JEN-JAY, INC

Preliminary Eelgrass Macro Algae Habitat Survey

Point Hudson Marina
9 August 2020

LOCATION: Point Hudson Marina, Port Townsend, WA

PURPOSE: To survey the area in anticipation of repairs to the marina breakwater structures.

TIME: 8:00 a.m. to 2:00 pm

VISIBILITY: +/- 15’

DEPTH CALCULATIONS: Bathymetric measurements were provided by others. Submersible dive computers were used to confirm depth contour measurements in the survey area using the tidal correction for Port Townsend tide station #9444900 with 0'=MLLW.

BOTTOM TYPE: Substrate in the northeastern part of the survey area was primarily mud and sand with 0-6" rock. Boulders up to 36-inches were observed in the deeper portions of the surveyed area. Substrate in the south and western survey area was also sand and mud, with 0-36" rocks located variably throughout the surveyed area. Areas at the toe of the existing riprap structures were observed during the survey and revealed loose riprap rocks that had rolled out of the breakwater and onto the seabed.

LATITUDE and LONGITUDE: 48.116009º N, -122.750243° W

VEGETATION: In the northeastern portion of the surveyed area was observed a large fringe eelgrass bed (*Zostera marina*) located approximately parallel to shore between the -5' MLLW and -15' MLLW tidal elevations. In an area nearest the marina entrance channel was another highly patchy and sparce eelgrass bed with an indistinct boundary. These eelgrass areas are depicted on the accompanying survey drawing.

The southwestern portion of the survey also revealed a moderately sized eelgrass bed located shoreward of the existing mooring platform between the -2' MLLW and -15' MLLW tidal elevations. This has also been depicted on the drawing.

Numerous macroalgae were observed in areas of the survey where larger rock was encountered. Observed macroalgae genera include *Agarum, Alaria, Chondracanthus, Costaria, Cryptopleura, Gracilaria, Laminaria, Mazaella, Palmaria, Porphyra, Prionitis, Saccharina, Sarcodiotheca, Ulva,* and unidentified filamentous brown algae.

The toe of the riprap breakwater included high concentrations of the described macroalgae, though vegetation in this area was primarily found growing on the non-native riprap rock debris material and timber pilings.

Areas with mud and sand, or smaller rock that were not colonized by eelgrass, were found to be primarily void of macroalgae with the exception of small amounts of *Sarcodiotheca* and *Gracilaria.* These are known to inhabit softer substrates.

SURVEY PATTERN: The survey pattern was not a typical rectangular survey area. Transect lines were established using pre-determined DGPS coordinates generated from a georeferenced GIS drawing of the existing breakwater structures. Transect lines were spaced at 15' intervals to ensure complete coverage of the surveyed area. Given the 15-foot visibility at the time of the survey, all surveyed areas would have been viewed at least twice. Observations were taken every 20′ along each transect line, with the diver observing the vegetation and substrate present on either side, and forward of each sample location. General characterizations were made about percent cover of algal species and/or eelgrass observed in the visual area at each location. The accompanying drawing shows a visual representation of the survey pattern.

In areas where eelgrass was discovered, a wireless DGPS unit was employed to delineate a real-time track of the eelgrass bed boundary. This information was then placed onto the georeferenced GIS drawing, to produce an accurate, scale depiction of the eelgrass location and extent.

