3. Description of the Potentially Affected Environment

This chapter is divided into four different sections which describe different components of the baseline or existing environmental conditions. The first section describes the river characteristics which will influence the development of alternatives. This information has been separated from the remaining description of the natural environment such that some emphasis can be given to those aspects of the existing environment that are driving the development of alternatives for the DMNP. The second section describes the remaining components of the natural environment: fish and fish habitat, terrestrial vegetation, and wildlife. The third section addresses components related to soils and groundwater contamination. The final section describes socio-economic components: land use, air quality and noise, archaeology, aboriginal interests, and built heritage.

3.1 River Characteristics in the Project and Impact Assessment Study Areas

The Don Watershed possesses a dendretic drainage pattern that flows southward for 38 kilometres (as the crow flies) from the Oak Ridges Moraine (ORM) to the Inner Harbour of Toronto. The Don possesses two major branches (the East and West Don), each consisting of many smaller sub-watershed systems, such as but not limited to Taylor Massey Creek, Wilket Creek, Patterson Creek and Pomona Creek. The confluence of the East and West Branches occurs approximately 6 kilometres upstream of the Impact Assessment Study Area. Downstream from the confluence, the sub-watershed is known as the Lower Don and includes all of the Don Narrows until reaching the Keating Channel.

The entire watershed area or drainage basin of the Don River is approximately 360 square kilometres (**Figure 3-1**). It is the most heavily urbanized major watershed in the TRCA jurisdiction. Although the headwaters of the Don arise from the ground water rich Oak Ridges Moraine, the majority of the river drains through the Peel Plain (**Figure 3-2**). Owing to the relatively impervious till comprising this feature discharge contributions through this zone are almost entirely from surface run-off. The river also crosses the Iroquois Beach, the former shoreline of glacial Lake Iroquois, which is dominated by sandy material that enables both recharge and discharge of groundwater through this section.

