

Berm Summery Report

November 2002

Existing Conditions The Birch Bay Community would like to enhance and protect the Birch Bay shoreline, possibly by removing the concrete groins and constructing a more natural beach berm. First we had to evaluate the coastal processes in the bay and shoreline of the proposed berm and look at some a conceptual designs of the beach berm. Some processes that will affect a berm include:

- relative sea level rise, estimated at 5.5 to 7.5 inches per century.
- sediment sources at Birch Point and Point Whitehorn
- direction of sediment drift, converging at Cottonwood Reach
- long term maintenance and clean-up requirements

Gravel drift The gravel that drifts along the shoreline is essential for a healthy beach but development in Birch Bay has disrupted that drift. For example, the harbor jetties at the Village Marina disrupt the transport of sediment to the east from Birch Point into Birch Bay. Gravel placement on the downcoast beach may somewhat mitigate this disruption. The road and buildings prevent the backshore from shifting during severe storm events to re-establish an equilibrium position. The present cobble/sand beaches offer inadequate flood protection for existing and future development.

Groins The North-Central reach is the area that the community is most interested in enhancing and protecting, so the study surveyed four locations in this area. In this stretch, about 30 concrete groins were built in the 1950s and early 1960s. The groins are in various states of disrepair and they prevent coarser gravel and cobbles from traveling along the beach leaving the beaches in the North-Central reach are left more vulnerable to erosion and overtopping.

Goals Birch Bay residents set these goals for the shoreline improvement plan:

- Widening the beaches to improve coastal and recreation access;
- Building a pedestrian/bicyclist promenade;
- Raising the beach berm crest to enhance flood protection;
- Incorporating a pedestrian or multi-use promenade to improve safety on Birch Bay Drive;
- Improving the appearance of the shoreline by removing the groins;
- Improving local habitat and ecosystem functioning.

The goals could be met by various designs and the report looks at engineering, transportation, aesthetic, and permitting factors.

Design considerations A beach restoration design must reconcile the beach slope, the gravel composition, the wave and tidal effects. The berm crest at a natural beach site reflects the elevation during a five-year storm event. To enhance flood protection, a higher berm elevation than what occurs naturally would be required. But a higher berm requires more fill (expensive), impedes habitat, obscures views, and would require more maintenance. Once the height of the desired berm has been defined, we can reach an accurate cost estimate for the amount of gravel.

Technical considerations If no action is taken, the road will continue to erode. If a berm is constructed, it could be designed to cover the existing groins, to move them to the backshore, or to remove them completely. About 60,000 yd³ of gravel, cobble, and sand would be necessary to construct the design beach from the mouth of Terrell Creek northward to the northeast corner of the bay, and will require a long term management program for periodically adding gravel. Other alternatives could include decreasing the width of the road to one-way or replacing the road with a multi-use path or promenade and removing the utility lines.

Next steps Public discussion of the objectives and alternatives is the next logical step in the shoreline planning process. The table provides an initial method to rank and compare the design alternatives in light of the original community objectives.

Design Objectives	Weighting (1 to 5) 5 is best	Alt. 1	Alt. 2	Alt.3	Alternative 4	Alternative 5	Alternative 6
Engineering Design/Construction Objectives							
Reduce severity of coastal flooding	5						
Minimize beach fill material/costs	5						
Minimize need for waste hauling	5						
Incorporate groins in design	4						
Accommodate potential relative sea level rise	2						
Minimize impacts to backshore drainage	2						
Minimize impacts to existing outfalls	2						
Reduce beach nourishment needs	3						
Reduce erosion potential at ends of	3						

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Reduce impacts to adjacent properties	4						
Minimize beach maintenance needs	3						
Optimize design with pending County CIP work	2						
Optimize design with land use planning	2						
Transportation design objectives							
Maintain existing traffic volumes	4						
Maintain two-way traffic pattern	4						
Maintain existing bay-side parking	3						
Reduce road repair and maintenance needs	4						
Minimize traffic disruption during construction	2						
Improve pedestrian/bicyclist safety	5						
Aesthetic design objectives							
Improve pedestrian access/mobility	5						
Reduce visual impacts of groins	4						
Reduce visual impacts of power lines	3						
Create a more natural beach	4						
Minimize impacts to current recreation	3						
Minimize shift of high tideline seaward	2						
Permitting objectives							
Minimize impacts to shellfish habitat	4						
Minimize impacts to fisheries habitat	5						

Minimize impacts to intertidal benthics	3						
Minimize impacts to archeological sites	4						
Minimize potential for road/parking spills	2						
Minimize land/bldg. acquisition needs	3						
Optimize use of in-water work period	2						
TOTAL SCORE	--						

Initial conclusions: Restoring the beach with a high elevation, **protective berm** crest along Birch Bay is a feasible option;

A design with **berm height level with the road** will not provide protection from overtopping during the 100-yr storm event, but may provide protection from 5 to 25 year storms, if maintained;

An appropriate sediment (gravel) **source for the beach fill** has not been found;

- Next step 1: design objectives agreed upon by local stakeholders must be focused to specify level of flood protection desired and maximum height of crest height;
- Next step 2: data gaps must be filled before proceeding to the preliminary design phase.

DATA GAPS

Historical beach change:

1.
 - a. Historic beach planform and section
 - b. Timeline of human interventions
 - c. An updated description of littoral conditions, including sediment budget
 - d. Estimates of seasonal and storm fluctuations
2. Longshore transport:
 - a. Flood Control beach nourishment activities at Terrell Creek

- b. Marina dredging schedule
- 3. Detailed beach composition data:
 - a. Grain size analysis of material along profile and change in grain size with depth
 - b. Sediment density

PRELIMINARY DESIGN PHASE SCOPING

Additional fieldwork (i.e., beach surveys and sediment grain-size analysis) at the project or reference site to better define the berm design geometry and composition;

1. Additional run-up analysis to optimize beach berm crest elevation;
2. A refined specification for the grading of gravels/cobbles;
3. A refined estimate of the volume of gravel/cobbles required for the berm;
4. Identification of potential sources of suitable gravel/cobbles;
5. Identification of potential temporary gravel/cobble storage areas along the beach to allow stockpiling prior to construction;
6. Development of a monitoring and maintenance plan, which will be adaptive and based on both the needs of the beach as it evolves and opportunities related to gravel/cobble availability.