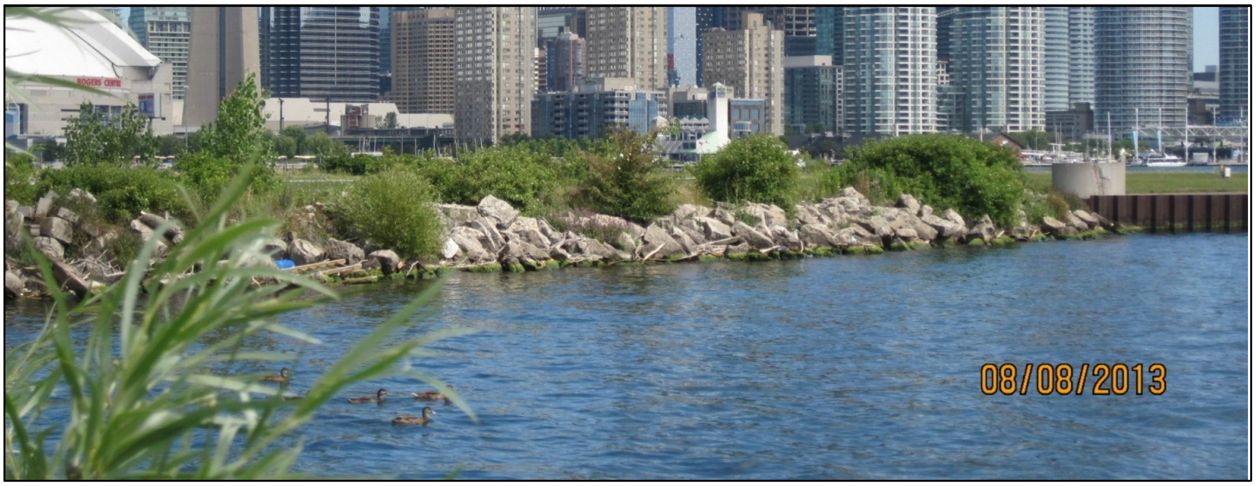
Figure 3-3 **The Southeastern Revetment (Face A)**



3.2.1.4 Northeastern Pier (Face D)

The northeastern pier is a steel sheet pile pier with a concrete deck that extends from the northeast limit of SSP Face C as shown in Figure 3-2. It is simply build as a double sheet pile wall connected with tie-rods and capped with a concrete deck. Similar to SSP wall at the end of the eastern end of the runway, some localized deterioration on the concrete surface was observed on the deck. At the time of the site visit on August 9, 2013, the deck was also hosting moss and lichen in several locations as shown in Figure 3-4.

Figure 3-4 **Moss and Lichen on the Northeastern Pier**

3.2.1.5 Northeastern Revetment (Face E)

The northeastern revetment extends from the eastern pier at the east end of the runway to the TPA float plane docks on the west end. It consists of dumped stone of various size, but ranging from approximately 2.5 tonne stones to small rip rap arranged on an approximately 1:4 slope. The revetment is overgrown with shrubs and small trees. At the eastern limit of the revetment, next to the Eastern Pier, an appreciable volume of sand has accumulated in front of the revetment against the pier as shown in Figure 3-5, in the relatively well sheltered embayment area.

Figure 3-5 **Sand Accumulation at the Eastern End of the Northeastern Revetment**

08/08/2013

3.2.2 Western Runway

3.2.2.1 Eireann Quay (Face F)

The Eireann Quay extends east to west along the Western Channel. It is constructed as a steel sheet pile wall with a flat concrete deck as shown in Figure 3-7. Mooring tools such as bollards and a rub-rail have also been installed on the pier. Based on visual assessments, the sheet pile wall is in good condition and functions well. In the central portion of the wall a sound barrier wall was constructed on the decks to attenuate noise and vibrations from landing and ascending planes.

3.2.2.2 Northwestern Cellular Steel Sheet Pile (Face G)

The northwestern steel sheet pile protection extends from Eireann Quay to the Western pier. The structure consists of a cellular sheet pile wall with a concrete deck. Its crest elevation is slightly higher than the Eireann Quay. Localized deterioration on the concrete decking was observed during an August 9, 2013 site inspection. Nonetheless, the sheet pile wall is generally in good condition (Figure 3-8).

3.2.2.3 Western Steel Sheet Pile (Face H)

This steel sheet pile protection extends from the northwestern cellular SSP face (Face G) to the southwestern revetment. It consists of a steel sheet pile wall with a sloping concrete deck in the central portion and a flat concrete deck in the northern and southern portions. The sloping concrete deck slopes down towards Lake Ontario, and extends across the width of the western end of Runway 08/26. The water level was almost at the same level as the crest height of the sheet pile wall during the August 9, 2013 site inspection. It is anticipated that this wall is occasionally overtopped by waves during periods of higher lake water levels. A few localized cracks between the concrete deck and SSP at the edge of the wall were observed.

3.2.2.4 Southwestern Revetment (Face I)

The southwestern revetment extends from the western SSP wall (Face H) to Hanlan’s Point Beach. It consists of dumped stone, ranging in size from approximately 3.0 tonne stones to small rip rap arranged on approximately a 1:1.5 slope. At the eastern limit of the revetment an appreciable volume of sand has accumulated due to the northerly longshore drift of sediments from Gibraltar Point and Hanlan’s Point Beach. In addition to the sand, floating debris has accumulated on the beach and revetment as shown in Figure 3-9.

Figure 3-6 Existing Shoreline Conditions on the Western Runway

3.2.3 Overall Shoreline Condition

The shoreline in the project area is currently protected by a combination of armourstone, rip rap revetments, and steel sheet piling. The existing shore protection has hardened the shoreline and prevents natural shoreline responses to wave action. Based on visual reconnaissance, overall the shoreline protection appears to be in good condition and appears to have prevented shoreline change since its installation.

The proposed runway extension is located in an area with a heavily armored shoreline that is resistant to wave action and shoreline change. The proposed extension works are not expected to have an impact upon the shoreline or shoreline protection structures near the project site, however may affect the movement of sediment northward into the Western Gap. Beach and dune impacts are detailed in Section 3.2.5. It is noted that there is an intake tunnel in the immediate vicinity of the eastern runway extension which supplies the John Street Pumping Station , located at 23m to 28m below International Great Lakes Datum 1985 (Dillon Consulting Ltd, 2013). It is recommended that a detailed site survey and sounding be carried out to determine its exact location with respect - to the proposed extension and construction activity near the eastern runway.

