AUDIT OF THE 2006 SEWAGE SPILL

2008

VÉRIFICATION DU DÉVERSEMENT D’EAUX USÉES 2006
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Executive Summary

Introduction
This audit was undertaken at the request of Council, following reports that the closures of the Petrie Island beaches in August 2006 were likely caused by a major unreported sewage spill at the Keefer regulator site adjacent to the John Street-Sussex Drive intersection.

Background
The combined sewer system was designed to convey sanitary sewage during dry weather and both sanitary sewage and storm water runoff during wet weather. The combined sewer system of the City of Ottawa has 18 known overflow sites, of which the largest 5 are controlled by regulators.

These regulators are simple mechanical devices which operate using a system of gates, floats, pulleys and chains. The five regulators operate on the same basis and are controlled by float-activated gates. In simple terms, within each regulator the gate is kept open by a float that acts as a counterweight during dry weather. When the gate is open, flow in the combined sewer is designed to flow into the outlet sewer and onto the sewage treatment facility at the Robert O. Pickard Environmental Centre (ROPEC). During a rainstorm event, as the flow in the combined sewer increases, the gate starts going down toward its closed position. If the flow in the combined sewer is high enough, the gate will shut completely until the flow starts to go down. As the gate begins to close, it forces the flow into the overflow sewer which leads into the river.

It is important to differentiate between a combined sewer overflow (CSO) and a sewage spill. A CSO, which can occur during rain events and is the result of the normal operation of the regulator, is permitted due to the design of the combined sewer system (CSS) used in this part of the City. After the rain event peak flow, the CSS should return to normal operation in which the sewage and storm runoff are taken to the sewage treatment plant. Under normal conditions, the combined sewer overflow into the river should end at this point.

During dry weather no sewage flow should be discharged into the river. If there is dry weather flow being directed to the river, the discharge is an unauthorized spill and not a CSO. Therefore, in the case of the August 2006 event, the initial part of the event (from July 31 to August 3) was a combined sewer overflow, which is permitted and not subject to reporting to Ministry of the Environment (MOE) or any other agency. The flow that discharged to the river from August 4 to August 15 inclusive was abnormal and the result of a malfunction at the Keefer regulator. It was therefore a sewage spill and was required to be reported to the Ministry of the Environment (MOE).
immediately. Subsequently, it was found that the volume of this spill was 764 million litres.

**Audit Objectives**
The objectives of this audit were as follows:

1. Determine the reasons for the August 2006 sewage spill;
2. Examine the response by City staff, including reporting responsibilities, communications methods, protocols, improvement;
3. Review the staff and management responsibilities with respect to inspection, maintenance, and operation;
4. Review the training levels of City staff;
5. Review the reasons for non-reporting of the spill; and,
6. Review the alarm system, regular inspections, and emergency inspections of the regulators.

**Audit Scope**
The audit scope encompassed the reasons for the sewage spill and the reactions by City staff to the spill. The audit comprised the following main tasks:

1. Review legislative framework;
2. Review background data;
3. Conduct interviews with City staff and MOE representatives involved in the project.

**Summary of Findings**

**Chronology of Events**
The following table briefly summarizes the key events in the chronology of the August 2006 sewage spill at the Keefer regulator site:

<table>
<thead>
<tr>
<th>Date</th>
<th>Key Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 31st 2006</td>
<td><img src="https://example.com/image1.png" alt="Rainfall event started late in the evening" /></td>
</tr>
<tr>
<td>August 3rd 2006</td>
<td><img src="https://example.com/image2.png" alt="Rainfall ended but the Keefer regulator failed to return to pre-storm condition allowing flows to continue into river." /></td>
</tr>
</tbody>
</table>
| August 15th 2006| ![A staff technician noticed an anomaly in the flow monitoring data and went to the site to verify that there was flow in the pipe leading to the river.](https://example.com/image3.png)  
                | ![The technician contacted his Supervisor, two other Supervisors and the Section Manager by e-mail informing them of the malfunction.](https://example.com/image4.png)  
                | ![The Operations Supervisor dispatched a crew to the site to repair the regulator and the flow to the river ended.](https://example.com/image5.png) |
### Audit of the 2006 Sewage Spill

<table>
<thead>
<tr>
<th>Date</th>
<th>Key Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-March 2007</td>
<td>- A Senior Engineer in Infrastructure Services Branch (ISB) noticed a discrepancy in the flow data from August 2006.&lt;br&gt;- The Engineer contacted Operations and received confirmation of closed regulator that was cleared on Aug. 15th 2006.&lt;br&gt;- The Engineer contacted the Manager, Wastewater and Drainage Services Division (WDSD) and the WDSD Program Manager by e-mail and advised them of the issue.</td>
</tr>
<tr>
<td>April 23rd 2007</td>
<td>- Discussion between City Engineer and MOE Engineer.&lt;br&gt;- The Engineer advised the MOE that the event would be documented in the upcoming 2006 annual report on CSOs.&lt;br&gt;- The Engineer estimated magnitude of the spill event to be approximately 1 billion litres.</td>
</tr>
<tr>
<td>May 1st, 2007</td>
<td>- Detailed information from which the Keefer Regular report can be prepared is provided from Infrastructure Services Branch (ISB) to WDSD.</td>
</tr>
<tr>
<td>May 2nd 2007</td>
<td>- The WDSD Manager directed his Program Manager to prepare a report to MOE describing the event in 2006. This would be done independently of the CSOs report being prepared by ISB.</td>
</tr>
<tr>
<td>May 16th 2007</td>
<td>- A letter is sent to MOE from WDSD Program Manager with copies to the Manager WDSD and Manager Infrastructure Management regarding the malfunction of the Keefer regulator and stating that incident was never formally reported to MOE.</td>
</tr>
<tr>
<td>April 2nd 2008</td>
<td>- The Senior Engineer in ISB becomes aware of a Public Health (PH) report on beaches.&lt;br&gt;- The Engineer calls the PH analyst regarding the possible correlation of beach closures to overflows and the August 2006 event spill.&lt;br&gt;- The Director of Water &amp; Wastewater (W&amp;W) is copied on an e-mail from the Senior Engineer to WDSD management regarding the link between overflows and beach closures, and informing him of the request by PH to be notified of spills.&lt;br&gt;- Director W&amp;WS requests Manager WDSD provide a report on the events of the spill that same day.&lt;br&gt;- The Manager WDSD directs his Program Manager to add PH to the spills reporting protocol.</td>
</tr>
<tr>
<td>April 3rd 2008</td>
<td>- The Director W&amp;W attends a Committee discussion on the PH 2007 beach report. Great deal of discussion around:&lt;br&gt;  o Impact of CSOs; and,&lt;br&gt;  o Untreated Stormwater.&lt;br&gt;- Environment Canada Study (Presence of E. Coli, as detected by EC is not indicative of poor performance at ROPEC during storm events. In fact presence of EC does not distinguish between viable and non-viable bacteria.)&lt;br&gt;- Director clarifies that delays in commissioning Digester at ROPEC and Waste Management Facilities at Lemieux and</td>
</tr>
</tbody>
</table>
### Key Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Britannia are not adversely impacting Petrie Island. ▪ No mention is made of the link between the August 2006 event, CSOs and beach closures.</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 23rd 2008</td>
<td>▪ The 2007 PH report on beaches is presented to Council. ▪ No mention is made of the link between the August 2006 event, CSOs and beach closures.</td>
</tr>
<tr>
<td>May 7th 2008</td>
<td>▪ During a tour of the treatment facility, the Manager WDSD informed Councillor Monette that the problems at Petrie Island during 2006 were likely the result of the August 2006 event at the Keefer regulator.</td>
</tr>
<tr>
<td>May 13th 2008</td>
<td>▪ The Deputy City Manager (DCM) of Public Works and Services first becomes aware of the August 2006 spill from the Director W&amp;W.</td>
</tr>
<tr>
<td>May 20th 2008</td>
<td>▪ The DCM issues a statement to Council to explain the event in 2006 and indicates that it was reported to MOE “shortly after the overflow is discovered…”</td>
</tr>
<tr>
<td>May 22, 2008</td>
<td>▪ The DCM issues “Sequence of Events Regarding August 2006 Combined Sewer Overflows from Keefer Regulator” memo complete with attachments of May 2007 Keefer Regulator report and first annual CSO report. In this memo, DCM reports that MOE verbally informed in August 2006 of spill.</td>
</tr>
<tr>
<td>May 27th 2008</td>
<td>▪ The DCM issues a new statement to Council retracting the statement of reporting the spill to MOE when it occurred in August 2006.</td>
</tr>
</tbody>
</table>

The occurrence of the August 2006 sewage spill at the Keefer regulator site was the result of an almost complete lack of proper preventative maintenance and proactive management of this equipment. Once the event had occurred and been corrected, a culture of not understanding the significance of sewage spills took over and the 2006 event was never viewed as noteworthy. It is our opinion that this represents incompetence on the part of the managers involved. Knowledge of the event was never escalated from Managers to their Directors and onto to executive management, as one would expect given the magnitude of the spill. Furthermore, the event was never reported to the MOE – as required by law – until 8 to 9 months later. Only the front-line staff deployed to repair the malfunctioning regulator can be said to have performed their duties effectively in this case by repairing it within hours of being informed. Similarly, the Senior Engineer who reported the spill to MOE in April 2007 fulfilled his duties and responsibilities.

### Maintenance

In July 1970, the American Public Works Association (APWA) reported that float-operated gate regulators require a continuous preventive maintenance program in order to function properly. Nearly forty years ago, the APWA was recommending inspections once per week and after each storm, and in no case less frequent than twice
per month and after each storm. It further recommended that, during each inspection, the gate be operated through a complete cycle of closing and opening; that the float well be cleaned to remove sand or sludge and debris; that chains and gears be lubricated; and that any parts that are excessively worn or corroded be replaced.

A condition assessment of the Keefer regulator dating back to 1992 indicated:

- It is the largest gate and float system;
- A railing system was required at the bottom;
- The pulley and axle system were corroded;
- The chains, gate and float were in good condition;
- The vertical post for the float needed to be replaced;
- The landings were in good condition but safety to be addressed;
- The grate was too loose at bottom of the ladder; and,
- The concrete was in good condition.

The next complete condition assessment of these regulators was not carried out until June 2008, 16 year later. It indicated:

- In most cases the chain is the wrong size so it does not sit properly on the wheel sprockets;
- The steel I-beam supports are in very bad condition;
- Pillow blocks are either in bad condition or are seized;
- Chain bolts are in the wrong location, causing the bolts to support the chain (not designed for this);
- Regulator gates and floats are very rusty;
- Float guide posts are missing in some cases (Keefer regulator is one); and,
- In all cases, access to the chambers is tight, particularly considering the amount of safety equipment that needs to be worn by the operators.

On May 20, 2008, Management had indicated to Council that, after the 2006 spill was reported to the MOE in May 2007, corrective action began. In fact, no corrective action was ever taken at that time, as noted in the May 22, 2008 memo to Council. Had such action been taken, it is unlikely that the Keefer regulator would have failed again later in the summer of 2008.

**Safety**

As a result of the lack of effective maintenance of this equipment, a number of safety concerns remained unresolved, including:

- Poor lighting;
- Poor air quality;
- High noise levels;
- No platform to permit inspection of the float and gate lift mechanisms;
- Water infiltration; and,
- Unprotected electrical wiring.

This information was provided to the City Manager in August 2008 after it was raised to the attention of the Auditor General.

**Inspections**

Shortly after amalgamation, the frequency of inspections of the regulators was reduced to only once per month and not after rain events, as opposed to the APWA recommended once per week and after each rainfall. The rationale given for the reduction in inspections was a lack of resources, however, the Collections Unit of WDSD had a budget surplus of approximately $563,000 in 2005, $1.88 million in 2006 and $667,000 in 2007. The budget surplus at the Division level was even greater with $1.9 million in 2005, $4 million in 2006 and $3.6 million in 2007 left unspent. We estimate that the cost of increasing inspections to the level recommended by the APWA would be approximately $110,000 per year which, given these surpluses, could have been easily absorbed within the existing budget.

This frequency of inspection is woefully inadequate and is even more of a concern given that the regulators had not received suitable maintenance since they were installed, even though 1995 reports noted that they had reached their expected design life and required renewal. In addition to the inadequate inspection frequency, the work done during the inspections was the bare minimum and included only application of grease to joints and chain, cleaning of all components, cleaning of float and float chamber, and tightening of bolts.

The low frequency of inspections prevented anyone from discovering the August 2006 gate malfunction for more than 10 days. If the procedure had been to inspect the regulators after every rainstorm, as is the industry standard, the malfunction would have been discovered in less than 24 hours after the rainfall stopped. As such, the volume of the sewage spill would have been less than one-tenth of the amount spilled.

**Alarms**

The former Regional Municipality of Ottawa-Carleton (RMOC) had a system of alarms on these regulators. The alarms were connected to the pagers of the program managers and supervisors in the sewer maintenance system. The alarms would go off frequently and a number of false alarms occurred. Shortly after amalgamation, the alarm system was allowed to fail and was never repaired. During interviews for the audit, the Manager, WDSD and Program Manager, Sewer Maintenance acknowledged
responsibility for the decision to reduce the frequency of inspections and to not replace the alarm system.

**Reasons for Sewage Spill**

In general, it is clear that this equipment has not been inspected and maintained in an adequate manner. The maintenance program was not based on any regular inspections, planned condition assessments, risk-based setting of priorities for renewal or life-cycle costing of renewal options. As evidenced by the lack of maintenance that the Keefer regulator had received, the fact that the gate became stuck in the closed position during the July 31 to August 2, 2006 rain storms was not an extraordinary event. In fact, the staff mechanic who conducted the June 2008 condition inspection expressed that he “wasn’t surprised” that this regulator had failed given its current condition.

**Real Time Control**

The “Real Time Control” project, as presented by management, is intended to reduce the volume of combined sewer overflow to the Ottawa River and enhance the City’s ability to monitor and regulate flows in the combined sewer system on a real-time basis. The objective is that, once operational, sewage spills will be prevented and combined sewer overflows will be significantly reduced.

Real-time control, and upgrades to regulators have been identified as a priority for nearly a decade. The project first received funding in 1999.

In the inaugural capital budget for the newly amalgamated City of Ottawa (2001), regulator upgrades were identified as a priority (11th) in the Sanitary Sewer Program. At that time, the project was described as “Upgrade / replacement, completion of design, construction of the structures and implementation of a real time control strategy to ensure an integrated approach to system operation”. It was expected to be complete by 2003 at a total estimated cost of $9.7 million. Council approved a total of over $1.0 million before the project was closed in 2003, at which time none of the approved funds had been expended.

In 2005, the Regulator Upgrade & Real Time Control project resurfaced again in the Capital Budget. In 2006, this project was identified as the number 1 priority within the Combined Sewer Area Management Program. The 2007 Capital Budget specifically identified 6 locations where “Real-Time Control of combined sewer overflows” would be implemented. These locations are: Booth – Wellington; Lloyd – Booth; Lloyd – Preston; Keefer; Rideau Canal; and Cathcart regulators. To date, this project has an approved budget of $20.45 million, with $3.7 million spent and $13.8 million committed. The majority of the commitments (90%) were for 2 contracts in 2008 & 2009. Management now estimates that the project will be completed by 2010.
Legislative Requirements

Among the many pieces of federal and provincial legislation governing the operation of a sewer system is the Licensing of Sewage Works Operators, Ont. Reg. 129/04. It requires that:

1. The owner shall designate an Overall Responsible Operator (ORO), who must have a license applicable to the type of facility;
2. If the ORO is absent, an Operator In Charge (OIC) with licence equal or one level higher than the facility must be designated;
3. The owner must ensure that logs or other record-keeping mechanisms are provided and that entries be chronological;
4. Only the OIC can make an entry into log;
5. Specific information for each shift shall be entered into log, including:
   i. Any departures from normal operating procedures that occurred during the shift and the time they occurred.
   ii. Any special instructions given during the shift to depart from normal operating procedures and the person who gave the instructions.
   iii. Any unusual or abnormal conditions that were observed in the facility during the shift, any action that was taken and any conclusions drawn from the observations.
   iv. Any equipment that was taken out of service or ceased to operate during the shift and any action taken to maintain or repair equipment during the shift.
6. Logs shall be kept for two years; and,
7. The owner of a facility shall ensure that operators and maintenance personnel in the facility have ready access to comprehensive operations and maintenance manuals that contain plans, drawings and process descriptions sufficient for the safe and efficient operation of the facility.

At the City of Ottawa, in August 2006:

1. The ORO had never been designated; rather, the operators made assumptions with respect to who this was at the time;
2. The OIC for each shift was never clearly designated;
3. No log was kept in the Sewer Maintenance section;
4. No comprehensive operations and maintenance manuals, including plans, drawings, and process descriptions had been developed;
5. No safety procedures had been developed for access to the regulator chambers;
6. The Environmental Services and Technical Support Division had no role in monitoring compliance to legislation and no policies, procedures or protocols for maintenance management of the wastewater collection system emanated from this Division;

7. No written procedures existed in the Operations and Maintenance (O&M) Manual for the maintenance of the regulators; and,

8. The protocol for spill notification was the one prepared by the RMOC prior to amalgamation and was found to be very unclear, in particular with relation to the definition of a spill and when it should be reported.

This situation was not changed until June 2008.

**Key Management Responsibilities**

The organizational structure of WDSD with respect to wastewater collection includes three management positions in addition to the operations supervisor. These positions are all staffed with Professional Engineers:

- Manager, Wastewater and Drainage Services (Professional Engineer required);
- Program Manager, Wastewater Collection (Professional Engineer required); and,
- Section Manager, Sewer Maintenance.

The position descriptions make it quite clear that these positions are responsible among other duties for:

- Developing and maintaining a proactive approach to loss control (i.e., reduction of risk, liability, safety, etc.);
- Ensuring maintenance management systems are in place and functioning effectively to maintain compliance with applicable legislation, including:
  - Reviewing all pertinent legislation, regulations, and regulatory process;
  - Ensuring that staff are knowledgeable in pertinent legislation, changes to legislation and regulations, responsibilities within legislation, and consequences of non-compliance;
- Overseeing the management of the wastewater collection system; and,
- Ensuring that employees are provided with and use appropriate equipment, material, and/or procedures required to perform the assigned duties.

In our view, as the professional position closest to the front line staff and the only one having a “Level 4” MOE certification, the key responsibility for ensuring that adequate operational and maintenance procedures are in place rests with the Section Manager, Sewer Maintenance. Management from both Water & Wastewater and Infrastructure Management identified this position as having the primary responsibility for the maintenance of this equipment. However, this manager did not develop maintenance
methods or operating procedures; he did not develop appropriate operating policies
and work programs to adequately maintain and inspect the regulators; he did not
ensure that the employees are provided with and use appropriate equipment, material
and procedures required to perform their assigned duties; and, he did not follow the
City of Ottawa corporate and departmental policies and procedures.

Overall, it can be concluded that neither the Manager, WDSD, nor the Program
Manager, Wastewater Collection, nor the Section Manager, Sewer Maintenance
delivered the duties required of their positions as they relate to the sewer collection
system. It is our opinion that their failure to correctly and completely deliver these
duties was responsible for the malfunction in August 2006, the length of time of the
malfunction, and the failure to notify the MOE about the sewage spill.

It is our opinion that these professional engineers may have failed to fulfill their duties
as required under the Professional Engineers Act. Under regulations made pursuant to
the Act, professional misconduct includes “failure to make responsible provision for
complying with applicable statutes, regulations, standards, codes, by-laws and rules in
connection with work being undertaken by or under the responsibility of the
practitioner.”

Finally, the linear structure of this area, with three levels of management between the
Branch Manager and front-line supervisors, was a contributing factor in the disconnect
regarding the events of August 2006 and the lack of proper operating procedures. This
structure should be re-visited in order to streamline communication and enhance
managerial oversight.

Additional Sewage Spills

Since the acknowledgement of the August 2006 sewage spill in May 2008, two
additional spills have occurred at different locations, one in June 2008 and another in
July 2008. There was a delay in reporting the June 15, 2008 spill to Council. It was not
reported to Council until July 23, 2008. Management has since undertaken a review of
historical flow monitoring data from 1998 to 2008 and has identified another nine spills
at various regulator locations.

As part of this audit, the Auditor General also examined this flow monitoring data as
well as work orders produced by the Collections Unit. Our assessment of the data
indicates that, in addition to the spills identified by management, four other spills
occurred during the period of 1998-2008. In total therefore it would appear that since
1998, 16 separate sewage spills of various magnitudes have taken place at these sites.

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1 Definition of Professional Misconduct: Section 72 (2)(c) of Ontario Regulation 941, made under the Professional Engineers
Act, R.S.O. 1990, C28
Management has agreed with one of these four additional spills and it was reported to the MOE on October 17, 2008 as a result of the audit. Throughout the audit, management disagreed that the other three incidents identified by the Auditor General were spills. However, on October 17, 2008, management discovered and provided to the Auditor General an MOE Incident Report dated April 4, 2005 concerning one of these incidents. It had in fact been deemed a spill at that time and was reported to the MOE by the Supervisor, Sewer Maintenance and Operations. Management maintains that the other two incidents are not spills.

The flow data discussed above is generated by sensors located in the regulator chambers. These sensors allow flows to be monitored on a daily basis so that any anomalies in the sewage flows can be quickly identified and investigated to prevent spills from occurring. In fact, the sensors are functional at only two of the five sites and the data generated was either never generated or never used to conduct daily flow monitoring for sewage spills. The identification of the unusual flows in August 2006 resulted from the technician at the time essentially noticing the abnormal data by chance and alerting operations to a potential issue.

**Communications and Reporting of Sewage Spills**

In our opinion, the operations staff did not receive clear instruction regarding the circumstances in which a CSO becomes a sewage spill. Furthermore, there is no requirement in the outdated protocol for the operator to record the incident number provided by the MOE. We conclude that the responsibility for reporting spills had been given in an informal manner to the Supervisor, Sewer Maintenance but in such a way that he considered his duty to report only in cases where he initiated the spill, such as when he opened the gate at the Wellington-Booth Street structure to relieve flooding pressure in the West Nepean Collector. The way in which the instructions for reporting were provided did not clearly include an event such as a sewage spill due to a closed or partially closed regulator gate as a reportable incident.

It is apparent that, prior to May 2008, a sewage spill from a malfunctioning regulator was not perceived by staff or management to be a sewage spill but a CSO. This is indicative of an organizational culture that, in our view, fails to regard these events as significant but as merely a normal course of operations.

The existing attitude and culture and the associated lack of effective reporting and communication protocols not only resulted in the August 2006 event not being reported to the MOE but also in it not being communicated properly to more senior levels in the organization. It is interesting to note that attendees at the March 25, 2008 meeting of the Fallingbrook Community Association were told of the event and its likely connection to the Petrie Island beach closures by a City Engineer (and also a member of the community association). In other words, the attendees at this meeting knew of the event and its likely consequences before the Director Water and Wastewater Services,
the Director of Infrastructure Services, the Deputy City Manager, the City Manager or Council were ever informed.

**Recommendations**

**Recommendation 1**
That the City immediately implement the maintenance standards and procedures for regulators as recommended by the APWA and required by legislation.

**Management Response**
Management agrees with this recommendation.

Over the last six months, the City of Ottawa has taken aggressive steps to improve the operations, monitoring, regulatory compliance and maintenance standards for the regulators.

Since May 2008, City staff have implemented more frequent maintenance inspections of the regulators. Current regulator inspection frequency is weekly and post a rainfall event consistent with the APWA maintenance standards and procedures. This has resulted in more than 320 site and regulator inspections and prompt identification and response to malfunctioning regulators.

As detailed in the management response to Recommendation 4 the City will be implementing a Quality Management System that will take an environmental risk-based approach. An important element to this system is to develop appropriate risk mitigation strategies, including maintenance and asset renewal strategies. For the regulators, the overall asset investment/renewal strategy will take into consideration the fact that many of the largest regulators (Rideau Canal, Keefer/John Street and Cathcart) are scheduled to be decommissioned within 6-8 months.

**Recommendation 2**
That the City address all safety issues related to the regulators.

**Management Response**
Management agrees with this recommendation.

Existing protocols/procedures ensure that any identified problems are promptly repaired and hazards are eliminated. Providing a safe work environment through a combination of hazard removal, appropriate safety equipment, policies, procedures and training is an essential management responsibility.

Operations and maintenance manuals will be reviewed, on a risk assessment basis, to prioritize the review and strengthen current practices.

Once approved in the 2009 Budget, management will develop and implement an Environmental Quality Management System as a first order priority. One of the
advantages of implementing an ISO-based (International Organization for Standardization) management system is its relatively easy expansion to incorporate other management systems, including safety. During the development and implementation of the Environmental Quality Management System, management will consider developing an associated Quality Management System specifically directed at safety issues.

**Recommendation 3**
That the City ensure the effective monitoring of flow data to identify anomalies and undertake investigations and required remediation in a timely manner.

**Management Response**
Management agrees with this recommendation.

The City has implemented a number of changes to improve upon the previous flow monitoring strategy. Regulator and/or outfall sewer operational information is available to operational staff ensuring 24/7 post rainfall event monitoring of the five monitored sites and, if necessary, appropriate response. This work included the installation of an interim status monitoring system. This will be supplanted with a permanent Real Time Status Upgrade on the three most significant outfalls by mid-2009.

As mentioned previously, management is proposing an Environmental Quality Management System that will cover all wastewater services. A key component of this work will be to identify all sites with a significant risk of environmental impacts. Combined sewer overflows and their associated regulators will be among those sites. Continuous site monitoring will be an important means of enabling staff to minimize the risk of future occurrences.

As a part of the 2009 Rate Budget, staff have requested $5 million in authority to assess the current monitoring strategy and undertake the identified infrastructure improvements for the remaining outfall and overflow sites in addition to those sites, which will receive priority asset reinvestment as part of the Real Time Control Project. A risk-based assessment of these sites will be undertaken in accordance with the development and implementation of the Environmental Quality Management System described in Recommendation 4. If approved, this assessment is expected to be completed by Q2 2009.

**Recommendation 4**
That the City review the organizational structure of the WSDS to ensure adequate communication and operational oversight is maintained.

**Management Response**
Management agrees with this recommendation.
A number of steps have already occurred to ensure that the previous operational oversight and communication concerns have been fully addressed. In addition, management have retained the services of SP3 Consultants to conduct a branch-wide assessment. This assessment will provide the management team with a thorough understanding of current strengths of the organizational design and will identify any remaining areas that require adjustment. This work is currently underway with a projected completion date of Q2 2009.