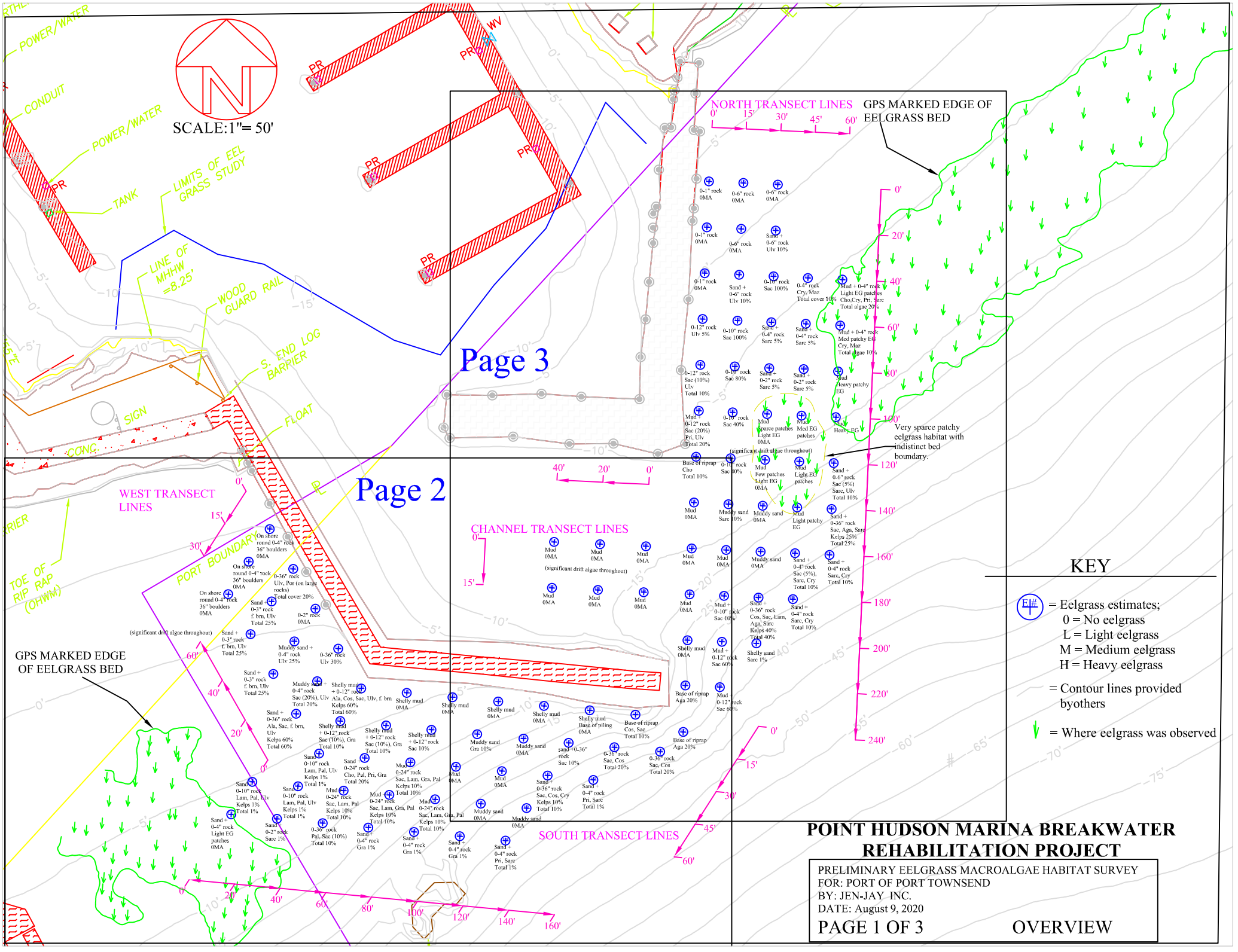
Survey methods for shoreline development activities are in accordance with the WDFW *Eelgrass Macro Algae Habitat Interim Survey Guidelines* revised in June 2008 and WAC 220-660-350, which states that "deviations from survey guidelines shall be approved by the AHB (Area Habitat Biologist) prior to conducting eelgrass or macroalgae surveys." The proposed project does not involve a typical recreational dock structure and the survey was designed in consultation with the appropriate WDFW AHB.