Figure 3-7 View Eastward of Eireann Quay and the BBTCA Sound Barrier

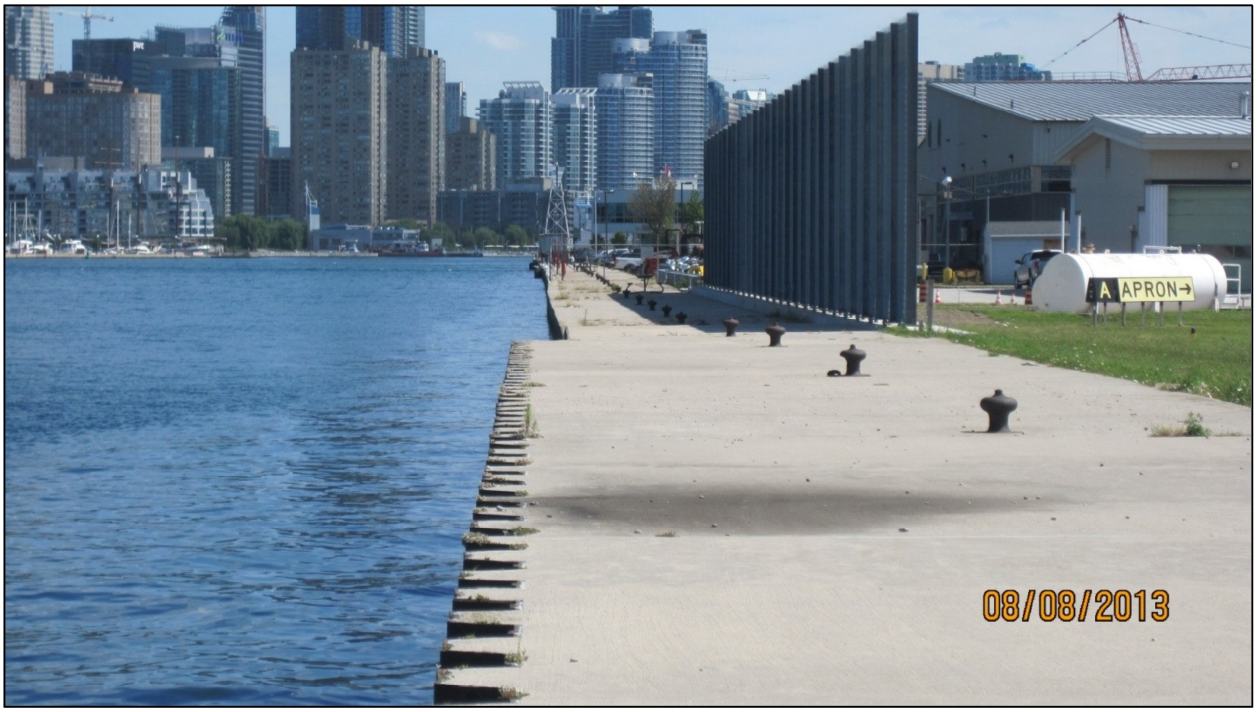


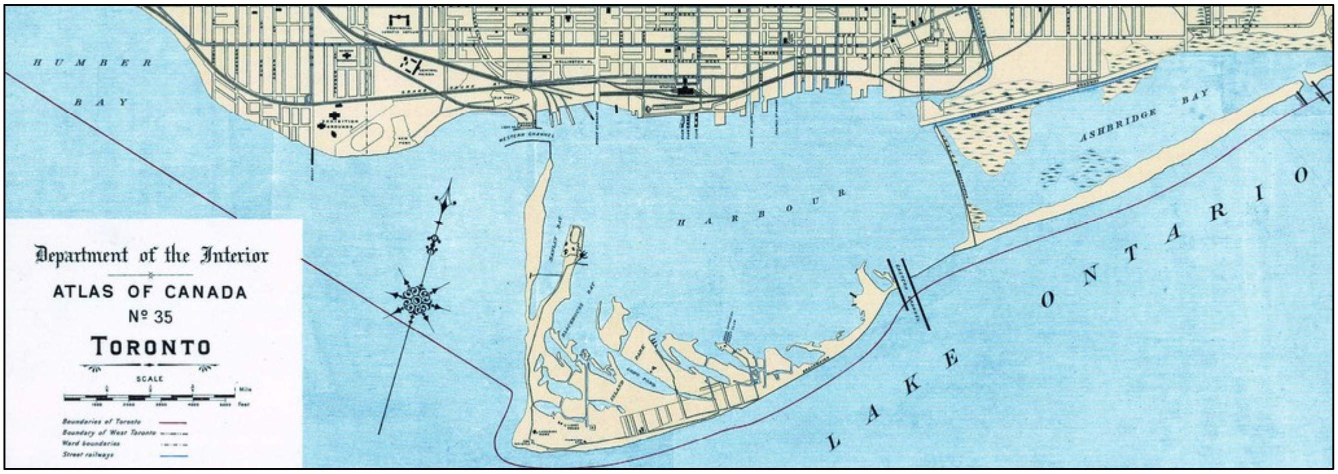
Figure 3-8 View South of the Northeastern Cellular Quay

Figure 3-9 The Southwestern Revetment and Hanlan's Point Beach

3.2.4 Sediment Transport and Future Shoreline Changes

The Toronto Islands were formed in the late glacial and post glacial periods by sediment supplied to Lake Ontario via rivers and bluff erosion along the Scarborough Bluffs (Sharpe, 1980). This resulted in the formation of a sand spit that extended from Ashbridge’s Bay, to the Toronto Islands. Figure 3-10 shows the Toronto shoreline in 1906. Considerable fill has been added to the islands and waterfront since the turn of the 20th century, most notably in the central waterfront, Ashbridge’s Bay and Buffer’s Park. This was followed by further lake filling at the west end of the Toronto Islands in the 1930s, to create the present day BBTCA. Construction of the Leslie Street Spit started in the 1950s and today, the Leslie Street Spit forms a complete barrier to littoral transport from the east. The net direction of sediment transport was in a westerly direction and the spit now forms an area of deposition.

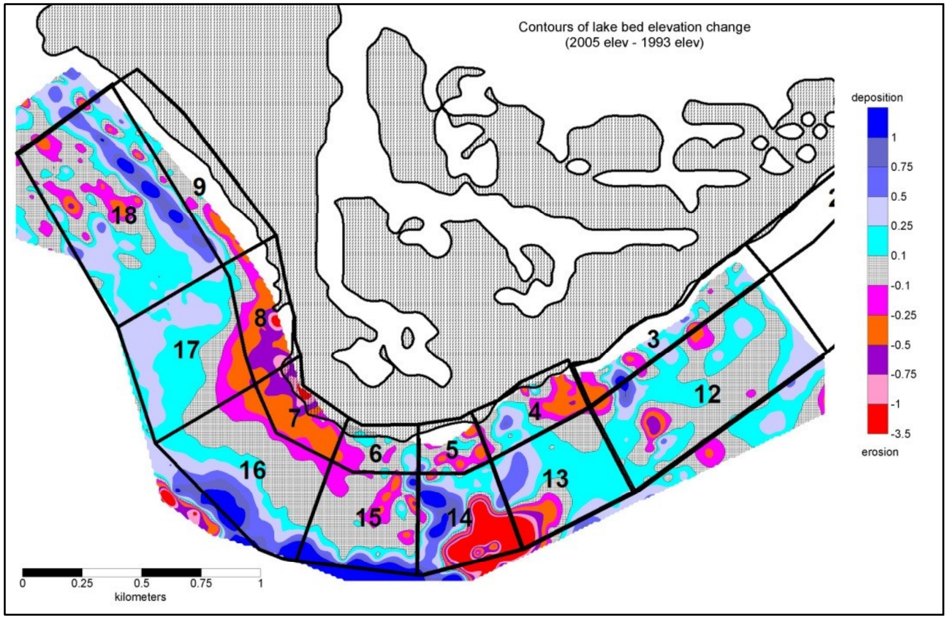
Figure 3-10 Map of Toronto Harbour from 1906 (Atlas of Canada)



The present day harbour is isolated from sediment sources. There is virtually no sediment transport into the Harbour through the Eastern and Western Gaps. The Don River, once a source of sediment to the area, now empties into the Keating Channel, which is regularly dredged.

