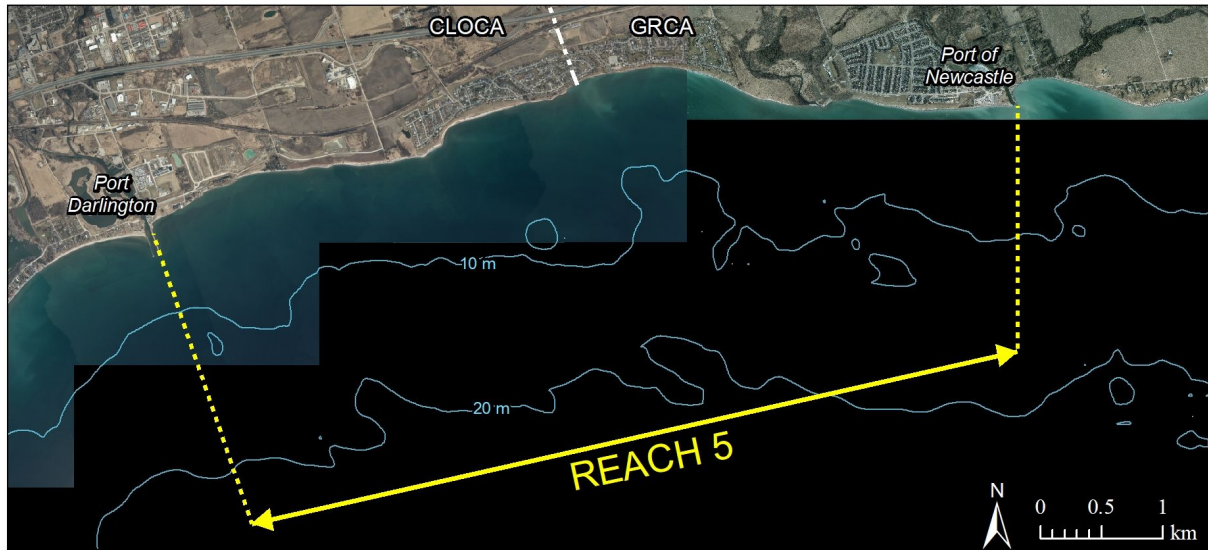


## Reach 5 – Port Darlington to Port of Newcastle



### Local Conditions

- Reach Length = approximately 7.1 km.
- The jettied entrances to Port Darlington the Port of Newcastle define a littoral sub-cell along the north shore of Lake Ontario.
- The boundary between the Central Lake Ontario Conservation Authority and the Ganaraska Region Conservation Authority is in the centre of Reach 5.
- Significant sedimentation is ongoing in the navigation channel in Port Darlington.
- Two new residential developments are under construction along the eroding bluff shoreline east and west of Lambs Road.
- The Wilmont Creek Community stretches along almost 3 km of the eroding bluffs.
- The Port of Newcastle community is located west of the jettied rivermouth.

