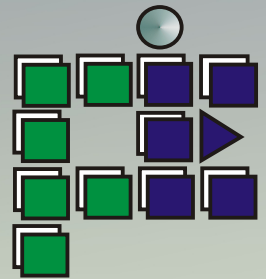




D - Servicing Systems



PLANNERS

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SECTION D – SERVICING SYSTEMS

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D 1.0 SERVICING SYSTEMS

D 1.1 Introduction

The Hespeler North Community Plan process will be initiated at the completion of this study. The Community Plan will finalize the neighbourhood and municipal servicing concepts. The Class Environmental Assessment process was initiated during the subwatershed planning process so that all relevant environmental issues would be reviewed and addressed. It is the objective of this study to select a series of water, sanitary and road servicing alternatives and then to evaluate these alternatives from an environmental perspective.

No recommendations on preferred alternatives have been made in this study. The conclusion of this study is a list of water, sanitary and road options that have been strictly ranked as to environmental preference. The Community Plan will incorporate the environmental information into a comprehensive decision matrix and complete the Class EA process.

The following sections detail the existing infrastructure and the servicing alternatives

D 2.0 EXISTING INFRASTRUCTURE

D 2.1 Sanitary Sewers

The natural drainage area of the Forbes Creek subwatershed covers approximately 350 hectares of agricultural, rural and urban residential land and is generally bounded by the Speed River and the City of Cambridge boundary on the east, Kossuth Road on the north and the extension of Guelph Avenue to the west.

The sanitary drainage area could be extended further to the east of the City boundary or west of Guelph Avenue by pumping sewage to the gravity sewer network through the use of local pumping stations.

As shown in [Figure D 2.1.1](#), there currently is an existing 200mm \varnothing sanitary sewer on Guelph Avenue extending southward from south of Poplar Drive to Milton Avenue. Also a 200mm \varnothing sanitary sewer is utilized in the developed lands to the west of Guelph Avenue. Along Guelph Avenue between Milton Avenue and Sheffield Street a 375mm \varnothing sanitary sewer exists. The sanitary network west of Guelph Avenue drains southward by gravity to Sheffield Street and westward to the Hespeler Wastewater Treatment plant. The sanitary sewer along Sheffield Street is a 600mm \varnothing sanitary pipe and has been designed to accept sanitary flows from the area of Hespeler, west of the Speed River.

A preliminary analysis of the existing sanitary network was performed and it was determined that the sewer at Guelph Avenue and Milton Avenue has sufficient capacity to receive drainage from approximately an additional 8,500 persons (equivalent to 2,500 residential units). The downstream sewer from this location increases in available capacity. As such, it is concluded that the Guelph/Sheffield receiving sewer does not have a capacity constraint as it relates to the subject study lands and is an appropriate potential outlet as it relates to capacity. The Steering Committee has instructed the Consultant Team to assume that plant capacity is an issue that cannot be addressed in the scope of this study.

Existing residential units on the south side of Blackbridge Road are to be included in sanitary calculations. Any additional units beyond Blackbridge Road are in an area where servicing is not planned, as this would require amendments to the Regional Official Policies Plan and City of Cambridge Official Plan.



The existing townhouses north of Poplar Drive are connected to the existing sanitary network by a private pumping station located within the townhouse property. To allow gravity sanitary service to the existing townhouses, a new gravity sewer should be designed and installed and attached to the sanitary network if possible.

At the east end of Shaw Avenue exists six proposed lots that need to be examined to see if these lots can be connected to the sanitary network.

As a result, future sanitary designs for the Forbes Creek development should include the following:

- Existing residential units on the south side of Blackbridge Road
- Existing townhouse units north of Poplar Drive, and
- Proposed future residential units at the east end of Shaw Avenue.

D 2.2 Water Supply and Distribution

Currently, all of the existing developments west of Guelph Avenue and south of Blackbridge Road are serviced with municipal water. (Refer to [Figure D 2.2.1](#)). A pumping station exists on Guelph Avenue south of Sheffield Street and north of the Speed River. Regional pipelines exist along Guelph Avenue from both Hespeler Well 5 (H-5) and Hespeler Well 6 (H-6). Hespeler Well 5 (H-5) is located south west of the intersection of Regional Road #24 (Hespeler Road) and Guelph Avenue. The H-5 Well has been noted in Section A and Section B1.0 where policy and technical issues have been discussed respectively. The well is not actively pumped at this time. The Regional watermain runs south along Guelph Avenue to Milton Avenue. Hespeler Well 6 (H-6) is located to the south east of Sheffield Street and Clemens Avenue. The Regional

watermain runs south crossing the Speed River, and north along Sheffield Street to the intersection of Guelph Avenue and Fisher Mills Road. A 300mm \varnothing watermain exists along Guelph Avenue, and extends along Milton Avenue to Scott Road. Along Scott Road exists a 250mm \varnothing watermain from Guelph Avenue to Nickolas Crescent, and is reduced to 150mm \varnothing watermain to service the remaining area west of Guelph Avenue. A 150mm \varnothing watermain exists along Milton Avenue, Henry Villa Drive, and Shaw Avenue east of Guelph Avenue.

In 2001, the Region of Waterloo extended a 450mm \varnothing trunk watermain from Fountain Street along Maple Grove to Beaverdale Road. In 2002, the Region has planned to extend a 300mm \varnothing watermain from Beaverdale Road along Fisher Mills Road to Scott Road. This water system will have sufficient capacity to service the subject lands, as verified by Regional Staff (personal communication, 2001).

D 2.3 Roads And Traffic

The major road network in the south part of the study area includes Blackbridge Road, Townline Road, Guelph Avenue and Fisher Mills Road. These roads will provide important linkages from the designated growth area in the south part of the study area to the remainder of Cambridge, the Region and beyond.

Recent traffic counts conducted in the south part of the study area indicate that Guelph Avenue is accommodating traffic volumes ranging from 5800 vehicles per day south of Fisher Mills Road to 2650 vehicles per day north of Blackbridge Road. Weekday traffic volumes on Blackbridge Road are in the order of 350-400 vehicles per day. Fisher Mills Road (near Guelph Avenue) and Townline Road (near Blackbridge Road) accommodate about 2800 and 1100 vehicles per day respectively. The existing traffic demands are summarized in [Figure D 2.3.1](#)



Future residential development in the area bounded by the CN rail line, Blackbridge Road and Guelph Avenue could accommodate in the order of 750 residential dwelling units based on typical new development densities in Hespeler. This level of development is expected to generate about 7500 vehicle trips per day and would require, as a minimum, two points of access and desirably three. In addition, joining the portion of the future development east of Forbes Creek to the existing and future development west of the creek by road will provide a more cohesive community while providing more direct access to Guelph Avenue for future residents, public transit and emergency/service vehicles.

D 3.0 SERVICING ALTERNATIVES

D 3.1 Sanitary Servicing

D 3.1.1 Sanitary Servicing Alternatives

For development to proceed within the Forbes Creek Study Area, sanitary servicing requirements for the development lands must be addressed. Potentially, three categories of servicing exist, as follows:

- Full sanitary servicing with outlet to existing City of Cambridge trunk sewers;
- Full sanitary servicing with outlet to a new communal treatment system; and
- Private on-site septic systems.

The Region's ROPP policy prefers servicing new development by extension of existing services from centralized treatment facilities. Municipal sanitary sewer infrastructure exists as discussed previously. As such, at this stage of the development of the subject lands, only

municipal servicing with an outlet to the existing City sanitary infrastructure will be considered.

Possible sanitary outlet options to the sanitary network for servicing the Forbes lands include:

1. Connecting to the existing sanitary at Milton Avenue and Guelph Avenue.
2. Connecting to the existing sanitary at Milton Avenue and Guelph Avenue via a sanitary pumping station.
3. Lowering the existing sanitary along Guelph Ave. from Milton Ave. south to allow gravity flow sanitary service.
4. Connecting to the existing sanitary at Guelph Avenue and Fisher Mills by extending sanitary trunk sewer across private driveways.
5. Connecting to the existing sanitary at Guelph Ave. and Sheffield Street by extending sanitary trunk sewer along the railroad right-of-way.

The sanitary servicing alternatives were discussed in detail under the following headings. Reference should be made to [Figures D 3.1.1](#) and [D 3.1.2](#) for the location of the sanitary servicing options.

Option No.1 Outlet to Existing Sewers

Under this option, gravity sanitary sewers would be installed along the west side of Forbes Creek to service the development lands between Guelph Avenue and Forbes Creek. The sewer would be installed within the future road right of ways. This sewer would outlet to the existing sanitary sewer at the intersection of Guelph Avenue and Milton Avenue.

This option would service the majority of the lands north of Milton Avenue, east of Guelph Avenue, west of Forbes Creek and south of the extension of Poplar Drive. The





service area is approximately 12 ha. Due to the outlet elevation, this option would not be able to service the area on the east side of Forbes Creek due to the low elevation of Forbes Creek which the sewer would have to cross. Similarly, this option could not service the area north of the extension of Poplar Drive, as there is not enough cover on the sewer.

Option No.2 Outlet to Existing Sewers with Sanitary Pumping Station

This option is similar to Option No.1, in that it would connect to the existing sanitary sewer at Milton Avenue and Guelph Avenue. A sanitary pumping station (SPS) would be utilized to receive sewerage from the lands extending up to Blackbridge Road on both the east and west sides of Forbes Creek. The trunk sanitary sewers would vary in depth depending on subdivision grading, but would have deep sections (in excess of 9m) in order to allow servicing of upstream lands. The SPS would be located at the eastern terminus of Milton Avenue near Forbes Creek (i.e., south of Pond D). This location was selected as it is the low point of the subject lands and close to the Creek crossing allowing servicing of the lands east of the Forbes Creek. The SPS would lift sewerage and outlet via an existing gravity sewer on Milton Avenue. A sanitary sewer crossing of Forbes Creek would be required to service the east side of Forbes Creek.

The service area would be the majority of the Forbes Creek subwatershed south of Blackbridge Road but would exclude a small area (approximately 5 ha) in the northeast corner between Blackbridge Road and the railroad right-of-way because of the low elevation of these lands. It should be noted that a local SPS could be used to service these low lands. In addition, this option would allow future extension of the sanitary sewer north of Blackbridge Road.

Option No.3 Outlet to Lowered Milton/Guelph Avenue Sanitary Sewers

Under this option, gravity trunk sewers would be installed through the subject lands extending up to Blackbridge Road on both the east and west sides of Forbes Creek. The outlet of this system would be to a reconstructed and deepened sanitary sewer on Milton and Guelph Avenues. The sewer would require deepening to a point south of the intersection of Fisher Mills Road and Guelph Avenue in order to service the majority of the subject lands. A sanitary sewer crossing of Forbes Creek south of Pond D would be required to service the eastern lands.

As with Option No.2, the service area would be the majority of the Forbes Creek subwatershed south of Blackbridge Road but would exclude a small area (approximately 5ha) in the northeast corner between Blackbridge Road and the railroad because of the low elevation of these lands. In addition, this option would allow ultimate extension of the sanitary sewer northward of Blackbridge Road to service future lands.






Option No.4 Outlet to Guelph Avenue South of Fisher Mills

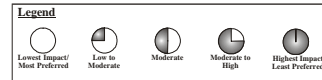
Similar to Option No.3, this option would use gravity trunk sewers installed on both the east and west sides of Forbes Creek extending up to Blackbridge Road. The outlet of this sanitary would be southerly along the western side of Forbes Creek following existing roads/trails on private landholdings, eventually outletting to the existing gravity sewer on Guelph Avenue south of the Fisher Mills Road intersection. A sanitary sewer crossing of Forbes Creek near Pond D would be required to service the eastern lands.

