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July 26, 2019

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VIA EMAIL ONLY

Henry O. Hearley
Assistant Planner
Lane Council of Governments
859 Willamette Street, Suite 500
Eugene, OR 97401

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

Dear Henry:

This letter, with attachments, responds to your June 12, 2019 letter regarding completeness review of the May 10, 2019 Jordan Cove Energy Project, L.P. ("Jordan Cove" or "JCEP") *City of Coos Bay Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA* (hereafter, "*Application*"). In your June 12, 2019 letter, you identify four (4) items for which City of Coos Bay (the "City") staff have requested additional information in order to proceed with the *Application*. Accordingly, JCEP provides the following supplemental information (with attachments) to address these items. As provided below, JCEP re-states the requested information from the June 12, 2019 letter and provides responses (with citations, as appropriate).

Item 1, Site Description, Zoning, Ownership:

"The Oregon Department of State Lands (DSL) is the owner/manager of the estuarine submerged land. You indicate JCEP is requesting DSL's signed consent to the application. Please submit the signed consent once you have obtained it."

JCEP RESPONSE:

JCEP has received the signed landowner consent from DSL dated July 22, 2019 (*see* Attachment A, hereto).

Item 2, Temporary Dredge Transfer Line:

***"Exhibit C** maps (page 8 of 14 and page 13 of 14) calls out a "temporary dredge transfer line" as part of the project required for mitigation. Please clarify how the "temporary dredge transfer line" will be used. Please thoroughly discuss any negative impacts in the immediate area within the 52-NA Aquatic Unit resulting from a temporary dredge transfer line. Additionally, please thoroughly describe how the proposed eelgrass mitigation will not harm existing eelgrass beds to the extent possible."*

JCEP RESPONSE:

A thorough response addressing: 1) how the temporary dredge transfer line will be used, 2) potential impacts (and appropriate mitigation) related to the temporary dredge transfer line, and 3) information on how the eelgrass mitigation project will not harm existing eelgrass beds is provided in the attached *Technical Memorandum: City of Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA - Supplemental Information (July 22, 2019)* which was prepared by David Evans and Associates (hereafter, "*DEA Technical Memorandum*"). *See* Attachment B, hereto. The *DEA Technical Memorandum* further provides references to additional information, supporting documents and citations. JCEP requests that the Technical Memorandum and supporting documents/citations be included in the record for the *Application*.

Item 3, Clarifications Requested: (Note: Item 3 includes "Clarifications Requested" for five separate issues, which JCEP responds to below as Items 3.A through 3.E).

Item 3.A: "*Staff understands this application is specific to an Eelgrass Mitigation Site located within the City of Coos Bay jurisdiction. Is there a separate land use application in a different jurisdiction for the Kentuck Project Site?"*

JCEP RESPONSE:

You are correct that the application pending before the City relates specifically to proposed eelgrass mitigation activities at a location within the City of Coos Bay. Regarding the Kentuck Mitigation Site (located in Coos County), this area is proposed for broader mitigation activities associated with the JCEP LNG project, but not specifically eelgrass mitigation. Required land use approvals from Coos County for

the proposed Kentuck mitigation activity have been obtained, and the remaining requests for authorization from the Oregon DSL and U.S. Army Corps of Engineers (USACE) are currently pending.

Item 3.B: "*On page 7 of 271 of Exhibit B at the bottom of paragraph four the report states 'All temporary impacts, short and long duration, will be addressed in a separate site restoration plan.' Does this plan relate to the Eelgrass Mitigation Site? If so, please provide it for the record."*

JCEP RESPONSE:

The reference on page 7 of Exhibit B (the November 1, 2019 *Compensatory Wetland Mitigation Plan*) to a "separate site restoration plan" is intended to make a distinction between permanent impacts that *require mitigation* under the applicable dredge/fill rules vs. temporary impacts that do not require mitigation, but will be addressed within the removal/fill permit application process (at areas where such temporary impacts occur). Because the Eelgrass Mitigation Site is specifically tied to *mitigation of permanent impacts*, the referenced "separate site restoration plan" is distinct from the Eelgrass Mitigation Site and is, accordingly, not relevant to the record for the *Application*.

Item 3.C: *"On page 16 of 271 of Exhibit B in the last paragraph, the report reads 'the proposed approach is to excavate the locally high area surrounded by eelgrass down to approximately...' Please provide an explanation of the excavation process so Staff is in a better position to field questions posed by the general public. If the process is detailed in the application materials, please point out to Staff where the information is contained."*

JCEP RESPONSE:

The excavation process for the Eelgrass Mitigation Site is designed to create optimal depth habitat for eelgrass (-1.0 to -2.0 ft NAVD 88) in the sandy shoal of the mitigation area, which is currently too shallow in areas to support eelgrass. The proposed method of excavation is via a shallow-water hydraulic dredge that will excavate the upper/shallow areas of the shoal to create more uniform depth for ideal eelgrass habitat. This is captured in a number of documents (in addition to

Exhibit B to the *Application*) including the JCEP *Joint Permit Application* submitted to Oregon DSL and the USACE to authorize removal/fill, *Attachment D.9*, *Technical Memorandum: Eelgrass Mitigation Site, Dredging/Excavation Means and Methods Feasibility (October 16, 2017)* which provides, in part, as follows:

> **4.1 DREDGE**
> For planning purposes, it is anticipated that a dredge designed to access and work in shallow water sensitive habitats such as marshes and nearshore areas would be utilized. The dredge would be equipped with a hydraulic dredge pump system mounted on an excavator arm. Dredges of this type are typically relatively small in footprint (14 foot by 48 foot range) and portable/truckable. They can often self-launch from a shallow bank without the assistance of a crane or other equipment. They are equipped with a spud system for positioning and holding the dredge in place, and some may be equipped with hydraulic pontoons or legs to enhance operations in shallow, soft bottom locations. The dredge may also be equipped with low impact self-propulsion systems. Pump sizes can vary, but a range of, 10 to 16 inch diameter discharge line, is typical. Considering the distance the dredge material will need to be pumped and potential site conditions, a 14 inch diameter discharge line is considered for planning. An example of the type of hydraulic dredge being discussed is shown in Figure 3. The contractor will need to take into consideration the impacts from potential wind waves and vessel wakes at the site, during all water levels,
> when selecting equipment and planning work.
>
> Production rates can vary significantly based on pump power and configuration, line length, booster pumps, material type, % solids in slurry, etc. The Initially estimated production rate for a 14-inch discharge line is 400 cubic yards per pumping hour. If a total efficiency rate of 50% is used with a 24-hour work day, the daily production rate is approximately 4,800 cy/day. If a 12-hour work day is considered, then the daily production rate is approximately 2,400 cy/day. Conservatively considering a 12-hour work day, it would take approximately 16 pumping days to remove 38,000 cubic yards of material. Adding in sufficient time for mobilization/demobilization, pipeline construction and removal, and loader construction/setup, a total work window of 40 - 50 days should be considered.

A complete copy of Attachment D.9 to the *Joint Permit Application* is provided as Attachment C, hereto.

Item 3.D: *"Please provide Staff an update on whether an application for the proposed excavation with respect to Eelgrass Mitigation has been submitted to appropriate state and federal agencies (ODSL, USACE, etc ...) (referenced previous approval from ODSL on page 42 of271 of Exhibit B)."*

JCEP RESPONSE:

The excavation component of the Eelgrass Mitigation Site is included in the *Joint Permit Application* to Oregon DSL and the USACE to authorize removal/fill, and approval will be required before JCEP can commence any excavation of the Eelgrass Mitigation Site.

