Etobicoke and Mimico Creeks Watersheds
Technical Update Report

Executive Summary

The Etobicoke Creek watershed (211 km$^{2)}$ and Mimico Creek watershed (77 km$^{2)}$ are highly urbanized and degraded systems. They begin south of the Oak Ridges Moraine and drain into the north shore of Lake Ontario, flowing through the Region of Peel, Town of Caledon, and Cities of Brampton, Mississauga and Toronto along their course. Much positive action has already been taking place toward their revitalization.

In these watersheds, new technical information has emerged since publication of the watershed revitalization strategy *Greening Our Watersheds: A Strategy for the Etobicoke and Mimico Creek Watersheds* (TRCA, 2002). A more recent report, *Turning over a new leaf: The Etobicoke and Mimico Creeks Watersheds Report Card* (TRCA, 2006), identified specific data gaps. As part of an adaptive approach to watershed management, the Toronto and Region Conservation Authority felt that an updated watershed study was necessary to provide a more informed basis for decisions affecting these watersheds. This information will be valuable to municipalities as they plan for further urban growth and adopt climate change strategies.

The purpose of this Technical Update is to develop an improved understanding of the watersheds and update the strategic management recommendations and implementation priorities, based on analysis of new technical information. The report addresses the following areas:

- Groundwater quantity and quality
- Surface water quantity
    - Baseflow and water use
    - Stormwater management and streamflow
- Surface water quality
- Fluvial geomorphology
- Terrestrial natural heritage system; and
- Aquatic system – instream barriers to fish passage.

Watershed objectives, indicators and targets from *Turning over a new leaf: The Etobicoke and Mimico Creeks Watersheds Report Card* (TRCA, 2006) were used to guide the scope of technical work, except in a few cases where they were revised or developed by this Technical Study to address gaps or reflect new science.

This Executive Summary presents a brief description of the focus of technical update work, key findings and management recommendations for each study component. This is followed by a summary of the strategic management directions, implementation priorities and guidance on how this information is to be used. The recommendations in this report are meant to inform the ongoing work of all watershed partners in their efforts to restore the natural function and resilience of these degraded watersheds and build their capacity to adapt to change.

Key Findings by Study Component

Groundwater Quantity and Quality (Section 3.0)

This section addresses a knowledge gap identified in previous watershed strategy and report card documents, by drawing upon new groundwater-related information available through the York-Peel-Durham-Toronto – Conservation Authority Moraine Coalition (YPDT-CAMC) groundwater program. The section introduces a set of objectives, indicators and targets for groundwater quantity and quality management in these watersheds. Key findings are as follows:

- Groundwater **recharge** is less than 100mm/year across these watersheds, due to the predominantly low permeability silt, clay and silt till soils, except for the Brampton Esker area of the Etobicoke Creek watershed (Highway 410 between Mayfield Road and Queen Street) where estimated recharge is close to 380 mm/yr and the remnant Lake Iroquois shoreline in Mimico Creek watershed with recharge rates up to about 340 mm/yr (Dundas Street and Islington Avenue area).
- Three principal **regional aquifer systems** exist, from deepest to shallowest: Scarborough Aquifer Complex, Thorncliffe Aquifer Complex, and the Oak Ridges Aquifer Complex.
- Groundwater **flow direction** is primarily from the headwater areas in the northwest toward Lake Ontario in the southeast.
- **Groundwater levels** appear to be rebounding in the vicinity of the Brampton Esker in response to cessation of dewatering associated with aggregate extraction, posing implications for the design of subsurface infrastructure, increased baseflow in the West Branch of Etobicoke Creek, stormwater management pond operations, and long term pumping.
- Groundwater **discharge** to streams is predicted to be highest in the Main Etobicoke Creek branch south of Bovaird Road to near Steeles Avenue (Oak Ridges aquifer outcrop) and in the Mimico Creek from about Eglinton Avenue south to Dundas Street (Thorncliffe Aquifer) and the Bloor Street area (Scarborough Aquifer).
- **Groundwater use** is concentrated in the upper reaches of the Etobicoke Creek watershed, primarily for livestock/agricultural purposes, commercial groundwater takings, and groundwater remediation.
- There are no **municipal water takings** for potable drinking water, although the capture zone for the Cheltenham wells extends into the Etobicoke Creek headwaters.
- The **groundwater use** for both watersheds represents less than 1% of the total recharge, representing a low level of stress on the groundwater system.
- **Heart Lake Wetland Complex** is primarily dependent on surface water inputs, although the lake remains part of the groundwater system due to leakage of surface water through finer grained/organic deposits that form the lake bottom.
- **Cheltenham wetland complex** located west of Creditview Road between King Street and Old School Road is also primarily surface water dependent.
- Limited **groundwater quality data** exist, but suggest typical chemistry as other shallow aquifers in Southern Ontario (i.e. calcium/magnesium carbonate).