Additionally, all preliminary surveys follow the Preliminary Survey and Tier 1 survey methods outlined in *Components of a Complete Eelgrass Delineation Report* developed by the Army Corps of Engineers (ACOE) and dated January 9, 2018. Eelgrass bed boundaries were identified using Eelgrass Delineation Method B, which defines an eelgrass bed as "any eelgrass within one square meter quadrat and within 1 meter of another shoot."

VERTEBRATE and INVERTEBRATE SPECIES: *Metridium* anemones were observed on riprap and piling debris in various locations along the existing breakwater. There is no documented forage fish spawning habitat in the vicinity of the marina.

Any questions regarding this survey should be addressed to:

Chris Betcher
JEN-JAY, INC.



KEY

EI# = Eelgrass estimates;
0 = No eelgrass
L = Light eelgrass
M = Medium eelgrass
H = Heavy eelgrass

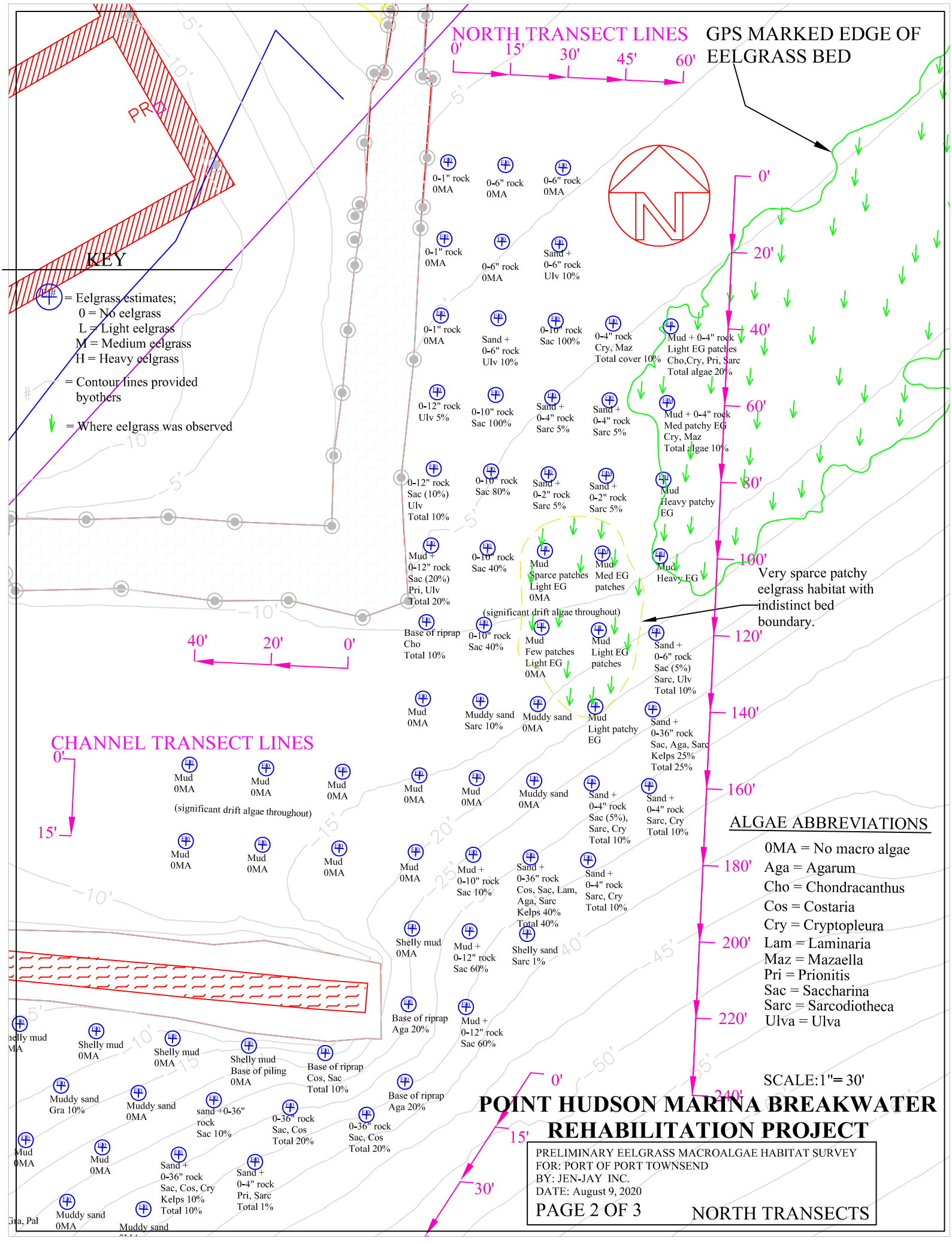
= Contour lines provided byothers

= Where eelgrass was observed

POINT HUDSON MARINA BREAKWATER REHABILITATION PROJECT

PRELIMINARY EELGRASS MACROALGAE HABITAT SURVEY
FOR: PORT OF PORT TOWNSEND
BY: JEN-JAY INC.
DATE: August 9, 2020

OVERVIEW


NORTH TRANSECT LINES
0'
15'
30'
45'
60'
GPS MARKED EDGE OF EELGRASS BED
KEY
= Eelgrass estimates;
0 = No eelgrass
L = Light eelgrass
