

TORONTO STAFF REPORT

May 16, 2002

To: Works Committee

From: Barry Gutteridge, Commissioner, Works and Emergency Services

Subject: Water Quality at Western Beaches, Eastern Beaches, and Ashbridges Bay
Wards 13, 14, 19 and 32

Purpose:

To provide information on water quality at selected waterfront beaches and Ashbridges Bay.

Financial Implications and Impact Statement:

There are no financial implications resulting from this report.

Recommendations:

It is recommended that this report be received for information.

Background:

At its meeting of February 13, 14 and 15, 2002, Toronto City Council, approved the recommendations contained in Clause No. 28 of Report No. 3 of the Works Committee from its meeting of January 15, 22 and 25, 2002, including a request that the Commissioner of Works and Emergency Services submit a report to the Committee at its meeting scheduled to be held on May 28, 2002 including a systematic analysis of the efficacy of retention tanks and the correlation with the number of days that beach postings have been reduced as a result of this investment.

Discussion:

In the early 1980s, waterfront beaches were frequently posted by the Medical Officer of Health as unsafe for swimming, due to elevated bacteria levels. This resulted in extensive water quality monitoring, to determine the main factors responsible for impaired water quality. Early investigations suggested that faeces from waterfowl were a significant source of the contamination along with stormwater discharges from the separated stormwater systems and

combined sewer overflows (CSO). Subsequent investigations determined that CSO and storm sewer outfalls which discharge directly to the nearshore area were the primary cause of degraded water quality at area beaches. In addition, other sources such as streams and rivers, dry weather discharges from sewers, accumulations in sediments, and washoff of feces from domestic animals and wildlife have varying degrees of importance, depending on site specific conditions.

To address the problem, two underground storage tanks have been constructed to mitigate beach postings at the Eastern Beaches and an underground facility is nearing completion at the Western Beaches. In addition, a number of stormwater quality improvement ponds and infiltration systems have been constructed and an aggressive Downspout Disconnection Program continues to be implemented.

Water quality monitoring has continued through the implementation of these control measures. Beach monitoring is carried out at designated waterfront beaches, during the summer swimming season (generally from June 1 to Labour Day). In a given year, sampling frequency during the summer months has varied from 4 to 7 days per week by Works and Emergency Services staff. However, samples are now being collected 7 days a week. The samples are analyzed by the Ontario Ministry of Health and the data is provided to the Medical Officer of Health. Beaches are posted advising against swimming when E. Coli levels exceed 100 counts/100 millilitres.

Although not a designated beach area, the Works and Emergency Services Department has undertaken sampling within Ashbridges Bay, over the last number of years in response to concerns raised about water quality conditions within this area.

