

## 6.0 Groundwater

Groundwater is a natural resource and many of the issues surrounding the overall protection and uses of groundwater fall under the City's environmental mandate. In some instances, however, the City's ability to fulfill a complete role in groundwater management is limited by the Province's overriding authority in the management of this resource. There are nonetheless very specific links between groundwater, growth and infrastructure planning. In order to play an effective role, the City adopted a framework for a Groundwater Management Strategy (GMS) in April 2003. As part of this framework the City undertakes studies to define groundwater resources by collecting baseline data on groundwater and develops public information to assist residents who rely upon this resource. The City will work on a watershed-based GMS led by its CA Partners.

The MOE is responsible for the *Ontario Water Resources Act, 1990* which regulates a wide variety of issues related to groundwater. Other provincial Ministries with interests in water management include MNR, Ontario Ministry of Agriculture and Food, and Ministry of Municipal Affairs and Housing.

The Ontario government has made municipal governments responsible for a number of matters which are related to water resource management. For example:

- Under the *Planning Act, 1990* the City of Ottawa regulates land use and development subject to the *Provincial Policy Statement, 2005*;
- Under the *Public Utility Act, 1990* the City of Ottawa operates public drinking water systems and other public utilities;
- Under the *Health Promotion and Protection Act, 1990* the City of Ottawa organizes and delivers a public health program to prevent the spread of disease and promote the health of Ontarians; and,

Under the *Clean Water Act, 2006*, municipalities, along with the Source Protection Authorities, are required to implement and enforce Source Protection Plans (SPPs; refer to *Annex D.4* for more information and links). Groundwater in sufficient quantity and quality to supply private residential uses is available in many areas of Ottawa, playing an important role in the economy of rural settlements. There are however some areas where the geological formations will not yield enough water of acceptable quality to support development. Other economic uses of groundwater include drinking water for livestock, crop watering and water use in aggregate extraction operations. Groundwater

contributes directly to surface water streams within many areas of the city, therefore contributing directly to the enhancement of fish habitat.

Action:

- The City will work on a watershed-based GMS led by its CA Partners, resulting in a document that will be used City-wide in the protection and management of groundwater.

## 6.1 Past Studies

The City has applied significant efforts towards the characterization of groundwater resources and has prepared or participated in the preparation of a number of groundwater studies, some of which are summarized as follows:

- Prior to municipal amalgamation, the Regional Municipality of Ottawa-Carleton completed a number of studies relating to groundwater resources and private servicing, the most prominent of which are: Private Individual Services in the Rural Area (1992), Rural Servicing Strategy (1993) and the implementation by Regional Council of a Private Services Program (1995).
- In late 1999, the City joined with the United Counties of Prescott and Russell (P&R) and the United Counties of Stormont, Dundas and Glengarry (SD&G) as a participant in the Eastern Ontario Water Resources Management Study (EOWRMS). This study, completed in March 2001, included an extensive compilation and evaluation of regional water resources and servicing infrastructure in the South Nation and Raisin Region watersheds and other smaller adjacent watersheds. The study relied on the cooperative efforts of many individuals and organizations, including the United Counties of P&R and SD&G, the MOE, South Nation Conservation, the Raisin Region Conservation Authority, and Agriculture and Agri-Food Canada.
- City staff is involved with the Eastern Ontario Water Resources Committee (EOWRC) which was formed following the completion of the EOWRMS. The purpose of this committee is to provide regional representation for the assessment and management of water resource studies and projects which improve the City's capacity to anticipate and prevent negative environmental impacts and to address health and environmental needs on a cost-effective basis. This ongoing work is funded annually by the City, as one of a number of funding partners.

- In 2001, a city-wide Preliminary Evaluation of Relative Aquifer Vulnerability study was completed. The goal of this study was to assess the relative vulnerability of aquifers to contamination in order to identify sensitive areas and help direct study efforts in these areas. Assessment Reports for the South Nation Source Protection Area (SPA), the Mississippi Valley SPA, and the Rideau Valley SPA completed in support of SPPs, under the *Clean Water Act*, 2006.

