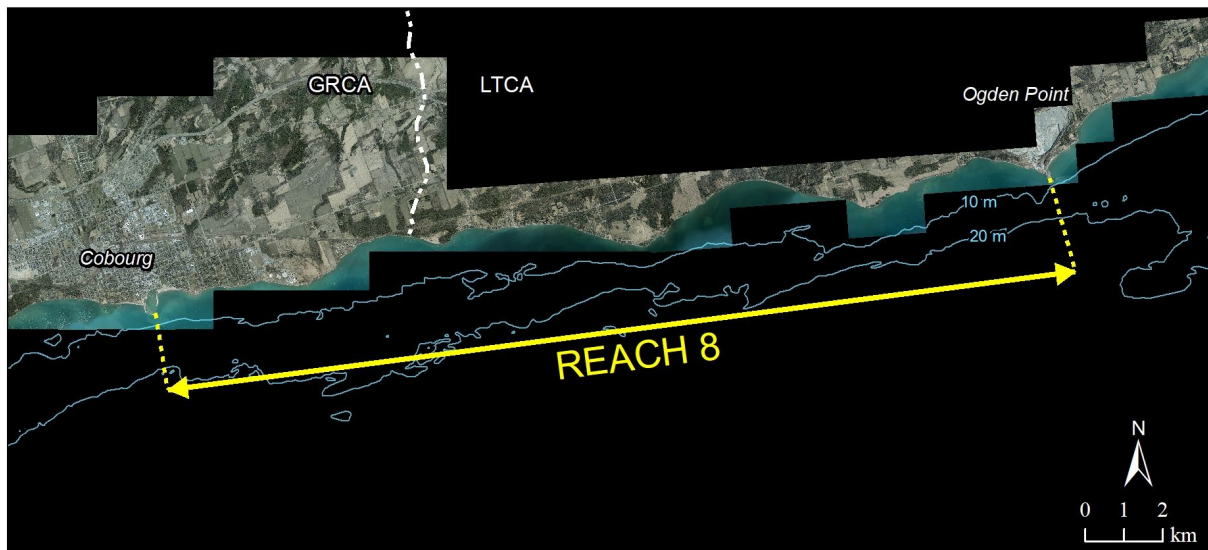


Reach 8 – Cobourg Harbour to Ogden Point



Local Conditions

- Reach Length = approximately 23 km.
- Cobourg Harbour extends more than 500 m into Lake Ontario and represents the west boundary of Reach 8. The east boundary is defined by the lakefill at St. Marys Cement that extends 400 m into Lake Ontario.
- Cobourg Harbour features a large sheltered basin for recreational boats that features an easterly facing opening to the lake.
- Hydraulic dredging from the harbour entrance is pumped to the east fillet beach to increase beach width.
- Bedrock exposures are prominent east of the Cobourg Harbour for 2 km then the shoreline transitions to an eroding bluff.
- The bluff shoreline from Cobourg to Ogden Point alternates between natural areas and shoe-string development with intermittent shore protection.
- The local beaches are important migratory habitat for birds and insects.

