order to provide optimal food and cover for wildlife, waterfowl, game mammals, and rare or endangered species. Upland habitat creation is a viable beneficial use option for virtually all sediments: rock, gravel and sand, consolidated clay, silt/soft clay, and sediment mixtures. Estuarine or marine sediments may require desalinization. Soil amendments, such as lime and organic matter, may be required to provide a suitable medium for the growth of upland plant species.

4.4.3.2 Beach/Littoral Nourishment

Beach nourishment refers to the direct placement of large quantities of beach quality sand on an existing beach to advance the shoreline seaward (Figure 4-9). Littoral nourishment is the placement of material in the near shore to supply material for littoral movement. Generally, nourishment projects are carried out along a beach where a moderate and persistent erosional trend exists. Sediment with physical characteristics similar to the native beach material may be placed by mechanical or hydraulic means.



Figure 4-9: Beach Nourishment (Photo Courtesy of www.waterways.nsw.gov.au)

4.4.3.3 Shoreline Stabilization

Shoreline erosion is a major problem along many ocean, bay, and estuary shorelines due to wave action, sea level rise, and/or subsidence. Shoreline stabilization is the process of restoring and/or mitigating a shoreline to its original or desired position following any natural or man-made disturbance, or providing protection measures to prevent further erosion along the shoreline. Dredged material may be used for shoreline stabilization in multiple configurations. Dredged material may be used to create berms or embankments at an orientation to the shoreline that will either modify the local wave climate to improve shoreline stability, or alter the wave direction to modify the rate or direction of local sediment transport (e.g. groins, breakwaters). Additionally, dredged material may be placed behind an impermeable structure (i.e., sheet-pile wall) to restore or reclaim lost shoreline. Depending on site and project characteristics, dredged material may be placed at the site mechanically by truck or barge, or may be transported into the site as slurry by a hydraulic pipeline.

4.4.3.4 Industrial and Commercial Use

Industrial and commercial development near waterways can be aided by the availability of fill material from nearby dredging activities. The direct placement of hydraulically placed fill requires specific engineering, environmental, and feasibility considerations, and is only viable if project sites are located within a few miles of dredging areas. Dewatered dredged material can also be used as construction fill to build industrial and commercial facilities. The use of dredged material as fill to expand or enhance waterfront facilities may be a viable beneficial use alternative because dredged material is typically in surplus from routine maintenance dredging near the proposed sites for port facilities.

4.4.3.5 Material Transfer

Dewatered dredged material may be beneficially used as construction fill for roads, construction projects, levees, or CDF expansion. The applicability of dredged material to a particular construction project depends on the physical and engineering properties of the material, as well as the specific requirements of the project. However, if the material has poor foundation qualities, a suitable additive such as cement may be added to increase shear strength and bearing capacity.

5.0 DESCRIPTION AND EVALUATION OF ALTERNATIVES

The purpose of this section is to provide an overview of placement alternatives identified and evaluated for the management of construction and maintenance material excavated and dredged from the POCB Slip and Access Channel. ***Management of material from the federal navigation channel is not included in the EDMMP. This material will continue to be dredged and managed, to the limits and depths of the federally authorized channel, by the USACE***. The alternatives include conventional open-water disposal, confined placement, and beneficial use.

An overview of the preferred excavated and dredged material placement sites and material handling logistics is included in this section due to the complexity of the interlinked dredge and placement schedules. The intent of this summary is to assist the reader with obtaining a full understanding of the preferred construction activities while reading the individual feasible placement site sections. A full description of the preferred excavated and dredged placement sites and the preferred maintenance dredging material management alternative is in Section 7.2.

The preferred excavated/dredged material management alternative for the POCB Slip and Access Channel EDMMP is the placement of construction excavated material at both the Mill Site and the Slip West Stockpile Site and the placement of construction dredged material at both the Mill Site and Ingram Yard (Table 7-2).

The construction excavation and dredging process will begin with the excavation portion of the *Upland Phase*, which includes the excavation of 1.63 mcy of material from the slip. Material will be hauled to either the Slip West Stockpile site or the Mill Site. The material hauled to the Slip West Stockpile site will be stockpiled behind the sheet pile wall up to 10 feet above grade. The material hauled to the Mill Site will be used to construct the containment berm for confined placement and to be used to complete the site closure plan.

The *In-Water Phase 1* will include the dredging of 1.35 mcy of material to form the Access Channel. This dredge activity will commence after the initial 18-foot high containment berm is completed at the Mill Site. Slurry dredged from Coos Bay will be hydraulically conveyed to the Mill Site and discharged within the containment berm. This work will be performed within the allowable in-water work window, October 1st through February 15th.

Excavation of the slip is required to be ongoing during *In-Water Phase 1* to have the *Upland Phase* of the slip completed by the following in-water work window.

The construction dredging portion of the *Upland Phase* will place a cutter suction dredge in the dredge launch pond to remove approximately 2.18 mcy of additional material from the POCB Slip. Approximately 800,000 cy of the 2.18 mcy will be hydraulically conveyed to the Mill Site and approximately 1.38 mcy of the 2.18 mcy will be

hydraulically conveyed to Ingram Yard. This dredge activity will commence after the construction excavation of the dredge launch pond is completed, however, it cannot be completed simultaneously due to limitations on equipment size within the dredge launch pond.

The *In-Water Phase 2* activities will include removal of the natural earthen berm, approximately 500,000 cy of material. Dredging will be conducted from both the Coos Bay side and the POCB Slip side of the berm to reduce the duration of breaching and removing the natural earthen berm. Slurry dredged from both sides of the berm will be hydraulically conveyed to the Ingram Yard placement site by pipeline. This work will be performed within the allowable in-water work window.

5.1 Formulation and Evaluation of Alternatives

The identification, design, and evaluation of potential dredged material placement alternatives were based on multiple sources of information. These included a literature review (e.g. *The Oregon Estuary Plan Book* [ODLCD, 1987]), meetings and discussions with involved parties, identification of historical dredged material placement sites, and USACE engineering manuals for the management of dredged material (*Dredging and Dredged Disposal* [USACE, 1983], *Beneficial Uses of Dredged Material* [USACE, 1987]). The following subsections summarize the decision process used to evaluate potential dredged material placement alternatives and the assumptions used to determine site capacities and the construction scheduling.

5.1.1 Evaluation Criteria

A three-step decision process was developed to conduct an evaluation of dredged material placement alternatives, as summarized in the flowchart in Figure 5-1. The decision process included the identification of potential dredged material placement alternatives, a preliminary screening of identified sites to ensure the sites are available for dredged material placement, a secondary screening to evaluate a site's ability to meet the capacity requirements of the project, and site feasibility assessment (technical, logistical, and environmental). These placement evaluation criteria are as follows:

- Capacity Requirements – This criterion evaluates an alternative based on its ability to meet the capacity requirements for material dredged from the POCB Slip and Access Channel. This criterion is in place in order to eliminate sites with small capacities relative to the quantity of dredged material. In order for a site to be considered as an open-water placement alternative, the site must be able to accommodate 50% or more of the dredged material cut-volume. Confined placement and beneficial use alternatives must be able to accommodate 20% or more of the dredged volume or 50% or more of the excavated volume. For maintenance dredging, an alternative must be able to accommodate the entire cut-volume for one dredging cycle of 115,000 to 160,000 cy. Sites that do not meet the capacity requirements may still be considered if a specific use is requested.

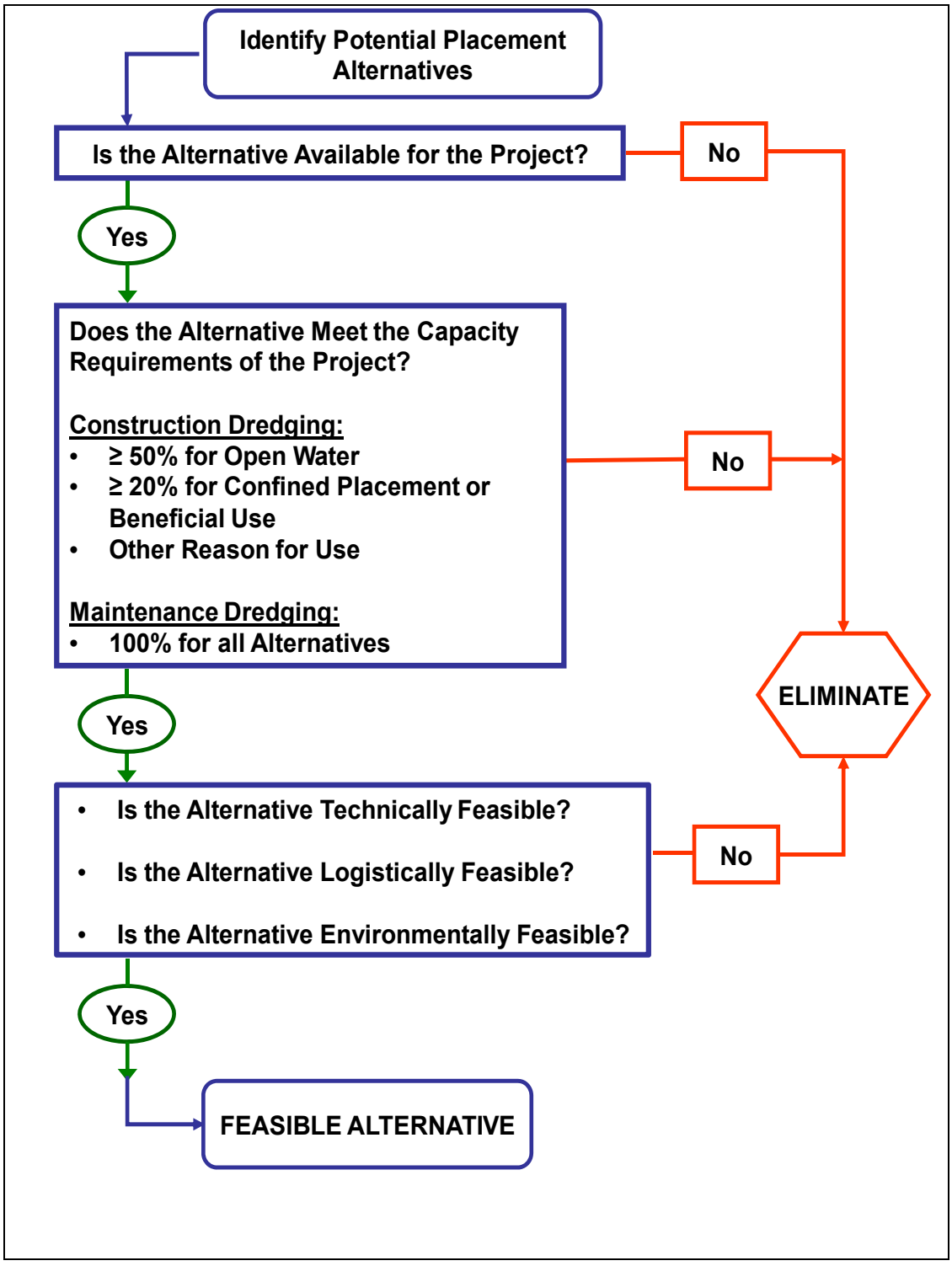


Figure 5-1: Decision Process Flow Diagram

- Technical Feasibility – This criterion evaluates the geotechnical considerations and existing physical conditions of each proposed management alternative. Based on extensive available data, grain size analyses and sediment characteristics of the dredged material were compared to the sediment requirements of the proposed management alternatives to assess the suitability of the dredged material. Other general site conditions include vegetative cover, shape of the site, and the ability to develop the proposed alternative based on current and proposed land use. A management alternative is rejected if it is not technically feasible.

- Logistical Feasibility – This criterion evaluates the operational aspects of the alternative in terms of its constructability, schedule, and operation and maintenance aspects. An alternative is rejected if it is not logistically feasible.

- Environmental Feasibility – This criterion outlines the permitting requirements for each alternative, as well as identified potential environmental impacts resulting from the implementation of each alternative. A management alternative is rejected if it has one or more impacts to sensitive resources that would likely be unacceptable to permitting agencies or difficult to mitigate below a level of significance.

5.1.2 Assumptions

Evaluation of the alternatives required several universal assumptions regarding capacity and construction scheduling. Descriptions of the assumptions are as follows:

Capacity Assumptions

Clamshell and cutter suction dredges are recommended for dredging of the slip, depending on the dredged material management alternative. Mechanical dredging with a clamshell and hydraulic dredging with a cutter suction dredge can increase the cut-volume by up to approximately 10% and 300%, respectively. However, since fine-grained sand tends to dewater rapidly, dredge volume in the context of this report is based on the cut-volume. Capacity of each alternative is calculated as the in-place volume, or the maximum volume the alternative provides and does not take into consideration consolidation, settlement, etc.

Construction Scheduling Assumptions

The construction durations and schedule presented here does not include site preparation for upland work. It is assumed that site preparation will be completed prior to the commencement of excavation and dredging operations.

Scrapers, excavators, and/or dump trucks are assumed to excavate, transport, and place all material within the slip above 0.0 ft NAVD88. It is assumed scrapers have the ability to remove material to an elevation near the water table, assumed to be +10 ft NAVD88. It is assumed excavators will remove material below +10 ft NAVD88 to approximately 0.0 ft NAVD88, including the initial dredge launch pond. It is assumed that 23 cy scrapers

and excavators with 2.5 cy buckets will complete the work. The work week for excavation is 10 hr/day, 7 days/week. Excavated material will be transported and placed at the intended placement site using 18 cy dump trucks. It is assumed that each truckload carries 14 cy of material and has a daily production rate of 560 cy/day (10 hr/day) for each truck. It is assumed three excavators will be used simultaneously in the slip and each excavator will be supported with a rotation of three dump trucks. The total production rate assuming three excavators and nine dump trucks is 5,000 cy/day.

Dredging in Coos Bay by private contractors is restricted to October 1 to February 15 (ODFW, 2008). The duration of construction and maintenance dredging of the slip depends upon required site preparation, the volume of material to be dredged, type of equipment, and production rate. It is assumed that the slip dredging activities will be able to commence prior to the completion of the slip excavation activities. ***Weather delays are not factored into the production rates and construction durations.***

Mechanical dredging assumes the use of a clamshell with a 12 cy bucket. Material will be placed into an adjoining 3,000 cy split hull dump scow. Tugs will transport the scows to the placement site. Using one clamshell dredge and two scows and working 24 hours/day, 7 days a week, and 75% efficiency, the assumed daily production rate is 3,000 cy/day.

Hydraulic dredging assumes the use of a cutter suction dredge. The work schedule for hydraulic dredging is 24 hours/day, 7 days a week, with 75% efficiency. The production rate for hydraulic dredging with a cutter suction dredge and transporting the material to the placement site via pipeline varies according to the transport distance.

- For alternatives adjacent to the dredging site and a 24-in pipeline, the production rate is 18,000 cy/day.

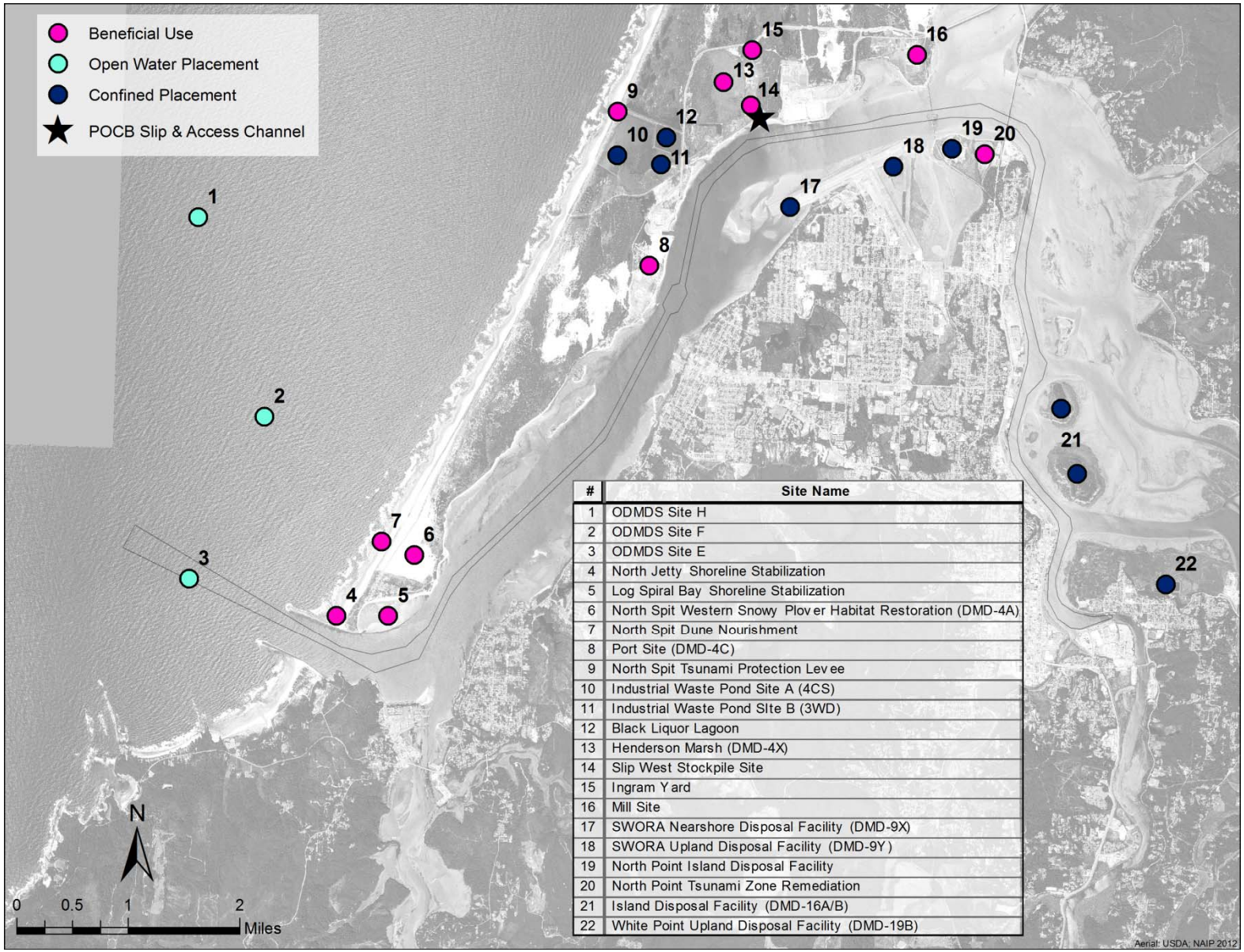
- For alternatives located offsite and a 24-inch pipeline, the production rate is decreased to 12,000 to 15,000 cy/day.

- For alternatives located offsite and a 30-in pipeline, the production rate is 30,000 cy/day.

5.2 Summary of Alternatives

In total, 22 alternatives were considered as potential placement sites, as shown in Figure 5-2. A summary of the alternatives and the results of the feasibility evaluation are given in Table 5-1.

During the course of the site investigations and subsequent feasibility evaluations, six of the sites were found to meet the capacity requirements and be logistically, technically, and environmentally feasible. Feasible alternatives are shown in Figure 5-3 and are discussed in the following subsections. The alternatives considered infeasible for technical, logistical, environmental, and/or economic reasons are discussed in Section 6.



#	Site Name
1	ODMDS Site H
2	ODMDS Site F
3	ODMDS Site E
4	North Jetty Shoreline Stabilization
5	Log Spiral Bay Shoreline Stabilization
6	North Spit Western Snowy Plover Habitat Restoration (DMD-4A)
7	North Spit Dune Nourishment
8	Port Site (DMD-4C)
9	North Spit Tsunami Protection Levee
10	Industrial Waste Pond Site A (4CS)
11	Industrial Waste Pond SIte B (3WD)
12	Black Liquor Lagoon
13	Henderson Marsh (DMD-4X)
14	Slip West Stockpile Site
15	Ingram Yard
16	Mill Site
17	SWORA Nearshore Disposal Facility (DMD-9X)
18	SWORA Upland Disposal Facility (DMD-9Y)
19	North Point Island Disposal Facility
20	North Point Tsunami Zone Remediation
21	Island Disposal Facility (DMD-16A/B)
22	White Point Upland Disposal Facility (DMD-19B)

Figure 5-2: Material Management Alternative Sites Evaluated for the EDMMP (Image Source: USDA, 2012)

Table 5-1: Summary of Alternatives

ID #	Alternative	Availability	Capacity	Technically Feasible	Logistically Feasible	Environmentally Feasible
1	ODMDS Site H			No - Restricted to finer-grained sands and silts from above RM 12		
2	ODMDS Site F	Yes	Yes - Virtually unlimited	Yes	Yes	Yes
3	ODMDS Site E	No - Site is closed and not accepting new material				
4	North Jetty Shoreline Stabilization	No - Site has not required additional material since original repair to a breach in 2002				
5	Log Spiral Bay Shoreline Stabilization		No - Capacity is limited to 500,000 cy, so site can handle less than 20% of dredged material			
6	North Spit Western Snowy Plover Habitat Restoration (DMD 4A)			No – Owned by BLM with restrictions on acceptance of dredged material		No – Would require significant environ-mental analyses and review prior to dredge material placement. Pink sand verbena, a state listed endangered plant species, is present
7	North Spit Dune Nourishment	Yes	Yes – Capacity for up to 3.8 mcy of dredged material	Yes	Yes	No – Would require significant environ-mental analyses and review prior to dredge material placement due to concerns related to snowy plover habitat, effects on recreation, and potential longshore transport of the placed materials.
8	POCB Site (DMD-4C)	Maybe – Possibly available as a temporary stockpile site for eventual material resale; however, the POCB intends to develop the site as a bulk material handling facility.	Yes – Capacity for up to 4.0 mcy of dredged material	Yes – Land use restrictions on placement of dredged material do not apply to sand intended for resale	Yes	Yes
9	North Spit Tsunami Protection Levee	Yes	Yes – Capacity for 2.3 mcy of material	Yes	Yes	Yes - Pending wetlands delineation in vicinity of proposed levee
10	Industrial Waste Pond – Site A (4CS)	No - Withdrawn by the owner due to wetland mitigation issues				

ID #	Alternative	Availability	Capacity	Technically Feasible	Logistically Feasible	Environmentally Feasible
11	Industrial Waste Pond – Site B (3WD)	No - Withdrawn by the owner due to wetland mitigation issues				
12	Black Liquor Lagoon	No - Withdrawn by the owner				
13	Henderson Marsh (DMD-4X)					No - Wetlands are located on site
14	Slip West Stockpile Site	Yes	Capacity criteria waived for this site	Yes	Yes	Yes
15	Ingram Yard	Yes	Yes – Capacity for up to 1.88 mcy of material	Yes	Yes	Yes
16	Mill Site	Yes	Yes – Capacity for up to 3.77 mcy of material	Yes	Yes	Yes
17	SWORA Nearshore Disposal Facility (DMD-9X)			No - A pier has been constructed that provides lighting for runway		No - Wetlands are located at site
18	SWORA Upland Disposal Facility (DMD-9Y)			No - Airport has extended runway on one end of site and an access road on the opposite side	No - Due to airport additions, access to open area of site is unavailable	
19	North Point Island Disposal Facility	No - Property is zoned for water dependent industrial developments. Dredged material was placed on the site in the 1980's creating wetland habitat.				
20	North Point Tsunami Zone Remediation	No - Dredged material has been placed on site previously, but zoning changes preclude the placement of additional material.				
21	Island Disposal Facility (DMD-16A/B)	No - Sites are at capacity and not accepting new material.				
22	White Point Upland Disposal Facility (DMD-19B)	No - Site is closed and not accepting new material				

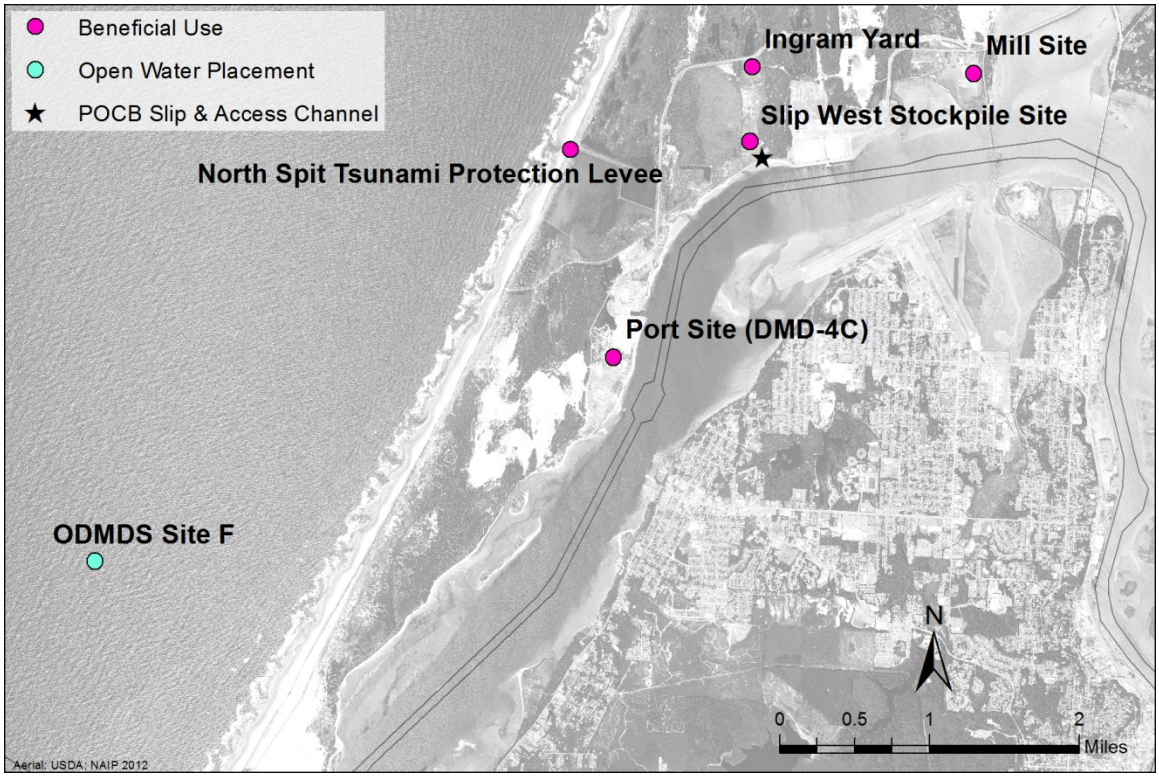


Figure 5-3: Feasible Alternatives for the POCB Slip and Access Channel EDMMP (Image Source: USDA, 2012)

5.3 Feasible Open-Water Placement Alternatives

5.3.1 ODMDS Site F

5.3.1.1 Description

ODMDS Site F is an existing USEPA offshore placement site in the Pacific Ocean. It is the largest of the Coos Bay ODMDS and is used by the USACE for the placement of clean sand and silt removed as part of maintenance dredging activities from below RM 12 in the Coos Bay Navigation Channel.

Site F has been expanded in past years (1989, 1995, and 2006) to accommodate annual maintenance dredging activities by the USACE (USEPA 2006) and is currently 3,075 ac in size. The larger size allows for disposal opportunities over a larger area (Drop Zones) compared to smaller sites, the reason for this being to reduce negative environmental or bathymetry impacts and improve site recovery time at any one location (USEPA & USACE 2006). Water depths range from -20 to -160 ft MLLW, and placement in this site could range from deep to nearshore reaches which would retain material within the littoral zone.

The center of the expanded site is located 1.75 mi north-northwest of the Coos Bay north jetty, as shown in the location map in Figure 5-4. Appropriate material for disposal in

Site F consists of clean sand and silt from below RM 12 that is suitable for ocean disposal.

One option for the use of ODMDS Site F would involve a clamshell dredge(s) for construction of the access channel and maintenance dredging of the slip and access channel. Dredged material would be placed into an adjoining scow and transported to ODMDS Site F by ocean-going tugs. The actual placement areas within the site would be determined by the USACE/USEPA.

5.3.1.2 Capacity

The expanded area of ODMDS Site F is 3,075 ac. Capacity of the site is not defined but is adequate for the volume of the access channel and maintenance dredged material (M. Siipola, USACE – Portland District, Personal Communication, February 15, 2006). However, there is probably an upper level limit to the amount of material that may be placed in the portion of the site that is part of the littoral zone of the north spit (J. Malek, Personal Communication, February 27, 2006).

Site F is further divided into offshore and nearshore zones. Dispersion of placed material at Site F has been found to be slower in water deeper than 59 feet and much faster along the nearshore.

The Site F offshore zone is approximately 2,020 ac in size ranging from a water depth of -160 ft MLLW to -60 ft MLLW. As an example, 9.7 mcy of dredged sand could be distributed throughout the offshore zone of Site F with an approximate depth of placed material of 3.0 ft. However it is unlikely that this large of quantity of dredged material would be permitted for this site.

The Site F nearshore zone is approximately 1,055 ac in size ranging from a water depth of -60 ft MLLW to -20 ft MLLW. Up to 3.4 mcy of dredged sand could be distributed throughout the nearshore zone of Site F with an approximate depth of placed material of 2.0 ft.

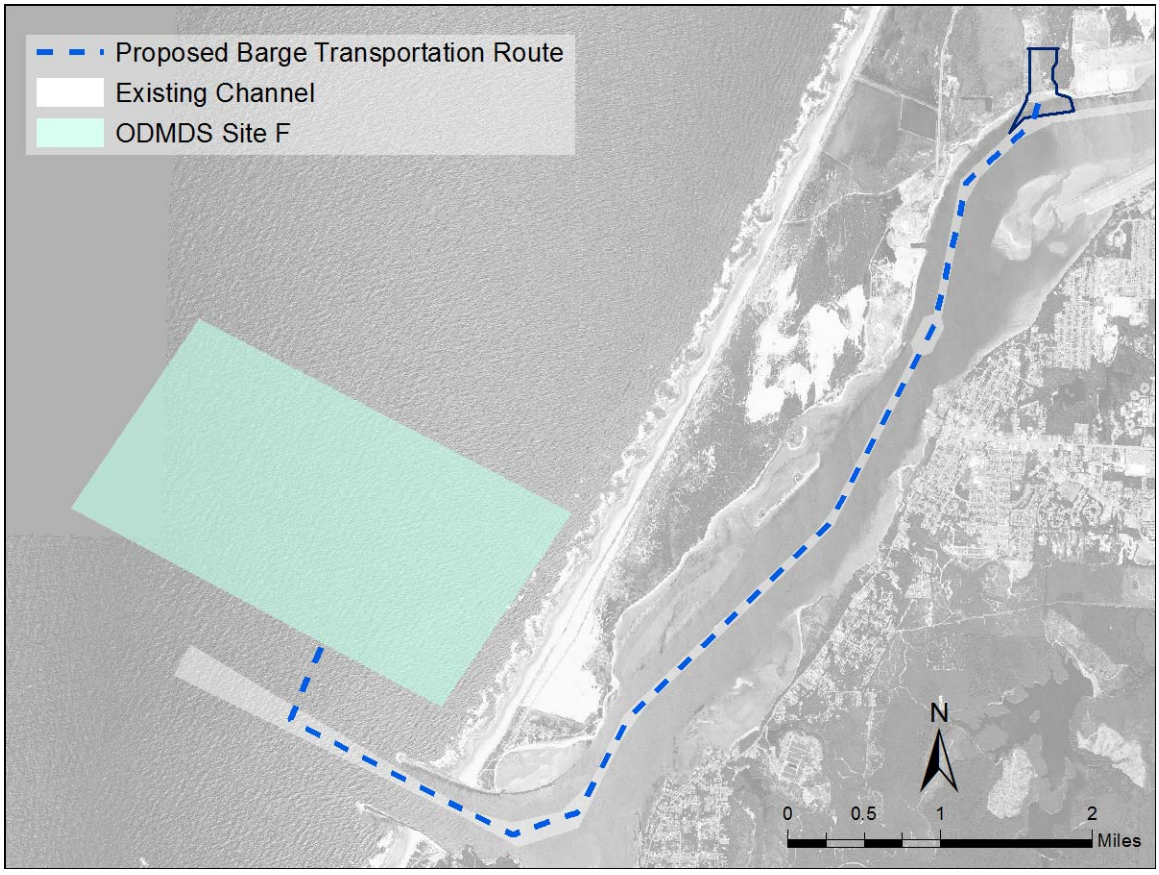


Figure 5-4: Location of ODMDS Site F (Image Source: USDA, 2012)

5.3.1.3 Feasibility Evaluation

Technical

Dredged material must meet criteria to qualify for open-water placement to ensure that the material will not unreasonably degrade or endanger human health or the marine environment. As described in Section 4.2.4, a SAP was conducted in accordance with the *Ocean Testing Manual* (USACE/USEPA, 1991) and *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (USACE/USEPA, 1998). Based on the findings, grain size distribution and TVS analysis for all samples were within acceptable criteria for unconfined aquatic disposal and the use of Site F as a dredged material placement alternative is deemed technically feasible.

Logistical

Located in open water northwest of the Coos Bay north jetty, Site F is easily accessible to both scows and hopper dredges. The primary restriction on the site's use is that the placement of slip dredged material not interfere with USACE maintenance dredging disposal activities. Weather delays are a concern during the latter half of the dredging window designated by the Oregon Department of Fish and Wildlife (ODFW). At a

production rate of 6,000 cy/day, based on the use of two mechanical dredges, construction dredging of the Access Channel would require 7.5 months. This duration is greater than the permitted dredging window for Coos Bay and will require either an extension of the existing dredging window or working through two consecutive windows. The duration for dredging 115,000 cy to 160,000 cy of maintenance dredged material using two clamshell dredges is less than one month. A summary of the estimated construction durations is provided in Appendix B.

The Site F nearshore is located quite close to shore. Dredged material would need to be transported to the site by barge and weather conditions within nearshore areas can be worse than in the offshore, delaying material placement during the construction season.

Environmental

A final ruling by USEPA on the designation of the expanded Site F requires that the site comply with MPRSA, CWA, and NEPA requirements. The USEPA designation indicates that no significant or long-term adverse environmental effects are anticipated from use. In addition, an investigation of Site F and its vicinity identified no shipwrecks or other cultural resource impacts [40 CFR Part 228.6(11)]. As stated under technical feasibility, sediment from the Access Channel is within acceptable criteria for unconfined aquatic disposal. Therefore, the use of Site F as a dredged material placement alternative is deemed environmentally feasible. Section 10/404 and 103 (MPRSA) permits from the USACE and Section 401 state water quality certification from the ODEQ would be required for dredging, as well as a fill/removal permit from the ODSL.

Along with new coastal studies to determine an upper capacity for Site F, additional consideration may be necessary to determine if negative impacts on biological conditions could result from more material being placed at Site F than what is currently used for maintenance dredging.

5.4 Feasible Confined Placement Alternatives

There are no confined placement alternatives that are considered to be feasible.

5.5 Feasible Beneficial Use Alternatives

5.5.1 Mill Site

5.5.1.1 Description

The Mill Site is the former location of the Weyerhaeuser Linerboard production mill that has since been demolished. The site is approximately 110-ac in size and located immediately to the north and east of Jordan Cove along the Coos Bay Navigation Channel, as shown in Figure 5-5. It is approximately 1.25 mi east of the POCB Slip. During initial site evaluation, the Mill Site was identified as a confined upland placement alternative; however, there are now plans to develop the site for the South Dunes Power Plant (SDPP) which will utilize the material from the POCB Slip and Access Channel to elevate the proposed power plant to an elevation of approximately +46 ft NAVD88 to mitigate the potential tsunami impacts.

Prior to construction of the slip, material from Ingram Yard will be placed at the Mill Site to initiate the Mill Site Closure Plan. Additional material from the slip will be required to complete the Closure Plan. The Mill Site Closure Plan will provide closure of the settling basins and landfills at the Mill Site, and raise the existing grades by a minimum of 3 ft. The full text of the Mill Site Closure Plan report prepared by GRI is available under a separate document titled "Work Plan for Joint Program Regulatory Closure: Settling Basins, Petroleum Contaminated Soil, Asbestos Waste, and Mill Waste; Weyerhaeuser Mill Site and Ingram Yard Properties, Oregon Department of Environmental Quality, ECSI #1083, ECSI #4707, and NPDES #101499, Coos County, Oregon" (GRI, 2012).

Excavated material from the slip will be transported to the site in dump trucks and will be used to construct a containment berm around the site and to complete the Closure Plan. Hydraulically dredged material will be transported via pipeline along an existing pipeline corridor and discharged within the containment berm.

5.5.1.2 Capacity

The capacity of the site is calculated based on the material required to construct the SDPP at approximately +46 ft NAVD88. The total site capacity is up to approximately 3.77 mcy of material, including the material to construct the containment berm (628,000 cy), the capacity of the containment berm (2.15 mcy) and the site closure material (990,000 cy). 1.62 mcy of dry excavated material will be used to complete the closure plan and also construct an 8,600 LF containment berm around approximately 83-ac of land. The berm will have an ultimate height of 28 ft above the existing grade, a crest width of 15 ft, and 3V:1H side slopes. Material will be stockpiled within the containment berm to an ultimate height of 23 ft above existing grade to provide 5 ft of freeboard below the top of the crest. The in-place capacity for dredged material will be 2.15 mcy; this is in addition to the initial placement of 1.62 mcy of dry excavated material.

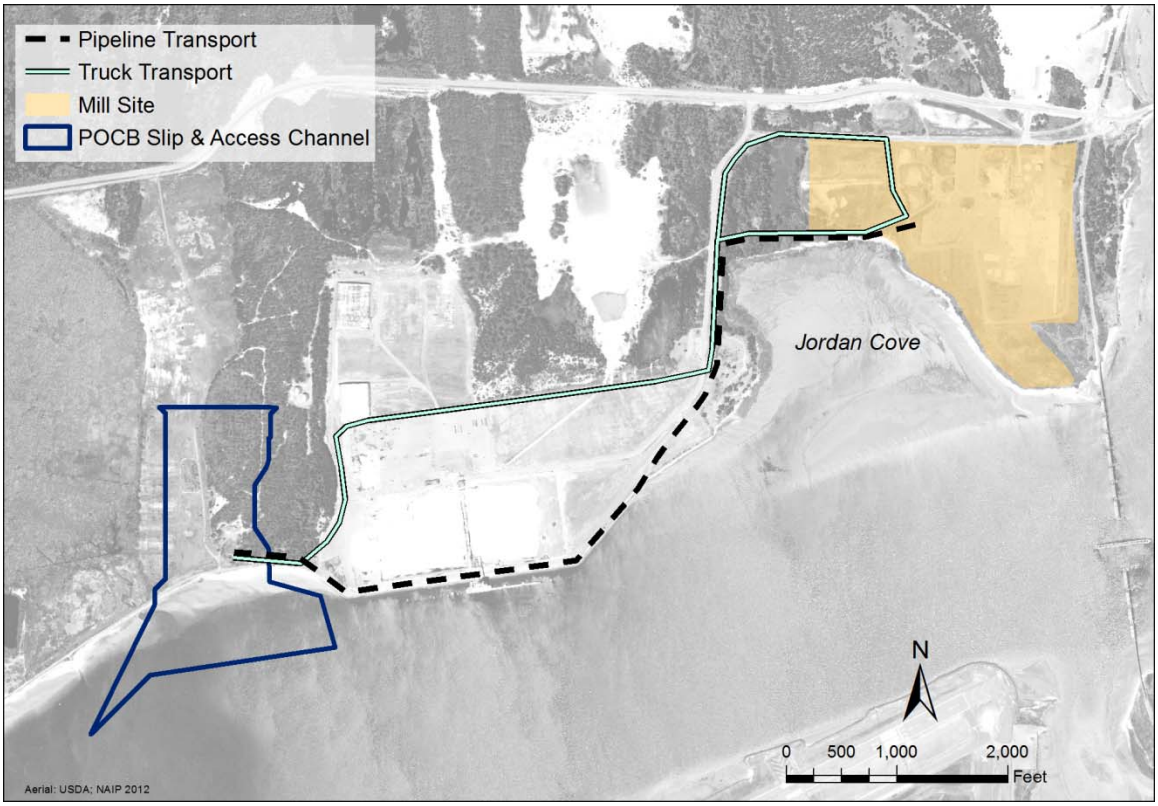


Figure 5-5: Location of the Mill Site Placement Area (Image Source: USDA, 2012)

5.5.1.3 Existing Conditions

The majority of the facilities of the Mill Site have been demolished; however, the concrete foundations of the major mill buildings and some minor structures and surface features remain. The Mill Site is relatively flat and minimally vegetated. Existing conditions at the Mill Site are shown in Figure 5-6. The average surface elevation is estimated to be +15 ft NAVD88. A large mound is present on the northwest side of the site. As previously mentioned, a site closure plan will commence at the Mill Site prior to the excavation and dredging activities at the slip. The Closure Plan will raise existing site grades a minimum of 3 ft using clean structural fill consisting of sand from the Ingram Yard property (GRI, 2012). Additional material from the slip will be required to complete the Closure Plan.

5.5.1.4 Feasibility Evaluation

Technical

The Mill Site is relatively flat and minimally vegetated over a large portion of the site, which simplifies the clearing and grading process. In addition, the Weyerhaeuser buildings have been demolished with only portions of the slabs remaining. It is assumed that the existing soil has sufficient bearing capacity to support the load associated with

the containment berm and future site development. For dredged material, dewatering of the dredged material and management of storm water will be required.

Geotechnical analyses will be required during final design to confirm bearing capacity and dewatering rates of the dredged material and existing soil. Geotextile soil reinforcement or other methods of soil stabilization may be required to achieve the required containment berm heights. Based on the preliminary evaluation, this alternative is technically feasible.

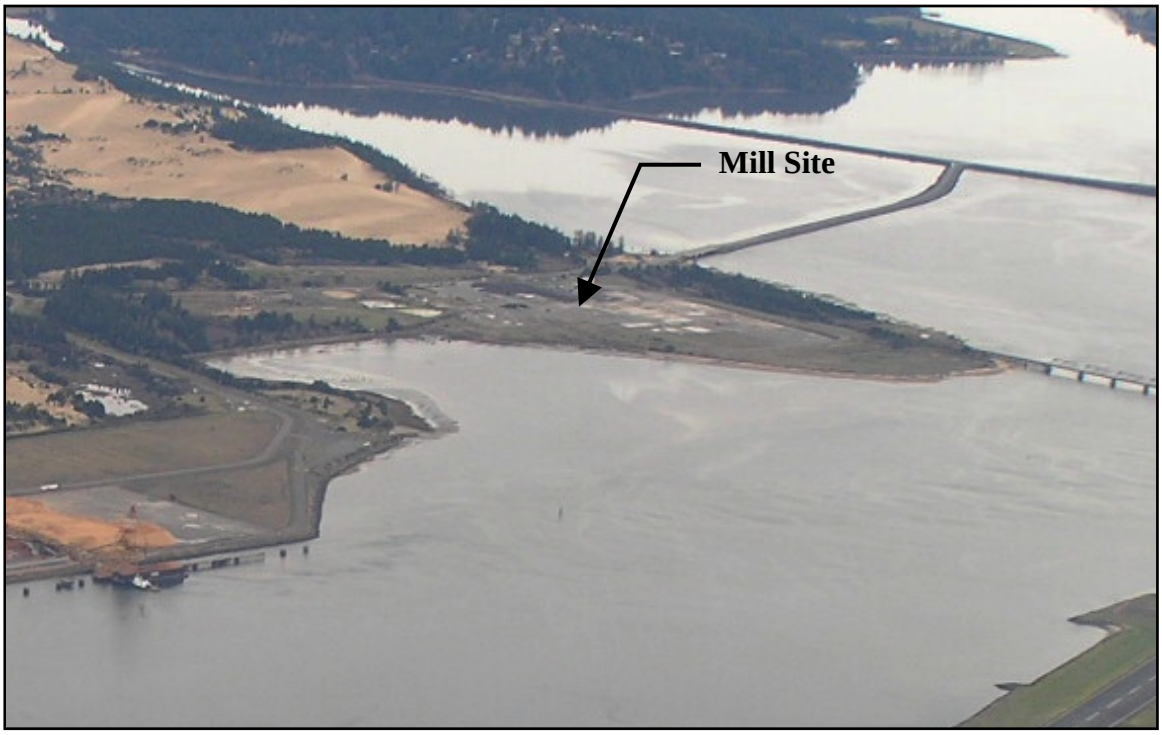


Figure 5-6: Existing Conditions at Mill Site

Logistical

Excavated and dredged material from the *Upland Phase* (dry excavation), *Upland Phase* (dredge launch pond), and the *In-Water Phase 1* will be placed at the Mill Site.

The *Upland Phase* (dry excavation) is anticipated to be on the critical path of the construction schedule based on the assumed production rates. To allow for continuous excavation of the slip, the containment berm will need to be constructed in two stages and the site closure will be completed in between the two berm construction stages. Constructing the berm in stages allows for placement of the Access Channel dredge material (*In-Water Phase 1* discussed below) within the initial berm to occur simultaneously with the placement of dry material to complete the closure plan. The *Upland Phase* (dredge launch pond) dredge activity will commence after the second construction stage of the containment berm is completed at the Mill Site. Refer to Figure

1-1 for the construction schedule showing the overlap of construction phases. A detailed description of each applicable phase for the Mill Site follows.

Material from the *Upland Phase* (Dry Excavation), discussed in Section 4.3.1.2, will be used to construct the containment berm on the Mill Site and complete the Closure Plan. The first berm construction stage will require an 18-foot high berm constructed in approximately 9-foot layers. The second berm construction stage will add an additional 10 feet to the top of the initial berm to reach the ultimate berm height of 28 feet above existing grade. The dry excavated material not needed to construct the berm, approximately 990,000 cy, will be used to complete the site closure plan and be stockpiled for future reshaping. Dump trucks used to transport the dry material will leave the slip and travel along an existing road behind the Roseburg facility and around Jordan Cove. The average round trip distance will be approximately four miles. Conventional earthmoving equipment will construct a containment berm using the excavated material. The berm slopes and crest width will be constructed to accommodate earth-moving equipment.

The anticipated duration to excavate, transport, and place 1.62 mcy of excavated material is 10.7 months. This duration assumes the *Upland Phase* is continuous and the production rate is 5,000 cy/day based on using three excavators in the slip with three dump trucks per excavator, working 7 days/wk, and 10 hrs/day.

The *In-Water Phase 1* discussed in Section 4.3.1.4 will include the dredging of 1.35 mcy of material to form the Access Channel. This dredge activity will commence after the initial 18-foot high containment berm is completed at the Mill Site. Slurry dredged from Coos Bay and the decant water will be transported to the Mill Site through a pipeline that will run along the southern and eastern edge of the Roseburg facility and discharge within the containment berm.

The anticipated duration to hydraulically dredge and convey 1.35 mcy of material from the Access Channel to the Mill Site is 2.5 months. This duration assumes a dredging production rate of 18,000 cy/day and operating 7 days/wk.

The *Upland Phase* (Dredge Launch Pond), discussed in Section 4.3.1.3, will place a cutter suction dredge within the dredge launch pond to remove approximately 2.18 mcy of additional material from the slip. Approximately 800,000 cy of the 2.18 mcy will be transported as slurry to the Mill Site through a pipeline that will run along the southern and eastern edge of the Roseburg facility and discharge within the containment berm. This dredge activity will commence after the final 28-foot high containment berm is completed at the Mill Site.

The anticipated duration to hydraulically dredge and convey 800,000 cy of material from the slip to the Mill Site is 2.2 months. This duration assumes a dredging production rate of 12,000 cy/day and operating 7 days/wk.

A summary of the estimated construction durations is provided in Appendix B.

Environmental

As described in Section 4.2.4, a SAP was conducted within the proposed Access Channel in accordance with the *Ocean Testing Manual* (USACE/USEPA, 1991) and *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (USACE/USEPA, 1998). Based on the findings, TVS analysis for all samples indicate material within the POCB Slip and Access Channel is free of contaminants.

Material placement may encroach into existing wetlands at the north western portion of the Mill Site when the stockpiled material is reshaped. Biological studies may be necessary to determine how much encroachment could occur and what the impacts could be, if any, on the existing wetland areas. If avoidance and conservation and minimization measures do not negate substantial impacts to the wetlands, mitigation may be necessary. The completion of any wetland studies and the proposal of any required mitigation would be necessary during the environmental review and permitting phase for the project.

Dredging and return water from the decanted dredged material will require a Section 10/404 permit from the USACE and Section 401 state water quality certification from the ODEQ.

5.5.2 Ingram Yard

5.5.2.1 Description

Ingram Yard is located immediately north and east of the proposed POCB Slip, south of the Trans-Pacific Parkway, east of Henderson Marsh, and west of the Roseburg site. The property is owned by the JCEP. The site is approximately 112 ac in size as shown in Figure 5-7.

The site has been identified as a beneficial use alternative and will handle containment for material hydraulically dredged from the slip. The dredged material placed at Ingram Yard will ultimately be reshaped for the construction of the JCEP LNG plant facility at an elevation of approximately +46 ft NAVD88 to mitigate the potential tsunami impacts. A containment berm will be constructed with earthmoving equipment using onsite material. Hydraulically dredged material will be transported via pipeline to the contained area.

5.5.2.2 Capacity

The capacity of Ingram Yard is based on the material required to construct the JCEP LNG plant facilities at an elevation of approximately +46 ft NAVD88. A 6,230 LF containment berm will be constructed around approximately 66-ac of land using existing material from the Ingram Yard site. The berm will have an ultimate height of

approximately 34 ft from the toe of the berm to the berm crest, a crest width of 15 ft, and 3V:1H side slopes. The ground elevation within the contained area will be lowered as a result of the construction of the berm from onsite material. Material will be stockpiled within the containment berm to an ultimate height of approximately 29 ft to provide 5 ft of freeboard below the top of the crest. The in-place capacity for dredged material will be approximately 1.88 mcy.

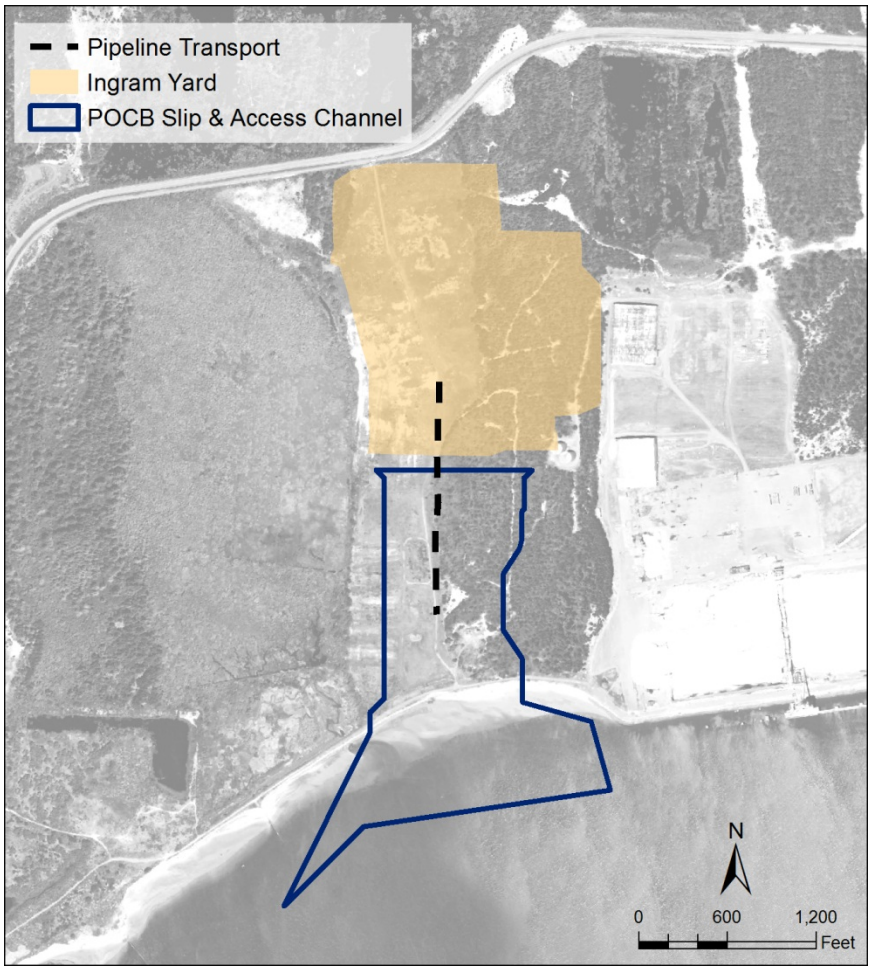


Figure 5-7: Ingram Yard Placement Site (Image Source: USDA, 2012)

5.5.2.3 Existing Conditions

The Ingram Yard placement site is located immediately south and adjacent to the Trans-Pacific Parkway and north of the proposed slip. Existing conditions are shown in Figure 5-8. The western half of the site is fairly level and grassed over. The surface elevation of the western half of the site ranges between +15 and +25 ft NAVD88. The eastern half of the site contains a sand dune with elevations up to +120 ft NAVD88.

5.5.2.4 Feasibility Evaluation

Technical

The Ingram Yard placement site is relatively flat on the western half of the site and minimally vegetated. The eastern half of the site contains sand dunes which will be used as part of the Mill Site Closure Plan. The minimal vegetation at the site will simplify the clearing and grading process. No structures are located on the site. It is assumed that the existing soil has sufficient bearing capacity to support the load associated with the stockpile of material and future site development. For dredged material, dewatering of the dredged material and management of storm water will be required. Subsequent geotechnical testing will be required during final design to verify maximum side slopes, crest height of the containment berm, dewatering rates of the dredged material and existing soil, and bearing capacity of the existing soil. Geotextile soil reinforcement or other methods of soil stabilization may be required to achieve the required containment berm heights. Based on the preliminary evaluation, this alternative is technically feasible.



Figure 5-8: Existing Conditions at the Ingram Yard Site

Logistical

Prior to placing dredged material at the Ingram Yard site, containment berms will be constructed using onsite material. The berm slopes and crest width will be constructed to accommodate earth-moving equipment. The berm will be constructed in approximately 10-foot layers and stacked as dredge material fills the containment area. The *Upland Phase* (dredge launch pond) discussed in Section 4.3.1.3, will place a cutter suction dredge in the dredge launch pond to remove approximately 2.18 mcy of material from the

slip. Approximately 1.38 mcy of the 2.18 mcy will be transported as slurry from the slip to the Ingram Yard placement site through a pipeline that will discharge within the containment berm. This dredge activity will commence after the containment berm is completed at the placement site.

The anticipated duration to hydraulically dredge and convey 1.38 mcy of material from the slip to Ingram Yard is 3.8 months. This duration assumes a production rate of 12,000 cy/day and working 7 days/wk. Additional time required for initial berm construction, using on-site material, will not add to the overall project schedule since the berm construction may be carried out in parallel with excavation and dredging of material to be placed at other placement sites.

The *In-Water Phase 2* discussed in Section 4.3.1.4 will include removal of the natural earthen berm, approximately 500,000 cy of material. Dredging will be conducted from both the Coos Bay side and the dredge launch pond side of the berm to reduce the duration for breaching and removing the berm. Dredging from the Coos Bay side may have a larger production rate compared to the dredge launch pond side of the berm because there are fewer limitations on equipment size. All 500,000 cy of material will be transported to Ingram Yard as slurry through a pipeline that will discharge within the containment berm.

The anticipated duration to remove the natural earthen berm is 0.5 months. This duration assumes a dredging production rate of 12,000 cy/day on the slip side of the berm, a rate of 18,000 cy/day on the Coos Bay side of the berm, and operating 7 days/wk. The total dredging production rate may be up to 30,000 cy/day when dredging from both sides of the berm.

A summary of the estimated construction durations is provided in Appendix B.

Environmental

As described in Section 4.2.4, a SAP was conducted within the proposed Access Channel in accordance with the *Ocean Testing Manual* (USACE/USEPA, 1991) and *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (USACE/USEPA, 1998). Based on the findings, TVS analysis for all samples indicate material within the POCB Slip and Access Channel is free of contaminants.

For construction dredging and decant water discharge, a Section 10/404 permit from the USACE and Section 401 state water quality certification from the ODEQ will be required.

Ingram Yard is sited near and adjacent to wetlands. Existing wetlands at the north western portion of Ingram Yard may be impacted when the stockpiled material is reshaped. Biological studies may be necessary to determine how much encroachment could occur and what the impacts could be, if any, on the existing wetland areas. If

avoidance and conservation and minimization measures do not negate substantial impacts to the wetlands, mitigation may be necessary. The completion of any wetland studies and the proposal of any required mitigation would be necessary during the environmental review and permitting phase for the project.

5.5.3 Port Site (DMD-4C)

5.5.3.1 Description

The Port Site is located on the North Spit on an undeveloped parcel owned by the POCB. The Port Site is approximately 68 ac in size and is located 1.5 miles southwest of the slip along the western shoreline of Coos Bay, as shown in Figure 5-9. The Port Site has been identified as a dewatering and stockpile site for material from the slip and access channel. Material will be stockpiled at the site and will remain there until the sand is later transported, most likely by barge, for sale on the open market. The POCB is developing plans to construct a bulk material handling facility at this site, which would make this site unavailable as a temporary material placement site.

A containment berm would be constructed around the perimeter of the Port Site with earthmoving equipment using onsite material. Material would be transported hydraulically via pipeline into the contained area.

5.5.3.2 Availability

The POCB has plans for developing the Port Site into a bulk material handling facility which may affect the availability of the site for placing material. In addition, the available size of the property has decreased because a northern parcel of the property has been sold to Southport.

5.5.3.3 Capacity

The capacity of the Port Site is based on a 6,450 LF containment berm constructed around the 68-ac site. The containment berm has a crest height 45 ft above the toe of the berm, crest width of 15 ft, and 3V:1H side slopes. The volume of the berm, assuming the ground elevation is uniform, is approximately 1.6 mcy. The ground elevation within the contained area would be lowered as a result of the construction of the berm from onsite material. This means the overall capacity of the site is not decreased by using onsite material to construct the berm.

Material would be stockpiled within the containment berm to a height of 40 ft to provide 5 ft of freeboard below the top of the crest. The in-place volume for material is 4.0 mcy.

5.5.3.4 Existing Conditions

The Port Site is located 4.5 miles north of the Coos Bay Jetty along the northern shoreline of Coos Bay. The property is bounded by Southport Forest Products to the north, the Trans-Pacific Parkway to the east and Port-owned property leased to DB Western to the south. Existing conditions are shown in Figure 5-10.

The site is roughly rectangular, with the longest dimensions measuring 1,500 ft wide by 2,500 ft long. The site is primarily sand with grass and pockets of thicker vegetation. A wetland is located to the immediate northwest of the facility. The surface elevation of the bottom third of the site is relatively uniform with an average elevation of approximately +20 ft NAVD88. The average surface elevation increases to +30 ft NAVD88 across the middle third of the property. The upper portion of the property experiences more relief with mounds reaching +45 to +50 ft NAVD88.

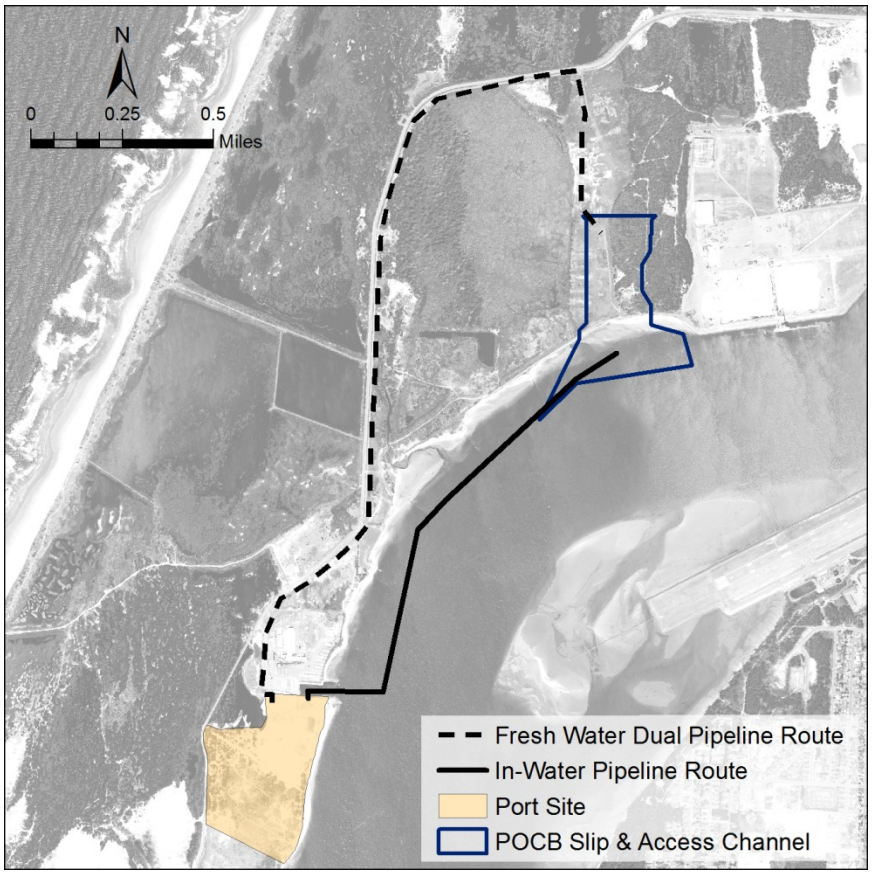


Figure 5-9: Location of Port Site (Image Source: USDA, 2012)

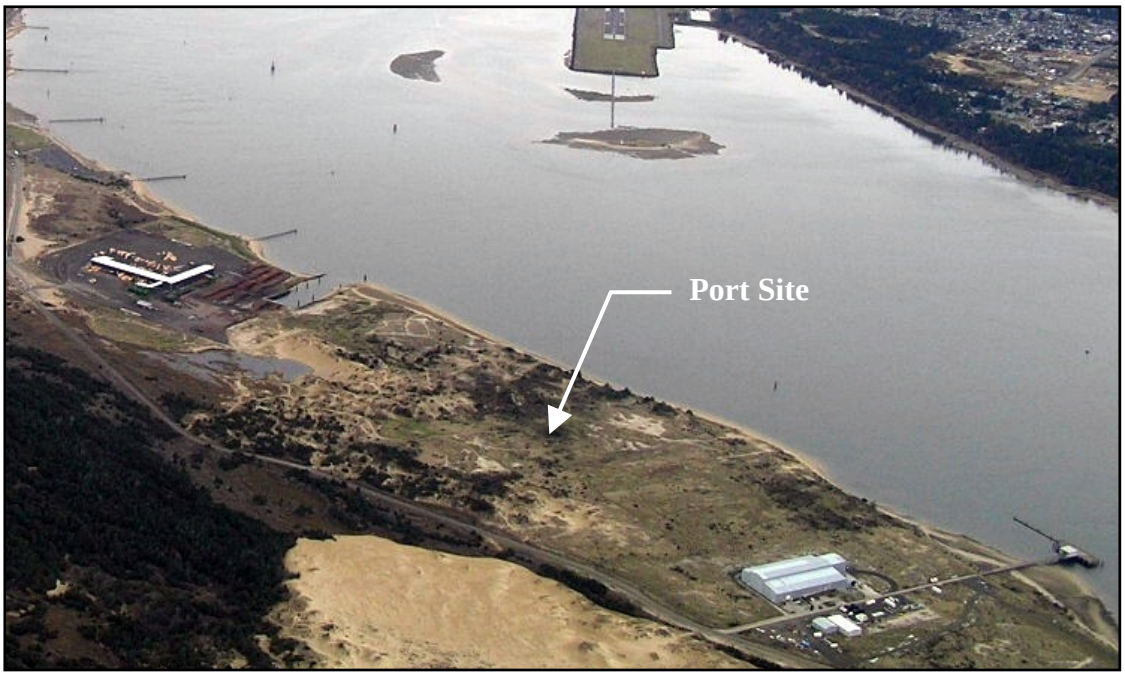


Figure 5-10: Existing Conditions at Port Site

5.5.3.5 Feasibility Evaluation

Technical

The Port Site generally increases in elevation from about +20 feet to +30 feet NAVD88, moving from south to north. Mounds of sand in the northern part of the site reach up to +60 feet NAVD88 in small areas. Much of the site is vegetated with grasses, but denser vegetation (including trees and brush) is located across the northern half of the property. The substrate throughout the Port Site appears to be sand: however, no existing geotechnical information has been obtained for the Port Site. It is assumed that the existing soil has sufficient bearing capacity to support the load associated with the placement of dredged material on the site. Subsequent geotechnical testing will be required during final design to verify maximum side slopes, crest height of the containment berm, dewatering rates of the dredged material and existing soil, and bearing capacity of the existing soil. Geotextile soil reinforcement or other methods of soil stabilization may be required to achieve the required containment berm heights.

The SWORA is located directly across Coos Bay from the Port Site, and the Port Site lies within the instrument approach landing system for Runway #4/22. This limits the height of the stockpile and any equipment to less than 150 feet above sea level, without FAA approval. This height limitation does not pose a significant constraint to the proposed alternative.

Based on the preliminary evaluation, this alternative is technically feasible.

Logistical

Material from the POCB Slip and Access Channel will be hydraulically dredged and transported into the containment berm at the Port Site via pipeline. Three different construction phases will be used to excavate and dredge the POCB Slip and Access Channel areas: the *Upland Phase,* the *In-Water Phase 1,* and the *In-Water Phase 2*.

The *Upland Phase* will involve completing a portion of the slip dredging activities while the slip is completely isolated from Coos Bay. This will be accomplished by retaining a natural earthen berm (approximately 40 feet wide at the crest) to provide a physical partition between Coos Bay and the *Upland Phase* construction activities. The berm will have sufficient size and height to prevent breaching by high sea water levels or ship wakes. Dredging equipment will be placed in the dredge launch pond and will hydraulically convey the dredged material in slurry form to the Port Site. Decant water will be pumped back to the dredge launch pond. The slurry and the decant water will both be freshwater. The freshwater slurry and decant will follow the proposed freshwater dual pipeline route shown on Figure 5-9. As the dredged material dewaters, the decant water will be returned via pipeline into the dredge launch pond.

The production rate for this phase is limited by the requirement that the dredging equipment fit inside the dredge launch pond. At a production rate of 12,000 cy/day for dredging within the launch pond, this would take up to 6.1 months (based on 2.18 mcy). Additional time required for initial berm construction, using on-site material, would not add to the overall project schedule since the berm construction could be carried out in parallel with excavation and dredging of material to be placed at other placement sites.

The *In-Water Phase 1* will include the dredging of the Access Channel. This will include dredging 1.35 mcy during the in-water work window between October 1st and February 15th. The anticipated duration to hydraulically dredge and convey 1.35 mcy of material from the Access Channel to the Port Site is 1.5 months. This duration assumes using relatively large dredging equipment with a dredging production rate of 30,000 cy/day and operating 7 days/wk.

The *In-Water Phase 2* will include 500,000 cy from the natural earthen berm. The *In-Water Phase 2* will be conducted during the in-water work window between October 1st and February 15th. Dredging will be conducted from both the Coos Bay side and the dredge launch pond side of the berm to reduce the duration of breaching and removing the natural earthen berm. Removing the berm will open the slip to Coos Bay. Final dredging to contour the Access Channel would complete the construction dredging activities. Dredging from Coos Bay could have a larger production rate compared to the *Upland Water Phase,* because there are fewer limitations on equipment size. If relatively large dredging equipment is used on the Coos Bay side with a production rate of 30,000 cy/day and smaller dredging equipment is used in the slip with a production rate of 12,000 cy/day, up to 0.5 months would be required for completion of the *In-Water Phase 2.*

For both In-Water Phase 1 and Phase 2, slurry and the decant water will be salt water and will be transported to the placement site by pipeline (Figure 5-9). Return water may flow through a separate pipeline and discharged to the slip, or may be discharged directly to Coos Bay. In either case, silt curtains will be used to decrease turbidity impacts to Coos Bay from the discharged water.

A summary of the estimated construction durations is provided in Appendix B.

Land Use

The Port Site is categorized as district 3-WD (water dependent) and 3-NWD (non-water dependent) under the Coos County Code, Section 3.2.400. The listed allowable activities in both the 3-WD and 3-NWD preclude dredged material disposal. However, allowable activities for both districts include "same or similar" to a "Log storage or sorting yard." The sand will not be disposed of on the site but will be temporarily stockpiled for sale and transport for a beneficial use. Prior to transport, the sand will be sorted to remove organic materials and other impurities. This activity is similar to log storage and sorting: consequently this usage is allowable under the Coos County Code. The temporary nature of the storage will not preclude more intense water dependent or non-water dependent uses in future. Additionally, two Special Consideration maps identify the property as a designated dredged material disposal site.

Environmental

As described in Section 4.2.4, a SAP was conducted within the proposed Access Channel in accordance with the *Ocean Testing Manual* (USACE/USEPA, 1991) and *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (USACE/USEPA, 1998). Based on the findings, TVS analysis for all samples indicate material within the POCB Slip and Access Channel is free of contaminants.

For construction dredging and decant water discharge, a Section 10/404 permit from the USACE and Section 401 state water quality certification from the ODEQ will be required.

The Port Site is sited near and adjacent to wetlands. Alignment of the containment berm and construction activities will be designed to avoid negative impacts to existing wetlands.

The Port Site is located near existing Snowy Plover habitat, a bird species listed on the Endangered Species list. Final siting of the containment berm and construction activities will require coordination with the USFWS and the Oregon Bureau of Land Management (BLM) to avoid impacts to the snowy plover population.

5.5.4 North Spit Tsunami Protection Levee

5.5.4.1 Description

A strip of land along the North Spit was identified as a potential beneficial use site for the construction of a tsunami protection levee. The purpose of the levee is to mitigate the impacts to the POCB Slip and the towns of North Bend and Coos Bay from a tsunami striking the North Spit. The levee is 5,750 ft in length, beginning at the southern end of the Industrial Waste Pond and extending northeast, as shown in Figure 5-11. The levee would be constructed to a height of +55 ft NAVD88.