Item 3.E: *"On page 46 of 271 of Exhibit B, the report references USACE comments (USACE 2018a). If the USACE comments with respect to the proposed eelgrass mitigation are available, please provide it for the record."*

JCEP RESPONSE:

The USACE comments referenced (*USACE 2018a*) were made in response to an earlier version of the *Compensatory Wetland Mitigation Plan* (dated October 31, 2017). The current version of the *Compensatory Wetland Mitigation Plan* (Exhibit B to the *Application*, dated November 1, 2018) was revised in response to the USACE comments. The *DEA Technical Memorandum* provides a discussion of the USACE comments including how the updated *Compensatory Wetland Mitigation Plan* addresses and/or responds to these comments. *See DEA Technical Memorandum*, pp. 6 through 11. In this regard, the current *Compensatory Wetland Mitigation Plan* has been modified to provide a robust Eelgrass Mitigation Site plan. With this caveat, the USACE comments (*USACE 2018a*) are provided as Attachment C, hereto.

Item 4, Process (Informational Only; no Documents Requested of Applicant):

JCEP RESPONSE:

The City's decision to use a Type III process for the *Application* is noted and Applicant supports this decision.

Thank you for your consideration of the enclosed information. If you have any further questions or require any additional information regarding the *Application*, please let me know.

Very truly yours,

Steven L. Pfeiffer

SLP:rsr

cc: Carolyn Johnson, City of Coos Bay (via email) (w/encls.)
Jake Callister, LCOG (via email) (w/encls.)
Client (via email) (w/encls.)

PROPERTY OWNER CERTIFICATION AND CONSENT

I hereby certify that the Oregon Department of State Lands is the manager of the submerged and submersible non-trust lands in Coos Bay owned by the State of Oregon. I hereby approve Jordan Cove Energy Project L.P. to file independent land use applications with the City of Coos Bay and Coos County for approval under applicable land use regulations (Coos Bay Estuary Management Plan) of (1) approximately 6.78 acres of eelgrass mitigation located in the City of Coos Bay via transportation from an existing eelgrass donor bed and (2) the transplanting of approximately 2.26 acres of salvaged eelgrass in Coos County. The proposed mitigation activity described above is located within our area of ownership, as depicted on attached Exhibit A.

By: _____
Vicki L. Walker, Director

Date: 7/19/19

Attachment A

Jordan Cove LNG SM
A Pembina Company

City of Coos Bay Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA – Supplemental Information

REV	DATE	DESCRIPTION	BY	CHKD	APPVD	COMPANY APPROVAL
1	07/22/19	Issued for Use	J. Starkes	J. Starkes	J. Starkes	
0	07/18/19	Issued for Use	J. Starkes	J. Starkes	J. Starkes	

IP SECURITY	☐ Confidential	Total amount of pages including coversheet:	14
FOR CONTRACTOR DOCUMENTS	Contract No.	Contractor Document No.	Contractor Rev.
	DEA-041, SO 1030	554	1

JCL DOCUMENT NUMBER	Proj. Code	Unit / Location	Discipline	Doc. Type	Orig. Code	Sequence No.	Sheet No.
	J1	000	TEC	TNT	DEA	00048	00

Revision Modification Log

Document Title :	City of Coos Bay Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA - Supplemental Information	**Rev. :**	1
Document No. :	J1-000-TEC-TNT-DEA-00048-00	**Rev. Date :**	07/22/19

Page No.	Section	Change Description
		Revised document per Chris Rich's comments.

TECHNICAL MEMORANDUM

DATE:	July 22, 2019
ATTENTION:	Derik Vowels
COMPANY:	Jordan Cove LNG
ADDRESS:	111 SW 5th Ave, Suite 1100 Portland, OR 97204
FROM:	David Evans and Associates
SUBJECT:	City of Coos Bay Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA - Supplemental Information
DEA PROJECT NAME:	Regulatory Permitting
DEA PROJECT NO:	JLNG0000-0003
DOCUMENT #	J1-000-TEC-TNT-DEA-00048-00
COPIES TO:	DEA File

1. INTRODUCTION

This Technical Memorandum provides supplemental information in support of Jordan Cove Energy Project's (JCEP's) May 10, 2019 application titled: *City of Coos Bay Estuarine Permit Application - Eelgrass Mitigation in CBEMP Aquatic Unit 52-NA - Initial Filing from Jordan Cove Energy Project L.P.* (*Application*). Specifically, this Technical Memorandum responds to a June 12, 2019 notice of incompletion from Henry O. Hearley, which requested additional information regarding the temporary dredge transfer line component of the proposed Eelgrass Mitigation project and generally mitigation strategies to project existing eelgrass beds.

2. REQUESTED SUPPLEMENTAL INFORMATION

Exhibit C maps (page 8 of 14 and page 13 of 14) calls out a "temporary dredge transfer line" as part of the project required for mitigation. Please clarify how the "temporary dredge transfer line" will be used. Please thoroughly clarify any negative impacts in the immediate area within the 52-NA Aquatic Unit resulting from a temporary dredge transfer line. Additionally, please thoroughly describe how the proposed eelgrass mitigation will not harm existing eelgrass beds to the extent possible.

Response:

Temporary Dredge Transfer Line Overview—Use and Placement. The temporary dredge transfer line will be used to remove sediments by hydraulic dredge from the existing elevated, unvegetated Eelgrass Mitigation Site to achieve optimal elevations for eelgrass transplantation and natural colonization (from an existing elevation of approximately +3 feet MLLW to a proposed elevation of –1.3 feet MLLW). The maximum diameter of the cylindrical dredge line will be 24 inches and will lie directly on the bottom.

The proposed alignment avoids aquatic land owned by the Southwest Oregon Regional Airport (SORA). The precise alignment will be subject to adjustment, based on eelgrass surveys conducted prior to dredge transfer line placement and within the season of dredge line placement. The goal of the alignment placement is to avoid, to the extent practicable, existing eelgrass within the area, while also avoiding airport operations at the SORA to the extent required by applicable ordinances.

Installation of the temporary dredge line will occur in early October (within the ODFW in-water work window) and be removed in mid-February (before the end of the ODFW in water work window). Intertidal eelgrass has a seasonal biomass cycle, building up growth in the fronds in the spring and summer, flowering from June into August, and then naturally dying back in the fall (due to low light and low water temperatures) to become detritus in the winter. During this period when the fronds detach, most of the rhizomes (roots) remain in place. In this cycle, eelgrass beds expand and contract significantly from year-to-year.

The in-water work window (October 1- February 15) corresponds to the period when eelgrass shoots are naturally dying back and the entire eelgrass bed contracts. In this way, installation, operation, and removal of the dredge line will occur during optimal period in conjunction with the eelgrass lifecycle, thereby greatly reducing impacts to existing eelgrass beds. Further, dredging will be completed within one fall/winter dredge season and the temporary dredge transfer line will be removed prior to the spring and summer eelgrass growth cycle.

In addition, up to two proposed booster pumps (to facilitate movement of dredge material through the temporary dredge transfer line) will be installed at approximate equidistant locations between the eelgrass mitigation site and dredge loading area; installation of both pumps will avoid existing eelgrass beds. The booster pumps will also act to anchor the dredge line to minimize movement of the dredge line on the bottom.

The proposed temporary dredge transfer line alignment will also be situated so that there is no potential interference with existing airport runway operations and the landing/takeoff of flights.

Potential Impacts to Eelgrass from the Temporary Dredge Transfer Line. Potential impacts to eelgrass will be temporary, involving the physical covering of existing blades of eelgrass by the temporary dredge transfer line. This may displace/eliminate remaining eelgrass shoots that have not already died-back as of October. As currently designed, the dredge line will follow the northern edge of one eelgrass bed and cross a narrow portion of another bed (Figure 1). Potential temporary displacement/elimination of eelgrass has been conservatively estimated as an area of approximately 3 feet wide (2-foot diameter dredge line with 6-inch buffer on either side) by 375 feet of eelgrass bed that is crossed for a total area of 1,125 square feet of potential temporary impact.

As noted, the temporary dredge transfer line will be removed by February 15 at the end of the in-water work window. It is anticipated that impacts to eelgrass will be temporary, particularly since substantially all potential displacement will occur when eelgrass beds are no longer expanding and eelgrass shoots have died off. However, an eelgrass survey will be conducted in the area during the following summer to determine/confirm whether eelgrass has recolonized the area where the dredge line was temporarily

located. If eelgrass has not reoccupied the area of dredge line placement at similar densities as before the temporary dredge transfer line was in place (as measured by statistically significant differences in shoot counts), the area of impact caused by the dredge line will be added to the total JCEP eelgrass mitigation project (which may be included as a condition of permit approval).