Shallow aquifer met potable water standards when used for municipal supply during 1964-1972.

Management Recommendations

1. Manage the rebounding groundwater levels and their effects, as necessary, in the vicinity of the former Brampton Esker aggregate pits: a) Undertake more monitoring of groundwater levels in this vicinity; b) Assess hydraulic capacity of outlet pipe from Major Oaks Park pond; c) Determine flow volumes at Esker Lake North pumping station; and d) Develop action plans that consider long term risk management, aquatic habitat enhancement opportunities and monitoring needs, as required.
2. Maintain and enhance (not beyond natural levels) groundwater recharge in relation to new and existing development.
3. Install groundwater level monitoring wells in Thorncliffe and Scarborough aquifers.
4. Install groundwater quality monitoring wells in Thorncliffe and Scarborough aquifers when sustainable funding becomes available; use BMPs to prevent contamination of Oak Ridges Aquifer or Equivalent.

Baseflow and Water Use (Section 4.0)

This section provides a more in-depth analysis of the low flow regime than was previously possible, with the benefit of additional low flow and water use survey data and an improved understanding of the groundwater flow system. Key findings are as follows:

- Mean **summer baseflow** in Etobicoke Creek has been increasing by 1.3% per year since 1967; larger increasing trends have been observed in both Creeks during the most recent 10 year period (1997 to 2006), among the highest in all TRCA watersheds.
- Some of the increase in baseflow in Etobicoke Creek may be attributed to the rising groundwater levels in the Brampton Esker area.
- Mean summer baseflow in Mimico Creek has decreased by 0.3% per year since 1966, but increased by 2.5% per year in the last 10 years, possibly associated with urbanization.
- Half the years in the recent 10 year period had normal or in excess of normal annual precipitation, suggesting that distribution of precipitation over the year is important in sustaining baseflow.
- Although the Oak Ridges Aquifer or Equivalent (ORAE) feeds the **headwaters** of other TRCA watersheds, this aquifer appears to be providing significant baseflow only in the middle reaches of the Etobicoke Creek West Branch between Bovaird Drive and Steeles Avenue and Mimico Creek north of Steeles Avenue.
- Although there are several locally significant groundwater contributions, believed to be from ORAE, many Etobicoke Headwater tributaries are dry in summer.

- The **Brampton Esker** feature is deemed to be an important source of groundwater inputs to Spring Creek with local contributions to baseflow downstream of the Esker Lakes.
- Significant **losing reaches** exist, particularly in Etobicoke Creek south of Steeles Avenue and Upper Mimico tributaries to below Derry Road, possibly due to water takings and interactions between the stream and alluvium deposits adjacent to the watercourse.
- The majority of the 48 known **water users** (surface and ground water) in these watersheds are located in the Etobicoke Creek headwaters with the water withdrawn for livestock watering purposes.
- The greatest **volume of water withdrawals** (from all sources) per year occurs in the Etobicoke West Branch and Mimico Creek for golf course irrigation, from solely surface water sources.
- There are ten known surface water users within these watersheds which include eight golf course operations, a nursery and a miscellaneous use.
- Three highly **vulnerable stream reaches** were classified, in which water users could potentially take more than 25% of measured baseflow (Lower Mimico Creek, Etobicoke Headwaters and Tributary 4); the latter two of these reaches were classified as such due to having dry stream conditions during the 2007 field measurements.