This alternative recommends the beneficial use of 2.3 mcy of material excavated above 0.0 ft NAVD88 from the slip for the construction of a tsunami protection levee. Scrapers will remove material to the water table and excavators will remove the remainder of material. Excavated material will be transported and placed at the intended placement site using dump trucks.

A portion of the land required to construct the levee is owned by the USA; coordination with the BLM will be required. The remaining portion of the land required to construct the levee is owned by the POCB.

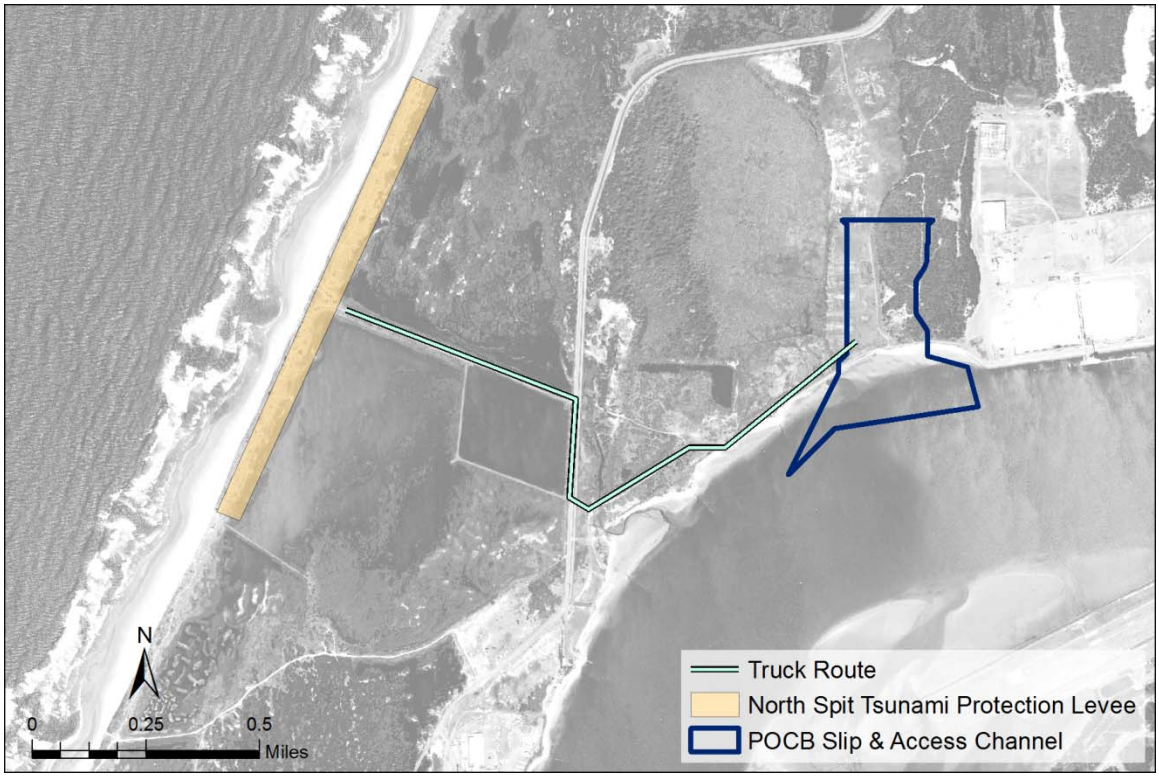


Figure 5-11: Location of Proposed North Spit Tsunami Protection Site (Image Source: USDA, 2012)

5.5.4.2 Capacity

The North Spit Tsunami Protection levee covers 60 ac and measures 5,750 ft in length. Based on the available topography data for the site, the average surface elevation is +15 ft NAVD88. The crest elevation of the levee is +55 ft NAVD88, and the crest width is 150 ft. Side slopes are 4:1. The capacity for this alternative is 2.3 mcy.

5.5.4.3 Existing Conditions

Existing conditions are shown in Figure 5-12. The levee lies along the existing dune bluff to the immediate east of 4WD Road and extends partially into the Industrial Waste Pond and a vegetated area north of the pond. The proposed levee is intersected at its midpoint by 4WD Road. The average surface elevation is +15 ft NAVD88.



Figure 5-12: Existing Conditions at Proposed North Spit Tsunami Protection Site

5.5.4.4 Feasibility Evaluation

Technical

The proposed North Spit Tsunami Protection site is relatively flat and minimally vegetated over a large portion of the site, which simplifies the clearing and grading process. It is assumed that the existing soil has sufficient bearing capacity to support the load associated with the levee. Geotechnical analyses will be needed during final design

to confirm bearing capacity of the existing soil. Based on the preliminary evaluation, this alternative is technically feasible.

Logistical

The North Spit Tsunami Protection Levee is located on the North Spit, approximately 1.2 mi west of the POCB Slip. Material above 0.0 ft NAVD88 would be excavated and transported from the POCB Slip to the site using conventional earth moving equipment. It is assumed that scrapers will remove material to the water table and then excavators will remove the remainder of material. Excavated material will be transported and placed at the intended placement site using 18 cy dump trucks. Trucks will leave the facility and travel southwest along Port Access Road to the intersection of the Trans Pacific Parkway (North Spit Road), continue north on Trans Pacific Parkway, and finally west along 4WD Road. The average round trip distance is 4 mi. Conventional earthmoving equipment will place the material in 6 to 12-in lifts followed by compaction. With a production rate of 5,000 cy/day, 7 days/wk, the anticipated duration for the completion of placement of material for this alternative is 15 months. The construction duration estimate is located in Appendix B.

Environmental

Material will be excavated in the dry above 0.0 ft NAVD88. Since this activity is not considered dredging, a Section 10/404 permit from the USACE and Section 401 state water quality certification from the ODEQ will not be required for this alternative.

Further investigation of the siting of the levee must be completed to include a wetlands delineation of this portion of the North Spit. The location of the levee would need to avoid and minimize negative impacts to wetlands.

5.5.5 Slip West Stockpile Site

5.5.5.1 Description

A grassland in the vicinity of the proposed slip was identified as a potential beneficial use site for excavated material. An approximate 6-ac strip of this grassland property immediately to the west of the slip will remain post-construction of the slip as shown in Figure 5-13.

This alternative includes the placement of excavated material to the west of the POCB Slip west sheet pile wall. This material will be stockpiled for later use above the top elevation of the sheet pile wall.

5.5.5.2 Capacity

The capacity of the Slip West Stockpile Site is limited by the average site width of 155 ft between the Henderson Marsh 50-ft buffer and the set back from the proposed sheet pile wall. The east toe of the stockpile will be set back approximately 75 ft from the sheet pile wall. An analysis of the surcharge effects on the wall will be required to determine the appropriate set back. The stockpile will be 1,500 ft long and will have a crest height approximately 10 ft above grade, a crest width of 10 ft, and 2V:1H side slopes. The volume of the Slip West Stockpile Site, assuming the ground elevation is uniform, is approximately 13,000 cy.

5.5.5.3 Existing Conditions

The Slip West Stockpile Site is located immediately west of the POCB Slip. The property is bounded by Ingram Yard to the north, the POCB Slip to the east and Henderson Marsh to the west. Existing conditions are shown in Figure 5-14. The site is roughly rectangular, with the average dimensions measuring 155 ft by 1,500 ft long. The site is primarily sand with grass and pockets of thicker vegetation. A wetland is located to the immediate west of the facility. The existing surface elevation of the site is relatively uniform with an average elevation of approximately +17 ft NAVD88.

5.5.5.4 Feasibility Evaluation

Technical

The proposed Slip West Stockpile Site is relatively flat and minimally vegetated over a large portion of the site. Material would be stockpiled with 2H:1V side slopes to approximately +40 ft NAVD88. It is assumed that the existing soil has sufficient bearing capacity to support the load associated with the stockpile. A Geotechnical analysis is required during final design to confirm bearing capacity of the existing soil. The sheet pile wall will need to be analyzed for the surcharge loads from the stockpile. Based on the preliminary evaluation, this alternative is technically feasible.

Logistical

The stockpiled material would be dry material excavated above 10.0 ft NAVD88. Trucks would leave the facility and travel around the west sheet pile wall to the stockpile site. The average round trip distance would be less than one mile. Conventional earthmoving equipment would shape the excavated material. The berm slopes and crest width would be constructed to accommodate earth-moving equipment.

With a production rate of 5,000 cy/day and operating 7 days/wk, the anticipated duration to excavate, transport, and place 13,000 cy of excavated material is 0.1 months. A summary of the estimated construction duration is provided in Appendix B.

Environmental

As described in Section 4.2.4, a SAP was conducted within the proposed Access Channel in accordance with the *Ocean Testing Manual* (USACE/USEPA, 1991) and *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (USACE/USEPA, 1998). Based on the findings, TVS analysis for all samples indicate material within the POCB Slip and Access Channel is free of contaminants.

Material will be excavated in the dry above 10.0 ft NAVD88. Since this activity is not considered dredging, a Section 10/404 permit from the USACE and Section 401 state water quality certification from the ODEQ will not be required for this alternative.

The location of the stockpile would be designed to avoid and minimize negative impacts to wetlands.

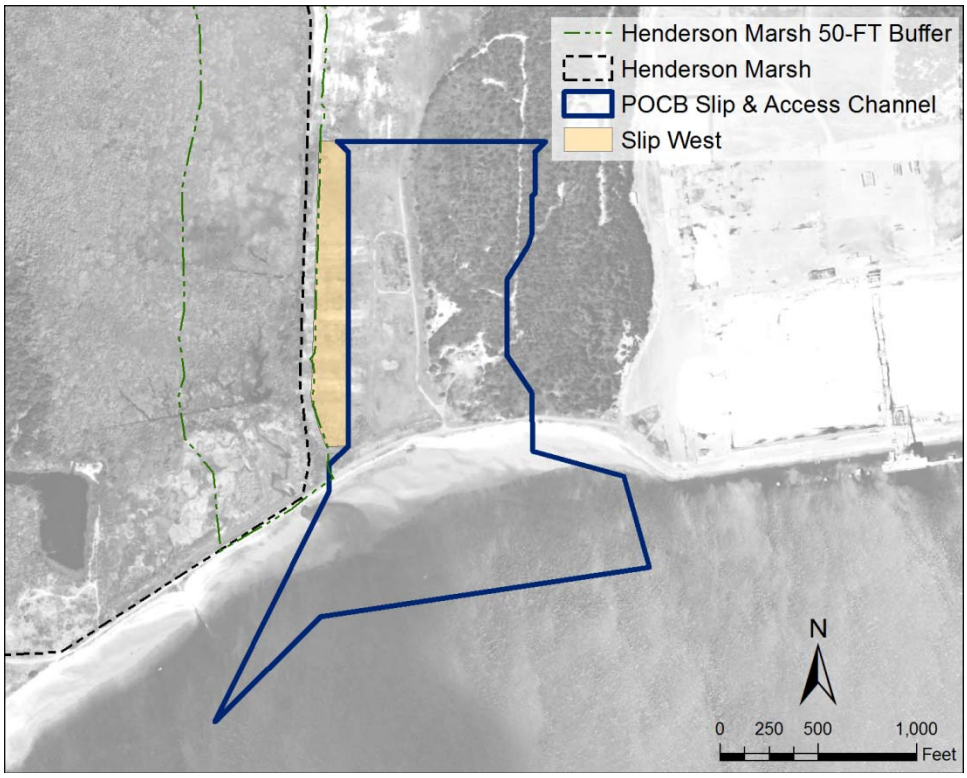


Figure 5-13: Location of Proposed Slip West Stockpile Site (Image Source: USDA, 2012)



Figure 5-14: Existing Conditions at Proposed Slip West Stockpile Site

6.0 SITES IDENTIFIED AND ELIMINATED FROM FURTHER CONSIDERATION

The initial investigation for the POCB Slip and Access Channel EDMMP identified 22 potential dredged material management alternatives. These sites included open-water disposal sites, confined placement alternatives, and beneficial use options. Further evaluation of the alternatives based on site availability and technical and logistical feasibility determined that 16 of these sites were not applicable. Therefore, these alternatives were eliminated from further evaluation and consideration. The locations of the eliminated alternatives are illustrated in Figure 6-1. This section provides a brief description of the alternatives found to be infeasible and reasons for elimination.

6.1 No Action

Dredging is required to construct the POCB Slip and Access Channel for the expansion of port-related marine facilities. The No Action alternative is defined as no construction dredging of the POCB Slip and Access Channel. Under the No Action alternative, future berths could not be constructed and ships could not access the onshore facilities.

6.2 Open-water Placement Alternatives

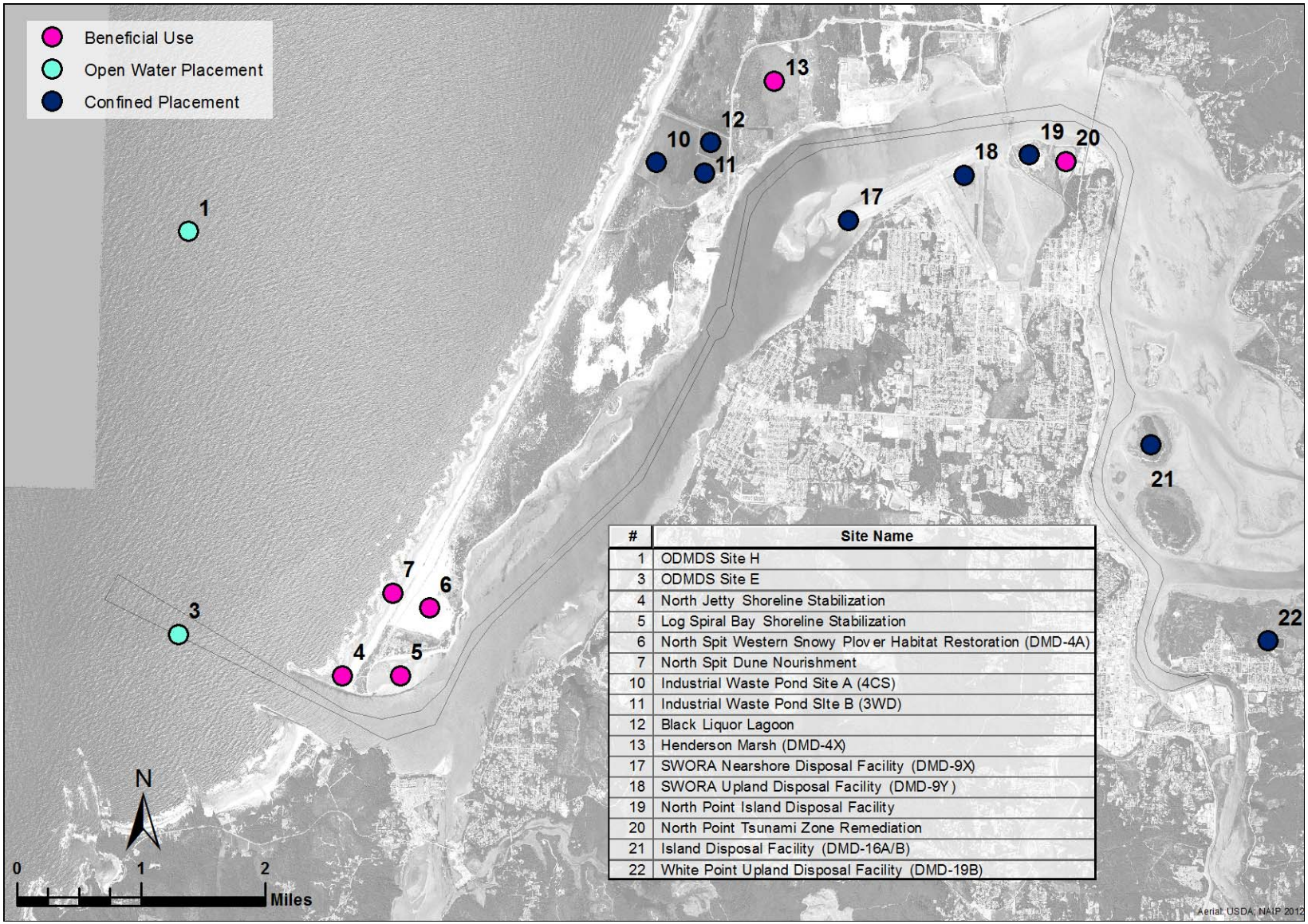
6.2.1 ODMDS Site H

6.2.1.1 Description

ODMDS Site H is an EPA designated open-water disposal site under the MPRSA and used for the disposal of finer-grained sand and silt materials from above RM 12. The site is located about 3.7 miles northwest of the Coos Bay entrance channel. Site H is 3,600 ft by 1,450 ft with an area of 120 ac. The average water depth is 180 ft.

6.2.1.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the technical requirements for the POCB Slip and Access Channel EDMMP. The material from the POCB Slip and Access Channel is classified as dense sand. Use of Site H is restricted to finer-grained sands and silt materials from above RM 12. Therefore, sediments from the POCB Slip and Access Channel are not applicable for disposal in ODMDS Site H.



#	Site Name
1	ODMDS Site H
3	ODMDS Site E
4	North Jetty Shoreline Stabilization
5	Log Spiral Bay Shoreline Stabilization
6	North Spit Western Snowy Plover Habitat Restoration (DMD-4A)
7	North Spit Dune Nourishment
10	Industrial Waste Pond Site A (4CS)
11	Industrial Waste Pond SIte B (3WD)
12	Black Liquor Lagoon
13	Henderson Marsh (DMD-4X)
17	SWORA Nearshore Disposal Facility (DMD-9X)
18	SWORA Upland Disposal Facility (DMD-9Y)
19	North Point Island Disposal Facility
20	North Point Tsunami Zone Remediation
21	Island Disposal Facility (DMD-16A/B)
22	White Point Upland Disposal Facility (DMD-19B)

Figure 6-1: Placement Sites Eliminated from Further Consideration (Image Source: USDA, 2012)

6.2.2 ODMDS Site E

6.2.2.1 Description

ODMDS Site E is an USEPA designated open-water disposal site under the MPRSA and used for the disposal of sand below River Mile (RM) 12. The site is located about 1.5 miles southwest of the Coos Bay entrance channel. Site E is 3,600 ft by 1,400 ft with an area of 116 ac. The average water depth is 51 ft.

6.2.2.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. Although ODMDS Site E is an EPA designated site and has been historically used by the USACE for maintenance material disposal, the site was closed in 1991 due to mounding issues. No plans to reopen ODMDS Site E for dredged material disposal are anticipated in the near future.

6.3 Confined Placement Alternatives

6.3.1 Black Liquor Lagoon

6.3.1.1 Description

Black Liquor Lagoon is a 32-ac aeration basin located on the North Spit and immediately adjacent to the Industrial Waste Pond. The site is approximately 0.75 mi west of the POCB Slip. The site is diamond-shaped with a northern and southern boundary length of approximately 1,300 ft and western and eastern boundary of 1,100 ft. The site was developed by the Weyerhaeuser Company to receive and treat effluent from the company's liner board mill. Effluent was settled in Black Liquor Lagoon before being put into the Industrial Waste Pond (discussed in 6.3.2) where it was aerated and diluted prior to being pumped to the outfall. An existing 20,000 gallon per minute (GPM) ocean outfall is located along the northern boundary and discharges into the Pacific Ocean.

6.3.1.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. The owner withdrew the site from consideration to maintain it in its current condition and retain the flexibility to utilize the site for a different purpose in the future.

6.3.2 Industrial Waste Pond – Site A (4CS) and Site B (3WD)

6.3.2.1 Description

The Industrial Waste Pond (IWP) is an approximately 300-ac settling pond located on the North Spit and was identified as a potential confined upland placement alternative for material from the POCB Slip and Access Channel. The site is approximately 1.0 mi west of the POCB Slip. The site was developed by the Weyerhaeuser Company to receive and treat effluent from the company's liner board mill. Effluent was settled in Black Liquor Lagoon (discussed in 6.3.1) before being put into the pond where it was aerated and diluted prior to being pumped to the outfall. The site also contains an existing 20,000 gallon per minute (GPM) ocean outfall that is located along the northern boundary of the site and discharges into the Pacific Ocean.

The IWP is divided into two parcels according to *The Oregon Estuary Plan Book* and identified as Site A (4CS) and Site B (3WD). Site A is approximately 235 ac and restricted to fill originating from either an upland source or from dredged material. Site B is approximately 51 ac and is restricted to fill consisting only of material originating from upland excavation.

6.3.2.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. The owner withdrew the site from consideration to maintain it in its current condition and retain the flexibility to utilize the site for a different purpose in the future. The sites were also withdrawn to avoid potential wetland mitigation requirements.

6.3.3 Island Disposal Facilities (DMD-16A/B)

6.3.3.1 Description

The Island Disposal Facilities (also referred to as sites DMD-16A and DMD-16B) were identified as a potential dredged material placement site in *The Oregon Estuary Plan Book*. The sites are existing islands approximately 30 and 50 ac in size, respectively. Owned by the Port, the sites are located in Coos Bay near RM 13 and were previously used as dredged material placement sites for maintenance material dredged from Coos Bay (M. Gaul, Personal Communication, March 1, 2006).

6.3.3.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. Sites DMD-16A and DMD-16B historically accepted maintenance material from Coos Bay. However, the sites were filled to capacity and are no longer available for use. Therefore, sediments from the slip and access channel are not applicable for placement at DMD-16A or DMD-16B.

6.3.4 North Point Island Disposal Facility

6.3.4.1 Description

A low-lying island at North Point was identified as a potential confined placement or mitigation site. The property is owned by the Al Pierce Lumber Company and is located at the northeastern tip of North Bend at RM 10. The site and the property adjacent to the east (also owned by the same company) received dredged material in the 1980's which created a small channel between the two and fostered the development of wetland habitat. The site is undeveloped and only accessible by rail or water.

6.3.4.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. New zoning regulations in Oregon preclude the placement of additional material on the property (Foss, personal communication 2006). Dredged material was placed on the site in the 1980's creating wetland habitat and has increased the difficulty for owners to sell the property (P. Havor, Al Pierce Lumber Company, Personal Communication, March 1, 2006).

6.3.5 SWORA Nearshore Disposal Facility (DMD-9X)

6.3.5.1 Description

The Southwest Oregon Regional Airport (SWORA) Nearshore Disposal Facility site (also referred to as DMD-9X) was identified as a potential disposal site in *The Oregon Estuary Plan Book*. The 60-ac site is located immediately southwest of Runway #4/22. A pier supporting Runway End Indicator Lighting (REIL) is located in the area of the proposed site, and the REIL is an essential element of the instrumentation for the FAA's precision approach to Runway #4/22.

6.3.5.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability and environmental feasibility requirements for the POCB Slip and Access Channel EDMMP. The above mentioned REIL has been constructed as part of the runway since the site was recommended in *The Oregon Estuary Plan Book*. Furthermore, wetlands are located in the vicinity of the proposed site and placement of dredged material would require wetlands mitigation (G. Cossey, Airport Operations Manager, Coos County Airport District, Personal Communication, March 2, 2006). Furthermore, this site was used as an eelgrass mitigation for impacts associated with the extension of Runway #4/22. This mitigation was funded by the FAA and the State of Oregon. For these reasons, the SWORA Nearshore Disposal Facility (DMD-9X) is not applicable for receiving sediments from the POCB Slip and Access Channel.

6.3.6 SWORA Upland Disposal Facility (DMD-9Y)

6.3.6.1 Description

The SWORA Upland Disposal Facility site (also referred to as DMD-9Y) was identified as a potential upland disposal site in *The Oregon Estuary Plan Book*. The 76-ac site is triangular in shape and located on the eastern edge of the airport property. Runways #4/22 and #16/34 are located on the proposed site.

6.3.6.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the capacity and logistical feasibility requirements for the POCB Slip and Access Channel EDMMP. Since its identification as a potential site in *The Oregon Estuary Plan Book*, Runway #4/22 has been extended east across the northern boundary of the site and Runway #16/34 has been constructed along the eastern boundary. In addition, a service road is located parallel to Runway #4/22. Although approximately 40 ac of the original site identified is undeveloped, it is not logistically feasible to construct an upland disposal facility because construction of the facility and placement of material within the facility would require traversing one, if not all three, runways and thus, impacting airport operations. Furthermore, the entire site within the controlled Airport Operating Area (AOA) for SWORA, and elevation of terrain in this area are tightly controlled, thus severely limiting any capacity of the site and adding restrictions and limitations to the time and nature of construction activities that could be performed.

6.3.7 White Point Upland Disposal Facility (DMD-19B)

6.3.7.1 Description

The White Point Upland Disposal Facility site (also referred to as DMD-19B) was identified as a potential dredged material placement site in *The Oregon Estuary Plan Book*. The approximately 185 ac site is located at White Point in the town of Eastside. The property is owned by several entities, but primarily by the POCB. The site had previously been used by the USACE as a placement site to manage maintenance dredged material.

6.3.7.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. Site DMD-19B historically accepted maintenance dredged material from Coos Bay. However, the site is near capacity and it is believed the existence of wetland habitat would preclude the site from further use (M. Gaul, Personal Communication, March 1, 2006).

6.4 Beneficial Use Alternatives

6.4.1 Log Spiral Bay Shoreline Stabilization

6.4.1.1 Description

Log Spiral Bay is a shallow body of water located on the Coos Bay side of the north jetty. The site was identified as a potential shoreline restoration and protection site due to erosion problems and fears that further erosion would breach the open shoreline. The bay is partially enclosed by a curved rock jetty, as shown in Figure 6-2.

This alternative proposed placing 500,000 cy within the bay to renourish the bay and decrease the potential for a breach to the North Spit (MN, 2012).

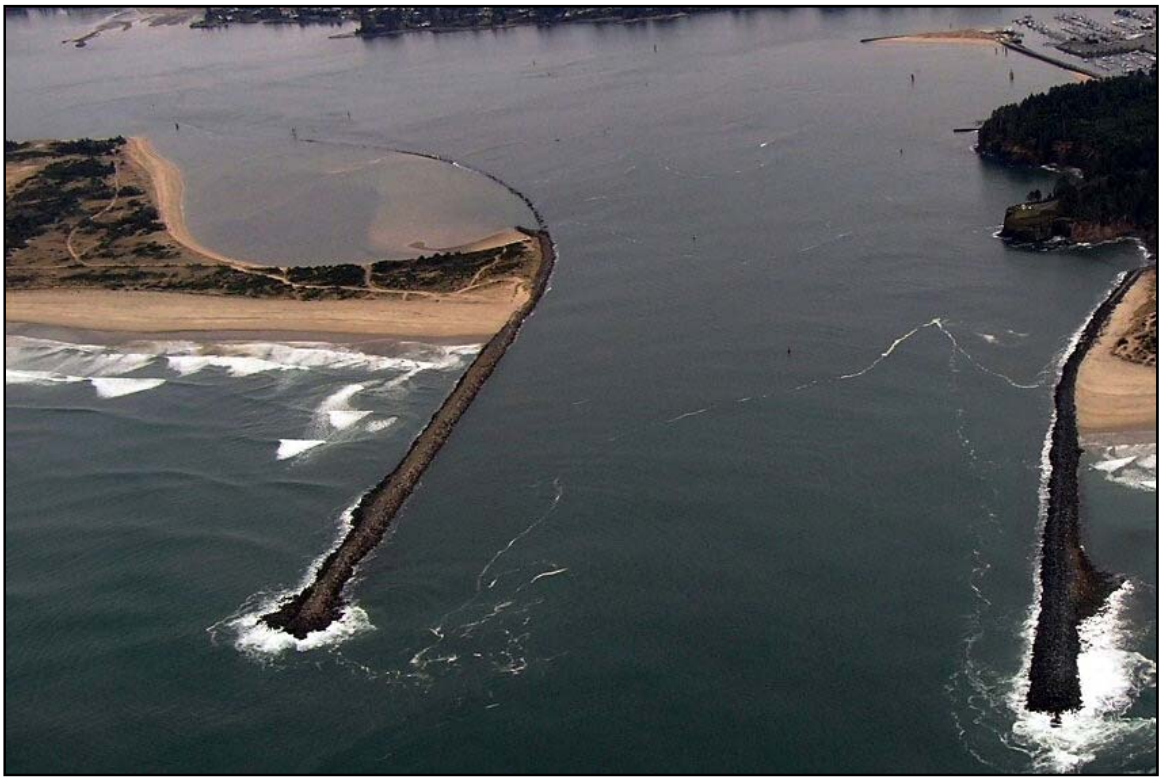


Figure 6-2: Existing Conditions at Log Spiral Bay

6.4.1.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the capacity requirement for the POCB Slip and Access Channel EDMMP. The in-place capacity for this alternative is 500,000 cy and is less than the 20% capacity requirement for beneficial use. Therefore, the Log Spiral Bay is not recommended for use as a placement site for placement of sediments from the POCB Slip and Access Channel.

6.4.2 Henderson Marsh (DMD-4X)

6.4.2.1 Description

Henderson Marsh (also referred to as DMD-4X) was identified in *The Oregon Estuary Plan Book* as a potential placement site for dredged material. The site is approximately 200 ac in size and is located immediately adjacent to the POCB Slip, as shown in Figure 6-3. Over the years, Henderson Marsh has been identified for industrial development due to its large area of flat terrain, location adjacent to the federal navigation channel, and extensive freshwater resource lying beneath it capable of serving a major industrial facility. This alternative recommended the beneficial use of construction dredged material from the POCB Slip and Access Channel as fill material within Henderson Marsh for future port-related development projects. The elevation of Henderson Marsh would be raised to match the proposed POCB Slip top of slope elevation of +30 ft NAVD88.

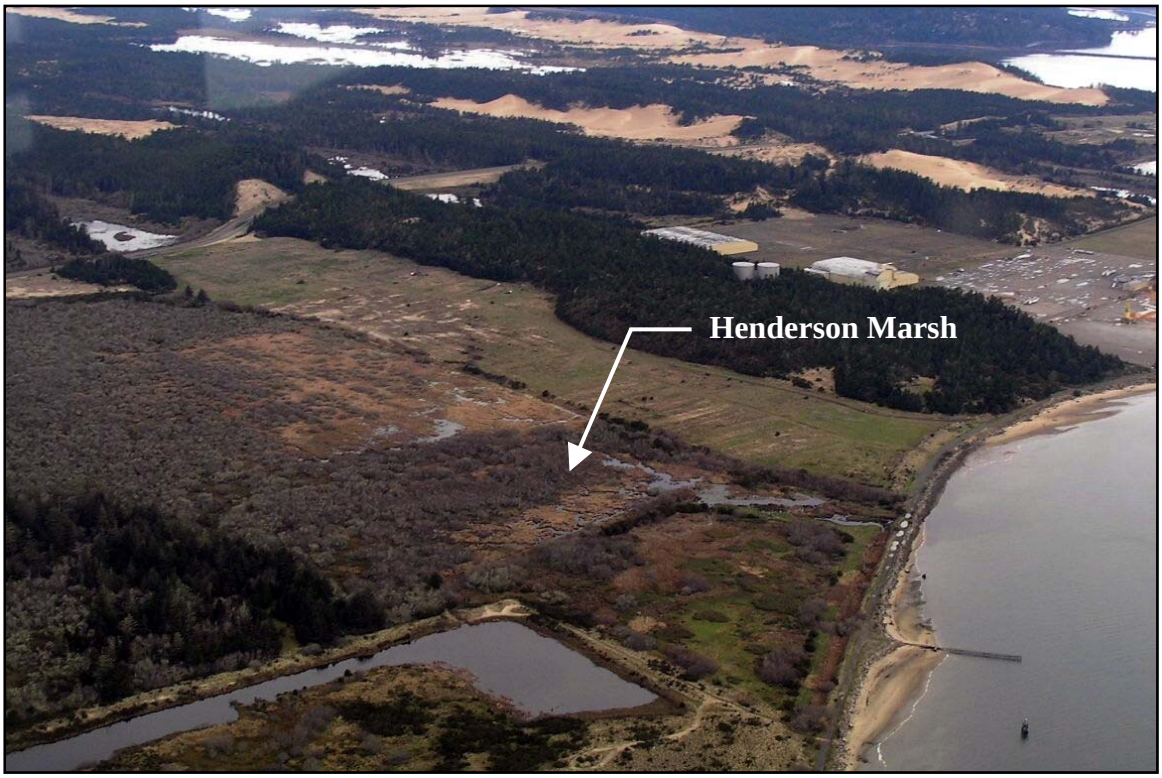


Figure 6-3: Existing Conditions at Henderson Marsh

6.4.2.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the environmental feasibility requirements for the POCB Slip and Access Channel EDMMP. The site is an existing wetland and would require mitigation when the wetlands are impacted due to material deposition.

6.4.3 North Jetty Shoreline Stabilization (North Jetty Breach)

6.4.3.1 Description

In November 2002, the north jetty at the entrance channel to Coos Bay was breached during a major Pacific Ocean storm. The USACE conducted an emergency repair of the jetty by placing a 50,000 cy sand fillet immediately north of the breach. The North Jetty was identified as a potential placement site for a limited volume of dredged material for ongoing protection of the north jetty.

6.4.3.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. According to the USACE, sand has not been placed at the site since the initial repair, and the USACE has no future plans to place material at the site. Furthermore, the USACE has an upland source of material should sand be needed (J. Craig, Project Manager, USACE – Portland District, Personal Communication, March 1, 2006).

6.4.4 North Point Tsunami Zone Remediation

6.4.4.1 Description

North Point was identified as a potential tsunami zone remediation site. North Point is an industrial site owned by the Al Pierce Lumber Company and is located at the northeastern tip of North Bend at RM 10. The site and the property immediately adjacent to the west (also owned by the same company) received dredged material in the 1980's which created a small channel between the two and fostered the development of wetland habitat. It was believed that the site was below the tsunami inundation zone and that material from the POCB Slip could raise the site to an elevation above the tsunami inundation zone.

6.4.4.2 Feasibility Evaluation and Reason for Elimination

This alternative does not meet the availability requirement for the POCB Slip and Access Channel EDMMP. The site had been raised previously with dredged material. However, new zoning regulations in Oregon precluded the placement of additional material on the property (J. Foss, Attorney, Foss, Whitty, McDaniel, Littlefield, & Bodkin, LLP, Personal Communication, February 22, 2006).

6.4.5 North Spit Western Snowy Plover Habitat Restoration (DMD-4A)

6.4.5.1 Description

The North Spit Western Snowy Plover Habitat Restoration site (also referred to as DMD-4A), identified in *The Oregon Estuary Plan Book* as a potential placement site for dredged material, is currently part of a larger 278-ac critical habitat area for the western snowy plover located on the western coast of the North Spit. The western snowy plover is a small shorebird that is one of two subspecies of snowy plover to nest in North America. The species reported to be at this location has been listed as a threatened species since 1993. Construction material dredged from the POCB Slip and Access Channel could be used beneficially to maintain up to 177 ac of snowy plover habitat (J. Seavy, USFWS, Personal Communication, March 2, 2006). The Oregon BLM owns 77 ac and the USACE owns the remaining 100 ac.

6.4.5.2 Feasibility Evaluation and Reason for Elimination

This alternative has the potential to meet the capacity requirement for beneficial use of construction dredged material. However, it may not meet the technical or environmental requirements for the POCB Slip and Access Channel EDMMP. As stated in the description, the habitat area is owned by several agencies and coordination among the agencies would be required for this alternative to proceed. Furthermore, the Oregon BLM may not be allowed to receive dredged material (M. Vander Heyden, BLM, Personal Communication, March 9, 2006). Dredged material received to date has been placed on the portion of the habitat area owned by the USACE. From an environmental standpoint, the site would require NEPA documentation before being used for dredged material placement. Additionally, pink sand verbena, a state listed endangered species and USFWS species of concern, thrives on the Oregon BLM-owned portion of the site. An investigation into the fate of the plant would be required before dredged material could be placed in areas where pink sand verbena is found. If these issues are resolved, and further geotechnical testing indicates that the construction dredged material is appropriate for use in snowy plover habitat areas, this alternative could be feasible. However, for the purpose of this EDMMP and considering the numerous unknown variables, it has been eliminated from further consideration.

6.4.6 North Spit Dune Nourishment

6.4.6.1 Description

The shoreline along the North Spit of Coos Bay was identified as a potential beneficial use site for construction dredged material from the POCB Slip and Access Channel. The beach has experienced severe scarping of the dune system due to storm waves. This alternative recommends nourishment of 4.5 mi of the dune line starting at the north jetty as shown in Figure 6-4. A containment berm would be constructed at the seaward edge of the nourished dune profile using existing beach material. Dredged material would be

transported hydraulically via pipeline behind the berm, with return water discharged into the Pacific Ocean. Existing conditions at the site are illustrated in Figure 6-5. This figure shows a Federal Aviation Administration (FAA) beacon approximately 3 mi north of the north jetty that is being threatened by ongoing erosion.

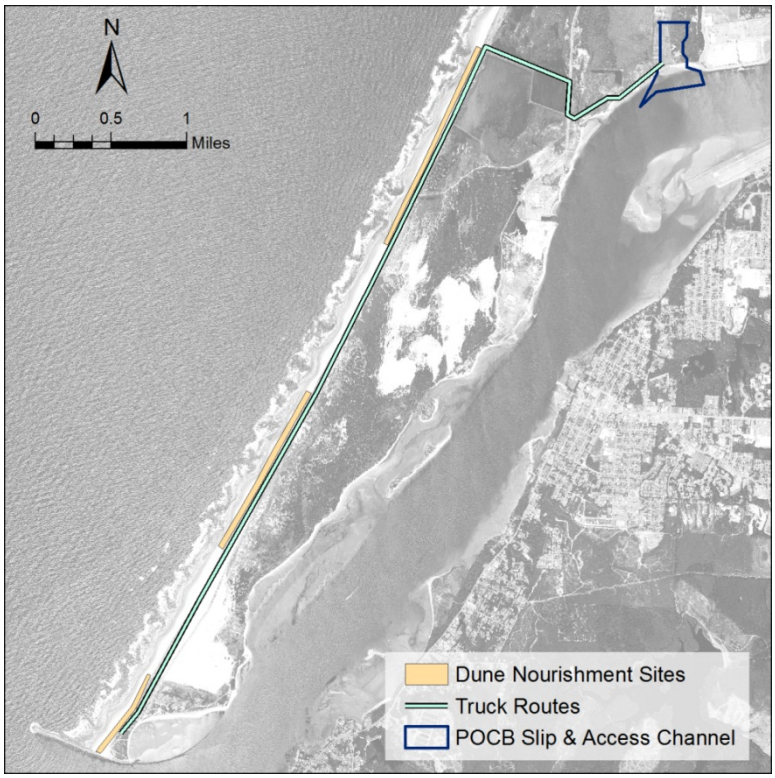


Figure 6-4: Location of Proposed North Spit Dune Nourishment (Image Source: USDA, 2012)



Figure 6-5: FAA Beacon Threatened by Erosion

6.4.6.2 Feasibility Evaluation and Reason for Elimination

This alternative calls for a continuous dune fill with material placed above MHHW. The post-construction design template in general has a dune height of +30 ft NAVD88, nourished top of dune width ranging from 200 to 300 ft, 1V:3H slope from the top of the dune to +10 ft NAVD88. The average nourished density is 145 cy/LF. With this nourished density, beach nourishment of the North Spit has the capacity to accommodate 3.3 mcy of dredged material associated with the construction of the POCB Slip and Access Channel, based on capacity estimates using Light Detection And Ranging (LIDAR) data collected along the Oregon coast in 1998 and 2002.

However, the North Spit Dune Nourishment alternative may not meet the environmental requirements for the POCB Slip and Access Channel EDMMP. The area is administered by the Oregon Parks and Recreation Department (OPRD). The OPRD may not be allowed to receive dredged material unless there is a beneficial use to the Parks Department (Calum Stevenson, OPRD, statements at Sediment Placement Subgroup Meeting, November 11, 2007), and there are concerns related to limitations on recreational use of the site during placement.

From an environmental standpoint, the site would require NEPA documentation before dredged material placement. Additionally, the site is used by western snowy plovers, listed as a threatened species, and the southern portion of the site is designated critical habitat for this bird species. An investigation into the effects of the placed sediment on longshore sediment transport, including potential effects to tide pools south of the Coos Bay Entrance Channel and the long-term beach characteristics would be required before dredged material could be placed on this site.

An investigation into cross-shore and longshore sediment transport would be required before dredged material could be placed at the North Spit nourishment site. If these issues are resolved, further geotechnical testing indicates that the construction dredged material is appropriate for use in snowy plover habitat areas, and the concerns related to recreational impacts are resolved, this alternative could be feasible. However, for the purpose of this EDMMP, it has been eliminated.

7.0 SUMMARY AND RECOMMENDATIONS

7.1 Summary

Construction of the POCB Slip and Access Channel will require the excavation of 1.63 mcy and dredging of 2.67 mcy from the Slip and dredging of 1.35 mcy from the Access Channel. Maintenance dredging of approximately 115,000 cy will be required every three years for the initial 10 years after construction is complete and approximately 115,000 cy to 160,000 cy will be required every five years after the initial 10 years. The approximate total volume of maintenance dredged material accumulated over 50-years is approximately 1.66 mcy. An evaluation of existing reports, discussions with interested parties and federal and state agencies, a survey of available dredging and material transport technologies, and a review of existing soil data has led to the identification of 22 potential dredged material placement and beneficial use alternatives for the management of excavated and dredged material associated with the POCB Slip and Access Channel (Figure 5-2).

Each potential dredged material management site was evaluated against a three-tier screening process developed specifically for the POCB Slip and Access Channel EDMMP. The screening process included criteria such as site availability; capacity; and technical, logistical, and environmental feasibility. Based on the screening criteria, six alternatives were considered feasible for the management of excavated and construction dredged material (Figure 5-3): ODMDS Site F (Open-Water Placement), Mill Site (Beneficial Use), Ingram Yard (Beneficial Use), North Spit Tsunami Protection Levee (Beneficial Use), Port Site (Beneficial Use), and Slip West Stockpile Site (Beneficial Use). A summary of feasible alternatives for construction and maintenance dredged or excavated material placement, including site capacity and construction duration, is presented in Table 7-1.

Table 7-1: Feasible Construction & Maintenance Excavation/Dredging Placement Alternatives

Placement Alternative	Type	Dredge Method	Capacity (cy)	Duration (months)
Feasible Construction Placement Alternatives				
ODMDS Site F	Open-Water Placement	Mechanical Dredged	1,350,000	7.5
Mill Site	Beneficial Use	Excavated	1,617,000	10.7
Mill Site	Beneficial Use	Hydraulic Dredge	2,150,000	4.7
Ingram Yard	Beneficial Use	Hydraulic Dredge	1,880,000	4.3
North Spit Tsunami Protection Levee	Beneficial Use	Excavated	2,300,000	15.0
Port Site	Beneficial Use	Hydraulic Dredge	4,000,000	7.5
Slip West Stockpile Site	Beneficial Use	Excavated	13,000	0.1
Feasible Maintenance Placement Alternatives				
ODMDS Site F	Open-Water Placement	Mechanical Dredged	37,700	<1.0

7.2 Preferred Management Alternative

The preferred excavated/dredged material management alternative for the POCB Slip and Access Channel EDMMP is the placement of construction excavated material at both the Mill Site and the Slip West Stockpile Site and the placement of construction dredged material at both the Mill Site and Ingram Yard.

These sites were chosen based on:

- The beneficial use of material;
- Proximity to the excavation/dredging site;
- Ability to meet scheduling constraints;
- Ability to meet excavated and dredged material capacity requirements; and
- The fill material required to raise site elevations for the proposed adjacent site developments.

Table 7-2 outlines the preferred material management alternative for project construction and the estimated durations to exhume the specified capacity at an assumed production rate. Figure 1-1 provides a conceptual level construction schedule for the preferred material management alternative.

Table 7-2: Preferred Material Management Alternative for Construction Activities

Placement Site	Upland Phase *(Excavation)*	Upland Phase *(Dredging)*	In-Water Phase 1 *(Dredging)*	In-Water Phase 2 *(Dredging)*	Total
Mill Site ***(Beneficial Use)***					
Volume (mcy)	1.62	0.8	1.35	-	3.77
Duration** (Months)	10.7	2.2	2.5	-	15.4
Ingram Yard ***(Beneficial Use)***					
Volume (mcy)	-	1.38	-	0.5	1.88
Duration (Months)	-	3.8	-	0.5	4.3
Slip West Stockpile Site ***(Beneficial Use)***					
Volume (mcy)	0.01	-	-	-	0.01
Duration (Months)	0.1	-	-	-	0.1
Total Volume* (mcy)	1.63	2.18	1.35	0.50	**5.65**
Total Duration (Months)**	10.8	6.0	2.5	0.5	**16.5**

* Total volume does not sum due to rounding.
** Total duration values do not sum due to overlap of construction activities; See Figure 1-1.

The construction process will begin with the excavation portion of the *Upland Phase*, which includes the excavation of 1.63 mcy of material from the POCB Slip. Material will be hauled to either the Slip West Stockpile site or the Mill Site. The material hauled to the Slip West Stockpile site will be stockpiled behind the sheet pile wall up to 10 feet above grade. The material hauled to the Mill Site will be used to construct the initial 18-foot high containment berm for confined placement and to be used to complete the site closure plan. Placement of excavated material to be used for the initial containment berm at the Mill Site will take up to 3 months for completion. A total of approximately 11 months is required to complete the excavation portion of the *Upland Phase*.

The *In-Water Phase 1* will include the dredging of 1.35 mcy of material to form the Access Channel. This dredge activity would commence after the initial 18-foot high containment berm is completed at the Mill Site. Slurry dredged from Coos Bay will be hydraulically conveyed to the Mill Site and discharged within the containment berm. Return water may be discharged directly to Coos Bay through a separate pipeline. This work will be performed within the allowable in-water work window, October 1st through February 15th. The hydraulic dredging of the access channel material will require 2.5 months for completion.

Excavation of the slip is required to be ongoing during the *In-Water Phase 1* dredging activities in order to have the *Upland Phase* of the slip completed by the following in-water work window.

The construction dredging portion of the *Upland Phase* will place a cutter suction dredge in the dredge launch pond to remove approximately 2.18 mcy of additional material from the POCB Slip. Approximately 800,000 cy of the 2.18 mcy will be hydraulically conveyed to the Mill Site and approximately 1.38 mcy of the 2.18 mcy will be hydraulically conveyed to Ingram Yard. This dredge activity will commence after the construction excavation of the dredge launch pond is completed, however, it cannot be completed simultaneously due to limitations on equipment size within the dredge launch pond. Decant water will be pumped back to the dredge launch pond through a separate pipeline to provide water necessary for dredge equipment flotation behind the berm. This work can be performed year-round because the dredge launch pond will be physically isolated from Coos Bay. This will be accomplished by retaining a natural earthen berm to provide a physical partition between Coos Bay and the *Upland Phase* construction activities. The berm will have sufficient size and height to prevent breaching by high sea water levels or ship wakes. The hydraulic dredging of the material to be placed at the Mill Site and Ingram Yard will require 6 months for completion. Additional time required for initial berm construction at the Ingram Yard site, using on-site material, would not add to the overall project schedule since the berm construction could be carried out in parallel with excavation and dredging of material to be placed at other placement sites.

The *In-Water Phase 2* activities will include removal of the natural earthen berm, approximately 500,000 cy of material. Dredging will be conducted from both the Coos Bay side and the POCB Slip side to reduce the duration of breaching and removing the natural earthen berm. Removing the berm will open the POCB Slip to Coos Bay. Final dredging to contour the Access Channel will complete the construction dredging activities. Dredging from the Coos Bay side may have a larger production rate compared to the dredge launch pond side because there are fewer limitations on equipment size. Slurry dredged from both sides of the berm will be hydraulically conveyed to the Ingram Yard placement site by pipeline. Return water may flow through a separate pipeline and discharged to the POCB Slip, or may be discharged directly to Coos Bay. In either case, silt curtains will be used to decrease turbidity impacts to Coos Bay from the return water. This work will be performed within the allowable in-water work window. The hydraulic dredging of the natural earthen berm material will require 0.5 months for completion.

The total time required to complete the construction excavation and dredging of the POCB Slip and Access Channel is approximately 16.5 months. See Figure 1-1 for a conceptual level construction schedule for the preferred material management alternative. The assumptions used to determine site capacities, berm construction, and excavation/dredging methods are discussed in Section 5.0.

The preferred maintenance dredging material management alternative for the POCB Slip and Access Channel EDMMP is placement offshore in ODMDS Site F. ODMDS Site F

is in close proximity to the entrance to Coos Bay and has sufficient capacity to accommodate all maintenance material that will be dredged for well over the first 50 years after construction is complete. Additionally, placement in Site F allows maintenance dredging to be conducted using a clamshell dredge. This type of dredge is already in use for maintenance dredging at various locations along the channel.

The details and assumptions used to estimate the construction durations for the preferred dredged material management alternatives is located in Appendix B.

7.3 Data Gaps

Several data gaps have been identified that must be completed during final design. Geotechnical investigation of the placement areas is required to confirm they have sufficient bearing capacity for the containment berms and the future site developments. Further geotechnical investigation of the excavated and dredged material is required to determine the dewatering rates of the hydraulically dredged material and existing soils, and verify the feasibility of the assumed containment berm side slopes and crest heights. Additionally, the sheet pile wall will need to be designed to accommodate the surcharge loads from stockpiled material at the Slip West Stockpile site. Finally, the construction schedule must be refined to account for weather delays and the possibility of an earlier start to the dredging window following further discussions and negotiations with ODFW, NMFS, and USFWS.

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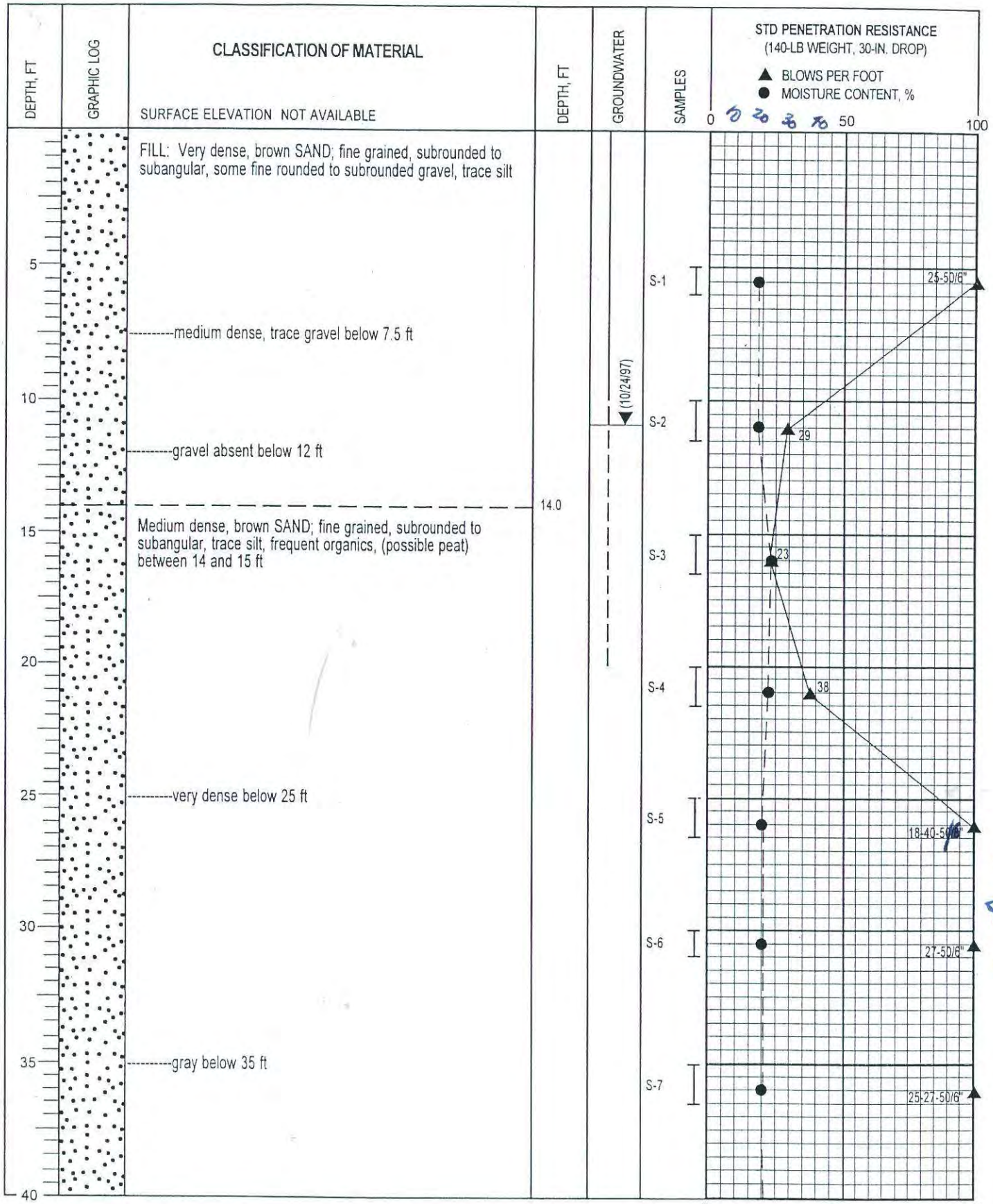
APPENDIX A

BORING DATA (1997 to 2007)



I 2-IN.-OD SPLIT-SPOON SAMPLER

II 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

■ UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

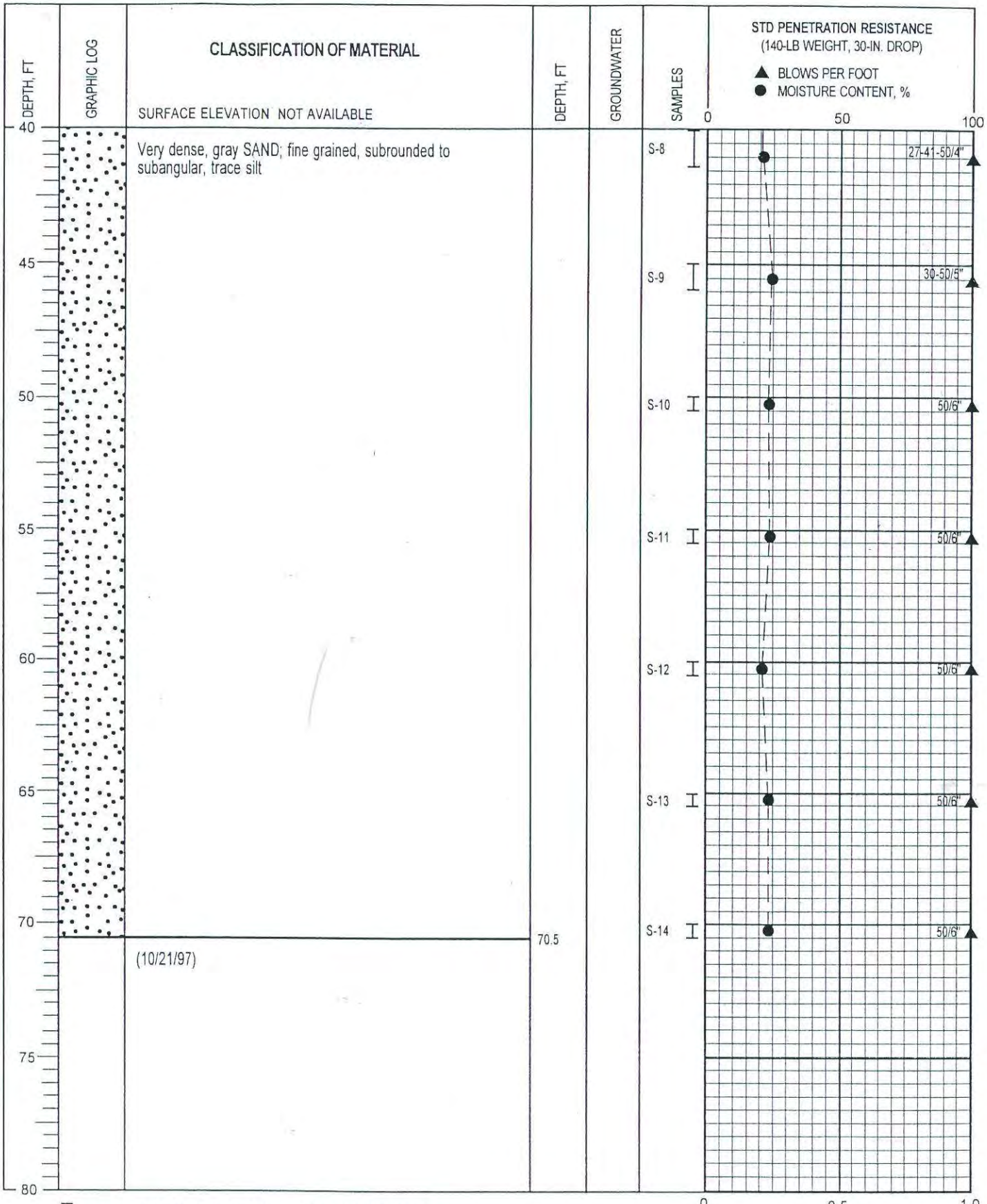
Moisture Content

Plastic Limit

GRI

BORING B-1

NOV. 1997 JOB. NO. 2577 FIG. 1A



I 2-IN.-OD SPLIT-SPOON SAMPLER
II 3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

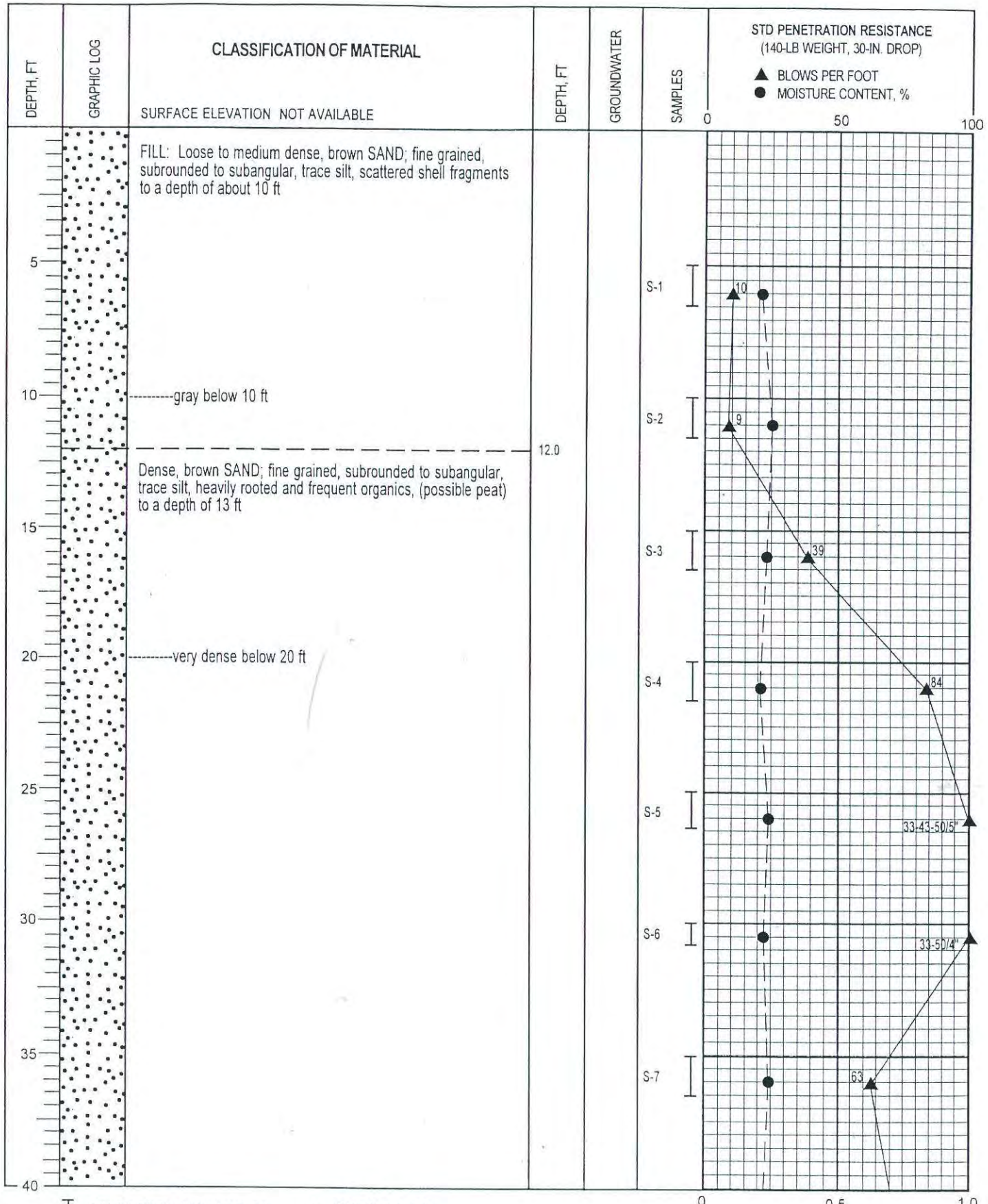
◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF
★ NO RECOVERY

Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-1 (cont.)

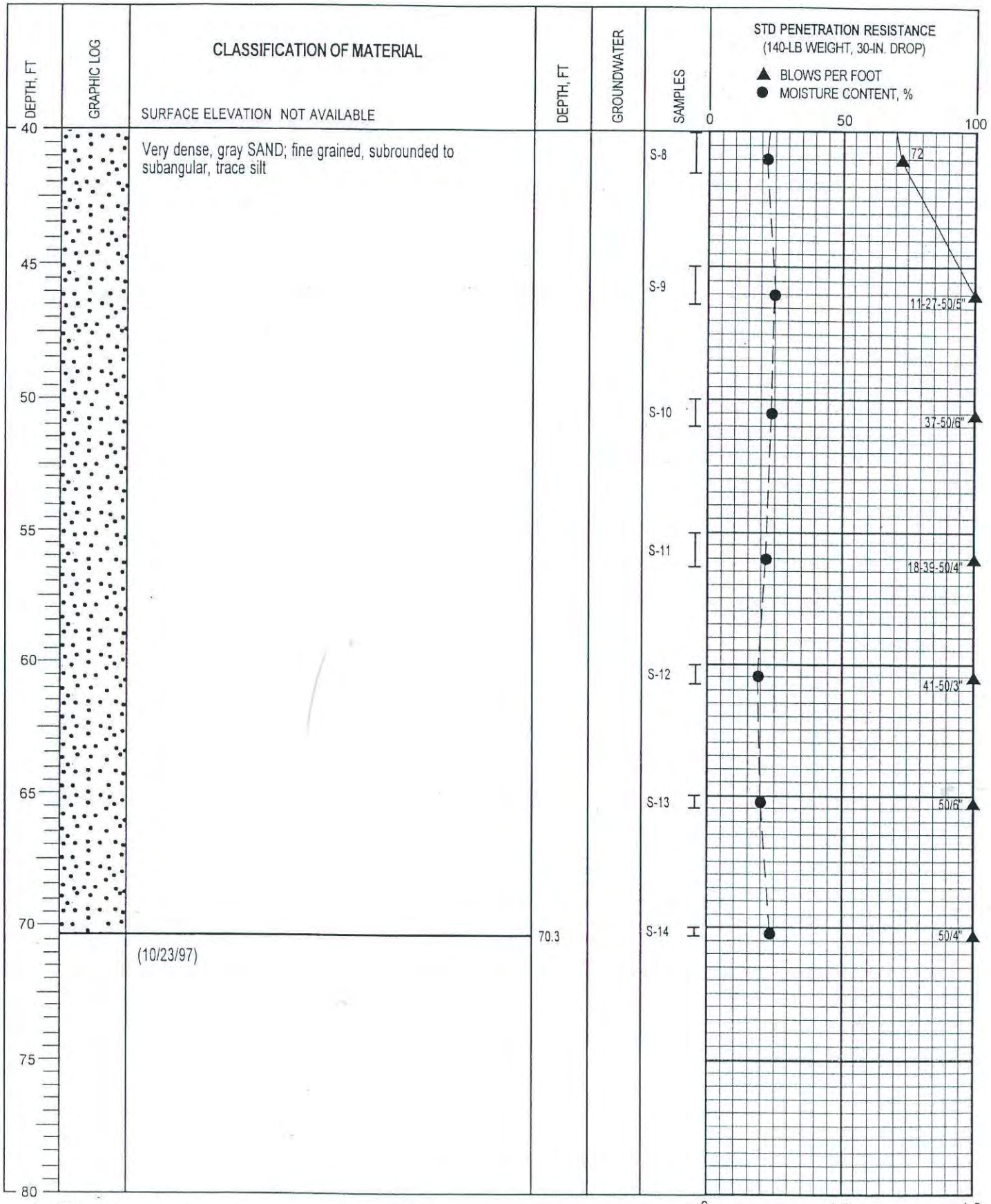
NOV. 1997 JOB. NO. 2577 FIG. 1A



GRI

BORING B-4

NOV. 1997 JOB. NO. 2577 FIG. 4A



I 2-IN.-OD SPLIT-SPOON SAMPLER
II 3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

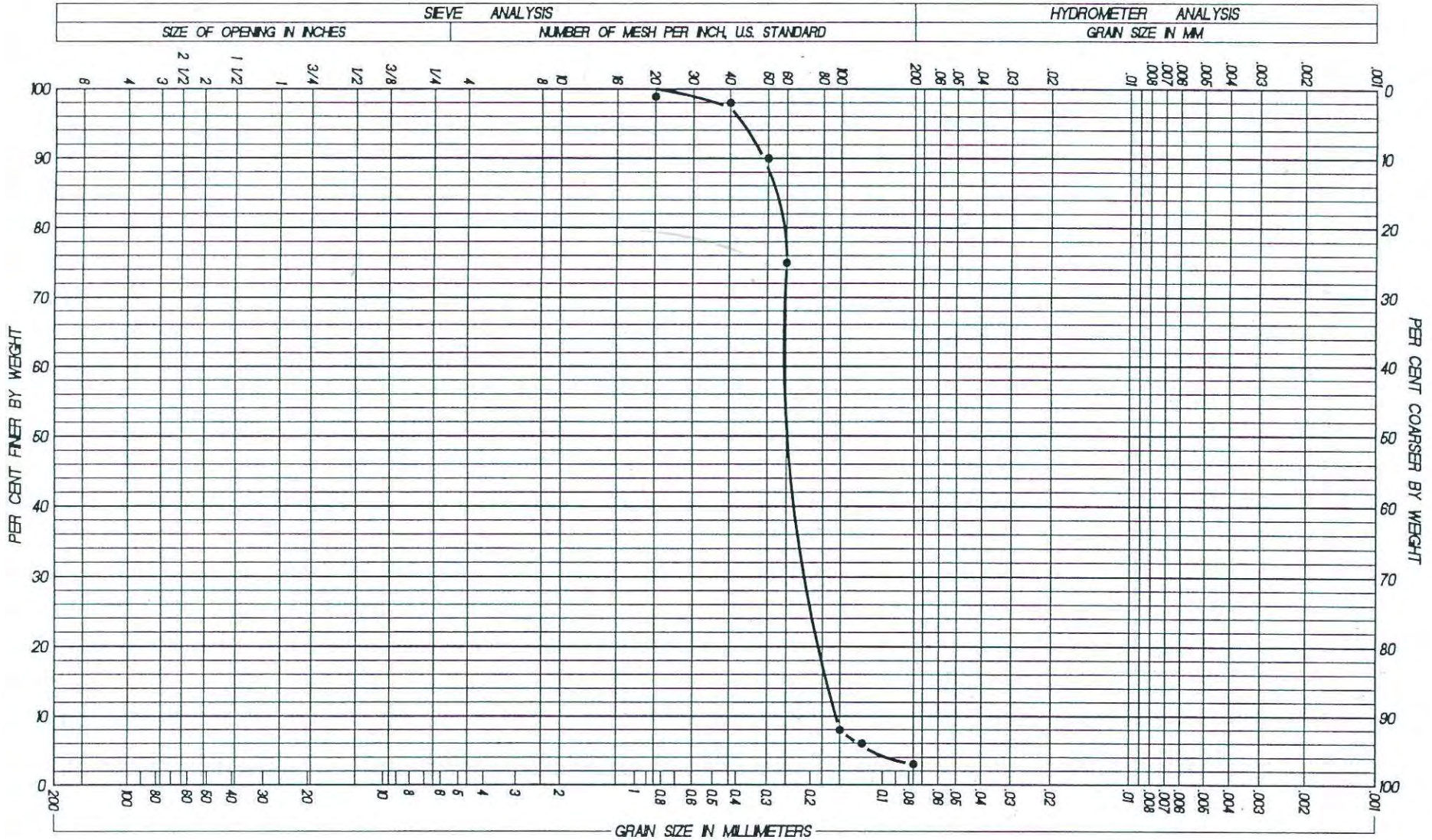
GRI

BORING B-4 (cont.)