Management is proposing to implement an Environmental Management System for all wastewater services. The benefits of the proposed Environmental Management System (which is modelled on the ISO 14000 standard) include:

- Reassuring customers of our commitment to demonstrable environmental management;
- Reducing and avoiding incidents that could result in liability;
- Facilitating compliance with all regulations, permits and authorizations;
- Helping improve public and community relations;
- Strengthening cost control;
- Conserving input material and energy;
- Fostering the development and sharing of environmental solutions; and,
- Improving relations with regulatory bodies.

These goals are attained through a Quality Management System model, which is centred around strategies to -- Plan, Do, Check and Improve. These improvements are similar to those recently implemented for the Drinking Water Quality Management System.

Key elements of the Quality Management System model include:

**Plan:**

- Risk-based environmental impact assessment of all ongoing operations;
- Development of a comprehensive and rigorous risk identification process looking at all services provided in wastewater collection and treatment. This includes risk identification and the establishment of clear objectives and targets for all identified environmental impacts.

**Do:**

- Strategies for risk avoidance including a thorough review of internal system planning, policies and procedures, organizational structure and responsibility, internal and external communications, operations and maintenance control activities, staff training, awareness and competence and emergency preparedness and response.

**Check:**
• Improved internal audit and reporting functions that can include external third party auditing and reporting; and,

Improve:

• A commitment from management to continually improve. This commitment includes an annual review of the results of operations, and an annual update on internal and external audits. There will also be a renewed commitment to service improvement strategies and an ongoing plan will be developed, implemented, and refreshed annually.
• The Environmental Management System will be developed incrementally with the first comprehensive internal audit complete by Q4 2010.

Recommendation 5
That the City review the reporting and communications protocols across all Departments to ensure proper and appropriate dissemination of information to executive management, Council and all regulatory bodies.

Management Response
Management agrees with this recommendation.

As has been previously reported to Council, significant improvement to communication protocols and training have already been developed and implemented within the branch. These protocols ensure that all interested parties, including the Public Health Branch, the Ministry of the Environment, downstream drinking water suppliers, senior management and Council, are promptly informed of any combined sewer overflows and sanitary sewage spills.

The communication protocol will be reviewed and included in the branch’s, department’s and, the Corporate Incident Escalation and Response plans. The branch will explore opportunities with the Corporate Emergency Management group to test this protocol using simulated exercises.

The development and implementation of a 360-degree communication strategy is a very important element of the Environmental Quality Management System as noted in the management response to Recommendation 4, and if approved, will be implemented within the branch and across departments. It is expected that this will be completed by Q2 2009.

Recommendation 6
That the City consider pursuing a complaint with the appropriate professional engineering association regarding the professional engineering staff identified in this report.
Management Response
Management agrees with this recommendation.

The City Solicitor will review the findings contained in the report, along with the provisions of the Professional Engineers Act and regulations and the associated definition of “professional misconduct”, as well as all other relevant factors, and will provide a legal opinion to the City Manager in this regard.

Conclusion
The August 2006 sewage spill was the result of long-standing inadequacies in the operation and maintenance of these regulators. The reduction in the frequency of inspections, the disabling of the alarm system, the lack of attention to legislative and job requirements and the absence of proper preventative maintenance procedures made such an event inevitable. Given these shortcomings, it is entirely likely that similar events have also occurred in the past. Furthermore, the magnitude of the August 2006 event was never recognized and, even now, it is unclear if the significance of such events on river water quality or public confidence is truly appreciated by all staff.

Acknowledgement
We wish to express our appreciation for the cooperation and assistance afforded the audit team by management and staff.
Résumé

Introduction
Cette vérification a été entreprise à la demande du Conseil, à la suite de rapports indiquant que les fermetures des plages de l’île Petrie au mois d’août 2006 avaient probablement été provoquées par un important déversement d’eaux usées non signalé au site du régulateur Keefer adjacent à l’intersection de la rue John et de la promenade Sussex.

Contexte
Le « réseau d’égout unitaire » a été conçu pour acheminer les eaux usées domestiques par temps sec et les eaux usées domestiques et les eaux de ruissellement lorsqu’il pleut. Le réseau d’égout unitaire de la Ville d’Ottawa a 18 sites de débordement connus, dont les 5 plus grands sont commandés par des régulateurs.

Ces régulateurs sont de simples dispositifs mécaniques qui fonctionnent à l’aide d’un système de vannes, de flotteurs, de poulies et de chaînes. Les cinq régulateurs fonctionnent selon le même principe et sont commandés par des vannes activées par des flotteurs. En bref, un flotteur garde ouverte la vanne à l’intérieur de chaque régulateur et agit comme contrepoids par temps sec. En s’ouvrant, la vanne achemine le débit de l’égout unitaire vers l’égout de sortie et l’usine de traitement de l’eau usée du Centre environnemental Robert-O.-Pickard (CEROP). Pendant un orage, comme le débit dans l’égout unitaire augmente, la vanne commence à s’abaisser vers la position fermée. Si le débit dans l’égout unitaire atteint une hauteur suffisante, la vanne se ferme complètement jusqu’à ce que le débit commence à redescendre. Pendant que la vanne commence à se fermer, elle force le débit dans l’égout de débordement et de là, dans la rivière.

Il importe de faire la distinction entre un débordement d’égout unitaire (DEU) et un déversement d’eaux usées. Un DEU, qui peut se produire pendant une précipitation et est le résultat du fonctionnement normal du régulateur, est autorisé par la conception du réseau d’égout unitaire (REU) utilisé dans ce secteur de la ville. Une fois passé le débit de pointe de la précipitation, le REU devrait reprendre son fonctionnement normal, acheminant le débit des eaux usées et des eaux pluviales vers l’usine de traitement de l’eau usée. Dans des conditions normales, le débordement de l’égout unitaire dans la rivière devrait s’arrêter là.

Par temps sec, aucun débit d’eaux usées ne devrait être déversé dans la rivière. Si cela se produit, il s’agit d’un déversement non autorisé et non d’un DEU. Par conséquent, dans le cas de l’événement d’août 2006, la partie initiale de l’événement (du 31 juillet au 3 août) était un débordement d’égout unitaire autorisé et son signalment au ministère de l’Environnement (MEO) ou à tout autre organisme n’était pas nécessaire. Le débit
qui s’est déversé dans la rivière du 4 au 15 août inclusivement était anormal et résultait d’une défectuosité du régulateur Keefer. Il s’agissait donc d’un déversement d’eaux usées qui devait être signalé immédiatement au ministère de l’Environnement de l’Ontario (MEO). Par la suite, on a découpé que le volume de ce déversement s’élevait à 764 millions de litres.

**Objectifs de la vérification**

Les objectifs de cette vérification étaient les suivants :
1. déterminer les raisons du déversement d’eaux usées d'août 2006;
2. examiner la réponse du personnel municipal, y compris les responsabilités en ce qui concerne les signalements, les méthodes et les protocoles de communication et leur amélioration;
3. passer en revue les responsabilités du personnel et de la direction en ce qui concerne l'inspection, l'entretien et les opérations;
4. passer en revue le niveau de formation du personnel municipal;
5. passer en revue les raisons du non-signalement du déversement;
6. passer en revue le système d'alarme, les inspections périodiques et les inspections d’urgence des régulateurs.

**Portée de la vérification**

La portée de la vérification comprenait les raisons du déversement d’eaux usées et les réactions du personnel municipal au déversement. La vérification comprenait les principales tâches suivantes :

1. l’examen du cadre législatif;
2. l’examen des informations documentaires;
3. des entrevues avec le personnel municipal et les représentants du MEO concernés par le projet;

**Sommaire des principales constatations**

**Chronologie des événements**

Le tableau ci-dessous récapitule brièvement, sous forme chronologique, les principaux événements du déversement d’eaux usées qui s’est produit en août 2006 au site du régulateur Keefer :

<table>
<thead>
<tr>
<th>Date</th>
<th>Événements clés</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 juillet 2006</td>
<td>Début de la précipitation tard dans la soirée.</td>
</tr>
<tr>
<td>3 août 2006</td>
<td>Les précipitations se sont arrêtées, mais le régulateur Keefer n’est pas revenu à son état d’avant l’orage permettant aux débits de</td>
</tr>
<tr>
<td>Date</td>
<td>Événements clés</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 15 août 2006     | - Un technicien du personnel note une anomalie dans les données de surveillance du débit et se rend sur place pour vérifier que le débit se fait par le tuyau menant à la rivière.  
|                  | - Le technicien communique par courriel avec son superviseur, deux autres superviseurs et le gestionnaire de section, les informant du défaut de fonctionnement.  
|                  | - Le superviseur des opérations dépêche une équipe sur place pour réparer le régulateur et le débit vers la rivière s’interrompt.  |
| Mi-mars 2007     | - Un ingénieur principal de la Direction des services d'infrastructure (DSI) note une anomalie dans les données de débit d'août 2006.  
|                  | - L'ingénieur entre en contact avec les Opérations et reçoit la confirmation de la fermeture du régulateur qui a été réparé le 15 août 2006.  
|                  | - L'ingénieur contacte par courriel le gestionnaire, Division des services de drainage et traitement des eaux usées (SDTEU) et le gestionnaire de programme des SDTEU et les informe de la situation.  |
| 23 avril 2007    | - Discussion entre l’ingénieur municipal et l’ingénieur du MEO.  
|                  | - L’ingénieur avise le MEO que l événement serait documenté dans le prochain rapport annuel 2006 sur les DEU.  
|                  | - L’ingénieur estime l’ampleur du déversement à quelque 1 milliard de litres.  |
| 1 mai 2007       | - DSI fournit à SDTEU des informations détaillées duquel peut être préparé le rapport du régulateur Keefer.  |
| 2 mai 2007       | - Le gestionnaire des SDTEU demande à son gestionnaire de programme de préparer un rapport au MEO décrivant l événement en 2006, qui serait fait indépendamment du rapport de DEU préparé par la DSI.  |
| 16 mai 2007      | - Le gestionnaire de programme des SDTEU envoie une lettre au MEO avec copie au gestionnaire des SDTEU et au gestionnaire, Gestion de l’infrastructure concernant la défectuosité du régulateur Keefer et déclarant que l incident n’a jamais été signalé officiellement au MEO.  |
| 2 avril 2008     | - L’ingénieur principal de la DSI est au courant d’un rapport de Santé publique (SP) sur les plages.  
|                  | - L’ingénieur appelle l’analyste de Santé publique concernant la corrélation possible entre les fermetures de plages et les débordements et le déversement d’août 2006.  
|                  | - Le directeur du service de gestion de l’eau et des eaux usées (SGEEU) reçoit une copie du courriel de l’ingénieur principal à la Division des SDTEU concernant le lien entre les débordements et les fermetures de plages et l’informer de la demande de SP d’être avertie des déversements.  
|                  | - Le directeur SGEEU demande au gestionnaire SDTEU un rapport sur l’incident cette même journée.  
|                  | - Le gestionnaire des SDTEU demande à son gestionnaire de |
Vérification du déversement d’eaux usées 2006

<table>
<thead>
<tr>
<th>Date</th>
<th>Événements clés</th>
</tr>
</thead>
</table>
| 3 avril 2008 | ▪ Le directeur de SGEEU assiste à une discussion d’un comité sur le Rapport sur les plages pour 2007 de SP. Nombreuses discussions s’afférent à :  
  ▪ L’impact des DEU;  
  ▪ Les eaux de ruissellement non-traitées  
  ▪ Une étude d’Environment Canada (La présence de la bactérie e-coli décelé par EC n’indique pas un piètre rendement à CEROP pendant les orages. En fait, la présence de EC ne distingue pas entre les bactéries revivifiables et non-revivifiables.)  
  ▪ Le directeur SGEEU indique que les délais de mise en service de digesteur à CEROP et aux facilités de gestion des déchets de Lemieux et Britannia n’a pas eu de répercussion négative sur l’île Pétrie.  
  ▪ Aucune mention du lien entre l’événement d’août 2006, les DEU et les fermetures de plages. |
  ▪ Aucune mention du lien entre l’événement d’août 2006, les DEU et les fermetures de plages. |
| 7 mai 2008  | ▪ Pendant une visite de l’usine de traitement, le gestionnaire des SDTEU informe le conseiller Monette que les problèmes survenus à l’île Petrie en 2006 étaient probablement le résultat de l’événement d’août 2006 au régulateur Keefer. |
| 13 mai 2008 | ▪ Le directeur municipal adjoint (DMA) de Services et Travaux publics est mis au courant pour la première fois du déversement d’août 2006, par le directeur de SGEEU. |
| 20 mai 2008 | ▪ Le DMA soumet une déclaration au Conseil pour expliquer l’événement de 2006 et indique qu’on l’a signalé au MEO peut de temps après la découverte du débordement. |
| 22 mai 2008 | ▪ Le DMA publie une note de service « Chronologie des événements du déversement d’eaux usées qui s’est produit en août 2006 au site du régulateur Keefer. |
| 27 mai 2008 | ▪ Le DMA soumet une nouvelle déclaration au Conseil rétractant l’affirmation que le déversement a été signalé au MEO lorsqu’il a eu lieu, en août 2006. |

L’événement du déversement d’eaux usées d’août 2006 au site du régulateur Keefer était le résultat d’un manque presque complet d’entretien préventif adéquat et de gestion proactive de ces installations. À l’événement et à la prise de mesures correctives a succédé une culture marquée par l’incompréhension de la signification des déversements d’eaux usées, et l’événement 2006 n’a été jamais vu comme digne d’attention. À notre avis, c’est un cas d’incompétence des gestionnaires concernés dans
l'exécution de leurs fonctions. L'événement n'a jamais remonté la hiérarchie pour être signalé par les gestionnaires à leurs supérieurs et à la haute direction, comme on pourrait s'y attendre vu l'importance du déversement. De plus, l'événement n'a pas été signalé au MEO - comme l'exige la loi - avant un délai de 8 à 9 mois. Seul le personnel de première ligne déployé pour réparer la défectuosité du régulateur peut être considéré comme ayant fait efficacement son travail dans ce cas-ci, en le réparant dans un délai de quelques heures après avoir été mis au courant de la situation. De même, l’ingénieur principal qui a signalé le déversement au MEO en avril 2007 s’est acquitté de ses tâches et a exercé ses responsabilités.

**Entretien**

En juillet 1970, l'Association américaine des travaux publics (APWA) a signalé que les régulateurs à vannes actionnées par des flotteurs exigent un programme d'entretien préventif continu pour fonctionner correctement. Il y a presque 40 ans, l'APWA recommandait des inspections hebdomadaires et après chaque orage, et en aucun cas moins de deux fois par mois et après chaque orage. Elle a aussi recommandé qu’à chaque inspection, on actionne la vanne durant un cycle complet de fermeture et d'ouverture; qu’on nettoie le puits de flotteur du sable, des boues et des débris qui pourraient s’y trouver; qu’on lubrifie les chaînes et les engrenages; et qu’on remplace toutes les pièces très usées ou corrodées.

Une évaluation de l’état du régulateur Keefer remontant à 1992 a établi les points suivants :

- C'est le plus grand système de vannes et de flotteurs;
- Un système de rampes était nécessaire au fond;
- Le système de poulies et d'axes était corrodé;
- Les chaînes, la vanne et le flotteur étaient en bon état;
- Le poteau vertical du flotteur devait être remplacé;
- Les paliers étaient en bon état, mais présentaient des problèmes de sécurité;
- La grille était trop lâche en bas de l'échelle;
- Le béton était en bon état.

La prochaine évaluation complète de l’état de ces régulateurs n’a pas été effectuée avant juin 2008, 16 ans plus tard. Elle a indiqué que :

- Dans la plupart des cas, la chaîne n’est pas de la bonne dimension, et ne repose donc pas correctement sur les pignons de roue;
- Les appuis en acier de la poutre en I sont en très mauvais état;
- Les paliers de battement sont en mauvais état ou sont coincés;
• Les verrous à chaîne sont mal placés, et font peser le poids de la chaîne sur les verrous, qui ne sont pas conçus pour cela;

• Les vannes et les flotteurs de régulateur sont très rouillés;

• Les poteaux-guides des flotteurs manquent dans certains cas (le régulateur Keefer en est un);

• Dans tous les cas, l'accès aux chambres est serré, surtout si on tient compte de la quantité d'équipement de sécurité que doivent porter les opérateurs.

Le 20 mai 2008, la direction avait indiqué au Conseil que, après le signalement du déversement de 2006 au MEO en mai 2007, on avait commencé à prendre des mesures correctives. En fait, aucune mesure corrective n'a jamais été prise à ce moment là, telle qu'indiqué dans la note de service au Conseil en date du 22 mai 2008. Si une telle mesure avait été prise, il est peu probable que le régulateur Keefer aurait fait défaut de nouveau par la suite durant l’été 2008.

Sécurité
En raison du manque d'entretien efficace de cet équipement, un certain nombre de préoccupations concernant la sécurité ont persisté, y compris :

• le manque d’éclairage;
• la mauvaise qualité de l’air;
• des niveaux élevés de bruit;
• aucune plateforme pour l'inspection des mécanismes de levage des flotteurs et des vannes;
• l’infiltration d'eau;
• le câblage électrique non protégé.

Ces informations ont été fournies au directeur municipal en août 2008, après avoir été portées à l'attention du vérificateur général.

Inspections
Peu de temps après la fusion, la fréquence d’inspection des régulateurs a été réduite à une fois par mois seulement, et pas après les précipitations, contrairement aux recommandations de l'APWA, soit une fois par semaine et après chaque précipitation. La raison donnée pour la réduction des inspections était le manque de ressources, cependant, l'unité de collecte des STEUD a enregistré un surplus budgétaire de quelque 563 000 $ en 2005, de 1,88 million de dollars en 2006 et de 667 000 $ en 2007. Le surplus budgétaire au niveau de la division était encore plus élevé, soit 1,9 million en 2005, 4
millions en 2006 et 3,6 millions de dollars non dépensés en 2007. Nous estimons que le coût de l’augmentation de la fréquence d’inspection au niveau recommandé par l’APWA à environ 110 000 $ par an ce qui, compte tenu de ces surplus, aurait pu être absorbé aisément par le budget existant.

Cette fréquence d'inspection est lamentablement inadéquate et d’autant plus inquiétante que les régulateurs n’avaient pas été entretenus adéquatement depuis leur installation, bien que des rapports datant de 1995 aient signalé qu’ils avaient atteint leur durée de vie prévue et devaient être remplacés. En plus de la fréquence d’inspection insuffisante, le travail effectué lors des inspections était le strict minimum et se limitait à l’application de graisse sur les joints et la chaîne, au nettoyage de toutes les pièces, y compris le flotteur et la chambre de flotteur, et au serrage des boulons.

La faible fréquence d’inspection a empêché la découverte du défaut de fonctionnement de la vanne durant plus de 10 jours en août 2006. Si la procédure avait été d’inspecter les régulateurs après chaque orage, selon la norme en vigueur dans l’industrie, le défaut de fonctionnement aurait été décelé moins de 24 heures après la fin de la précipitation. Ainsi, le volume de déversement d’eaux usées aurait été de moins d’un dixième du volume déversé.

**Alarmes**

L'ancienne municipalité régionale d'Ottawa-Carleton (MROC) avait installé un système d’avertisseurs sur ces régulateurs. Les alarmes étaient reliées aux téléavertisseurs des gestionnaires de programme et des superviseurs du réseau d’entretien des égouts. Les alarmes se déclenchaient souvent et un certain nombre de fausses alertes ont eu lieu. Peu de temps après la fusion, on a laissé le système d’alarme faire défaut et on ne l’a jamais réparé. Lors des entrevues menées dans le cadre de la vérification, le gestionnaire des STEUD et le gestionnaire de programme, Entretien des égouts, ont reconnu leur responsabilité quant à la décision de réduire la fréquence d’inspection et de ne pas remplacer le système d’alarme.

**Raisons du déversement d’eaux usées**

Dans l’ensemble, il est clair que cet équipement n'a pas été entretenu ni inspecté correctement. Le programme d'entretien n'était aucunement basé sur des inspections périodiques, l’évaluation planifiée de l’état, l’établissement de priorités de renouvellement en fonction du risque ou le calcul du coût des options de renouvellement en fonction du cycle de vie. Comme le montre le manque d'entretien du régulateur Keefer, le fait que la vanne est restée coincée en position fermée lors des orages du 31 juillet au 2 août 2006 n’est pas extraordinaire. En fait, le mécanicien du personnel qui a fait l’inspection de l’état en juin 2008 a dit qu’il « n’était pas étonné » que ce régulateur ait fait défaut étant donné son état actuel.
Commande en temps réel

Le projet de « commande en temps réel », sous la forme présentée par la direction, vise à réduire le volume de débordements d’égout unitaire à la rivière Outaouais et d’accroître la capacité de la Ville à surveiller et à réguler en temps réel les débits dans le réseau d’égout unitaire. Une fois le projet réalisé, l’objectif poursuivi est d’empêcher les déversements d’eaux usées et de réduire sensiblement les débordements d’égout unitaire.

La commande en temps réel et les mises à niveau des régulateurs sont des priorités reconnues depuis près de 10 ans. Le projet a fait l’objet d’un financement pour la première fois en 1999.

Dans le budget d’immobilisations inaugural de la Ville d’Ottawa nouvellement fusionnée (2001), on a établi les mises à niveau des régulateurs comme des priorités (11e) dans le Programme d’égout sanitaire de réseau séparatif. À ce moment-là, le projet a été décrit comme « le remplacement/la mise à niveau, l’achèvement de la conception, la construction des structures et l’exécution d’une stratégie de commande en temps réel visant à assurer une approche intégrée à l’exploitation du système ». On s’attendait à ce que le projet soit achevé en 2003 à un coût total estimé à 9,7 millions de dollars. Le Conseil a approuvé un financement total de plus de 1 million de dollars avant l’achèvement du projet en 2003, date à laquelle aucun des fonds approuvés n’avait été dépensé.

En 2005, le projet de Mise à niveau de régulateur et de commande en temps réel a refait surface dans le budget d’immobilisations. En 2006, ce projet a été défini comme la priorité absolue du Programme de gestion de secteur relatif au réseau d’égout unitaire. Le budget d’immobilisations 2007 a énuméré six secteurs précis où « la commande en temps réel des débordements d’égout unitaire » serait mise en application. Ces endroits sont les régulateurs Booth - Wellington; Lloyd - Booth; Lloyd - Preston; Keefer; Canal Rideau; et Cathcart. Jusqu’ici, ce projet dispose d’un budget approuvé de 20,45 millions de dollars, dont 3,7 millions ont été dépensés et 13,8 millions, engagés. La plupart des sommes engagées (90 %) concernaient deux contrats en 2008 et 2009. La direction estime maintenant que le projet sera achevé d’ici 2010.

Exigences législatives

Un des nombreux instruments législatifs fédéraux et provinciaux régissant le fonctionnement d’un réseau d’égout est le Règlement de l’Ontario 129/04 sur la délivrance des permis d’exploitation de réseaux d’égout, lequel prévoit que :

1. Le propriétaire désigne un exploitant responsable en chef (EREC), ayant un permis valide concernant ce type d’installation;
2. Si l’EREC est absent, il désigne un exploitant général (EG) ayant un permis qui est soit de même catégorie, soit de catégorie supérieure à celle de l’installation;

3. Le propriétaire s’assure que les registres ou autres méthodes de tenue d'archives sont fournis et que les entrées suivent l’ordre chronologique;

4. Seul l’EG peut consigner une entrée dans le registre;

5. Les données précises pour chaque quart sont consignées dans le registre, y compris :

   i. Toute dérogation aux procédures de fonctionnement habituelles pendant le quart, et l’heure à laquelle elle a eu lieu.

   ii. Toute instruction spéciale donnée pendant le quart de déroger aux procédures de fonctionnement habituelles et le nom de la personne qui a donné l’instruction.

   iii. Toute situation inhabituelle ou anormale observée dans l’installation pendant le quart, toute mesure prise et toute conclusion tirée des observations.

   iv. Tout matériel mis hors service ou qui a cessé de fonctionner pendant le quart et toute mesure d’entretien ou de réparation prise pendant le quart.

6. On conserve les entrées pendant deux ans;

7. Le propriétaire de l’installation s’assure que les exploitants et le personnel d'entretien de l’installation ont un accès facile aux manuels complets de fonctionnement et d'entretien qui contiennent des plans, des schémas et des descriptions des processus suffisantes pour l'opération sécuritaire et efficace de l’installation.

À la Ville d'Ottawa, en août 2006 :

1. L’EREC n’avait été jamais désigné; plutôt, les exploitants ont fait des hypothèses sur son identité à l’époque;

2. L’EG pour chaque quart n’a jamais été clairement désigné;

3. Aucun registre n’était tenu dans la section de l’entretien des égouts.

4. Aucun manuel complet de fonctionnement et d'entretien, y compris des plans, schémas, et descriptions de processus n'avait été rédigé;

5. Aucune procédure de sécurité n'avait été élaborée pour l'accès aux chambres des régulateurs;

6. La Division des programmes environnementaux et du soutien technique n'a exercé aucun rôle dans la surveillance de la conformité à la loi, ni émis aucune
politique, procédure ou protocole pour la gestion de l'entretien du réseau de
collecte d’eau usée;

7. Il n’existait pas de procédure écrite dans le manuel de fonctionnement et
d’entretien pour l’entretien des régulateurs;

8. Le protocole de l’avis de déversement était celui préparé par la MROC avant la
fusion et s’est révélé très imprécis, notamment en ce qui concerne la définition
d’un déversement et le moment où il doit être signalé.

Cette situation n’a pas été changée à la Ville jusqu’au mois de juin 2008.

Principales responsabilités de la direction

La structure organisationnelle des SDTEU en ce qui concerne la collecte d’eaux usées
comprend trois postes de direction, en plus du superviseur des opérations. Ces postes
sont dotés d’ingénieurs :

- Gestionnaire, Services de drainage et traitement des eaux usées (Désignation
professionnelle d’ingénieur requise);
- Gestionnaire de programme, Collecte des eaux usées (Désignation professionnelle
d’ingénieur requise);
- Gestionnaire de section, Entretien des égouts.