Within Toronto Harbour, the north, east and west shores of the Harbour consist of lakefill, protected by timber cribs, concrete walls and steel sheet piling. The south shore, which is the sheltered shoreline of the Toronto Islands, consists of sand deposits, also largely protected with revetments and seawalls. As a result, the shoreline does not erode in response to wave action, and it does not represent a sediment supply within the Harbour.

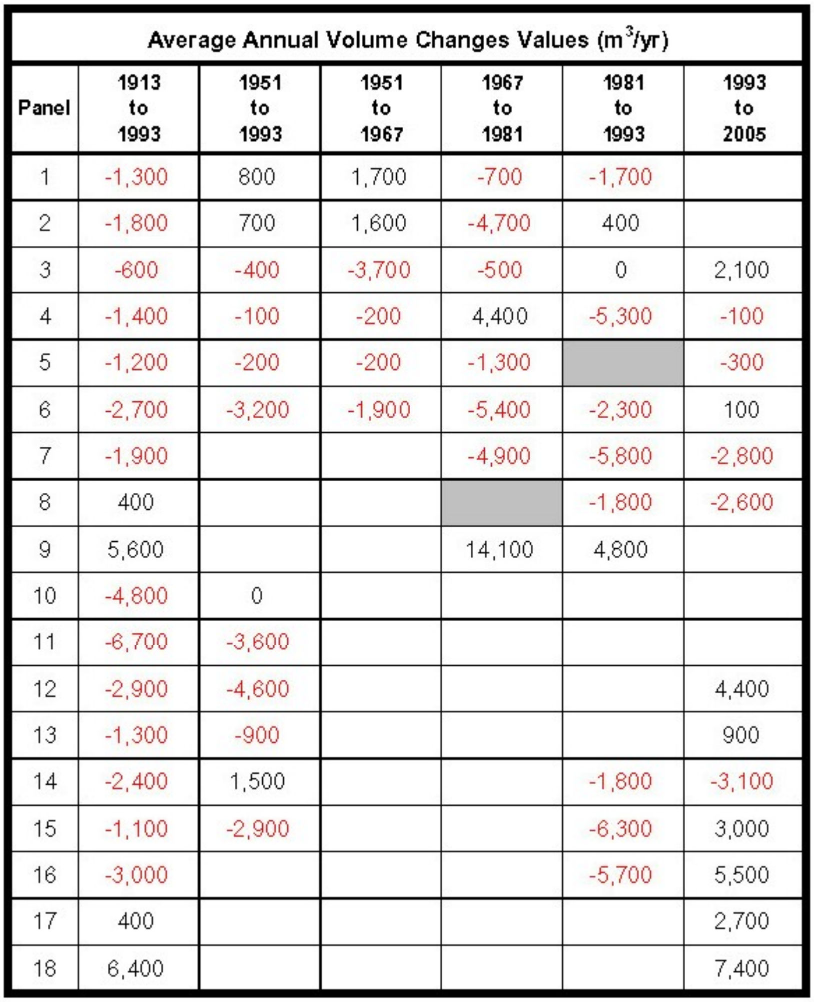
Figure 3-11 Lakebed Elevation Change Contours from 1993 to 2005
Adapted from Shoreplan, 2005



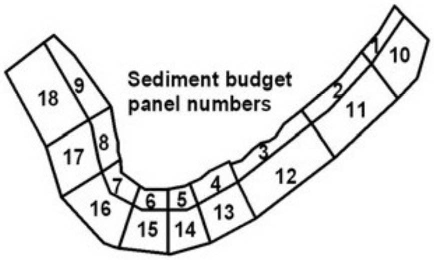
As part of a 2007 Class Environmental Assessment for Remedial Flood and Erosion Control Projects completed for the TRCA, Shoreplan Engineering completed a coastal analysis study to determine the regional processes around Gibraltar Point and assist with the development of alternative long-term solutions to the shoreline erosion (Shoreplan, 2007). Shoreplan investigated sediment transport characteristics around Gibraltar Point using numerical models and survey comparisons as well as previous studies. Based on a 1994 Baird sediment transport modeling study which covers the 35 year period from 1958 to 1993, Shoreplan developed a sediment budget analysis for Gibraltar Point and Hanlan's Point Beach using profile surveys from 1993 and a nearshore bathymetry survey conducted at the end of 2005. Figure 3-11shows the contour map of the lakebed elevation changes that occurred within the 1993-2005 timeframe. Table 3-1 shows the lakebed volume changes calculated as part of the sediment budget analysis. Negative volume changes indicate erosion and positive volume changes indicate accretion. It may be noted that Panel 18 is near the proposed runway extension on the western end of the island, where sand accumulates in the nearshore. Based on these analyses it is anticipated that the alongshore sediment transport rate in front of the western end of Runway 08-26 is approximately 7,400 m^3/year.

If a deck on piles is constructed to extend the runway, changes to the sediment transport will be minor and limited to the immediate area of the proposed extension on the western. As for the lakefill, it is anticipated that northerly directed alongshore sediment transport will be partly blocked by the extension at the western end and sand may accumulate against the lakefill. On the eastern end of the runway it is anticipated that a runway extension constructed with either lakefill or a deck on piles will result in no impact to the sediment process in the Inner Harbour. However, during the construction there is a potential for increased suspended sediment concentration and the resulting turbidity plume near both construction sites. The potential impact would largely be related to fisheries. It is recommended that a silt curtain/barrier be used during the construction to reduce these impacts. To quantify the impacts on sediment movement that will result from the proposed runway extension, a detailed numerical sediment transport modeling study is recommended to determine the transport path around the island with and without the proposed extension.

Table 3-1 Annual Sediment Volume Changes at Gibraltar Point and Hanlan's Point Beach (Shoreplan, 2007)



Average Annual Volume Changes Values (m^3/yr)						
Panel	1913 to 1993	1951 to 1993	1951 to 1967	1967 to 1981	1981 to 1993	1993 to 2005
1	-1,300	800	1,700	-700	-1,700	
2	-1,800	700	1,600	-4,700	400	
3	-600	-400	-3,700	-500	0	2,100
4	-1,400	-100	-200	4,400	-5,300	-100
5	-1,200	-200	-200	-1,300	▨	-300
6	-2,700	-3,200	-1,900	-5,400	-2,300	100
7	-1,900			-4,900	-5,800	-2,800
8	400			▨	-1,800	-2,600
9	5,600			14,100	4,800	
10	-4,800	0				
11	-6,700	-3,600				
12	-2,900	-4,600				4,400
13	-1,300	-900				900
14	-2,400	1,500			-1,800	-3,100
15	-1,100	-2,900			-6,300	3,000
16	-3,000				-5,700	5,500
17	400					2,700
18	6,400					7,400



3.2.5 Beach and Dune Environment

Beach and Dune environments are limited to the section of the coast extending south from the western end of the runway, known as Hanlan's Point Beach. Significant restoration efforts have been ongoing along this section of coastline, slowing erosion and improving dune species diversity. A study by the TRCA (currently on hold) is examining the feasibility and design of a dune replenishment program that will replace beach sand with lost sand dredged from the Western Gap. As the greatest threat to this dune environment is the movement of sand northwards into the Western Gap, it is not anticipated that the proposed runway extension, at the northernmost end of Hanlan's Point Beach will negatively affect the dune environment. The design of a proposed BBTCA runway extension at the western end of the runway can be optimized to capture beach substrate and sediments before they enter the Western Gap, potentially facilitating or reducing the costs associated with mechanical sand replenishment activities on Hanlans' Point Beach and Gibraltar Point, the southernmost tip of the beach. Accretion at the proposed runway extension will also extend the dune environment, potentially creating additional dune habitat, as shown conceptually in Figure 3-12, below.