NOV. 1997 JOB. NO. 2577 FIG. 4A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-1	S-3	15		GRAY SAND; FINE GRAINED, SUBROUNDED TO SUBANGULAR, TRACE SILT



COBBLES	GRAVEL: COARSE	GRAVEL: FINE	SAND: COARSE	SAND: MEDIUM	SAND: FINE	FINES

UNIFIED SOIL CLASSIFICATION

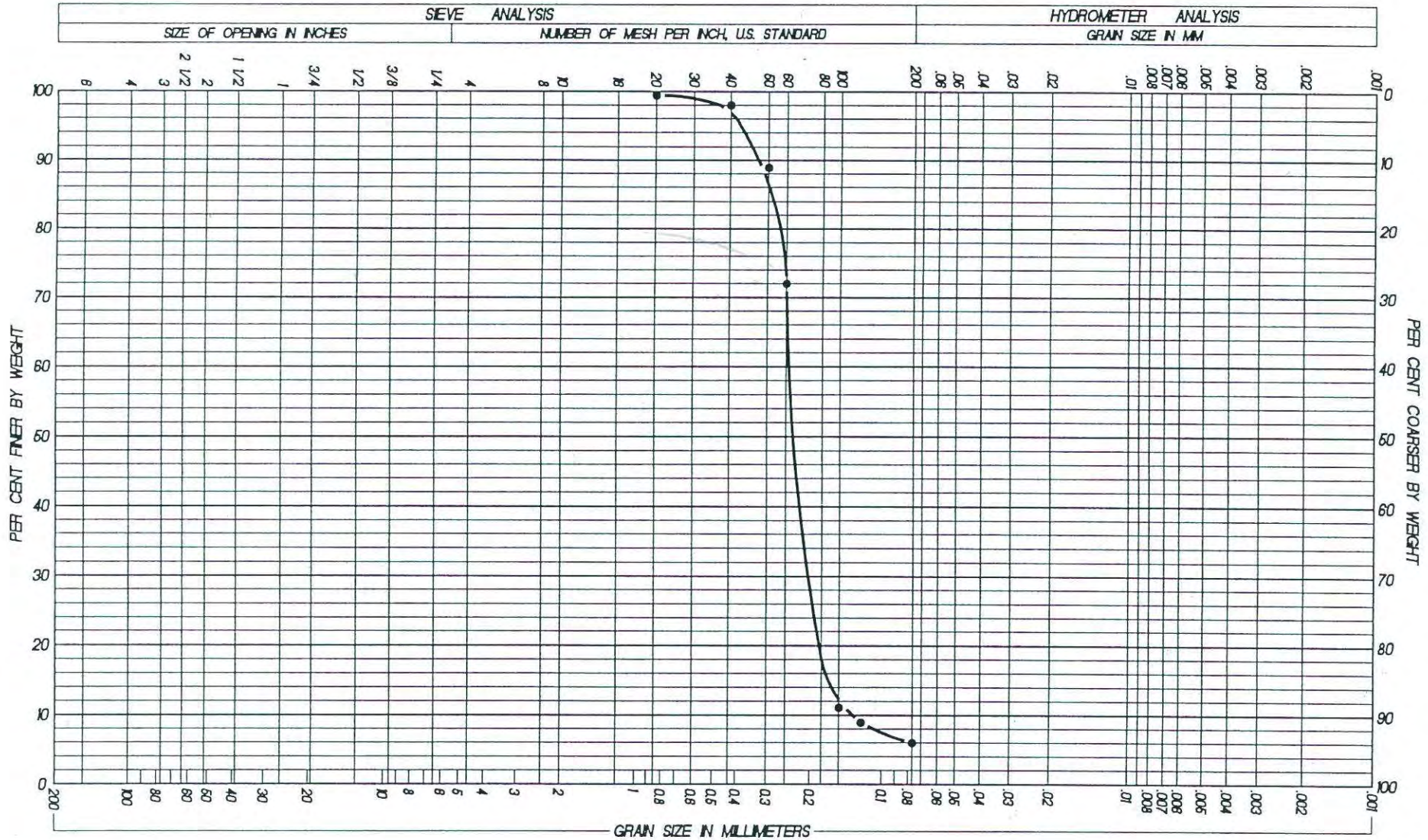
NOV. 1997

JOB NO. 2577

FIG. 7A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-1	S-8	40		GRAY SAND, FINE GRAINED, SUBROUNDED TO SUBANGULAR, TRACE SILT



COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

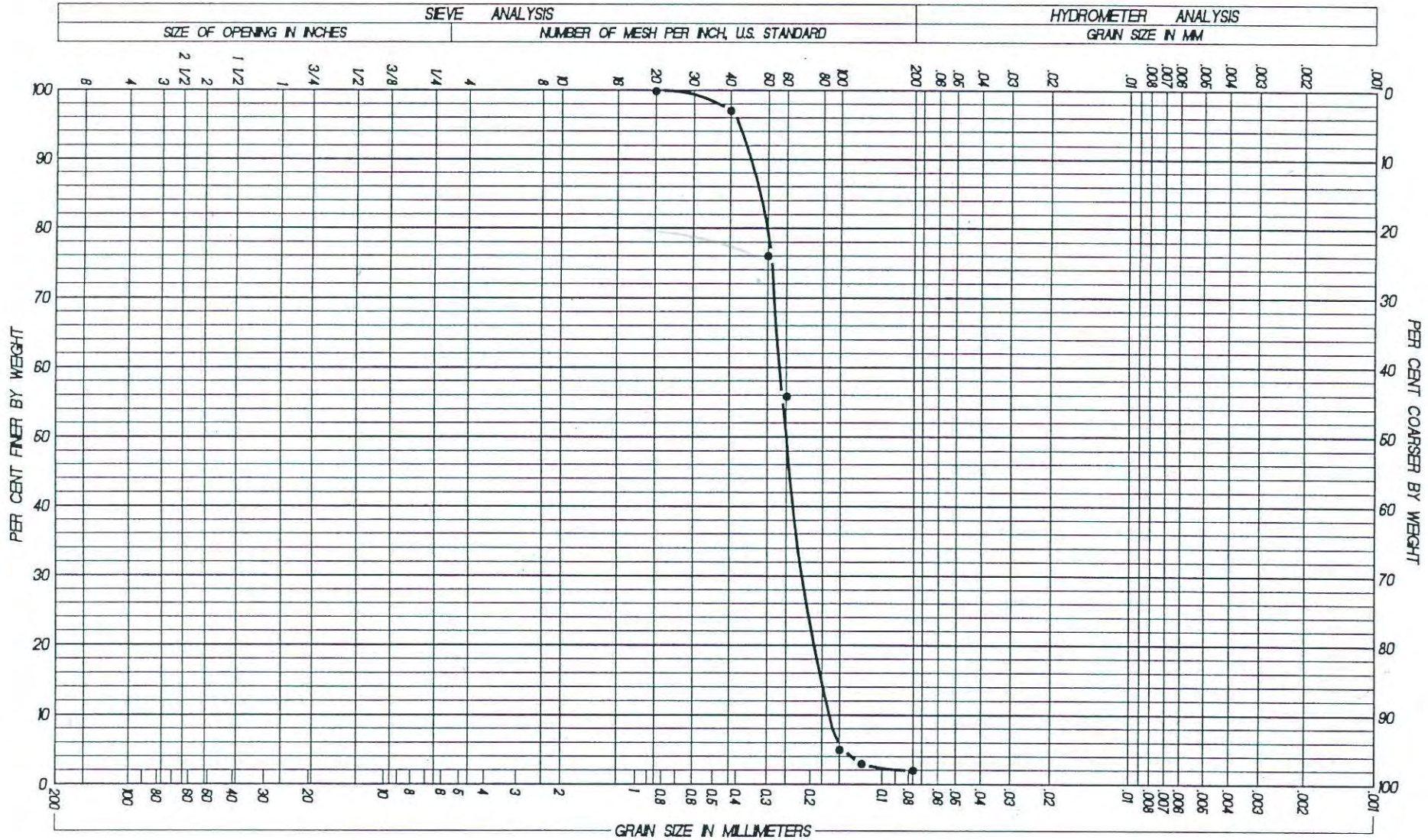
NOV. 1997

JOB NO. 2577

FIG. 8A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-4	S-2	10		GRAY SAND; FINE GRAINED, SUBROUNDED TO SUBANGULAR, TRACE SILT



COBBLES	GRAVEL: COARSE	GRAVEL: FINE	SAND: COARSE	SAND: MEDIUM	SAND: FINE	FINES

UNIFIED SOIL CLASSIFICATION

NOV. 1997

JOB NO. 2577

FIG. 14A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
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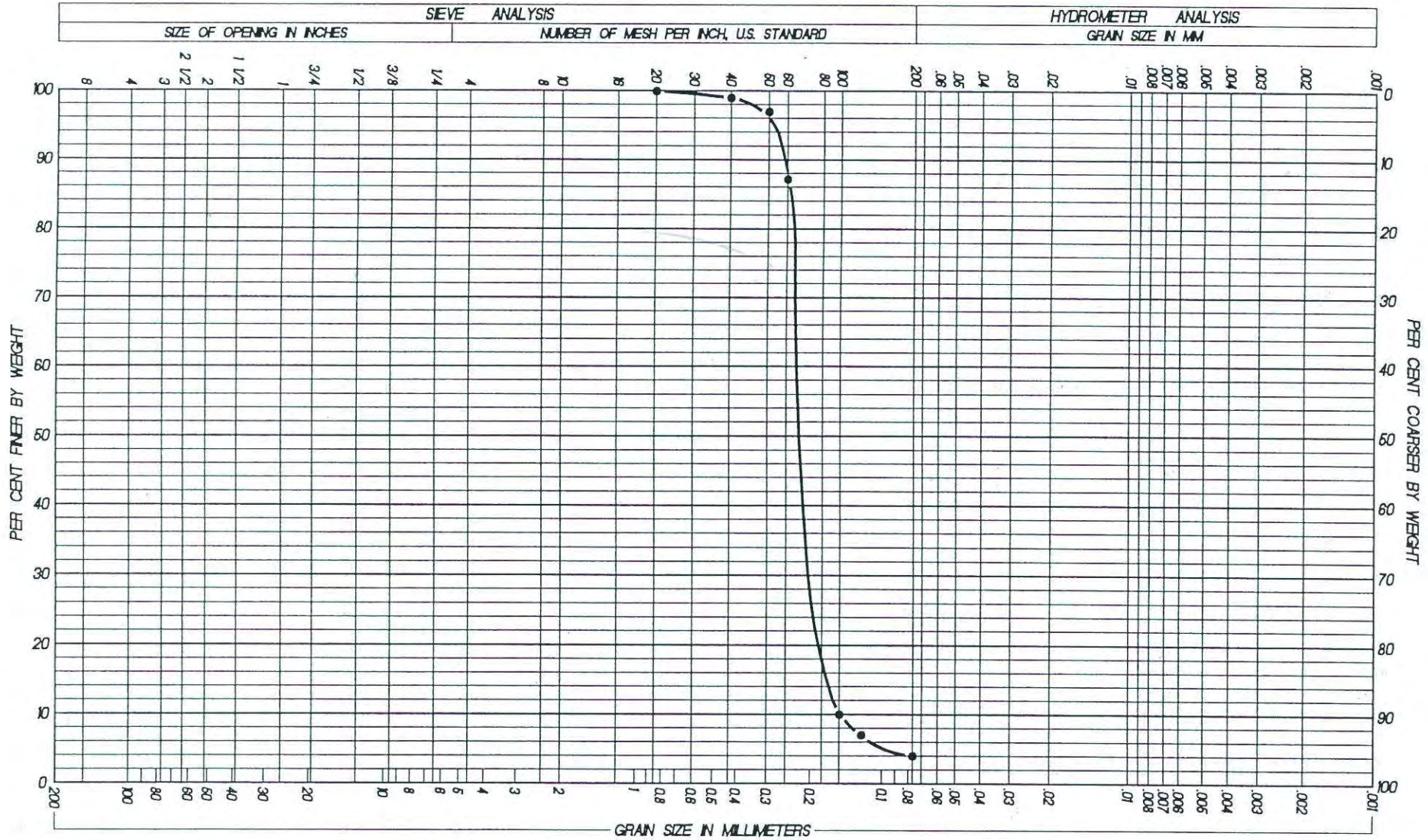
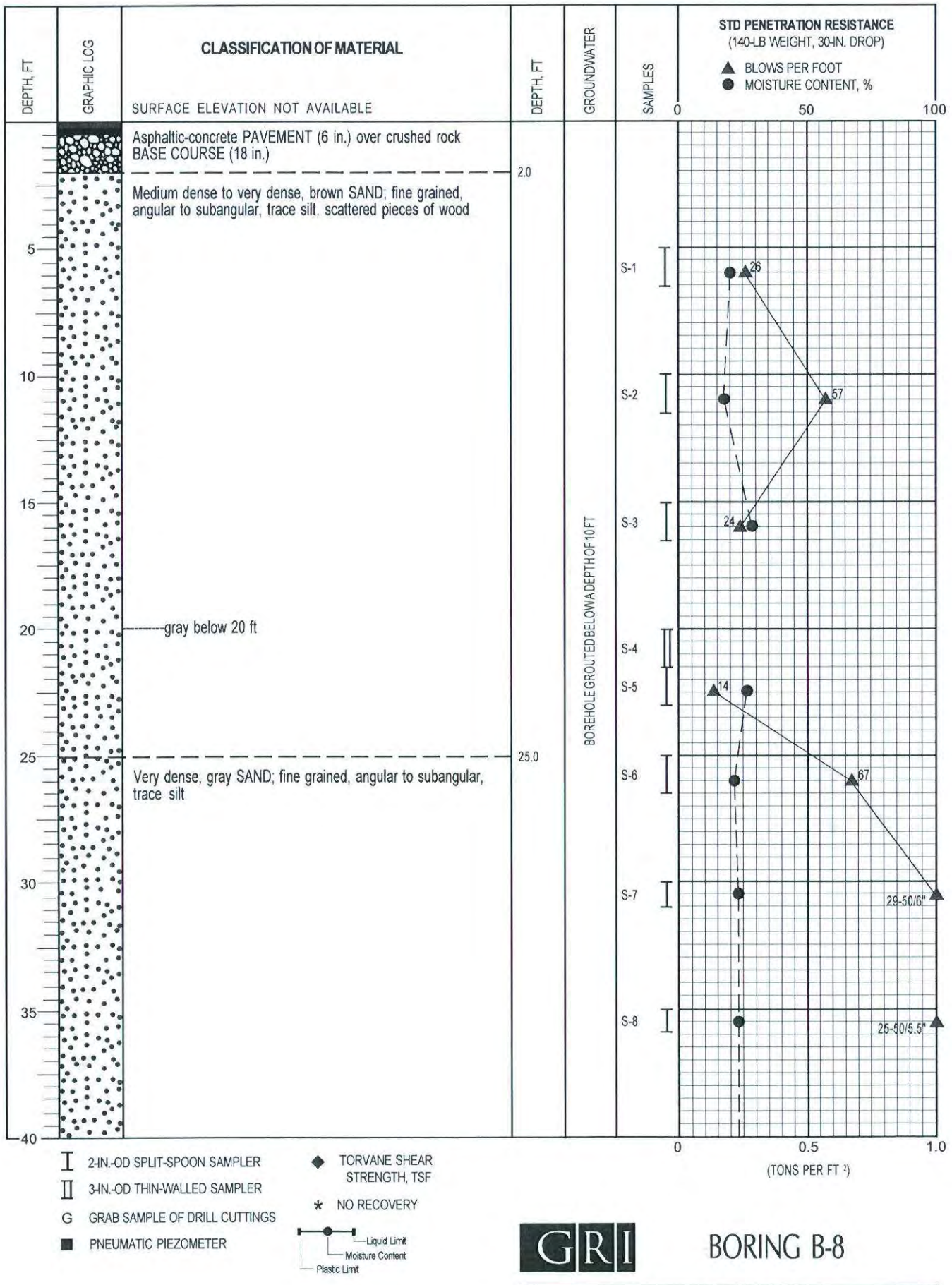


NOV. 1997

JOB NO. 2577

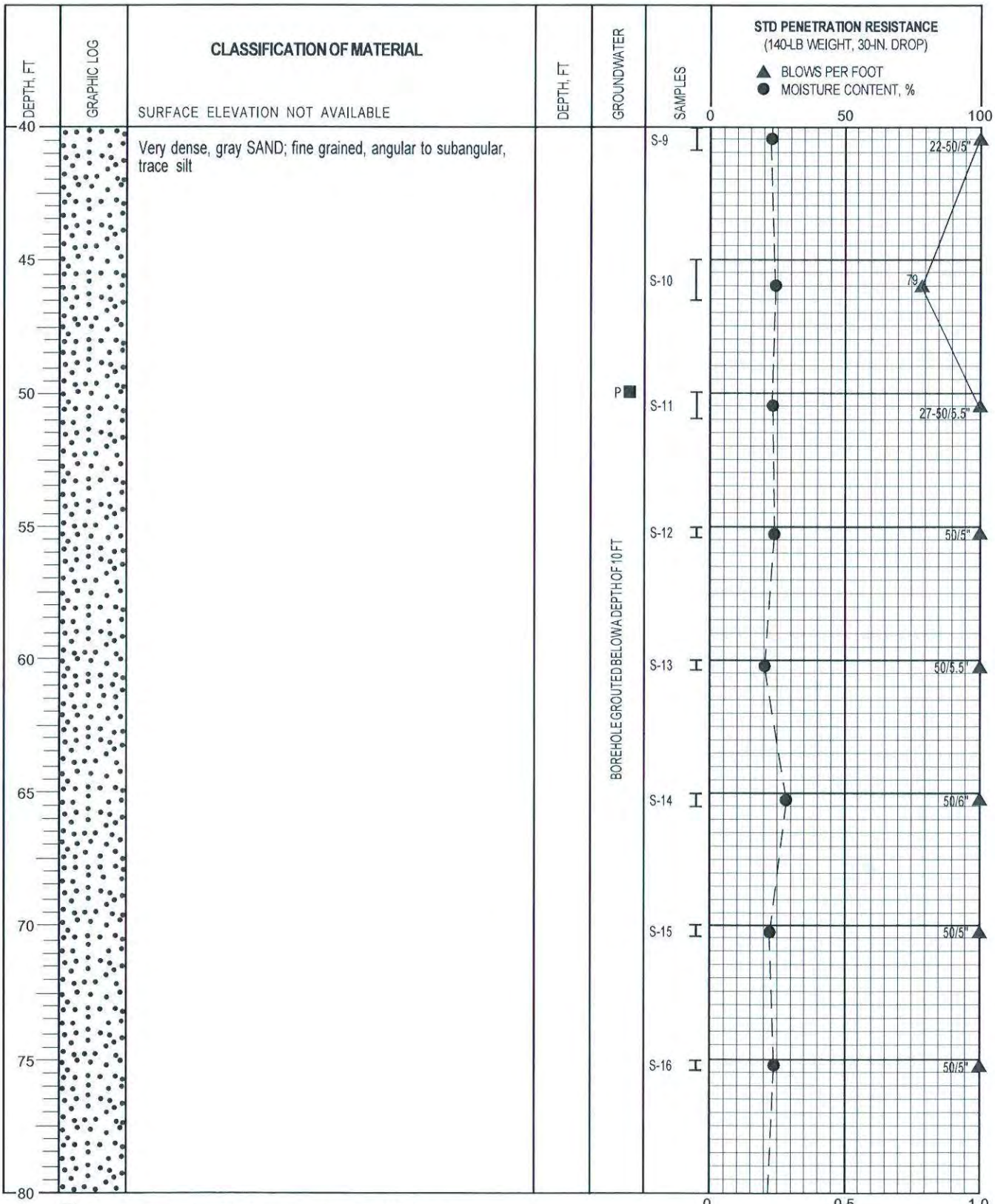
FIG. 15A



GRI

BORING B-8

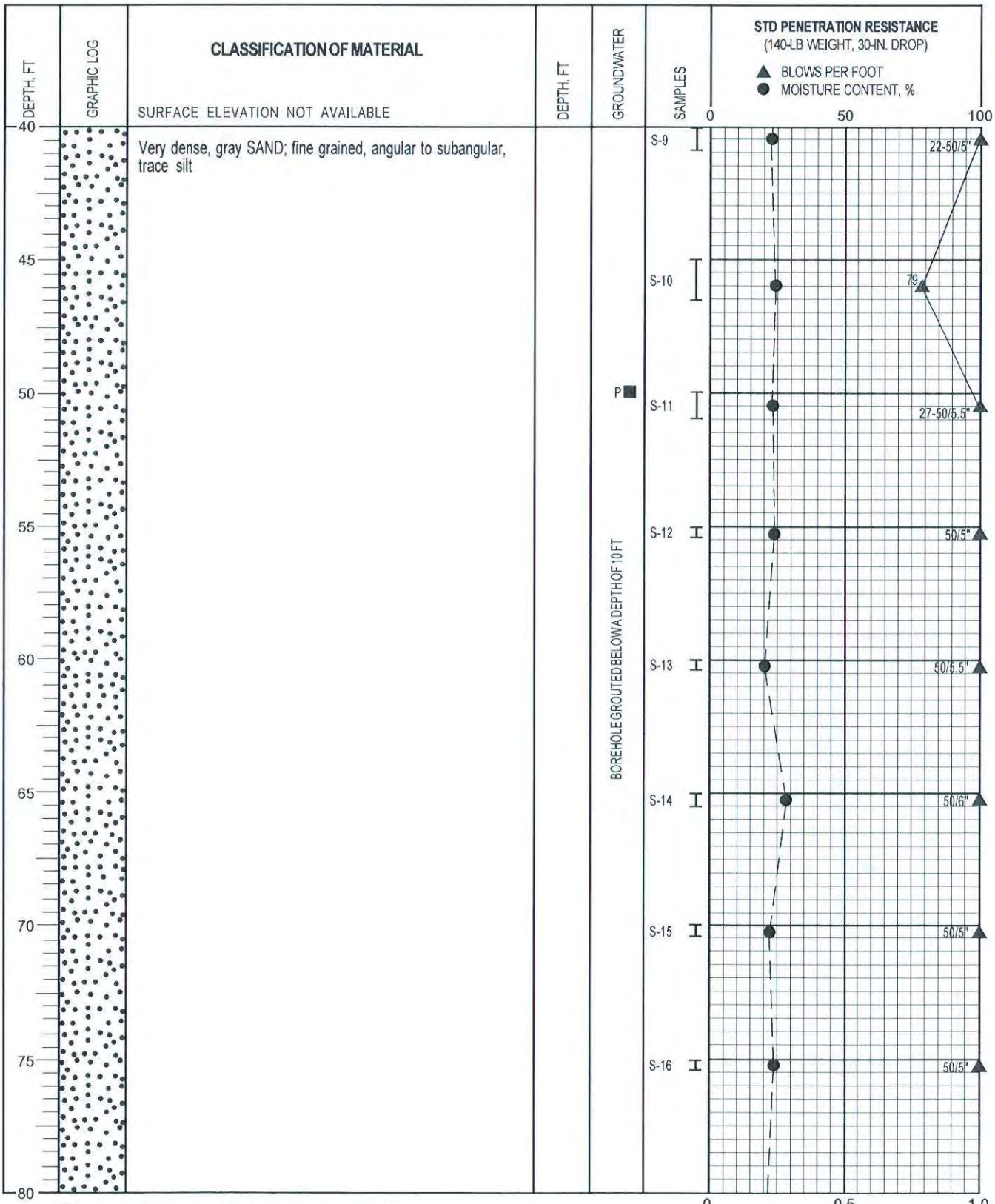
SEPT. 2005 JOB. NO. 4277-B FIG. 8A



GRI

BORING B-8 (cont.)

SEPT. 2005 JOB. NO. 4277-B FIG. 8A



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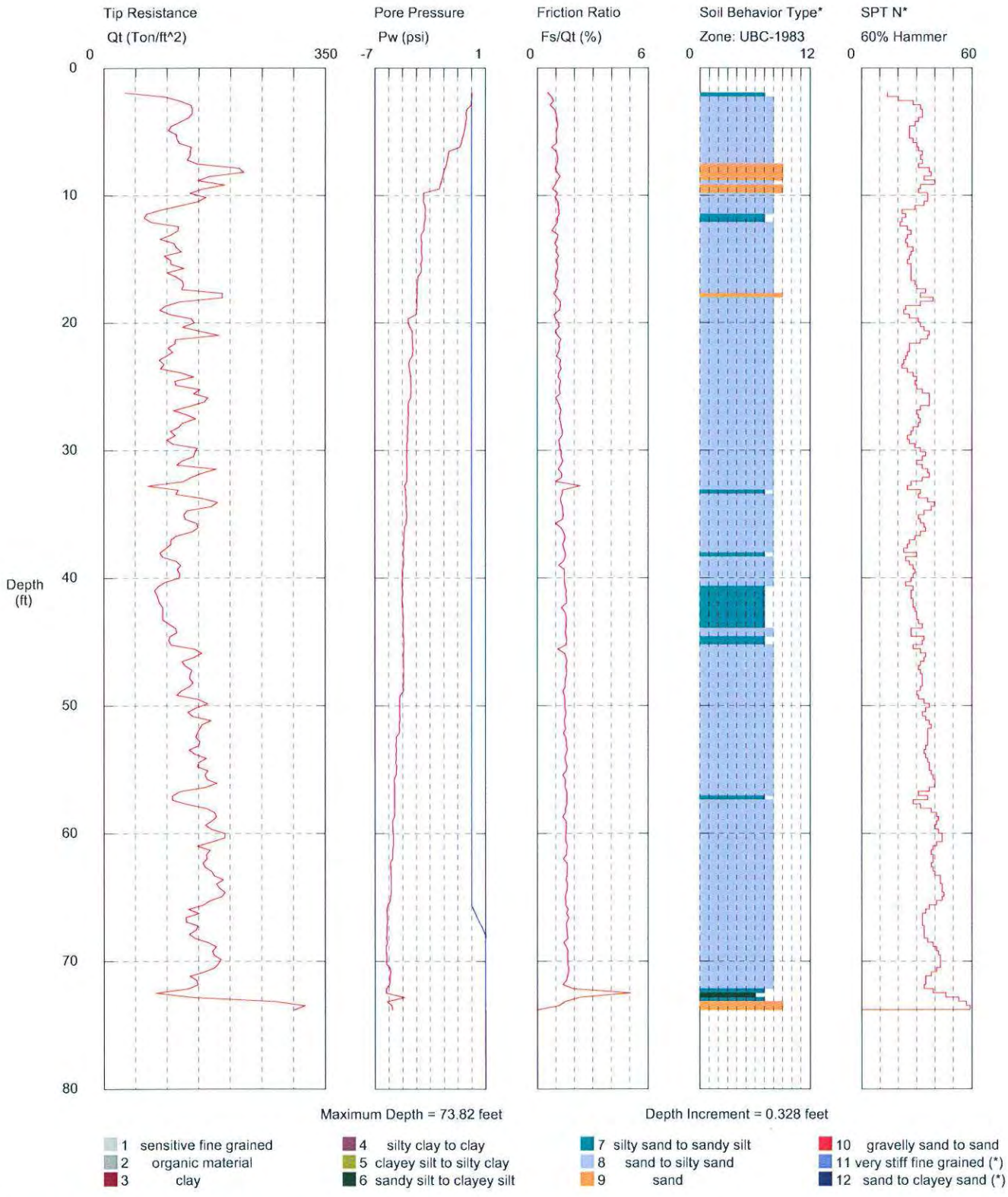
BORING B-8 (cont.)

SEPT. 2005 JOB. NO. 4277-B FIG. 8A

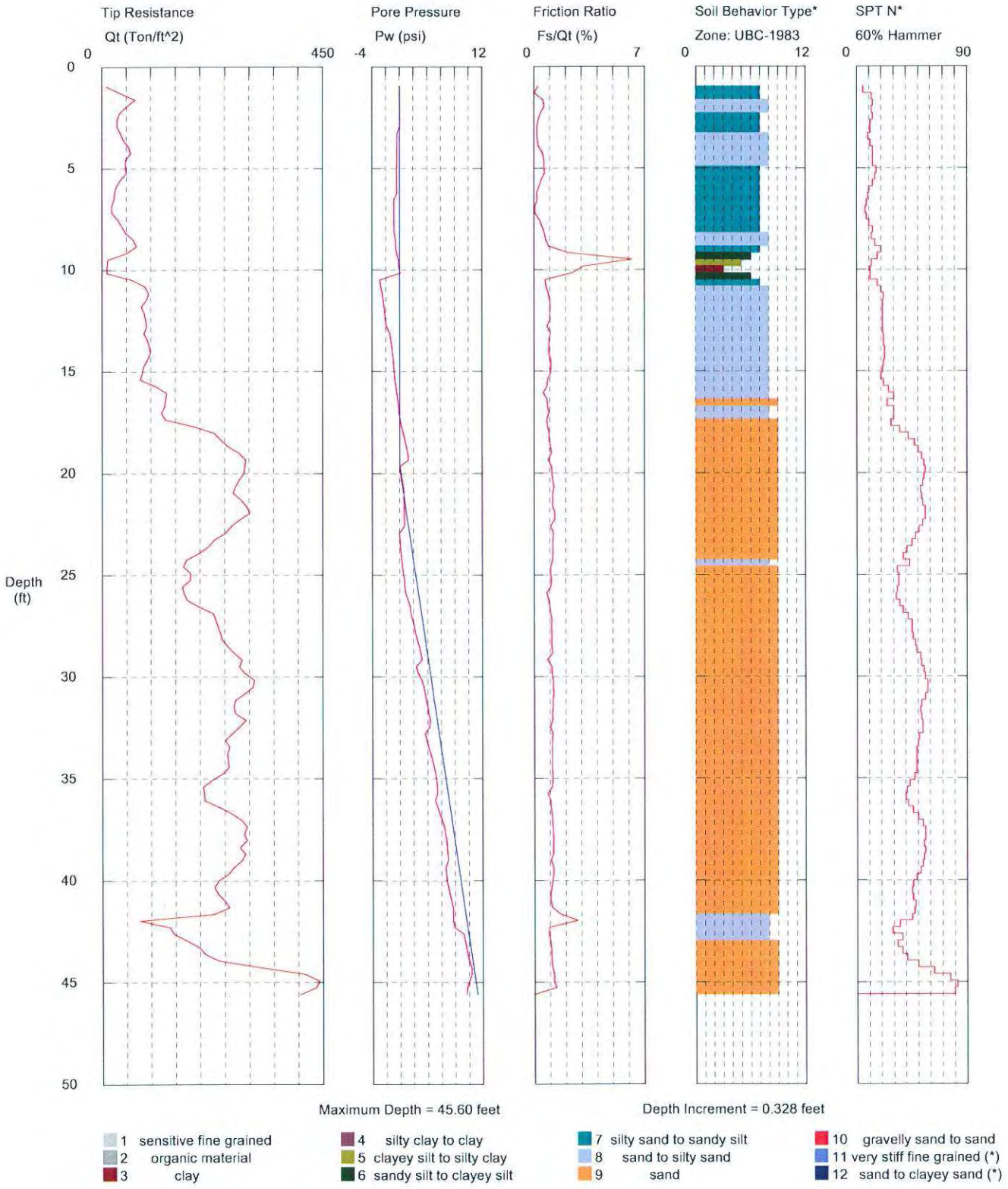


*Soil behavior type and SPT based on data from UBC-1983

GRI

CONE PENETRATION TEST CPT-20

JULY 2007 JOB NO. 4277-E FIG. 5B

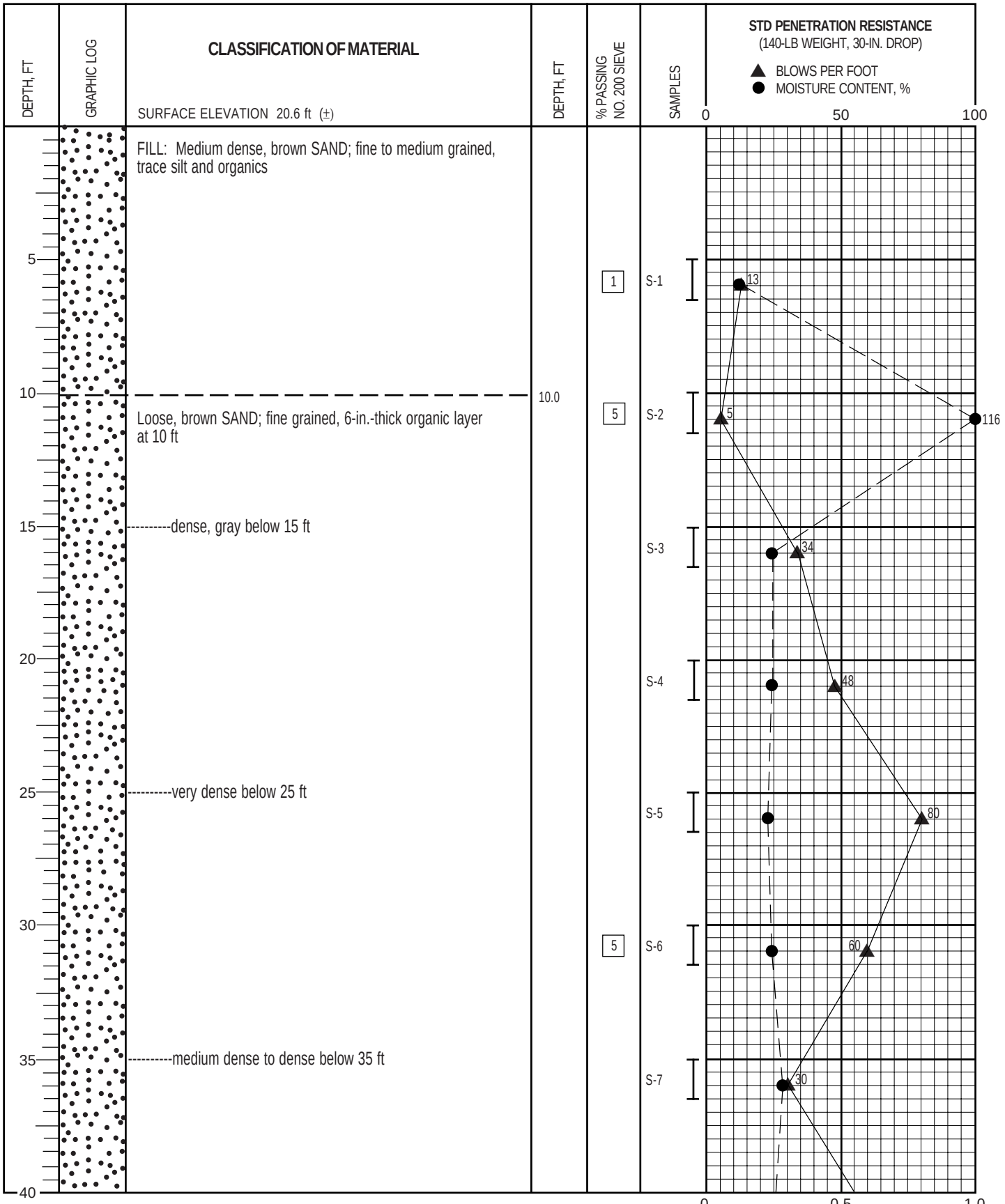


*Soil behavior type and SPT based on data from UBC-1983

GRI

CONE PENETRATION TEST CPT-26

JULY 2007 JOB NO. 4277-E FIG. 8B



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

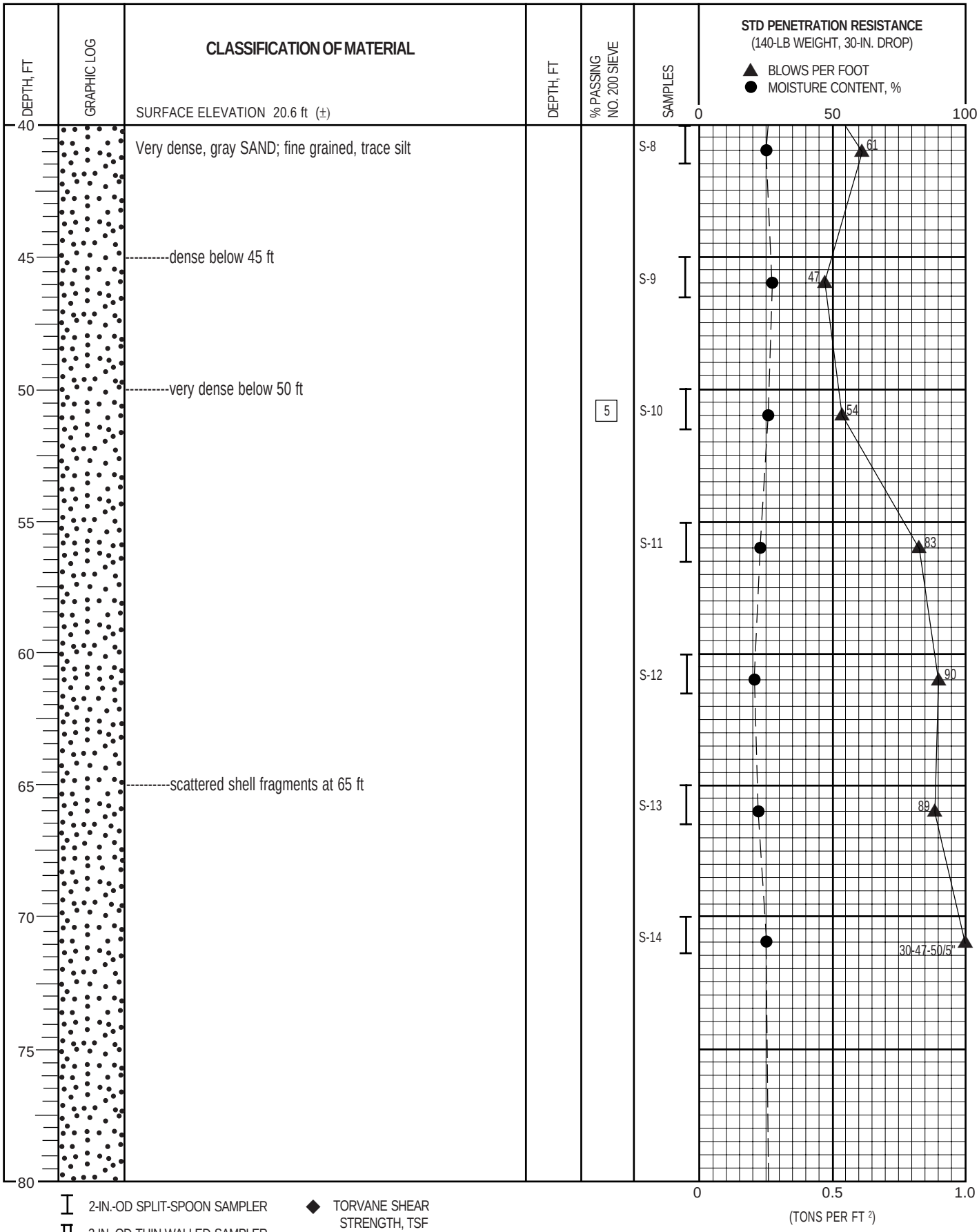
Moisture Content

Plastic Limit

GRI

BORING B-18

AUG. 2007 JOB NO. 4277-J FIG. 1A

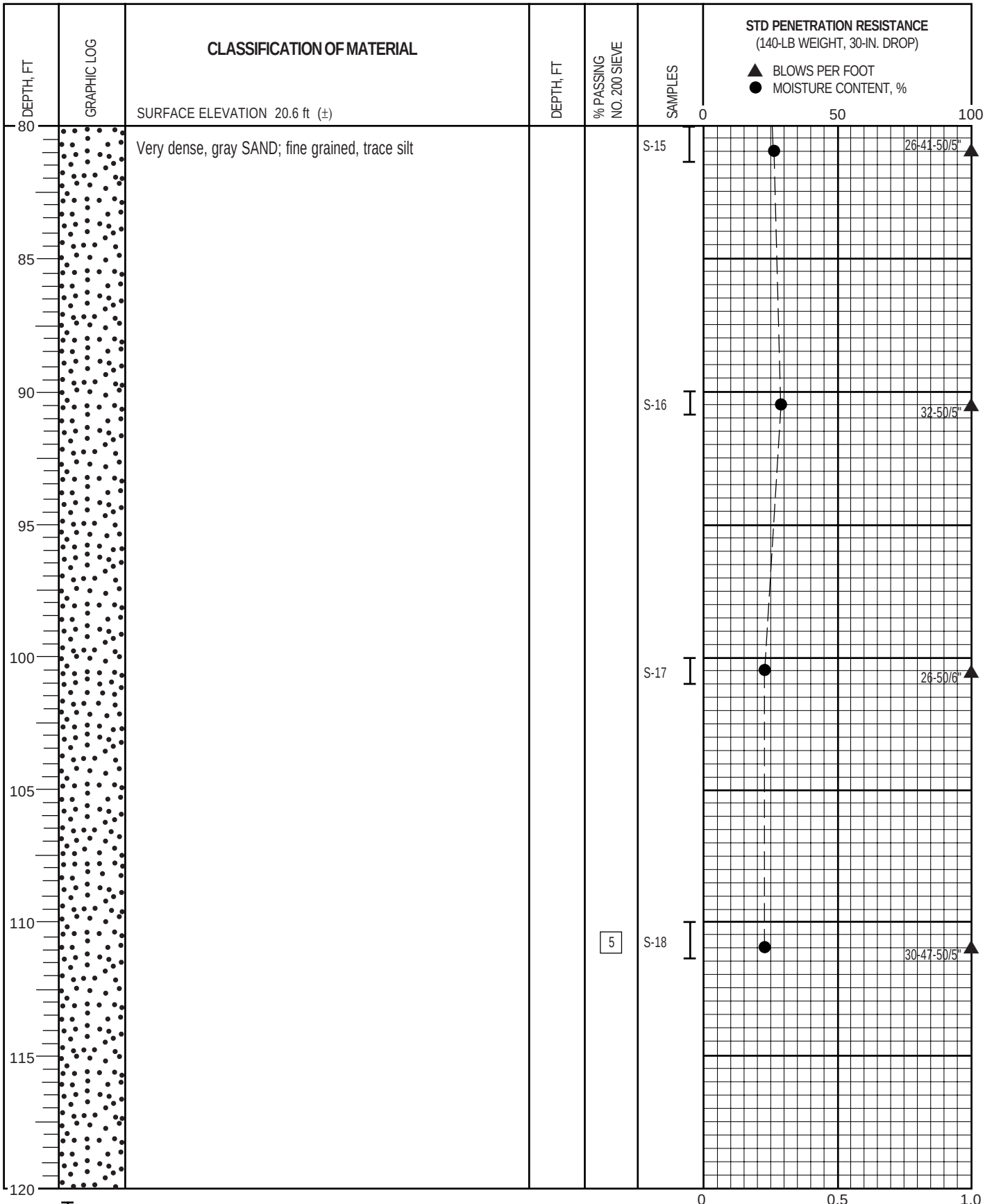


2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)
TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-18 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 1A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

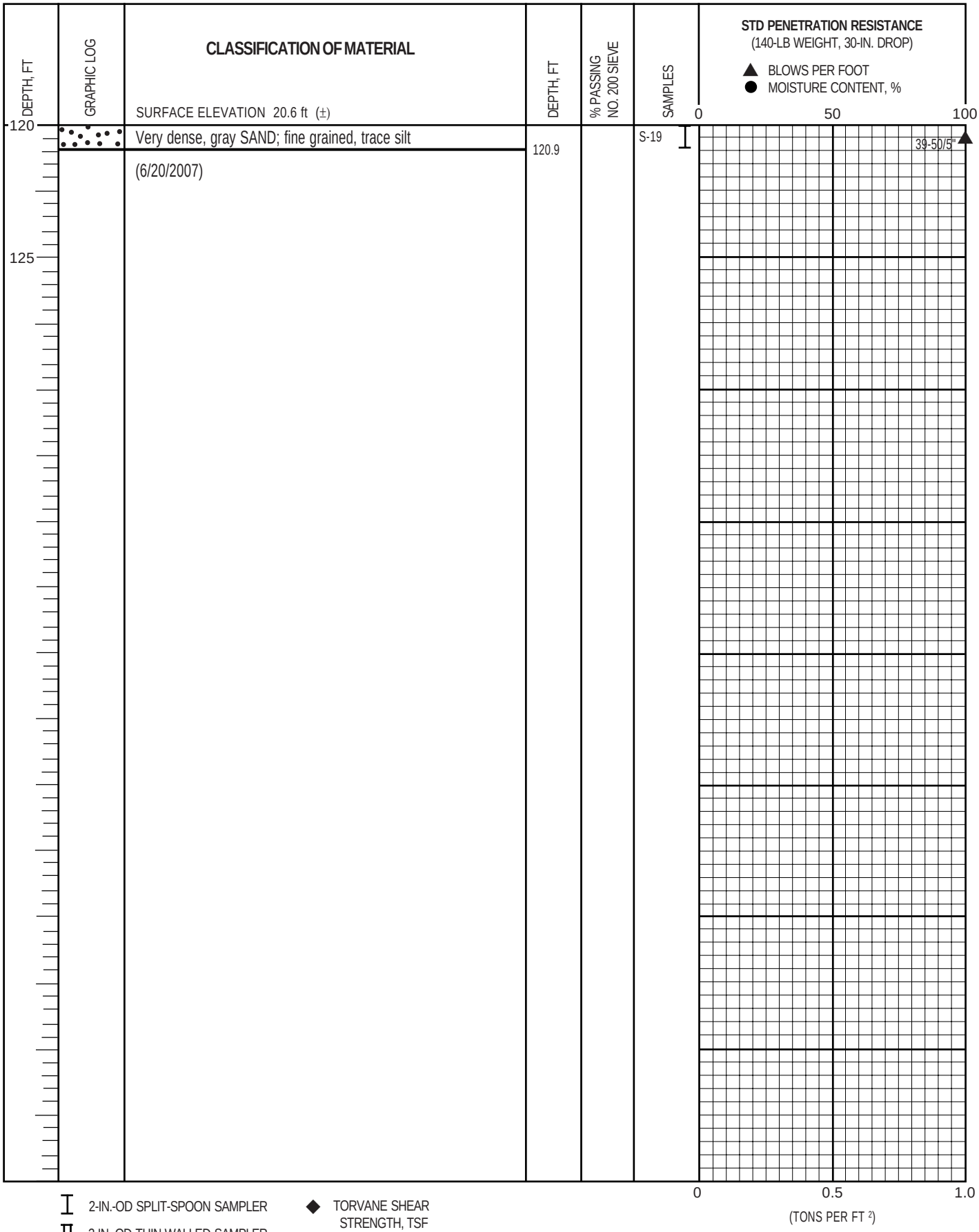
Moisture Content

Plastic Limit

GRI

BORING B-18 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 1A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

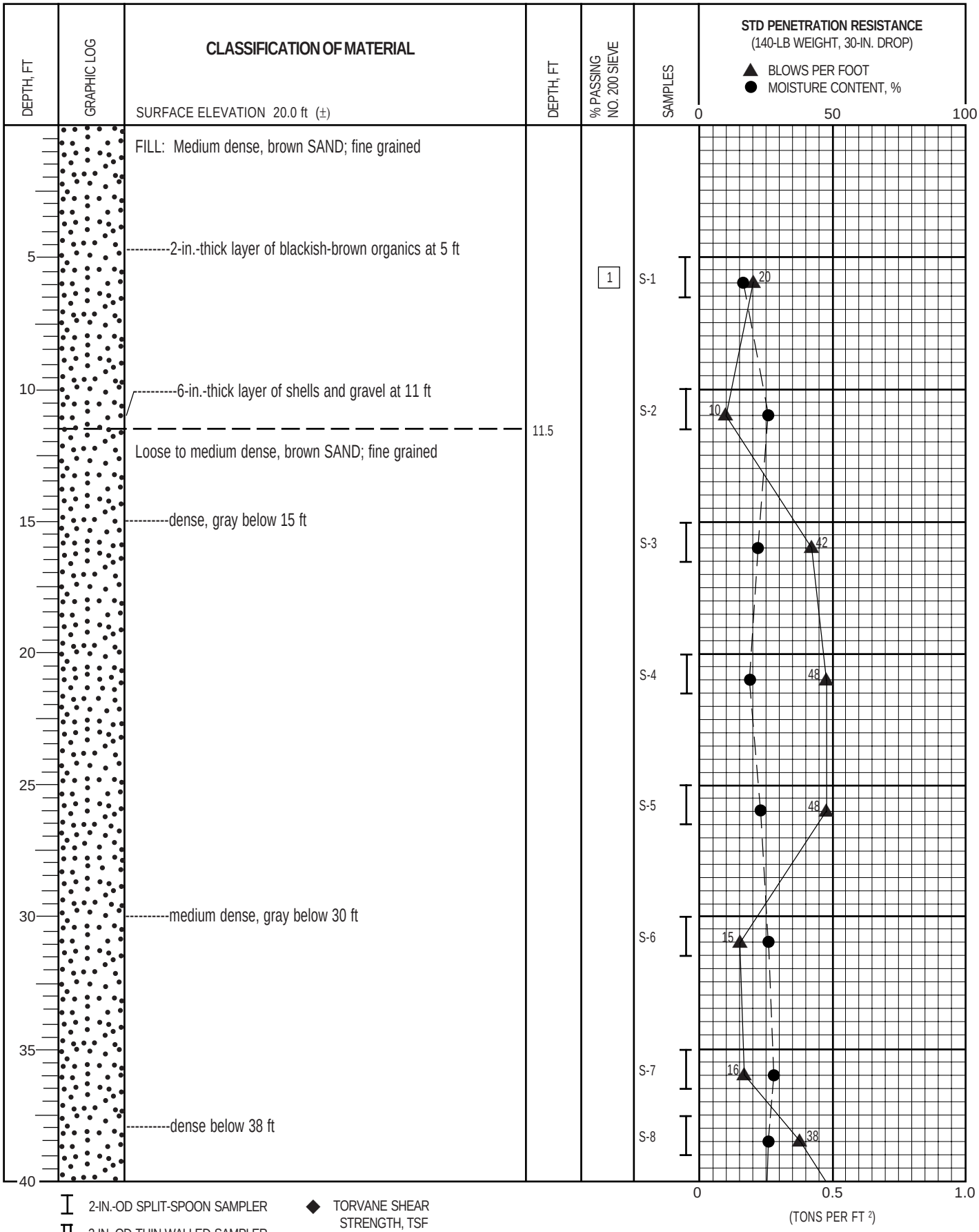
Moisture Content

Plastic Limit

GRI

BORING B-18 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 1A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

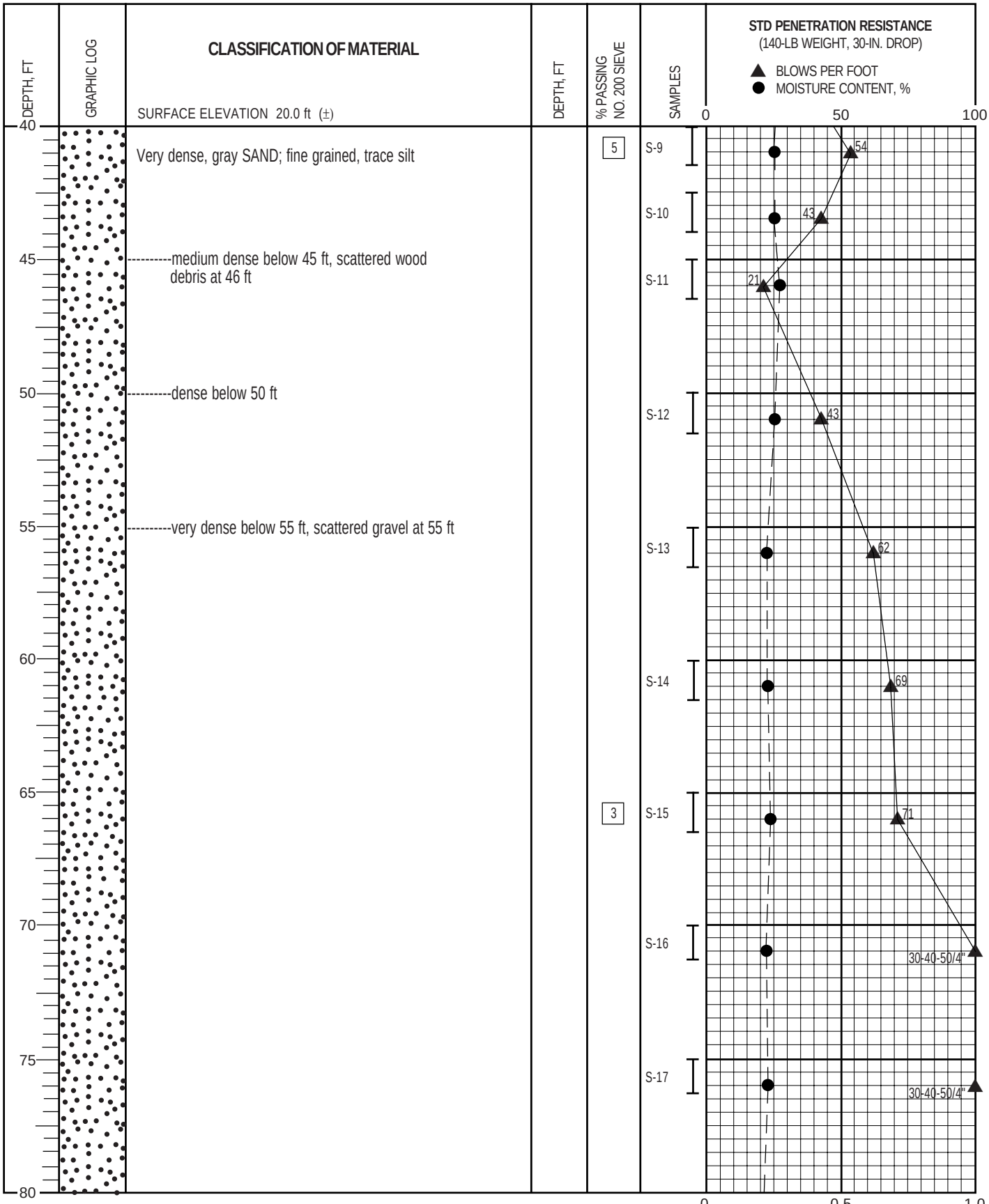
Moisture Content

Plastic Limit

GRI

BORING B-19

AUG. 2007 JOB NO. 4277-J FIG. 2A

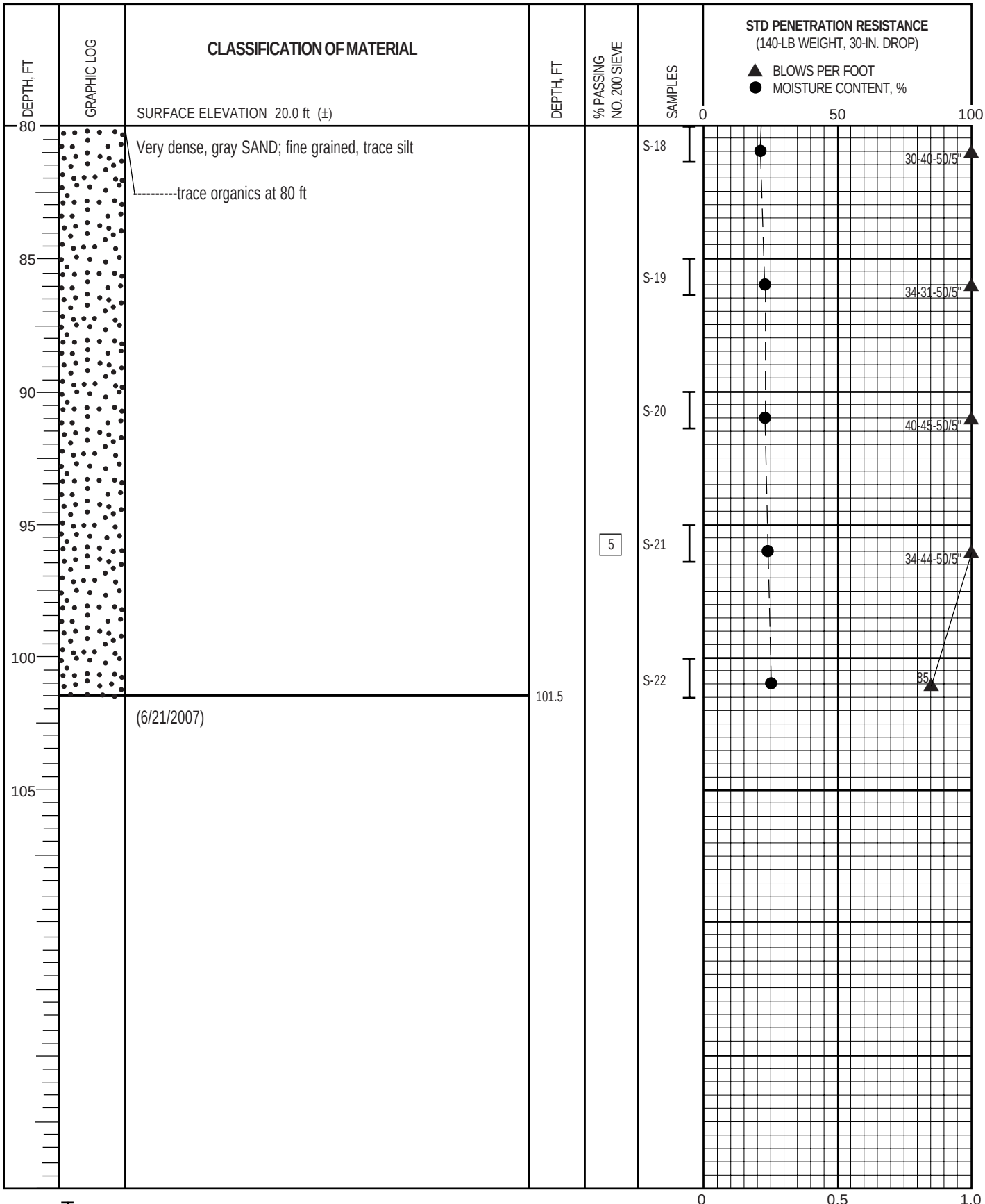


2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)
TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-19 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 2A



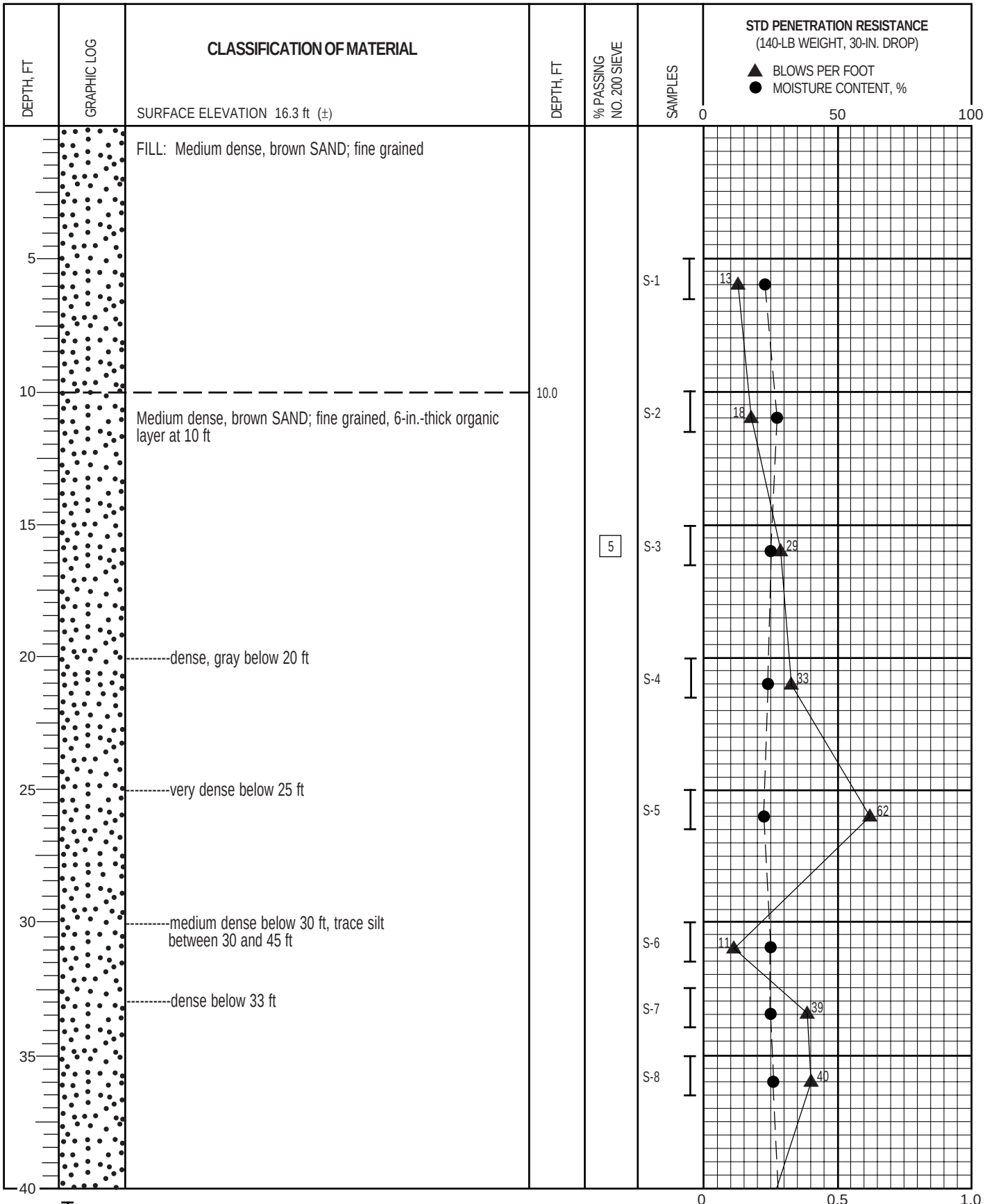
I 2-IN.-OD SPLIT-SPOON SAMPLER
II 3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-19 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 2A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

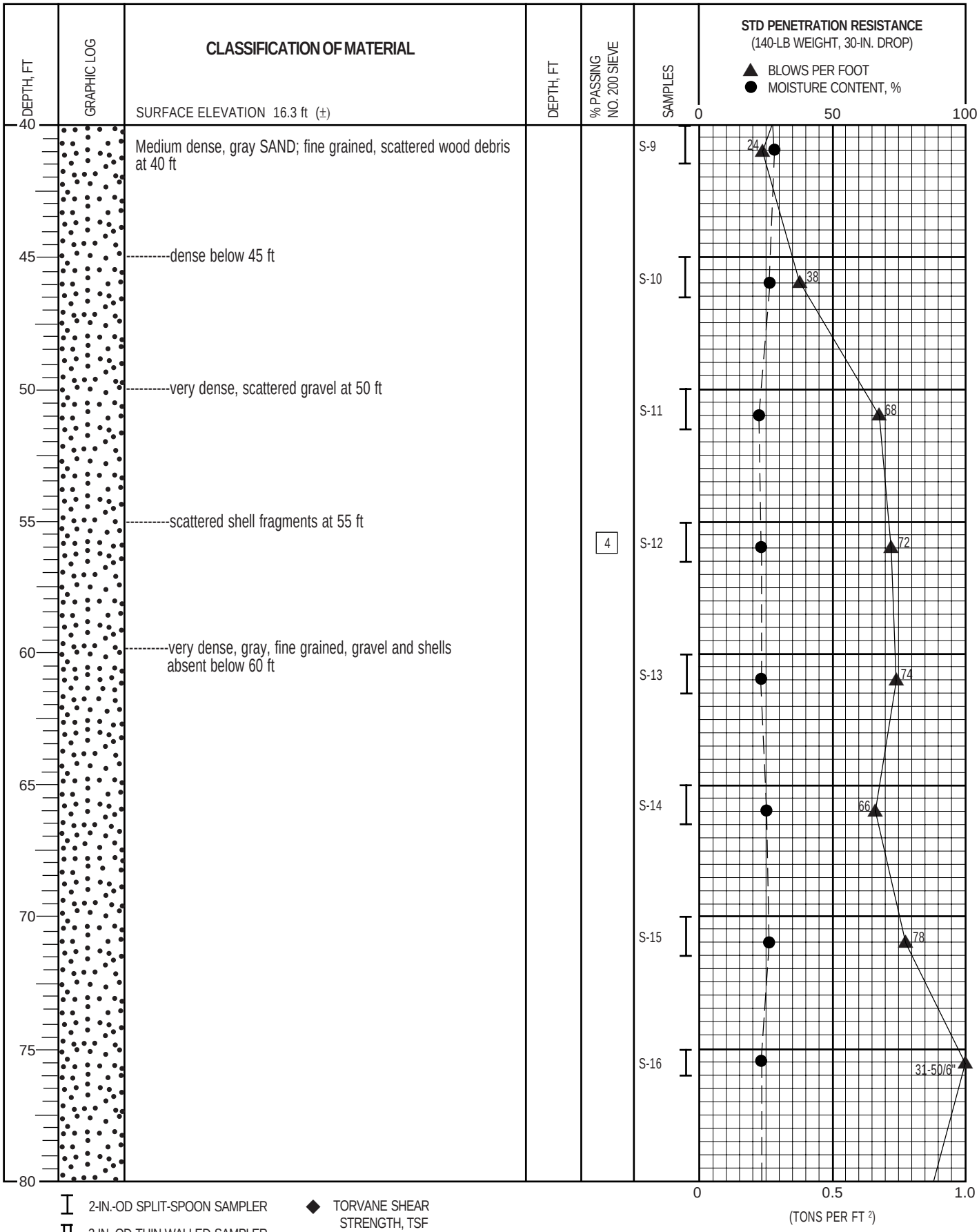
Moisture Content

Plastic Limit

GRI

BORING B-20

AUG. 2007 JOB NO. 4277-J FIG. 3A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

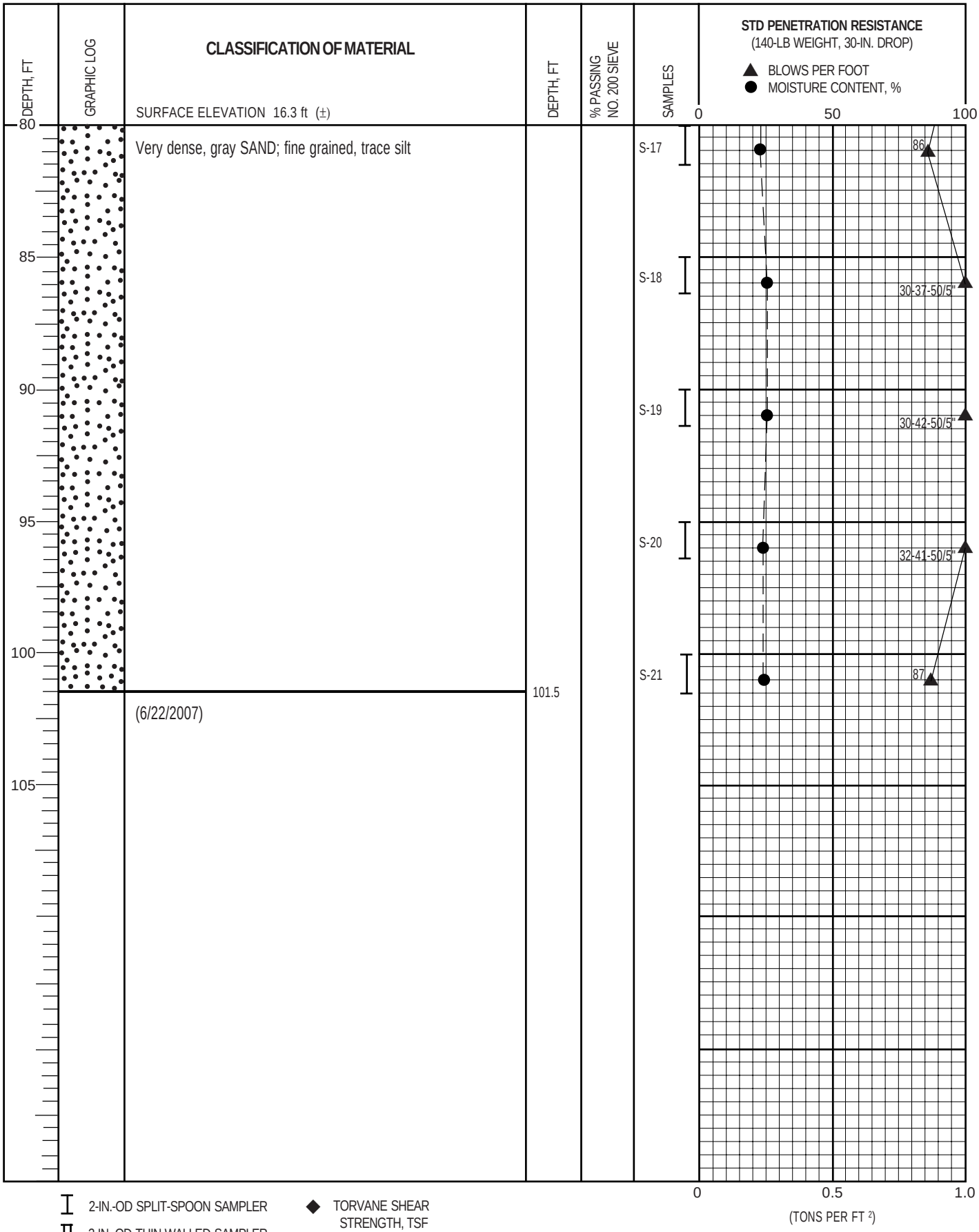
Moisture Content

Plastic Limit

GRI

BORING B-20 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 3A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

NO RECOVERY

Liquid Limit

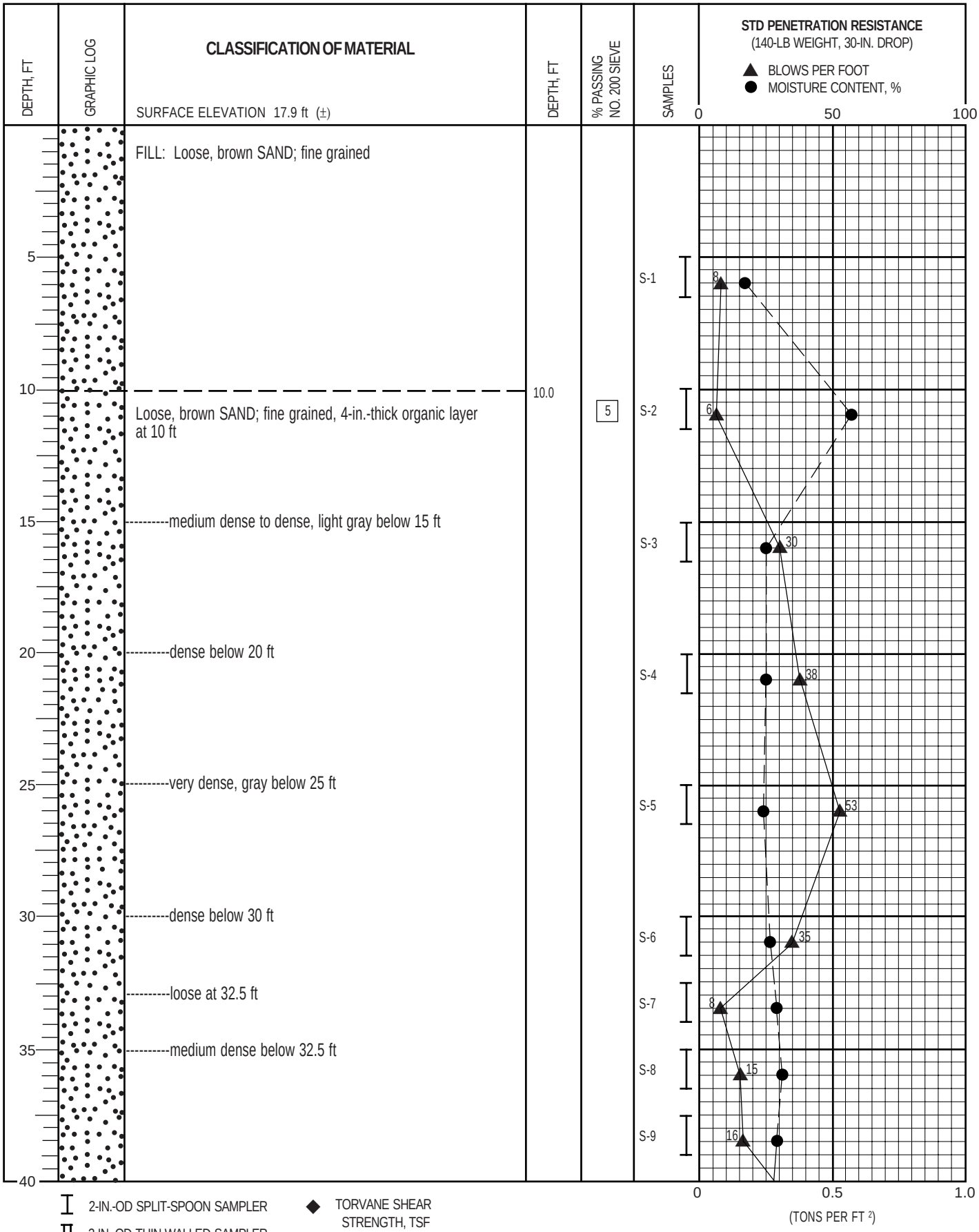
Moisture Content

Plastic Limit

GRI

BORING B-20 (cont.)

