TORONTO

STAFF REPORT
INFORMATION ONLY

Recreational Water Quality at Bluffer's Park Beach

Date:	November 20, 2007
To:	Board of Health
From:	Medical Officer of Health
Wards:	**Ward 36 – Scarborough Southwest**
Reference Number:	

SUMMARY

The purpose of this report is to provide information on recreational water quality improvements at Bluffer's Park Beach and the measures taken in achieving these improvements.

Financial Impact

This report has no financial impact.

DECISION HISTORY

At its June 19, 2007 meeting, the Board of Health requested the Medical Officer of Health (MOH) to report on the proposed plan for improving water quality at Bluffer's Park Beach.

ISSUE BACKGROUND

The City of Toronto has supervised beaches that are monitored for microbiological water quality by the Medical Officer of Health. This is done in accordance with the Ministry of Health and Long-Term Care (MOHLTC) Beach Management Protocol. The purpose of the monitoring program is to identify beach water quality that poses an elevated risk of infection to bathers due to higher concentrations of pathogenic micro-organisms in the water and to warn bathers against swimming in such contaminated waters.

In accordance with the Beach Management Protocol, the MOH posts a "beach unsafe for swimming" sign, if the geometric mean of the sample collected over a two day period exceeds the Provincial Water Quality Objective of 100 *E.coli* per 100mL of water. *E.coli* in this context is an indicator of the probability of finding pathogenic micro-organisms in the water. As the concentration of *E.coli* bacteria in water increases, the probability of

encountering disease-causing microbes increases and therefore there is a greater risk of infection.

Ontario's standard of 100 *E.coli* per 100mL of water is amongst the most stringent in North America if not the world. For example, the federal standard is 200 *E.coli* per 100 mL of water, and the US – EPA and WHO standards are 126 and 1000 *E.coli* per 100 mL of water respectively. In Europe, the standard is equivalent to 1000 *E.coli* per 100mL of water.

Bluffer's Park is a 473 acre public park with a supervised beach front located at Brimley Road South on the shores of Lake Ontario. The beach faces south with a gradually descending grade composed of fine sand and gravel, and the backdrop of the Scarborough Bluffs is composed of fine clay-like material that is constantly eroding into the lake. A large marsh and forested area is located behind the beach and extends part way up the Bluffs.

In the early 1980s, the Health Department of the former City of Scarborough frequently posted Bluffer's Park Beach as unsafe for swimming due to elevated bacteria levels. After amalgamation extensive water quality monitoring continued.

COMMENTS

Currently each summer from early June to Labour Day, Toronto Water staff collect water samples daily, at five locations from the beach area (consistent with the Ministry of Health and Long-Term Care's Beach Management Protocol). The samples are analyzed by the MOHLTC laboratory and on weekends by the Toronto Water Laboratories.

Bluffer's Park Beach had a poor record for beach postings a detailed site assessment was undertaken in 2005 to identify and quantify the relative contributions of *E. coli* from local direct and diffuse sources.

Additionally in 2004, a microbial source tracking (MST) study was initiated by Toronto Water, in collaboration with Environment Canada's National Water Research Institute (NWRI) to identify principle sources of bacterial contamination at beaches without direct pollution sources, which continue to be posted at high frequencies. In 2005 Bluffer's Park Beach was studied. The study used DNA fingerprinting and antibiotic resistance arrays (ARA) to identify and quantify *E. coli* sources.

Potential Sources of E. coli at Bluffer's Park Beach:

Sanitary Sewer Infrastructure

During heavy rainfall events, storm water can combine with sanitary sewage in older areas of the city which are still serviced by combined sewers. This combined sewer flow can overload the system and cause direct sewage discharge to the lake. It is important to note that these types of structures are not located in the vicinity of Bluffer's Park Beach.

Occasional failures in sewer system infrastructure can lead to the accidental direct discharge of sewage overland to local water bodies or by groundwater transport. However, extensive dye-testing and smoke testing of the infrastructure surrounding the beach showed no sign of failure.

Gull and Waterfowl Feces

During rain events, *E. coli* found in both domestic and wild animal feces can be washed into surrounding water bodies causing contamination. Bluffer's Park Beach is a popular area for dog owners and has a very high resident population of waterfowl. As many as 542 gull droppings and 417 Canada geese droppings have been counted in wet foreshore sand and on occasion, over 500 gulls and over 150 Canada geese were counted on the beach (*Environment Canada, 2007*). These bird droppings have led to elevated levels of *E. coli* in beach waters. This type of direct contribution of *E.coli* has been observed at other beaches around Toronto and The Great Lakes Basin.