*Annex B.4* contains information on and a link to the Assessment Reports and *Annex B.9* provides a full list of Groundwater Characterization Studies.

## 6.2 Public Awareness

The City develops and implements programs to inform the public about groundwater issues and involves the community in making decisions regarding these issues. There are also opportunities for informing the public through neighbourhood meetings and mail-outs in the context of groundwater characterization studies. The SPPs have sections on public awareness and outreach, which the City and the Source Protection Authorities implement.

Other on-going public education and awareness activities include homeowner workshops on the safe operation of wells and sewage systems, and involvement with public education through activities funded by the EOWRC, such as the Children's Water Festival.

## 6.3 Groundwater Resource Definition

The City investigates and evaluates the characteristics of groundwater resources. Groundwater characterization (sampling) studies have been completed for most villages reliant on private wells. These studies are part of an ongoing effort to characterize the health of the aquifers. Ongoing monitoring is required to provide information to track the effect of ongoing development on groundwater quality and quantity.

Action:

- The City will maintain and enhance a monitoring system to assess the potential impact of development on groundwater resources.

Specific groundwater resources and their environmental functions are also typically defined in subwatershed studies, and in some EA studies prepared for privately serviced villages (e.g. Metcalfe and Cumberland).

## 6.4 Identification of Potential Sources of Contamination

The City identifies and evaluates potential sources of groundwater contamination on an ongoing basis. These sources arise from a variety of land use practices and industrial activities, both present and historic, that use compounds, or produce waste products that have the potential to contaminate the groundwater resource.

In early 2000, a Historical Land Use Inventory was completed. The purpose of this inventory was to collect information on the type and location of all land uses in the city which had caused or have the potential to cause contamination in soil, groundwater or surface water. This inventory is a screening tool that is used by the City in making planning decisions.

Phase 1 Environmental Site Assessments (ESAs) are required for most development applications, e.g., subdivisions and site plans, as well as Phase 2 ESAs where these are required as a result of the Phase 1 ESA. The results of the Phase 1 and Phase 2 ESAs must be taken into account when reviewing hydrogeological studies and other reports in support of an application.

The City is also responsible to enforce and implement the provincially-approved SPPs. This involves eliminating certain threats and managing others within specific vulnerable areas around wellheads (Well Head Protection Areas) and surface water intakes (Intake Protection Zones) for the City's water supplies.

Action:

- The City will liaise with all source water protection partners regarding source water protection issues.

## 6.5 Major Aquifers

There are a number of major aquifers that have been identified within the city. These aquifers form an important source of drinking water for much of the rural area.

The sedimentary limestones, dolostones and shales of the area are the primary water supply for many private homes, although some rock formations are more reliable (e.g., Oxford Formation) as a supply than others (e.g., Bobcaygeon). Another important source of drinking water is the sandstone of the Nepean formation, which is less readily accessible (due to its greater depth) but is used on a progressively more frequent basis, particularly for the construction of municipal wells and other large water takings, as well as when a more protected drinking water source is required. Another source of good

quality water can be found in eskers, such as the Kars Esker and the Vars-Winchester Esker which serves as a water supply for the Village of Vars.

## 6.6 Groundwater Monitoring

In accordance with the OP, owners of land being developed through the subdivision process are to provide to the City one instrumented monitoring well for each phase of the subdivision. Through this effort a city-wide monitoring well network has been developed. The City monitors water levels continuously using data-loggers and baro-loggers, and collects quarterly water samples for analysis of selected parameters. This data is saved in a location that is available to City staff from various departments, and is analyzed for trends in groundwater quality and variation in water levels. Quarterly sampling helps delineate seasonal variations, and multi-year tracking helps to identify long-term trends. The groundwater monitoring network is a recent addition to the City's monitoring activities, and the data is therefore currently limited.

