

CHAPTER 7.0
SUMMARY AND RECOMMENDATIONS

7.0 SUMMARY AND RECOMMENDATIONS

7.1 SUMMARY

This Watershed Plan and Comprehensive Environmental Impact Statement has been produced to meet the requirements of current legislation. The existing environment has been described and mapped, the potential impacts of development have been assessed and recommendations for mitigation and monitoring provided. Implementation of the recommendations of this plan is required to ensure that the key natural features and areas of the Moffat Creek Watershed are managed and protected over time. The key recommendations of this document are as follows:

- The City of Cambridge undertake a Master plan for the open space areas of the Moffat Creek Watershed below Highway 8, including Churchill Park;
- The Natural Heritage Management Plan be implemented as presented herein;
- The Storm Water Management Plan be implemented as presented herein;
- The Monitoring Plan be implemented as presented herein;
- The Implementation Guidelines set out for the agencies be followed; and
- Environmental Impact Statement reports be completed for all development proposed on lands defined by this Comprehensive Environmental Impact Study as Adjacent Lands (refer to Map 6.1).

7.2 KEY WATERSHED ISSUES AND RECOMMENDED SOLUTIONS

Nine key Watershed issues were identified in Section 2.4 of this report. Each of these issues has been reviewed, relative to the findings of this Watershed Plan and Comprehensive Environmental Impact Statement, and the findings are summarized below.

7.2.1 Flooding

The flood flow regime of the Moffat Creek Watershed is greatly affected by the flow attenuation effects of the Moffat Creek Wetland. Flood risk along Moffat Creek has been minimized over the past 20 years by restricting development to areas outside the Moffat Creek regional floodplain. The Regional water levels following complete development of the Watershed are similar to those occurring under existing conditions. The five residential buildings and six outbuildings which are susceptible to Regional flooding under existing conditions will continue to flood following development. No buildings are inundated during rainfall events with less than a 100-year return period.

Storm water management will be required to maintain the existing flows in Moffat Creek. The Christopher Drive and Highway 24 culverts are undersized and overtop during minor rainfall events. The remaining culverts will overtop with the same frequency following development.

Recommendations to Mitigate Flooding

It is recommended that:

- Flood control priorities and solutions for existing problems be decided by the City of Cambridge in conjunction with the Region and GRCA, and integrated into the appropriate capital budgets;
- Upstream flood control storage be maintained through the preservation of significant floodplain and wetland detention areas;
- Flood risk at existing flood-susceptible areas be reduced using either non-structural or structural measures;
- At Christopher Drive, the following is recommended:
 - The existing culvert crossing be upgraded with a culvert designed to current municipal standards;
 - The channel along Christopher Drive be improved to increase capacity and to reduce flood channel confinement;
 - Floodline mapping at Christopher Drive be updated to accurately reflect hydraulics;
 - The impacts of culvert replacement and channel improvement on flood risk for the apartment buildings that are currently within the Regional floodplain be assessed. Further structural flood proofing measures may be required; and
 - The culvert replacement and associated channel works to be completed as a Class Environmental Assessment by the City of Cambridge prior to additional development within the Watershed.
- At Highway 24 (Water Street), the following is recommended:
 - The existing culvert crossing be upgraded with a culvert designed to current municipal standards;
 - The channel downstream of Highway 24 be improved to remove all obstructions; and
 - These improvements be undertaken by the Region of Waterloo in conjunction with the Highway 24 future upgrade.

- Future road crossings of the Creek be designed with the capacity to convey runoff generated during a Regional rainfall event;
 - The City of Cambridge undertake a Master Plan for the open space areas of the Moffat Creek Watershed below Highway 8 (including Churchill Park). This Master Plan should address the following enhancements:
 - Replacement of the footbridges in Churchill Park with open span structures; and
 - Modification of the gabion weir and lower channel in Churchill Park to reduce flood channel confinement.
 - Within the City of Cambridge:
 - The floodplain mapping presented in this report be adopted for administration of the GRCA Fill, Construction, and Alterations to Waterways Regulation; and
 - The regulatory floodlines be included on the appropriate Cambridge Zoning By-Law Schedules.
 - Runoff volumes in the Creek be minimized by:
 - Maximizing infiltration using at-source and conveyance measures; and
 - Maintaining or replicating existing detention such as depressions or isolated wetland units.
 - Within the Township of North Dumfries:
 - The Regulatory flood levels be adopted for administration of the GRCA Fill, Construction, and Alterations to Waterways Regulation;
 - The extent of the floodplain be determined on a site-by-site basis as required or as part of Environmental Implementation Reports to be completed prior to major development; and
 - Runoff volumes in the Creek be minimized by:
 - Maximizing infiltration using at-source and conveyance measures; and
 - Maintaining or replicating existing detention such as depressions or isolated wetland units.
 - Flood damage and risk to life be minimized by prohibiting or restricting new development in the floodplain; and
 - Runoff rates from developing areas be controlled to 0.01 m³/s/ha for the 5-year and 0.03 m³/s/ha 100-year storms respectively.
-