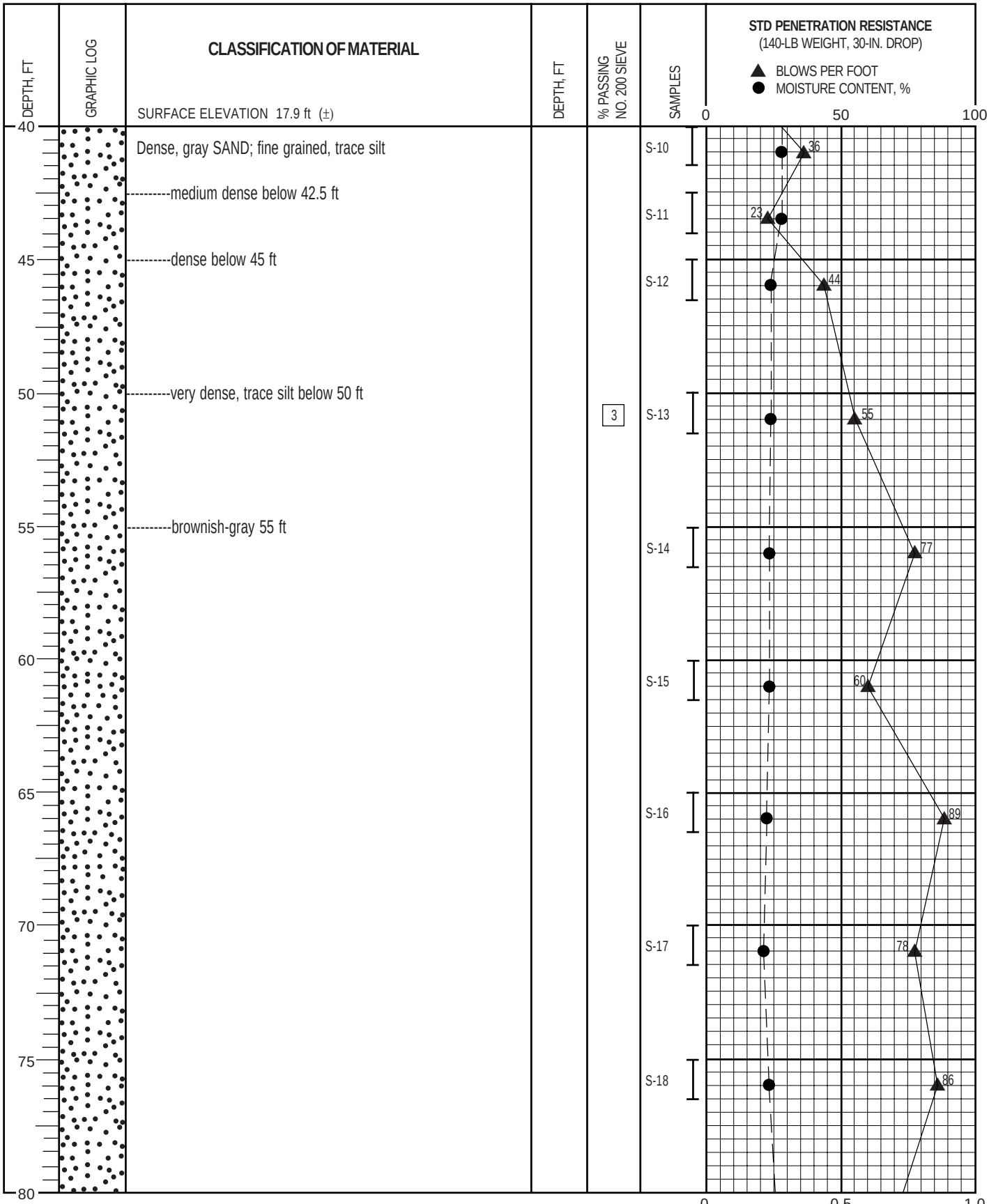
AUG. 2007 JOB NO. 4277-J FIG. 3A



GRI

BORING B-21

AUG. 2007 JOB NO. 4277-J FIG. 4A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

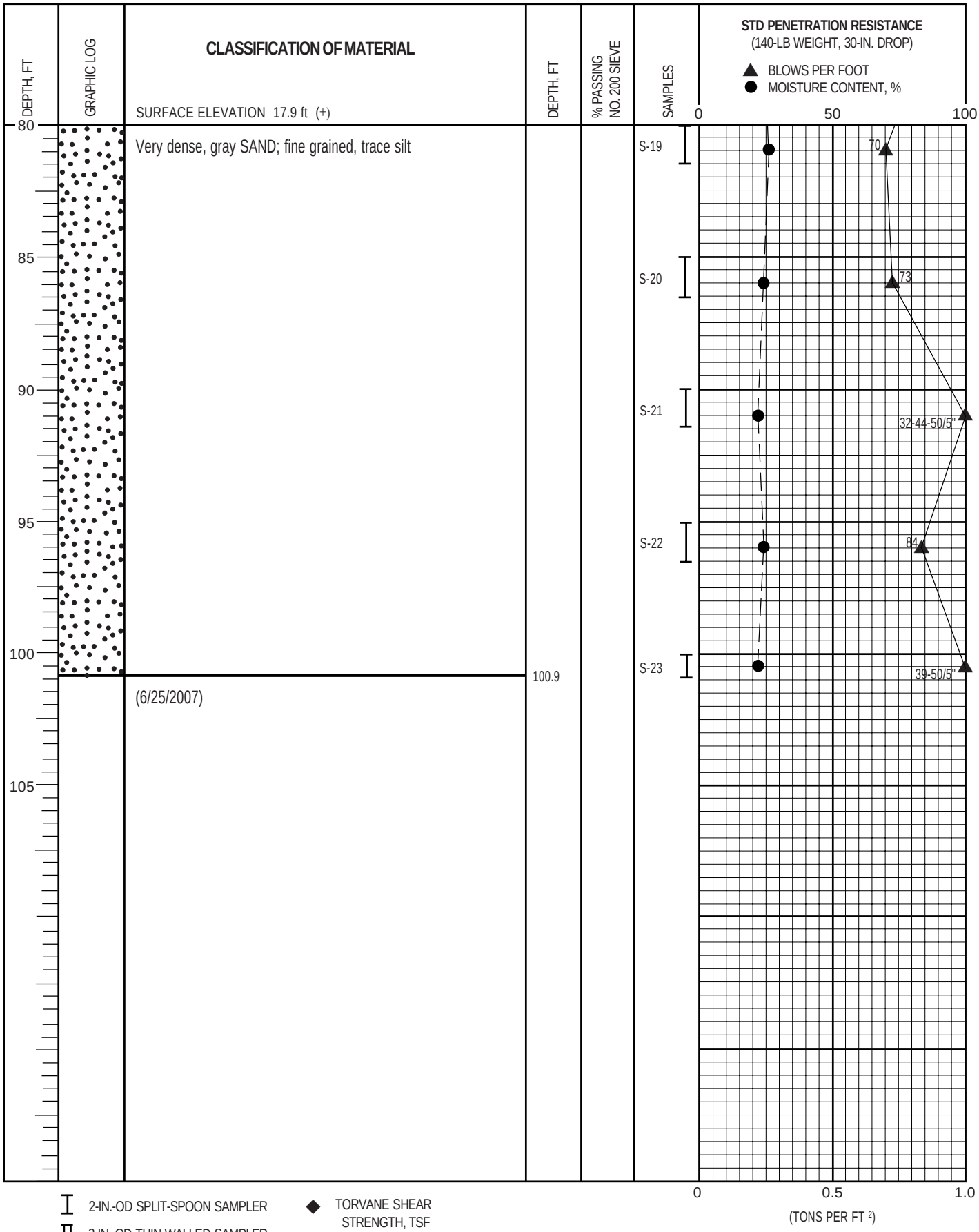
Moisture Content

Plastic Limit

GRI

BORING B-21 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 4A



I 2-IN.-OD SPLIT-SPOON SAMPLER

II 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

■ UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

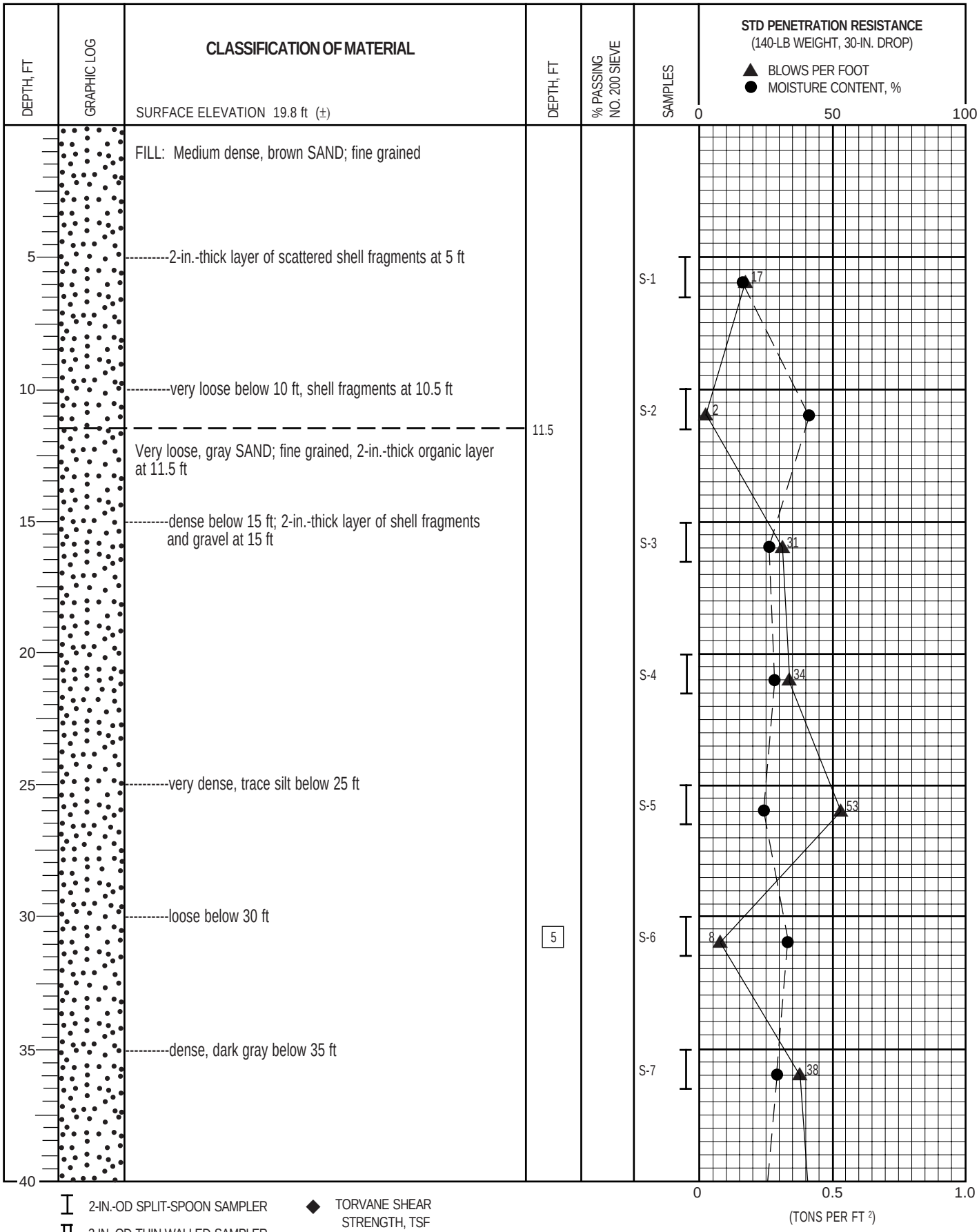
Moisture Content

Plastic Limit

GRI

BORING B-21 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 4A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

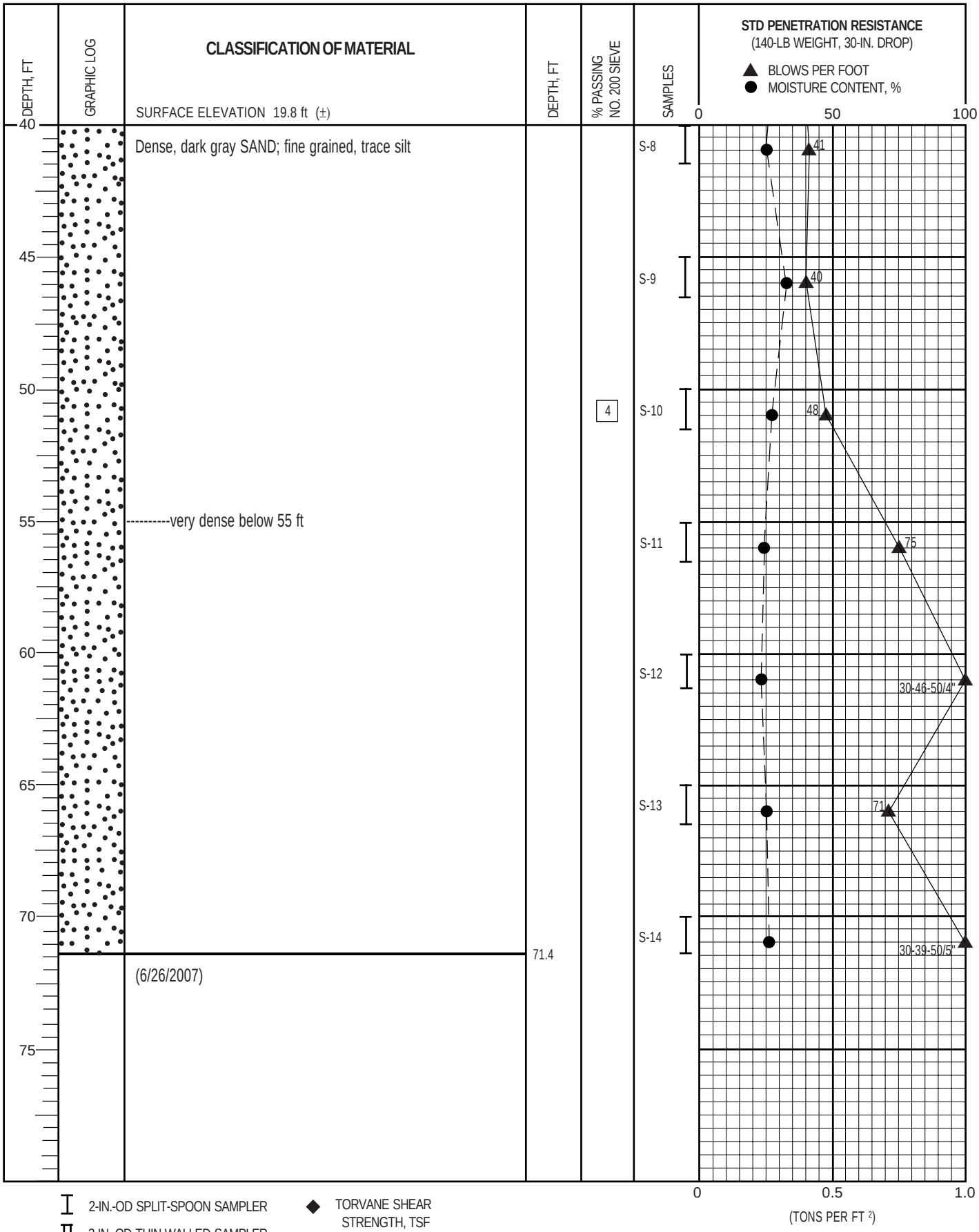
Moisture Content

Plastic Limit

GRI

BORING B-22

AUG. 2007 JOB NO. 4277-J FIG. 5A



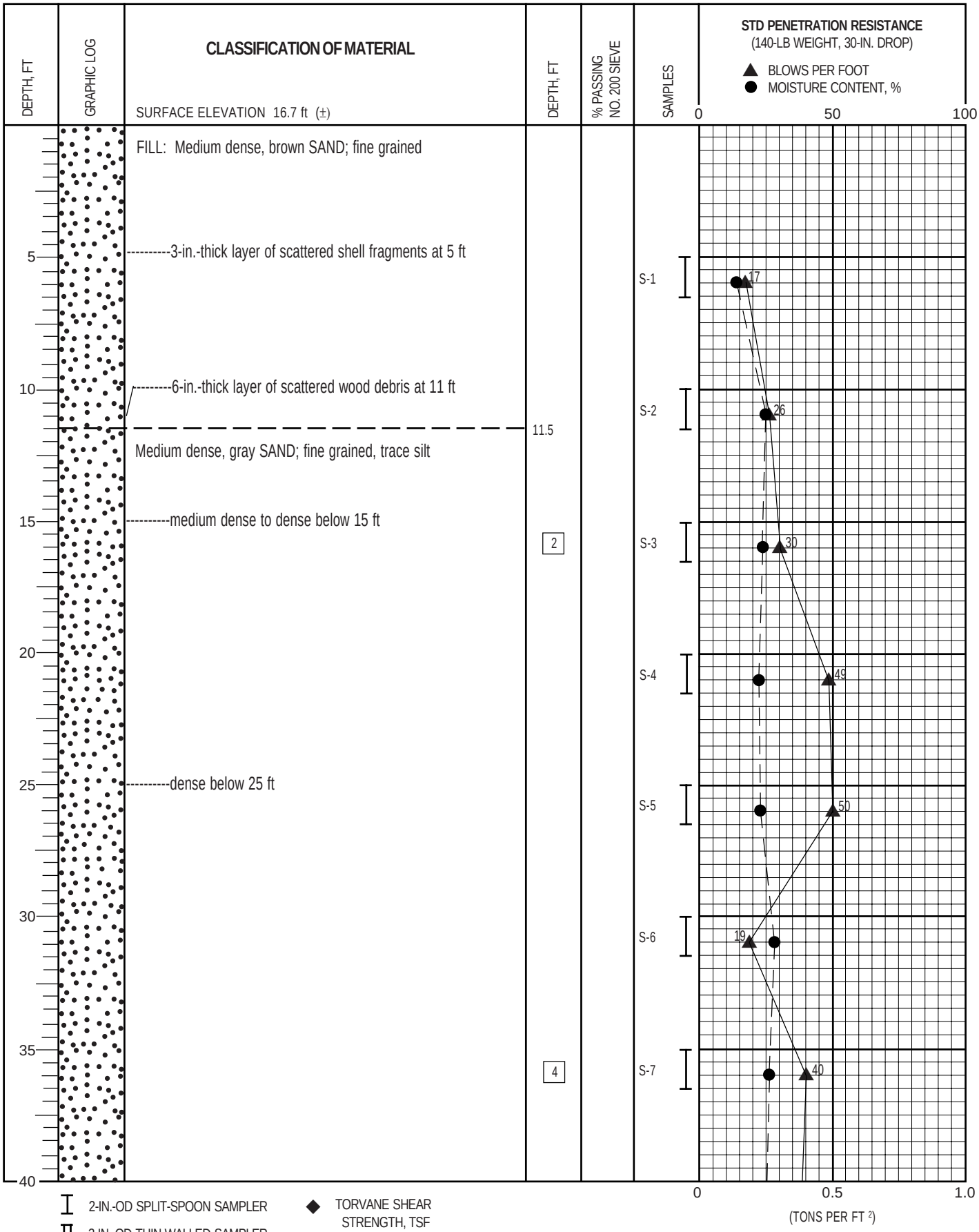
2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-22 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 5A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

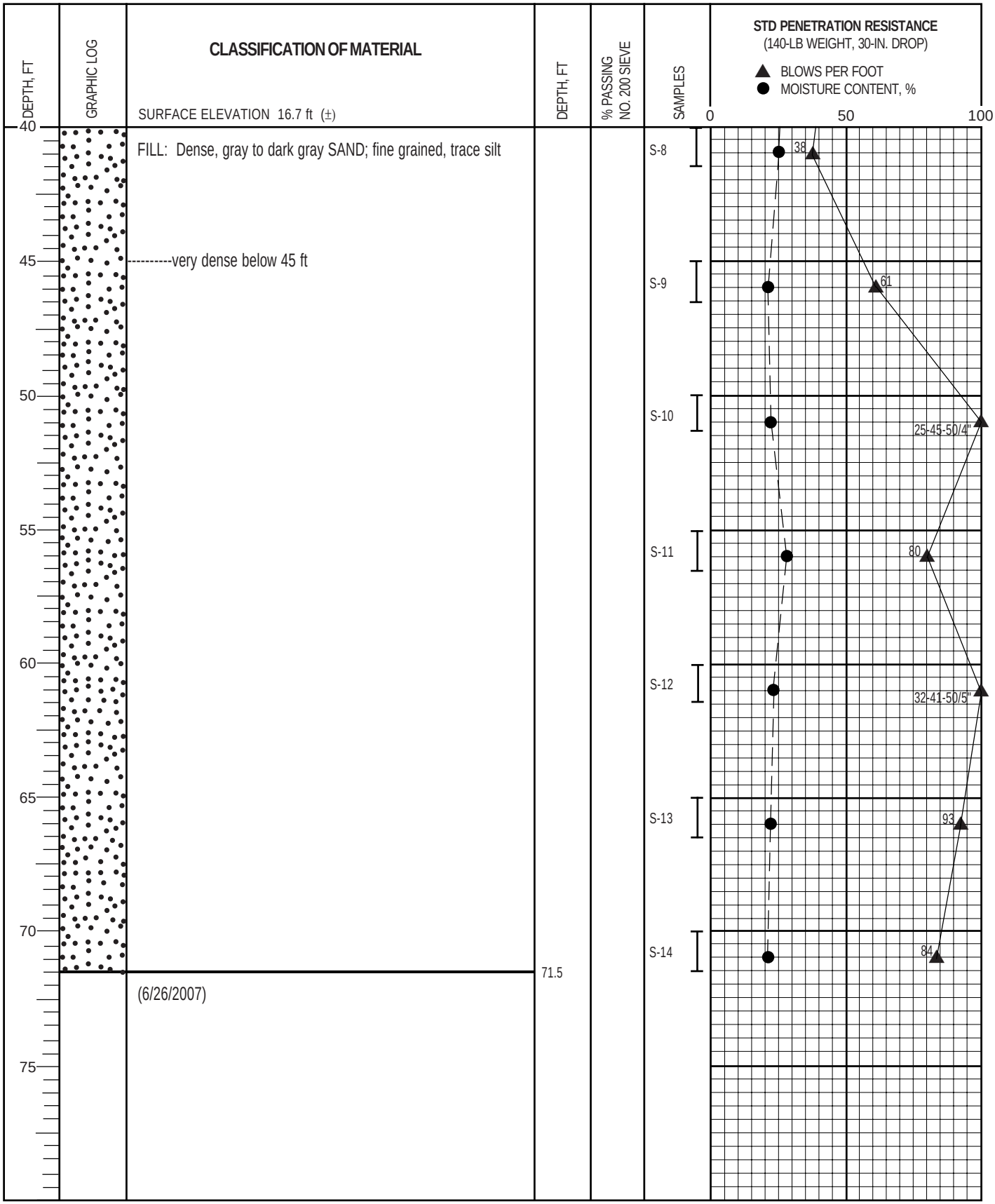
Moisture Content

Plastic Limit

GRI

BORING B-23

AUG. 2007 JOB NO. 4277-J FIG. 6A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

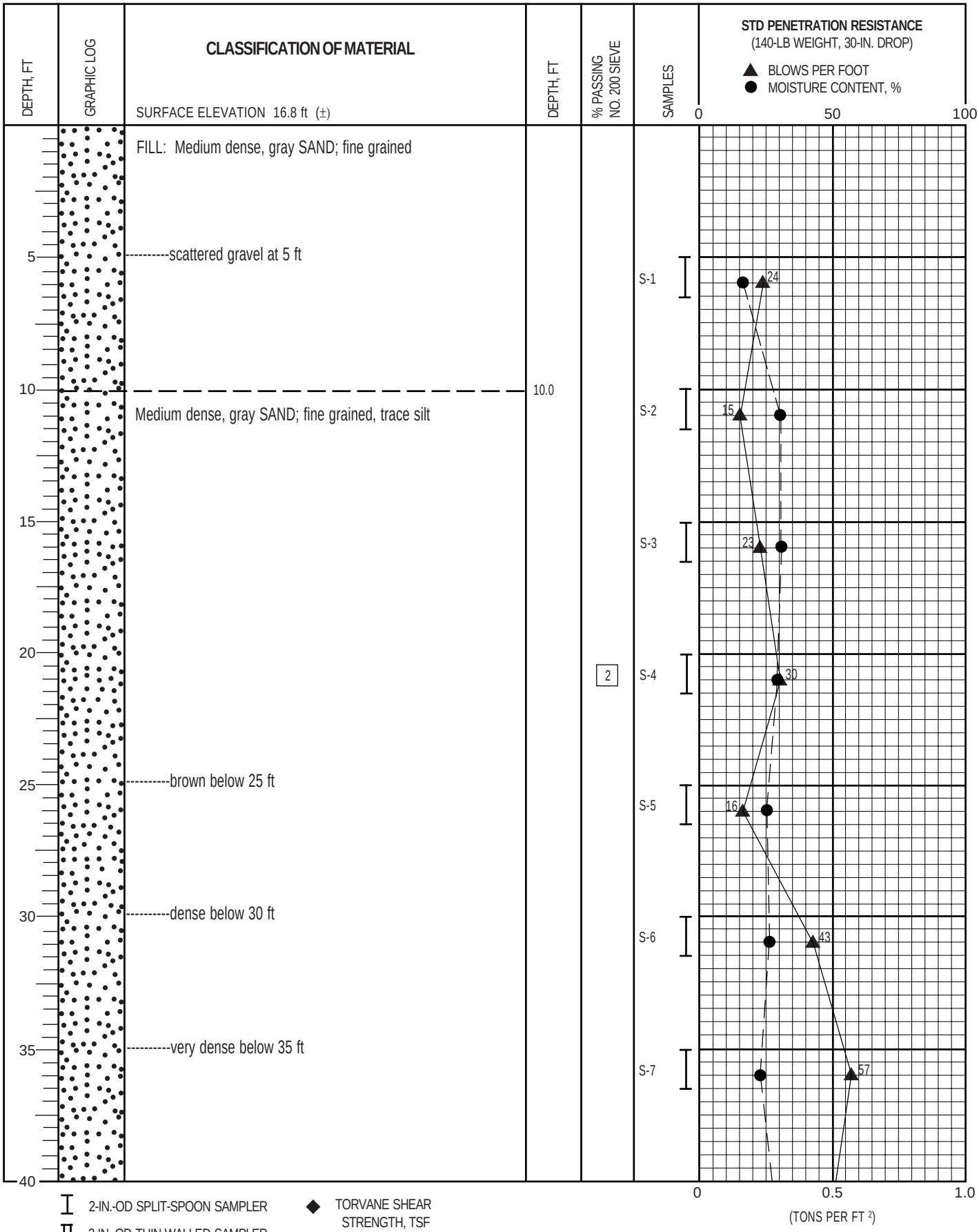
Moisture Content

Plastic Limit

GRI

BORING B-23 (cont.)

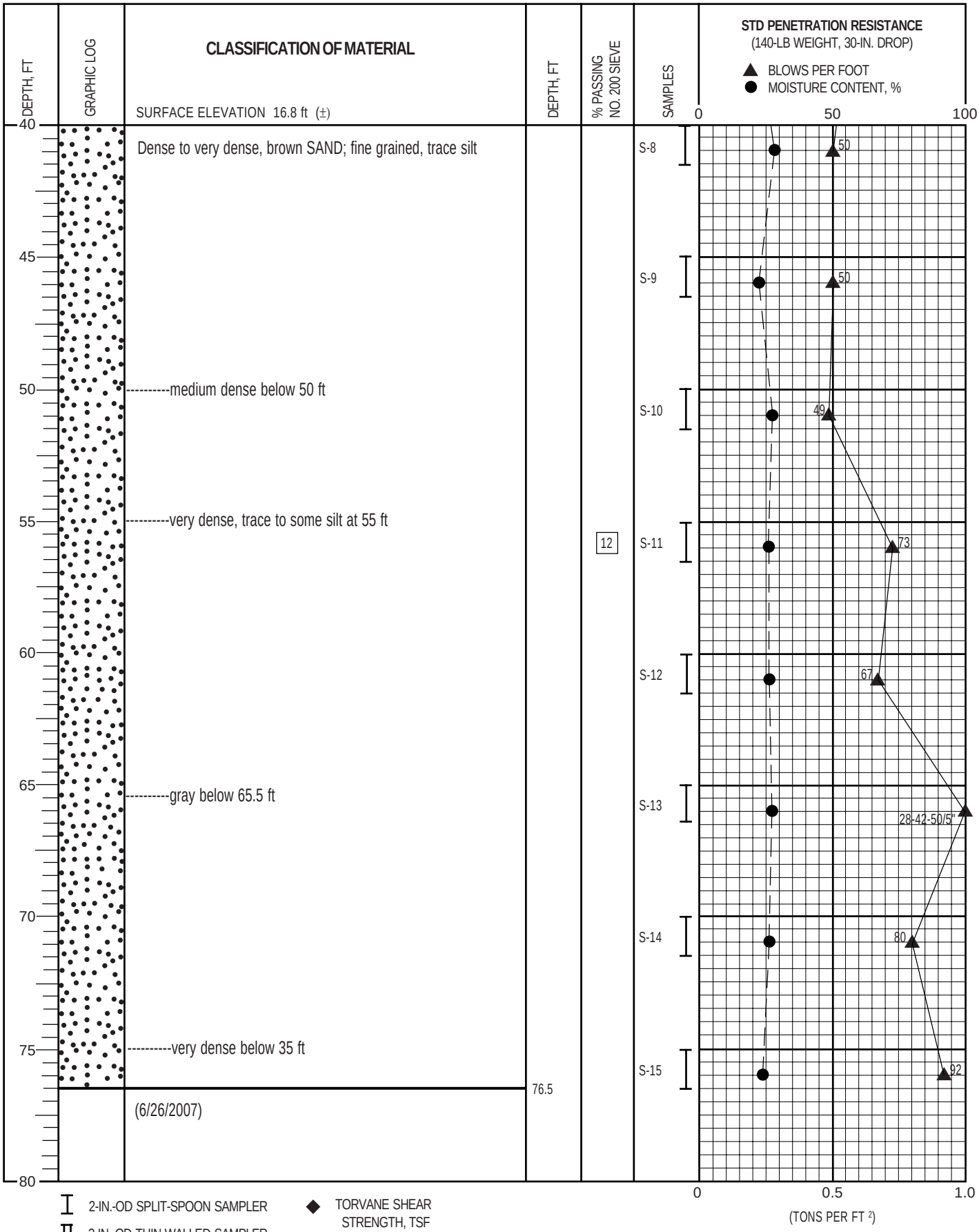
AUG. 2007 JOB NO. 4277-J FIG. 6A



GRI

BORING B-24

AUG. 2007 JOB NO. 4277-J FIG. 7A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

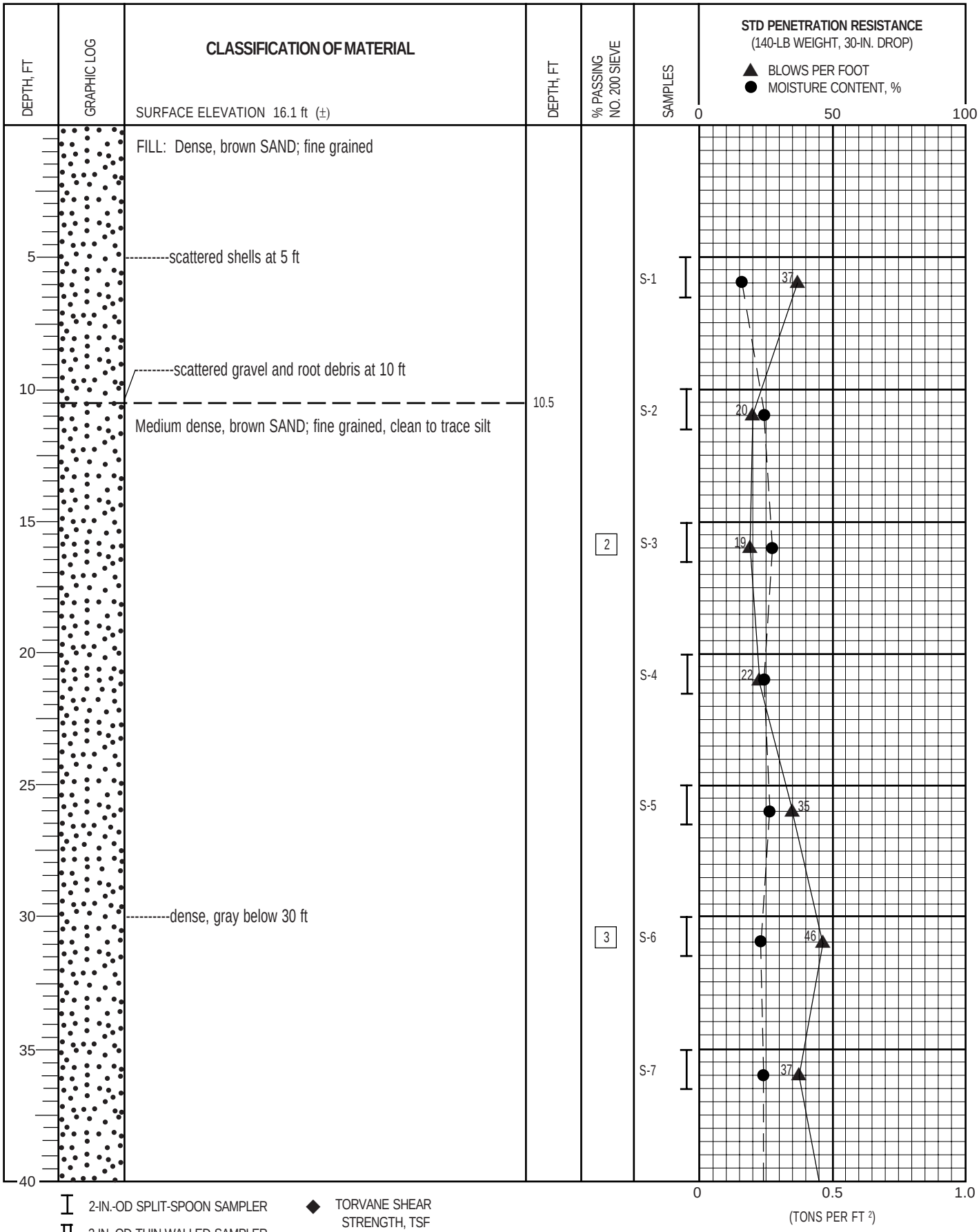
Moisture Content

Plastic Limit

GRI

BORING B-24 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 7A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

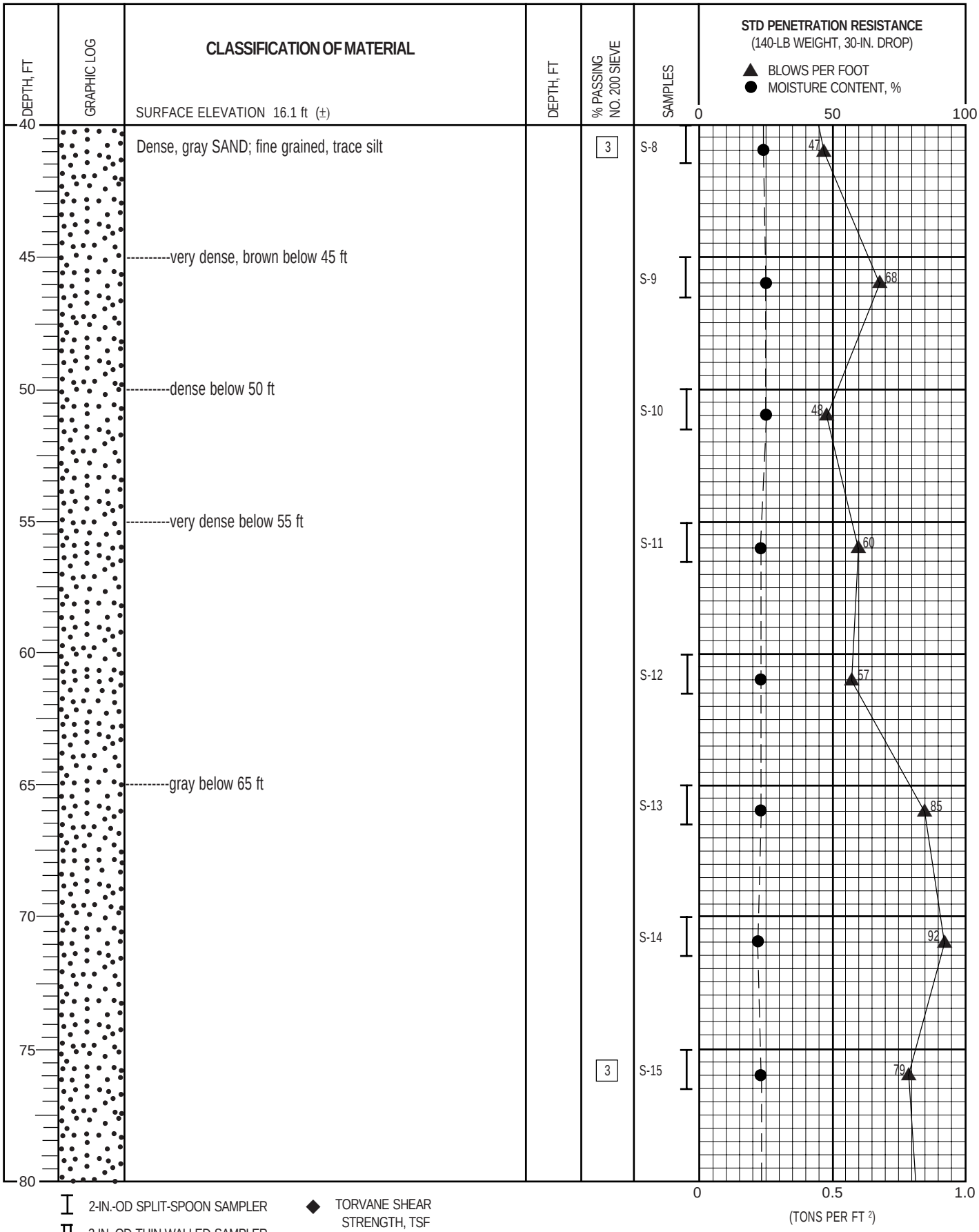
Moisture Content

Plastic Limit

GRI

BORING B-25

AUG. 2007 JOB NO. 4277-J FIG. 8A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

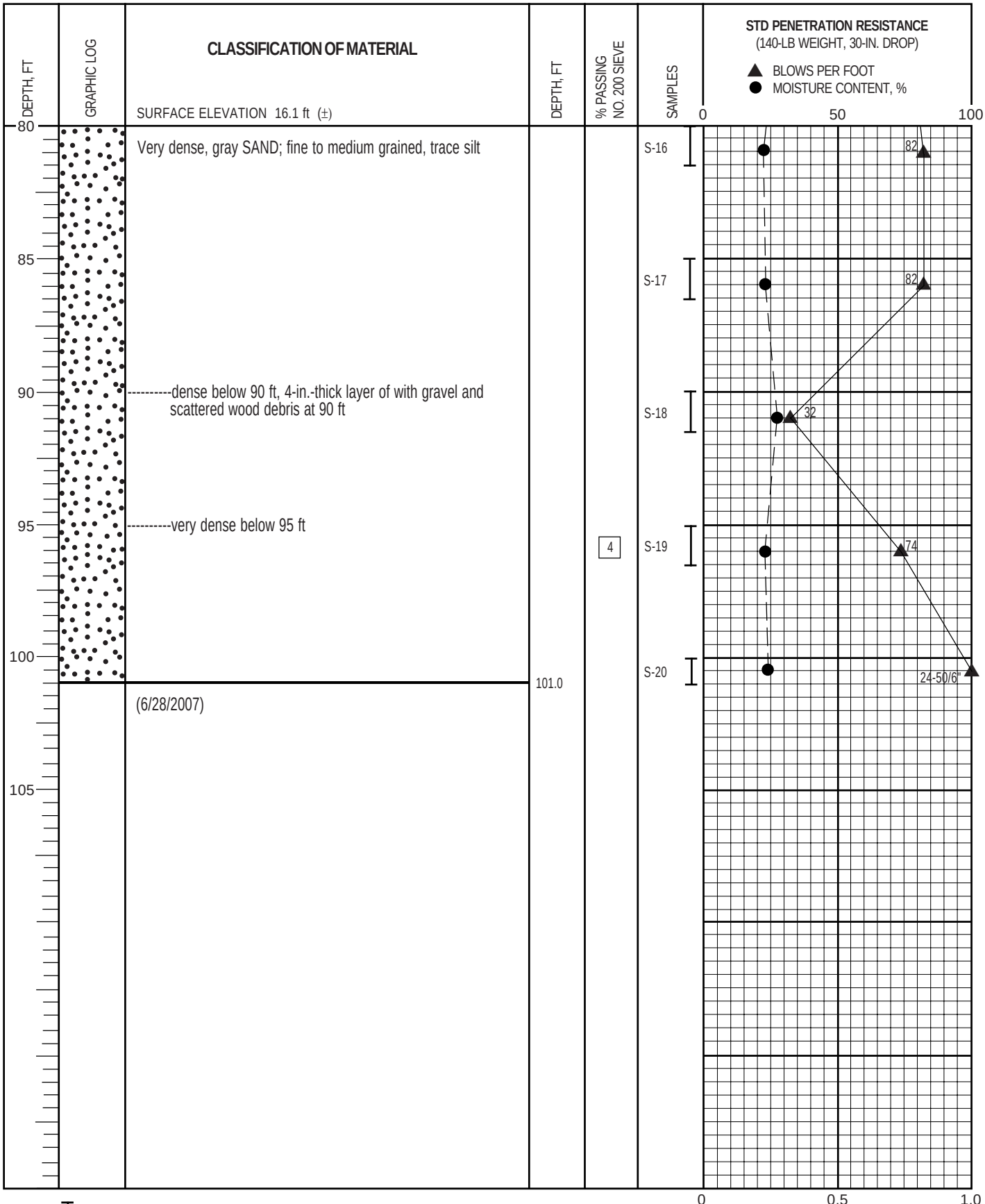
Moisture Content

Plastic Limit

GRI

BORING B-25 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 8A



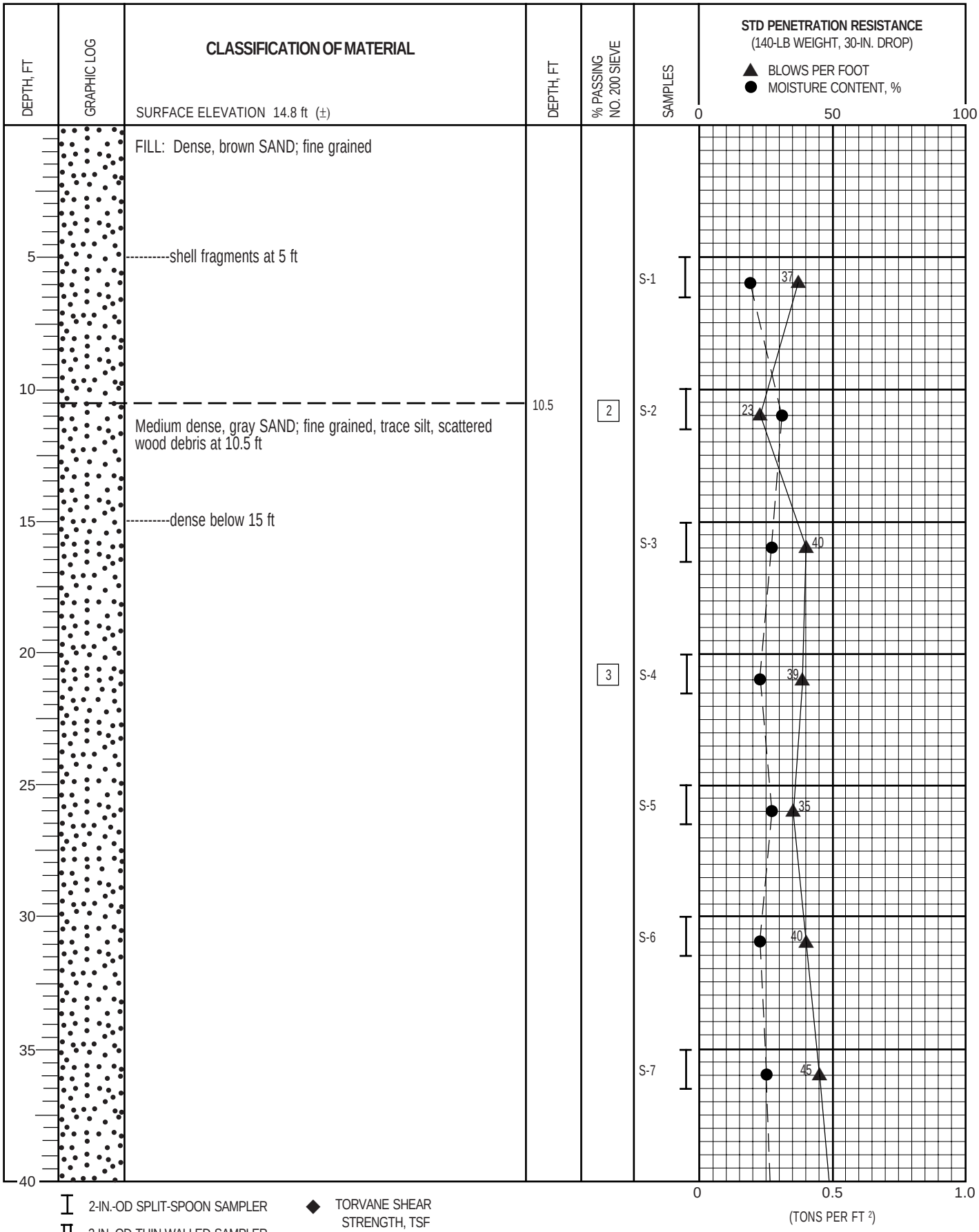
2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-25 (cont.)

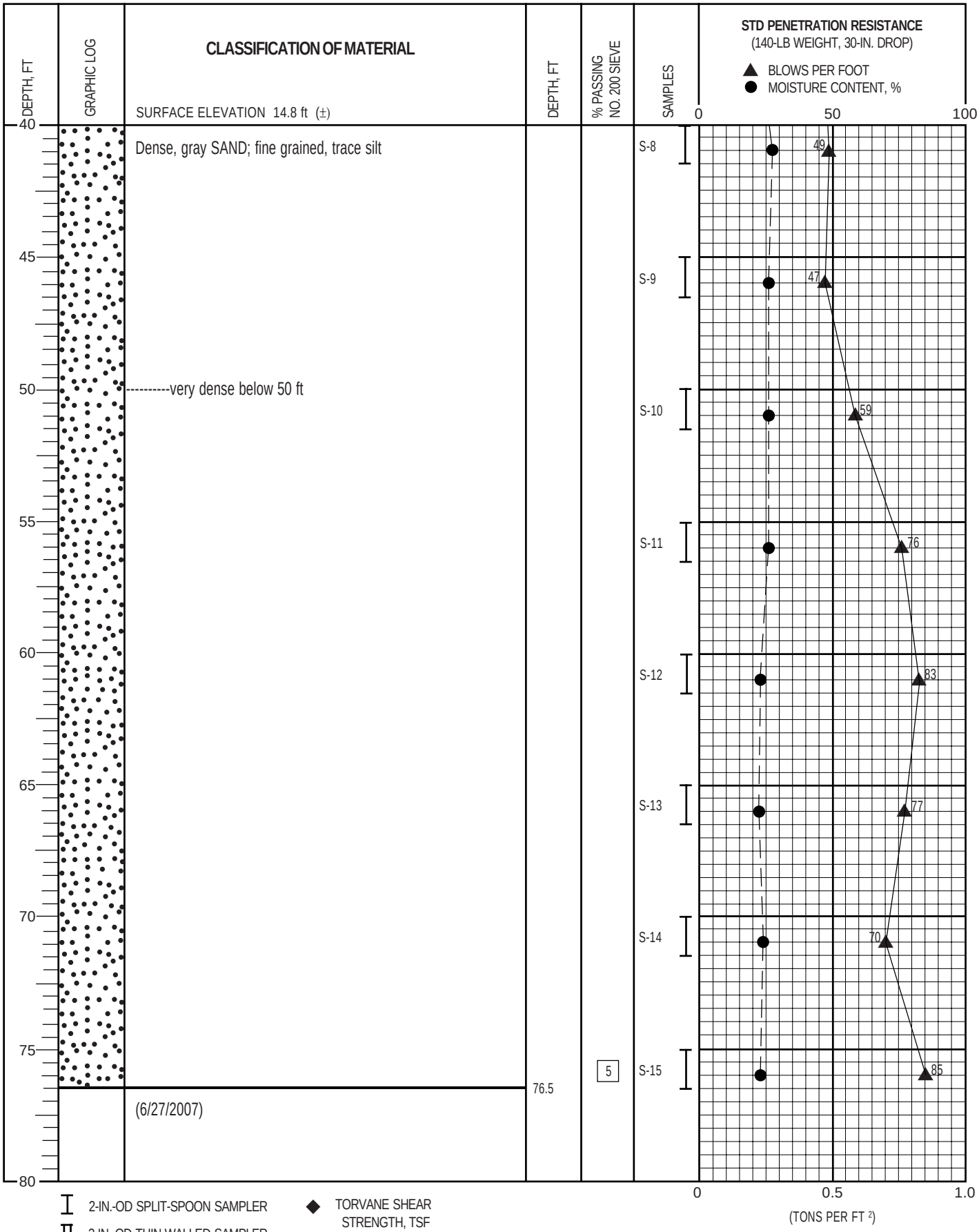
AUG. 2007 JOB NO. 4277-J FIG. 8A



GRI

BORING B-26

AUG. 2007 JOB NO. 4277-J FIG. 9A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

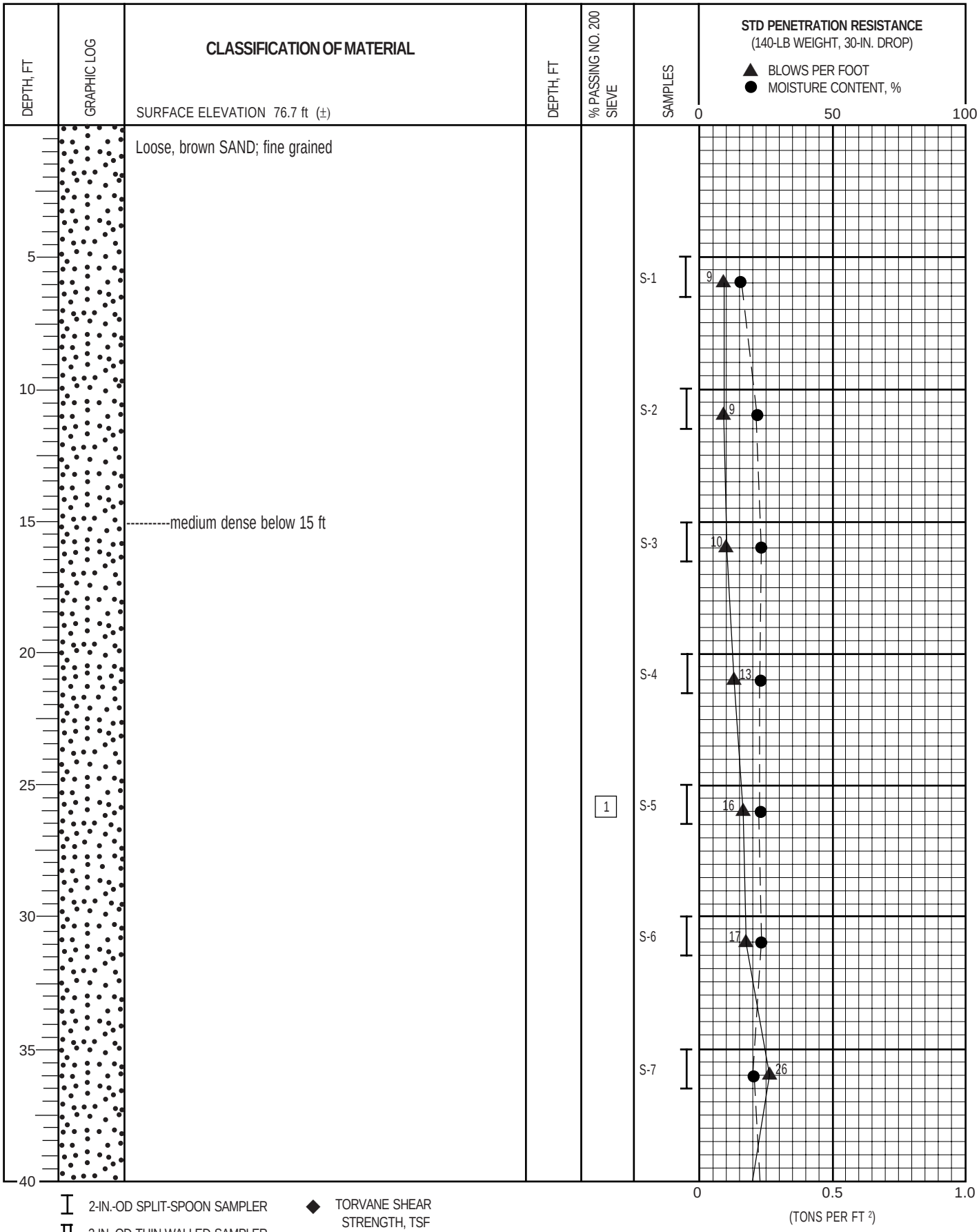
Moisture Content

Plastic Limit

GRI

BORING B-26 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 9A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

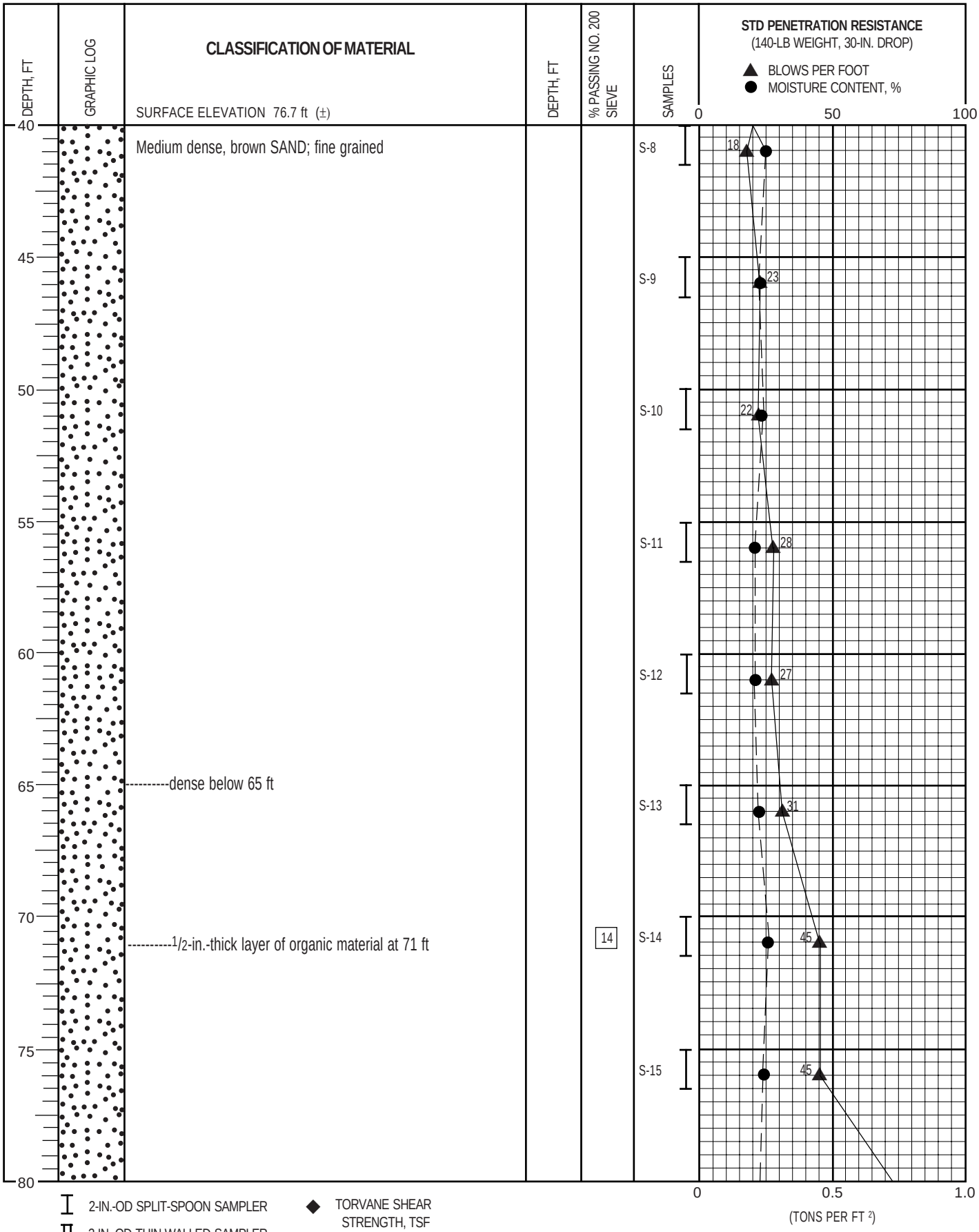
Moisture Content

Plastic Limit

GRI

BORING B-27

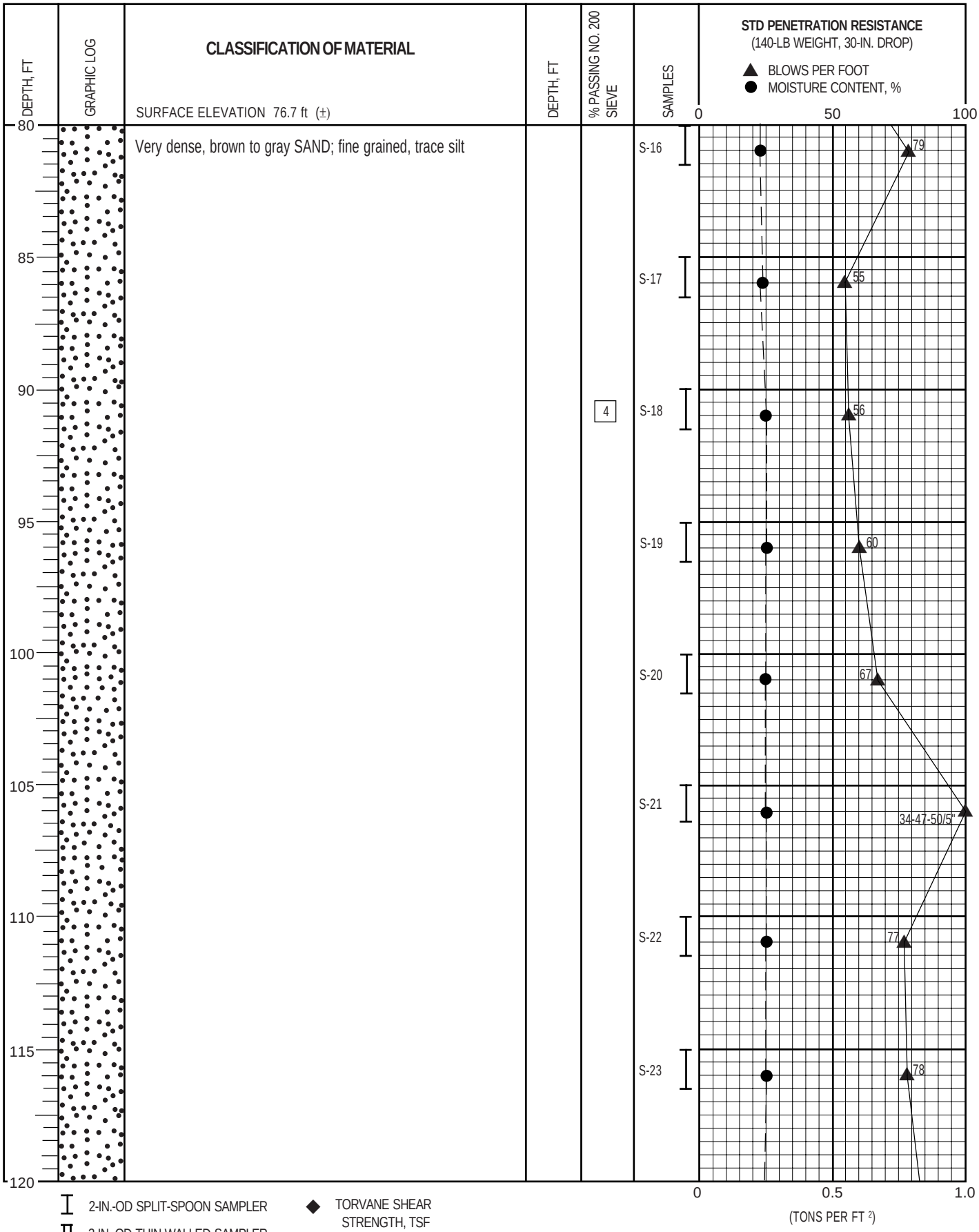
AUG. 2007 JOB NO. 4277-J FIG. 10A



GRI

BORING B-27 (cont.)

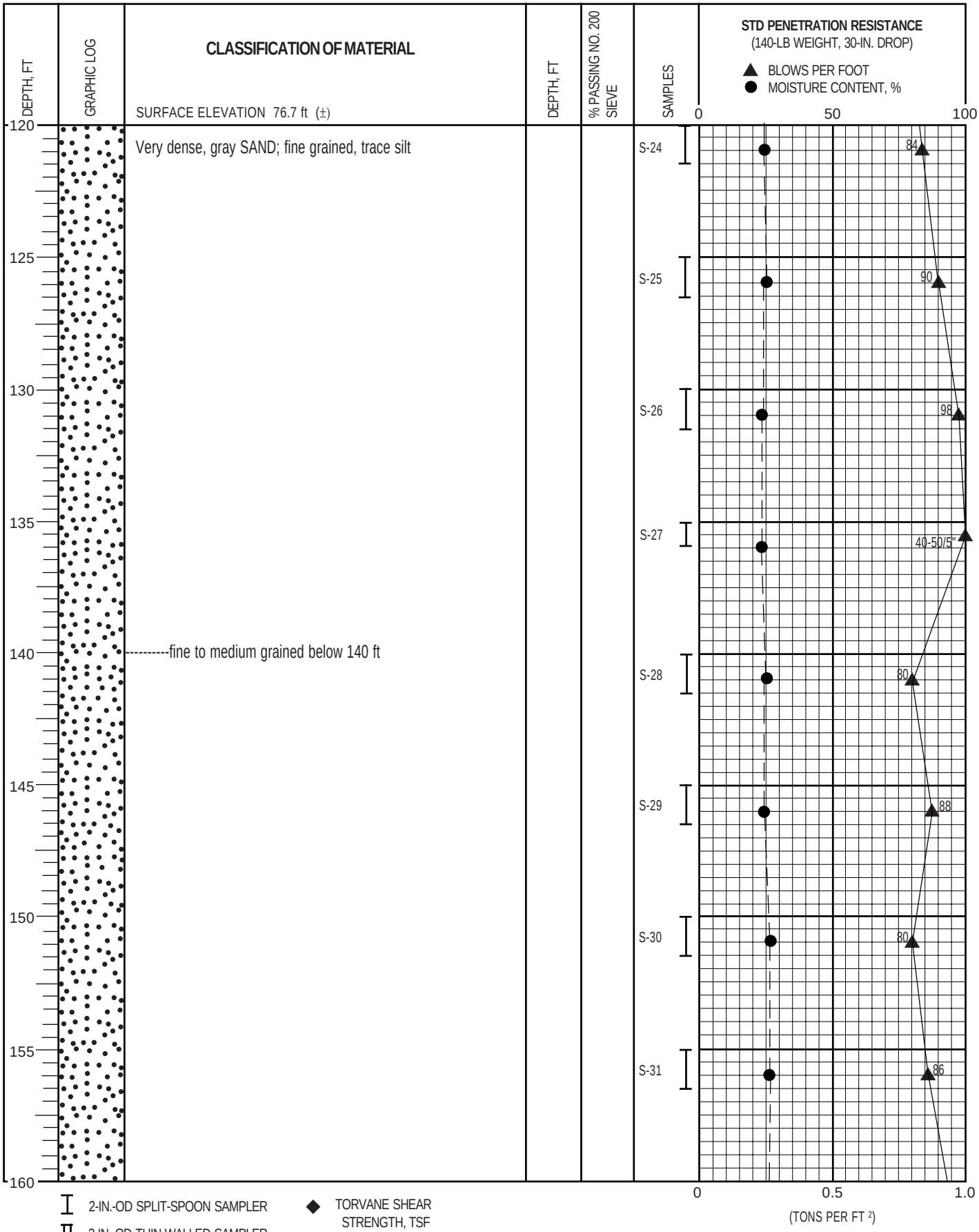
AUG 2007 JOB NO. 4277-J FIG. 10A



GRI

BORING B-27 (cont.)