Potential Impacts to Adjacent Eelgrass Beds from Construction of the Eelgrass Mitigation Site. During the dredging of the Eelgrass Mitigation Site, care will be taken to minimize disturbances to surrounding eelgrass beds. Potential impacts should be minimal because substantial amounts of eelgrass are not proximal to the proposed Eelgrass Mitigation Site. Fringing eelgrass has been documented within Site boundaries along the east and south in 2016 (Figure 1), but these areas were void of eelgrass in 2017 and 2018. This eelgrass, if present prior to dredging, will be quantified and added to the total JCEP eelgrass mitigation requirement. Eelgrass presence or absence within mitigation Site boundaries will be confirmed before the start of dredging (and before installation of the temporary dredge transfer line) by conducting an eelgrass survey over the entire Eelgrass Mitigation Site, the proposed dredge transfer line alignment area, and areas adjacent to the mitigation Site.

A small amount of eelgrass (597 square feet) was present within the Eelgrass Mitigation Site boundaries at a relatively high elevation of +2 feet MLLW in 2018. Eelgrass densities (shoot counts) were not collected on this small isolated bed. It is not known if this is a permanent eelgrass bed or an unestablished remnant. If present the summer before excavation/grading occurs, it will be carefully removed by field biologists and transplanted to a suitable area outside of the potential influence of dredging.

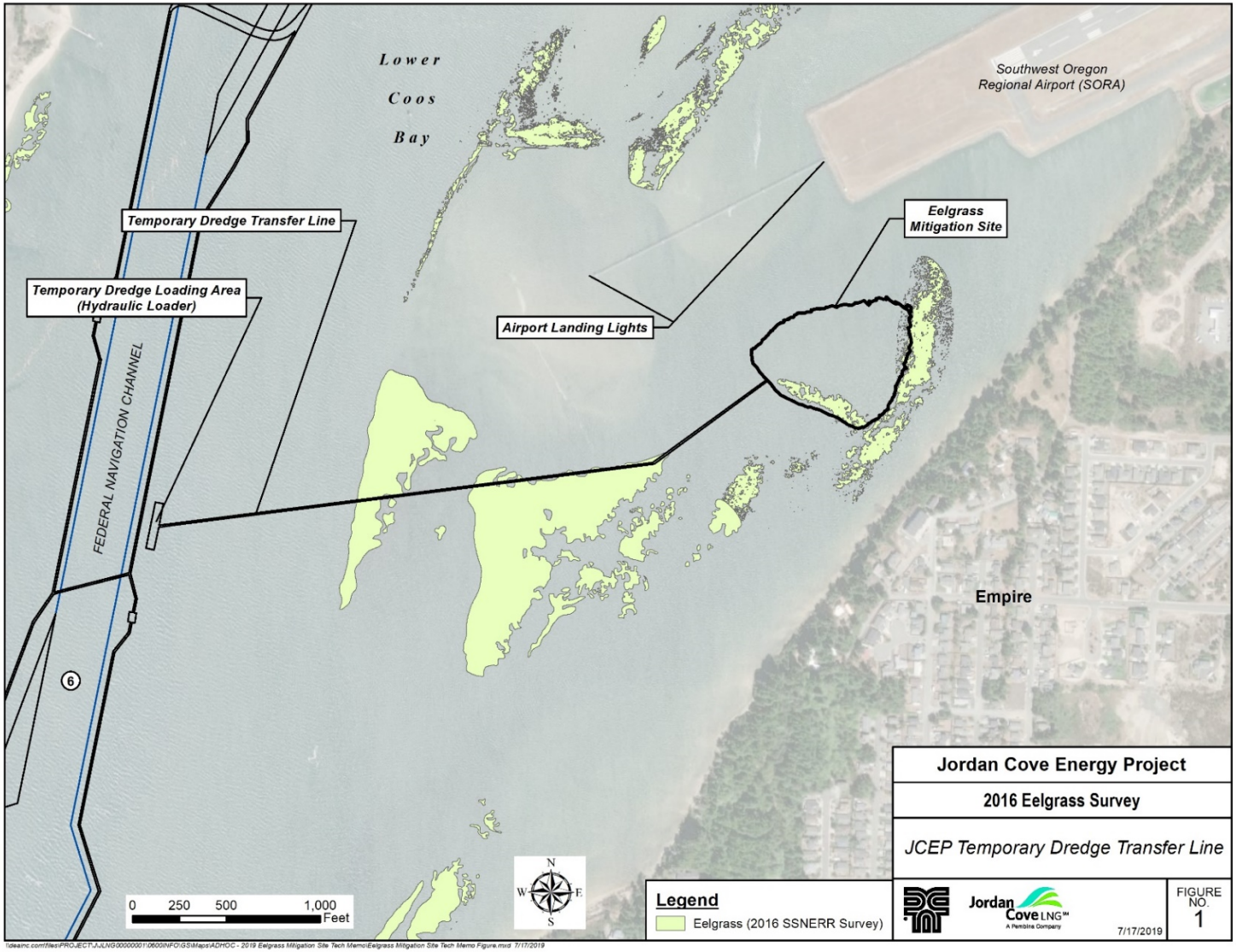
The principal manner in which adjacent eelgrass beds may be adversely impacted by excavation and grading of the Eelgrass Mitigation Site would be from the resultant turbidity generated by the hydraulic dredge. Turbidity plume dispersion modeling conducted by JCEP indicates that turbidity will be minor, temporary, and localized to the immediate area of the Eelgrass Mitigation Site. Implementation of Best Management Practices (BMPs) will allow no more than a 10 percent increase in project-caused turbidity above background levels (DEA 2019). Sediment composition of the existing Site is medium to fine sands, with a low fines content. Turbidity plumes will likely last for only for a few hours after daily dredging is completed and will be attenuated by tidal and river currents. Suspension of sediments within the water column will settle rapidly because of the low fines content. Any lowering of light penetration into the water column that may occur during the fall/winter dredge period will have negligible adverse impacts on eelgrass growth because very little growth occurs during this period.

Impact Minimization and Avoidance. In summary, JCEP has identified substantial conservation measures that will avoid or greatly minimize the potential impacts of the temporary dredge transfer line and construction of the Eelgrass Mitigation Site on existing eelgrass beds, including the following:

- All dredging will occur during the ODFW in-water work window (between October 1 and February 15) during the period of natural die-back of the eelgrass beds.
- Dredging for the Eelgrass Mitigation Site will be conducted during one fall/winter season work window.
- Before installation of the temporary dredge transfer line or dredging/grading activities, a quantitative eelgrass survey using approved methods will be conducted at the Eelgrass Mitigation

Site project area. It is anticipated that the eelgrass survey will be conducted in August, just two months before the in-water work window begins in October to obtain the latest baseline eelgrass distribution and density data. Based on survey results, the dredge transfer line alignment will be adjusted to minimize to the extent practicable the crossing of eelgrass beds. If eelgrass is found to be fringing the excavation/grading boundaries of the Eelgrass Mitigation Site, this eelgrass area will be quantified via the survey.

- The summer following dredging activities, the Eelgrass Mitigation Site project area will again be surveyed, concentrating on those areas that may have been impacted by the temporary dredge line placement or excavation/grading. Those areas that have not statistically recovered will be documented and mapped (distribution and density), agency notification conducted, and an agency-approved mitigation strategy developed to include such area in the total Eelgrass Mitigation project.
- All dredged material will be deposited at the upland APCO site. No open water disposal of dredged sediments will be conducted, thereby avoiding burial of existing eelgrass beds.
- Installation of the temporary dredge transfer line will be conducted at higher tidal elevations so vessel related scouring/grounding of eelgrass will be minimized.
- Booster pumps will not be installed within existing eelgrass beds to avoid impacts. Booster pumps will also anchor the dredge line to minimize movement/scouring in existing eelgrass beds. Portions of the dredge line below the dredge vessel that would actively move with the vessel during dredging will not be located near existing eelgrass beds.
- The dredge operator will use GIS generated geo-referenced maps with the Eelgrass Mitigation Site grading boundaries and the latest eelgrass bed locations on the map, so that the operator can stay within the boundaries and avoid existing eelgrass.