Figure 3-12 **Potential Conceptual Dune Accretion Resulting from Proposed Runway Extension**

4. Physical Processes Affecting the Aquatic and Terrestrial Environment

Although much of the geography of the Toronto Islands, Inner and Outer Harbors, and the lake shore of the City have been shaped and hardened by anthropogenic means, the area is still subject to numerous dynamic processes resulting from cyclic climate and lacustrine changes. These processes and the effects they have on the BBTCA runway are described below.

4.1 Water Levels

Water levels in Lake Ontario vary annually and seasonally in response to general climatic conditions, and hourly in response to storm events. Canadian Hydrographic Service hourly digital water level data was collected from January 1962 to August 2013 and analyzed to estimate extreme high water levels as a function of various return periods. Figure 4-1 shows the frequency of occurrence and frequency of exceedance for hourly water levels over the fifty-two year period analyzed from the Toronto Gauge. Table 4-1 documents the maximum and minimum water levels over the period of record of hourly data (1962-2013).

Figure 4-1 **Frequencies of Occurrence and Exceedance Statistics for Hourly Water Levels at the Toronto Island Gauge**

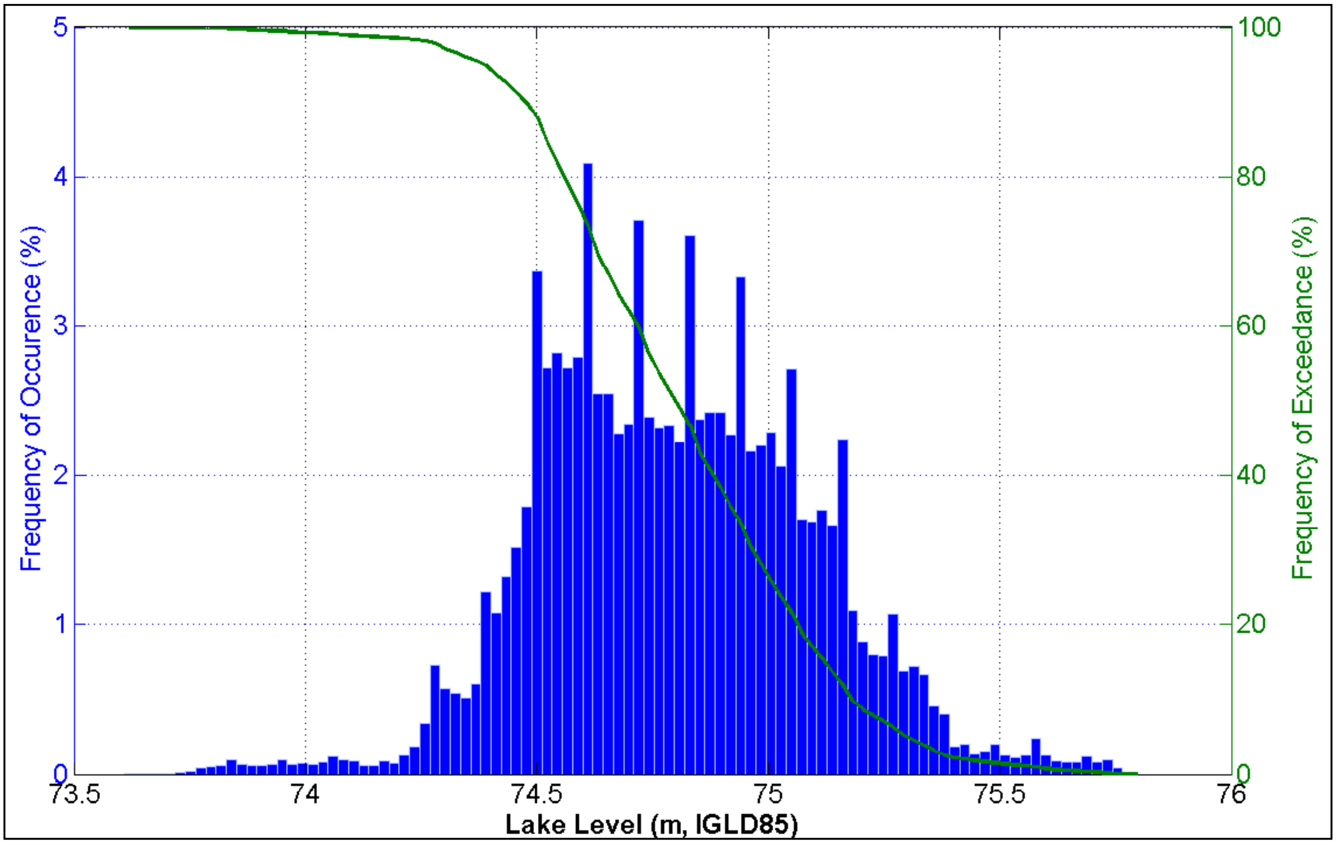


Table 4-1 **Maximum and Minimum Hourly Water Levels at Toronto Gauge (1962-2013)**

Water Level	Water Level (IGLD 1985)	Date
Max.	75.81	May 28 1973
Min.	73.62	February 4, 1965
Range	2.19	-

First, storm surge events were separated out from the hourly water level by subtracting three days average mean water level from the measured water levels during the same period. Similarly, the maximum three days averaged water levels were determined from the data. A combined probability analysis was then performed in order to estimate three days mean, surge and combined water level (surge + weekly) as a function of the 1, 5, 10, 25, 50 and 100 year return periods. The results are summarized in Table 4-2 for the full year and for the boating season (May 1 to October 31).

Table 4-2 High Water Level as a Function of Return Period (m IGLD 1985)

Period	Water Level	Return Period (yrs)				
		5	10	25	50	100
Full Year	Static	75.72	75.75	75.78	75.79	75.80
	Surge	0.19	0.21	0.23	0.25	0.27
	Combined	75.75	75.79	75.82	75.84	75.86
Boating Season	Static	75.71	75.75	75.77	75.78	75.79
	Surge	0.16	0.18	0.20	0.22	0.25
	Combined	75.74	75.78	75.81	75.82	75.83

A similar analysis was also undertaken to estimate extreme low water levels as a function of same return periods as above. Again, the results are shown in Table 4-3 for the full year and for the boating season (May 1 to October 31).

Table 4-3 Low Water Level as a Function of Return Period (m IGLD 1985)

Period	Water Level	Return Period (yrs)				
		5	10	25	50	100
Full Year	Static	73.85	73.80	73.75	73.71	73.67
	Surge	-0.24	-0.26	-0.30	-0.33	-0.37
	Combined	73.78	73.72	73.64	73.59	73.55
Boating Season	Static	74.34	74.26	74.16	74.07	73.98
	Surge	-0.17	-0.18	-0.20	-0.22	-0.23
	Combined	74.25	74.18	74.09	74.02	73.95

Water levels in the harbor and Lake Ontario will not be affected by the extension.