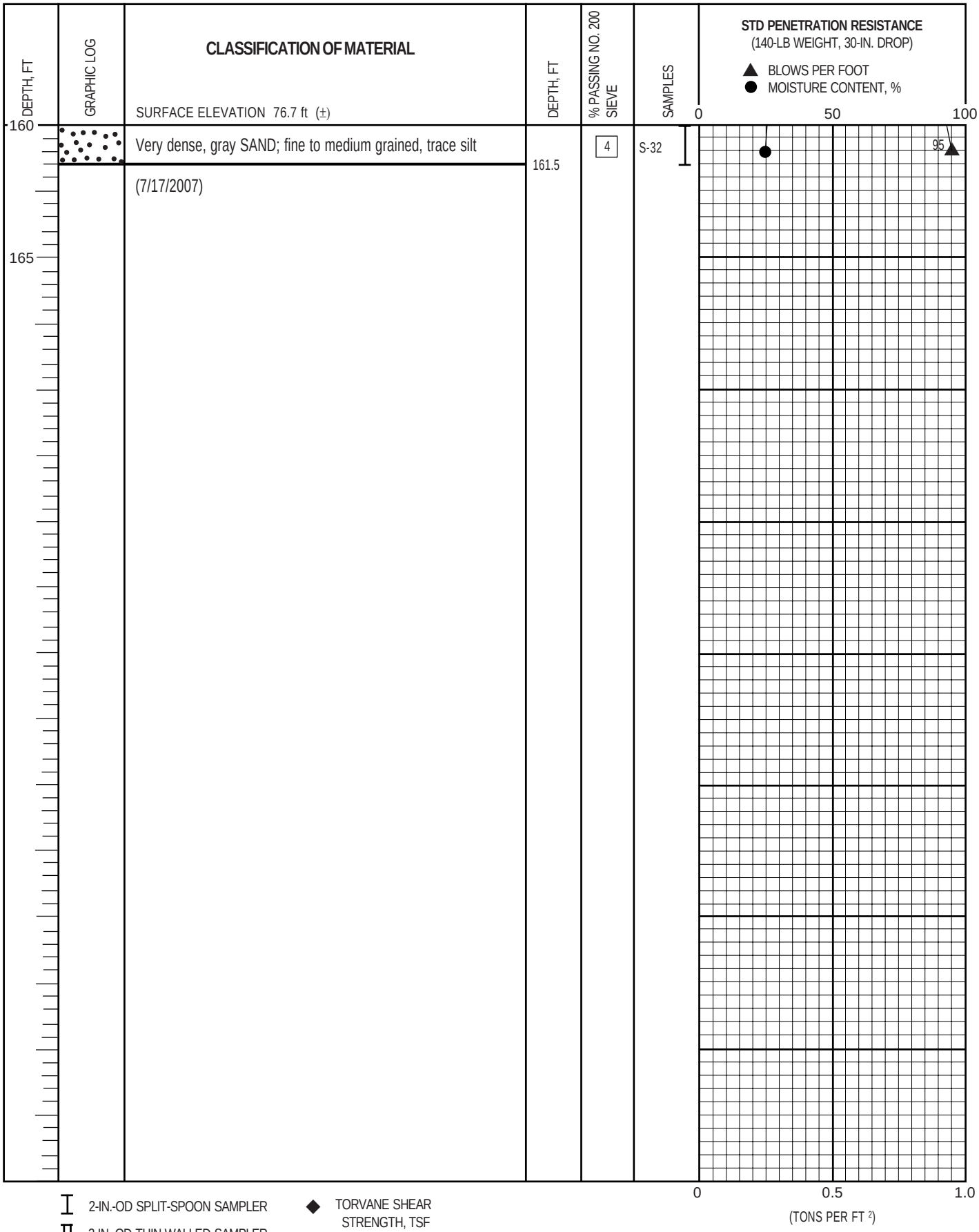
AUG. 2007 JOB NO. 4277-J FIG. 10A



GRI

BORING B-27 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 10A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

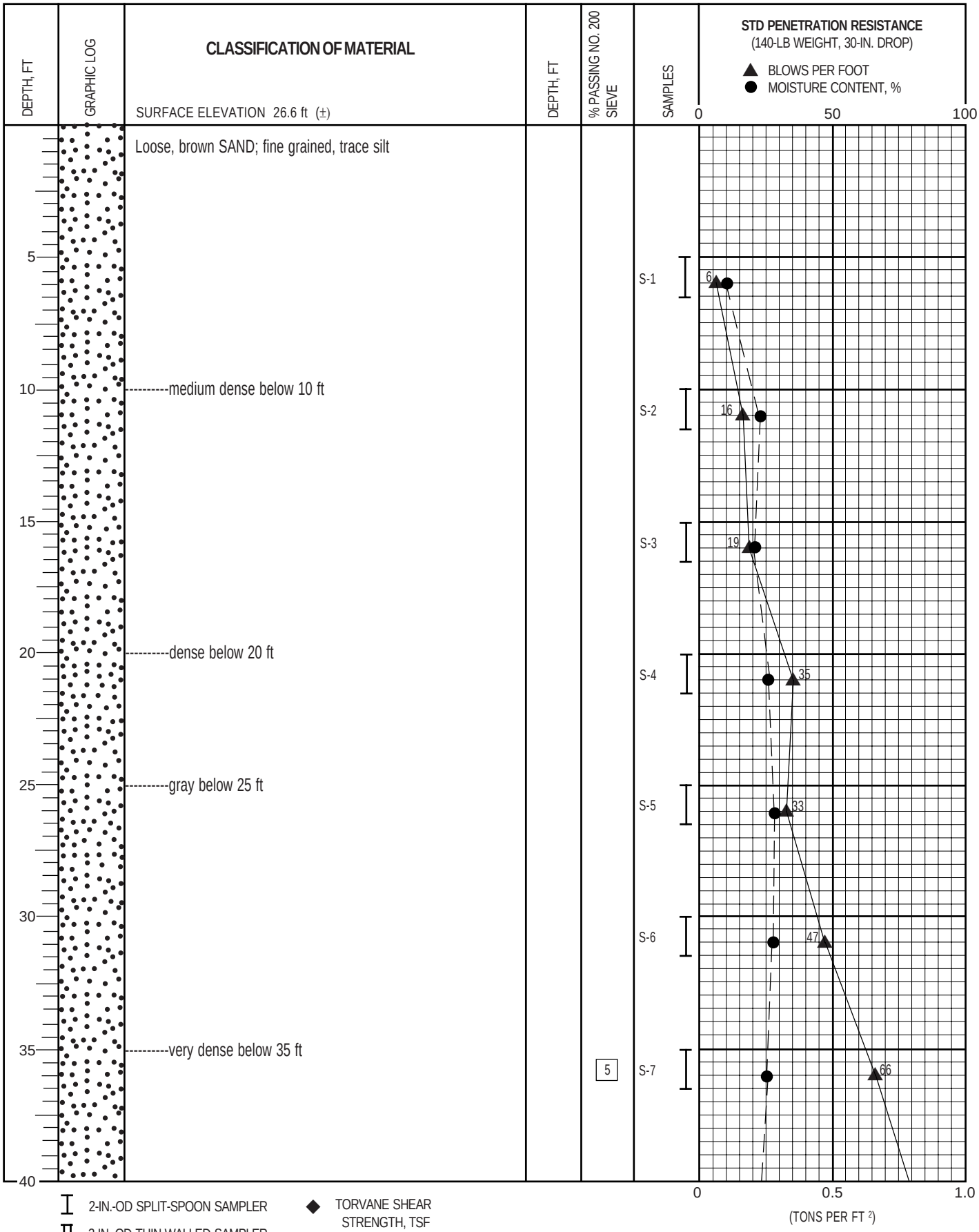
Moisture Content

Plastic Limit

GRI

BORING B-27 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 10A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

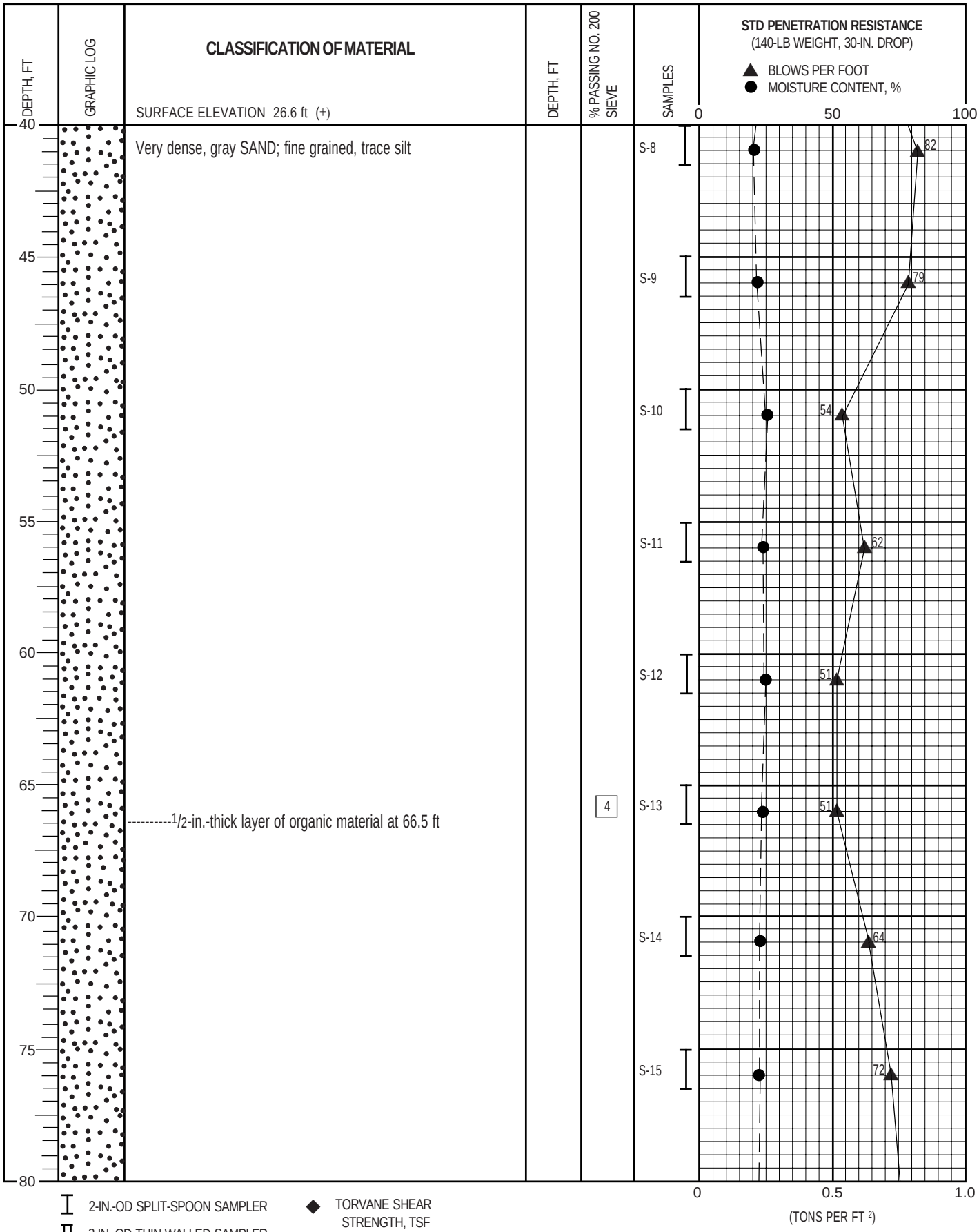
Moisture Content

Plastic Limit

GRI

BORING B-28

AUG. 2007 JOB NO. 4277-J FIG. 11A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

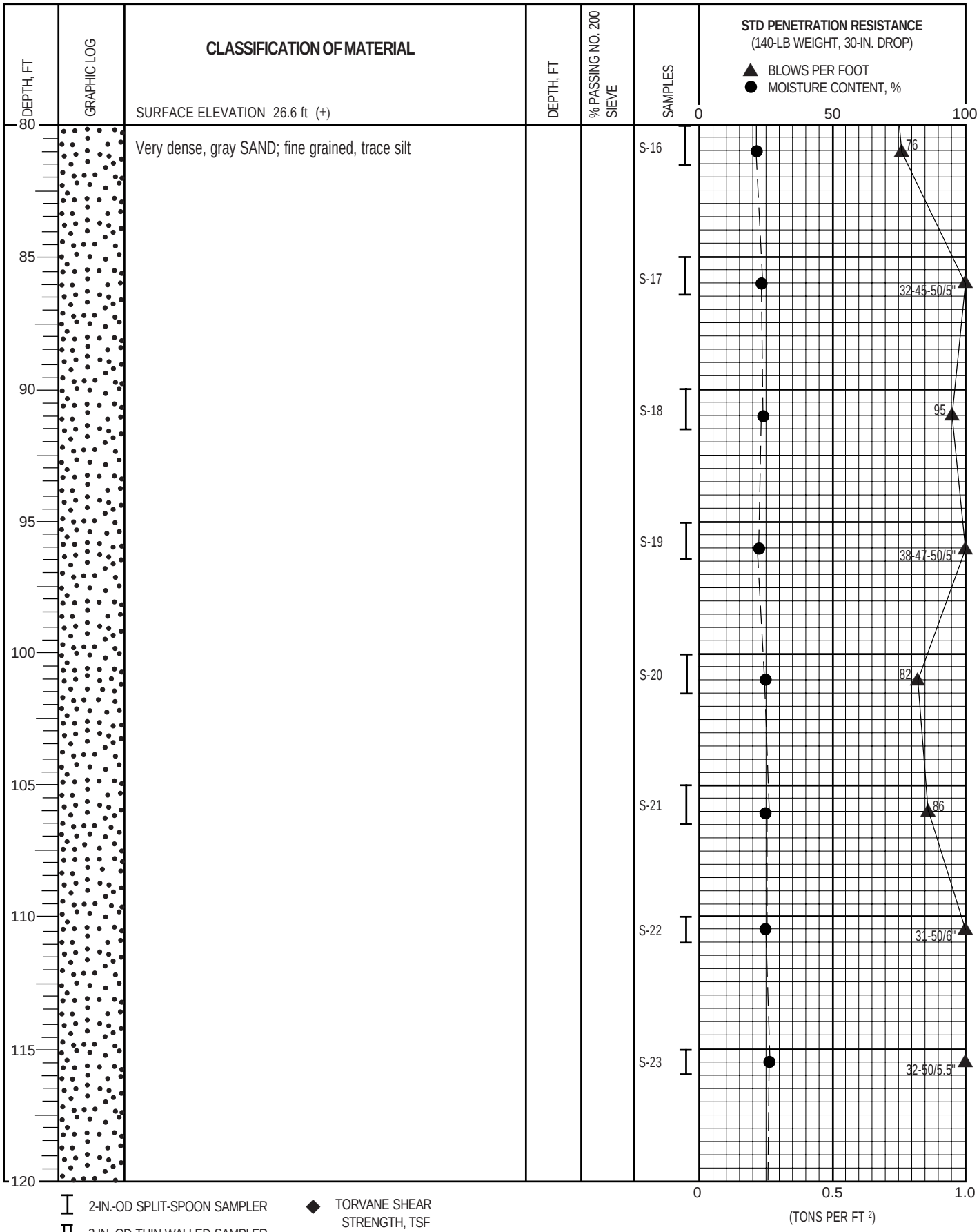
Moisture Content

Plastic Limit

GRI

BORING B-28 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 11A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

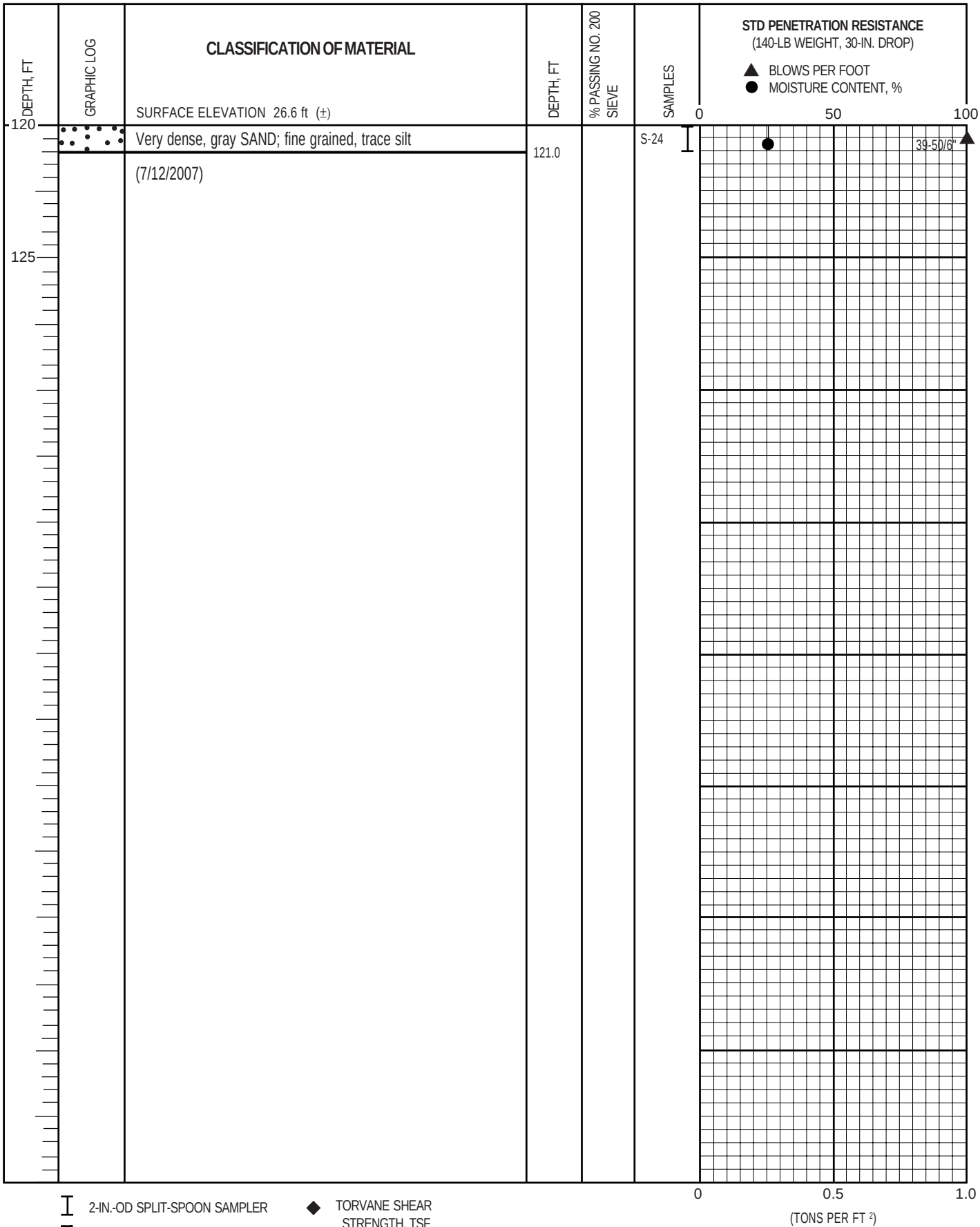
Moisture Content

Plastic Limit

GRI

BORING B-28 (cont.)

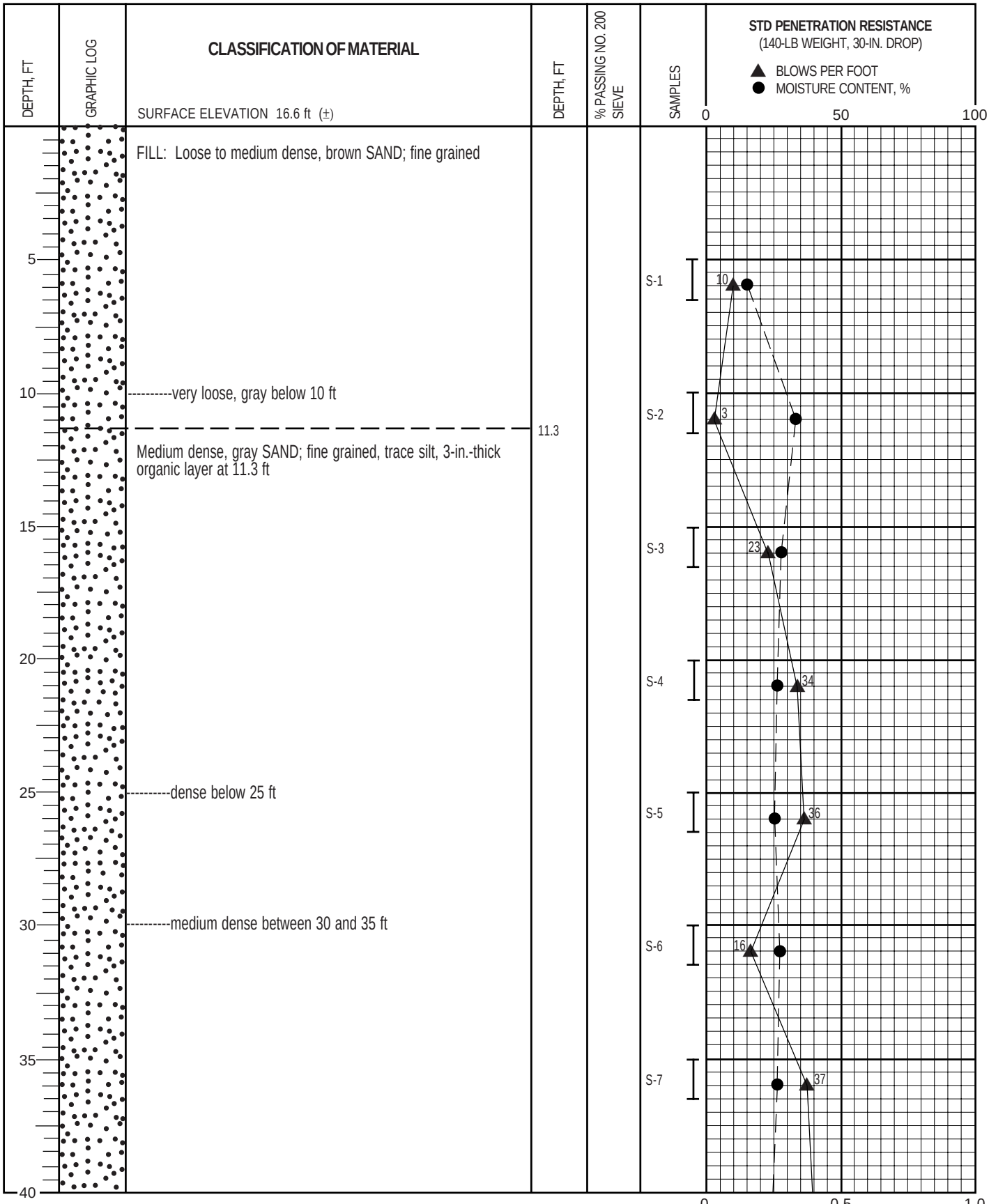
AUG. 2007 JOB NO. 4277-J FIG. 11A



GRI

BORING B-28 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 11A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

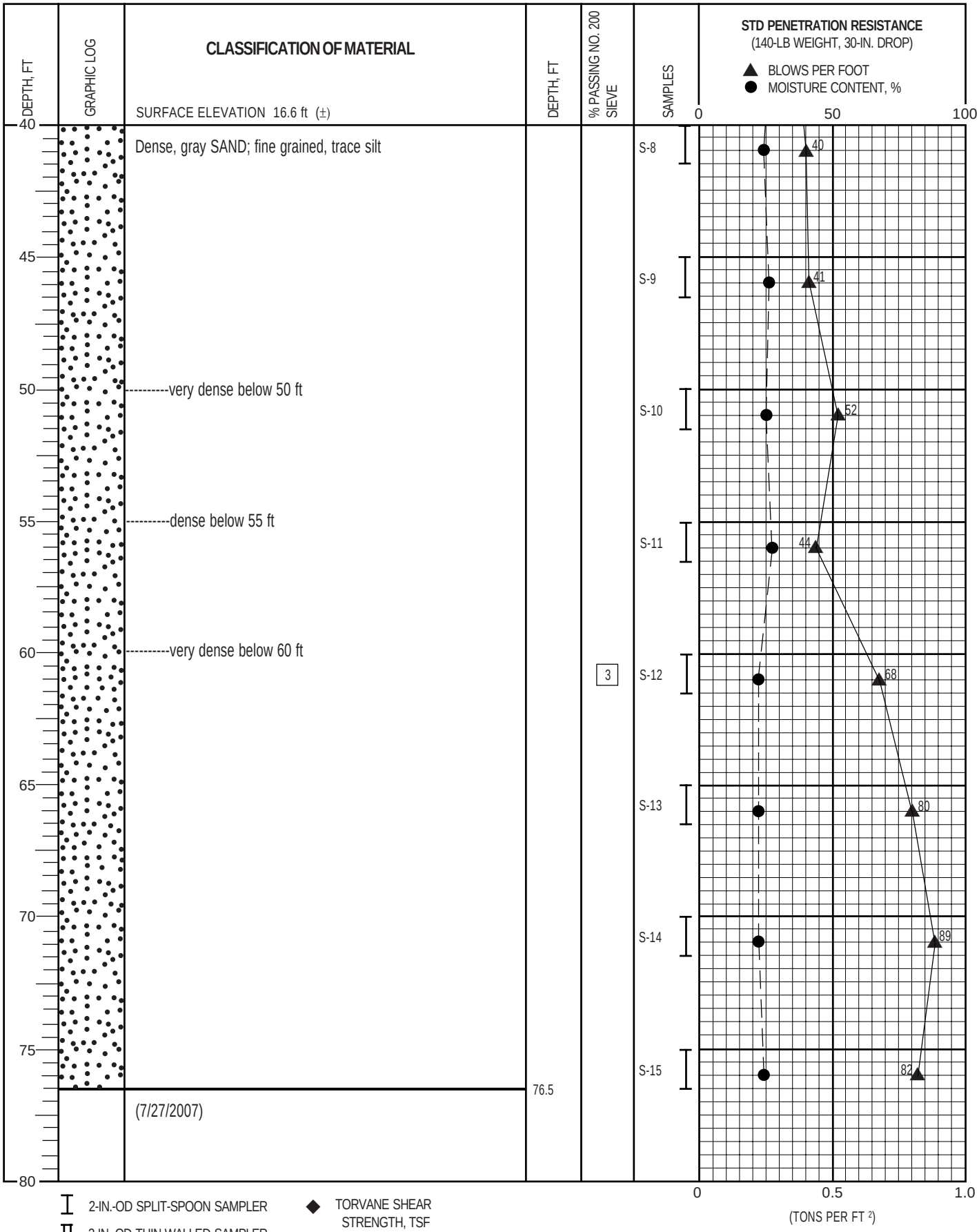
Moisture Content

Plastic Limit

GRI

BORING B-29

AUG. 2007 JOB NO. 4277-J FIG. 12A

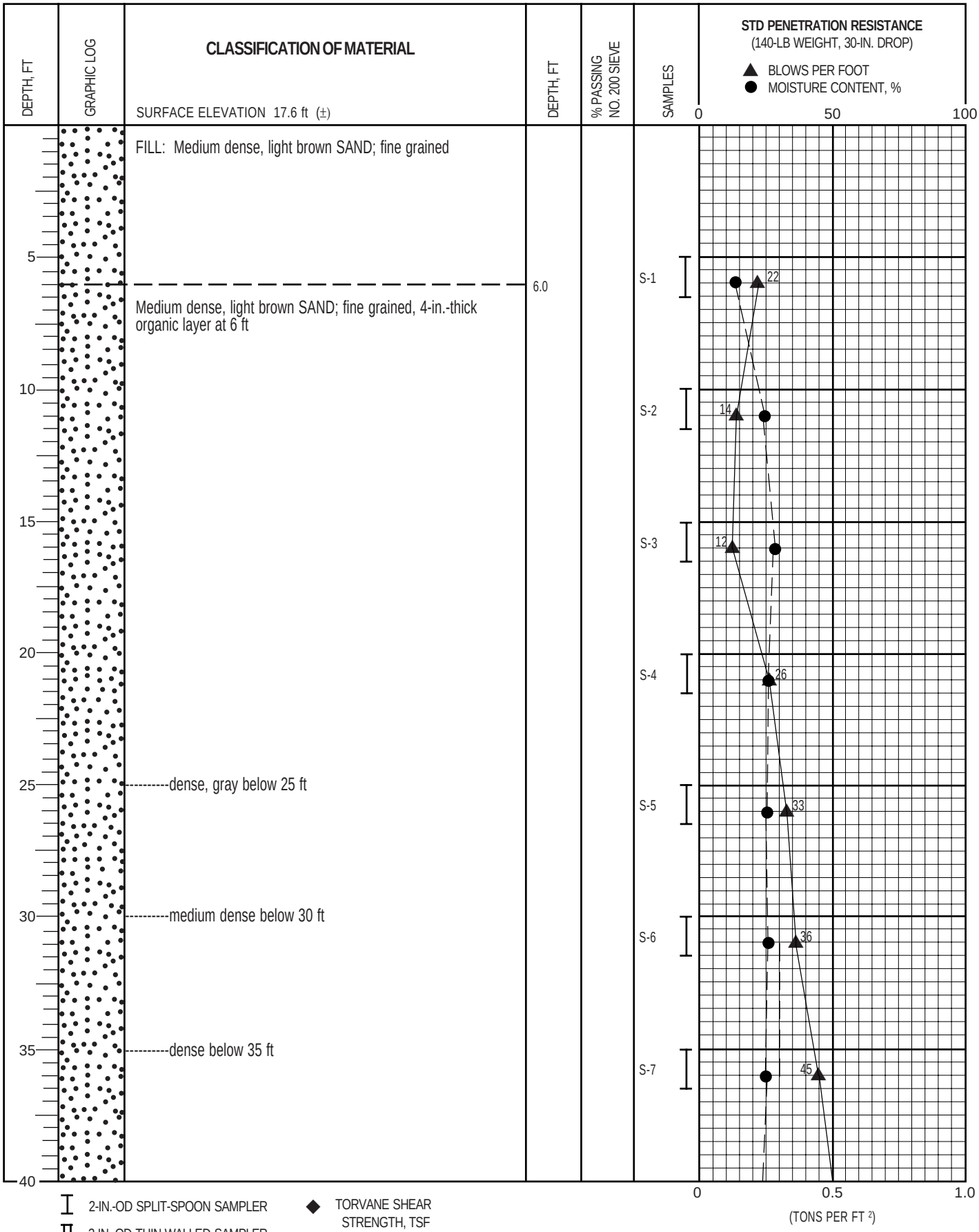


2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)
TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-29 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 12A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

P VIBRATING-WIRE PIEZOMETER

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

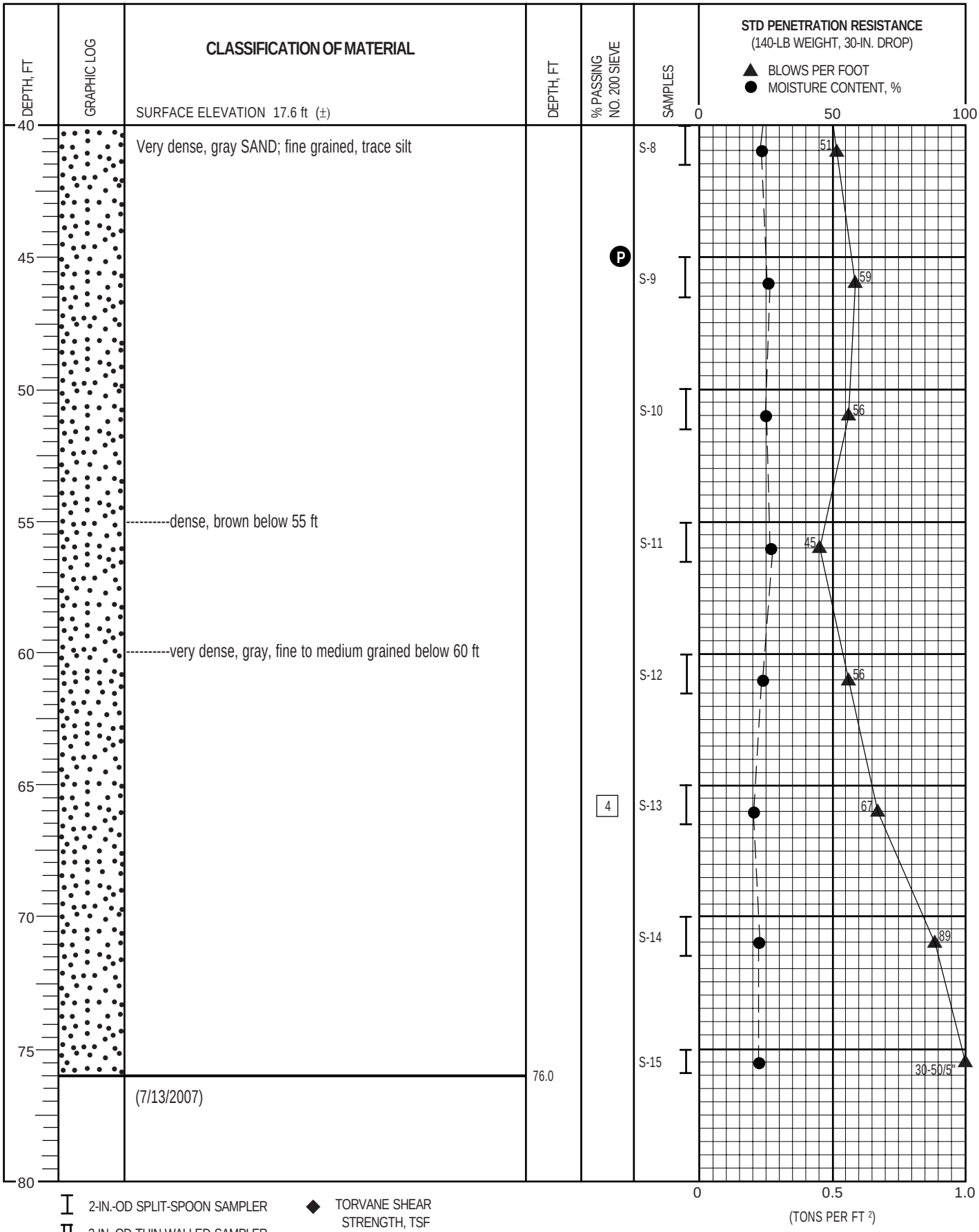
Moisture Content

Plastic Limit

GRI

BORING B-30

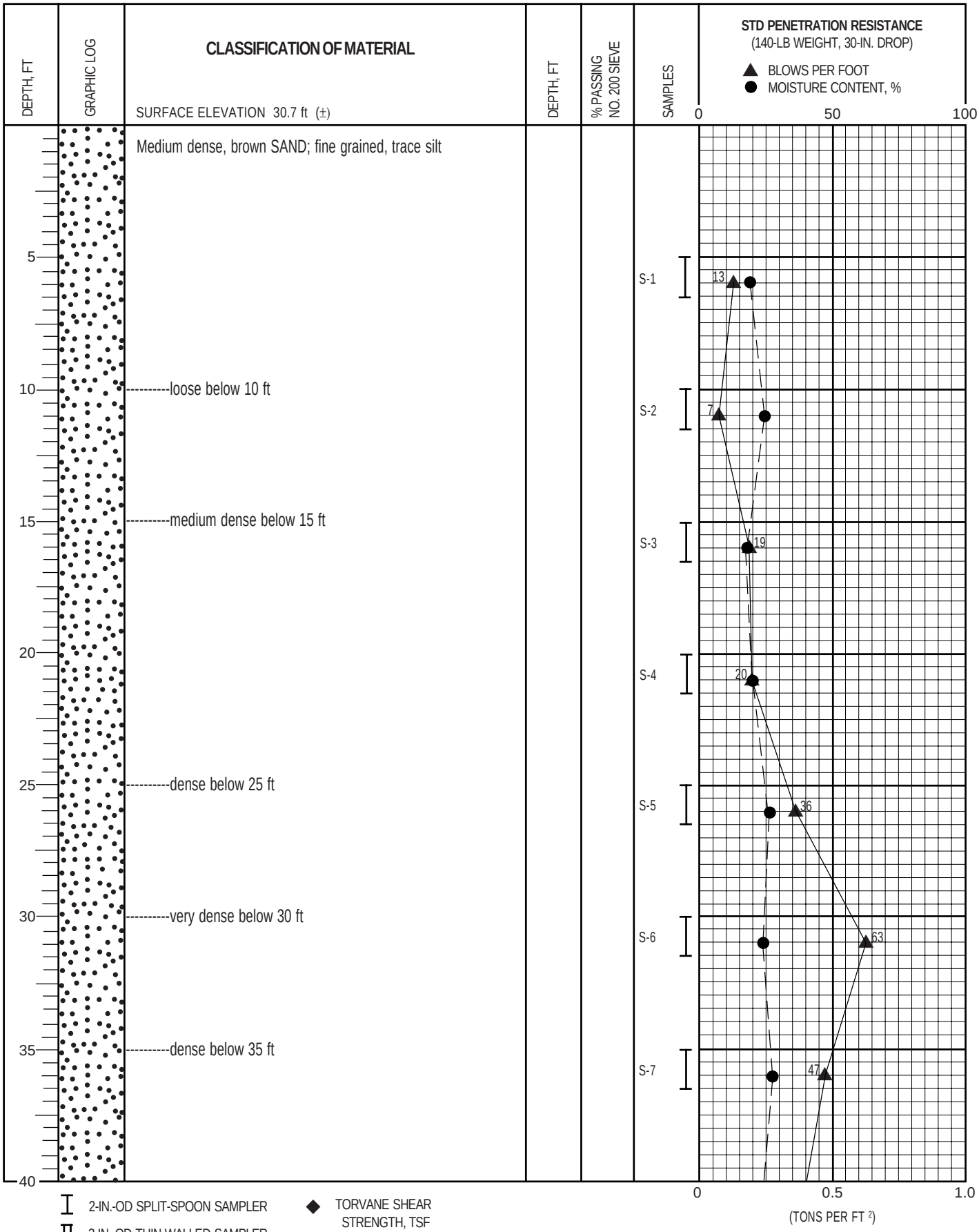
AUG. 2007 JOB NO. 4277-J FIG. 13A



GRI

BORING B-30 (cont.)

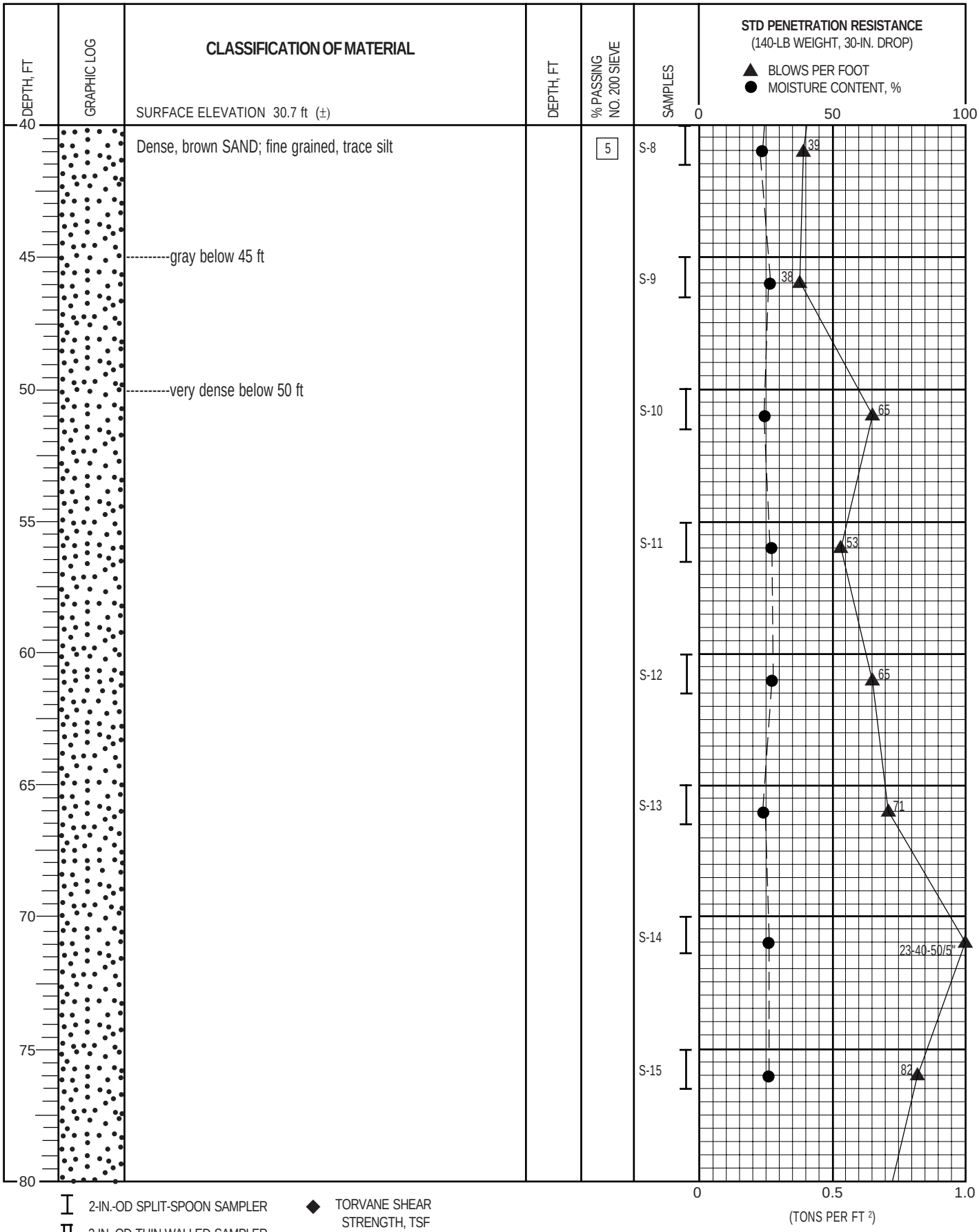
AUG. 2007 JOB NO. 4277-J FIG. 13A



GRI

BORING B-31

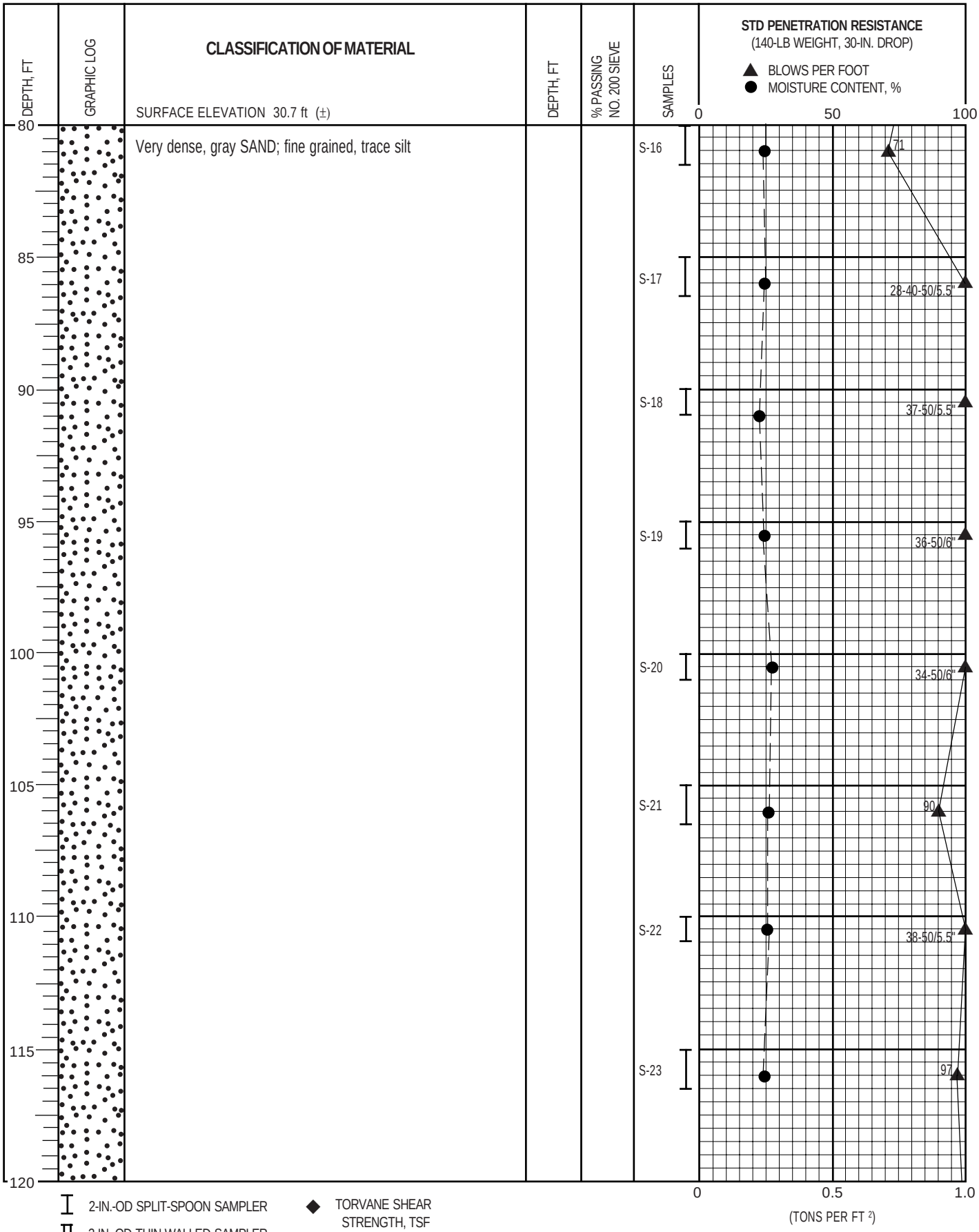
AUG. 2007 JOB NO. 4277-J FIG. 14A



GRI

BORING B-31 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 14A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

P VIBRATING-WIRE PIEZOMETER

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

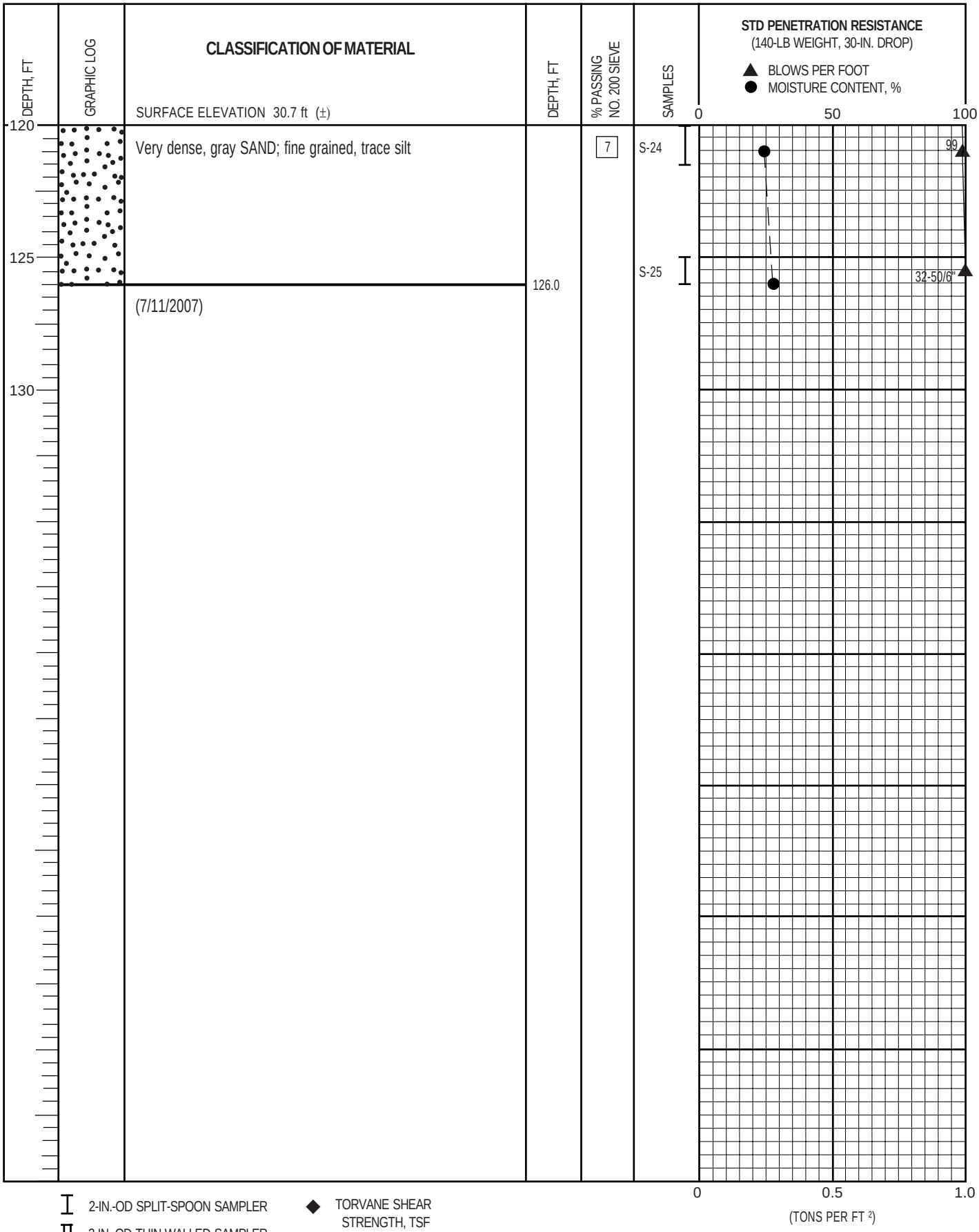
Moisture Content

Plastic Limit

GRI

BORING B-31 (cont.)

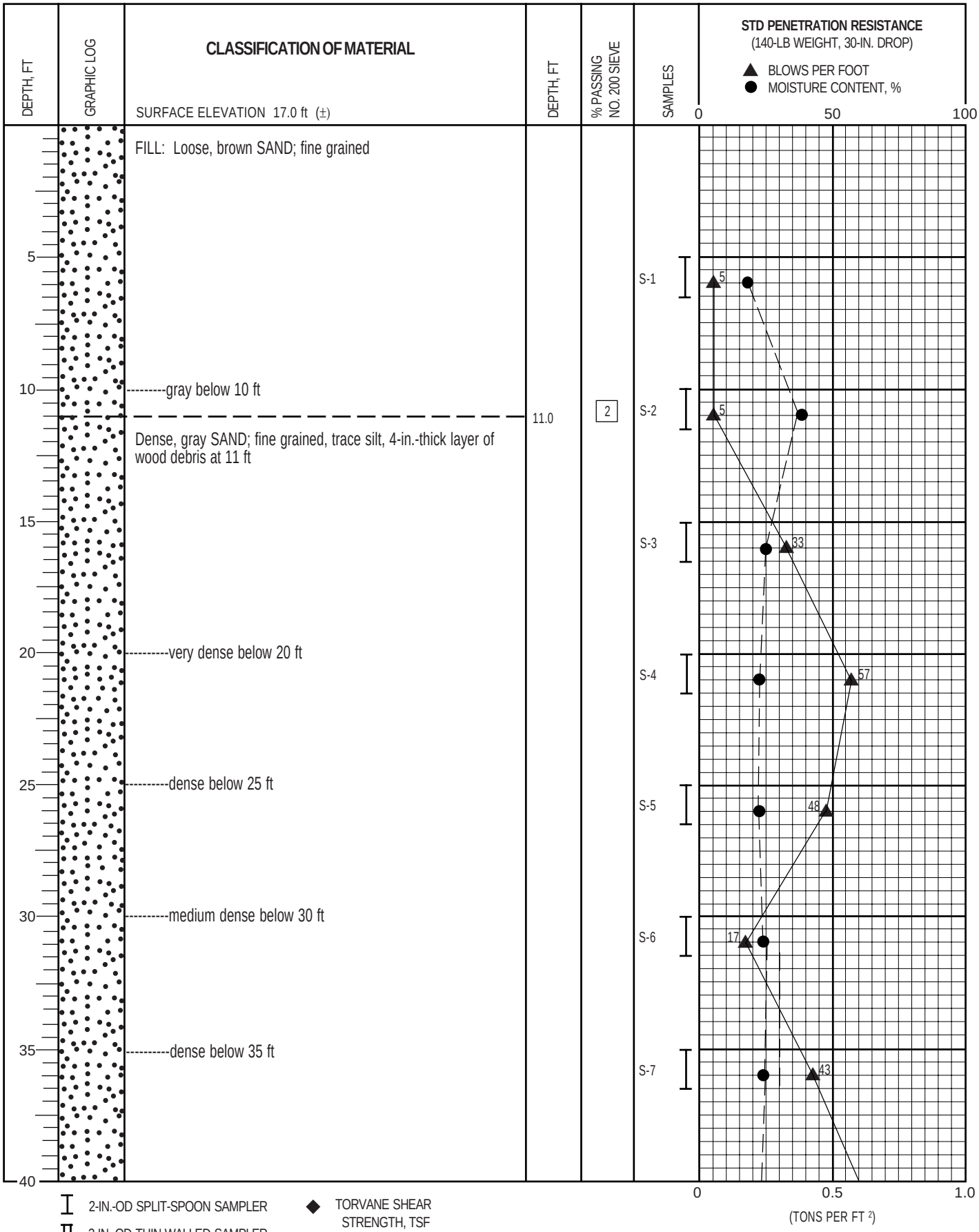
AUG. 2007 JOB NO. 4277-J FIG. 14A



GRI

BORING B-31 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 14A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

P VIBRATING-WIRE PIEZOMETER

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

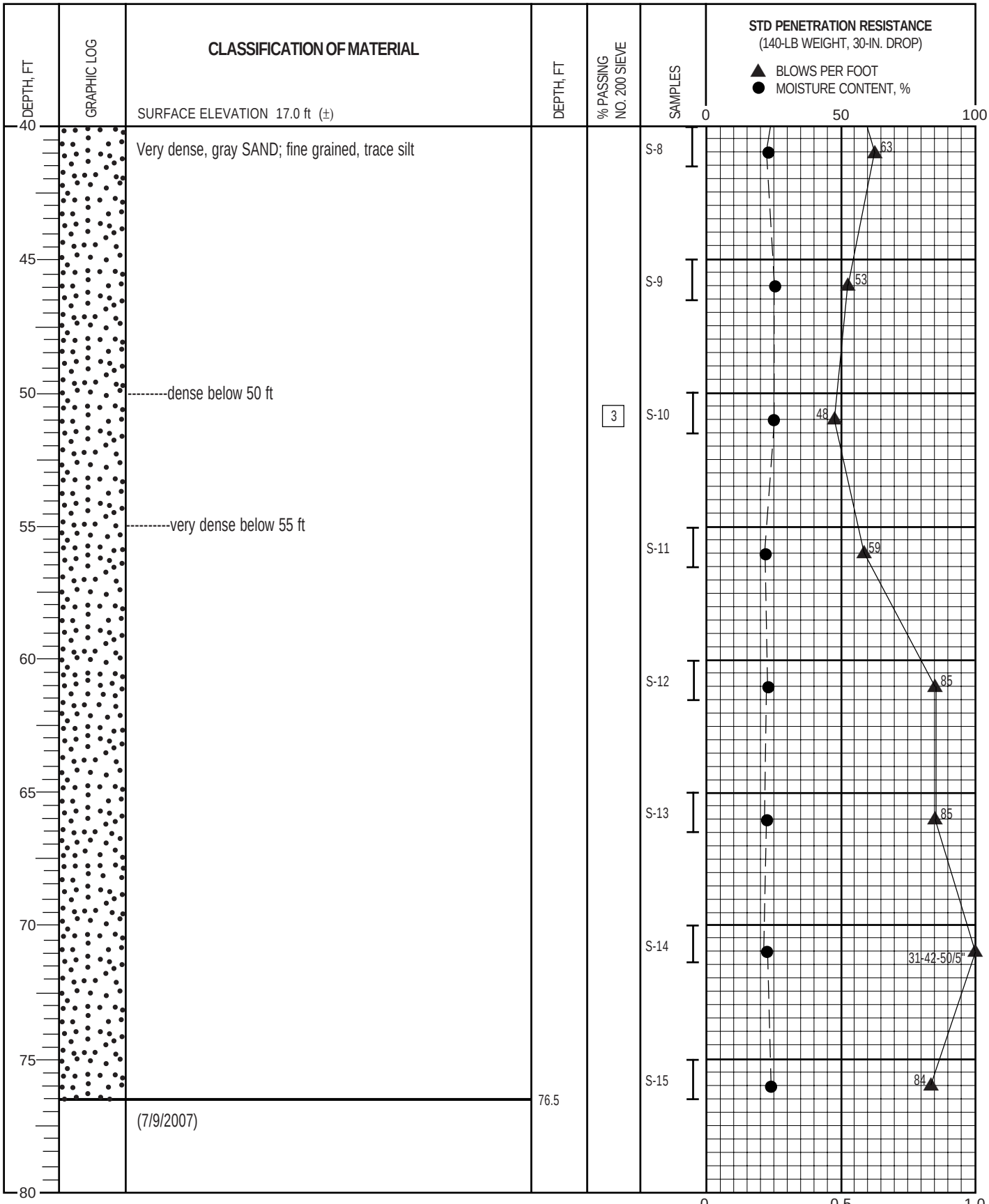
Moisture Content

Plastic Limit

GRI

BORING B-32

AUG. 2007 JOB NO. 4277-J FIG. 15A

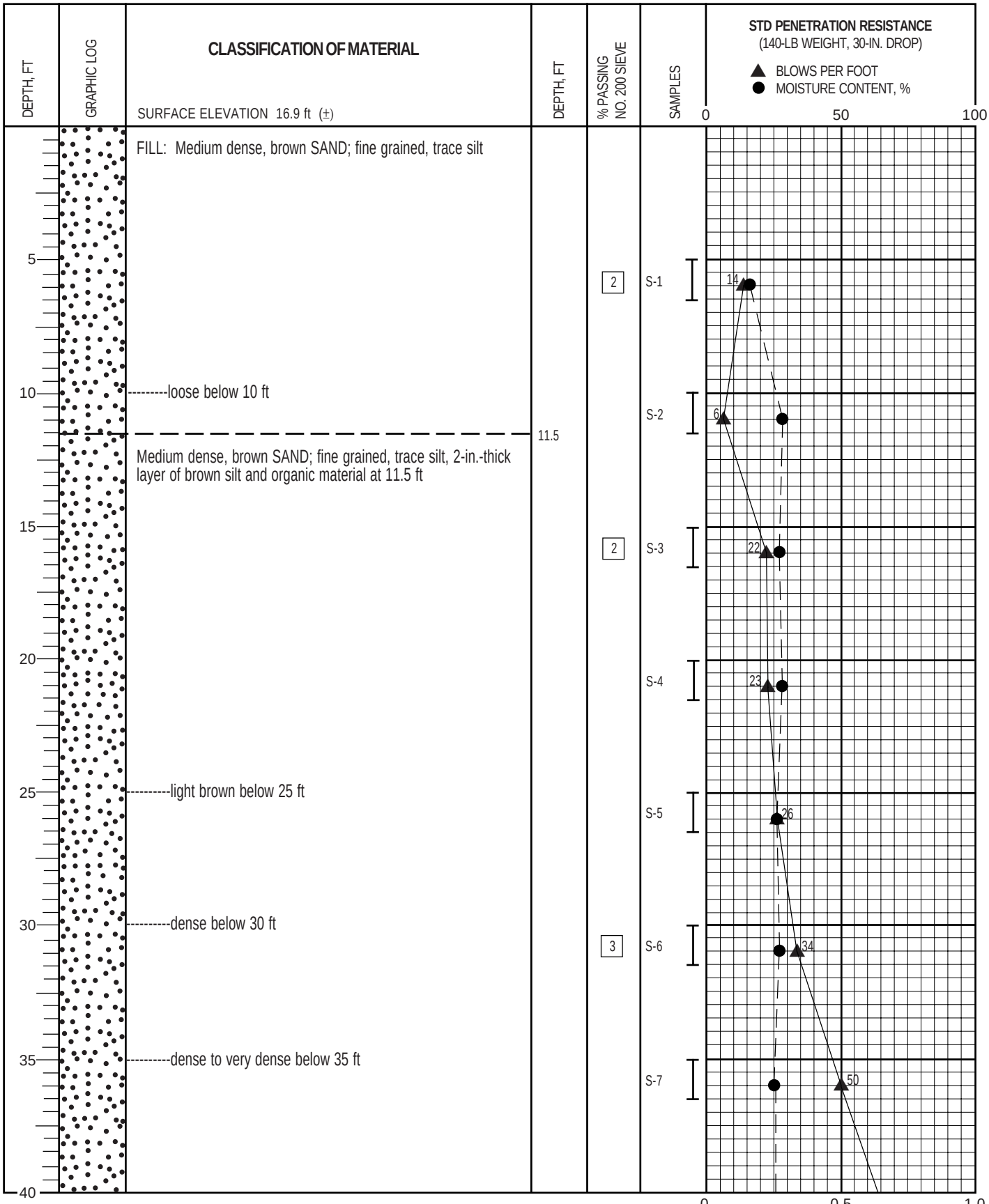


2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
P VIBRATING-WIRE PIEZOMETER
SLOTTED PVC PIPE
Water Level (date)
TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-32 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 15A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

P VIBRATING-WIRE PIEZOMETER

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

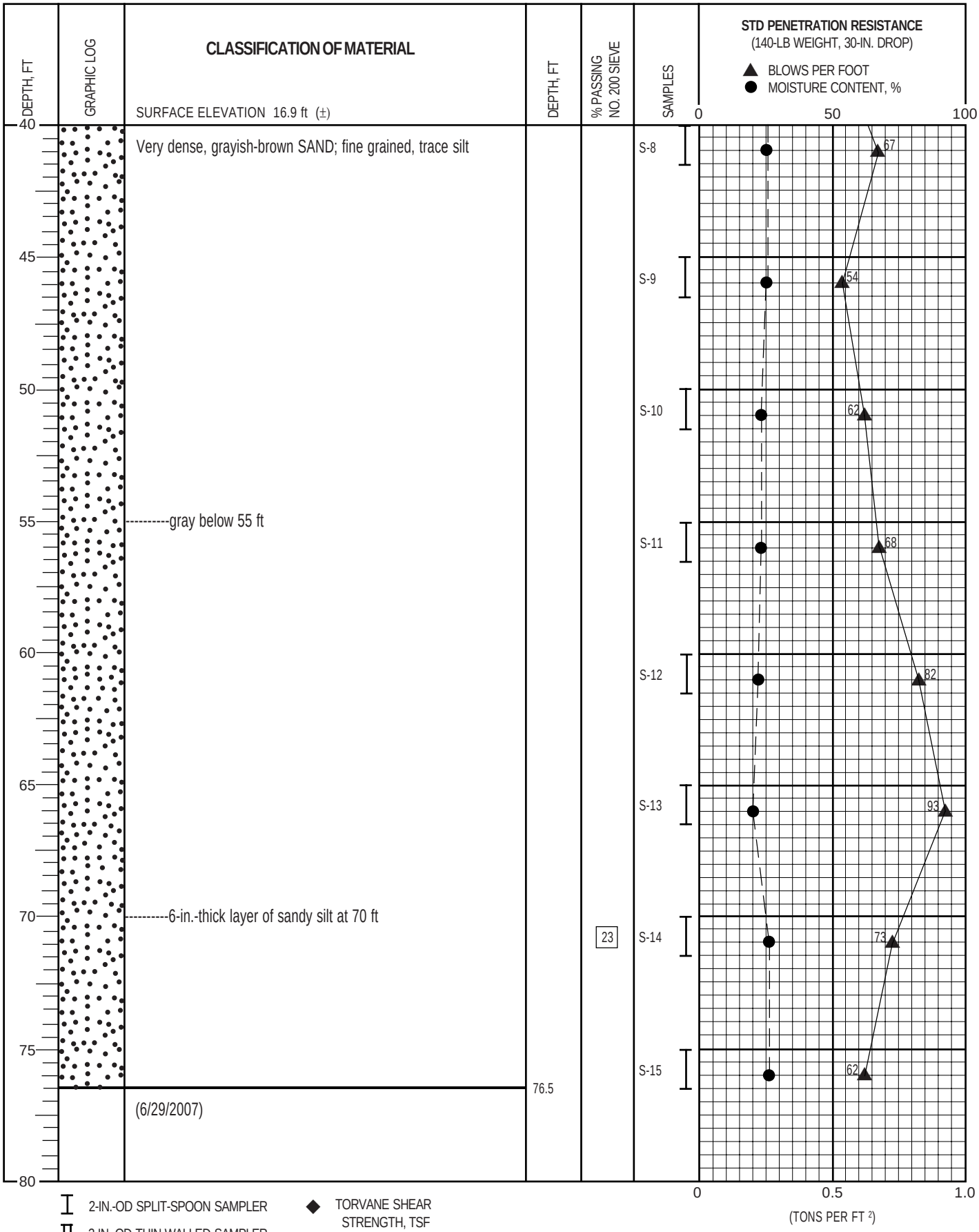
Moisture Content

Plastic Limit

GRI

BORING B-33

AUG. 2007 JOB NO. 4277-J FIG. 16A



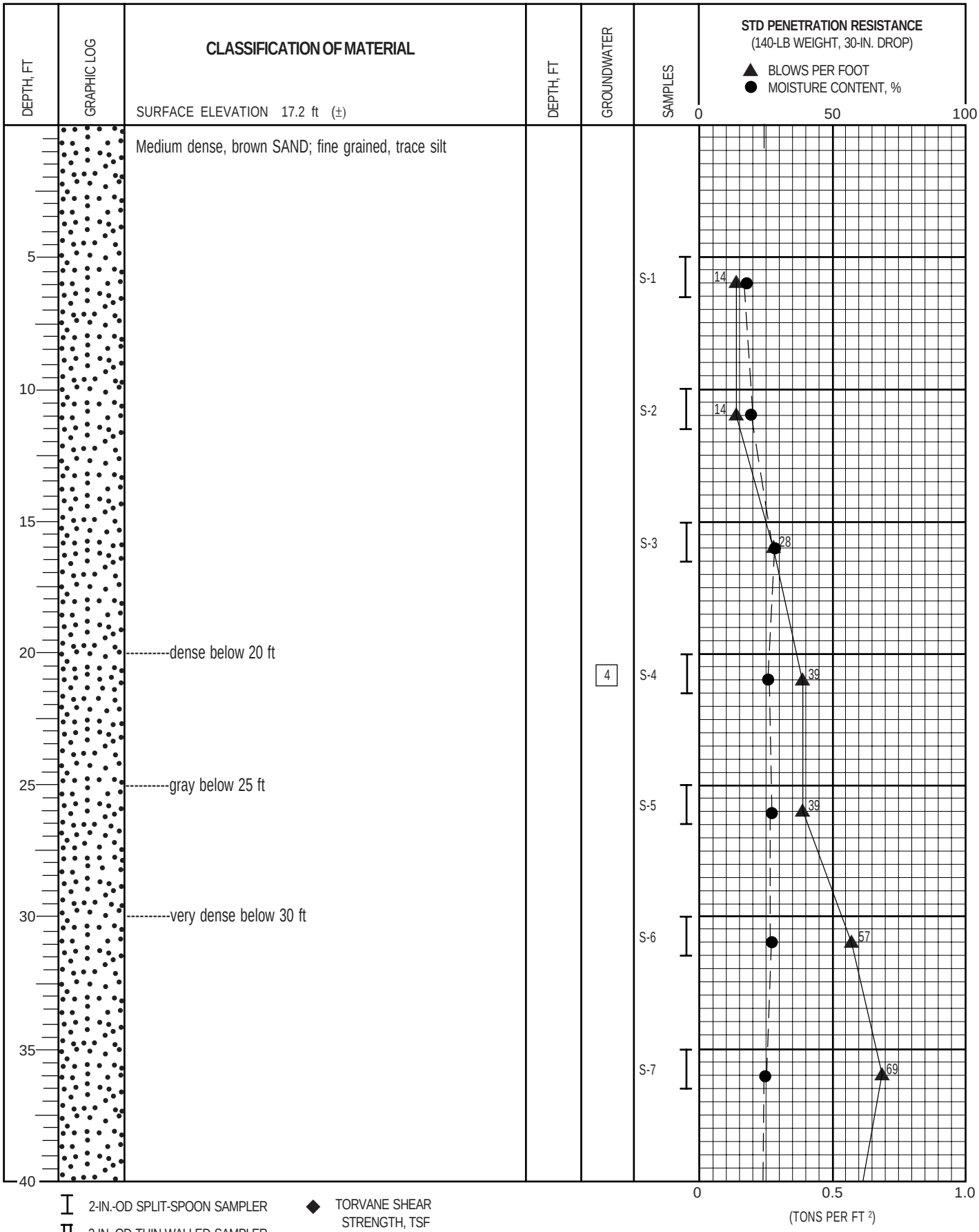
2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
P VIBRATING-WIRE PIEZOMETER
SLOTTED PVC PIPE
Water Level (date)

TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-33 (cont.)