7.2.2 Erosion

All existing erosion and sedimentation problem areas are located in the developed portion of the Watershed downstream of Highway 8/Dundas Street. The most significant bank erosion is seen in the most confined reach upstream of the weir at Churchill Park, and the reach along Christopher Drive. Local erosion problems are evident at storm outlets and culvert crossings. Sedimentation of the watercourse is causing erosion on the downstream side of the middle park walkway, and on the upstream side of the Champlain Avenue culvert.

If mitigation measures are not implemented following development, increased flow durations and peak flows, in the Creek will result in an increase in erosion potential. Erosion at existing problem areas in the lower end of the Watershed may increase following development due to the increased flows and additional problem areas may develop.

Natural sections of the Creek upstream of Franklin Boulevard will continue to be sustained by their unconfined lower bank heights. The openness of the floodplain in these sections and the deep rooted bank vegetation provide relief and protection of the watercourse. However, localized erosion and sedimentation problems may occur at outlets from storm sewers.

Recommendations to Mitigate Erosion

It is recommended that:

- Erosion control priorities and solutions for existing problems be decided by the City of Cambridge in conjunction with the Region and GRCA and integrated into the appropriate capital budgets;
- The channel enhancements be implemented downstream of Franklin Boulevard as described in this report;
- Natural channel design principles be implemented to:
 - Provide small, meandering low-flow channel with relief floodplain; and
 - Provide deep-rooted vegetation along stream margins.
- The city follow up on areas within subdivisions still under subdivider's agreement to see that erosion control measures are being implemented and maintained;

- Eroding storm outlets be repaired in conjunction with City maintenance works or in conjunction with fisheries rehabilitation;
- Erosion potential be minimized by prohibiting or restricting new development on stream valley slopes;
- Temporary erosion controls be provided during construction to minimize the migration of soils from development sites; and
- Permanent erosion controls be provided for future development by:
 - Maintaining 5-year runoff volume draining from developing sites;
 - Maintaining existing detention areas such as wetlands and depressions; and
 - Maximizing infiltration.

7.2.3 Groundwater

The shallow groundwater flow system has been identified as a minor contributor to Moffat Creek and the wetland complexes throughout most of the Watershed. This is primarily a function of the overburden geological deposits which have a relatively low hydraulic conductivity, limiting recharge rates and the flow of groundwater towards the wetlands and the Creek.

Infiltration occurs in the upland areas and the resulting groundwater flow joins the local or regional flow systems. The local flow system discharges to the Creek corridor or perched wetland areas, and contributes to the baseflow of the stream. The Regional flow system contributes directly to the Grand River. Surface runoff captured in depression storage areas also contributes to the groundwater system.

Groundwater Mitigation

It is recommended that:

- Where feasible and acceptable, maintain or enhance existing groundwater recharge rates by:
 - Providing at-source infiltration equivalent to the first 25 mm of runoff from roof areas;
 - Promoting infiltration of the runoff volume generated during the first 13 mm of rainfall from all non-roof areas;
 - Maintaining or replicating existing detention areas; and
 - Providing infiltration along fringes of wetland units.

- Pre-treatment of surface runoff from paved areas be provided to minimize risk of groundwater contamination; and
- Prior to major development a hydrogeological report be prepared by the development proponents to confirm information and address the objectives of the Moffat Creek Watershed Plan.

7.2.4 Wetlands

The Provincially Significant Wetlands have been identified as areas of non-development. Intrusion of human recreational uses may result in habitat degradation and thereby contribute to a decline in wildlife species diversity and quality. Changes in nutrient loading may contribute to invasion of exotic weed species into native plant communities. Intrusion by both humans and exotic weed species will increase with the proximity and density of development.