4.2 Climate Conditions

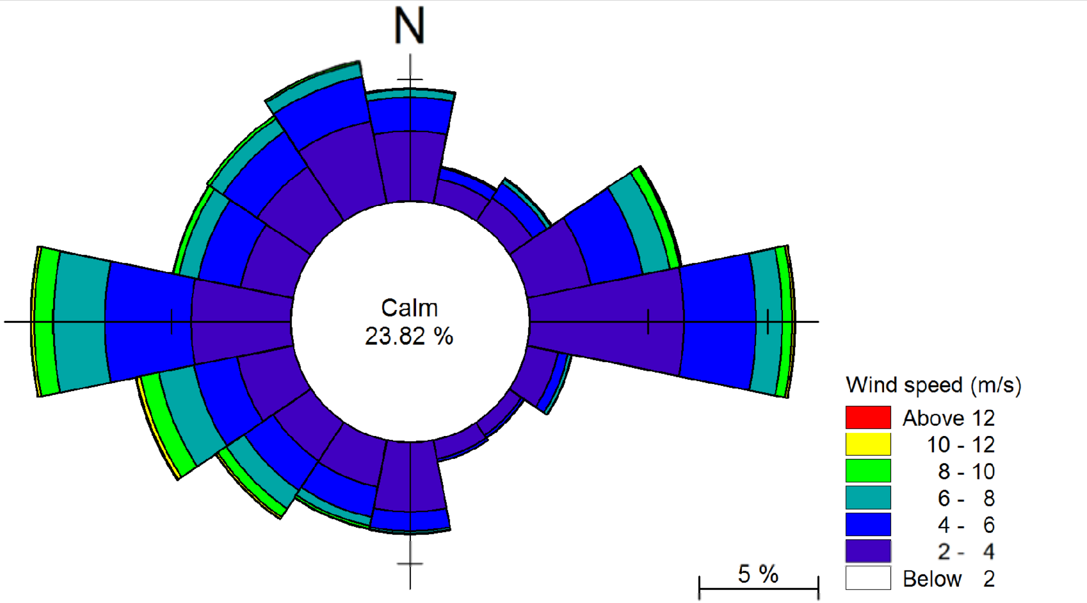
4.2.1 Wind

Wind data from the Toronto Island Airport anemometer (WMO ID code: 71265) was downloaded from the National Climate Data and Information Archive. The anemometer is located at latitude 43.6286° N and longitude 79.3950° W, at an elevation of 76.5 metres above sea level (masl).

Although the wind data record spans from February 1957 to March 2006, data prior to 1973 were not used, since measurements were not continuously taken throughout the day. The wind data was corrected to 10m anemometer elevation per U.S. Army Corps of Engineers guidelines (USACE, 2003). Following standard convention, wind data is “direction from,” meaning that, for example, a northerly wind refers to wind that is coming from a northerly direction. A wind rose diagram and scatter diagram for Toronto Island wind data from

1973 to 2006 is shown in Figure 4-2. The strongest winds are mainly from the west to south-southwest sector. The wind speed rarely exceeds 14 m/s (0.03 % of the time in 24 years). The wind speed is calm, or less than 2 m/s approximately 23.8% of the time. Frequency of occurrence and exceedance frequency of the wind speed are shown in Figure 2.4.

Figure 4-2 Wind Rose and Scatter Diagram for Toronto Island Airport: Hourly Wind Speeds from 1973-2006



Wind Spd. (m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	*Sum*
<2	1.02	0.39	0.43	1.11	3.10	1.08	0.78	0.78	2.03	1.62	1.72	2.33	2.96	1.34	1.62	1.52	***23.82***
2 - 4	2.85	1.02	1.19	2.73	6.51	1.34	0.63	0.78	2.83	1.96	1.91	2.41	4.21	2.25	2.72	3.46	***38.80***
4 - 6	1.40	0.47	0.72	2.25	3.00	0.42	0.11	0.12	0.82	1.27	1.47	1.84	3.60	1.81	1.75	1.87	***22.92***
6 - 8	0.32	0.07	0.19	1.14	1.11	0.13	0.02	0.01	0.10	0.38	0.90	1.50	2.16	0.83	0.63	0.55	***10.05***
8 - 10	0.03	0.01	0.06	0.43	0.42	0.04	0.00	0.00	0.02	0.11	0.43	0.79	0.80	0.23	0.14	0.09	***3.61***
10 -12	0.00	0.00	0.01	0.07	0.08	0.00	0.00	0.00	0.00	0.02	0.10	0.17	0.13	0.03	0.01	0.01	***0.64***
12 - 14	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.02	0.00	0.00	0.00	***0.13***
14 - 16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	***0.02***
>16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.01***
Sum	**5.63**	**1.96**	**2.60**	**7.74**	**14.25**	**3.01**	**1.54**	**1.68**	**5.79**	**5.36**	**6.56**	**9.08**	**13.89**	**6.50**	**6.88**	**7.51**	***100***

A peaks over threshold (POT) analysis was performed on the Toronto Island Airport wind data to determine extreme events in the dataset. An extreme value analysis (EVA) was then completed using MIKE 21 EVA (DHI, 2012b) on the resulting data. Wind speeds for varying return period are listed in Table 4-4. The upper and lower confidence limits are based upon the 95% confidence interval. Considering the length of the data set used in the analysis (33 years), the predicted 50 and 100 year return period wind speeds should be used with caution.

Figure 4-3 Frequency of Occurrence and Exceedance Frequency of Wind at Toronto Island Airport from 1973 to 2006