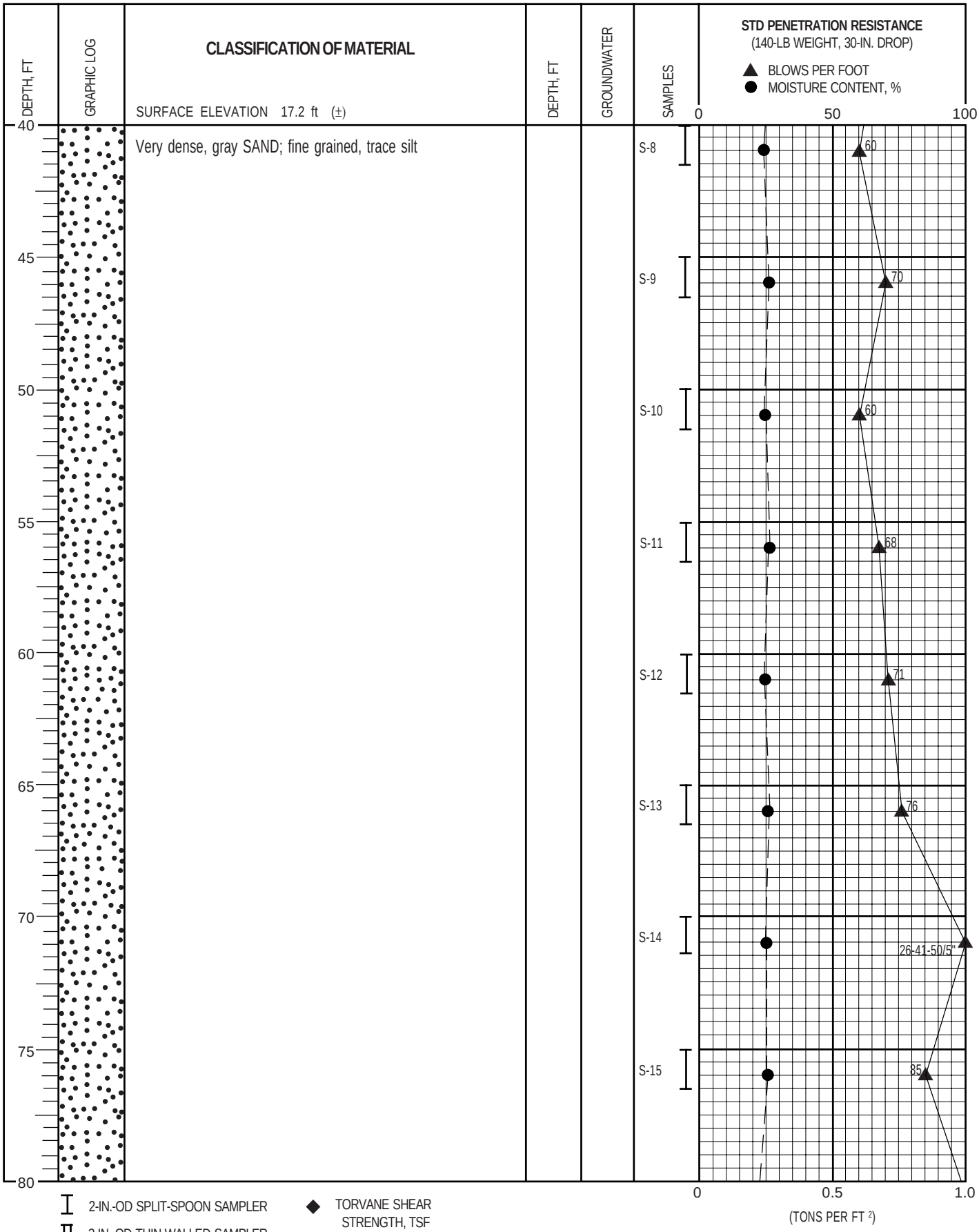
AUG. 2007 JOB NO. 4277-J FIG. 16A



GRI

BORING B-34

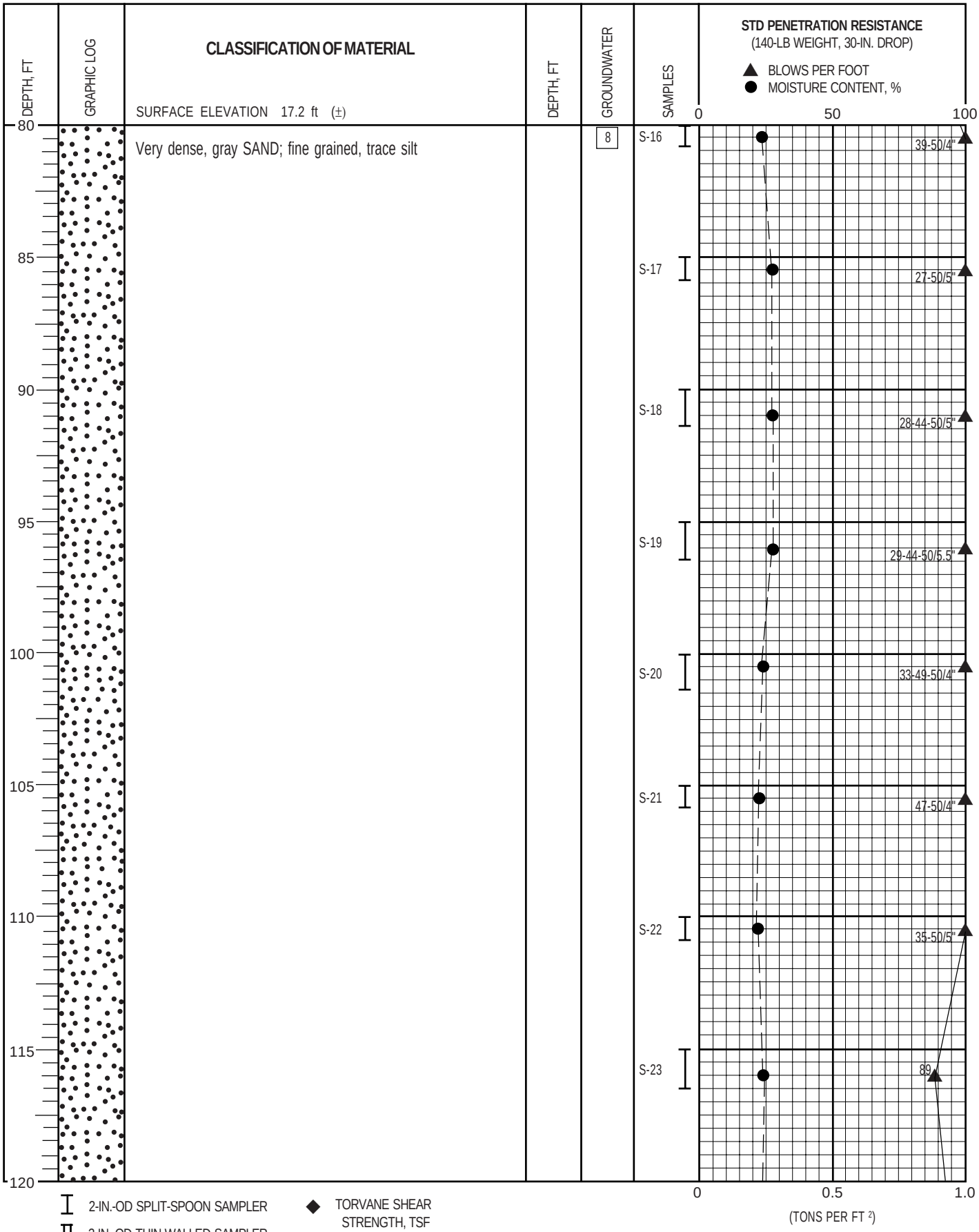
AUG. 2007 JOB NO. 4277-J FIG. 17A



GRI

BORING B-34 (cont.)

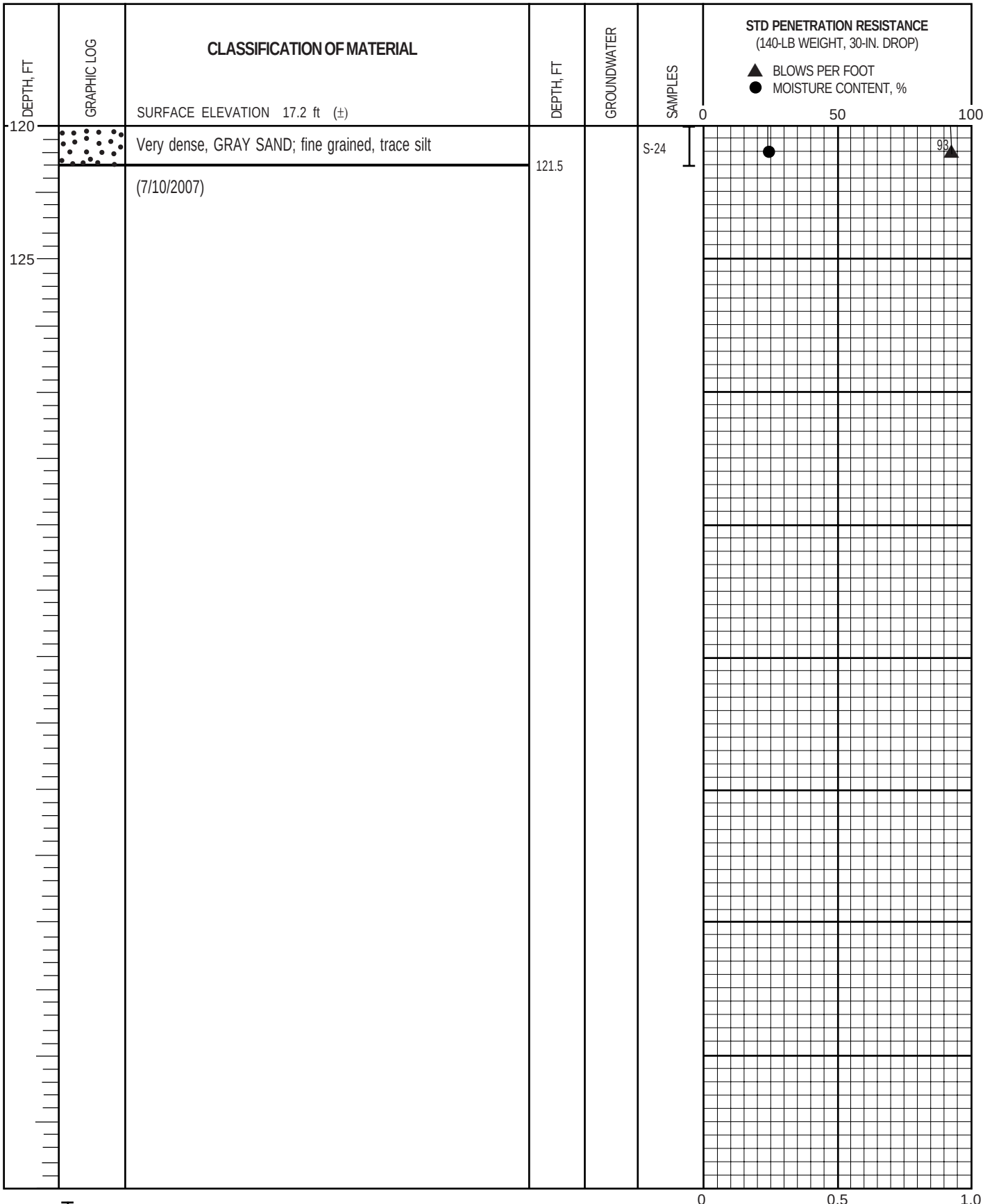
AUG. 2007 JOB NO. 4277-J FIG. 17A



GRI

BORING B-34 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 17A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

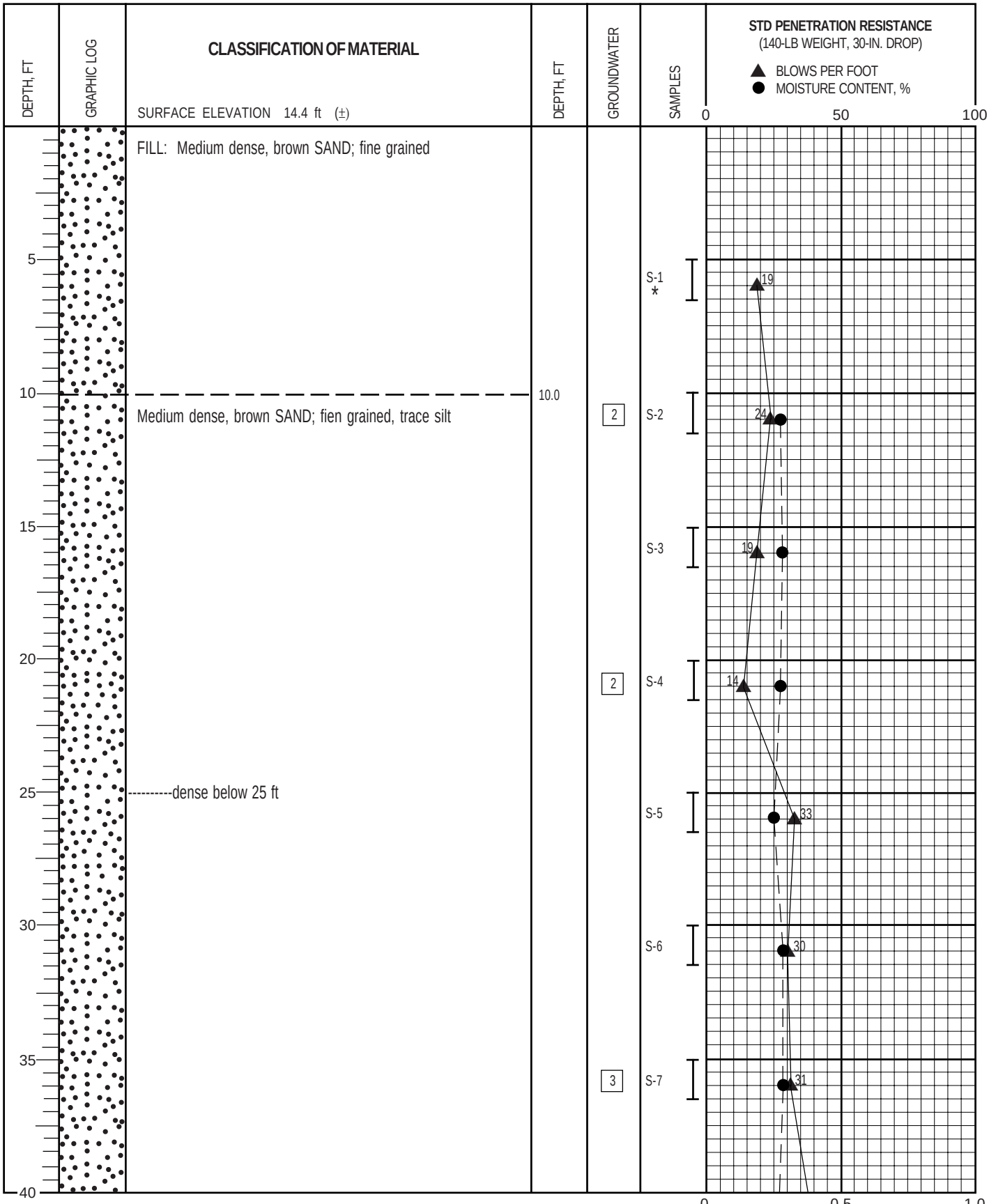
Moisture Content

Plastic Limit

GRI

BORING B-34 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 17A



2-IN.-OD SPLIT-SPOON SAMPLER

3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

NX CORE RUN

SLOTTED PVC PIPE

Water Level (date)

TORVANE SHEAR STRENGTH, TSF

UNDRAINED SHEAR STRENGTH, TSF

* NO RECOVERY

Liquid Limit

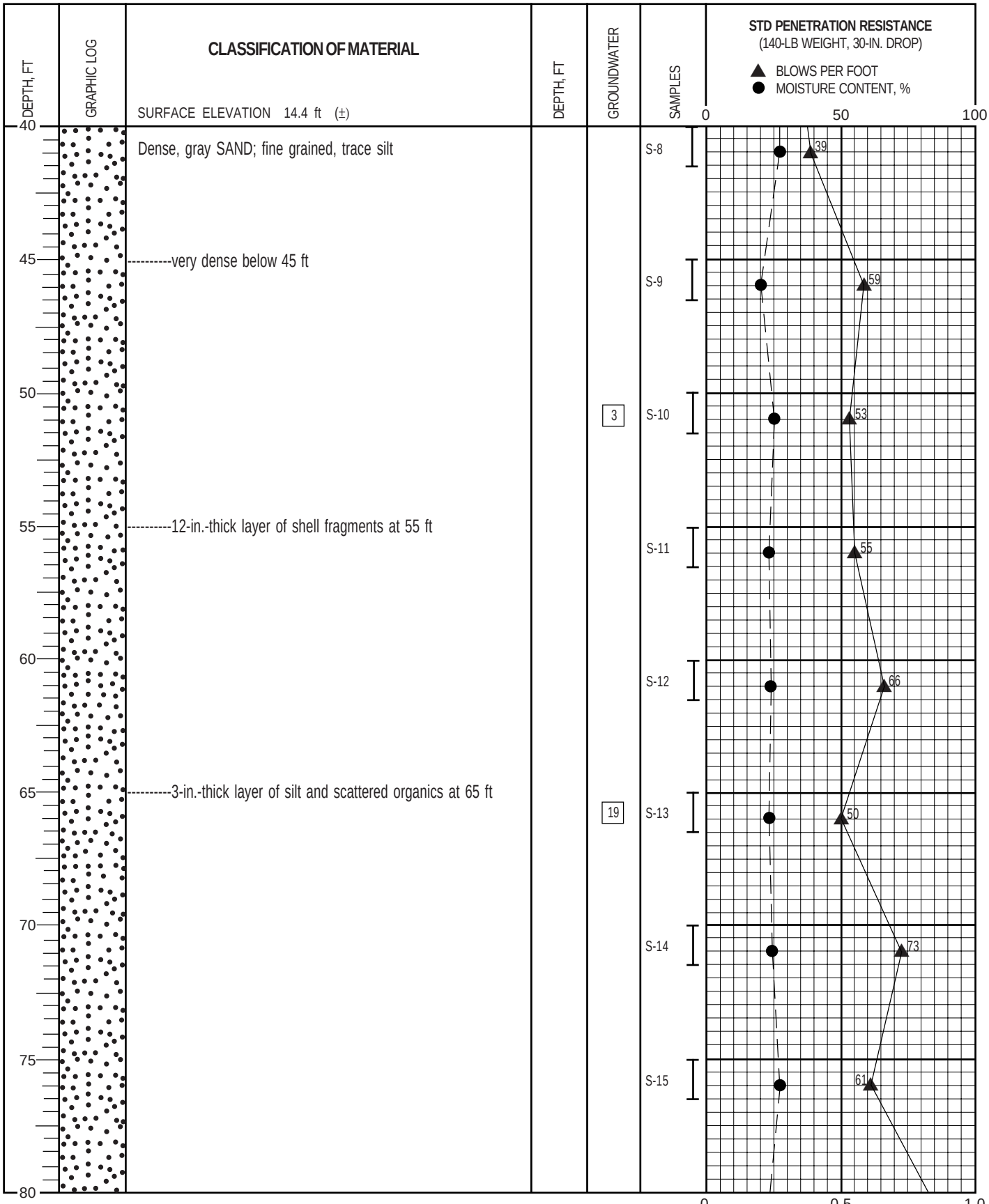
Moisture Content

Plastic Limit

GRI

BORING B-35

AUG. 2007 JOB NO. 4277-J FIG. 18A



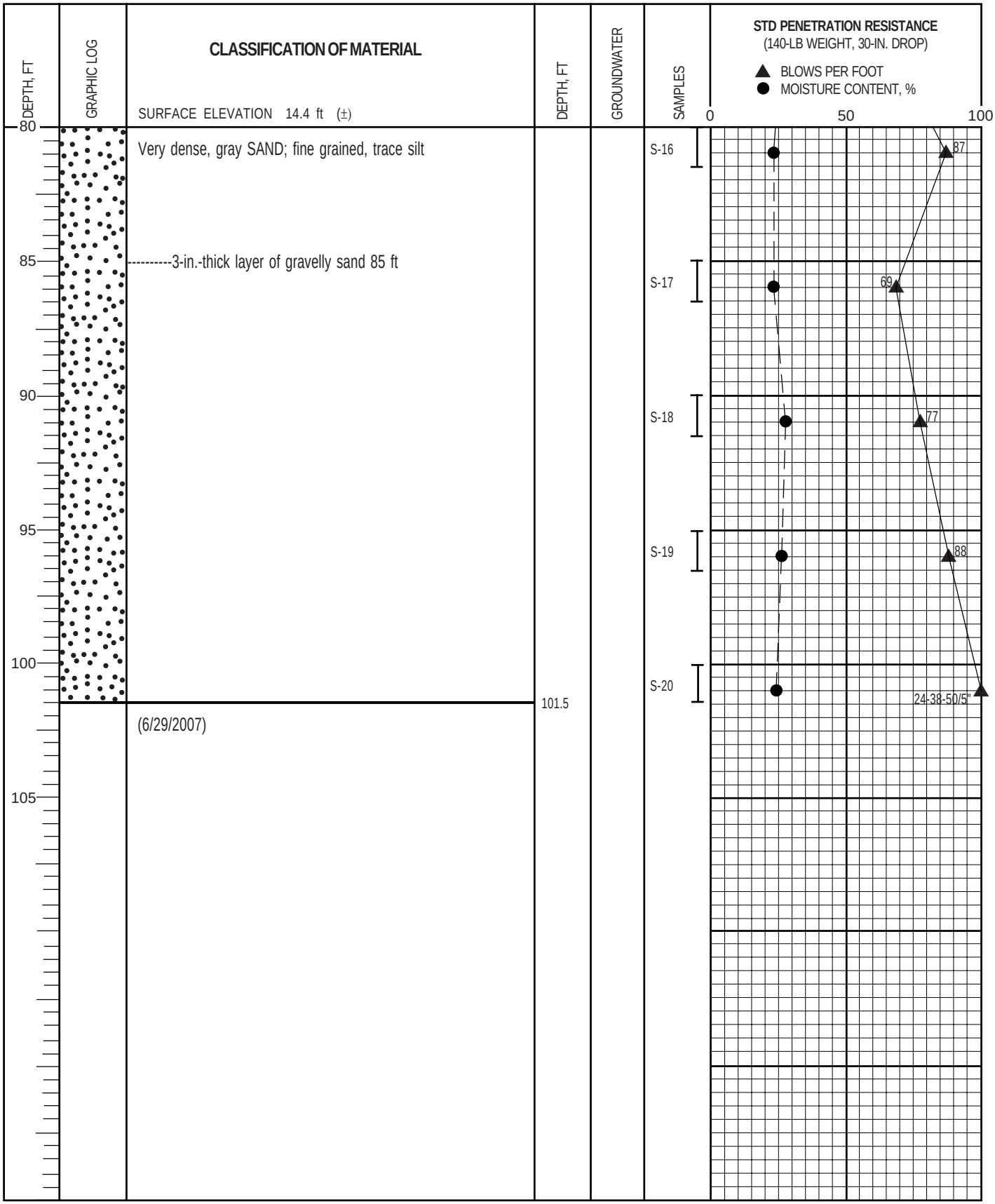
2-IN.-OD SPLIT-SPOON SAMPLER
3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

TORVANE SHEAR STRENGTH, TSF
UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-35 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 18A



I 2-IN.-OD SPLIT-SPOON SAMPLER
II 3-IN.-OD THIN-WALLED SAMPLER
G GRAB SAMPLE OF DRILL CUTTINGS
NX CORE RUN
SLOTTED PVC PIPE
Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF
* NO RECOVERY

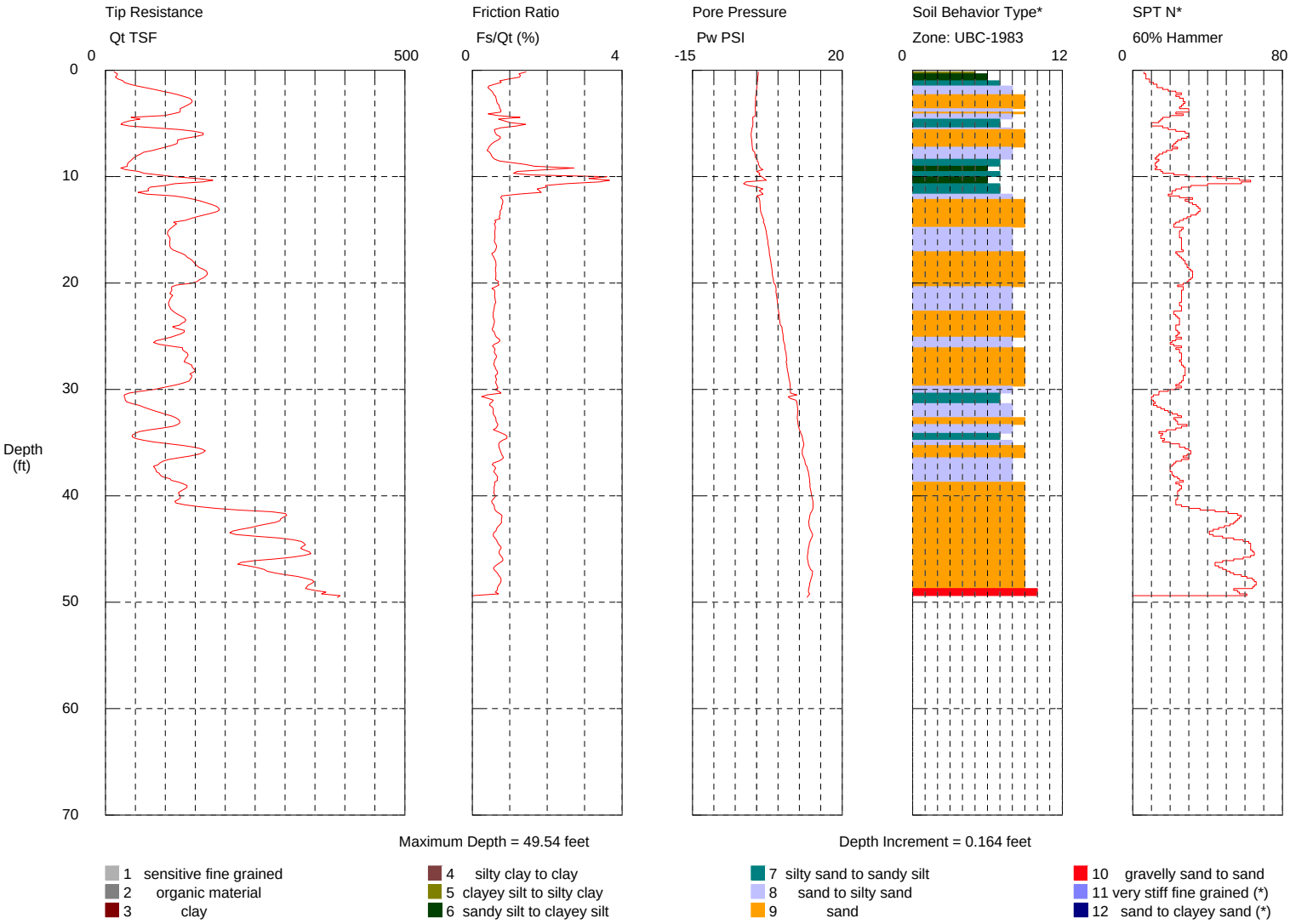
Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-35 (cont.)