M = Medium eelgrass
H = Heavy eelgrass
= Contour lines provided byothers
= Where eelgrass was observed
PROP
0-1" rock 0MA
0-6" rock 0MA
0-6" rock 0MA
0-1" rock 0MA
0-6" rock 0MA
Sand + 0-6" rock Ulv 10%
0-1" rock 0MA
Sand + 0-6" rock Ulv 10%
0-10" rock Sac 100%
0-4" rock Cry, Maz Total cover 10%
Mud + 0-4" rock Light EG patches Cho,Cry, Pri, Sarc Total algae 20%
0-12" rock Ulv 5%
0-10" rock Sac 100%
Sand + 0-4" rock Sarc 5%
Sand + 0-4" rock Sarc 5%
Mud + 0-4" rock Med patchy EG Cry, Maz Total algae 10%
0-12" rock Sac (10%) Ulv Total 10%
0-10" rock Sac 80%
Sand + 0-2" rock Sarc 5%
Sand + 0-2" rock Sarc 5%
Mud Heavy patchy EG
Mud + 0-12" rock Sac (20%) Pri, Ulv Total 20%
0-10" rock Sac 40%
Mud Sparce patches Light EG 0MA
Mud Med EG patches
Mud Heavy EG
(significant drift algae throughout)
Base of riprap Cho Total 10%
0-10" rock Sac 40%
Mud Few patches Light EG 0MA
Mud Light EG patches
Sand + 0-6" rock Sac (5%) Sarc, Ulv Total 10%
Mud 0MA
Muddy sand Sarc 10%
Muddy sand 0MA
Mud Light patchy EG
Sand + 0-36" rock Sac, Aga, Sarc Kelps 25% Total 25%
0'
15'
Mud 0MA
Mud 0MA
Mud 0MA
(significant drift algae throughout)
Mud 0MA
Mud 0MA
Mud 0MA
Mud 0MA
Mud 0MA
Muddy sand 0MA
Sand + 0-4" rock Sac (5%), Sarc, Cry Total 10%
Sand + 0-4" rock Sarc, Cry Total 10%
Mud 0MA
Mud 0MA
Mud 0MA