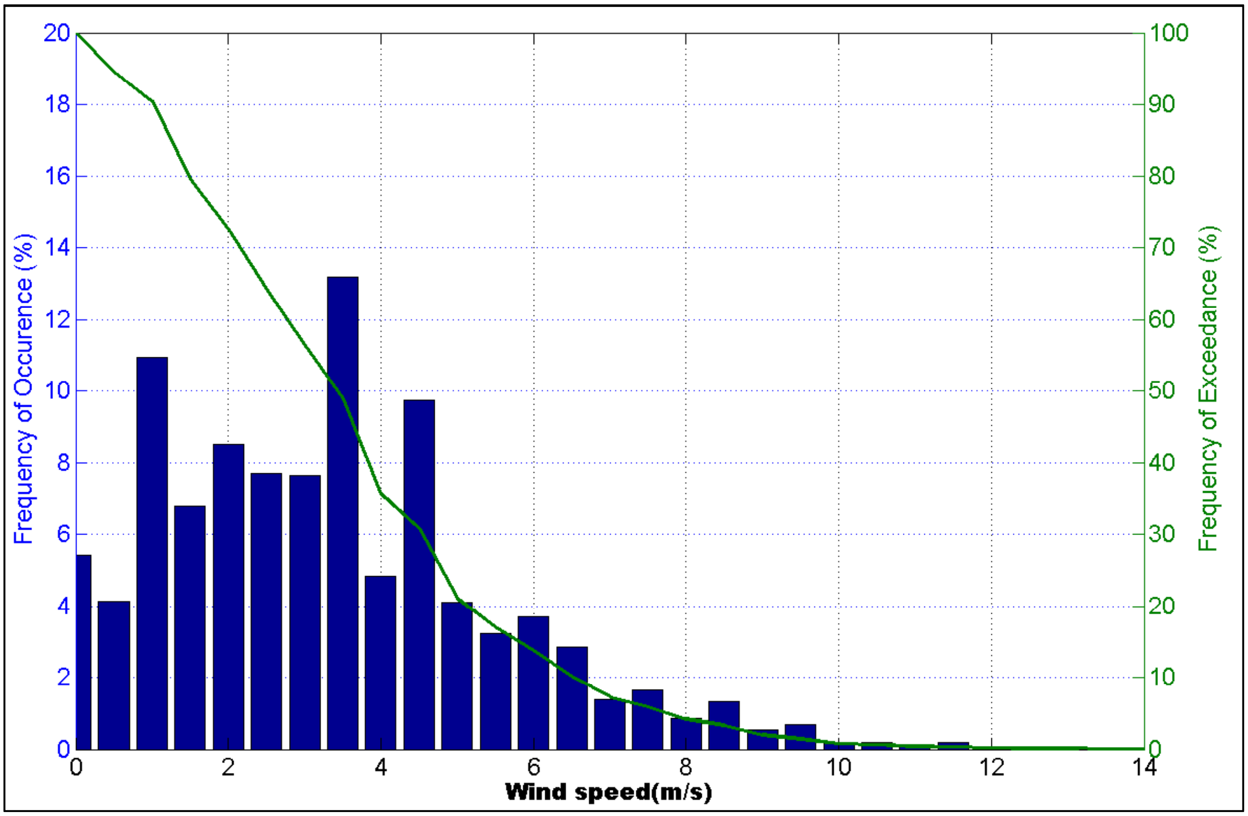


Table 4-4 Summary of Extreme Wind Speed and Confidence Limits for Toronto Island Weather Station Data

Return Period (yrs)	Wind Speed (m/s)	Upper Confidence Limit (m/s)	Lower Confidence Limit (m/s)
1	14.0	14.2	13.8
5	14.7	15.2	14.2
10	15.8	16.6	14.9
25	16.8	17.8	15.5
50	18.2	19.8	16.1
100	19.3	22.0	16.3

The wind field in the harbor and lake will not be impacted by the project.

4.2.2 Waves

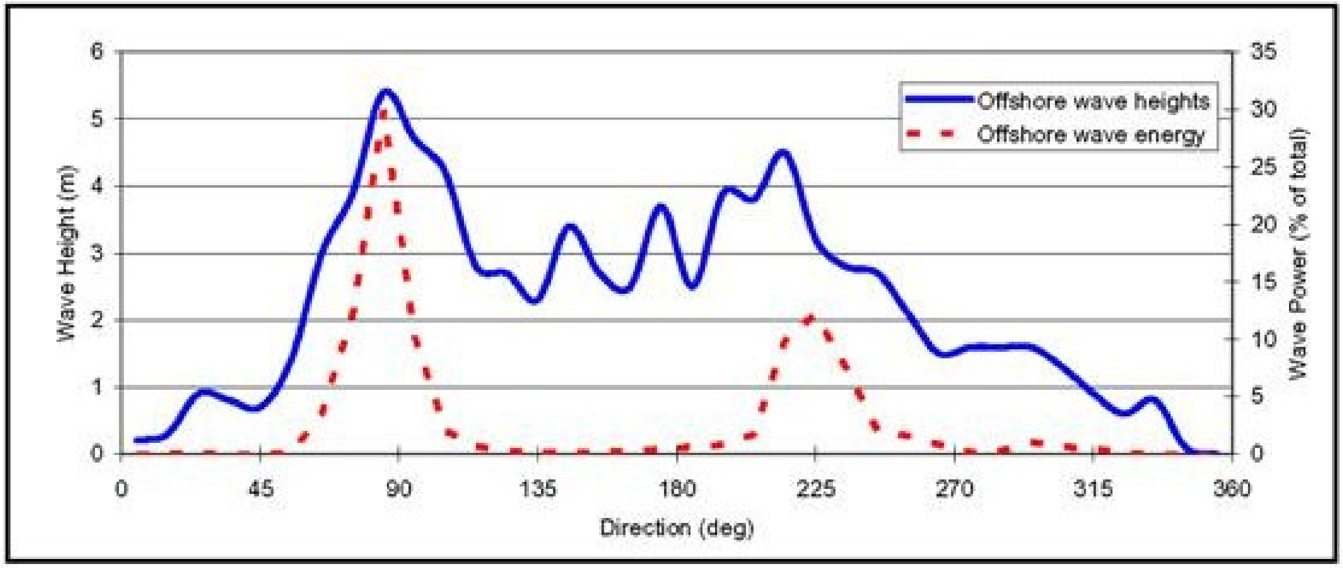
4.2.2.1 Wind Waves at the Inner Harbor

Baird and Associates (2012) carried out a one-dimensional wave hindcast using 39 years of wind data (1973-2012), measured at the Toronto Island Airport for the Inner Harbor. It is noted that wind data were not corrected for the overwater effects and assumed to be at a 10 m elevation, although the station elevation was stated as 76.5masl. Based on Baird's analysis, significant wave heights are less than 0.4m 98% of the time. The maximum wave height is estimated to be 0.9m from the east (90^{o} N) at the eastern runway. An extreme value analysis was also carried out on the hindcast data. A 100 yr return period wave height is estimated to be 0.93m, which is slightly larger than the maximum wave height found from the hindcast.

4.2.2.2 Offshore Wave Climate

Shoreplan (2007) carried out a wave hindcast study using 33 year wind data (January 1973 to December 2005) observed at the Toronto Island Airport. Figure 4-4 shows the highest hindcast wave height and total wave energy distribution by direction from the hindcast. Both the wave height and the wave energy distributions show two distinct peaks; one from the east and one from the southwest. There is significantly more wave energy associated with the easterly peak than the southwesterly peak.

Figure 4-4 Distribution of Offshore Wave Heights and Wave Energy (Shoreplan, 2007)



4.2.2.3 Nearshore Wave Climate

Shoreplan (2007) also assessed the nearshore wave climate around Gibraltar Point at the southernmost end of Hanlan's Point Beach by transferring offshore wave hindcast date from deep water into the nearshore area using DHI's MIKE21 Parabolic Mild Slope (PMS) numerical wave transformation model. Figure 4-5 shows the location of 13 nearshore nodes where the nearshore wave climate data was estimated. Figure 4-6 shows a comparison of the nearshore wave energy distributions for nearshore nodes 3, 6 and 9 as well as the offshore distribution. Although, the closest nearshore point to the BBTCA site is node 13, wave conditions presented for node 9 are more representative of conditions near the western runway due to the predominant direction of wind and wave movement. Figure 4-6 shows that waves from the southwesterly direction are dominant near the western end of the runway. A 100 year return period southwesterly extreme significant wave is estimated to reach a height of 4.5 m with a peak period of 9 seconds in the nearshore.

4.2.2.4 Ship Generated Waves

Ship generated waves in the harbor were evaluated by Baird and Associates (2012). Vessels are limited to a speed of 5.4 knots in the Inner Harbor, and thus the wakes from vessels in the Inner Harbor are limited. The fireboat, however, is authorized to exceed this speed limit when responding to emergencies and thus potentially generates one of the largest wakes in the harbor. The fireboat is a 26 m long, all weather, 1500 horsepower, twin-screw tug. The vessel has an 8-knot hull design and is used as an icebreaker when the harbor freezes in winter months. Data collected by Baird (2012) showed that when the fireboat was travelling less than 6 knots the wake was minimal (wave height less than 0.3 m). During an emergency, when speed is a priority, the fireboat may attain speeds greater than 6 knots and wakes become more significant, however maximum waves generated by the boats were less than the maximum wind generated waves, and wind waves (as opposed to ship generated waves) should therefore govern the design of the runway extension.