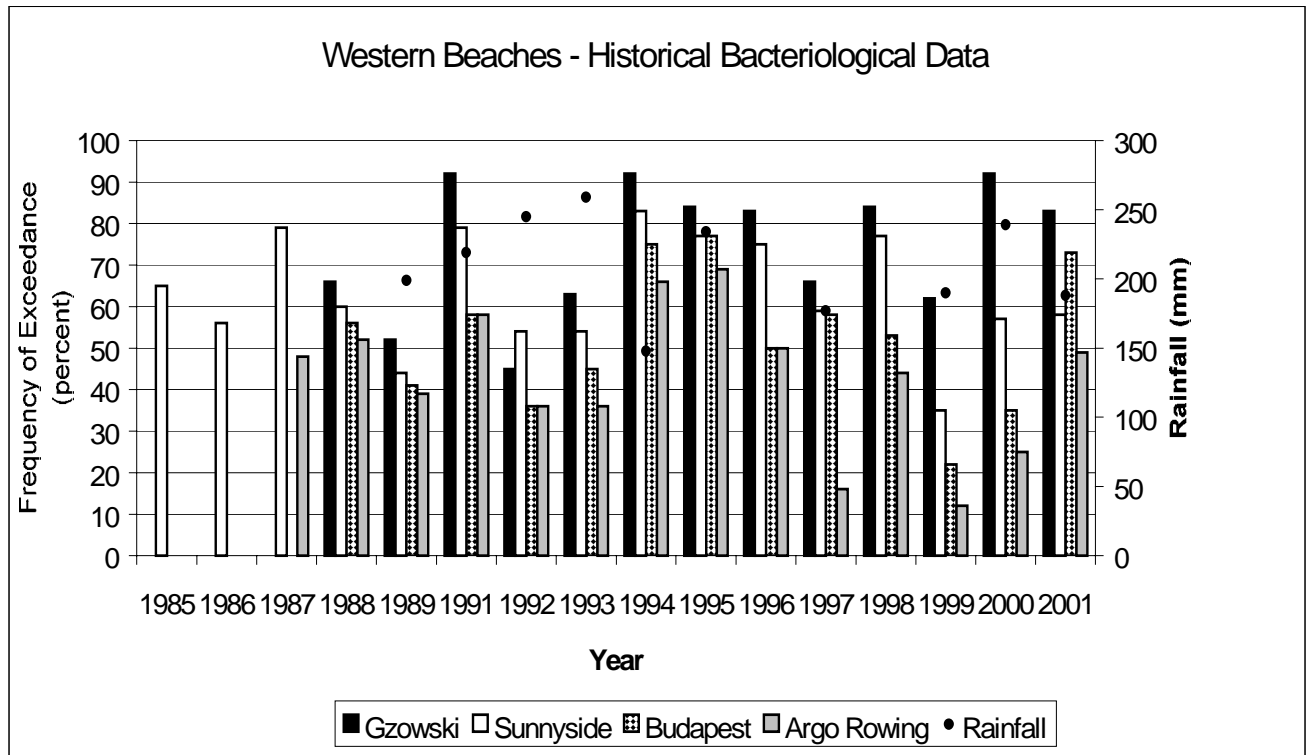
Bacteriological data collected for the Western Beaches, Eastern Beaches, and Ashbridges Bay is presented in Figures 1, 2, and 3, respectively, and discussed in detail in succeeding report sections. Figures 1 and 2 show the 'frequency of exceedance' of (the percentage of samples exceeding) the Provincial Water Quality Objective for E. Coli bacteria in body contact recreation areas, for samples collected since the mid 1980s. Figure 3 shows the measured E. Coli densities (number of E. Coli per 100 mL) for samples collected in Ashbridges Bay in 2001.

Western Beaches

Construction of the Western Beaches Storage Tunnel facility was initiated in 1998, and is expected to be operational this summer. It will mitigate direct discharges to the Western Beaches from eight combined sewer overflow outfalls and two storm sewer outfalls located between Parkside Drive and Strachan Avenue. The tunnel is designed to capture flows from all discharges and will overflow for the two largest rainfall events during a typical summer season, when it's design capacity is exceeded, consistent with the Ontario Ministry of Environment and Energy requirements for the control of combined sewer overflow discharges.

The data collected at each beach is summarized separately in Figure 1 from the west (nearest to the Humber River) to the east: Gzowski Beach, Sunnyside Beach, Budapest Beach, and Argo Rowing Club (which is located most easterly and near the CNE grounds). The frequency of exceedance has remained elevated throughout the monitoring period, consistently within the 60 to 90% range. As expected, the higher frequencies of exceedances are observed for those beaches closest to the mouth of the Humber River.

Figure 1 Western Beaches Historical Data – Percentage of Samples Exceeding the Provincial Objective for E. Coli Bacteria



Computer simulation results undertaken to support the Class Environmental Assessment Study for the Western Beaches Tunnel project indicated that the frequency of beach postings should decline from the present range of up to 90%, to about 30% across all Western Beaches. The most significant improvements are expected in those areas further from the Humber River, while less improvement is expected for those beaches closest to the Humber River (Gzowski and Sunnyside). Additional restoration of beach water will occur when further improvements are made to water quality conditions within the Humber River, expected as part of the implementation of the Wet Weather Flow Management Master Plan Recommendations.

Eastern Beaches

Stormwater/Combined Sewer Overflow Control Measures Implemented

Two underground detention tanks were constructed at the Eastern Beaches in the early 1990's, at the foot of Kenilworth Avenue and Maclean Avenue, respectively, to address beach water quality impairment.

The Kenilworth Avenue Tank was operational in July 1990, intercepting flows from one combined sewer overflow outfall and four storm sewers between Woodbine Avenue and Lee Avenue. This tank was designed to capture the flow from most storms in a typical summer season. The detained flows are routed to the Ashbridges Bay Treatment Plant when the flows in the trunk sanitary sewer subside. On average, the capacity of this detention tank is exceeded once per swimming season, resulting in a direct discharge of combined sewer overflows and stormwater to the nearshore beach. Beach water quality data collected post-construction of the tank demonstrated a significant improvement in beach water quality, especially in the area adjacent to where the flows were intercepted.

