Toronto and Region Remedial Action Plan

APPENDIX C.

Degradation of Aesthetics Beneficial Use

Additional Sampling 2018 - Summary Report

February 2019

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Introduction

Toronto and Region was designated a Great Lakes Area of Concern (AOC) in 1987, under the Great Lakes Water Quality Agreement (GLWQA). AOCs are areas where water quality and ecosystem health are considered to be severely degraded as a result of local sources of pollution caused by human activities. A Remedial Action Plan (RAP) was developed for each AOC to guide restoration and protection efforts with the goal of restoring local Beneficial Use Impairments (BUIs) and ultimately having Toronto and Region removed from the list of AOCs.

Degradation of Aesthetics was one of 11 beneficial uses that were identified as impaired in the Stage 1 RAP Report *Environmental Conditions and Problem Definition* (RAP, 1989). Considerable efforts to improve the management of municipal stormwater and sewage, and increased public education have led to improved aesthetic conditions throughout the Toronto and Region AOC. An evaluation of the aesthetics BUI was performed in 2012, 2013, and 2015. In 2017, a *BUI Status Re-designation Report – Degradation of Aesthetics* was released, which summarized the monitoring results and made a recommendation for re-designation of the BUI. In 2018, additional aesthetics monitoring was performed, focusing on the highly urbanized lower Don River and Toronto waterfront. This report summarizes the results of the summer 2018 aesthetics sampling season.

Methodology

The 2018 samples were collected using the same methodologies as the 2012, 2013, and 2015 sampling, but in a more concentrated subsection of the AOC: the lower Don River and Toronto Waterfront (figure 1 & 2). The Toronto RAP Asessement Protocol method was used. Detailed methodology can be found in *Appendix B. Method to Assess Beneficial Use Impairment (BUI) Degradation of Aesthetics (Toronto)* (Mutton, 2012).

Aesthetics sampling was conducted opportunistically, taking advantage of water quality monitoring for bacterial source tracking work being undertaken under the Great Lakes Action Plan in conjunction with the Cooperative Science and Monitoring Initiative (CSMI) taking place on Lake Ontario in 2018.   From June to September 2018, samples were collected from 48 locations across the study area, yielding 436 observations for analysis.

Figure 1 Location of the 33 Toronto Harbour sampling sites for summer 2018.
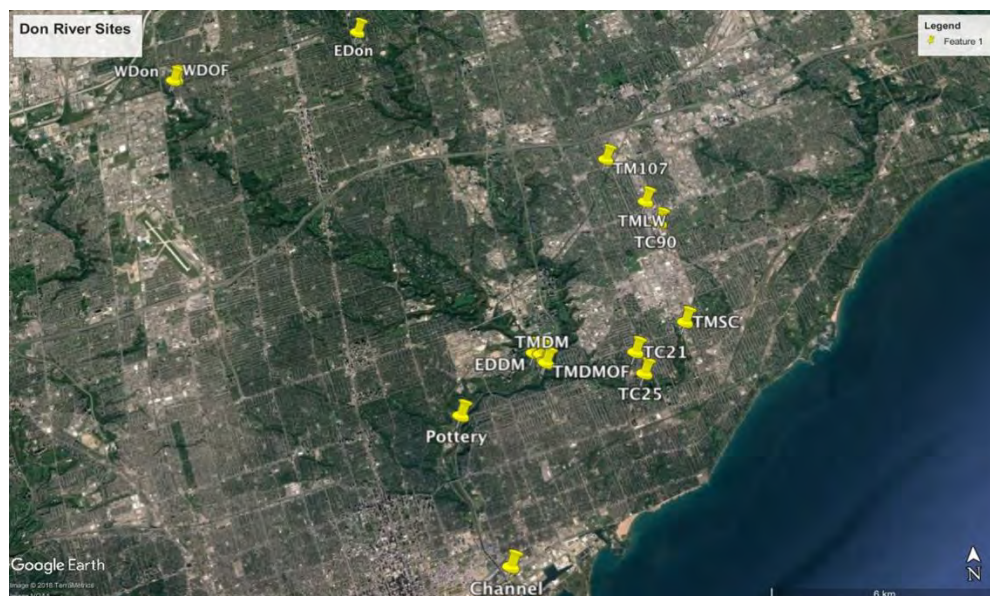
Figure 2 Location of 15 lower Don River sampling sites for summer 2018.