Actions:

- Groundwater level monitoring will be implemented at all municipal well locations and at strategic sentinel wells.
- The City will continue to perform groundwater studies in villages and some privately serviced enclaves within the urban area. Multiple sampling events within villages will help the City identify trends in groundwater quality as a result of ongoing development.

## 6.7 Data Management

In addition to managing the data for the city-wide groundwater monitoring network, the City is also working with its CA Partners to develop and maintain a database system for other water quality and quantity data from various sources, including information obtained from consultant reports prepared in support of development projects. This database will provide easy access to groundwater information and will assist in making planning decisions. Some of the objectives are as follows:

- improved records management, e.g., filing of consultant reports;
- improved use of Geographic Information System (GIS) tools/information for hydrogeological study review;
- better presentation of key water protection findings, e.g., watershed characterization report and water budget reports; and,

- development of comprehensive hydrogeology database.

Action:

- The City will work with its CA Partners to develop and maintain a database system for water quantity and quality data from various sources, including information obtained from consultant reports prepared in support of development projects.

## 6.8 Hydrogeological Guidelines and Best Management Practices

The City is developing a new Hydrogeological and Terrain Analysis Guideline, with anticipated completion by the end of 2013, which will provide guidance for what is required to be included in technical studies in support of privately serviced subdivision and severance applications. This guideline will not replace MOE Technical Guidelines (e.g., Procedures D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment and D-5-5: Technical Guideline for Private Wells: Water Supply Assessment), but rather the City's guideline will provide directions that conform to current industry practices, and will also bring focus to issues that are commonly encountered within the city.

The hydrogeological studies that are produced as a result of planned development coupled with the data compiled from the groundwater monitoring network, will eventually enable the mapping of aquifers throughout the city. Mapping of aquifers is being encouraged by the Province and the CAs and supported by the City as an important tool in providing useful information to understand the potential impacts from development on the groundwater resource and ultimately how it should be further protected. Moving forward, the City will work with the Province and the CAs to define and participate in any future aquifer mapping exercises.

The work to be undertaken including the hydrogeological studies and the aquifer mapping will form the basis of best management practices (BMPs) to be developed and adopted for the management of the City's groundwater resources. These BMPs will be required in all reports in support of privately serviced developments and will include consideration of advanced sewage treatment where applicable.

Actions:

- The City will review the development review process and requirements for groundwater management, and develop recommendations to ensure the process protects public health.

- In view of issues related to improperly constructed wells, the City, working with its CA Partners, will investigate the possibility of a well inspection program to ensure that all wells conform to the regulations and the requirements of the hydrogeological report.
- As part of the requirements of the Source Protection Plans (SPPs), the City will work with its CA Partners and the Ottawa Septic System Office to create a program for sewage system maintenance inspection in areas where sewage systems are significant threats. The City will also review the benefits of extending a similar program for other areas as well.

## 7.0 Affordability and Financing

### 7.1 Affordability

A key goal provided by Council as part of the Building a Liveable Ottawa process was to ensure that any IMP and TMP projects required to support the OP directions must be affordable, in other words they must not exceed the City's ability to pay. To determine the affordability of the IMP, the recommended capital growth investments were compiled along with updated capital renewal and, water and wastewater operating forecasts and compared to the projected available funding consistent with the City's most recent water and wastewater ten year funding plan. In addition, the impact of and coordination with the TMP projects was considered to determine whether the projects proposed for the city as a whole were affordable.