Les descriptions de fonction indiquent clairement que les titulaires de ces postes sont
responsables, entre autres, des fonctions suivantes :

- Élaborer et maintenir une approche proactive à la maîtrise des pertes (c.-à-d.
réduction des risques, responsabilité, sécurité, etc.);
- Assurer que des systèmes de gestion de l’entretien sont en place et fonctionnent
de manière efficace pour assurer la conformité aux lois en vigueur, y compris :
  - Passer en revue l’ensemble des lois, règlements et processus réglementaires en
vigueur;
  - S’assurer que le personnel connaît les lois applicables, les modifications aux
lois et règlements, les responsabilités prévues par la loi et les conséquences du
non-respect des lois;
  - Surveiller la gestion du réseau de collecte des eaux usées;
  - S’assurer que le personnel a reçu et utilise l’équipement, le matériel, et/ou les
procédures adéquats nécessaires à l’exécution des tâches qui lui sont
assignées.

À notre avis, comme le gestionnaire de section, Entretien des égouts, est le titulaire du
poste professionnel le plus proche du personnel de première ligne et qu’il est le seul
ayant une accréditation du MEO de « catégorie 4 », la responsabilité principale de
s’assurer que des procédures adéquates de fonctionnement et d’entretien sont en place lui incombe. La direction d’Eau et Eaux usées et des Services d’infrastructure a déterminé ce poste comme exerçant la première responsabilité de l’entretien de cet équipement. Cependant, ce gestionnaire n’a pas élaboré de méthodes d’entretien ou de procédures opératoires, ni de politiques d’opération et de programmes de travail visant l’entretien et l’inspection adéquats des régulateurs; ne s’est pas assuré que les employés ont reçu et utilisent l’équipement, le matériel et les procédures adéquats nécessaires à l’exécution des tâches qui leur sont assignées; et n’a pas suivi les politiques et procédures générales et des services de la Ville d’Ottawa.

De façon générale, on peut conclure que ni le gestionnaire des STEUD, ni le gestionnaire de programme, Collecte des eaux usées, ni le gestionnaire de section, Entretien des égouts n’ont accompli les tâches requises par leurs postes respectifs en ce qui concerne le réseau de collecte d’eau d’égout. À notre avis, leur échec à accomplir ces tâches de manière correcte et complète était responsable du défaut de fonctionnement du mois d’août 2006, de la durée de ce défaut de fonctionnement et de l’omission d’aviser le MEO du déversement d’eaux usées. À notre avis, ces ingénieurs ont possiblement failli à leurs obligations telles qu’il est requis en vertu de la Loi sur les ingénieurs. En vertu de ladite loi, un manquement professionnel se définit, entre autre, comme « l’omission de prendre des dispositions responsables afin de se conformer aux lois, règlements, normes, codes, règlements municipaux et règles applicables connexes au travaux effectués par l’ingénieur ou sous sa responsabilité. »

Enfin, la structure linéaire de ce secteur, avec trois niveaux hiérarchiques entre le gestionnaire de la division et les superviseurs de première ligne, est un facteur qui a contribué à l’échec des communications sur les événements d’août 2006 et l’absence de procédure opératoire adéquate. Cette structure devrait être revue afin d’améliorer la communication et d’accroître la surveillance administrative.

**Déversements additionnels d’eaux usées**


Dans le cadre de cette vérification, le vérificateur général a aussi examiné ces données relatives à la surveillance du débit ainsi que les ordres de travail émis par l’Unité de la

La direction est en accord avec l’un des quatre déversements additionnels et en a fait le signalement au MEO le 17 octobre 2008 suite à la vérification. Tout au long de la vérification, la direction a disputé que les trois autres incidents identifiés par le vérificateur général étaient des déversements. Cependant, le 17 octobre 2008, la direction a découvert et fournit au vérificateur général au rapport d’incident au MEO en date du 4 avril 2005 concernant l’un de ces événements. À cette époque, l’événement avait effectivement été considéré un déversement et avait été signalé au MEO par le superviseur, opérations et entretien des d’égouts. La direction maintient que les deux autres incidents ne sont pas des déversements.

Les données de débit citées ci-dessus sont produites par des sondes placées dans les chambres de régulateur. Ces sondes permettent la surveillance quotidienne des débits, de sorte que toute anomalie dans le débit des eaux usées puisse être rapidement décelée et étudiée pour prévenir les débordements. Dans les faits, les sondes sont fonctionnelles à deux sites sur cinq seulement et les données n’ont jamais été produites ou n’ont jamais été utilisées pour la surveillance du débit quotidien des déversements d’eaux usées. La détection des débits inhabituels en août 2006 est le fait du technicien qui s’est aperçu d’une anomalie par hasard et a averti les opérations d’un problème éventuel.

**Communications et signalement des déversements d’eaux usées**

À notre avis, le personnel des Opérations n’a pas reçu de directive claire concernant les circonstances dans lesquelles un DEU devient un déversement d’eaux usées. De plus, aucune disposition du protocole périmé n’exige que l’opérateur enregistre le numéro d’incident fourni par le MEO. Nous en concluons que la responsabilité du signalement des déversements avait été déléguée de façon non officielle au superviseur de l’entretien des égouts, mais de telle sorte qu’il croyait uniquement devoir signaler les cas où il était à l’origine du déversement, comme lorsqu’il a ouvert la vanne à la structure de Wellington-rue Booth pour relâcher la pression de crue dans le collecteur Nepean Ouest. La transmission des instructions relatives au signalement ne précisait pas clairement que les déversements d’eaux usées dus à une vanne de régulateur fermée ou partiellement fermée comptaient parmi les incidents à signaler.

Il est évident que, avant mai 2008, le personnel et la direction ne voyaient pas un débordement d’eau d’égout attribuable à un régulateur défectueux comme un déversement d’eaux usées, mais bien un DEU, ce qui dénote une culture organisationnelle qui, à notre avis, néglige de considérer certains événements comme digne de mention, mais plutôt comme faisant partie du cours normal des opérations.
L’attitude et la culture existantes et l’absence de protocole efficace de signalement et de transmission qui en découle ont non seulement causé le non-signalement de l’événement d'août 2006 au MEO, mais elles ont aussi eu comme conséquence qu’il n’a pas été communiqué de manière adéquate aux niveaux supérieurs de l'organisation. Il est intéressant de noter que les participants à la réunion du 25 mars 2008 de l'Association communautaire de Fallingbrook ont été mis au courant de l'événement et de son lien probable avec les fermetures de plages de l'île Petrie par un ingénieur municipal (et membre de l'Association communautaire). En d'autres termes, les participants à cette réunion ont été informés de l'événement et de ses conséquences probables avant même le Directeur du service d’eau et d'épuration des eaux usées, le Directeur du service d’infrastructure, le Directeur municipal adjoint, le directeur municipal ou le Conseil.

**Recommandations**

**Recommandation 1**

Que la Ville mette immédiatement en œuvre les normes et procédures d'entretien des régulateurs selon les recommandations de l'APWA et les exigences législatives.

**Réponse de la direction**

La direction accepte cette recommandation.

Avec les protocoles et les procédures en vigueur, les problèmes repérés sont rapidement résolus et les risques sont éliminés. L’une des responsabilités essentielles de la direction est de procurer un milieu de travail sûr grâce à la fois à l’élimination des risques, ainsi qu’à du matériel de sûreté, à des politiques et procédures et à une formation appropriés.

Les manuels des opérations et de l’entretien seront réexaminés compte tenu de l’évaluation des risques afin que nous puissions établir un ordre de priorité pour l’examen et le renforcement des pratiques actuelles.

Une fois l’approbation obtenue dans le budget de 2009, la direction élaborera et mettra en œuvre en tout premier lieu un système de gestion de la qualité de l’environnement. L’un des avantages de l’adoption d’un système de gestion ISO (Organisation internationale de normalisation) est la relative facilité de le développer pour y intégrer d’autres systèmes de gestion, notamment en matière de sécurité. Pendant l’élaboration et la mise en œuvre du système de gestion de la qualité de l’environnement, la direction déterminera s’il est nécessaire d’élaborer un système de gestion de la qualité connexe axé expressément sur les aspects de sécurité.

**Recommandation 2**

Que la Ville traite de toutes les questions de sécurité liées aux régulateurs.

**Réponse de la direction**

La direction accepte cette recommandation.
Avec les protocoles et les procédures en vigueur, les problèmes repérés sont rapidement résolus et les risques sont éliminés. L’une des responsabilités essentielles de la direction est de procurer un milieu de travail sûr grâce à la fois à l’élimination des risques, ainsi qu’à du matériel de sûreté, à des politiques et procédures et à une formation appropriés.

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**Recommandation 3**
Que la Ville assure la surveillance efficace des données de débit afin de déceler les anomalies, d’effectuer des enquêtes et de prendre des mesures de remédiation nécessaires en temps opportun.

**Réponse de la direction**
La direction accepte cette recommandation.

La Ville a adopté un certain nombre de changements pour améliorer la stratégie antérieure de surveillance du débit. Le personnel dispose maintenant de données sur le fonctionnement des régulateurs et/ou des émissaires d’évacuation de sorte qu’il peut assurer une surveillance 24 heures sur 24, 7 jours sur 7, des cinq sites surveillés après les précipitations et, au besoin, prendre les mesures nécessaires. On a aussi mis en place un système intérimaire de surveillance qui sera remplacé d’ici le milieu de 2009 par un système amélioré permanent de surveillance en temps réel des trois plus gros émissaires d’évacuation.

Comme nous l’avons mentionné précédemment, la direction propose la mise en place d’un système de gestion de la qualité de l’environnement qui sera utilisé pour l’ensemble des services des eaux usées. L’un des volets importants de ce travail consistera à déterminer quels sites comportent un risque élevé d’effets sur l’environnement. Parmi ces sites, il y a ceux où se trouvent des réseaux combinés de débordement des égouts et leurs régulateurs associés. La surveillance constante des sites sera un moyen important pour le personnel de minimiser le risque d’autres incidents.

Dans le budget tarifaire de 2009, le personnel a demandé une autorisation de 5 millions de dollars pour évaluer la stratégie actuelle de surveillance et entreprendre
les travaux d’amélioration recensés de l’infrastructure des autres émissaires d’évacuation et déversoirs outre ces sites, qui auront la priorité pour les réinvestissements dans l’équipement dans le cadre du projet de contrôle en temps réel. Une évaluation fondée sur les risques de ces sites sera entreprise concurremment avec l’élaboration et la mise en œuvre du système de gestion de la qualité de l’environnement mentionnée à la quatrième recommandation. Si elle est autorisée, cette évaluation devrait être terminée d’ici le deuxième trimestre de 2009.

**Recommandation 4**
Que la Ville révise la structure organisationnelle des STEUD pour assurer le maintien d’une communication et d’une surveillance opérationnelle adéquates.

**Réponse de la direction**
La direction accepte cette recommandation.

Un certain nombre de mesures ont déjà été prises afin que les problèmes précédents de surveillance du fonctionnement et de communication aient été entièrement réglés. En outre, la direction a retenus les services de SP3 Consultants pour faire l’évaluation de l’ensemble de la Direction. Les cadres pourront ainsi mieux connaître les points forts actuels de la structure organisationnelle et déterminer quels autres aspects doivent être améliorés. Ce travail est actuellement en cours et la date d’achèvement prévue est le deuxième trimestre de 2009.

La direction propose la mise en œuvre d’un système de gestion de l’environnement pour tous les services des eaux usées. Les avantages du système de gestion de l’environnement proposé (qui s’inspire de la norme ISO 14000) sont les suivants :

- rappeler à notre clientèle notre détermination à assurer une gestion concrète de l’environnement;
- réduire et éviter les incidents qui pourraient nous exposer à des poursuites;
- faciliter l’observation de tous les règlements, permis et autorisations;
- contribuer à améliorer les relations avec le public et les citoyens;
- renforcer le contrôle des coûts;
- économiser les matières premières et l’énergie;
- favoriser l’élaboration et la mise en commun de solutions pour l’environnement;
- améliorer les relations avec les organismes de réglementation.

Ces buts pourront être atteints grâce à un système de gestion de la qualité axé sur des stratégies de planification, d’exécution, de vérification et d’amélioration. Ces améliorations sont semblables à celles qui ont été apportées récemment pour le système de gestion de la qualité de l’eau potable.

Voici les principaux éléments du système de gestion de la qualité :
Planification :

• Évaluation de l’effet sur l’environnement en fonction du risque pour toutes les opérations en cours;
• élaboration d’un processus complet et rigoureux de recensement des risques permettant d’examiner tous les services fournis pour la collecte et le traitement des eaux usées, ce qui comprend le recensement des risques et l’établissement d’objectifs et de cibles bien définies pour tous les effets connus sur l’environnement.

Exécution :

• Stratégies visant à éviter les risques, c’est-à-dire l’examen approfondi des activités internes de planification des systèmes, des politiques et des procédures, de la structure organisationnelle et des responsabilités, des communications internes et externes, des opérations et des activités de contrôle de l’entretien, de la formation, de la sensibilisation et de la compétence du personnel, ainsi que de la capacité d’intervention en cas d’urgence.

Vérification :

• Amélioration des fonctions de vérification interne et de présentation de l’information, ce qui peut comprendre l’exécution de ces fonctions par des tierces parties externes.

Amélioration :

• L’engagement de la direction à apporter constamment des améliorations. Il s’agit notamment de faire l’examen annuel des résultats des opérations et de faire le point annuellement à la suite des vérifications internes et externes. La direction devra aussi renouveler constamment son engagement à améliorer les services et à maintenir un plan qui doit être élaboré, mis en œuvre et mis à jour annuellement.

Le système de gestion de l’environnement sera élaboré progressivement et la première vérification interne globale sera faite d’ici le quatrième trimestre de 2010.

Recommandation 5
Que la Ville passe en revue les protocoles de signalement et de communication entre tous les services afin d’assurer la diffusion adéquate de l’information à la haute direction, au Conseil et à tous les organismes réglementaires.

Réponse de la direction
La direction accepte cette recommandation..

Comme il a été mentionné précédemment au Conseil, les protocoles de communication et la formation ont déjà été bien améliorés au sein de la Direction.
Ces protocoles visent à ce que toutes les parties intéressées, c. à d. la Direction générale de la santé publique, le ministère de l’Environnement, les fournisseurs d’eau potable en aval, la haute direction et le Conseil, soient rapidement informés à la fois des débordements d’égouts sanitaires et des déversements d’eaux usées.

Le protocole de communication sera examiné et inclus dans les plans de mesures progressives et d’intervention en cas d’incident de la Direction, du Service et de la Ville. La direction examinera avec le groupe de gestion des interventions en cas d’urgence de la Ville les possibilités de mise à l’essai de ce protocole dans le cadre de simulations.

L’élaboration et la mise en œuvre de la stratégie de communication tous azimuts est un élément très important du système de gestion de la qualité de l’environnement, ainsi qu’il est mentionné dans la réponse de la direction à la quatrième recommandation et, si elle est approuvée, elle sera mise en œuvre dans la Direction et dans l’ensemble des services. Elle devrait être achevée d’ici le deuxième trimestre de 2009.

**Recommandation 6**

Que la Ville considère déposer une plainte auprès des ordres des ingénieurs appropriés envers les ingénieurs professionnels identifiés dans ce rapport.

**Réponse de la direction**

La direction est d’accord à propos de cette recommandation.

Le chef du contentieux examinera les constatations contenues dans le rapport parallèlement aux clauses de la *Loi sur les ingénieurs* et de ses règlements d’application ainsi qu’à la définition de « manquement professionnel » qui s’y rattache, de même qu’à d’autres facteurs pertinents, et fera part d’une opinion juridique au directeur municipal à ce sujet.

**Conclusion**

Le déversement d’eaux usées d'août 2006 est le résultat d’insuffisances de longue date dans le fonctionnement et l'entretien de ces régulateurs. La réduction de la fréquence d’inspection, la neutralisation du système d’alarme, le manque d'attention porté aux exigences législatives et professionnelles, et l'absence de procédures d'entretien préventives adéquates ont rendu un tel événement inévitable. Étant donné ces lacunes, il est tout à fait probable que des événements similaires aient déjà eu lieu. De plus, l'importance de l'événement d'août 2006 n'a pas été évaluée et, encore maintenant, il est difficile de savoir si l’ensemble du personnel mesure véritablement l’effet de tels événements sur la qualité de l’eau de la rivière ou la confiance du public.

**Remerciements**

Nous tenons à remercier la direction pour l’aide et la collaboration qu’elle a apportées à l’équipe de vérification.
1 BACKGROUND

1.1 Audit
This Audit was undertaken at the request of Council, following reports that the closures of the Petrie Island Beaches in August 2006 were likely caused by a major unreported sewage spill at the Keefer regulator site adjacent to the John Street and Sussex Drive intersection.

1.2 Background Information

1.2.1 The System
When the original sewer system of the City of Ottawa was constructed, it was designed to collect both sanitary sewage and storm and snowmelt runoff. This type of sewer systems is called a combined sewer system (CSS) since it carries both dry-weather flow (the sanitary sewage) and wet weather flow (the storm and snowmelt runoff). The hydraulic capacity of the combined sewer system is capable of accommodating wet weather runoff a number of times greater than the dry weather flow.

Originally, the combined sewers in Ottawa discharged directly and without treatment to the Ottawa River. In 1949 the City of Ottawa started a program to intercept the flows in the combined sewers and to convey them to a sewage treatment plant near Green Creek, the location of the current sewage treatment plant, the Richard O. Pickard Environmental Centre (ROPEC). The interceptor outlet sewer and the modifications to the sewer system to enable interception of the flows were completed in 1961. The interceptor outlet sewer is located roughly parallel to the bank of the Ottawa River. Appendix A contains a description of the system.

The interceptor sewer was designed to accept the dry weather flow plus 2.5 times that flow during wet weather. However, during severe rain storms or in the event of significant snowmelt events, the flow in the combined sewers can exceed the hydraulic capacity of the interceptor sewer. Consequently, the combined sewer system is provided with a number of locations where the flow in excess of the capacity of the interceptor sewer is allowed to discharge to the river. These locations are called overflow sites.

The combined sewer system of the City of Ottawa has 18 known overflow sites, of which the largest five (in terms of overflow volume) are controlled by regulators, namely the Keefer, Lloyd-Booth, Kent Street, Rideau Canal, and Cathcart Regulators. Another regulator existed near the Lloyd-Booth regulator, called the Lloyd-Preston regulator.

Appendix A contains a description of the system.
In addition, a manually-operated gate exists at Wellington and Booth, which permits discharge of sewage to overflow in the event that the West Nepean Collector starts surcharging, to prevent basement flooding in the area.

1.2.2 The Regulators

The five regulators in the City operate on the same basis, controlled by float-activated gates. In simple terms, in each regulator the gate is maintained open by a float that acts as a counterweight to the gate during dry weather. When the gate is open, flow in the combined sewer is designed to flow through the gate opening, then through an orifice, into a vertical drop pipe and into the interceptor sewer. During a rain storm or snowmelt event, as the flow increases the orifice can accept flow only up to its design capacity. As the flow in the combined sewer continues to increase and the orifice cannot accept more flow, the water level in the chamber starts to rise, making the float rise with the rising water level. As the float rises it allows the gate’s weight to lower the gate toward its closed position. If the flow in the combined sewer is high enough, the gate will shut completely, until the flow in the combined sewer starts to go down. As the gate begins to close it will control how much of the flow can enter the chamber, forcing excess flow to continue into the overflow sewer and to the river. The overflow sewer is the original outfall sewer to the river, which existed in 1949 and was left in place for this purpose.

The float-operated regulator was favoured at the time of the design and installation because it does not require controls or electrical power to operate. It is a relatively simple mechanism, but as we discuss in Section 4.1 it requires significant maintenance.

A description of the regulators and their operation is included in Appendix B, and Appendix C presents photos of the Keefer Regulator taken in May 2008.

1.2.3 Combined Sewer Overflows and Sewage Spills

It is important to differentiate between a combined sewer overflow (CSO) and the sewage spill, sometimes called a sanitary sewage overflow (SSO). In essence, a CSO is a discharge of sewage and runoff during a wet-weather event; the combined sewer system is designed to operate this way. An SSO is a discharge of sanitary sewage during dry-weather conditions, whether accidental or planned, and it is not supposed to occur under normal conditions.

A combined sewer overflow (CSO) is a Class I spill that is permitted due to the design of the combined sewer system (CSS) used in this part of the City. Based on the background information reviewed, the CSS was designed to convey up to 2.5 times the dry weather flow to the sewage treatment plant (ROPEC) during rainstorms and snowmelt events (wet-weather flow). Excess flows in the CSS above this level are designed to be discharged untreated via the overflow sites to the Ottawa River. After
the rainstorm or snowmelt event peak flow, the CSS should return to normal operation in which the sewage and storm runoff are taken to the sewage treatment plant. Under normal conditions, the combined sewer overflow event should end at this point.

During dry weather there should be no flow discharged to the river from the combined sewer system. In a case where there is dry weather flow being directed to the river, accidentally or on purpose, the SSO discharge is an unauthorized spill. Therefore, in the case of the August 2006 event, the initial part of the event, from July 31 to August 2, was a combined sewer overflow, which is not subject to reporting as a spill (it is reported to the MOE as part of the City’s CSO report). The flow that discharged to the River from August 3 to August 15, inclusive, was abnormal because it occurred during dry weather flow; therefore, the discharge is an SSO and is a sewage spill, which must be reported to the Spill Action Centre of the MOE.

1.2.4 The Keefer Regulator

The Keefer Regulator and associated works were constructed in 1961, when the interceptor sewer was constructed to intercept the flow from sewers that used to discharge directly to the Ottawa River. As the other regulators, the Keefer Regulator is a float-operated regulator, a semi-automatic control device that operates without a motor and without manual input. The principle of the regulator is that as the flow in the combined sewer increases beyond a given level, the water level in the sewer lifts the float, which as it rises permits the closure of the regulator gate. The regulator gate closure restricts the flow that can enter the interceptor sewer, thus permitting that the flow in the interceptor does not exceed its hydraulic capacity. When the flow in the sewer recedes, the float goes down, lifting the gate to permit flow to the interceptor.

When the regulator gate is operated to restrict the flow into the interceptor sewer, the excess flow is discharged in the John Street overflow sewer to the Ottawa River. The Wastewater and Drainage Division maintains a water level monitoring station on the John Street overflow sewer.

1.2.5 The Sewage Spill Incident

On July 31, 2006, the Ottawa MacDonald-Cartier International Airport weather station recorded 9.2 mm of rainfall, followed by 21.2 mm and 32.4 mm on August 1 and 2. As a result of the rain, the flow in the combined sewer system increased substantially above the dry weather flow. The flow in the combined sewer system was sufficiently high to close the regulator gate at the Keefer Regulator. The gate malfunctioned and although it was supposed to open after the rain ended, it remained closed, blocking the flow of sanitary sewage to the interceptor sewer, forcing the sewage flow to the overflow sewer and thence to the Ottawa River. The gate remained closed until about 3:40 p.m. on August 15, 2006, when a City sewer maintenance crew opened it again and removed a
substantial amount of silt and sand that had accumulated behind the gate. This action stopped the sewage spill.

1.2.6 Petrie Island Beaches Closure

High levels of E. coli were recorded at Petrie Island starting on July 31, 2006 until August 15, 2006. Because the rainfall had stopped on August 2nd and the E. coli levels remained high when they were expected to return to normal, Public Health initiated an investigation on the possible reasons for the high E. coli levels. The link between the raw sewage spill at the Keefer Regulator and the high E. coli levels at the Petrie Island beaches was not made until April 2, 2008.

1.2.7 City Staff Actions

The Keefer Regulator had been inspected on July 28, 2006 and had been found to be working properly. The work order for the monthly inspection indicates that all was normal with the regulator.

On August 15, 2006 a flow monitoring technician with the Sewer Inspections Section downloaded the data from the data logger located on the John Street overflow sewer; he noticed that the data showed that the water levels were above zero, which is not the normal situation for a day without rain. He attended the site and was able to confirm that indeed there was flow in the overflow sewer, when there should have been none. The flow monitoring technician sent an email message at 2:30 p.m. to the Supervisor, Sewer Maintenance & Operations (WG I) with copy to the Supervisor, Sewer Maintenance & Operations (WG II), his supervisor (Supervisor, Sewer Inspections) and the Section Manager, Sewer Maintenance (supervisor of the two Supervisors, Sewer Maintenance & Operations).

At about 3:00 p.m., shortly after the call from the flow monitoring technician, the Sewer Maintenance Supervisor sent two crews to the Keefer Regulator site to investigate the reason for the existence of flow in the John Street overflow sewer; the crews arrived on site at 3:30 p.m. When sewer inspectors entered the chamber, they found that the gate was completely shut. Indications are that the gate was found completely jammed shut. Once the sewer maintenance crew was able to open the gate, they found a significant amount of black sand and silt which had completely blocked the channel to the regulator gate opening and did not permit any flow to the interceptor sewer. Subsequently, a hydrojet truck was called to assist in removing the packed sand and silt. The operators had to use a high-pressure water jet to dislodge the packed sand and gravel, to restore flow through the regulator and to the interceptor sewer. The work order indicates that the crew left the site at 5:30 p.m. and that the regulator gate was left working normally. There is no indication in the work order with respect to the situation in the overflow sewer, but the recorded water levels measured at the John Street overflow went to zero at about 3:40 p.m.
The sewage spill came to light again in March, 2007 when a Senior Engineer, Water Resources in the Infrastructure Services Division, in the course of preparing a report to the MOE regarding combined sewer overflows in 2006, discovered that the recorded overflow volume in the John Street overflow for the period August 1 to 15, 2006 was substantially higher than the overflow volumes calculated by the hydraulic model of the sewer system for that period. He contacted the Supervisor, Sewer Inspections, who confirmed that there had been flow in the overflow sewer during that time.

The volume of the August 2006 sewage spill calculated by Infrastructure Services Branch is 960 million litres over the period August 3 to 15 (12 days), making the daily discharge of sewage 80 million litres per day. This volume of sewage is equivalent to approximately 18% of the total sewage volume received in one day (453 million litres) at the Robert O. Pickard Environmental Centre (ROPEC), the sewage treatment plant. In other words, the total sewage spill was equivalent to discharging the entire sewage volume from the City for two days directly and untreated into the River.

As a result of his findings, the senior engineer communicated the spill to the MOE District Engineer via a telephone conversation on April 23, 2007, and informed him that the spill had not been reported to the MOE. At the same time, he informed the Program Manager, Infrastructure Assessment – Water Resources Assets and the Manager, Wastewater & Drainage Services via email of his conversation with the MOE District Engineer, and sent a copy to the MOE District Engineer. The Senior Engineer does not recall how he determined that the sewage spill had not been reported to MOE, but he was certain that it had not been.

