

File 423390

May 21, 2026

Angela Loney
Clerk Administrator
Township of Machar
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Re: Eagle Lake Narrows Beach, Machar
Design Report

Dear Angela:

Eagle Lake Narrows Park and Beach is located between Eagle Lake Road and Eagle Lake within the Township of Machar. In 2023, Tatham Engineering Limited (Tatham) was retained by the Township to develop a solution to address ongoing erosion along the shoreline slope within the park. Following completion of design and tendering, construction of the shoreline protection works was carried out in Fall 2025.

This report documents the project background, existing site conditions, alternatives considered, and the rationale for the selected design. It also outlines safety considerations, including guard requirements, and accessibility considerations. Reference is made to pre-construction and post-construction photographs to provide visual context for both the original conditions and completed works.

SITE SETTING AND EXISTING CONDITIONS

The park is situated on a sloping site extending from Eagle Lake Road to a relatively level mid-slope bench which contains playground equipment, picnic tables, benches, and other public facilities. From this bench, a steep, near-vertical slope (generally less than 1.0m in height) transitions to a sandy beach below. The beach extends toward Eagle Lake and slopes gently into the water.

Shoreline conditions vary seasonally in response to fluctuating lake water levels. During spring and other high-water periods, water levels can rise to the base of the beach slope, reducing the available beach width and increasing susceptibility to erosion.

Prior to construction, the slope exhibited active erosion and instability, including exposed tree roots, leaning and undermined trees, localized slope failures, and erosion rills. These conditions are documented in pre-construction photographs and demonstrate the extent of slope degradation.



Figure 1: Exposed tree roots within shoreline slope.



Figure 2: Leaning tree and erosion of toe of shoreline slope.





Figure 3: Shoreline erosion and compromised tree within slope.

The erosion resulted from a combination of uncontrolled drainage from Eagle Lake Road, wave action along the shoreline, and fluctuating lake levels. These processes contributed to ongoing slope deterioration and increased risk to park users and adjacent infrastructure.

PROJECT OBJECTIVES

The primary objectives of the shoreline works are to stabilize the slope, mitigate ongoing erosion, and protect existing park amenities while maintaining the layout and functionality of the park. Additional objectives included minimizing impacts to mature trees and natural features and providing a durable, long-term solution.

CONSIDERATION OF ALTERNATIVES

A range of shoreline stabilization alternatives were considered, including both naturalized and engineered approaches, as well as a “do nothing” scenario, as follows:

1. Do nothing;
2. Boulder revetment;
3. Vegetated Envirolock bags;



4. Vegetated erosion control blanket; and
5. Armour stone shore wall.

Each option was reviewed at a high level, including approximate costs and how it would fit within the site. The “do nothing” option would involve leaving the shoreline in its current condition without intervention. While this approach avoids immediate disturbance, it would allow ongoing erosion processes to continue. Over time, this could lead to progressive slope instability, loss of parkland, and increased risk to existing infrastructure and mature trees. On this basis, the option was not considered suitable as a long-term management strategy for the site.

Naturalized solutions, such as vegetated slopes and vegetated erosion control mat systems, were also reviewed. These approaches can be effective in lower-energy environments and where sufficient space exists to accommodate flatter, stable slope geometries. However, at this site, implementation would require significant regrading, including encroachment into the park and/or beach area. This would result in a reduction of usable parkland and/or beach width, along with the potential removal of a greater number of mature trees. Given these constraints, the applicability of these approaches was limited.

Engineered options, including Envirolok (geobag) wall systems and boulder revetment, were similarly evaluated. The Envirolok system offers flexibility in configuration and can support vegetation establishment. Its applicability at this site was considered in the context of available space, constructability, long-term performance, and integration with adjacent park uses and existing slope conditions. Boulder revetment systems are widely used and robust; however, they require slope flattening and a wider footprint, which would result in impacts comparable to the naturalized options in terms of parkland encroachment and tree removal. As such, while technically feasible, these alternatives present trade-offs related to space requirements and site impacts.

The armour stone retaining wall approach was identified as an alternative implemented within the existing spatial constraints while minimizing encroachment into the parkland and beach areas. This type of system is a commonly used shoreline stabilization method in constrained environments and can be designed to incorporate appropriate foundation support, filtration, and drainage controls. In comparison to the other alternatives considered, it provides a means of addressing long-term stability requirements while reducing the extent of grading, vegetation removal, and impacts to existing site features.