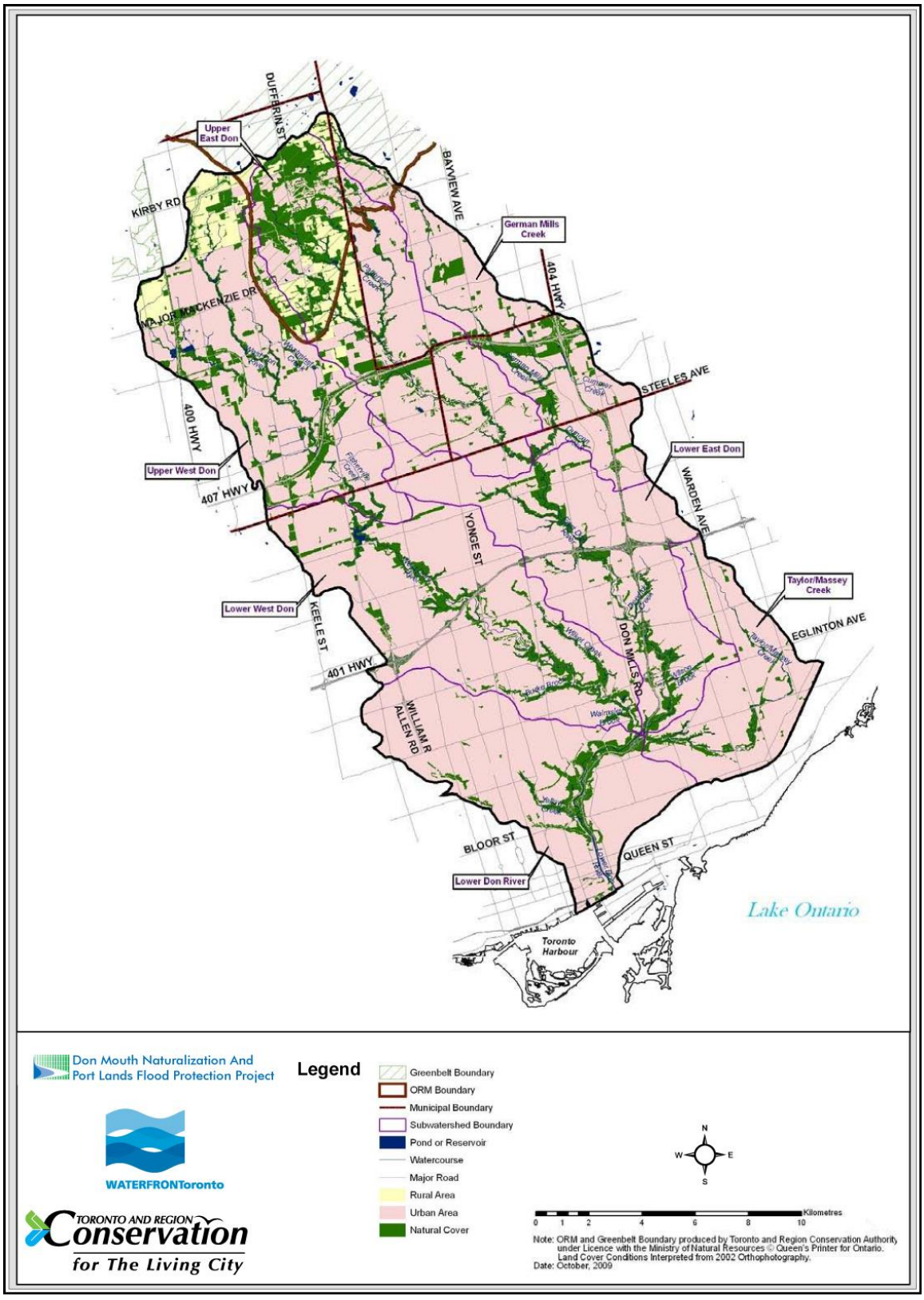

Figure 3-1 Don River Watershed

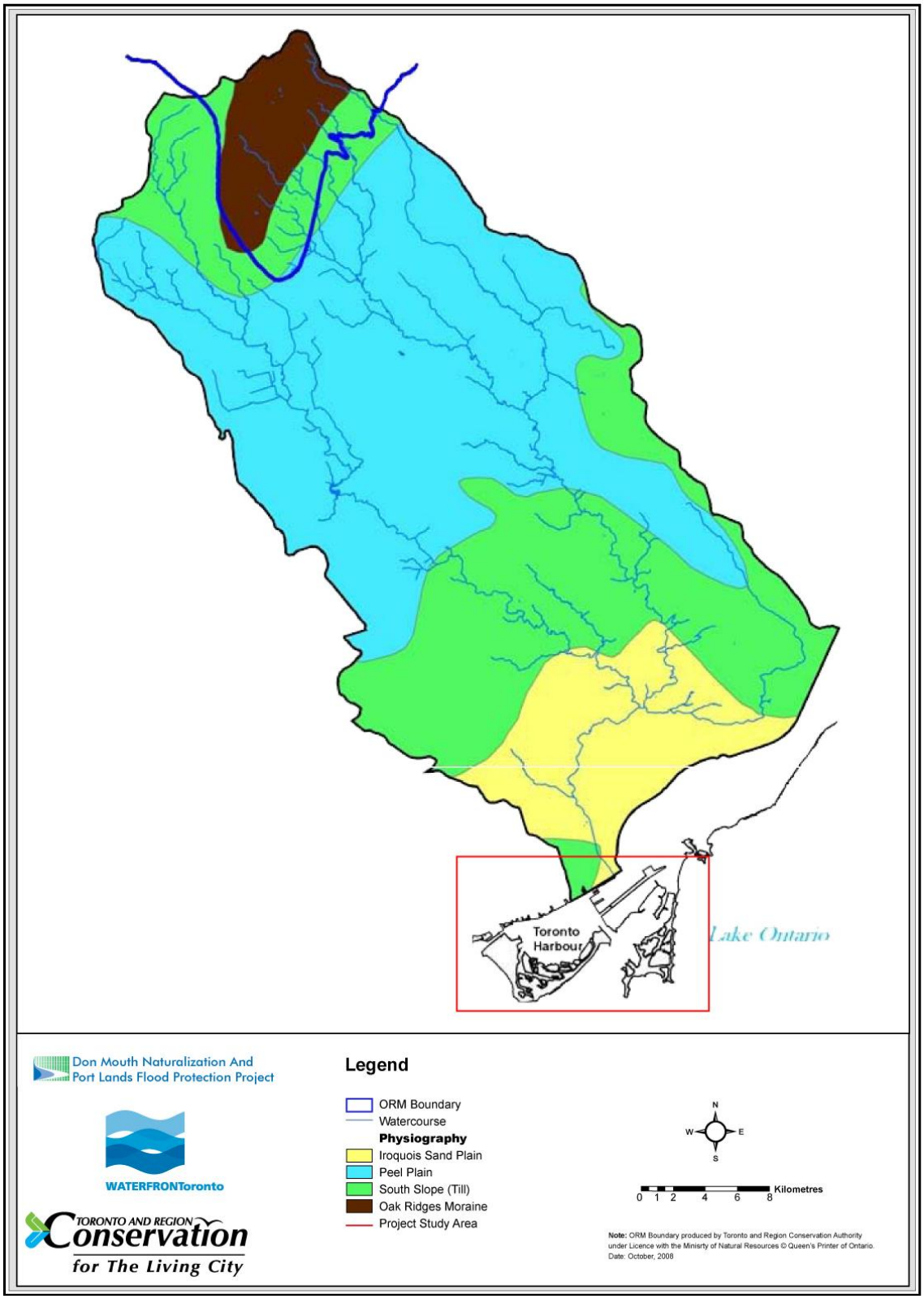

Figure 3-2 Surficial Geology of the Don River Watershed

The final 4 kilometres of the river (south of Bloor Street) lies within the Impact Assessment Study Area (**Figure 2-4**), and ends at Lake Shore Boulevard as it enters the Keating Channel, the Inner Harbour (also known as Toronto Bay), and Lake Ontario. Within the Project Study Area (**Figure 2-3**), the Don River from Riverdale Park downstream to the Keating Channel has been significantly altered as a result of adjacent land uses. Along this lower 4 kilometres section, the river is relatively straight (the channel banks largely consist of vertical steel sheet pile walls), lacks discernable grade, and has little natural connectivity to the floodplain.

The river in this lower area averages 40 metres in width and, depending upon lake levels, exhibits an approximate depth of 1 to 2 metres. South of Lake Shore Boulevard, the Don enters into the Keating Channel. The Keating Channel extends approximately 0.7 kilometres in length, varies between 37 and 60 metres in width and has depths between 2 metres and 5 metres, depending