Lower
Coos
Bay
Southwest Oregon
Regional Airport (SORA)
Temporary Dredge Transfer Line
Eelgrass
Mitigation Site
Temporary Dredge Loading Area
(Hydraulic Loader)
Airport Landing Lights
FEDERAL NAVIGATION CHANNEL
Empire
6
0 250 500 1,000
Feet
N
W E
S
Legend
Eelgrass (2016 SSNERR Survey)
Jordan Cove Energy Project
2016 Eelgrass Survey
JCEP Temporary Dredge Transfer Line
Jordan Cove LNG A Pembina Company
7/17/2019
FIGURE NO.
1

3. SUPPLEMENTAL INFORMATION REQUEST 2

A Review of the Jordan Cove Energy Project and Pacific Connector Gas Pipeline Project Compensatory Wetland Mitigation Plan Report, October 31, 2017. Comments by Deborah J. Nelston, PhD, US Army Corps of Engineers (USACE 2017)

Response

The US Army Corps of Engineers (USACE) provided an extensive review of the first version of the Compensatory Wetland Mitigation Plan (CWMP), dated October 31, 2017. The current version of the CWMP (November 1, 2018; DEA 2018a) incorporated all USACE comments; this Technical Memorandum briefly summarizes the comments, the JCEP Response, and where in the most recent version of the CWMP a detailed response has been provided. Individual comments and responses are summarized below.

USACE Comment – Mitigation Sequencing. Applicant must first be able to demonstrate impacts to aquatic features, including special aquatic sites, have been minimized or restored to the maximum degree practicable. Corps will consider accepting compensatory mitigation only for unavoidable impacts to aquatic resources.

The version of the CWMP the USACE evaluated proposed to eliminate all eelgrass from the proposed Access Channel of the LNG facility (2.26 acres as of 2018) because of dredging requirements. JCEP has since revised the CWMP such that all eelgrass within the dredge footprint would be removed before dredging begins and transplanted to identified areas within the adjacent Jordan Cove embayment. Eelgrass is abundant in Jordan Cove so it is known that suitable habitat is present; two selected areas were identified during 2018 eelgrass and bathymetry surveys (DEA 2018b). The identified areas are large enough to accommodate eelgrass from the Access Channel, are at suitable elevations, and are currently unoccupied by eelgrass. Please review Section 3.4.3 in the November, 2018 version of the CWMP for further details and survey mapping conducted in Jordan Cove. The 2018 eelgrass and bathymetry survey report also provides additional details and methodologies used to quantify eelgrass abundance within the proposed Access Channel and Jordan Cove embayment (DEA 2018b).

The salvage and transplantation of eelgrass from the proposed Access Channel prior to dredging will meet the USACE requirement of avoiding and minimizing impacts to eelgrass. The transplantation site in adjacent Jordan Cove will be monitored annually over the entire post-construction monitoring period to determine the success of transplantation efforts.

USACE Comment – Reasonable Likelihood of Success.

- *Recent mitigation projects in the Pacific Northwest, and more specifically, in Oregon estuaries, have shown high failure rates.*
- *JCLNG's current mitigation site location is considered a "very high risk of failure" due to:*

- *General scientific understanding of the complexities involved with adequately recouping lost environmental function/service with use of mitigation sites;*
- *Excavation down to create the site vs. filling an area to create the site;*
- *Filling areas to create habitat has been successful;*
- *Excavating areas to create habitat has not;*
- *As little as 4cm of sediment shoaling in the mitigation site can result in burial and depth of SAV transplants;*

These comments were made by the USACE before they knew of sediment transport modeling that JCEP conducted; these modeling studies had not been appended to the 2017 version of the CWMP, but are appended to the revised November 2018 CWMP in Appendix I (Sediment Transport Analysis Technical Memorandum). Results are also summarized in Section 3.4.1.4.2 of the 2018 CWMP. Study results indicate that proposed bathymetric changes at the eelgrass mitigation site will not become altered to a significant extent over time.

To bolster these modeling conclusions, JCEP also conducted an historical geomorphic analysis of the Eelgrass Mitigation Site and surrounding areas from the 1940s to present. This analysis is summarized in Section 3.4.1.4.2 and the Technical Memorandum appended in Appendix D (Eelgrass Site Geomorphic History and Analysis) of the 2018 CWMP. The analysis found that the elevated shoal of the existing Eelgrass Mitigation Site was likely created by dredge spoil islands placed near the site between 1948 and 1951. The use of these dredge spoils for a SORA runway extension project in 1988 both removed the source of sediments that created the elevated shoal, and the runway extension, once completed, blocked the tidal processes that originally created the shoal.

The USACE also stated that eelgrass restoration sites in Oregon have failed, particularly those that excavate down to create the site because of burial issues. JCEP is confident this will not occur with the proposed Eelgrass Mitigation Site. In 2018, JCEP conducted an eelgrass survey at the nearby SORA Eelgrass Mitigation Site; the USACE considers this a failed mitigation site and used it as an example of why the JCEP site will fail. However, eelgrass and bathymetry investigations conducted in 2018 indicate that a substantial, healthy, and continuous eelgrass bed is present within the SORA mitigation site. This site was first excavated and planted in 1989 and likely represents one of the oldest eelgrass mitigation sites in the Pacific Northwest. Eelgrass occupies nearly the entire area between elevations of +1 foot and -1 foot MLLW, nearly 30 years after the mitigation site was created. Though some filling has occurred, the current acreage of eelgrass surpasses the original permit requirements, indicating that the site has met its compensatory mitigation requirements. The site does not provide scientific evidence that long-term longevity or burial will be an issue at the JCEP Eelgrass Mitigation Site. Survey results are presented in DEA (2018b).

USACE Comment –. Mitigation Ratios

The USACE must require a mitigation ratio greater than one-to-one where necessary to account for the method of compensatory mitigation (e.g., preservation), the likelihood of success, differences between the functions lost at the impact site and the functions expected to be produced by the compensatory mitigation project, temporal losses of aquatic resource functions, the difficulty of restoring or establishing the

desired aquatic resource type and functions, and/or the distance between the affected aquatic resource and the compensation site. The USACE considers eelgrass mitigation successful if it meets eelgrass habitat coverage over an areas that is 1.2 times the impact area with comparable eelgrass density as impacted habitat.

These comments have been incorporated into the November 2018 version of the CWMP, presented in detail in Section 1.3.1. To mitigate for the permanent impacts to 2.26 acres of eelgrass, JCEP proposes to initially enhance a minimum of 6.78 acres of existing intertidal habitat to support a minimum of 2.71 acres of eelgrass beds. This section also provides additional details on transplant procedures, selection of donor and reference eelgrass beds, and eelgrass survey methods, all of which will use methods outlined in USACE eelgrass documents (USACE 2016, 2018). These sections were not present in the 2017 version of the CWMP.

USACE Comment – Site Evaluation and Selection

- *The USACE has concerns with the proposed use of existing eelgrass in the mitigation plan:*
- *Under no circumstance should existing eelgrass beds within the mitigation site be used for relocation or transplanting in the site.*
- *In addition, areas within 100m of the existing site which possess eelgrass or bare areas should be excluded from the site selection. Bare areas would be expected to become vegetated through natural rhizome extension and/or seeding over time on their own;*
- *Test plots/smaller projects are suggested for a mitigation site of this scale to gain an understanding if the overall plan will work at the selected site or if it will fail;*

These comments have been incorporated into the November 2018 version of the CWMP (Section 1.3.1.1). Eelgrass surveys conducted in 2018 found very little eelgrass within the grading boundaries of the eelgrass mitigation site. The only eelgrass observed was less than 600 square feet found at an unusually high elevation of +2 feet MLLW (DEA 2018b). It is not known whether this eelgrass is permanent or an isolated remnant that will not survive. Whichever the case, the small bed will be monitored, and if present the summer before excavation activities begin, will be removed and transplanted to an existing eelgrass bed. Any other eelgrass that may recruit to the Eelgrass Mitigation Site will either be salvaged and transplanted to nearby areas prior to excavation/grading, or the area of this eelgrass will be added to the JCEP total eelgrass mitigation requirement.

