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A Review of the Response of Ottawa to Water Quality Issues in the Ottawa River

Introduction

The quality of the water in the Ottawa River has been a growing concern to the people in Ottawa for a number of years. The main focus has been on bacterial contamination that follows rainfall events. These events overwhelm the combined sewer system and allow untreated sewage to the river, resulting in beach closures. The peoples' anxiety has been punctuated by two serious incidents (in 2006 and 2009) of sewage being by-passed from the combined sewer system, due to infrastructure failures.

In July of 2009, I was asked as the Environmental Commissioner of Ontario by Jim Watson, MPP Ottawa West-Nepean, to review the situation and advise as to what actions need to be taken to address this problem. This report is the product of that review.

Background

The problem of combined sewer overflows is not unique to Ottawa. It is common to older Ontario cities that were developed in an age before sanitary sewage was collected and treated. In early times, sanitary needs were met by individual privies in close proximity on residential properties. In addition, horse manure accumulated in the streets. Since water supply came from local wells around the community, it was deemed necessary in the interests of public health to build sewers to transport human sewage from toilets and drains (sanitary sewage) combined with manure charged rainwater runoff from the streets (stormwater) out to the nearest river or large body of water (hence the term "combined sewers.") Sometimes basement sump pumps and even the downspouts from eaves troughs were connected to these combined sewers as well.

Decades later, when the benefits of sewage treatment technology became available, these sewers were "intercepted" by a trunk sewer typically laid parallel to the river flowing downstream to a new sewage treatment plant (STP). But it was not thought feasible to build sewers large enough to accommodate the volumes of flow generated by major rainfall events, so these combined sewers were built with "overflows." These overflows were points in the sewer system where surplus flow was discharged directly to the river or some nearby creek. At the time, it was thought that these overflows were harmless enough, because of the large dilution of the sewage by the rainfall runoff. We now know

that such events are not harmless: they are responsible for, amongst other things, high bacterial counts resulting in municipal beach closures.

In the past 40 or so years we have recognised this problem, and so more recent development has been built with "separated sewers." This means that there are two sets of sewer pipes in the streets: those carrying human sewage directly to the sewage treatment plant, called "sanitary sewers;" and those which convey surplus rainwater from the streets to nearby water courses, known as "stormwater sewers." This is a much improved situation, but not perfect. Stormwater can still convey bacteria and other pollutants into the aquatic environment and so, in recent years, best practices in storm water management and treatment have been identified to minimize such problems.

The Ottawa story follows this classic pattern of sewer development. The city has a densely developed old core with combined sewers, surrounded by phases of more recent development of mixed sewer types, and then new outer suburbs that have fully separated sewer systems. Combined sewer overflows and beach closures are experienced in the old development area. In recent years, the situation had become untenable, in that a mere 2 mm rainfall event would cause a combined sewer overflow (CSO) to the Ottawa River. This problem was exacerbated by four consecutive seasons of rainfall above historical averages.[1] There are stormwater issues as well.

A fortunate aspect of the Ottawa case is that, unlike many other municipalities, the sewage treatment plant has the capacity to treat a large volume of the dilute sewage produced by the combined sewers. The greatest challenge for Ottawa is that the limited capacity of the trunk sewer does not allow all the diluted sewage to be transported to the sewage treatment plant.

Given the preponderance of combined sewers in older built infrastructure, the minimum standard for performance of these systems is not set at zero discharge by the Ministry of Environment. The standard is set by Policy F-5-5, which requires that all sewage must be contained during dry weather and that 90% of the wet weather flows must be contained and treated during the warm months of the year. This means that 10% (by volume) of the dilute sewage is permitted to be released from overflows typically during major storms. There are other requirements necessary to satisfy F-5-5, including compliance with bacterial standards at beaches 95% of the time, and the need for the city to develop and operate under an acceptable Pollution Prevention and Control Plan.

Methodology

In conducting this review the following four step approach was taken:

[1] The concept of average rainfall itself as a planning tool has recently been called into question because of unusual weather patterns which may be reflecting climate change. It is quite possible that the recent series of wet years are the new normal for Ottawa.