upon lake levels and the degree of sediment accumulation in the channel. During a period of approximately 5 years from the mid 1970s to early 1980s when dredging activities were halted in the Keating Channel, sediment deposition had resulted in the bed of the Keating Channel being higher than water levels in many locations during baseflow conditions.

In the context of a naturalization program for the mouth of the Don River, the form (morphology) and functions of the current river mouth differ dramatically from that of the river mouth that existed at the time of European settlement. Historic perspectives of the Lower Don River and its mouth at Lake Ontario are numerous (see **Figure 3-3**). For this reason, the following is a brief synopsis of the Lower Don Riverôs evolution over the past 200 years. It is provided here as context for where the River has been and to set direction towards its future improvement and rehabilitation.

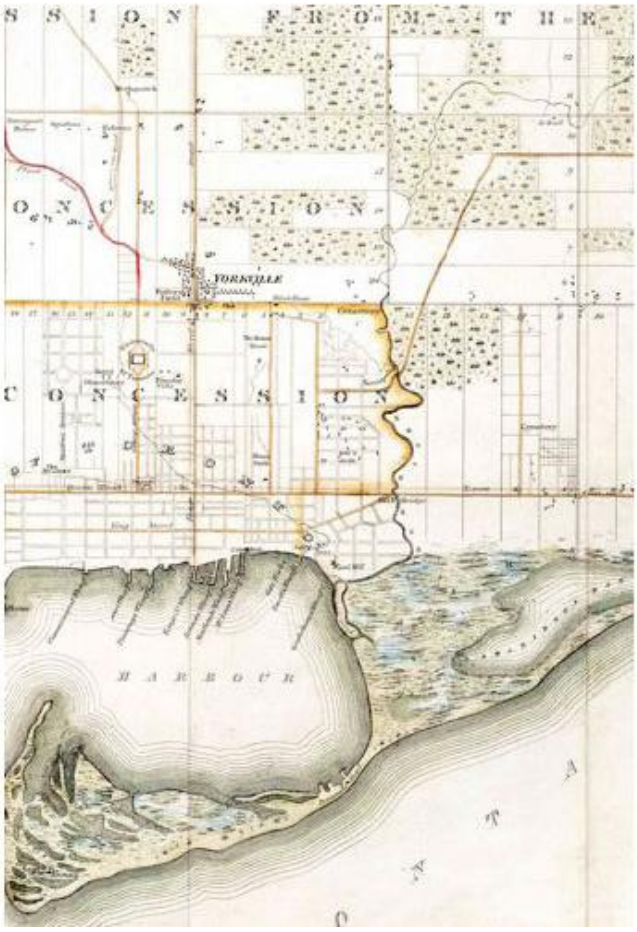

Figure 3-3 **Historical Detail from J.O. Browne and J. Ellis, *Map of the Township of York in the County of York, Upper Canada, 1851*, Toronto Public Library 912.71354 B68, courtesy of Derek Hayes (Bonnell, 2010)**