As with Option No.2 and No.3, the service area would be the majority of the Forbes Creek subwatershed south of Blackbridge Road but would exclude a small area



Table D 3.1.1 Evaluation of Alternative Sanitary Servicing Options

Evaluation Factor	Option 1 (Connect to Existing)	Option 2 (Connect to Existing w/ SPS)	Option 3 (Lower Existing)	Option 4 (Along Creek to Guelph Ave)	Option 5 (Along CNR to Guelph Ave)
Description	<p>Gravity Sewer installed on West side of Forbes Creek to service the area between Guelph Ave. and Forbes Creek.</p> <p>Outlet is to sanitary system at Guelph Ave. and Milton Ave. via gravity.</p>	<p>Gravity sewer installed along east and west sides of Forbes creek to service an area from Black Bridge Rd. to Milton Ave. and Guelph Ave. to CNR.</p> <p>Outlet is to existing sanitary system on Milton Ave. using a SPS.</p>	<p>Gravity sewer installed along east and west sides of Forbes creek to service an area Black Bridge Rd. to Milton Ave. and Guelph Ave. to CNR.</p> <p>Outlet is to sanitary system on Milton Ave. Requires reconstruction to lower the sanitary along Milton Ave. and Guelph Ave. to south of Fisher Mills Rd. to allow gravity flow.</p>	<p>Gravity sewer installed along east and west side of Forbes creek from Black Bridge Rd. to Milton Ave.. Trunk sewer to be installed from the connection to Guelph Ave. along trails to the end of Shaw Ave. E.</p> <p>Reconstruction is needed to lower the existing sanitary sewer along Guelph Ave. south of Fisher Mills Rd.</p>	<p>Trunk gravity sewer installed along the CNR connecting Guelph Ave. to Black Bridge Rd..</p> <p>Gravity sewers are to be constructed along the east and west sides of Forbes Creek to service the agricultural lands surrounding Forbes Creek.</p> <p>Outlet is to sanitary system on Guelph Ave. at the intersection of Guelph Ave. and Sheffield Street.</p>
Environmental Effects	<p>Minor impact as sewers are installed in former agricultural lands.</p> <p>Impact to groundwater flows can be reduced if required with cut off collars.</p>	<p>Minor impact as sewers are installed in former agricultural lands.</p> <p>Impact to groundwater flows can be reduced if required with cut off collars.</p> <p>Elimination of private SPS in Townhouse block north of Poplar Dr. will reduce environmental risk of SPS failure.</p> <p>Possible noise, odour and site lighting from Sewage Pumping Station (SPS) may affect nearby residents/wildlife.</p> <p>Energy consuming (for life of system/ community)</p> <p>Possible problems if system malfunctions or is inoperative.</p> <p>Single crossing of creek required.</p>	<p>Minor impact as sewers are installed in former agricultural lands.</p> <p>Impact to groundwater flows can be reduced if required with cut off collars.</p> <p>Elimination of private SPS in Townhouse block north of Poplar Dr. will reduce environmental risk of SPS failure.</p> <p>Single crossing of creek required.</p>	<p>Minor impact as sewers are installed in former agricultural lands.</p> <p>Impact to groundwater flows can be reduced if required with cut off collars.</p> <p>Elimination of private SPS in Townhouse block north of Poplar Dr. will reduce environmental risk of SPS failure.</p> <p>Single crossing of creek required.</p>	<p>Minor impact as sewers are installed in former agricultural lands.</p> <p>Impact to groundwater flows can be reduced if required with cut off collars.</p> <p>Elimination of private SPS in Townhouse block north of Poplar Dr. will reduce environmental risk of SPS failure.</p> <p>Single crossing of creek required.</p>
OVERALL EVALUATION	 PREFERRED ALTERNATIVE				



(approximately 5ha) in the northeast corner between Blackbridge Road and the railroad right-of-way because of the low elevation of these lands. In addition, this option would allow ultimate extension of the sanitary sewer northward of Blackbridge Road to service future lands.

Option No.5 Along Railroad Right-of-Way to Guelph Avenue

The final sanitary servicing option would be an extension of a primary trunk along the existing railroad corridor. Three secondary gravity trunk sanitary sewers would be required. The first branch would be installed on the west side of Forbes Creek and extend northward along existing roads/trails into the subject lands on the west side of Forbes Creek. The second branch would be installed to the east of Forbes Creek and extend to the subject lands on the east side of Forbes Creek. Depending on the northern limit of the serviced lands, the trunk sewer could be extended further northward along the railroad right-of-way to service the northeast areas. The outlet for these secondary trunks would be to the primary trunk within the railroad right-of-way, which outlets at the intersection of Guelph Avenue and Sheffield Street.

As with Options No.2, No.3 and No.4, the service area would be the majority of the Forbes Creek subwatershed south of Blackbridge Road. However, depending on the length of the trunk sanitary sewer along the railroad tracks, all subject lands could be serviced without exception.

D 3.1.2 Results of Sanitary Servicing Analysis

Table D 3.1.1 and [Figures D 3.1.1](#) and [D 3.1.2](#) detail our analysis of the environmental issues associated with the various sanitary servicing options. Option 1 is the environmentally preferred alternative although it is readily understood that construction and mitigation methods will make other options very viable.

D 3.2 Water Servicing

D 3.2.1 Water Servicing Alternatives

For development to proceed within the Forbes Creek study area, water servicing requirements for the development lands must be addressed. Potentially, three categories of servicing exist, as follows:

- Full water servicing from existing municipal water supply;
- Full water servicing via communal supply; and
- Private on-site wells.

The Region's ROPP policy prefers servicing new development by extension of existing services from centralized supply systems. Municipal water infrastructure exists to the immediate west and south of the southwest corner of the subject property. Further, as discussed previously, the Region of Waterloo is planning extensions of trunk watermain along Fisher Mills Road to service the subject area. As such, at this stage of the development of the subject lands, only municipal servicing from the existing municipal water system will be considered.

Option No.1 Municipal Servicing via Regional Water System

Trunk watermains would follow proposed road right-of-ways and be sized and installed per City and Regional requirements.

Option No.2 Municipal Servicing via Communal Water System

Full municipal servicing could be achieved using a series of communal wells located strategically within the community. The location of these wells would depend on groundwater conditions and the quantity of water available. Additional wells would have an impact on the existing Regional water



wells at the intersection of Guelph Avenue and Regional Road #24, also the well to the south east of Sheffield St. and Clemens Avenue. Depending on water pressures available in the communal pipe system, fire service protection to the Forbes community may not be possible. While this option does not conform to the ROPP, for completeness, this report will assess this option.

Option No.3 Individual Water Wells

Under this option, individual water wells would be drilled for each new development lot. The addition of several individual wells could have a direct impact on the existing Regional wells at the intersection of Guelph Avenue and Regional Road #24, also the well to the south east of Sheffield St. and Clemens Avenue. Fire protection could not be provided to the proposed subdivisions. While this option does not conform to the ROPP, for completeness, this report will assess this option.

D 3.2.2 Results of Water Servicing Analysis

The preferred water servicing alternative is Option 1, the use of municipal water supply and trunk watermains which will follow any proposed road pattern. Any creek crossing in the absence of a road crossing must be determined during the completion of the Class Environmental Assessment component of the Community Plan process. A preferred location, if a single crossing is required in order to loop the system, would be on Forbes Creek south of Pond D.

D 3.3 Traffic Servicing

D 3.3.1 Traffic Servicing Alternatives

Roads and transportation issues were also evaluated during the Forbes Creek Subwatershed Study to identify early in the process the potential environmental impacts

and the traffic from potential development in the subwatershed and expanded study area.

As a result, several optional internal road network options have been developed for input from the public and the Project Team. These include:

OPTION 1 – NO CROSSING OF FORBES CREEK

Option 1a: No Crossing of Forbes Creek: This road network option avoids a crossing of Forbes Creek and the Provincially Significant Wetlands but it creates three separate communities. The largest part of the future development area would have its sole access to Blackbridge Road resulting in an increase of 6000 vehicles per day on this roadway. Only two roadways would provide access to about 600 homes.

Option 1b: No Crossing of Forbes Creek: Similar to Option 1a), this road network option avoids a crossing of Forbes Creek but crosses an arm of the Provincially Significant Wetland and creates two separate communities.

OPTION 2 - POPLAR DRIVE EXTENSION

Option 2a: Single Crossing of PSW & Forbes Creek: This road network provides a crossing of Forbes Creek via the extension of Poplar Drive to Blackbridge Road. This road system connects the future development east of Forbes Creek to Guelph Avenue and the existing community to the west. Option 2 provides improved access to the easterly part of the development and three primary access roadways are provided to serve the development area. There will be significantly lower traffic impacts on Blackbridge Road under this alternative. There will be a significant crossing of the Forbes Creek and the Provincially Significant Wetland.





Option 2b: Poplar Drive Extension with Additional Crossing of PSW: This option is similar to 2a but with an additional crossing of the Provincially Significant Wetland arm.

OPTION 3 – INDIRECT ROAD CONNECTION TO BLACKBRIDGE ROAD

Option 3: Indirect Road Connection to Blackbridge Road: This internal road network is similar to Option 2 in that there is a connection across Forbes Creek and the road system provides access to both Blackbridge Road and Guelph Avenue. Again, only three primary points of access are provided to the development area. The street system is less direct reducing potential shortcutting of through traffic between Blackbridge Road and Guelph Avenue compared to Option 2. There will be a significant crossing of the Forbes Creek and Provincially Significant Wetland and a crossing of the PSW arm.

OPTION 4 – MILTON AVENUE EXTENSION

Option 4a: Milton Avenue Extension With No PSW Crossing: Four primary points of access are shown to the new development area providing improved circulation. The development area is more accessible for resident, emergency and public transit vehicles and will be integrated with existing residential development. Traffic volumes will increase on Milton Avenue and there is some potential for through traffic between Blackbridge Road and Guelph Avenue on the internal road network. A single crossing of the Greenspace Corridor is proposed for this option, however, there are no crossings of Provincially Significant Wetland.

Option 4b: With One PSW Crossing: This option is similar to Option 4a except that a single crossing of the Greenspace Corridor is proposed. Four primary points of access are provided. However, there still is a crossing of Forbes Creek and the PSW arm.

Option 4c: Two PSW Crossings: This option is similar to 4a but with two additional crossings of the PSW i.e. a significant crossing of the primary wetland and a crossing of the PSW arm. Two primary crossings will reduce traffic on Milton Avenue.

OPTION 5 – NO CONNECTION TO BLACKBRIDGE ROAD

Option 5a: No Connection to Blackbridge: The roadway system provides access to Guelph Avenue only with one crossing of Forbes Creek through the extension of Milton Avenue. Traffic volumes would increase significantly on Milton Avenue but traffic on Blackbridge Road, and any potential for through traffic, would be reduced.

Option 5b: With One Additional PSW Crossing: This option is similar to 5a except that there would also be a crossing of the PSW arm.

Option 5c: With two additional PSW Crossings: This option is similar to 5a but with two additional crossings of the PSW i.e. a significant crossing of the primary wetland and a crossing of the PSW arm. Two primary crossings will reduce traffic on Milton Avenue.

D 3.3.2 Results of Traffic Servicing Analysis

It is not the intent of this study to develop a recommended roadway pattern, but to identify the potential environmental issues that must be considered in the future development of the area. **Table D 3.3.1** details our analysis of the environmental issues associated with the various traffic servicing options. From the analysis, it can be seen that no crossings are preferred, a single crossing less preferred, while two crossings are the least preferred. A single crossing of Forbes Creek at Milton Avenue is preferred over an alternative single crossing of the Provincially



Significant Wetland. Option 1b) is the most preferred alternative from an environmental perspective.

Development of the area can be supported by the adjacent roadway network based on two points of access to Guelph Avenue and/or improvements to Blackbridge Road, the existing railway overpass and the bridge crossing of the Speed River. The issues that need to be addressed with respect to future developments include:

1. The need for improvements on Blackbridge Road and historic issues associated with improvements to the railway and river structures.
2. The final internal roadway network may require left turn lanes and signalization on Guelph Avenue. Additional studies are to be completed in the future to address this issue.
3. Providing two points of access to the development area while minimizing roadway construction impacts on Forbes Creek and traffic impacts on Milton Avenue.
4. Development of an internal road network that is transit supportive requires linking the future community both east and west of Forbes Creek by road.
5. Providing bicycle and pedestrian linkages throughout the future community and linkages to Guelph Avenue and the village core area.
6. Ensuring that environmental issues such as maintaining linkages, wildlife movement, loss of habitat, loss of wetland form and function and aquatic/fluvial impacts are addressed in future studies.

D 3.3.3 Mitigation of Forbes Creek Provincially Significant Wetland Crossing Impacts

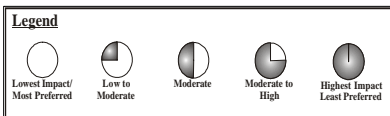
While the preferred scenario does not include a crossing of Forbes Creek or the Provincially Significant Wetland, it is recognized that at the Community Plan Stage, other non-environmental factors must be included in the analysis. Should a crossing of the preferred Greenspace System be required, it will impact on terrestrial habitat, wildlife, water management (flood flows), stream corridors (fluvial and aquatic impacts), and trail activities. Road crossings of terrestrial features need to consider potential impacts due to habitat fragmentation, encroachment into features with grading, road noise, road – related contaminants, and direct impacts (e.g. road-kills, barriers) to the movement and survival of wildlife species. Impacts associated with multiple road crossings are obviously cumulative. The ideal approach to prevent negative impacts on sensitive terrestrial systems is to place the road system outside and away from natural heritage features. The placement of roadways in locations where spans are possible (as opposed to fill embankments) would enhance the mitigation potential of road crossings. Vegetative plantings may act as visual screens or may discourage wildlife movement onto busy roads, thereby reducing impacts. A crossing will require careful attention with the completion of a Class Environment Assessment study, specifically addressing the above noted issues. It is preferred, if ultimately required by the Community Plan, that the crossing:

- Be located at the Milton Avenue extension;
- Be limited to two lanes;
- Incorporate extensive plantings on the boulevards;
- Incorporate traffic calming features;
- Be constructed of interlocking pavement stones, not asphalt; and
- Provide sidewalks on only one side.