1. Is the problem defined?
2. Have alternatives been developed and considered?
3. Has there been adequate public consultation?
4. Is there a course of action to completion?

Findings

Problem Definition

The situation in the Ottawa River is complex, especially with regard to beach closures. Not only are there combined sewer overflows, stormwater outflows and a sewage plant discharging from the City of Ottawa, but all of these discharges are mirrored in Gatineau on the other side. To deal with this complexity, the City has collected data and created a computer model of the river which allows them to predict the bacterial contamination at any point in the river through time following a rainfall event. This allows them to assess how the contributions of various discharge points affect a sensitive receptor (such as Petrie Island Beach) and to predict with some confidence the improvement created by various mitigation measures. This model reveals, for example, that although the Gatineau sewage treatment plant provides a major load of bacteria to the river as a whole, it is quite a minor contributor to the problem at Petrie Island Beach. The major contributors to those beach closures are CSOs on the Rideau Canal and the Rideau River.

Alternative Solutions

In old sewer systems, there are practical constraints which limit the options available to address problems. A simplistic approach would plan to separate all sewers. Although this is desirable, it is not always feasible or wise. The construction of sewers requires the destruction of existing infrastructure, especially roads. In older built neighbourhoods, the extent of destruction required may simply be beyond all reasonable limits with respect to the functioning of the city. Additionally, the costs involved may be so high as to be unaffordable.

An alternative approach used in other cities is to leave the sewers combined in older areas and build chambers which store the surplus water flowing during rainfall events. It can then be pumped back into the trunk sewers to flow to the treatment plant during dry periods. To the extent that this can be accomplished, such a system actually gives enhanced protection to the river, because all the sanitary sewage as well all the stormwater collected receive treatment in the sewage plant.

The city of Ottawa has identified measures that could be implemented quickly that would provide substantial (but not complete) relief from the worst of the overflow problem. Up until recently, the overflow structures at the CSO points employed crude technology which by-passed flows routinely, irrespective of the actual capacity of the trunk sewer at that time. This has been largely replaced by an intelligent technology which releases an overflow only when necessary, due to the capacity of the trunk sewer having been

reached. This initiative is referred to as the Real Time Controls (RTC) plan by the city and should be completed in spring 2010.

The city has also identified the need to develop strategies to reduce the wet weather flow into both the sanitary and stormwater collection systems. To support this, a stormwater management retrofit master plan is being developed. These and many other measures, including monitoring, are built into a strategic approach to the overall problem called the Draft Short-Term Integrated Protection Plan.

Public Consultation

The public consultation process on the plans to protect the Ottawa River are only beginning this month (November 2009). In the broader perspective of public consultation processes, this is unusual in such circumstances. The public will be presented with a comprehensive and complicated list of initiatives called the Draft Short-Term Integrated Protection Plan, and then asked to comment on future initiates that would take the city beyond minimal compliance with MOE policy. This is a lot for the public to digest at one time, and it will be confusing that much of the Plan, like the critical RTC project, will already be completed (or substantially so).

Public consultation is a process that builds understanding, solicits and integrates responses, and hopefully creates consensus and social consent. In order for the public's input to be meaningful, they must have the capacity to comprehend what is being discussed, and the implications of same. If that understanding is not there, the public may develop misunderstandings or be apprehensive of the initiative. In the worse case, they may develop distrust or even resentment of the process. For complicated technical undertakings such as this plan, it is incumbent on the proponent to work with the public to develop that capacity to understand and meaningfully contribute.

In this case, it would have been much better to engage the public early and gradually even before the whole plan took shape. If the concerned public were caught up with the analysis and consideration that clearly was put into this plan by the technical staff, then they might well have bought into the solutions proposed to date and they would now be in a much stronger position with respect to discussing future efforts to go beyond minimal compliance. One can speculate that the failure of infrastructure that occurred this past summer would have been viewed by the public as just that if they had been fully engaged in the ongoing plan. Instead, the incident was seen as another illustration of how the city that had failed to take action on a long-standing problem, which was clearly not the case, as the RTC installation was well underway.