*Eroding Bluffs and Failed Shore Protection East of Port Darlington*

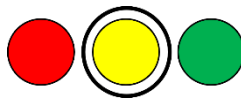


*Cobble Fillet Beach and Jetties at Port of Newcastle*

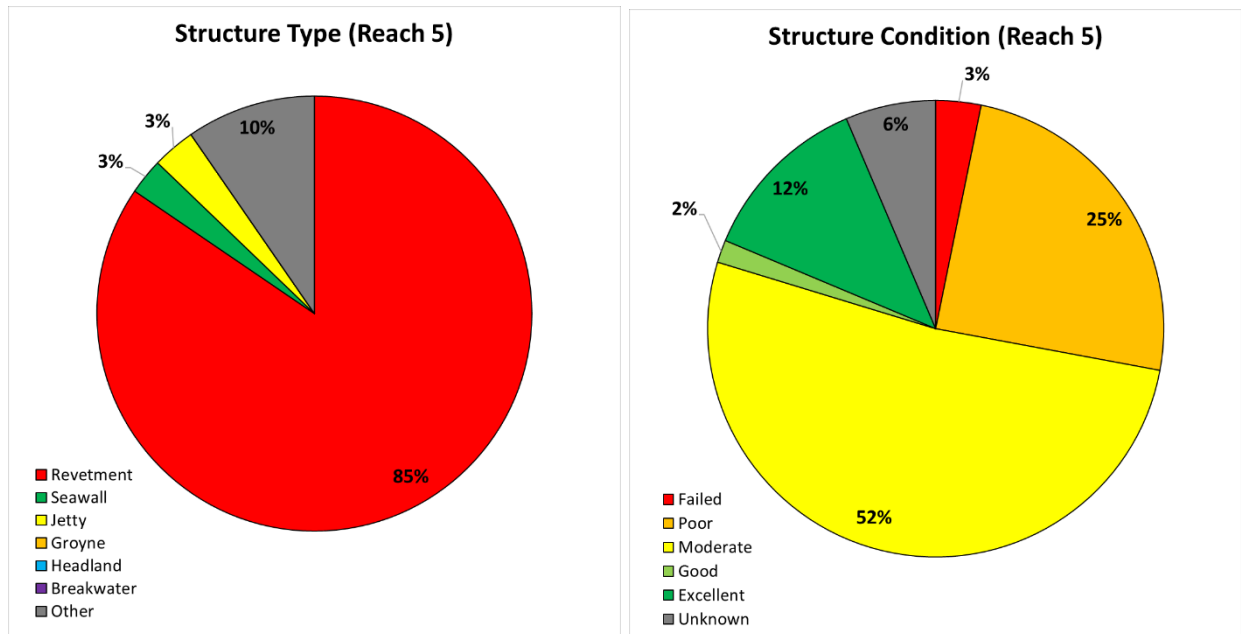


## Shoreline Structures

- Reach 5 is 25% armoured, 75% natural.
- The west end of the reach features well engineered and recently constructed shore protection fronting Port Darlington East Beach. This structure is robust and in excellent condition.
- Immediately east of Port Darlington East Beach there are a number of properties sitting atop a high, rapidly eroding bluff. Some properties feature shore protection of varying quality and condition, while others are unprotected and continue to erode. These properties are at high risk due to their proximity to the bluff crust.
- The majority of shore protection within the reach is found in along the shores of Wilmot Creek, a retirement community that spans the border between the Central Lake Ontario Conservation Authority and the Ganaraska Region Conservation Authority. This structure has been engineered and implemented in the last decade, however it is only an interim, porous structure comprised of an armour stone berm resting directly on the beach at the toe of the bluff. Some vertical beach erosion and horizontal recession of the bluff is expected to continue behind the structure during periods of extreme lake levels.
- The jetties at Graham Creek (Port of Newcastle) are composite gravity structures and are both in moderate condition. The root of both structures is comprised of native fill material with a thin layer of minimal rock protection. These areas have suffered significant damage during the high-water periods in 2017 and 2019 and have nearly breached, particularly on the east side at Bond Head Parkette. These structures should be repaired and upgraded to prevent the propagation of waves and sediment into Graham Creek.
- Tolerance for additional shoreline armouring (low/**medium**/high):

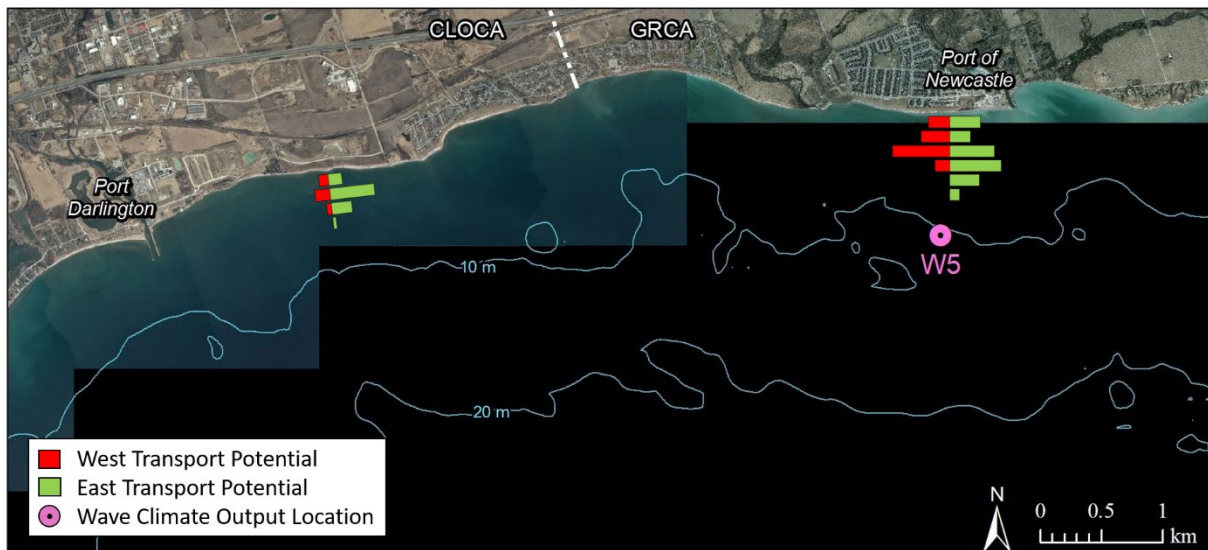


- Sample statistics (for armoured portion of shoreline):