Test plots have not been proposed because JCEP is confident that the eelgrass mitigation site will be successful, for the following reasons:

- The nearby SORA eelgrass mitigation site has been successful even though it was planted 30 years ago. It is located approximately 1,200 feet to the north of the JCEP Eelgrass Mitigation Site and proposed excavation/grading and transplantation techniques will be similar.
- The JCEP Eelgrass Mitigation Site will be allowed to overwinter before planted to allow complete settling of sediments. Bathymetric surveys will be conducted prior to transplantation to determine if sediments have remained at the desired elevations.

- Eelgrass in the donor beds are at similar elevations and similar environmental conditions (due to proximity) as the Eelgrass Mitigation Site.
- Salvage and transplantation of eelgrass from the proposed Access Channel to Jordan Cove will have occurred and monitored for two full seasons prior to the planting of the Eelgrass Mitigation Site. Lessons learned will be applied to the Eelgrass Mitigation Site.

USACE Comment – Site Monitoring

- *Monitoring methods:*
    - *Use of echo sounding equipment unacceptable for monitoring due to various reasons in the report;*
    - *In situ monitoring via divers, snorkelers, or waders, depending on the water depth, should be required in order to assess percent survival of transplanted shoots, and shoot density of eelgrass in the transplanted beds, both of which are essential components of any eelgrass mitigation monitoring plan. Shoot density is the most commonly used metrics to assess mitigation performance. (mean shoots per square meter)*
    - *Statistically rigorous data collection is needed (low probability/high probability error incorporation);*

These comments have been incorporated in the 2018 version of the CWMP and will be conducted during all monitoring, as presented in Section 7.3.2.1. USACE guidelines will be followed, as presented in Section 1.3.1.5 (including statistical methods). During 2018 eelgrass surveys, all quantitative surveys were conducted with divers using 0.25 m^2 quadrats to collect shoot counts to estimate the density of beds (DEA 2018b). This was conducted within the proposed Access Channel, selected reference site, and selected donor bed to determine baseline densities. Surveys will be repeated the summer before dredging or excavation/grading activities occur to determine the most recent baseline eelgrass densities prior to inwater work.

USACE Comment – Performance Standards

- *Specific, measureable performance standards for eelgrass mitigation must include, at a minimum:*
    - *% survival of the transplanted shoots after 1 year, and preferably after the first 6 months;*
    - *measurements of the areal coverage (total areas occupied by eelgrass within the transplanted site, (e.g. square feet, meters, acres)) at each monitoring interval, and*
    - *measurements of the shoot density (expressed as mean # shoots per square meter) within the vegetated areas of the transplant site, donor bed(s), and reference site(s) at each monitoring interval.*
    - *See proposed performance milestones at point #13 of the report review;*
    - *5 year monitoring period;*

The specific performance monitoring standards recommended by the USACE have been incorporated into the 2018 version of the CWMP in Section 7.1.1

USACE Comment – Additional Information Needs

- *JCLNG's mitigation site selection process (how was the site selected?);*

An Alternatives Site Analysis was presented in the 2018 version of the CWMP. Ten different sites within Coos Bay were originally evaluated before the current proposed Eelgrass Mitigation Site was selected, as presented in Section 3.4.1. This process was not presented in the 2017 version of the CWMP that the USACE reviewed. Specific site criteria were developed (Table 6), as well as an eelgrass mitigation site evaluation matrix (Table 7). This evaluative process narrowed the original 10 sites to four, which were selected for further evaluation. Further evaluations conducted at the remaining sites included site visits, determination of current eelgrass coverage, estimation of the total amount of habitat available for eelgrass mitigation, discussions with ODFW, and other relevant considerations.

- *Further explain reference site location(s) and monitoring;*
- *Overall monitoring plan shall include reference site monitoring;*
- *Describe how the data collected at the reference site will be used to evaluate success of the mitigation planting;*
- *Further discuss donor site use and their monitoring;*
- *Harvest no more than 10% of the donor bed;*
- *Further discuss donor site damage management;*
- *Harvest from similar elevations (donor to mitigation site elevations);*

Section 1.3.1 in the 2018 CWMP presents the data collected during the 2018 eelgrass and bathymetry survey (DEA 2018b), which identified both the reference and donor beds. Quantitative eelgrass surveys were used to determine the location and size of each eelgrass bed, determine baseline densities, and determine the elevations of existing eelgrass. As reported, post-construction monitoring is discussed in detail in Section 7.3.2 of the 2018 CWMP. The donor bed was identified, quantitative data presented, and donor harvest methods outlined in Section 1.3.1.3 in the 2018 CWMP. Monitoring of the donor bed is discussed in section 7.3.2, including quantitative methods to ensure that only 10 percent or less of existing eelgrass would be harvested for transplantation. Eelgrass harvest will avoid the creation of bare areas, as per USACE recommendations.

- *Further define monitoring needs for existing natural eelgrass beds near the proposed site (potential temp/perm impacts to these eelgrass beds).*

The 2018 eelgrass and bathymetry study collected data to determine the current proximity of eelgrass beds to nearby areas (DEA 2018b). No fringing eelgrass is present within the grading boundaries, except for the small isolated bed previously mentioned. As noted, this small bed, if still present prior to inwater work will be salvaged and transplanted to a nearby area. Monitoring is discussed in detail in Section 7.3.2 of the 2018 CWMP.

- *Further discuss how transplants will be collected, handled and stored prior to planting;*

Eelgrass harvest, handling, and storage is discussed in detail in Sections 1.3.1.2 and 1.3.1.3 in the 2018 CWMP.

- *No contingency/adaptive management plan;*

A contingency/adaptive management plan is discussed in detail in Section 7.4.1 of the 2018 CWMP. Contingency measures will be based on monitoring data; a strategy is outlined if eelgrass is not meeting performance standards, including a replanting schedule and the need for additional agency consultation.

- *Planting stock needs research. Use of eelgrass plugs within planting units would require collecting and handling thousands of eelgrass plugs (w/associated sediments). This is impracticable for a planting/site of this size.*

Further research has been conducted on eelgrass transplantation techniques since the 2017 CWMP; JCEP will not use eelgrass plugs to conduct transplantation. An eelgrass expert has been identified and is under contract to work with DEA biologists during all phases of eelgrass transplantation, as presented in Section 1.3.1.2 of the CWMP and in the Eelgrass and Bathymetry Report (DEA 2018b).

4. REFERENCES

David Evans and Associates (DEA) 2019. Dredging Pollution Control Plan (Navigation Reliability Improvements, Kentuck, APCO). Document No. J1-RGL-PLN-DEA-00002-00. April 8, 2019.

David Evans and Associates (DEA) 2018a. Jordan Cove Energy Project and Pacific Connector Gas Pipeline Project. Compensatory Wetland Mitigation Plan. Document No. J1-000-TEC-PLN-DEA-00002-00. Revision H, November 1, 2018.

David Evans and Associates (DEA) 2018b. Jordan Cove LNG, LLC. 2018 Eelgrass and Bathymetry Surveys, Coos Bay, Oregon. Document No. J1-740-TEC-RPT-DEA-00001-00. Prepared by David Evans and Associates, Portland, Oregon, and GeoEngineers, Redmond, Washington. February 2018.

USACE 2016. Components of a complete eelgrass delineation and characterization report. Prepared by the Seattle District, US Army Corps of Engineers, Seattle, Washington.