Between April 23, 2007 and May 16, 2007 the Senior Engineer, the Program Manager, Wastewater Collection and the Manager, Wastewater & Drainage Services prepared the information requested by the MOE regarding the sewage spill. It is noted that the communications indicate that these individuals were all aware at the time that the MOE had not been informed of the sewage spill incident. The sewage spill and the letter to MOE were discussed at the Divisional Management Team Meetings of May 10 and 24, 2007 under the heading “Regulatory Issues”; aside from the letter to MOE, no pertinent action is noted in the minutes.

The Senior Engineer, Water Resources drafted a letter to the MOE providing the details of the sewage spill. The letter to the MOE was sent by the Program Manager, Wastewater Collection on May 16, 2007, with copies sent to the Manager, Wastewater & Drainage Services and the Senior Engineer, Water Resources. Shortly after that, the City submitted to the MOE the “Report on Combined Sewer Overflows in 2006”, in which the sewage spill is also mentioned, but making reference to details submitted under separate cover (the May 16, 2007 letter to MOE). The 2006 CSO Report was sent to the Manager, WDS, the Senior Engineer, and the Manager, Infrastructure Management.
The sewage spill did not receive any further attention from Public Works & Services until early 2008. In the interim, Public Health continued to investigate the possible causes of the unusually high E. coli levels at the Petrie Island Beach during 2006, in particular during the first half of August. Environment Canada was retained to conduct a study of water quality in the beaches during 2007, which was submitted to the Community and Protective Services Committee on April 3, 2008 and to Council on April 23, 2008.

During the winter of 2008, the Senior Engineer, Water Resources continued to investigate a possible link between combined sewer overflows and water quality at Petrie Island Beach. He notified his supervisor, the Program Manager, Infrastructure Assessment – Water Resources Assets of the possibility of the link on February 2, 2008 when he completed an initial analysis, and again on February 15, 2008, when he became aware that Council was planning to meet to decide on $900,000 of expenditures on Petrie Island. The Program Manager in turn notified the Manager, Infrastructure Management of the Senior Engineer’s findings regarding the possible CSO – beach closures link.

Another ISB staff engineer found out about the link between the sewage spill and the Petrie Island beach closures in March 2008 and communicated this finding to a meeting of the Fallingbrook Community Association.

As a result of these investigations and in light of the Environment Canada report on the Petrie Island Beach, the Senior Engineer, Water Resources noted the likely link between the August 2006 spill and the high E. coli readings at the Petrie Island beach. He communicated the sewage spill to Public Health on April 2, 2008 during a meeting that he had arranged to discuss the Environment Canada report. Following the meeting, he contacted by email the Manager, Wastewater & Drainage Services to let him know that Public Health had not been aware of the sewage spill until his meeting, and to notify the Manager, WDS of the request that in the future Public Health be informed of any spills similar to the August 2006 event that could impact Petrie Island Beach. The Manager, Wastewater Services directed the Program Manager, Wastewater Collection to modify the protocol for spill notification to include Public Health, and forwarded the Senior Engineer’s email to the Director, Water & Wastewater Services for his information.

On the same day, the Director, Water & Wastewater Services requested the Manager, Wastewater & Drainage Services Division and the Program Manager, Wastewater Collection to provide information on the event, including date of identification, date of repair, notifications issued, estimates of the volume released, etc. The Program Manager, Wastewater Collection asked the Section Manager, Sewer Maintenance to provide information on the incident. We note that the PM-WC signed the letter to MOE.
in May 2007 with all this information, including that the MOE had not been notified until May 2007.

On April 3, 2008 the Community and Protective Services Committee received the Environment Canada report on the water quality in Petrie Island beach, which could not pinpoint the source of the pollution at the beach during 2006. It is noted that the Director, Water & Wastewater Branch was present at the meeting, but did not inform the meeting of the fact that there was a likely link between the August 2006 sewage spill and the high E. coli levels at the beach during the same period.

On May 7, 2008 during a tour of the R. O. Pickard Centre, the Manager, Wastewater & Drainage Services informed a tour group that included Councillor Monette and members of Friends of Petrie Island that there is a likely link between the August 2006 sewage spill and the poor water quality at the beach on the same period. This information led the Councillor to ask why it had taken almost two years to report the SSO.

The Deputy City Manager of Public Works & Services first learned of the spill on May 13, 2008, when the Director, Water & Wastewater Services informed him.

On May 20, 2008, the Deputy City Manager, Public Works & Services provided council with a memorandum “to provide information related to a recently identified correlation between a 2006 prolonged overflow event from the City’s combined sewer area and coincident Petrie Island Beach closures.” The memorandum indicates that “this event was reported by the City to the Ministry of the Environment shortly after the overflow was discovered” and was reported again to the MOE in May 2007. The memorandum also provided information on the actions that the City had taken to minimize the possibility of repetition of such an incident.

On May 21, 2008 the Director, Water & Wastewater Services Branch provided a sequence of events to the Deputy City Manager, in which he lists that the City and MOE staff generally discuss the Keefer Regulator Overflow occurrence as having taken place in August 2007, and marks the time with a question mark. The DCM noted in his reply that “there seems to be something wrong with August 2007 timing as that would imply we discussed the spill with the MOE months after we wrote them about it.” The DCM also suggests including a reference to the number of overflows that occur in a year, and in particular that in 2006 “notwithstanding xx overflows during the year, the regulator did not perform correctly only on this occasion.”

On May 22, 2008, the Director, Water & Wastewater Services Branch and the Manager, Wastewater & Drainage Services Division meet with the Supervisor, Sewer Maintenance & Operations to discuss the sewage spill. The SSMO indicated that he probably informed the MOE the same day or the next day.
Also on May 22, 2008 the DCM provided a memorandum to Council including a timeline of events, indicating that the sewage spill had been reported on August 15, 2006 (even though in the same package provided to Council he included the letter to MOE dated May 16, 2007 which indicated that the incident had not been reported to MOE).

As a result of this information, the MOE reviewed its files and informed the City that there is no record of a report of the sewage spill. A few days later, on May 27th, the DCM wrote again to Council to indicate that after further investigation it had been determined that the incident had not been reported to the MOE. Consequently, the Supervisor, Sewer Maintenance & Operations (WG I) was suspended without pay on that day and was fired the following day.

As a result of the events in May 2008, the City Manager commissioned a report on the timelines and the sewer maintenance department. This audit was initiated at the request of Council.

Following the May 20, 2008 memorandum to Council, the City modified the frequency of regulator inspections to “after every major rainstorm”. In addition to modifying the inspection protocol, the City also modified the notification protocol.

In June and July 2008 two sewage spills to the Ottawa River occurred as a result of regulators staying closed after a rainfall event. On August 28, 2008, the Director, Water and Wastewater Services informed the MOE and Council that based on recorded data for the period between 1998 and 2008 it appears likely that there have been nine other sewage spills from the City of Ottawa combined sewer system.

### 1.2.8 MOE Actions

The MOE’s District Engineer received a copy of the April 23, 2007 email from the Senior Engineer, Water Resources to the Manager, Wastewater & Drainage Services Division and the Infrastructure Management’s Program Manager, Water Resources. MOE subsequently received the May 16, 2007 letter from the City’s Program Manager on May 18th, informing them officially of the sewage spill and that it had not been reported previously. There was no formal response to the letter.

The MOE has been working closely with the City regarding the implementation of the Real Time Control system, the corresponding applications for Certificates of Approval, and the reporting of CSOs. Consequently, at that time they did not consider that there would be need for further action.
Following the May 20, 2008 press conference, the MOE appointed an investigator to review the incident. The MOE formally charged the City under the Ontario Water Resources Act on July 31, 2008 as a result of the August 2006 sewage spill.

2 AUDIT OBJECTIVES AND CRITERIA

Following a review of the background information available from the City, the scope of the audit was synthesized in the Audit Objectives. The Criteria attached to each Audit Objective explain the scope of the review.

On the basis of the review of the background information and the direction from Council, the objective of this Audit was to provide answers to the following questions:

1. What is reporting responsibility?
2. Should these events be reported at least to managers?
3. Who knew what and when?
4. Was there an attempt to conceal the equipment malfunction?
5. Review training provided vs. required
6. Why were the alarms removed and inspections after storms discontinued?
7. Why was event not reported?

Based on these questions, the audit objectives can be expressed as follows:

1. Determine the reasons for the sewage spill.
2. Examine the response by City staff, including reporting responsibilities, communications methods and protocols.
3. Review the staff and management responsibilities with respect to inspection, maintenance, and operation.
4. Review the training levels of city staff.
5. Review the reasons for non-reporting of the spill.
6. Review the alarm system, regular inspections, and emergency inspections.

Audit Objective No. 1 – Determine the reasons for the sewage spill

Criteria:

- Maintenance
- Inspections
- Condition of the Regulator
- Alarm System
Audit Objective No. 2 – Review the staff and management responsibilities with respect to inspection, maintenance and operation

Criteria:
- Regulatory requirements
- City Policies, Procedures and Protocols
- Industry standards

Audit Objective No. 3 – Review the training levels of city staff

Criteria:
- Training requirements
- Position descriptions

Audit Objective No. 4 – Examine the Response by City Staff

Criteria:
- Reporting responsibilities
- Communications methods
- Protocols

Audit Objective No. 5 – Review the reasons for not reporting the spill

Criteria:
- City Policies, Procedures and Protocols
- Reporting in 2006
- Reporting in 2007

Audit Objective No. 6 – Review Maintenance and Inspections

Criteria:
- Preventive maintenance program
- Condition assessments
- Regular inspections
3 AUDIT SCOPE

The Audit Scope encompassed the reasons for the sewage spill and the actions by the City staff prior to the spill and their reactions in the aftermath.

The Audit comprised the following main tasks:

- Review legislative framework.
- Review background data.
- Conduct interviews with individuals involved in the project.
- Conduct additional interviews for confirmation of issues, if necessary.

The audit began by reviewing the legislative framework for the project, to confirm the requirements that should have been followed in the management, maintenance, and inspection of the system. Collection and review of the background information were undertaken in light of the Audit Objectives and Criteria. The results of the review are an evaluation of the recommendations to determine whether the interests, including exposure to risk, of the City were adequately considered and protected.

3.1 Review Legislative Framework

This review comprised the legislative requirements combined sewer systems and overflows, spills and spills reporting, beaches water quality, etc. The relevant legislation and regulations included the Ontario Water Resources Act, the Environmental Protection Act, the Lakes and Rivers Improvement Act, the Sustainable Water and Wastewater Systems Act, the Federal Fisheries Act, and other requirements of the Ministries of the Environment and Natural Resources.

3.2 Interviews

Interviews were held with City staff involved in the various aspects of the operation, maintenance, inspection, etc. of the Keefer Regulator and the combined sewer system, to obtain information on the event itself, background data, relevant reports, the regulator condition and inspections.

3.3 Review Background Data

Background data available from the City and other public data was collected and reviewed. This included regulator drawings, reports on the combined sewer system, reports on the proposed improvements to the system, and industry standards.

3.4 Correspondence Reviewed

Internal email correspondence as well as correspondence with the MOE was reviewed.
3.5 **Documents Examined**
Several background reports prepared for the City by several authors, and reports prepared by City staff were reviewed.

3.6 **Analysis**
The analysis evaluated the background information, the results of the interviews, the operation and maintenance methods, procedures and protocols, recommendations for improvements, communications, reaction to the spill and overall performance of the City staff involved.

4 **BACKGROUND INFORMATION**
The background information reviewed for this Audit included:

i. Design, Operation and Maintenance Standards.
ii. Federal and Provincial legislation
iii. City’s Policies, Procedures, and Protocols
iv. Other Procedures and Protocols
v. Regulator Reports and Drawings
vi. Intracity Communications
vii. Communications with outside agencies
viii. Maintenance Records

The details of the background information are provided in the following sub-sections.

4.1 **Design, Operation and Maintenance Standards**
The American Public Works Association in its publication titled “Combined Sewer Regulator Overflow Facilities Report” dated July 1970 presented the results of an investigation of combined sewer regulator practices in the United States and Canada. The study found that float-operated gate regulators require a continuous preventive maintenance program in order to function properly. Collection of debris in the float chamber results in the build-up of debris under the float, which prevents the float from lowering; if the units are not properly greased the depth of sewage required for overcoming the inertia of the float and the gate is significant, resulting in spillage of sewage. Generally, float-operated gates were unsatisfactory, with the most common problem being clogging; the frequency of clogging was about once per week on average.

In the report titled “Combined Sewer Regulation and Management, A Manual of Practice”, dated July 1970, the APWA provides recommendations for the design and operation and maintenance of combined sewer regulators.
The APWA Manual of Practice states that some of the causes of failure of float-operated regulators and other similar regulators are clogging, silting, sticking due to lack of lubrication, parts failure and corrosion. Clogging is the principal cause of failure; silting can to some extent be eliminated by flushing of the regulator.

For float-operated regulators, the APWA Manual of Practice recommends inspections once per week and after each storm, and in no case less frequent than twice per month and after each storm. The Manual recommends that the gate be operated through a complete cycle of closing and opening; the float well should be cleaned to remove sand or sludge and debris; chains and gears should be lubricated and all parts of the mechanisms should be inspected; parts that are excessively worn or corroded should be replaced.

The same Manual devotes an entire chapter to instrumentation and control, both to enable optimization of the operation of the regulators and to provide alarms in case of malfunction or failure.

Maintenance of the regulators for adequate performance requires that they be inspected frequently. The EPA recommends inspections of the regulators after every rainfall event. The City of Indianapolis, IN, USA inspects their regulators daily, as indicated in their CSO Control Operational Plan.

As with any mechanical equipment, particularly in a corrosive environment such as the one existing in a combined sewer, it may be necessary to replace and refurbish parts to ensure that the equipment functions correctly. Waterware Corporation, the firm licensed to manufacture Brown & Brown regulators, provides inspection and maintenance guidelines, including specifications for the replacement and/or refurbishing of regulators. The following information relating to the regulator inspection, maintenance, and renewal is available from Waterware Corporation:

- Waterware Corporation – Sample Regulator Inspection and Reporting (as industry standard)
- Waterware Corporation – Sample Regulator Reconditioning Specifications, Reconditioning Brown & Brown Mechanical Regulators (as industry standard)

### 4.2 Federal and Provincial Legislation

The following table summarizes the federal and provincial legislation that have bearing on the combined sewer overflows and the Keefer Regulator in particular.

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Description</th>
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<tbody>
<tr>
<td>Environmental Protection Act, R.S.O. 1990</td>
<td>Part X of the Act – Spills describes the requirements and obligations relating to the reporting of spills</td>
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<tr>
<td>Legislation</td>
<td>Description</td>
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<tr>
<td>Classification and Exemption of Spills O. Reg. 675/98 (version of July 18, 2006)</td>
<td>CSOs are Class I spills A Class I spill is exempt from Part X of the Act if, (a) all orders, requirements and directions made under the Act, the <em>Ontario Water Resources Act</em> or the <em>Pesticides Act</em> with respect to the spill and the source of the spill have been complied with; and (b) the spill does not contravene any other Part of the Act, any other provincial Act or federal Act, any regulation made under those Acts or any municipal by-law. O. Reg. 675/98, s. 1 (2).</td>
</tr>
<tr>
<td>Ontario Water Resources Act Enabling statute for Ont. Reg. 129/04</td>
<td>Particularly relevant to this audit are the Operating Standards, which require that 2. Every operator must have a licence applicable to the facility 3. The owner shall designate an Overall Responsible Operator (ORO), who must have a licence applicable to the type of facility. 4. If the ORO is absent, an OIC with licence equal or one level lower than the facility must be designated. 5. The regulation limits the length of time that an OIC can be designated as ORO. 6. A professional engineer can be ORO if he has been employed less than six months. 7. The owner must ensure that logs or other record-keeping mechanisms are provided. Entries shall be chronological. 8. Only OIC can make entry into log 9. Specific information for each shift shall be entered into log</td>
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Table 4.1  
Federal and Provincial Legislation

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<tr>
<td></td>
<td>a. The date, the time of day the shift began and ended and the number or designation of the shift.</td>
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<td></td>
<td>b. The names of all operators on duty during the shift.</td>
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<td></td>
<td>c. Any departures from normal operating procedures that occurred during the shift and the time they occurred.</td>
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<td></td>
<td>d. Any special instructions that were given during the shift to depart from normal operating procedures and the person who gave the instructions.</td>
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<td></td>
<td>e. Any unusual or abnormal conditions that were observed in the facility during the shift, any action that was taken and any conclusions drawn from the observations.</td>
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<td></td>
<td>f. Any equipment that was taken out of service or ceased to operate during the shift and any action taken to maintain or repair equipment during the shift.</td>
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<td>10. Logs shall be kept for two years</td>
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<td></td>
<td>11. The owner of a facility shall ensure that operators and maintenance personnel in the facility have ready access to comprehensive operations and maintenance manuals that contain plans, drawings and process descriptions sufficient for the safe and efficient operation of the facility.</td>
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<td>12. The owner of a facility shall ensure that every operator employed in the facility is given at least 40 hours of training every year.</td>
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<td>13. The training may include, for example, training in new or revised operating procedures, reviews of existing operating procedures, safety training and studies of information and technical skills related to environmental subjects.</td>
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<tr>
<td>Legislation</td>
<td>Description</td>
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<tr>
<td>Federal and Provincial Legislation</td>
<td>14. The owner shall ensure that records are maintained of the training given under this section, including the names and positions of the operators who attend training sessions, the date or dates of each training session, the duration of each training session and the subjects covered at each training session.</td>
</tr>
<tr>
<td>Fisheries Act</td>
<td>(3) Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water. Deposits authorized by regulation (4) No person contravenes subsection (3) by depositing or permitting the deposit in any water or place of (a) waste or pollutant of a type, in a quantity and under conditions authorized by regulations applicable to that water or place made by the Governor in Council under any Act other than this Act; or (b) a deleterious substance of a class, in a quantity or concentration and under conditions authorized by or pursuant to regulations applicable to that water or place or to any work or undertaking or class thereof, made by the Governor in Council under subsection (5).</td>
</tr>
<tr>
<td>Occupational Health &amp; Safety Act</td>
<td>Enabling statute for regulation Confined Spaces, Ont. Reg. 632/05</td>
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Table 4.1
Federal and Provincial Legislation

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<tr>
<th>Legislation</th>
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<tbody>
<tr>
<td>Confined Spaces, Ont. Reg. 632/05</td>
<td>Requires that the City develops and maintains a written program for the confined space in accordance with the Regulation before a worker enters the confined space.</td>
</tr>
<tr>
<td></td>
<td>Requires that before any worker enters a confined space, the City ensures that an adequate assessment of the hazards related to the confined space has been carried out.</td>
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<tr>
<td></td>
<td>Requires that the City ensures there is a written plan for the confined space.</td>
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4.3 City’s Policies, Protocols and Procedures

The comments in this subsection refer to the conditions in 2006. It is recognized that the City is currently preparing Standard Operating Procedures and is revising the Operation and Maintenance Manual, albeit the Program Manager, Wastewater Collection indicated that there was not set time for completion of the revisions.

Operation & Maintenance Manual

The City used the Operation & Maintenance Manual prepared by the Regional Municipality of Ottawa-Carleton (RMOC). The RMOC O&M Manual contained procedures for various sewer maintenance activities, but did not have a section dedicated to the operation and maintenance of the regulators. The latest review of the RMOC O&M Manual is dated 1997.

The RMOC O&M Manual contains a section titled “ACTIVITY – SPILLS OF OIL AND FLAMMABLE LIQUIDS (REVIEWED – 1983)” but no procedures or protocol for sewage spills.

The same manual provides instructions for entry to manholes and sewers for inspection. However, there is no explicit procedure for air quality testing prior to entrance into a manhole or other confined space. Confined Space Entry procedures are available separately.

Standard Operating Procedures

The City used a mix of old policies and procedures from the old City of Ottawa and the former Regional Municipality of Ottawa-Carleton (RMOC). The City at the time did not have a Standard Operating Procedure for Entry into Regulators, and had no formal
written procedures for inspections, confined space entry, and condition assessments of regulators.

The Wastewater Collection Section provided a copy of a procedure for regulator maintenance, labelled WJ02P07, which was used by the RMOC. The procedure is out of date (the manhole numbers do not correspond to the Structure Numbers used by the City at present) and is essentially a procedure for inspection of the regulators. The information on preventive maintenance is very sketchy.

**Procedures for Spill Reporting**

The City did not have a formal policy for reporting of spills, but relied on the policies that had been in place by the Region and the former City of Ottawa. Based on the information obtained during this audit, the former Region employees and City employees simply used the policy that they had received before amalgamation from their respective former employers.

### 4.4 Other Policies and Protocols

**MOE Guideline F-5**

The Ministry of the Environment prepared Guideline F-5 “Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters”, which is supported by five Procedures, of which Procedure F-5-5 “Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems” is applicable to the regulator.

Procedure F-5-5 indicates that its goals are to eliminate dry-weather overflows, minimize the potential impacts on human health and aquatic life resulting from combined sewer overflows, and achieve as a minimum compliance with body contact water quality objectives at beaches impacted by CSOs for at least 95% of the June 1 to September 30 period for an average year.

The minimum CSO controls comprise:

(a) Eliminate CSO during dry weather, except in an emergency (dry weather overflows are spills)

(b) Establish and implement Pollution Prevention programs that focus on pollution reduction at source.

(c) **Establish an implement proper operation and regular inspection and maintenance programs for the combined sewer system.** [emphasis ours]

(d) Establish and implement a floatables control program

(e) Maximize the use of the collection system for storage of wet weather flows

(f) Maximize the flow at the Sewage Treatment plant for treatment of wet weather flows.
(g) During the seven-month period from April 15 to November 15, capture and treat all dry weather flow plus 90% of the wet weather flow above the dry weather flow for the average year.

(h) For beaches, this requirement increases to compliance with body contact water quality objectives at beaches impacted by CSOs for at least 95% of all wet weather flows and two overflow or less events for the June 1 to September 30 period.

Procedure F-5-5 is used by MOE to review applications for approvals, assist regional staff in preparing Control Orders to bring systems into compliance with the Procedure, and assist enforcement staff in evaluating a combined sewer system operator’s due diligence when investigating violations of the Environmental Protection Act or the Ontario Water Resources Act.

**Licensing Guide for Operators of Wastewater Facilities, Ministry of the Environment, 2004**

The wastewater operator licensing guide provides information on the requirements to obtain and maintain a wastewater license, in accordance with Ontario Regulation 129/04 – Licensing of Sewage Works Operators, made under the Ontario Water Resources Act.


The Technical Brief summarizes the administrative changes in the separate wastewater operator certification regulation as a result of Ont. Reg. 129/04.

**MOE Guideline No. 5.1 – Overall Responsible Operator vs. Operator-in-Charge**

This guideline clarifies the role of the overall responsible operator (ORO) and the operator-in-charge (OIC).

**Stormwater Pollution Prevention Handbook**

The Handbook was prepared by the MOE for use by municipalities. It defines pollution prevention and urban hydrology concepts, describes pollution prevention and flow reduction techniques, provides information on implementation approaches at the municipal level, and serves as a technical resource in preparing pollution prevention and control plans and municipal environmental management systems plans, and provides resources and advice on public consultation and outreach programs.

**The Municipal Performance Measurement Program**

In the fall of 2000 the provincial Ministry of Municipal Affairs and Housing started the Municipal Performance Measurement Program, which requires all municipalities in Ontario to file financial and performance data with the province. One of the parameters that must be reported is the volume of sewage treated and the volume that bypasses treatment.
Ontario Municipal Benchmarking Initiative

The City of Ottawa is currently participating in the Ontario Municipal Benchmarking Initiative (OMBI). The Ontario Municipal CAO’s Benchmarking Initiative is a partnership project comprising fifteen municipalities, with the objective of achieving service excellence in municipal government. Participating municipalities are working together to identify and share performance statistics, operational best practices and to network in a spirit of innovation and entrepreneurship. The objective is to identify and develop appropriate performance measures, capture performance data, analyze and benchmark results, in order to identify best practices in Ontario municipalities.

4.5 Reports and Drawings

The City provided a number of reports and drawings for review, as listed below:

- Drawings of the Regulator Design in 1959 and the proposed regulator improvements in the Regulator Upgrade Pre-Design Project 2006.
- Ottawa Interceptor Regulator Chambers - Phase I and II - Preliminary Discussion Report - Novatech - October 1989
- RMOC Access Shaft Rehabilitation Study - McNeely Engineering Consultants Ltd. - April 1993
- Combined Sewer Area - Pollution Control Planning Study - Final Report - RV Anderson - May 1993
- Wastewater System operational Review Study - RV Anderson - August 1995
- Analysis of Flows to the Ottawa Interceptor Sewer and Operation of the Cathcart Regulator - Infrastructure Services City of Ottawa - January 2001
- Operation of the Regulators on the Ottawa Interceptor Sewer - Draft Report - Infrastructure Services, City of Ottawa - December 2002
- Somerset Wastewater Storage Facility project - Phase III - Preliminary Design - O’Connor Relief Sewer - RV Anderson / JL Richards / XCG Consultants - May 21, 2004
- Interceptor Outfall Sewer Hydraulic Transients Study - Analytical Tools Technical Memorandum - Delcan - November 2004
- Regulator Upgrade Pre-Design project Volumes 1 and 2 - Stantec / Delcan / BPR CSO - August 2006
Audit of the 2006 Sewage Spill

- Interceptor Outfall Sewer Hydraulic Transients Study - Phase I - Final Report - Delcan - July 2008
- Inspection and Maintenance Records since 2004. No data on inspections for 2003 and earlier is available at the time of writing, although a search for the records is ongoing.
- Condition Assessment, June 26, 2008
- An Investigation of the Sources of Fecal Contamination at Petrie Island Beach on the Ottawa River in 2007, National Water Research Institute, Environment Canada, February 2008

4.6 Intra-City Communications
The following documents were reviewed:
- Electronic mail messages from 2001 to 2008
- Reports to Committees and Council and the corresponding minutes for the period February 2008 to May 2008
- Minutes of Departmental Management Team Meetings for Public Works & Services for part of 2006, 2007 and 2008
- Minutes of Wastewater & Drainage Services, Divisional Management Team Meetings, for parts of 2006, 2007 and 2008
- Council and Committee Reports and Memoranda

4.7 Communications with Outside Agencies
The only communications with outside agencies have been the emails and letters sent to the MOE District Office. In this respect, the following communications were reviewed:
- Email from Senior Engineer to MOE District Engineer, April 23, 2007
- Letter from Program Manager, Wastewater Collection to MOE District Office, dated May 16, 2007
- Letter from Director, Water & Wastewater Services to MOE District Manager, dated May 28, 2008

4.8 Maintenance Records
No maintenance records of the Keefer Regulator or any other regulator are available. Work order records for monthly inspections and basic maintenance are kept in the computer database maintained by the City. The original work orders could be found
for the period 2004 to date; no hard copies of the work orders were kept for earlier years.