Environmental Endpoints

At each site observations were recorded for four endpoints: water clarity, water colour, water odour, and the presence of debris at the site. Observations were matched to a pre-defined descriptor for each category (Table 1). Aesthetic descriptors were then converted to an aesthetic score for each category (Table 1). The scores ranged from 0 (the aesthetically worst condition) to 10 (the aesthetically best condition). If more than one descriptor was present, the lowest score was recorded.

Table 1 Environmental endpoints (clarity, colour, odour, debris) with descriptors and assigned scores for determining overall aesthetic condition. Adapted from Heidtka and Tauriainen (1996).

Environmental Endpoint	Descriptor	Score
Clarity	Clear	10
	Cloudy	7
	Opaque	0
Colour	Colourless	10
	Green	7
	Yellow/Amber	6
	Brown	5
	Grey	2
	Black	0
Odour	None	10
	Musty	6
	Petroleum *(transitory)*	5
	Sewage	2
	Petroleum *(spill)*	0
	Anaerobic	0
Debris	None	10
	Natural *(unusual accumulation)*	8
	Oil film *(non-natural)*	3
	Trash *(large amount)*	2
	Foam *(non-natural)*	2
	Sewage	0

Aesthetic Quality Index

An index value for aesthetic condition – referred to here as Aesthetic Quality Index (AQI) and originally developed by Heidtke and Taurianinen (1996) – was calculated using the scores from the clarity, colour, odour, and debris observations at a given time and location. The AQI for the Toronto and Region AOC aesthetics monitoring program was calculated by giving an equal weighting to each of the four environmental endpoints, as follows:

$$AQI = \frac{colour\ score + clarity\ score + odour\ score + debris\ score}{4}$$

AQI values were converted to an aesthetic condition of poor, fair, good, or excellent (Table 3) according to Heidtke and Taurianinen (1996). If a sample was assigned the lowest score for any of the four endpoints it could not attain an AQI value above 8. An AQI score of 9 or greater was considered representative of excellent aesthetic condition, while samples with an AQI score below 6 were assessed as poor and considered to have unacceptable aesthetic condition.

Table 2 Aesthetics Quality Index (AQI) values and corresponding aesthetic condition based on methodology developed by Heidtka and Tauriainen (1996).

AQI Range	Aesthetic Condition
AQI ≥ 9	Excellent
8 ≤ AQI < 9	Good
6 ≤ AQI < 8	Fair
AQI < 6	Poor

Results

Environmental Endpoints

The majority of the 436 water samples collected were odourless (70%) and had no debris (63%) present during sampling (Table 3). Clarity was generally clear (47%) or cloudy (46%). Colour fell mainly into clear (48%) or green (28%) categories.

Table 3 Aesthetic qualities of samples collected by general location for 2018 sampling season.

Environmental Endpoint		Don	Waterfront	Total
Clarity	Clear	105 (54%)	98 (41%)	203 (47%)
	Cloudy	67 (34%)	133 (55%)	200 (46%)
	Opaque	24 (12%)	9 (4%)	33 (8%)
Colour	Clear	98 (50%)	112 (47%)	210 (48%)
	Green	13 (7%)	109 (45%)	122 (28%)
	Yellow/Amber	11 (6%)	6 (3%)	17 (4%)
	Brown	51 (26%)	9 (4%)	60 (14%)
	Grey	21 (11%)	3 (1%)	24 (6%)
	Black	2 (1%)	1 (<1%)	3 (1%)