USACE 2017. A review of the Jordan Cove Energy Project and Pacific Connector Gas Pipeline Project Compensatory Wetland Mitigation Plan. Review Date: October 31, 2017. Reviewed by Deborah J. Nelson, PhD, Seattle District, US Army Corps of Engineers, Seattle, Washington

USACE 2018. Components of a complete eelgrass delineation report. Prepared by the Seattle District, US Army Corps of Engineers, Seattle, Washington.

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	Document Number: J1-000-TEC-TNT-DEA-00028-00	
	Rev.: A | Rev. Date: 10/16/17	

TECHNICAL MEMORANDUM

DATE:	October 16, 2017
ATTENTION:	Mick Rowlands
COMPANY:	Jordan Cove LNG, LLC
ADDRESS:	5615 Kirby Drive, Suite 500, Houston, TX 77005
FROM:	William Gerken, P.E. – Moffatt & Nichol
SUBJECT:	Eelgrass Mitigation Site, Dredging/Excavation Means and Methods Feasibility
DEA PROJECT NAME:	Engineering Support for Environmental Permits – Kentuck & Eelgrass Mitigation Sites
DEA PROJECT NO:	JLNG0000-0014, Service Order 1173
M&N Project NO:	9893, Task Order MN-1173-001
DOCUMENT #	J1-000-TEC-TNT-DEA-00028-00
COPIES TO:	DEA (Sean Sullivan, Derik Vowels)

1. INTRODUCTION

In support of permitting efforts for Jordan Cove LNG (JCLNG), Moffatt & Nichol (M&N) has prepared this draft technical memo and concept drawings outlining potentially feasible construction means and methods that could be employed to remove and transfer excavated/dredged material from the Eelgrass Mitigation site.

The intent at the Eelgrass Mitigation site is to lower the existing bottom grade in an area of approximately 9.3 acres within an existing eelgrass bed. This elevated area (mound) is currently not supporting eelgrass due to its elevation. Most of this area is currently between elevations +1.0' and +2.5' MLLW (+0.0' and + 1.5' NAVD88 based on a conversion factor of -0.97') and would be lowered to an elevation of -1.5 MLLW (-2.0 NAVD88). Approximately 38,000 cubic yards would need to be removed to bring the area down to design grade. Material excavated/dredged from the Eelgrass Mitigation site would be transported to APCO Site 1 and 2 for disposal. The surrounding shallow water eelgrass beds and construction grade within the lower intertidal elevation range pose significant challenges to construction.

2. LOCATION

The Eelgrass Mitigation site is located approximately 500 feet southeast of the offshore end of the North Bend Municipal Airport runway and about 200 feet off the opposite North Bend shoreline (Figure 1). The area of Coos Bay surrounding the Eelgrass Mitigation site and extending west to the Federal Navigation Channel, is comprised of lower intertidal mudflat and shallow subtidal habitat(s), including eelgrass beds. There is currently no feasible navigable water access route to the Eelgrass Mitigation site, except for shallow draft vessels during high tide. Below are the tidal elevations and ranges at the site:

Datum	Elevation (ft., MLLW)
Extreme High Water	11.1
Mean Higher High Water (MHHW)	7.7
Mean High Water (MHW)	7.1
Mean Tide Level (MTL)	4.2
Mean Low Water (MLW)	1.3
Mean Lower Low Water (MLLW)	0.0
Extreme Low Water	-3.0
Mean Tide Range	5.8
Diurnal Tide Range	7.7

3. ALTERNATIVES CONSIDERED AND ELIMINATED

Site access from shore, and/or loading of dredged/excavated material from an adjacent shoreside site for transport by truck, was found to be unacceptable due to property ownership, environmental impacts, and potential traffic impacts. Based on elimination of adjacent uplands use, it was determined that the Eelgrass Mitigation site would need to be accessed from the water and work completed with waterborne equipment.

Creation of an access channel for dredge equipment and material barges/scows across the intertidal and shallow subtidal mudflats southwest of the Eelgrass Mitigation site was considered and determined unfeasible. Primary reason for elimination of this alternative was significant environmental impacts including extensive disturbance to existing eelgrass beds.

Disposal/hydraulic placement of material in-water, in relatively close proximity to the site (700 – 1,400 feet), in an area where existing water depth is too deep to support eelgrass was considered. Goal would be to raise existing depths at disposal location to an elevation range more suitable for eelgrass. This alternative was eliminated based on potential environmental impacts and permitting requirements associated with in-water disposal in the shallow sub-tidal zone.

Use of crane mounted buckets or pumps for dredging/excavation was eliminated from consideration due to proximity of site to the adjacent airport runway and potential issues associated with height restrictions.

4. PROPOSED ALTERNATIVE

The proposed alternative is to use a small, self-propelled hydraulic dredge capable of working in very shallow water and/or being able to work if grounded. The dredge, and booster pumps, would pump material through a pipeline from the site to a barge mounted, scow loading facility.

The loading facility would need to be sited as close as possible to the Eelgrass Mitigation site, in water naturally deep enough to accommodate the transport barges/scows and tugs to be used by the construction contractor. For initial planning, a minimum 20 foot of water depth at the loader is considered adequate. The loading facility would also need to provide sufficient room for safe approach, mooring and departure. A potentially suitable location for the temporary loading facility east of, and adjacent to, the Lower Jarvis Range of the Federal Navigation Channel is depicted in Figure 2.

4.1 DREDGE

For planning purposes, it is anticipated that a dredge designed to access and work in shallow water sensitive habitats such as marshes and nearshore areas would be utilized. The dredge would be equipped with a hydraulic dredge pump system mounted on an excavator arm. Dredges of this type are typically relatively small in footprint (14 foot by 48 foot range) and portable/truckable. They can often self-launch from a shallow bank without the assistance of a crane or other equipment. They are equipped with a spud system for positioning and holding the dredge in place, and some may be equipped with hydraulic pontoons or legs to enhance operations in shallow, soft bottom locations. The dredge may also be equipped with low impact self-propulsion systems. Pump sizes can vary, but a range of, 10 to 16 inch diameter discharge line, is typical. Considering the distance the dredge material will need to be pumped and potential site conditions, a 14 inch diameter discharge line is considered for planning. An example of the type of hydraulic dredge being discussed is shown in Figure 3. The contractor will need to take into consideration the impacts from potential wind waves and vessel wakes at the site, during all water levels, when selecting equipment and planning work.

Production rates can vary significantly based on pump power and configuration, line length, booster pumps, material type, % solids in slurry, etc. The Initially estimated production rate for a 14-inch discharge line is 400 cubic yards per pumping hour. If a total efficiency rate of 50% is used with a 24-hour work day, the daily production rate is approximately 4,800 cy/day. If a 12-hour work day is considered, then the daily production rate is approximately 2,400 cy/day. Conservatively considering a 12-hour work day, it would take approximately 16 pumping days to remove 38,000 cubic yards of material. Adding in sufficient time for mobilization/demobilization, pipeline construction and removal, and loader construction/setup, a total work window of 40 - 50 days should be considered.

4.2 LOADER

For planning purposes, the loader is assumed to operate from a deck barge of up to approximately 60-foot by 200-foot in size. Actual loader configuration would be developed by the contractor depending on the equipment and barges they propose to provide. The number of temporary pile and/or spuds required to moor the loader barge and material scows would vary depending on contractor's actual equipment and configuration. For planning purposes, 10 – 24 inch pile should initially be considered.

The diameter of pipeline through which material is pumped to the loader could vary from approximately 10 inches up to 16 inches. As previously noted, 14 inches is considered a reasonable size for planning.

For planning purposes, the loader would be positioned to provide a minimum 20 foot of water depth to accommodate the anticipated draft of material scows to be utilized. This minimum draft may be adjusted to accommodate the actual scows to be utilized by the contractor. Scows and/or barges utilized to transport material from the loader shall be configured to allow hydraulic loading of material, i.e. there would need to be the additional capacity and draft available to contain water at a level sufficient to allow adequate settling of dredge material prior to decant water overflow/discharge back into the bay.

4.3 PIPELINE

Pipeline length from the Eelgrass Mitigation site to the proposed hydraulic loader location is up to approximately 3,900 feet. Potential location of hydraulic loader and pipeline alignment is shown in Figure 2.

