

## Reach 6 – Bond Head to Port Hope West Beach



### Local Conditions

- Reach Length = approximately 23.4 km.
- This long reach stretches from the Port of Newcastle to Port Hope West Beach.
- East of the Port of Newcastle, the Bond Head bluffs and gullies dominate the shoreline.
- The central portion of the reach features large tracks of agricultural land and small shoreline communities, such as Port Granby and Port Britain.
- The Ontario Power Generation Wesleyville Storage is located 8 km west of Port Hope.
- Port Hope west beach is a large deposition sink for the sand and gravel transported west to each in this reach.
- Immediately west of West Beach, the railway into Port Hope runs right along the bluff crest and will soon require shoreline protection to stabilize the slope.

*Eroding Bluffs at Bond Head*

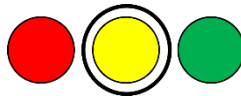


*Port Hope West Beach and Jetties*

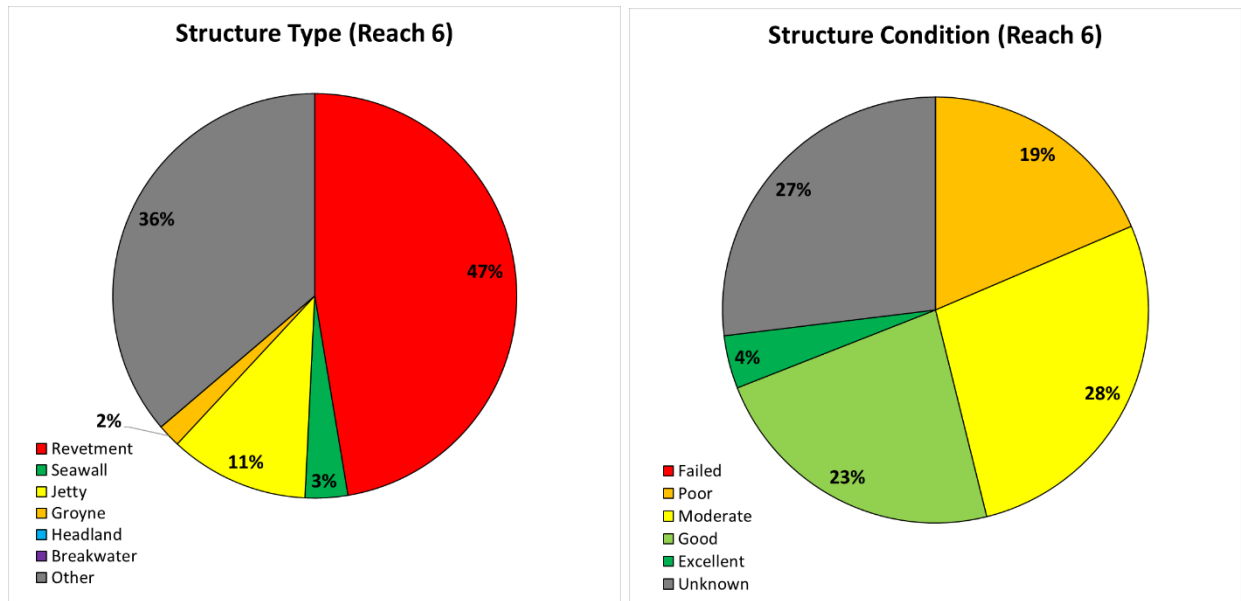


## Shoreline Structures

- Reach 6 is 7% armoured, 93% natural.
- The jetties at Graham Creek at the west end of the reach are in poor condition at their root, where the structures were close to breaching during record high lake levels in 2019.
- There is a significant offset in shoreline position from the west side of Graham Creek (Reach 5) to the east side, where the Bond Head Parkette and properties along Boulton street have suffered significant erosion due to a lack of sediment supply. The Parkette and neighbouring properties have all been hardened to some degree to mitigate ongoing erosion. These structures are mostly well engineered and in good condition, with a few exceptions.
- Lakeshore Road is protected by an engineered armour stone revetment and is in generally good condition.
- The high bluff shoreline from Bond Head to Port Britain, a distance of over 17 km, is entirely natural and unprotected.
- Many private properties at Port Britain feature mostly ad-hoc shore protection. This protection is generally in poor to moderate condition and may require upgrades.
- Tolerance for additional shoreline armoured (low/medium/high):