Cobourg Harbour East Beach

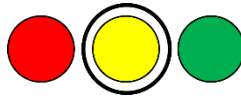


Bedrock Shoreline and Nearshore

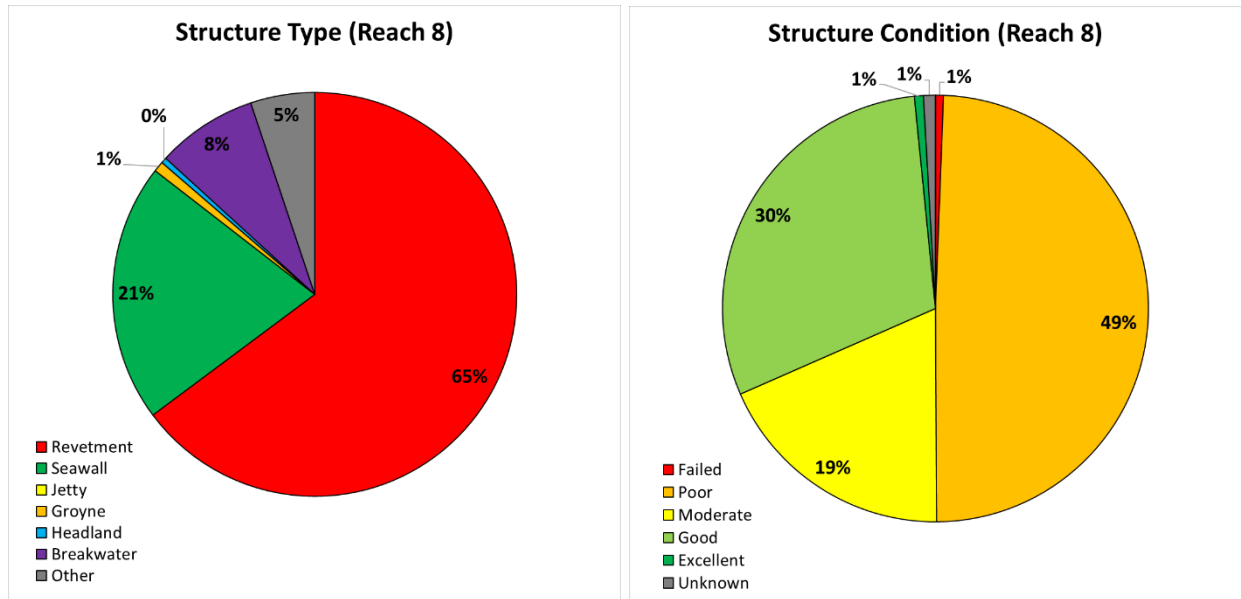


Shoreline Structures

- Reach 8 is 26% armoured, 74% natural.
- The majority of armoured shoreline within Reach 8 is private property shore protection and is located east of Cobourg East Beach, in the town of Spicer, and intermittently through the Grafton Shores area.
- Private property shore protection east of Cobourg is a combination of older, ad-hoc structures in generally poor condition, and newer, well-engineered structures in generally good condition.
- The majority of private properties east of Cobourg remain unprotected, however they benefit from the natural protection provided by an extensive limestone bedrock shelf along the shoreline and in the nearshore.
- Shore protection fronting the Pentecostal Camp at Spicer and adjacent CN rail line to the east is generally ad-hoc revetment-type protection built from a combination of stone and scrap concrete. This shore-protection is generally in poor condition and is vulnerable during extreme events.
- Intermittent shore protection throughout the Grafton Shores region is generally well-engineered and in good condition. The majority of properties remain unprotected and have suffered significant erosion in recent years.
- Tolerance for additional shoreline armouring (low/**medium**/high):



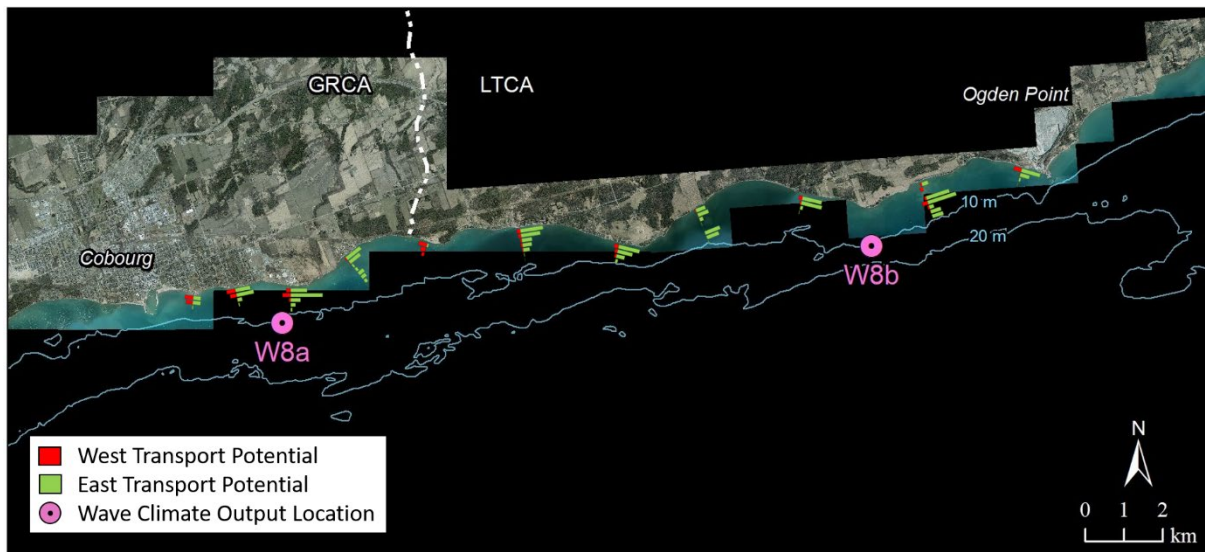
- Sample statistics (for armoured portion of shoreline):