SELECTED DESIGN

The preferred alternative consists of an armour stone retaining wall founded on a prepared granular base with geotextile separation to prevent soil migration while allowing drainage. Granular backfill and subdrainage provisions have been incorporated to manage groundwater and reduce hydrostatic pressures acting on the structure. The design maintains the existing top and bottom of slope elevations, such the overall slope height remains unchanged.



The wall ties into the existing grades at the top and bottom of the wall and is finished with a sand cover to match adjacent beach conditions.

The post-construction condition, including the relationship of the works to adjacent features and the shoreline, is shown in the accompanying photographs. In consultation with the Town, guardrails will be installed separately by others and are therefore not shown.

Tree removals were limited to those already significantly compromised by erosion. Where feasible, stable trees were retained through minor adjustments to the wall alignment. Tree removals and root impacts were assessed in the context of existing site conditions, including exposed and undermined root systems. The works improve slope stability and reduce ongoing erosion and root exposure relative to pre-construction conditions.



Figure 4: Constructed armour stone shore wall.





Figure 5: Minor adjustment to wall alignment to accommodate tree root systems.



Figure 6: Stone step access to beach.



GUARD RAIL REQUIREMENTS

Guards are typically required where elevation differences exceed prescribed thresholds adjacent to areas accessible to the public. While the proposed works represent an improvement over the pre-construction condition, the retaining wall formalizes an existing change in elevation, resulting in a defined vertical face exceeding these limits. Accordingly, a guard was recommended and was incorporated to address this condition.

The design replaces a previously steep, actively eroding slope characterized by uneven and unstable footing with a defined wall face and a wide, generally flat natural beach at the toe. This results in a more regular and visible transition between the upper area and the shoreline, with an open and unobstructed landing surface below.

Following construction of the retaining wall, a guard was installed by the Township along the wall. In recognition of both the defined vertical edge and the public nature of the site, the guard provides a consistent and clearly defined barrier along the interface.

ACCESSIBILITY AND PUBLIC USE CONSIDERATIONS

The design sought to maintain the overall functionality of the park, including continued access to the waterfront. While the introduction of the retaining wall and guard alters the direct interface between the park and the beach, access to the shoreline is maintained at designated locations, including the existing beach access ramp at the west end.

Waterfront environments present inherent challenges for achieving fully accessible connections due to variable water levels, changing substrate conditions, and natural terrain. The design reflects a balance between access considerations and the need to control erosion and provide a stable shoreline condition. Overall, accessibility is improved relative to the pre-construction condition.

CONSTRUCTION OVERVIEW

Construction was completed in Fall 2025 in general accordance with the design drawings. Minor adjustments were made on site to respond to field conditions and minimize impacts to vegetation and park features. These refinements were localized and consistent with the overall design intent. The completed works are illustrated in the post-construction photographs.

WATER LEVEL CONDITIONS (SPRING 2026)

Spring 2026 has been characterized by elevated water levels across the region. While there are no hydrometric stations on Eagle Lake providing real-time data, a review of nearby monitored lakes indicates peak water levels over the past month have exceeded previously recorded daily highs.



At the site, elevated water levels have been observed extending significantly up the beach profile, at times reaching the lower portion of the constructed shoreline wall. During original construction, the wall was set back more than 3 m from the water's edge under typical conditions. As water levels recede, these conditions are expected to return.

Elevated seasonal water levels reduce the effective width of the beach. Such conditions are typical during the spring freshet and are understood to have contributed to the localized erosion at the toe of the slope, which formed part of the basis for the remedial works. These conditions reflect short-term hydrologic variability rather than long-term baseline conditions.

CONCLUSION

Prior to construction, the shoreline at Eagle Lake Narrows Park was actively eroding, contributing to slope instability and increased risk to users and infrastructure, as documented in the pre-construction photographs. The selected design replaces this condition with a stable retaining structure while maintaining the natural beach interface.

The original design approach demonstrated a reduction in risk and was considered consistent with the intent of applicable safety provisions. Following consultation with the Township and consideration of public use, shoreline variability, and long-term conditions, a guard was incorporated to provide an enhanced and consistent level of safety.

The completed works, as shown in the post-construction photographs, provide a durable shoreline protection solution stabilizing the slope, preserves key park features, and supports continued public use while maintaining an appropriate level of safety for a public waterfront environment.

Yours truly,

Tatham Engineering Limited



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