#### 7.1.1 Affordability Assumptions

The initial nine year period of the IMP capital planning timeframe to 2022 was assessed to consider its affordability. The 2013/2014 Rate Supported Programs Budget approved by Council included a ten year capital forecast and funding strategy that provided a basis for comparison and covered the initial nine year timeframe of the IMP. The IMP capital investment projections together with revised capital renewal and operating plan forecasts were reviewed to determine whether the net annual rate requirements were similar to the ten year forecast. The comparative analysis was made using the following assumptions:

- Water and wastewater revenues would be consistent with the rates and volumes forecasted in the last ten year forecast presented to Council as part of the 2013/2014 Rate Supported Operating Budget.
- Capital project cost estimates include appropriate provisions for contingencies and will inflate over time in accordance with the City's Construction Price Index.
- Revenue from development charges will be collected in accordance with the Development Charge Background Study and reflect Council's collection policies.
- Development Charges will apply to growth projects as well as to the growth component of renewal projects in areas subject to intensification.
- Principal and interest on water and sewer rate supported debt will be limited to no more than 15% of rate revenues, and water and sewer reserves will maintain balances equal to one year's debt servicing charges.

- Where debt financing is required, the term of debt will not exceed an asset's anticipated useful life.
- Priority will be given to funding renewal projects to maintain assets in a good state of repair.

The following sub-sections detail the cost and timing of the infrastructure over the 2031 planning period.

## 7.1.2 Project Cost Summaries

The total estimated cost to implement the IMP is estimated at \$1.675 billion over the 2031 planning period. The scope of projects covered by this estimate is described in the following sub-section.

## 7.1.3 Priority Setting

Priorities are set for infrastructure projects in consideration of whether they are renewal as a first priority given Council's commitment to keep existing assets in a state of good repair, or growth based projects. Setting priorities for renewal projects is based on a risk assessment approach, rating such factors as current condition and age of the infrastructure. Setting priorities for growth projects is based on a LOS approach.

The LOS for new development in suburban areas outside the Greenbelt is established in the various City design guidelines. For growth areas inside the Greenbelt, in areas slated for intensification, any shortcomings in the current LOS, such as existing problems due to wet weather inflows resulting in capacity constraints, must be considered. In these intensification areas, the City must evaluate opportunities to deal with renewal projects in conjunction with growth projects. In some cases, and where affordable, to enable development to occur sooner in intensification areas, it may be warranted to advance the need for a renewal project as they offer opportunities to add capacity for growth. Consideration needs to be given to how priorities for both water and wastewater projects are determined.

Priorities are also influenced by coordination with other City project needs, notably those that fall under the City's asset renewal program, to achieve maximum cost benefit and affordability. The City's IMP and TMP have been reviewed to identify potential coordination opportunities. In many cases, buried and transportation infrastructure planned for the same corridor can proceed as an integrated project. In some cases, buried infrastructure will need to be built many years before transportation

infrastructure, and will need to be planned and designed to avoid ‘throw-away’ costs. In other cases, developers may be required to front-end the cost of a City project in order that it be coordinated a growth-driven project.

*Table 7.1* summarizes the results of the priority assessment and details the major IMP growth project costs by implementation phase. This capital cost summary accounts for the projects recommended in the recently completed Water Purification Plant Development Plan, and the preliminary draft ROPEC Development Plan. Costs reflect both growth (development charges) and renewal (rate) components. It should be noted that *Table 7.1* does not include all infrastructure projects that will be subject to development charges, such as local development-driven infrastructure, and renewal projects as described in *Section 5.1*.

**Table 7.1: Infrastructure Master Plan Growth-Related Project Phasing**

Type	Phase 1: 2013-2018	Phase 2: 2019-2024	Phase 3: 2025-2031	Total
<b>Water</b>	\$299 M	\$242 M	\$70 M	\$611 M
<b>Wastewater</b>	\$435 M	\$372 M	\$257 M	\$1,064 M
<b>Total</b>	<b>\$734 M</b>	<b>\$614 M</b>	<b>\$327 M</b>	<b>\$1,675 M</b>

Source: City of Ottawa, Environmental Services Department, Environmental Engineering Branch: Water Purification Plant Development Plan, 2012, and ROPEC Development Plan, 2013. City of Ottawa, Planning and Growth Management, Infrastructure Policy Unit: Water Infrastructure Master Plan, 2013 and Wastewater Collection System Assessment, 2013.