Mud + 0-10" rock Sac 10%
Sand + 0-36" rock Cos, Sac, Lam, Aga, Sarc Kelps 40% Total 40%
Sand + 0-4" rock Sarc, Cry Total 10%
Shelly mud 0MA
Mud + 0-12" rock Sac 60%
Shelly sand Sarc 1%
Base of riprap Aga 20%
Mud + 0-12" rock Sac 60%
Shelly mud 0MA
Shelly mud 0MA
Shelly mud 0MA
Shelly mud Base of piling 0MA
Base of riprap Cos, Sac Total 10%
Base of riprap Aga 20%
Muddy sand Gra 10%
Muddy sand 0MA
sand +0-36" rock Sac 10%
0-36" rock Sac, Cos Total 20%
0-36" rock Sac, Cos Total 20%
Mud 0MA
Mud 0MA
Sand + 0-36" rock Sac, Cos, Cry Kelps 10% Total 10%
Sand + 0-4" rock Pri, Sarc Total 1%
Muddy sand 0MA
Muddy sand 0MA
Gra, Pal
0'
20'
40'
60'
80'
100'
120'
140'
160'
180'
200'
220'
240'
40'
20'
0'
0'
15'
30'
Very sparce patchy eelgrass habitat with indistinct bed boundary.
CHANNEL TRANSECT LINES
ALGAE ABBREVIATIONS
0MA = No macro algae
Aga = Agarum
Cho = Chondracanthus
Cos = Costaria
Cry = Cryptopleura
Lam = Laminaria
Maz = Mazaella
Pri = Prionitis
Sac = Saccharina
Sarc = Sarcodiotheca
Ulva = Ulva
SCALE:1"= 30'
POINT HUDSON MARINA BREAKWATER REHABILITATION PROJECT
PRELIMINARY EELGRASS MACROALGAE HABITAT SURVEY
FOR: PORT OF PORT TOWNSEND
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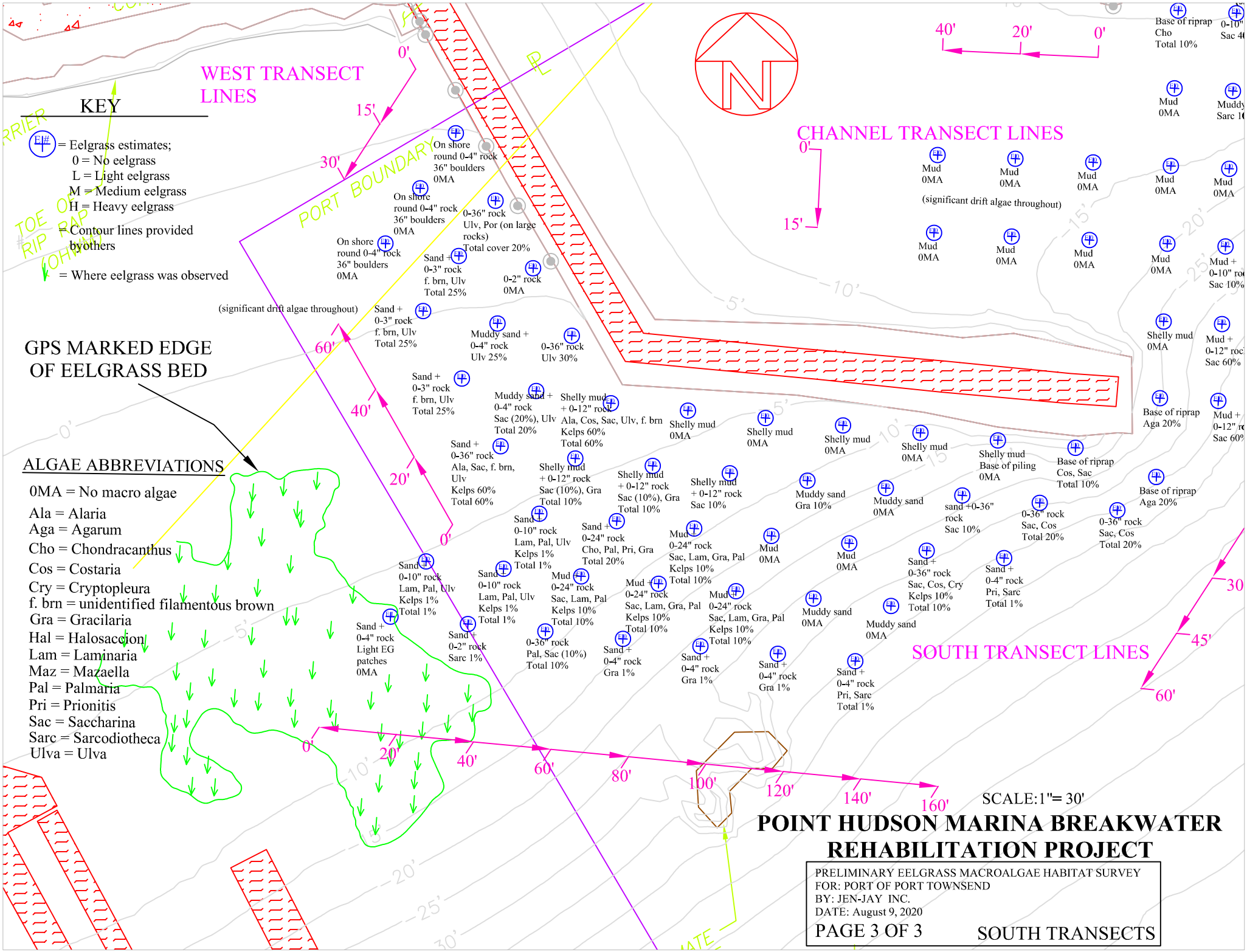
DATE: August 9, 2020
PAGE 2 OF 3
NORTH TRANSECTS