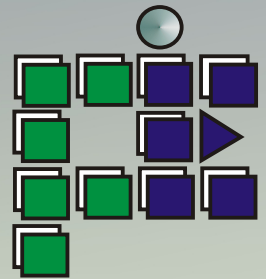
Table D 3.3.1 Evaluation of Alternative Road Alignments

Evaluation Factor	Option 1 No Crossing of Forbes Creek		Option 2 Poplar Extension to Blackbridge Single Crossing of PSW Additional crossing of PSW		Option 3 Indirect Connection to Blackbridge No PSW Crossing		Option 4 Milton Extension to Blackbridge Single PSW Crossing Two PSW Crossings		Option No 5 Connection to Blackbridge Road Single PSW Crossing Two PSW Crossings	
	<p>Traffic Servicing Alternatives</p> <p>1a) Avoids crossing of Forbes Creek and the PSW.</p> <p>1b) Avoids crossing of Forbes Creek, but crosses an arm of the PSW</p> <p>Largest part of future development would have sole access to Blackbridge Road resulting in an increase of 6000 cars per day.</p> <p>Two roadways provide access to 600 homes.</p>	<p>2a) Connects future development east of Forbes Creek</p> <p>Improved access to easterly part of the development</p> <p>Lower traffic impacts on Blackbridge Road</p> <p>Significant crossing of Forbes Creek and the PSW</p>	<p>2b) Additional crossing of the PSW</p> <p>Significant crossing of Forbes Creek and the Provincially Significant Wetland</p> <p>Street system is less direct</p> <p>Three access roadways</p>	<p>4a) Four primary points of access</p> <p>More accessible for vehicles</p> <p>Traffic volumes will increase on Milton Avenue</p> <p>Single crossing of the Greenspace</p> <p>No crossing of the PSW</p>	<p>4b) Four primary points of access</p> <p>Single crossing of the Greenspace corridor</p> <p>Crossing of Forbes Creek and the PSW arm</p>	<p>4c) Two additional crossings of the PSW</p> <p>Two primary crossings will reduce traffic on Milton Avenue</p>	<p>5a) Access to Guelph Avenue only with one crossing of Forbes Creek</p> <p>Traffic would increase on Milton Ave, traffic on BBR and through traffic would be reduced</p>	<p>5b) Crossing of the PSW arm</p>	<p>5c) Two additional PSW crossings</p> <p>Significant crossing of the wetland, and crossing of the PSW arm</p> <p>Reduction of traffic on Milton Ave.</p>	
<p>Natural Heritage Issues</p> <p>Highest traffic volumes along Blackbridge Road compared with other options, resulting in increased barrier effects to wildlife movement along corridor.</p> <p>Recommended mitigation measures be implemented.</p>	<p>Highest traffic volumes along Blackbridge Road compared with other options, resulting in increased barrier effects to wildlife movement along corridor. Recommend mitigation measures be implemented.</p> <p>Single crossing of Forbes Creek PSW arm may result in increased risk wetland contamination</p>	<p>Single crossing of Provincially Significant Wetland and corridor</p> <p>Fragmentation/isolation of remaining natural areas</p> <p>Potential loss of Regionally significant plant species. Wildlife movement impaired</p> <p>Significantly increased risk of wetland contamination</p>	<p>Crossing of PSW Corridor and PSW arm (i.e. two crossings)</p> <p>Fragmentation/isolation of remaining natural areas</p> <p>Potential loss of Regionally significant plant species. Wildlife movement impaired</p> <p>Significantly increased risk of wetland contamination & disturbance</p>	<p>Crossing of PSW Corridor and PSW arm (i.e. two crossings)</p> <p>Fragmentation/isolation of remaining natural features; wildlife movement impaired</p> <p>Significant risk of wetland/online pond contamination</p> <p>Decreased utilization of northern online pond by waterfowl/wildlife due to increased noise and disturbance</p>	<p>Single crossing of Forbes Cr. Corridor resulting in the fragmentation/ isolation of remaining natural features; Milton Ave. crossing avoids PSW corridor</p> <p>Wildlife movement along corridor impaired</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>	<p>Single crossing of PSW arm; single crossing of main corridor</p> <p>Milton Ave. crossing avoids PSW corridor</p> <p>Fragmentation/isolation of remaining natural features; impairment of wildlife movement</p> <p>Increased risk of wetland contamination and disturbance</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>	<p>Double crossing of Forbes Creek Corridor (incl. PSW corridor), and PSW arm</p> <p>Signif. risk of wetland contamination and disturbance</p> <p>Significant fragmentation/isolation of natural features resulting in significant impairment to wildlife movement</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>	<p>Single crossing of Forbes Cr. Corridor resulting in the fragmentation/ isolation of remaining natural features; Milton Ave. crossing avoids PSW corridor</p> <p>Wildlife movement along corridor impaired</p> <p>Increased risk of wetland contamination and disturbance</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>	<p>Single crossing of PSW arm; single crossing of main corridor</p> <p>Milton Ave. crossing avoids PSW corridor</p> <p>Fragmentation/isolation of remaining natural features; impairment of wildlife movement</p> <p>Increased risk of wetland contamination and disturbance</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>	<p>Double crossing of Forbes Creek Corridor (incl. PSW corridor), and PSW arm</p> <p>Signif. risk of wetland contamination and disturbance</p> <p>Significant fragmentation/isolation of natural features resulting in significant impairment to wildlife movement</p> <p>Utilization of southern online pond by waterfowl/wildlife will be negatively impacted by road noise and disturbance</p>
<p>Aquatic Systems Issues (Fluvial and Aquatic)</p> <p>None</p>	<p>None</p>	<p>Low impact to stream system</p> <p>Single crossing of creek at confluence of East & West tributaries.</p> <p>Impact to fish habitat from a properly designed culvert or bridge is not likely to seriously effect productive capacity, but impact does increase as the number of crossings increase</p>	<p>Low impact to stream system</p> <p>Single crossing of creek at confluence of East & West tributaries.</p> <p>Impact to fish habitat from a properly designed culvert or bridge is not likely to seriously effect productive capacity, but impact does increase as the number of crossings increase</p>	<p>Low impact to stream system</p> <p>Single crossing of Creek upstream of Pond G</p> <p>Impact to fish habitat from a properly designed culvert or bridge is not likely to seriously effect productive capacity, but impact does increase as the number of crossings increases.</p>	<p>Low impact to stream system</p> <p>Crosses stream at two locations at confluence of east and west tributaries and downstream of Pond D.</p> <p>Impact to fish from a properly designed culvert or bridge is not likely to seriously effect productive capacity, impact increases with number of crossing</p>	<p>Low impact to stream system</p> <p>Crosses stream at two locations at confluence of east and west tributaries and downstream of Pond D.</p> <p>Impact to fish habitat from a properly designed culvert or bridge is not likely to seriously effect productive capacity, impact increases with number of crossing</p>	<p>Low impact to stream system</p> <p>Crosses stream at two locations at confluence of east and west tributaries and downstream of Pond D.</p> <p>Impact to fish habitat from a properly designed culvert or bridge is not likely to seriously effect productive capacity, impact increases with number of crossing</p>	<p>same as Option 4</p>	<p>same as Option 4</p>	<p>same as Option 4</p>
<p>OVERALL EVALUATION</p>										





E - Subwatershed Management: Strategy



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SECTION E – SUBWATERSHED MANAGEMENT STRATEGY

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E 1.0 SUBWATERSHED MANAGEMENT REQUIREMENTS

The initial phases of the Subwatershed Study (Sections A to D) established background information, performed detailed studies and provide an environmental analysis for the area. Based on the information documented in these sections, the Management Plan (Section E) recommends requirements and criteria to be implemented across the subwatershed to preserve or enhance existing environmental features while allowing development to proceed in other areas.

The Forbes Creek subwatershed is characterized into four general areas when describing the management requirements. These are the same areas described in Section C.

- the existing developed community area (west of Guelph Avenue);
- the area north of Blackbridge Road and Regional Road #24 where agriculture predominates;
- the area south of Blackbridge Road where the principle of development for further residential land use has previously been established; and
- the expanded study area.

Management approaches will consider the following objectives:

- Any management strategy should embrace the fact that human activity will continue within the subwatershed and that urbanization within the Official Plan designated area is imminent.
- Subwatershed management strategies must meet Federal Fisheries and Oceans – “No Net Loss” policy objectives for fisheries habitat.

- In dealing with impact assessment and alternative strategy evaluation, it is necessary to concurrently address the requirements of the economic, social and natural (abiotic and biotic) environment.
- Stormwater management practices should, to the greatest extent possible, preserve the existing hydrologic regime, including surface and groundwater flows by maintaining the volume and distribution of groundwater recharge / discharge in the subwatershed.
- Land use proposed for the urban area should complement the recharge / discharge characteristics of the subwatershed and expanded area, enhance and protect terrestrial resources (including corridors) and stream systems.
- Natural Heritage provisions of the Provincial Policy Statement and the Region’s and Cambridge’s Official Plan should be implemented in existing and new urban areas.
- A Greenspace Management Plan should form the basis for the planning and management of the natural heritage system in the subwatershed. This plan should be designed to ensure that natural features and functions will be maintained and improved in a robust and adequate manner, minimizing the need for intervention and ongoing management on the part of the City and other agencies.
- Opportunities for restoration / rehabilitation of degraded resources should be identified.

E 1.1 Greenspace Management Strategy

The Greenspace Management Strategy (GMS) is intended to reflect the key features that will be protected in the subwatershed, and the key management measures to ensure protection. The GMS is comprised of the following components; management tools for implementation are

described in subsequent sections and the Aquatic Rehabilitation and Community Trail Strategies are listed separately due to interconnective nature and criteria of the strategies related to the ecosystem components they are managing.

1. Natural Heritage System (Core areas, corridors and linkages, buffers and enhancement areas)
2. Aquatic Rehabilitation Strategy
3. Conceptual Trail Strategy
4. Environmental Impact Assessment (E.I.S.) Requirements

The Natural Heritage System is the foundation of the Greenspace Management Strategy. It is comprised of five important components:

- A. Core Areas
- B. Aquatic Habitat
- C. Buffers
- D. Linkages
- E. Enhancement and Restoration Areas

Core Areas are upland and wetland habitats comprised of the following components:

- Environmental Policy Areas (PSW, ESPA, LSNA)
- Environmental Constraint Areas (High and Medium)
- Regulatory floodplain area
- Regional Environmentally Significant Discharge Areas

To summarize, the following chart indicates the relationship of these features / terminology.

Greenspace Management Strategy					
Aquatic Remediation Strategy	(Refer to Section E 2.3)				
Conceptual Trail Strategy	(Refer to Section E 2.4)				
EIS Requirements	(Refer to Section E 2.5)				
Natural Heritage System	Core Areas	Aquatic Habitat	Buffers	Linkages	Enhancement Areas
	- Environmental Policy Areas (PSW, ESPA, LSNA) - Environmental Constraint Areas (High & Medium) - Regulatory Floodplain Areas				

These features have individual constraints as well as collective functions potentially affected by development that are addressed in detail below. Constraints associated with vegetation and wildlife components, and environmental policy areas are identified on [Figures B 8.3.2](#) and [C 1.2.1](#) respectively.

Buffers, Linkages and Enhancement Areas were discussed in detail in Section C, and their implementation under the preferred management option is outlined below.

Implementation of the preferred Aquatic Habitat management option is discussed in Section E 1.1.6. Implementation aspects for Environmental Policy Areas and Constraint Areas are presented below.

E 1.1.1 Environmental Constraint Areas

Environmental Constraint Areas are composed of sensitive and/or significant biological and physical resources. They include High and Medium constraint features. Terrestrial

(i.e. vegetation and wildlife) constraints have been identified as part of this study and are depicted on [Figure B 8.3.2](#). These constraints are an amalgamation of the environmental constraints related to vegetation communities and wildlife inventories completed as part of this study. Watercourse systems and related fish habitat constraints are contained within, or absorbed by the terrestrial constraint areas. Groundwater constraints do exist within these features and buffers however, for areas outside these features, it is not considered a limiting factor to development provided that the Stormwater Management Strategy recommendations are implemented.

Terrestrial constraints are assigned to vegetation features that, based on an assessment of vegetation and wildlife resources, are considered constraints to future development. The specific attributes used in the terrestrial constraint assessment can be viewed in Appendix J3 and Appendix J6. Appendix J4 lists the breakdown of scores.

High constraint terrestrial features are predominantly associated with wetlands in the Forbes Creek or Speed River Provincially Significant Wetland (PSW) Complexes. They are of high quality and sensitivity, containing significant species, high species diversity, and seasonally wet soils. Other high constraint features are those associated with steep slopes.

High Constraint areas are core areas of the Greenspace Strategy where development, encroachment and stormwater management facilities (i.e. ponds) are not permitted as per the Provincial Policy Statement, Regional and City Plan policies. These constraints are associated with:

- the watercourses, existing ponds and associated fish habitat
- Regulatory floodplain associated with Forbes Creek and the ponds

- Provincially Significant Wetlands
- Environmentally Significant Policy Areas (to be designated by the Region)
- Areas with steep slopes

Protection can be achieved by designating the features Class 1 (Significant Natural Features) Open Space, as defined in the City of Cambridge Official Plan and zoning them OSI. In the case of wetlands, buffers are recommended (see following sections). Steep slopes adjacent to the railway line should be protected with an open space designation and with development setbacks applied as recommended in this study or refined through the completion of site-specific geotechnical investigations. Slope set back requirements will be detailed at the draft plan of subdivision stage of development.