Wetland Mitigation

It is recommended that:

- The Watershed Natural Heritage Plan outlined in Section 6.3.2, including Map 6.1, be adopted and implemented to address concerns related to the protection of natural areas and systems;
- Areas recommended as “no-development” be incorporated into the Regional, City and Township Official Plans, as appropriate, thereby formalizing recognition of the constrained areas;
- Significant contiguous wetland blocks be protected by:
 - Protecting the boundary integrity of wetland units with adequate buffers;
 - Protecting the integrity of core habitat areas with buffers, fencing, and careful trail placement;
 - Designating all buffers and adjacent land areas in the Cambridge Official Plan and incorporate into appropriate supporting policies;
 - Designating core wetlands and associated uplands as an Environmentally Sensitive Policy Area pursuant to Policy 4.3.4 of the Regional Official Policies Plan;
 - Avoiding new road alignments or widenings through the wetland and if possible, relocating existing roads to further consolidate wetland blocks (EA process); and

- Reviewing and revising adjoining land use(s) which contribute to increased demand for fragmentation.
- Adequate buffers be provided for the wetland units by:
 - Providing zoning control for adjoining land use(s) which contribute to increased demand for encroachment activities such as recreational uses of open space;
 - Providing specialized buffers in key sensitive areas, possibly including fences, plantings, or regeneration of native species cover;
 - Protecting natural features in adjoining upland areas; and
 - Educating urban and rural landowners regarding maintaining and enhancing wetland and riparian buffers.
- Hydroperiod, groundwater regime, and surface flow characteristics be maintained within subcatchments by:
 - Promoting stormwater infiltration where practical to maintain recharge;
 - Directing treated stormwater to wetlands and maintain discharge zones; and
 - Maintaining or replicating surface water input points.
- Nutrient and sediment entry into wetland units be minimized by:
 - Employing strict controls on siltation during development;
 - Establishing effective vegetated buffers during and following development; and
 - Providing water quality treatment at stormwater outfalls.
- Groundwater recharge role of isolated and palustrine wetland units be maintained by:
 - Providing adequate buffers and setbacks for isolated wetland pockets;
 - Integrate isolated and palustrine units, where possible, within protected habitat corridors, using native species plantings to buffer wetland units and to enhance connectivity where presently deficient;
 - Enhancing the range of ecosystem functions through ancillary habitat creation;
 - Recharging groundwater system by infiltrating stormwater using at-source infiltration techniques; and
 - Maintaining existing water balance.
- The GRCA provide information on wetlands and the Natural Area Protection Strategy to affected landowners.

7.2.5 Surface Water Quantity and Quality

Surface water quantity will increase as a result of development in the upstream reaches of the Watershed. The development of more land area and higher densities will result in higher proportions of impervious land and therefore increased surface water runoff. Water quality will be most negatively affected by industrial development. However, most lands within the Moffat Creek Watershed have been zoned for residential uses.

Filtered ammonia nitrogen, total kjeldahl nitrogen, phosphate, phenols, hydrogen sulphide, aluminum, and zinc levels are all high in Moffat Creek. These levels are such that this warm water Creek is considered to be polluted.

Providing water quality, erosion and flood management measures will reduce the impact of development on surface water quality and quantity. A combination of water quality/attenuation facilities, maintenance of existing depression storage and infiltration measures will reduce the flows and volume of runoff draining to Moffat Creek. As well, these measures will improve water quality by promoting sedimentation prior to discharge to the Moffat Creek and providing pre-treatment of runoff.

Surface Water Quantity and Quality Mitigation

It is recommended that:

- Water quality enhancement of storm runoff be achieved by providing 40 m³ of active extended detention volume for each hectare of land draining to a storm sewer or road drainage system;
- Migration of sediment to the Creek be minimized during construction by:
 - Minimizing the amount of soil exposed to wind and rain;
 - Minimizing length of time soil is exposed;
 - Providing temporary erosion controls to minimize the migration of soils from the development sites; and
 - Maintaining vegetated areas along the Creek channel.
- Available programs be used to address point-source pollution problems;
- The Ontario Ministry of the Environment follow up on the reported pollution problems under the Ontario Water Resources Act or other appropriate legislation;