AUG. 2007 JOB NO. 4277-J FIG. 18A

GROUND SURFACE ELEVATION 17.9 FT

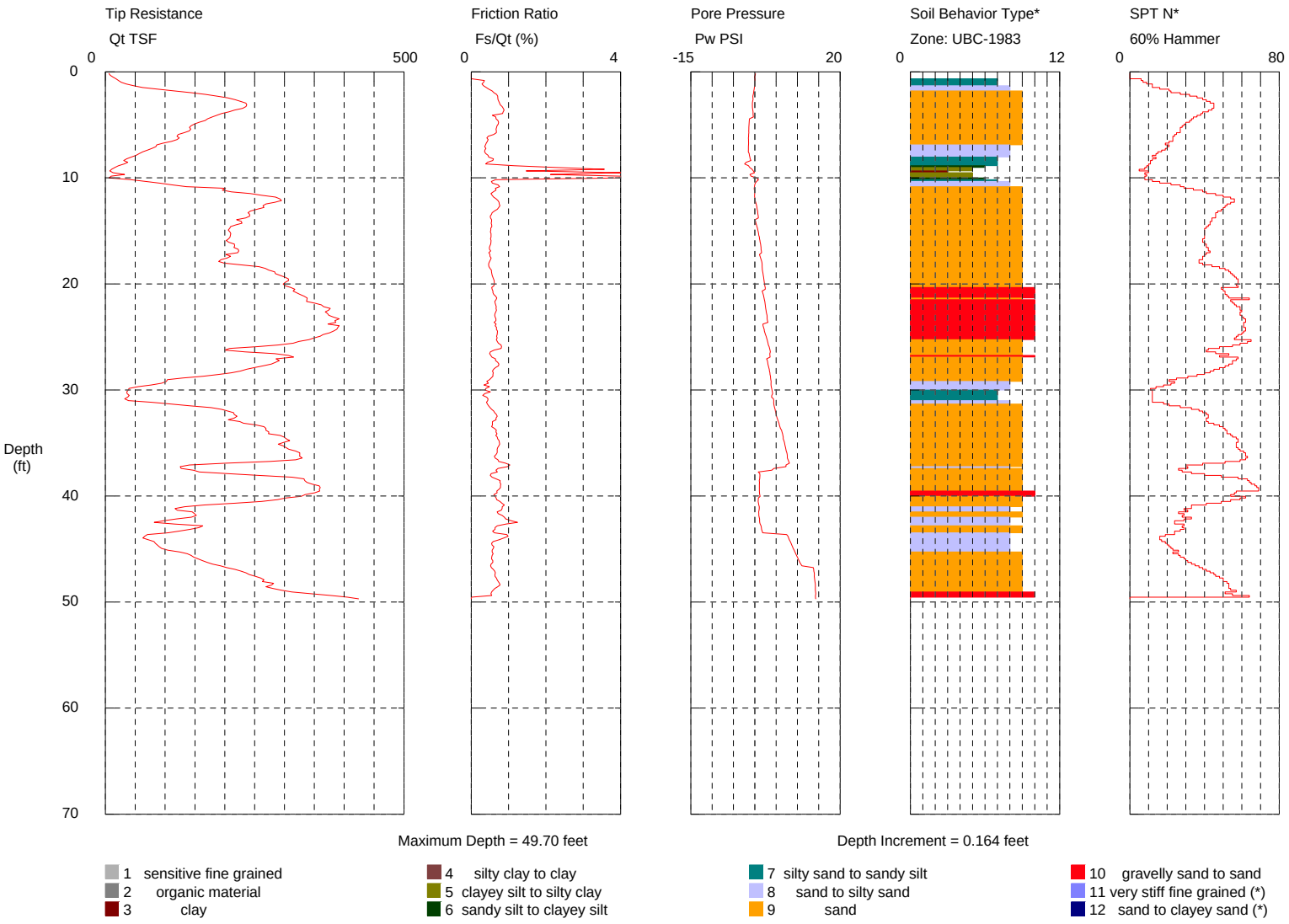


GRI

CONE PENETRATION TEST CPT-27

AUG. 2007 JOB NO. 4277-J FIG. 19A

GROUND SURFACE ELEVATION 18.1 FT

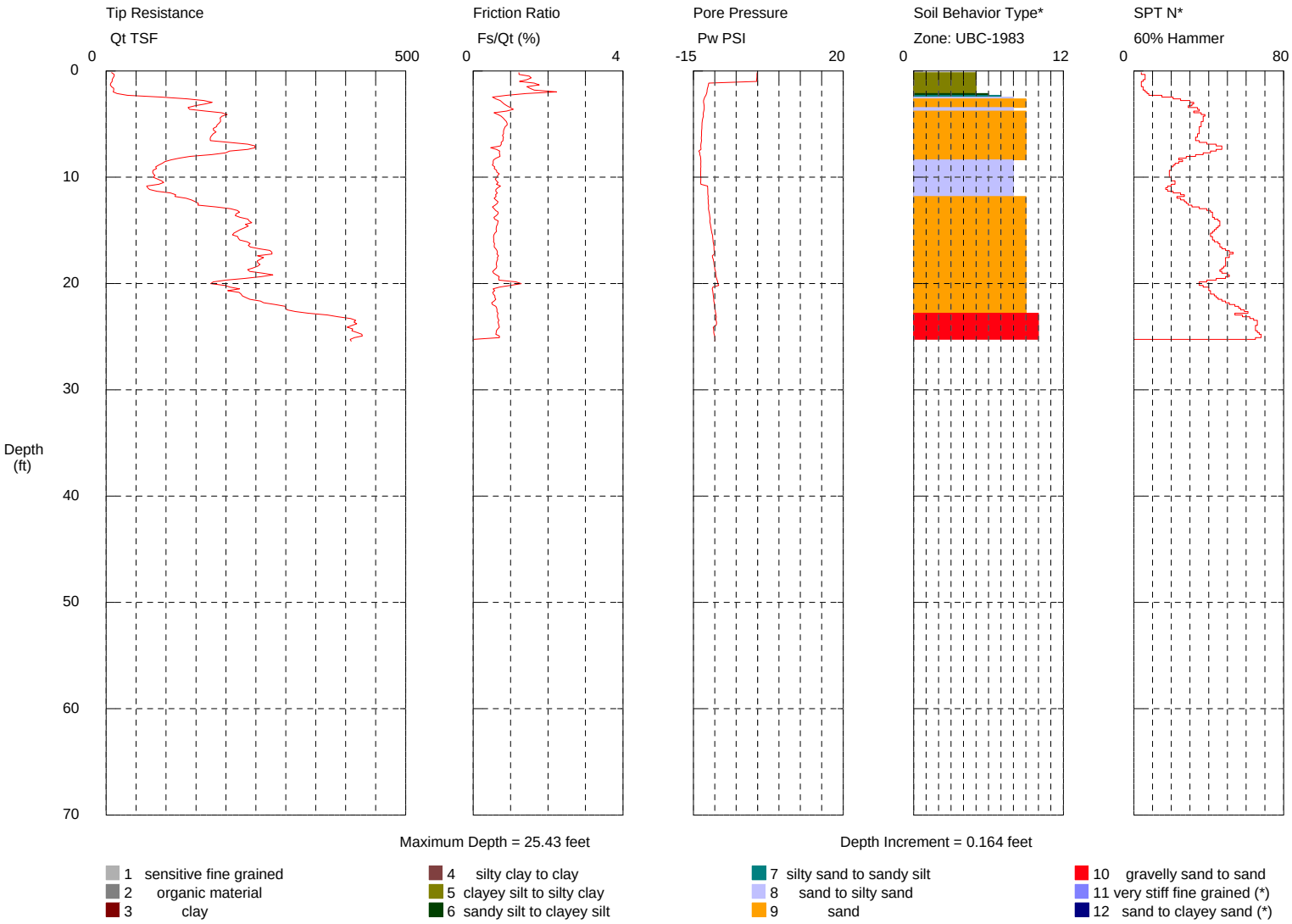


GRI

CONE PENETRATION TEST CPT-28

AUG. 2007 JOB NO. 4277-J FIG. 20A

GROUND SURFACE ELEVATION 18.7 FT

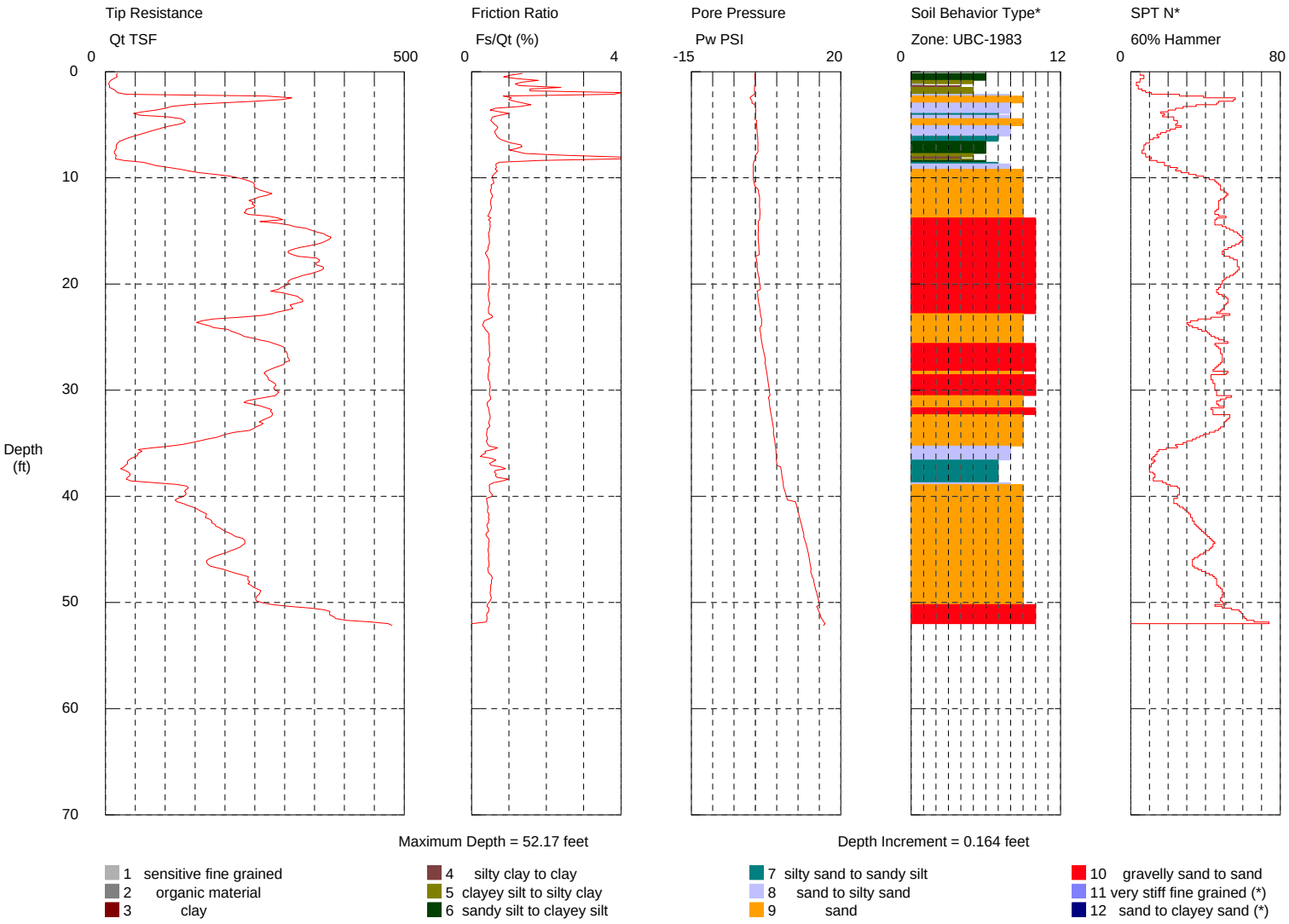


GRI

CONE PENETRATION TEST CPT-29

AUG. 2007 JOB NO. 4277-J FIG. 21A

GROUND SURFACE ELEVATION 18.7 FT

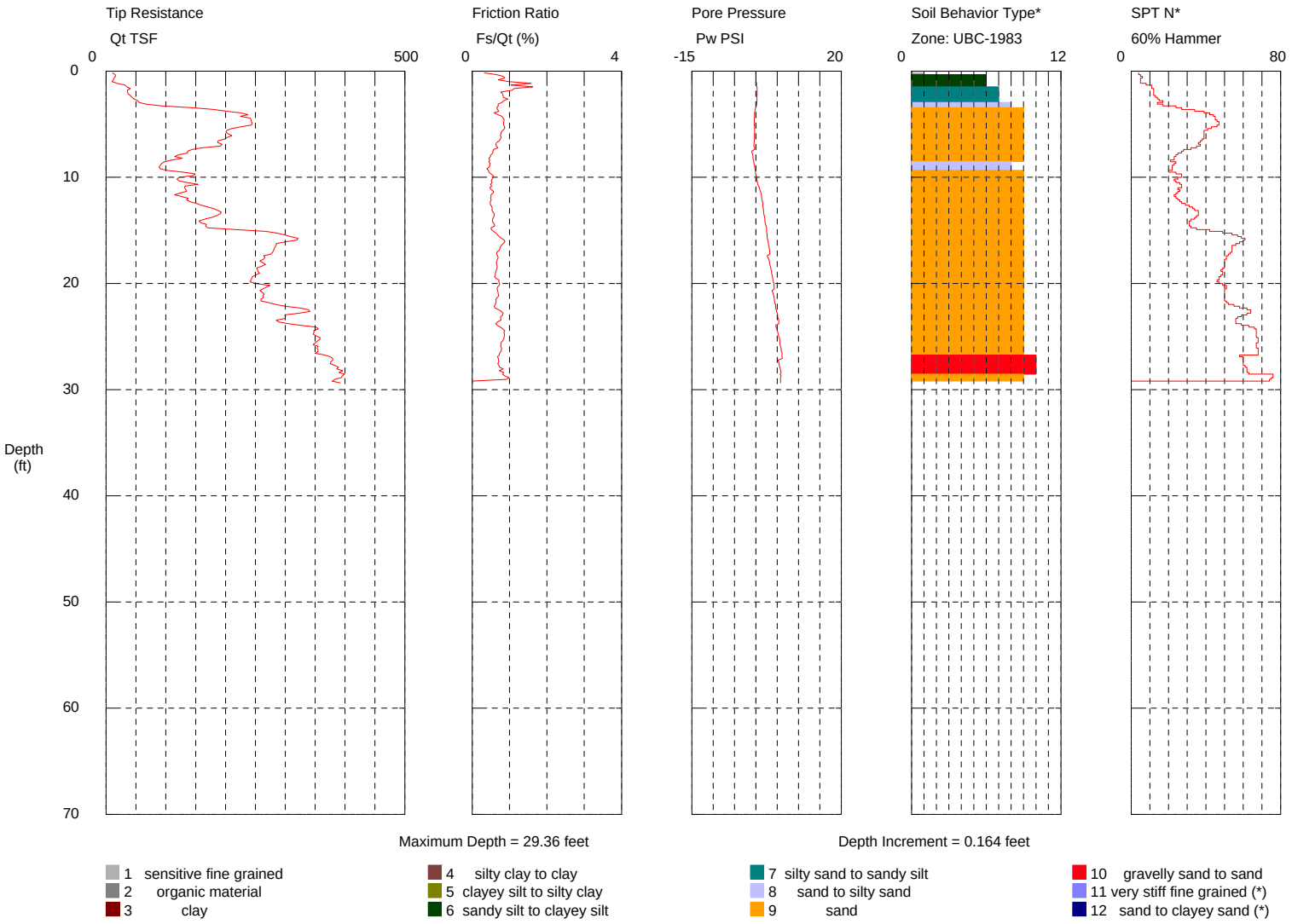


GRI

CONE PENETRATION TEST CPT-29A

AUG. 2007 JOB NO. 4277-J FIG. 22A

GROUND SURFACE ELEVATION 18.7 FT

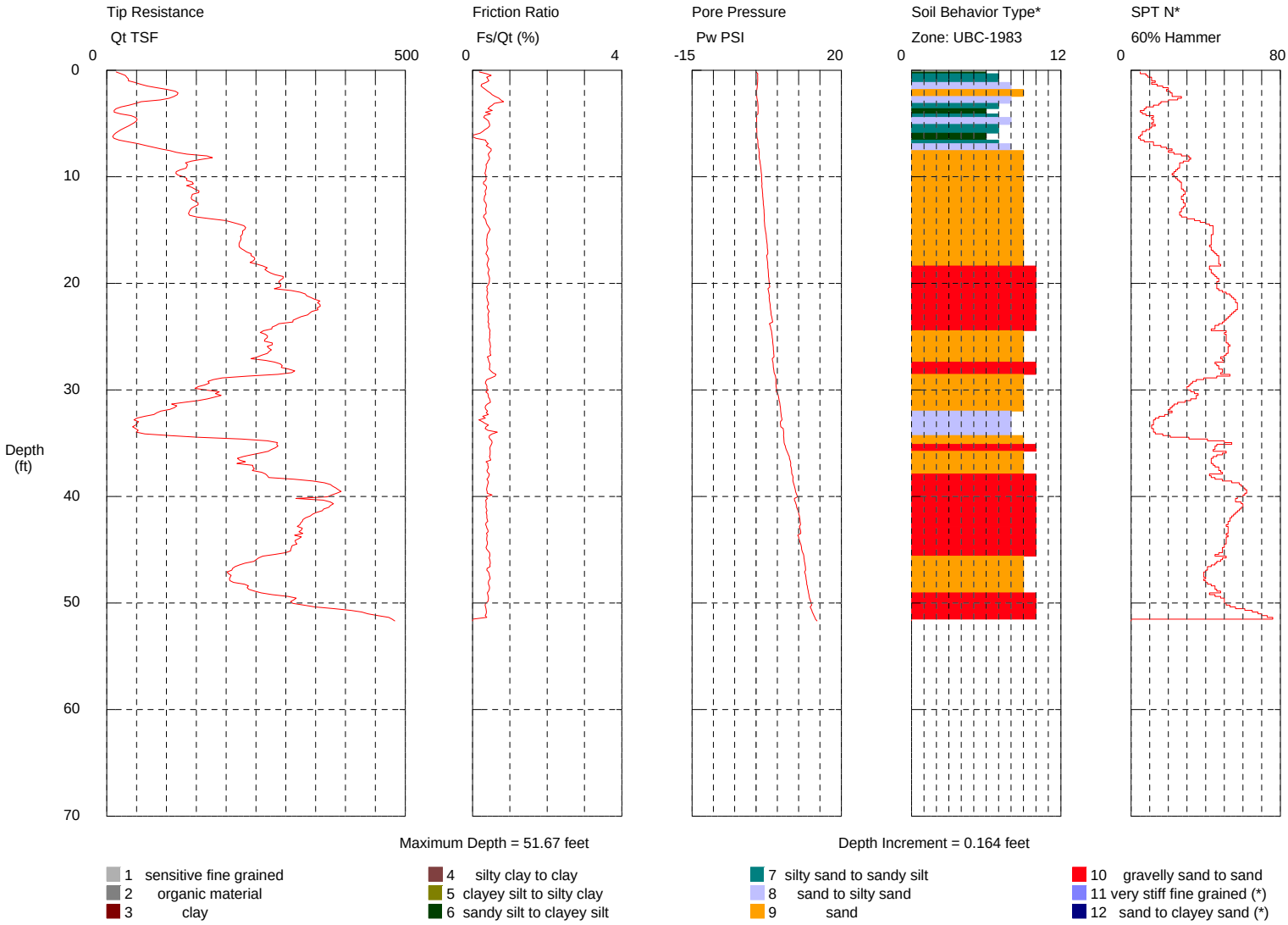


GRI

CONE PENETRATION TEST CPT-30

AUG. 2007 JOB NO. 4277-J FIG. 23A

GROUND SURFACE ELEVATION 18.3 FT

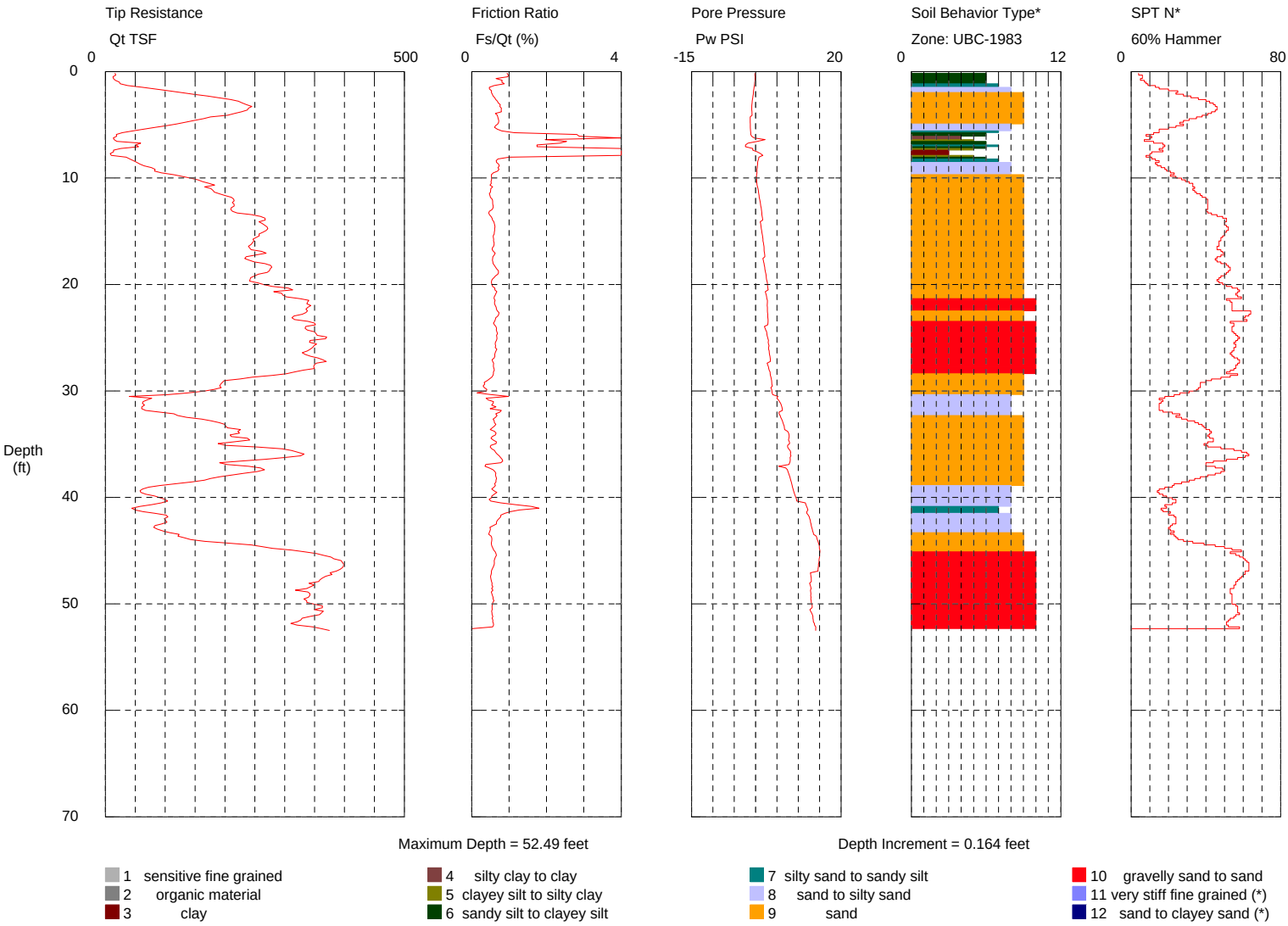


GRI

CONE PENETRATION TEST CPT-30A

AUG. 2007 JOB NO. 4277-J FIG. 24A

GROUND SURFACE ELEVATION 17.3 FT

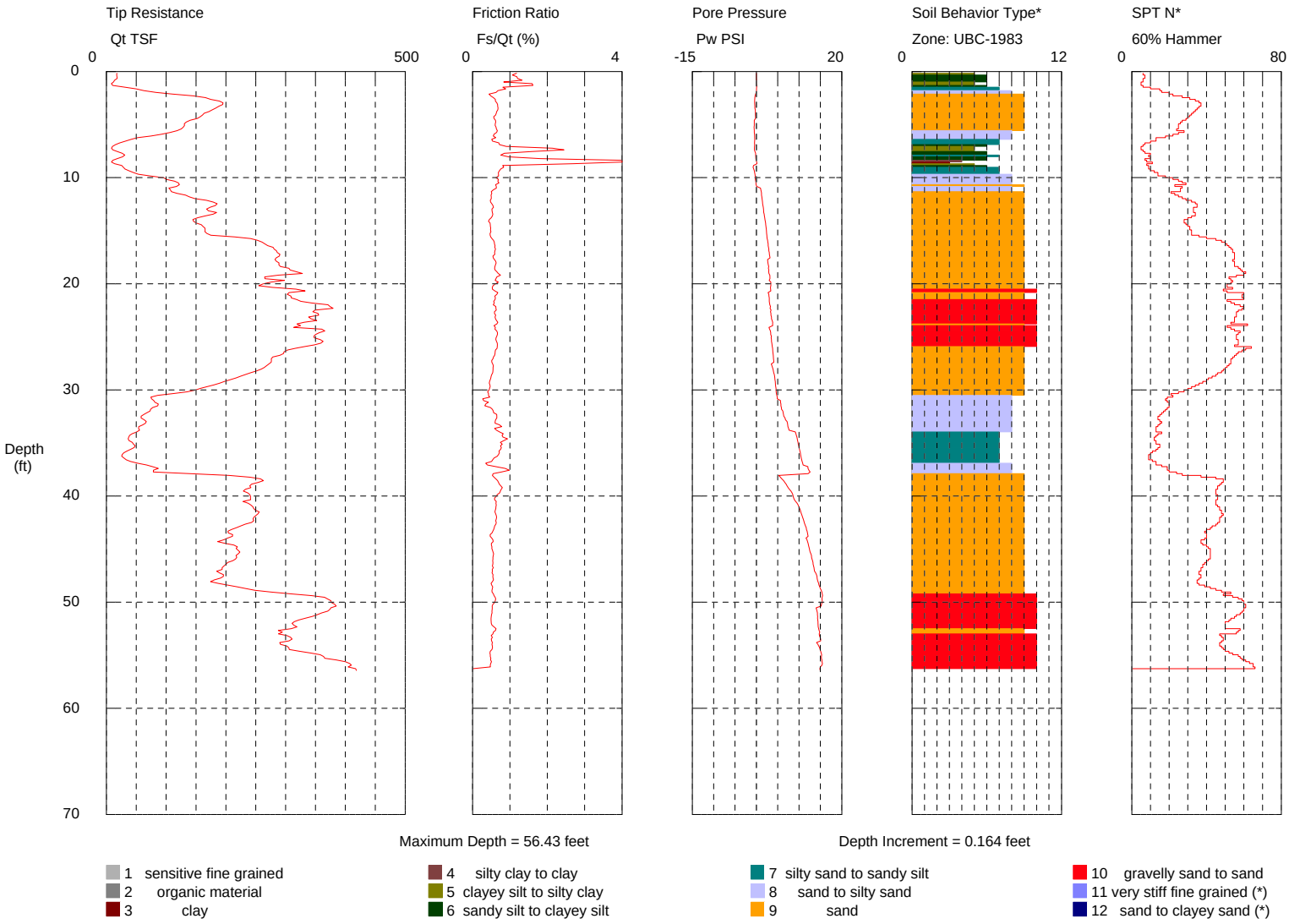


GRI

CONE PENETRATION TEST CPT-31

AUG. 2007 JOB NO. 4277-J FIG. 25A

GROUND SURFACE ELEVATION 18.4 FT

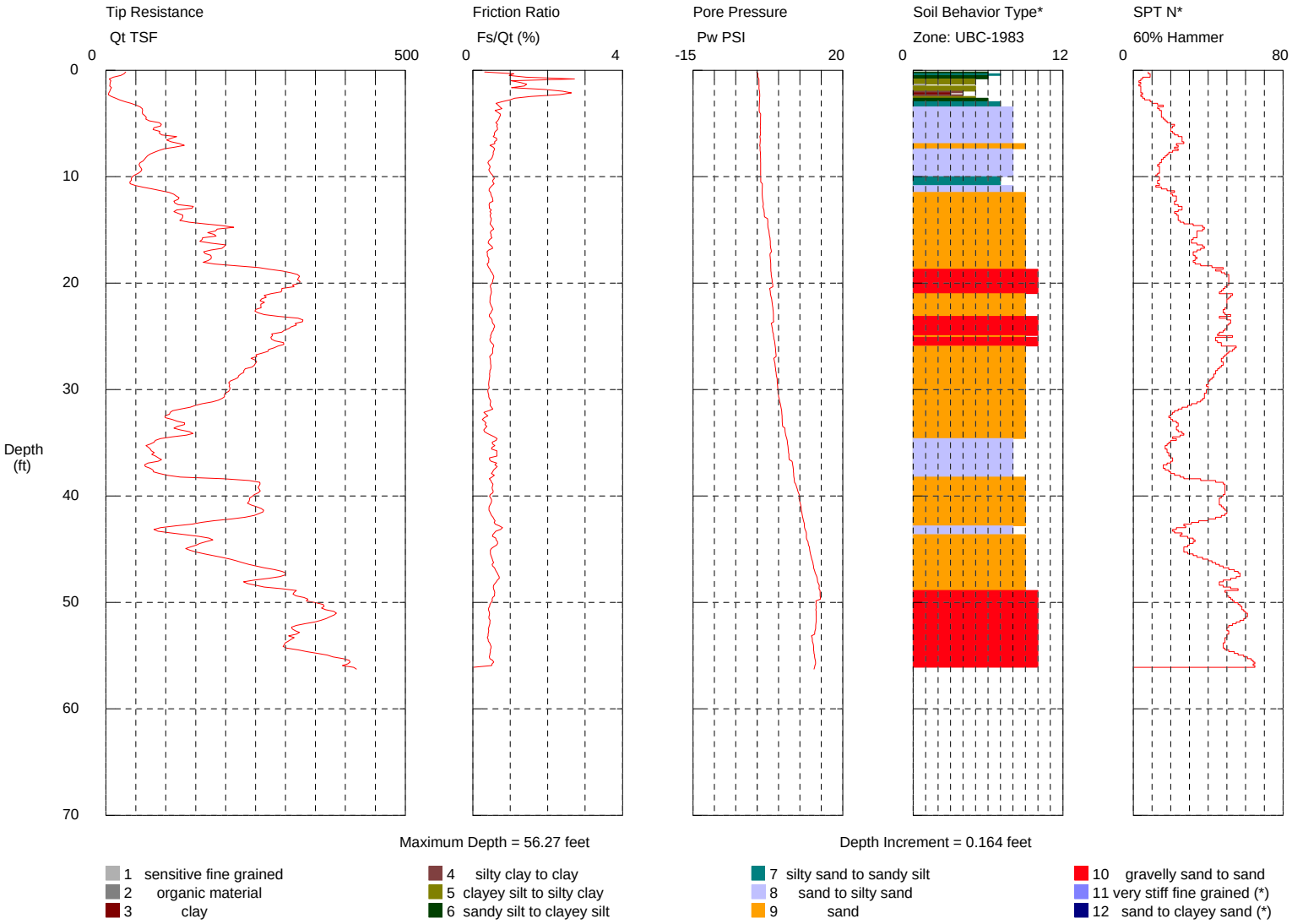


GRI

CONE PENETRATION TEST CPT-32

AUG. 2007 JOB NO. 4277-J FIG. 26A

GROUND SURFACE ELEVATION 22.7 FT

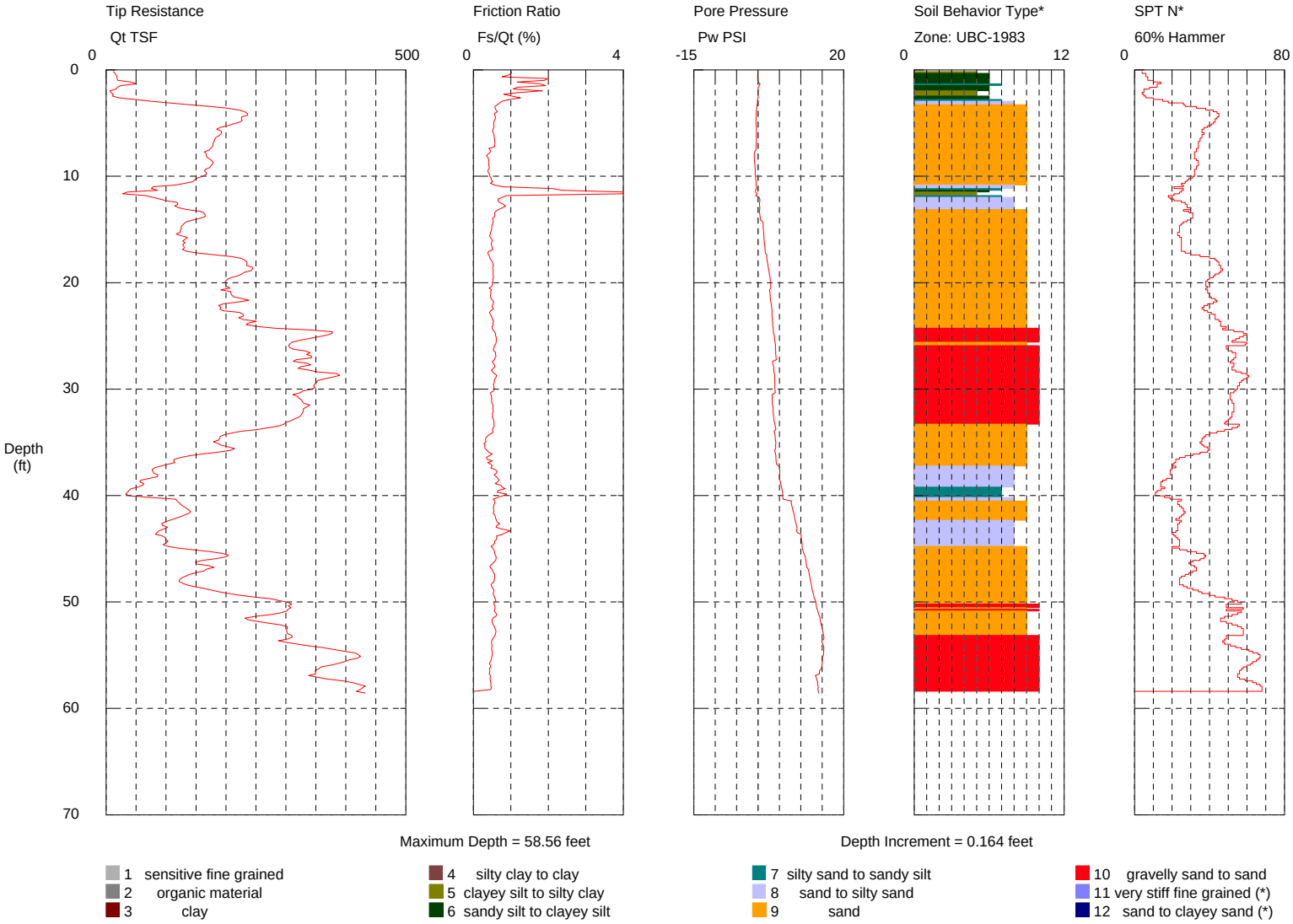


GRI

CONE PENETRATION TEST CPT-33

AUG. 2007 JOB NO. 4277-J FIG. 27A

GROUND SURFACE ELEVATION 20.8 FT

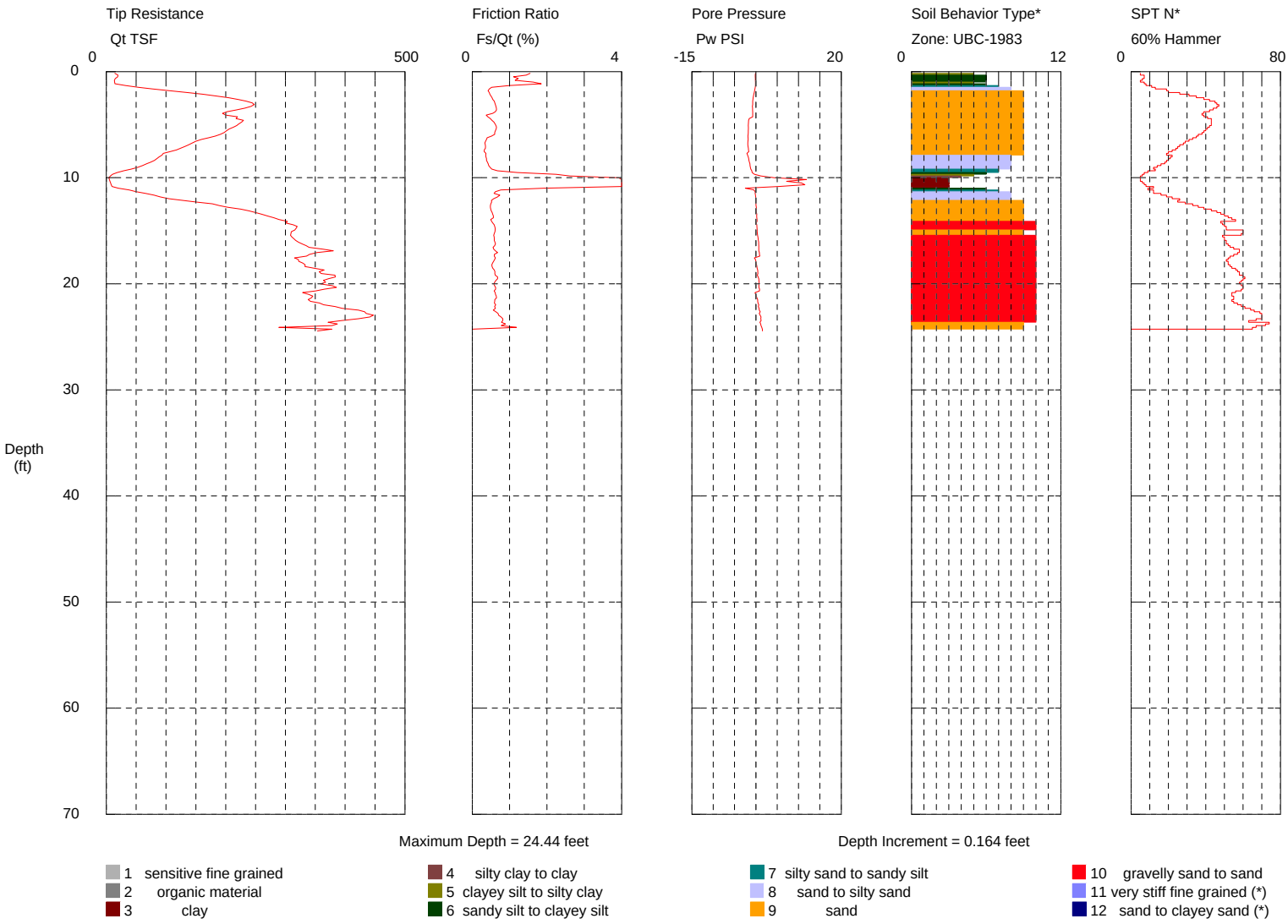


GRI

CONE PENETRATION TEST CPT-34

AUG. 2007 JOB NO. 4277-J FIG. 28A

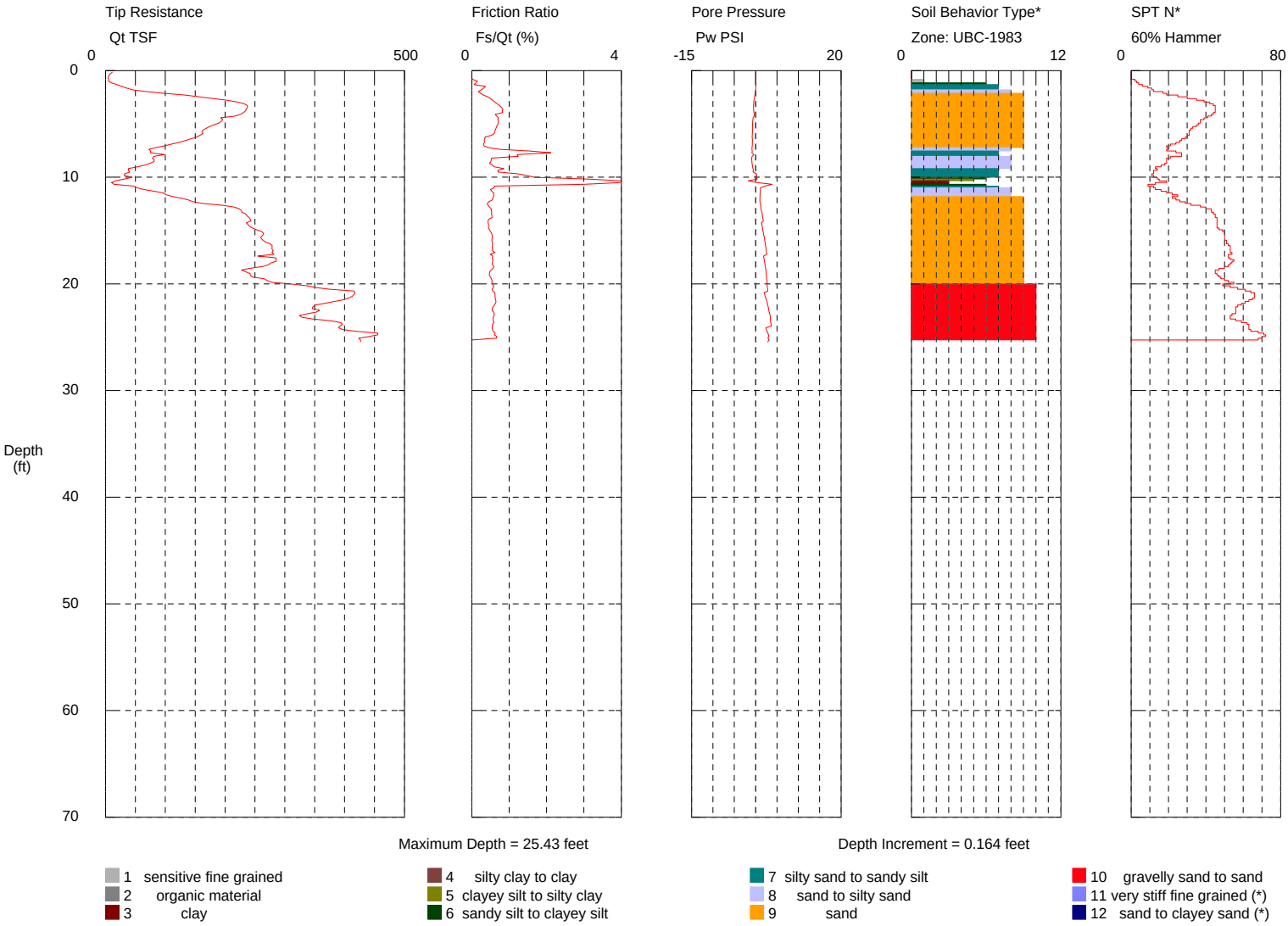
GROUND SURFACE ELEVATION 19.6 FT



GRI

CONE PENETRATION TEST CPT-35

AUG. 2007 JOB NO. 4277-J FIG. 29A

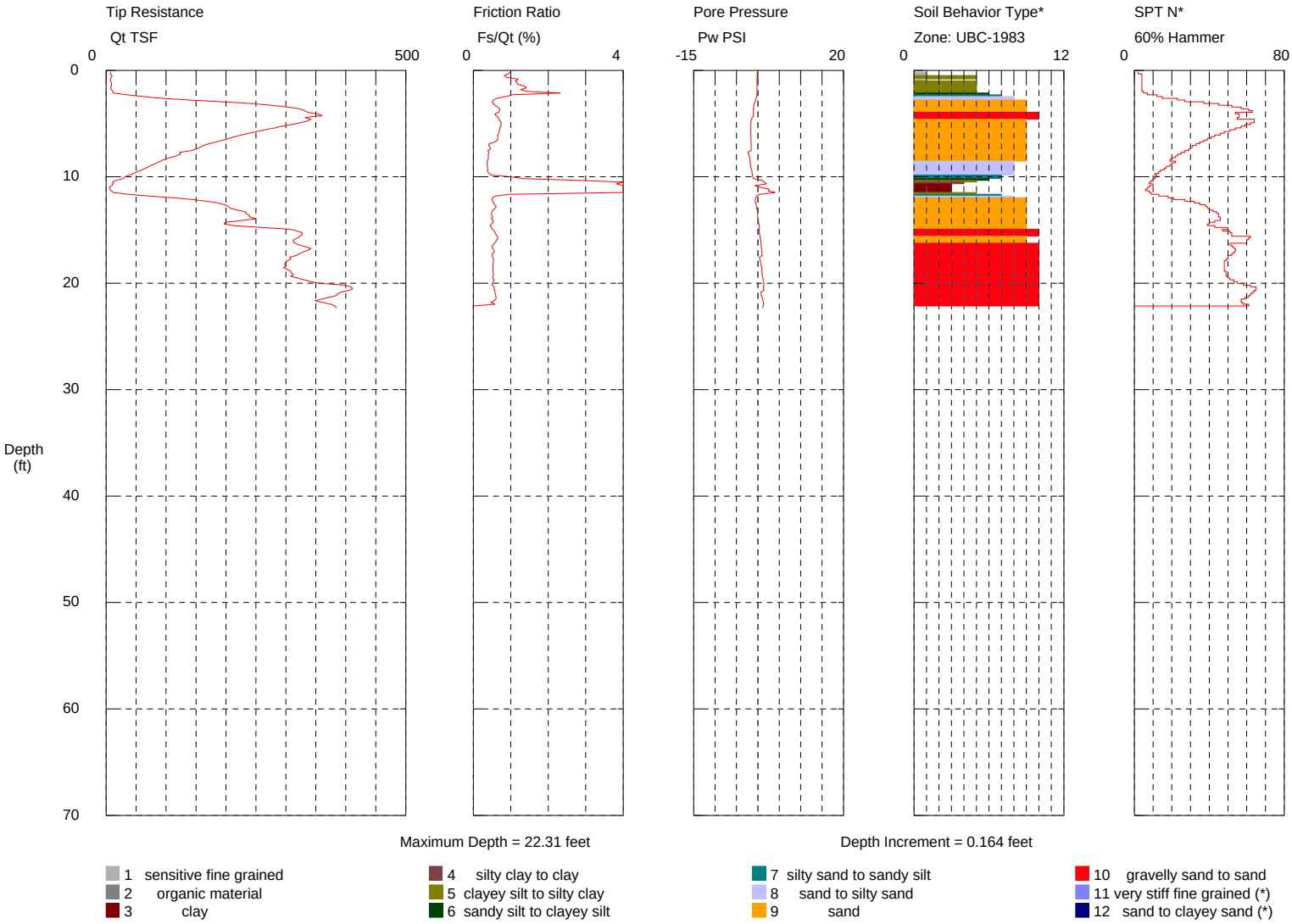


GRI

CONE PENETRATION TEST CPT-35A

AUG. 2007 JOB NO. 4277-J FIG. 30A

GROUND SURFACE ELEVATION 19.6 FT

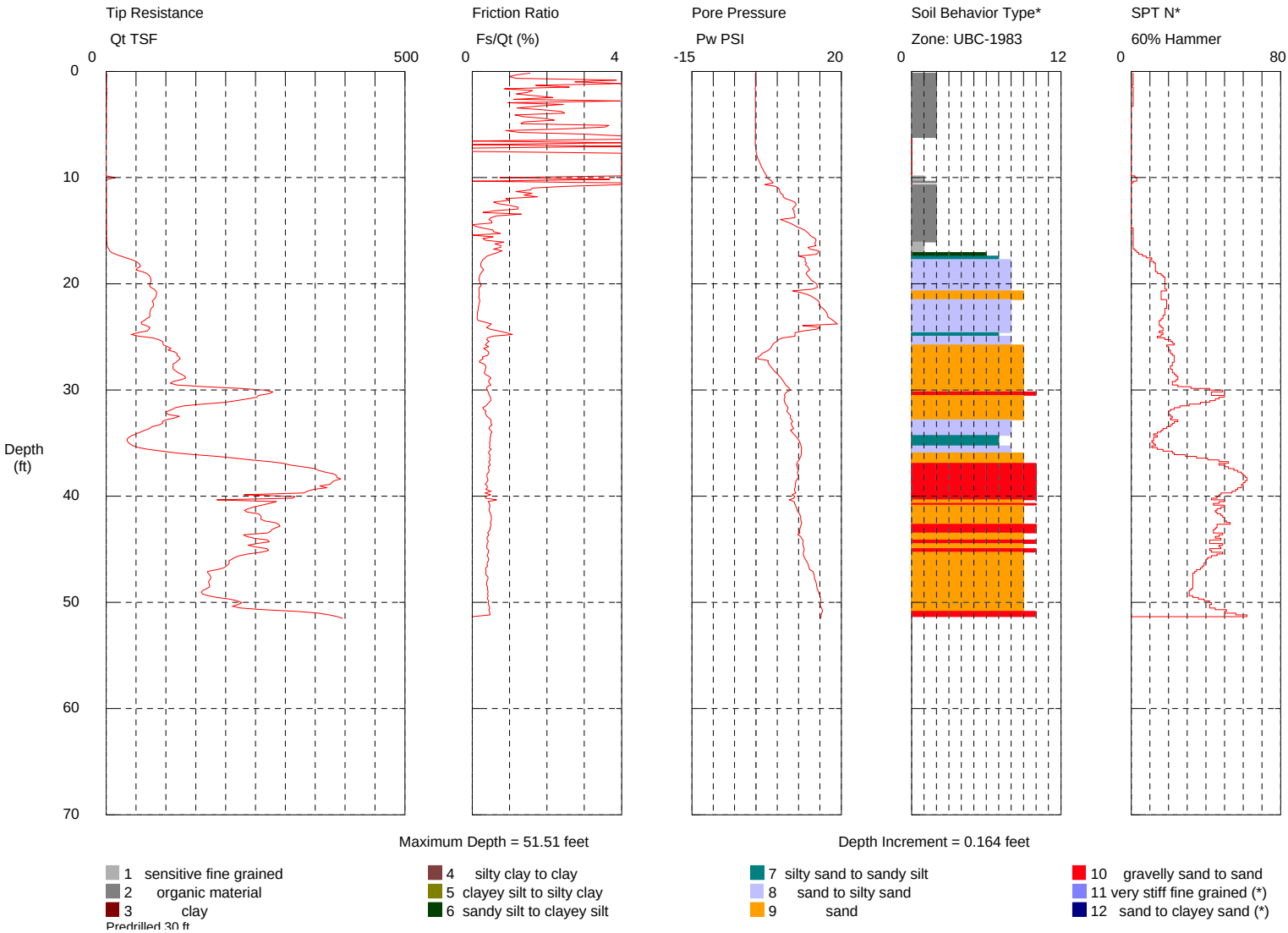


GRI

CONE PENETRATION TEST CPT-35B

AUG. 2007 JOB NO. 4277-J FIG. 31A

GROUND SURFACE ELEVATION 19.6 FT

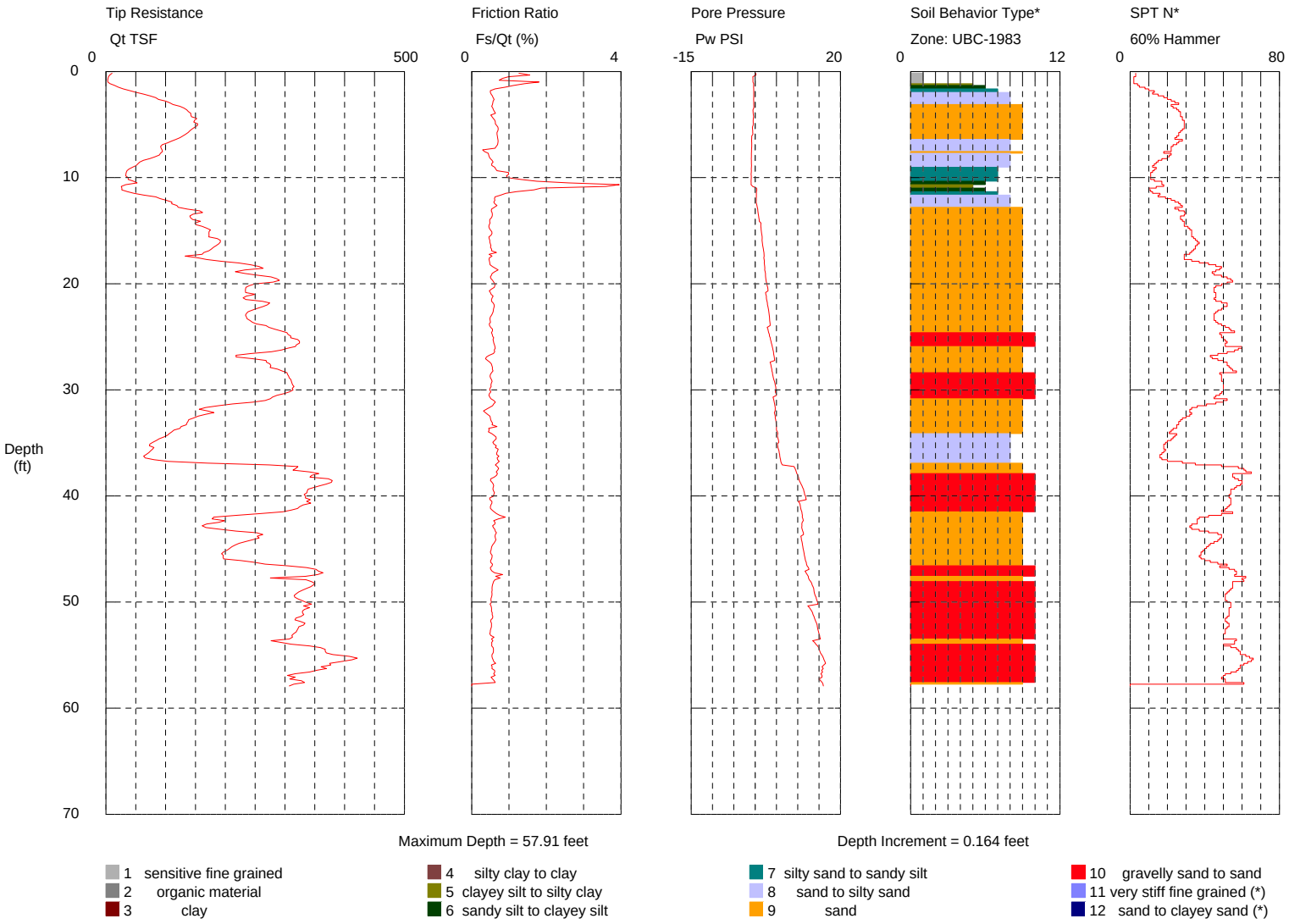


GRI

CONE PENETRATION TEST CPT-35C

AUG. 2007 JOB NO. 4277-J FIG. 32A

GROUND SURFACE ELEVATION 20.5 FT

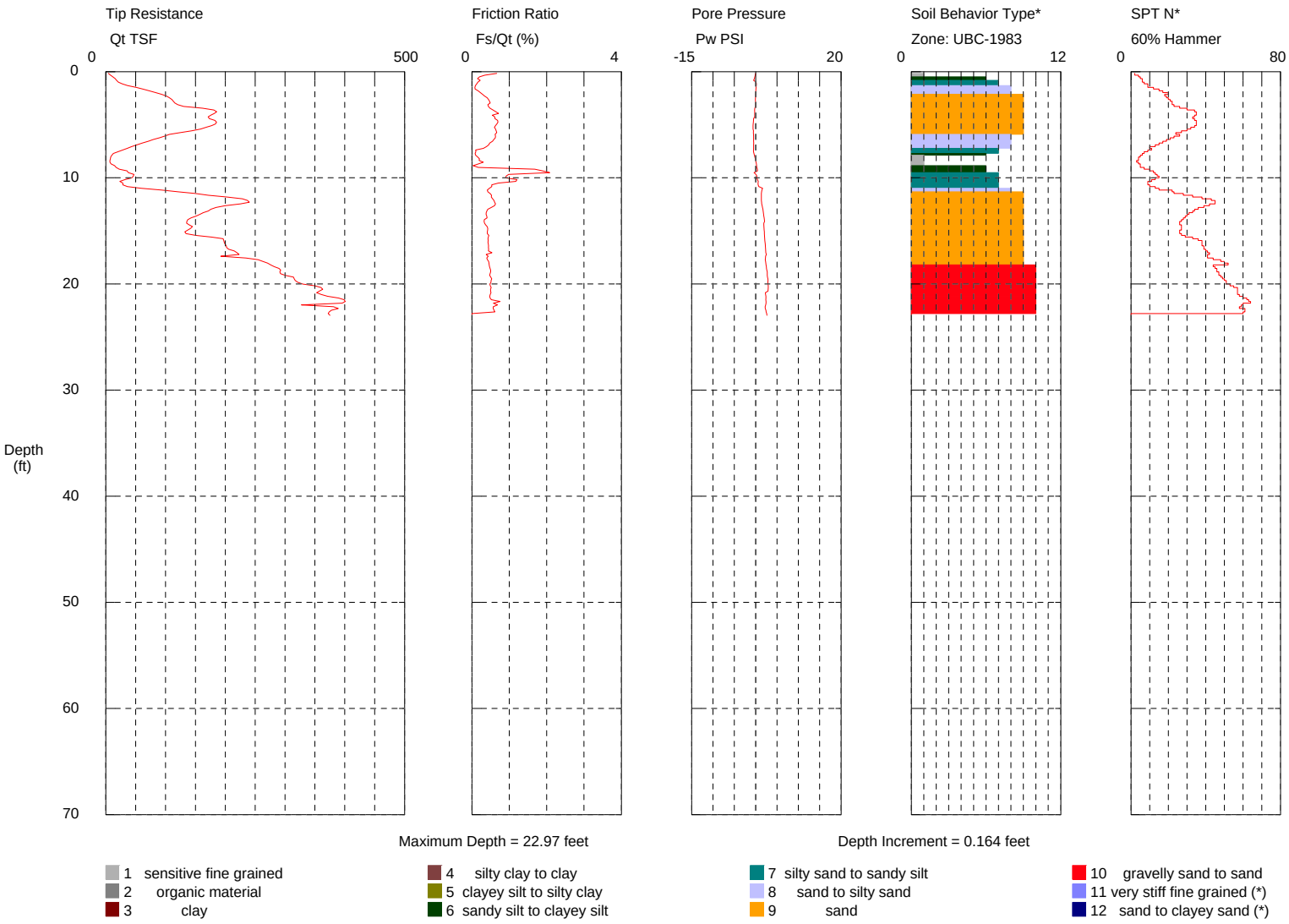


GRI

CONE PENETRATION TEST CPT-36

AUG. 2007 JOB NO. 4277-J FIG. 33A

GROUND SURFACE ELEVATION 17.2 FT

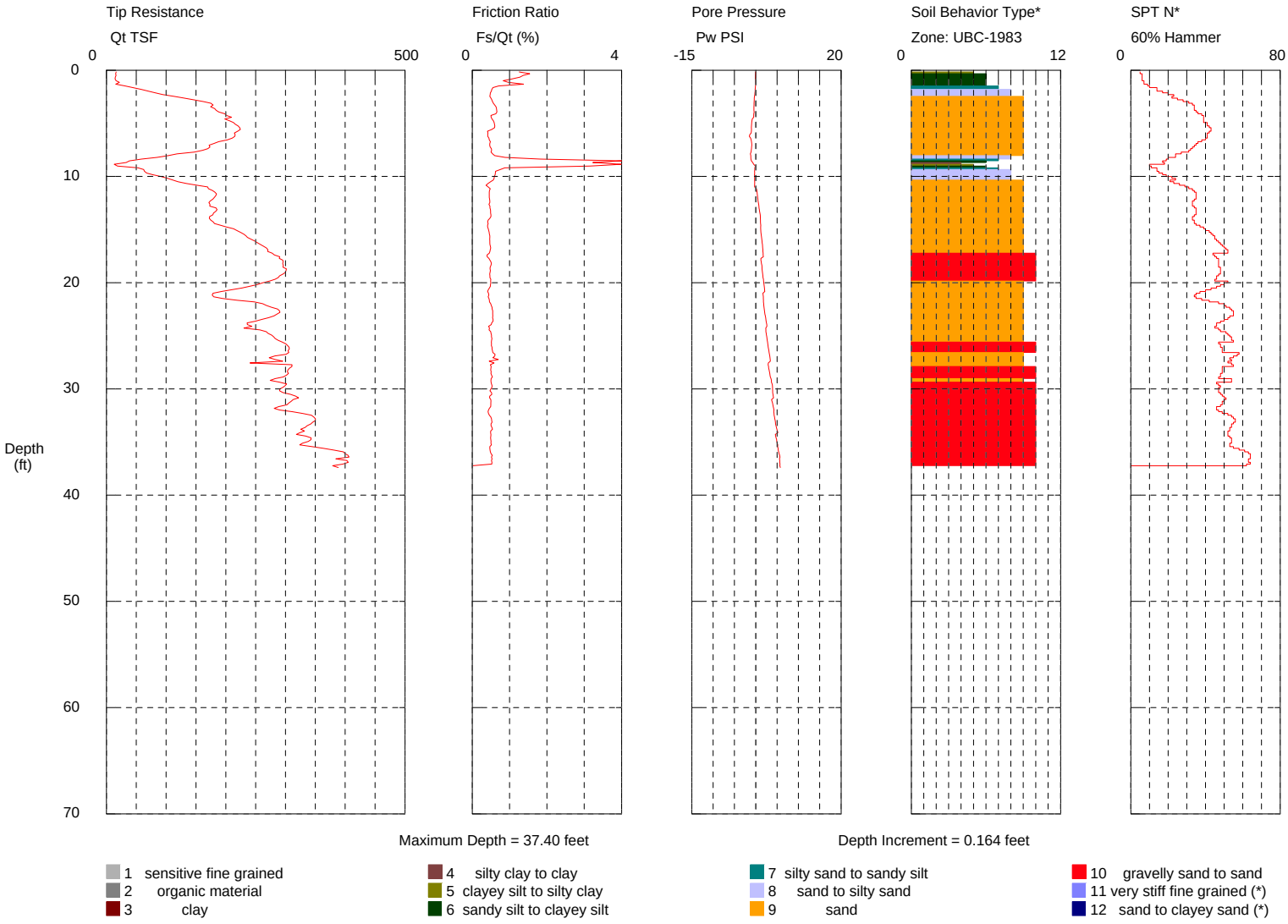


GRI

CONE PENETRATION TEST CPT-37

AUG. 2007 JOB NO. 4277-J FIG. 34A

GROUND SURFACE ELEVATION 16.9 FT

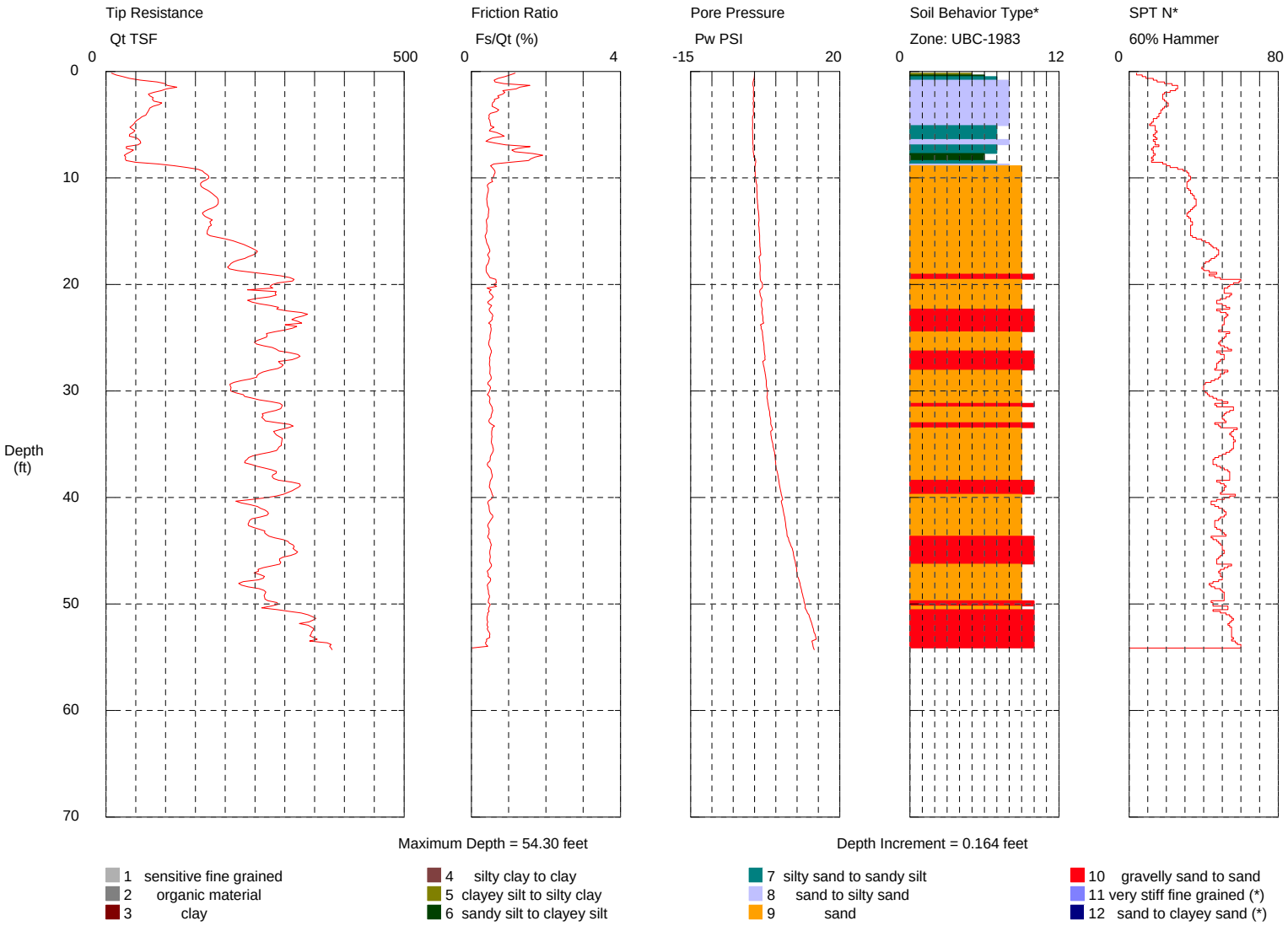


GRI

CONE PENETRATION TEST CPT-38

AUG. 2007 JOB NO. 4277-J FIG. 35A

GROUND SURFACE ELEVATION 15.2 FT

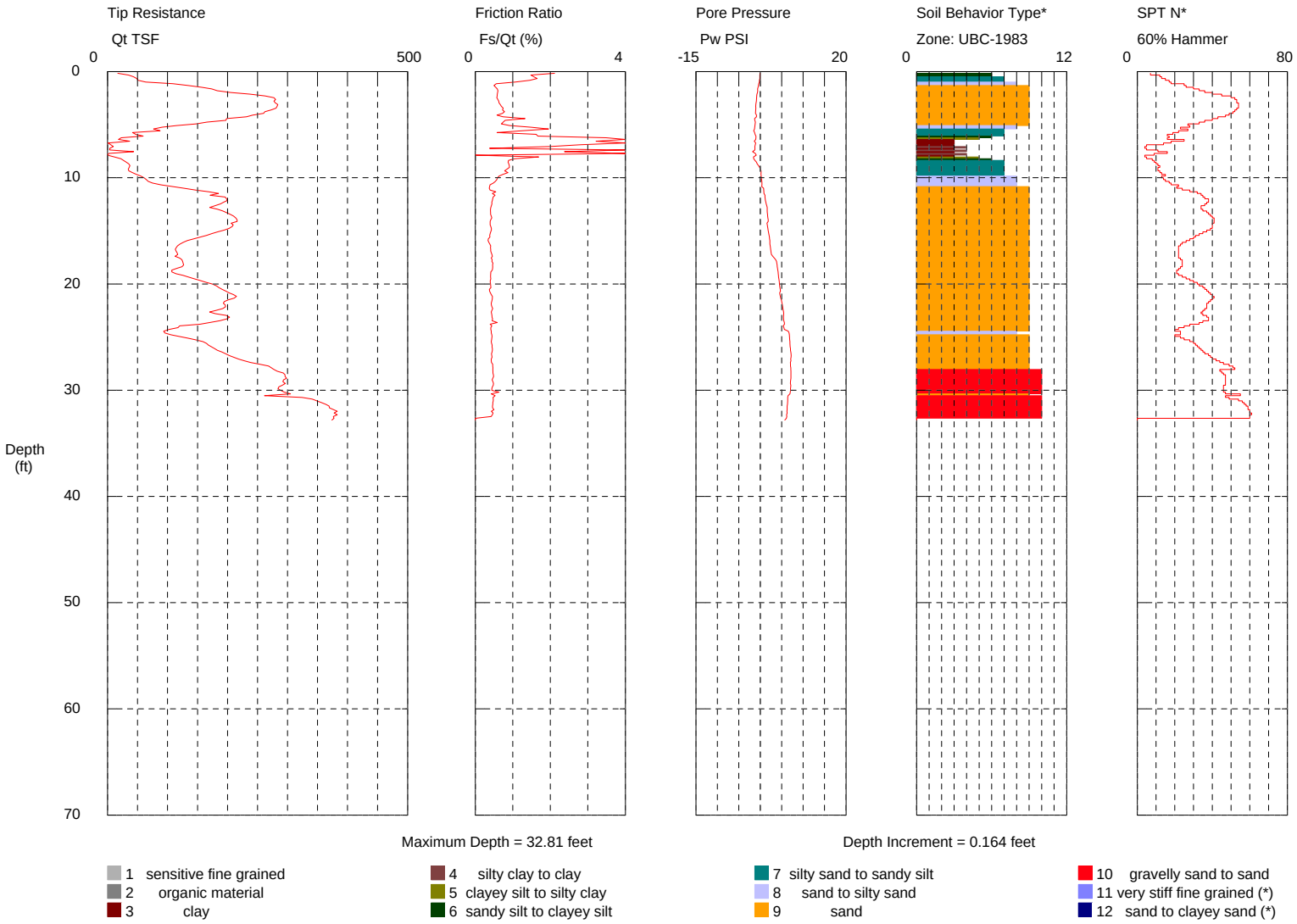


GRI

CONE PENETRATION TEST CPT-39

AUG. 2007 JOB NO. 4277-J FIG. 36A

GROUND SURFACE ELEVATION 16.1 FT

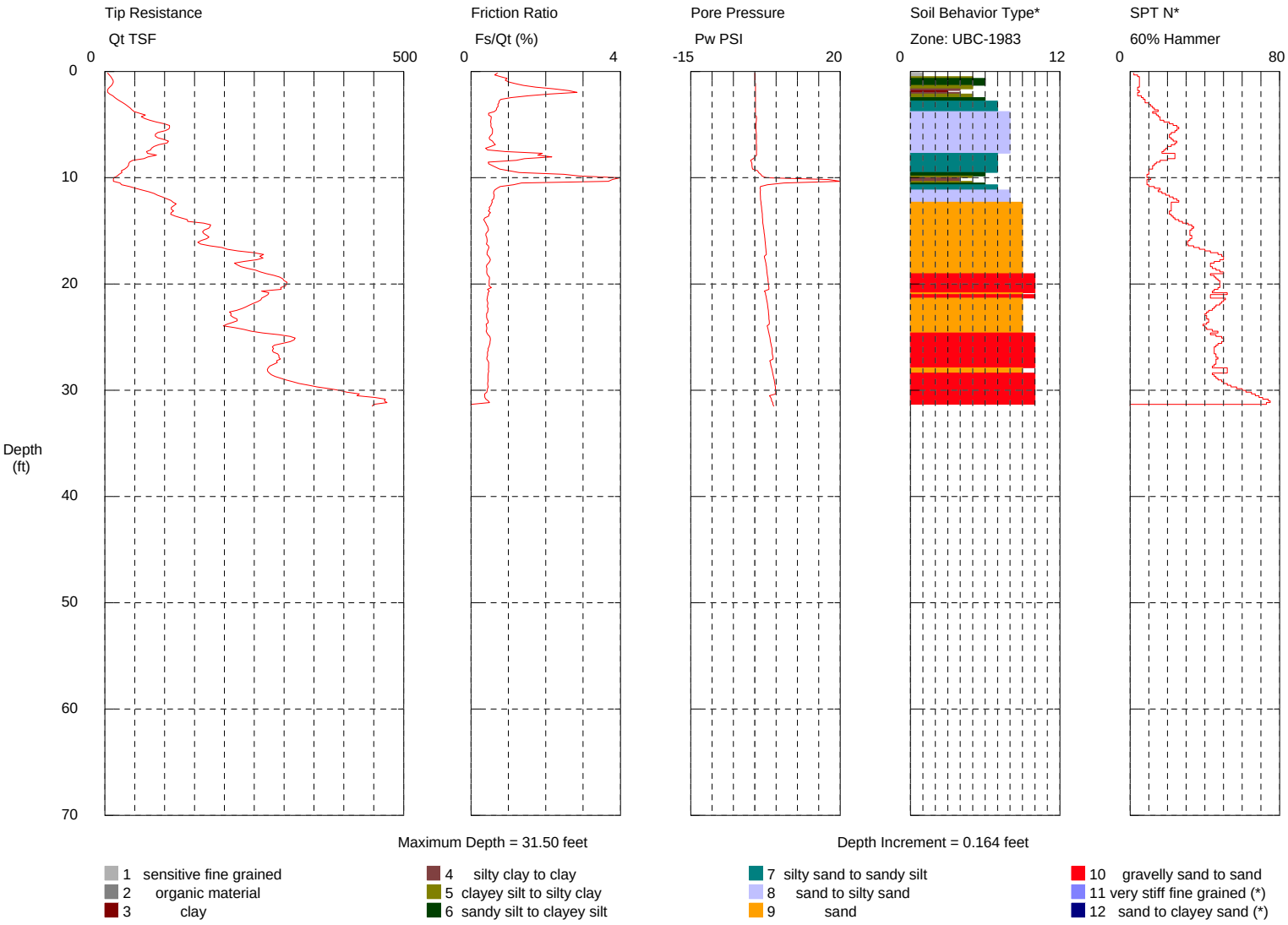


GRI

CONE PENETRATION TEST CPT-40

AUG. 2007 JOB NO. 4277-J FIG. 37A

GROUND SURFACE ELEVATION 16.6 FT

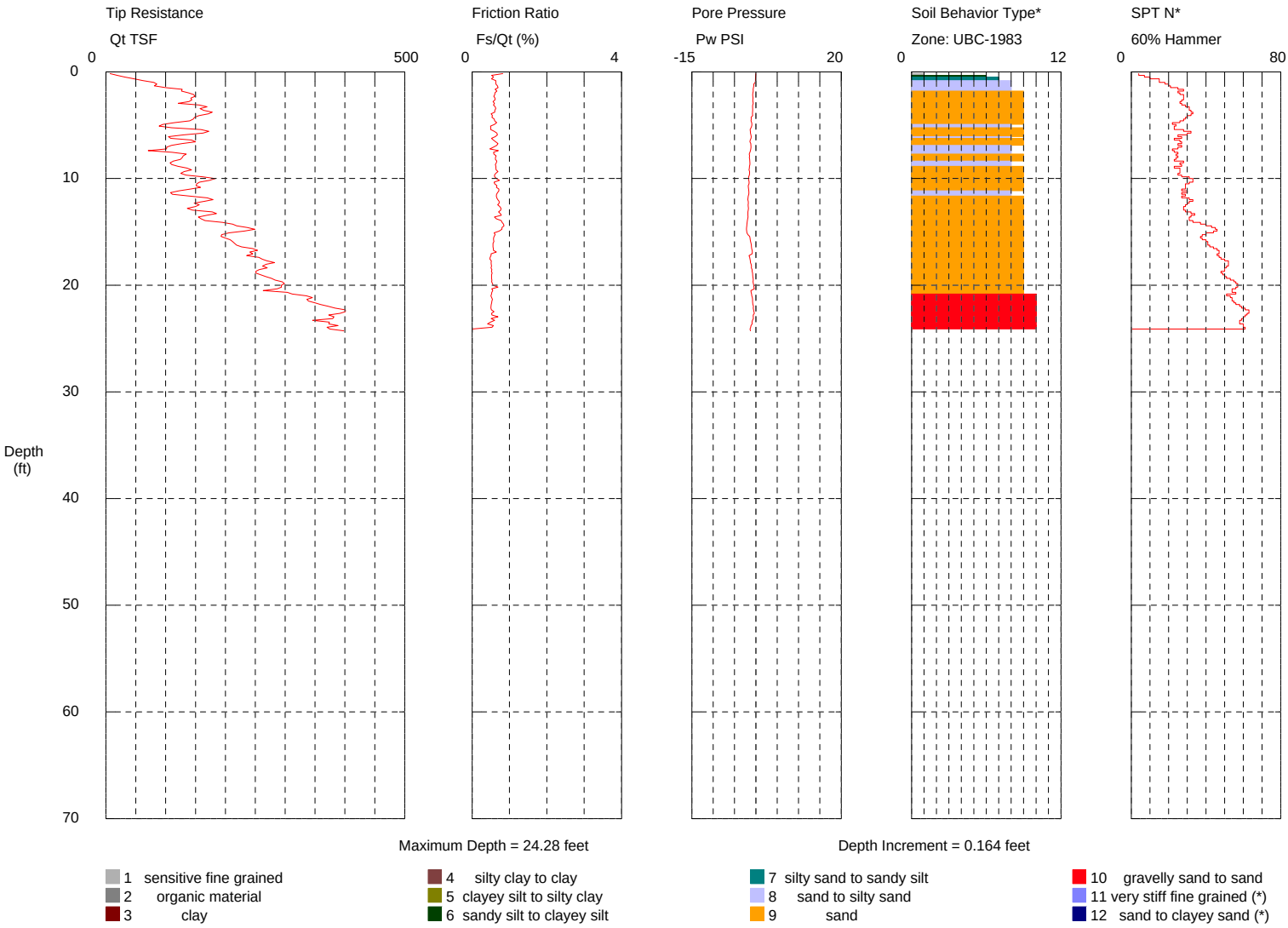


GRI

CONE PENETRATION TEST CPT-41

AUG. 2007 JOB NO. 4277-J FIG. 38A

GROUND SURFACE ELEVATION 23.0 FT

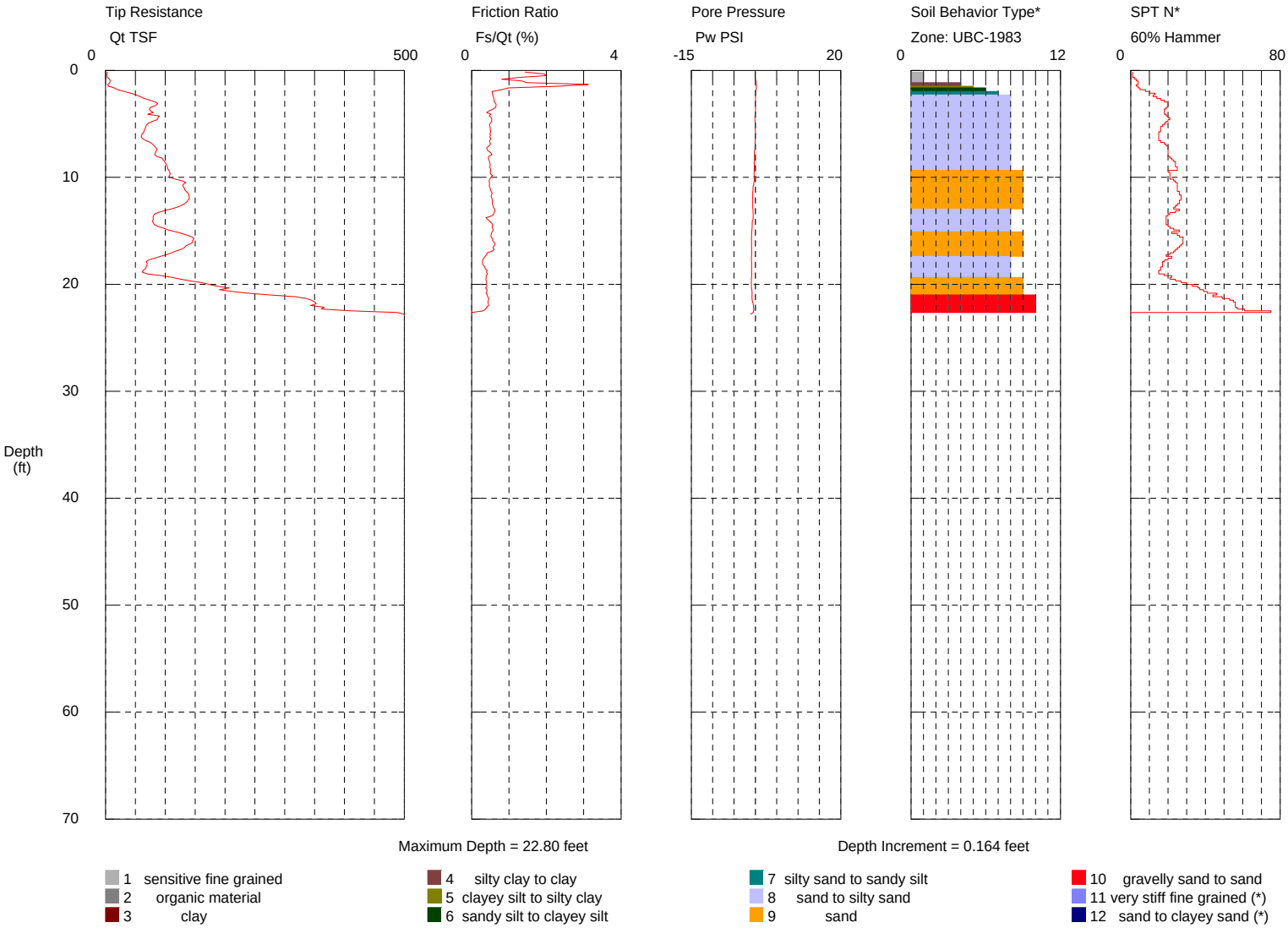


GRI

CONE PENETRATION TEST CPT-42

AUG. 2007 JOB NO. 4277-J FIG. 39A

GROUND SURFACE ELEVATION 26.6 FT

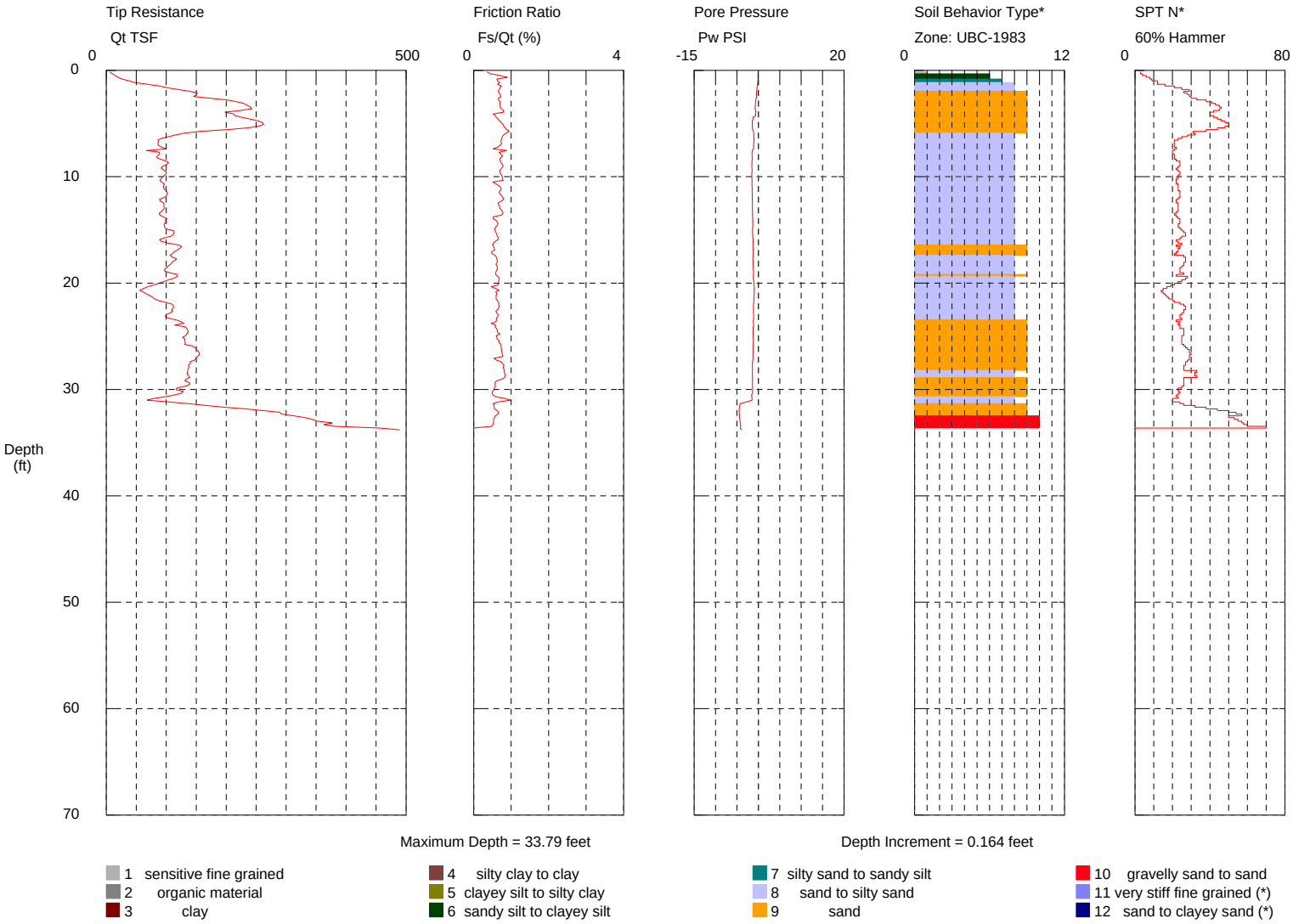


GRI

CONE PENETRATION TEST CPT-43

AUG. 2007 JOB NO. 4277-J FIG. 40A

GROUND SURFACE ELEVATION 39.3 FT

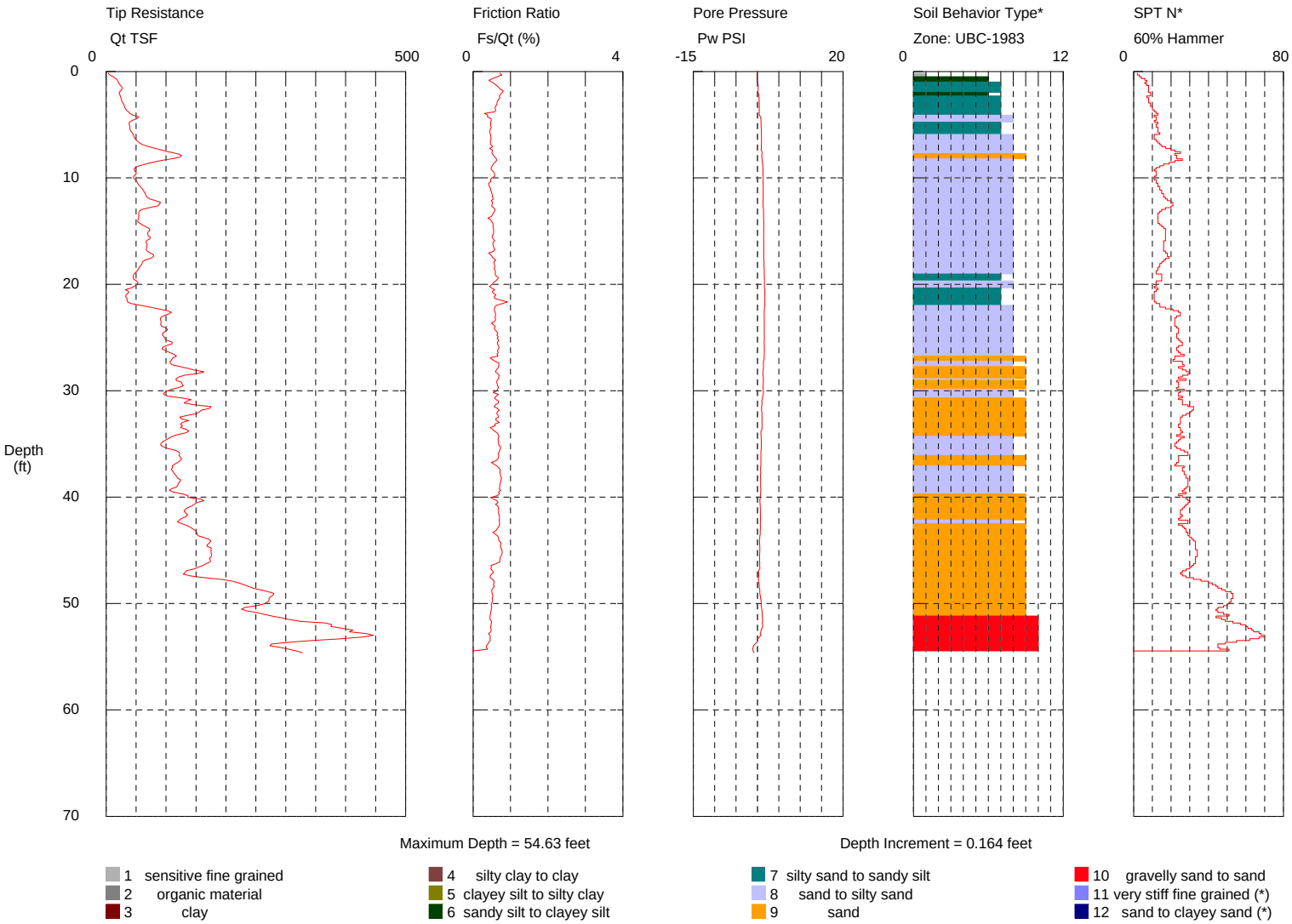


GRI

CONE PENETRATION TEST CPT-44

AUG. 2007 JOB NO. 4277-J FIG. 41A

GROUND SURFACE ELEVATION 57.4 FT

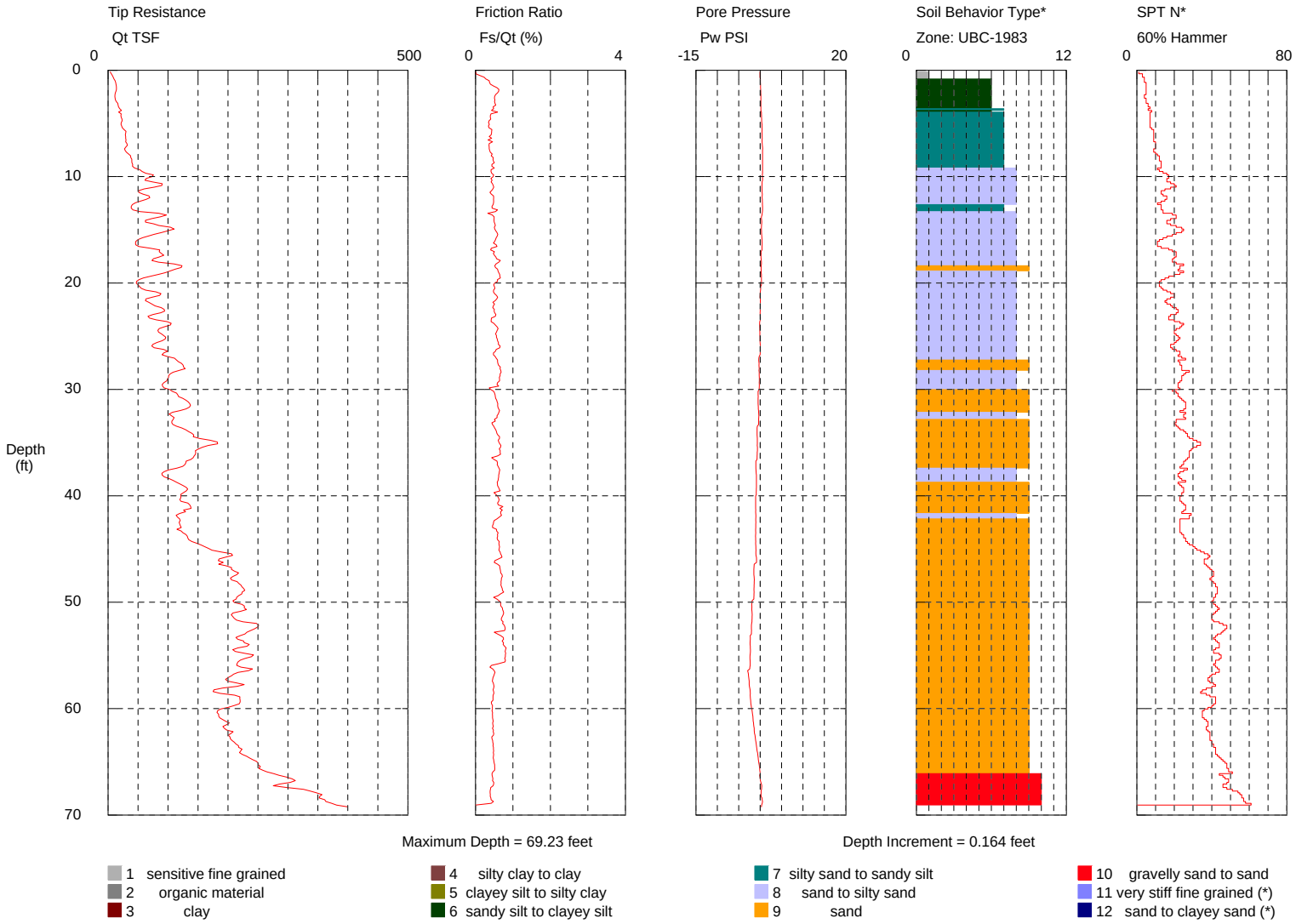


GRI

CONE PENETRATION TEST CPT-45

AUG. 2007 JOB NO. 4277-J FIG. 42A

GROUND SURFACE ELEVATION 70.0 FT

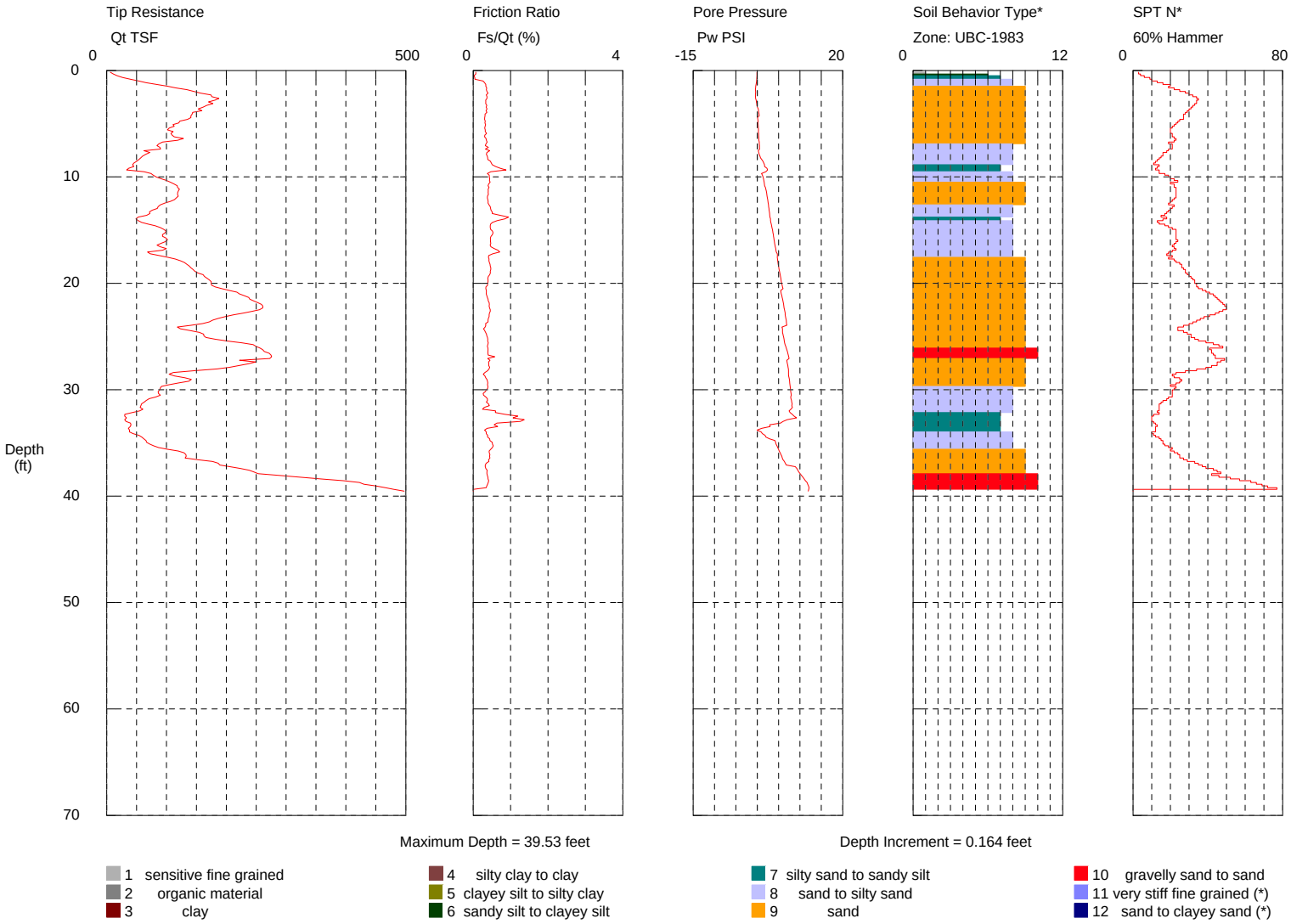


GRI

CONE PENETRATION TEST CPT-46

AUG. 2007 JOB NO. 4277-J FIG. 43A

GROUND SURFACE ELEVATION 18.7 FT

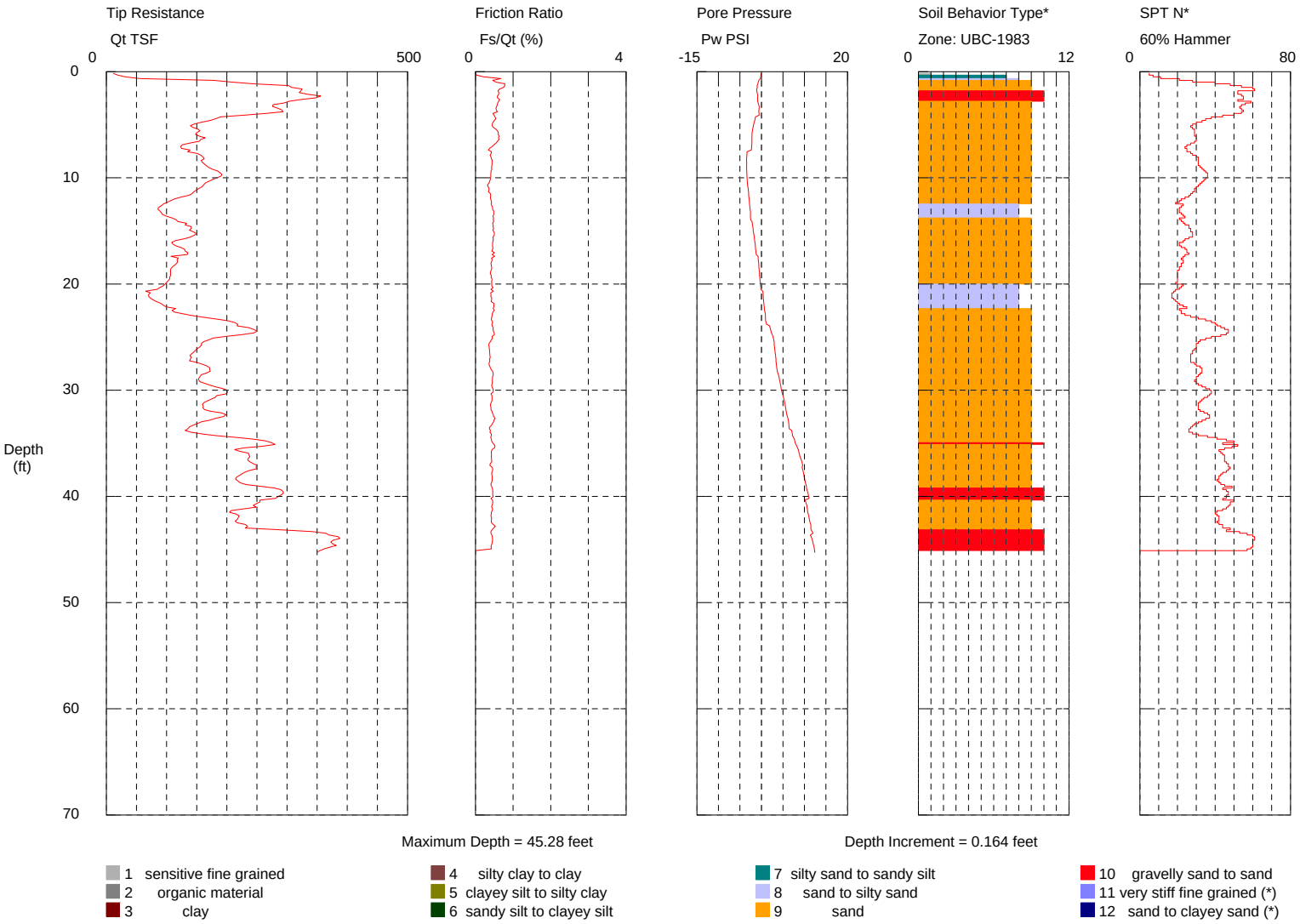


GRI

CONE PENETRATION TEST CPT-47

AUG. 2007 JOB NO. 4277-J FIG. 44A

GROUND SURFACE ELEVATION 13.6 FT

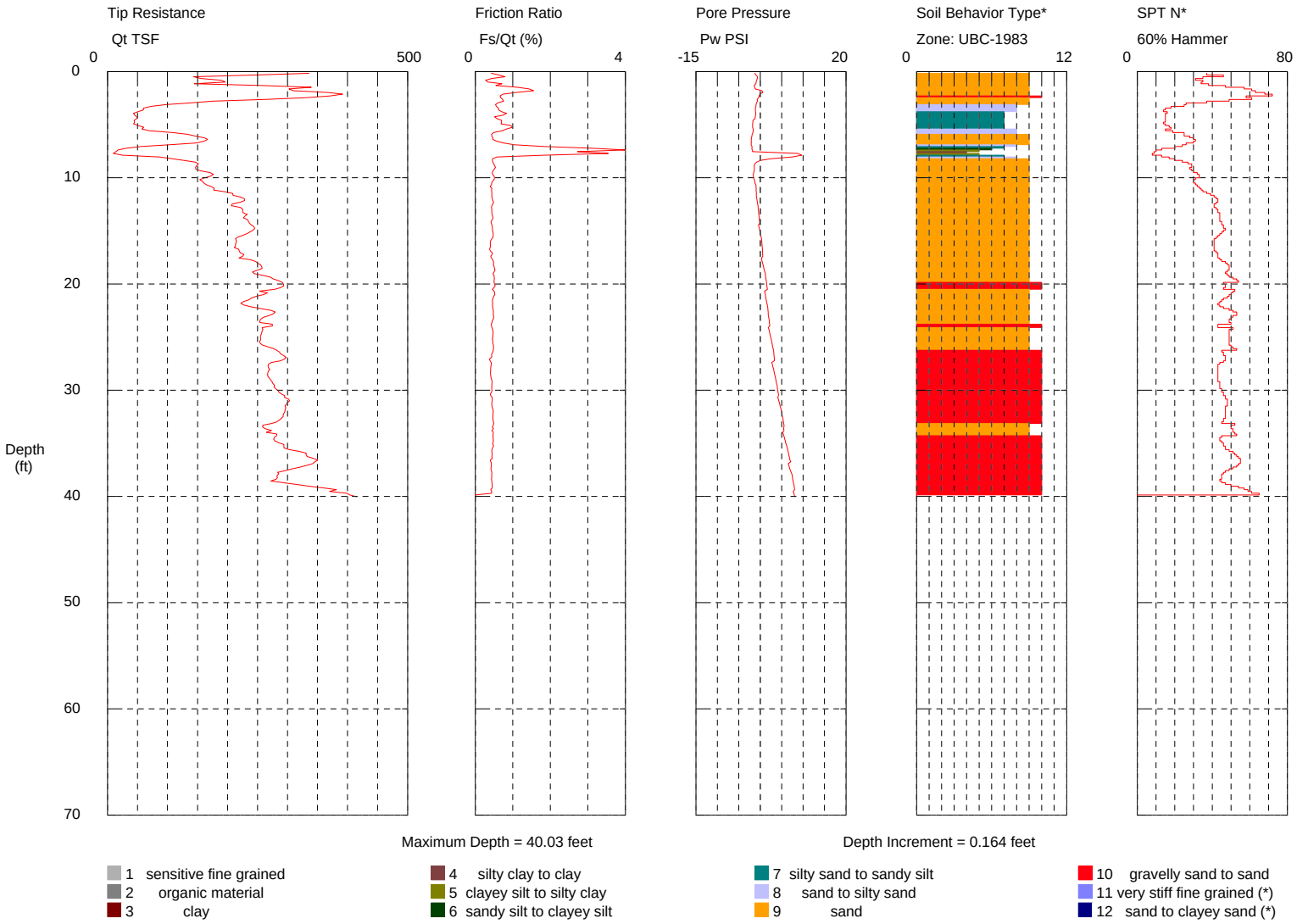


GRI

CONE PENETRATION TEST CPT-48

AUG. 2007 JOB NO. 4277-J FIG. 45A

GROUND SURFACE ELEVATION 12.4 FT

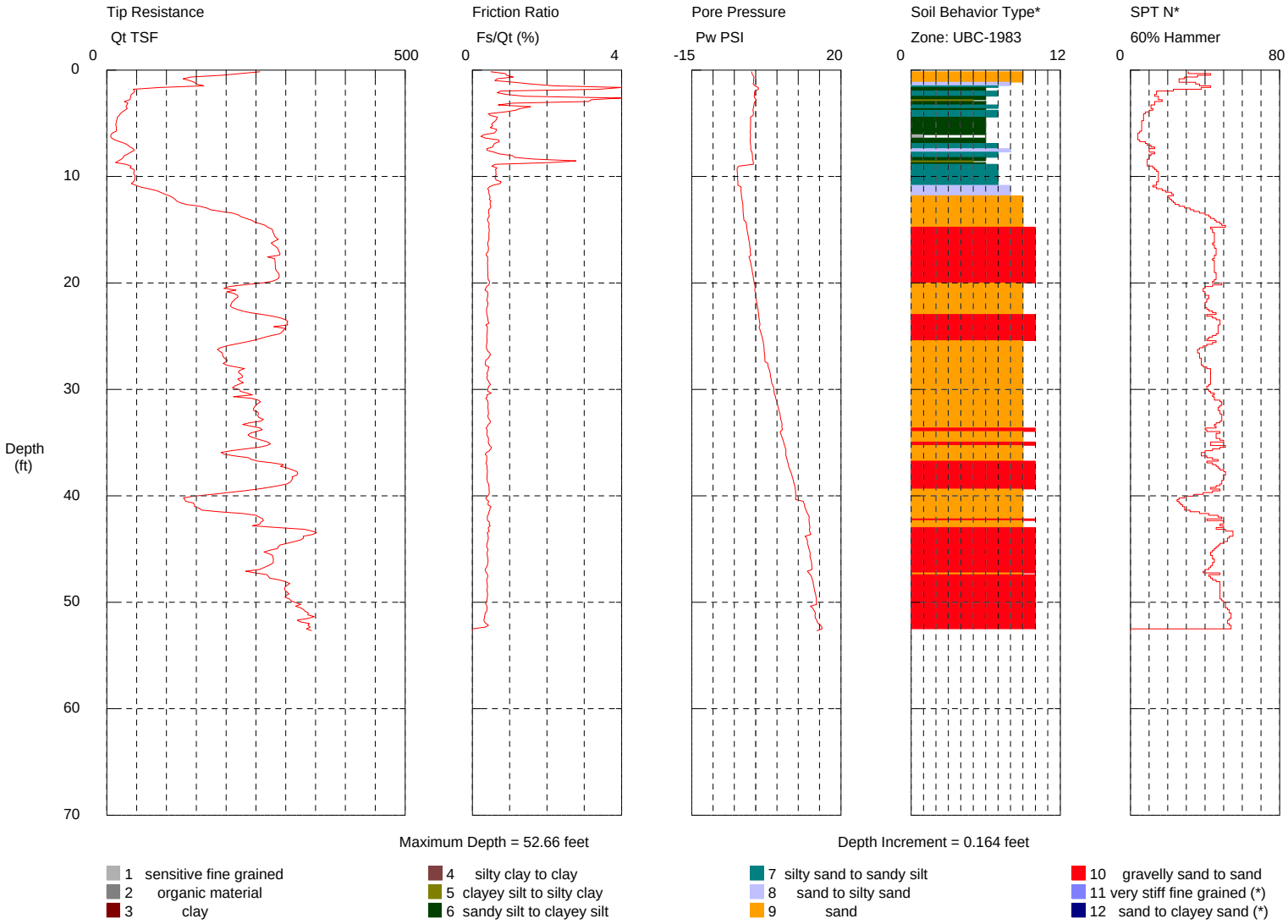


GRI

CONE PENETRATION TEST CPT-49

AUG. 2007 JOB NO. 4277-J FIG. 46A

GROUND SURFACE ELEVATION 11.4 FT



GRI

CONE PENETRATION TEST CPT-50

AUG. 2007 JOB NO. 4277-J FIG. 47A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-25	S-3	15	SP	BROWN SAND; FINE GRAINED, CLEAN



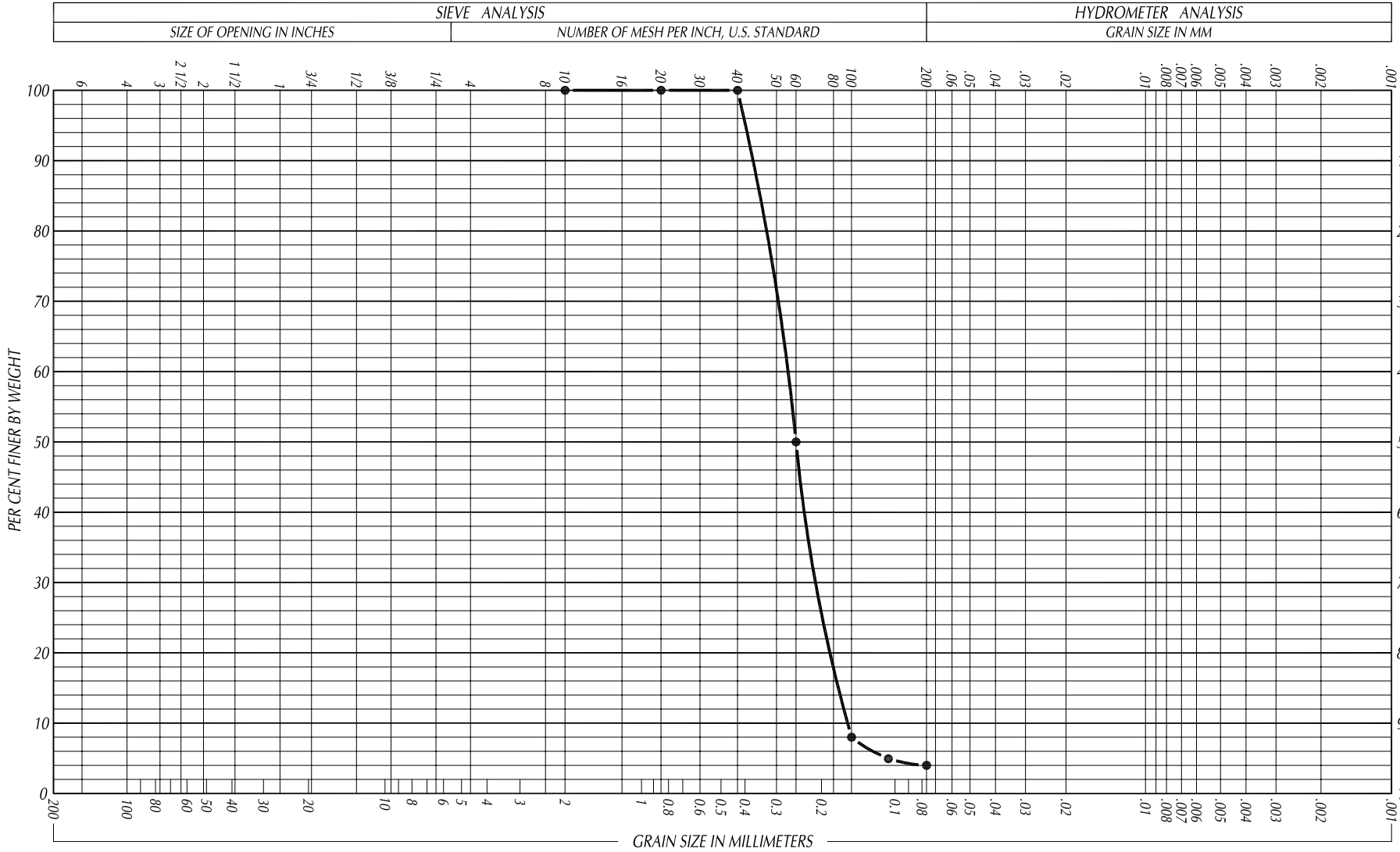
COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 48A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-25	S-6	30	SP	BROWN SAND; FINE GRAINED, TRACE SILT



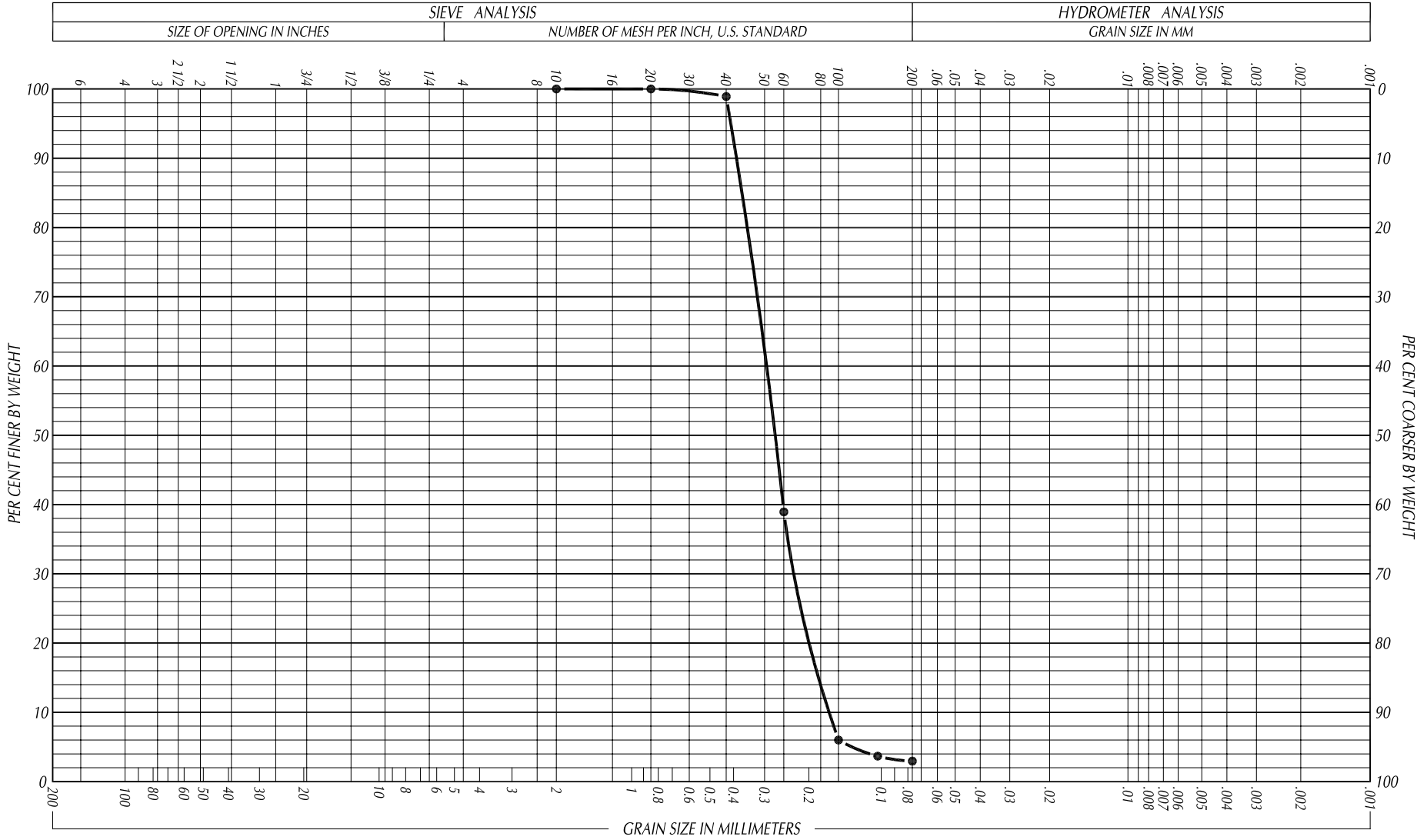
COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 49A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-26	S-4	20	SP	GRAY SAND; FINE GRAINED, TRACE SILT