Management Recommendations

1. Manage current and future water use, particularly water taking permit decisions, with reference to the new information provided by this Technical Update.
2. Protect important recharge and discharge zones, including natural features such as the Oak Ridges Moraine (or equivalent) and the Brampton Esker.
3. Continue baseflow monitoring within the Etobicoke and Mimico Creeks.
4. Investigate ways to identify stream reaches that may be sensitive to baseflow fluctuations due to climate change.

Stormwater Management and Streamflow (Section 5.0)

This section presents an updated summary of existing stormwater management practices and analysis of historical and modeled streamflows. Substantial additional work has been completed as part of this Technical Update to improve the stormwater pond infrastructure database and identify where minor modifications to the sewershed and hydrologic sub-basin boundaries are needed to reflect existing drainage conditions. This work will provide a more accurate basis for future hydrological studies, stormwater retrofit designs and analysis of streamflow conditions. Key findings are as follows:

- Approximately 88% of the Mimico Creek watershed and 63% of the Etobicoke Creek watershed are designated as **urban** (2002 land use data), resulting in a high degree of imperviousness.
- **Stormwater management practices** have evolved to address an increasingly broader range of objectives as urban growth has occurred in these watersheds.

- 46 **stormwater management ponds** lie within the Etobicoke Creek watershed, 25 ponds are in the Mimico Creek watershed, and 2 ponds lie within the Lake Ontario drainage area. The majority of these ponds do not meet current standards, as they were developed prior to the implementation of water quality and erosion control.
- Only 30% of the urbanized areas within the watersheds were developed with the benefit of **stormwater management plans.**
- Approximately 8% of the urbanized areas in the Mimico Creek watershed have **quality treatment** and only 0.2% of the developed areas provide an Enhanced level of quality treatment, as defined in the Ministry of the Environment's Stormwater Management Planning and Design Manual. Approximately 21% of the developed areas in the Etobicoke Creek watershed have quality treatment and only 2% represents an Enhanced level of treatment.
- Only 9% of the developed areas in the Mimico Creek watershed and 25% of the developed areas in the Etobicoke Creek watershed have **erosion controls**. The predominant level of erosion control is 25 mm/24 hour.
- 22% of the developed areas in the Etobicoke Creek watershed and 26% of developed areas in the Mimico Creek watershed have **quantity controls;** this generally reflects current requirements at the time of the development. It is time to review and confirm quantity control criteria.
- Opportunities to **improve the level of treatment** of stormwater have been identified by TRCA and individual municipalities (by retrofitting existing stormwater management facilities, constructing new end of pipe facilities at outfalls and applying other innovative approaches).
- **Design flows** from the original and updated hydrology models were compared for both watersheds. For Mimico Creek, updated models showed an increase in flows for the 5 year event at 3 nodes within the watershed, an increase in flow during the 100 year event at the upper portion of the watershed only, and a decrease at the lower nodes. The Regional event showed a decrease in flow. Results for both the Regional and 100 year may be attributed to variations in the modeling techniques.
- Etobicoke Creek modeled design flows showed a 50% reduction for both the 5 year and 100 year events at the top end of Spring Creek, due to flow attenuation now provided by the Dixie Bovaird pond. Further downstream, the impact of the pond dissipates and flows were shown to increase for both events. The Regional event (which is not affected by the Bovaird pond) showed an increase by 2-19% throughout the watershed.
- **Historical streamflow data** analysis showed that mean annual streamflow in both watersheds has increased over the past 40 years (27% increase in Mimico Creek and 44% increase in Etobicoke Creek), and the increase has been accelerating for the past 10 years (with a 60% increase measured over this time period).
- Current stormwater management practices within the watersheds are not adequate to achieve the overall quantity control targets. More stringent **stormwater management controls** are required for both watersheds (i.e. maintain or reduce baseline peak flows for 2 to 100 year return periods).
- Updated **floodline mapping** will be completed in 2010. Draft information indicates that although the number of **flood vulnerable "clusters"** has not

increased since the 1980 Flood Control Study, there appear to be significant changes in floodlines, which may result in increased risk to structures within the floodplain. Further analysis and consultation with municipalities and landowners will continue into 2011.