Medium constraint features are identified on [Figure B 8.3.2](#), consisting of terrestrial features that are often located close to high constraint areas. They are associated with imperfectly drained areas, moderate slopes, successional areas, or areas containing lesser concentrations of significant species. While they are not as sensitive to development as high constraint lands, their features and functions frequently support those of the high constraint features. Wherever possible, they will be integrated as part of the Natural Heritage System, as natural features, or supporting Complementary Land Uses (including school playgrounds, stormwater management facilities and other open spaces), areas for trail development or as Enhancement Areas. A list of complementary land uses should be prepared as part of the Community Plan and updated as additional information on this alternative management technique becomes available. At the time of development applications in the subwatershed, the municipal Zoning By-Law should be amended to recognize the land use restrictions on these lands as outlined in Section C 2.0.

In the case of hedgerows rated as medium constraint, integration may be difficult due to grading or other considerations unless particular features are taken into account in the layout of land uses. Compensation for hedgerow loss or fragmentation should take the form of replacement plantings in strategic areas in order to maintain and enhance existing functions.

Areas outside the High and Medium constraint features are primarily agricultural fields and cultural landscape features, which are generally available for development, stormwater management, and roads. Standard policies and guidelines regarding the density of development, stormwater management, and servicing applies to these areas. Agricultural fields currently provide for extensive movement of small to large mammals, amphibians and reptilian species, which will not occur under urban conditions. Conversion of specific areas to naturalized buffer within the Enhancement Area is recommended under the Greenspace Management Strategy to offset the loss of ecological functions associated with urbanization of the agricultural lands.

E 1.1.2 Environmental Policy Areas

Environmental Policy Areas ([Figure C 1.2.1](#)) are planning designations assigned to areas of the greenspace strategy. They represent natural heritage features that have been identified as significant either at the provincial, regional or local (City) levels. Environmental Policy Areas may include the following:

- Provincially Significant Wetlands (PSWs)
- Fisheries Habitat
- Environmentally Sensitive Policy Areas (ESPAs - Regional)
- Locally Significant Natural Areas (LSNAs - City)

- Class 1 (Significant Natural Features) Open Space District designated lands (City OP)
- Regulatory floodplain associated with Forbes Creek and the ponds

These features have individual constraints associated with them regarding development that are addressed by various management approaches as discussed in this chapter of the Subwatershed Study. Therefore, the difference between Environmental Constraints and Environmental Policy Areas is that Policy Areas have identified and formally designated in land use policy the related constraint attributes. Overlap between these two criteria or description does exist.

A proposed Environmentally Significant Policy Areas (ESPA) has been identified in the upper subwatershed by the Region based on findings of this Subwatershed Study. This area may be officially designated as an ESPA according to Regional Official Policy Plan. If approved by the Region, the ESPA would be considered a no development area in the City's Official Plan. The addition to the Speed River Wetland complex southwest of Blackbridge Road and the railway is a new wetland area identified in the study.

Locally Significant Natural Areas (LSNAs) encompass all of the identified core terrestrial features in the subwatershed, including the Provincially Significant Wetland. They also include medium constraint natural (e.g. old field succession) and cultural (e.g. plantations, screen plantings) vegetation features.

The boundaries of the current Class 1 (Significant Natural Features) Open Space designation on Map 15 of the Cambridge Official Plan ([Figure C 1.2.1](#)) may have to be slightly adjusted to reflect the ESPA, PSW and LSNA boundaries.

E 1.1.3 Enhancement Areas

Enhancement of the basic stream/wetland corridor is considered fundamental to ensuring that function will be retained in this landscape, and to minimize ongoing management requirements by the City.

Enhancement opportunities have been identified on [Figure C 3.3.1](#). They are considered essential to substantially retain existing wildlife habitat functions downstream of Blackbridge Road/Regional Road #24 under urbanized conditions. The intention is to provide a natural corridor 250 to 300 m in width, which substantially maintains existing wildlife movements, and eventually reinforces core habitats to offset the encroachment effects of urban proximity. In the upper subwatershed, they represent areas where significant improvements could result from strategic additions of habitat such as along the main creek channel, or in larger woodlot complexes where the extent of forest interior habitat could be readily increased.

Enhancement approaches are recommended using available tools and mechanisms to improve the extent and diversity of naturalized vegetation cover, protect habitat characteristics, maintain wildlife corridor connections, and allow for pedestrian trail development. These approaches, discussed in Section C 3 include naturalizing of adjoining agricultural lands in specified corridor and linkage areas and supplementing riparian vegetation along waterways.

E 1.1.4 Buffers

Vegetated buffers serve an important function as described in Sections C and E. Buffers are normally designated as open space (Class 1 (Significant Natural Features) Open Space using City of Cambridge terminology). Public ownership of the buffer areas preserves the integrity and function of the buffer, and their ongoing management. The

ownership of buffers, their land use designation and the possible use of Conservation Easements will be negotiated at the Community Plan stage.

Three options regarding Natural Heritage system management were presented and evaluated in Section C. The options included:

- Option 1 - No Buffers – considered unacceptable under Provincial, Regional, City and GRCA Policies;
- Option 2 – 50/30 metre buffers – considered adequate to protect local scale wetland hydrogeologic and water quality functions, but inadequate to address corridor functions in the area to be urbanized downstream of Blackbridge Road and therefore unacceptable under Provincial, Regional, City and GRCA Policies;
- Option 3 – Enhanced Corridor - 50/30 m Buffers supplemented with Enhancement Areas, creating a corridor 250 to 300 m wide downstream of Blackbridge Road. This is considered adequate to address corridor functions in the area to be urbanized downstream of Blackbridge Road and therefore acceptable under Provincial, Regional, City and GRCA Policies.

The 50/30 metre buffer approach under Options 2 and 3 identifies 50 m as the minimum buffer width to address hydrogeologic and water quality concerns for the wetlands downstream of Blackbridge Road, with the potential to reduce the buffer to a minimum of 30 metres through specified Environmental Impact Study investigations. Buffers around natural features in the rural upper watershed would be 30 metres due to different physical conditions, and lower intensity rural development in that area.

These approaches are described on **Table C 3.3.1** with regards to their impact to vegetation, wildlife, functions, future land use and trails and recreation. Option 3 (Enhanced Corridor) is the recommended strategy as it is most effective in a) maintaining wetland habitats, wildlife, and corridor functions in an urbanized setting, b) fulfilling the expressed desire of local residents (as well as technical agencies) for a substantial, sustainable stream corridor connection, and c) minimizing future management requirements by the City and other agencies to maintain habitat quality and functions. [Figure C 3.3.2](#) therefore reflects Option 3.

The proposed Locally Significant Natural Area features located south of Blackbridge Road are predominantly successional and cultural features (e.g. plantation) identified as medium constraint. Under existing conditions, these features contribute to ecological functions in the subwatershed by providing additional habitat structure, species diversity, and buffering from existing residential and agricultural uses. When the lower subwatershed is urbanized, these functions will increase in importance. The LSNAs include small upland features around the wetland, usually located within the 50 metre buffer area recommended in Option 3. As such they would be mostly protected within the buffers, although some extend marginally beyond. They are not considered large enough to warrant dedicated buffers, but are to be protected from development through the establishment of a limit of development one (1) metre beyond the dripline of the outermost tree cover, where trees are the dominant cover, at the limit of natural vegetation cover where successional cover (i.e. shrubs or herbaceous cover) is the dominant cover, or through additional considerations as required on the proposed “enhancement areas.” The intention is to ensure that grading does not extend into the LRNA features. Based on consideration in the Community Planning process, most of these features should be further

protected by the placement of enhancement areas as recommended under the Greenspace Management Strategy.

The implementation of the buffer and enhancement areas will require detailed negotiations at the Community Plan stage. Section C also discussed possible use of Complementary Land Uses to further support the corridor functions through the future urban area.

The recommended buffer standards meet or exceed those generally recommended by the Province, Region, City and GRCA, which are as follows:

- ESPA: 1.5 x the crown radius (trunk to dripline) measured outwards from the dripline, minimum 7 metres with no significant, vulnerable or rare species.
- Provincially Significant Wetland: Minimum 30 metres from boundary edge.
- Coldwater (perennial) Stream: Minimum 30 metres from top of bank, both sides.
- Warmwater (intermittent) Stream: Minimum 15 metres from top of bank, both sides.
- Hedgerows: Dripline buffer, minimum 7 metres. Temporary buffer during construction of 1.5 x the crown radius (trunk to dripline) or 7 metre minimum from trunk.

E 1.1.5 Local Road and Service Crossings of Forbes Creek

Potential road and servicing options are discussed in Section D as well as the context for minimizing the impacts on the natural heritage features and functions. Five broad options for road networks are identified in Section D 3.3 and **Table D 3.3.1** with related environmental advantages and disadvantages. A recommended roadway pattern is not presented here.

While other issues must be considered in the future development of the area through the Community Planning process, the preferred road network precludes ANY creek or wetland (PSW) crossing (Option 1a). However, if a single crossing of Forbes Creek is deemed necessary, then the least environmental impact would be to place the crossing at Milton Street (Option 4a). Multiple crossings would have the most negative environmental impact and is therefore the least desirable approach.

Five sanitary servicing options are provided in Section D 4.1. with related environmental advantages and disadvantages. Option 1 is the preferred sanitary servicing alternative from an environmental perspective. However, as previously stated all issues must be considered in the future development of the area through the Community Planning process and this study recognizes that construction and remediation effects will minimize impacts of any required crossing. Directional bore methods are preferred.

E 1.1.6 Aquatic Remediation Strategy

Rehabilitation scenarios for Forbes Creek were identified in Section C 3.1.1 and ten options were discussed for this highly altered fluvial system. The advantages and disadvantages of three suggested approaches were discussed as being realistic. They are:

- do nothing
- rehabilitate the lower portion of creek to Pond A
- rehabilitate the lower portion of creek to Pond D.

[Figures C 3.1.1](#) and [3.1.2](#) illustrates the preferred alternative to rehabilitate the aquatic system focused on the pond and connections discussed in Section C 3.1.2, Option 3.

E 1.2 Lands Outside the Greenspace System

E 1.2.1 Recharge on Medium Constraint and Other Lands

The shallow groundwater aquifer that provides base flow to the Forbes Creek system underlies portions of the watershed (refer to [Figure B 1.5.2](#)). These areas require consideration during the community plan and subdivision scale stages. Buffer requirements outlined in Section E 1.1.4 (50 metre minimum buffer width with the opportunity to reduce the width to a minimum width of 30 metre through more detailed study) provides protection for high constraint lands from shallow groundwater disruption related to development. [Figure B 1.5.5](#) shows where significant infiltration has to occur in post development conditions.

E 1.2.2 Restrictions on Infiltration Losses

Surfacewater infiltration on lands surrounding Forbes Creek will be managed through subdivision approval and site plan control. Maintaining density requirements and lot sizes that maximize porous surface area and therefore infiltration is a prime consideration of this plan and the subsequent community planning process. This is due to the importance of base flow to Forbes Creek and the expanded study area and the desire to reduce the intermittent nature of the present system.

E 1.2.3 Restrictions on Land Use

South of Blackbridge Road, land use requirements will match the need to control and manage the density and degree of lot coverage impacting surfacewater infiltration properties of the area. Compatible land uses may be considered in the areas included in Buffer Option 2 and 3 (see Section E 1.1.3). These compatible land uses are primarily open space and passive recreational uses such

as soccer fields, baseball diamonds, trails and viewing areas.

North of Blackbridge Road, agricultural stewardship practices will be implemented using existing programs and opportunities, where possible. These opportunities are discussed in Section C 3.5 and include programs such as the Healthy Futures program administered by the Grand River Conservation Authority. Implementation of these programs is encouraged.

E 1.3 Water Management Strategy

The proposed Water Management Strategy has been based on the detailed studies outlined in the previous sections. This overall strategy has three main goals:

- To maximize infiltration across the subwatershed;
- To protect the quality of the surfacewater and the groundwater in the subwatershed; and,
- To minimize the impact of post development conditions on downstream areas.

These goals will be achieved with a combination of facilities across the catchments (i.e., one end-of-pipe facility is not satisfactory). Section C summarizes each of the parameters, targets and the stormwater management components for the various catchments. These will be addressed by a preliminary Stormwater Management Plan at the Plan of Subdivision stage.

Due to the degraded nature of the receiving watercourse and downstream areas, the stormwater management parameters are important in enhancing and improving these areas. This report has provided specific guidelines for a variety of parameters (e.g., water temperature, nutrients, bacteria, etc.) which must be met. Monitoring of the facilities (see Section E 2.10) during and after

construction will confirm that they are operating properly. It is therefore imperative that all targets be met where flows are discharged from the developing areas.

The Water Management Strategy includes primary facilities such as: lot-level infiltration, soakaway pits, or extended detention wetlands. Secondary facilities may also be implemented which will include: oil/grit separators, rooftop and parking lot controls, filter strips, buffer strips, grassed swales, and reduced lot grading outside the building envelope.

