Apr 26th, 4:00 PM - 4:30 PM

# Shoreline Restoration in an Urban Environment – Lowman Beach Park

Pablo Duarte Quiroga
*ESA*

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# Lowman Beach Park

Pablo Quiroga, P.E.[1]; Janice Liang, P.E.[2]; David Graves, AICP[2]
[1]ESA, [2]Seattle Parks and Recreation

## Introduction

A shoreline restoration project will be completed at Lowman Park by May 2022. The project conforms with the variation between the expected natural morphology along the shore and the constraints formed by the park facilities and neighboring structures. Major project design elements include:

1. Removing the existing seawall along the Puget Sound Shoreline that is failing and the accompanying retaining wall.
2. Constructing a new seawall near the northern boundary of the park.
3. Removing the tennis court and restoring the backshore beach with native materials, grading and planting while maintaining access and recreation.
4. Daylighting Pelly Creek through the park.
5. Constructing accessible paths and landscaping in the upland portion of the park.

The Park is located in The Puget Sound in an urban context in the Morgan Junction neighborhood in West Seattle and just to the north of Lincoln Park. The approximately 300-ft of park shoreline is characterized by a 140-foot long concrete failed seawall at its north end, with the remainder of the shoreline composed of gravel beach and vegetated backshore that was created in 1995.


**Figure 1.** Project Site Location

## History

Oral history and archaeological evidence demonstrate that Native American people have lived in this region of the Puget Sound for thousands of years. The shoreline, now known as Lowman Beach Park was known in Lushootseed as *gʷal* or "capsized/to capsize," which is thought to be related to the conditions offshore and the potential for canoes overturning.

Lowman Beach Park was originally established as Lincoln Beach Park in December 1909 and changed its name in April 1925. In 1936 the SPR built a seawall and a tennis court using federal grant funds from the Works Progress Administration (WPA). In 1950 the north portion of the original seawall began to fail and was replaced. In 1994, the southern portion of the 1936 seawall failed, and in 1995 a portion of the remaining seawall was replaced with a new concrete return wall and a gravel beach restoration.

The remaining 1950s-era concrete seawall began to fail in early 2015, and Parks started looking at possible alternatives.

## Restoration Design

Multiple technical studies completed for this project revealed several key considerations related to historical and archeological resources, ecology, coastal process (geomorphology, erosion/accretion, sediment transport, shoreline evolution), geotechnical conditions, structure conditions, existing utilities, hydrology, coastal, structural and landscape design.

### Coastal Processes

A nearshore wind wave model (SWAN) was implemented on The Puget Sound to estimate waves at the site based on wind and tide records from 2003 to 2006. The resulting wave time series were used to estimate sediment transport rates for existing and design conditions. Results show a low net transport rate to the north, although actual transport rates and directions may change year by year. Based on these results and the performance of the beach design shown on the next section is expected that the beach will largely remain in place with lower rates of erosion to the north. The proposed beach nourishment would be approximately 200 ft wide and contemplates placing approximately 2,000 CY of native material back into the littoral system.


**Figure 2. a.** Example of Wave Model results using winds from the north. **b.** Potential Average Net Annual Longshore Sediment Transport.

### Beach Design

The beach restoration design comprises the restoration of the back beach at the site with native materials, grading and planting. The design was developed by applying coastal geomorphology and investigated with process-based morpho-dynamic models and applied geomorphology using reference sites and regional guidance documents.

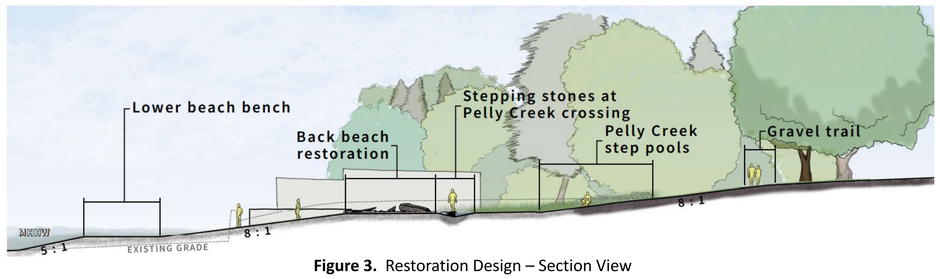


**Figure 3.** Restoration Design – Section View

The design conforms with the variation between the expected natural morphology along the shore and the constraints formed by the park facilities and neighbored structures to the north. The primary parameters taking into consideration were the prevailing coastal processes, wave exposure, tide climate, sediment grain size, and associated beach geometry (specifically, slope, berm elevation, and beach width).