Note: Updated cost estimates for SWM growth-related projects to be provided in the 2014 update to the Development Charge By-law.

## 7.2 Financing Strategies

The Long Range Financial Plan IV - Water and Sewer Rate Supported Programs (January, 2012) ACS2012-CMR-FIN-0004 established a series of financing strategies that balanced the need to maintain and build capital assets with the need to manage debt, reserve balances and rate increases. It successfully made the case that debt financing must be considered as a greater part of the City’s overall funding strategy, particularly in light of the high level of renewal required in upcoming years. As such, Council approved an increase to the Fiscal Framework (2007) Targets for Debt to allow for principal and interest on rate supported debt to be limited to no more than 15% of rate supported revenues. In 2013 the ten year capital and operating requirements were updated as part of the 2013/2014 Rate Supported Budget and followed the financing strategy as set out in the LRFP IV.

The City’s ability to increase capital investment beyond projected levels is limited. The last LRFP funding strategy already contemplates a continued need to increase water

and sewer rates in the range of 5 -7%. The City's debt service levels will also rise over the next nine years and, while remaining below the new target limit of 15% of own source revenues, must be closely managed so as to allow the City to maintain its favourable credit rating. Reserve fund balances are low in the near term and well below the targeted levels. Water consumption has fluctuated and can further impinge on the City's revenues and forecasted rate increases. The City, like many other Canadian municipalities must monitor and manage the significant level of capital requirements regarding these services to ensure that they remain affordable.

The sources of financing required to support infrastructure investment are identified in the City's Long Range Financial Plan as described in the sub-sections below.

### 7.2.1 Revenue from Rates

The sole source of revenue for the operation and maintenance of the water, wastewater and stormwater systems is from water/sewer billing. Additionally, water/sewer billing must fund the City's share of capital infrastructure requirements for water, wastewater and stormwater assets. For the water system this consists of the water rate and associated fire supply charge. For the wastewater system, this consists of the sewer surcharge.

In order to ensure that the LOS is maintained, it is important, as both the water and wastewater systems continue to grow and age, that the rates set are appropriate and sustainable to support the need for ongoing operation and maintenance including resourcing.

The operation and maintenance of the stormwater system is also supported from the sewer surcharge revenue. There is some concern that there is not a direct link, from a user pay perspective, between the funds collected as part of the sewer surcharge which is based on a percentage of water usage and the funds required to operate and maintain the stormwater system. Moving forward, consideration needs to be given to developing a separate rate to support stormwater which could be based on the quantity of stormwater generated from individual properties as this has a direct impact on the stormwater collection and treatment systems.

Action:

- The City will assess the mechanisms available to support the operation and maintenance of its stormwater systems and determine whether a user specific rate should be developed to support this infrastructure.

## 7.2.2 Revenue from Development Charges and Grants or Subsidies

The major source of revenue for the growth related component of water, wastewater projects come from Development Charges, grants or subsidies. Other rates, such as a frontage rates, or areas specific rates, are for cost recovery of specific services provided which includes SWM. Development Charges revenue can only be used for growth related projects that are defined under the Development Charges By-Law. This By-law is updated every five years and will be updated in 2014.

Development Charges for water and wastewater projects are held in separate reserve funds. Reserve funds are differentiated by whether the project is a benefit city wide, inside the Greenbelt, outside the Greenbelt or to the serviced rural area. The reserve funds are maintained to buffer fluctuations in timing of cash inflow and outlay. For water and wastewater projects required in areas which will be subject to intensification, identifying the component of the project that is growth related is important so this component can be captured in the Development Charges By-law. *Annex A.2* contains the water and wastewater project sheets which summarize the projects and details the estimated breakdown of funding required between the rates and Development Charges.

