TECHNICAL MEMORANDUM

Prepared by: Grette Associates LLC
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Tacoma, WA 98403

July 25, 2014

Prepared for: Kennedy/Jenks Consultants, Inc.
ATTN: Jarod Fisher
32001 32nd Ave. South, Suite 100
Federal Way, WA 98001

File No.: 304.005

Re: Cornet Bay Marina Model Toxic Control Act Cleanup Mitigation Plan As-Built Report

Grette Associates, LLC is under contract with Kennedy/Jenks Consultants, Inc. to complete the post construction monitoring (Year 0) requirements of the approved *Cornet Bay Marina Mitigation Plan* (Plan; Grette Associates 2013). A Grette Associates staff wetland biologist completed a compliance inspection on May 29, 2014 to verify that the mitigation site was installed according to the Plan. During the site visit, Grette Associates staff traversed the mitigation site to ensure that the approved vegetation was installed properly and in the appropriate locations. This memorandum is intended to serve as the As-Built Report required in the approved Plan.

As required by the Plan, a total of three (3) permanent transects were established within the mitigation site to provide consistency of data collection between monitoring years. Transect endpoints were marked with wooden stakes and were labeled 1 through 3 (T1, T2 and T3) and their locations marked on the attached figure. In addition, each endpoint will serve as a photo point to document the success and development of the site over time. Photographs from each transect endpoint are presented at the end of this memorandum.

The intent of the As-Built Report is to document the implementation of the mitigation actions and describe any deviations from the approved Plan that occurred due to unforeseen site conditions. Based on survey measurements completed by the project contractor, a total of 1,320 square feet of aquatic habitat was created within the mitigation site (Table 1). Upon completion of the post-construction inspection, it appears the planting plan was implemented according to the approved Plan. However, at the time of the as-built inspection it was observed that many of the plants that were planted within the wetland enhancement area were dead or severely stressed, likely due to regular inundation by tidal waters. This specific issue is discussed below in greater detail. A summary of the required Year 0 ("As-Built Year") performance standards within the Plan is presented in Table 1.

Table 1. Year 0 Performance Standard Summary

Performance Standards	Performance Standard met?
1a. A minimum of 1,300 square feet of aquatic area will be created by the end of the Cornet Bay cleanup.	Yes - 1,320 sq ft
2a. A minimum of two (2) species of native shrubs will be present by the end of the monitoring period within the wetland enhancement area.	Yes – 2 species present
2b. A minimum of 100% survival of planted shrub species in Year 0 within the wetland enhancement area.[1]	No - 49%
3a. A minimum of two (2) species of native shrubs will be present by the end of the monitoring period within the buffer enhancement area.	Yes – 4 species present
3b. A minimum of 100% survival of planted shrub species in Year 0 within the buffer enhancement area.[1]	Yes – 100%

[1] Year 0 requires 100% survival of planted stock. The remaining scheduled monitoring periods are required to have a minimum of 80% survival of planted stock within the enhancement areas.

With the exception of the wetland enhancement survival performance standard, the mitigation site met all of the required performance standards for Year 0. The wetland enhancement area contains Hooker's willow (*Salix hookeriana*) and sweet gale (*Myrica gale*), while the buffer enhancement area contains Nootka rose (*Rosa nutkana*), Scouler's willow (*S. scouleriana*), oceanspray (*Holodiscus discolor*), and sweet gale.

Many of the shrub species that were planted within the wetland enhancement area did not survive. It appears that many of these species were planted at too low an elevation and are being regularly inundated by marine waters. During the site inspection, 63 of the 65 shrub species planted were identified, 32 of which did not survive. Based on the data collected, the two unaccounted for shrubs were likely planted in the adjacent wetland buffer enhancement area (Table 2). The survival rate within the wetland enhancement area is 49 percent. The high mortality within the wetland enhancement area is likely due to over exposure to salt water. A majority of the wetland is relatively steep and transitions to upland in a moderately short distance. As a result, there is a narrow area where groundwater and salt water meet and brackish conditions exist. Based on these conditions, replanting the species in the general location where they did not survive is not recommended.