No log books are available, as none were kept.

5 FINDINGS

The results of the analysis and the findings of the audit are presented in this section in accordance with the Audit Objectives. For ease of reference, the Audit Objectives and the Criteria used are repeated here and the findings are discussed in relation to the criteria.

5.1 Reasons for Sewage Spill

The stated reasons for the sewage spill are that the Keefer Regulator gate became stuck in the closed position and that the regulator malfunction was not discovered until 11 days after the rainstorm had passed. However, these reasons are in fact effects of the lack of a regulator preventive maintenance program and of inadequate inspection frequency and procedures. The regulator condition – as a result of the lack of maintenance since the regulator was installed and the fact that it is well beyond its design life – was a significant factor in the gate malfunction.

5.1.1 Maintenance

During the regular monthly inspections the regulators are provided with basic maintenance, such as application of grease to joints and chain, cleaning of all components, cleaning of float and float chamber, tightening of bolts. Major maintenance of the regulators, including their heavier parts, has not been done since the regulators were installed in 1961.

The 1995 Wastewater System Operational Review Study report refers to the 1993 RMOC Access Shaft Rehabilitation Study report, and states the following making reference to the 1993 RMOC report:

- (a) The access to some regulators could take up to five persons to provide adequate emergency retrieval;
- (b) The regulator hardware is approximately 30 years old and has exceeded the estimated design life;
- (c) Several components showed significant corrosion and loss of area, including the wheel and axle, the vertical posts controlling the float movement, and the beam supports;
- (d) Other concerns were identified with the condition of the landings, stairs and ladders, the top slabs; access hatch; and ventilation.
The 1995 Wastewater System Operational Review Study report includes in its Appendix A the findings of the inspection of the regulators done as part of the 1993 RMOC study. With respect to the Keefer Regulator, the 1993 inspection notes as follows:

- This is the largest gate and float system
- Railing system is required at the bottom
- Pulley and axle system are corroded
- Chains, gate and float are in good condition
- Vertical post for float control need to be replaced.
- Landings are in good condition (but safety to be addressed)
- Grate too loose at bottom of ladder
- Concrete is in good condition.

The 1995 Wastewater System Operational Review Study report indicates that the regulators were approaching their life expectancy and should be refurbished or replaced. The review of the data shows that the RMOC let a contract for safety improvements to the shafts, landings and stairs in the regulator chambers. However, there is no record of major maintenance of the regulators. Consequently, we could not confirm whether any of the recommendations given for renewal of parts of the regulator [wheel and axle, the vertical posts controlling the float movement, and the beam supports] were ever implemented.

As part of the review of background data, we reviewed the specifications prepared by Waterware Corporation, the Brown & Brown regulator manufacturers, for the refurbishing of the regulators. The specifications require reconditioning of some parts and replacement of others. The main point in mentioning these specifications is that the regulators can be renewed, in a similar way as other infrastructure assets [e.g. bridge and culvert renewal]. An order-of-magnitude estimate for rebuilding the five major regulators is $1.0 Million. Rebuilding the regulator is not required, however proper renewal maintenance is required.

The two reports undertaken by Infrastructure Services in 2001 and 2002 (listed in Section 4.5) discuss the flow and operation of the regulators, with emphasis on the Cathcart regulator. The 2001 report notes that the regulators were near their design life and recommended that a Waterware Corporation be retained to carry out a condition assessment of all the regulators and to provide training to City staff on condition assessment and preventive maintenance of the regulators. This was never done.

A condition assessment was undertaken as part of the Real Time Control study, as reported in the August 2006 “Regulator Upgrade Pre-Design Project” report. With reference to the Keefer Regulator, the report indicates that “Although the environment within the Keefer regulator is corrosive as observed by the condition of the existing Brown and Brown hardware, the shaft and structural components of the regulator appeared to be in good,
sound condition. The access hatches, ladders and landings were in very good condition as they were replaced in the mid-1990’s as part of a City rehabilitation program to address safety issues and improve access to a number of access shafts.”

Unfortunately the 2006 condition assessment stopped short of a detailed condition assessment which would have measured and recorded sound metal dimensions vs. design dimensions, loss of section in the support beams, poor condition of the chains, chain size incompatible with the transmission wheels and sprockets, and other similar information. For example, it does not note that the absence of a platform prevents proper inspection of the wheel and the pillow blocks, etc. The August 2006 Regulator Upgrade Pre-Design Report does not discuss the operational limitations of the existing regulators.

A number of photographs were taken in May 2008 by the Wastewater Collection Section. These are included in Appendix C. It is notable in the description of the photos that the Program Manager, Wastewater Collection makes the following notes:

As he describes the photos of the regulator, he comments on galvanized chain as follows:

“The galvanized chain is the one that breaks now and then, through corrosion. We are looking for a stainless steel chain with the same size and characteristics to fit on the existing sprockets.”

In our view, the replacement of the chain with a suitable chain should have been implemented immediately, as it is an essential part of the operation of the regulator.

When reviewing the gate photos, we note that the Environment Canada records for the Ottawa Airport meteorological station show no rain for the date of the photos, but the gate is partially open when it should be completely open. We note that the gate has counterweights on it, which clearly are not necessary if the gate is partially open under dry weather conditions.

A condition assessment was carried out in June 2008, at the request of the Program Manager, Wastewater Collection, by a licensed mechanic who is part of the Pumping Station/Process Control Section. His report on the regulators’ condition disclosed the following common issues with respect to the regulators condition:

(a) In most cases the chain is the wrong size chain so it does not sit properly on the wheel sprockets.
(b) The steel I-beam supports are in very bad condition
(c) Pillow blocks are either in bad condition or are seized
(d) Chain bolt is in wrong location, causing the bolt to support the chain (not designed for this)
(e) No platform provided to permit inspection of float and gate lift mechanisms
(f) Regulator gates and floats are very rusty

(g) Float guide posts are missing in some cases (Keefer Regulator is one)

(h) No lighting in regulator chamber makes inspection very difficult

(i) In all cases, access to the chambers is tight, particularly considering the amount of safety equipment that needs to be worn by the operators

In addition to the maintenance concerns found above, the licensed mechanic noted safety concerns regarding the Booth and Rideau Canal regulators, as follows:

(a) Booth Regulator – Water from a drainage pipe discharges above the working area; the location of the access manhole is within a bus lane (very poor location)

(b) Rideau Canal Regulator – An unprotected electrical cable is exposed along the wall of the chamber, below an electrical box; the access to the chamber is very narrow

Based on these findings, it is concluded that the regulators had not been maintained in a comprehensive way. Part of a maintenance program should include the replacement of parts that are not reliable, and use of parts that are compatible with each other. Current practice is to use stainless steel in lieu of galvanized steel as it is much more durable and resistant to rust.

The fact that the gate became stuck in the closed position during the July 31 to August 2, 2006 rain storms was not an extraordinary event, as evidenced by the lack of maintenance that the regulator had received. The City’s licenced mechanic who did the condition inspection in June 2008 expressed that he “wasn’t surprised” that this regulator had failed.

As if to underline this, the Kent regulator shaft supporting the gate snapped on June 24 2008, causing another sewage spill. The failure of the shaft goes to show how weak the system has become as a result of the lack of timely renewal.

At amalgamation, the responsibility of the regulators was held by RMOC, and it was transferred to the new City without major changes to the responsible group. The processes and the manual that existed at that time could have been revised and expanded to suit the City. However, in five years not a page was added to or revised in the O&M Manual.

It is important to note that the pumping stations have a program of preventive maintenance, which dictates the type and frequency of maintenance for the various components and equipment in the pumping stations. The preventive maintenance program provides for items that should be maintained weekly, monthly, semi-annually, and annually. The Sewer Maintenance section does not have a similar program, as evidenced by the lack of protocols and procedures and up-to-date operations and maintenance manual. The weak maintenance program for the regulators also contrasts
with the maintenance program for bridges and structures, which is based on regular inspections, planned condition assessments, risk-based setting of priorities for renewal, and life cycle costing of renewal options. In addition, the infrastructure management section works closely with the construction section in undertaking detailed condition assessments, materials testing, and design of the renewal options.

5.1.2 Inspections

Based on the interviews with managers and staff of the Wastewater & Drainage Division, it was determined that when the interceptor outfall sewer and the regulators were under the jurisdiction of the RMOC they were inspected at least once a month and after all major rainstorms. Some time after 2001 the frequency of inspections of the regulators was reduced to only once per month, and the inspection after large runoff events was eliminated. This frequency of inspection is woefully inadequate, and is more so given that the regulators had not received a suitable overhaul since they were installed, even though 1995 reports noted that they had reached their expected design life. The managers and staff of the Wastewater & Drainage Branch acknowledged this conclusion during the interviews.

Based on the recommended practices as published by the APWA in 1970, float-operated regulators should be inspected weekly and after all major rainstorms; at the very least the regulators should be inspected biweekly and after major rainstorms. Since 2001 the regulators had been inspected with less than half the frequency recommended by the APWA.

In addition to the inadequate inspection frequency, the work done during the inspections is the bare minimum that could be done. As noted in the previous section, during the regular monthly inspections the regulators are provided with basic maintenance, such as application of grease to joints and chain, cleaning of all components, cleaning of float and float chamber, and tightening of bolts. Due to the nature of the regulator gates and floats a substantial amount of time is dedicated to cleaning debris from the float chamber.

The very poor condition of the equipment, due to lack of proper maintenance, made frequent inspections more, not less, necessary.

The low frequency of inspections prevented anyone from discovering the gate malfunction for more than 11 days. Evidently, if the procedure had been to inspect the regulators after every runoff event the malfunction would have been discovered in less than 24 hours after the rainfall stopped, and the volume of the sewage spill would have been less than one-tenth of the volume spilled.

The rationale given for the reduction in inspections was a lack of resources, however, the Collections Unit of WDSD had a budget surplus of approximately $563,000 in 2005, $1.88 million in 2006 and $667,000 in 2007. The budget surplus at the Division level was even greater with $1.9 million in 2005, $4 million in 2006 and $3.6 million in 2007 left
unspent. We estimate that the cost of increasing inspections to the level recommended by the APWA would be approximately $110,000 per year which, given these surpluses, could have been easily absorbed within the existing budget.

Inspection of the regulators takes approximately 1 hour each. If it is assumed that the inspections take an entire 8 hour day and that the crew requires five persons for confined entry and health & safety reasons, the cost per day of inspections is approximately $1,200. If the frequency of regular inspections is increased from the monthly to weekly, the additional cost is $48,000. The cost of inspections after a rainfall event would be $62,000 on the basis of 52 events in a year. The additional cost of the required inspections is $110,000 over the current process. This cost would have been very easy to accommodate in the section budget.

5.1.3 Keefer Regulator Condition

The condition of the Keefer Regulator in August 2006 is a reflection of the lack of a preventive maintenance and upgrading program, as discussed in Section 5.1.1.

The condition assessment carried out by a City’s licensed mechanic in June 2008 disclosed a number of concerns regarding the Keefer Regulator (See Section 5.1.1).

The sewer maintenance worker who entered the regulator chamber on August 15, 2006 informed us that:

i. The gate was completely closed and there was no flow through the gate.

ii. There was no debris in front of the gate

iii. The regulator chamber was dry when he entered the chamber

iv. There was no debris in the float chamber

v. When he managed to open the gate, he found silt and sand packed against the gate

From the information provided it would appear that the gate jammed due to a malfunction and not due to extreme flow or water level conditions in the chamber. It is noted that the float’s vertical guide posts are missing and that the float was ascending and descending without guide. This could have had an effect on the ability of the gate to close directly centered on the gate opening and may have contributed to the jamming of the gate.

5.1.4 Overflow Monitoring and Alarm Systems

5.1.4.1 Alarm System

Managers and staff who were employed by the former Regional Municipality of Ottawa-Carleton indicated that the regulators had a system of alarms until shortly after amalgamation. The alarms were connected to the pagers of the program managers and
supervisors in the sewer maintenance system. The alarms would go off frequently and a number of false alarms occurred.

The alarm system was allowed to fail and was never repaired. The decision to reduce the frequency of inspections and to not replace the alarm system was made by the current Manager, Wastewater & Drainage Division and Program Manager, Sewer Maintenance.

5.1.4.2 Overflow Monitoring System

The RMOC installed a system of water level and velocity monitoring stations in 1998 at several locations within the sewer system. The status of the flow monitoring stations located at the various overflow sewers corresponding to the five operating regulators is summarized in Table 5.1. As shown in the table, only the monitoring stations at the Keefer and Rideau Canal interceptor regulators can be used with confidence to determine whether a sewage spill is occurring.

<table>
<thead>
<tr>
<th>No.</th>
<th>Regulator</th>
<th>Monitoring Station</th>
<th>Monitoring Device? Type?</th>
<th>Can be used to detect spill?</th>
<th>Determine Spill Flow &amp; Volume?</th>
<th>Data Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keefer</td>
<td>John Street Overflow</td>
<td>Yes, Water Level</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lloyd-Booth</td>
<td>Booth Overflow</td>
<td>Yes, Water Level</td>
<td>Yes</td>
<td>No</td>
<td>No data recorded for last part of 2001, all of 2002, and first part of 2003</td>
</tr>
<tr>
<td>4</td>
<td>Cathcart</td>
<td>Bolton Overflow</td>
<td>Yes, Water Level</td>
<td>No</td>
<td>No</td>
<td>It is practically impossible to determine if there is a spill due to flow from storm sewer system.</td>
</tr>
<tr>
<td>5</td>
<td>Kent</td>
<td>None</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Devices are not being actively monitored for potential sewage spills. Management indicates that the level or flow devices were not designed, installed or maintained with the purpose of being a collection system.
operational condition monitor. The periodic retrieval of data makes this data collection of little benefit in an operational setting.

2. From 2001 to June 2007, the data recorded was collected and input into the Environmental Time Series (ETS) database, without analysis.

3. Any analysis of data quality is carried out by Infrastructure Services.

4. The ETS data is used by Infrastructure Services for modelling purposes, and was used to determine the feasibility of using the Real Time Control system to optimize capture rates at each overflow site.

5. From June 2007 to May 2008 the data collected at the working sites was saved only, but it was not entered into ETS. Therefore, no analysis of potential spills could be done.

6. It is common to see in the records in ETS that the monitoring device gives significant noise signals that are recorded as abrupt ups and downs of the recorder. Some of these records can be mistaken for sewage spills or may mask whether there is a spill in the overflow sewer.

7. Since the beginning of monitoring in 1998, the device data with noise (as noted in No. 6) has drifted both above and below zero, an obvious anomaly.

5.1.5 Additional Spills

Based on a review of work orders since 1999, we found 12 cases where the regulator gates were found CLOSED during the monthly inspections, in addition to those found in August 2006 and June and July 2008. However, after review with Infrastructure Services Branch and the Wastewater & Drainage Services Division, it was found that the work orders’ structure name and number were wrong in a number of cases corresponding to the Wellington-Booth gate, which is supposed to be closed; therefore, some of the “gate found closed” cases did not apply. Consequently, only four of these cases were confirmed as situations in which a regulator was closed.

Based on the way that the gates function and the volumes of sewage in the sewers, it would be expected that at least in some of these cases, if not all of them, there would have been a sewage spill, as confirmed by subsequent review. However, none of the work orders have recorded an MOE incident number.

A review of the Environmental Time Series (ETS) database where the flow monitoring data is stored contained several events when a significant period of flow in the overflow sewer occurs when there is no runoff event associated with the overflow.

We requested the MOE to review its records since 2004 to date to determine if the City had notified the Ministry of other sewage spills. The MOE informed us that only three events were reported to the MOE from January 1, 2004 to July 31, 2008: the August 2006 sewage spill, the June 2008 sewage spill, and the July 2008 sewage spill.
The fact that a review done as part of this audit and the review reported to MOE and Council in August 2008 disclosed a number of spills that were not reported to the MOE and others confirms our conclusion that prior to May 2008 a sewage spill from a regulator was not perceived as a sewage spill; but as a combined sewage overflow that continued after the rainfall stopped.

From our audit, we found the following four additional spills:

<table>
<thead>
<tr>
<th>Date</th>
<th>Regulator</th>
<th>How determined</th>
<th>Comment</th>
<th>Volume Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. April 15, 2002 (No ETS graph of spill available)</td>
<td>Kent Street Regulator (Reported to MOE October 17, 2008)</td>
<td>Work Order No. 7024424</td>
<td>Gate found closed due to failure of the chain. ISB estimates the daily dry weather flow is 6,200,000 litres. The last time the gate was inspected was March 5, 2002. The last day with rain before April 15 was April 12</td>
<td>18 million litres to 148 million litres</td>
</tr>
<tr>
<td>2. May 5, 2004 (ETS Graph of spill in Appendix H)</td>
<td>John Street Regulator</td>
<td>Work Order No. 172442</td>
<td>Gate partially closed. ETS data shows that there is flow after the runoff event ends.</td>
<td>165,000 litres</td>
</tr>
<tr>
<td>3. April 3, 2005 (ETS Graph of spill in Appendix H)</td>
<td>Booth Regulator (Reported to MOE in April 2005)</td>
<td>ETS data Flagged by ISB staff</td>
<td>West Nepean Collector gate was opened to discharge sewage. ISB does not have appropriate data to estimate the spill volume.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.2

<table>
<thead>
<tr>
<th>Date</th>
<th>Regulator</th>
<th>How determined</th>
<th>Comment</th>
<th>Volume Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. April 18 to 19, 2007</td>
<td>John Street Regulator</td>
<td>ETS data</td>
<td>Snowmelt ended April 17, 2007</td>
<td>ISB was unwilling to provide an estimate of the spill volume.</td>
</tr>
</tbody>
</table>

Management has agreed with one of these four additional spills and it was reported to the MOE on October 17, 2008 as a result of the audit. Throughout the audit, management disagreed that the other three incidents identified by the Auditor General were spills. However, on October 17, 2008, management discovered and provided to the Auditor General an MOE Incident Report dated April 4, 2005 concerning one of these incidents. It had in fact been deemed a spill at that time and was reported to the MOE by the Supervisor, Sewer Maintenance and Operations. Management maintains that the other two incidents are not spills.

As discussed in Section 5.1.4.2 the monitoring data recorders were not operating during long intervals in 2001, 2002 and 2003. Therefore, it is not possible to ascertain if there were other sewage spills during that period. Based on the results in Table 5.2, it could be surmised that there were other sewage spills that went unrecorded and unreported. ETS graphs of three of the spills are attached in Appendix H.

### 5.2 Staff and Management Responsibilities

In this section of the report we discuss the responsibilities of staff and management members since the new City of Ottawa was created in 2001. As noted in Section 5.1, the decisions and actions taken since the beginning of the City affected the incident, its causes and the response by the City.

#### 5.2.1 Regulatory Requirements

Regulatory requirements for staff are contained in Ontario Regulation 129/04 – Licensing of Sewage Works Operators, made under the Ontario Water Resources Act. The regulation in the Operating Standards requires that:

1. Every operator must have a licence applicable to the facility.
2. The owner shall designate an Overall Responsible Operator (ORO), who must have a licence applicable to the type of facility.

3. If the ORO is absent, an Operator in Charge (OIC) with licence equal or one level lower than the facility may be designated as ORO.

4. The regulation limits the length of time that an OIC can be designated as ORO.

5. A professional engineer can be ORO if he has been employed less than six months.

6. The owner must ensure that logs or other record-keeping mechanisms are provided. Entries shall be chronological.

7. Only the OIC can make entry into log.

8. Specific information for each shift shall be entered into log.
   
   i. The date, the time of day the shift began and ended and the number or designation of the shift.
   
   ii. The names of all operators on duty during the shift.
   
   iii. Any departures from normal operating procedures that occurred during the shift and the time they occurred.
   
   iv. Any special instructions that were given during the shift to depart from normal operating procedures and the person who gave the instructions.
   
   v. Any unusual or abnormal conditions that were observed in the facility during the shift, any action that was taken and any conclusions drawn from the observations.
   
   vi. Any equipment that was taken out of service or ceased to operate during the shift and any action taken to maintain or repair equipment during the shift.

9. Logs shall be kept for two years.

10. The owner of a facility shall ensure that operators and maintenance personnel in the facility have ready access to comprehensive operations and maintenance manuals that contain plans, drawings and process descriptions sufficient for the safe and efficient operation of the facility.

The Regulation states that

15 (1) The owner of a facility shall designate as overall responsible operator of the facility an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility.

15 (2) If the overall responsible operator who is designated under subsection (1) is absent or unable to act, an operator who holds a licence that is applicable to that type of facility and that is not more than one class lower than the class of the facility may be designated as overall responsible operator.

The operators of the sewer collection system have the required licences for the Class of facilities. In August 2006 the Overall Responsible Operator had not been designated;
rather, the operators made assumptions with respect to who was at the time the ORO, based on the licence class of the program manager and the supervisors.

In August 2006 the OIC for each shift was not clearly designated at each shift, but the operators have indicated that they assumed that the Supervisor, Sewer Maintenance & Operations was the OIC. This lack of adequate designation was corrected during the course of the audit.

The regulation requirement to maintain a log was not met in the Sewer Maintenance division. The operators, supervisors and program managers relied exclusively on the Work Orders issued for the shift. The Work Orders are input to a computer database.

The requirement that the operators and maintenance personnel be given ready access to comprehensive operations and maintenance manuals, including plans, drawings, and process descriptions was not met at the time, and is only met partially at present. During this audit we requested copies of the O&M manual for the sewer system and found, as described in Section 4.3, that the manual is incomplete and out-of-date. The O&M Manual is currently being updated, but we were not given a due date. We requested copies of the drawings of the regulator from the Program Manager, Wastewater Collection and were provided with a general sketch of a float regulator taken from a 1989 report (see Appendix D for a copy of the “drawing” provided by the Program Manager). We had to request drawings of the regulator from the Manager, Infrastructure Management, who provided the as-built drawings for the regulator.

5.2.2 Policies, Procedures and Protocols

5.2.2.1 Policies

The City’s policy with respect to combined sewer system and the combined sewer overflows is to meet or exceed the requirements of Procedure F-5-5, discussed in Section 4.4. Although there is not specific written policy, the studies and reports dealing with the combined sewer system and control of combined sewer overflows show that the City has a policy in this regard, spearheaded by the Infrastructure Services Branch.

Unfortunately, the policy in 2006 and up to May 2008 addressed only the future improvements to the system, based on the Real Time Control Project. The Infrastructure Management Division has responsibility for the planning of the future improvements to the system, but leaves the responsibility for maintenance management to the Operations group, in this case the Wastewater & Drainage Services Division. The maintenance management, as has been explained in Section 5.1.1, was for practical purposes, non-existent.

The Manager, Environmental Services and Technical Support indicated that his responsibilities encompass maintenance scheduling and data collection, but with a focus on the pumping stations and the wastewater treatment plant, including data on failure history and corrective maintenance. His section does not encompass the wastewater collection system, although he is part of the Waste & Wastewater Services
Branch. There are no policies, procedures or protocols for maintenance management of the wastewater collection system emanating from this Division.

The unwritten policy with respect to the regulators was, by all appearances, to provide the minimum level of maintenance to the facilities, as they would be replaced in the RTC project. However, this train of thought that prevented any proactive renewal of the regulator hardware and equipment started fairly early: In 1993, the RMOC was considering implementation of a storage tunnel; and, the regulators were not renewed. The regulators would have continued to be required even if the tunnel had been built, and therefore the regulators should have been renewed. From 2004 to date the City has been planning and designing the proposed Real Time Control system, with the resulting unwritten policy of “no renewals”. Although it makes sense not to spend money on unnecessary repairs, we believe that there was not sufficient investigation and analysis to evaluate the policy.

The minimum level of maintenance was determined by the Wastewater and Drainage Services Branch. As we have reported in Section 5.1, the level of service selected for maintenance and inspections was too low, and did not meet the requirements for proper functioning of the regulators. The level of maintenance and inspections was driven by the perception that the Section was short-staffed. We heard this justification several times during the interviews. We do not agree with this explanation for not performing the work. A review of their budget surpluses for 2005, 2006 and 2007 shows that the Program Manager and the Section Manager had ample resources to complete the work.

In this respect we noted that the 1993 RMOC Access Shaft Rehabilitation Study states that the regulator hardware was about 30 years old (at the time) and was judged to have exceeded its estimated design life; the report indicated that timely replacement of all components is judged economically viable. The report continues: “On the other hand, it is recognized that sewer operation is currently under study and that study may suggest that the current regulator design is obsolete.” The report recommends, in light of these considerations, that the regulator rehabilitation be confined to those components noted above as having significant corrosion, especially the wheel and axle, the vertical posts controlling the float movement, and the beam support. It appears that this work was never carried out.

Infrastructure Services prepared the 2001 report Analysis of Flows to the Ottawa Interceptor Sewer and Operation of the Cathcart Regulator. This report also recommends that Waterware Corporation (refer to Section 4.1) “be engaged to conduct a condition assessment of the existing regulators and review operation and maintenance practices with operations staff.” There is no evidence that any action was taken regarding this recommendation.

In this regard it is worth noting a significant difference in policy within the Infrastructure Management Division. The Bridge Maintenance Procedures are based on
a risk assessment of the bridge and culvert assets of the City. The bridge and culverts are inspected every two years as a minimum and their condition is recorded and input into the database; based on the condition of the structures, a risk analysis is carried out to set priorities for renewal of the structures; as the structures condition changes with time, they are brought up for detailed condition assessments and evaluation of renewal options.

In contrast, the regulators, although they are a significant component of the combined sewer system, are not subject to a formal risk assessment or life cycle analysis of renewal options.

The conclusions from these findings are:

a. The unwritten policy of “bare minimum” maintenance is not appropriate and should be based on a risk assessment and consideration of APWA standards.

b. The sewer collection system is not considered an important component of the wastewater collection and treatment system.

c. The maintenance policies are set at the program manager level and depend on the training, experience and competency of the incumbent. These policies should be set at the Section Manager level, based on a risk assessment, and approved at the Director level.

5.2.2.2 Procedures

As previously noted in Section 4, there were no written procedures for maintenance of the regulators in 2006. A Regulator Maintenance procedure WJ02P07 was provided by the Wastewater Collection section for the inspection and basic maintenance of the regulators. However, this form only provides for basic maintenance of the regulators, and the steps in it cannot be considered preventive maintenance procedures for the regulators. After May 2008, a procedure for entry to the regulator chambers was prepared and made available.