Odour	None	116 (59%)	191 (80%)	307 (70%)
	Musty	44 (22%)	39 (16%)	83 (19%)
	Petroleum (transitory)	0	9 (4%)	9 (2%)
	Sewage	36 (18%)	1 (<1%)	37 (8%)
	Petroleum (spill)	0	0	0
	Anaerobic	0	0	0
Debris	None	107 (55%)	166 (69%)	273 (63%)
	Natural	53 (27%)	53 (22%)	106 (24%)
	Oil Film (unnatural)	3 (2%)	0	3 (1%)
	Trash (lrg amount)	3 (2%)	6 (3%)	9 (2%)
	Foam (unnatural)	2 (1%)	1 (<1%)	3 (1%)
	Foam/Trash (Unspecified)	27 (14%)	13 (5%)	40 (9%)
	Sewage	1 (1%)	1 (<1%)	2 (<1%)

Aesthetic Condition

Acceptable aesthetic conditions (i.e., Excellent, Good, or Fair) were reported for the majority of observations (89% of samples) (Figure 4). Poor aesthetic conditions were recorded for 11% of samples (15% of lower Don samples and 8% of waterfront samples).
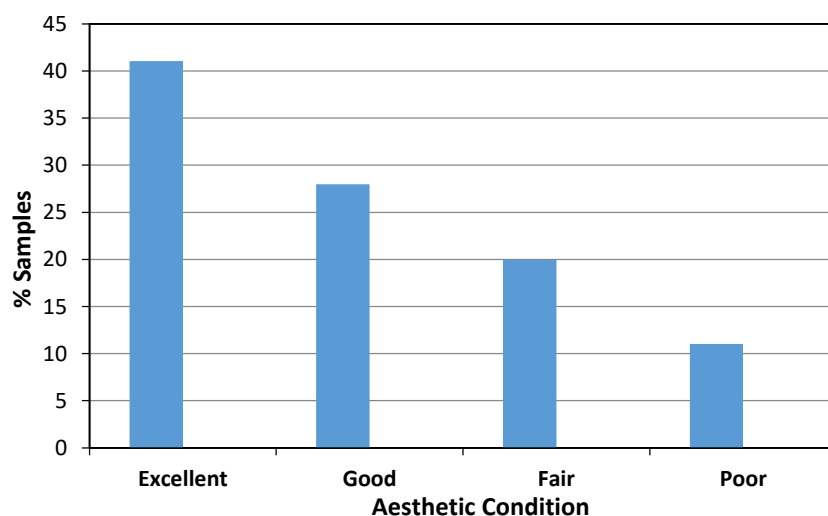

Figure 3 Percentage of samples assessed as having Excellent, Good, Fair, or Poor Aesthetic Condition in study areas during the sampling period (summer 2018)

Poor Aesthetic Condition

A total of 48 of 436 samples (11% of observation) were assessed as having poor aesthetic condition. At the majority of the locations where poor samples were recorded, observations were also made of excellent or good conditions on other occasions. Of the15 locations in the Don River, poor samples were recorded at nine locations. Of these locations, poor samples were observed more than 25% of the time at 2 locations: Channel and TC21 (table 4). Along the waterfront, poor samples were observed at 7 of 33 sampling locations. Poor AQI scores were found more than 50% of the time at 3 of the 33 total monitoring sites: Jarvis, QQT (Queens Quay Terminal) and Turn (table 5). Of these, QQT was only sampled twice and Turn was only sampled once.

Table 4 Aesthetic Quality Index and total poor samples (%) by monitoring site for the lower Don River (summer 2018).

Monitoring Site	1 - Excellent	2 - Good	3 - Fair	4 - Poor	Grand Total	% poor
Lower Don (totals)	66	45	55	30	196	15%
Channel		1	1	9	11	82%
TC21				9	9	100%
Pottery		5	4	2	11	18%
WDOF	2	1	6	3	12	25%
TC25		6	4	1	11	9%
TMDMOF		4	4	1	9	11%
E Don		1	8	3	12	25%
W Don	5	3	4	1	13	8%
TC90	4	3	2	1	10	10%
TMLW	11	4	8		23	0%
EDDM	3	5	2		10	0%
TMSC	8	2	6		16	0%
TM107	13	3	5		21	0%
TMDM	15	4	1		20	0%
WDDM	5	3			8	0%

Table 5. Aesthetic Quality Index and total poor samples (%) by monitoring site for the Toronto Waterfront (summer 2018).