Prior to settlement and development of the City of Toronto, the lands along the lakefront were composed of forest and marsh habitats. The river was sustained by underground aquifers in its headwaters, as well as by rainfall and snowmelt that infiltrated the soils of the regionôs vast forests. Sheltered stretches of shoreline were lined with stands of emergent vegetation and much of the near shore was comprised of sand, gravel and stone (AHT, 2009). Of particular interest was the Ashbridges Bay Marsh complex. Named after the first settlers east of the Don River, Ashbridges Bay Marsh was in the late 1700s a 4 kilometres long marsh extending from present day Woodbine Avenue to the Toronto Harbour, covering an area of 560 hectares. It formed at the mouth of the Don River and was bounded to the south by a sandy peninsula that extended from the east to west and was formed from depositional materials eroded from the Scarborough Bluffs. The marshes were also bounded to the west by another sandy peninsula that extended south along the current Cherry Street alignment. The Ashbridges Bay marsh was one of the largest coastal marshes in the Great Lakes basin and offered extremely rich coastal habitat for hundreds of species of birds, mammals, reptiles and fish. Remnants of the east-west peninsula from the Scarborough Bluffs still exist today as a prominent feature of the Toronto Harbour, the Toronto Islands.

The channel and watershed of the Don River underwent profound changes, beginning around the late 1700s with extensive clearing of forest cover and grading of land contours. As settlement continued sawmills and gristmills were built along the river banks resulting in physical barriers to fish movement and migration, trapped sediments, siltation of fish spawning grounds and altered flow and water temperature regimes as a result of mill ponds. The native salmon populations that were once plentiful in this area declined rapidly, with the last recorded catch in Toronto Bay occurring in 1874 (Whillans, 1999).

Ashbridges Bay and the Lower Don River also became polluted by wastes from the growing Town of York, the Gooderham and Worts Distillery and cattle production. In addition to chemical pollutants other additions to the aquatic environment include non-native and invasive species. Since the 1800s, more than 140 exotic aquatic organisms have become established in the Great lakes (AHT, 2009). Some of these including Zebra mussels and common carp have been responsible for major alterations in aquatic communities.

Physical habitat alterations that have also occurred along the nearshore areas within the Impact Assessment Study Area include stone hooking, shoreline alteration (removal and filling) and hardening of shorelines. Stone hooking was a practice employed to remove aggregate materials from the lake bottom to support construction of buildings. This activity occurred from 1850 to 1910, during which significant changes to shoreline processes and its physical condition and loss of valuable aquatic habitat resulted (AHT 2009). Other early shoreline alterations included aquatic plant removal to improve navigation as early as the 1790s. Between 1900 and 1960, during the industrial period, extensive lake filling transformed the 560 hectares of Ashbridges Bay wetland complex.

The Ashbridges Bay Marsh, the recipient of decades of neglect between the 1880s to 1912, was largely lost by 1930 through active filling with garbage, building rubble and sediment dredge materials. Today the Lower Don Lands and former Ashbridges Bay, once home to a complex and rich wildlife community, are occupied by Torontoôs main sewage treatment plant, salt and coal storage, oil tanks, industrial buildings, shipping docks and vacant lots (Royal Commission on the Future of the Toronto Waterfront, 1992). The river mouth of today consists of a highly altered, hardened, artificial channel, sheltered from the lake, continuously dredged, and cut off from the sediments of the Scarborough Bluffs.

Fortunately, in recent decades attention has moved towards improving and rehabilitating the Toronto Waterfront and in particular the Don River mouth. These efforts are summarized in **Chapter 2** of this document. As described in this early section, the naturalization of the Don River Mouth will provide many opportunities to improve and enhance the natural and physical components of the Lower Don River environment, while other issues such as water quality (bacteria, nutrients and contaminants) are being addressed through complementary studies such as the City of Torontoôs Wet Weather Flow Management Master Plan.

The following sections describe the physical characteristics of the Lower Don and Don River Mouth for both the Impact Assessment and Project Study Areas.