No written procedures existed in the O&M Manual used in 2006 for maintenance of the regulators. As discussed in Section 4, the most recent revision to the O&M Manual is dated 1997, at the time that RMOC was responsible for the regulators. The operators indicated that no maintenance provision had been provided to them prior to the 2006 Sewage Spill.

We note that the Program Manager, Wastewater Collection initiated the June 2008 condition assessment, but no further action has been taken to improve the conditions in the regulators and their chambers.

When the procedures in the Wastewater Collection Section are contrasted to those in the Pumping Station and Control section, the conclusion is similar as the one reached in Section 5.2.2.1: the quality of the operation is fully dependent on the individual
program manager; there is not an overall concerted method to have the entire wastewater collection system operating in a coordinated manner.

5.2.2.3 Protocols
The protocol for spill notification used in 2006 was prepared by the RMOC. No updated version was available until June 2008. A copy of the protocol provided by the Manager, WDS and the one found in the office of the Supervisor, Sewer Maintenance & Operations are included in Appendix E. The spill notification protocol used in 2006 was reviewed and found to be very unclear, in particular with relation to the definition of a spill and when it should be reported. The introduction to the document reads as follows:

AUTHORITIES TO CALL FOR SANITARY SEWAGE, OIL & CHEMICAL SPILLS PUMPED INTO DRAINAGE SYSTEM

Will you ensure that in the event that it is necessary to direct sanitary sewage into a drainage system other than the sanitary or combine (sic) system as a result of overtaxing or blockage, or any type of spills or illegal discharge in the sewer system, etc., the following agencies should be immediately notified:

[The document proceeds to list the Ottawa-Carleton Regional Health Unit, RMOC Pollution Control, Ontario Ministry of Environment (sic), ROPEC Industrial Waste, and the former City of Ottawa]

The protocol for spill notification found in the office of the Supervisor, Sewer Maintenance & Operations was similar, except that it did not list RMOC Pollution Control and listed the former City of Ottawa Project Officer, Surface Water Control.

The main aspect that makes the direction confusing is that it makes notification required only in the event that spills are pumped and are directed to the drainage system other than the sanitary or combined system. The protocol should be specific that continuation of an overflow event due to a gate malfunction is a sewage spill and not a combined sewer overflow, necessitating notification to those listed in the protocol. Furthermore, if the gate is found in a partially closed or closed position, the crew should take the time to inspect the overflow sewer to confirm whether there has been a sewage spill. The operators have informed us that this is the new inspection procedure.

5.2.3 Industry Standards
In the Province of Ontario the industry standard requirements are set by Procedure F-5-5, which provides the requirements of the Province with respect to combined sewer overflows. Based on those standards, the MOE prepared a document entitled “Stormwater Pollution Prevention Handbook” in 2001.

As discussed in Section 4.1, the American Public Works Association (APWA) in their Manual published in 1970 recommend that the regulators be inspected regularly weekly
and after every storm. The Manual indicates that biweekly inspections would be the minimum acceptable frequency of regular inspections.

The USA EPA Combined Sewer Overflow O&M Factsheet also indicates that debris makes regulators susceptible to clogging and blockages. The EPA Factsheet recommends that regulators that have proven to be problematic should be inspected after every rainfall event.

The Water Environment Federation produced a report entitled “The O & M in CMOM: Operation & Maintenance A Reference Guide for Utility Operators” refers to the American Society of Civil Engineers (ASCE) publication “Optimization Of Collection System Maintenance Frequencies And System Performance”. The ASCE publication defines Maintenance as that set of activities required to keep a component, system, infrastructure asset, or facility functioning as it was originally designed and constructed to function. The ASCE recognizes three levels of maintenance effort: routine maintenance, inspection maintenance, and rehabilitation maintenance. Based on this definition, the City applied only routine and inspection maintenance to the regulators.

The City of Waterloo formally designates the Overall Responsible Operator at a meeting of Council. He is then authorized to designate the Operators-in-Charge as required by Ontario Regulation 129/04. The ORO is the Water Services Director. It would appear that in other municipalities the designation is not done by council resolution. Nevertheless, the Owner must designate the ORO.

The City of Indianapolis, IN, USA standards require that regulators be inspected daily. This work is contracted out by the City.

In the United States the NDPES program requires municipalities to prepare a CSO Long Term Plan. In this respect, the requirements are similar to Ontario’s requirements in Procedure F-5-5.

The City of Toronto and the City of Kingston have implemented storage to their combined sewer systems. Therefore, they no longer have regulators in their systems.

5.2.4 Position Descriptions

The position descriptions for the Manager, Wastewater and Drainage Services, Program Manager, Wastewater Collection, Section Manager, Sewer Maintenance, and Supervisor, Sewer Maintenance & Operations were reviewed to establish the responsibilities assigned to each individual within the City, in relation to the actions that were taken in relation to the 2006 Sewage Spill.

5.2.4.1 Manager, Wastewater and Drainage Services

Overall Responsibilities:

Responsible for directing the financial and human resources of the Wastewater and Drainage Services Division and developing the Division’s strategic, financial
and operational plans; through subordinate section heads, provides technical and managerial leadership in the development, implementation and monitoring of best practices, performance indicators and service delivery standards in the management of the City of Ottawa wastewater, stormwater, and land drainage infrastructure and systems, including wastewater and stormwater treatment facilities, wastewater and stormwater collection and land drainage systems; participates on the department management team and provides divisional input to the development of department budgets, strategic and human resources plans, and branch/department/corporate wide program initiatives, policies and service delivery standards; and performs other related duties or tasks.

Of specific relevance to the CSO Sewage spill are the following duties and responsibilities:

5. Developing and maintaining a proactive approach to loss control within the division [This refers to liability mitigation, risk management, and similar issues].

7. Ensuring management systems are in place and functioning effectively to maintain compliance with applicable legislation
   - Reviewing all pertinent legislation, regulations, and regulatory process
   - Ensuring that section heads are knowledgeable in pertinent legislation, changes to legislation and regulations, responsibilities within legislation, and consequences of non-compliance.

A review of the events and actions of the Manager, Wastewater & Drainage Division indicates that he did not meet his duties and responsibilities.

5.2.4.2 Program Manager, Wastewater Collection

Overall Responsibilities:

Responsible for managing the human and financial resources of the Wastewater Collection Section; through subordinate supervisors, overseeing the provision of wastewater and stormwater collection operations and communal wastewater treatment facilities within the City, and ensuring that activities are conducted in accordance with loss control principles; overseeing the management of large projects and contracts within the Section; coordinating and planning the Section’s longer term activities with internal and external groups; participating in public and inter-governmental consultations and on the Divisional management team; and performing other related duties and tasks. Directs the implementation of division strategies, and the operations of the work unit, including organization structure and job design, and manages financial and human resources. Accountable for hiring and firing, performance management and discipline of
staff as necessary, and acts as spokesperson for the employer at grievance hearings.

Of specific relevance to the CSO Sewage spill are the following duties and responsibilities:

3. Oversees the management of the wastewater collection systems; some treatment facilities within the City; inspection and rehabilitation and operational support and capital projects by
   - Ensuring that Section activities are performed in accordance with the applicable Certificate of Approval and regulations, and that adequate systems are in place to demonstrate due diligence in the performance of all activities; and,
   - Ensuring that the responsibilities of the Operator in “Overall Operational Responsibilities” (as defined under the Regulations dealing with mandatory certification) are fulfilled.

11. Ensures that employees are provided with and use appropriate equipment, material, and/or procedures required to perform the assigned duties. Ensures that all employees perform work in accordance with applicable health and safety legislation and all City of Ottawa corporate and departmental policies and procedures. Ensures that appropriate action is recommended for those employees who do not work in compliance with the legislation, policies or procedures.

A review of the events and actions of the Program Manager, Wastewater Collection indicates that he did not meet his duties and responsibilities.

5.2.4.3 Section Manager, Sewer Maintenance

Overall Responsibilities:

The Section Manager, Sewer Maintenance plans, organizes, coordinates and controls assigned maintenance activities of the Sewer Operations section. Provides guidance and assistance to employees engaged in occupations concerned with maintenance of storm, combined, and sanitary sewer systems. Directs the strategic planning process, including organizational structure and design, and manages the financial and human resources. Accountable for hiring and firing, lay off and recall of staff, performance management of the work unit, maintaining discipline as necessary, and acts as spokesperson for the employer at grievance hearings. Participates on the management tam and develops section budgets, strategic and operational plans.

Of specific relevance to the CSO Sewage spill are the following duties and responsibilities:

3. Manages maintenance of the Sewer Operations section by
- Administers by-laws which pertain to Sewer Operations activities;
- Initiates and directs research and analysis programs to develop new and improved maintenance methods, operating procedures, and management techniques; and,
- Works closely with the Wastewater Collection Manager in developing operating policies, long range plans, and work programs.

7. Ensures that employees are provided with and use appropriate equipment, material, and/or procedures required to perform the assigned duties. Ensures that all employees perform work in accordance with applicable health and safety legislation and all City of Ottawa corporate and departmental policies and procedures. Ensures that appropriate action is recommended for those employees who do not work in compliance with the legislation, policies or procedures.

A review of the events and actions of the Section Manager, Sewer Maintenance indicates that he did not meet his duties and responsibilities:

- Did not develop maintenance methods or operating procedures.
- Did not develop appropriate operating polices and work programs to adequately maintain and inspect the regulators.
- Did not ensure that the employees are provided with and use appropriate equipment, material and procedures required to perform their assigned duties.
- Did not ensure staff were properly trained and adequately supervised.
- Did not follow the City of Ottawa corporate and departmental policies and procedures.

It is noted that the job description for this position does not have a description of the Overall Responsible Operator.

The Statement of Qualifications requires MOE Level IV Water Treatment Certification. The incumbent has Level IV Wastewater Collection Certification. This may be a typographical error in the Statement of Qualifications.

In our view, as the professional position closest to the front line staff and the only one having a “Level 4” MOE certification, the key responsibility for ensuring that adequate operational and maintenance procedures are in place rests with the Section Manager, Sewer Maintenance. Management from both Water & Wastewater and Infrastructure Management identified this position as having the primary responsibility for the maintenance of this equipment. However, this manager did not develop maintenance methods or operating procedures; he did not develop appropriate operating polices and work programs to adequately maintain and inspect the regulators; he did not ensure
that the employees are provided with and use appropriate equipment, material and procedures required to perform their assigned duties; and, he did not follow the City of Ottawa corporate and departmental policies and procedures.

5.2.5 Training Levels

Regulatory requirements for training of staff are contained in Ontario Regulation 129/04 – Licensing of Sewage Works Operators, made under the Ontario Water Resources Act. The regulation requires that:

1. Every operator must have a license applicable to the facility
2. The owner of a facility shall ensure that every operator employed in the facility is given at least 40 hours of training every year.
3. The training may include, for example, training in new or revised operating procedures, reviews of existing operating procedures, safety training and studies of information and technical skills related to environmental subjects.
4. The owner shall ensure that records are maintained of the training given under this section, including the names and positions of the operators who attend training sessions, the date or dates of each training session, the duration of each training session and the subjects covered at each training session.

We found that the Program Manager has only a Level III Certificate when he is required to have a Level IV Certificate by the terms of his offer of employment, made in 2002. This individual was aware of a condition assessment done in 1989, but had no idea that other evaluations were done in 1992/1993 or of the condition of the regulators. He had not reviewed a set of drawings, or any other information on the regulators. The June 2008 Price & Associates report notes that this individual did not know what a regulator is or its function.

At present, the Section Manager, Sewer Maintenance is designated as the Overall Responsible Operator, since he has a Level IV Certificate. In our opinion, the Overall Responsible Operator for the Wastewater Collection System should be the Program Manager, Wastewater Collection.

All section managers, supervisors, and staff interviewed stated that they had received the minimum mandatory level of 40 hours of training per year. However, we noted that the Program Manager admitted that 20% of his staff had received the statutory training. In addition, some received more while others less than the requirement.

The Manager, WDS, the Program Manager, Wastewater Collection and the Section Manager, Sewer Maintenance attended several conferences and courses during 2005, 2006 and 2007. A detailed list is included in Appendix F.
5.2.6 Reporting Responsibilities

In reviewing the job descriptions noted above it is evident that the responsibility for reporting a sewage spill was not clearly assigned. During the interviews, it was determined that the general understanding was that the Supervisor, Sewer Maintenance & Operations would have been responsible for reporting a sewage spill to the MOE.

The interviews and the correspondence also provided insight into the “culture” within the Public Works Branch and the Wastewater & Drainage Services Division: a sewage spill was not considered a reportable spill, as it could be considered a continuation of a combined sewer overflow, which is not reportable being a Class I spill.

Examples of the above can be found in a May 2008 email from the Manager, WDS to the Director, Water and Wastewater Services where he indicates to the Director that he and the Program Manager probably were aware of the spill but likely considered it simply as an overflow event that continued beyond the normal period. In an email from the Director to the Manager, WDS the Director indicates that he believes that the incident can be given a positive spin as in “we found the problem and it is fixed”. In a May 21, 2008 email from the DCM to the Director, he states that the report to Council could be framed as “we had xx overflow events during the year and the regulator failed only once”.

We conclude that the responsibility for reporting spills had been given in an informal manner to the Supervisor, Sewer Maintenance and Operators, but in such a way that he considered his duty to report only in cases where he initiated the spill, such as when he opened the gate at the Booth structure to relieve flooding pressure in the West Nepean Collector. The way in which the instructions for reporting were provided did not clearly include as a reportable spill an event such as the sewage spill due to a closed regulator gate.

5.2.7 Communications Methods

Until recently, the work in the Sewer Maintenance Section was recorded using the work orders only, and the log book required by Ontario Regulation 129/04 was not maintained. The Supervisor, Sewer Maintenance & Operations prepared the work order and the sewer maintenance foreman completed it when the work was carried out; subsequently, the Section Manager reviews and signs the work order. After that, the work order is submitted for data input to the computer system.

The sewer maintenance foremen and the Supervisor, Sewer Maintenance & Operations indicated in the interviews that the Section Manager, Sewer Maintenance would review each work order and that they would bring to his attention any unusual circumstances found during the work.

In addition to the above, the communication in this case did not proceed to the correct management level. The Section Manager did not communicate the event to any one
else above his level. We believe this was due to the fact that the spill was not perceived as a spill.

5.2.8 Protocols

The Spill Reporting Instructions provided to the operations staff, in addition to being out of date, were not clear. In our opinion, the Operator staff did not receive clear instruction regarding the circumstances in which a combined sewer overflow becomes a sewage spill. Furthermore, there is no requirement in the outdated protocol for the operator to record the incident number provided by the MOE.

The 2007 MOE Spills Reporting brochure explains the circumstances in which a sewage spill needs to be reported:

In the case of s.15 (1) of the EPA, a discharge must be reported if it is out of the normal course of events and it causes or is likely to cause an adverse effect (and the person is not otherwise required to notify the Ministry under s. 92 of the EPA). The discharger must determine whether the potential risks that arise from events such as storm related sewage bypasses (e.g. potential health impacts to downstream water users) meet the criteria in s.15(1) and need to be reported.

5.2.9 Conclusion

It is possible to conclude that neither the Manager, Wastewater & Drainage Services, the Program Manager, Wastewater Collection, and the Section Manager, Sewer Maintenance delivered their duties as required. It is our opinion that their failure to correctly and completely deliver their responsibilities was responsible for the malfunction, the length of time of the malfunction, and the failure to notify the MOE about the sewage spill. Given the extent to which they did not address their duties, it can be asserted that they were delinquent in their performance.

5.3 Response by City Staff

5.3.1 Water and Wastewater Services

This section of the report discusses the actions by the staff of the Water and Wastewater Services Branch. The actions by management and staff of the Infrastructure Services Branch are discussed in Section 5.3.2.

5.3.1.1 August 2006

On August 15, 2006 a flow monitoring technician downloaded the data from the data logger located on the John Street overflow sewer.

When the Flow Monitoring Technician downloaded the data from the overflow sewer monitor he noted that there was flow in the sewer, even though there had been no rain for about 12 days. He visited the site and was able to confirm visually and by the sound in the sewer that indeed there was flow in the overflow sewer when there should not be
any. He contacted his supervisor via cell phone and the Supervisor, Sewer Maintenance & Operations and informed them of his findings.

The Supervisor, Sewer Maintenance & Operations directed a crew which was near the end of their shift to the site. The work order shows that five of six persons who worked on the incident recorded the entire time as overtime.

One of the most experienced sewer workers in the crew descended into the regulator chamber and found the gate completely closed and the chamber dry; he found no debris in the chamber. He tried to open the gate by climbing onto the float, without success; he then called for a pry bar to be lowered into the chamber and proceeded to pry the gate open after several tries; once the gate opened, there was no flow at all, and he saw that the conduit from the collector sewer to the gate was blocked by packed, black silt and sand. He then tried to dislodge the silt and sand with the pry bar but was unable to force flow. It was necessary to use a high-pressure hose with a nozzle to dislodge the blockage. After some time, the flow through the regulator gate and the orifice plate to the interceptor sewer was restored.

The sewer maintenance worker who entered the chamber worked in very difficult circumstances and conditions. We are concerned, however, with the safety of the worker and that he exposed himself to significant danger of injury to re-open the regulator gate and restore flow to the interceptor sewer.

The sewer maintenance worker who entered the chamber and restored the flow in the regulator stated that the circumstances of this blockage were very unusual and that they were discussed by several staff of the sewer maintenance section. He also noted that this was not the first time that a gate had been found closed. We confirmed this during a review of the work orders, as noted in Section 5.1.5.

During the interviews during this audit other staff of the Sewer Maintenance Section stated that they did not know about or did not remember this incident.

The MOE has confirmed that the sewage spill event was not reported to the Spill Action Centre, and that the Duty Officer’s log shows no record of a call in August 2006 or later.

Based on the findings of this audit, we conclude that there was no appropriate procedure to inform MOE of sewage spills from the regulators. As noted in Section 5.2, it is evident that any flow from the regulators was considered as a combined sewer overflow and was not reported.

There was no follow up by the Section Manager, Sewer Maintenance, although this malfunction appeared to be quite singular in that the high pressure water jet had to be used to re-establish flow in the regulator; no other work order reviewed during this audit had indication that a Hydrojet truck had to be used to re-open the gate.

The interviews with Sewer Maintenance staff disclosed that the Section Manager, Sewer Maintenance reviewed all Work Orders issued by the Supervisors reporting to him. In addition, the description of the work done to re-open the gate and remove the grit...
accumulated behind the gate shows that this was not an ordinary event. As noted previously, this was the first time that a water jet had to be used to remove grit from behind a gate. Based on the past practice of the Section Manager, the SSMO would have briefed him on the events. Given that he was responsible for the Section, we would have expected that he would have followed up on whether the MOE had been notified about the event. It is worthy of note that the Section Manager, Sewer Maintenance was not in Ottawa during this time because he was attending a conference regarding spills into the Great Lakes.

The Section Manager, Sewer Maintenance did not inform anyone above his level of this event. Based on the review of background report and correspondence, we conclude that the event was not considered serious, and probably for that reason it was not brought to the attention of any manager. As we describe elsewhere in this report, we have concluded that the culture of the WDS Division was such that the incident was not considered a reportable spill, but simply the continuation of a combined sewer overflow.

5.3.1.2 March to May 2007

During the course of preparing the May 16, 2007 letter to the MOE reporting the sewage spill the Manager, Wastewater & Drainage Services received an email from the Program Manager, Wastewater Collection, indicating that the Supervisor, Sewer Maintenance & Operations had indicated “that the regulators are getting old and sometimes stick”. There was no management reaction to this event: there was no investigation of whether MOE had been notified after the event and more importantly, there was no modification to the inspection schedule or the preventive maintenance program.

During an interview as part of this audit, the Program Manager admitted that he was “remiss in his duties”. He also stated that in his view the sewage spill was “Not a big deal in 2007, but became a big deal when it hit the papers”.

The Manager, WSD and the Program Manager, Sewer Maintenance were informed that the MOE had been notified about the spill by the Senior Engineer, Water Resources in the Infrastructure Services Branch, and that the MOE had not been notified at all before then. They discussed via email the event and prepared a letter to the MOE informing them of the spill and its magnitude. The letter draft was prepared by the Senior Engineer.

It is noted that the Manager, WDS wrote to the Program Manager, WC on May 2, 2007, telling him that “apparently the MOE are expecting a report on this.” The Program Manager, WC sent an email to the Manager, WDS, in reply, indicating the Flow Monitoring Technician discovered the overflow at the John Street regulator on August 15 and that the problem was “taken care of that day.” He continues by saying that “J.P. stated that the regulators are old, and sometimes stick.” It is obvious that all the managers at all levels considered this event as an “overflow”, and not a sewage spill.
During the interview, this individual stated that he would have “escalated up the food chain” if he knew the magnitude of the spill in 2006; however, in 2007 he did know and did nothing. Furthermore, it did not take much effort to realize that the sewage spill was a significant portion of the daily flow to the sewage treatment plant, yet he did not pursue the matter at all.

The Manager, WDS has responsibility for the operations at ROPEC. Given the large magnitude of the sewage spill as discussed in Section 1.2.7, we find it very unusual that no one at the sewage treatment plant noticed that for 12 days the volume of sewage reaching the plant was almost 20% lower than the normal daily volumes.

During the Divisional Management Meetings in May 2007 the sewage spill was discussed, but aside from the letter to MOE, nothing was done. The minutes do not record any reaction from the Manager, WDS or the Program Manager, Wastewater Collection. It is noted that the event is called “the incident”.

There was no further action in this respect after May 2007: No modifications to the inspection program, no investigation of the malfunction, no modification to the preventive maintenance program, no condition assessment of the regulators, no questions about whether the spill was a problem. This reaction by the Manager, WDS and the Program Manager, Wastewater Collection is confounding, given the magnitude of the sewage spill.

It is noted that the Manager, WDS, the Program Manager and the Section Manager did not notify Public Health in May 2007 when they became aware of the sewage spill, although Public Health are listed in notification list that was used at the time. At the time they all were aware of the magnitude of the sewage spill and should have been aware of the fact that the volume of sewage spilled during the August 2006 incident was almost equal to the volume of combined sewer overflows discharged by the City to the Ottawa River and equal to two days of sewage received at ROPEC.

The lack of reaction at the management level demonstrates that none of these individuals, two of them professional engineers, considered that these events had to be reported. They considered the sewage spill as an “extended” overflow. This reaction can only be explained by incompetence on their part.

At this point, the PEO Code of Ethics and the Professional Engineers Act should be mentioned, as the Code and the Act impose a duty to report and a duty to protect the public. The City should consider reporting the issue of incompetence in the practice of professional engineering to the appropriate engineering associations.

5.3.1.3 February to May 2008

On May 22, 2008, the Manager, Wastewater & Drainage Services Division met with the Supervisor, Sewer Maintenance & Operations to discuss the sewage spill. The SSMO indicated that he probably informed the MOE the same day or the next day. There is no
record of the meeting, except for an email from the Manager, WDS to the Director, indicating that the SSMO had stated that he notified the MOE.

The SSMO indicated during this audit that he could not recall the event and was not aware of the magnitude of the sewage spill. When he heard of the sewage spill in the news, he went to see the Manager, WDS. There was no serious discussion of the case, although later the Manager, WDS expressed to the SSMO that “this thing’s got legs”. At the May 22nd meeting with the Manager, WDS and the Director, the SSMO consented to proceeding with the meeting without a shop steward being present. According to the SSMO the meeting was friendly.

Following the May 22, 2008 memorandum to Council, the MOE reviewed their record of spills and found no record of anyone from the City informing them of the sewage spill. When confronted by the Director, WWS and the Manager, WDS with the fact that the MOE could not locate a record of the call, the SSMO stated that perhaps he did not call after all.

Based on our review of the background information, email correspondence, procedures, etc. related to this matter, we conclude that the SSMO may have not called the SAC because he did not consider at the time that the consequences of the closed Keefer Regulator were a spill, but simply a continuation of a combined sewer overflow. We make reference by an email from the Manager, WDS to the Director, WWSB in which he states that he and the Program Manager, WC may not have called for the same reason. Evidently, the matter was not considered serious by anyone in the Wastewater & Drainage Services Division.

When the Senior Engineer, Water Resources notified the Manager, WDS about his meeting with Public Health and that Public Health had asked to be included in the notifications protocol, the Manager, WDS asked the Program Manager, Wastewater Collection to include Public Health in the notification protocol. This would not be worthy of note, except for the fact that the Spills Notification Protocol used by the Wastewater Collection section should have been familiar to both the Manager, WDS and the Program Manager, WC, as notification to Public Health was already listed in the Protocol they were supposed to be using. As we have discussed elsewhere, the problem was not that Public Health was not listed on the Notification Protocol, because they were, but that the protocol was not followed. Evidently, neither the Manager, WDS nor the Program Manager were aware of their Spill Notification Protocol.

When on April 2, 2008, the Director, Water & Wastewater Services requested the Manager, Wastewater & Drainage Services Division and the Program Manager, Wastewater Collection to provide information on the August 2006 event, including date of identification, date of repair, notifications issued, estimates of the volume released, etc., the Program Manager, Wastewater Collection asked the Section Manager, Sewer Maintenance to provide information on the incident.
When the Community and Protective Services Committee received the report on the water quality in Petrie Island Beach discussing the possible sources of the pollution at the beach during 2007, the Director, Water & Wastewater Branch was present at the meeting, but did not inform the meeting of the fact that there was a likely link between the CSOs and the contamination at the Petrie Island Beach. We consider, given that the beach closures in 2006 did not have an explanation at the time that the Director should have let the Committee know of the results of the meetings and emails that took place on April 2nd. The same happened at the presentation of the 2007 Beaches Report to Council three weeks later; similarly, the Director did not notify Council then.

The incident appeared to have receded in importance during the time that followed the Committee meeting and 2007 Beaches Report presentation, as evidenced by the fact that the emails on this subject stopped on April 3, 2008. This situation changed on May 7, 2008 when during a tour of the R. O. Pickard Centre, the Manager, Wastewater & Drainage Services informed a tour group that included a City Councillor and members of Friends of Petrie Island that there is a likely link between the August 2006 sewage spill and the poor water quality at the beach on the same period. The significance of this information was immediately apparent to some of those in attendance. As a result, the August 2006 sewage spill started receiving the attention that it should have received in August 2006 and in May 2007.