All facilities will be required to meet stormwater management targets and will generally be designed in accordance with the standard practices at the time of the development application submission (e.g., Stormwater Management Practices (SWMP) Planning and Design Manual, MOEE, 1994 or the most recent version), and the City of Cambridge Guidelines. All facilities are to be located outside of any Provincially Significant Wetland. It is also preferred that any stormwater management facilities be designed without fencing. Location and design parameters are to be determined at the Community Plan stage. The selection and siting of facilities must account for site specific hydrogeologic considerations such as soil infiltration potential and connectivity with the regional aquifer and potential for groundwater contamination. Performance criteria for the overall management strategy are detailed in Section C 3.2. These performance criteria will take precedence over any performance criteria presented in the SWMP Planning and Design manual.

Many facilities will also provide stormwater management for more than one landowner. These facilities are provided by the developer of the lands with the City cost-sharing for any oversizing required to accommodate external lands draining to the facilities.

E 1.3.1 Stormwater Quality

A portion of the developable area of the subwatershed recharges to the shallow aquifer. Therefore, maintaining existing water quality is necessary to protect the function and quality of this aquifer and to protect downstream fisheries and fish habitat. Level 1 water quality control (MOEE 1994) is required based on: the existence of the coldwater stream at the lower end of Forbes Creek; habitat issues related to the Speed River; and due to the existence of the PSW.

Stormwater management practices (SWMP) are described and evaluated in Section C 3.2. These include both primary and secondary control methods and are described under the three categories of lot level controls, conveyance controls and end of pipe controls. It is anticipated that a combination of several of the measures outlined in this section will be required to meet water quality targets.

E 1.3.2 Stormwater Quantity

As discussed above, stormwater management practices (SWMP) are described and evaluated in Section C 3.2. These include both primary and secondary control methods and are described under the three categories of lot level controls, conveyance controls and end of pipe controls. It is anticipated that a combination of several of the measures outlined in this section will be required to meet water quantity targets. Generally, post development conditions will need to match pre development conditions and they will need to meet instream erosion targets. In addition, discharge to the Speed River PSW will require volume control.

Five possible stormwater management (SWM) pond locations for end of pipe controls have been identified within the area south of Blackbridge Road. SWM pond

locations have been identified for individual catchment areas but have not been evaluated with regards to their impact on natural heritage values and buffer conditions such as proximity to floodplains and sensitive vegetation communities. This evaluation needs to be completed as part of the more specific community planning and site control. SWM pond targets are presented in Section C.

E 1.3.3 Infiltration

Infiltration rates are generally highest along the easterly boundary of the study area near areas where bedrock outcrops. Infiltration targets are presented in **Table B 1.5.3** for a selected number of subcatchments. These recharge rates must be maintained or enhanced for each phase of development. If a development straddles two areas, a prorated recharge rate (based on area) should be determined.

E 2.0 IMPLEMENTATION FRAMEWORK

The Forbes Creek subwatershed is comprised of natural heritage features and functions that are inter-related. These features are identified and defined with varying degrees of environmental sensitivity. The management premise is that you protect those areas and functions that are certain to be environmentally significant and provide opportunities to further assess those areas with marginal environmental significance or sensitivity in more specific planning exercises and development processes that are prerequisites to development. Implementation of these management options which reflect the goals and objectives of the subwatershed study are discussed under the following headings:

E 2.1 Interim Land Use Management Strategy

E 2.2 Greenspace Management Strategy



E 2.3 Aquatic Rehabilitation Strategy	City OP	PSW, ESPA, LSNA, floodline, Community Plan recommendations (i.e. Buffers)
E 2.4 Conceptual Trail Strategy		
E 2.5 Environmental Impact Studies (EISs)		These amendments should be completed as soon as possible upon the completion of the Subwatershed Study to ensure adequate protection.
E 2.6 Community Plan		
E 2.7 Class Environmental Assessments		
E 2.8 Best Management Practices		
E 2.9 Tree Protection		
E 2.10 Adaptive Management Strategy		

While the majority of the information outlined in the foregoing headings can be applied to the whole of the study area, specific components will generally be applicable only to the area anticipated for development as outlined in the Regional Official Policies Plan of the Regional Municipality of Waterloo and in the City of Cambridge Official Plan. This area is generally described as south of Blackbridge Road and east of Guelph Avenue.

E 2.1 Interim Land Use Management Strategy

The City of Cambridge Official Plan (OP) and Region of Waterloo Official Policies Plan (R.O.P.P) should be amended to incorporate recommendations from the Forbes Creek Subwatershed Study. Furthermore, these changes should occur prior to the Community Plan since many features will not be included in the boundaries of a future Community Plan (e.g. are located north of Blackbridge Road and/or north of Regional Road #24). Specifically, the amendments would include:

R.O.P.P. PSW, ESPA

E 2.2 Greenspace Management Strategy

The Greenspace Management Strategy is comprised of a Natural Heritage System, Aquatic Rehabilitation Strategy, Conceptual Trail Strategy and EIS requirements. The Greenspace Management Strategy will protect the key environmental features associated with the Forbes Creek subwatershed and expanded study area and preserve their functions. These features and functions are included due to their role and significance in achieving the goals and objectives of the Subwatershed Study. The Natural Heritage System can be described as being comprised of Core Areas (which include existing and proposed ESPAs and LSNAs, in addition to PSWs, High and Medium Constraint Areas, Regional Environmentally Significant Discharge Areas and Regulatory Floodplains); Aquatic Habitat; Buffers; Linkages; and Enhancement Areas. The organization chart first introduced in Section E 1.1 is provided again to assist in explanation. The Aquatic Remediation Strategy, Conceptual Trail Strategy, and EIS Requirements are explained under separate sections (E 2.3 to E 2.5) due to their importance in the implementation of the study.

Greenspace Management Strategy					
Aquatic Remediation Strategy	(Refer to Section E 2.3)				
Conceptual Trail Strategy	(Refer to Section E 2.4)				
EIS Requirements	(Refer to Section E 2.5)				
Natural Heritage System	Core Areas	Aquatic Habitat	Buffers	Linkages	Enhancement Areas
	- Environmental Policy Areas (PSW, ESPA, LSNA) - Environmental Constraint Areas (High & Medium) - Regulatory Floodplain Areas				

It is recommended that the Natural Heritage System components appear on appropriate mapping and with appropriate text in the Community Plan to support the goals and objectives of the Forbes Creek Subwatershed Study. These mapping designations would include Natural Heritage Corridor, Open Space, Provincially Significant Wetlands, Locally Significant Natural Areas and Environmentally Sensitive Policy Area designations, buffers and perhaps Enhancement Areas to protect and enhance the environmental features contained within their boundaries (see [Figure C 3.3.2](#))

These Natural Heritage System components and features can be complemented through the Community Plan process by the establishment of parks and open spaces and other complementary land uses consistent with the Greenspace Management Strategy (see Section C 3.3.2 – Management Alternatives). This may include portions of the Conceptual Trail Strategy (as per Section C 3.4) within those areas that are not sensitive to environmental disturbance.

Opportunities by both public and private interests to enhance habitat cover and linkage functions outside existing Core Natural Heritage System areas (i.e. buffers and enhancement areas) include:

- consolidation of fragmented natural habitats or irregular natural feature boundaries in the lower and upper Subwatershed using naturalization, reforestation, and/or habitat restoration
- protection of successional habitats on the same basis as more mature habitats
- enhancement of stream and wetland corridors to exceed existing vegetated buffer widths to achieve a total corridor width of 250 to 300 m through the lower subwatershed
- naturalization of portions of public open space and private recreational lands
- integration of new or established features (hedgerows, small woodlots, successional features, utility easements) as linkages
- landscape-level management of species diversity, through the widespread promotion and use of native plant materials and the control of invasive, non native species including areas such as streetscapes and public parks.

In order to successfully integrate identified natural features and expand opportunities in the context of creating a net gain of local corridor functions and to increase the proportion of woodlands to offset the change in land use,

consideration must be given at the Community Plan and Subdivision level to ensure that:

- Core features reliant on local overland flows and groundwater conditions are adequately protected
- Features and their natural functions and attributes are protected, by means of buffering, fencing, development setbacks and other site specific management approaches
- Habitat augmentation or restoration occurs to reinforce habitat cover in the Forbes Creek corridor, improve habitat connectivity, and enhance ecosystem functions after development (includes conservation easements on private lands, buffers on public lands, naturalization of disturbed or degraded lands to be dedicated as public parks, stormwater management wetlands, naturalized utility easements, culvert retrofitting for wildlife movement).
- Locations and standards for trails, stormwater management facilities, and other infrastructure are compatible and protective of natural features and functions in the long term.
- Landownership (private versus public versus Conservation Easements) of natural features.
- Control of invasive, non-native species.

Buffers provide a key component in the Natural Heritage System. A substantial increase in natural cover can be most effectively achieved through the adequate buffering of existing natural cover (forests, wetlands), riparian corridors and stormwater facilities, and naturalization of utility corridors wherever available. Buffers (50 metres adjacent to the PSW unless re-evaluated by a scoped EIS) and enhancement areas to retain ecological functions under future conditions are consistent with the “adjacent land” definition in the Provincial Policy Statement. Normally, any adjustments to the recommended buffers and other

protective measures for these features are determined on the basis of site specific Environmental Impact Studies (see Scoped and Full Site EIS Requirements). R.O.P.P. provide a definition for the expression “contiguous to” that may be more or less than the suggested buffer widths. This is dependant on the ESPA location and site conditions.

The plan will be implemented by the City of Cambridge in conjunction with the major stakeholders and relevant government agencies. The timing of implementation for the various sections of the Greenspace Management Strategy should be at the Community Plan, Draft Plan of Subdivision, Scoped EIS reports for the specific areas of the subwatershed. It is the intent that the Community Plan for applicable areas of the subwatershed will implement the recommendations of the subwatershed Management Strategy through the formulation of specific policies. The Greenspace Management Strategy provides the framework for protection, enhancement, and use of ecological resources in the area.

The Greenspace Management Strategy for the subwatershed incorporates the following key features:

- Identify responsible agencies for each component of the open space
- Identify ownership options of the ecological resources (private / public / easements).
- Incorporate natural regeneration and naturalization of buffers required along Forbes Creek and for areas between the ESPA areas (both proposed and existing).
- Incorporate the Aquatic Rehabilitation Plan for the conservation and rehabilitation of the ponds and associated wetlands
- Develop community accessible trails within the Open Space that are ecologically sustainable.

- Conduct Environmental Impact Studies where proposals exceed protective thresholds, or where information to support detail design is considered inadequate.
- Outline and initiate a monitoring program that defines limits of acceptable change for sedimentation, bank stability, aquatic and riparian vegetation for the open space areas.
- Further define buffer widths of ESPAs, wetlands, hedgerows and riparian communities.
- Develop and implement public education and stewardship programs outlining terrestrial protection, conservation, rehabilitation/enhancement, principles of the Community Trails, approach to personal property use, community stewardship and monitoring.

Many of these items will be more fully investigated through a subsequent Community Plan and implementing Official Plan amendment policies that will designate land use.

E 2.3 Aquatic Rehabilitation Strategy

The preferred management option regarding the management of the ponds and related watercourse channel of Forbes Creek includes retaining components of the ponds while rehabilitating portions of the channel. These actions will assist in rehabilitating the entire watercourse system to an improved state that better reflects a stable and functioning natural system. These actions will be directed through an Aquatic Systems Rehabilitation Plan for Forbes Creek. The Plan will follow the recommendations outlined in Section C 3.1 and E 1.1.5

E 2.4 Conceptual Trail Strategy

It is necessary that a Conceptual Trail system be supplied by this Conceptual Trail Strategy and through more

comprehensive trail analysis at the Community Plan stage. The general goals of the trail system are:

- to encourage passive recreational use of least environmentally sensitive or most resilient natural areas.
- to provide non-motorized options for people in a way that is efficient, convenient, enjoyable, and reasonably safe.
- to channel pedestrian traffic away from areas of special ecological sensitivity, steep slopes, areas of erosion, and to discourage the creation of new unauthorized trails.
- to provide a degree of pedestrian and wildlife safety in a natural setting.
- to provide opportunities for the appreciation of nature.
- to design trail treads with pervious material.
- to provide a healthier, better informed, appreciated, human/environment relationship.
- to facilitate efficient maintenance by parks staff.
- to provide connection to existing and future communities and to serve as links in the trail network spanning Cambridge.

The specific components are described in Section C 3.4 with conclusions listed in Section C 3.4.9 to be considered and implemented. In order to help guarantee the longer term success of the trail system, participation by the public should be considered.