Sediment Supply and Longshore Sediment Transport

- Longshore sediment transport is predominantly from west to east in Reach 8 with fairly high net transport potential of upwards of 150,000 m³/year at several locations throughout the reach.

- The actual transport rate in the west portion of the reach from Cobourg to Spicer is likely very small (0 to 10,000 m³/year). This is due to the obstruction Cobourg Harbour presents to longshore sediment supply arriving from the west, in combination with the exposed bedrock shoreline and nearshore.
- The actual transport rates east of Spicer to Ogden Point are more significant but likely less than 20% of the potential transport rates due to the limited supply of sediment. Sediment comes from two main sources, the first being sand and gravel provided by local eroding bluffs and the second being shingle material provided by eroding bedrock in the nearshore.
- Longshore transport from Spicer to Ogden Point is generally west to east and is partially contained within several sub-cells. These sub-cells exist within small embayments, in which the headlands at either end typically feature significant exposed bedrock in the nearshore (such as at Chub Point). Sub-cells within Reach 8 include:
 - Spicer to west of Hortop Conservation Area
 - Hortop Conservation Area to Chub Point (Grafton Shores)
 - East of Chub Point to McGlennon Road
 - McGlennon Road to Ogden Point
- Sediment moves from west to east within each sub-cell. In the Grafton Shores region this process is apparent with significant bluff erosion taking place along Lakeshore Road and significant sand and cobble deposits overlying bedrock off of Chub Point.



Summary of Natural Hazards

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

Start (lat, long)	End (lat, long)	100-year Erosion Rate (m/year)	Bluff Crest or Waterline
43.9567, -78.155	43.9581, -78.132	0.12	Bluff Crest
43.9581, -78.132	43.9572, -78.115	0.36	Bluff Crest
43.9572, -78.115	43.9672, -78.0832	0.31	Waterline
43.9672, -78.0832	43.9667, -78.0794	0.74	Waterline
43.9667, -78.0794	43.9653, -78.0726	0.36	Bluff Crest
43.9653, -78.0726	43.9688, -78.0612	0.74	Waterline

43.9688, -78.0612	43.969, -78.0371	0.36	Bluff Crest
43.9679, -77.9986	43.9707, -77.9919	0.36	Bluff Crest
43.9707, -77.9919	43.9727, -77.9876	0.14	Waterline
43.9747, -77.9584	43.9716, -77.9405	0.14	Waterline
43.9716, -77.9405	43.97, -77.9341	0.1	Bluff Crest
43.97, -77.9341	43.979, -77.9053	0.14	Waterline
43.9794, -77.9034	43.9805, -77.9018	0.14	Waterline
43.9784, -77.8854	43.9756, -77.8771	0.1	Bluff Crest