## Beach Performance

**Figure 4(top)** shows the beach after construction. The beach profile has been designed to be constructed/restored as far seaward as possible; such an erosion response is elicited after initial construction. **Figure 4(bottom)** shows a graphic representation of the expected shoreline once it reaches equilibrium. The backshore of the beach is expected to evolve into a vegetated beach with wood debris from storm events. A storm berm is expected to form after several high tide storms. The lower bench will provide additional storm mitigation and beach material to be transited along the shore

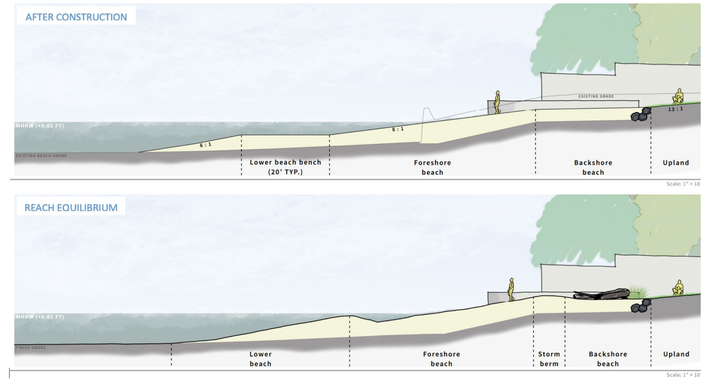


**Figure 4.** Beach Design. (top) After Construction. Bottom. Expected profile after reaching equilibrium

A process-based morphodynamic model for gravel beaches call XBeach-G (McCall et al., 2015) was used to evaluate the performance and evolution of the new design grade. **Figure 5** shows model results after a 10-year storm was modeled at a typical range of water levels at the site. The resulted beach profile mimics existing natural beach profiles found south of the site and other places in Puget Sound (Johannessen, *et al*, 2014).

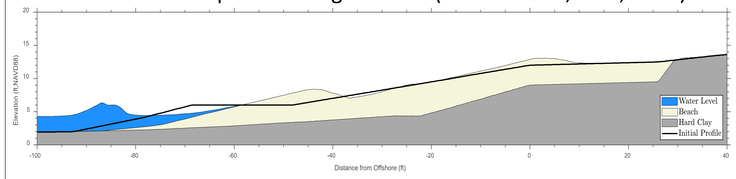


**Figure 5.** Beach Profile Response Under Storm Wave Conditions and Full Tide Range

## Project Benefits

The Lowman Beach Park Shoreline Restoration Project will enhance the park and the shoreline in a naturally sustainable way that meets multiple objectives: Improve access to the park, substantially improve the ecological process, increase nearshore habitat and allow more adaptive capacity in the face of rising sea levels.

While it isn't possible to fully restore Pelly Creek to pre-settlement conditions, this project daylights over 100 feet of the previously piped creek, provides freshwater flow across the shoreface, and allows the public to experience the interactions of fluvial and coastal systems on this site for the first time in nearly 80 years.

## Contact Information

Pablo Quiroga, P.E.
ESA | Environmental Hydrology
Email: pquiroga@esassoc.com

## Acknowledgements

The project was funded in part with grants from the State of Washington through the Salmon Recovery Funding Board and the Aquatic Lands Enhancement Account and grants from the King County Flood Control District/WRIA 9 through the Cooperative Watershed Management fund program.

## References

1. ESA, 2017.Lowman Feasibility Analysis [LINK]
2. ESA, 2020. Basis of Design Report [LINK]
3. Johannessen, J., A. MacLennan, A. Blue1, J. Waggoner, S. Williams1, W. Gerstel, R. Barnard, R. Carman, and H. Shipman. 2014. Marine Shoreline Design Guidelines. Washington Department of Fish and Wildlife, Olympia, Washington.
4. McCall, R.T., Masselink, G., Poate, T.G., Roelvink, J.A., Almeida, L.P., 2015. Modelling the morphodynamics of gravel beaches during storms with XBeach-G. *Coastal Engineering*, 103, 52-66.