For planning level evaluation, the shallow water/intertidal temporary impact area of the pipeline is estimated at approximately 0.9 acres.

In critical applications where down time at the loader can significantly impact overall project schedule, a second (spare) pipeline can be installed. For this project where the Eelgrass Mitigation site represents a relatively small volume of material, multiple material placement areas exist, and there is schedule flexibility with construction of the mitigation site, a second pipeline is not currently seen as necessary.

4.3.1 Pipeline Material

Two basic material types commonly used for pipelines in dredging projects are plastic high-density polyethylene (HDPE) and steel. Each material type has its advantages and disadvantages for use as a dredged material pipeline. For this evaluation, the service life of the pipeline would be up to 6 months. Following project completion, the pipeline would be removed. Most of the pipeline would extend across shallow subtidal mudflats, lower intertidal areas, and eelgrass areas close to the mitigation site. These areas may be subject to environmental constraints which were not identified in this preliminary feasibility evaluation. The pipeline would be exposed to tidal currents, wave action, and small boat traffic.

HDPE Pipeline

The primary benefits of HDPE pipe are a cheaper pipe cost per lineal foot, low internal friction during pumping, flexibility, and its lighter weight. However, due to the lighter weight, the HDPE pipe would float and would require anchoring to be submerged or to remain stable in areas that are subject to tidal action. Costs for anchoring the pipe would need to be included in the total cost for using HDPE. HDPE pipelines are reasonably easy to assemble and install. The pipe sections may be joined by fusion butt welds performed on land or on a barge. Once assembled, the pipeline can be floated and towed into place. Connection flanges may be added to allow for easier installation or maintenance. For a submerged section, the pipeline would be floated into position, then anchored in place. Due to the tidal fluctuation, potential for high winds, and wind and vessel waves in Coos Bay, the pipeline would need to be anchored/weighted into position on the bottom. The durability of HDPE pipe due to abrasion from coarse, angular material is good compared to that of other material types, however the exterior can be susceptible to cuts or gouging. Routine repairs on plastic pipe can sometimes be difficult. If a joint cracks and needs to be repaired, or the pipe is punctured, the pipeline must be exposed and placed on a working surface/deck for repair. Once the pipe is fully exposed on a dry working deck, each side of the joint or repair area would be resurfaced, and then re-welded using the fusion weld machine. A small deck barge and crane used during a higher tide would be required to assist in any repair procedure.

Steel Pipeline

Steel pipelines are commonly used in dredging operations for discharge lines. As a submerged line, steel pipe provides adequate weight to sink the pipe to the bottom when filled with water, eliminating the need for anchoring. Over time, the weight of steel pipeline could settle into softer mud bottoms, making maintenance repairs and removal more difficult. If a floating line is required, floatation must be added to a steel pipeline. Steel pipe can be assembled by welding manageable sections together on land and floating them into place where the sections are joined with either flanged or ball and socket connections. Once in place the line is filled with water and sunk to the bottom. The coarseness of material being pumped, duration of installation/volume of material being pumped, and potential corrosion over length of installation should be considered when determining appropriate wall thickness of pipe. In addition to not needing an anchoring system, the main advantage of a steel pipeline is its strength. Steel pipe is not easily cut or damaged by impacts and is not easily vandalized. Most repairs to a steel pipeline can be made with a portable welding machine.

Either pipeline type would be suitable for this project. Steel may provide some advantage relative to durability and ease of maintenance, but considering the relatively small pipeline size and short period of operation, HDPE may be better suited for this installation. Ultimately, the decision would be left to the contractor.

To accommodate dredge movement during operations, a section of flexible floating line will be necessary.

4.4 BOOSTER PUMP(S)

The size and/or number of booster pumps required is dependent on the size, type, and power of the dredge pump. Considering the size range of potential dredge pumps/discharge lines, for planning purposes, it is assumed that two booster pumps would be employed to maintain necessary flow within the line. Due to the exceptionally shallow depths, and/or lack of water, at low tides, the booster pumps would likely need be mounted on small anchored/spudded barges capable of grounding, or placed on small temporary platforms constructed with 3 or 4 support piles. Access to the booster pumps for operation, fueling or maintenance would be limited to periods when the water level was high enough for a sufficient period to allow service vessel access. Remote pump operation/control and monitoring may be necessary.

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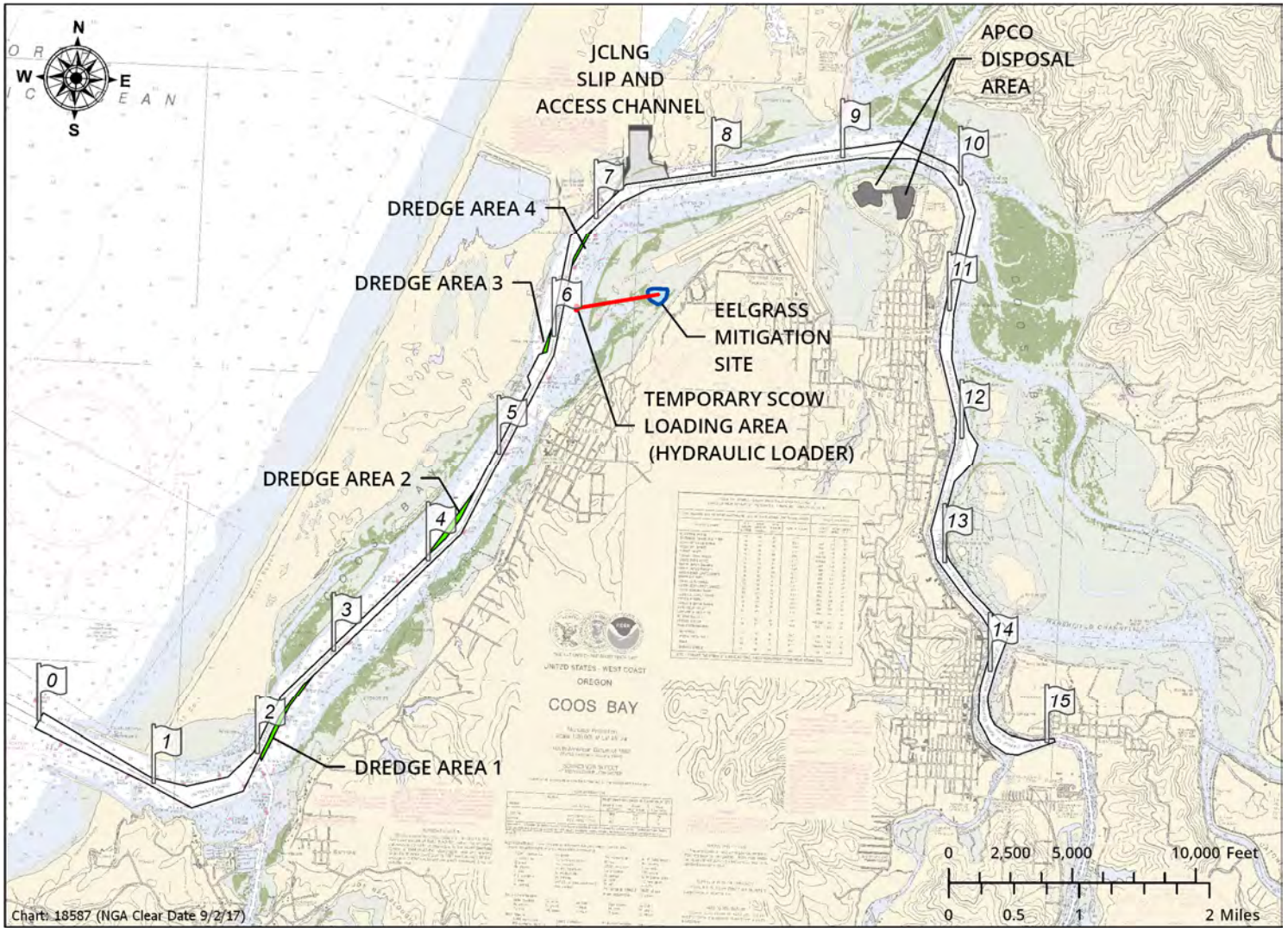

Figure 1. Overview.