Table 2. Mortality Results

Common Name	*Scientific Name*	Alive	Dead
Wetland Enhancement Area			
Hooker's willow	*Salix hookeriana*	21	18
Sweet gale	*Myrica gale*	10	14
Wetland Buffer Enhancement Area			
Nootka rose	*Rosa nutkana*	13	0
Scouler's willow	*Salix scouleriana*	41	1
Oceanspray	*Holodiscus discolor*	18	0
Sweet gale[1]	*Myrica gale*	6	0

[1] sweet gale was scheduled to be planted in the Wetland Enhancement Area only.

Per the approved Plan, contingency actions may be implemented if physical or biological processes are responsible for non-attainment of the performance standards. The following contingency actions are recommended:

- Substitute 15 of the shrubs that did not survive with seashore saltgrass (*Distichlis spicata*), saltmarsh bulrush (*Schoenoplectus maritimus*), and Lyngby's sedge (*Carex lyngbyei*) in the lower areas where the shrubs did not survive. These emergent species should be planted in clusters, consisting of four (4) plugs of the same species per cluster, with the clusters planted two feet on center (see attachment). Each cluster would substitute one shrub. The recommended substitution and plantings of these emergent species should occur in bare areas and at the same elevation of existing emergent vegetation within the wetland. Once all emergent species are planted a temporary goose exclusion fence should be installed to protect the planted emergent vegetation. A typical goose exclusion fence consists of grid like structure made with rebar and natural fiber twine that spans the planted emergent vegetation. Extending emergent vegetation within portions of the wetland will increase foraging opportunities for salmonids and waterfowl.
- Replant 17 of the shrubs that did not survive within the wetland enhancement area with sweet gale. Hooker's willow is not recommended to be replanted because sweet gale generally has a higher salt tolerance. The plantings should occur along the upper perimeter of the wetland at the highest elevation while remaining within the boundaries of the wetland. Further, sweet gale should not be planted below the elevation where existing shrubs are surviving; any shrub that is planted below this elevation would likely not survive. Relocating this species to the upper extent of the wetland should increase survival and reduce exposure to regular tidal inundation, while still providing vegetation complexity, wildlife habitat, shade, and the requirements of the approved Plan.
- It was anticipated that the cleanup project would not need to import amended soils within the mitigation area. However, based on the highly permeable, mineral soils within the northeast portion of the enhancement areas, it is recommended that the shrubs that are to be replanted be placed in pits that contain organic soil amendments. Plant installation should consist of excavating a plant pit at least three times the diameter of the root system and backfilled with a mixture of topsoil and organic material (no manure). Refer to

Section 5.2.5 of the approved Mitigation Plan for detailed instructions for installing plant material. Further, it is recommended that a biologist be present during the plant installation to ensure proper location and installation of the plants.

- A temporary irrigation system should be installed within the northeast portion of the enhancement area to provide water to the planted vegetation. The soils within the enhancement areas adjacent to the cleanup consist of coarse sand and fine gravel. The highly permeable soil conditions will likely increase future mortality rates if the plants are not watered.

The recommended contingency actions are intended to correct deficiencies observed after planting, and to enable the mitigation site to achieve the goals and objectives defined in the Plan. While the original area proposed for wetland enhancement consisted of only shrub species, these contingency actions should result in the same amount of enhanced wetland area required in the approved Plan. Furthermore, the recommended contingency actions would retain the required species composition and diversity within the wetland. Currently, the wetland contains two native shrub species, thus meeting performance standard 2a (Table 1). Installation of the species listed above should be done in the fall to reduce mortality. The removal and replanting of vegetation below the Ordinary High Water Mark must comply with appropriate fish work windows. Based on the Project's USACE permit, the approved work window is July 16th through February 15th. However, starting October 15th, forage fish surveys will be required to ensure no spawning has occurred in the vicinity, allowing work to continue to February 15th.

Upon completion of the contingency actions stated above, a compliance inspection should be conducted to ensure that these actions were correctly implemented. All other monitoring surveys will comply with the monitoring schedule in the approved Plan.

If you have any questions on the site assessment observations or contingency action recommendations, please contact me at (253) 573-9300, or by email at chadw@gretteassociates.com.

