

August 19, 2015

Alain Magnan
Regulatory Reviews Manager
Fisheries and Oceans Canada
3190 Hammond Bay Road
Nanaimo, British Columbia V9T 6N7

Dear Mr. Magnan:



**Reference: Pacific NorthWest LNG Mitigation and Offsetting Commitments for Fish,
Fish Habitat and Marine Mammals**

In the six weeks following our meeting of July 7, 2015, Pacific NorthWest LNG (PNW LNG) has worked with Fisheries and Oceans Canada (DFO) to compile a summary of our proposed mitigation and offsetting commitments related to the marine works for our project on and near Lelu Island. Building on our first and second draft documents, this letter provides a final compilation of the fish, fish habitat and marine mammal mitigation and offsetting commitments.

It is our understanding that the fisheries protection and pollution prevention provisions of the *Fisheries Act* aim to provide for the sustainability and ongoing productivity of commercial, recreational, and aboriginal (CRA) fisheries. These provisions include: (1) section 35, which prohibits any unauthorized work, undertaking, or activity that results in serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery; and (2) section 36, which prohibits deposition of waste, pollutants or deleterious substances into watercourses or water bodies unless authorized by regulation. In addition, sections 7 and 8 of the Marine Mammal Regulations under the *Fisheries Act* prohibit disturbance or killing of marine mammals unless fishing is authorized for marine mammals under authority of the regulations.

Marine works include construction of a: vehicle bridge from Port Edward to Lelu Island; pioneer dock; materials offloading facility (MOF); suspension bridge, trestle and LNG berths. In-water activities associated with construction of this infrastructure will occur year-round for approximately four years. Table 1 attached identifies:

- The potential effects of the project's marine infrastructure on fish, fish habitat and marine mammals,
- The activities that could lead to these effects, and
- The mitigation measures that PNW LNG proposes to implement to reduce or avoid serious harm to fish, and comply with section 36 of the *Fisheries Act* and sections 7 and 8 of the Marine Mammal Regulations.

The information in Table 1 has been structured in a manner that directly links the requirements of the *Fisheries Act* and Marine Mammal Regulations to the mitigation measures.

With respect to the residual serious harm to fish, the Federal Fisheries Protection Policy Statement (2013) and Fisheries Productivity Investment Policy (2013) outline DFO's policy for maintaining and Federal Fisheries Protection Policy Statement and sustainability of the fish and fish habitats that support CRA fisheries. Where residual harm to fish habitat cannot be avoided or fully mitigated, this can be authorized under paragraph 35(2)(b) of the *Fisheries Act* where offset measures can be implemented to maintain or improve the productivity of the affected CRA fishery. Offset measures may include habitat enhancement, habitat restoration, or complementary measures.

The extent of habitat offsets defined within the PNW LNG offsetting plan will be based on the predicted residual serious harm to habitat after application of mitigation measures. These habitats will be permanently altered (in a manner harmful to fish) or lost as a result of project construction. Based on the preliminary engineering designs of the proposed infrastructure and the hydrodynamic modelling completed to date, residual serious harm to fish habitat is predicted to occur as a result of constructing the MOF in Porpoise Channel and the marine infrastructure across Agnew Bank. Based on the information that is currently available with respect to the proposed marine infrastructure design, and subject to refinement through additional engineering design work and associated modelling, up to of 30,135 m² of marine habitat will be lost or permanently altered. In summary, this includes:

- Permanent alteration of 8,630 m² of intertidal eelgrass habitat and subtidal brown algae habitat used by juvenile salmonids, herring, surf smelt, sandlance and crab within the dredge area planned for the materials offloading facility (MOF).
- Loss of 8,760 m² of subtidal open water/soft substrate area used as habitat by Dungeness crab and local flatfish species under the southwest tower and anchor blocks for the marine terminal suspension bridge substructures, trestle piles, and berth piles (see Figure A for details).
- Permanent alteration of 12,745 m² of subtidal open water/soft substrate area used as habitat by Dungeness crab and local flatfish species due to placement of armouring to prevent scour around the tower block, anchor block, and piles; however, as the material to be used for armouring has not been specified, it is not certain whether this change in habitat would be harmful (see Figure A for details).

Table 2 attached outlines the project components and footprints associated with each. Habitat offsets being considered include habitat enhancements within three sites around the west and south perimeter of Lelu Island, nearshore anthropogenic debris cleanup (e.g., abandoned derelict vessels, marine batteries, abandoned gillnets, logging boom debris and dolphins), and a complimentary research initiative.