- Properties in the vicinity of **Major Oaks Pond** in Brampton are at a potential risk of flooding due to recent modifications to the Brampton Esker system. Further study is required to assess risks.
- Development potential of the special policy areas within the watersheds, and in particular, the **Downtown Brampton SPA** and the **Dixie**/**Dundas SPA** will require harmonizing of the planning policies with hazard management policies.
- Need for **updates** including**:** delineation of drainage boundaries to address discrepancies identified in this study, future updates to hydrology models in keeping with the timing of Official Plan updates, and reassessment of stormwater management criteria based on study findings.

Management Recommendations

Stormwater management policy, criteria and program maintenance:

1. Encourage the implementation of source controls and conveyance controls (following low impact development techniques) for all new development and infill developments and as part of retrofit programs in older urban areas.
2. Develop new stormwater quantity control criteria, based on findings of the most recent hydrology updates.
3. Undertake timely updates to the hydrology models for both watersheds. Timing should coincide with the municipal Official Plan updates.
4. Develop strategies and protocols that are adaptive to climate change scenarios, such as intensity and frequency of extreme events.
5. Ensure that Master Environmental Servicing Plan (MESP) studies address quality, erosion, quantity and water balance aspects of stormwater management, for all new development blocks. Infill development should be subjected to the current stormwater management criteria and site level retrofits (such as greenroofs or bioswales) should be required.
6. Recognize the need to integrate floodline management with development review in high risk areas (such as Special Policy Areas).

Monitoring and Further Study

7. Maintain TRCA's Regional Monitoring Network sites within the watershed to measure quality, erosion at sensitive locations. Identify and install additional stream gauge sites at appropriate locations to allow effective calibration of hydrology models.
8. Update the delineation of external watershed boundaries to reflect existing conditions and allow for more accurate modeling and watershed management.
9. Undertake further monitoring and analysis of the Brampton Esker system (particularly the outlet of the Major Oaks stormwater pond) to assess potential changes to the hydrology and hydraulics as a result of the backfilling of Esker Lake North. Determine mitigation options as necessary.

Continuous improvements to stormwater management practice

10. Complete the flood protection and remedial capital works strategy and undertake projects that will mitigate flooding as funding permits.
11. Implement the findings of the municipal stormwater retrofit studies and the Catchment 219 study.
12. Strengthen partnerships to expedite improvements to the watersheds and continually advance the science and the practice.

Surface Water Quality (Section 6.0)

This section provides an updated evaluation of current water quality conditions for routine parameters in Etobicoke and Mimico Creeks, according to targets set out in the previous watershed report card. Key findings are as follows:

- **Non point sources** of contamination from urbanization are still considered to be the largest contributor to surface water quality in these Creeks.
- Levels of **nutrients and metals** have been maintained or decreased over the past decade.
- **Chloride** concentrations and **bacteria** levels show an increasing trend.
- It will be a challenge to meet **2025 targets** for total phosphorus, chloride and bacteria.

Management Recommendations

1. Improve stormwater management quality and quantity control in new and existing urban areas (see Stormwater and Streamflow section), with particular effort on addressing common pollutants including total suspended solids, phosphorus and bacteria.
2. Investigate sources of high E. coli levels in both Creeks.
3. Monitor the effectiveness of salt management plans.
4. Investigate the potential significance of chloride contributions from groundwater sources associated with marine shale formations in the lower watersheds.
5. Promote the adoption of a Provincial chloride objective for the protection of freshwater aquatic life.
6. Improve knowledge of wet weather water quality.
7. Update the analysis for non-routine water quality parameters not addressed by this Technical Update.