A Course of Action to Completion

There is a course of action prescribed to address this problem in its entirety. It begins with a series of measures collectively know as the Draft Short-Term Integrated Protection Plan.

When fully implemented, this is expected to achieve compliance with Policy F-5-5.[2] It also includes a process of public consultation to consider measures that would go beyond minimal compliance and achieve a status where (in normal rainfall years) there are no longer any combined sewer overflows, and beach closures become so rare as to be insignificant.

Basically, the whole Integrated Protection Plan can be considered to have four major components:

1. The Real Time Controls initiative, which is almost complete and will greatly reduce the magnitude of the sewage discharge from the regulators (the points where the overflows are released).

2. Completion of the Sewer Separation Project for those parts of the city where separation is feasible. This is the last phase of a separation process that has been underway for some years, and is expected to be completed by the Fall of 2011.

3. Designation of the "Ultimate Combined Sewer Area," which is that area in the old part of town where separating the sewers doesn't make sense. Instead, those sewers will be left combined and "surge tanks" will be built to hold some of the combined sewage during storm events so it can be pumped to treatment during dry periods. The issue is how much storage capacity to build. There are two proposed options. A capacity of 15,400 m^3 would provide enough storage to capture 90% of the wet weather flow and meet F-5-5 in a normal year. But 46,400 m^3 of storage would be required if there are to be no CSOs in a normal year.[3] There is a substantial difference in cost.

4. Implementation of Storm Water Management (SWM) measures. The model shows that once the CSOs are curtailed, stormwater discharges will still close beaches. Enhanced SWM measures can be required on new construction, but the challenge is to retrofit the 70% of the city that does not have SWM. Such a project would be implemented over a number of years on a priority basis.

Conclusions

The City has defined the problem well. The model and related work provide an adequate picture of the nature, scope and magnitude of the problem sufficient to allow mitigation and correction measures to be developed. In addition, the strategic approach taken by the city to find solutions is comprehensive and considers all reasonable alternatives.

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[2] This compliance is contingent on the normal average precipitation during the control period remaining constant, unaffected by climate change.

[3] A normal year is a historic average. There will still be wet years where some CFOs will occur.

The public consultation process of the City's planning process was not optimally designed or implemented. By not involving the public early in what was clearly a sincere and comprehensive attempt to address a long standing problem, the City lost the opportunity for potentially valuable input and ideas, as well as the good will and buy-in such consultation cultivates. At the time of the infrastructure failure at the regulator this summer, the public was unaware of the RTC being installed and near completion, so they inaccurately cast the incident as an example of the City's inaction on the problem. Now that the public consultation is about to commence, it will be challenging to bring participants to a level of understanding of the Integrated Protection Plan, both short-term and long-term, such that they can form options and give thoughtful direction to council.

From a technical perspective, the Long-Term Integrated Protection Plan looks to be well thought out and adequate to address the problems in Ottawa River. Sewer separation has been ongoing for years and is nearing completion. The RTC project is almost complete, and hopefully will substantially improve the situation at the beaches starting next season. However, there is as yet no commitment to proceed with the more substantive (and more expensive) parts of the plan that would bring the water quality problem in the Ottawa River to a resolution. There are two tough decisions to be made.

The City must commit to construction of the storage tanks in the Ultimate Combined Sewer Area. Together with the public, they must decide either to go with the minimum volume option (which would allow CSOs to continue to occur with some frequency, but meet the MOE Policy) or to build the tanks bigger (and have the confidence that in a normal rainfall year, the people of Ottawa could expect to have no combined sewer overflows into the Ottawa River.)

The second tough decision relates to storm water management. The problem will not be solved unless the city is retrofitted with SWM technologies and techniques. This requires the people of Ottawa to embrace a vision of a city where the rainwater runoff flows clean into its watercourses, and to commit to a long-term continuous effort to make it happen in thousands of very local situations.

Ottawa is the capital of our nation. Ottawa sees itself and is seen by others as a green city. Internationally it is listed as a Transition Town. It has a water quality problem but it knows what must be done to fix it. The choices may be expensive but they seem obvious.

Respectfully submitted by
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