With respect to the habitat enhancements, there are approximately 90,000 m² of lower productivity habitats present within three identified offsetting sites around the perimeter of Lelu Island that could be modified to increase the productivity of CRA fisheries. The potential offset enhancements in these locations include approximately:

- 20,000 m² of intertidal eelgrass across three sites adjacent to Lelu Island. These habitats would be created by constructing sheltered bench areas comprising eelgrass-suitable sand and silt substrates. Eelgrass will be transplanted from the proposed MOF site or Flora Bank.
- 10,000 m² intertidal brown algae across three sites adjacent to Lelu Island. These habitats would be created by constructing intertidal and subtidal benched rock reefs and boulder clusters using materials that would allow natural colonization by brown algae.
- 28,000 m² intertidal soft sediment across three sites adjacent to Lelu Island. These habitats would be created by constructing sheltered bench areas comprising soft sand and silt substrate. The benches will be designed with sufficient protection from wave action to prevent compaction and enable natural colonization by clams and other infaunal invertebrates.
- 30,000 m² intertidal soft sediment and cobble habitats across two sites adjacent to Lelu Island. This habitat would be created by constructing sheltered bench areas of gravel and cobble substrates. The benches will be located in areas that are well swept by local currents to minimize risk of sediment deposition to allow for use by flatfish and invertebrates.

Reference: Pacific NorthWest LNG Mitigation and Offsetting Commitments for Fish, Fish Habitat and Marine Mammals

Figure B shows the locations of the potential offset sites. Figures 8 and 9 of Appendix G10 to the December 2014 EIS Addendum (Preliminary Habitat Offsetting Plan) shows typical plan and cross-sections of possible enhancements for sites A and B. Updated preliminary designs for site C are not yet available. These figures have been attached for reference.

The impacts to fish habitat will be updated based on final engineering designs of the marine infrastructure and outcomes of additional hydrodynamic modelling. Based on these results, the areas of serious harm and proposed habitat offsets will be discussed with DFO and First Nations. Regardless of the final engineering design for the marine infrastructure and the outcomes of additional modelling, PNW LNG believes the mitigation measures summarized in Table 1 and the approach to offsetting outlined above will be the minimum measures proposed and committed to. Additional measures may be considered based on the final engineering design and the construction execution plan proposed by the contractor. It is PNW LNG's belief that the measures outlined above will, from our perspective, protect and enhance the productivity of the fish habitats in the vicinity of Lelu Island and support the long term sustainability of CRA fisheries in the area.

Sincerely,

<Signature Removed>

Mike Lambert
Head, Environmental and Regulatory Affairs

Attachments: Tables 1 and 2
Figures A and B
Appendix G10 Figures 8 and 9
PNW LNG Construction Methodology for Marine Facilities

cc: Lisa Walls, Regional Director, Pacific and Yukon Region, Canadian Environmental Assessment Agency

Table 1 Fish and Fish Habitat Mitigation Measures for the Pacific NorthWest LNG Project¹

Material Offloading Facility, Pioneer Dock, Vehicle Bridge from Mainland; Total estimated in-water construction period of approximately 7 months		
Potential Project Effect	Activity - Approximate Duration	Mitigation Measure
Fish Mortality	Dredging – ~7 months Blasting – intermittent during ~7 months Pile installation – ~3 months	<ul style="list-style-type: none"> • Trapping and relocating Dungeness crab before start of dredging. • Development of a Blasting Management Plan that considers both high and low risk works: <ul style="list-style-type: none"> ○ Mitigation for both high and low risk works include: <ul style="list-style-type: none"> ▪ Fisheries and Oceans Canada’s Blasting Guidelines ▪ Measures to reduce overpressure ▪ Timing blasting with low tides to reduce the number of underwater detonations ○ Mitigation for high risk works only: Blasting will be conducted within DFO least-risk timing window of November 30 to February 15; this window will be refined based on 2015 fish and fish habitat monitoring data prior to start of construction. • Use of low noise pile installation techniques (i.e., vibratory installation methods) in softer sediments. • Use of bubble curtains or bubble containment casing to reduce underwater pressure waves during impact pile driving and blasting. • Use of pile within pile installation techniques should monitoring suggest that the use of bubble curtains are not sufficient mitigation during pile installation • Use of silt curtains to exclude fish from the MOF work area.
Disturbance or killing of marine mammals	Blasting – intermittent during ~7 months Pile installation – ~3 months	<ul style="list-style-type: none"> • Development of a Blasting Management Plan that considers both high and low risk works: <ul style="list-style-type: none"> ○ Mitigation for both high and low risk works include: <ul style="list-style-type: none"> ▪ Fisheries and Oceans Canada’s Blasting Guidelines ▪ Measures to reduce overpressure ▪ Timing blasting with low tides to reduce the number of underwater detonations ▪ Establishing a variable 500 m to 1,000 m safety zone from blast sites - the distance is based on modelling and will be refined through in-situ underwater sound monitoring using a 160 dB re 1µPa rms sound pressure level threshold for marine mammals ▪ Implement a marine mammal observation program during blasting and impact pile driving. Blasting and impact pile driving will be halted if, in the 160 dB re 1µPa rms safety zone, harbour seals are observed in distress or other marine mammals are observed. ▪ Limiting blasting to daylight hours to allow marine mammal observers to visually determine if an animal is in the safety zone ○ Mitigation for high risk works only: Blasting within DFO least-risk timing window of November 30 to February 15; this window will be refined based on 2015 marine mammal monitoring data prior to start of construction.