Monitoring Site	1 - Excellent	2 - Good	3 - Fair	4 - Poor	Grand Total	% poor
Waterfront (total)	113	77	32	18	240	8%
B-CSO		3	1	4	8	50%
Turn				1	1	100%
Don Cherry	1		4	4	9	44%
Jarvis	1		2	4	7	57%
QQT				2	2	100%
Yonge		4	3	2	9	22%
Ferry	4	3		1	8	13%
Don QE	1	2	5		8	0%
WARD	6	1	2		9	0%
Sugar	2	3	3		8	0%
Ferry Off	2	4	2		8	0%
MT35	6	4	1		11	0%
Ship	7	1	1		9	0%
OutCherry	7		1		8	0%
OuterSail	6		1		7	0%
OutPl	5		1		6	0%
Bath	4	5	1		10	0%
GULL	1	6	2		9	0%
Cherry Beach	7	3	1		11	0%
Rebel	3	3	1		7	0%
GAP E	7	2			9	0%
Rees Mid	4	5			9	0%
GAP-W	3	6			9	0%
Ferry Isl	4	5			9	0%
Ferry Mid	4	5			9	0%
Police	5	3			8	0%
Rees Isl	7	3			10	0%
Rees off	6	4			10	0%
REF	7	1			8	0%
Rees		1			1	0%
Out Cherry	1				1	0%
Outer Pl	1				1	0%
Outer Sail	1				1	0%

Discussion

The addition of the aesthetics data from 2018 to the results from the 2012, 2013, and 2015 sampling seasons provides a more robust pool for data analysis. In all sample seasons, the majority of sites were assessed as having good or excellent aesthetic condition (table 6). In 2018, targeted sampling of the highly urbanized lower Don River and Toronto Harbour yielded a higher percentage of poor AQI scores. Poor AQI scores were reported at 5 of 48 sites sampled more than 50% of the time, although in some cases, only limited samples were collected such as at QQT and Turn.

Table 6 Total number (percentage) of samples assessed as having Excellent, Good, Fair, or Poor Aesthetic Condition in the RAP and Non-RAP watersheds during 2012, 2013, 2015 and 2018.

		Excellent	Good	Fair	Poor	Total
RAP	2012	498 (80%)	73 (12%)	37 (6%)	18 (3%)	626
	2013*	701 (95%)	13 (2%)	27 (4%)	1 (<1%)	742
	2015	271 (91%)	16 (5%)	11 (4%)	1 (<1%)	299
	2018**	179 (41%)	122 (28%)	87 (20%)	48 (11%)	436
Non-RAP	2012	206 (94%)	10 (5%)	4 (2%)	0	220
	2013	166 (97%)	1 (<1%)	5 (3%)	0	172
	2015	109 (92%)	6 (5%)	2 (2%)	1 (<1%)	118

*In 2013, no aesthetics samples were collected from waterfront sites in the RAP or Non-RAP areas.
** In 2018, samples were exclusively collected from lower Don river and waterfront sites.

Conclusion

Assessment of the Degradation of Aesthetics BUI

Overall, the additional aesthetic monitoring in 2018 demonstrated that even within the most highly urbanized regions of the AOC, the majority of samples (89%) were of acceptable aesthetic condition (excellent, good or fair).

Observations recorded during aesthetics sampling conducted in 2012, 2013, and 2015 found that waters of the Toronto and Region AOC were free of substances which produced persistent, objectionable deposits, unnatural colour or turbidity, or unnatural odour. The additional data corroborated this finding. It is therefore recommended that the Degradation of Aesthetics beneficial use be considered not impaired for the Toronto and Region AOC.