Fluvial Geomorphology (Section 7.0)

This section addresses a knowledge gap identified in previous watershed strategy and report card documents, by analysing and interpreting the fluvial geomorphic data collected in Etobicoke and Mimico Creeks. The section introduces a set of objectives, indicators and targets for fluvial geomorphology in these watersheds. Key findings are as follows:

- This study has introduced **preliminary findings** and begun to establish an understanding of the fluvial geomorphology of these complex altered creek systems. It is premature to draw conclusions without additional years of data collection, and consequently key findings should be interpreted with caution.
- **Erosion threshold analysis** found that in the upper part of the watershed, the critical discharge values represented flow conditions well above bankfull conditions. Critical discharges in the lower reaches of the watershed represented erosive flow conditions much more frequently (within bankfull). When coupled with the typically more incised lower reaches, which constrain flow within the channel, these flows increased the potential for erosion.
- **Cross-sectional assessment** identified a total of ten sites within Etobicoke Creek which showed greater than 5% change between 2001 and 2008 (considered to be in state of active adjustment). Of these sites, four showed greater than 5% change in terms of erosion and the other six sites showed greater than 5% change in terms of deposition (aggradation).
- **Detailed field investigations** at the three Etobicoke Creek sites which exhibited the highest rates of erosion, indicated that only one site appears to be actively eroding at a reach scale, while the other two are tending toward deposition. Thus, further data is required to draw conclusions about the pattern of change.
- Only one site on Mimico Creek exceeded 5% change in cross-sectional area in the form of deposition. This site, however, is located within the tailwaters of the system; an area characteristically associated with sediment storage due to lower gradients and the backwater effect induced by Lake Ontario.
- Majority of **channel enlargement** noted within Etobicoke Creek and to a lesser extent in Mimico Creek was within the headwaters and mid-waters, as expected (these zones are typically responsible for sediment production and transport).
- **Bedrock controlled sites** tended to be wider and shallower than other sites of comparable drainable area in Etobicoke Creek, due to the erodible nature of the shale bedrock.
- Within Etobicoke Creek, the strongest relations identified through the **regional curve analysis** were with respect to upstream drainage area and the following parameters: bankfull discharge, cross-sectional area and bankfull width. Relations developed through the regional curve analysis can be used to establish estimates of stable channel dimensions for portions of the watercourse lacking detailed geomorphic information or flow data.
- Within Mimico Creek the strongest relations identified through the regional curve analysis were with respect to upstream drainage area and the following parameters: bankfull width and cross-sectional area.
- Only 45% of the **riparian zone** in Etobicoke Creek and 49% in Mimico Creek has natural cover.
- Much of the **instability** in headwater reaches is due to natural causes. Channel alteration, together with the effects of urbanization, have caused instability in the reaches of Etobicoke Creek and lower Spring Creek around Lester B. Pearson International Airport. Channel sensitivity is also noted in the lower Etobicoke Creek which meanders through a shale bedrock valley and has also seen substantial channel alteration.

Management Recommendations

1. Prioritize remedial erosion works, based on a watershed-wide assessment which has identified infrastructure or property at risk.
2. Repeat detailed field assessments at Regional Watershed Monitoring Network (RWMN) fluvial geomorphologic sites and expand the network of sites.
3. Manage runoff volumes through SWM and water balance maintenance.
4. Utilize erosion threshold values as guide for new development applications and stormwater retrofit designs.
5. Promote reach-based design and management of erosion protection and channel works.

Terrestrial Natural Heritage System (Section 8.0)

This section presents a refined target terrestrial natural heritage system (TNHS) for the Etobicoke and Mimico Creeks watershed, based on the TRCA's Regional Terrestrial Natural Heritage System Strategy (TRCA, 2007). Key findings are as follows:

- **Existing TNHS** is degraded with impaired ecological function.
- Only 12.4% natural cover remains. Natural cover includes forest, wetland and meadow communities.
- Habitat patches tend to be small, convoluted and disconnected.
- The **refined targeted TNHS** for these watersheds would comprise 14.1% natural cover, representing a small increase over existing conditions.
- Watersheds continue to provide habitat for TRCA **species of conservation concern**, including some L2 species.
- Valley systems allow greater north-south connections, acting as wildlife corridors for both migrant and resident species.
- Heart Lake Conservation Area and Etobicoke Headwaters support a diversity of forests and wetlands.
- Etobicoke and Mimico terrestrial **biodiversity** may be supported by the relatively more diverse systems in the neighbouring Humber and Credit River watersheds.
- East-west connectivity is severely reduced; target system helps to address the lack of connectivity by identifying new habitat areas to provide east-west connections (e.g. hydro corridor south of 407).
- Given the limited opportunities to expand the TNHS, there is an even greater need to manage the **urban matrix** through stewardship, naturalized landscaping and urban forest management.