E 2.5 Environmental Impact Studies

Current policies including the Provincial Policy Statements, Regional OP Policies, and the City OP provide a hierarchy of significance and protection for environmental features. The existing policy framework suggests “No Development” within:

Table E 2.5.1 Scoped and Full Site E.I.S. Requirements in Forbes Creek Subwatershed

Subwatershed Area		Area South of Blackbridge Road (including Extended Study Area)				Area North of Blackbridge Rd (incl. Extended Study Area) ****		
		Within 50 m but greater than 30 m from PSW		Within 30 m of PSW		Stormwater Management Facilities ***	Within 30 m of Natural Features	
Type and Location of of Development		General *	Full Service Trails **	General *	Full Service Trails **	Scoped or Full Site ***	Scoped ****	
EIS Level of Detail		Scoped	Scoped	Full Site	Scoped	Scoped or Full Site ***	Scoped ****	
Biological Inventory	TERRESTRIAL RESOURCES							
	Document natural features within 50/30 m buffer area to be affected	X	X	X	X		X	
	Updated seasonal surveys of vegetation			(X)	(X)		(X)	
	Updated seasonal wildlife surveys (mammals / amphibians / reptiles)			(X)	(X)		(X)	
	Identify critical habitat areas & features to be avoided			X	X		X	
	Document existing disturbance levels in buffers, habitat areas and corridors	X		X	X		X	
	Document critical dependencies of nearby significant species / habitats (i.e. minimum habitat requirements, habitat age & structure, hydrology, connectivity to other habitats)			X	X		X	
	Indicate location of existing tree cover	X	X	X	X		X	
	AQUATIC RESOURCES							
	Verify location of known fish habitats and species			(X)	(X)		(X)	
Document dependencies of identified fish habitat / species			(X)	(X)		(X)		
Biological Impact Assessment	TERRESTRIAL AND AQUATIC RESOURCES							
	Describe direct effects on significant species, habitats and functions(short- & long-term)	(X)		X	X		X	
	Describe indirect effects on significant species, habitats and functions (short- & long-term)	X		X	X		X	
	Document mitigation or enhancement required to maintain & improve terrestrial & aquatic species and habitats	X	X	X	X		X	
	Summarize cumulative effects	X	X	X	X		X	
	Groundwater	Confirm hydrostratigraphy (including shallow groundwater system)	(X)		X	X		
		Confirm groundwater recharge / discharge conditions and rates (specifically Regional Environmental Significant Discharge Areas)	(X)		X			
		Confirm site-specific connection between groundwater and wetlands	(X)		X	X		
		Confirm site-specific connection between groundwater and Forbes Creek	(X)		X			
		Document existing site-specific groundwater quality	(X)		X			
Evaluate risk of impacts to site-specific and downstream groundwater quantity & quality based on development proposal	X	X	X	X	X	X		
Identify mitigation measures	X	X	X	X	X	X		
Surface Water	Complete Storm Water Management Plan in accordance with guidelines in Subwatershed Study	X		X		X		
	Identify areas prone to sediment damage or quality impacts	X		X		X	X	
	Identify potential impacts to buffer performance & downstream wetlands based on proposed runoff quantity changes (including event related seasonal hydroperiod changes)	X		X	X	X	X	
	Identify potential impacts to buffer performance & downstream wetlands based on proposed runoff quality changes	X		X		X		
	Identify mitigation measures	X			X	X	X	
Monitoring	Base on recommended monitoring in Subwatershed Study/Comprehensive E.I.S.	X	X	X	X	X	X	

General * - includes residential, commercial or parkland development; stormwater management facilities will require 'General' Full Site EIS if they occur within 30 m of the PSW, in addition to Scoped requirements listed under Stormwater Management Facilities ***)

Trails ** - assumes full service, asphalt surface all-season trails; soft-surfaced seasonal trails do not require EIS.

Stormwater Management Facilities *** - facilities located outside the 30 m minimum buffer will require Scoped EIS; those proposed within 30 m will require Full Site EIS (under General *)

Area North of Blackbridge Road (incl. Extended Study Area) **** - assumes low intensity rural development; more extensive development proposals may require Full Site EIS

(X) - Discretionary; may be requested by City, Region or GRCA if existing information is considered out of date (> 5 years old) or otherwise inadequate given proposed development

- Provincially Significant Wetland boundaries
- Forbes Creek
- Forbes Creek regulatory floodplain (other than limited development of SWM facilities)
- Approved ESPA's
- LSNA designated Class 1 (Significant Natural Feature) Open Space

Limited development may be considered in the existing policy framework however only after consideration to the environmental significance of features and functions through the completion of supplementary Environmental Impact Study (EIS) investigations (see **Table E 2.5.1**) relating to proposals for encroachment into:

- Locally Significant Natural Areas (not designated Open Space)
- woodlots / forested areas
- groundwater infiltration zones
- locally significant wetlands (not within ESPA or designated LSNA)
- buffer areas

As outlined in Section E 1.1.4 (Buffers), it is recommended that Option 3 be implemented incorporating a 50 metre buffer surrounding the Provincially Significant Wetland features south of Blackbridge Road (30 metres north of Blackbridge Road) as discussed in Section C 3.2.2 and shown on **Table C 3.3.1**. This buffer width may be subject to further refinement if it can be supported through an environmental impact study. However, a minimum buffer of 30 metres must be implemented to provide protection to the features and their functions. Option 3 also recommends the supplemental provision of enhancement areas in the lower watershed in order to maintain existing corridor functions in accordance with provincial, regional and City policies.

This subwatershed study has been conducted to the level of a Comprehensive Environmental Impact Study which defines limits of development and recommended management strategies under future conditions. Scoped or full site Environmental Impact Studies should be required where proposals exceed protective thresholds identified in the Subwatershed Plan, or where information to support detail design is considered inadequate. In general, the more extensive the encroachment/interference, the more detailed the required studies to examine alternatives, identify impacts, and recommend means to avoid or reduce impacts. Typically, such EIS investigations must address impacts to groundwater and vegetation where development of various types is proposed within buffers or protected natural features, or where adequate "functional buffering" is desired (e.g. for stormwater facility placement and functional design). EIS studies will be completed by the development proponent, to the satisfaction of the City of Cambridge and those public agencies having jurisdiction.

The EIS Table summarizes EIS requirements in different areas of the subwatershed and extended study area. Development beyond the 50 m buffer can usually occur without the need for an EIS, subject to findings of the Community Planning process which will identify the recommended enhancement areas required to maintain corridor functions in the lower subwatershed. Full service trail development (i.e. asphalt surface) would not be allowed within buffer areas, or natural (limestone screening or wood-chip surface) closer than 15 metres to wetland features except under guidance of an EIS.

Full site EISs may rely on data collected for the Subwatershed Study for up to five (5) years after the adoption of the study by the City. However, updated or more site-specific information may be requested by the City, Region or GRCA depending on the nature of specific proposals.

E 2.6 Community Plans

Community Plans are a requirement of the City of Cambridge. They are described in Section 3.2.1.2 of the Official Plan as a document to:

“...provide guidance and a framework within which approvals for amendment to the Official Plan or for plans of subdivision, zoning, site plans and other applications can be considered, building on other policies of the Official Plan and recommendations of watershed plans and other special studies, to provide a greater level of detail on how an area will develop. They implement such matters as the design and layout of trunk infrastructure, the protection of natural systems and built heritage resources over broad areas, the identification of hazard lands, and the planned function and coordination of individual developments for diverse and compatible land uses.”

Issues that will be more precisely defined in the Community Plans will relate to road and servicing crossings, density of development, the size of buffers from environmentally significant areas, identification of areas to be acquired or zones to accomplish the enhancement area functions under future development, and site specific criteria for the preparation of Environmental Impact Studies. The Regional Wellhead Sensitivity Protection Area will also be reflected and implemented through the Community Plan.

Community Plan recommendations must achieve the following management measures:

- identify steps to implement buffers and their policies explaining the criteria for establishing the width, use and location;
- identify steps to implement the aquatic rehabilitation procedures that provide for the

improvement of the watercourse system from an environmental perspective;

- identify steps to implement the Conceptual Trail Strategy goals and methods of creating them as part of Community Planning and or subdivision plan process;
- provide direction on the implementation of the Water Management Strategy concerning stormwater and infiltration opportunities;
- implementation of an adaptive environmental monitoring strategy that provides for the continuous municipal assessment of the Forbes Creek ecosystem;
- recognition of the Forbes Creek Subwatershed Study as integral to planning and development within this portion of the City of Cambridge;
- recognizing that tree protection is an important part of the protection of the natural heritage features identified. Policies should be administered to follow the intent of preservation of these areas;

Issues related to phasing of development should also be implemented through the Community Planning process. The purpose of phasing is to identify inter-development timing dependencies for construction of stormwater and environmental management infrastructure which would serve to:

- minimize overall cost
- minimize environmental impacts due to repeated construction disturbance
- minimize requirements for temporary works
- avoid liability associated with impacts of out-of-phase works

Typically, new development does not proceed in a sequence which is compatible with the timing and need for

major infrastructure projects. This is particularly true of drainage works. When this occurs, it is necessary to have a good understanding of the dynamics of the proposed system along with all its interdependencies. These include temporary works, SWM facility staging, centralization, stream corridor management and the maintenance of “out-of-phase” linkages. The Community Plan process will confirm servicing requirements that will trigger any necessary Environmental Assessment.

The Greenspace Management Strategy in particular needs to be implemented through the Community Planning process and prior to development occurring so to establish and protect the watercourse corridor south of Blackbridge Road and take advantage of rehabilitation opportunities associated with development related infrastructure (e.g. the siting of storm water management facilities). Funding and implementation of the Greenspace Management Strategy may be possible through Development Charges process. Use of the Holding Zone land use designation may be considered for the Greenspace Management Strategy in the interim. There may also be a role in the development community initiating some of the preliminary investigations further in the interim. The City may wish to investigate these possibilities further.

E 2.7 Class Environmental Assessments

The subwatershed planning concept has been recognized in current guidelines including the “Stormwater Management Practices Planning and Design manual”, Ministry of the Environment and Energy / Ministry of Natural Resources, June 1994, and MEA, “Class Environmental Assessment for Municipal Water and Wastewater Projects”, 1993.

In essence, this approach represents the integration of long range planning and environmental assessment

incorporating the following environmental planning principles:

- consultation with affected parties early and throughout the process
- consideration of a reasonable range of alternatives
- identification and consideration of the effects of each alternative on all aspects of the environment
- systematic evaluation of alternatives in terms of their advantages and disadvantages to determine their net environmental effects
- provision of clear, complete documentation of the planning process to allow for traceability of the proponent’s decision making process

The Subwatershed Study has initiated the Class EA process to ensure that environmental impacts and issues are being identified as early in the process as possible. The Servicing Class Environmental Assessment is to be completed at the Community Plan stage.

Any other related projects that impacts the study area and requires a Class Environmental Assessment would need to consider the results of this study. This includes any servicing crossings of Forbes Creek not associated with a road crossing and the expansion of the Hespeler Road (Regional Road #24).

E 2.8 Best Management Practices

Where lands are designated and used for agriculture, agricultural Best Management Practices (BMP’s) are recommended to achieve subwatershed goals. These practices, outlined in Section C 3.5, are directly related to the protection and management of surfacewater quality and the reduction of non-point pollution sources. Such practices as conservation tillage, crop rotation and contour cropping

will assist in the prevention of soil erosion and potential nutrient loading to the related watercourses.

Where lands are designated and used for residential use, residential BMP's are recommended to address issues such as pesticide use on lawns, domestic pet manure, and related issues. These will include issues such as the fencing surrounding the Forbes Creek Sanctuary, the removal of debris and garbage near the railroad tracks, the elimination of trimming and cutting of the grassed area surrounding the Forbes Creek wetland and creek system.

E 2.9 Tree Protection

Opportunities to achieve the goal and objectives of the Subwatershed Plan may occur through other related land use processes and regulations. These may include the Regional Tree By-law and the City's Tree Management policies and guidelines. The Regional Tree By-law applies to all woodlots (rural and urban) 0.8 ha in size or greater. It does not apply to lands under draft plan of approval. The City Tree Management Policies and Guidelines for New Developments also provide a mechanism to protect, preserve, manage and replace forested areas within the City (Policy 6.4.1.4).

E 2.10 Adaptive Management Strategy (Monitoring)

It is recommended that an Adaptive Management / Monitoring Strategy be adopted and implemented on the subwatersheds. This section recommends that public agencies and public stewardship programs undertake the Systems and Post-Development Monitoring and that the During Development Program be undertaken by the developer. The During Development Program includes three phases: 1) pre-development; 2) during construction; and 3) guarantee period. The proponent is responsible for monitoring surface water, groundwater, and terrestrial

features which could potentially be impacted by construction.

A Monitoring Program is required to ensure the required management practices are performing as designed to determine whether the High and Medium Constraint areas are affected by future development. A comprehensive maintenance and monitoring program is required to ensure the proposed management measures for the development are adequate. The response program will also provide guidance for appropriate response actions if problems are identified.

The monitoring program is in three parts which includes:

- System Monitoring;
- During Development Monitoring;
- Post-development Monitoring.

The proposed proponents for the During Development Monitoring would be the developer. The proposed System Monitoring will occur across the Forbes Creek Watershed and will be carried out by the municipality and other agencies or groups (e.g., the Grand River Conservation Authority, the Ministry of Natural Resources, the Region of Waterloo or community groups). A table showing terrestrial aspects of the Natural Heritage System is provided. The scope of the During Development and Post Development Monitoring are limited to the developing areas. The proposed proponents for the Post-Development Monitoring would be the municipality. **Table E 2.10.2** outlines the base monitoring program components, requirements, and proponents.