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

Start (lat, long)	End (lat, long)	100-year Flood Level (m IGLD85')	Flood Hazard (m IGLD85')
43.9536, -78.1687	43.9570, -78.1560	+76.01	+77.77
43.9570, -78.1560	43.9609, -78.1063	+76.01	+77.55
43.9609, -78.1063	43.9673, -78.0823	+76.01	+77.97
43.9673, -78.0823	43.9647, -78.0171	+76.03	+77.91
43.9647, -78.0171	43.9665, -77.9999	+76.03	+78.06
43.9665, -77.9999	43.9747, -77.9584	+76.03	+77.91
43.9747, -77.9584	43.9743, -77.9222	+76.03	+78.00
43.9743, -77.9222	43.9774, -77.9096	+76.03	+77.91
43.9774, -77.9096	43.9784, -77.8856	+76.03	+77.43
43.9784, -77.8856	43.9756, -77.8765	+76.03	+77.58

- Dynamic Beach(es):

Start (lat, long)	End (lat, long)	100-year Erosion Rate (m/year) or Stable	Dynamic Beach Name
43.9563, -78.164	43.9567, -78.155	Stable	Cobourg East Beach
43.969, -78.0371	43.9678, -78.0287	0.36	Grafton Shores
43.9678, -78.0287	43.967, -78.0269	0.14	Nawautin Beach
43.967, -78.0269	43.9654, -78.0027	0.36	Grafton Shores
43.9654, -78.0027	43.9679, -77.9986	0.14	Ruttan Road
43.9727, -77.9876	43.9752, -77.9829	0.36	Unknown
43.9752, -77.9828	43.9774, -77.9743	0.14	Jubilee Beach
43.9774, -77.9743	43.9747, -77.9584	0.1	Wicklów Beach
43.979, -77.9053	43.9794, -77.9034	0.1	Lakeport West
43.9805, -77.9018	43.9796, -77.8904	0.35	Lakeport East
43.9796, -77.8904	43.9784, -77.8854	0.1	Ogden Point West

- Wave climate ~1 km offshore, west portion (output location W8a):

ARI (years)	Depth (m)	Hs (m)	DIR (deg)	Tp (s)
5	12.6	4.59	217	10.0
10	12.6	4.82	217	10.0
25	12.6	5.14	216	10.5
50	12.6	5.25	216	10.5
100	12.6	5.35	216	10.5

- Wave climate ~1 km offshore, east portion (output location W8b):

ARI (years)	Depth (m)	Hs (m)	DIR (deg)	Tp (s)
5	13.4	4.59	214	10.5
10	13.4	4.81	213	10.5
25	13.4	5.06	213	10.5
50	13.4	5.21	213	10.5
100	13.4	5.30	213	10.5

Infrastructure and Ecosystem Threats

- The Cobourg East Beach is low lying and vulnerable to high lake levels, as 2019 demonstrated.
- Sedimentation in the Cobourg Harbour entrance is a navigation risk but managed with maintenance dredging.
- Properties east of Cobourg are vulnerable to high lake levels (protected by bedrock shelf at low to average levels).
- Buildings and parking lots east of Lucas Point Park are vulnerable to shoreline erosion and gullying due to overland drainage.
- The rail corridor east of Spicer is at the waters edge and very vulnerable to shore erosion.
- Pentecostal Camp and CN Rail Line: lakefront development and buildings impacted by flood and erosion hazards.
- Grafton Shores Subdivision: highly erosive bluff threatens existing development.
- Wicklow Beach Road is very close to the lake.

Shoreline Management Recommendations

- Continue with beach nourishment program for east fillet beach and consider construction of an artificial dune and foredune complex to inflate the elevation of the beach.
- Lucas Point Industrial Area: parking lots and buildings are on hazardous lands and will require relocation. Landside drainage should also be addressed.
- Pentecostal Camp and CN Rail Line: shoreline protection requires upgrades for the entire property and the CN Rail Line.
- Hortop Subdivision: Community scale solution for a protection option is a good model for other high-risk areas.
- Grafton Shores Dynamic Beach: avoid shore perpendicular structures that may disrupt the natural transport of sediment alongshore. If armouring is required, shore parallel structures should be implemented.
- Wicklow Beach Road: monitor. Protection or re-alignment likely required in the future.
- For undeveloped shorelines, consider erosion hazard setbacks greater than the standard 100-year distance.

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