3.1.1 Channel Origins

3.1.1.1 Geology of the Project and Impact Assessment Study Areas

The Georgian Bay Formation underlies the Project and Impact Assessment Study Areas. The formation consists of blue-grey shale with minor siltstone, sandstone and limestone interbeds. Upward in section, pale grey to cream, fossiliferous limestone and dolostone interbeds become more common. The Georgian Bay Formation is interpreted to represent a shallowing upward, storm-dominated shelf succession.

Outcrops of the Georgian Bay Formation are common along watercourses west of the Project and Impact Assessment Study Areas, notably the Humber River, Mimico Creek, Etobicoke Creek and the Credit River. Construction excavations in downtown Toronto commonly intersect and expose this formation. The Georgian Bay Formation is part of a Palaeozoic sequence of Late Ordovician age. The Georgian Bay Formation is underlain by the Blue Mountain Formation. This entire sequence dips (slopes) gently to the south at 5 metres per kilometre.

3.1.1.2 Soils of the Project and Impact Assessment Study Areas

The potential effects of the DMNP on soils will only occur within the Port Lands area, and thus the existing soil conditions are only relevant for this area in the context of the EA. The following discussion thus only focuses on soils within the Project Study Area.

The majority of the lands that make up the Port Lands were reclaimed during the 1800s and mid 1900s by filling Ashbridges Bay between the Don Mouth on the mainland and Fisherman's Island to the south. Reclamation reportedly proceeded with the use of hydraulically and mechanically moved harbour floor dredge spoils. Numerous different sources of fill, including dredge spoils, excavated native soils from borrow pits and construction sites, construction debris, residual stockpiled materials and so forth were used in the reclamation of the Port Lands. The composition of the fill overburden within the Port Lands may vary considerably over short distances. The use of excavated materials from urban construction sites and reported instances of municipal solid and other waste dumping in some sectors of the Port Lands indicates that non-soil inclusions including metal fragments, fireplace ash, clinker, coal, timber, brick, asphalt and concrete rubble and glass, as well as soil affected by environmental contaminants from off-site sources, may be present.

The overburden consists of layers of sand and silt and extensive areas of peat. The typical depth to bedrock within the Project Study Area ranges between 15 and 67 metres deep. The variability in the depth of layered sand and silt in the Project Study Area represents late-and post-glacial deposition of deltaic sediments on the underlying bedrock surface, which underwent differential weathering and erosion during pre-glacial time.

The land created by the reclamation scheme under the Toronto Harbour Commission (THC) Waterfront Development Eastern Section Plan in 1912 for the construction of what was then known as the Toronto Harbour Industrial District called for public and commercial wharfage and marketable land for promoting and servicing industrial development; however, heavy industrial usage commenced during the First World War and has predominated to date. The THC continued to construct and operate port facilities including the Keating Channel, extensions to the Ship Channel, quays on the East Bayfront including the Queen Elizabeth Docks and ultimately the container terminal at the Eastern Gap. The THC also continued to fill land initially for mixed purposes, but ultimately for heavy industrial/commercial uses due to the strategic requirements for industrialization during the First and Second World Wars.

A more fulsome discussion of the contaminants found in the soils and groundwater within the Project Study Area is found in **Section 3.3.**

3.1.1.3 Geomorphology of the Project and Impact Assessment Study Areas

The position and form of the mouth of the Don River have changed continuously and dramatically over the 13,000 years since the last glaciers retreated from the Toronto region. The Don River is a "drowned river mouth", which had formed as a result of changing volumes of glacial melt-waters, isostatic rebound of the landscape in response to release from the massive weight of the glaciers, and successive changes in lake levels. The current water level of Lake Ontario lies between the two extremes of the last 13,000 years: extremes that have left their mark as two parallel lines of beach bluffs.

The extent and composition of the wetland communities at the new mouths of the rivers in the Toronto region depended upon how far up the valleys the lake waters flooded. Where the Iroquois Plain was wide and the lake levels did not reach the old Iroquois shoreline, the wide, shallow river mouths allowed the formation of large fertile marshes and lagoons. Where the plain was narrow and the lake levels extended as far as the old Iroquois Shoreline, the narrow, deep river mouths allowed only the formation of small, peripheral wetlands. The historical mouth of the Don River, on Ashbridges Bay, was of the former type. The current mouth of the Don River, redirected, artificially narrowed, hardened and dredged, functions more as the latter type.