Figure 4-5 Location of Nearshore Wave Climate Nodes (Shoreplan, 2007)

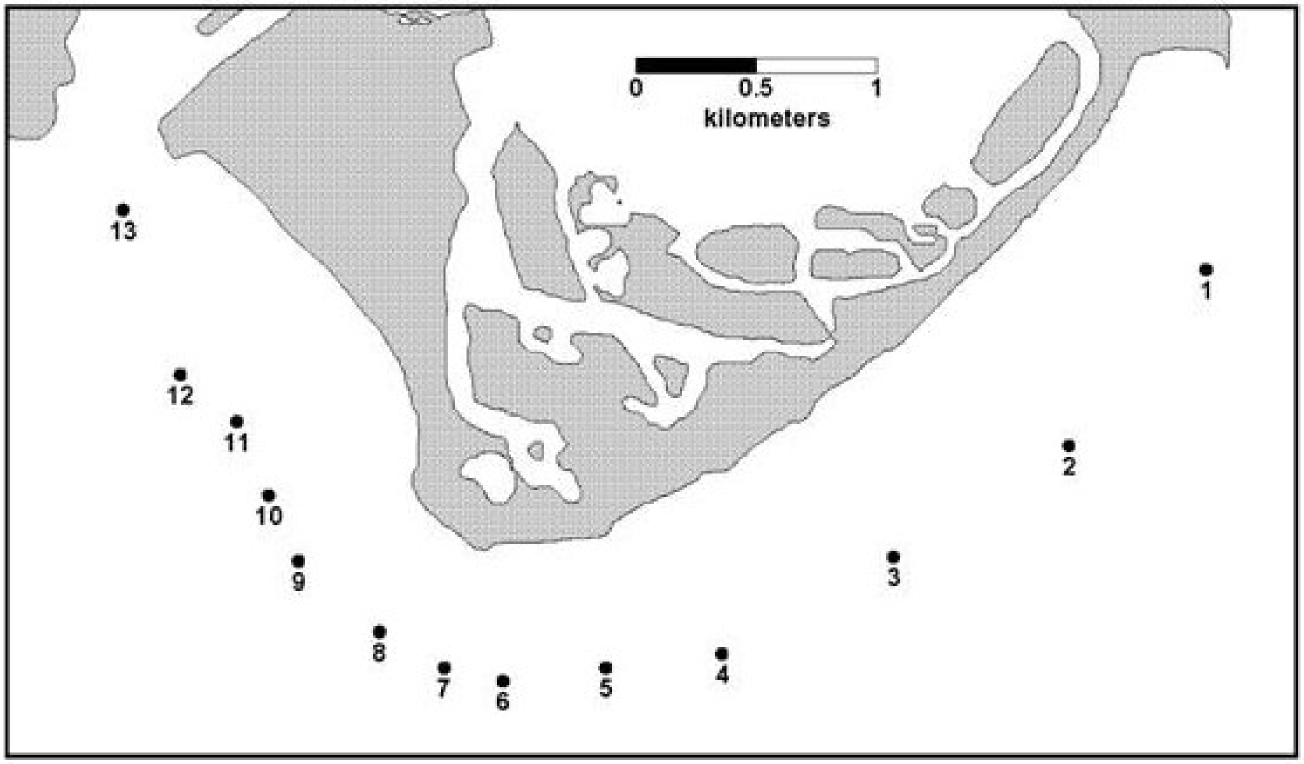
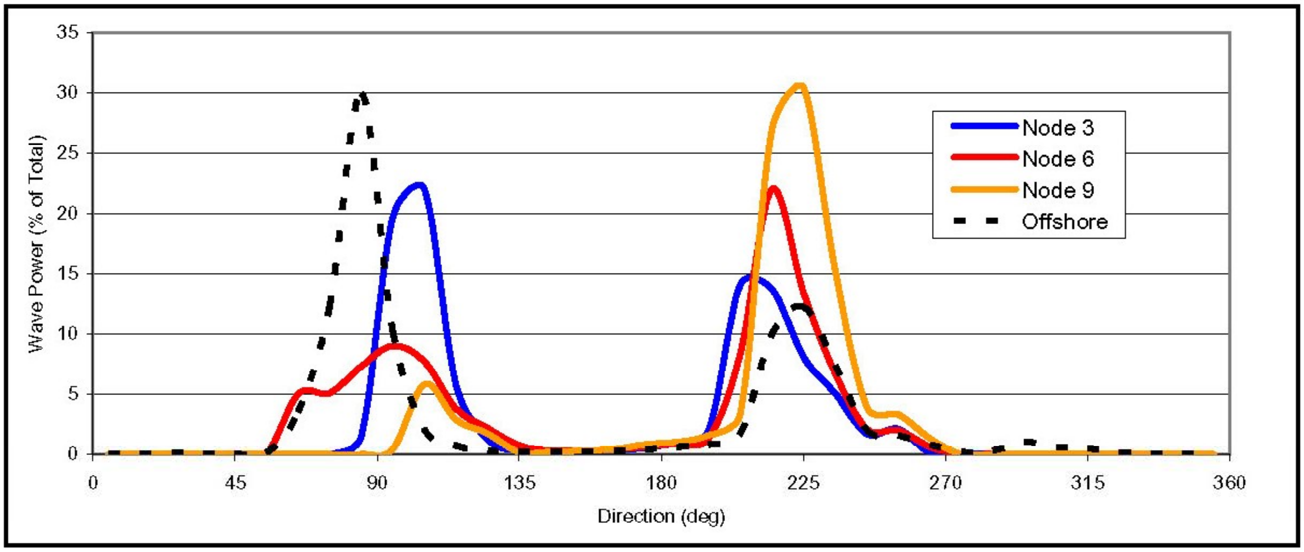


Figure 4-6 Comparison of Wave Energy Distributions



There will be minor change to the waves entering into the Western channel around the western runway due to reduction in size of wave energy window for the southwesterly waves by the expansion. It is not expected that the minor changes to wave height will increase siltation in the Western Gap. In the eastern runway extension there won't be any changes to the waves at the shoreline. However, a detail numerical wave modeling study is recommended to quantify these effects during the detail design of the project.

4.2.3 Currents

Wind generated surface currents may be estimated as about 3 percent of the wind speed (e.g., British Standards, 1984). For a typical wind speed of 3.5 m/s as shown in Figure 2.4, surface currents would be in the range of 0.1 m/s. During the 1-year return period wind speed of 14.0 m/s surface currents are estimated to be 0.4 m/s.

Changes to the currents as a result of the proposed runway extension will be minor and limited to the immediate area of the proposed extension on the western end of the runway if the extension is constructed as a deck on piles. In this case, it is anticipated that current velocities will decrease compared to the existing situation in the vicinity of the extension, as the piles will slow the speed of the water moving around them. If the extension is constructed as lakefill, it is anticipated that there won't be any changes to the current both at the western and eastern runway extension areas. Detailed hydrodynamic model of the harbor and surrounding area should be carried out to quantify the currents within the harbor and localized areas during operational and storm conditions.

4.2.4 Ice

Ice is a significant design factor for any marine construction project in Lake Ontario. Ice may impact coastal structures due to forces resulting from thermal extension, horizontal forces due to ice floes, and ice scour. Ice scour may be a consideration at this site, and must be accounted for during the detailed design of the proposed runway, should the project be approved.

Limited ice data are available for the Inner Harbor from Environment Canada's Ice Service. Previous work undertaken in a study by Baird and Associates (2012) suggests that ice thicknesses in the range of 55cm to 65cm for 30 year and 100 year return periods, respectively, may be found in the vicinity of the BBTCA. If construction occurs in the winter, ice may cause downtime and minor inconveniences. The fireboat operates as an ice breaker in the winter when required.