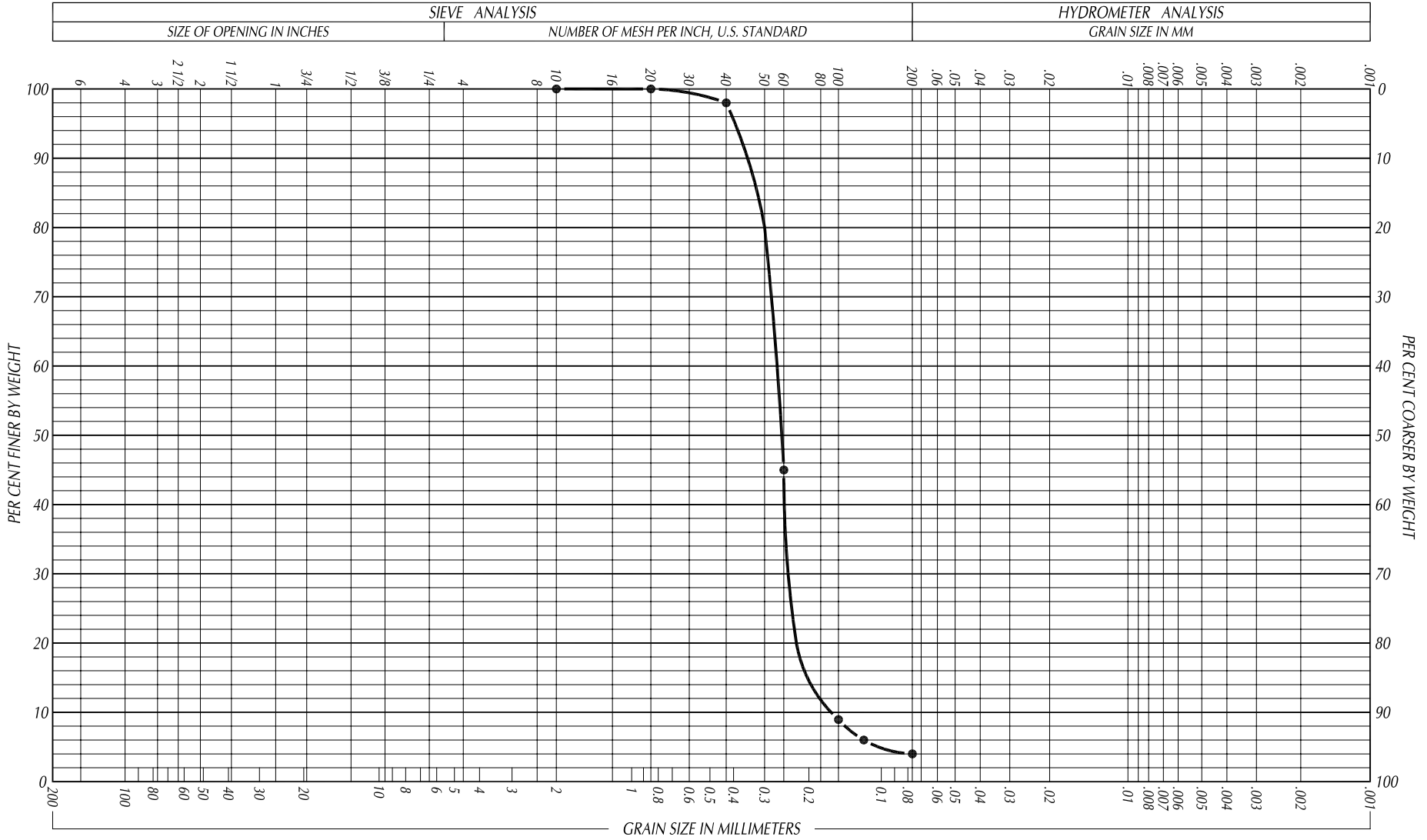
COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 50A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-27	S-18	90	SP	BROWN SAND; FINE GRAINED, TRACE SILT



COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 51A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-30	S-13	65	SP	GRAY SAND; FINE TO MEDIUM GRAINED, TRACE SILT



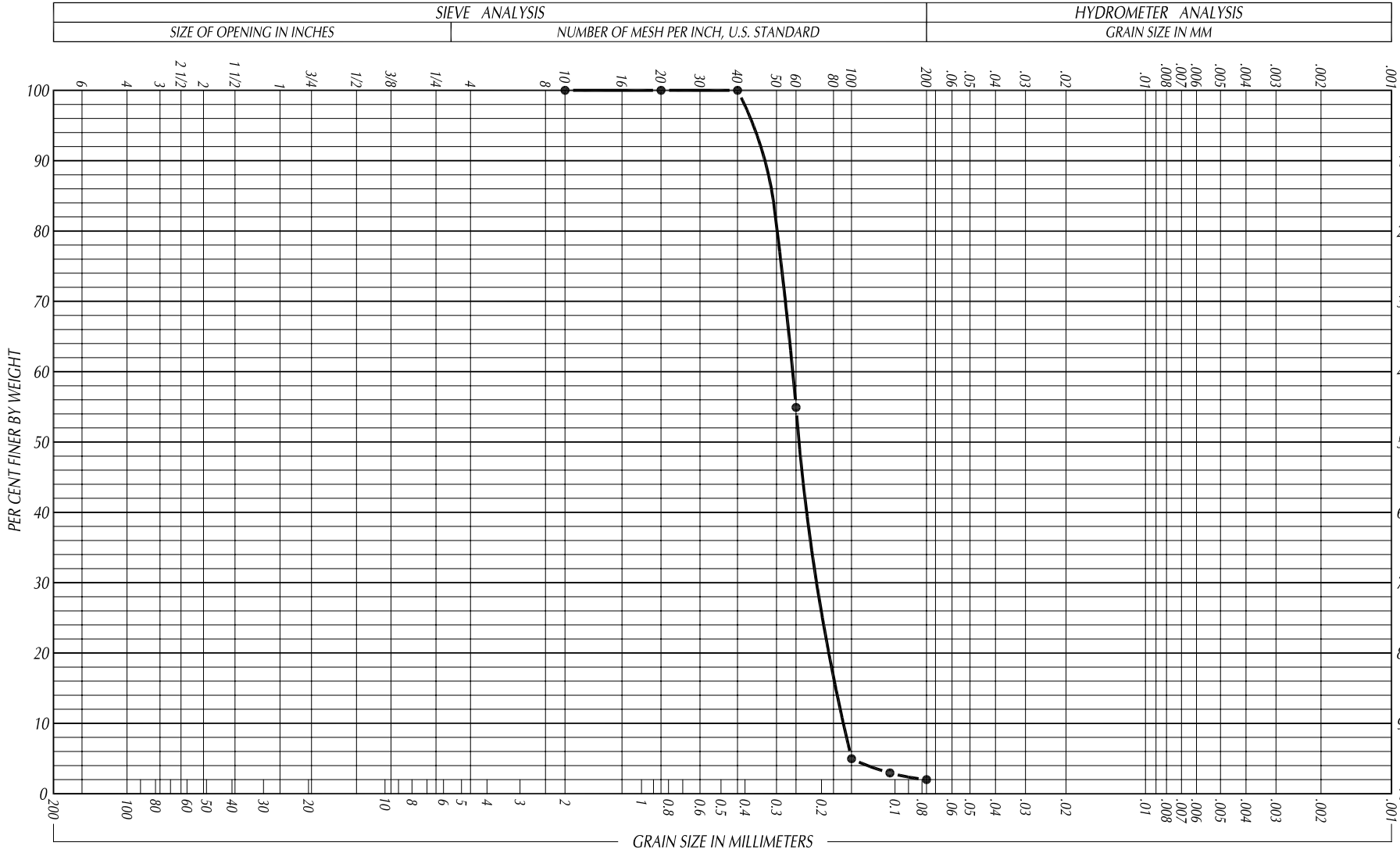
COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 52A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-35	S-4	20	SP	BROWN SAND; FINE GRAINED, TRACE SILT



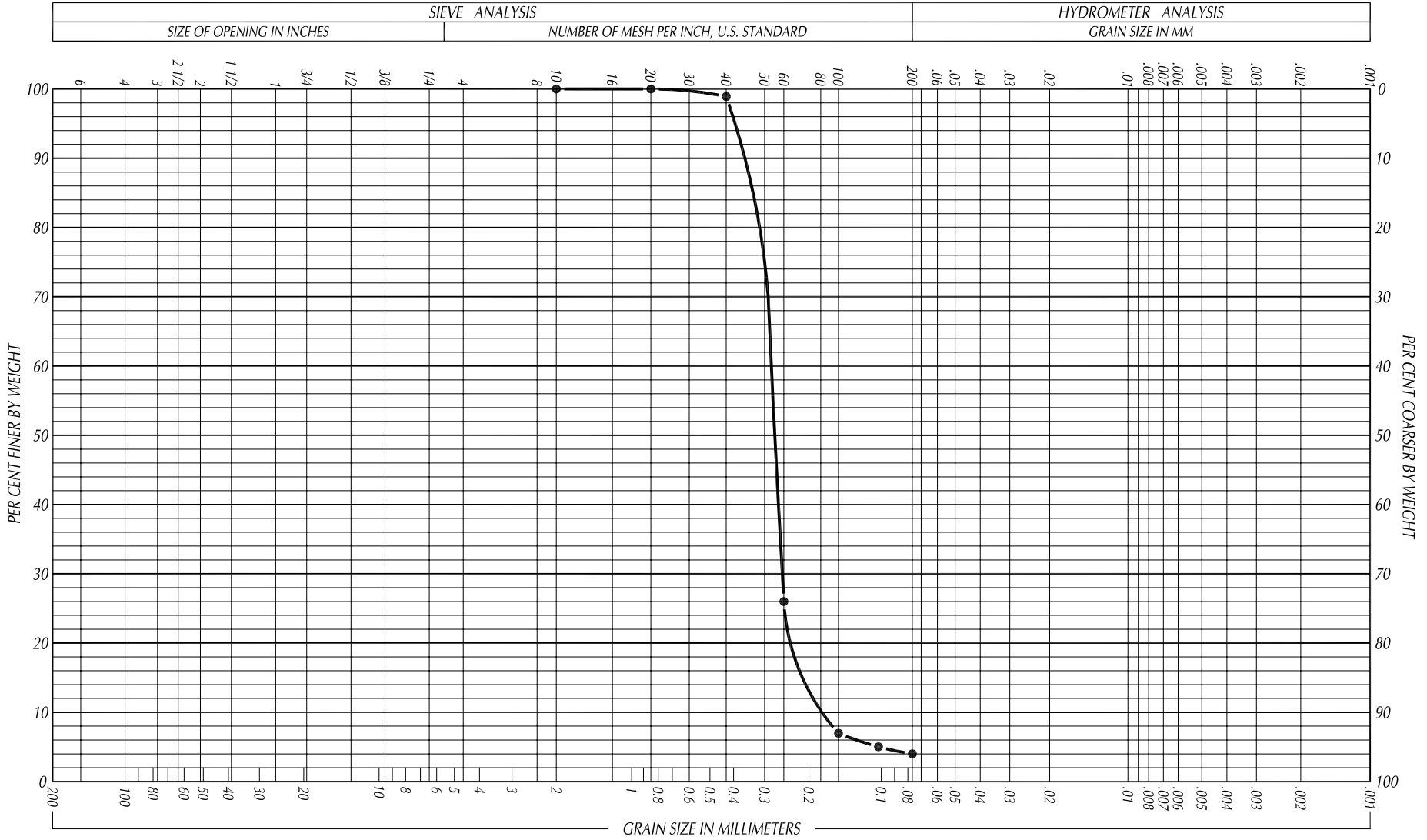
COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 53A

GRAIN SIZE ANALYSIS

SYMBOL	BORING	SAMPLE	DEPTH	CLASSIFICATION	DESCRIPTION
●	B-35	S-10	50	SP	GRAY SAND; FINE GRAINED, TRACE SILT



COBBLES	GRAVEL		SAND			FINES
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION

AUG. 2007 JOB NO. 4277-J FIG. 54A

APPENDIX B

CONSTRUCTION DURATIONS

POCB Slip and Access Channel EDMMP
Construction Duration Estimate

ODMDS Site F Open Water Disposal

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging	Clamshell/scow	1,350,000 yd^3	6,000 yd^3 /day	225
			Total (days)	**225**
			Total (months)	**7.5**

Notes: Dredging of access channel using two 12 cy clamshell dredge with four 3,000 cy scows. Duration based on 3,000 cy/day production rate per dredge working 24 hrs/day, 7 days/week.

Slip West Stockpile Site - Excavation

Item	Description	Quantity	Construction Rate	Total Time (days)
Excavation - Slip	Scraper/Excavator/Dump Truck	13,000 yd^3	5,000 yd^3 /day	3
			Total (days)	**3**
			Total (months)	**0.1**

Notes: Excavation of POCB Slip with 23 cy scrapers and hauled to site in 18 cy dump trucks. Assumes truck loads of 14 cy and R/T haul distance of less than 1 mile. Duration based on 560 cy/day production rate of dump trucks working 10 hrs/day, 7 days/week and nine dump trucks for a total production rate of 5,000 cy/day.

Mill Site - Excavation & Dredging

Item	Description	Quantity	Construction Rate	Total Time (days)
Excavation - Slip	Scraper/Excavator/Dump Truck	1,617,000 yd^3	5,000 yd^3 /day	323
Dredging - Slip	Cutter Suction Dredge	800,000 yd^3	12,000 yd^3 /day	67
			Total (days)	**390**
			Total (months)	**13.0**

Notes: Excavation of POCB Slip with 23 cy scrapers and hauled to site in 18 cy dump trucks. Assumes truck loads of 14 cy and R/T haul distance of 4 miles. Duration based on 560 cy/day production rate per dump truck working 10 hrs/day, 7 days/week and nine dump trucks for a total production rate of 5,000 cy/day. Dredging of POCB Slip using cutter suction dredge and pumping to placement site. Duration based on 12,000 cy/day production rate of dredge working 24 hrs/day, 7 days/week.

POCB Slip and Access Channel EDMMP
Construction Duration Estimate

Mill Site - Dredging

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging - Access Channel	Cutter Suction Dredge	1,350,000 yd^3	18,000 yd^3 /day	75
			Total (days)	**75**
			Total (months)	**2.5**

Notes: Dredging of Access Channel using cutter suction dredge and pumping to placement site. Duration based on 18,000 cy/day production rate of dredge working 24 hrs/day, 7 days/week.

Ingram Yard

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging - Slip	Cutter Suction Dredge	1,380,000 yd^3	12,000 yd^3 /day	115
Dredging - Berm	(2) Cutter Suction Dredges	500,000 yd^3	30,000 yd^3 /day	17
			Total (days)	**132**
			Total (months)	**4.3**

Notes: Dredging of POCB Slip using cutter suction dredge and pumping to placement site. Duration based on 12,000 cy/day production rate of dredge working 24 hrs/day, 7 days/week. Dredging of the earthen berm includes dredging from the Coos Bay side and the Slip side using cutter suction dredge and pumping to placement site. Duration based on 30,000 cy/day (12,000 cy/day + 18,000 cy/day) production rate of dredge working 24 hrs/day, 7 days/week.

POCB Slip and Access Channel EDMMP
Construction Duration Estimate

North Spit Tsunami Protection Levee

Item	Description	Quantity	Construction Rate	Total Time (days)
Excavation - Slip	Scraper/Excavator/Dump Truck	2,300,000 yd^3	5,000 yd^3 /day	460
			Total (days)	**460**
			Total (months)	**15.1**

Notes: Excavation of POCB Slip with 23 cy scrapers and hauled to site in 18 cy dump trucks. Assumes truck loads of 14 cy and R/T haul distance of 4 miles. Duration based on 560 cy/day production rate per dump truck with nine dump trucks working 10 hrs/day and 7 days/week, for a total production rate of 5,000 cy/day.

Port Site

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging - Upland Phase	Cutter Suction Dredge - In Launch Pond	2,180,000 yd^3	12,000 yd^3 /day	182
Dredging - In-Water Phase 1	Cutter Suction Dredge - From Bay	1,350,000 yd^3	30,000 yd^3 /day	45
Dredging - In-Water Phase 2	Cutter Suction Dredge	500,000 yd^3	42,000 yd^3 /day	12
			Total (days)	**227**
			Total (months)	**7.5**

Notes: Dredging of POCB Slip using cutter suction dredge and pumping to placement site. Duration based on 12,000 cy/day production rate of dredge working 24 hrs/day, 7 days/week. Dredging of the earthen berm includes dredging from the Coos Bay side and the Slip side using cutter suction dredge and pumping to placement site. Duration based on 42,000 cy/day (12,000 cy/day + 30,000 cy/day) production rate of dredge working 24 hrs/day, 7 days/week. Dredging of the Access Channel using cutter suction dredge and pumping to placement site. Duration based on 30,000 cy/day production rate of dredge working 24 hrs/day, 7 days/week.

POCB Slip and Access Channel EDMMP
Maintenance Duration Estimate

ODMDS Site F Open Water Disposal

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging	Clamshell/scow	115,000 yd^3	6,000 yd^3/day	19
			Total (days)	**19**
			Total (months)	**0.6**

Item	Description	Quantity	Construction Rate	Total Time (days)
Dredging	Clamshell/scow	160,000 yd^3	6,000 yd^3/day	27
			Total (days)	**27**
			Total (months)	**0.9**

Notes: Maintenance dredging of the POCB Slip and Access Channel using a 12 cy clamshell dredge with two 3,000 cy scows. Duration based on 3,000 cy/day production rate per dredge working 24 hrs/day, 7 days/week.

1617000

TAB: E. LAND USE COMPATIBILITY STATEMENT (LUCS) and ORDINANCE 1982

Oregon Department of Environmental Quality
LAND USE COMPATIBILITY STATEMENT (LUCS)
p. 1 of 2

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 I.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 I.C. For example, if the applicant's project is described in I.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)*:
- [XX] 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

TAB: F. REPORT ON TURBIDITY DUE TO DREDGING

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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

S. Tonkin

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.

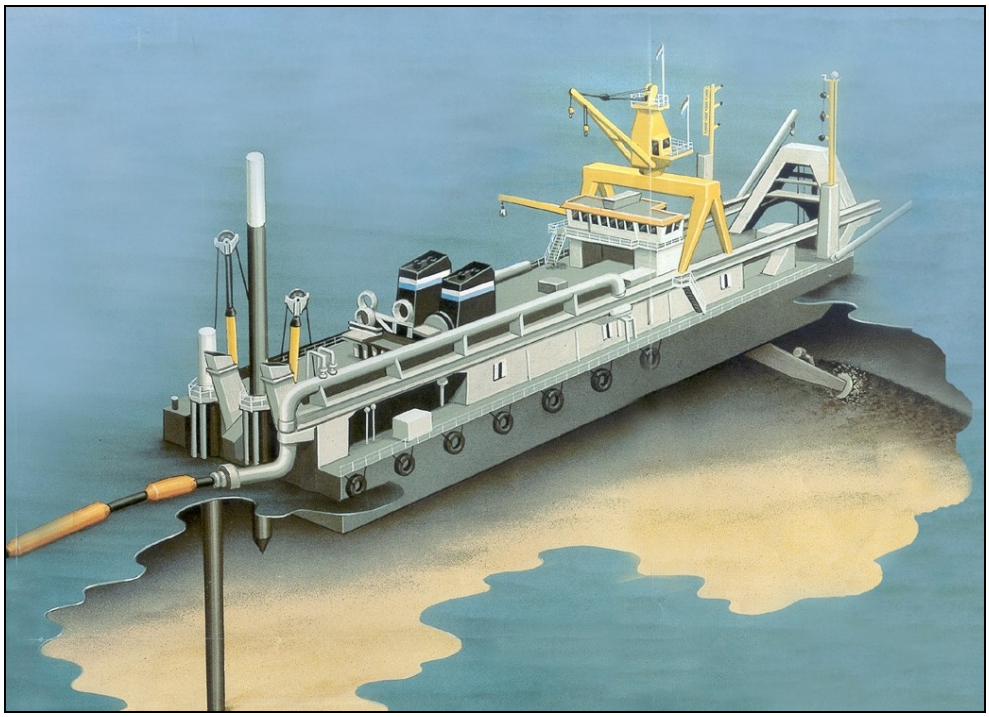

Figure 2-1: Hydraulic Cutterhead Suction Dredge (from Oilfield Publications Limited, n.d.)



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.

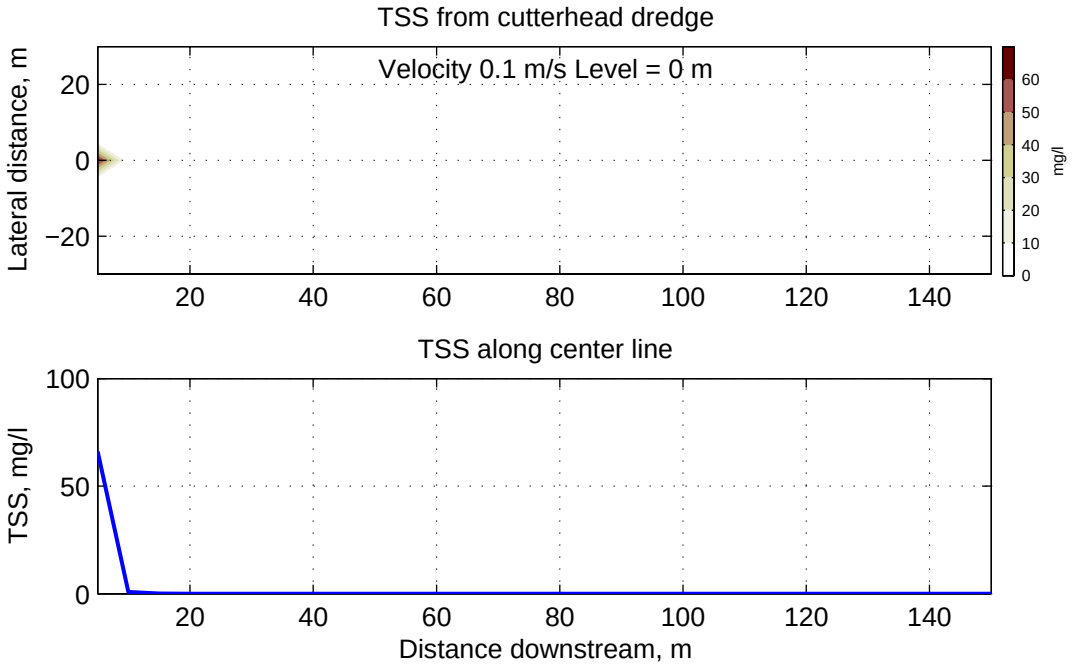

Figure 3-1: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.1 m/s (0.2 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

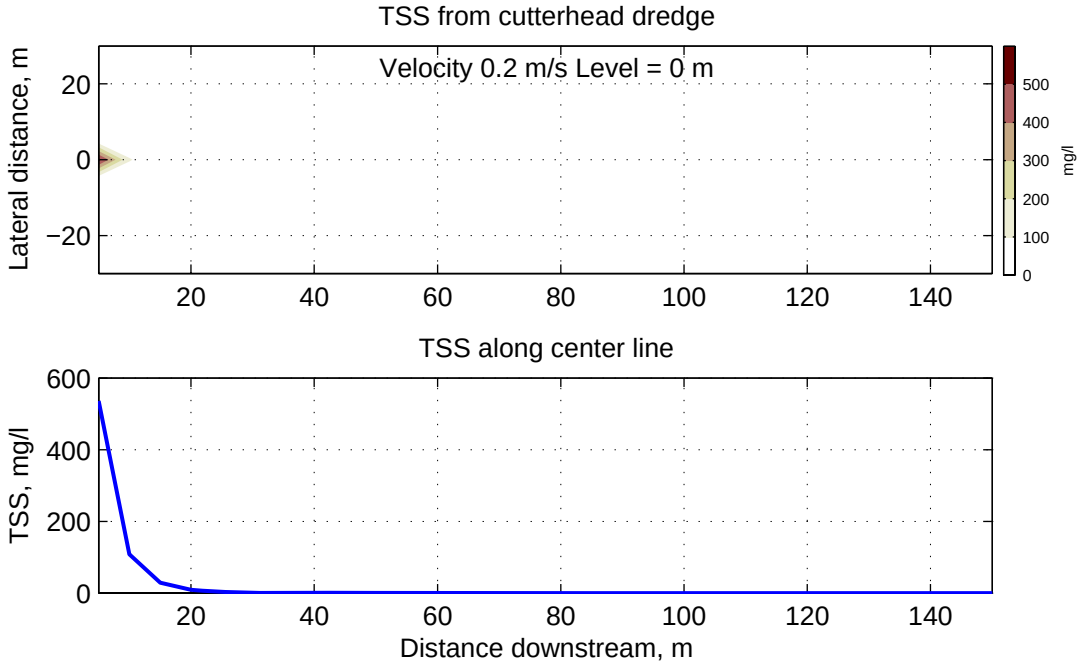

Figure 3-2: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 0.2 m/s (0.4 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

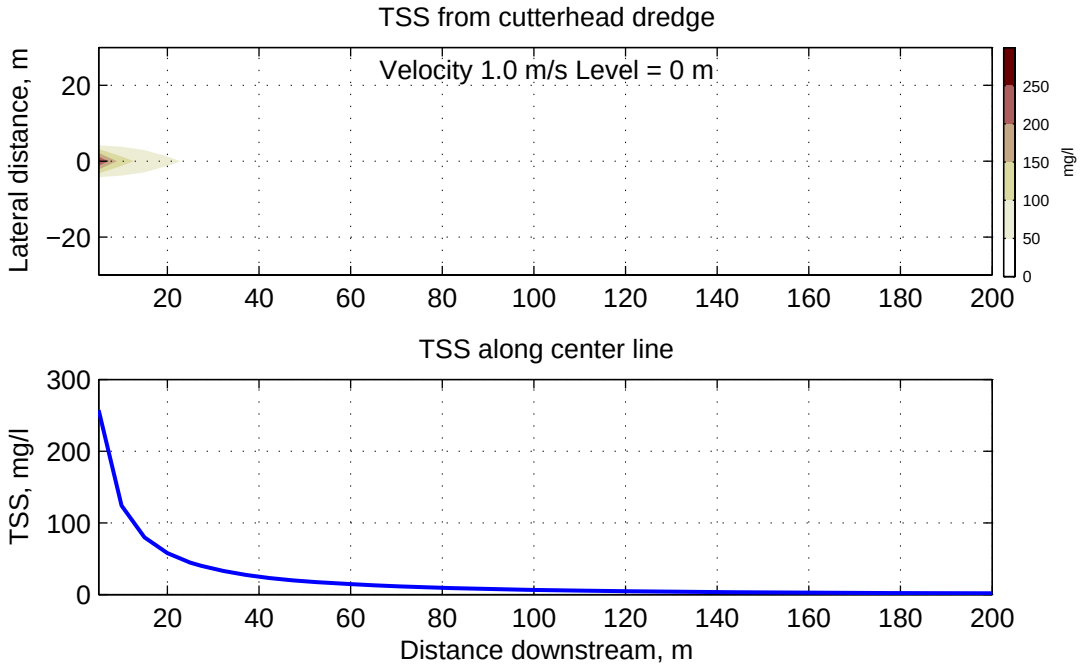

Figure 3-3: Results for Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of Cutterhead during Construction Dredging

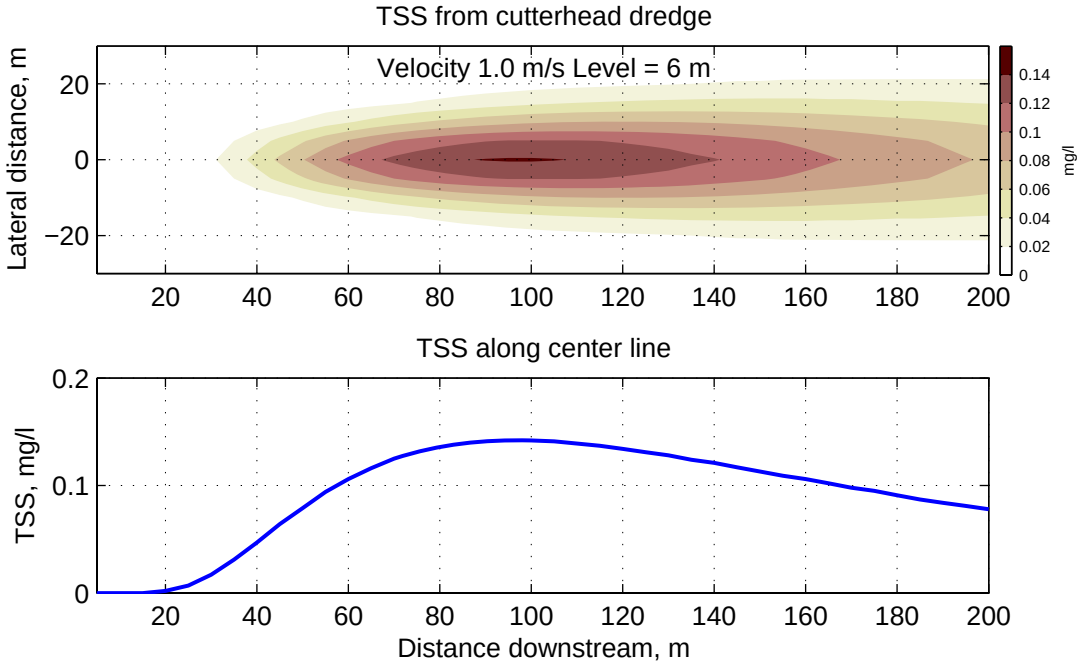

Figure 3-4: Suspended Sediment Concentrations from DREDGE Model for Hydraulic Dredge for 1.0 m/s (1.9 knots) Current at Elevation of 6 m above Cutterhead during Construction Dredging

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.

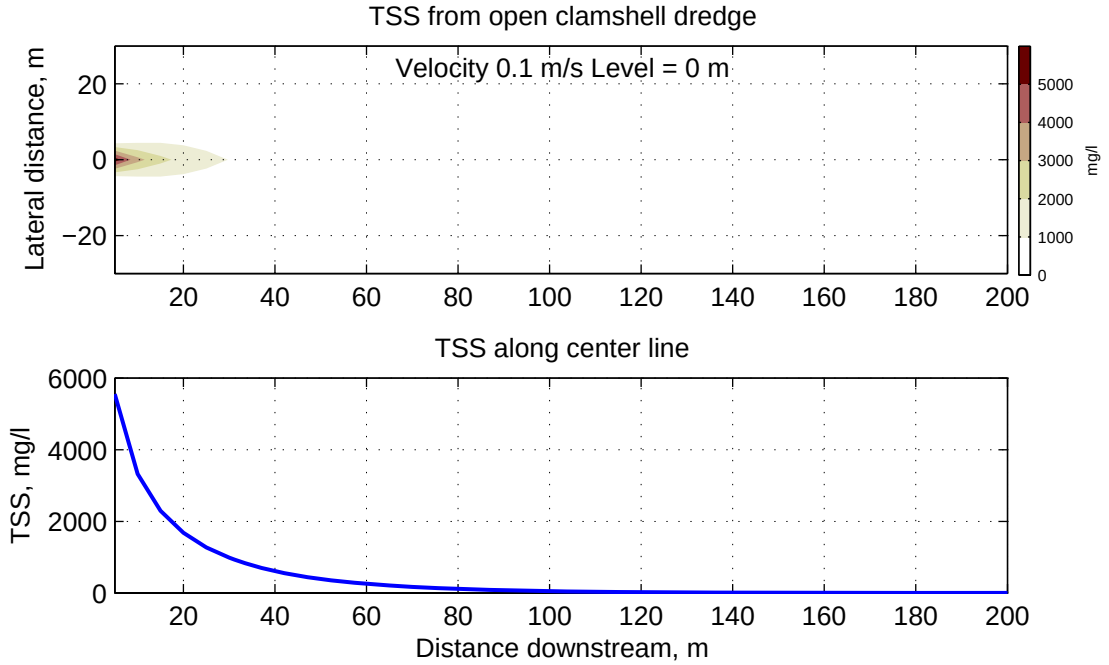

Figure 3-5: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Construction Dredging

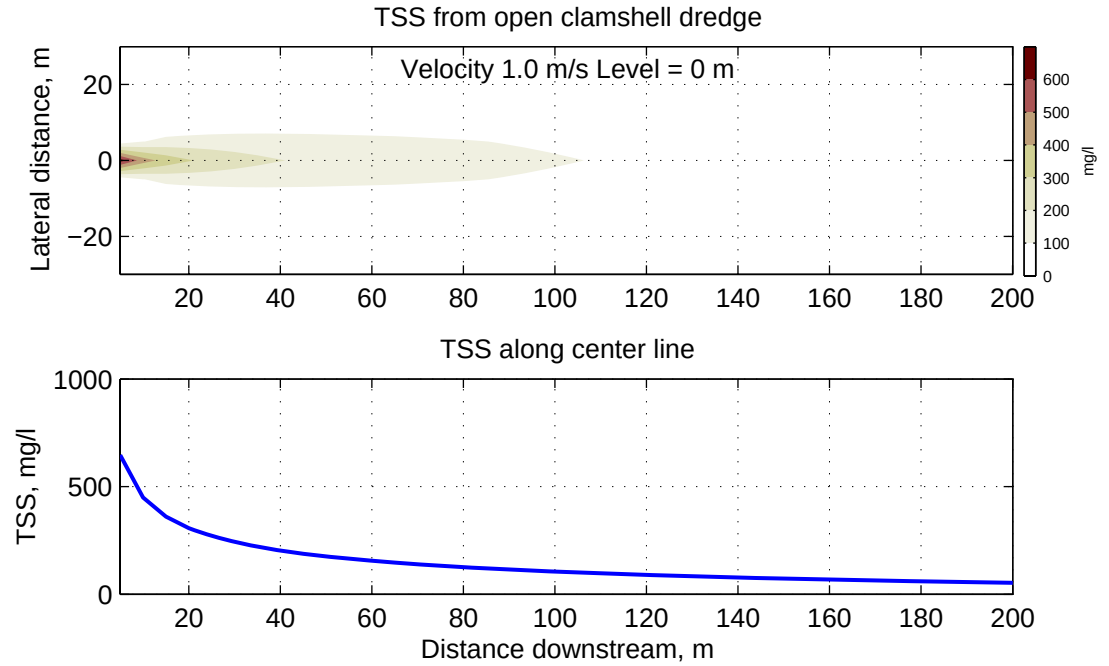

Figure 3-6: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Construction Dredging

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.

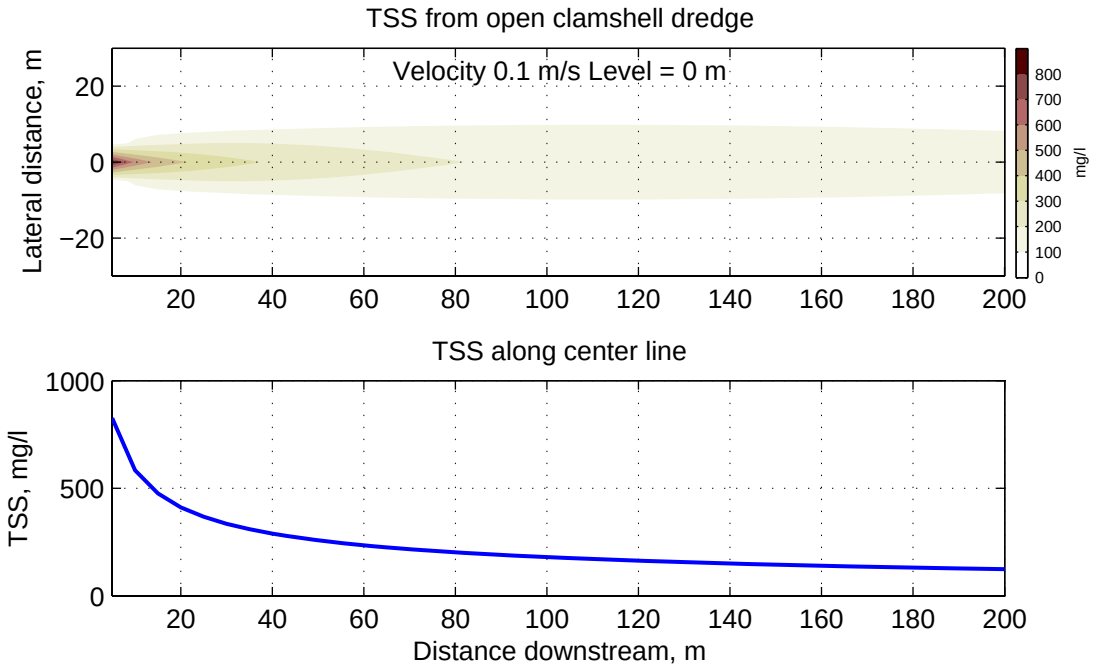

Figure 3-7: Suspended Sediment Concentrations from DREDGE Model for Open "Clamshell" Dredge for 0.1 m/s (0.2 knots) Current during Maintenance Dredging

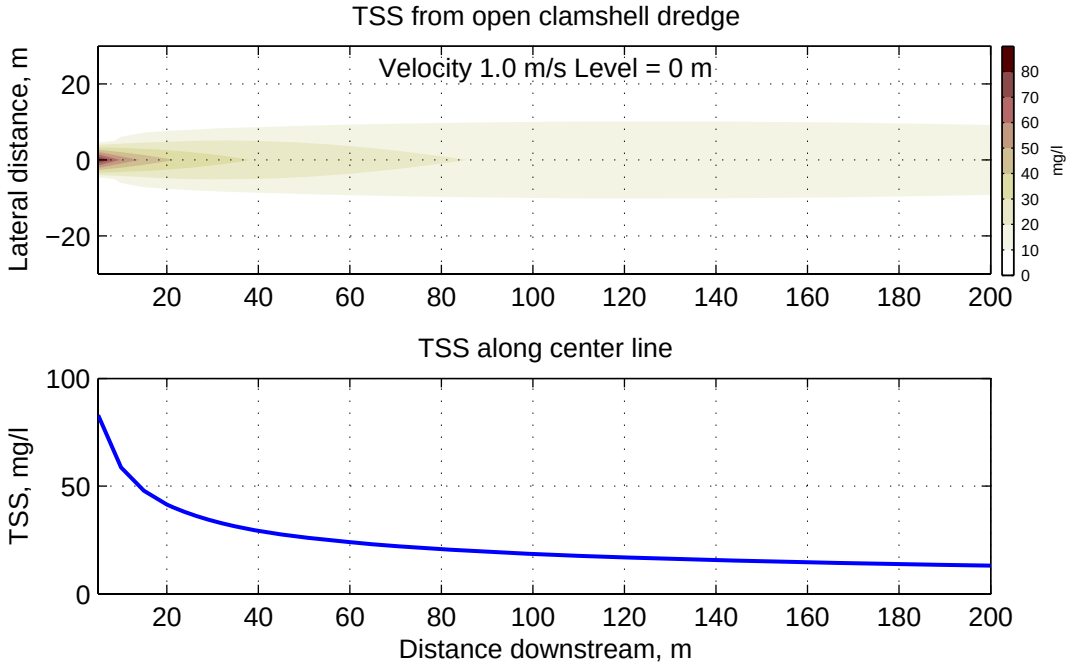

Figure 3-8: Suspended Sediment Concentrations DREDGE Model for Open "Clamshell" Dredge for 1.0 m/s (1.9 knots) Current during Maintenance Dredging

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.

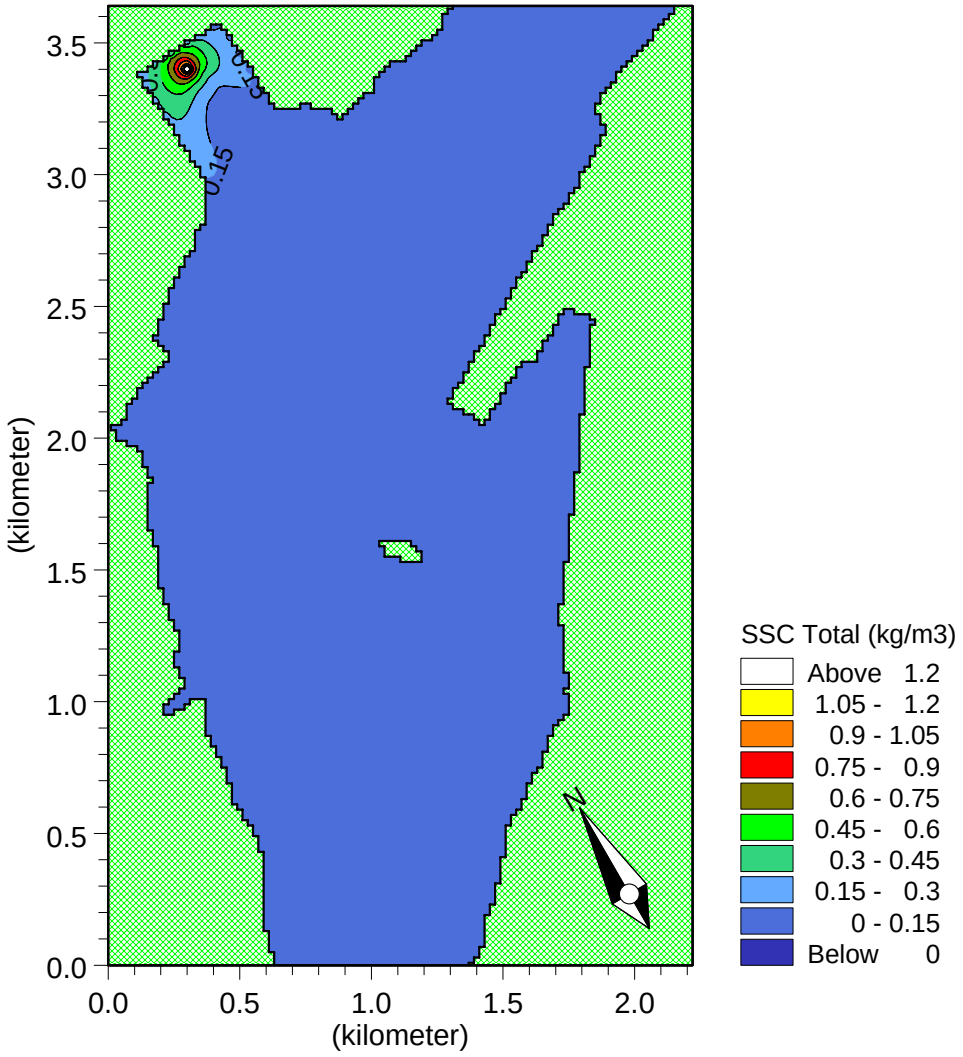

Figure 3-9: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging Inside Basin (1 kg/m^3 = 1,000 mg/l)

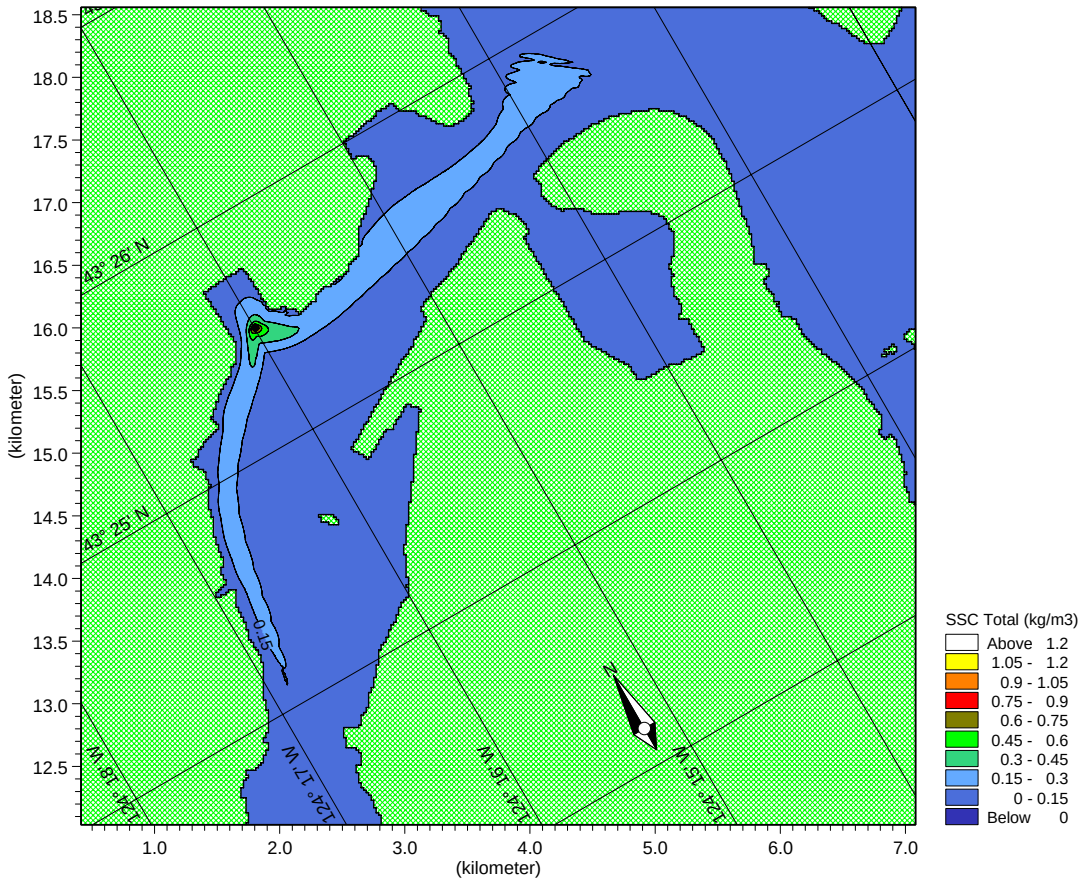

Figure 3-10: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging at Basin Entrance (1 kg/m^3 = 1,000 mg/l)

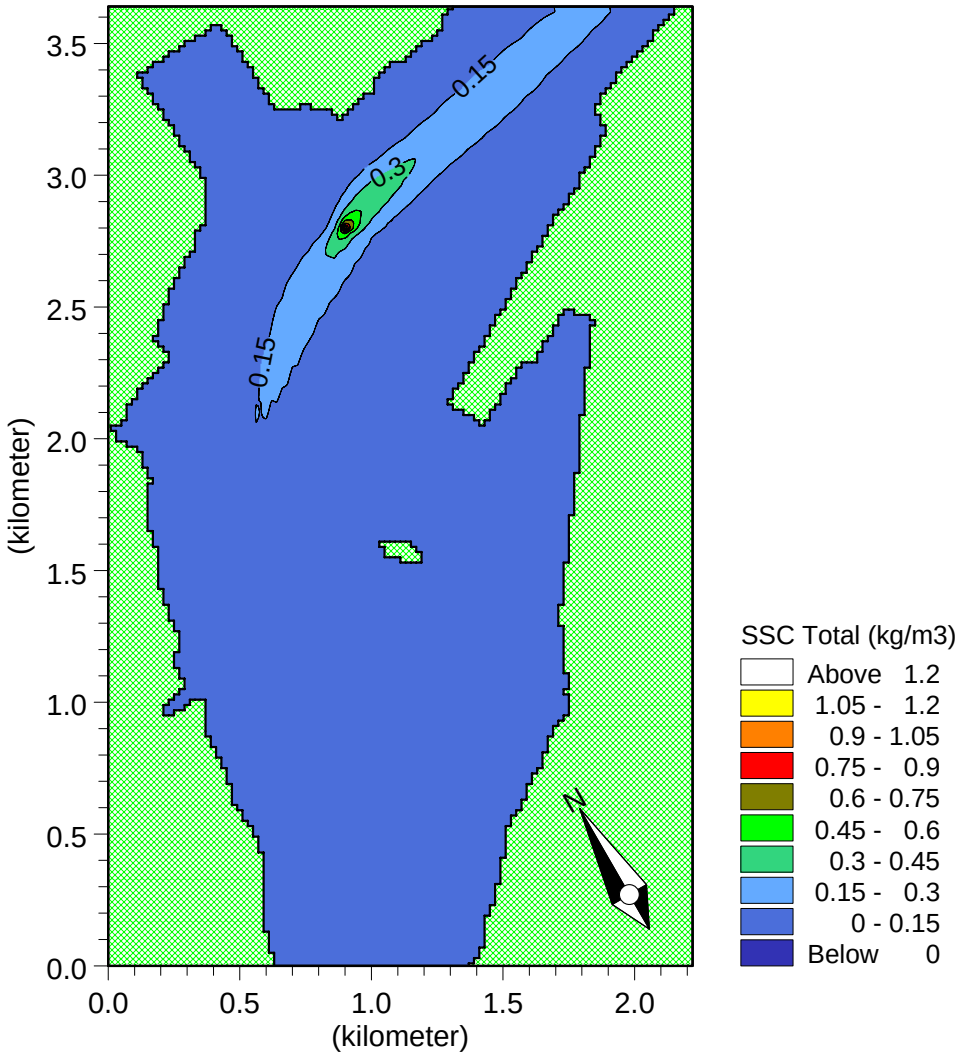

Figure 3-11: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Construction Dredging in the Channel (1 kg/m^3 = 1,000 mg/l)

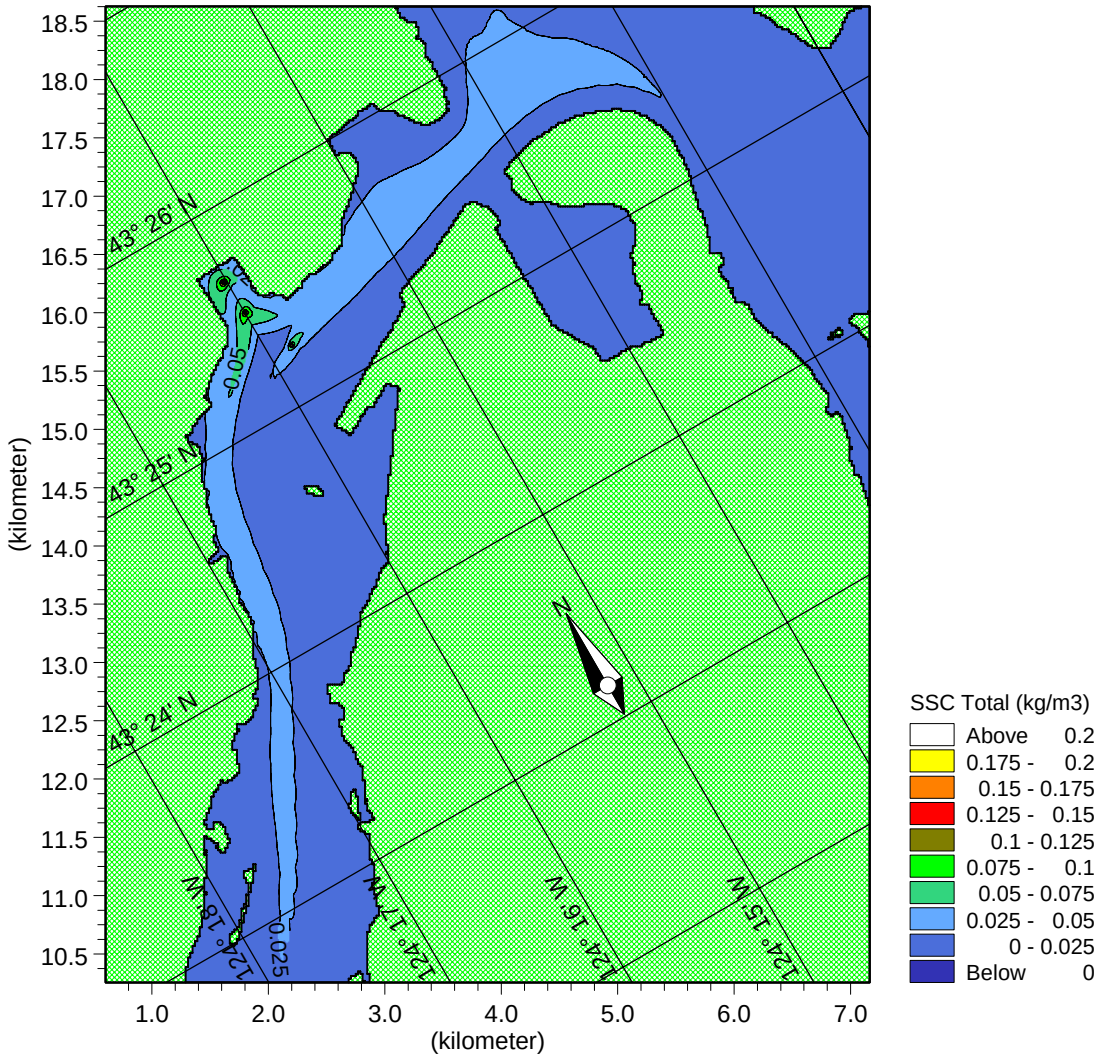

Figure 3-12: Maximum Suspended Sediment Concentrations Predicted with Mike21 Two-Dimensional Model for Open "Clamshell" Dredge during Maintenance Dredging (1 kg/m^3 = 1,000 mg/l)

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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Kuo, A., Welch, C., and Lukens R. (1985). *Dredge induced turbidity plume model*, ISCE Journal of Waterway, Port, Coastal, and Ocean Engineering, Vol. 111, No. 3.

Nakai, O. (1978). *Turbidity generated by dredging projects*. Paper presented at the 3rd U.S./Japan Experts Meeting, US Army Engineer Water Resources Support Center, Ft. Belvoir, VA.

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Packman, J.J, Comings, K.J., and D.B. Booth (1999) *Using turbidity to determine total suspended solids in urbanizing streams in the Puget Lowlands*, in Confronting Uncertainty: Managing Change in Water Resources and the Environment, Canadian Water Resources Association annual meeting, Vancouver, BC, 27–29 October 1999, p. 158–165.

NANOOS (2006) *Pilot Project, Pacific Northwest estuaries and shores*, retrieved from http://www.ccalmr.ogi.edu/nanoos/

TAB: G. ENVIRONMENTAL PROTECTION AGENCY DE-DESIGNATION OF OCEAN DREDGED MATERIAL DISPOSAL SITE AND DESIGNATION OF NEW SITE NEAR COOS BAY (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

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

[[Page 27400]]

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

TAB: H. MEAN LOW TIDE CONCURRENCE

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

March 11, 2013

State Land Board

John A. Kitzhaber, MD
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

JG410\JORDAN COVE ENERGY PROJECT
SEAN SULLIVAN
SENIOR PROJECT MANAGER
DAVID EVANS AND ASSOCIATES, INC
2100 SW RIVER PARKWAY
PORTLAND OR 97201

RE: Concurrence of Line of Mean Low Tide for Jordan Cove Energy Project in Coos River Estuary

Dear Sean:

The Land Management Division of the Department of State Lands received your request for concurrence of the location (elevation) of the Line of Mean Low Tide (Mean Low Water Line) at the slip site for the Jordan Cove Energy Project in the Coos River Estuary (Figure 1). Accompanying your request was supporting survey data and a figure.

The Line of Mean Low Tide in this part of the Coos River Estuary demarks the upper (landward) limit of the state of Oregon (Department of State Lands) ownership of the bed and banks of the river. Structures and uses landward of this 'line' are exempt of proprietary jurisdiction of the Department, except for those issues related to the historical placement of state-owned dredge material on the adjoining uplands As you are aware, activities landward of this line (elevation) may still require other state, federal and local agency approvals.

The survey information that was forwarded with your request referenced the location of the Line of Mean Low Tide (Mean Low Water Line) as 0.36 feet NAVD88. Our Ownership Specialist and I reviewed your information and compared it with our data, and concur your determination of the Line of Mean Low Tide (Mean Low Water Line) as 0.36 feet NAVD88 (Figure 2).

If you have any questions or comments, please contact me at your convenience, 503 986-5233, or our Ownership Specialist, Gerry Hutson at 503-986-5291.

Sincerely,

Jim Grimes
Land Manager
North Columbia Region
Land Management Division
Enclosure

Cc: David Koch, International Port of Coos Bay
Bob Braddock, Jordan cove Energy Project, LC
Lynn McAllister DSL Wetlands, Gloria Kiryuta, DSL Regulatory
Gerry Hutson, DSL Proprietary
Coos County Planning

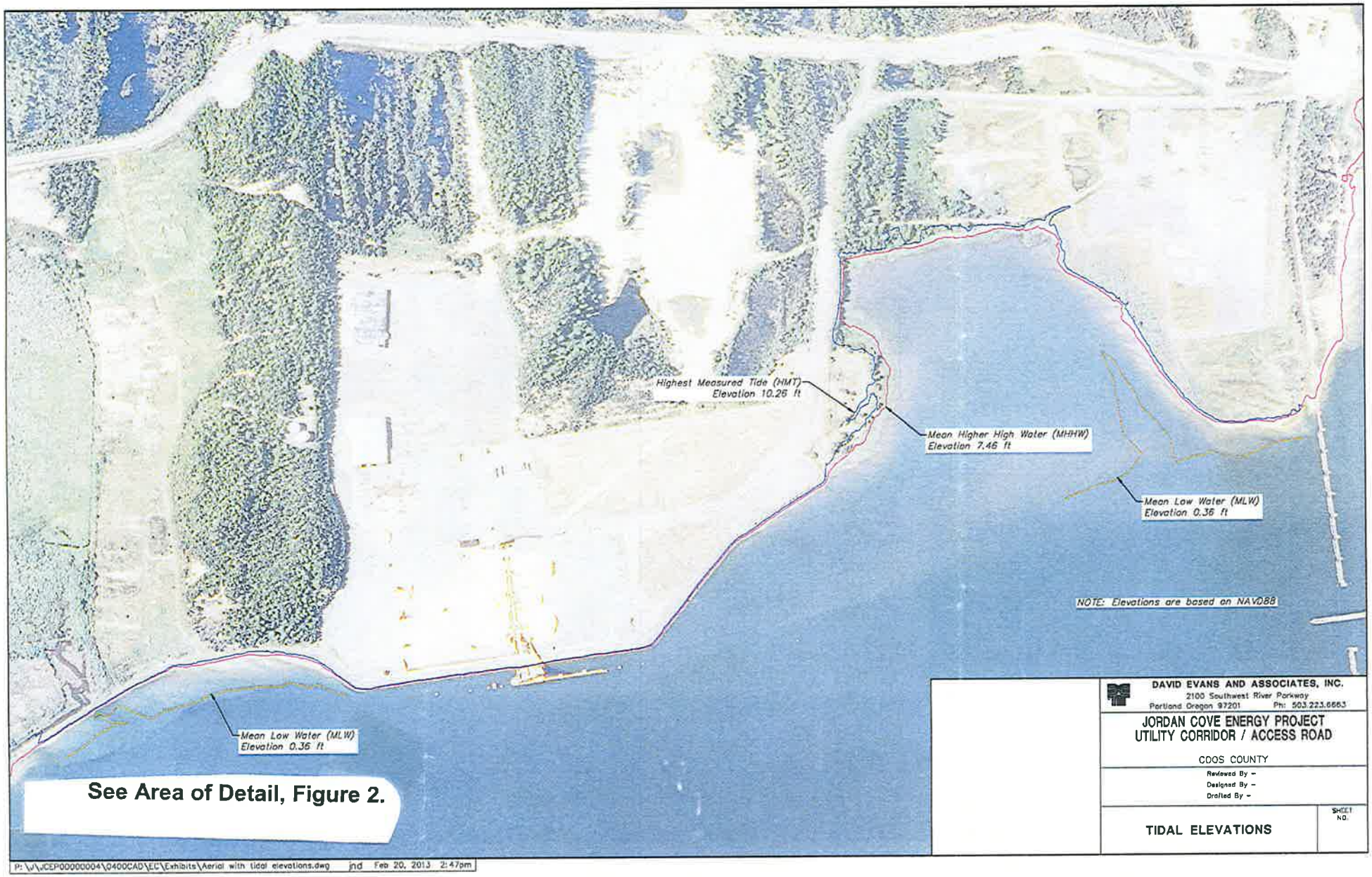


Figure 1. Jordan Cove Energy Project – Confirmation of Line of Mean Low Tide at the Slip Site.

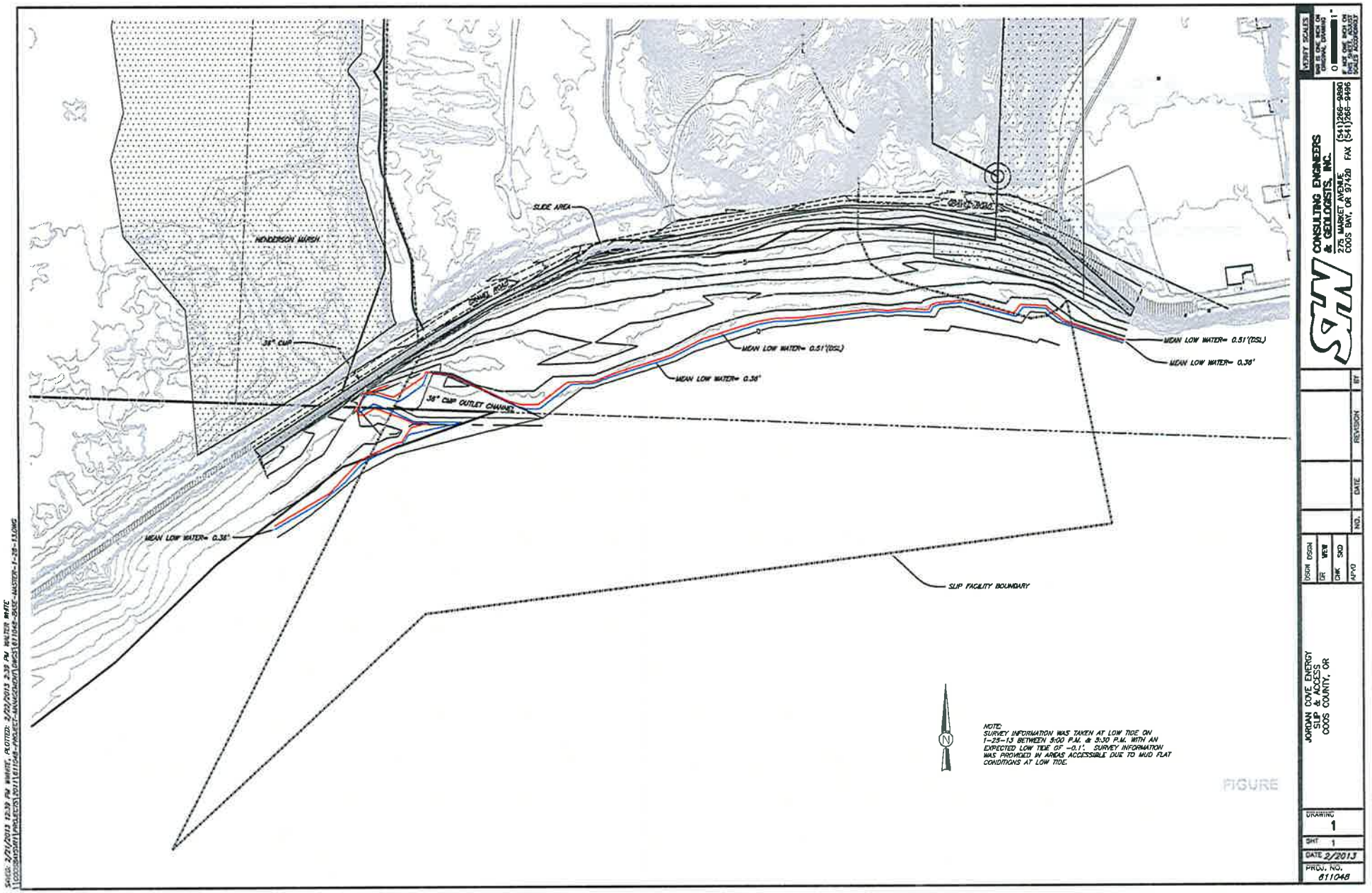
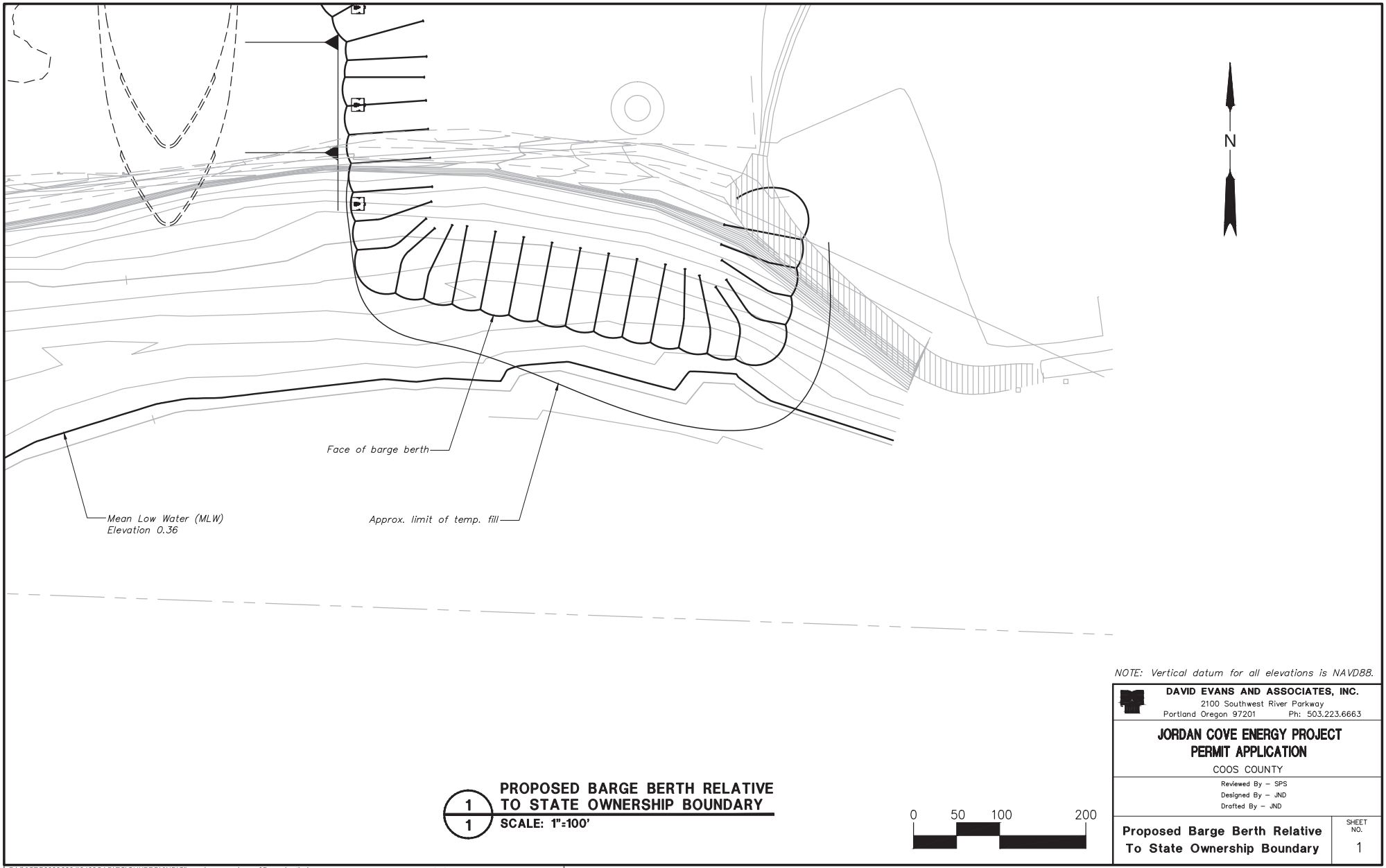


Figure 2. Area of Detail, Location of Line of Mean Low Tide, elevation of 0.36 feet NAVD88.



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PROPOSED BARGE BERTH RELATIVE TO STATE OWNERSHIP BOUNDARY

SCALE: 1"=100'

0 50 100 200

NOTE: Vertical datum for all elevations is NAVD88.

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2100 Southwest River Parkway
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JORDAN COVE ENERGY PROJECT
PERMIT APPLICATION

COOS COUNTY

Reviewed By – SPS
Designed By – JND
Drafted By – JND

Proposed Barge Berth Relative To State Ownership Boundary

SHEET NO. 1

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