KEY
E# = Eelgrass estimates;
0 = No eelgrass
L = Light eelgrass
M = Medium eelgrass
H = Heavy eelgrass
= Contour lines provided byothers
= Where eelgrass was observed
GPS MARKED EDGE OF EELGRASS BED
ALGAE ABBREVIATIONS
0MA = No macro algae
Ala = Alaria
Aga = Agarum
Cho = Chondracanthus
Cos = Costaria
Cry = Cryptopleura
f. brn = unidentified filamentous brown
Gra = Gracilaria
Hal = Halosaccion
Lam = Laminaria
Maz = Mazaella
Pal = Palmaria
Pri = Prionitis
Sac = Saccharina
Sarc = Sarcodiotheca
Ulva = Ulva
WEST TRANSECT LINES
CHANNEL TRANSECT LINES
SOUTH TRANSECT LINES
PORT BOUNDARY
TOE OF RIP RAP (OHWM)
(significant drift algae throughout)
SCALE:1"= 30'
POINT HUDSON MARINA BREAKWATER REHABILITATION PROJECT
PRELIMINARY EELGRASS MACROALGAE HABITAT SURVEY
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PAGE 3 OF 3
SOUTH TRANSECTS

Point Hudson Marina Breakwater Rehabilitation Project

Preliminary Eelgrass and Macroalgae Habitat Survey

August 9, 2020

(Survey Data Grouped by General Site Location and mapped coordinates as depicted on accompanying drawing)

Location	Map Coords	Observations
North	0,0	0-1" Rock, 0MA
North	0,20	0-1" Rock, 0MA
North	0,40	0-1" Rock, 0MA
North	0,60	0-12" Rock, Ulv 5%
North	0,80	0-12" Rock, Sac (10%), Ulv, Total Cover 10%
North	0,100	Mud + 0-12" Rock, Sac (20%), Pri, Ulv, Total Cover 20%
North	0,120	Base of riprap, Cho 10%
North	0,140	Mud, 0MA
North	0,160	Mud, 0MA
North	0,180	Mud, 0MA
North	0,200	Shelly Mud, 0MA
North	0,220	Base of riprap, Aga 20%
North	0,240	Base of riprap, Aga 20%
North	15,0	0-6" Rock, 0MA
North	15, 20	0-6" Rock, 0MA
North	15,40	Sand + 0-6" Rock, Ulv 10%
North	15,60	0-10" Rock, Sac 100%
North	15,80	0-10" Rock, Sac 80%
North	15,100	0-10" Rock, Sac 40%
North	15,120	0-10" Rock, Sac 40%
North	15,140	Muddy sand, Sarc 10%
North	15,160	Mud, 0MA
North	15,180	Mud + 0-10" Rock, Sac 10%
North	15,200	Mud + 0-12" Rock, Sac 60%
North	15,220	Mud + 0-12" Rock, Sac 60%
North	15,240	---
North	30,0	0-6" Rock, 0MA
North	30,20	Sand + 0-6" Rock, Ulv 10%