Management Recommendations

1. Focus terrestrial restoration, enhancement and management activities on the 21 Priority Management Areas identified in this Technical Update.
2. Promote stewardship, naturalized landscaping and urban forest management within the urban matrix.

Aquatic System - Instream Barriers to Fish Passage (Section 9.0)

As recommended by the *GTAA Living City Project Etobicoke Creek - The Aquatic System* (TRCA, 2006), an instream barrier assessment in Etobicoke Creek was initiated in 2005 and completed in 2008. A similar assessment was completed in Mimico Creek in 2009. This section of the Technical Update reports on the findings of the barrier assessment work and identification of priority barriers for management action. Key findings are as follows:

Within Etobicoke Creek:

- The assessment confirmed the presence of 513 **instream structures** within 150 km of watercourse.
- Of the 513 instream structures assessed, 179 are **barriers** to non-jumping fish species and of those, 125 barriers prevent passage of jumping species.
- The issue of **habitat fragmentation** is greatest in Little Etobicoke Creek and Etobicoke Creek East Branch (Spring Creek system). There are lengthy portions of the Etobicoke Creek West Branch that remain open with few anthropogenic barriers.
- The areas that support relatively high quality stream reaches are within the Etobicoke Creek Headwaters subwatershed and are targeted for **reconnection** by barrier mitigation. By reconnecting good habitat to similar habitat, there will be greater opportunity for successful reproduction and fish survival.
- Only eight barriers would have to be mitigated to allow **fish passage** between Lake Ontario and the headwaters, along the Etobicoke Creek West Branch, allowing fish access to 50 km of watercourse.
- The potential increase in baseflow in the Etobicoke Creek West branch, due to rebounding groundwater levels (discussed in Groundwater Section), may affect barrier mitigation priorities if further investigations reveal aquatic habitat opportunities.
- Multiple local benefits could also be achieved in the upper reaches of Spring Creek through wetland enhancement and connection to the stream.

Within Mimico Creek:

- The assessment confirmed the presence of 338 **instream structures** along 57.2 km of watercourse.
- Of the 338 instream structures, 145 are **barriers** to non-jumping fish species, and of those, 126 barriers prevent passage of jumping species.
- **Habitat fragmentation** is a result of typical physical barriers, but also high flow velocities, damaged infrastructure and/or engineered instream works, major transportation infrastructure (i.e. highways and railway crossings), and garbage pollution.
- Reconnecting Lake Ontario to the Mimico Creek headwaters would require a lot more effort as compared to Etobicoke Creek, due to the numerous barriers that exist. Therefore, the most immediate gains in Mimico Creek would likely be measurable in the lowest reaches by mitigating the first few barriers to allow

native species from Lake Ontario to become better connected with the watershed.
- Opportunities for multiple local benefits center on restoration efforts that have greatly improved habitat conditions in the East Mimico Creek headwaters.

Management Recommendations

1. Manage instream barriers to fish passage on a priority basis and as opportunities arise. Barriers in each Creek were organized into one of three categories of management priority, from a fisheries management perspective (i.e. further analysis of engineering, approvals, cost etc. was beyond the scope of this assessment):
   a. Category A works to achieve the overall target of connectivity from the Lake to headwaters;
   b. Category B priorities include the extension of existing natural habitat within a watercourse;
   c. Category C priorities are small scale projects that address local issues and provide stewardship opportunities.

Summary and Strategic Management Directions (Section 10.0)

This Technical Update has helped to fill gaps and improve knowledge about the Etobicoke and Mimico Creeks watersheds – how they functioned naturally, how they have been influenced by human activities and how the future challenges of additional urban growth and climate change can be addressed to achieve the watershed vision.