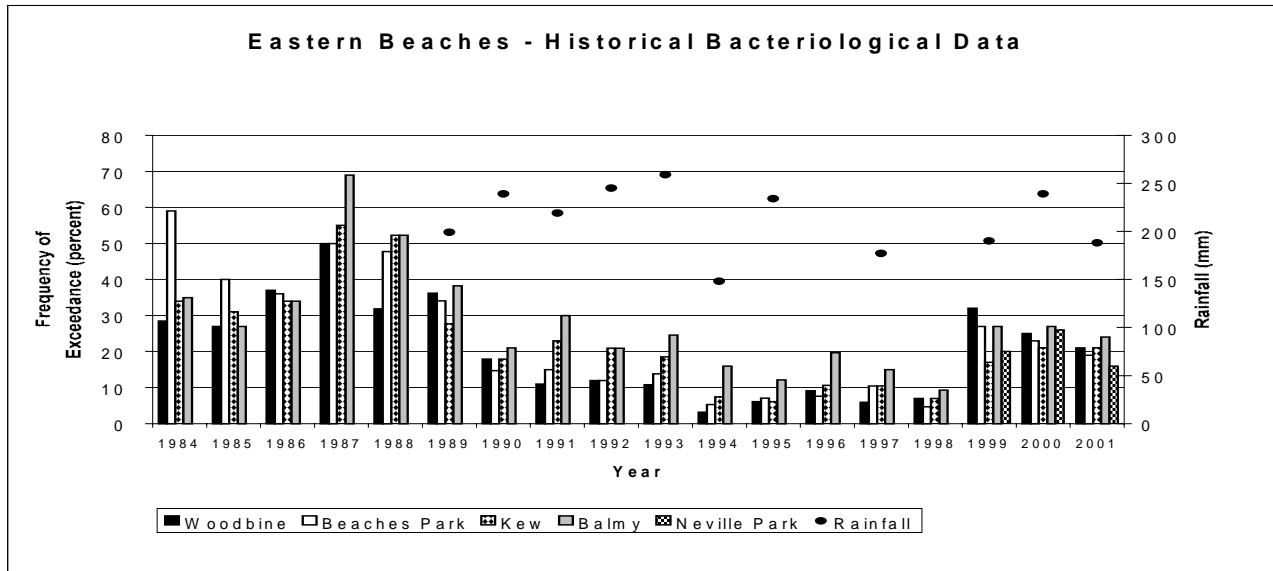
Based on the water quality improvements achieved by the first tank and a review of options, a second tank was recommended to provide additional protection to the Eastern Beaches. The Maclean Avenue Tank was operational in 1995 and intercepts flows from two storm sewers and one combined sewer overflow. The tank consists of two compartments, separating the storm sewer flows from the combined sewer overflows. The south compartment is designed to detain flows from two storm sewers from Glenn Manor Road and Balsam Avenue for 10 hours to permit treatment by sedimentation. After this period, the stored stormwater is pumped through a force-main buried in the lake bottom, to a distance 400 metres offshore, to minimize impacts on the beaches. The flow from the Maclean Avenue combined sewer overflow outfall is captured in the second compartment and this flow is routed to the Ashbridges Bay Treatment Plant when the flows in the trunk sanitary sewer subside.

These two detention tanks control stormwater flows and CSO's from 89% (289 hectares) of the sewersheds draining directly to the Eastern Beaches. There remains four storm sewers at the east end of the Eastern Beaches, by Neville Park, which are uncontrolled and discharge untreated stormwater to the nearshore area which can impact beach water quality.

Water Quality Improvements

Unlike the Western Beaches, data for the Eastern Beaches (Figure 2) indicate that there have been positive improvements in beach water quality over the period from 1984 to 2001. Data collected at the five beaches is summarized in Figure 2: Woodbine, Beaches, Kew, Balmy, and Neville Park. The frequency at which E. Coli levels exceed the Provincial Water Quality Objective (PWQO) for E. Coli bacteria, was highest from 1984 to 1989, ranging from 30 to 50 percent. The frequency of exceedance of the PWQO decreased to about 5% to 20%, depending on which beach, following the commissioning of the two detention tanks.

Figure 2 Eastern Beaches Historical Data – Percentage of Samples Exceeding the Provincial Objective for E. Coli Bacteria



However, an unexpected increase in the percent exceedance has been observed over the past three years. A systematic evaluation of several factors is continuing in search of an explanation. Climatological, meteorological, and lake circulation factors would not appear to be an explanation given the consistency of E. Coli levels for the Western Beaches.