The current mouth of the Don River lies further south than the pre-disturbance river mouth, having been relocated during the construction of the Port Lands and filling along the lakeshore. The resulting very low grades in the lower Don River provides an additional complication, since even minor wind-driven (seche) or seasonal changes in lake levels can have influences hundreds of metres upstream.

The Lower Don River and Keating Channel are best characterized as lacustrine in nature, with hardened concrete channel banks. The lake effect can dominate riparian functions as far north as Gerrard Street. The current geomorphology of the mouth of the Don River differs so dramatically from the historical form of the river mouth, that the restoration of the pre-disturbance ecosystem is not possible.

3.1.2 Hydrology

The hydrology of the Don River has been dramatically affected by the highly urban nature of the watershed. Unlike less developed watersheds, the Don River watershed demonstrates a rapid response to storm events, with flows moving quickly through the river and into Lake Ontario.

A summary of the calculated flows for a range of storm events at the existing mouth of the Don River watershed is presented in **Table 3-1**. The flow values shown reflect the anticipated future land uses within the watershed.

Table 3-1 Peak Flow (m^3/s) Associated with Storm Events at the Mouth of the Don River

2-year	5-year	10-year	50-year	100-year	Regulatory Flood
164.0	240.0	295.0	430	496.0	1,694.0

The urban nature of the watershed has led to a river system with no well defined annual hydrograph (i.e., no well-defined spring freshet peak), but instead a series of peaky storm events throughout the spring, summer and fall seasons (**Figure 3- 4**).

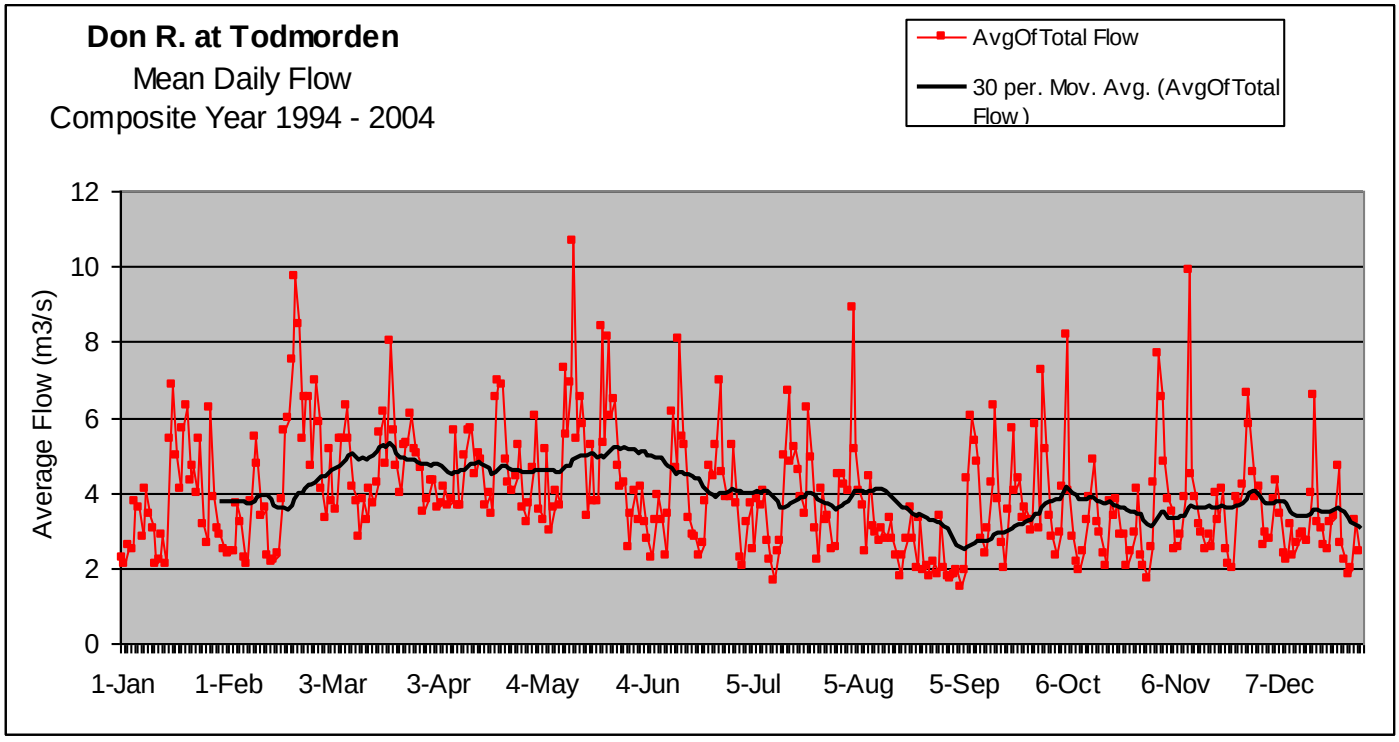

Figure 3-4 Annual Timing of Flows in the Don River at Todmorden (1994-2004)