Regards,

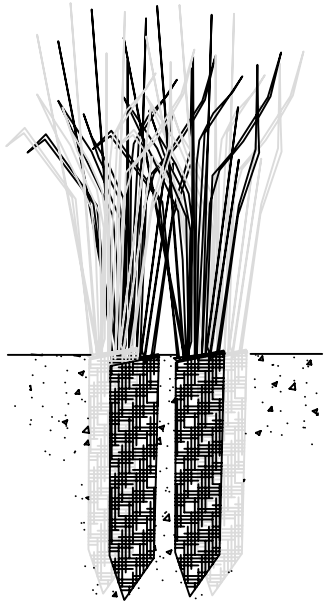
Chad Wallin
Biologist

References:

Grette Associates, LLC. 2014. Cornet Bay Marina – Cornet Bay Marina Mitigation Plan: Model Toxic Control Act (MTCA) Cleanup. Prepared for Kennedy/Jenks Consultants, Inc. July 2013.

EMERGENT PLUG PLANTING DETAIL

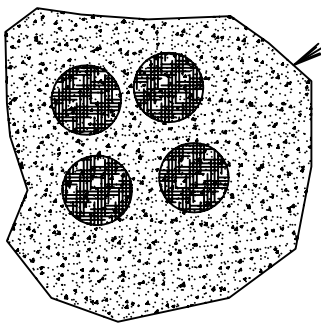
NOT TO SCALE



NOTES:

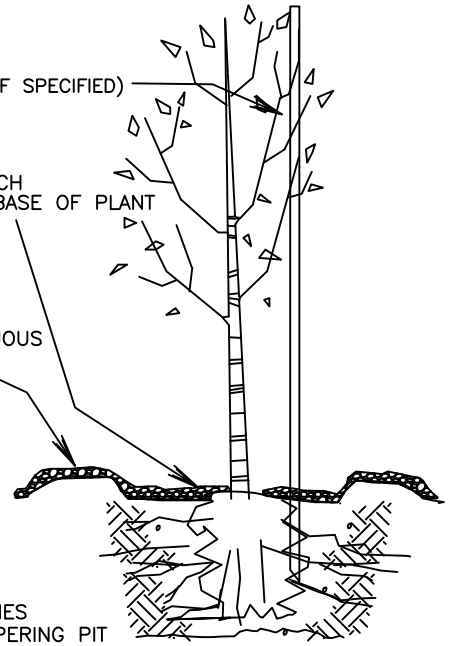
- PLANT IN CLUMPS OF 4 OF SAME SPECIES AT SPACING SPECIFIED IN PLAN
- BACKFILL TO BE SETTLED USING WATER ONLY
- EXCAVATE PLANTING PIT 1 FOOT DIAMETER AND 1 FOOT DEEP
- GRADE TO FINISH GRADE
- WATER IMMEDIATLEY AFTER INSTALLATION

PLAN VIEW – 4 PUGS IN SAME HOLE



TREE + SHRUB PLANTING DETAIL

NOT TO SCALE



NOTES:

- PLANT SHRUBS IN GROUPS OF 3 TO 5 OF SAME SPECIES AT SPACING SPECIFIED IN PLAN
- REMOVE CONTAINER & WORK ROOTS FREE OF SOIL; SPREAD ROOTS INTO EXCAVATION
- BACKFILL TO BE SETTLED USING WATER ONLY
- EXCAVATE TREE PIT AT A MIN. OF 4 TIMES DIA. OF ROOTBALL AT BALL CENTER, TAPERING PIT GRADE TO FINISH GRADE
- WATER IMMEDIATELY AFTER INSTALLATION
- BARE–ROOT SIMILAR; EXCAVATE TO FULL DEPTH OF ROOT MASS AND CANOPY DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. WATER IMMEDIATELY AFTER INSTALLATION

SHEET 1 OF 1

TYPICAL PLANTING DETAIL

CORNET BAY AS-BUILT REPORT

SITE ADDRESS: CORNET BAY,WA

DRAWING SCALE: NTS

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CLIENT: CORNET BAY MARINA

PROJECT #: 304.005

DESIGNED BY: CW DATE: 07/24/14

CHECKED BY: SM DATE: 07/24/14