Confirming these observations, the preliminary MST results indicate that feces from gulls and waterfowl are a significant source and that *E. coli* levels found in the beach water samples are not associated with a human or municipal wastewater source (*T. Edge, Environment Canada Water Science and Technology Directorate, personal communication, 2006*). The 2004-2005 Environment Canada study also pointed to waterfowl as the major source of *E. coli* contamination found in sand at Bluffer's Park Beach.

Beach Sand and Groundwater E. coli

Recent studies have indicated that *E. coli* can reside in sand adjacent to the shoreline and the groundwater below the beach (*Alm, E.W., J. et al. 2003*). Further, a scoping level investigation of beach sand close to the water's edge also showed elevated *E. coli* levels in the sediments, sometimes over 10,000 CFU/gram of dry sand. This suggests that the beach sand is serving as a reservoir of *E. coli* that is re-suspended in beach waters under certain wave conditions. Sediment and sand accumulations of E. coli have become an intensive area of research across the Great Lakes.

Over 63 boreholes were dug in a grid pattern to determine if *E.coli* contaminated groundwater was moving toward the beach. The study indicated no evidence of *E. coli* contaminated groundwater moving toward the beach (*Environment Canada, 2007*).

Intermittent Stream Drainage

During the detailed site assessment of 2005, it was noted that a small stream draining the marsh land north of the beach intermittently carries *E. coli* laden sediment to the water's edge and that during rain events, the nearby parking area also contributes a diffuse source of *E. coli* bacteria from the washing of feces from gulls and waterfowl. Analyses of this intermittent runoff showed high levels of *E. coli*, although quantifying the significance when one considers the diluting effect of lake water was difficult. Also significant is that *E. coli* levels found in the small stream water samples are not associated with a human or municipal wastewater source (*T. Edge, personal communication, 2006*). Further MST studies are underway to determine the source of this *E. coli.*

Decaying Algae
Lake Ontario water clarity and nutrient values have proven a hospitable environment for the growth of algae. Two species which wash up onto Bluffer's Park Beach and collect in the near shore area are Cladophora and Spirogyra. As the algae decays, it provides food and nutrients for the growth of bacteria such as *E coli.* Constant wave action washes over the decaying algae moving the associated *E. coli* into the near shore water.

Other potential sources of *E. coli* away from the beach area were insignificant relative to the contributions of bird droppings, beach sand, intermittent stream drainage and decaying algae.

Remediation Efforts Bluffer's Park Beach:

Gull and Waterfowl Deterrent
Microbial source tracking work undertaken at Bluffer's Park Beach indicated that bird feces are a significant source of pollution at this beach. Large numbers of gulls and geese colonize the active beach area and the park area to the west (near the parking lot where they are regularly fed food scraps by visitors to the park). The implementation of an integrated waterbird and waterfowl management program was undertaken for the 2006 beach season and enhanced in 2007. The process included the following measures:

- Parks, Forestry and Recreation staff employ trained dogs to spur geese into flight.
- Utilizing the existing Canadian Wildlife Service sponsored waterfowl transfer and egg oiling program.
- A focused public education and communication campaign advising park users against feeding of birds. By –law enforcement used if required.
- Enhanced beach grooming to remove decaying food and vegetable matter which serves as food sources for birds.
- Other methods of bird control are under study.

Beach Grooming
The 2004-2005 Environment Canada study suggests that the beach sand is serving as reservoir of *E. coli* that is re-suspended in beach waters under certain wave conditions. To reduce the ability of the sand to act as a hospitable host to the bacteria, Parks, Forestry & Recreation implemented an improved park maintenance program during summer 2006. This included enhanced beach grooming programs which involves tilling the top layer of sand, thus exposing the residual *E. coli* to UV light which is known to have a lethal effect on the bacteria.

In addition, the algae collecting at water's edge is removed.

Intermittent Stream Drainage and Parking Lot Run Off Controls
Consultation with Toronto and Region Conservation Authority has resulted in a plan to redirect the stream draining the marsh away from the immediate beach area. A later phase will capture the parking lot run off. Work has begun in the fall of 2007.

CONCLUSION

The implementation of an integrated waterbird and waterfowl management program, intermittent stream drainage, parking lot run-off controls and beach grooming are resulting in improved beach water quality. Beach postings have been reduced as illustrated in Table 1:

Table 1

Bluffer's Park Beach Postings 1999 - 2007								
1999	2000	2001	2002	2003	2004	2005	2006	2007
96%	82%	91%	43%	84%	88%	95%	41%	26%

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SIGNATURE

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Alm, E.W., J. Burke and A. Spain. 2003. Fecal indicator bacteria are abundant in wet sand at freshwater beaches. Water Res. 37: 3978-3982

T. Edge, A. Crowe, S. Hill, P. Seto and J. Marsalek. 2007. Surveillance for Potential Sources of E. coli at Toronto's bluffer's Park Beach 2005-2006. Environment Canada Water Science and Technology Directorate.