COASTAL GEOLOGIC SERVICES

memorandum

Date: July 16, 2015

To: Lisa Kaufman, Northwest Straits Foundation

Fred Herzon, Seahorse Siesta land owner and contact

4654 Strawbridge Lane, Langley, WA, 98260

From: Jim Johannessen, Licensed Engineering Geologist, MS

Re: **Conceptual Design for Bulkhead and Fill Removal and Partial Feeder Bluff Restoration at Seahorse Siesta Community, Langley, WA – PRELIMINARY REVISED - FINAL**

Site Conditions

The site is the community beach and beach access area of the Seahorse Siesta community. The site is located in the western portion of Langley on south Whidbey Island, in Island County, WA.

This site is within net shore-drift cell WHID-1 (Keuler 1988). A net shore-drift cell is a long-term littoral sediment transport cell, which over the long-term has a net sediment transport direction, driven by waves, in one direction alongshore. Cell WHID-1 originates about 1.4 miles northwest of the site and continues to Sandy Point, east of Langley, approximately 2.4 miles east of the site.

The subject shore armor (bulkhead) is one of the larger protruding structures in the residential portions of Island County. A derelict barge comprises the outer approximately one-half of the filled and bulkheaded area. It was stated that a former community member bought an old military surplus barge and grounded it in this location with intent to build the bulkhead.

The bulkhead extends 98 feet (FT) out on the beach from the toe of the bluff on the north side and 62 FT on the south side. The bulkhead and fill area extend 136 lineal feet (LF) alongshore. The total beach area covered waterward of the bluff toe is 10,800 square feet (SF). A concrete bulkhead generally 9 FT high and 8 inch (IN) thick surrounds the barge and fill area. The bulkhead toe extends to 8 FT mean low low water (MLLW) elevation which is 2.6 FT below local mean higher high water (MHHW) and 5 FT lower than the average bluff toe elevation.

An old beach access road comes down the bluff towards the east-northeast landing in the fill area. The access is still in use by the community, and is to be maintained. The access path is generally 10–15 FT wide, and has numerous tension cracks and small slide scarps showing that it is somewhat unstable at present.

Project Description

Purpose

The purpose of the project is to remove the large protruding barge and associated vertical concrete wall extending over the beach to provide:

- Increased intertidal and backshore area
- Enhanced nearshore habitats
- Partial or full feeder bluff restoration

- Restored littoral drift
- Removal of potentially creosoted treated wood from the nearshore

Detailed Project Descriptions

It is anticipated that all work and materials transport will be accessed and provided by barge. The trail down the bluff is too unstable to haul equipment and material. The main elements of the conceptual designs for coastal habitat enhancement and partial or full feeder bluff restoration are as follows, each of which will be outlined below:

- Full armor removal which includes bulkhead, barge, and fill removal and lower bluff grading to maintain the existing beach access.
- Partial armor removal which includes bulkhead, barge, and fill removal, and the construction of a small rockery to protect the existing beach access.

The full armor removal alternative is preferred because it will have a higher benefit to the nearshore, is less expensive, more desirable for grants, and easier to permit than the partial removal alternative. The preferred alternative enhances the nearshore by fully removing the armor and retaining more sediment. The sediment currently landward of the barge was pushed down from the bluff and is therefore the natural material of the drift cell. Additionally, full armor removal will restore the feeder bluff function over time. The full removal alternative will be much easier to permit and receive grant funding for, as well as cost substantially less than the partial alternative.

Full Armor Removal – Preferred Alternative

The full armor removal option includes removing the entire bulkhead and barge as well as minor grading of the remaining fill to allow for beach access. The fill between the bluff toe and the barge will remain after bulkhead removal and will be graded slightly in the southeast corner for beach access. It is anticipated this fill will slowly erode to feed down-drift beaches. This option fully removes all anthropogenic structures from the project beach area.

Bulkhead, Barge, and Fill Removal

The entirety of the vertical concrete wall and footing will be removed from the project site through direct excavation. The total amount of concrete to be removed is on the order of 70-100 CY.

Following vertical wall removal, the barge within the outer portion of the fill area will be removed and disposed of properly off-site. Wood in the barge will likely need to be tested to determine if it is creosoted or treated with other harmful materials. This will dictate specific handling and disposal needs. The barge measures 136 FT by 40 FT, resulting in uncovering of 5440 SF through its removal.

Minor Lower Bluff Grading for Beach Access

Landward of the barge extents, the existing fill will be left in place with a small amount of grading to maintain the existing beach access as shown on the Sheets 2-5 of the attached Full Armor Removal Preliminary Plan set. The 50 CY of fill removed for the access within this option could potentially be placed within the project limits to also feed down-drift beaches and limit removal quantities depending on permit approvals. The Full Armor removal option will require the items and actions detailed in Table 1.

Table 1. Quantities estimated for bulkhead, barge, and fill removal and rockery construction for full removal alternative.