The hydrology of the river has also been influenced greatly by industrial activity in the late 19th and early 20th centuries at the shoreline. As described in **Section 3.1.1,** the Don River lacks a defined valley feature south of Queen Street as a result of the artificial extension of the shoreline into Lake Ontario that accompanied the industrialization of the lakefront. As a result, there is little gradient at the south end of the Don River, which in turn means that water levels under normal, or low flow, conditions, are influenced more by the lake than by the river. The average water elevation of Lake Ontario at the Inner Harbour (i.e., Cherry Street) is 74.7 metres above sea level (mASL), and thus under low flow conditions the average water level of the Don River is equal to 74.7 mASL. This level can fluctuate by approximately 1 metre in either direction due to annual changes in lake levels (**Figure 3-5**).

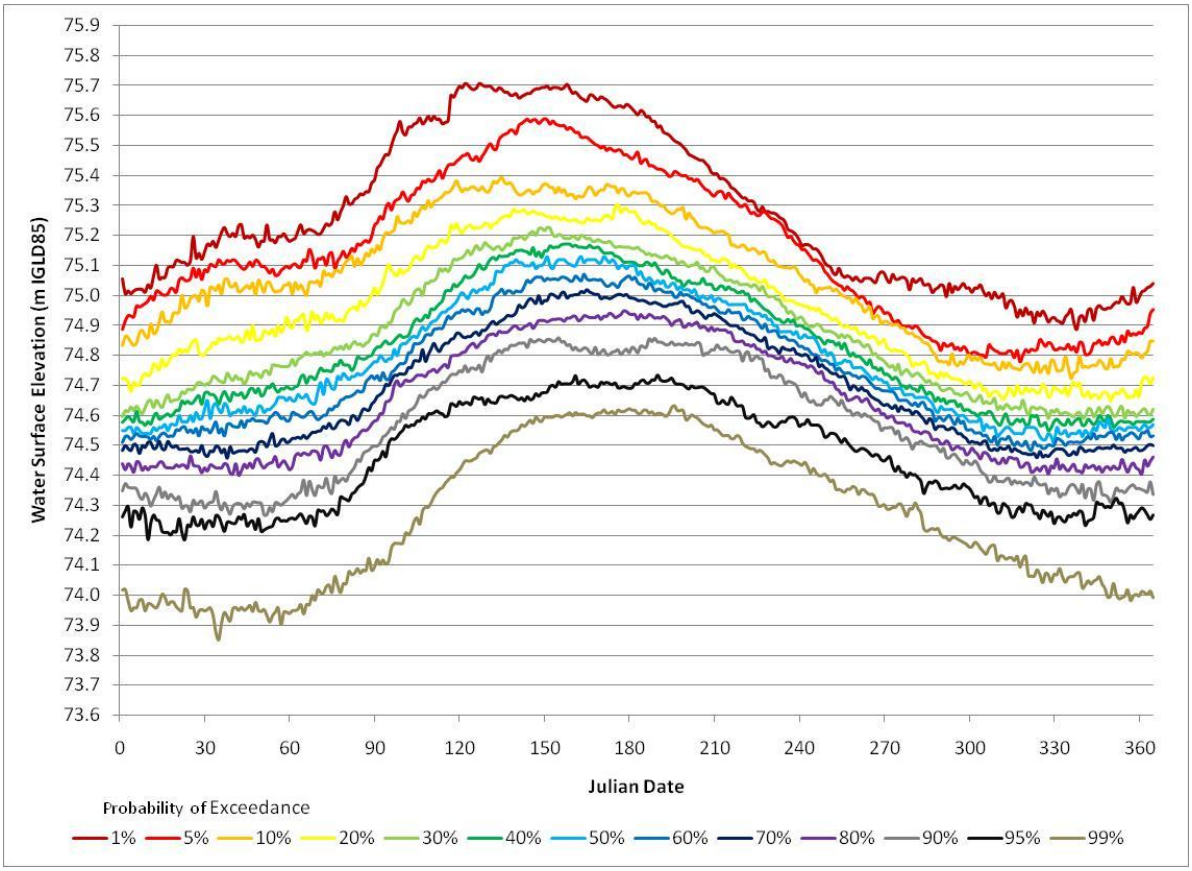

Figure 3-5 Daily Toronto Harbour Water Surface Elevation (WSE), Probability of a WSE at or Above an Elevation as a Function of Julian Date[1] (Limnotech, 2008)