- The Grand River Conservation Authority conduct a land use inventory in conjunction with the state-of-the Watershed report update:
 - To further evaluate the watershed and identify stream quality problems related to farm practices; and
 - To establish the watershed scale significance of water quality issues on the receiving system.
- If funding becomes available under the Green Plan, this area be targeted for financial assistance to carry out corrective measures identified in the land use inventory and Environmental Farm Plans;
- The City of Cambridge investigate the possible pollution effects of the waterfowl in Churchill Park, and, if necessary, look at ways to minimize the impacts;
- Best management practices such as vegetative buffers and silt traps be used to buffer the creek as much as possible from the direct discharge of road runoff. In particular, the Class 1 wetland should be buffered from direct road discharge along Highway 8 and Branchton Road and the Regional Municipality of Waterloo should realign the low flow channel downstream from the Regional Road 97 culvert to move Moffat Creek away from the highway ditch at the time of upgrading of the road;
- The City and community review and/or institute the following preventative water quality measures in existing urban areas:
 - Increase or modify street sweeping frequency;
 - Clean out catch basin sumps more frequently;
 - Enhance litter control programs;
 - Educate the public and enforce pet litter control bylaws;
 - Reduce usage of chemicals such as fertilizers, herbicides, and pesticides;
 - Upgrade household toxic disposal program; and
 - Encourage storm drain marking program.
- The community provide information to the owners of larger block developments (condominium and co-op housing corporations, apartment buildings, commercial and industrial developments) on how they can assist in controlling storm water quantity and quality on their property, for example:
 - Disconnecting roof runoff from the storm sewers and directing to grassed areas or dry wells;
 - Minimizing and reducing the amount of paved area;

- Directing paved area drainage to grassed areas;
 - Including oil and grit separators for storm sewers;
 - Keeping paved areas swept; and
 - enforcing pet litter control.
- A structured plan of stream rehabilitation be developed as part of the Master Plan for open space below Highway 8. This plan should:
 - Be carried out in conjunction with public groups and agencies responsible for aquatic habitat;
 - Encourage the rehabilitation of large areas along the stream edge to natural woody vegetation from current mown grass vegetation under the co-ordination of the Cambridge Community Services Department;
 - Consider the creation of small cattail beds/marshed storm sewer outfalls to trap nutrients during growing season;
 - Provide direction through the City Green Strategy, for rehabilitation and seek/encourage community and neighbourhood association involvement;
 - Obtain support from the Ministry of Natural Resources, in conjunction with the Grand River Conservation Authority, for the provision of technical assistance for stream rehabilitation and support in accessing available rehabilitation funding;
 - Recommend that any stream channel rehabilitation upstream of Highway 8 be compatible with wetland management and the protection of the wetland form and function;
 - Use information from the two new stream flow gauges in the Master Plan to determine the potential to improve the habitat in Moffat Creek for a wider range of fish species including sport fish; and
 - Recommend if there is potential, physical improvements be made to the stream channel between Highway 8 and the Grand River over the long term to enhance the warmwater bait fishery and allow opportunity for a warm water sport fishery, by:
 - Eliminating barriers to fish movement in lower reaches;
 - Removing, rebuilding, or modifying the in-stream gabion weir in Churchill Park to allow pike migration for spawning;
 - Establishing a well-defined low flow channel; and
 - Improving in-stream habitat.
- Trash in and along the stream through urban Cambridge be cleaned up; and

- The Grand River Conservation Authority require sediment control plans as a part of all GRCA permits granted under Regulation 149/90 for construction, filling, and grading within the regulated areas in the Moffat Creek watershed.

7.2.6 Aquatic Resources

Although Moffat Creek will remain a warm water stream, indirect impacts such as loss of infiltration capacity, increased stormwater discharge, increased water temperature, and changes in nutrient loading may result in a reduced sustainability of the Creek's Class 4 warm water bait fishery. The study has identified some potential areas for riparian and aquatic enhancement. Much of the enhancement area is located downstream of Highway 8.