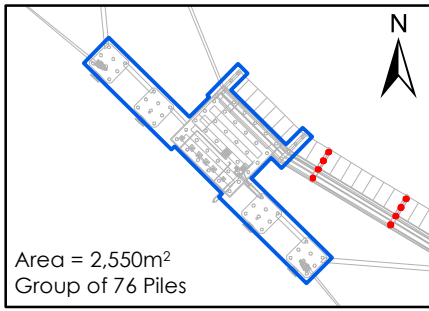
Material Offloading Facility, Pioneer Dock, Vehicle Bridge from Mainland; Total estimated in-water construction period of approximately 7 months		
Potential Project Effect	Activity - Approximate Duration	Mitigation Measure
Disturbance or killing of marine mammals (continued)	Blasting – intermittent during ~7 months Pile installation – ~3 months	<ul style="list-style-type: none"> • Use of low noise pile installation techniques (i.e., vibratory installation methods) in softer sediments. • Use of bubble curtains or bubble containment casing to reduce underwater noise during impact pile driving and blasting. • Use of pile within pile installation techniques should monitoring suggest that the use of bubble curtains is not sufficient mitigation during pile installation.
Permanent alteration or destruction of fish habitat	MOF Dredging – ~7 months	<ul style="list-style-type: none"> • A Habitat Offsetting Plan will be developed and implemented in accordance with DFO’s Fisheries Productivity Investment Policy (2013). This plan will be provided to DFO in an application for a paragraph 35(2)(b) Fisheries Act authorization.
Change in sediment or water quality (TSS)	MOF Dredging – ~7 months	<ul style="list-style-type: none"> • In-situ turbidity/TSS will be monitored during dredging activities. • If TSS levels exceed modelled predictions outside of the active work area (defined as the immediate area surrounding operating construction equipment), dredge methods will be modified to reduce TSS levels to an acceptable standard or other means, such as silt curtains, will be used to contain the suspended sediments
Marine Infrastructure Across Agnew bank (Suspension Bridge sub-structures, trestle, berths); Total estimated in-water construction period of 21 months		
Potential Project Effect	Activity -Approximate Duration	Mitigation Measure
Fish Mortality	Pile installation – ~21 months	<ul style="list-style-type: none"> • Use of a coffer dam to isolate the tower block and anchor block in-water work areas from surrounding waters. • Use of low noise pile installation techniques (i.e., vibratory installation methods) in softer sediments. • Use of bubble curtains to reduce underwater pressure waves during impact pile driving to seat the piles into bedrock. • Use of pile within pile installation techniques should monitoring suggest that the use of bubble curtains are not sufficient mitigation during pile installation