Flows in the Don River have changed significantly since pre-settlement times. The watershed is now over 80% urbanized, and approximately 70% of this area was developed before stormwater management controls were a requirement of development. Discharge in the Don River increases rapidly due to precipitation resulting in turbid, sediment-laden water, erosion of the stream banks, and scouring and deposition, smothering in-stream habitat features.

3.1.3 Flooding

Flooding within the area of the Lower Don River has a written history dating back to the mid-1870s, beginning first with ice jams and late fall flooding. However with rapid development of the headwaters over the last few decades and the corresponding increase in stormwater responsiveness, floods can occur at any time during the year. As recently as August of 2005, extensive flooding occurred within the Impact Assessment and Project Study Areas resulting from a series of severe thunderstorms. The flooding that has occurred over the last few decades has resulted in mainly nuisance type flooding. However, the area would be subject to extensive flooding under a tropical storm similar to Hurricane Hazel, which occurred on October 15 and 16, 1954.

1. *In astronomy, the Julian year is a unit of time defined as 365 days long. For the purposes of Figure 3-5, Julian Day value of 0 is January 1, and Julian Day value 364 is December 31.*

The Province of Ontario currently uses the rainfall from Hurricane Hazel centered over the Don Watershed to define the limits of flooding, known as the Regulatory Flood. Upstream of Queen Street within the Project Study Area, the valley feature is narrow but is sufficiently deep to be able to contain the extremely high discharge rates estimated to be in the range of 1,700 cubic metres per second.

South of Queen Street within the Project Study Area, there is no valley, but rather a broad, wide, low-lying area comprised of lakefill, possessing no valley containment of the Regulatory Flood. Flooding within this area is further influenced by the elevated embankment of CN Rail's Kingston Subdivision, forcing floodwaters further west and restricting flows under the embankment through existing north-south road underpasses (e.g., Spill Zone 3 (**Figure 2-1**)). Water from the Regulatory Flood would spill west into the downtown core of the city, and south and eastward through the Port Lands and South Riverdale community (**Figure 2-1**).

Flood protection works are currently being implemented upstream in the Lower West Don Lands (as per the LDRW Class EA) in order to stop flood waters from spilling west through Spill Zone 3. The elevated railway crossing at the Don River has already been lengthened to accommodate the additional flood flows that would be prevented from flowing through the West Don Lands.

On the north side of the Kingston Subdivision, floodwaters would also exit east of the Don River and flow under the Eastern Avenue underpass of the Kingston Subdivision before flowing east through the South Riverdale community towards Ashbridges Bay.

South of the Kingston Subdivision, floodwaters under the Regulatory Flood continue to exceed channel capacity, spilling south of the Keating Channel and east of the Don River. These waters combine with flows originating through the Eastern Avenue underpass of the Kingston Subdivision, and merge to form Spill Zones 1 and 2 (**Figure 2-1**). Spill Zone 1 is mainly comprised of industrial and vacant lands whereas the vast majority of Spill Zone 2 is comprised of residential and commercial land uses.

Immediately north of the Kingston Subdivision, floodwater depths are calculated to be in excess of 3 metres at the peak flood depth. Given the relatively uniform topography and the widespread extent of flooding south of the Kingston Subdivision, depths are for the most part less than 1 metre, with some areas exceeding 1 metre, primarily associated with the Unilever site and along Lake Shore Boulevard East.

In addition to the influences of a highly urbanized watershed and an artificially extended shoreline, the mouth of the Don River contains a number of other human-made impediments to flood conveyance (**Figure 3-6**). The known impediments to flood flow downstream from the CN rail bridge are:

- Utility bridge;
- Gardiner Expressway piers;
- Lake Shore Boulevard road and rail crossing; and
- 90-degree bend at the top of the Keating Channel.

Figure 3-6 Impediments to Flood Conveyance