## Sediment Supply and Longshore Sediment Transport

- Net longshore sediment transport potential is from west to east through reach 5 with a potential volume of 80,000 to 100,000 m<sup>3</sup>/year. The actual transport is likely less than 10,000 m<sup>3</sup>/year as the supply of sediment is predominantly limited to local bluff erosion within the reach.
- Deposition occurs primarily in the fillet beach to the west of the Graham Creek jetties, as is evident by the significant offset in shoreline position from the west side to the east (~140 m).
- Some deposition occurs at the west end of the cell at Port Darlington East Beach during periods of wave action from the southeast quadrant.
- The significant amount of hardened shoreline fronting the Wilmot Creek Retirement Community reduces the sediment supply to the reach, however the structure is reasonably low crested and porous and therefore does not completely mitigate the bluff erosion that contributes sediment to the region.



## 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
43.8891, -78.663	43.8976, -78.6203	0.24	Bluff Crest
43.8976, -78.6203	43.8959, -78.5975	0.24	Bluff Crest
43.8962, -78.5947	43.8953, -78.5815	0.24	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')
43.8885, -78.6624	43.8895, -78.6617	+76.01	+77.64
43.8895, -78.6617	43.8967, -78.6257	+76.01	+77.77
43.8967, -78.6257	43.8956, -78.5767	+76.01	+77.77

- Dynamic Beach(es):

Start (lat, long)	End (lat, long)	100-year Erosion Rate (m/year) or Stable	Dynamic Beach Name
43.8885, -78.6641	43.8891, -78.663	Stable	Port Darlington East Park
43.8959, -78.5975	43.8962, -78.5947	0.11	Wilmot Creek Barrier Beach
43.8953, -78.5815	43.8955, -78.5764	Stable	Newcastle Beach

- Wave climate ~1 km offshore (output location W5):

ARI (years)	Depth (m)	Hs (m)	DIR (deg)	Tp (s)
5	13.1	4.72	211	9.5
10	13.1	4.82	211	9.5
25	13.1	5.02	208	10.0
50	13.1	5.08	208	10.0
100	13.1	5.13	208	10.0

### Infrastructure and Ecosystem Threats

- West jetty at Bowmanville Creek requires a significant structural upgrade to mitigate wave and sediment transmission into the navigation channel (reported in Reach 4).
- Port Darlington East Beach suffers from a sediment deficit.
- Residences atop bluff east of Port Darlington East Beach are threatened by erosion.
- Wilmot Creek: interim shore protection that only provides partial erosion mitigation.
- Jetties at Graham Creek require significant repairs/upgrades to their roots to mitigate wave and sediment transmission into Graham Creek.
- Jetties at the Graham Creek trap longshore sediment transport and starve the downdrift shoreline to the east (Bond Head).

### Shoreline Management Recommendations

- Impacts of additional shoreline armouring: moderate impacts within Reach 5 but significant negative impacts to Reach 6 to the east.
- West jetty at Bowmanville Creek requires significant structural upgrade to mitigate wave and sediment transmission into the navigation channel.
- Implement a sediment bypassing program from the Port Darlington west fillet beach to nourish Port Darlington East Beach Park.
- A long-term community scale solution is required for Port Darlington East Beach community to reduce erosion and flood hazards, such as protection or retreat. For example, a long-term voluntary land acquisition program for lands subject to acute hazards could be implemented to return the shore lands to public open space.
- Maintain naturally eroding bluff environments.
- Wilmot Creek Development: monitor shore protection and upgrade structures as required to provide the necessary protection.
- Monitor trail location at Newcastle and relocate inland when threatened by erosion.
- No further development in the floodplain west of Graham Creek (Port of Newcastle).
- Root of jetties at Graham Creek require significant repairs/upgrades.
- Implement a sediment bypassing program for the west fillet beach at Port of Newcastle to nourish the eroding east beach (Bond Head Parkette, Boulton Street).

### **Use Disclaimer**

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