Marine Infrastructure Across Agnew bank (Suspension Bridge sub-structures, trestle, berths); Total estimated in-water construction period of 21 months		
Potential Project Effect	Activity -Approximate Duration	Mitigation Measure
Disturbance or killing of marine mammals	Pile installation – ~21 months	<ul style="list-style-type: none"> • Use of a coffer dam to isolate the tower block and anchor block work areas from surrounding waters • Establishing a 500 m to 1,000 m safety diameter zone from impact pile driving activities. The distance is based on modelling and will be refined through in-situ underwater sound monitoring using a 160 dB re 1µPa rms sound pressure level threshold for marine mammals • Implement a marine mammal observation program during impact pile driving. Activities will be temporarily suspended if, in the safety zone, harbour seals are observed to be in distress or other marine mammals are observed • Use of bubble curtains to reduce underwater pressure waves during impact pile driving to seat the piles into bedrock • Use of pile within pile installation techniques should monitoring suggest that the use of bubble curtains are not sufficient mitigation during pile installation
Change in (permanent alteration or destruction of) fish habitat	Pile installation – ~21 months	<ul style="list-style-type: none"> • A Habitat Offsetting Plan will be developed and implemented in accordance with DFO’s Fisheries Productivity Investment Policy (2013). This plan will be provided to DFO in an application for a paragraph 35(2)(b) Fisheries Act authorization after the CEA Agency has distributed its environmental assessment report for public comment. • Scour protection will be placed around tower platform informed by hydrodynamic modelling of the final detailed marine infrastructure design (i.e., the works that will be constructed). • Hard multi-faceted shoreline protection material (e.g., rip rap boulders) will be used where needed (e.g., trestle abutment) to promote colonization by marine biota
Change in sediment or water quality (TSS)	Pile installation (scour and deposition)	<ul style="list-style-type: none"> • Use of a coffer dam to isolate the tower block and anchor block in-water work areas from surrounding waters. • In-situ turbidity/TSS will be monitored during pile driving. • If TSS levels exceed modelled predictions outside of the active work area (defined as the immediate area surrounding operating construction equipment), work methods will be adjusted and may include pile within pile techniques
Marine Terminal Operations – 30 years		
Potential Project Effect	Activity – Approximate Duration	Mitigation Measure
Change in sediment or water quality (TSS)	Tug maneuvering (during operations)	<ul style="list-style-type: none"> • Tugs will be equipped with Voith Schneider propulsion systems to minimize the suspension of sediments by propeller wash.
Change in fish behaviour	Lighting on marine infrastructure (incl. suspension bridge, trestle and berths)	<ul style="list-style-type: none"> • Lights will be shielded and directed onto the deck structures to prevent spillage onto the water.

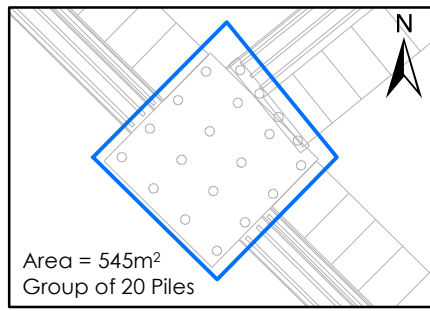
Note 1: The mitigations proposed in this table will apply year-round with only one exception, blasting in high risk areas which will occur as defined herein.

Table 2 Summary of Areas of Fish Habitat Loss or Permanent Alteration by Project Component

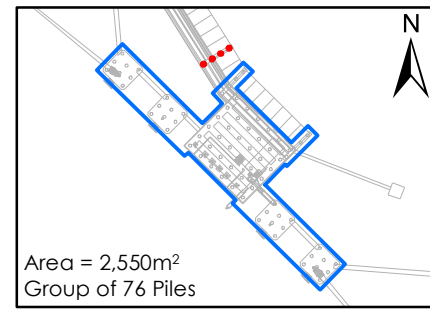
Material Offloading Facility		
Project Component	Type of Habitat Impacted	Area of Habitat Loss or Alteration (m²) [rounded to nearest 5 m²]
Dredging / Blasting	Soft bottom intertidal eelgrass	1,830
	Hard bottom subtidal kelp - algae	6,800
(A) Total Area of Habitat Loss or Permanent Alteration (m ²)		8,630
Marine Infrastructure (Suspension Bridge marine sub-structures, Pipe pile supported trestle)		
Project Component	Habitat Impacted	Area of Habitat Loss or Alteration (m²) [rounded to nearest 5 m²]
Suspension bridge tower:		
- Tower block (36.4 m x 20.2 m)	Soft bottom subtidal clay-silt	735
- Tower block scour protection (10.8 m offset from block)	Soft bottom subtidal clay-silt	1,690
Suspension bridge anchor:		
- Anchor block (44 m x 45 m)	Soft bottom subtidal clay-silt	1,980
- Anchor block scour protection (15.8 m offset from block)	Soft bottom subtidal clay-silt	3,810
Marine trestle:		
- Piles (180 piles, 1.22 m diameter)	Soft bottom subtidal clay-silt	210
- Pile scour protection (2.05 m offset from pile)	Soft bottom subtidal clay-silt	3,790
Marine berth:		
- Piles (164 piles, 1.22 m diameter)	Soft bottom subtidal clay-silt	190
- Pile scour protection (2.05 m offset from pile)	Soft bottom subtidal clay-silt	3,455
- Group piles (2.05 m offset from outermost piles in group)		
- Central berth platform and final trestle pile bend (Group of 20 piles)	Soft bottom subtidal clay-silt	545
- Northern loading platform (Group of 76 piles)	Soft bottom subtidal clay-silt	2,550
- Southern loading platform (Group of 76 piles)	Soft bottom subtidal clay-silt	2,550
(B) Total Area of Habitat Loss or Permanent Alteration (m ²)		21,505
Total Area of Habitat Loss or Permanent Alteration for Project (m²)		30,135 (A+B)