Factors such as bacteriological loadings from domestic animals and wildlife in the vicinity of the Beaches is unlikely. The four uncontrolled storm sewers continue to discharge to the east end of the beaches, but land use or changes to sewer infrastructure in these sewershed are not considered to be significant enough to cause the change. Other factors such as variations in the volumes of discharges, changes in the location of the shoreline due to coastal geomorphological processes, and sampling methodology (locations, personnel, protocols), are being evaluated.

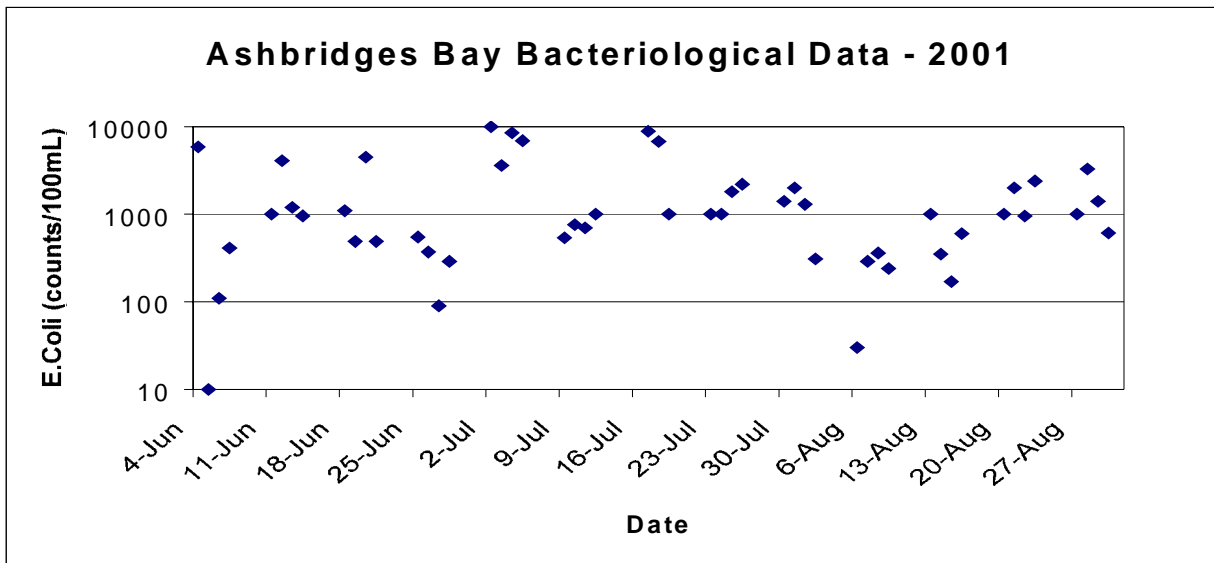
A factor that is also being investigated is a break in the forcemain pipe from the Maclean Tank recently discovered at a distance of 250 to 270 metres offshore. While the date at which the break occurred is not known, the break would result in the discharge of stormwater closer to shore. Preliminary computer simulations for this waterfront area, for a defined set of conditions, suggests that the frequency of exceedance in E. Coli levels increase from 17% if the discharge is at a distance of 400 m offshore (the design distance) to about 30% if the discharge distance is 250 m offshore. This increase is consistent with the observed increase in exceedances shown in Figure 2 over the past three years. Work has been initiated to repair the break.

Additional monitoring is being undertaken to confirm the importance of this factor, and to complete an analysis of the other potential factors.

Table 1 Bacteriological data for Ashbridges Bay

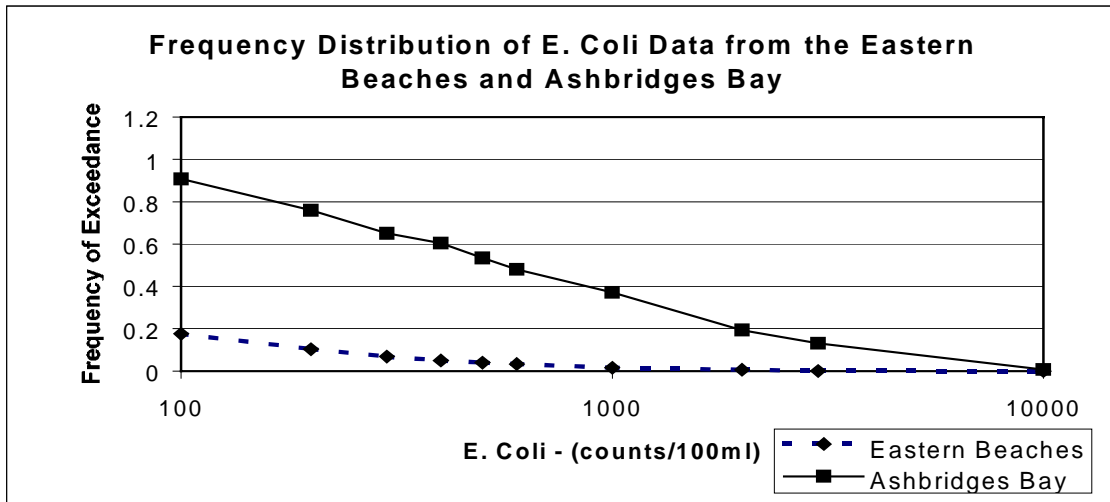
Year	# of Samples	Percentage of Samples Exceeding PWQO
1996	70	93
1999	40	92
2000	38	84
2001	51	94