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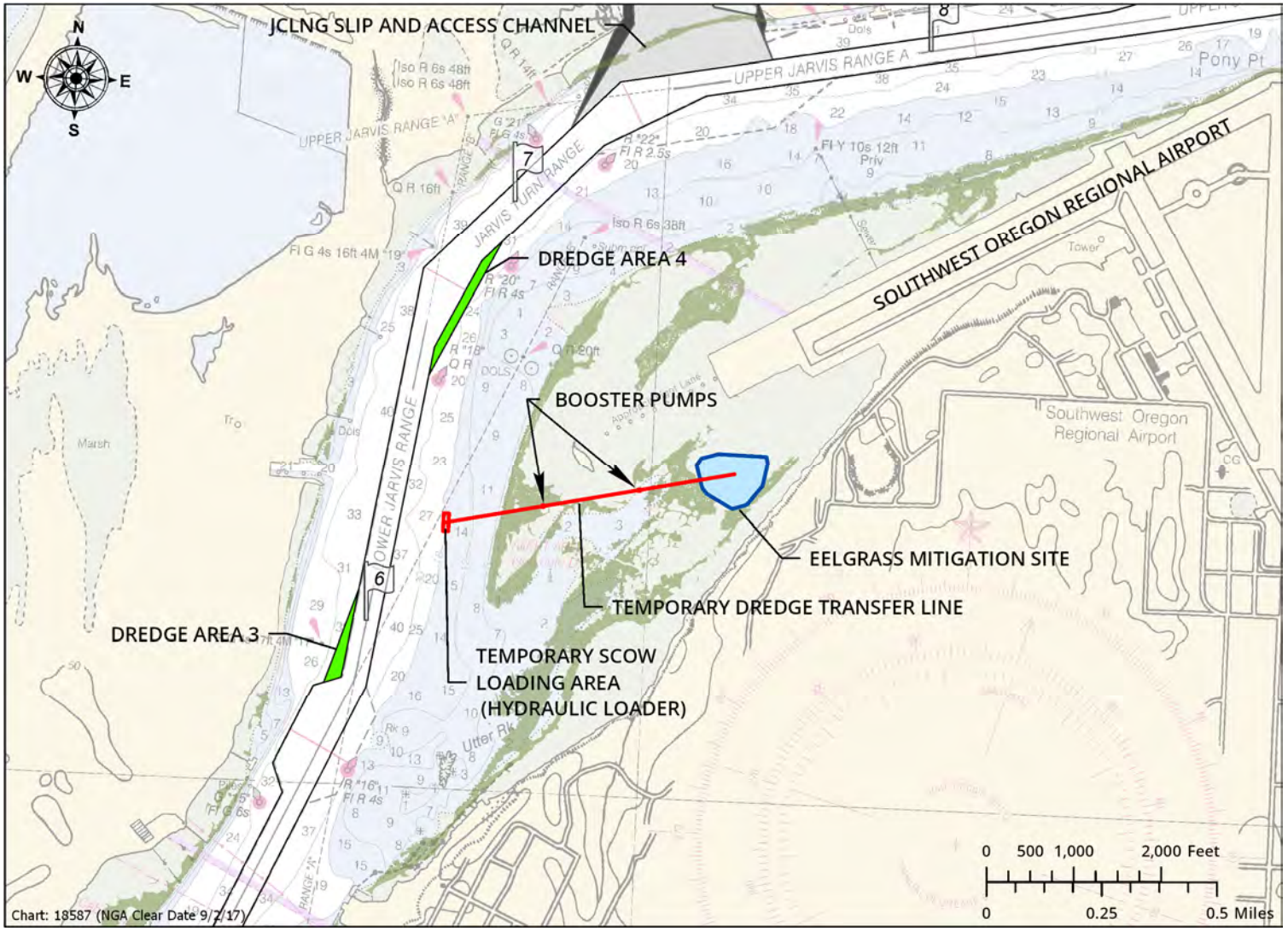

Figure 2. Eelgrass Mitigation Site.

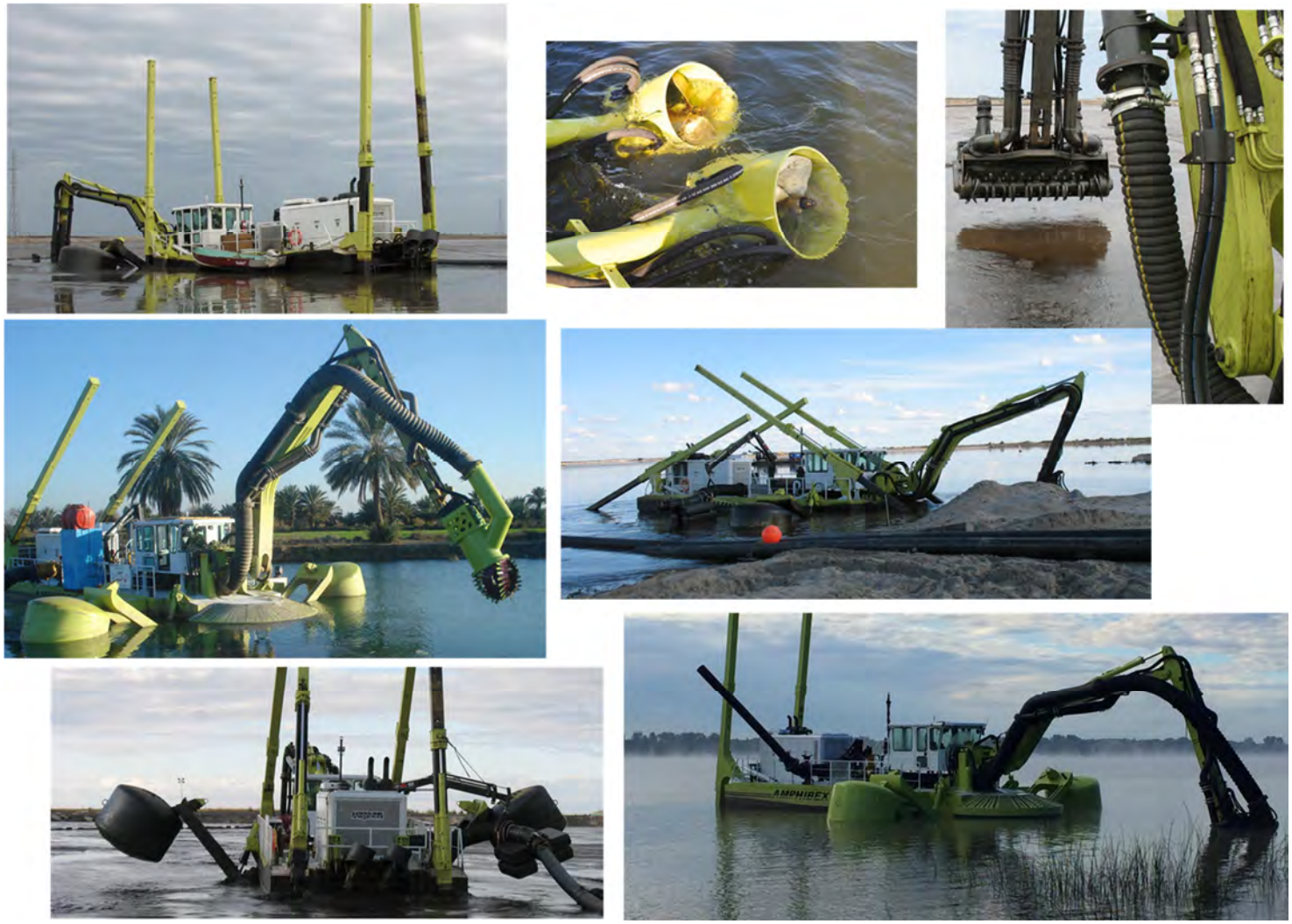

Figure 3. Example Shallow Water Dredges.