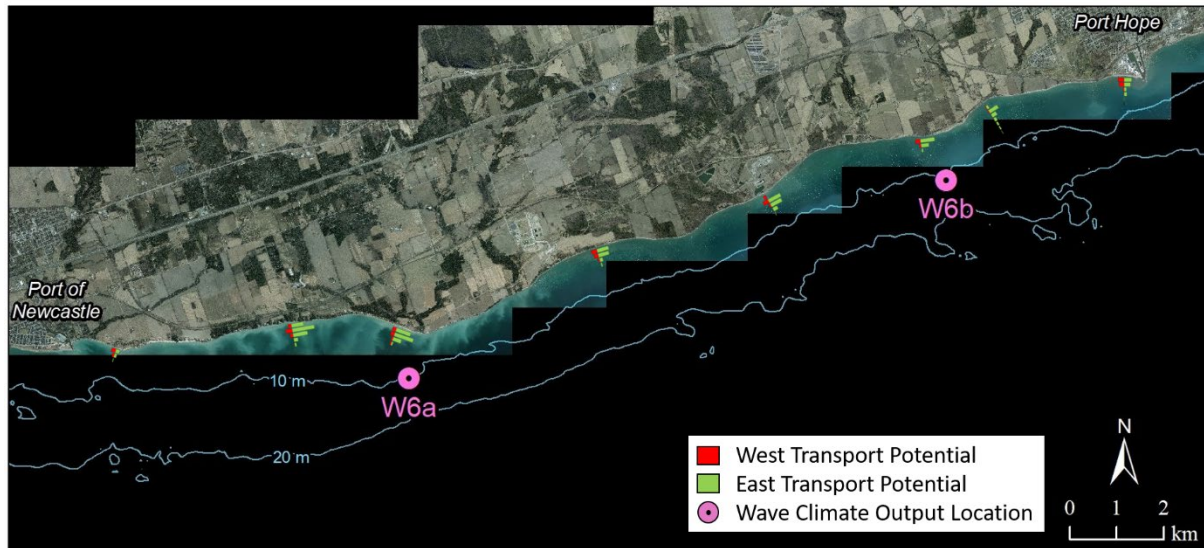
- Sample statistics (for armoured portion of shoreline):



## Sediment Supply and Longshore Sediment Transport

- Longshore sediment transport potential is very low in the embayment at the west end of the reach (Boulton Street), with very little sediment entering this region from either direction.

- Net longshore sediment transport potential from Bond Head to Port Hope is from west to east with net potential transport volumes in excess of 100,000 m<sup>3</sup>/year at several locations.
- A significant percentage of this transport potential is likely realized, perhaps up to 50% and particularly during high lake levels, due to the significant length of unprotected eroding bluff that contributes sediment to the reach and the nearshore lakebed which is comprised primarily of sand and cobble.
- Deposition occurs primarily at the Port Hope west fillet beach to the west of Port Hope Harbour jetties, as is evident by the significant offset in shoreline position from the west side of the harbour to the east (over 300 m).



### Summary of Natural Hazards

- 100-year Erosion Rate (Stable Slope not included):

| Start<br>(lat, long) | End<br>(lat, long) | 100-year Erosion Rate<br>(m/year) | Bluff Crest or<br>Waterline |
|----------------------|--------------------|-----------------------------------|-----------------------------|
| 43.8956, -78.5759    | 43.8965, -78.4836  | 0.59                              | Bluff Crest                 |
| 43.8965, -78.4836    | 43.9033, -78.4591  | 0.17                              | Bluff Crest                 |
| 43.9033, -78.4591    | 43.9134, -78.4132  | 0.41                              | Bluff Crest                 |
| 43.9134, -78.4132    | 43.9166, -78.408   | 0.29                              | Waterline                   |
| 43.9202, -78.3955    | 43.9229, -78.3889  | 0.29                              | Waterline                   |
| 43.9229, -78.3889    | 43.9282, -78.3803  | 0.2                               | Bluff Crest                 |
| 43.9308, -78.3605    | 43.936, -78.3355   | 0.2                               | Bluff Crest                 |
| 43.936, -78.3355     | 43.9372, -78.3337  | 0.29                              | Waterline                   |
| 43.9384, -78.3286    | 43.9409, -78.3019  | 0.2                               | Bluff Crest                 |