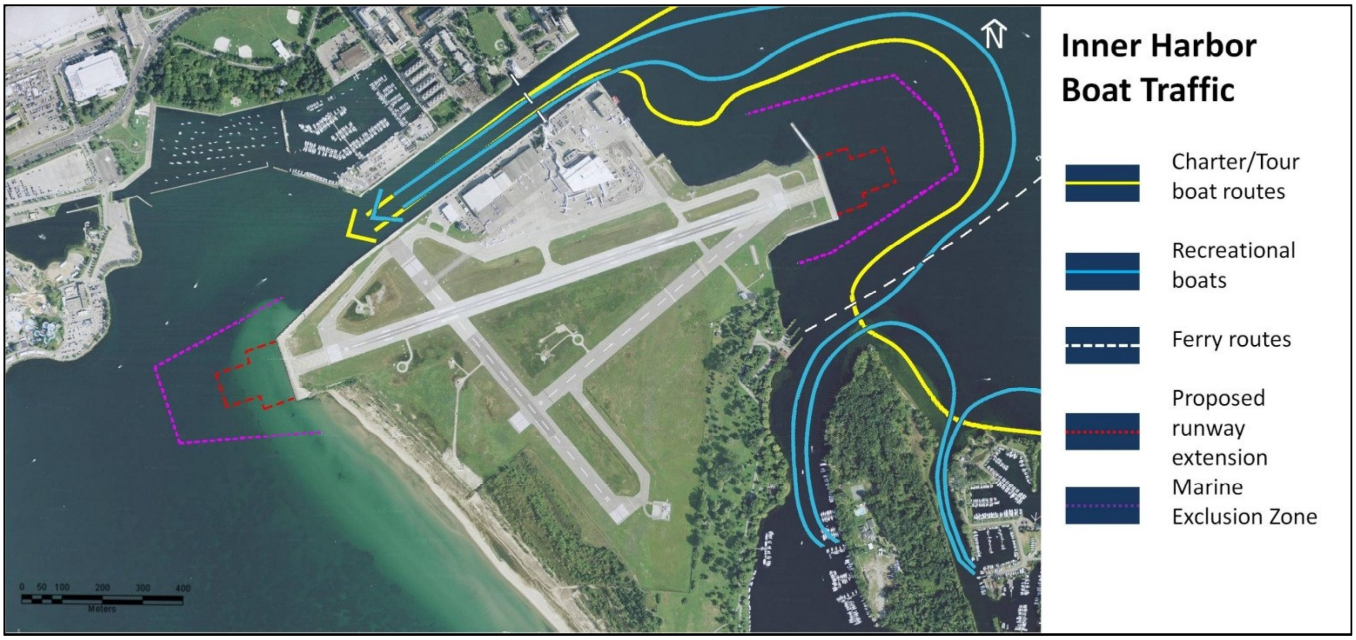
No significant changes to ice formation are anticipated in case of lakefill concept. If extension shall be decking with pile structures, ice blocks may trapped under the deck, between the piles and may impose additional forces both to the piles and to the deck slab.

5. Existing Conditions and Effects of Proposed Runway Extension on the Social/Cultural Environment

5.1 Marine Vessel Use

A 2006 marine use study of the inner and outer harbors by the Toronto Waterfront Revitalization Corporation (TWRC) – now Waterfront Toronto – mapped the routes commonly taken by commercial, recreational, sport and ferry vessels. This study found the Inner Harbor and Western Gap were heavily used by all four types of vessels (TWRC, 2006), however no marine traffic occurs in the immediate vicinity of the ends of the existing runway due to the location of buoy markers around the MEZ. The proposed extension as submitted will be accommodated entirely within the existing MEZ and does not require relocation of the MEZ buoy markers. It should be noted that City Council directed staff to exclude any consideration of either a runway or an extension of the Marine Exclusion Zone as currently configured, that would materially encroach upon the Western Gap. As the marine exclusion zone (MEZ) will not be altered as a result of the proposed BBTCA runway extension, recreational vessels, shipping routes and activities, and ferry routes will not be affected by the extension of the runway, as it is proposed within the existing MEZ[1]. Currently the Ward's Island Ferry must detour slightly around the eastern MEZ. This will remain unchanged as a result of the proposed BBTCA runway extension.

Figure 5-1 **Generalized Marine Vessel Routes in the Vicinity of the Proposed Runway Extension**
Adapted from TWRC, 2006



The impacts of the proposed runway extension to navigation and marine uses were assessed for both the construction phase and the operational phase of the runway extension. While no negative effects of the extension are anticipated after the extension is built, there may be some impacts to marine use while construction occurs. Because the BBTCA is on an island, a mix of land and marine borne equipment will be required throughout construction activities. Berthing of barges along the BBTCA's water edge perimeter for the build-up of stockpiles

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[1] It should be noted that, according to a 2013 AirBiz study, although the proposed runway layout and aerial approach will ensure the integrity of the MEZ, approval will be nonetheless required from Transport Canada for exemptions to the requirements for the aerial runway approach configuration. In addition, "for take-off operations, declared distances (e.g. TORA, TODA) should be confirmed with Transport Canada to ensure that appropriate clearances from obstacles are also provided" (Airbiz, 2013, p. 36).

should not interfere with navigation through the Western Gap, if berthed outside the Western Gap, however may result in a mild increase in congestion while travelling to berthing sites. Suitable berthing locations include the dock wall to the southeast of the Western Gap (where the second BBTCA Ferry berths), and the dock wall to the north of the Hanlan's Point Ferry docks. Barges should avoid berthing in sensitive dune environments, and within the MEZ.

5.2 Archaeological and Cultural Heritage Conditions

According to the Archaeological Master Plan for the Central Waterfront (City of Toronto, 2003), areas of the Toronto Islands have the potential for archaeological discoveries, however the ends of the runway have been constructed out of lake fill, and therefore do not feature archaeological potential. According to Dillon (2013) the TPA is not aware of any marine archaeological resources in the vicinity of the proposed runway extension in the Inner Harbor. It is anticipated that no artifacts are submerged at the western end of the runway either.

The Mississaugas of the New Credit First Nation settled a land claim in 2010 that included the lands within the study area. The land claim and agreement, known as the Toronto Purchase and Brant Tract Specific Claim Settlement Agreement and Trust Agreement, do not affect the ownership of any of the land for the proposed Project (Dillon, 2013), and do not affect the future use of the Inner Harbor.

5.3 Designated Natural and Recreational Areas

A number of cultural amenities are located in the immediate vicinity of the proposed runway extension, including Hanlan's Point Beach, the Hanlan's Point ferry docks, and the parkland in between. Although the proposed runway extension will not affect these amenities once construction is complete, construction activities may result in temporary and slight increases to noise levels, which could scare away wildlife. Adequate notice should be given to users of Hanlan's Point Beach of planned construction activities in the vicinity of the proposed western runway extension.

The Toronto Islands are used heavily by amateur and professional field naturalists and by the general public for recreational nature observation (see Kidd, n.d.). Construction activities may temporarily limit opportunities for observation of bird and other wildlife species in the vicinity of the proposed works, however if aquatic habitat features are enhanced, nature observation opportunities could improve as a result.

Recreational boaters are prohibited from entering the MEZ; however, there are multiple marinas to the south of the BBTCA on the Toronto Islands and on the mainland to the north of the Western Gap. Construction activities may have impacts on boating, as described in Section 5.1.