Other parameters to be monitored as part of the Program are:

Groundwater: Groundwater levels should be measured during the spring, summer and fall at appropriate

Table E 2.10.2 Natural Heritage System Monitoring

Category	Feature / System	Parameters	Locations	Monitoring Evidence	Adaptive Management Response	Responsibilities & Resources		
Natural Heritage System – Terrestrial Component	PSW	<ul style="list-style-type: none"> Boundary integrity & revisions Buffer and setback condition Based on air photo review and field reconnaissance Frequency: Every 5 years or as part of Official Plan Reviews; opportunistically as part of development-related studies.	All PSW, ESPA, LSNA boundaries	<ul style="list-style-type: none"> Encroachments into boundaries Inappropriate buffer uses 	<ul style="list-style-type: none"> Review Zoning requirements Inform landowner(s) of boundary and buffer requirements Initiate restorative actions 	Lead Agency: City Other Partners: GRCA, Region Affected landowners; Development proponents		
		<ul style="list-style-type: none"> Ecological integrity including known physical and biological attributes Problem species Overall diversity of species and habitats Based on field studies in growing season Permanent monitoring plots would greatly facilitate Frequency: Every 5 years or as part of Regional Official Plan Reviews; opportunistically as part of development-related studies.	All PSW, ESPA, LSNA areas	<ul style="list-style-type: none"> Loss of quality species/habitat diversity Invasion of problem species Degradation of physical environment (e.g. erosion, sedimentation, soil compaction, alteration of hydrology) 	<ul style="list-style-type: none"> Initiate management study to determine causes and appropriate actions/options to deal with identified problems Identify and correct sources of physical degradation 	Lead Agency: City Other Partners: City; Region, affected landowners; Development proponents; naturalist groups community stewards; CWIP Program		
	Upland Forest	<u>Rural Area</u>	<ul style="list-style-type: none"> Review of rural forest boundary, area Review integrity of key physical & biological attributes Problem species Review of current forestry operations and practices. Based on air photo analysis supplemented by field studies in growing season. Permanent monitoring plots would greatly facilitate Frequency: Every 5 years or as part of Official Plan Reviews; opportunistically as part of development-related studies	Rural woodlots	<u>Rural Area</u>	<ul style="list-style-type: none"> Encroachments into boundaries Loss of species/habitat diversity Significant diseases Unsustainable forestry practices Invasion of problem species Degradation of physical environment (e.g. erosion, sedimentation, soil compaction, alteration of hydrology) 	<ul style="list-style-type: none"> Initiate management study to determine causes and appropriate actions/options to deal with identified problems Identify and correct sources of physical degradation 	Lead Agencies: City Other Partners: Region, affected landowners; Development proponents; MNR, naturalist groups and community stewards; CWIP program
		<u>Urban Area</u>	Review of forest integrity, buffer effectiveness, and human activity impacts. Based on field assessment in growing season. Frequency: Annual 'walk-throughs'; detailed review every 5 years or as part of Official Plan Reviews; opportunistically as part of development-related studies	Urban woodlots	<u>Urban Area</u>	<ul style="list-style-type: none"> Encroachments into boundaries Inappropriate buffer uses Loss of species/habitat diversity Invasion of problem species Degradation of physical environment (e.g. erosion, sedimentation, soil compaction, alteration of hydrology) 	<ul style="list-style-type: none"> Initiate management study to determine causes and appropriate actions/options to deal with identified problems Identify and correct sources of physical degradation 	Lead Agency: City Other Partners: affected landowners; Development proponents; naturalist groups and community stewards; CWIP program
		<u>Rural Corridors & Linkages</u>	<ul style="list-style-type: none"> Compare current rural corridors and linkages with those reported in this study Air photo analysis supplemented by ground truthing. Permanent monitoring plots would greatly facilitate Frequency: Every 5 years or as part of Official Plan Reviews; opportunistically as part of development-related studies	All SWS Plan identified corridors and conceptual linkages	<u>Rural Corridors & Linkages</u>	<ul style="list-style-type: none"> Loss of connectivity Disease or damage to corridor elements Degradation of physical environment along stream corridors 	<ul style="list-style-type: none"> Initiate corridor re-establishment through co-operative actions Identify and correct sources of physical degradation 	Lead Agencies: City Other Partners: GRCA, Region, affected landowners; Development proponents; stewardship groups; MNR; CWIP program
	Corridors & Linkages	<u>Urban Corridors & Linkages</u>	Review of urban corridors and linkages, based on field assessment in growing season. <ul style="list-style-type: none"> Permanent monitoring plots would greatly facilitate Frequency: Annually; integrated review during Official Plan Reviews; opportunistically as part of development-related studies	All SWS Plan identified corridors & conceptual linkages	<u>Urban Corridors & Linkages</u>	<ul style="list-style-type: none"> Loss of connectivity Disease or damage to linkage elements Degradation of physical environment along stream corridors 	<ul style="list-style-type: none"> Initiate re-planting and disease management strategies; Consult with local residents/users Identify and correct sources of physical degradation 	Lead Agency: City Other Partners: GRCA, residents and users; Development proponents; stewardship groups

monitoring wells. Groundwater quality samples from the wells should also be analyzed regularly for general chemistry.

Water Temperature: Maximum/Minimum thermometer placed in the tributary, checked regularly and recorded when water is flowing in the tributary. Alternately, a temperature datalogger (such as HOBO's) could be used to provide more detailed information.

Erosion Assessment: Two permanent erosion stations should be established on the watercourse. Channel renaturalization for the Forbes Creek will be carried out in conjunction with the proposed development. Once this has been completed and the system stabilized, cross-sections of the watercourse should be surveyed at the indicated locations. As part of the erosion assessment, a photographic inventory and inspection of the entire watercourse should be carried out annually to monitor any change to the cross-sections.

Terrestrial Resources: During the preparation of the Subwatershed Management Plan, a significant amount of data on vegetation and wildlife species and habitats was collected and recorded. This information will be updated as development occurs over a period of years, largely through additional Environmental Impact Studies (see Section E 2.3.), and future Official Plan Reviews. Table E summarizes:

- Features or Systems to be monitored
- Parameters to be monitored (including timing)
- Locations to be monitored
- Monitoring Evidence that warrants action
- Adaptive Management Response
- Responsible agencies/groups

Table E 2.10.1 summarizes key monitoring parameters, focusing on boundary integrity of features, ecological integrity indicators (species diversity, physical attributes), unauthorized activities, and problem species. Remote sensing using aerial photographs can document gross changes in shape, composition or density of vegetative cover. Permanent vegetation plots (monitored for composition, and vegetation type under the Ecological Land Classification system) and photographic inventories at fixed locations in key habitats and buffer areas are effective to produce a consistent base of long-term conditions.

The Subwatershed Study has indicated that wildlife movement and habitat utilization is extensive in the study area. From a monitoring perspective, wildlife are useful indicators of changes to habitat quality. As individual species and as species associations, birds can be excellent indicators of habitat quality that are readily surveyed in the appropriate seasons. The monitoring of habitat specialist bird species (rather than habitat generalists that will likely increase in number after development) during the breeding season, will provide an efficient sample of subwatershed terrestrial health and changes. Observations of birds, mammals and amphibians provide evidence of habitat and buffer adequacy. A network of permanent monitoring points in the PSW, enhanced corridor, and in upland forests within the upper watershed (including bird survey stations in areas at least 100 metres from the forest edge) would effectively track changes over time.

Table E 2.10.1 contains detailed specifications for site-specific monitoring, based on an approach developed by the City of Waterloo, Regional Municipality of Waterloo, and City of Kitchener. The City and GRCA should develop resources and personnel equipped for this level of monitoring. Over time, stewardship programs and local naturalists can be trained to collect this information using

established protocols (Ontario Breeding Bird Atlas, Marsh Monitoring Program).

Water Quality: Water quality samples should be taken during the spring, during the fall and during the summer after a rainfall event greater than or equal to 25 mm. The samples should be analyzed for concentrations of suspended sediments, bacteria and phosphorus, in situ measurements of dissolved oxygen, temperature and flow should also be carried out at the time of sampling. Where infiltration of road runoff is approved, groundwater should be monitored for salt.

Benthic and Fishery Inventories: For the perennial portion of Forbes Creek near the downstream end, sampling of benthic and fish communities is recommended. Fisheries data collected during the Subwatershed Study will assist in the development of an existing fisheries database.



Table E 2.10.1 Base Monitoring Program

Monitoring Stage	Phase	Proponent	Items to be Monitored	Time Frame
System Monitoring		Municipality or Public Agencies with Jurisdiction and/or Local Citizen Groups	Streamflow levels, groundwater levels, water temperature, erosion, vegetation, wildlife, water quality (surface water and groundwater), benthics and fisheries (if required)	Ongoing
During Development Monitoring	Pre-Development Phase	Developer	Surface water and groundwater (monitor levels and analyze samples), buffers, fisheries and benthics (if required)	To be proposed and approved at Draft Plan submission stage. Program must be conducted for at least two seasons prior to construction and will continue until the end of the guarantee period. A summary report is to be submitted at the detailed design stage.
	During Construction Phase	Developer	Erosion and sediment control measures, buffers.	To be proposed with the detailed design submission (erosion, sediment control plan and landscape plan). Weekly reports are to be submitted to the City during active construction (checklist style) from start of grading until completion of base asphalt).
	Guarantee Period Phase	Developer	Performance of at-source and conveyance infiltration facilities, end-of-pipe facilities, buffers.	To be proposed with the detailed design submission. Annual reports are to be submitted to the City. Continues from the end of the during construction phase to the end of the guarantee period (2 years from substantial completion of areas tributary to the pond), provided that performance is satisfactory.
Post Development Monitoring		Municipality and Region	Performance of stormwater management facilities. Wildlife, vegetation, benthics, fisheries.	To be submitted with the final Guarantee Period report ,and will recommend exactly what monitoring activities will be required. Ongoing



E 3.0 SUMMARY RESOLUTION OF ISSUES AND PROBLEMS

The goal of the Forbes Creek Subwatershed Plan is to protect, maintain and enhance the ecological processes and functions and significant natural features of the

subwatershed in a way which is environmentally sound and socially and economically sustainable.

The following table outlines the issues and tools/requirements identified in the outset of the study and discussed in previous sections of the Subwatershed Plan.

Table E 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
1. AQUATIC 1.1 To identify, protect, maintain and enhance aquatic resources 1.2 To prepare a strategy for the aquatic component of the Forbes Creek Sanctuary 1.3 To determine the impact of bridges, dams and ponds on fish habitat 1.4 To determine the status, potential, and management objectives for Forbes Creek in accordance with the Grand River Fish Habitat Management Plan	A, B, C, E, F, G, I	Delineate and Protect green space system functions and features, Rehabilitate Forbes Creek and associated ponds, Maintain/improve riparian conditions along selected stream reaches.	Adoption and implementation of the Aquatic Rehabilitation Strategy
2. TERRESTRIAL 2.1 To identify, protect, maintain and enhance terrestrial resources 2.2 Identify, protect and manage Environmental Preservation Areas, Environmentally Sensitive Policy Areas and Regionally Significant Natural Corridors 2.3 To confirm the wetland boundaries and the status of the wetland complex 2.4 To prepare a strategy for the terrestrial component of the Forbes Sanctuary 2.5 To assess and provide recommendations for future management of the agricultural lands within the subwatershed 2.6 To determine a preferred Natural Habitat Network and the elements of a Natural Habitat Network/ Greenspace Management Plan as per the Regional Official Plan Policies	A, E, F, H, I, J A, B, C, F, H, I	Delineate and Protect green space system functions and features, Delineate and protect environmentally significant areas, Direct scoped EIS reports to guide adjacent development.	Adoption and implementation of the Greenspace Management Strategy



Table E 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
2.7 To determine appropriate woodlot and vegetation management strategies.			
3. NATURAL HAZARDS 3.1 To minimize the risk to life and property due to flooding and erosion	A, B, E	Implement appropriate BMP's that maintain / reduce runoff peaks and volumes, Delineate regulatory flood lines, Require levels of development and runoff peak and volume control that maintain existing flood lines, Manage floodplain as integrated whole within greenspace system.	Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy
4. SURFACEWATER RESOURCES 4.1 To preserve natural hydrological systems 4.2 To protect and manage surfacewater quality and quantity in order to ensure the future ability of Regional water-taking requirements and maintain the assimilative capacity of downstream wastewater treatment plants.	A, B, E, F, G D	Delineate and protect greenspace system functions and features, Rehabilitate Forbes Creek and associated ponds, Maintain /improve riparian conditions along selected stream reaches, Delineate and protect environmentally significant areas.	Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy
5. GROUNDWATER RESOURCES 5.1 To preserve natural hydrogeologic systems 5.2 To protect and manage the quantity and quality of groundwater resources 5.3 To determine implications on water quality and quantity from infiltrated stormwater runoff from development	D, F, H, J	Implement appropriate water quality control BMP's and promote infiltration and/or sedimentation control and maintain / reduce runoff peaks and volumes, Limit impervious cover, Promote water conservation, Protect greenspace system functions and features.	Adoption and implementation of the Natural Heritage Strategy and the Water Management Strategy
6.0 THE RURAL and URBAN ENVIRONMENT 6.1 To develop an ecosystem-based approach to land use planning and resource management in the subwatershed 6.2 To produce an implementation and monitoring plan to guide future development in the subwatershed	ALL ALL	Identify process related to implementing management options through land use planning and stewardship approaches. Identify monitoring requirements related to the management options.	Adoption and implementation of the Subwatershed Management Strategy composed of the following components: The Greenspace Management Strategy, The Aquatic Rehabilitation Strategy,





Table E 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
6.3 To determine and address the implications on development opportunities on the provision of infrastructure	D, E		The Water Management Strategy, Conceptual Trail Strategy and the Adaptive Management - Monitoring Strategy
6.4 To determine the current state of repair of bridges, dams and ponds and to develop long-term remediation recommendations which would address public safety, maintenance and operation, public use and aesthetics			
6.5 To determine ownership and management strategies of the Forbes Sanctuary.			
6.6 To determine potential road and servicing crossings of the Forbes Creek and associated wetlands and to assess the potential impacts of these crossings from an environmental perspective.		Provide options regarding servicing crossings of sensitive environmental features, Delineate and protect greenspace system functions and features, Delineate and protect environmentally significant areas.	
6.7 To determine the appropriate buffers from development			
6.8 To determine the location and status of any existing agricultural or municipal drains			
6.9 To determine a potential trail system with potential linkages (within and beyond the subwatershed) and interconnection of natural areas.			