Grants and subsidies from either the Federal and/or Provincial governments may be available from time to time for special capital projects (either renewal or growth). Unless there has been a funding commitment provided from the other levels of government, it is generally not assumed that they will be available to fund the capital water and wastewater projects.

Action:

- The City will update the 2014 Development Charges background study regarding Water, Wastewater and Stormwater services to reflect the requirements identified in the IMP.

## 7.2.3 Debt Financing

The other significant source of financing is through debt. Council has recognized the need to utilize debt in order to meet the upcoming significant renewal requirements in regards to water, wastewater, and storm water assets. Debt is also an appropriate way to finance longer-life capital projects since future rate payers who will benefit from the project will pay for it through future debt charges.

Actions:

- Front-ending and negotiated agreements will be used to facilitate the construction of infrastructure required to support more than one development.
- Development Charges will be used as the major source of funding to construct infrastructure for greenfields development.

## 8.0 Monitoring and Reporting

To measure the success of the IMP over time, monitoring of the Plan's policies, actions and recommended projects will be required. Through monitoring, deviations from the IMP can be highlighted, assessed and adjustments can be made if necessary. When preparing the next IMP, this monitoring and reporting will be reviewed and used to inform any changes that may be needed to the new plan.

Monitoring of water demand and wastewater generation is recommended on an annual basis. To tie this monitoring to City's development pattern, it is recommended that this information be reported in conjunction with the 'Annual Development Report' which is presented for information to Planning Committee. In addition to monitoring and reporting on water demand and wastewater generation, any potential impact on proposed projects in the IMP, including those resulting from further EAs, will be identified. Any needed adjustments will be reflected in the annual priority setting and budgeting process.

To monitor the policies and actions in the IMP and to ensure coordination within the city, it is recommended that the interdepartmental Steering Committee established for this IMP continue to meet. The IMP Steering Committee can then vet any of the monitoring results and provide additional input into the 'Annual Land Development Report' regarding the success of the IMP policies and status of the actions.

Actions:

- The City will track development approvals and growth characteristics to support infrastructure planning and the timing of capital projects.
- The City will assess how factors related to population growth, such as employment characteristics and household demographics, may impact infrastructure planning.
- The City will monitor the effectiveness of its policies, the status of its actions and the implementation of its projects and report on these on an annual basis as part of the 'Annual Development Report'.

## 9.0 Beyond 2013: Future Planning Initiatives

There are many strategies, supporting plans and studies which shape the IMP. Those which have been completed have been taken into consideration. Others, however, are at various stages of development and/or implementation. It is recognized that there are many future initiatives, beyond the 2013 IMP, where further work is required to develop and define programs. The following list highlights these major initiatives which have been described in the IMP:

- Undertake more detailed local servicing studies in response to development proposals to identify local pipe upgrades that may be needed to support the increased levels of intensification.
- Establish an interdepartmental working group to identify the local servicing study priorities and opportunities to coordinate upgrades with the City's infrastructure renewal program. As part of reviewing and assessing priorities, identify resourcing requirements.
- Completion of the R.O. Pickard Development Plan.
- Development of detailed implementation plans for the Wet Weather Infrastructure Master Plan programs.
- Develop a more comprehensive wastewater flow monitoring program
- Development of a SWM Master Plan through the completion of the following actions:
  - A Capacity Review of the remaining build-out areas for Large Existing SWM Ponds.
  - An assessment of the potential for further increases in imperviousness above the value used for the detailed design of SWM facilities.
  - Moving Forward LID Approaches by:
    - implementation of local LID demonstration projects on various land uses, public and private;
    - seeking out and supporting training opportunities for City staff, agencies, and consultants; and
    - development and adoption of LID design guidelines and standards.

- SWM Retrofit plans for all existing urban area that developed with little or no SWM.
- A Stormwater Collection Systems Master Plan as a component of the WW-IMP.
- A Best Practices Review of Adaptive Approaches to Climate Change for SWM and Drainage.
- Complete a new Hydrogeological and Terrain Analysis Guideline.