North	30,40	0-10" Rock, Sac 100%
North	30,60	Sand + 0-4" Rock, Sarc 5%
North	30,80	Sand + 0-2" Rock, Sarc 5%
North	30,100	Mud, sparce patches of light eelgrass, 0MA
North	30,120	Mud, few patches of light eelgrass, 0MA
North	30,140	Muddy sand, 0MA
North	30,160	Muddy sand, 0MA
North	30,180	Sand + 0-36" Rock, Cos, Sac, Lam, Aga (Kelps 40%), Sarc Total Cover 40%
North	30,200	Shelly sand, Sarc 1%
North	30,220	---
North	30,240	---
North	45,0	---
North	45,20	---
North	45,40	0-4" Rock, Cry, Maz, Total cover 10%
North	45,60	Sand + 0-4" Rock, Sarc 5%
North	45,80	Sand + 0-2" Rock, Sarc 5%
North	45,100	Mud, Medium patches of eelgrass
North	45,120	Mud, Light patches of eelgrass
North	45,140	Mud, Light patchy eelgrass
North	45,160	Sand + 0-4" Rock, Sac (5%), Sarc, Cry, Total cover 10%
North	45,180	Sand + 0-4" Rock, Sarc, Cry, Total cover 10%
North	45,200	---
North	45,220	---
North	45,240	---
North	60,0	---
North	60,20	---
North	60,40	Mud + 0-4" Rock, Light eelgrass patches, Cho, Cry, Pri, Sarc, Total macroalgae cover 20%
North	60,60	Mud + 0-4" Rock, Medium patchy eelgrass, Cry, Maz, Total macroaglae cover 10%
North	60,80	Mud, Heavy patchy eelgrass
North	60,100	Mud, Heavy eelgrass
North	60,120	Sand + 0-6" Rock, Sac (5%), Sarc, Ulv, Total cover 10%
North	60,140	Sand + 0-36" Rock, Sac, Aga (kelps 25%), Sarc, Total cover 25%
North	60,160	Sand + 0-4" Rock, Sarc, Cry, Total cover 10%
North	60,180	---

North	60,200	---
North	60,220	---
North	60,240	---
Channel	0,0	Mud, 0MA
Channel	0,20	Mud, 0MA
Channel	0,40	Mud, 0MA
Channel	15,0	Mud, 0MA
Channel	15,20	Mud, 0MA
Channel	15,40	Mud, 0MA
South	0,0	---
South	0,20	Shelly mud + 0-12" Rock, Ala, Cos, Sac (kelp 60%), Ulv, f. brn, Total cover 60%
South	0,40	Shelly mud, 0MA
South	0,60	Shelly mud, 0MA
South	0,80	Shelly mud, 0MA
South	0,100	Shelly mud, 0MA
South	0,120	Shelly mud, base of piling, 0MA
South	0,140	Base of riprap, Cos, Sac, Total kelp 10%
South	0,160	---
South	15,0	---
South	15,20	Shelly mud + 0-12" Rock, Sac (10%), Gra, Total cover 10%
South	15,40	Shelly mud + 0-12" Rock, Sac (10%), Gra, Total cover 10%
South	15,60	Shelly mud + 0-12" Rock, Sac (10%), Gra, Total cover 10%
South	15,80	Muddy sand, Gra 10%
South	15,100	Muddy sand, 0MA
South	15,120	Sand + 0-36" Rock, Sac 10%
South	15,140	0-36" Rock, Sac, Cos, Total kelp 20%
South	15,160	0-36" Rock, Sac, Cos, Total kelp 20%
South	30,0	---
South	30,20	Sand + 0-10" Rock, Lam (1%), Pal, Ulv, Total cover 1%
South	30,40	Sand + 0-24" Rock, Cho, Pal, Pri, Gra, Total cover 20%
South	30,60	Mud + 0-24" Rock, Sac, Lam (kelps 10%), Gra, Pal, Total cover 10%
South	30,80	Mud 0MA
South	30,100	Mud 0MA
South	30,120	Sand + 0-36" Rock, Sac, Cos (kelps 10%), Cry, Total cover 10%