- 100-year Flood Level and Flood Hazard Limit (including wave uprush):

| Start<br>(lat, long) | End<br>(lat, long) | 100-year Flood Level<br>(m IGLD85') | Flood Hazard<br>(m IGLD85') |
|----------------------|--------------------|-------------------------------------|-----------------------------|
| 43.8965, -78.5766    | 43.8973, -78.5718  | +76.01                              | +77.67                      |
| 43.8973, -78.5718    | 43.8958, -78.5656  | +76.01                              | +77.77                      |
| 43.8958, -78.5656    | 43.8961, -78.5567  | +76.01                              | +77.85                      |
| 43.8961, -78.5567    | 43.9045, -78.4563  | +76.01                              | +77.77                      |
| 43.9045, -78.4563    | 43.9335, -78.3393  | +76.01                              | +77.77                      |

|                   |                   |        |        |
|-------------------|-------------------|--------|--------|
| 43.9335, -78.3393 | 43.9406, -78.3032 | +76.01 | +77.86 |
| 43.9406, -78.3032 | 43.9408, -78.2913 | +76.01 | +77.77 |

- Dynamic Beach(es):

| Start<br>(lat, long) | End<br>(lat, long) | 100-year Erosion Rate<br>(m/year) or Stable | Dynamic Beach Name   |
|----------------------|--------------------|---|----------------------|
| 43.9166, -78.408     | 43.918, -78.4046   | 0.2   | Wesleyville Beach    |
| 43.918, -78.4046     | 43.9191, -78.4003  | 0.29  | Wesleyville Beach    |
| 43.9191, -78.4003    | 43.9195, -78.3975  | 0.2   | Wesleyville Beach    |
| 43.9195, -78.3975    | 43.9202, -78.3955  | 0.29  | Wesleyville Beach    |
| 43.9282, -78.3803    | 43.9299, -78.3731  | 0.2   | Willow Beach         |
| 43.9299, -78.3731    | 43.9302, -78.3681  | 0.29  | Willow Beach         |
| 43.9302, -78.3681    | 43.9308, -78.3605  | 0.2   | Port Britain Road    |
| 43.9372, -78.3337    | 43.9384, -78.3286  | 0.2   | Unknown              |
| 43.9409, -78.3019    | 43.9409, -78.2926  | Stable                                      | Port Hope West Beach |

- Wave climate ~1 km offshore, west portion (output location W6a):

| ARI (years) | Depth (m) | Hs (m) | DIR (deg) | Tp (s) |
|-------------|-----------|--------|-----------|--------|
| 5           | 12.5      | 4.03   | 207       | 9.5    |
| 10          | 12.5      | 4.20   | 207       | 9.5    |
| 25          | 12.5      | 4.59   | 205       | 10.0   |
| 50          | 12.5      | 4.77   | 205       | 10.0   |
| 100         | 12.5      | 4.94   | 205       | 10.0   |

- Wave climate ~1 km offshore, east portion (output location W6b):

| ARI (years) | Depth (m) | Hs (m) | DIR (deg) | Tp (s) |
|-------------|-----------|--------|-----------|--------|
| 5           | 12.2      | 4.34   | 210       | 9.5    |
| 10          | 12.2      | 4.51   | 210       | 9.5    |
| 25          | 12.2      | 4.90   | 208       | 10.0   |
| 50          | 12.2      | 5.06   | 208       | 10.0   |
| 100         | 12.2      | 5.22   | 208       | 10.0   |

### Infrastructure and Ecosystem Threats

- Jetties at Graham Creek are at risk of breaching at their structure roots (north of composite sections).
- Boulton Street and Bond Head Parkette threatened by erosion due to sediment deficit.
- Bond Head Bluffs: high erosion rates and large gullies threaten homes close to the bluff edge.
- West rail line (CN and CP) entering Port Hope is at the crest of an eroding bluff.

### Shoreline Management Recommendations

- Sediment bypassing from west fillet beach at Graham Creek to sediment starved shoreline fronting Bond Head Parkette and Boulton Street.
- Bond Head Bluffs: Avoid further development on hazardous lands. Monitor proximity of bluff crest to existing development and slope stability. Relocate homes at risk.
- Conservation Authority should regularly update hazard mapping at Bond Head to account for latest toe of slope, slope stability, and erosion. The 2020 hazard mapping must be updated frequently.

- Maintain naturally eroding bluff environments. Avoid rezoning agricultural land for residential development along gully dominated shoreline.
- Relocated buildings along high bluff environments susceptible to erosion and slope stability hazards.
- Implement floodproofing measures for development on low lying lands adjacent to the lake (Port Granby, Port Britain).
- Monitor rail line west of Port Hope and upgrade shore protection as required.
- West Beach at Port Hope would benefit from dune and vegetation restoration to stabilize the back beach and enhance local habitat.
- Mechanical bypassing of sediment from Port Hope West Beach to East Beach to avoid sedimentation in the navigation channel.

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