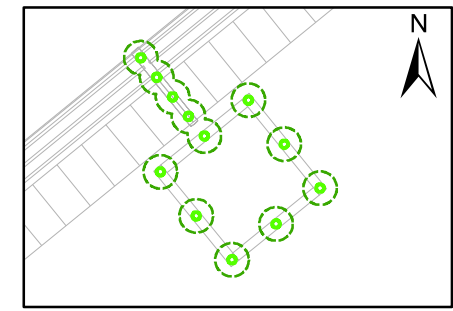
Northern Loading Platform:



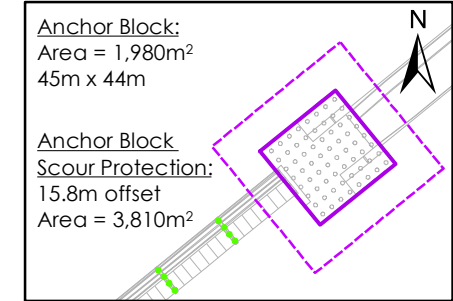
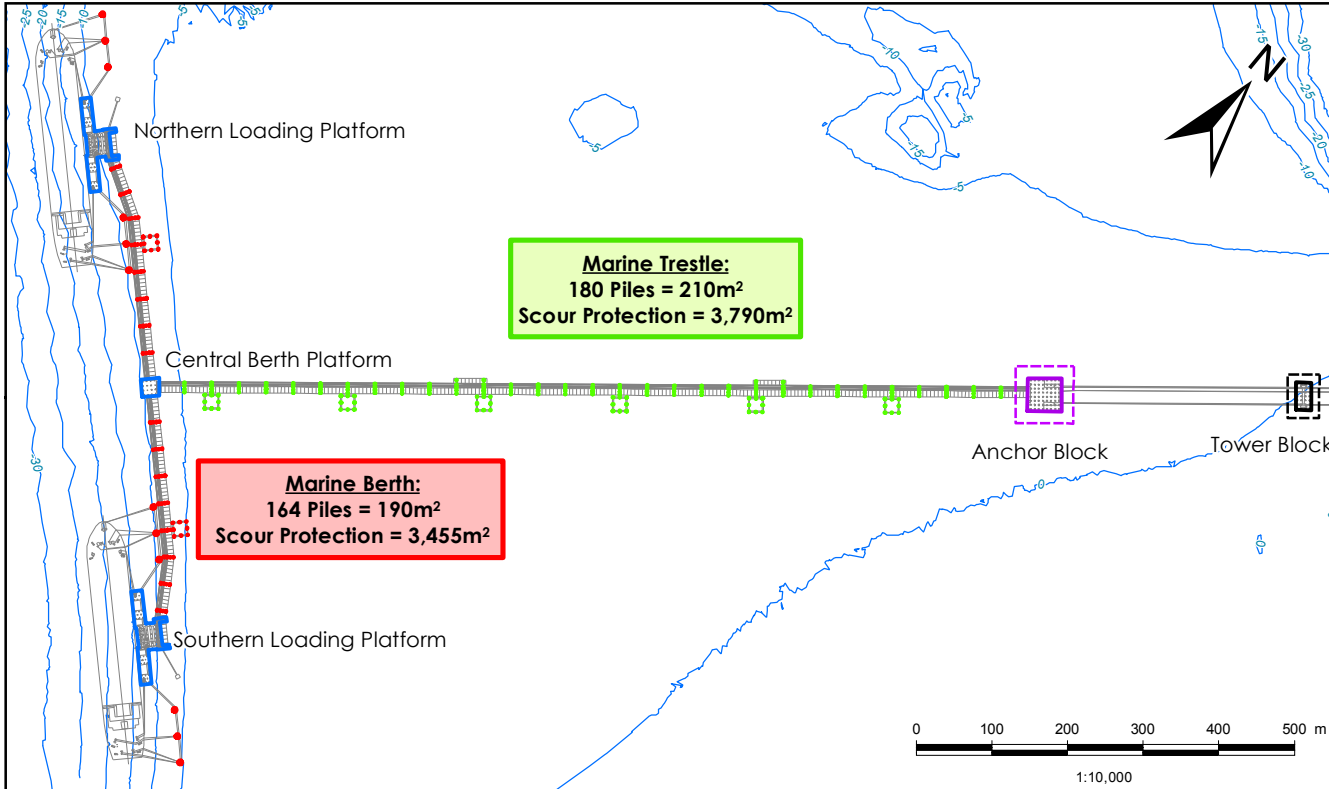
Central Berth Platform:



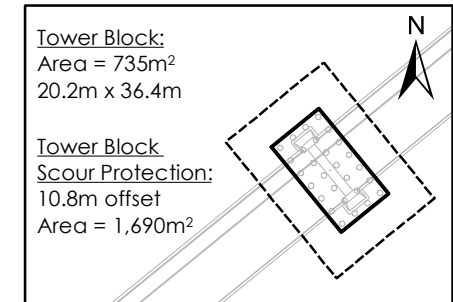
Southern Loading Platform:



Trestle Piles



Anchor Block



Tower Block

Legend

- Tower Block
- Anchor Block
- Marine trestle pile
- Marine berth pile
- Pile Group

Note: All area calculations have been rounded to the nearest 5m²

Pacific NorthWest LNG

Areas of Habitat Alteration and Loss Associated with Marine Infrastructure

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada; Natural Resources Canada; Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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PROJECTION: UTM - ZONE 9
DATUM: NAD 83
CHECKED BY: B. BYRD

PREPARED BY:

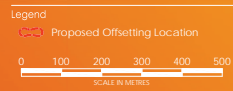


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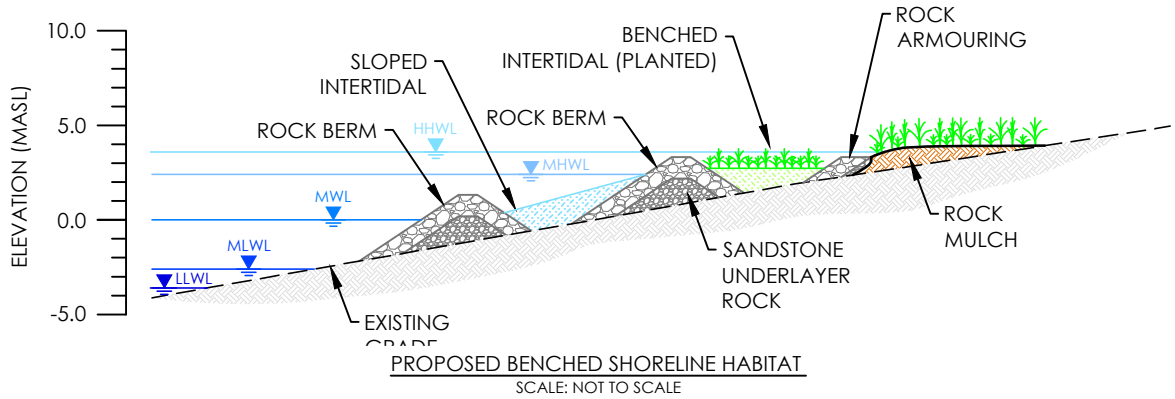
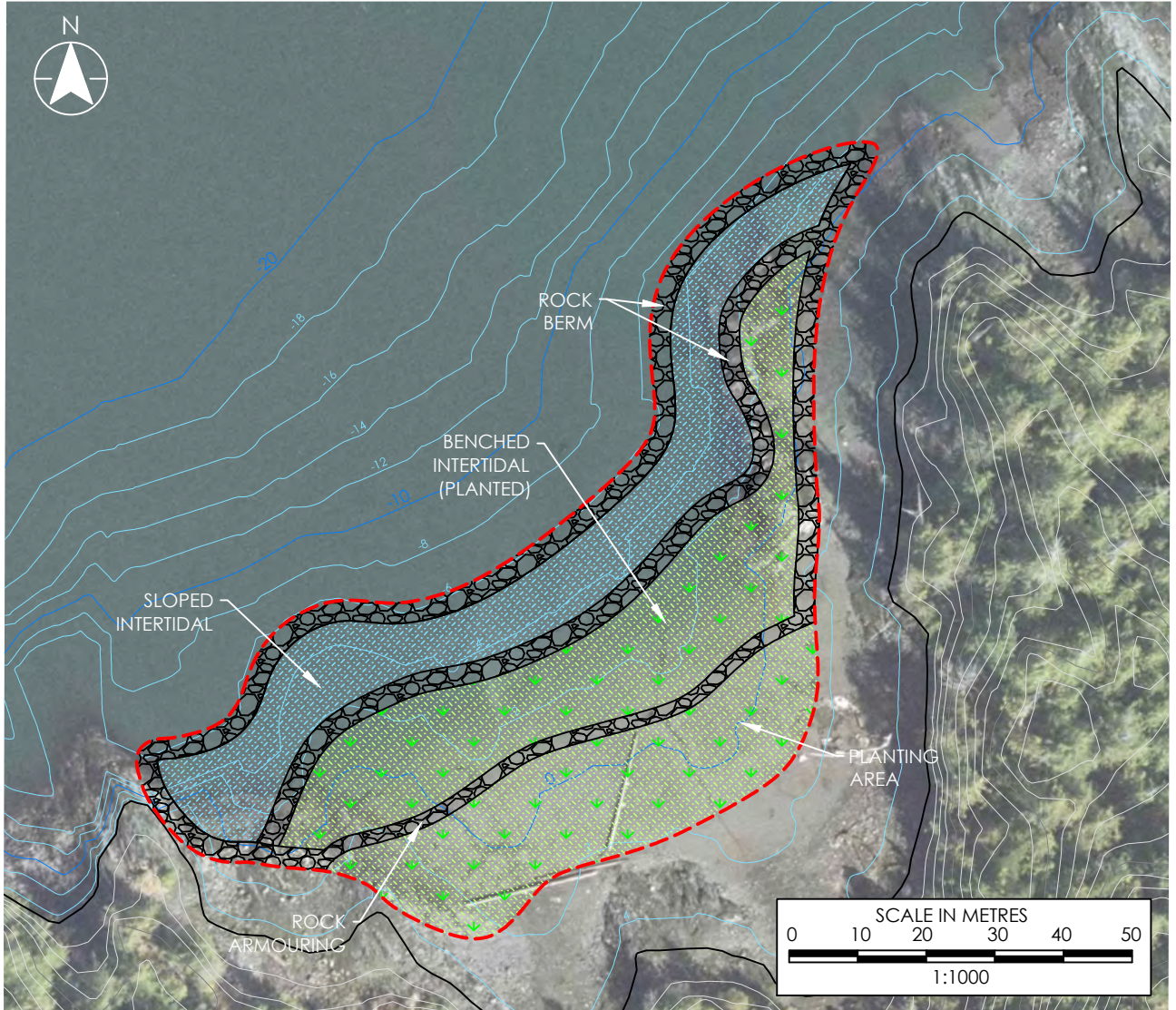
FIGURE NO:

A




Title
**PROPOSED MARINE FISH HABITAT
 OFFSETTING LOCATIONS**

Figure **B**



Legend

 Proposed Marine Habitat Compensation Site

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Pacific NorthWest LNG

Marine Habitat Offsetting Site A

Sources: Base map provided by Microsoft Bing Imagery

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DATE: 27-OCT-14
FIGURE ID: 123110537-855
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DATUM: NAD 83
CHECKED BY: M. PROUDFOOT

PREPARED BY:

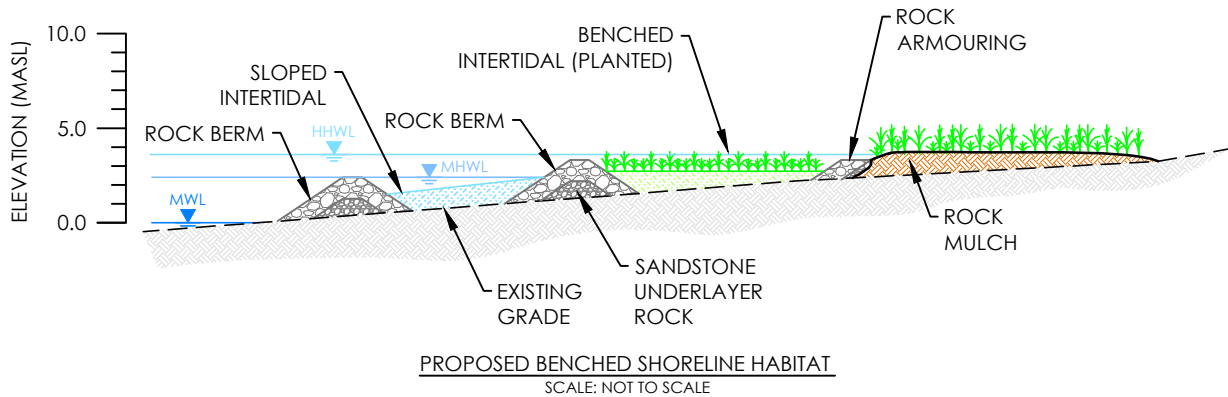
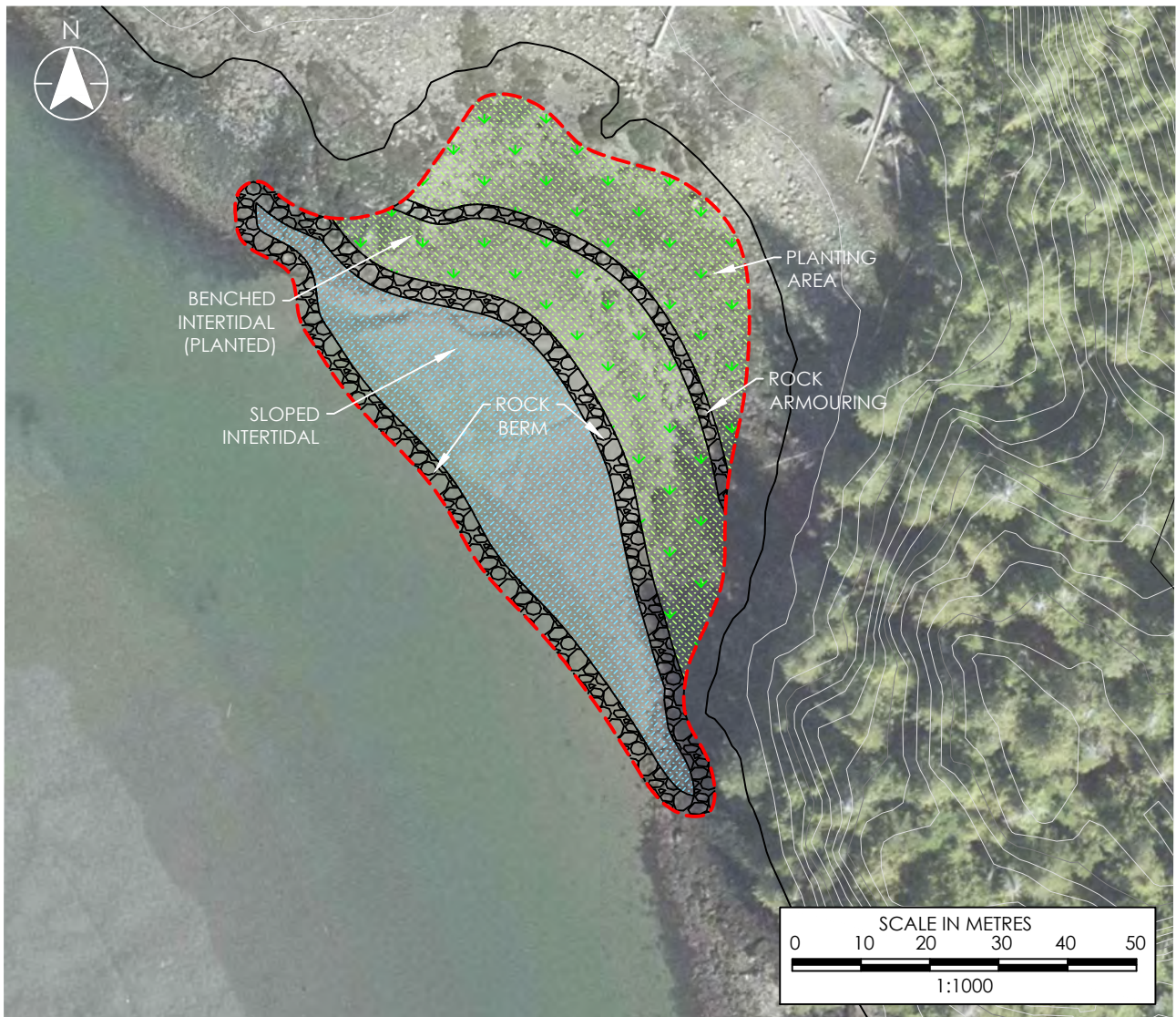


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FIGURE NO:

8



Legend

Proposed Marine Habitat Compensation Site

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Pacific NorthWest LNG

**Marine Habitat Offsetting
Site B**

Sources: Base map provided by Microsoft Bing Imagery

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FIGURE NO:

9