Item Description	Quantity	Unit
Design	1	LS
Permitting	1	LS
Mobilization	1	LS
Barge Access	5	DAY
Construction Survey/Staking	20	HR
Clearing and Grubbing	0.1	AC
Final Cleanup	1	LS
Demolish and Remove Bulkhead and Haul	296	LF
Demolish and Remove Barge Material and Haul	362	TON
Fill Removal and Grade	50	CY
Erosion Control and Water Pollution Control	1	LS

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Partial Armor Removal

The Partial Armor Removal option includes removing everything waterward of the bluff including bulkhead, barge, and associated fill as well as construct a new rockery for access to the beach. It is named 'partial' removal due to the new rockery maintaining shore armor along the feeder bluff even though all of the current bulkhead structure is being removed. This option uncovers the most amount of intertidal area at project completion but does not allow the fill to erode to feed down drift beaches. The design elements of this option are described below.

Bulkhead, Barge, and Fill Removal

The entirety of the vertical concrete wall and footing will be removed from the project site through direct excavation. The total amount of concrete to be removed is on the order of 70-100 cubic yards (CY).

Following vertical wall removal, the barge within the outer portion of the fill area will be removed and disposed of properly off-site. Wood in the barge will likely need to be tested to determine if it is creosoted or treated with other harmful materials. This will dictate specific handling and disposal needs. The barge measures 136 by 40 FT, resulting in uncovering of 5440 SF through its removal.

Approximately 2,000 CY of fill in the landward half of the bulkhead area will be excavated uncovering an additional 4,050 SF of beach. It is anticipated that a moderate amount of this fill however could be left in place to be incorporated into the drift cell, as it appears the sediment came from the bank and can provide benefit down-drift. A portion of this fill may also be placed immediately west of the project on the upper beach away from the drainage lines if acceptable and approvable through the design and permitting process.

Rockery Wall to Protect Beach Access

Shore armor can be used to maintain long-term access of the lower portion of the beach access ramp. The groin function of the current bulkhead would be removed through the project and the western up-drift beach is anticipated to lower by 1-2 FT. Therefore, for this option, a rockery wall is proposed starting 30 FT east of the southwest corner of the bulkhead running eastward as seen on the Partial Armor Removal Preliminary Design Plans Sheets 2-5. The rockery wall would extend to 15

FT west of the northwest corner of the bulkhead for a total length of 60 LF as seen on the Partial Armor Removal Preliminary Design Plans Sheets 2-5.

The rockery is anticipated to require a 4 FT depth of burial below beach grade and extend up to approximately +17 FT MLLW with an exposed toe above MHHW. The specific design details will be developed in the next stage of the project if this option is selected. The rockery would extend to defend the lower portion of the beach access ramp, curving landward at this location. A portion of the rockery would be constructed using precise placement of slab-like armor stones to create steps within the structure.

The completion of the proposed bulkhead structure, barge and fill removal and construction of the new rockery to protect the existing beach access as shown on the Sheets 2-5 of the attached Partial Armor Removal Plan set will require the items and actions detailed in Table 2, below.

Table 2. Quantities estimated for bulkhead, barge, and fill removal and rockery construction for partial removal alternative.

Item Description	Quantity	Unit
Design	1	LS
Permitting	1	LS
Mobilization	1	LS
Barge Access	8	DAY
Construction Survey/Staking	20	HR
Clearing and Grubbing	0.3	AC
Final Cleanup	1	LS
Remove Bulkhead and Haul	296	LF
Remove Barge Material and Haul	362	TON
Fill Removal From Lower Bluff and Haul	2000	CY
Excavation for Rockery includes Haul	70	CY
Construct New Rockery	60	LF
Construct Access Stairs Within New Rockery	1	LS
Erosion Control and Water Pollution Control	1	LS
Armor Stone Rock for New Rockery Import	100	TON
Quarry Spall for New Rockery Import	65	TON
Geotextile Material for New Rockery Import	170	SY

Limitations of This Report

This report was prepared for the specific conditions present at the subject property to meet the needs of specific individuals. No one other than the landowner and their agents should apply this report for any purposes other than that originally contemplated without first conferring with the geologist that prepared this report. The findings and recommendations presented in this report were reached based on a brief field visit. The report does not reflect detailed examination of sub-surface conditions present at the site, or drainage system designs, which are not known to exist. It is based on examination of surface features, bank exposures, soil characteristics, gross vegetation characteristics and beach processes. In addition, conditions may change at the site due to human influences, floods, groundwater regime changes, or other factors. This report may not be all that is

required to carry out recommended actions. More detailed design specifications may be needed for proper implementation of a habitat enhancement project.

References

Keuler, R. F., 1988. Map showing coastal erosion, sediment supply, and longshore transport in the Port Townsend 30- by 60-minute quadrangle, Puget Sound region, Washington: US Geological Survey Miscellaneous Investigations Map I-1198-E, scale 1:100,000.

ATTACHMENTS:

CGS Full Armor Removal Preliminary Design Plan Sheets 1-5

CGS Partial Armor Removal Preliminary Design Plan Sheets 1-5