South	30,140	Sand + 0-4" Rock, Pri, Sarc, Total cover 1%
South	30,160	---
South	45,0	Sand + 0-10" Rock, Lam (1%), Pal, Ulv, Total cover 1%
South	45,20	Sand + 0-10" Rock, Lam (1%), Pal, Ulv, Total cover 1%
South	45,40	Mud + 0-24" Rock, Sac, Lam (kelps 10%), Pal, Total cover 10%
South	45,60	Mud + 0-24" Rock, Sac, Lam (kelps 10%), Pal, Gra, Total cover 10%
South	45,80	Mud + 0-24" Rock, Sac, Lam (kelps 10%), Pal, Gra, Total cover 10%
South	45,100	Muddy sand, 0MA
South	45,120	Muddy sand, 0MA
South	45,140	---
South	45,160	---
South	60,0	Sand + 0-4" Rock, Light eelgrass patches, 0MA
South	60,20	Sand + 0-2" Rock, Sarc 1%
South	60,40	0-36" Rock, Sac (10%), Pal, Total cover 10%
South	60,60	Sand + 0-4" Rock, Gra 1%
South	60,80	Sand + 0-4" Rock, Gra 1%
South	60,100	Sand + 0-4" Rock, Gra 1%
South	60,120	Sand + 0-4" Rock, Pri, Sarc, Total cover 1%
South	60,140	---
South	60,160	---
West	0,0	0-36" Rock, Ulv 30%
West	0,20	0-2" Rock, 0MA
West	0,40	0-36" Rock, Ulv, Por (on large rocks), Total cover 20%
West	0,60	On shore during survey, 0-4" round rock + 36" boulders, 0MA
West	15,0	Muddy sand + 0-4" Rock, Sac (20%), Ulv, Total cover 20%
West	15,20	Muddy sand + 0-4" Rock, Ulv 25%
West	15,40	Sand + 0-3" Rock, Ulv, f. brn, Total cover 25%
West	15,60	On shore during survey, 0-4" round rock + 36" boulders, 0MA
West	30,0	Sand + 0-36" Rock, Ala, Sac (kelps 60%), Ulv, f. brn, Total Cover 60%
West	30,20	Sand + 0-3" Rock, Ulv, f. brn, Total cover 25%
West	30,40	Sand + 0-3" Rock, Ulv, f. brn, Total cover 25%
West	30,60	On shore during survey, 0-4" round rock + 36" boulders, 0MA

Macroalgae abbreviations on following page

Macroalgae Abbreviations:

0MA = no macroalgae
Aga = Agarum (kelp_
Ala = Alaria (kelp)
Cho = Chondracanthus
Cos = Costaria (kelp)
Cry = Cryptopleura
f. brn = unidentified filamentous brown
Gra = Gracilaria
Hal = Halosaccion
Lam = Laminaria (kelp)
Maz = Mazaella
Pal = Palmaria
Pri = Prionitis
Sac = Saccharina (kelp)
Sarc = Sarcodiotheca
Ulv = Ulva
--- = Observations not made at this location