On May 20, 2008, the Deputy City Manager, Public Works & Services provided council with a memorandum “to provide information related to a recently identified correlation between a 2006 prolonged overflow event [emphasis ours] from the City’s combined sewer area and coincident Petrie Island Beach closures.” The memorandum indicates that “this event was reported by the City to the Ministry of the Environment shortly after the overflow was discovered” and was reported again to the MOE in May 2007. The memorandum also provided information on the actions that the City had taken to minimize the possibility of repetition of such an incident. It is noted that at this point the authors of the memorandum were (or ought to have been) fully aware that the incident was not reported to the MOE until May 2007. We do not know why this memorandum indicated that the MOE had been timely notified, as by May 2007 it was known that the MOE was not called immediately. In addition, the memorandum states that changes to the procedures had been implemented “as a result of this event”, which is not correct, as the changes only occurred once the situation was made public in May 2008, and not when the managers first learned about it in May 2007.

On May 21, 2008 the Director, Water & Wastewater Services Branch provided a sequence of events in an email to the Deputy City Manager, in which he lists that the “City and MOE staff generally discussed the Keefer Regulator Overflow occurrence” as having taken place in August 2007, and marks the date with a question mark. The DCM noted in his reply that “there seems to be something wrong with August 2007 timing as that would imply we discussed the spill with the MOE months after we wrote them about it.” The DCM also suggests including a reference to the number of
overflows that occur in a year, and in particular that in 2006 “notwithstanding xx overflows during the year, the regulator did not perform correctly only on this occasion.” These comments indicate that the Director was aware that the MOE had not been informed in August 2006 but in May 2007, and that the sewage spill was considered a rare and long overflow event.

The Manager, WSD was aware of the spill in 2007 but did not follow up with the Supervisor to determine if the spill had been reported. Whether there was a report to MOE only became an issue once the event made the news. Even in 2008, the Manager, WSD wrote to the Director indicating that “I can’t remember whether or not I was informed, but I likely was. Again, neither [the Program Manager] or me would have known the magnitude of the flow.” This, of course, is completely inaccurate, as the Program Manager signed the May 2007 letter to MOE and the Manager, WSD was copied on it and received a copy of the 2006 CSO Report which provided the volume of CSOs for the entire year. It was evident then from the report and the letter that the volume of the sewage spill over 10 days was about as large as the volume of CSOs over an entire year and as large as two days of sewage flow at ROPEC.

In an email from the Manager, WDS to the Director dated May 23, 2008, the Manager indicated that neither he or the Program Manager could recall if they were made aware of the spill, but believe they probably were. The Manager indicated he “would like to think that if they knew in August 2006 the magnitude of spill that they would have paid more attention to it”.

In reviewing the correspondence and memoranda to Council, it is our opinion that the writer of the May 20th memorandum assumed incorrectly that the MOE had been notified of the spill. However, the fact that MOE was not notified until May 2007 was readily apparent in the correspondence that was used as a basis for the memorandum.

The Manager, WSD and Program Manager, Wastewater Collection made no changes to the inspection procedures, notification protocols, or any other changes until after the matter was published by the news media. In addition to modifying the inspection protocol, the City also modified the notification protocol. Not until after the sewage spill became news, was action taken: Changes to the monitoring system, planning of installation of alarms, changes to the inspection frequency, and a condition assessment of the regulators.

During the interviews forming part of this audit, the Program Manager indicated that he did not consider the regulator malfunction to be an issue in 2007, but that it became an issue when the news media published it. This statement demonstrates a total lack of appreciation of the duties of the position by this individual.

The response to the event became serious once Council decided to undertake the various investigations. In an email from the Director, Water and Wastewater Services to the former Director (now with the Regional Municipality of Niagara), the Director
indicated that he “thought things were cooling down a bit, but Councillors announced independent investigation.”

5.3.2 Infrastructure Services Management and Staff

This section of the report discusses the actions by management and staff of the Infrastructure Services Branch. The actions by management of the Water & Wastewater Services Branch are discussed in Section 5.3.1.

5.3.2.1 August 2006

The Infrastructure Services Branch had no direct involvement during the sewage spill itself. However, the background reports indicated that the management of the sewer infrastructure as part of the asset management mandate of the Infrastructure Management Group was not carried out in the same comprehensive way that other assets, such as roads and bridges, are being managed. The Infrastructure Management Group has indicated that the level of maintenance to maintain the regulators in working condition is responsibility of the Wastewater & Drainage Services Division.

However, when contrasted to the manner in which the Bridge Maintenance Program is run, there are some very evident gaps. For instance, in the case of the Bridge Management Program the priority for condition assessments, renewal options evaluation (including replacement), and execution of the renewal works or replacement of structures is managed by the Transportation Infrastructure Section of the Infrastructure Management Group. The assessment of priorities includes a life cycle cost analysis of the various options and the selected alternative.

Although the Infrastructure Services Branch did not have a direct involvement in the events of August 2006, we conclude that the event itself could be attributed at least in part to the effect of infrastructure management program, or lack thereof.

5.3.2.2 March to May 2007

The Senior Engineer determined at the time that the spill had not been reported to the MOE. The Senior Engineer does not recall how he determined that the sewage spill had not been reported to MOE, but he is certain that it had not been reported. He has stated that sometime between March 22 and April 23 he determined that a report of the sewage spill had not been filed with MOE; he states that he may have talked about it to one or all of the Section Manager, Sewer Maintenance, the Program Manager, Wastewater Collection, the Supervisor, Sewer Inspections, or the Manager, WDS, or he discussed the event with the MOE District Manager. In any case, it is obvious that the matter was discussed by these individuals between those two dates.

According to the account by the MOE District Engineer, at about the same time, the National Capital Commission called the MOE District Office to express concern about what they believe to be sewage pipes discharging from the City to the Rideau Canal. As part of the due diligence by the MOE, the District Engineer contacted the Senior
Engineer and they agreed to meet on site to inspect the sites accompanied by a NCC representative. This issue has been resolved, the pipes being storm drains.

The Senior Engineer communicated the spill to the MOE District Engineer via a telephone conversation on April 23, 2007, and informed him that the spill had not been reported to the MOE. His actions in this respect are considered correct.

The letter to the MOE was sent by the Program Manager, Wastewater Collection on May 16, 2007, with copies sent to the Manager, Wastewater & Drainage Services and the Senior Engineer, Water Resources. Shortly after that, the City submitted to the MOE the “Report on Combined Sewer Overflows in 2006”, in which the sewage spill is also mentioned, but making reference to details submitted under separate cover (the May 16, 2007 letter to MOE).

The Report on 2006 Combined Sewer Overflows was sent to the MOE and a copy was provided to the Manager, WSD, the Senior Engineer, and the Manager, Infrastructure Management Group. The August 2006 incident is mentioned in this report, but no information on the volume of the sewage spill is given. Nevertheless, the Manager, Infrastructure Management indicated during this audit that he was aware of the spill in April 2007.

In our opinion, the Manager, Infrastructure Management should have followed up on the regulator malfunction, as it is a reflection of the condition of the asset, as we discussed in the previous section. Although he did not directly received a copy of the May 16, 2007 letter to the MOE, the fact that a gate remained jammed shut for 15 days clearly indicates a major concern. In addition, he was aware of the magnitude of the spill in April 2007.

In our opinion, the Manager, Infrastructure Management should have followed up on the reasons for the malfunction, seeing as the eventual replacement of the regulators will not start until 2009, three years later. During this period, the Manager, Infrastructure Management, being aware of the incident, including the magnitude of the sewage spill, did not inform the Director of Infrastructure Services. The letter was prepared by Infrastructure Services Branch and the Director should have been alerted to the problem.

5.3.2.3 February to May 2008

As noted previously, the Senior Engineer, Water Resources continued to investigate a possible link between combined sewer overflows and water quality at Petrie Island, and notified those that he considered should be informed of his findings. In our opinion, this engineer took his responsibilities seriously, and clearly satisfied his obligations as an employee of the City and as a professional engineer. We could say that without this engineer’s thorough and conscientious work this situation would not have come to light.
When the matter was made public and the Director, WWS branch and the DCM required information on the event, the Senior Engineer was prepared to cooperate fully. During this audit the Director, Infrastructure Services Branch indicated that he does not think that it is necessary that he be informed of an incident such as the sewage spill. He considers that the operation and maintenance of the wastewater collection system is the responsibility of the Water and Wastewater Services Branch. However, we consider that since his branch is in charge of infrastructure asset management, he should be interested in the condition of the assets that his branch is supposed to be managing. We view this position with respect to the flow of information as not assuming the overall responsibilities of his position.

5.3.3 Summary of Actions & Omissions

Table 5.3 in the following pages summarize the actions or omissions respecting this subject.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event/Action</th>
<th>What should have been done</th>
<th>Who should have done it</th>
<th>What was done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2001</td>
<td>Following Amalgamation</td>
<td>Coordinate and update regulator inspection procedures</td>
<td>Manager, WDS; Program Manager, WC; Section Manager, Sewer Maintenance; Section Manager, Sewer Inspections</td>
<td>Nothing until May 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Procedures updated in June 2008</td>
</tr>
<tr>
<td></td>
<td>Prepare Sewage spill notification protocols</td>
<td></td>
<td>Manager, WDS; Program Manager, WC</td>
<td>Nothing until May 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Procedures updated in June 2008</td>
</tr>
<tr>
<td></td>
<td>Update O&amp;M Manuals</td>
<td></td>
<td>Program Manager, WC; Section Manager, Sewer Maintenance; Section Manager, Sewer Inspections</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Condition assessment of regulators</td>
<td></td>
<td>Manager, WDS; Program Manager, WC</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Training of staff on regulator inspections and maintenance</td>
<td></td>
<td>Manager, WDS; Program Manager, WC</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Maintain alarm system</td>
<td></td>
<td>Manager, WDS; Program Manager, WC</td>
<td>Not done</td>
</tr>
<tr>
<td>Date</td>
<td>Event/Action</td>
<td>What should have been done</td>
<td>Who should have done it</td>
<td>What was done and by whom</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------</td>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td>Inspections of regulators frequency: weekly and after every significant storm</td>
<td>Manager, WDS; Program Manager, WC; Section Manager, Sewer Maintenance; Section Manager, Sewer Inspections</td>
<td>Not done</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Ontario Regulation 129/04</td>
<td>Designate Overall Responsible Operator</td>
<td>Manager, WDS</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Assign Operator-in-charge for each shift</td>
<td>Program Manager, WC</td>
<td>Not done</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set up log books for inspections and maintenance</td>
<td>Manager, WDS; Program Manager, WC; Section Manager, Sewer Maintenance; Section Manager, Sewer Inspection</td>
<td>Not done</td>
<td></td>
</tr>
<tr>
<td>August 2006</td>
<td>Sewage Spill</td>
<td>Inspect regulator after major storm</td>
<td>Program Manager, WC; Section Manager, Sewer Maintenance; Section Manager, Sewer Inspection</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Notify MOE, Public Health, Community Services</td>
<td>Section Manager, Sewer Maintenance; Supervisor, Sewer Maintenance &amp; Operations</td>
<td>Not done</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.3
Summary of Actions and Omissions

<table>
<thead>
<tr>
<th>Date</th>
<th>Event/Action</th>
<th>What should have been done</th>
<th>Who should have done it</th>
<th>What was done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Notify Management</td>
<td>Section Manager, Sewer Maintenance; Section Manager, Sewer Inspection</td>
<td>Not done</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Review inspection and maintenance procedures</td>
<td>Section Manager, Sewer Maintenance</td>
<td>Not done</td>
<td></td>
</tr>
<tr>
<td>February – May 2007</td>
<td>Sewage Spill identified by Infrastructure Services</td>
<td>Notify MOE, Public Health, Community Services of August 2006 spill</td>
<td>Manager, WDS; Program Manager, Wastewater Collection</td>
<td>Only MOE was informed, initially verbally by Senior Engineer, ISB, then in writing by Program Manager, WC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify Upper Management</td>
<td>Manager, WDS</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carry risk assessment of existing regulator condition</td>
<td>Manager, Infrastructure Management</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify Council immediately</td>
<td>Manager, WDS via Director, WWS</td>
<td>Not done</td>
</tr>
<tr>
<td>March – May 2008</td>
<td>Link between Sewage spill and Petrie Island Beach closures identified</td>
<td>Notify MOE and Public Health of link</td>
<td>Manager, WDS; Program Manager, Wastewater Collection</td>
<td>Senior Engineer in ISB notifies Manager, WDS</td>
</tr>
<tr>
<td>Date</td>
<td>Event/Action</td>
<td>What should have been done</td>
<td>Who should have done it</td>
<td>What was done and by whom</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>-------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Notify Upper Management</td>
<td></td>
<td>Manager, WDS</td>
<td>Manager, WDS notified Director of request by Public Health to be notified. The Director noted to us.</td>
</tr>
<tr>
<td></td>
<td>Notify Community Committee</td>
<td></td>
<td>Director, Water &amp; Wastewater Services Branch</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Notify Council immediately</td>
<td></td>
<td>Director, Water &amp; Wastewater Services Branch</td>
<td>Manager, WDS informs Councillor and others during a tour of ROPEC. No formal notification given until May 20, 2008</td>
</tr>
</tbody>
</table>
5.4 Reasons for Non-Reporting of Spill

5.4.1 August 2006

The spill may have been reported, as several operators indicated that calls to the MOE were fairly informal and that in no case was an incident number provided. However, based on the interviews we have come to the conclusion that the sewage spill was not reported for two reasons:

1. The discharge of sewage from the malfunction of a regulator was not considered a spill and the operators saw no reason to report it.

2. The notification procedure used was interpreted as requiring notification of spills only in the case that the sewage was directed by the operator to the overflow (such as in the case of the West Nepean Collector gate at the Wellington-Booth Structure).

Neither management nor the operations staff considered that the event was reportable. There appeared to be a culture that sewage spills from combined sewer overflows are nothing more than an extended overflow event.

This perception is reinforced by the view of some of the managers. For example, during the interview the Manager, Strategic & Environmental Services indicated that in his view the spill is not significant when compared to the volume of flow in the Ottawa River. This manager indicated that 1.0 million litres of sewage was insignificant when compared to the river flow (0.01%). Even after we corrected him by pointing out that the volume of sewage spill was 1000 times larger than he said, he insisted that in his view the sewage spill was not significant. It was also pointed out to him that the volume of the spill over 10 days was equal in volume to the total 2006 CSO annual volume, except that the concentrations in the sewage spill could be 10 times higher than in the CSOs. Although the initial investigations reported by Infrastructure Services in April 2008 show that there is a strong correlation between the sewage spill and the E. coli readings at the beach in August 2006, this manager indicated that he is not convinced that the spill was the cause of the beach closures. In essence, in his view, the spill of sewage is a negligible component of pollution in the river.

Further corroboration of the perception by the Wastewater & Drainage Services that a sewage spill is nothing more than a prolonged combined sewer overflow is provided by an email from the Manager, WDS to the Director, WWS in which he clearly indicates just that.

5.4.2 May 2007

In May 2007 the sewage spill was reported by the Senior Engineer, Water Resources, who recognized the spill and realized that the event was a significant environmental concern. This engineer recognized that the unplanned and unauthorized bypass of
sewage to the River did not meet the requirements of a combined sewer overflow and decided to inform the MOE about it. In this manner he fulfilled his duties as an engineer and as a senior staff member of the City. The initiative shown by the Senior Engineer is commendable, as he automatically reduced the potential prosecution risk to the City.

Reviewing the emails that were exchanged following the notification to the MOE, it is possible to identify the perception by the entire Wastewater & Drainage Services Division that the accidental discharge of sewage to the river was not a reportable event. This reinforces our conclusion that the sewage spill was not reported initially because it was identified as such and therefore it was not associated with the responsibility to report it.

5.5 Communications

5.5.1 Management

Communications within the City have several paths and levels, determined by the need to know basis. This is normal procedure in any organization. In reviewing the communications during the event and the two years since it occurred, we have concluded that the reason why the information was not moved sufficiently high in the organization was because initially the event was not considered significant (and as we discussed earlier, some managers still consider the event not significant and that it only became significant when the press got a hold of it).

The initial telephone conversations and emails sent on August 15, 2006 followed the path and reached the persons who could carry out the work and solve the problem as fast as possible.

The Section Manager, Sewer Maintenance should have notified the Program Manager, Wastewater Collection when he became aware of the regulator gate malfunction when he returned to the office. He indicated that he reviews a very large number of work orders and that he receives a very large number of emails, and that for that reason the event did not register as such a serious failure. However, this is not an acceptable explanation, for two reasons:

a. The sender of the email was someone who only communicated with the Section Manager for special projects. This alone was a reason for the email to have been flagged. In addition, the email was tagged as High importance, which makes it stand out.

b. The procedure instituted by him, according to staff who report to him is that he reviews all work orders and discusses those with special characteristics. Based on the information gathered during this audit, this event had both characteristics.
The Senior Engineer recognized that the event he had identified in March 2007 was a serious incident, and treated it as such. He discussed the event with his supervisor, the Program Manager, Water Resources, and with the Manager, WDS and other Wastewater Collection staff. When discussing the event with the MOE District Engineer, he disclosed the sewage spill at the first opportunity he had. We have asked ourselves why this engineer did not inform MOE as soon as he found out about the spill, and have concluded that it was not his responsibility; however, it is evident that he was the first one to fulfill the City’s obligations in this regard.

The Program Manager, Water Resources did not inform his superior, the Manager, Infrastructure Management. We consider that he should have communicated the event to the Manager, IM simply because the responsibility of the group is Infrastructure Management and this was a case of a failure of a part of the infrastructure. We cannot understand why the Infrastructure Management Division is not interested in the condition and maintenance of the regulators.

The Senior Engineer informed the Program Manager, Wastewater Collection and the Manager, WDS formally by email after he discussed the matter with the MOE District Engineer. At this point both these individuals were aware of the spill, so the email made the notification formal.

The Manager, WDS did not move the information to the Director level for reasons unknown. During the interview he noted that if he had known of the sewage spill in August 2006 he would have moved it “up the food chain”. Then in May 2007, when he had all the information, he failed to advise the Director. This was a significant error in judgement, as by this point he knew the event had not been reported in August 2006 and that failure to report placed the City in a serious non-compliant situation. Although the reasons are unknown, we venture to conclude that the matter did not appear important to the Manager, WDS, as has been discussed elsewhere in this report.

In this respect the Program Manager, WC appears to be covered, since the communication with the Director is responsibility of the Manager, WDS. However, we note that this is really not an excuse when we see that the Senior Engineer did not hesitate to inform those he judged should be informed, without regard for reporting chains.

The Manager, WDS and Program Manager, WC in effect blocked the communications to senior management in May 2007. In April 2008 the Manager, WDS had no alternative but to inform the Director, as the Senior Engineer had discussed the issue with Public Health and the Director was going to hear one way or another about the event and its consequences. We note, however, that in his email of April 2, 2008 the Manager, WDS informed the Director of the recommended modification to the notification procedure, not necessarily that the event was a serious equipment failure.

The Director, Water and Wastewater Services Branch received the information about the spill on April 2, 2008, including information that there was a significant correlation
with the Petrie Island Beaches closures in August 2006. At this point, the Director recognized that this was a serious matter and proceeded to request as much information as he could get regarding the event and the consequences.

Unfortunately for the communications process, the Director also hindered the communications process. He attended the meeting of the Community and Protective Services Committee on April 3, 2008, during which the 2007 Beaches Report was presented, and did not forward the information he just received from his Manager. We should note that at the same meeting staff of Public Health had much more information, including all of the details of the event (date, duration, volumes, etc.) and did not present it or discuss the matter with the Committee. In our view, both the Director and the Public Health staff should have discussed this new information with the Committee. The Director, WWSB, having recognized the seriousness of the event, should have informed the DCM immediately. Even after the sewage spill was made public, it is possible to see that there is a tendency to try to soften the implications of the spill. For example, in a May 21, 2008 email from the Deputy City Manager, Public Works & Environment, he suggests that the report to Council should indicate that with xx number of overflows per year, the regulator failed only once. In the same email, the DCM identifies that there is something wrong with timing of report to MOE, as the email from the Director, WWDS indicates that the MOE was notified in May 2007 and that conversations were held in August 2007.

The City should consider whether it really requires all the levels of management it has for the Wastewater Collection section. As can be seen, the system was essentially moving along without active work by the Program Manager, Wastewater Collection. Perhaps this position and the Section Manager, Sewer Maintenance position could be merged.

5.5.2 Council

It is imperative that Council be informed immediately of any event that could have a financial or liability impact on the Corporation. In this case, reporting only occurred when the City Manager became aware of the issue.

We have concluded that the main reason that this incident was not reported on time to Council or the City Manager is that Management did not realize or understand the seriousness of the incident. This is evidenced by the following comments:

- Comments by the Program Manager that the matter became an issue when the news media got involved.
- Comment by the Manager, Strategic and Environmental Services that the spill is small when compared to the flow in the river and that other inputs affect water quality.
- Comments in the emails from the Manager, WDS indicating that perhaps they viewed the spill as the continuation of an overflow event after the rain stopped.
- Failure of the Director Water & Wastewater to inform his DCM, Committee and Council of the spill and potential relationship to the pollution at Petrie Island.

In reviewing the Memoranda that were submitted to Council in May 2008, it is possible to see that they contained inaccurate information, although the correct information was readily available. These inaccuracies are discussed below.

<table>
<thead>
<tr>
<th>May 20, 2008 Memo to Council</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>Comment</td>
</tr>
<tr>
<td>Gate operated outside its normal range</td>
<td>This is not correct, as the gate was closed, and closed is within its normal range</td>
</tr>
<tr>
<td>Malfunction was found on August 15, 2006 during a regular maintenance inspection</td>
<td>The malfunction was found by a Flow Monitoring Technician based on flow data</td>
</tr>
<tr>
<td>Event was reported to MOE shortly after the overflow</td>
<td>Not right. Note that this statement is in DCM’s report before meeting with SSMO. May 2007 letter states that it was not reported. Email to Director says it was not reported. Email from Director to DCM says it was not reported then.</td>
</tr>
<tr>
<td>Immediately implemented a number of regulator maintenance and monitoring changes</td>
<td>Actually the changes were implemented in May 2008 after the press conference, not after the event was discovered.</td>
</tr>
<tr>
<td>The link with the water quality at Petrie Island beach was made following submission of Beaches report</td>
<td>Not right, it was before the report was submitted, as both the Director and the Manager, WDS were aware earlier.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>May 22, 2008 Memo to Council</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>Comment</td>
</tr>
<tr>
<td>Extreme overflow caused regulator to jam</td>
<td>Not right, gate closing completely is within its operating range.</td>
</tr>
<tr>
<td>First record of this regulator becoming jammed</td>
<td>Not right either, as it had malfunctioned more than once since 1998.</td>
</tr>
<tr>
<td>August 2006 – MOE verbally informed</td>
<td>This is not correct, and the author of the report knew this on May 14th.</td>
</tr>
</tbody>
</table>
Audit of the 2006 Sewage Spill

May 22, 2008 Memo to Council

<table>
<thead>
<tr>
<th>Statement</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Protocol – reporting to MOE – intended to ensure that city stays in compliance, reporting to Public Health.</td>
<td>City already had protocol albeit very poorly worded. It was not used.</td>
</tr>
<tr>
<td>States that RTC will solve this problem. “In the longer term, continued progress on the implementation of the City’s Real Time Control program will serve to upgrade existing regulator overflow control equipment, reduce the number and volume of overflow events while providing staff with a real time knowledge of the operating conditions in the major regulators that continue to exist within the combined sewer area of the City.”</td>
<td>Problem should have been solved by maintaining the alarm system, by comprehensive condition assessments followed by renewal of the equipment, and by a proper inspection procedure.</td>
</tr>
</tbody>
</table>

It is important to note that sewage spills cannot be guaranteed not to happen again by the RTC system. The best that can be expected is that the frequency and volume of spills will be considerably reduced relative to present levels. The RTC system is designed to meet the requirements of MOE Procedure F-5-5 regarding CSO discharges, and not to control 100% of CSO discharges. In a combined sewer system the only way to practically remove the risk of any CSO or sewage spill event is to completely separate the sanitary and storm sewer systems. Even in the case of a separate sewer system, if extraneous flows (infiltration and inflow) into the sewer are not controlled, there will always be the chance that the capacity of the sanitary sewer will be taxed, resulting in sewage spilling out of the system. The best that can be done is to reduce the risk to an acceptable level.

It is interesting to note that attendees at the March 25, 2008 meeting of the Fallingbrook Community Association were told of the event and its likely connection to the Petrie Island beach closures by a City engineer (and also a member of the Association). In other words, the attendees at this meeting knew of the event and its likely consequences before the Director of Water and Wastewater Services, the Director of Infrastructure Services, DCM, the City Manager or Council were ever informed.

5.6 The Municipal Performance Measurement Program

In 2000 the Ministry of Municipal Affairs and Housing announced the Municipal Performance Measurement Program (MPMP), which required all municipalities in
Ontario to file financial and performance data with the province. Municipalities are also required to publish the results for the taxpayers of the municipality.

The concept of performance measurement had one of its earliest cases in the former Regional Municipality of Ottawa-Carleton. During each winter from 1985 to 1993, frost penetration averaged 180 cm and the RMOC had on average $200±$ frozen water services. During the winter of 1993-94, frost penetrated to almost 200 cm and caused 2,344 frozen services. The additional cost to the Region was almost $2.2 million; in addition, the Region had to issued 7,000 notices to “run water” to prevent further freeze-ups. The RMOC developed a performance measurement and monitoring system, which permitted the RMOC to anticipate depth of frost penetration and prevent frozen services in subsequent winters.

The results of the City of Ottawa performance measurement program for the years from 2001 to 2006, both inclusive, are provided in the City’s website, as reported to the Province. One of the parameters that the MPMP requires to be reported is the total volume of treated wastewater plus the total volume of sewage that bypasses the plant and thus is not treated.

Our review of the MPMP data for the six years revealed that in all those years the City reported zero bypass volume. The Manager, WDS has indicated that the reported bypass volume applies only to sewage that is bypassed at the plant headworks. In our opinion, this interpretation does not provide an accurate representation of the performance of the wastewater collection and treatment system, as it leaves unreported the volume of combined sewer overflows that occur annually. The report is a further demonstration that the Manager, WDS did not consider any loss in the collection system as significant.

It is noted that the average daily volume of sewage that was spilled during the August 2006 sewage spill (80 million litres) constitutes approximately 18% of the daily flow to the Robert O. Pickard Environmental Centre in 2006 (453 million litres). This is a very significant amount that should have been reported to MPMP.