Figure 4 Bacteriological data for Ashbridges Bay for 2001.



A comparison of E. Coli data collected over the past five years is presented in Figure 5, for the Eastern Beaches and Ashbridges Bay, respectively. The figure shows the percentage of the time that a given E. Coli density is exceeded. The comparison shows the influence of stormwater controls and circulation patterns on E. Coli densities. The data show that Ashbridges Bay E. Coli levels exceed the PWQO of 100 E. Coli per 100 mL over 90% of the time in a Bay whose discharges are uncontrolled and which has limited circulation. Conversely, within the Eastern Beaches, the PWQO is exceeded about 18% of the time in an embayment where most of the discharges are controlled and lake circulation is improved. Furthermore, the figure shows that E. Coli levels are generally higher in Ashbridges Bay than those measured in the Eastern Beaches. For example, almost 40% of the samples collected in Ashbridges Bay exceed 1,000 counts/100 mL, while almost 0% of the samples collected in the Eastern Beaches exceed this value.

Figure 5 Comparison of E. Coli data collected from the Eastern Beaches and Ashbridges Bay over the past five years



Due to these E. Coli densities in Ashbridges Bay and the influence of the four discharges into this confined embayment, a standard sign is permanently posted in the area of Ashbridges Bay, shown in Figure 6.

Subsequent to recent media reports about elevated E. Coli levels found in this area, the Mayor has requested the placement of more visible signs in the area. The Works and Emergency Services Department has arranged to have five large format signs (approximately one metre by one metre) placed in visible areas, where the Bay water may be accessed by the public. A mock-up of the new signs is present in Figure 7.

In order to avoid confusion, Toronto Public Health has requested that the reference to the 'Medical Officer of Health' not be included on the new signs to be posted at Ashbridges Bay. Toronto Public Health does not monitor all of Toronto's recreational lake water. Toronto Public Health's specific role is to monitor Toronto's 14 waterfront beaches.

Figure 6 Sign which was posted at Ashbridges Bay warning of polluted waters



Figure 7 Mock-up of new signs to be posted at Ashbridges Bay



Conclusions:

Waterfront water quality data collected since the mid 1980's has shown that areas close to uncontrolled discharges of stormwater and combined sewer overflows (CSOs) experience consistently degraded water quality conditions, such as the Western Beaches and Ashbridges Bay.

As a result of significantly degraded water quality conditions within Ashbridges Bay, the Mayor has requested the placement of more visible signs in the area. The Works and Emergency Services Department has arranged to have five large format signs placed in visible areas, where the Bay water may be accessed by the public.

Two underground detention tanks used to contain the discharge of stormwater and combined sewer overflows to the Eastern Beaches have significantly improved water quality along the Eastern Beaches. While an unexpected increase in E. Coli levels measured in the Eastern Beaches has been observed over the past three years, repair works for one contributing factor (a broken force main from a detention tank) has been initiated. Additional monitoring is being

undertaken to confirm the importance of this factor, and to complete an analysis of the other potential factors.

Contact:

Wayne Green, P.Eng.
Director, Quality Control and System Planning
Tel: (416) 392-8242 Fax: (416) 392-2974
e-mail: wgreen@city.toronto.on.ca

Michael D'Andrea, M.E.Sc., P.Eng
Manager, Infrastructure Asset Management
Tel: (416)-397-4631 Fax: (416) 397-0908
email: mdandre@city.toronto.on.ca

Michael A. Price, P.Eng., FICE
General Manager
Water and Wastewater Services

Barry H. Gutteridge
Commissioner
Works and Emergency Services