Beginning south of the Oak Ridges Moraine on the Peel Plain, the streams naturally have weak baseflow and wide, shallow warmwater channels in their mid to lower reaches where they eroded down to the shale bedrock. In the past two centuries, intensive land clearing for agriculture and urbanization has resulted in the loss of natural cover, drainage of wetlands, channelization of watercourses, aggregate excavation and dewatering around the Brampton Esker, and introduction of impervious surfaces and pollutants into the watersheds. These activities have left a legacy of fragmented and degraded habitats, risks to human life and property and potential management requirements associated with groundwater level recovery. Further urban growth and climate change represent future challenges. Much positive action has already been taking place to turn the watersheds toward the path to regeneration. Watershed partners have come together to develop plans and strategies and undertake projects for more sustainable urban growth, improved stormwater management, regeneration of degraded systems and various other greening initiatives.

A common theme among the detailed management recommendations is the need to restore the natural function and resilience of the watersheds and build their capacity to adapt to change. The following five strategic management directions have emerged from this work:

1. **Expand and enhance natural cover and habitat connectivity**, particularly through protection of existing vulnerable habitat patches in the rural headwaters,

restoring east-west connections in the mid reaches and by improving the urban matrix.
2. **Restore a more natural water balance** through a combination of low impact development (LID) measures and end-of-pipe stormwater retrofit projects, particularly for extensive areas of impervious urban surface.
3. **Foster stewardship and sustainable behaviour** to achieve greater rates of participation by private landowners.
4. **Manage the rebounding groundwater levels** in the vicinity of the Brampton Esker, as necessary based on additional information.
5. **Advance the science and practice of watershed management** through continued testing and refinement of innovative approaches.

These integral directions address many of the technical component objectives. They reinforce recommendations already set out in *Greening Our Watersheds* and *Turning over a new leaf* and provide additional insights into priorities for action.

Implementation Priorities (Section 11.0)

Many policies and programs of municipalities, TRCA and other agencies and groups are already in place to support implementation of the management recommendations in this report. Implementation priorities have been identified in the following areas:

1. Policy Directions (Refer to Table 11-1):
    - Water balance, volume control and groundwater recharge
    - Stormwater retrofits in existing developments
    - Master environmental servicing plans (MESPs) for new development, redevelopment and regeneration areas
    - Sustainable urban form and practices
    - Terrestrial natural heritage system
    - Comprehensive flood risk assessment plans
    - Monitoring and adaptive management

2. Monitoring Enhancements (Refer to relevant report sections for details):
    - Groundwater wells in Thorncliffe and Scarborough aquifers.
    - Baseflow in Etobicoke Creek West Branch near Steeles Ave., Spring Creek in the vicinity of the Brampton Esker, Upper East Mimico Creek between Steeles Ave. and Derry Rd.
    - Stream gauges as appropriate to allow effective calibration of hydrology models.
    - Fluvial geomorphic sites (locations to be confirmed pending results of ongoing stormwater management analysis).

3. Further Investigation (Refer to sections 3.0, 4.0, 5.0 and 6.0):
    - Groundwater level recovery in the vicinity of the Brampton Esker
    - Specific needs in other areas concerning climate change, hazard management and water quality.

4. Regeneration
    - Subwatershed Regeneration Plans (see Figures 11-1 to 11-11)
        - Subwatershed scale maps compiling the regeneration actions identified from each technical study component

    - Priority Areas for Integrated Regeneration Projects (Refer to Table 11-3):
        - Little Etobicoke Creek subwatershed
        - Spring Creek subwatershed
        - Upper Mimico Creek East Branch subwatershed
        - Pearson Eco-Business Zone

    - Priority Areas for Habitat-focused Regeneration Projects (Refer to Table 11-4):
        - Etobicoke Creek Headwaters – Terrestrial Natural Heritage Regeneration
        - Lower Etobicoke Creek – Aquatic barrier mitigation and Terrestrial Natural Heritage Regeneration

How this information is to be used

This updated technical information is meant to inform the ongoing implementation of policies and programs by TRCA and its partners. It will assist in priority setting and contribute to the production of the next watershed report card. Overall, the programs, policies and projects informed by this update will contribute to the achievement of our watershed vision and the goals and objectives of sustainability strategies, climate change adaptation and mitigation plans, the Toronto and Region Remedial Action Plan and to the management of the Lake Ontario nearshore.