5.7 Ontario Municipal Benchmarking Initiative

The Ontario Municipal CAO's Benchmarking Initiative is a voluntary partnership project to strive for service excellence in municipal government. Participating municipalities are working together to identify and share performance statistics, operational best practices and to network in a spirit of innovation and entrepreneurship to improve service.

As described by OMBI direction, the purpose of OMBI is to identify and develop appropriate service specific performance measures, capture performance data, and analyze and benchmark results in order to identify best practices of service efficiency and quality in Ontario municipalities; and to provide a useful management tool that
integrates financial and performance data to assist in decision making within municipalities.

5.8 Professional Engineers Act and Code of Ethics

The PEO Code of Ethics and the Professional Engineers Act impose a duty to report and a duty to protect the public on all professional engineers. The City should consider reporting the issue of incompetence in the practice of professional engineering detailed in this audit to the appropriate engineering associations.

It is our opinion that some professional engineers may have failed to fulfill their duties as required under the Professional Engineers Act. Under the Act, professional misconduct includes “failure to make responsible provision for complying with applicable statutes, regulations, standards, codes, by-laws and rules in connection with work being undertaken by or under the responsibility of the practitioner.”

5.9 Recommendations

Recommendation 1

That the City immediately implement the maintenance standards and procedures for regulators as recommended by the APWA and required by legislation.

Management Response

Management agrees with this recommendation.

Over the last six months, the City of Ottawa has taken aggressive steps to improve the operations, monitoring, regulatory compliance and maintenance standards for the regulators.

Since May 2008, City staff have implemented more frequent maintenance inspections of the regulators. Current regulator inspection frequency is weekly and post a rainfall event consistent with the APWA maintenance standards and procedures. This has resulted in more than 320 site and regulator inspections and prompt identification and response to malfunctioning regulators.

As detailed in the management response to Recommendation 4 the City will be implementing a Quality Management System that will take an environmental risk-based approach. An important element to this system is to develop appropriate risk mitigation strategies, including maintenance and asset renewal strategies. For the regulators, the overall asset investment/renewal strategy will take into consideration the fact that many of the largest regulators (Rideau Canal, Keefer/John Street and Cathcart) are scheduled to be decommissioned within 6-8 months.

1 Definition of Professional Misconduct: Section 72 of Ontario Regulation 941, made under The Professional Engineers Act, R.S.O. 1990, C28
Recommendation 2
That the City address all safety issues related to the regulators.

Management Response
Management agrees with this recommendation.

Existing protocols/procedures ensure that any identified problems are promptly repaired and hazards are eliminated. Providing a safe work environment through a combination of hazard removal, appropriate safety equipment, policies, procedures and training is an essential management responsibility.

Operations and maintenance manuals will be reviewed, on a risk assessment basis, to prioritize the review and strengthen current practices.

Once approved in the 2009 Budget, management will develop and implement an Environmental Quality Management System as a first order priority. One of the advantages of implementing an ISO-based (International Organization for Standardization) management system is its relatively easy expansion to incorporate other management systems, including safety. During the development and implementation of the Environmental Quality Management System, management will consider developing an associated Quality Management System specifically directed at safety issues.

Recommendation 3
That the City ensure the effective monitoring of flow data to identify anomalies and undertake investigations and required remediation in a timely manner.

Management Response
Management agrees with this recommendation.

The City has implemented a number of changes to improve upon the previous flow monitoring strategy. Regulator and/or outfall sewer operational information is available to operational staff ensuring 24/7 post rainfall event monitoring of the five monitored sites and, if necessary, appropriate response. This work included the installation of an interim status monitoring system. This will be supplanted with a permanent Real Time Status Upgrade on the three most significant outfalls by mid-2009.

As mentioned previously, management is proposing an Environmental Quality Management System that will cover all wastewater services. A key component of this work will be to identify all sites with a significant risk of environmental impacts. Combined sewer overflows and their associated regulators will be among those sites. Continuous site monitoring will be an important means of enabling staff to minimize the risk of future occurrences.
As a part of the 2009 Rate Budget, staff have requested $5 million in authority to assess the current monitoring strategy and undertake the identified infrastructure improvements for the remaining outfall and overflow sites in addition to those sites, which will receive priority asset reinvestment as part of the Real Time Control Project. A risk-based assessment of these sites will be undertaken in accordance with the development and implementation of the Environmental Quality Management System described in Recommendation 4. If approved, this assessment is expected to be completed by Q2 2009.

**Recommendation 4**

That the City review the organizational structure of the WSDS to ensure adequate communication and operational oversight is maintained.

**Management Response**

Management agrees with this recommendation.

A number of steps have already occurred to ensure that the previous operational oversight and communication concerns have been fully addressed. In addition, management have retained the services of SP3 Consultants to conduct a branch-wide assessment. This assessment will provide the management team with a thorough understanding of current strengths of the organizational design and will identify any remaining areas that require adjustment. This work is currently underway with a projected completion date of Q2 2009.

Management is proposing to implement an Environmental Management System for all wastewater services. The benefits of the proposed Environmental Management System (which is modelled on the ISO 14000 standard) include:

- Reassuring customers of our commitment to demonstrable environmental management;
- Reducing and avoiding incidents that could result in liability;
- Facilitating compliance with all regulations, permits and authorizations;
- Helping improve public and community relations;
- Strengthening cost control;
- Conserving input material and energy;
- Fostering the development and sharing of environmental solutions; and,
- Improving relations with regulatory bodies.

These goals are attained through a Quality Management System model, which is centred around strategies to -- Plan, Do, Check and Improve. These improvements are similar to those recently implemented for the Drinking Water Quality Management System.

Key elements of the Quality Management System model include:
Plan:

- Risk-based environmental impact assessment of all ongoing operations;
- Development of a comprehensive and rigorous risk identification process looking at all services provided in wastewater collection and treatment. This includes risk identification and the establishment of clear objectives and targets for all identified environmental impacts.

Do:

- Strategies for risk avoidance including a thorough review of internal system planning, policies and procedures, organizational structure and responsibility, internal and external communications, operations and maintenance control activities, staff training, awareness and competence and emergency preparedness and response.

Check:

- Improved internal audit and reporting functions that can include external third party auditing and reporting; and,

Improve:

- A commitment from management to continually improve. This commitment includes an annual review of the results of operations, and an annual update on internal and external audits. There will also be a renewed commitment to service improvement strategies and an ongoing plan will be developed, implemented, and refreshed annually.

The Environmental Management System will be developed incrementally with the first comprehensive internal audit complete by Q4 2010.

**Recommendation 5**

That the City review the reporting and communications protocols across all Departments to ensure proper and appropriate dissemination of information to executive management, Council and all regulatory bodies.

**Management Response**

Management agrees with this recommendation.

As has been previously reported to Council, significant improvement to communication protocols and training have already been developed and implemented within the branch. These protocols ensure that all interested parties, including the Public Health Branch, the Ministry of the Environment, downstream drinking water suppliers, senior management and Council, are promptly informed of any combined sewer overflows and sanitary sewage spills.
The communication protocol will be reviewed and included in the branch’s, department’s and, the Corporate Incident Escalation and Response plans. The branch will explore opportunities with the Corporate Emergency Management group to test this protocol using simulated exercises.

The development and implementation of a 360-degree communication strategy is a very important element of the Environmental Quality Management System as noted in the management response to Recommendation 4, and if approved, will be implemented within the branch and across departments. It is expected that this will be completed by Q2 2009.

**Recommendation 6**

That the City consider pursuing a complaint with the appropriate professional engineering association regarding the professional engineering staff identified in this report.

**Management Response**

Management agrees with this recommendation.

The City Solicitor will review the findings contained in the report, along with the provisions of the Professional Engineers Act and regulations and the associated definition of “professional misconduct”, as well as all other relevant factors, and will provide a legal opinion to the City Manager in this regard.

**6 CONCLUSION**

The August 2006 sewage spill was the result of long-standing inadequacies in the operation and maintenance of these regulators. The reduction in the frequency of inspections, the disabling of the alarm system, the lack of attention to legislative and job requirements and the absence of proper preventative maintenance procedures made such an event inevitable. Given these shortcomings, it is entirely likely that similar events have also occurred in the past. Furthermore, the magnitude of the August 2006 event was never recognized and, even now, it is unclear if the significance of such events on river water quality or public confidence is truly appreciated by all staff.

**7 ACKNOWLEDGEMENT**

We wish to express our appreciation for the cooperation and assistance afforded the audit team by management and staff.
Appendix A – Description of the Combined Sewer System

In the following pages we include two figures from the Pollution Prevention and Control Plan submitted in December 2007 to the MOE, for illustration of the combined sewer system area.
Appendix B – Description of the Regulators
NOTE: THE EXISTING 2'-0" DIAM. SEWER WAS CONSTRUCTED BY TRENCHING METHODS. THE AREA ABOVE THIS SEWER IS COMPRISED OF RUBBLE FILL.

SECTIONAL ELEVATION E-E

BASE CONCRETE MAY BE REDUCED TO THIS LINE IF SO ORDERED BY THE ENGINEER.
Appendix C– Keefer Regulator Photos – May 2008
Photo 1 – (56) Gate. Note that the gate is Partially Open, but it should have been Fully Open.

Photo 2 – (57) Gate. Note the counterweights centre bottom. The gate is prevented from opening fully.
Photo 3 – (58) Orifice Plate

Photo 4 – (59) Float
Photo 5 - (60) Float

Photo 6 - (61) Float and tie rod (linked to chain)
Photo 7 - (62) Float and Gate

Photo 8 - (63) Gate
Photo 9 - (64) Upper Wheel Sprocket Galvanized Chain. Note the rust in the chain.

Photo 10 - (65) Steel Beam Supporting the Gate and Float Transmission
Photo 11 - (66) Rideau River Collector, upstream of the Regulator. Note the infiltration to the sewer.
Photo 13 - (70) Rideau River Collector

Photo 14 - (71) Rideau River Collector
Appendix D – Regulator Drawing Provided by Program Manager

The sketch provided by the Program Manager, Wastewater Collection when we requested drawings of the Regulators is attached.
Ray, here is a drawing of the regulator. I have altered it to conform to the actual lay-out of the regulator chamber.

Barrie.
VIEW OF FLOAT OPERATED REGULATOR CHAMBER

Similar to Keefer Regulator

Concrete wall between float & gate has 2 or 3 6" square holes for slow flow of water.

Orifice is rectangular, not circular.

Gate and float attached to sprockets on either end of a shaft.

Gate generally modulates flow to flow it is not normally fully closed.

There is a dip in this sewer near the gate entrance. The sewage falls down and to the left through the gate.

This wall does not exist at Keefer.

Note: Slides weights can be placed on a bar on the front of the gate or on a plate on the top of the float to balance them against each other.
Appendix E – Spill Reporting Protocol (Until June 2008)
AUTHORITIES TO CALL FOR SANITARY SEWAGE
OIL & CHEMICAL SPILLS PUMPED INTO
DRAINAGE SYSTEM

Will you ensure that in the event that it is necessary to direct sanitary
sewage into a drainage system other that the sanitary or combine system as a
result of overtaxing or blockage, or any type of spills or illegal discharge in the
sewer system, etc. The following agencies should be immediately notified:

Ontario Ministry of Environment:
Duty Officer at 521-3450 after hours and weekends at
1-800-268-6060.  Fax number: 521-5437
Spills Action Centre at 1-800-268-6063

Ottawa-Carleton Regional Health Unit:
East – James McEachern (Inspector) 724-4122, Ext 23624
West – Bill Law (Inspector) 724-4122, Ext 26309
Andy Roach - 722-2200
Martha Robinson – 722-2200
Fax Number – 724-4191
After hours – 580-2400
Note: Any calls placed to the Information and Customer Service
Section outside of normal working hours on behalf of the Regional
Health Unit should be passed on immediately to the Health Unit on-
call person.

Industrial Waste Contacts & Phone
ROPEC – 580-2424, Ext 23326 (7:00 AM – 3:30 PM) or after hours ✓
leave a voice mail at 598-5282
Fax Number: 745-9197

City of Ottawa
Ron Rooke – (Project Officer, Surface Water Control)
580-2424, Ext 22305
After hours: 580-2400
Fax Number: 745-9197

City of Ottawa
Christine Hartig (Project/Policy Development Officer, By-law
Services). (Only on the Rideau River to remove the Swans if oil
spill)
Dispatcher: 580-2424, Ext 2659
Fax Number: 580-4770
### Appendix F – List of Courses Attended

**Conferences Attended by Manager, Wastewater & Drainage Services Division, Program Manager, Wastewater Collection, and Section Manager, Sewer Maintenance**

2001 - June 2008

<table>
<thead>
<tr>
<th>Name</th>
<th>Conference</th>
<th>Event</th>
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<tbody>
<tr>
<td><strong>Program Manager, Wastewater Collection</strong></td>
<td>Mar 30 - Apr 2/03 Water Environment Association of Ontario (WEAO) Technical Symposium</td>
<td>National Water and Wastewater Benchmarking Initiative (NWWBI)</td>
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<tr>
<td></td>
<td>May 6-9/03 Workshop</td>
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<tr>
<td></td>
<td>Apr 18-22/06 Unidentified</td>
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<td></td>
<td>Apr 1-5/07 Wastewater Forum</td>
<td></td>
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<td></td>
<td>Apr 8-12/06 Emissions Conference</td>
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<td></td>
<td>Dec 2-4/07 Sewer Overflow</td>
<td></td>
</tr>
<tr>
<td><strong>Manager, Wastewater &amp; Drainage Services Division</strong></td>
<td>Mar 29 - Apr 2/03 Water Environment Association of Ontario (WEAO) Exhibition</td>
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<tr>
<td></td>
<td>Apr 2-4/05 Wastewater Forum</td>
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<tr>
<td></td>
<td>Oct 29 - Nov 2/05 Water Environment Federation Technical Exhibition and Conference 2/05</td>
<td>(WEFTEC) Annual Conference</td>
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<tr>
<td></td>
<td>Dec 1-2/05 Canadian Water and Wastewater Association</td>
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<td></td>
<td>Nov 29/06 Canadian Council of the Environment (CCME) Meeting</td>
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<tr>
<td></td>
<td>Apr 1-5/07 Wastewater Benchmark</td>
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<td></td>
<td>Jun 4/07 OMBI Expert Panel</td>
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<td></td>
<td>Jun 24-28/07 Biosolids Conference</td>
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<td></td>
<td>Aug 13/07 OMBI Expert Panel</td>
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<tr>
<td></td>
<td>Sep 4-6/07 National Biosolids Meeting</td>
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<tr>
<td></td>
<td>Sep 11/07 Water Environment Association of Ontario (WEAO) Biosolids Committee</td>
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<tr>
<td></td>
<td>Oct 13-19/07 Water Environment Federation Technical Exhibition and Conference 2/05</td>
<td>(WEFTEC) Annual Conference</td>
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<td></td>
<td>Jan 28-30/08 Effluent Strategy</td>
<td></td>
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<tr>
<td></td>
<td>Feb 10-11/08 OMBI Expert Panel</td>
<td></td>
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<tr>
<td></td>
<td>Mar 16-17/08 OMBI Expert Panel</td>
<td></td>
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<tr>
<td><strong>Section Manager, Sewer Maintenance</strong></td>
<td>Aug 21-22/01 SAP Fact Finding</td>
<td></td>
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<tr>
<td></td>
<td>Mar 29 - Apr 2/03 North American Society for Trenchless Technology (NASTT)</td>
<td></td>
</tr>
</tbody>
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### Conferences Attended by Manager, Wastewater & Drainage Services Division, Program Manager, Wastewater Collection, and Section Manager, Sewer Maintenance

**2001 - June 2008**

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<td>National Water and Wastewater Benchmarking Initiative (NWWBI)</td>
<td>May 6-9/03 Workshop</td>
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<tr>
<td></td>
<td>Fundamentals of Buried Asset Management</td>
<td>Nov 19-21/03 W. Beaches</td>
</tr>
<tr>
<td></td>
<td>No Dig Conference</td>
<td>Apr 23-29/05 No Dig Conference</td>
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<tr>
<td></td>
<td>Strategic Spills</td>
<td>Nov 24-25/05 Strategic Spills</td>
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<td></td>
<td>Collection Systems Conference</td>
<td>Aug 5-10/06 Collection Systems Conference</td>
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<td></td>
<td>Collection Systems Conference</td>
<td>May 12-17/07 Collection Systems Conference</td>
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<tr>
<td></td>
<td>No Dig Conference</td>
<td>Apr 26-May 1/08 No Dig Conference</td>
</tr>
</tbody>
</table>
Appendix G – Detailed Project Chronology

The Detailed Project Chronology is provided in the following pages. This table is extracted from the June 2008 report by M. Price & Associates, and has been updated and augmented where appropriate.
### Appendix G - DETAILED PROJECT CHRONOLOGY

<table>
<thead>
<tr>
<th>Date</th>
<th>EVENT</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 31&lt;sup&gt;st&lt;/sup&gt; 2006</td>
<td>Rainfall event started about 10 p.m.</td>
<td>Normal occurrence in heavy rainfall. System was designed to operate this way.</td>
</tr>
<tr>
<td>August 1&lt;sup&gt;st&lt;/sup&gt; 2006</td>
<td>Keefer Regulator activated automatically to allow overflows of combined sewage into Ottawa River via John Street overflow pipe.</td>
<td>Blockage of a regulator or the outflow pipe due to debris is not uncommon. However, the gate became stuck closed, which should not happen. At this point the flow is not a CSO but an overflow of sanitary sewage (sewage spill) and reportable to MOE as a spill.</td>
</tr>
<tr>
<td>August 3, 2006</td>
<td>Regulator failed to return to pre-storm condition allowing flows to continue overflowing into River and not passing through the Sewage Treatment Plant.</td>
<td>Pre-amalgamation this regulator was maintained by the Region and it had monitors and alarms directed to an on-call supervisor’s pager. Post-amalgamation the alarm system was no longer available.</td>
</tr>
<tr>
<td>August 4, 2006</td>
<td>Impacts of storm passed, but the gate is stuck in closed position. Raw sanitary sewage is now passing through the overflow directly into the river.</td>
<td>Pre-amalgamation Region staff would routinely check the key regulators after a major storm event. Post amalgamation the staff shortage meant no post storm checks were routinely carried out.</td>
</tr>
<tr>
<td>Date</td>
<td>EVENT</td>
<td>COMMENTS</td>
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<tr>
<td>August 15th 2006</td>
<td>Staff technician in WSB was downloading flow data remotely from the John Street overflow pipe in question. Noticed an anomaly and went to the site to verify that there was flow in the pipe even though there was no recent rain event. Contacted his Supervisor in operations and three other Supervisors by e-mail at 2.27pm on August 15th and advised that there was flow in the overflow pipe even though there was no rainfall. Operations supervisor dispatched a crew to the site who opened the gate and used high pressure water hose to clear debris. Gate returned to normal position and bypass of raw sanitary sewage ceased. Crew returned to yard after end of day shift and filed completed work order.</td>
<td>The field staff and especially their Supervisor failed to comprehend the magnitude of the event and to differentiate between a normal overflow during a storm event and an extended sanitary spill in dry weather. The event should have been reported to MOE spills action centre at this point in time.</td>
</tr>
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</table>
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<tr>
<th>Date</th>
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<th>COMMENTS</th>
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<tbody>
<tr>
<td>First half of August 2006</td>
<td>Ottawa Public Health recorded very elevated E. coli counts at the Petri Island Beach and posted the beach as unsafe for swimming throughout the period that the spill was occurring. They did not know why the counts remained so high after the rainfall event had long passed. The matter generated considerable media attention.</td>
<td>The total overflow event last approximately 12 days and the sewage spill flow rate was estimated to be 80,000,000 litres per day. No-one had connected the beach postings to the continuing spill. The sewer-shed is very large and this sanitary sewage flow was about 18% of the normal dry weather flow at the sewage treatment plant.</td>
</tr>
<tr>
<td>November 7th 2006</td>
<td>MOE staff request that Ottawa start reporting annually on the CSO overflows.</td>
<td>The MOE had issued letters to all municipalities on April 26th 2006 asking for reporting regarding compliance with F-5-5. MOE first started request to Region in 1996. Letter to Manager WDS on May 18th 2006 asking for data on certain events. Meeting with Ottawa staff June 27th 2006 where data on CSO flows requested.</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>Mid-March 2007</td>
<td>Senior Engineer in ISB is preparing data to go in the first annual CSO report to the MOE. He is reviewing data from 2006 and sees a discrepancy between a modeled overflow of a few hours and real overflow of hundreds of hours in duration. He contacts Operations and receives confirmation of closed regulator that was cleared on Aug 15th 2006. Time coincides with end of flows.</td>
<td></td>
</tr>
<tr>
<td>April 23rd 2007</td>
<td>He contacts the WSB Manager and his ISB Program Manager by e-mail and advises them of the issue and that he mentioned this event to MOE staff during a discussion on another matter. Advised MOE that the whole event would be documented in the upcoming 2006 annual report on CSOs.</td>
<td>MOE District Manager is given brief overview of conversation between his engineer and the Ottawa engineer regarding the gate being stuck in early August 2006.</td>
</tr>
<tr>
<td>Date</td>
<td>EVENT</td>
<td>COMMENTS</td>
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</tr>
<tr>
<td>April 25th</td>
<td>He sends draft CSO report/letter to WSB Manager for his review and transmittal to MOE.</td>
<td>In the e-mail dated May 01, 2007 the Engineer clearly states to the Manager WSB and his Program Manager in ISB that ‘...this incident was never officially report to MOE...’</td>
</tr>
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<tbody>
<tr>
<td>May 23rd 2007</td>
<td>First Annual Report on CSOs for 2006 issued to MOE.</td>
<td>Staff could not provide any clear direction, or protocol, for issues management within the Department.</td>
</tr>
<tr>
<td>Mid-February 2008</td>
<td>Senior Engineer in ISB is preparing Part B of Report on Combined Sewer Area Pollution Prevention and Control Plans. Wanted to see if there was any correlation between beach postings and CSOs. Obtained data from PH and found correlation not only for CSO events, but for the August 2006 SSO event.</td>
<td>He advised his program manager of the connection. This information never moved anywhere else in the organization.</td>
</tr>
<tr>
<td></td>
<td>He also mentions this connection in casual conversation to fellow employee who is a member of the Fallingbrook Community Association, which encompasses Petrie Island beach.</td>
<td>The connection between spill and beach postings is mentioned in public meeting of Fallingbrook Community Association on March 25th 2008. Minutes were distributed on April 19th 2008.</td>
</tr>
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</table>
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<tr>
<td>April 2nd</td>
<td>Senior Engineer reads about PH report on beaches in the press. Calls PH analyst to explain his findings regarding the possible correlation to overflows and even the SSO event.</td>
<td>PH analyst advises her Program Manager immediately. He immediately writes an e-mail to the MOH explaining the possible connection of spill to Petrie Island beach postings.</td>
</tr>
<tr>
<td>2008</td>
<td>He advises his supervisor in ISB. He sends e-mail to PH.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Director of WW is cc’d on an e-mail from the Senior Engineer to the WSB management staff and indirectly made aware of link between overflows and beach postings.</td>
<td>The information was never circulated within the PW&amp;S Department and never reached the DCM level.</td>
</tr>
<tr>
<td></td>
<td>Manager WSB told his Program Manager to add PH to the Spills reporting protocol.</td>
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<tbody>
<tr>
<td>April 3rd</td>
<td>MOH and Director of WW are at Committee during the discussion on the</td>
<td>At this point both have been e-mailed the very preliminary information their respective staff have, regarding the possible connection between overflows and beach postings at Petrie Island.</td>
</tr>
<tr>
<td>2008</td>
<td>PH 2007 beach report.</td>
<td></td>
</tr>
<tr>
<td>April 23rd</td>
<td>PH report on beaches 2007 went to Council.</td>
<td>MOH announces his departure from City of Ottawa right after the Council meeting.</td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
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<tr>
<td>May 5th</td>
<td>Manager WSB advises verbally the Manager SES of connection between the</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>beach postings and SSO event.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>May 13th</td>
<td>DCM first becomes aware of whole issue while his Director WSB was</td>
<td>DCM asks Director WSB for more information and is briefed over the following week as information becomes available.</td>
</tr>
<tr>
<td>2008</td>
<td>heading to a meeting with East End Councillors regarding Petrie Island</td>
<td></td>
</tr>
<tr>
<td></td>
<td>beach. Intent of meeting was to brief Councillors and prepare for press</td>
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<td></td>
<td>conference and timing of the release of the information.</td>
<td></td>
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<tr>
<td>May 15&lt;sup&gt;th&lt;/sup&gt; 2008</td>
<td>Director WSB receives more detailed information from ISB staff regarding possible correlation of beach postings to regulator malfunction.</td>
<td></td>
</tr>
<tr>
<td>May 20&lt;sup&gt;th&lt;/sup&gt; 2008</td>
<td>Local politician holds press conference to announce that the beach postings in August 2006 were now explainable.</td>
<td></td>
</tr>
<tr>
<td>May 20&lt;sup&gt;th&lt;/sup&gt; 2008</td>
<td>DCM issues statement to Council to explain event in 2006 and mentions it was reported to MOE at that time.</td>
<td>The Senior Engineer in ISB, back on May 1&lt;sup&gt;st&lt;/sup&gt; 2007, had advised this Manager, WDS by e-mail that he could not substantiate any reporting to MOE.</td>
</tr>
<tr>
<td>May 22&lt;sup&gt;nd&lt;/sup&gt; 2008</td>
<td>DCM issues sequence of events memo to Council regarding the event and still assumes spill had been reported to MOE.</td>
<td>Based on discussion between the Manager WDS and the responsible Supervisor the assumption was that the incident had been reported. Director WSB still believed staff had reported incident to MOE in 2006.</td>
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<tr>
<td>May 27&lt;sup&gt;th&lt;/sup&gt; 2008</td>
<td>DCM issues new statement to Council retracting the mention of reporting the spill to MOE when it occurred in August 2006.</td>
<td>The key Supervisor, during an interview with Director WSB and Manager, WDS on May 26&lt;sup&gt;th&lt;/sup&gt;, retracted his statement regarding reporting the August 2006 event to the MOE – SAC.</td>
</tr>
<tr>
<td>May 28&lt;sup&gt;th&lt;/sup&gt; 2008</td>
<td>Key Supervisor terminated as a result of internal review.</td>
<td>Assignment of ORO designation to staff person holding Level IV Certification.</td>
</tr>
</tbody>
</table>
Figure H1 – John Street Overflow, May 5, 2004
Figure H2 – Booth Street Overflow, April 3, 2005
Figure H3 – John Street Overflow, April 18 to 19, 2007