Issues List for Table E 3.0.1

- A. Forbes Creek Wildlife Sanctuary – status and future plans – ownership, management;
- B. Bridges, Dam and Ponds – impact on fisheries, current state of repair, recommendations;-Fisheries – status, potential, management objectives (per Grand River Fisheries Management Plan);
- C. Wellhead protection area – implications for stormwater infiltration;
- D. Potential road and servicing crossings of Forbes Creek and its wetlands;
- E. Forbes Creek Wetland Complex – confirmation of wetland boundaries, buffers from development;
- F. Location and status of municipal drains;
- G. ROPP Elements of the Natural Habitat Network);
- H. Woodlot protection and vegetation management;
- I. Potential trail linkages (within the subwatershed and beyond) and interconnection of natural areas;
- J. Agricultural land classification and consideration





E 4.0 KEY RECOMMENDATIONS

These recommendations are to be read and implemented in conjunction with the findings and recommendations addressed in Section D 1.0 and D 2.0, with Section B: Detailed Study and Section C: Management Alternatives. These will be implemented through the policies of the Community Plan, Zoning, Draft Plans of Subdivision, Severances, Site Plans, and all other development applications and building permit applications subject to approval under the Planning Act and/or the Ontario Building Code Act.

Interim Land Use Management Strategy

It is recommended that land use amendments be completed to both Regional Official Policy Plan and City Official Plan Policies to recognize the PSW, ESPA and floodline features determined through the investigations of this study. These features are located in areas of the subwatershed that may not be included in future Community Plans and, therefore cannot rely on this mechanism for recognition. Some recommendations from the Community Plan (i.e. buffers) may also trigger amendments to City OP policies.

Greenspace Management Strategy

It is recommended that the Greenspace Management Strategy outlined in [Figure C 3.3.2](#) be adopted and implemented. The strategy will aid in the protection, enhancement, and use of ecological resources for the subwatershed. The strategy will be implemented at the Community Plan, Zoning, Draft Plan of Subdivision, Scoped EIS Studies and other such studies. As outlined in Section E 2.3, timing of the Greenspace Management Strategy should be at the Community Plan stage.

Policy Areas and Environmental Constraints

It is recommended that the Policy Areas Map ([Figure C 1.2.1](#)) and GMS ([Figure C 3.3.2](#)) be adopted and implemented in the Forbes Creek Subwatershed. These areas should be shown as Class 1 (Significant Natural Feature) Open Space in land use documents. This map amalgamates all constraint mapping relating to the vegetation and wildlife inventory completed as part of this plan. These include the related environmental features being the Regulatory Floodline, Provincially Significant Wetlands, LSNA and proposed ESPA sites, but does not include buffers of Constraint Level 1 lands. All future development application subject to approval under the Planning Act must conform to this Map and Plan.

Buffers and Enhancement Areas

Buffers are intended to protect habitats and key functions including: sensitive vegetative species and habitat, wildlife species and habitat for nesting or foraging, shallow groundwater movement, surface water quality, and local topography. Enhancement areas supplement the buffers to maintain natural corridor functions, and will contain naturalized cover, or Complementary Land uses. Section C 4.3 and [Figures C 3.2.1](#) and [C 3.3.2](#) define the recommended approach for buffers and enhancement areas, which can be summarized as follows:

- 30 metre buffer from features north of Blackbridge Road
- 50 metre buffer from features south of Blackbridge Road with the opportunity to reduce the buffer justified through an EIS process to no narrower than a 30 metre buffer
- a 250 to 300 metre wide enhanced corridor south of Blackbridge Road including enhancement areas.

It is recommended that these buffers, in conjunction with enhancement areas, be implemented to ensure that the key natural areas of the Forbes Creek subwatershed are maintained and protected. Development within natural features or their buffers will not be permitted without completion of additional Environmental Impact Studies. Grading within buffers may be necessary to create transitional grades between natural features and adjoining lots. Buffers should be designated as Class 1 (Significant Natural Features) Open Space and be publicly owned in order to preserve their integrity and function. However, the ownership of buffers and the dedication of buffers as parkland which serve a public function should be negotiated at the Community Plan level. Buffers around the proposed ESPA should be addressed in the Community Plan, if necessary. Where multiple features and constraints coincide (i.e. a PSW within a proposed ESPA) the greater buffer width will be applied.

Environmental Impact Studies (EIS)

Prior to any urban development, it is recommended that EIS investigations be carried out where encroachment is anticipated into the recommended buffer. These EIS studies will be completed at the expense of the developer and completed to the satisfaction of the City of Cambridge and other public agencies having jurisdiction based on the guidelines in Section E of this document.

Aquatic Rehabilitation Strategy

It is recommended that rehabilitation of riparian corridors associated with Forbes Creek and associated ponds be carried out prior to, and in accordance with the Community Plan. The remediation plan includes some channel rehabilitation and buffer plantings as outlined in Section C 4.1 and C 4.3. Any future plans to upgrade Blackbridge Road / culvert crossing by the City and/or culverts under Regional Road #24 by the Region should consider the

viability of enlarging the culvert size. This would improve the corridor function and improve the potential for the movement of wildlife through the culvert.

Conceptual Trail Strategy

It is recommended that the Conceptual Trail Strategy be established by implementation at the Community Plan stage. Detailed trail treatment and placement will occur at that stage where adjacent land use is determined and trail requirements are better understood. The specific components are described in Section C 3.4 with conclusions listed in Section C 3.4.9 to be considered and implemented. In order to help guarantee the longer term success of the trail system, participation by the public should be considered.

Water Management Strategy

It is recommended that the Water Management Strategy outlined in Section C 3.2 and E1.3 in this report be adopted and implemented for the Forbes Creek subwatershed. The intent of the Water Management Plan is to maintain existing peak flows, maintain the existing infiltration rates, and to reduce the post-development volume of runoff in order to protect local and downstream features. Where a single stormwater management facility serves more than one landowner, an appropriate cost sharing agreement should be implemented through the appropriate means (i.e., Draft Plan conditions, Community Plan, agreement, etc.). General stormwater management criteria are outlined in Section C 3.2 and include the following:

- maintain or enhance infiltration using at-source controls for rooftop runoff and pre-treatment facilities and infiltration trenches for road runoff;
- protect water quality by implementing a range of Stormwater Management Practices;
- provide stormwater quantity control; and

- provide erosion control measures for slopes and stream channels.

Adaptive Management Strategy (Monitoring)

It is recommended that the Adaptive Management Strategy outlined in Section E 2.10 be adopted and implemented in the subwatershed. This section recommends that public agencies and public stewardship programs undertake the Systems and Post-Development Monitoring and that the During Construction Program be undertaken by the developer. The During Development Program includes three phases: 1) pre-development; 2) during construction; and 3) guarantee period. The proponent is responsible for monitoring surface water, groundwater, and terrestrial features that could potentially be impacted by construction.

Best Management Practices

Where lands are designated and used for agriculture, agricultural Best Management Practices (BMP's) are recommended to achieve subwatershed goals.

Where lands are designated and used for residential use, residential BMP's are recommended to address issues such as pesticide use on lawns, domestic pet manure, and related issues. These will include issues which may be considered prior to the Community Plan such as the treatment of existing fencing surrounding the Forbes Creek Sanctuary, the removal of debris and garbage near the railroad tracks and the elimination of trimming and cutting of the grassed area surrounding the Forbes Creek wetland and creek system.

Future Urban Expansion

If all or part of the upper subwatershed is to be brought into the Urban Area designation of the Regional and City planning documents, the subwatershed study must be

updated and supplemented to address the environmental features and major infrastructure concerns on those lands as comprehensively as the present report addresses the lands south of Blackbridge Road.

Fluvial Options, Natural Heritage System Alternatives, Servicing Options, Subwatershed Management Requirements and Implementation Framework of the Subwatershed Study would need to be looked at in more detail if additional lands are to come into the Urban Designation.

Public Education

It is recommended that public education (referenced in many sections of this Plan) be implemented by the City of Cambridge, Regional Municipality of Waterloo, other public agencies and the development proponents at the time of development. The Region and the City would develop a consistent and comprehensive public education program that should include (but not be limited to) the following information:

- potential environmental impacts of the public's activities (e.g., fertilizer application, disposal of hazardous materials, etc.);
- groundwater protection strategies; and
- terrestrial preservation techniques.

This information could be used to provide information for local schools, neighbourhood associations and groups, real estate, and development industries and other relevant groups. The developer would use this information and distribute it to builders, real estate firms and potential home buyers (e.g., included in the offer to purchase and other correspondence). Educational signs would be provided as part of the construction work for the development. A Subwatershed Study List of Quick facts is a potential tool to

assist in the dissemination of data, info and findings from this study. The following framework is provided:

Quick Facts: Forbes Creek Subwatershed Study (2001) (Fact Sheet for Public Education Purposes)

- Total drainage area of subwatershed = 390 ha
- Drainage area above Blackbridge Road = 224 ha
- Drainage area below Blackbridge Road = 126 ha
- Drainage area of the expanded area = 40 ha
- Forbes Creek subwatershed in length = 3 km; width 2 km
- Approximate human population = 500 households (approximately 1500 people)
- Percent of subwatershed covered by 'wooded cover' = 15% (includes forests, woodlands, swamps and plantations)
- Percent of subwatershed covered by wetland = 13 (includes swamps)
- Percent of subwatershed covered by development = 12
- Percent of subwatershed covered by agricultural lands = 42
- Percent of subwatershed covered by vegetation = 83
- Percent of subwatershed underlain by sands & gravels = 85
- Percent of subwatershed where dolomite limestone bedrock outcrops at the ground surface near the railway embankment = 10
- Number of Provincially Significant Wetlands (PSW) polygon units found in the Forbes Creek subwatershed and expanded study area = 15
- Number of Environmentally Sensitive Policy Areas (ESPA) polygon units found in the Forbes Creek subwatershed and expanded study area = 0 (2 units have been recommended for designation by the Regional Municipality of Waterloo)
- Number of Locally Significant Natural Area (LSNA) polygon units found in the Forbes Creek subwatershed and expanded study area = 7
- Number of ponds exist both on-line and adjacent to Forbes Creek = 7
- Provincially or nationally 'vulnerable' (special concern), 'threatened' or 'endangered' species = none found
- Provincially Significant vascular plant species = 1
- Regionally Significant vascular plant species = 10
- Regionally Significant wildlife species = 9
- Vascular plant species = 279
- The Small Yellow Ladyslipper is used as the logo for the Forbes Creek Subwatershed Study and is a regionally significant vascular plant species

Quick Facts: Forbes Creek Subwatershed Study (2001) (Fact Sheet for Public Education Purposes)

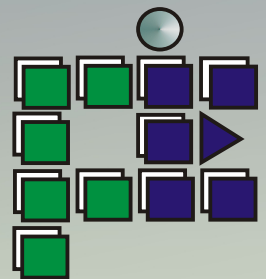
- Bird species = 114 (76 observed during the breeding season)
- Butterfly species = 26
- Mammal species = 15
- Damselfly and Dragonfly species = 13
- Amphibian and Reptile (herpetofauna) = 11
- Fish species = 7
- Number of existing private water supply wells = 121 (105 into bedrock)
- Number of municipal water supply wells = 1

These facts are only a few items extracted from the Forbes Creek Subwatershed Study. They are provided here to assist the reader in understanding the diversity and complexity of the Forbes Creek subwatershed. Please consult the study report for additional and more complete information and analysis.





F - References



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