Aquatic Resources Mitigation

It is recommended that:

- Baseflow stability and water quality in the Creek be maintained or enhanced;
- Measures be implemented to enhance recharge of pre-treated stormwater to groundwater systems;
- Fish habitat be improved by:
 - Providing plantings to shade the Creek;
 - Creating refuges along the stream banks;
 - Removing barriers to migration; and
 - Improving utilization of groundwater.
- As a first priority, efforts be concentrated on maintaining or improving existing stream water quality and allowing existing warm water baitfish communities to respond over time by:
 - Identifying and mitigating point-sources of water pollution;
 - Identifying and recommending solutions to non-point sources of water quality impairment;
 - Identifying and stabilizing badly eroding bank areas;
 - Establishing a naturally vegetated buffer strip where appropriate; and
 - Mitigating the potential for contamination of stormwater runoff from new development.

7.2.7 Wildlife Habitat Corridor and Functions

Wherever possible, linkages, including hedgerow connections, have been selected by incorporating a range of natural heritage opportunities such as wetland pockets and minor tributary channels. These linkages to core areas and between isolated wetland pockets should maintain wildlife habitat and corridor functions. Suggestions for enhancement of these linkages have been made.

Wildlife Habitat and Corridor Functions Mitigation

It is recommended that:

- Critical (primary) habitat links be preserved by:
 - Providing buffers along critical habitat links including plantings or regeneration of native species cover;
 - Avoiding fragmentation resulting from new road alignments or widenings (EA Process);
 - Educating urban and rural landowners regarding maintaining and enhancing wetland and riparian buffers; and
 - Providing zoning controls of adjoining land use(s) which contribute to increased demand for encroachment activities such as recreational uses of open space.

- Protect connection with adjoining natural upland habitats by:
 - Providing adequate buffers and setbacks for protected habitat corridors;
 - Enhancing protected habitat corridors with native species plantings to protect interior areas and to enhance connectivity where presently deficient;
 - Minimizing fragmentation of protected corridors by roads and service easements;
 - Verifying significant species presence, where suspected, and the extent of potential habitat usage;
 - Protecting wildlife habitat based on scientific review; and
 - Enhancing range of ecosystem functions through ancillary habitat creation.

7.2.8 Development Opportunities and Servicing Requirements

Development opportunities do exist within the Moffat Creek Watershed. When development occurs, there will be servicing requirements. Servicing may disrupt

wildlife during construction and may result in increased sediment loading to the Creek and adjacent wetlands. Development may also require the construction of roads across the Creek corridor to connect developed areas. Construction of these crossings may also result in temporary disruption to wildlife and increased sediment loading. Improperly designed road crossings may increase flood risk due to increased upstream water levels.

Mitigation of Development and Servicing

It is recommended that:

- Class Environmental Assessments be completed for trunk sewers and roads;
- Servicing routes of least environmental impact be chosen;
- Local residents be educated with regard to the significance of their local environment and its level of sensitivity;
- The local community be involved in open space clean-up;
- The location of the open space boundaries be physically identified with posts and/or signage.

7.2.9 Recreation

Churchill Park presently provides the only formal recreation along Moffat Creek. The open space through the rest of the existing built area of the City is used by local residents for passive recreation. The non-developable lands above Highway 8 are generally not used for recreational purposes.

Access to wetland areas may result in degradation. Increased housing density increases the probability of more access. Mitigation and public involvement will be required to minimize impacts to wetland areas. The natural features of the Watershed also provide opportunities for recreation.

Recommendations for Recreation and Visual Amenities

It is recommended that:

- The use of creative and imaginative resources be maximized to rehabilitate the urban stream corridors into an attractive community asset;

- The community be encouraged to develop a sense of opportunities, responsibility, and ownership to prevent further abuse of the system, by:
 - Allowing participation of a variety of community and neighbourhood groups in the Creek rehabilitation projects identified in a Master Plan to be undertaken by the City, through the City Green Strategy; and
 - Providing informative signage and displays in Churchill Park, at the site of rehabilitation projects, along recreational trails in the area.

- A continuous green corridor be established for passive recreational pursuits;

- Access be encouraged in less vulnerable areas by improving ease of movement along particular pathways;

- The City pass a by-law enforcing pets to be leashed;

- The most sensitive areas be fenced;

- Hedgerow linkages be maintained and preserved; and

- The following be incorporated into the design of new development:
 - Sense of place;
 - Recreation;
 - Integrate natural environment into neighbourhood;
 - Location of school sites;
 - Settings for housing types;
 - Land uses, eg. schools:
 - Vistas; and
 - Buffers between land uses.
 - Naturalize as much as possible - no concrete channels.